

PRACTICAL HI-FI & AUDIO

MAY 1977 price 35p

AUSTRALIA 95c
NEW ZEALAND \$1.00
SOUTH AFRICA 75c
MALAYSIA \$3.25

£500 GARRARD COMPETITION

turntables &
cassette decks
to be won!

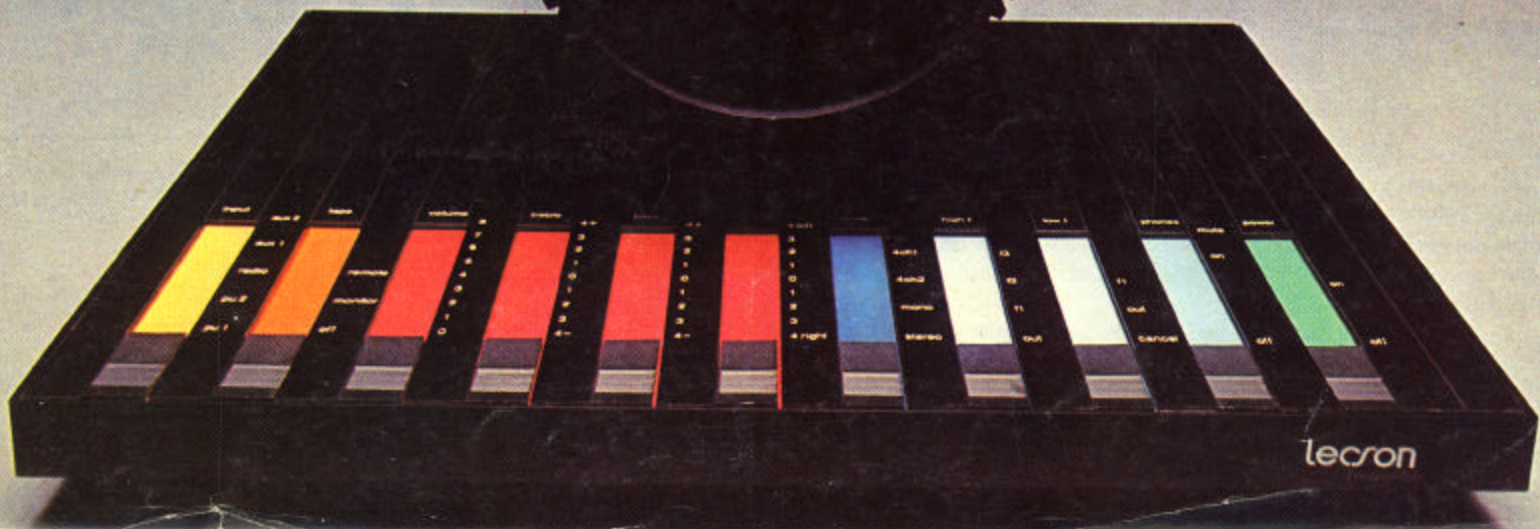


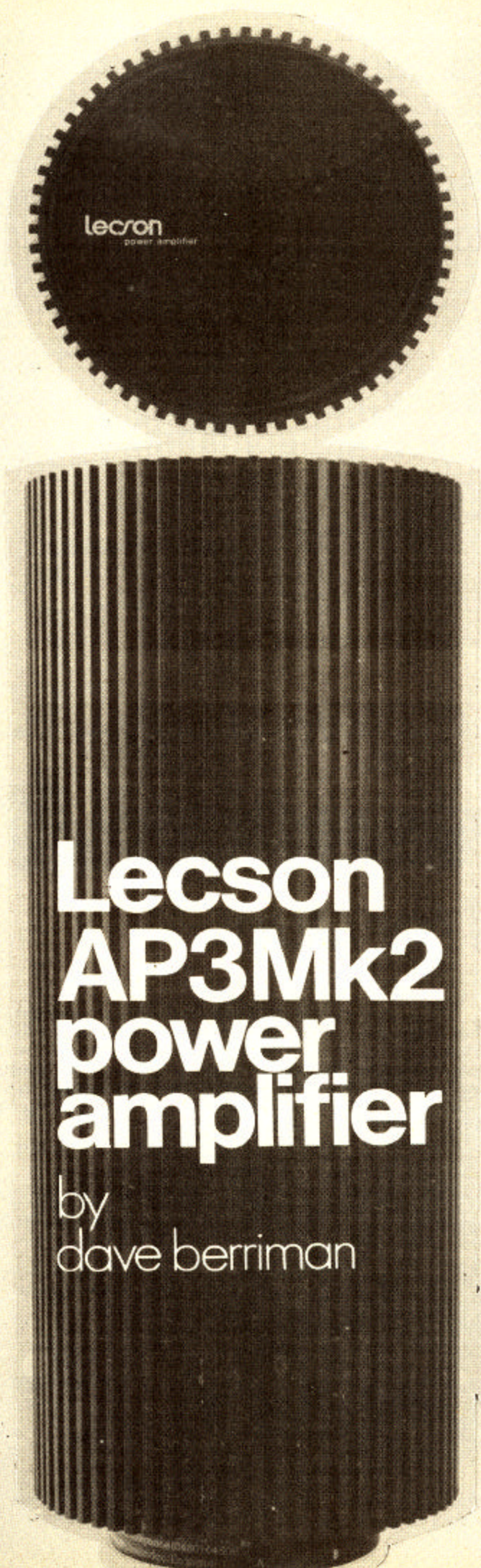
hi-fi on
a budget

-WHAT'S THE BEST
IN LOW-PRICED
EQUIPMENT?



LECSON'S
new 100-watt
power
amplifier
on test





Lecson AP3Mk2 power amplifier

by
dave berriman

AUDIOLAB special

REGULAR readers will have noted my constant praise for the sound of valve amplifiers—in general—compared with transistorised ones, and this has simply been because no transistor amplifier I have tried at home has bettered, or even equalled, my reference valve amplifier for overall 'musicality'. (That word again, I'm afraid!)

'Musicality' is not really as vague a term as some would suppose, but is a convenient way of saying that the music is allowed to reach the listener, despite the interjection of hi-fi equipment. To attain 'musicality', for me, equipment should fulfil all the following criteria, then it has a chance of at least approaching the reproduction of music realistically. In practice, however, 'musicality' remains something felt rather than analysed. Those criteria are:

