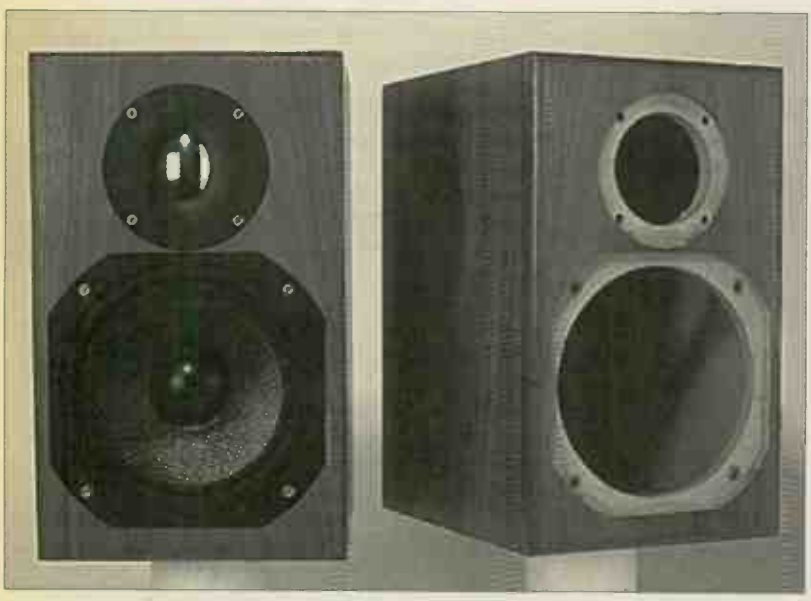
Hi-Fi WORLD

NO.38 AUGUST 1998

SUPPLEMENT

ASSEMBLAGE L-1 PRE-AMP KIT



BOOK REVIEWS:

Saga Of The Vacuum Tube
by Gerald E.J. Tyne

Stereophonic Sound Recording
by Hugonnet And Walder

PORT-TUNING KLS10 MINI MONITOR

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D.I.Y. Supplement

Contents

KIT NEWS

SIX-FIVE SPECIAL

For users of the 6550 valve, Sovtek are producing two upgraded versions, the 6550WD at $30.50 and the 6550WE at $33. Improvements to the specification include the use of thicker anodes and claimed increased linearity, superior tone and higher power output.

New Sensor Corporation
Sovtek/Electro-Harmonix,
20 Cooper Square,
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Tel: 001 (212) 529 0466

SONOR YOU KNOW

Designed around the Volt BM2500.4 bass driver, Wilmslow Audio's new Sonor loudspeaker is available both in kit and fully-finished form. Incorporating the Morel MDT33 tweeter and a passive crossover, the cabinet has a partially sloped front baffle which is intended to prevent standing waves.

The distributed-port reflex loading of the bass unit gives a claimed 91dB sensitivity and the overall frequency response +/-3dB is 34Hz-20kHz. The front elevation is (h) 900mm by (w) 305mm; in other words, 3ft by 1ft. Wilmslow recommend these 'speakers particularly for all types of Rock music and will supply them complete in Dark Oak, Cherry or Black Ash, factory-built, for £1600. The kit is available either with the 1in. MDF flat-pack cabinet included for £1025 or without for £799.

Wilmslow Audio
50 Main Street,
Broughton Astley,
Leicester LE9 6RD
Tel: 01455 286603

COLOMOR RELOCATE

After more than 25 years at their Goldhawk Road emporium, Colomor (Electronics) Ltd. have moved lock, stock and barrel to Sussex (by the Sea). Hi-Fi World was told that business is continuing as usual with a wide range of valves and high-voltage capacitors as well as an enlarged choice of chokes and transformers. Customers and well-wishers can find them at:

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Golden Dragon's lab coats have come up with a 'back-to-basics' version of the famous KT66 output valve. For those of you despairing of ever finding a matched pair of real KT66s for your Quad/Williamson/Leak, these might be just the job. The specification is intended to duplicate exactly the original GEC recipe while incorporating some of the improvements in materials which have surfaced during the last 60 years. Best of all, the shape of the envelope is similar to the real McCoy, although to our eyes it looks a smidgen more like an '88 than a '66. Meanwhile, £69.99 buys a matched pair.

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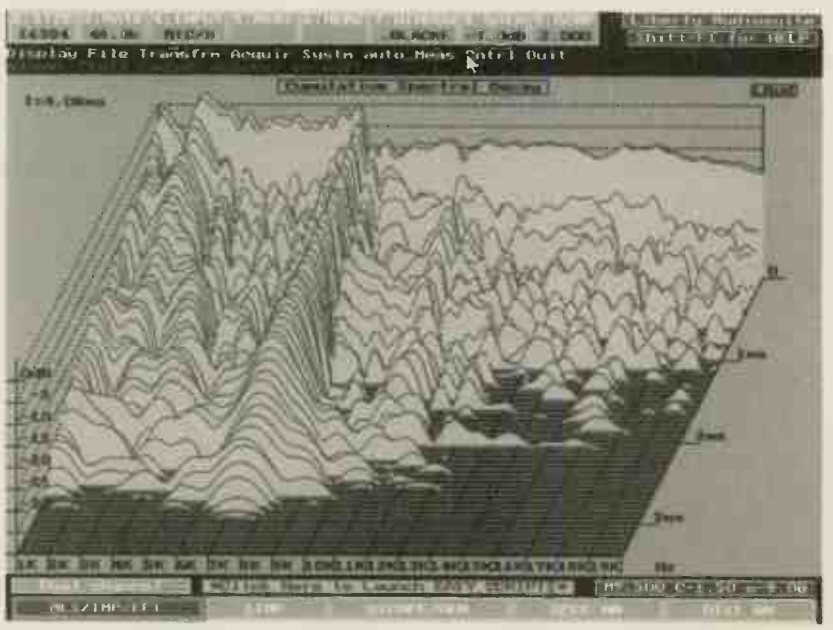
IT'S A LIBERTY

Liberty Instruments' LAUD system for audio measurement and development has been upgraded with the addition of, among other things, multi-tonal analysis for inter-modulation and harmonic distortion. Package 3.0 also includes a choice of linear or log display format and a persistent-hold reference curve. Liberty claim that the 3.0 offers a substantial upgrade over version 2.0 while maintaining the same all-in price of £696 + VAT.



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KLS10 PART II

A high-performance mini monitor using a carbon-fibre mid/bass driver and advanced piezo-electric, gold-dome tweeter from Audax. Noel Keywood discusses fine tuning.

In the first part of this article we discussed the basic design philosophy behind KLS10, provided all the necessary build information (including cabinet and crossover construction), and also published the loudspeaker's measured performance. In this second and final part we discuss fine tuning.

1) PORT TUNING

We designed KLS10 to work close to a rear wall and, from the outset, to match a subwoofer. Both roles demand well-damped bass and a smooth low-frequency roll-off, properties exhibited by KLS10 as dimensioned. The port can, however, be tuned to favour use without a subwoofer by changing its tune frequency. This coaxes more bass from the 'speaker. The sonic differences between the two ports are not vast, but they are clearly audible.

Let me recap upon the now all-pervasive port which most modern loudspeakers have. A port is an anti-resonant system which is usually dimensioned to oppose the bass unit's own resonance. This effectively damps the bass unit, reducing its excursion, which in turn improves power handling. Parasitic anti-resonant systems, by the way, have been known about and used for decades. In cartridges, Shure fitted one on the end of the V15-IV's cantilever to counter its resonance, and I believe Citroen once relied on the technique to control suspension resonance.

Port output takes over from drive unit output at the port resonance frequency, putting a sharp dip in the bass driver's forward response (as you'd expect from an anti-resonant system). In effect, the driver stops radiating and the port takes over. Port output is out of phase with driver output, but since driver output is minimal little cancellation occurs.

Reflex loudspeakers are, in the text books, generally given precedence over all other types of bass loading. They deliver more bass and go lower, whilst at the same time improving the bass unit's power handling It seems almost too good to be true. These benefits pass without comment in all the books I have read, but since energy can neither be created nor destroyed (unless you want to go nuclear in your own living room),

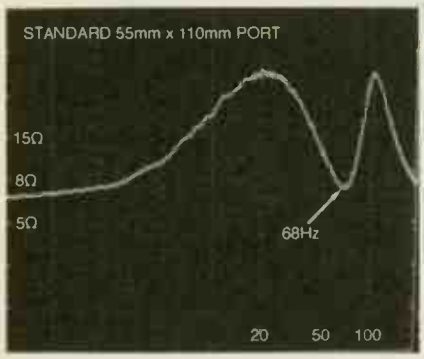

Fig.1 - KLS10 impedance from 0.5Hz - 200Hz, showing how the standard 110mm long port puts a dip in the curve at 68Hz.

something is going on here. Where is this wonderful bass energy coming from? Is it really for free? I have learnt to be sceptical about such matters - there's no such thing as a free lunch.

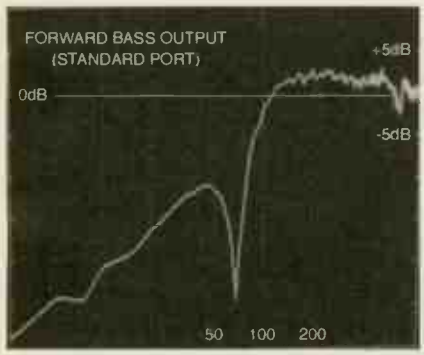

Fig.2 - KLS10 forward bass response from 2.5Hz - 1kHz, showing the port notch at 68Hz.

The answer to this conundrum is both simple and illuminating. The port's motional impedance is reflected in the overall impedance curve: it puts a dip into what would otherwise be the resonant peak of the bass driver. The dip, an area of low impedance, draws amplifier current at the port's resonant frequency. This means the port grabs its own current from the amplifier. So extra energy is drawn from an amp by a reflex loudspeaker and that's where reflex designs get their extra bass from. The impedance curve says it all, something Gilbert Briggs, founder of Wharfedale, noted many moons ago - an important truth equally valid today.

Port dimensions are not very critical. Perhaps surprisingly, smaller diameter ports tune lower, but suffer power compression, introducing distortion at high volume levels. These days, larger diameter ports are preferred as a result - they are the vogue. But to tune them low enough to oppose bass-unit resonance, a fairly long tube, or duct, must be used. Lengthening the tube lowers resonance.

But what are we tuning for? It is common to tune 'high' with a small loudspeaker like KLS10. The idea is to make sure the port's output is at a frequency which makes a clearly audible contribution to bass quality. Since small loudspeakers usually sit in small rooms which will not support deep bass, port output is set to 60Hz or so. The ear perceives bass at this frequency quite well, a phenomenon the music business knows well; it's common to boost this region in Rock music to ensure a track has 'bass punch'.

The port of KLS10 as originally dimensioned meets this criterion and also provides the sort of bass performance that suits wall placement and subwoofer matching. The impedance analysis shown in Fig.1 puts the dip caused by the port (which drops to the driver's DC resistance) at 68Hz. The dip is not symmetrically placed, meaning the port is tuned above driver resonance, which in this cabinet occurs at 48Hz.

