BOOK REVIEWS
LETTERS AND Q&A
THIRTEEN BASS UNITS TESTED
BUILD A NOVELTY LAMP USING THE 211 VALVE

SPECIAL COMPENSATED PASSIVE PRE-AMPLIFIER

WE BUILD THE SPEAKER CO.'s 101 MINI MONITOR

FREE D.I.Y. SUPPLEMENT No. 8
Audio valves with famous Brand Names of yesteryear such as MULLARD, MOV, GEC, RCA etc., are in very limited supply and their scarcity also makes them very expensive.

We at Chelmer Valve Company however provide high quality alternatives to these old makes. We have over 30 years experience in the supply of electronic valves of all types and during this time have established close ties with factories and sources worldwide.

For high fidelity use we further process valves from these sources using our specially developed facilities. After rigorous testing - including noise, hum, microphony, post burn-in selection and matching as needed - we offer this product as CVC PREMIUM valves.

A selection of the more popular types is listed here.

<table>
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<th>Price list &amp; Order Form for CVC PREMIUM Audio Valves</th>
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<tr>
<td><strong>PRE-AMP VALVES</strong></td>
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<tr>
<td><strong>UNIT PRICE</strong></td>
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<tr>
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<tr>
<td>ECC83/12AS7T7</td>
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<tr>
<td>ECC82/12AU7</td>
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<td>ECC88</td>
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<p>| <strong>POWER VALVES</strong>                                  |</p>
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<td>TOTAL TO PAY</td>
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<td>£</td>
</tr>
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* MATCHING, if required; state valve types & if PAIRS, QUADS or OCTETS - Allow £1.00 per valve for this service.

Make CHEQUES payable to: 'CHELMER VALVE COMPANY' or pay by ACCESS/MASTERCARD/Visa, give details:

Name
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Post Code

World Radio History
KIT NEWS
We search out interesting news from the enthusiast hi-fi industry.

THE SPEAKER CO. 101 MONITOR
The Speaker Co. have taken KEF's 101 monitor, based on the BBC LS3/5a, and added a little more bass. We build the kit and listen to the results.

BUILD A NOVELTY LAMP USING THE 211 VALVE
We show you how to make a 211 triode valve into an ornamental lamp.

CABLE COMPENSATED PASSIVE PRE-AMPLIFIER
Richard Brice approaches the passive pre-amp from a different angle to give you the cable compensated passive pre-amp.

KIT SUPPLIERS
Where do you go for the bits to build your latest project? Our listing points you in the right direction.

THE ESSENTIAL BOOK LIST
Books that every hi-fi enthusiast should own, available by mail order.

BOOK REVIEWS
Interesting books for the valve enthusiast and the DIYer.

History of the British Radio Valve

The Parts Connection Catalogue

WOOFERS TEST
Thirteen 10" and 12" bass drivers that promise to shake the foundations. We test them and suggest how best to utilize their strengths.

DIY LETTERS
Our minds are put to work this month by your DIY hi-fi queries.
AUDIOPHILE CATALOGUE
RATA have just finished their new Audiophile Catalogue, full of high quality components and products for the DIYer and hi-fi enthusiast.

As well as their high performance hi-fi equipment, RATA offer a large range of specialist components. These include: Vishay and Holco resistors, Sfemice capacitors, transformers, drive units, valves and more.

For your copy of the latest RATA catalogue, phone or write to:
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Edge Bank House,
Skelsmergh,
Westmorland,
L A S 9 A S.
Tel: 0539 823247

MAPLIN STRIP OFF
The new CW33L wire stripper for Maplin Electronics is a compact and unique cable stripper capable of removing both the inner and outer insulations of round cables up to 8.5mm cross section. Ideal for the home constructor, or professional electrician, it costs just £6.75.

Maplin electronics are also keen to make themselves more available to the general public, opening new shops in Stoke-on-Trent and Dudley recently.
Maplin Electronics,
P. O. Box 3,
Rayleigh,
Essex.
SS6 8LR
Tel: 0702 544161

A CATALOGUE OF KITS
The Speaker Co. have just finished updating their kit loudspeaker and drive unit catalogue, bursting with lots of new products. New drive units include the massively engineered Precision Devices bass drivers, Audax HDA units, and automotive speakers from Altec and Macrom.

There are also several new kits on the way. First to arrive should be the DTM I, a 2-way desk top monitor using twin 5inch bass units and a soft dome tweeter, both supplied by Morel. The Speaker Co. are also working on a small horn loudspeaker, using a 6.5inch bass unit, possibly the Audax HDA unit, although this design is at a very early stage. Also due sometime in the future is The Speaker Co.'s first subwoofer, using the dual voice coil Volt DVC 250 bass unit.

Also in the new catalogue are Ansar Supersound polypropylene capacitors and high value E-core inductors which have a lower DC resistance than standard inductors. For your copy of the new Speaker Co catalogue, contact:
The Speaker Co,
Unit 9,
Waterside Mill,
Waterside,
Macclesfield,
Cheshire.
SK11 7HG
Tel: 0625 500507

AUDIOJUMBLE
The second Audiojumble, organised by John Howes, is due to take place on Sunday 17th July at the Royal Victoria Hall, Southborough, Tunbridge Wells, Kent. A wide range of vintage and modern hi-fi equipment will be on sale, so if you've always fancied restoring a piece of vintage esoterica, or even just browsing for interesting books and gadgets, pop along and have a look. Admission is £1, and if you're interested in taking a stall, the cost is £15. For all enquiries, Tel: 0892 540022

300B PRODUCTION DEVELOPMENT COMPLETED
And now some news from us. Frustrated potential customers champing at the bit worldwide will be delighted, even amazed, that we have finally completed development of our 300B 30watt/ch amplifier. It is now going into production as a kit.

The delay has been caused by numerous factors, including Chinese valve unreliability, which triggered a power supply re-design, an improvement of the input/driver stage to further reduce distortions and allow removal of tertiary feedback, improved driver transformers for wider bandwidth for substantial reduction of ringing, physical re-arrangement to lessen heat build up over extended periods.

And then there's been the subjective fine tuning, to select the capacitors, valves, and resistor makes/types and set values where possible (e.g. bypass caps).

The improvement in performance has been so great that 300B does not now need feedback of any sort, distortion has become so low. In other words, it has become an unusually linear amplifier - always the promise of the 300B valve, usually frustrated by transformer and/or circuit limitations. All the same, loop feedback can be applied by the flick of a switch: the amp. can be monoblocked as well to give around 60watts. We hope to be giving much more information on this project soon, which has become totally absorbing to us. NK

DIY Supplement, Tabula Rasa report an excellent response, so much so, that they have reduced the price even further, it's now down from £295 to £280!