- 1—Good reproduction of ambience so that the spatial distribution of musical forces, including three-dimensional depth, and their original acoustic environment can be re-constructed.
- 2—Good stereo imagery, which coupled to point number one, aids one to locate the original distribution of the players at the recording and recreates the acoustics of the original musical event.
- 3—Clear, open sound, not only in the mid-band but in the bass and treble, too; and, *ergo*, a lack of muddling of sounds.

- 4—Re-creation of the natural tonal balance and definition of the original instruments.
- 5—Smooth treble—ideally both smooth *and* clear—but not bright hard or gritty.

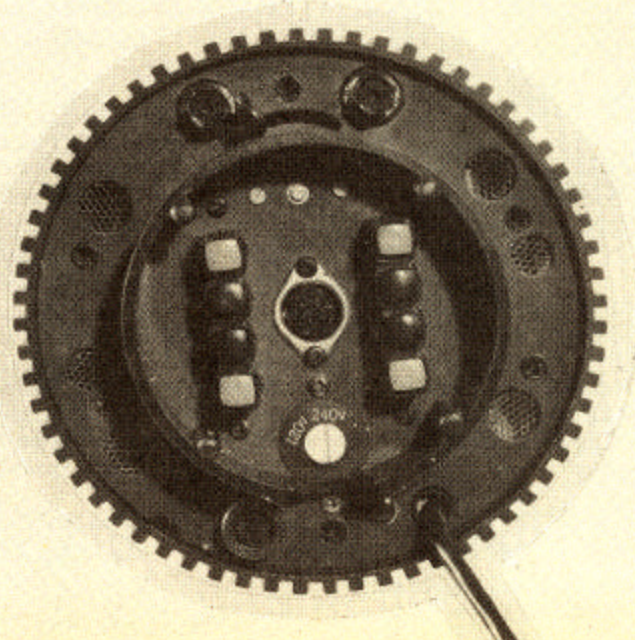
My opinions on valve amplifiers are based on my own experience, which is that virtually all of them fulfil the above criteria reasonably closely, something no transistorised amplifier that I have heard at home has been able to do—except the Naim Audio range. Harsh and gritty treble is probably the worst fault, and it is possible for an amplifier, while not coming up to scratch on the other points, to be enjoyable to listen to because it does not possess this fault. It may not attain the heady heights of ultimate reproduction—but if it is not expensive then it can, I feel be described as 'musical'.