The analysis in Fig.2 shows forward bass response, from 2.5Hz up to 1kHz. Output rolls off below 100Hz, the sharp dip at 68Hz being caused by the port. As I explained earlier, forward output is effectively notched out by the relatively high-Q anti-resonant system of the port, a phenomenon clearly shown in this analysis. I have not shown port output here. It radiates from the back of the cabinet, 180degrees out of phase, but at 60Hz the wavelength is so long that the sound propagates evenly around the cabinet. Port output extends down to 50Hz and this is the lower limit of KLS10.

Extending port length to 180mm tunes it down to 55Hz, as the impedance analysis in Fig.3 shows. The corresponding frequency response shows the port notch has moved down to 55Hz, as expected, and that forward bass output has increased a little around 100Hz, so a little more bass energy exists. Looking at the dip in the impedance curve (Fig.3), it has widened a little, so more bass power is now being drawn from the amplifier. Again, there's no magic here and in fact

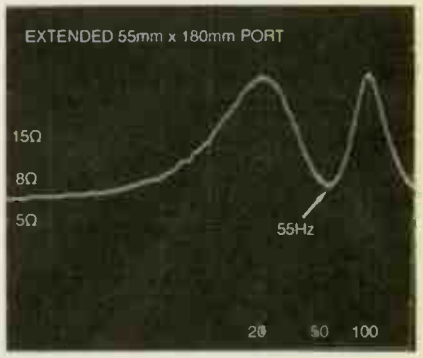

Fig.3 - KLS10 impedance, showing how the extended 180mm long port puts a dip in the curve lower down, 55Hz.

the ideal port would, in my view, impose a broad dip that better 'flattened' the bass peaks, turning more unused power into useful bass energy and additionally reducing the amount of reactance seen by the amplifier.

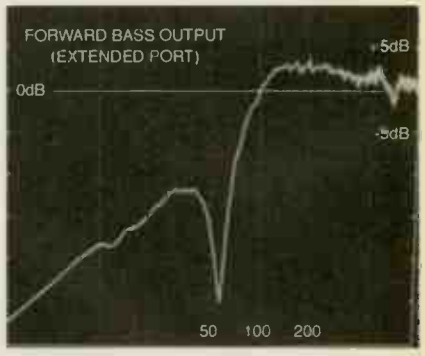

Fig.4 - KLS10 forward bass response with extended port showing the port notch at 55Hz and a little more output just above 100Hz.

Smoothing the impedance curve like this can be achieved by using a short, quarter-wave transmission line we have found, or what I term a 'room-matched port'. Such things have yet to be widely understood or applied.

Today's tubular loudspeaker ports are not very clever. They have developed in an ad-hoc fashion, equations have been applied to them and they have been incorporated into computer design programmes. That is why such ports are omnipresent. They don't work very well, the impedance curve tells us that, but they are easy to apply and cheap, so everyone and his dog uses them.

To lengthen our port I got a spare port, hacksawed off 70mm of tube, and glued it to the standard item to extend it to 180mm, the limit determined by

cabinet depth. To tune lower than 55Hz means reducing port diameter to 45mm-50mm, in conjunction with a length of 180mm. There are many ways of doing this and I leave it up to you to experiment. You do not need test equipment to judge results: if it sounds better it is a success, if it sounds worse don't blame me! The port as supplied can be sleeved down by gluing in thick-wall Perspex tube, rolling up some cardboard or inserting drinking straws, some of which can be blocked. Just make sure that you can reverse any modification in case it doesn't work for you. Personal taste and room behaviour interact to make the precise outcome difficult to predict.

There are no ideal dimensions for a port. How you dimension one depends entirely upon what end you are aiming for. There is plenty of room for hours of absorbing experiment here, which can justifiably be validated by listening. My measurements and our calculations and specifications get you into the right ball-park, working with an advanced and effective basic design by current standards. It is up to you to optimise it to suit your own requirements.

2) DAMPING

Reflex loudspeaker cabinets - commercial ones that is - are usually horribly bare inside. I've looked inside and thought "Humph! Cheap skate!" - but unjustifiably. General advice is not to overstuff a reflex cabinet with absorbent like long-haired wool or BAF wadding because the air inside then ceases to act as a pure mass, or spring, or whatever it is supposed to be (perhaps both in distributed form). I can confirm this from measurement and listening tests. Reflexes seem to work best when there's little inside. Big cabinets like KLS3 and KLS9 can usefully be tweaked a little by adding long-haired wool, but KLS10 did not like it much, sounding literally a bit woolly and soft. Our advice is not to bother.

Lining the cabinet walls is another issue that concerns readers and traditionally we have recommended using thick, natural carpet underlay (felt). Trouble is, rubber underlay is pushing the old traditional felt out; these days it is difficult to find. So what about Deflex panels?

To date I have not been surprised to see a poorer result from Deflex panels than carpet felt. They perform a different function - carpet felt absorbs sound, Deflex panels disperse it. The idea of dispersing sound energy is a good one; we've had a lot of success with it in our listening room. But the dimensions of Deflex panel ridges suggest they are unsuitable for long wavelengths/low frequencies. Look at our comparative analyses in Figs.5 and 6. There's a sharp 'phase suck-out' at 700Hz, caused by a reflection off the cabinet's rear wall coming back out

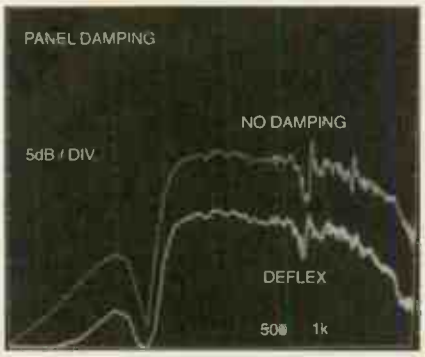

Fig.5 - The effect of Deflex panels upon internal reflections. The large notch around 700Hz is suppressed little.

through the cone. This is a problem more obvious with modern lightweight cones than the old, heavily-damped

Fig.6 - The effect of carpet felt upon internal reflections. The notch around 700Hz is well suppressed.

plastic jobs, by the way. Where the distance from cone to rear wall and back equals half a wavelength the return wave is 180 degrees out of phase with forward radiation and cancellation occurs, causing the dip.

Attempting to suppress this effect I first put a Deflex panel on the rear wall alone. It made little difference to the suckout. I then lined every wall, and this time the suck-out decreased a little in amplitude and bandwidth, as the lower trace in Fig.5 shows. Deflex does reduce the amount of energy returned, but cannot eliminate it. Worse, this is at 700Hz or so; larger cabinets typically suffer this problem around 300Hz, where longer wavelengths will make Deflex even less effective.

There is another perturbation above 1kHz (upper trace, Fig.5) and Deflex does disperse this. The suggestion here is that Deflex works best at higher frequencies, above 1kHz. Carpet felt and wool will impose their own dull/dead sound if used heavily. I'd expect Deflex to avoid this.

Our fondness for thick carpet felt is justified by the analysis in Fig.6. Two strips were placed against the rear wall alone; the side panels and top and bottom were left bare. These two meagre strips absorbed most of the rear-wall return energy, all but eliminating the reflection.

Thick carpet felt is a very effective absorbent. Deflex panels cannot do the same job. However, to disperse high-frequency energy within a cabinet without absorbing it (in order to avoid dullness), and to damp cabinet panels to suppress ringing, Deflex is effective. With KLS10 we used both: carpet felt on the rear panel, Deflex on side and bottom panels, to try and get a balance between absorption and dispersion.

The ear is not especially sensitive to narrow-band effects of the sort produced by this rear-panel reflection. It is sensitive to time-domain problems (i.e. coloration) and to the extent that this effect represents one (box honk or ringing) it does demand suppression. But again, listening tests must be used to get a grip upon the real-life impact of this reflection. Over-use of absorbents can eliminate one problem to replace it with another that is subjectively more intrusive, we find. Light use of wadding is often recommended and generally this is wise advice, in order to suppress ringing without introducing deadness.

Out of interest, our spectrum analyser clearly shows copious use of long-haired wool gives best measured performance. Our ears say otherwise. There's no contradiction here, so much

as a highly complex situation. Narrow-band suck-outs are high-Q and decay quickly; the ear is not sensitive to them, although the spectrum analyser picks them up easily. Time-domain colorations are less obvious during measurement, but more obvious to the ear and more consequential to our senses (i.e. the brain places more significance on them).

3) TREBLE LEVEL

KLS10 has a beautifully flat frequency response. Again, measurement tells us the loudspeaker is deadly accurate, but we feel it tends toward a little brightness. The piezo-electric, gold-dome tweeter is so sweet and precise, unlike conventional tweeters, that this quality is not unpleasant. However, for anyone who wants treble output to be less obvious, the HD3P can be easily adjusted by simply placing a small-value capacitor across it. Since the tweeter is, in effect, a capacitor fed by a 1kohm resistor, placing an additional 4N7 (4700pF) polystyrene capacitor across the tweeter does not affect load characteristics.

This capacitor slowly and smoothly rolls treble output down, by around 1dB or so above 5kHz. Our analysis in Fig.7, from 1kHz up to 21kHz, shows frequency response unmodified (upper trace) and with the capacitor (lower trace). The ear can hear this small change quite easily and it is just about all that is needed to make KLS10 sound very neutral, but of course the precise amount of attenuation is a matter of taste. Funnily, we can't make up our minds over this one. Everyone agrees there's a little brightness in KLS10 as standard and that the modified version sounds smoother, better integrated and less characterful. However, we then start to miss the exciting bite on guitar strings, shimmer on violins and edge-of-seat incision that a good tweeter like the HD3P can provide. You end up wanting to hear the HD3P! Perhaps we should compromise and settle on 2N2 (2200pF).

Fig.7 - Output from the HD3P tweeter can be rolled off progressively by connecting a 4700pF capacitor across the tweeter.

4) PLACEMENT

Do bear in mind that KLS10 uses a well-damped bass alignment so it can work well close to a rear wall, avoiding boominess. We did not optimise it for stand mounting away from rear walls, where less damping is tolerable. KLS10 is a high-quality, small 'speaker designed to blend into the home and the subwoofer extends its abilities whilst keeping to this theme. See page 14●

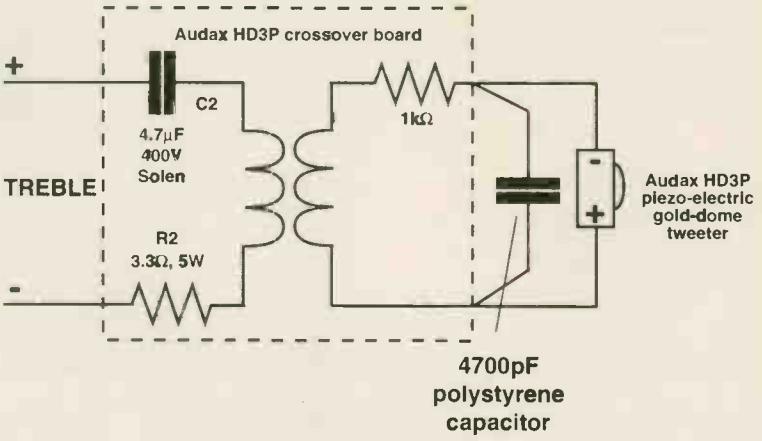

Fig.8 - A 4N7 (4700pF) capacitor soldered across the output pins of the HD3P's crossover board reduces treble by around 1dB above 5kHz (see Fig.7), softening treble slightly.