Within the next month or so, they will also be importing the beautifully styled and built Burmester range of hi-fi equipment, and audio components from Inter Technik who produce a wide range of inductors, foil capacitors and transformers.
Tabula Rasa
136 Kilmwood,
High Wycombe.
HP14 4UR
Tel: 0494 565116

TABULA RASA EXPAND
Tabula Rasa have been hard at work expanding and diversifying. They have just launched a range of loudspeaker stands to complement their loudspeaker kits, and equipment racks are to follow shortly.
Following the review of the floorstanding CT77s in our October' 93
THE SPEAKER CO. KIT

Building The 101 Monitor Loudspeaker

Dominic Baker tackles a quality mini monitor from The Speaker Co.

The LS3/5a theme. Some use more modern drive units, up-rated crossovers and differently dimensioned boxes. The Speaker Co. have recently added their kit version to the market, based on the KEF 101 monitor, which, itself, was an LS3/5a pretender. They've added a little more volume to the box though, to get better bass, and used very heavy 30mm MDF, for an uncoloured midband.

The kit comes with high quality components throughout, including knurled gold plated terminals, Deflex damping pads, a pre-built KEF crossover and grilles. The instructions were clear and easy to follow, but this is a very simple kit to build anyway, so anyone who can use a soldering iron and drill should encounter few problems.

BUILDING THE KIT

Like the IPL S3 kit I built for the last supplement, The Speaker Co's 101 Monitor kit went together very easily. The wide rebated edges give plenty of room for the glue to be applied and should ensure that the box is airtight.

There is a little drilling to be done with this kit, to provide fixing holes for the drive units, input connector panel and grille fixings, but this only takes a few minutes and can be done with a small electric drill. Just small pilot holes are needed for the tweeter and input panel - self-tapping wood screws are used - but threaded 'T' nuts have to be hammered into the rear of the baffle for the bass unit.

The kit comes supplied with Deflex damping pads which replace the traditional carpet felt and long haired wool. It is best to cut the damping pad to size and glue it to the rear baffle before putting the cabinet together; it's much harder once the box has been built.

I glued the cabinets together not forgetting to stick the pre-built KEF crossover board to the bottom surface; it was a quick process. Excess glue can be smoothed away easily with a damp cloth and the cabinet then held firm with carpet tape. Other wide tapes can be used, but carpet tape in particular has some stretch in it, which helps to pull the panels tightly together. While the cabinets are drying the rest of the kit can be prepared. The latest addition to the Deflex range are small circular damping pads that are fixed to the rear of the magnet assemblies. The idea is to reduce reflections off the hard surface of the magnets.

Once the cabinet glue has dried the tape can be removed and the terminal panel and drive units mounted. If you want to apply a painted or veneered finish it is best done at this stage, since drive units and paint don't mix.

A small hole has to be cut through the Deflex damping to allow the wires from the crossover to be soldered to the terminal panel before it is screwed into place. The drive units are easily mounted, thanks to the 'T' nuts already in place, but care is needed in getting the wires the right way round.

The kits come complete with grilles which have to be assembled by the constructor. This is a relatively simple operation. The thin board which forms the crossover frame is placed over the cabinet, making sure it is straight. Four small (3mm) pilot holes are drilled through each corner of the grille frame and just into the surface of the cabinet. This ensures that the cups and studs that fix the grille in place will line up. The hole in the grille frame has to be widened out to 4.5mm and the one in the cabinet to 10mm to accept the fixings. The grille cloth can now be glued or stapled into place, finishing the loudspeaker.
SOUND QUALITY

The 101 Monitor kit is basically an LS3/5a with a little more bottom-end welly, thanks to the increased volume of The Speaker Co's cabinet. It still doesn't have real deep bass, like any small speaker, but what's there is firm and punchy, adding speed and dynamics to the bottom end. I found there was little sign of one-note bass. Overdriving them brings a crack from the bass unit as it hits its end stops. It sounds dramatic, but it is a deliberate design feature used to deter owners from over-driving, KEF told us some time ago.

Above the solid upper bass lies a soft midrange. It doesn't project as well as many more modern versions based on the LS3/5a theme do, but the heavy MDF cabinet ensures that it is not boxy. For example, John Lee Hooker didn't fill the room with quite the same larger-than-life image that some speakers produce, but his voice was clear and free from any artificial colouration contributed by the cabinet.

MEASURED PERFORMANCE

The frequency response of The Speaker Co's 101 monitor is, as you'd expect with the crossover being engineered by KEF, very smooth indeed. There is a little dip in the upper mid which explains the softness I heard, and a lift in the upper bass which will give the sound speed and punch. There isn't much low bass, but there's enough to give a balanced outlook.

The impedance curve is very high indeed, giving an overall impedance of 7.25 ohms. In consequence, the 101 monitors will not demand much current from an amplifier, but they aren't very sensitive either. Measured at 1m with a 2.8V pink noise audio band signal, it was a very low 81dB. This means that you'll need an amplifier that can supply a lot of volts, a good power or hi-fi integrated being best at this.

Overall, The Speaker Co's 101 monitor is a well engineered loudspeaker. The combination of high impedance and low sensitivity is a little inconvenient, but shouldn't cause any modern transistor amplifier problems. DB

The Frequency Response

The frequency response is flat and even.

The Impedance

The impedance is very high, giving an overall impedance of 7.25 ohms.

The Speaker Company
Unit 9, Waterside Mill,
Waterside, Macclesfield,
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SPEAKER KITS FROM IPL ACOUSTICS

Over a 5 year period I.P.L. Acoustics have developed a range of high quality speaker kits, using the best units from SEAS, MOREL, AUDAX, VISATON and I.P.L. and have produced a comprehensive range of speakers which will compete with the most expensive of commercial designs. All speakers have BIWIRED crossover kits containing high quality components and terminals.

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If you would like further details please send £1.50 for 36 PAGE SPEAKER BUILDING CATALOGUE, comprising VALUABLE ADVICE on DESIGNING, BUILDING and TESTING speakers and full technical specifications including response curves of eight kits, drive units, and details of SPECIALIST CABLES and ACCESSORIES.

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A selection of our stocks of New Original Mullard - Brimar audio types made in UK.