Now the Lecson AP3 Mk2 is an expensive power amplifier at £199.00, excluding VAT, though not as expensive as some I have heard which could never, in my opinion, be described as musical. I decided to use a Lecson AC1 pre-amplifier with the AP3 for my listening tests, since these two have been designed to work together.

The AP3 Mk2 is the latest in the Lecson electronics line (along with the FM1 tuner) and has a minimum power output of 100 watts per channel. It has been designed with an eye (or should it be an ear?) firmly fixed on sound quality.

For instance, transient intermodulation distortion has been minimised by arranging for a wide open-loop bandwidth of around 20kHz with a slewing rate of 20V/μs, and the feedback components form a zero-pole compensation network. This results in the open-loop and closed-loop frequency responses being the same.

Lecson claim that within frequency limits, presumably up to 20kHz, there could not possibly be any transient disturbances.



The whole amplifier is designed to be as linear as possible before feedback is applied. In addition the amount of feedback is kept low to about 20dB. Curiously, this is typical of the levels of feedback applied in valve amplifiers, though often they had even less.

Apart from dc offset protection which isolates the loudspeakers to protect them in the case of dc appearing at the output, there are no protection circuits.

These have been omitted, say the Lecson design team, because they were found to be a cause of harshness in the sound quality. Instead, the output transistors have a 30amp capability and they have been fuse protected. The amplifier has been cunningly designed so that the output stage is claimed to be able to handle the full energy of the power supply without blowing up.

In the event of a short circuit, one of the fuses will blow to protect the output stage. I did not put this claim to the test, however.

Even the power transformer has entered into the sound-quality equation. Lecson have found that by using an over-rated power transformer with good regulation (in fact it is toroidal), comparatively small smoothing capacitors, and low levels of negative feedback, subjective bass reproduction is much improved.

Biasing the output transistors is always a problem and Lecson (and others) have found that the biasing of a class B stage alters according to the programme dynamics. By arranging for the bias transistor to be in thermal contact with one of the driver transistors instead of the more usual much larger output devices, thermal tracking is much improved due to the lower thermal delay between the two small devices.

Without close tracking, reproduction of music with alternate loud and quiet passages would suffer from periods of crossover distortion with attendant roughness for the few seconds it takes for the output stage to become thermally stabilised.

So there we have an overall picture of what Lecson are trying to achieve. Their aim is the reproduction of music rather than, say, low harmonic distortion figures, and their products have been designed to meet the former criterion first and foremost.

Fortunately, however, they have not ignored aesthetics. The original design work was carried out by Bob Stuart (the electronics) and Allan Boothroyd (the styling and production engineering), and I personally

find the appearance of the AC1 and AP3 to be unparalleled among amplifiers for sheer beauty—it's almost a work of art.

Measurements

Measurements are really pretty meaningless when it comes to telling you what the amplifier will sound like, but we decided to take a few on the AP3 as a matter of interest.

Power output at 1kHz with the channels separately driven to clipping was in the region of 140 watts per channel, and taking total harmonic distortion readings at 50 watts (which is the highest power I can go to with my test equipment for distortion) gave at 1kHz readings of 0.02 per cent which is down in the measuring limit of that equipment (about 0.025 per cent). In other words, I was simply measuring distortions generated outside the AP3!

At one watt and 1kHz into eight ohms, 0.025 per cent was measured—slightly higher, but still not a meaningful figure. The real level of distortion is much lower. At 10kHz at 50 watts I measured 0.09 per cent and at one watt it was 0.075 per cent THD, both into eight ohms. The limit of my equipment at this frequency is about 0.06 per cent, so we are really still reading my measuring-equipment's distortion, in the main.