HART

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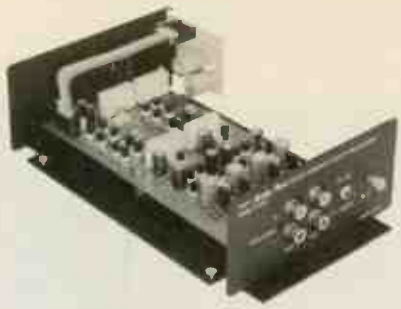

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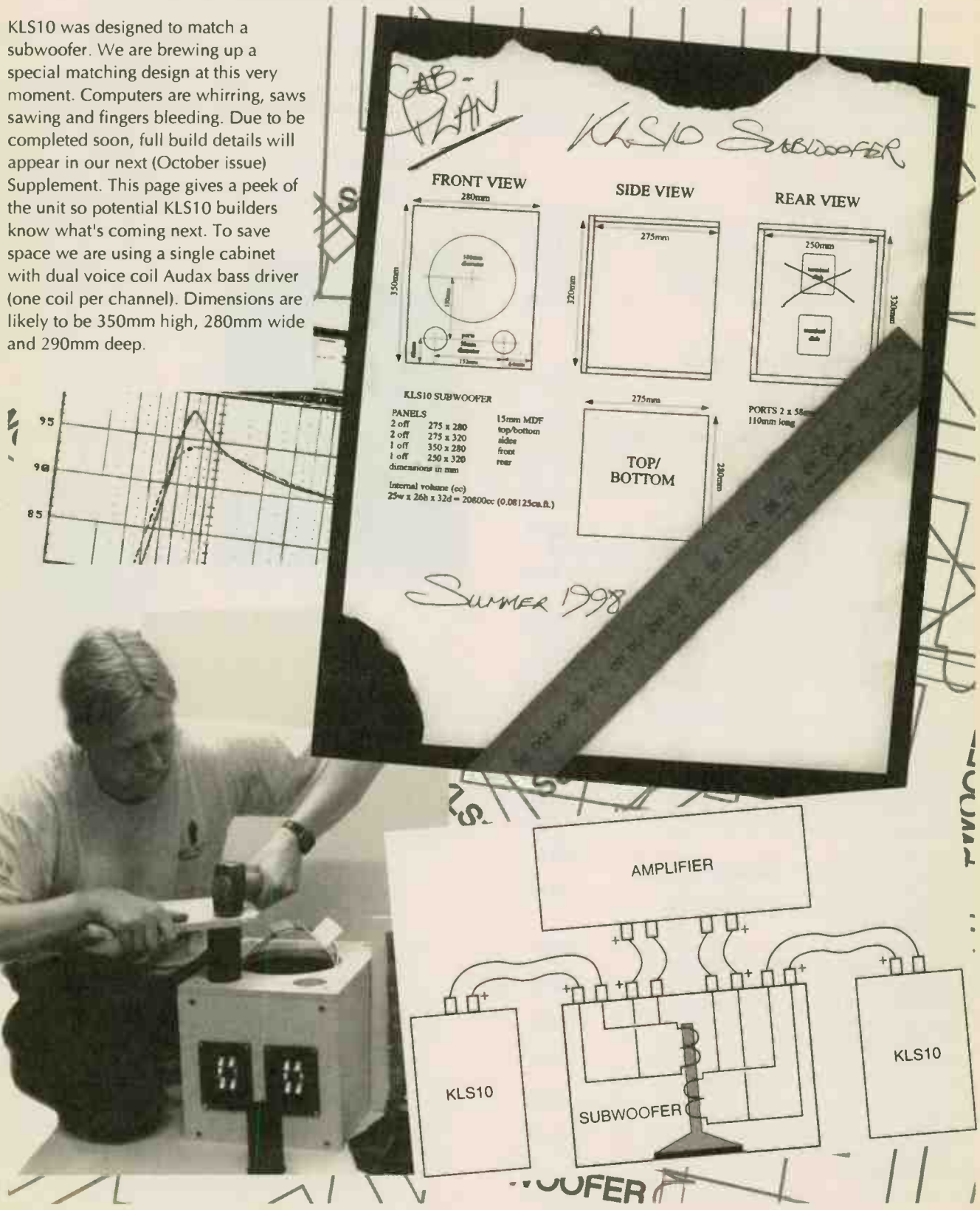
KLS10 SUBWOOFER

A quick look at our forthcoming subwoofer for the KLS10 mini monitor - concluded this month on p7. We will be publishing full details in our next DIY Supplement, with the October 1998 issue.

KLS10 was designed to match a subwoofer. We are brewing up a special matching design at this very moment. Computers are whirring, saws sawing and fingers bleeding. Due to be completed soon, full build details will appear in our next (October issue) Supplement. This page gives a peek of the unit so potential KLS10 builders know what's coming next. To save space we are using a single cabinet with dual voice coil Audax bass driver (one coil per channel). Dimensions are likely to be 350mm high, 280mm wide and 290mm deep.



ASSEMBLY TIME

Following the success of their DAC kits, Assemblage have now released their long-awaited L-1 pre-amplifier kit. Leo Lam did the building.

Back in June 1997, we put solder to iron and constructed Assemblage's DAC-2 digital-to-analogue convertor. With its clear instructions and excellent parts quality it was a joy to work on. Not only that, it had a sound that was accurate, transparent and musical to the extent that there is little competition at twice the asking price. At around £400, providing that you can spare the few hours to tackle the minimal soldering, the DAC-2 offers great value for money.

However, the Parts Connection (who produce the Assemblage kits) is the DIY subsidiary of Sonic Frontiers, the Canadian high-end equipment manufacturer renowned mainly for valve amplifiers. An exchange of e-mails at the end of last year revealed that there were indeed two amp kits in the pipeline, the L-1 line-level hybrid pre-amp and the all-valve ST-40 power amp. Well, it's been a long wait, but both kits finally arrived at World Towers a month ago. We decided to begin at the beginning with the L-1 pre-amp.

1 L OF AN AMP. . .

The L-1 is a revamped version of the classic Sonic Frontiers SFL-1 pre-amp which sold for around $1400 until it was discontinued two years ago. Not content with the levels of distortion caused by the original circuit's power supply, the Parts Connection team set out to create a more robust replacement. Part of this process involved component upgrades.

Following in the tradition of the Assemblage DAC-2 kit, the L-1 features high-grade components of the kind you'd normally see only in esoteric equipment. Capacitors are sourced from MIT, Wima and Solen, resistors from Holco, and those desirable volume and balance potentiometers from Noble and Bourns. Even better, an upgrade kit is available which you can order either as an afterthought for US$300 or together with the kit (the 'Signature version') at a slightly discounted price.

Just as impressive is the casework, which is weighty and solid; it felt every bit like an expensive ready-made product. The printing on the front panel is commendably precise and clear too - a lot of attention has been paid to minor detail in this kit.

BY THE BOOK

The L-1's concise manual starts out with the mandatory

The L-1 kit might contain more plastic bags than a supermarket, but at least it's difficult to make a mistake while putting the amp together.

parts list, but this is almost redundant because the individual bits and pieces are so well packaged. A word of warning - do NOT unpack the contents of the various plastic bags yet as these are marked with the part numbers to facilitate construction.

As stated in the manual, you will need a number of tools to put the L-1 together properly: a pencil-tip soldering iron (700F tip temperature, or around 30watt), #1 and #0 Philips screwdrivers, a 12mm socket, a 10mm combination spanner, a pair of needle-nosed electronics pliers, a wire-stripper or hobby knife for preparing wires, a 1/16in. Allen key and, finally, a ruler for some rough measurement. From experience, a desoldering gun and some Blu-tack would also be very handy to have nearby.

The manual then goes on to provide an overview of the building procedures which have been designed to minimise mistakes. Every single set of components is packaged in its own small plastic bag with the part number clearly printed on it. All you need to do is note the part number on the PCB and find the corresponding bag. For example, if you are after the resistor R1, simply track down the right bag and solder the part into the correct area. The instructions even include a recap on soldering, emphasising the points which even some seasoned DIYers occasionally overlook.

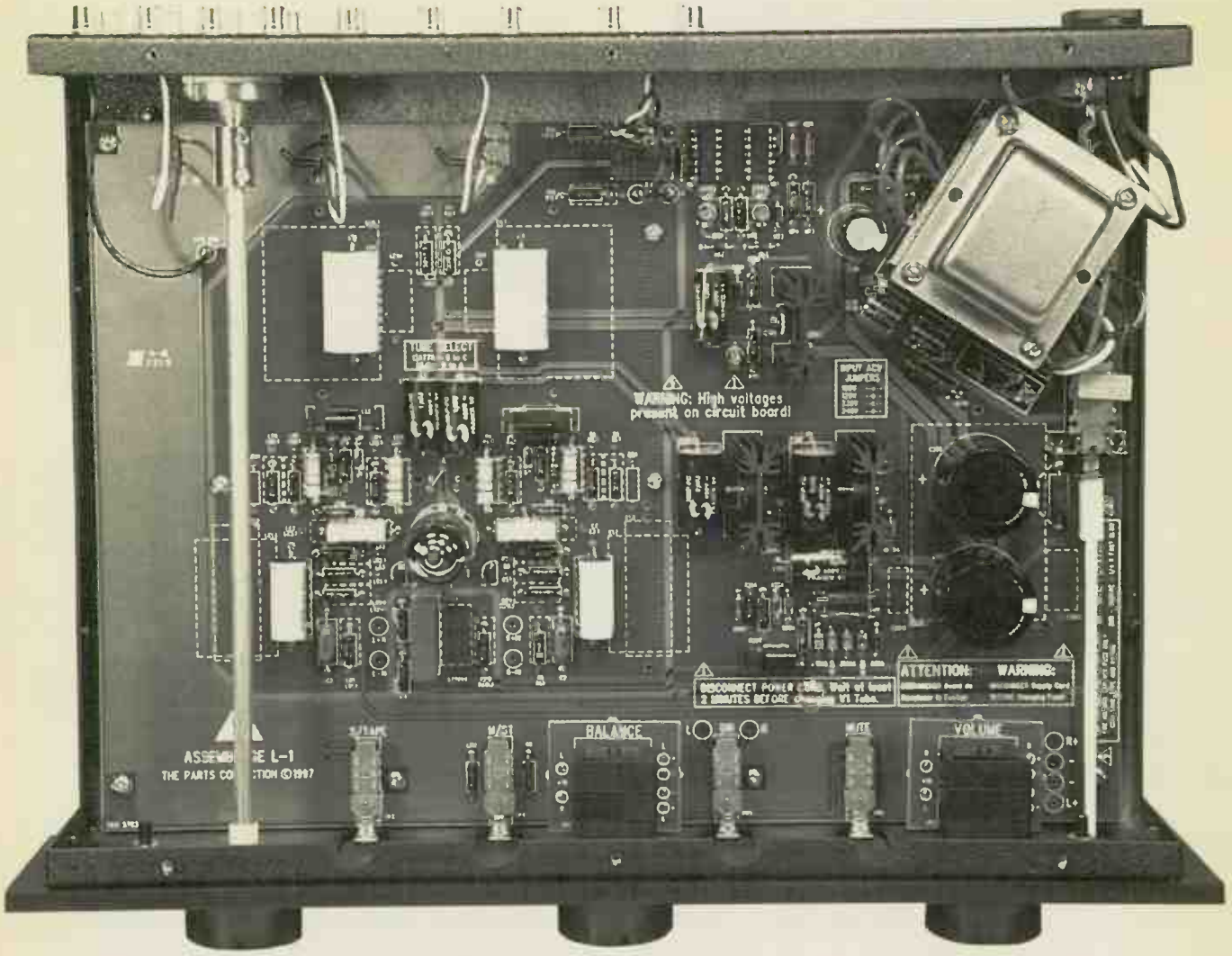
BUILDING THE MAIN PCB

Unlike the DAC-2 kit, the L-1 does not come about 80% pre-built - you have to populate the PCB from scratch. After removing the loosely-mounted transformer installed on the PCB for transit, the resistors should be installed first. Those which will radiate quite a lot of heat in use should be raised around a quarter of an inch above the circuit board. A footnote reminds you that some 12 chopped-off resistor leads should be retained for use later on as jumpers.