<table>
<thead>
<tr>
<th>STANDARD TYPES</th>
<th>SPECIAL QUALITY TYPES</th>
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<tr>
<td>ECC88 MULLARD</td>
<td>E88CC - GOLD PIN MULLARD</td>
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<td>ECH81 MULLARD</td>
<td>ECC81 - M8162 / CV4024 MULLARD</td>
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<td>ECL86 MULLARD</td>
<td>ECC81 - 6201 / GOLD PIN MULLARD</td>
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Access

World Radio History
HI-FI WORLD SUPPLEMENT JUNE 1994
Building a kit valve amplifier isn't that easy. You need to be able to solder neatly, follow circuit diagrams and have a fairly good understanding of electronics in general. But that doesn't mean that you can't build something with a glowing valve in it - and perhaps do a little dreaming. Here is a simple ornament or lamp - albeit a dim one - made using the bright emitter 211/VT4C valve, found in exotic amplifiers such as the £43,000 Audionote Ongaku.

Our lamp is a bit more affordable than an Ongaku and the electronics knowledge required to build it is minimal, so almost anyone should be able to participate. The heaters of the 211 which give off the bright glow only need 10V, so a transformer is used to step-down the 240V mains voltage. But the 211 takes 3.25A of heater current, so a highly rated transformer must be used.

Most of the components needed came from Maplin, who produce an electronics mail order catalogue that can be found in W. H. Smith. The components for the lamp cost an affordable £15 or so and the 211 itself can be purchased from P.M. Components for £19.95, quite a lot for a light bulb, but then it'll last for many years and it's bit more unusual and evocative.

To build the 211 ornament you will need some solder, a soldering iron and the components listed at the bottom of the page. There is a schematic diagram to help you build it, showing exactly where each wire goes. Remember, don't touch anything unless the mains switch is turned off and the plug has been pulled out of the socket.

BUILDING THE 211/VT4C LAMP

Start by mounting all of the hardware on the ABS box. A 48mm diameter hole needs to be cut for the 211 to drop through, into the capacitor dip. I did this by first drilling a small pilot hole and then widening it out with a fine blade in a jigsaw. By screwing the valve into the capacitor clip, the fixing holes can be marked and drilled, and then the clip bolted in. The mounting hole for the switch can be drilled straight out using a 13mm bit, as can the one for the mains lead using a 5mm bit. The transformer is bolted to the bottom of the box, positioned to be half way between the valve base and the mains switch. Once all the hardware has been fitted the components have to be soldered up. It is best to solder from the valve backwards, connecting the mains lead last. Solder two wires to the heater pins and then to the transformer as shown in the diagram. Wire the transformer to the switch and the mains, putting a knot in the mains lead to prevent it being pulled out of the box. Wire up a mains plug and then go back and check that you've made all the connections correctly. If you're sure that all is O.K. plug in and turn on. Hopefully you will now be sitting in front of a glowing 211/VT4C valve- and it won't have cost you £43,000.

LIST OF COMPONENTS FOR 211 LAMP

<table>
<thead>
<tr>
<th>Component</th>
<th>Vendor</th>
<th>Price</th>
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<td>Red Switch</td>
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<td>ABS Box</td>
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<td>2m Mains cable</td>
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<td>4 Stick-on Feet</td>
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<tr>
<td>Cap Clip</td>
<td>543-046</td>
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<td></td>
<td>543-046 204555</td>
<td>£2.95 p&amp;p</td>
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Unfortunately, if you order from Electromall you have to order 5 clips and pay £2.95 for postage making £4.18, but most small electronics shops should be able to oblige for around 50p or so.

PM COMPONENTS 0474 560521
211/VT4C Valve £19.50
AUDIOTECH AOD 2011 COMPONENTS PRICES & PRICE LIST

We have decided to offer a range of the ultra high quality components used in most of the AUDIOTECH amplifiers to the discriminating "do-it-yourself" valve amplifier enthusiast. These components are of the highest quality and include the associated bases, paper in all signal capacitors, copper and silver foil signal capacitors, Black Gate graphite sintered chassis, Gold 845, Silver 6L6G and Gold transistor, audio output transformers, valves and many other useful for building or constructing new valve amplifiers.

All pricings are excluding Vat, which, if you live inside the EEC will be added to your purchase, for houses outside the UK another USS 10.00 will suffice. Delivery is normally about 7 days from receipt of cleared funds, but please allow up to 60 days for some items. If you have had no stock for some time or order over 50 items, please ring first.

If you ordered this way then we will ship it for you now, with your address, card no., valid start and expiry dates, you can also pay by bank draft, Eurocheque or cheques drawn on a UK bank account. Please note that there is a minimum charge on credit card transactions of 25.00.

We can also supply a set of data sheets for the following valves.

- 300B, 30014, 3002A/6080, 2A3 4-fin (notNOS)
- 4-pin UX4 for 300B
- 5-pin 080 for EL34, 6550.
- 6-pin for 6L6G, 6V6G, KT66, 6250
- 7-pin BM for ECC83, ECC88.
- 9-pin for ECC83, ECC88, 5687, 6350 etc.
- Chassis from above silver
- 9-pin E180 for EL34, 6550 etc.
- Chassis from below silver.
- 4.59 6-pin for 6L6G, 6V6G, 5687 etc.
- Chassis from below silver.
- 4.95 8-pin for EL34, 6550 etc.
- Chassis from below silver.
- 5.70 6-pin for 6L6G, 6V6G, 5687 etc.
- Chassis from below silver.

The above solid silver wires are suitable for inductors for speaker crossovers, both active and passive, and for internal wiring in turntable arm bearings.

- If any of you reading this have possession of any of the above mentioned components, please let us know. Or, if you live outside the UK, another USS 10.00 will suffice. If you would like some suggestions to base a transistor circuit on, please let us know your experience and background to the subject of valve amplifiers, and we will provide you with a circuit pack containing good information about valve amplifiers design. We can also supply a set of data sheets for the following valves.

- 3APACITORS Mainly lc: use In  Traductor  power transformers whether for microphones, moving coil speakers, tape heads, etc., or if you live outside the UK another USS 10.00 will suffice. If you live outside the UK another USS 10.00 will suffice. If you live outside the UK another USS 10.00 will suffice. If you live outside the UK another USS 10.00 will suffice.

- But it must be pointed once again that the subject of Audio Design and which would not be useful to share with others, please let us know.

- Any books which contain information relevant to the subject of Audio Design and which would be useful to share with others, please let us know.

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- Or if you live outside the UK another USS 10.00 will suffice. If you live outside the UK another USS 10.00 will suffice. If you live outside the UK another USS 10.00 will suffice.
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Beyond 1 watt, 1% resistors up to 500kOhm, 0.01%, above 500kOhm of 50 Ohm each.

HOLD-O

Better sound quality can be achieved with the H-2, 1%, 2% non-magnetic resistors, which we regard as the best "industrial grade" metallfilm resistors available. They have one small drawback, as they are quite fragile and require careful handling, do not bend the legs too close to the body, they may become noisy.