Lecson claim less than 0.05 per cent at all power levels up to 100 watts at all frequencies between 20Hz and 10kHz with a typical figure of 0.005 per cent at 1kHz at 100 watts. Indeed the 'Customer Test Certificate' supplied with this particular AP3 (every amplifier they make receives one) shows figures of 0.006 per cent (left) and 0.005 per cent (right). The fact that my figures are not as low is *not* an indication that this AP3 is not up to specification, but simply shows up my test equipment as being not good enough!

Observing the distortion residual measurements on the oscilloscope did not reveal any crossover distortion at any of these powers and frequencies. Signal-to-noise ratio, including hum, worked out to 90dB unweighted, ref. to 100 watts into eight ohms and this tallies well with Lecson's claimed 90dB CCIR-weighted figure.

Overall, then, the AP3 Mk2 measures extremely well in steady state terms, but these measurements give no indication of its reaction to transient information such as a music waveform. That is best carried out by critical listening tests.

In order to find out what the AP3 sounds like I used it in

conjunction with a Lecson AC1 pre-amplifier, as mentioned earlier.

The AC1 has a long list of features which have, according to Lecson, been included for sound quality reasons. For instance the inputs are switched by FETs via reed relays, not for aesthetic reasons, or to prevent clicks and bangs as I had supposed, but because Lecson have found that an oxide layer forms on conventional switches, even gold plated ones, and this creates a small non-linear junction (like a diode).

This in turn produces distortion and sound roughness, as does the non-linear junction between the wiper and track of the potentiometers which are normally as used for volume controls. By placing their potentiometer in a feedback loop they claim this effect has been reduced.

In addition the filters have been designed for low transient distortion and the tone controls are completely by-passed when switched to 'cancel'.

All in all, then, the AC1 and AP3 Mk2 make an interesting pair, and my subjective findings are really for them both. I did briefly try the AP3 Mk2 with another transistorised pre-amplifier, which measures exceptionally well, but which gave very much inferior subjective results, even though I had previously thought this pre-amplifier to be good.

The AC1 proved lively, transparent and immediate with smooth treble and lack of muddling of sounds. Ambience was also well reproduced, and so it scored top marks for musicality.

These tests on the AC1 were necessary as I needed to know of its effect on the sound before connecting the AP3 Mk2 to it. Otherwise I wouldn't know how much it was contributing to the sound.

Well, I was duly impressed with the AC1, so I could now carry out some comparative tests between the AP3 Mk2 and my trusty Shackman valve amplifier.

Regular readers will know how this and my Quad II/22 (valved and obsolete) seem to see off transistorised opposition.

The II/22 is currently out of action pending an overhaul (which is a pity because when working, it is more transparent than the Shackman) but the latter amplifier is excellent and is a good reference for me.

Auxiliary equipment is extremely important, and so I used a Supex SD900E Super moving-coil cartridge mounted in a Hadcock GH228 arm on a Linn Sondek LPI2 with a selection of known records, and also a Pioneer TX9500 tuner. Loudspeakers were the Quad electrostatics which are not only very transparent over the whole audio band but also clearly reveal subtle changes in ambience and stereo imagery. They are also an awkward load, being highly reactive with a low impedance at high frequencies.

Listening to discs using the AC1 via both the Shackman valve amplifier and the AP3 Mk2 gave me a few surprises. The Shackman had the softer treble performance but the Lecson, though providing slightly more treble, seemed clearer yet with a smooth sound. So the AP3 Mk2 had clarity with an absence of harshness or grittiness, which is a desirable combination.

Bass of the AP3 Mk2 had more impact, and there seemed to be more of it. In addition, using a direct-cut disc, drum-kit sound seemed not only more controlled, but its position was more precise. Bass seemed more 'focussed' with the positions of the different drums making up the kit detectable.

Stereo imagery was also assessed by a playing a single-stereo-microphone recording of choral music and via the Lecson it was easier to pick out the positions of the sections of the choir. In addition, there was a greater clarity in the voices—the mouth sounds, for example, were clearly distinguishable.