I found it a good idea to jot down the resistor value next to the part number in the manual and then solder it in with the value facing upwards for convenient error checking in the final stage. The L-1's Holco resistors make this very easy as the values are printed in numbers rather than the customary colour bars. There is one misprint in the manual though: R212 should read LR211. The Parts Connection have been notified and they've promised a correction as soon as possible.

After the resistors come the diodes. Make sure that the band on the diode (indicating the direction of current flow) matches the band on the circuit board and, again, that those which get hot in use are raised appropriately. A little bit of Blu-Tack will hold them in place while they're soldered.

Next, it's the turn of the capacitors. These proved to



The large, white coupling capacitors are from MIT and the resistors from Holco. As you can see from some of the PCB markings, space has been left for upgrade components, which we'll cover in a future Supplement.

be slightly more tricky than their resistor counterparts. Some of the caps, especially the MITs, are quite bulky and easy to damage if too much pressure is exerted on them during soldering. Watch out for the polarity of electrolytics too.

More care needs to be taken while installing the semiconductors, namely the voltage regulators, the input buffer JFETs and the logic circuits. Since static electricity can build up on the body and in clothes, it's necessary to earth yourself before handling these devices. Wearing a grounding bracelet is one way to accomplish this, as is touching the metal casework of earthed electrical appliances (like most hi-fi).

The heatsinks and isolation pads should be mounted before the devices are soldered on to the board. By this stage, most of the electronics have been installed, so some of the other components like the relay, switches and tube socket can be lowered into their abodes.

The transformer then returns to the PCB. The orientation of the transformer is important - it's marked on the board, so all you have to do is follow the wire colour scheme.

VALVE VARIABLES

The L-1 can be configured to use two types of dual-triodes: the 6922 supplied and its equivalents (E88CC/6DJ8/ECC88), or the 12AT7, according to your personal preference. Modifying the circuit to take the latter is achieved by soldering in a jumper lead which connects two points on the PCB. The amp can also be configured to take any mains voltage with another set of jumpers.

IN AND OUT

After some wiring in preparation for fixing the IEC mains socket, the back panel (which houses the gold-plated RCA sockets) was assembled. Instead of screwing the sockets directly to the back panel itself (which was an eminently practical arrangement in the DAC-2), the L-1's were soldered to a daughter board. In this section of the assembly, the only precaution is to ensure the Red sockets are for the Right channel and the White ones for the Left. The substantial selector switch was then attached to the same board after checking its orientation.

Volume and balance controls, each of which occupies its own dedicated PCB, were dealt with after the socketry. Since the Noble devices utilise thin-film technology to form their stepped attenuators, they are vulnerable to heat damage; keeping solder time short is vital. The trickiest area of the construction starts here with the insertion of 12 jumper leads (those saved from the resistors) to the main PCB to connect it to the

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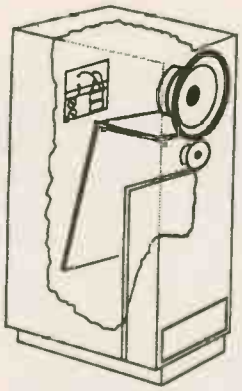

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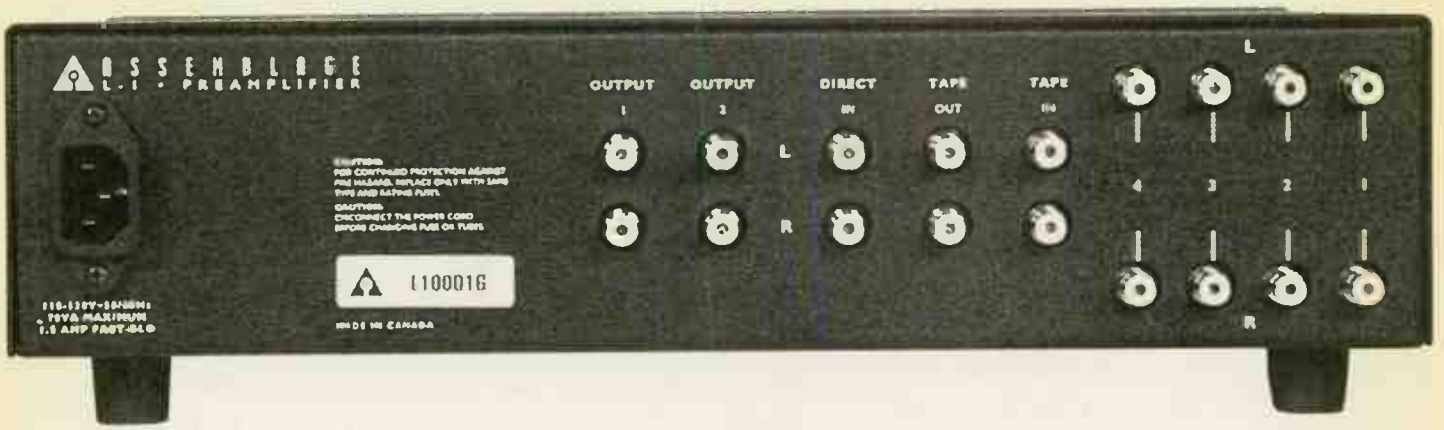


The gold-plated sockets on the rear panel include a Direct input which bypasses the balance control and selector switch. This makes an appreciable difference to sound quality.

Balance and Volume boards later on.

The remaining hardware and main PCB were now installed in the chassis. Using the screws and washers provided, I also fitted the four plastic feet to the underside of the L-1. The washers were a bit on the large side, but with some gentle persuasion it was possible to squeeze them into the feet. The IEC socket was next up, then the RCA socket board. All of this was a relaxing preamble to the near-disaster which followed.

After securing the main PCB, I had to install the volume and balance control boards. The problem here was that the 12 jumpers are extremely close to the front panel, and the manual asks you to slip the two boards over the jumpers (which protrude vertically from the main board) while simultaneously bolting them to the fascia. This turned out to be very fiddly indeed - either I managed to push the jumpers through the holes but failed to get the shafts of the controls through the front panel, or it was the other way round. The solution was to shorten the jumpers and, with a little careful pressure, slide the two pots into place.

I hesitate to imagine what it will be like when it comes to retro-fitting the upgrade kit. . . I spoke to The Parts Connection on this subject and they told me they may be able to think of a more elegant solution.

All that remained was routine wiring and bolting on parts like the shafts that connect the selector and the power switch to the front panel. One minor point to note is that the shafts of the switches themselves can be damaged by too much lateral force, so take care when pushing the buttons on.

After placing the appropriate fuse in its socket (250mA, fast-blow for us here in the UK) and very carefully checking all the connections, you can plug the L-1 in with the power switch in the Off position.

One way to carry out a last check before switch-on is to look for remaining parts - there should not be any. Check too for any solder bridges (links between two components due to excessive application of solder). If you happen to be as electronically paranoid as I am, make sure all the resistor values on the board match those in the circuit diagram. If all is well, turn the unit on but do NOT put the valve in yet. Keep your finger on the power switch so that you can immediately switch the power off if there is any sparking or smoking. Luckily for me, the L-1 I built didn't immolate itself.

Turn the unit off after 60 seconds and give the capacitors a couple of minutes to discharge. Do remember that lethal voltages are present in this amplifier, so be patient and take your time because it really is worth living to hear this fascinating piece of equipment. Carefully insert the valve into the socket and power the unit up again; the heater should start to glow in the bottle.

Everything was in order, so I put on the cover and hooked it up to the rest of my system.

SOUNDING OFF

The L-1 was used alongside the DAC-2 fed from a Teac T-1 transport and Musical Fidelity X-A50 monoblocs, all linked by Kimber cables. Having spent some time with the original Sonic Frontiers SFL-1, I was expecting a similar sound. I was quite wrong - in fact, it was better!

The control and timing were first-rate, tonal colour was rich and music flowed with the utmost ease. There was a hint of valve warmth in the recipe, but this was minimal and certainly didn't impair clarity; the L-1 was as clean as the Creek OBH-12 passive and at the same time provided more slam and power in basslines (a failing of passive pre-amps in general).

The excellent piano transcription recording of Volodos (Sony SK62691) possessed a natural 'rightness' and confidence, with the glassy treble I find typical of Sony Classical recordings. This is the L-1's main virtue - it is true to the original and faithful to its source.

If I had to choose between the ready-made Unison Research Feather One reviewed in this very issue and the L-1 kit, it has to be the latter. The Canadian's sense of speed, scale and musicality was simply unmatched by the Italian. Compared to the L-1, even the sprightly Feather sounded slightly slow and uninspiring. The Creek closed the gap but again the L-1, while retaining the Creek's crystal-clear detail, excelled in the bass-control department. Although the L-1 won't suffer poor front-ends or recordings gladly, connect it to a source worth its salt and you're in for a treat. This 'warts and all' presentation is one of the signs of true high-fidelity equipment.

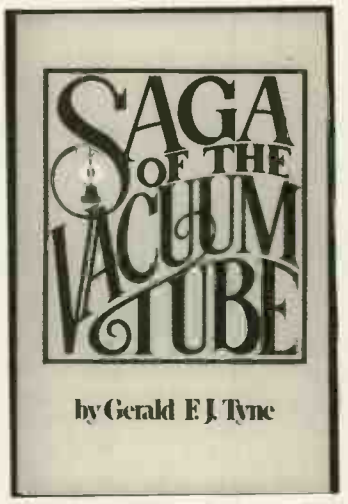
FAST FORWARD

The marriage of the DAC-2 and the L-1 seems to be a perfect one. In October's Supplement, we find out if the ST-40 kit valve power amplifier is a successful addition to the Assemblage family.

Saga Of The Vacuum Tube

By Gerald E. J. Tyne

Reviewed by Noel Keywood.



I have ploughed through a few histories of the valve to date, but none as comprehensive as this one. Although from an American author, Gerald Tyne, it doesn't tread the usual ground of Edison, De Forest and give just a passing reference to Fleming. Tyne has comprehensively researched the early history of the valve, not only in America and Britain, but also in France and Germany, Holland, Denmark and Norway. I have seen tantalising references to German research in the past, for example, but little of substance. Gerald Tyne seems to have had the wherewithal to personally visit people and companies across Europe in researching this book, interviewing researchers of the period, inspecting company records, visiting museum collections of valves, improving his own collection it seems and gathering enormous amounts of information for this book. There is a lot from Germany, with discussion and reproduction of relevant patents from 1903 onwards.