HOLD-0 resistors type HP 92096 Per meter 0.36 each from 100mOhm to 500kOhm, higher and lower values are at 0.63 each.

SHIMEX Tantalum Film Resistors.

This is definitely the best sounding resistors available, target the WATSON, which may be ok in high feedback transistor amplifiers, but in our opinion quite uncomplimentary to the qualities of real Audio Amplification (i.e. directly heated triode amp) and running line to line in some high-end circuits, this is where you will need the tantalum film resistor for the best results.

Up to now the tantalum film resistors have been extremely difficult to get, however, after much persuasion and against a minimum quantity guarantee from AUDIO NOTE UK, the manufacturers have agreed to widen the range and is called ' Improving your CD-Player and can be obtained by sending a stamped addressed envelope to us requesting this leaflet.

There are very few audio parts that promise a guaranteed improvement when replacing practically any other part, but this is what 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 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...

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There are very few audio parts that promise a guaranteed improvement when replacing practically any other part, but this is what 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 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.

BLACK GATE ELECTRON TRANSFER, High Performance, Graphite Electrolytic capacitors.

The Audi0 NOTE silver wire outputs listed here are designed and made in the UK, we can supply the AUDIO NOTE Japan manufactured outputs for the best results.
I first suggested the idea of a cable-compensated "passive preamplifier" in my column Recorded Message in the March 1994 issue of Hi-Fi World. Since then, judging from the number of telephone enquiries, I've come to realise that the project clearly appeals to many would-be constructors, having the particular merit that it is extremely simple to build.

The principle behind cable-compensation is not new, the concept is borrowed from its implementation in test equipment. For instance, the designers of oscilloscopes ameliorate the effects of high-frequency distortion due to the cable connecting the measuring probe to the oscilloscope display itself by using a cunning technique to make the cable "disappear" in electrical terms. Fig I illustrates the principle: $V_{c1}$ is used to "tune-out" the effect of the cable.

Unfortunately, the straightforward execution of the method illustrated in Fig I applied to a passive pre-amp is hindered by several practical hurdles. It is for this reason that, when I first suggested the idea, I omitted component values. Neither due to deliberate obscuration nor oversight, the problem with suggesting circuit values stems from the fact that the choice of exact values depends on knowing:

1) The output impedance of the source being fed to the control unit.
2) The resistance of the potentiometer.
3) The capacitance per unit length of the following cable.
4) The length of the following cable.
5) The input impedance of the power-amplifier.
6) The position of the volume control when listening at normal levels.

So many imponderables in fact, that it seemed to me the inclusion of some hastily-conceived circuit values could lead to some disappointing results should anyone wish to try the technique. The new design, shown in Fig. 2, eschews many of the disadvantages of the simple circuit suggested in my original article by including a continuously variable cable compensation control which allows the control unit to be "tweaked" to match the cable it is intended to be used with. A further refinement is the implementation of a quasi log-taper volume control achieved by means of a linear 100kΩ.
control shunted with a 10kΩ fixed resistor across the wiper and earth. This circuit arrangement has the virtue that the output resistance remains more constant with respect to control position than is the case with a simple log control. (Be warned - the price you pay for this advantage is that the input impedance variation is normally larger) The cable compensation control is designed to compensate for capacitive loads between 50pF and 500pF, which should allow adequate allowance for the majority of interconnects.

The cable-compensation control must act equally on both channels, so the control should be a linear dual ganged 100kΩ potentiometer. You can choose to adjust the control in a number of different ways:

1) use test equipment - a scope or an AC voltmeter - to give the best frequency response.
2) by ear, or,
3) using the rubic shown in Fig. 3.

**MEASUREMENTS**

Measurements with and without cable compensation for a load of 500pF are given in Table I. As you can see, the technique reduces frequency response aberrations and (perhaps more importantly) reduces phase-shift, thus preserving the waveform of complex signals more faithfully.

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<td>-5.9dB</td>
<td>19°</td>
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</table>

My prototype pre-amp is illustrated in the head shot. I named the unit the j-solat interconnect isolated control unit, the "j" refers to the engineer's term for the complex (eg. capacitive) part of the following circuit impedance which the cable compensation is intended to isolate. (Isolate becomes j-solat becomes j-solat, oh well, it was fun at the time!)

Bored of the usual run-of-the-mill control knobs, I opted for my own design which I had turned at a local engineering works from a rod of Nickel Steel. Inspired by my favourite fashion designer, Jean-Paul Gaultier, the pre-amp inexplicably sounds its very best playing Madonna CDs!

**References**

* Hi-Fi Choice Pocket Guide to Interconnect Cables 1992
Dennis Publishing.
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**HI-FI WORLD SUPPLEMENT JUNE 1994**

Please allow 28 days for delivery
Jimmy Hughes sets to work on his Impulse H-1 speakers with a set of polymer panels designed to improve the sound by eliminating standing waves.

For or five years ago I wrote an article describing the benefits to be had by removing the internal damping from loudspeakers. An undamped speaker typically has more life and impact than its damped counterpart. Undamped speakers sound more freely able to move air, giving a bigger sound even at lowish volume levels. In a word, the music breathes.

Drawbacks? Well, undamped speakers can lack tightness and control, and coloration levels may be higher too. So I was intrigued when a set of acoustic damping pads arrived from Spectra Dynamics. At first I intended to use them in a conventional damped speaker, but then decided to try them in my undamped Impulse H-1 horn speakers instead. Previouslty, I'd heard H-1s damped, and much preferred the undamped version. However, fitting Deflex panels seemed to give greater tightness and control, improved internal clarity, and

THE DESIGN BEHIND THE DEFLEX PANEL

Deflex panels are made from an advanced polymer on the verge of turning liquid. An excellent shock absorber, its surface emulation has been designed to eliminate standing waves.

The panel's thick heavy composition makes it very good at damping resonances, and for this reason Spectra Dynamics recommend you remove laminations damping panels first, inside the speaker where these are fitted. These years were spent developing them, emphasising that Deflex panels are purpose-designed speaker fittings not a by-product of another industry.

The panels can be cut to size using scissors and then stuck in place using a glue such as Copydex. If required, distributors The Speaker Company can supply panel adhesive.

Panel size is 280x210mm, and maximum thickness 12mm falling to 5mm at the centre. Fitting should be straightforward, but not all speakers are suitable.

For example, Linn Isobariks may benefit, but are extremely difficult to gain entry to because the drive units are inwall-sealed in place.

