Hi-Fi WORLD

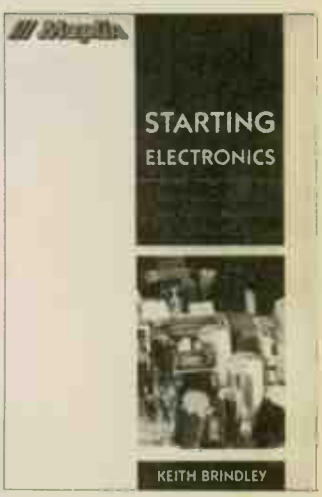
NO.35 FEBRUARY 1998

SUPPLEMENT

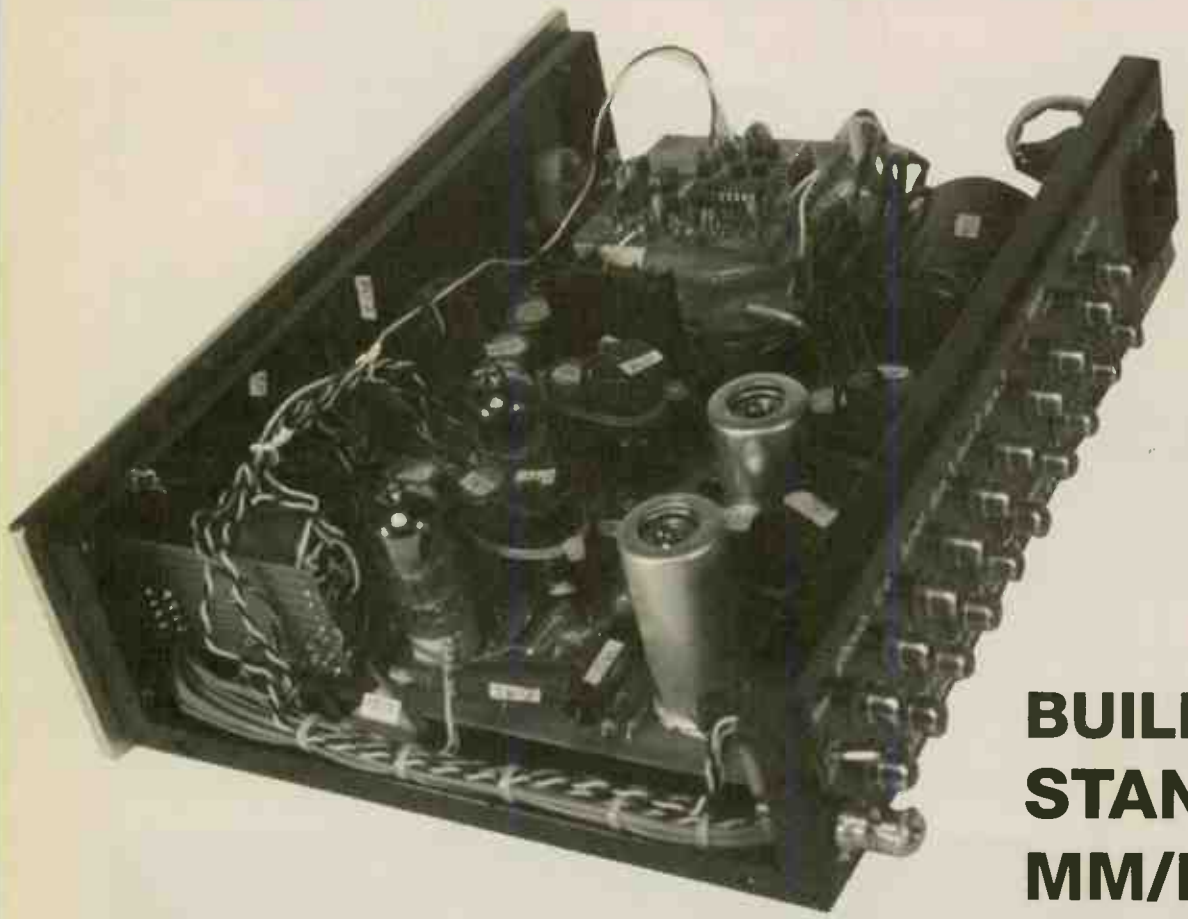
UPWARDLY MOBILE

KLPP1 PHONO PRE-AMP WITH SPECIALIST COMPONENTS

BOOK REVIEWS:



STARTING ELECTRONICS
by Keith Brindley



BUILDING KPP1 STAND-ALONE MM/MC STAGE

FREE D.I.Y. SUPPLEMENT No.35

PRICE VALIDITY TO END FEB 1998 - ASK ABOUT ANY TYPES NOT ON THIS LIST

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6CG7/6FQ7 *SYLVANIA*	7.50
6CL6 *RCA or GE*	5.00
6CW4 *RCA*	11.00
6SL7GT *STC*	5.50
6SN7GT *BRIMAR*	5.50
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12AZ7 *GE*	7.50
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12BY7A *GE*	9.00
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13E1 *STC*	110.00
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5842A *GEC*	15.00
6080W *TUNGSTOL*	12.50
6550A *GE*	22.00
6146B *GE*	17.00

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✆ 44 (0)1245 355296 Fax: 44 (0)1245 490064

D.I.Y. Supplement

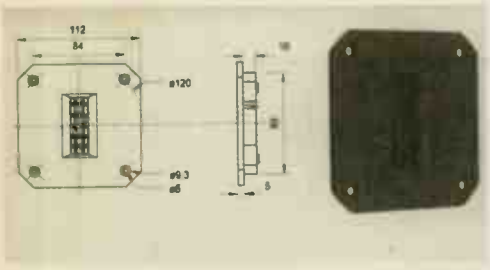
Contents

KIT NEWS

VISATON TWEETER REVISITED

South Coast Speakers have announced the immediate availability of the re-launched Visaton Ribbon Tweeter (RHT 12).

In this unit the ribbon is constructed from very thin plastic foil with a copper wire layer as the voice coil wound in a manner similar to the way a river meanders. The ribbon element is then mounted between a double cobalt-samarium magnet. The moving mass of this system is therefore minimised, resulting in a fast, accurate response. The double magnet construction causes a homogenous magnetic field within which the ribbon moves, reducing



harmonic distortions which have traditionally been a problem with ribbon tweeters.

The specification of this tweeter boasts a 4kHz -30kHz response, a power handling of 200watts and 90dB sensitivity. Price for the RHT 12 is £89.99 each.

South Coast Speakers
326 Portswood Road,
Southampton,
Hampshire SO17 2TD
Tel: 01703 559312

HIGH-POWER SOVTEK

Sovtek has just announced the release of their EL34WXT valve. This features a unique grid-block construction which is claimed to allow it to operate at higher transconductance and power ratings than any other EL34. This, Sovtek say, makes it a more consistent, longer-

lasting valve than its rivals. They also claim the EL34WXT is "the richest sounding, most dynamically sensitive EL34 ever produced" - a bold claim indeed!

Sovtek
New Sensor Corporation,
20 Cooper Square,
New York NY 1003,
USA
Tel: (001) 212 529 0466

TRIODE QUARTET FROM SVETLANA

Svetlana Electron devices has developed a new four-strong triode range for use in high-end audio applications. The SV572 series of valves has directly-heated tungsten filaments and rugged graphite anodes which are rated for 125watts of dissipation. Four amplification factors are offered to give circuit-design flexibility and a variety of sonic characters.

The SV572-3 is claimed to give a clean sound without feedback whereas the SV572-10 offers a triode sound, is easy to drive and has a high power output. The SV572-30 on the other hand has an efficiency of over 40% when used in single-ended mode while, last but not least, the SV572-160 is designed for push-pull Class AB or Class B applications with a power output of up to 300watts.

Svetlana Electron Devices
8200 S. Memorial Parkway,
Huntsville, AL 35802,
USA
Tel: (001) 205 882 1344

NEW CLOCK ON THE BLOCK

AudioCom (UK) has announced the arrival of a new precision CD clock, 'The Superclock'. This unit has a two-stage analogue oscillator and a high-impedance buffer which feeds the digital square-wave converter. The analogue and digital sections have separate Linear Technology regulators and are built predominantly of surface-mount components. Low-noise RF transistors and high-speed digital circuitry ensure a clean clock waveform is supplied to the CD player or transport. A separate power supply is to be made available soon. The kit price of the Superclock is £145, or it can be fitted for £185 including return carriage.

AudioCom (UK)
Unit 6,
Tindle Enterprise Centre,
Warren Street,
Tenby SA70 7JY
Tel: 01834 842803

Riverside Audio

18, Riverside, Cambridge CB5 8HL.