The author has imposed a clear historical and national structure on the presentation of information. The chapters are arranged by date and country, starting with the 20th century's first decade, in Great Britain (Chapter Three), the United States (Chapter Four) and Continental Europe (Chapter Five). And so it goes on, for no fewer than 22 chapters.

There are further subdivisions, into Industrial and Military Demands, and then Broadcasting, areas which drove development of the valve in the early part of the century. You must remember that at this time, consumer electronics hadn't been invented! People in the UK did start to experiment privately with 'radio' from the 1920s onwards but there were difficulties, including the need to maintain corrosive and fume-producing batteries which used dangerous chemicals. What remains unanswered is why individual amateurs such as De Forest were active in the USA but far less so in Europe, especially the UK; even Marconi was Italian.

All the real action in terms of research and development took place in the labs of big manufacturers, including producers of light bulbs, like Philips of Holland, or in the United States by telegraph companies like American Telephone and Telegraph (AT&T), or Western Electric. When you consider that AT&T was prepared in 1912 to pay Lee De Forest no less than $50,000 for rights to manufacture the Audion amplifying triode - a fortune then - and in 1914 increased this to $90,000 for all rights, it becomes clear that the value of electronic amplification was clearly understood and thought worth pursuing in the USA at that time. When making comparisons it is worth bearing in mind that the US economy was little larger than Britain's then.

Although Tyne uses a very rigid chapter structure and has researched his book with academic diligence and thoroughness - and this is a reference work of sorts - he has a reasonably fluid writing style and includes personal information about the trials and tribulations of some characters, such as De Forest for example. Early inventors seem to have bordered upon being "rogues and charlatans", rather than the sort of qualified engineers we would expect to encounter nowadays. But then, mass education was still a new idea and science the province of Royal Societies (in the UK) which were exclusive.

The picture was rather different from today's, radio and communication being uppermost in people's minds at that time. The independent amplifier, for Public Address (theatres, halls, etc) rather than domestic use, did not appear until the 1920s, and it was late in the 1930s that people like Harold Leak started to offer such items for use in the home. So valve histories such as this one centre on radio communications for industrial and military use. In this case the focus is tight; there is little about the uses to which valves were put.

Which is to say that Saga Of The Vacuum Tube is a specialised tome, but one rich in detail and fact, as well as broad in outlook. Chapter 13 even answers the inevitable question: "How about the rest of the world?" Subtitled 'The Netherlands, Russia, Australia, Italy, Denmark, Japan', it provides snippets of information on developments in these countries.

All pictures are black-and-white and reproduction quality often mediocre, dark originals causing over-inking, producing areas of black ink with no detail. Line diagrams have in general reproduced well, however. I counted three pictures of people, only one being significant, that of De Forest. This book is strictly about valves (tubes in fact; Tyne identifies Fleming as using the word valve and dubs its use a British peculiarity), so those with a casual interest might find it a bit intense. It is incredibly thorough and comprehensive though, wonderfully researched and well written.

Saga Of The Vacuum Tube

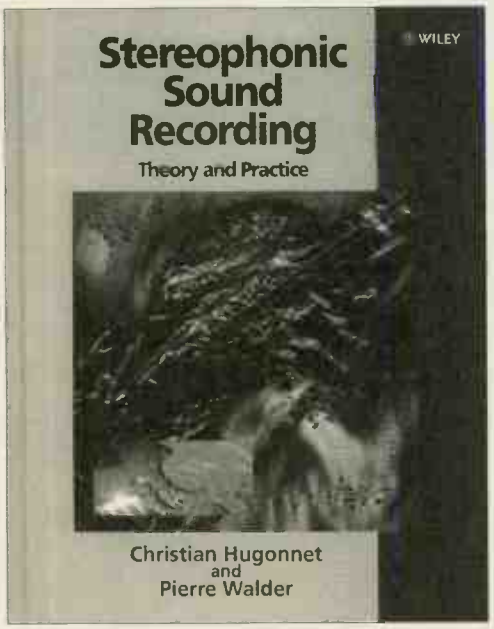
ISBN: 0-6722-1470-9

Saga Of The Vacuum Tube is available from the World Library: see p50 for order form (book code: 1540). Price: £16.95 + £2.50 GBP UK P+P

STEREOPHONIC SOUND RECORDING - THEORY AND PRACTICE

By Christian Hugonnet and Pierre Walder

Reviewed by Haider Bahrani.



On analysing hi-fi equipment and discussing aspects like musicality, etc, many neglect to consider the quality of the original recorded material. As a former hi-fi reviewer I have been guilty of taking a shine to equipment which makes recordings sound 'better' and more enjoyable than they truly are. This isn't necessarily a bad thing, as long as you realise that such equipment is not being faithful to the original music. In my career I have gained experience at each stage of the music production chain; performing, recording, designing the replay equipment and, of course, listening to the end result. It is the second of these stages that Stereophonic Sound Recording examines.

The text opens with a little history, charting the course of sound recording from the 19th century up to latter-day digital machinery. If you're expecting an instruction manual that concentrates only on how to plug in and position a microphone after this though, then you're in for a minor shock.

Chapters Two, Three and Four present a mini study on sound, the philosophical approach to recording it, the acoustic perception of it in terms of position, pressure and timbre, its behaviour through and on interaction with different media, and so on. To be frank, the authors could have put across many of their detailed descriptions a lot more clearly without losing any of the content. That said, the bulk of the information in these chapters will be useful to hi-fi enthusiasts who spend half their lives moving their 'speakers about the room in search of the optimum position.

Chapter Five may come across to some as a handbook on how to sit down. It consists of a brief lecture on interpersonal interaction between the sound engineer and artist followed by studio location and recording venue study. Of course, sound doesn't mean music alone, so other recording subjects (like natural sounds and mechanical noises) are discussed.

Microphones are given a thorough going-over in the next chapter, with varieties ranging from moving coil through diaphragm and on into tube and parabolic. If you want to know the differences between omnidirectional and cardioid microphones, look no further. Pick-up angles and directivity factors there are aplenty too. In fact, a lot of is couched in dry, academic terminology rather than plain English, which may put some less than die-hard audiophiles off. Chapter Six, in its comprehensive appraisal of the microphone, serves as a build-up to the three chapters which follow and deal with the practical implementation of microphones in sound recording.

Chapter Seven examines multi-miking techniques. Amongst other things you are introduced to the pan pot, which is much like the sound engineer's version of the balance control available on some mid-end hi-fi products. Then you are given an insight into multi-channel recording, overdubbing and multi-tracking alongside a brief guide to the mixing console. Close miking techniques bring the curtain down on this chapter with cardioids turning hypercardioid in this application.

The book's eighth section turns to stereo. Recording a cello isn't just a sound - the presence of the cellist, their instrument and the ambience around them have to be reproduced in the space between the loudspeakers at the listening end. This is followed by a chapter on methods of acoustic correction, or how to record under circumstances that are less than ideal. Some masterly methods are revealed for injecting a little, um, 'realism' where the recording itself doesn't provide it.

The penultimate chapter forms a sound engineer's guide to preparing their studio. The steps listed here aren't cast in stone, but a guide to set-up before a recording like this is a good check list. However the final chapter, which draws a picture of the archetypal sound engineer, is one that I find myself a little uneasy with, as it doesn't seem to accept that a recording engineer can be an inspired and gifted individual without necessarily having long years of experience. Knowledge can obviously be gained through practice, but natural ability is often more important.

Stereophonic Sound Recording as a text is presented as part thesis/part guide book and to me fails as anything more than that. It's hard to recommend to anyone starting out in the field as the writing style isn't the most accessible. As one reference among others it might be a useful addition to a library, but it's as daunting a read as the accountancy textbook I have sitting next to it on my own bookshelf.

Stereophonic Sound Recording £29.95
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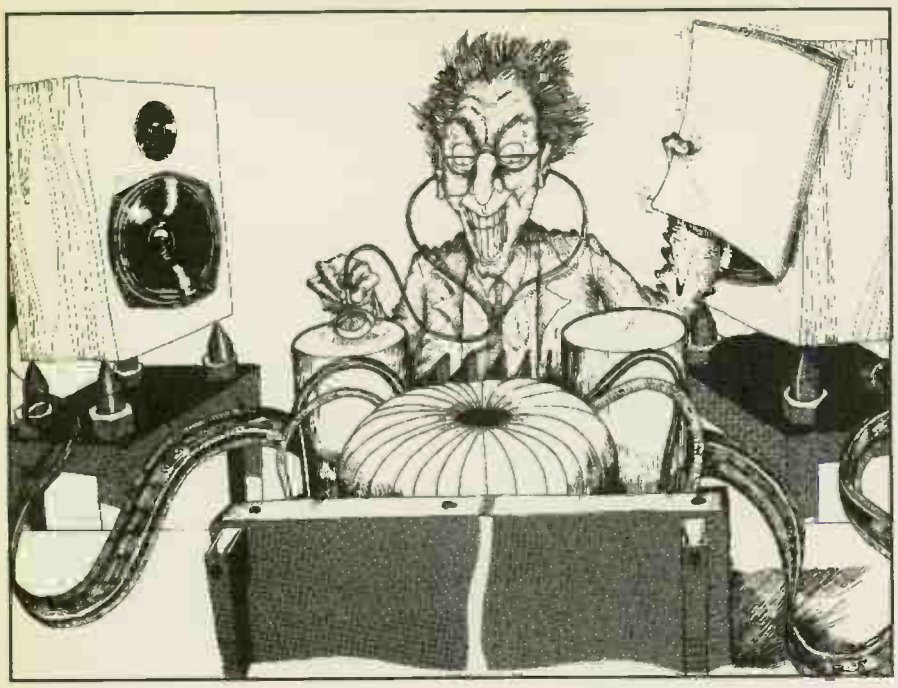


DIY Letters

CLOSE CONTACT

One of the great discoveries in the last five or 10 years has been how much difference good interconnect and 'speaker cables can make. This has led to a greater quest for simplicity in component connections and much greater interest in passive pre-amps and the like.

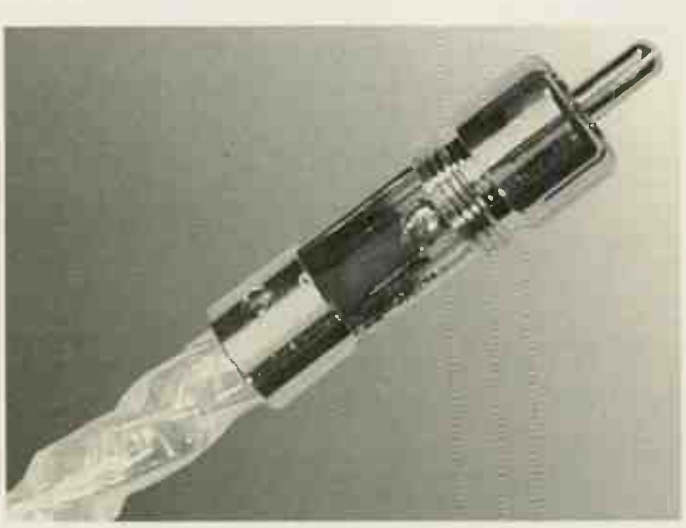
I recently built a Hart Electronics headphone amp and now use it as a passive pre-amp since the sound seems more open than my Rogers RS-2. The rest of my gear is a DPA Enlightenment DAC, Rogers RS-6, Focus Audio FR-8, Audioquest Indigo+ and assorted interconnects.