It's difficult to decide beforehand whether Deflex panels are going to make an improvement. For you can gain an idea of the likely outcome by listening to the speaker minus its damping before auditioning. This allows you to hear any adverse effects produced by the existing damping, and also tells you how easy it is to gain access to the speaker's innards. Modify one speaker only, then compare it to the other.

If the damped speaker sounds modified and "slow" and you prefer the undamped unit (even if nominally it isn't quite right), a set of Deflex panels should both work successfully giving the best of both options.

Because the Impulse H-1 has an open-backed midrange unit, accessible simply by removing the top cover, it was easy to fit and remove Deflex panels behind it for A/B comparisons. However, the benefits were so obvious that it was hardly necessary to compare back and forth.

I later tried four panels in the bass chamber and again heard big improvements in control, definition, and clarity. I especially liked the way Deflex treatment gives the benefits of damping with none of the drawbacks.

Each panel is fairly easy to fit — though much depends on the speaker being treated. In most cases you'd simply remove the bass driver, take out the speaker's internal wadding/damping, and fit the Deflex panel as required. Naturally such work invalidates the speaker manufacturer's guarantee, so only attempt the modification if you feel competent to do so.

For Information Pack — Contact: Spectra Dynamics (0745) 570194

January 1994

Spectra Dynamics Ltd, Talargoch Trading Estate, Meliden Road, Dyserth, Clwyd LL18 6DD
**HISTORY OF THE BRITISH RADIO VALVE TO 1940, by K. R. Thrower.**

Reviewed by Noel Keywood.

What a delightfully obscure title, and how appropriate too, for this is an obscure book in lay terms, yet for valve-heads it will be required reading. As its name suggests, the book covers valves generally, rather than in a hi-fi context, which isn’t surprising because hi-fi is a post-war notion which this book pre-dates. All the same, anyone with an interest in valve history will find the book impressively well researched and detailed; I personally found it fascinating.

The early history of the valve is covered in detail, revealing the difficulties Fleming and then Lee de Forest had in producing adequate vacuums and satisfactory electrodes at the turn of the century, as well as the difficulties they had in appreciating fully the mechanisms at work in thermionic emission. For example, many scientists and engineers of the time thought that air was necessary for conduction. Although Langmuir of AT&T labs. in the USA realised a ‘hard’ vacuum was necessary, even the Americans had to import a special mercury pump from Germany to achieve it.

Both Alexander Fleming, who worked in London on the diode until 1906, and Lee de Forest who invented the three-electrode (triode) valve in 1905, saw them as rectifiers rather than as amplifiers. It was the laboratories and scientists of AT&T and General Electric in the USA who developed de Forest’s ‘Audion’ valve into an amplifier for telephony. They paid de Forest no less than $390,000 in all for his patents, a fantastic amount for the time.

Parallel developments in Germany are covered, including a fascinating comment that “Nernst, Lieben’s teacher and friend, on numerous occasions observed the fidelity of amplification of Lieben’s device.” Made in 1906, this comment must surely be one of the first ever references to the notion of fidelity in amplification.

Keith Thrower’s book is intensively researched from original research papers and records, copiously illustrated with pictures and diagrams, wide ranging in its coverage (American, British and German work is described) and possesses long lists of references and bibliographies. There’s no doubt that he has put enormous effort into this book.

From early researches, the book moves on to cover development of the valve as an amplifier, from 1913 until 1940, mainly within the context of radio, but with good reference to audio amplification too. Surprisingly, as if all this was not enough, there’s a comprehensive chapter on valve construction as well, covering materials, design rationales, problems and solutions. Plus a short history of British valve manufacturers.

If there’s any criticism I could make of this book it is that it attempts too much, in the process losing the thread of the story of the valve’s development, for example. But this is a very minor point in comparison to all that it achieves, and all that it offers.

The History of the British Radio Valve to 1940 is an impressive work by an engineer quite obviously dedicated to his subject and determined to produce a valuable reference work. As far as I know, it is one of a kind. The book is not on general sale. I had to contact Keith Thrower, the author (and Research Director at Racal Radio), personally to get hold of a copy. So will you! Copies of this book can be obtained by sending a cheque for £10.25 to:

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THE PARTS CONNECTION CATALOGUE

Reviewed by Noel Keywood.

Per head of population, Canada supports a larger hi-fi market than Britain, I was once told. Looking at this highly specialised catalogue, I can believe it. What's more, Canadian enthusiasts seemed more tuned onto super-esoterica ("real" hi-fi to some) than the British, if The Parts Connection, "A Division of Sonic Frontiers", is anything to go by.

In their own words, "The Parts Connection is a one-stop audiophile shop". And their definition of audiophile coincides precisely with ours: the catalogue has ranges of highly specialised capacitors, resistors, valve amplifier output transformers, valves, volume controls, connectors, kits, tools, solder and many other items.

Where this catalogue differs from most is in the rarity and specialty of some of the items. For example, we were taken aback to see Teflon capacitors in stock. These are extremely difficult to manufacture, a capacitor supplier told us recently, so they are as rare as thermionic transistors. Mind you, the price of $43 (U.S. Dollars; equivalent to £29 at the time of writing) for a 0.1 μF reflects this. Teflon is said to be the best dielectric, however. Otherwise, film-and-foils with a polypropylene dielectric rate highly, which The Parts Connection also stock. There are no Black Gates, but they do have Mallory electrolytics and at $10.25 (£6.92) for a 100μF/450V (525V surge) they are competitively priced.

Resistors include Vishays and Holcos, but there are plenty of other makes too. Magnequest output transformers for single ended 300B amps and general purpose push-pull usage are stocked, but insufficient information is given to apply them optimally. Further info. would be needed.

Tested valves like Golden Aeros are listed, as are new old types. The Parts Connection also stock, to a limited degree, specialised solid state devices. This is an area that could beneficially be expanded I feel, because semiconductors could well benefit from greater specialisation of design toward audio usage, supportable by higher audiophile pricing. But then, that's for the chip fabricators to consider; operations like The Parts Connection might well stimulate this.

Canada? Yep. There is a lot of water between them and us, but they're fully geared for overseas orders, with answerphone and fax. First class air mail or UPS (C.O.D. if wanted) will keep UK-bound parcels dry and payment can be made by money orders (US dollars), bank transfer for large amounts, American Express, Visa and Mastercard. Delivery times are 7-10 days approx., but it's always best to check availability first.

Contact The Parts Connection at: 2790 Brighton Road, Oakville, Ontario, CANADA L6H 5T4. Tel: 0101-905-829-5858 Fax: 0101-905-829-5388

The 96-page A4-size catalogue costs $5, but offers a $10 discount against the first order over $100. Britain is 5 hours ahead, so 'phone 3pm-10pm to speak direct. At the time of writing exchange rate was $US1.48=£1.
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Seas P21REX

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QED
BASS POWER!