When pushing both the amplifiers harder, the lower power (30 watts maximum) of the valve design manifested itself as intermodulation between the voices whereas the sound stayed clean with the Lecson even at higher levels. So the extra power of the AP3 Mk2 gave it the edge. *continued*

SPECIFICATIONS

| | |
|----------------------------|--|
| Nominal sensitivity: | 500mV for 100W into 8 ohms. |
| Minimum power output: | 100W per channel into 8 ohms. |
| Typical output: | 140W per channel into 8 ohms, 200W per channel into 4 ohms. |
| Total harmonic distortion: | Less than 0.05% at all power levels up to 100W between 20Hz and 20kHz. Typical 1kHz 100W figure is 0.005%. |
| Noise: | Better than 90dB unweighted below 100W into 8 ohms. |
| Open-loop response: | -3dB at 24kHz. |
| Frequency response: | Within ±0.5dB 20Hz-20kHz typical. |

Ambience via the AP3 Mk2 was exceptionally good for a transistor design and it took a lot of listening to detect much difference between the ambience performance of the two power amplifiers. The Shackman gave fractionally more ambience in the mid-band with a fuller and slightly 'rounder' quality, and lacking the upper clarity and stereo imagery of the AP3 Mk2.

My out-of-action Quad II/22 may have produced more ambience than either the Shackman or Lecson but that is merely a supposition.

If I were to list all the points where the AP3 Mk2 excels in sound quality over the Shackman valve reference I am bound to the conclusion that, overall, taking every factor into account, it beats it, which is really amazing.

The last transistorised amplifier I used which took my valve reference (then the Quad) to task was the Naim NAP250 and, though this was exceptional, I thought its weak point to be slight 'steeliness' in the treble.

I have not been able to directly compare the AC1/AP3 Mk2 with an NAC12N/NAP250, but I have been using exactly the same equipment as I used with the Naim a few weeks ago.

I am bound to say that the AC1/AP3 reminded me of the NAC12N/NAP250 with its similarly solid bass and good transparency, but it unquestionably had a smoother treble than the Naim. The Lecson lacks that 'steeliness' of the Naim, and since I am particularly sensitive to anything amiss in the treble I would prefer the AC1/AP3 Mk2 with this particular choice of auxiliary equipment.

I must point out, however, that the AP3 Mk2 should not be used with the Quad ESLs as a system due to the high power output—you could easily blow up the Quad ESLs. 54 watts (or below 66V peak-to-peak maximum) is really the safe limit—above that and you'll cause arcing between the diaphragm and plates with consequent permanent damage.

Returning to the AP3 Mk2 versus Shackman, I also carried out comparisons with some moving-coil loudspeakers, including the Lentek Monitors reviewed last month, and came to similar conclusions. I also realised that the AC1/AP3 works particularly well with the Lenteks and produced a particularly well-balanced sound.

Listening to the AC1/AP3 with Quad ESLs and Lenteks I was struck by the sheer enjoyment that could be derived from the music. It was easy to forget

the hi-fi. This, I feel, is the ultimate test for equipment. If there is something amiss, you can't relax and enjoy the music.

So on the points I listed at the start of the article, and on overall enjoyment, I feel that the AC1/AP3 stands head and shoulders above other amplifiers tested—except the Naim (which it is probably comparable to, and possibly beats on treble performance). In other words I find it a highly musical combination.

Considering that the AC1 and AP3 together cost just under £400 (exc. VAT), which is a good deal cheaper than a Naim NAC12N/NAP250 and power supply, then it is certainly good value and can be heartily recommended.

Discarding a value for money approach and adopting a how-good-is-it-at-any-price attitude I think it sufficient to say that I shall regard the AC1 and AP3 Mk2 as a transistorised reference, to use in addition to the Shackman, until—and if—something better arrives.

Minor niggles with the AP3 Mk2 include a fan which automatically turns on at quite a low temperature in order for the amplifier to comply with the old American FTC requirements. Though the noise it makes is very soft, Lecson are considering raising the temperature at which it turns on.

Apparently the latest FTC regulations are not quite as strict, and the elevated temperature should be quite satisfactory.

The AC1 and AP3 Mk2 lead me to the inevitable conclusion that careful design can give comparable results to valve designs, with different characteristics, between the two families. The valve still gives a smoother treble, which may well be preferable, and weaker bass performance—though which is most accurate will be a matter for debate.

It is likely that better valve designs will extract yet more ambience from the programme material. It seems that for transistor amplifiers to be comparable to valved ones the design must be done very carefully, whereas with valves it just comes naturally.