But all this led me to thinking - what about the connections between the cables and the components? I remember hearing that gold has a lower surface resistance than other metals and that is why so many components have gold plating, but why have a socket and plug at all, especially on a passive pre-amp? Wouldn't it make more sense for me to cut a cable in half, solder the middles to an Alps potentiometer, put it in a box and call it a pre-amp?

Going further, couldn't I solder one end directly to the circuit board in my amp? Of course it makes changing components harder, but how often do you need to switch your pre-amp? And what about 'speakers? Is there any reason not to solder 'speaker cable onto the 'speaker terminals? I have not done this yet for fear that there is something I am overlooking and I may damage my components, but if it will improve the sound I am willing to try it.

Similarly, in several of your articles you mention that polishing the mains fuse in the power cable can improve sound. Why are these fuses there at all? In the US, there are no fuses in mains cables, as most components are internally fused, and every house has a circuit breaker. Is it really dangerous to bypass the fuse completely, or is this just an outmoded fire-safety law left in the UK?

Jesse Lentchner
bj@netvigator.com



Soldering interconnect cables directly into a pre or power amp gives a better connection than plugs and sockets.

Yes, by far the best way to link components together is simply to solder the interconnects directly into place. Plugs and sockets, even some of the best, have mating surfaces which are surprisingly rough when viewed under a microscope. DNM's Licon contact enhancer, for example, works by flowing out over the metal and filling in a lot of the surface irregularities to give superior contact between plug and socket.

I've been using a Danish Audio Connect CT1 stepped attenuator with DNM Reson flying leads soldered to it as a passive pre and this is a very effective arrangement.

There's no reason not to go the whole hog and do the same for all of your equipment. Just make sure you don't cause any damage by applying excessive heat or static voltages to sensitive PCBs (mainly inside CD players) or crossover parts. For the latter you'll probably need quite a powerful soldering iron (around 40watts) because of the thickish cables involved.

According to a spokesman from the British Standards Institute, the reason US mains plugs are not fused and UK ones are is because of the ring mains used in the UK. The US, on the other hand, relies on a radial mains arrangement. We were told: "Development of the BS 1363 system of plugs and sockets began in the United Kingdom during the latter half of the Second World War, and the British Standard was

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first published in 1947. To save cable, which was in very short supply, the system was primarily designed for use with 30Amp 'ring' circuits rather than the 5Amp or 15Amp radial circuits which had hitherto been used. In consequence, it was necessary for the plugs' associated ring circuits to be fused to protect the flexible cables of the appliances associated with the system.

It was therefore important to ensure that sockets for the 'new' system would not accept unfused plugs intended for use with older systems which were still widely available at that time, since this would have lead to 'dangerous compatibility.' It was primarily for this reason that rectangular-pin plugs were chosen for the BS 1363 system. Furthermore, there were four variants of BS 546 round-pin plugs in use at the time and it would have been impractical to safely introduce yet another. Rectangular and round-pin plugs both perform well provided that they are used in conjunction with appropriate socket contacts."

Although it might be tempting to bypass fuses in plugs, for the sake of safety this shouldn't be done. JM

PIONEERING WORK

As I have a Pioneer A-400 amplifier that is gathering dust, I have decided to upgrade it by doing a few tweaks. I am looking for an article published in a British hi-fi magazine a few years ago that gave details on improving the A-400. Apparently the improvements were quite remarkable. Can you direct me to the article?

Simon Vanderzeil
Sydney,
Australia.

None of us here remembers the article you mention, but there's a few sure-fire tweaks which apply to most budget-ish integrated amps. The first step is to get hold of the circuit diagram for the component in question, as this makes life so much easier. Without a schematic, it can be all too easy for a lapse in concentration to cost you a new amp.

Replacing the cheap carbon-track potentiometers which are commonly fitted to budget amps should yield a major improvement for little effort. Try an Alps Blue or Black if you can't afford more than about £25. Above that, Panasonic's For Audio and Danish Audio Connect's CT1 stepped attenuator enter the picture. The latter might cost over £100, but it really is light years better than any of the pots used in amps like the A-400.

The next target should be the ribbon cable often used to link PCBs. If you wanted to push out the boat, you could go for pure silver here, although you won't actually need that much of it. Alternatively, a good silver-plated copper cable with PTFE insulation from some of the suppliers listed in this Supplement should be a marked step up.

Cutting long PCB signal tracks and soldering in more of the same cable also tends to bring major gains. I tried this with a DPA 50S pre-amp and some DPA White Slink. The result was a lot more transparency and greater midrange smoothness.

Swapping smaller-value capacitors in supply rails and feedback circuits for either Black Gates or Os-Cons helps too. We fitted a 6.3V 100uF Black Gate in the feedback loop of our 5881 and were amazed at the benefits considering the cost was less than £2. JM

D/A CONVERTOR ON A BUDGET

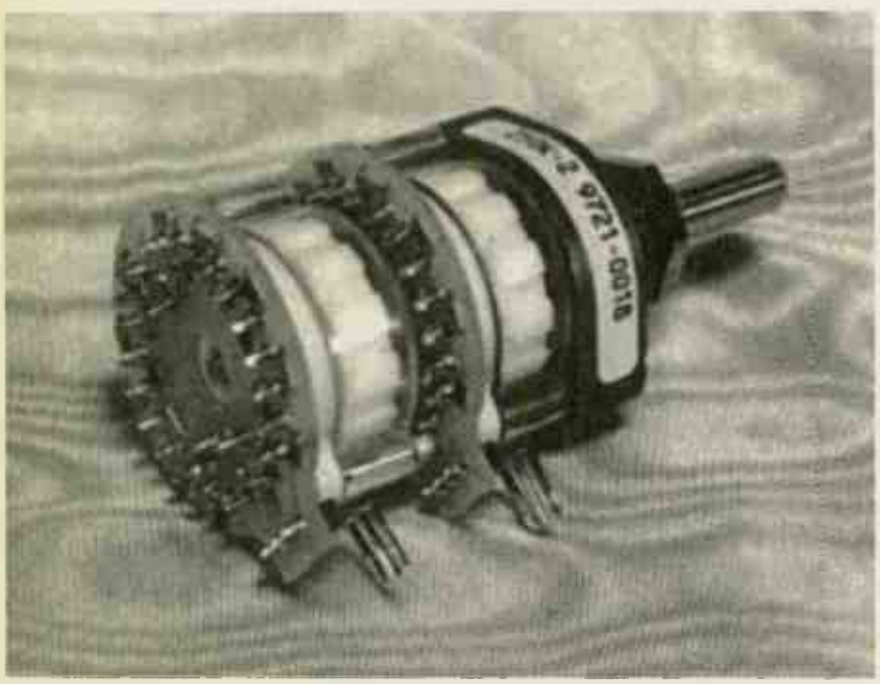
Those of us with modest hi-fi systems all read with envy the reviews of high-end kit and wonder what it is all about. In this world it seems that you should never use one box where two will do, and I for one have often thought some of the reasoning on planet high-end a little bemusing. Ever since the much-maligned CD player evolved from one expensive box into two I have wondered what all the fuss is about. My chance to find out came as I was pondering my next system upgrade.

I had originally intended to replace my old CD player (a six-year-old budget Pioneer model), but then I read a couple of articles in the DIY Supplement about designing and building DACs. Could this be another path to sonic bliss? After all, my CD player was still perfectly capable of reading discs, it just had a rather old multi-bit convertor circuit. Luckily, I was able to get hold of a selection of data sheets for D/A devices and interfacing chips, and find out a bit more about how the S/PDIF link between a transport and DAC works. A plan of action was now beginning to form in my mind.

THE CIRCUIT

Since this was my first sophisticated project for a while, I decided to go for the simplest design which would still offer some improvement, at least on paper. The result of many hours reading data sheets and scribbling in the margins is the schematic in Fig.1.

The S/PDIF digital input (a 75ohm co-ax line from the transport) is fed straight to the Crystal Semiconductor CS8412 digital interface receiver chip via



Danish Audio Connect's CT1 stepped attenuator offers massive improvements over standard carbon-track potentiometers.

the resistor/capacitor termination network. This device breaks down the S/PDIF signal into master clock, L/R channel select, data clock and serial data lines which are processed by the D/A convertor proper.

I chose another Crystal Semiconductor chip, the CS4329, for D/A conversion. This approach is simple and very cost-effective, since this IC contains an interpolation filter that expands the digital signal from 16 to 20 bits and also performs oversampling. No extra digital circuitry is required. It is also a Bitstream device and so should exhibit good conversion linearity according to theory. Some care had to be taken to ensure that the respective output and input data formats of the receiver and D/A chips were selected correctly - there are a lot to choose from!

The differential analogue outputs from the CS4329 offer two advantages. First, the chip can operate from a single positive 5V supply whilst still providing a standard 2V peak-to-peak output. Secondly, any common-mode noise will be rejected to a very high degree by the differential-mode buffer amplifier/filter circuit.

The left and right channel outputs are fed to differential-mode op-amp output buffers, which also have a two-pole Butterworth low-pass filter response (corner frequency approximately 50kHz). The op-amps in question are two of the well known NE5534 type. This is actually a circuit recommended in an application note produced by Crystal Semiconductor and is a neat solution to providing an output capable of buffering, filtering out undesirable aliasing and driving the input of the amplifier which follows.

The power supplies for each section of the circuit were given careful consideration. Each digital chip has an individually-regulated 5V supply. RF chokes and decoupling capacitors help to reduce noise transmitted along PSU lines too. The filter/buffer op-amps share a +/-12V regulated supply which provides plenty of headroom for the output signal. A 15V-0V-15V toroidal transformer (15VA rating) provides power for the whole circuit. The total cost of the project, including case, connectors, etc, came in at under £100.

CONSTRUCTION

I chose to construct the circuit on a double-sided PCB with a ground plane on the top (component side) and signal tracks on the underside. The ground plane itself is split between the analogue and digital sections of the board. These are joined together at a common earthing point where the 0V lead from the mains transformer joins the board.

It should be possible to route the whole circuit out on perforated stripboard without any detriment to performance, though it won't look quite as nice (electronic vanity?) I fitted the whole circuit in a 6in. wide by 10in. deep by 2in. high aluminium box from Maplin. Connection to the CD player is via a 75ohm BNC connector whilst gold-plated phono sockets take care of the output termination and a green neon rocker switch controls mains power.