Telephone: (01223) 512253 Fax 01223 572629

Our aim at Riverside Audio is to enable the home constructor to build valve amplifiers which combine superb sound quality with the professional finish of the best high-end products - at a low price. Our rigorous and conservative designs ensure that you get long and trouble free service from your amplifier. We offer our amplifiers in various forms, from circuit designs, through printed circuit boards, to full kits and even fully assembled amplifiers for those who cannot wait to listen to them.

The Riverside 4040 is our integrated amplifier. It features dual mono construction and has five line level inputs and both 4Ω and 8Ω outputs. The output stage is configured in the classic McIntosh connection, which gives stable, wide-band operation even with difficult loudspeaker loads. The stainless steel chassis and transformer cover are hand polished to a mirror finish, and come with a semi-matt black valve cover. 4xEL34, 4xECC83, 2xECC82. A full description, including circuit diagram, is given in the 4040 reference manual, £6.50. Kit £780, fully assembled £995.

Technical specification: dual mono construction, 40W/channel, 12Hz to 25kHz power bandwidth, distortion <0.1%, five line level inputs, tape output, 230/240V mains input.

Stereo amplifier circuit board : board only £49.50; component pack (including valve bases), add £63; populated board £125; full valve set, add £45. Power supply board : board only £20.50; component pack, add £44; populated board £66. Input board : board only £15.50; component pack, add £16; populated board £33.

The output transformers are configured for the McIntosh connection and have excellent low frequency response and a primary reflected impedance of 3800Ω. Full connection instructions provided. Price £70. The mains transformer is wound for dual mono construction, as this gives superior isolation between channels which sharpens imaging and elliminates inter-channel ground loops in the amplifier. Primary 0-230-240V. Secondaries 2x295V@0.25A (0.4A int.), 2x70V@30mA, 2x6.3V@5A. Price £60. Other primary voltages can be supplied to special order. Data sheets giving connection diagrams, specifications, as well as circuits for using each transformer, £2.50 each.

The chassis, comprising main chassis and transformer cover, is hand polished, welded 1/16" stainless steel - NC machine tooled for a perfect fit and clean finish. Each kit also includes a mesh valve cover and baseplate, finished in semi matt black. Price £310. Also available in mild steel finished in black, £195. For those who wish to use one of these high quality chassis for their own projects, details of the chassis are given in the 4040 reference manual, £6.50.

Connector kit: twelve gold plated phono connectors, two sets of loudspeaker terminals, an IEC mains socket with integral fuse and switch, and an IEC mains lead with fitted 13A plug. £51.50. Cable kit: all cables required for the 4040, £6.

The Riverside P2 phono preamplifier is designed to partner the Riverside 4040 for those who enjoy the vinyl sound. Equalization is provided for moving magnet output to line level. The P2 features a high accuracy feedback RIAA equalization circuit, ensunng a natural tonality, a regulated high voltage supply per channel and cathode follower outputs. 3xECC83, 1xECC81, 2xECF80. Full details and circuit diagram in the P2 reference manual, £6.50. Kit £225, fully assembled £275.

Technical specification: 47kΩ input impedance, 1kΩ impedance output for driving long interconnects.

Stereo circuit board: board only £25; component pack, add £37.50; populated board £70; full valve set £20.

The mains transformer is wound for dual mono construction and is toroidal for low leakage flux. Primary 0-230-240V. Secondaries 2x295V@20mA, 2x6.3V@0.45A, 16V@1A. Price £30. Other primary voltages can be supplied to special order. These transformers are also suitable for power supplies in preamplifiers and other line level valve circuits - see data sheet for details, £ 2.50.

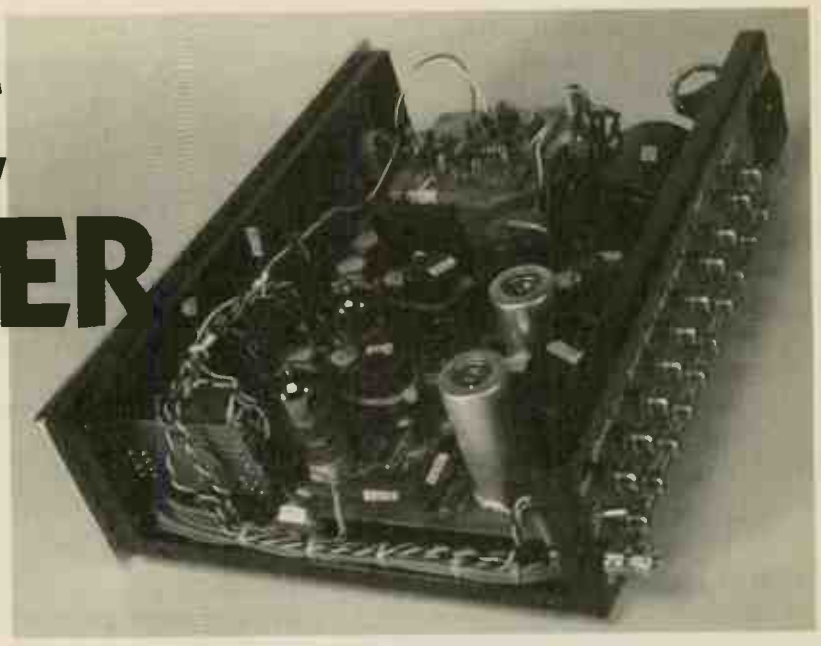
The chassis (main chassis and transformer cover) is made from mild steel. Each kit comes complete with a mesh valve cover and baseplate, finished in black. Price £110. For those who wish to use a high quality chassis for their own projects, details of the chassis are given in the P2 manual, £6.50.

Connector kit: four gold plated phono connectors, IEC mains socket with integral fuse and switch, and IEC mains lead with fitted 13 A plug, £15.

We normally ship within three working days. If we do not have the item in stock we will advise you of expected delivery and confirm before despatch. P&P (in UK): £2 for each part of £40, maximum of £10; manuals free of charge. Assembled units despatched by courier free; courier service on other items £10.

Write, phone or Fax for a catalogue sheet of the full range of Riverside products.

BOTTLE BOOSTER



Nick Lucas explains how to upgrade our KLPP1 valve phono pre-amp with audiophile components, while Jon Marks and Ketan Bharadia assess the benefits.

Following on from upgrading our KLP1 line-level pre-amp and K5881 Class A 20watt power amp in previous Supplements, our next mission was to turbo-charge the KLPP1 valve phono pre-amplifier and find out just how good vinyl could sound. As there are so many types of audiophile components on the market, we simply supply good-quality standard versions in our kits. Therefore, once the kit's built and working, all you DIYers out there have a solid foundation to work on when installing those creme-de-la-creme capacitors and top-grade resistors.

The components used here were supplied by Paul Morawski at Audio-Links in Scunthorpe (tel: 01724 870432). I did a trial fitting to make sure they'd fit inside the case and then soldered them into KLPP1 and left it running for around 40 hours to get everything nicely settled into the new working environment.

The overall upgrade was broken down into five separate sections and each dealt with in turn: power supply, volume potentiometer with remote control, phono equalisation capacitors, signal coupling capacitors and finally the cathode-bypass capacitors (see circuit diagram on p13).

A SOURCE OF POWER

Warming my soldering iron on the power supply section (namely C14, C15, C17, C18, C19, C20 and Reg 1, the 7805) I swapped C14, a miniature 100uF 400V electrolytic capacitor, for an Ansar Supersound polypropylene reservoir cap of 100uF at 320VDC working. According to Paul, Audio-Links commissioned Ansar exclusively to construct this value which isn't generally available.

The sonic improvements polypropylene reservoir capacitors offer over their electrolytic counterparts (a crisper, more tonally colourful and open sound) are well known. This is because of their superior dissipation factor - their charge and discharge cycles are faster and quieter, making for a cleaner sound.

C20, originally a 10000uF 16V electrolytic, was replaced with two 1000uF 16V Sanyo Os-Con SGs in parallel. Os-Cons are constructed of aluminium with a solid organic electrolyte made of 'Black Salt'. This means they have a very high ripple-current rating, remain uninfluenced by external vibrations and possess a high charge and discharge rate. What this adds up to is high ripple-voltage rejection and very low noise.

I investigated these claims by measuring the ripple content of the 10000uF 16V cap and the 2000uF combination of the Os-Cons. On my oscilloscope, the ripple of the Os-Cons was 25% less, even though their capacitance was 80% lower.