Putting this discussion to one side, the Lecson AP3 Mk2 and its partnering AC1 are a remarkable combination which offer the highest quality of reproduction from a subjective, musical enjoyment viewpoint. If you are considering spending £400 (exc. VAT) on amplification, then you should hear them with your proposed matching equipment. Then you'll be able to hear for yourself just what a Lecson can do.



'Listening in at Lecson'

WHEN we called in at Lecson's works in St Ives, Huntingdon, to collect the AP3 power amplifier for this month's review, we took the opportunity to look around the facilities they have there, and to talk to the people involved in the design and manufacture of that uniquely styled amplifier combination. The distinctive AC1 pre-amplifier (the slim, black box with its 'rainbow' of coloured controls) has now, been joined, by an exciting, matching fm tuner, complete with led tuning display and optional digital frequency readout, unit. Another innovation we saw and heard was the Lynette LB1 loudspeaker, indicating that Lecson are well on the way to offering customers a complete system. Both the tuner and loudspeaker should be with Lecson dealers when you read this.

All of which is good news for a company that was none too financially healthy not so long ago, but now, thanks to some enterprising leadership by Technical Director, Stan Curtis and Sales Manager, Mike Harris, has re-established itself in the top-end hi-fi market, both in the UK, and in Europe and the United States.

Looking around the factory, we were immediately impressed by the number of people actually involved in just testing the products. Half the staff of twenty-two, we were told. Reliability, unfortunately, was never one of the strong points of the old Lecson company, and now they are, if anything, over-zealous in their testing of every unit before it leaves the factory.

'We always had a good product', said Stan Curtis, 'but now we ensure every one we make is good!' That means each of the hundred or so amplifier combinations produced every month or so goes on a soak test—for two whole weeks. It also means that each power amplifier and pre-amplifier gets its own test card, signed by the tester, giving the exact power and distortion figures for that individual item.

Stan added that one of the problems of any manufacturer was variability in the quality of the components they bought in to make their products, whether it be transformers, semi-conductors or just simple switches. *Trouble is, the customer doesn't blame the supplier when one of these components goes wrong—why should he? No, he blames us, and rightly so.*

So now Lecson undertake rigorous checking of incoming components; having established a good reliability record at last, they intend to keep it.

Although the Lecson set-up, as our pictures show, is on a modest scale by some standards, one cannot help but be impressed by the

depth of facilities they have built up to ensure the quality of what they make. For instance, even though the loudspeaker side of the business is very much secondary to the electronics, they've gone to the trouble of building an anechoic chamber in one corner of the shopfloor, and elsewhere establishing a small listening room. And *each* loudspeaker they make goes through both technical evaluation in the chamber and listening tests. Conscientious isn't the word!

Evidence of Lecson's care for the customer lies in the small, but significant, fact that they have gone to the trouble of supplying connecting leads which will enable either the AC1 pre-amplifier or AP1, AP1X or AP3 power amplifiers to be used with other makes, ie to connect the AC1 to the Naim power amplifiers, or to use the AC1 with Quad or Radford valve amplifiers. Stan Curtis told us he was also considering modifying the virtually redundant four-channel outlets on the AC1 for patching in other equipment.

So, a pretty happy state of affairs up in St Ives at the moment (it's notable that Lecson's success also means a lot to many other firms on the St Ives Industrial Estate. Quite a lot of components, etc, come from local firms, including the stylish silk-screen printing for the amplifiers).

Inevitably, we got round to asking Mike and Stan about their ideas for the future of Lecson, new products, and the whole controversial business of amplifier sound in general. Stan Curtis said that they had a policy of *'modification and improvement to existing designs'*, either as improvements become necessary or as dealers requested them. The FM1 tuner, for instance, had been designed with a *'development life'*.

'We would never bring out a product that could not be refined', he commented. He added that Lecson would bring out new products *'gradually'* and certainly *'nothing would come out until we knew it was right'*. *'Yes, it would be advantageous to offer a complete Lecson system, but it would have to be for the right reasons'* ie not the purely commercial ones that propel many manufacturers into expansion. There was no chance of the AC1/AP1/AP3 being rendered obsolete, but they could be made better: the design still had great potential. There was the AP1X model, for instance, primarily intended for export, but now being supplied to UK dealers both to satisfy a supply problem and because many people had expressed preference for the sound quality of the 'X' version. *'It has a "stiffer" power supply'*, said Stan Curtis, *'and this leads to a tighter bass response which some listeners prefer'*.