Incidentally, I had to fit a digital output to my CD player as well. Inside the unit I found that a TTL level S/PDIF-format signal is provided for an optical link which was not fitted to my model. I connected this to a buffer circuit comprising four NAND gates (all inputs and outputs connected respectively). This feeds the primary winding of a pulse transformer (turns ratio 15:3) wound on a ferrite core. The secondary of the transformer is connected to a BNC socket fitted to the CD player rear panel. This

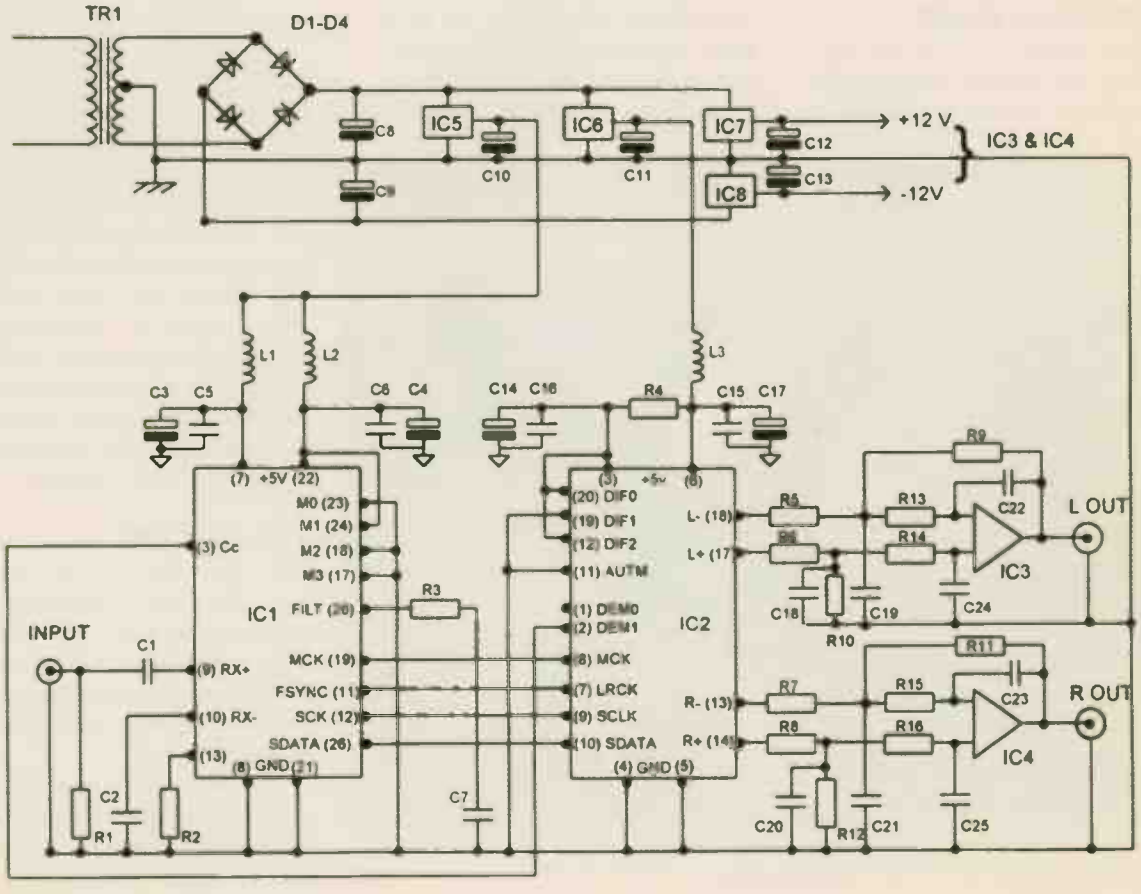


Fig.1 The circuit diagram shows just how simple the DAC is.

arrangement provides an electrically-isolated digital output at the standard voltage level (500mV p-p).

And so the time came to unite player and DAC. My fears were realised immediately. . . I was greeted by total silence, yet a disc was spinning in the player and the clock display was ticking its way through track one. A quick check showed that the D/A chip was receiving data but doing nothing about it. I checked all the track connections again and went back to the data sheets. Doh! I had mistakenly wired up the output mute pins for each channel. Once these were removed I was rewarded by the gentle strains of Iron Maiden going full tilt at the 'Number Of The Beast.' Brilliant!

Having now spent some time listening to my new creation on a variety of programme material I am pleased to report a subtle but noticeable improvement in quality. The sound is very clear, with less of the muddled quality evident in my Pioneer's own conversion circuitry. This is evident on busy passages and in the presentation of vocals, which seem better defined in the sound stage.

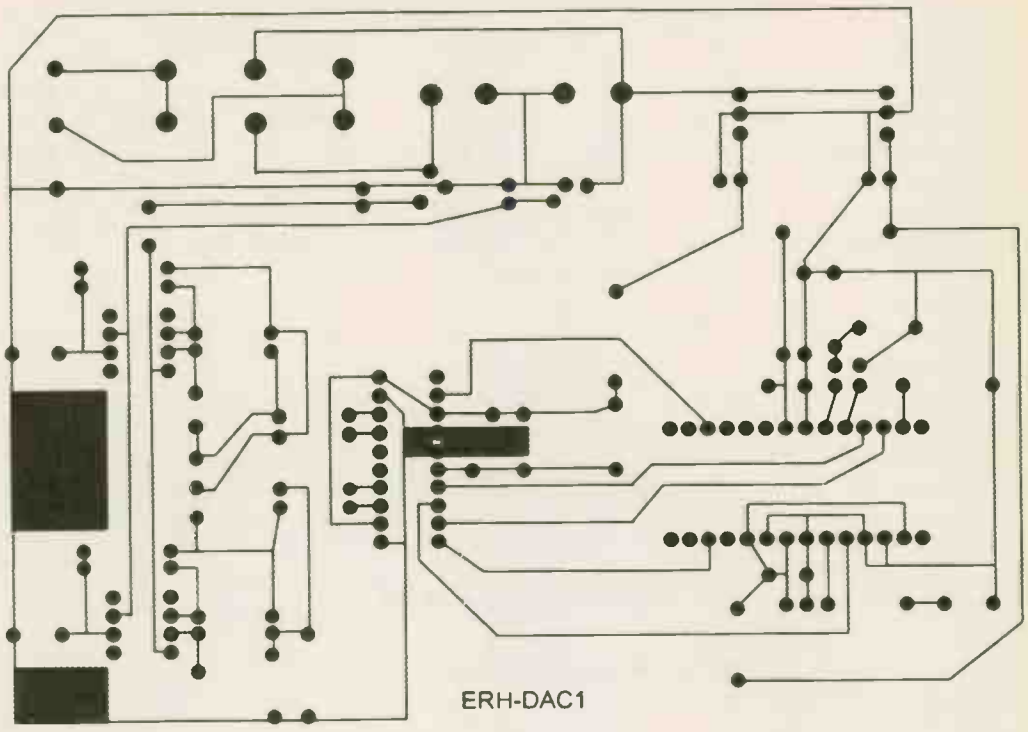


Fig.2 This shows the PCB track layout from the underside.

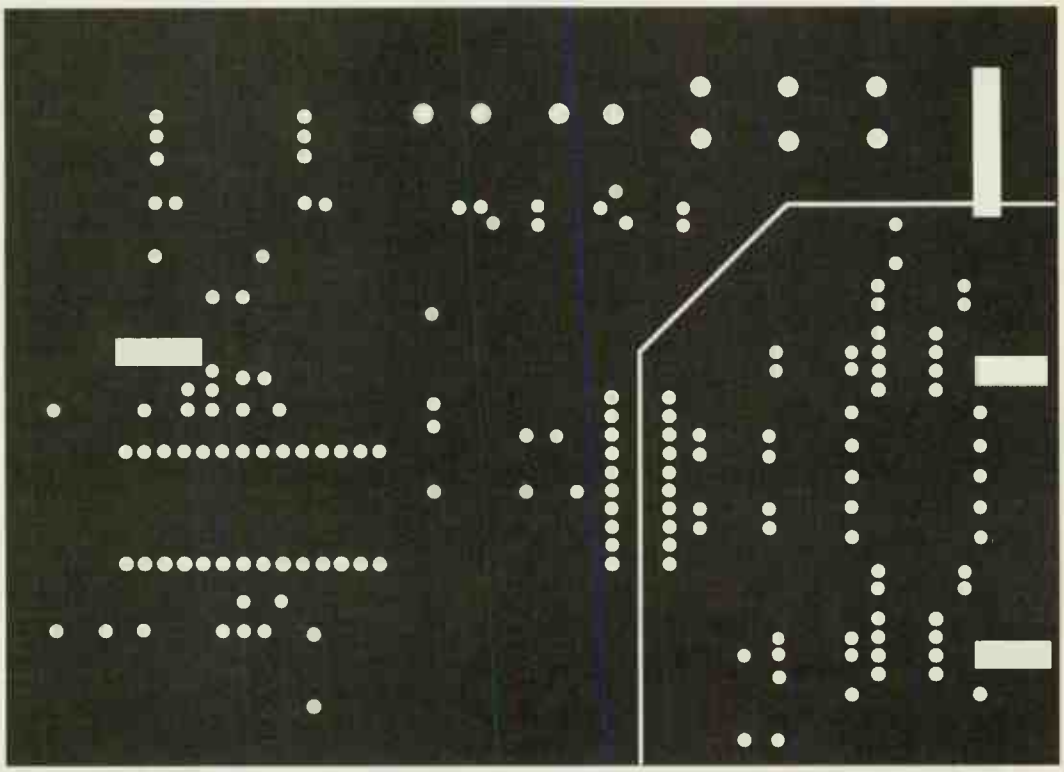


Fig.3 This shows the PCB ground plane from the component side. Both PCB diagrams are at 100% of real size.

TIPS FOR WOULD-BE BUILDERS

The artwork in Figs.2 and 3 is suitable for the production of a double-sided PCB for the whole circuit, less mains transformer and input/output sockets. Fig.4 is a component layout guide. I did not have access to photolithographic PCB production facilities, so I masked the circuit design using rub-down, etch-resistant transfers (available from RS or Maplin). These are a bit fiddly to use, but you can create quite a neat looking board. Large areas can be masked with etch-resist marker pen or even electrical tape.

The most important thing is to degrease the bare copper surface before applying any masking material to ensure good adhesion during the etch process. This is performed in ferric chloride solution. A quick test to ensure all the tracks are continuous after etching and drilling can save a lot of time later on.

The components can now be added to the board, with care taken to observe the polarity of electrolytic capacitors and the pin orientation of semiconductor devices. The two 5V regulators will need heatsinks attaching to them. In fact, I mounted ICs

1, 2, 3 and 4 in sockets which allowed me to test the power supply and voltage regulator operation separately and also prevented damage caused by soldering the chips directly.

A few safety checks should be made after final assembly. Make sure that if a metal case is used, it is well bonded to mains earth. Double-check the connection to the power transformer (test this separately if possible) and that all the chips are inserted with the correct orientation. Don't connect the unit up to transport or amp yet, but check the DC levels on the outputs of each channel: they should be a few mV at the most. If there is a large offset (Volts) you have just avoided blowing up your amplifier and/or 'speakers! Also make sure that there is no accidental DC on the digital input. If all is well, you are ready to hook the unit up and listen to some music.