For C17, C18 and C19, normally Philips metallised polypropylenes, we used M Cap ZN™ polypropylene capacitors of 0.22uF at 250V. Even though these capacitors are dealing with the High Tension voltage of 275VDC, this is still well within the proof voltage of 375VDC which these German caps are tested to.

Regulator 1 was replaced with a Linear Technology 5V LT323AT 3A device which has the same pin-outs as the original L78S05CV. The suffix 'AT' denotes the fact that this is a high-specification IC burnt in by the manufacturer on a test rig, hence the scratch marks on the pins.

REMOTELY READY

Moving to the second upgrade level involves the replacement of the standard Alps 250kohm Blue potentiometer with a 100kohm motorised Panasonic For Audio potentiometer (250kohm Panasonics are not available but a 100kohm impedance causes no sonic or impedance matching problems).

Accompanying the Panasonic was Audio-Links' Remote Volume Module, a ready-stuffed PCB with four user-selectable speeds and a 14-metre control range for even the largest lounges. The module is powered by the unregulated DC side of the valve heater supply so no external supply is necessary, although one is available for £7.60 if required.

A programmable infra-red handset was included, but for those who aren't happy unless their coffee table is lined with a bunch of remotes a single-source version can also be had. Informative instructions come with the module to ease the installation, which is relatively straightforward anyway.

'E' IS FOR EQUALISER

Modification No3 is an upgrade to the phono equalisation capacitors, namely C4, C5, C6 and C7. We fitted new Scan-Ex polystyrenes, Swedish-built components offering very good stability, 2.5% tolerance, 160V DC working, very low dielectric absorption and extremely low losses.

SENDING SIGNALS

The fourth part of the upgrade concerns all the signal coupling capacitors, namely C2, C3, C9, C11, C12 and C13. C2, C3, C9 and C13 were substituted for M Cap ZNs™. These are extremely dense capacitors made from tin foil and a high-purity polypropylene film wound in a spiral under great tension to make them much less susceptible to external vibration.

For C12 we used a PCB Swedish polypropylene cap of 22nF at 1kV specifically to match the hole pitch of KLPP1's PCB so it would fit in nicely. This was then bypassed with another Scan-Ex polystyrene cap to lower the PCB's impedance.

BYPASS BOOST

The fifth and final piece of the puzzle concerns the cathode-bypass capacitors, C1, C8 and C10. We used, yes you've guessed, Sanyo Os-Con SG 1000uF 16V electrolytics. Another important characteristic of these caps not mentioned previously is the low ESR (equivalent series resistance) and low ESL (equivalent inductance). This provides a much improved bass and treble response compared to normal industrial electrolytics.

AUDIOPHILE COMPONENTS LIST

PART 1	COST (EACH)	
5V LT323AT Regulator x1	£5.40	£5.40
C14, Ansar Supersound 100µF 320V x1	£26.60	£26.60
C15, 0.1uF 250V M Cap ZN™ x1	£3.40	£3.40
C17, 0.22uF 450V Ansar x2	£1.40	£2.80
C18, 0.22uF 450V Ansar x2	£1.40	£2.80
C19, 0.22uF 450V Ansar x2	£1.40	£2.80
C20, 1000uF 16V Sanyo Os-Con SG x2 in parallel	£11.40	£22.80
C21, 100uF 16V Os-Con SG x1	£3.00	£3.00
TOTAL		£69.60

PART 2		
Motorised Panasonic potentiometer 100kOhm Log, Dual Gang x 1	£78.70	£78.70
Audio-Links remote volume control module x 1	£62.10	£62.10
Three-source infra-red handset x1	£28.20	£28.20
or		
Single-source handset x1	£12.70	£12.70
TOTAL (with three-source handset)		£169.00
TOTAL (with Single-source handset)		£153.50

PART 3		
C4, 1.5nF 2.5% 160V Scan-Ex x 2	£1.20	£2.40
C5, 1.5nF 2.5% 160V Scan-Ex x2	£1.20	£2.40
C6, 6.8nF 2.5% 160V Scan-Ex x 2	£1.40	£2.80
C7, 2.2nF 2.5% 160V Scan-Ex x 2	£1.20	£2.40
TOTAL		£10.00

PART 4		
C2, 1uF 250V M Cap ZN™ x2	£8.50	£17.00
C3, 0.22uF 250V M Cap ZN™ x2	£3.90	£7.80
C9, 1uF 250V M Cap ZN™ x2	£8.50	£17.00
C11, 4.7nF Scan Ex x2	£1.40	£2.80
C12, 22nF 1000V Rifa Polyprop Cap x2	£2.20	£4.40
C13, 1uF 250V M Cap ZN™ x2	£8.50	£17.00
TOTAL		£66.00

PART 5		
C1, 1000uF 16V Os-Con SG x2	£11.40	£22.80
C8, 1000uF 16V Os-Con SG x2	£11.40	£22.80
C10, 1000uF 16V Os-Con SG x2	£11.40	£22.80
TOTAL		£68.40

SOLDERING IRON AT THE READY. . .

Due to the generally larger size of the upgrade components compared to the originals it's a good idea to do a dry run on component positioning. Bear in mind as well that it's not a good idea to have components suspended in the air on long leads.

Where PCB space doesn't allow direct fixing to the board, components should be fixed down to prevent mechanical vibrations affecting the sound. You can use clamps bolted to the chassis, tie wraps threaded through the underside ventilation grids, glue or self-adhesive foam strips. We used the latter and found this technique worked well mechanically and sonically.

If component leads need extending make sure they're no longer than absolutely necessary and well isolated with some sort of sleeving to avoid the possibility of shorts.

The Panasonic potentiometer with its motor and gearbox extends approximately 8cms back into the chassis and the adjacent BUZ 78 FET which forms part of the HT regulator has to be tilted out of the way to ease positioning. Flying leads need to be soldered to the potentiometer pins before fixing as access is tricky once the pot has been attached. The control PCB was positioned on top of KLPP1's toroidal mains transformer.

The infra-red sensor for the remote control can be mounted in place of the LED power indicator on the front panel, or using extended leads passed through the vent holes, you can position it externally.

Please note that the Scan-Ex radial capacitors have different end markings. The red lead is attached to the outer foil of the capacitor and, if soldered to the lowest voltage connection, it will act as a screen to further reduce noise levels.

Now I'll pass you over to the editorial boys for the ultimate test, the listening. My thanks go to Paul Morawski for his assistance.

SOUND QUALITY

It was with heady anticipation that we linked KLPP1 up to our K5881 MkII power amp, Jamo's Concert 8 stand mounters and a Garrard 401 turntable powered by Slate Audio's Powerhouse power supply. I dropped Ortofon's MC 30 Supreme cartridge (on the end of an SME 312 tone-arm) into the lead-in groove of Ray Charles and Betty Carter with the Jack Halloran Singers.

KLPP1 with its audiophile component contingent sounded far more transparent, solid and rhythmic than the unmodified version with its standard components, which is no slouch in these areas anyway.

The most obvious benefactor was sound staging, which swelled to fill our listening room. Images were crystal clear, three-dimensional and truly solid whether centre stage or out in the wings to the left and right. A firm, weighty bottom end underpinned all this, but what really impressed was the combination of gorgeous vocal smoothness and superb projection. Completely free of grain, the modded KLPP1 caught the album's mellow feel perfectly.

The extra bass control meant LPs like The Stone Roses' Second Coming had far more drive and funk without ever sounding aggressive. Cymbals, for example, were as smooth as silk but still crashed with real energy, their decay tantalisingly prolonged and full of the subtle harmonics which give them their golden shimmer. This tonal range came through with every slab of the black stuff which hit the Garrard's platter.

A Decca pressing of highlights from Puccini's Turandot showed just what bass depth and power KLPP1 was now capable of, with the timpani of Act 1 almost shaking the room, while the sound stage's new-found size had us setting the Concert 8s further apart to take full advantage. The result was a presentation of cinematic scale without any of the bass waffle and blurred imaging you often get in film houses. And the music's emotional impact made it hard to drag ourselves away, especially when Joan Sutherland's singing was so pure and sweet.

If you aren't operatically inclined, try a bass-laden 12 incher and you'll find the Os-Con SGs, M Caps™ et al will pin you to the back wall with brutally hard, deep bass. This switch, from the kind of delicacy you need for Classical music to the slam and punch which gets Dance going, is a measure of the transparency of KLPP1.

The line stages showed the same leap in performance, with our Teac P- 30/Pink Triangle Da Capo transport and DAC now sounding far more open, spacious and involving than before. The Da Capo's characteristic smoothness was more obvious too.