Here are thirteen of the best known ten and twelve inch bass units, ranging from £30.50 to £185 each.

To measure the frequency response of the bass units, we used a huge baffle, achieved by mounting each driver in a doorway between two rooms. The frequency plots show how low bass will go naturally on such an open baffle, but bear in mind that with units that are amenable to the effect, bass will be extended down by the cabinet eg. the Beyma reaches 72Hz on the open baffle, but 34Hz in a cabinet.

The high Q (0.37) bass units are best suited to sealed enclosures, and their bass response in a box will not go lower than on the open baffle. Lower Q units can be used in a reflex enclosure, where the bass response can be forced downwards by the port.

Other areas that are important to how the bass unit will perform are sensitivity and BL factor. Make sure that if you decide to use one of these bass units that it is sensitive enough to keep up with the midrange and tweeter units you have chosen, else they'll have to be attenuated, which is a waste. The higher the BL factor is, the harder the bass unit will push outwards for a given input. So a high BL factor will give good clean bass, with low distortion.

A simple second order filter is all that you're likely to need to roll off the midrange from these units. Pick the frequency you want to use the bass unit up to, say 200Hz, and then use the impedance curve to give you a value for R. This value can then be inserted into the equations below to give a value for the inductor and capacitor.

Most of the units can be used right up to 1kHz but some can be seen to break up lower down. This break-up can be clearly seen, and they should not be used above this point.

To see what they could actually do, I ran all of the units through a computer box designer. I fixed the volume at 100itres, about the size of a large floorstander. This gives you an indication of how low the bass unit will go in a given box size, making comparison easier.

The bass units in this test are available from:
The Speaker Co. Unit 9, Waterside Mill, Waterside, Macclesfield, Cheshire. Tel: 0625 500507
Richard Allan Audio Ltd, Bradford Rd, Gomersal, Cleckheaton, W. Yorks. Tel: 0274 869935
Beyma bass units available from:
LMC. Unit 10, Acton Val Industrial Park, Cowley Rd, London. Tel: 081 743 4680

AUDAX HT240M0 £30.50

Audax's HT240M0 is a 10inch bass unit with an undoped paper cone. Sensitivity is high at 92dB, making it suitable for most midrange units and tweeters. It is best suited to reflex loaded enclosures, reaching 37Hz in a 100 litre box with an 80mm diameter, 71mm long port.

MOREL MW1075 £52.89

Morel's 10inch MW1075 damped polymer cone bass unit is best suited to sealed enclosures, reaching down to 34Hz in a 100 litre cabinet. It is only 89dB sensitive so efficient midrange units and tweeters will have to be attenuated to match.
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122 x 33 x 21.16 cm

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Wilmslow Audio

As any discerning sound engineer will tell you, the ATC SCM50 and 100 are the ultimate in accurate low distortion professional monitoring. But what they may not know is that self-assembly versions based on these classic monitors are now available from the UK's leading loudspeaker kit supplier, Wilmslow Audio, at a fraction of the ready built price. ATC and Wilmslow Audio have worked very closely on the cabinet and crossover design to ensure that the completed kit lives up to the very high standards associated with the ATC name. As with all Wilmslow products, the ATC50 and K100 kits come complete with precision machined cabinet panels, crossovers, and all necessary hardware, including factory matched ATC drivers. Cabinet parts are machined from high grade MDF for easy assembly and consistent acoustic performance. ATC's MK1 Tri-Amp Pack systems are available as an option if required.

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VINTAGE VALVE

This is one of the most famous American tube amps ever made. Rated at 35 watts per channel, it uses 4-E134's, 1-GZ34, and two 7199's. This very reliable amp is great for those who wish to modify parts or use it just as it is. Bias is easy to adjust, and the unit can switch between mono and stereo. The output tubes can operate at 65% of their capacity, and the filter caps at less than 85% of their rated voltage. A true classic.

Dynaco, Sherwood, Scott, The Fisher, McIntosh, Eico, Harman-Kardon, Heath, Altec, Stromberg-Carlson


FAX: (604) 876-5876
P.O. BOX 147, STATION A, VANCOUVER, B.C.
CANADA V6C 2M3
MOREL MW1275 £69.33

We quickly named this unit the frisby, it is lightweight and has a very small magnet. However it managed to get down to 30Hz in a 100 litre sealed box, which is very reasonable. Sensitivity of this 12inch DPC coned unit is high enough for use with the majority of mid and treble units.

**Frequency Response**

An old favourite this one, I found the B139 worked best in a reflex enclosure reaching down to 30Hz in a 100 litre box with an 80mm diameter, 120mm long port. Sensitivity is drastically low though, so most mid and treble units will have to be attenuated to match.

**VOLT B250.8 £108**

The VOLT B250.8 is massively built. A low Q makes it suitable for reflex enclosures and in a 100 litre box it reached down to an impressive 27Hz with an 80mm diameter, 166mm long port. The sensitivity is a little low, so partnering units may have to be attenuated.

**VOLT B2500.1 £185**

The even lower Q of the B2500.1 means that this unit gets down to 24Hz in a 100 litre reflex enclosure with an 80mm diameter, 181mm length port. It's sensitive enough to work with the majority of partnering units, and the high BL factor should ensure strong, clean bass.
Even though the L10/020 has a high Q, I found lowest bass came from a reflex enclosure. In a 100 litre cabinet with an 80mm diameter, 163mm length port, it reached down to 27Hz. Sensitivity is very low though, most midrange units and tweeters will have to be attenuated.

**RCF L10/020**

- Frequency Response
  - Frequency Range: 10Hz - 25kHz
  - Sensitivity: 87dB
  - Power Handling: 70W
  - Impedance: 8 ohms

**Impedance**

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**RCF L10P10-1**

- Frequency Response
  - Frequency Range: 10Hz - 25kHz
  - Sensitivity: 87dB
  - Power Handling: 70W
  - Impedance: 8 ohms

**Impedance**

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**RCF L12P48**

- Frequency Response
  - Frequency Range: 10Hz - 25kHz
  - Sensitivity: 90dB
  - Power Handling: 100W
  - Impedance: 8 ohms

**Impedance**

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The L10P10-1 has higher sensitivity than the L10/020, making it suitable for a wider range of partnering units. The soft fibrous cone should give a good sound, and bass went low, 29Hz in a 100 litre reflex loaded cabinet, with 80mm diameter, 163mm long.