Looking ahead, it was obvious they had great hopes for the Lynette loudspeaker, and on our way round the factory, we took time out to examine the design and listen to it. The loudspeakers come in matching pairs with inwardly angled baffles. Two drive units are employed (a Norwegian Seas tweeter and the familiar KEF B200) in a reflex enclosure with the ports filled with plastic drinking straws! (Actually, quite a common practice, and an original Gilbert Briggs' idea.) Mike Harris revealed that they planned to introduce a new monitor-quality loudspeaker, hopefully this coming autumn, utilising the existing HL1 horn-loaded loudspeaker box.

In the long term, Stan Curtis revealed that he was doing an enormous amount of research into why amplifiers behave as they do. Why do we have this phenomenon of *'subjective loudness'* in amplifiers? Why does the sound improve with minimum feedback (as in valve amplifiers)? He was certainly a firm believer in having the minimum number of signal-processing transistors in an amplifier. There was *'elegance in simplicity'*.

Stan added: *'I think we make very good amplifiers. But we also have a lot to learn; there is no "magic formula" for designing amplifiers'*.

'I am always looking at new—and old—amplifier designs. Currently, we're investigating the traditional Class A technique, but heat remains the problem. In the tuner field which is new to us, we obviously have a lot to learn from the Japanese on tuner technology. But it still comes down to the simple question "what does it sound like"? It's just no good reading the meters and leaving it at that!'

We asked if it was difficult to communicate that philosophy to dealers. *'Not at all'*, Mike Harris told us. *'We have nearly seventy dealers now, and they're all the sort of dealer that says "have a listen for yourself" to his customers. That can but do everybody good.'* (It's worth noting that about thirty per cent of Lecson dealers, according to Mike, actually use the product at home in their domestic hi-fi systems. Quite a recommendation.)

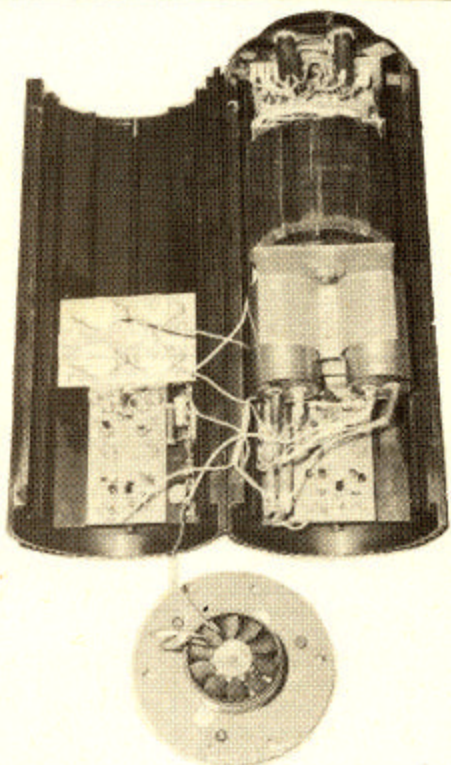
Finally, we asked Stan Curtis, as he removed—much to our astonishment—our review sample AP3 at random straight off the soak test shelves and put it in its box (there's confidence), how he would sum up Lecson as a company.

He thought a bit. *'Well, we can't compete in scale with the Japanese giants, yet we're also out to make a thoroughly reliable, value-for-money, and, naturally, excellent-sounding product. I suppose you could call us a "professional cottage industry"'*



Above and far left: Putting the Lecson electronics through their paces with some pretty demanding test equipment. Each and every amplifier emerges at the end with its own test certificate.

Right: A look inside the Lecson AP3 Mk2 power amplifier; note the fan in the top plate (necessary at one time to meet United States Federal Technology Commission regulations) and the massive toroidal transformer.



Below: Measuring one of the Lynette LB1 loudspeakers inside Lecson's new anechoic chamber.