Soldering a wealth of audiophile components into any hi-fi equipment is likely to improve quality, but for it to be sonically worthwhile as well as cost effective you need to know which components are making what changes to the sound. So we decided to remove the various new parts stage by stage and replace them with the originals.

STAGE ONE - THE BYPASS CAPS

Putting back the standard components (C1, C8 and C10) we found KLPP1 lost some stage depth and imaging clarity. On Classical recordings in particular, the orchestra appeared flatter and less three-dimensional, with individual sections less distinct.

On choral and operatic works, the most noticeable change was a loss of that lush tonal colour and treble smoothness which had made voices hauntingly realistic with the audiophile goodies in circuit. The music was still a pleasure to listen to but it was missing that last iota of subtlety, nuance and richness which had made it captivating.

When it came to music with more beats per minute, we discovered Sanyo's Os-Con SGs had taken with them some extra bass extension, power and speed. The Stone Roses were less punchy and rhythmic than before, although tweaked KLPP1 remained taut, focused and dynamic.

STAGE TWO - THE SIGNAL CAPS

Now it was time to say goodbye to C2, C3, C9, C11, C12 and C13. Without the M Cap ZNs™, the Rifa and the Scan-Ex, the sound stage shrank back towards the Jamo Concert 8s' cabinets and became flatter. On the Ray Charles and Betty Carter LP the rich tonal colours had faded somewhat, Ray's vocals possessing a slight but previously unheard greyness.

My feet were telling me the rhythm department was now taking a less active part in the proceedings because of the looser bass. Musical tempos slowed a touch, with fewer rhythmic and timing expressions apparent.

What the audiophile components really revealed, which the standard ones didn't, was how the tonal richness and smoothness of a capable valve phono stage leaves solid-state offerings sounding hard and artificial.

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Why not buy the reprints and construction manual for the kit you are interested in to see how easy it is to build your own equipment the HART way. The FULL cost can be credited against your subsequent kit purchase.

'AUDIO DESIGN' 80 WATT POWER AMPLIFIER.

Our John Linsley Hood designed 80 watt Power Amplifier continues to amaze all who listen to it, and it is now finding new friends among speaker manufacturers who use it to show their own products to their best advantage. Its flawless performance is a result of the combination of inspired circuit design and the very best components, specified by the designer. Such innovations as the six rail fully stabilised power supply make great contributions to the overall reproduction quality yet are not found on even the most expensive run-of-the-mill designs in the High St shop window.

We have long known that the delicacy and transparency of sound from this amplifier placed it in the world class and side-by-side comparisons with amplifiers costing five times as much still show small performance advantages, which suggests that even the most expensive amplifiers will only equal rather than exceed, its sound quality. All amplifiers in the range have the same basic quality and the decision about whether to use a preamplifier is governed by the facilities you need. The STANDARD amplifier has switching for up to three inputs, if you need more than this then a preamplifier feeding a SLAVE power amplifier will give you up to seven inputs.
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All amplifiers are available in kit or factory assembled form.

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A1100 Factory Assembled version £515.21

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A1100S Factory Assembled £522.22

K1100M MONOBLOC Amplifier Kit £271.20
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All HART kits are designed for easy home construction to the very highest standards, and can be built by anyone of average manual ability. If you are still not convinced how easy it is to build it yourself with a HART kit you can order the Instruction Manual to read for yourself and we will refund the cost when you buy your kit!.

JOHN LINSLEY HOOD 15W SINGLE ENDED CLASS 'A' POWER AMPLIFIER

A design for the experimenter who wants to try and re-create the warmth and purity of sound given by valve amplifiers from the vintage years, without the problems of cost, deterioration and danger associated with trying to use valves today.
It employs the newly re-discovered single-ended circuit configuration to give total freedom from crossover artifacts and to give a sound that is indistinguishable from the famous 'Williamson' design, the undisputed leader of the field, with its triode connected KT66s and all-triode drivers. See our list for full details.

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All our kits use standard IEC mains leads and these are available for a range of countries. We also stock distribution boxes with IEC sockets to minimise the space needed for power leads. See our lists for details.

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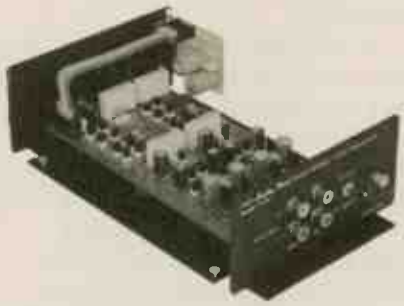
K2100 Complete Standard Kit £112.50
K2100SA 'Senes Audiophile' Kit with selected audiophile components £115.46
A2100SA 'Series Audiophile', Factory Assembled £115.46
CM2100 Construction Manual £2.50

SHUNT FEEDBACK PICKUP PREAMPLIFIER



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A1450SA Factory assembled Audiophile unit £188.94

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At long last, switches to match the quality of our Alps pots. These switches not only solve the quality gap but also have features facilitating their use in real audio applications. The "Flex" version having a panel mounting control coupled to a rear mountable switch unit by a 190mm Flex Link. Also available is a motor driven option which, like the pots, can also be operated with its control knob.
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845-008 100g. Reel Special Valve Grade, 20swg £12.90
845-009 100g. Precision PCB Grade, 22swg £14.75
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ASM100 ACTIVE SUBWOOFER MODULE

This attractive module consists of a low pass filter and power amplifier ready for you to mount in a suitable sub-woofer cabinet. The combined unit can then be combined with any new or existing hi fi or home cinema speaker system to add in the real bass punch missing from most setups.
The ASM 100 module comes as a ready-to-mount unit on a solid diecast aluminium frame/heatsink. Input signal can be at line or speaker level for easy system integration. There are three separate stereo inputs at line level and the unit will use any signal presented or mix all inputs to add bass to any signal. The speaker level inputs are used by simply wiring the unit in parallel with the existing speakers to provide them with strong bass support. Crossover frequency can be selected to 50, 100 or 200Hz and the bass level can be adjusted by a front panel control. The 'Green' power supply switches the unit to standby if no signal is present. Drawings are included free for the compact 418 x 380 x 303mm cabinet.
With its powerful 125 watt output and versatile filtering the ASM 100 is the ideal universal active driver module for all subwoofer requirements.
ASM 100 Module, complete with IEC mains lead, instructions and ASM - W20 cabinet drawings. Pt. No. V7000 . . . . . **£185.29**
W 200 S 20cm Long Throw Drive unit for use in ASM - W20 cabinet **£36.68**

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A speaker kit from the VISATON range that really fits the modern idiom, giving a full uncoloured, and highly defined, sound stage combined with unobtrusive elegance that does not look out of place, even in a smaller room. A frequency response from 38-20,000Hz and a power rating of 100W make it easy to drive. The novel arrangement of five high/mid tweeters, angled at 45 degrees, creates a really dynamic sound stage with sharply defined sound staging. With its compact 200mm square section it can also be used as ultra high quality main speakers for home cinema applications. The kit includes all drive units, crossovers, terminal blocks and damping materials for you to make a stereo pair of speakers.
LK5961 Kit **£392.42**

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A real heavyweight performer with a total of no less than five drive units in each cabinet. Together these produce a satisfyingly smooth and wide frequency response. The single tweeter is a special 25mm high-end unit with a double coated fabric dome and ferrofluid for cooling and damping. There are two 13cm mid-range speakers and two 20cm long throw woofers for extended bass.

Nominal Power Rating	180W
Max. Music Power	300W
Impedance	4Ω
Freq. Response	29 - 30,000Hz.
Crossover Frequency	450Hz, 3KHz
Mean Sound Pressure	88dB
Box Volume	100Ltr. & 7Ltr.
Size.Height	1,300mm
Width	300mm
Depth	360mm

LK5965 Per Pair **£538.70**

ASM - T20 SUBWOOFER

An easy to build, but very effective, bass reflex cabinet design using the ASM 100 Active Sub-woofer Module and the W200S, high compliance, 8" driver, with its 20mm maximum cone displacement!. Easy to incorporate into a modern living environment the size of the cabinet has been kept as small as possible at 418 mm high, 303 mm wide, and 380 mm long. To aid its ease of positioning in the room both the drive unit and the vent are situated on the front of the cabinet. Despite these compact dimensions, and with a volume of only 31Ltrs, the ASM T20 gives up to 106dB with an acoustical cut-off frequency of 25 Hz.!. The cabinet is made from 19mm MDF, and needs about 8 sq.ft.