**SEAS 25F-EWRX**

- Frequency Response
  - Frequency Range: 10Hz - 25kHz
  - Sensitivity: 91dB
  - Power Handling: 150W

**Impedance**

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The SEAS 25F-EWRX is a good all rounder combining high sensitivity and power handling with a low Q, which will give deep bass. It reaches 35Hz in a 100 litre box, port being 80mm diameter, 71mm long and the doped paper cone should give a smooth sound.
This beautifully built 12 inch paper cone unit has a lot going for it. High sensitivity and BL factor should give powerful, clean and loud bass. The low Q also helps it to reach 34Hz in a 100 litre reflex enclosure tuned with an 80mm diameter, 85mm length port. Good, even at the price.

**Conclusions**

The good all rounders are those with high enough sensitivity to match the majority of midrange and treble units, and good low bass performance from the 100 litre cabinet. This includes: Audax's HT240M0, Morel's MW1275, VOLT's B2500.1, RCF's L10P10-1, SEAS's 25F-EWRX, Beyma's 12B-100/R and Richard Allan's B1OCVH. All of these are above 90dB sensitivity and reach down below 40Hz, low enough to play bass fundamentals properly. The others are either not sensitive enough for general use, or didn't get below 45Hz.

Of these seven, the Audax HT240M0, RCF's L10P10-1, SEAS's 25F-EWRX and Richard Allan's B1OCVH stand out as being best value. The home constructor should not only find these affordable, but will get good deep bass and high sensitivity.

If money is no object, this leaves three, of which I must say the Morel MW1275 looks the weakest. Its low BL factor and tiny magnet suggest bass quality and power handling will be suspect. The beautifully made and engineered Beyma 12B-100/R and VOLT 2500.1 are the most expensive in the group, but what you get is a combination of high sensitivity, low Q for good bass in a reasonably sized cabinet, and massive BL factor, which will ensure that bass is not only loud, but powerful and clean.
This very attractive stereo amp provides 17 1/2 watts per channel, a centre channel output for connection to a new amp, input level adjustments, easy to use bias adjustments, as well as AC and DC adjustments. This is all under a lovely brass cage on a solid copper chassis. With an efficient speaker this is a marvelous amplifier.

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**World Radio History**
I OW CLASS A TRANSISTOR DESIGN

In the light of the recent introduction of kits for valve amps I feel it worth mentioning a transistor design for a 10 watt pure Class A design by J. Linsley-Hood that appeared in Wireless World (April 1969, October 1969 and December 1970). The latter two articles are relating to refinements.

This amp was built on a single tri-pad board, with the output transistors on a suitable heat sink. In addition to the original design a choke smoothed power supply was used.

In use this amplifier feeds LS3/5as and is open and punchy in sound with delicate music (e.g. Rory Block) and good vocal recordings, being so involving that I prefer its sound to some of the valve designs that have passed through my hands (perhaps this is just a personal choice). I do feel, however, that this amp provides a very affordable intro to Class A and would make a suitable kit.

As regards pre-amps, the one in use is also from Wireless World, this time a design by Doug Self published on October 1983. In place of the suggested NE5532/4 originally specified I have used OP275GP op amps from Analogue Devices which give a smoother and better controlled sound with improved bass (not volume, but quality). This preamp has a very well designed phono stage, which seems to be a rarity these days.

Just a note on output power: 10 watts into LS3/5as is enough to fill a Victorian 2 up 2 down. So the amp should be adequate for most normal use.

The rest of the kit includes a Rega Planar 3, NAD 5420 and a tampered with geriatric Pioneer tape deck.

Keep up the good work with kits etc.

A Jones
Southville,
Bristol.

We are looking into designing a low powered transistor amplifier at the moment, although it will be some time before it appears in the magazine. What we hope to be able to do is offer a 10-15w single-ended or push-pull transistor design with very low, or preferably no feedback, at a reasonable cost. The components will almost certainly be cheap, but the mains transformer and heatsinks needed will account for most of the cost. However, at the moment we are up to our necks in production engineering the other designs that we have published over the last year. So it will be towards the end of '94 at the earliest before such a design appears. DB

300B KIT QUERY

Your recent design and project for a 300B push-pull amplifier is very interesting. The design seems to have many excellent features and to offer the promise of very good sound quality. I am aware that any amplifier design is the outcome of a complex process of trade-offs and on the whole the 300B amplifier represents a well chosen combination of compromises. Even so there are perhaps a number of points where the design might perhaps be changed for the better or modified successfully. I would
be interested to have your comments on the following points.

1. Firstly I do approve of the use of a interstage coupling transformer in the place of a phase-splitter arrangement. But what I do find somewhat surprising is the absence of any arrangement for balancing the output valves. Even very highly specified valves like the 300B can show power variations in the region of 7-10% when new and it would seem obviously desirable to include in the circuitry a means of balancing the output pairs.

2. Secondly, I am wondering if consideration was given to the use of the Western Electric 310A valve for the voltage amplification stage. This valve was produced as a high gain voltage amplifier for driving the 300B and its use in your design would eliminate one of the two stages of voltage amplification. The elimination of a whole stage of amplification would seem an obvious benefit. I am aware that arguments are frequently advanced in favour of all-valve amplifiers but the 310A is a very special valve designed to give high gain while meeting the exacting Western Electric standards for low distortion.

3. I have acquired some Western Electric application notes for their amplifiers and theatre systems and I have been much impressed by the thoroughness and sophistication of their investigations into the problems of high fidelity sound in theatres. Some time ago I acquired a Western Electric 1086 amplifier. While this had been converted in the 1960s from a 300B output stage to a 6L6 output stage, most of the original circuitry and components remained. Harmonics cannot manifest themselves in the primary of the output transformer where they meet out-of-phase and cancel, but commonly appear as voltage in the return between the centre tap of that primary and the output valve filaments. They also appear in the space of the output valves themselves. The very low impedance of 60ohms is a critical value. For other values the third harmonics generated in the valves would be either too weak to cancel the original harmonics or too strong and thus add to the distortion.

I have never seen another version of this unusual circuit and I can't find any mention of it in the Radiotron Designer's Handbook (Radio Designers Handbook in the UK). It is an interesting example of the Western Electric engineer's efforts to build low distortion amplifiers in the 1930s.

I would also like to take the opportunity to point out that polypropylene capacitors with working voltage ratings of 900V and values of 25, 32 and 50 µF are manufactured in Australia by Plessey. These are high pulse grade capacitors intended for electric fence power pack applications and their high working voltage rating makes them eminently suitable for valve amplifier power supplies. They are also very cheap and I am a very satisfied user of them.