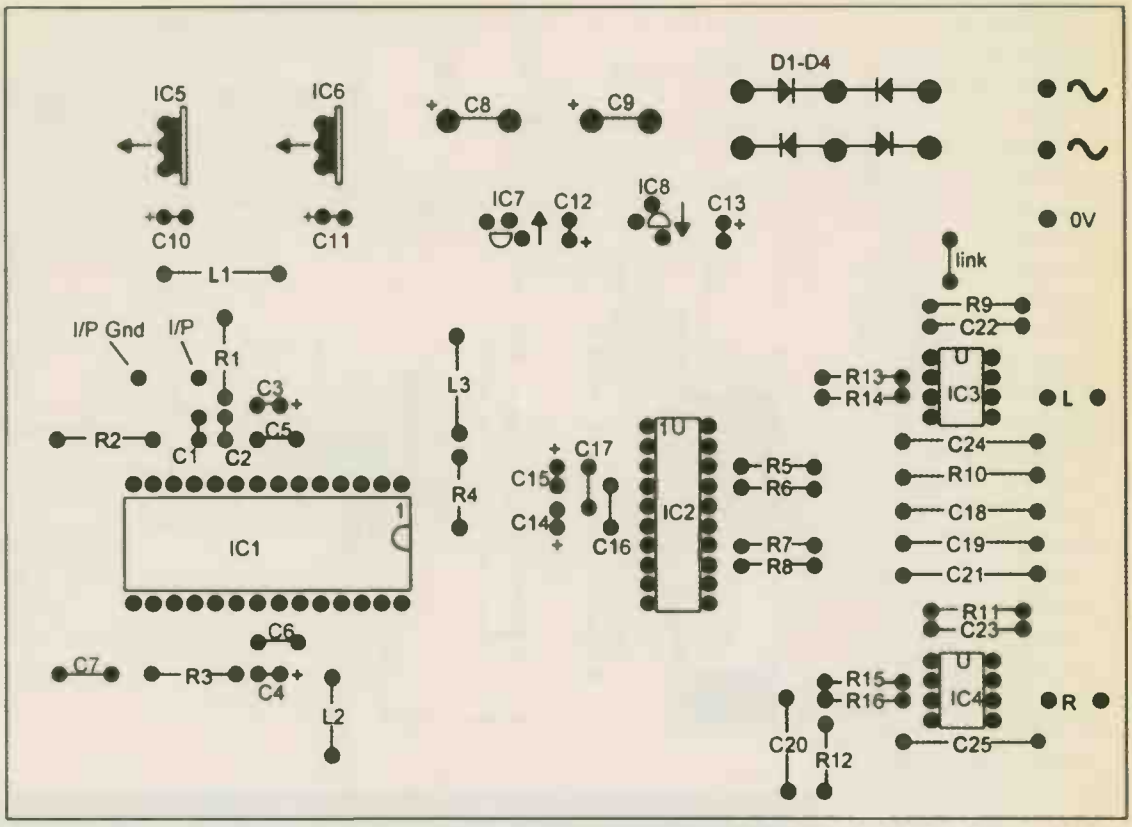


Fig.4 - Component Layout. Double-check that all the components are in the right positions before you power up the circuit and begin testing it.

LIST OF COMPONENTS

Resistors, metal film, 0.25watt

R1	75R
R2	39K
R3	1K
R4	10R
R5, 6, 7, 8	13K
R9, 10, 11, 12	13K
R13, 14, 15, 16	33K

Capacitors

C1,2	0.01uF resin-dipped ceramic
C3, 4, 10-15,	10uF electrolytic
C8, 9	2200uF electrolytic
C5, 6, 16, 17	0.1uF polyester film
C7	0.047uF polyester film
C18, 19, 20, 21	1000pF axial-lead polystyrene
C22, 23, 24, 25	200pF axial-lead polystyrene

Semiconductors:

IC1	Crystal Semiconductor CS8412
IC2	Crystal Semiconductor CS4329
IC3, 4	op-amp, NE 5534
IC5, 6	+5V, 0.5A regulator LM78M05CV
IC7	+12V, 0.1A regulator LM78L12ACZ
IC8	-12V, 0.1A regulator LM79L12ACZ
D1-4	rectifier diode 1N4001

Miscellaneous

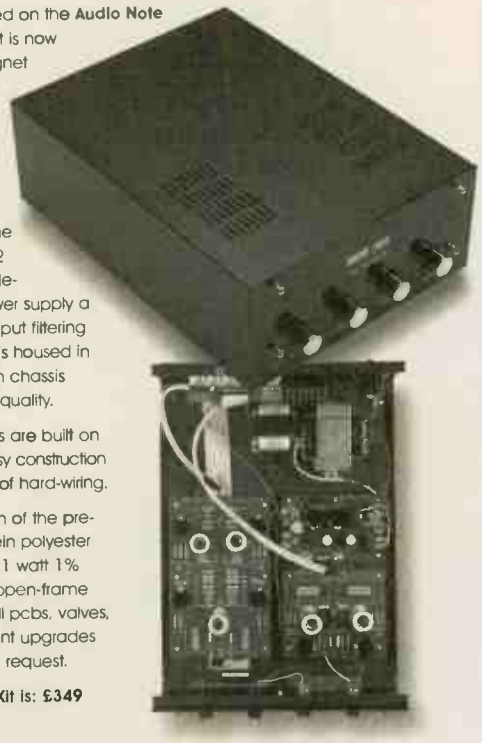
TR1 15V-0V-15V, 15VA toroidal
Double-sided, copper-clad board, 8in. by 4in.
BNC connector (or appropriate connector for other digital links)
RCA Phono sockets x2
Case, eg 6in. 11.75in. by 2in. (Maplin KR56L aluminium case)
Mains switch, IEC inlet and connectors, cable and plug.

Dr Holland can be contacted by e-mail at: ed.holland@Materials.ox.ac.uk

Components & Valves

Pre-Amp Kit

The **Audio Note** Pre-Amplifier Kit *(illustrated)*



A complete kit loosely based on the **Audio Note** M7Tube pre-amplifier circuit is now available. The moving-magnet compatible phono stage consists of a cascode input, with passive RIAA equalisation and anode-follower output using the 12AX7/ECC83. Line buffer/ amplification for the four line inputs consists of an ECC82 configured in parallel anode-follower mode. For the power supply a valve rectifier and choke-input filtering are employed. All circuitry is housed in a non-magnetic aluminium chassis giving the very best sound quality.

Both phono and line stages are built on 'track-less' pcbs allowing easy construction but with the sonic benefits of hard-wiring.

The standard-quality version of the pre-amp kit includes Roederstein polyester film capacitors, Beyschlag 1 watt 1% metal film resistors, Noble open-frame style potentiometers and all pcbs, valves, wire etc. Various component upgrades are available, details upon request.

Cost of The Pre-Amplifier Kit is: £349 incl. VAT but not delivery.

Audio Note Black Gate Electron Transfer, High Performance, Graphite Foil Capacitors

Audio Note is currently the sole source in Europe that holds any significant range of values in stock, we use literally 1000's in production, as we were the first company to realise the tremendous benefits that Black Gate capacitors offer, and we are to date the only high-end audio company in the world to incorporate Black Gate capacitors consistently in our finished products.

There are very few audio parts that promise a guaranteed improvement when replacing practically any other part, but this is what the BLACK GATE capacitors actually do. Exchanging any electrolytic capacitor anywhere in the circuit of an amplifier or in the crossover of a speaker will greatly improve sound quality. We are working on some guidelines as to where, how and which types of Black Gates to use in different circuits, the first such technical guideline is available now and is called "Improving your CD-Player" and can be obtained by sending a stamped addressed envelope to us requesting this leaflet. All AUDIO NOTE Level 2 Signature products use Black Gate Electron Transfer in critical signal / power supply junctions.

Audio Note Cerafine Powdered Ceramic Electrolytic Capacitors

We have at long last secured a reliable source for these fine power supply filter capacitors, a must in any single-ended project. The Ceratines really cover many of the Black Gates values and where the prices for the BG's are prohibitive the Cerafine is a fine sounding alternative. We have increased the range of Cerafines we stock quite recently, and strongly recommend all the Cerafines as a far superior replacement or substitute for ordinary electrolytics, and at the prices offered that should be within most budgets. All power supply Cerafines are supplied with a capacitor clamp and are upright mounting.

Audio Note Potentiometers

The best available from a sound quality / price viewpoint, made by Noble in Japan, utilising high quality conductive plastic film. However a better alternative is the KO-ON volume controls which are used in pre-amplifiers like the M7 Tube, M7Line, and in a mono version on the input in the NEIRO, KASSAI, KEGON and GAKU-ON, these are very good sounding pots by any standard.

Audio Note also carry large quantities of STANDARD TYPE SWITCHES, STANDARD ELECTROLYTIC CAPACITORS (good quality industrial types), RCA, BNC, BANANA, PLUGS, RCA SOCKETS, SPEAKER & GROUND TERMINALS & LOUDSPEAKER SPADES.

Audio Note Moving Coil, CD Line & Input Matching Transformers

Audio Note now offer moving coil, CD and input matching transformers for general sale. Common to all of these small signal transformers is that they come in a mumetal screening can with a threaded spindle with a nut for mounting.

Valves

The **Audio Note** AV300BSL *(illustrated)*

Audio Note is proud and happy to announce a joint venture with Mr Alesa Vaic of AVT in the Czech Republic, under the agreement reached Alesa Vaic's company will be making a range of directly heated triodes for small signal, driver and output stages exclusively for **Audio Note**. This will with time allow us to explore hitherto uncharted territory in the field of Single-Ended Audio Amplifier design, by putting us in a position to design and manufacture triodes specifically for a given purpose, something which has not been within our reach in the past, where we have always had to settle for the best amplifying devices available, but which good as many of them are, were generally made for other purposes.

Currently, we have a super linear version of the 300B available, dubbed The **Audio Note** AV300B SL it is available in limited numbered samples at US $250 each either single, or in matched pairs. We will follow this fairly quickly by a new, more powerful, power triode, the **Audio Note** AV32B SL with 65 watt dissipation for about 18 watt class A in single-ended configuration for an expected price of US $300 each. The **Audio Note** AV52B SL with an 85 watt dissipation for 28 watts of class A operation will be available in early 1998. This will be quickly followed by the most powerful and linear power triode available - the **Audio Note** AV62B SL with 120 watt dissipation for about 40 watt class A in single ended configuration at an expected price of US $500 each, it will help advance the case for SE operation despite the deplorable inefficiency of most modern loudspeakers!!

Audio Note Selected Audio Valves

Our valves are selected from the best available sources and are tested to the same stringent standards that we apply in the production of our own amplifiers. They fall into two categories, standard production items and rare, mostly NOS *(New Old Stock)* valves which are no longer in production. We have compiled a special list of the NOS items, which is available against a stamped self addressed envelope, if you live outside the UK, send US $2. You should be aware that the valves on this list are NOT cheap, but we have stock of original GE, RCA and United Electronics 211, both standard versions and reinforced anode type for the US airforce, 845 Westinghouse, VT25/10/10Y, VT62/801A, WE300B, STC4300A, Mullard GZ34/CV1377, Tungsol 5U4G *(best sounding 5U4G we have ever heard!)*, Chatham 5R4WGY and many others.

Audio Note Recommended Magazines *Full list available on request*

Listener – Review based music & hi-fi magazine that contains some of the best considered & well written articles in print. A very good read £4 per copy.

The Audio Adventure – Well produced publication, a good alternative to the established magazines. Not afraid to be controversial. £4 per copy.

Sound Practices – Our best seller. A must for all DIY projects. Contributors include Audio Note, Herb Reichert and Diego Nardi. £5 per copy.

Vacuum Tube Valley – Specialising in anything to do with audio valves. A wealth of information on specific valves and their applications. £8.50 per copy.

Positive Feedback – Including zany, controversial articles from a wide range of contributors including our own Peter Qvortrup. £7 per copy.

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Audio Note

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SALE SALE SALE

VALVE SECONDS

These valves have been tested and are electrically to the same standard as Golden Dragon premium quality valves. However, during testing some discolouration of the glass envelope has occurred which means we cannot offer them as first quality.

The following are available until stocks are sold (few of each only, matched pairs available (subject to stock):

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