W200S 20cm. Long Throw Drive unit.
Part No. 9030 . . . . . **£36.68**

COUPLED CAVITY SUBWOOFER.

An alternative design by David Purton, from his little "Coupled Cavity Handbook", using the same drive unit but requiring a bit more woodworking skill as the speaker is set on a baffle in the middle of the box. The total box size is even smaller than the ASM T20 at only 418 mm high, 303 mm wide, and 344 mm long.
Construction Drawing. **£1.50**

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All programs are for IBM or compatible computers.

VISATON SPEAKER PRO 6. Software (PC) for cabinet and crossover design and calculation with full extendable data bank of drive unit parameters with performance curves aquired in tests in VISATON's own anechoic chamber. This is the essential tool that turns you into a speaker designer!.
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BASSBOX 5.0 for WINDOWS. Harris Technologies.
This program aids the design of bass enclosures by allowing you to model how a speaker will sound in a variety of boxes and then modelling the maximum loudness of the speaker/box combination. It then helps to calculate the dimensions of the box and port, if vented. Needs Windows 3.1+, DOS 5.0+, 386 or better, 4MB RAM and 44MB hard disk space. With easy-to-use printed manual. Shipping Wt. 450g
SOF-BAS **£87.50**

BASS HORN DESIGN. A.L.Senson.
This program, patterned after Brian Smith's tractrix horn design program, calculates dimensions for a catenoid, exponential or hyperbolic bass horn and prints out in less than a minute. Provides mouth and throat areas, back chamber volume, and dimensions to design your enclosure.
SOF-HOR **£17.95**

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SOF-XOV **£27.90**

"QUICK & EASY TRANSMISSION LINE LOUDSPEAKER DESIGN" Larry D.Sharp.
Explanetary booklet plus computer disk that requires Lotus 123, or equivalent spreadsheet software on your machine. 1993. 22pp. 215 x 280. Spiralbound.
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The excellent performance of modern cassette recorders depends totally on the quality of the R/P head. Even the slightest amount of wear can impair the frequency response and distortion levels. Our HC80 is a top quality head from one of the foremost manufacturers in Japan.
It is easily fitted to most standard stereo recorders (except Sony) and will transform the performance over a worn head. The fact that we buy these in vast quantities enables us to offer them at the amazing price.
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STAGE THREE - THE EQUALISER CAPS

Considering this change amounted to a mere four capacitors I was quite taken aback by the scale of the difference. It wasn't a sea-change, but it was still very noticeable. What it boiled down to was a continuation of what had happened when the other audiophile components were replaced with the originals.

The low-level detail and spaciousness that KLPP1 can rustle up with the top-notch caps was masked by the more industrial-grade offerings. The decay of individual notes, whether it was in the lower bass or the upper treble, was curtailed and basslines and melodies came across as rather perfunctory and uninvolving.

Sound staging diminished once more, vocals lacking the gorgeously smooth projection of yore, while imaging was shallower and more diffuse and the tonal palette restricted.

STAGE FOUR - THE VOLUME POTENTIOMETER

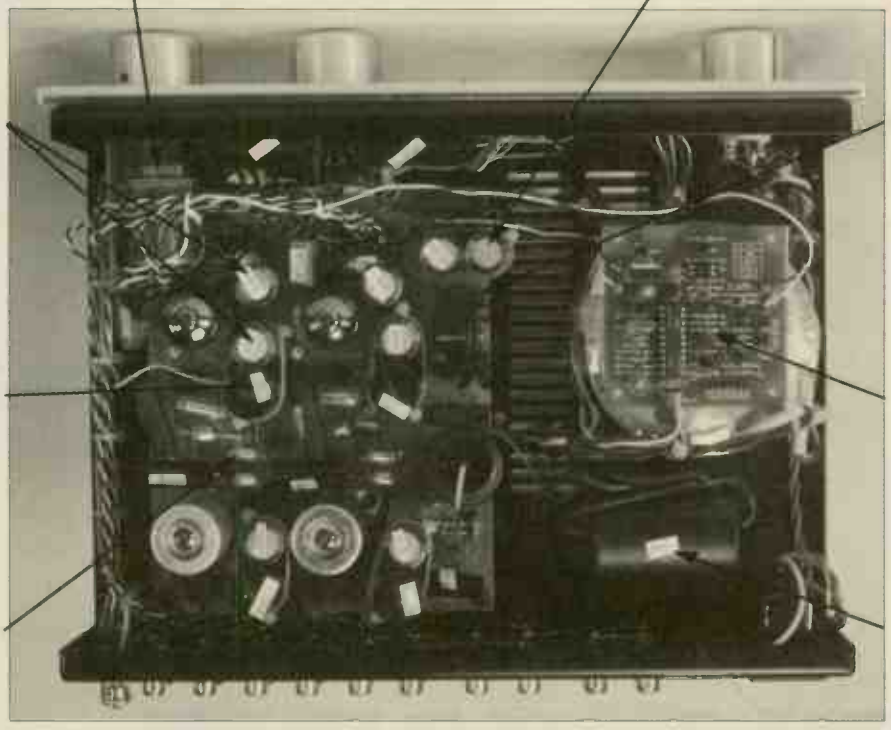
Replacing the Panasonic pot with an Alps Blue Velvet (fitted to the standard KLPP1) proved interesting. Although the Alps Blue is a high-quality audiophile pot in its own right, returning to it showed just how much better the Panasonic laser-trimmed version actually is.

Individual voices in a choir were harder to identify and were reduced in presence and weight. Tonally things became greyer, and lacked the expressive nature of the Panasonic-potted KLPP1. Rhythmically the sound suffered due to a bass end which was now less taut and precise. Subtle acoustic clues which were previously highlighted were now less apparent, leading to a reduction in image depth and scale.