John Rivers
Palmerston North, New Zealand.

Balancing the output valves only serves to eliminate low order harmonic content, which is subjectively not intrusive. With my modifications to the 300B amplifier driver stage (Ed. note: in development for production kit form, Andy Groves has altered and refined our 300B amplifier, but we have not published details yet) design distortion is in the region of 2% at max output without A.C. balancing and 0.2% with it, both with zero feedback. We carried out listening tests here and found that sonically the two performances were all but indistinguishable. The valves will be reasonably balanced in anode currents because of the cathode biasing (auto-bias) used.
The 310A pentode + 300B triode + 274B rectifier is the classic circuit used widely in Japan and France, but 310As are very rare and expensive. Using a single gain stage has both advantages and disadvantages, as one valve is asked to do the job of voltage amplification and driving the output stage. The S687 valve now used to drive the 300Bs in the kit is just about the most linear valve available for this purpose, considerably more linear than a 310A.

The “Harmonic Equalizer” circuit is interesting, but it will have problems because of the valve variations you mentioned. Cancellation circuits like this need to be set up with accurate test gear and have a tendency to drift with time, hence the popularity of feedback which eliminates a lot of these problems. Western Electric used feedback, along with everybody else, to improve the figures of their amplifiers, but nowadays it tends to be used as a “magic bullet” to cover up terrible faults in the open loop performance.

Andy Groves

PENTODE AS TRIODE!

It is with great interest that I follow your DIY projects and I have some comments and suggestions which I hope will prove of interest to yourselves and to constructors.

I was never a fan of the original Mullard 5-20 and converting from pentode to triode input stage has been an acknowledged modification for many a year to the Mullard and other (i.e. Radford) designs. With the K5881 it is interesting to note that you have followed this path, which I am sure provides a worthwhile improvement, but why cudge up a pentode to act as a triode? A strapped pentode never seems to perform like the genuine article, still being prone to parasitic oscillation, hence your grid stopper resistor.

Good triodes are readily available, the ECC83 being a logical choice. Your tagboard construction method is a good idea. It has an advantage in making experimentation and modification easy. One half of an ECC83 will work well if the anode load resistor R5 is increased to 220K and the HT voltage adjusted to maintain V2a grid at 97 volts. This leaves a spare triode unit which it seems a shame not to form a constant current source and uses only one resistor along with the triode. This resistor can be mounted directly on the valve holder and again this circuit can be incorporated with very little effort. These circuits are suggested for experiment and are shown on the enclosed sheet.

By providing mounting holes on the front panel and additional mounting holes on the rear panel the constructor could benefit from this.

Three different input circuits that could be used on our K5881 amplifier.

Three different input circuits that could be used on our K5881 amplifier.
core becoming live. With the core mounted so close to earthen metalwork, and exposed, the danger is obvious.

The situation with output transformers can be even worse, since the full H.T. voltage could appear on the core. The very idea makes me shudder. It is usual when designing signal transformers to assume that the core will be earthed and transformer capacitances are usually calculated making this assumption. To float the core will change these capacitances and the transformer may not perform as intended. Safety must be our first priority and all exposed metalwork must be earthed.

I feel that you must have misinterpreted the function of the fibre washers which is to prevent the bolts from acting as shorted turns, lowering inductance and causing losses. They should isolate only the ends of the bolts and not the whole core; this is the true function of the washers.

How about making your transformers available separately, rather than in sets? Should I decide, say, to scratch build K588I, for instance, I already have mains transformers and chokes which would be suitable, so only output iron would be required. Likewise, should I decide to substitute an 845 single-end stage for your 300B, you have indicated the K588I. The grid stopper on the input is essential, and should be present no matter what type of input valve is used. The fact that the input on K588I is a triode connected pentode makes no difference and I would say that you have been lucky not to experience tweeter vaporizing parasitics yet, especially when you get a bad earth or faulty input connector.

Your ECC83 modifications are worth a try for experimenters, but I would like to point out that the SRPP circuit is not quite the cure-all it seems. Firstly, problems occur when the cathode of the load valve is elevated above the heater by more than a few volts. This usually shows itself by valves becoming severely microphonic after a few weeks (or even days) of use, so the heater winding must be biased up from ground by +45 to +55 volts D.C.

Secondly the linearity of this type of circuit is dubious. If the transfer function of the combination is plotted, it is S shaped like a pentode and weird kinks show up near the A.C. zero crossing point unless care is taken when setting quiescent currents and operating voltages.

The load valve in the standard SRPP circuit does not function as a constant current source because there is not enough feedback associated with its cathode resistor. As you have drawn it, the bottom valve thinks the top valve is a non-linear impedance of around 300kΩ.

Transformers should not be considered in the same way as other passive components. When Tim or I design a transformer, it is specially constructed to perform at its best in a particular circuit. The 300B driver transformer is intended to be used as a phase splitter and driver and would not be suitable for driving a single-ended 845; a bi-filar single-ended transformer with something like a 5687 or 6BXT valve should be used to drive the 845.

The design is original in that it is not a data sheet clone, which unfortunately many commercially available amplifiers, valve and solid state, are. This type of topology has been around for a long time, so has using canvas and oil paints, but that doesn't mean that all oil paintings are re-hashes of older works.

The core of the transformer should be electrically earthed as you say, but it needs to be lifted off of the chassis otherwise large eddy currents are set up in the chassis causing the transformer to heat up. AG

On the safety front, I had a discussion with Tim about core isolation and he pointed out that transformer bobbins are heat resistant and flash tested to over 3000V and that there comes a time that you have to trust to the properties of insulators or, for example, ordinary electrical cabling could be considered an unacceptable hazard. In his view, it was unnecessary to put in a special earth, but it can be done by using an earth wire between chassis and core. However, the laminations should not, for magnetic reasons, touch the chassis, as Andy explains. The output transformers can be electrically earthed in the same manner if desired.

Study the original manufacturers descriptions and then note that K588I is quieter (hiss) than most solid state amplifiers available today and you'll understand why I used the EF86 instead of an ECC83.

Both Tim de Paravicini and Andy Groves are experienced transformer designers and, I'm learning, the driver transformer is the most difficult transformer of all to make work well, even though it is technically the most elegant solution to phase-splitting and driving. Tim insisted his be preset by himself alone, in a specially made can of one-eighth inch thick mild steel, with ball bearings in the potting compound to prevent people hacksawing the thing open. Andy spends hours musing over cross coupling arrangements and ways of lessening and neutralising capacitances to smoothly extend bandwidth whilst retaining high frequency balance (he also spends more fortune on getting prototypes built). It's a dark art, but a fascinating one. NK
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