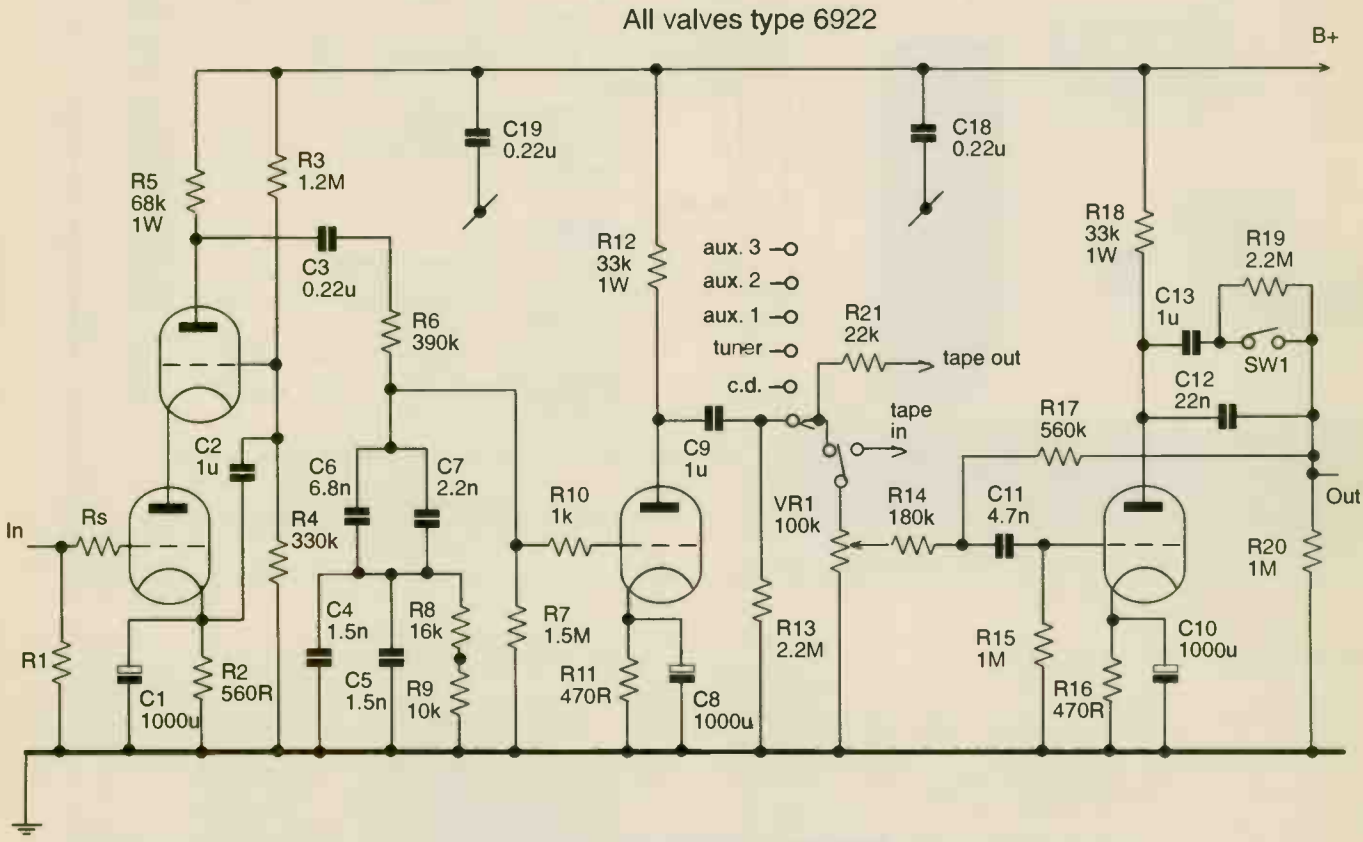
STAGE FIVE - THE POWER SUPPLY

The final step in the listening test concentrated on the KLPP1 with its original power supply capacitors and regulator. High frequency detail was now fuzzier, and cymbals which previously sparkled sounded slightly blurred and thin, lacking both bite and power. The biggest change caused by the removal of the upgraded power supply components was the loss of fine detail. This most significantly affected tonal colour and consequently made instruments and vocals less natural. Sound staging also suffered, the depth plane flattening into a more two-dimensional image. Listening to John Lee Hooker the bass end had reduced attack and definition, leaving the music slower and less involving.

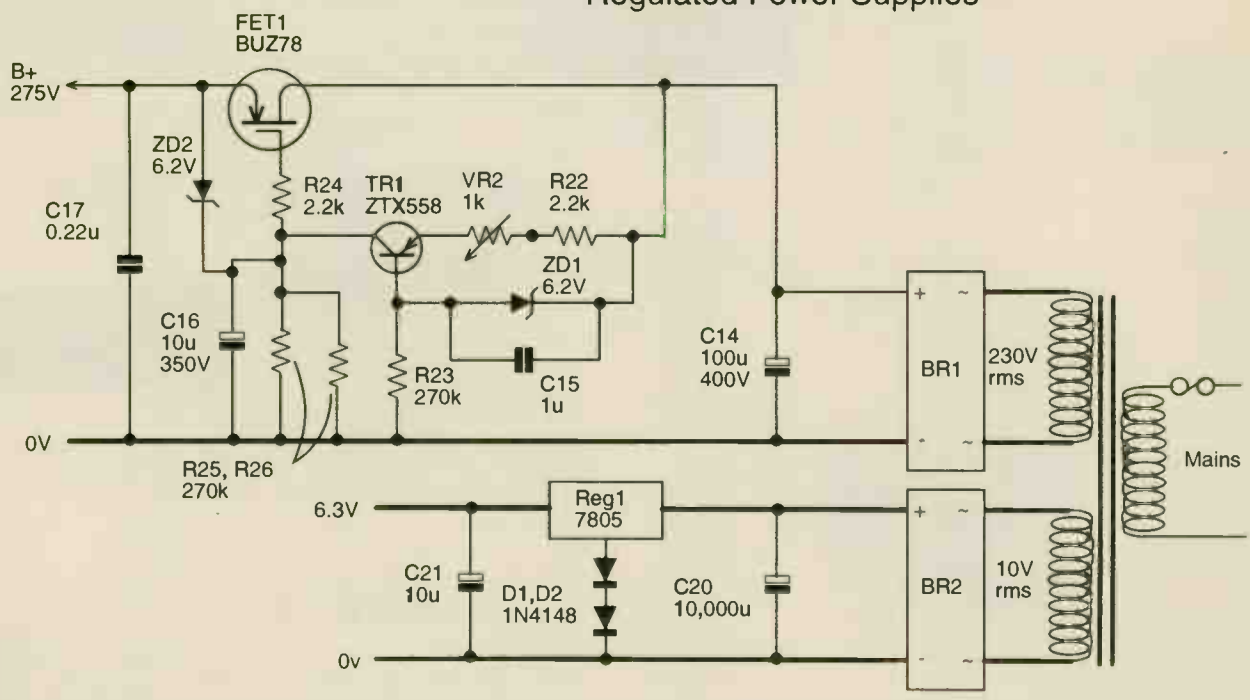
Splashing out on audiophile components is guaranteed to soup up your sound, but taking the mods one component at a time will spread the cost and familiarise you with individual sonic signatures, as well as giving parts time to burn in and achieve their optimum performance. True, it takes longer than soldering in an entire bag of components in one sitting, but it will save you loads of time removing caps and resistors that haven't been used in the correct circuit location. It also means that when it comes to future upgrades, you'll know what will work best where and how to tune your hi-fi to get exactly the balance you're after. As they say, you can't buy experience. . .



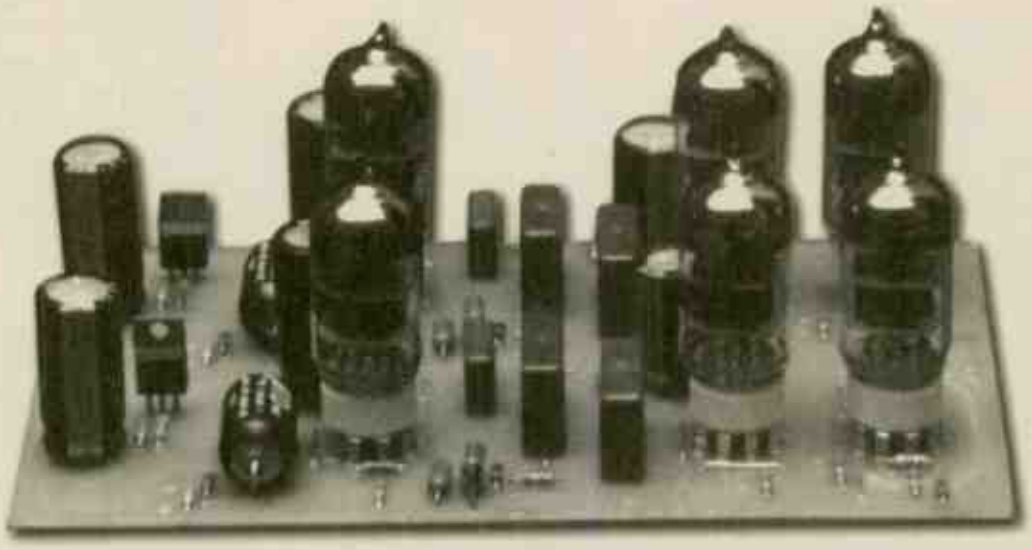
KLPP-1 (one channel)



Regulated Power Supplies



KPP1 PHONO STAGE PT II



Chris Found explains how to build the KPP1 phono stage introduced in the December 1997 Supplement.

In the last Supplement we dealt with the basic concept of the KPP1 phono stage and its design. In this article we show you how to build the unit. As with all designs that employ high overall gain plus a lot of boost at low frequencies, important matters such as keeping background hum and noise to a low level are a major problem - and this design is of no exception.

The main problem with hum in a pre-amplifier comes from the radiating fields of the mains transformer and the mains input wires. Although this can be reduced to a low level you can never really remove it completely, at least while the mains transformer is in the same case as the pre-amplifier.

To mitigate this problem with some certainty in a DIY project we decided to distance the mains transformer from the main electronics as far as possible. This meant mounting the transformer in its own dedicated case, not a new idea. In fact, in many high quality pre-amplifiers that sell for three figures it is virtually mandatory to have a remote transformer and when you think about just how much gain exists at 50Hz because of RIAA equalisation, it makes the most sense. High impedance valve circuits are also more susceptible than low impedance transistor circuits, because they load the radiation source less.

Using a remote supply does, however, pose another potential problem: long wires can cause earthing problems through raised impedance. This can be minimised by using thicker wires for the earth returns than normal.

POWER SUPPLY

As with all commercial designs, the first prototype is designed for top performance but inevitably some changes are required. In the earlier phono stage I found that the heater power supply was not as well optimised as I would like, so I decided to change the wiring of the heaters of the valves from parallel to series connection. This changed the main operating voltage from 6V to 12V and allowed a single high-current regulator (heatsinked) to be used in place of the three regulators of the original.

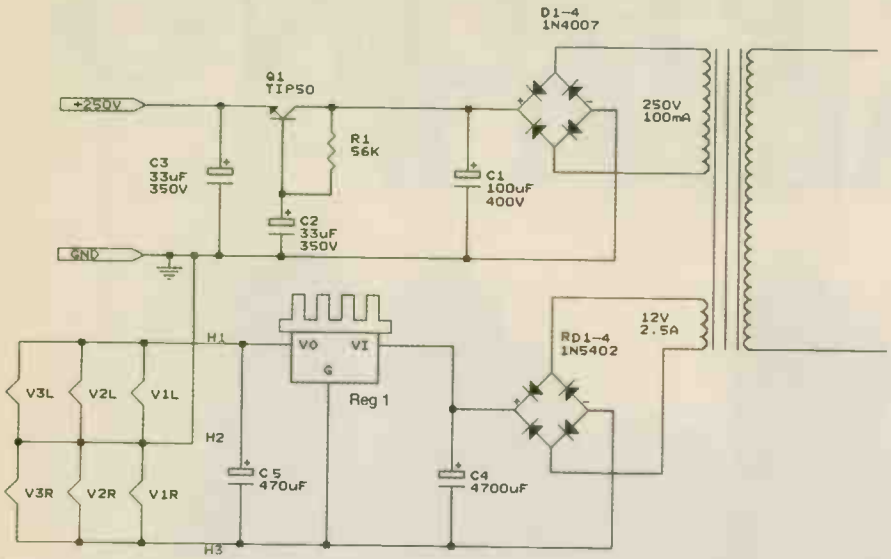
This has the additional benefit of removing the centre tap requirement on the mains transformer, allowing the unit to be built with standard parts. The valves still see a split supply rail but it is configured differently and has the extra benefit of reducing the current to the regulator, producing less heat. A split rail automatically cancels noise, reducing hum, hiss and random interferences.

To simplify the wiring of the heaters even further, I decided to group the valves into three pairs, where each left and right heater supply for that section has its own dedicated heater wires. Each pair of valves is now fed from the power supply board and is connected by three wires. Two of these are for the main supply voltage to the valve heaters and a third provides the series connection that is connected to the ground return.

This arrangement is more effective than the original proposal and provides the best results, with no negative aspects. With the valves grouped in this way, it is easier to fault-find, if one set of valves does not light up.

CONSTRUCTION

There is a construction routine for building this phono stage. It allows you to check each individual stage, as it would be quite difficult to remove a component once the



The power supply features a high-voltage regulator to improve sound quality.

PCB is fixed into the chassis.

After building up the printed circuit board (PCB), the first set of wires for connection are the feeds to the heaters. I suggest that different colour wires be used for each pair of valves. This removes any problems later in trying to find the correct wire for each of the three positions. In the prototype, I used the following colours.

The first YELLOW wire connects to Pin 5 of the right channel input valve. The GREEN wire links between Pin 4 of the right channel valve and Pin 5 of the left channel valve. This wire also runs back to the power supply board. The second YELLOW wire connects to Pin 4 of the left channel valve to finish off this first group. The end result should be 3 groups of 3 wires (YELLOW, GREEN, YELLOW).

To separate each group of heater wires I recommend each triplet be tied together with a small piece of insulating tape or a cable tie. This removes the error factor when connecting these wires to the power supply board.

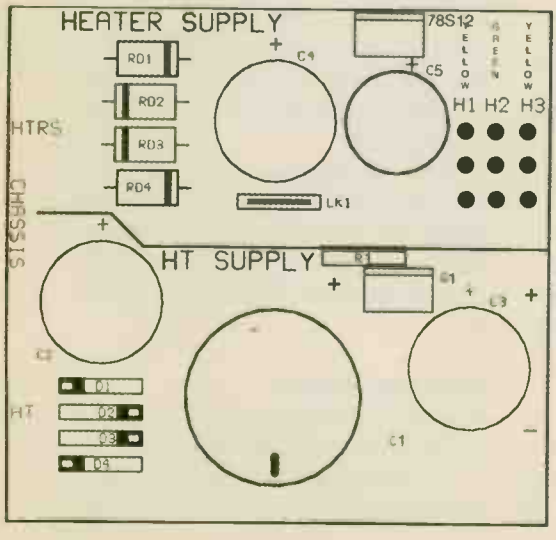
After the heaters have been wired up, we can connect the HT (high tension) wires. These are coloured RED for HT and GREEN for the ground connection. Following the HT wires, we can now fit the two screened wires that feed to the output sockets. These are placed to one side of the chassis to minimise hum pickup from the power supply.

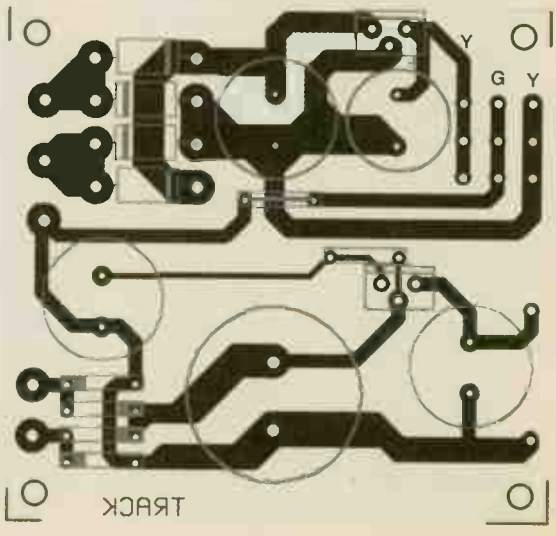
If you have decided not to use the PCB-mount input RCA socket, you can connect the PCB to the input sockets via three solid-core wires. Make sure that these wires are as short as possible to reduce any noise pickup when using the pre-amplifier in MC mode.

With the main PCB inside the case, we can now wire up the power supply board. The coloured wires that have been run to the board to connect up the heaters and HT can now be soldered to the power supply PCB.

For the heater supply, there are 9 holes grouped into three sets of three holes labelled H1, H2 and H3. These are the heater connections for each individual group of valve pairs, and correspond to the group of three wires that have been connected to the phono stage PCB. H1 connects to the YELLOW wires, H2 connects to the GREEN wires, with a final connection to the last of the YELLOW wires at H3. Do the same for each of the three groups and you have wired up the heaters.

Now that all the power supply output wires have been fitted to their respective holes on the board, all that is required is to connect up the multicore cable that feeds from the external mains transformer case and you are almost ready to power up the unit.





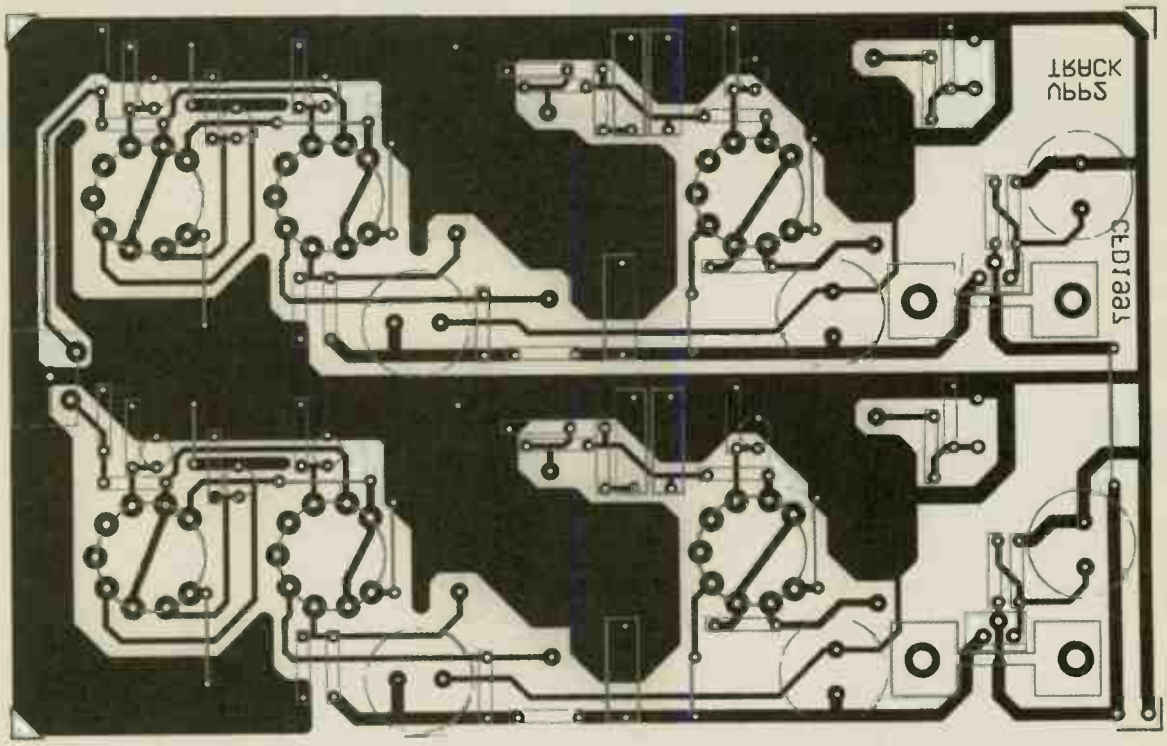
Left: component layout from above. Right: tracks seen through PCB from above. 80% full size.

CHECKING

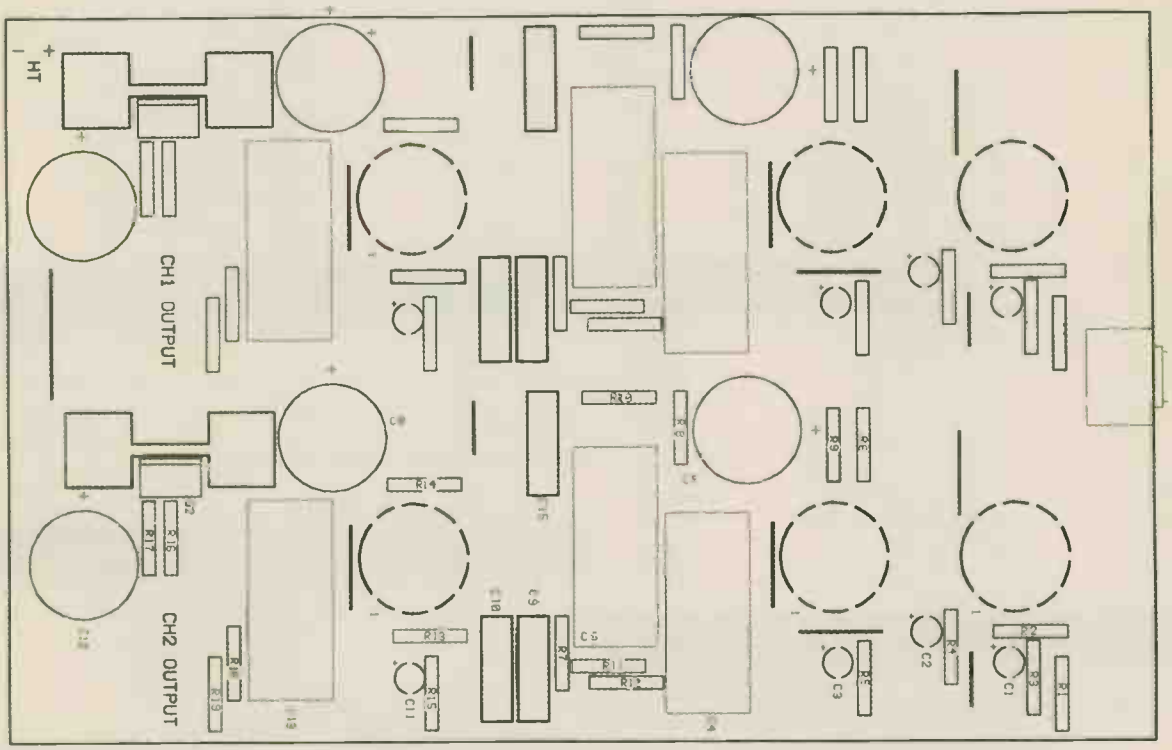
Now comes the checking. I do hope you have checked the heater wires before the phono PCB was installed, as this is where you find out if they are wired up correctly. Double check each wire from the multicore cable to power supply board, checking each goes where it should. One final check of the Phono board and power supply connections, and off we go.

Without the valves in place or anything connected to the phono unit other than the mains plug, plug in the mains and switch on. Look for any burning or signs of distress from a relative distance (just in case). If all seems to be OK, switch off and let the power rails discharge (10-15 minutes).

Still with no valves in place, switch back on. With a multimeter set to 400V or higher check the power from the power supply board. You should have around 280V DC on the HT output positive connection and 12V between H1 & H3 pins of the heater output wires. If the



The circuit board for the phono stage. Top are the tracks on the board's underside, as seen through the PCB from above, bottom the component layout as seen from above (pictured at 80% of full size). Upper channel numbering same as lower.



voltages are about right, switch off and put in the valves after the same discharge time.

Switch back on and look for any problems. You may smell a small amount of heat from certain components as they get accustomed to their new job, but nothing more.

Recheck the HT and heater voltages. The HT should have dropped slightly to 250V but the heaters should be the same voltage. Look at each valve in turn for the heaters lighting up. Some valves glow a little brighter when powered up but settle to the same brightness after a minute or so. If after 2 minutes one valve glows a lot brighter than the rest, switch off and recheck its heater connection. Look for excess voltages on input and output with a multimeter. The inputs should read zero voltage and the outputs should have no more than a few millivolts on their pins. If all is well, switch off and connect up to the rest of your Hi-Fi.

KPP1 PARTS LIST

RESISTORS (all 0.66W carbon film)

R1	47k
R2	100
R3	1k2
R4	1k2
R5	1k2
R6	33k
R7	33k
R8	22k, 1W carbon film/metal oxide
R9	100k
R10	10k
R11	270k
R12	100k
R13	1k2
R14	1k2
R15	1k2
R16	56k
R17	100k
R18	820
R19	100k

CAPACITORS

C1	100µ, 25V electrolytic
C2	100µ, 25V electrolytic
C3	100µ, 25V electrolytic
C4	0.47µ, 250V polyester
C5	33µ/350V electrolytic
C6	0.47, 250V polyester
C7	0.1, 400V, polypropylene
C8	33µ, 350V electrolytic
C9	10n, 1% polystyrene 160V
C10	2n7, 1% polystyrene 160V
C11	100µ, 250V electrolytic
C12	33µ, 250V electrolytic
C13	1µ, 400V polypropylene Solen

TRANSISTORS

Q1	TIP50

PSU PCB PARTS LIST

DIODES

RDI-4	IN5402
DI-4	IN4007

CAPACITORS

C1	100µ, 400V
C2	33µ, 350V
C3	33µ, 350V
C4	4700µ 16V
C5	470µ 16V

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RESISTORS

R1 56k

TRANSISTORS

Q1 TIP50

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STARTING ELECTRONICS

by Keith Brindley

Reviewed by Haider Bahrani.

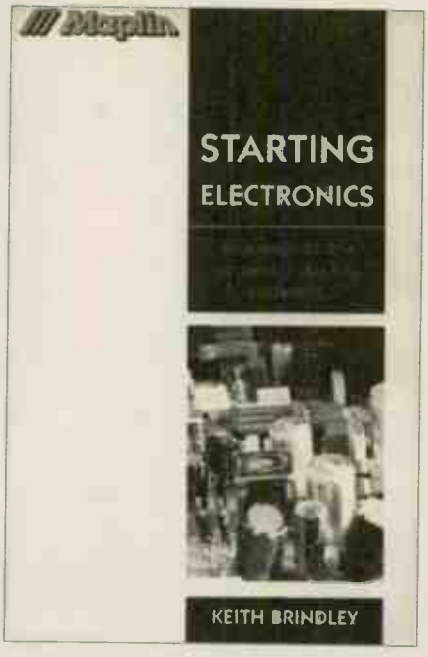
One of the hardest things about learning electronics from scratch is finding a starting point. Many books begin by claiming they assume the reader has no prior knowledge of the subject, then spend a couple of paragraphs formally introducing the resistor before swiftly pushing students in at the deep end without armbands by bombarding them with complex circuit analyses. Starting Electronics in principle takes a step back from all that and tries to lead the reader through the basics, holding their hand at every step of the journey.

Chapter One sets out the stall by getting to grips with the necessary tools that hobbyist wannabes need to stock their toolboxes with. Wire cutters, snipe nose pliers and the soldering iron all make an appearance. At this point the first of many 'hint' boxes raises its head, telling us not to blunt the wire cutters on thick wire. Now we've been told!

The good old analogy comparing the flow of electricity to that of water is given an airing next. A briefing on resistance then follows; that's the electrical type as opposed to the French.

'On The Boards' is Chapter Two, which gets you breadboarding. Not nearly as exciting as snow boarding, this entails the use of a breadboard-look-alike block purpose-built for connecting components together in experimental circuits. A selection of simple circuits introduces the use of a multimeter and the practical application of the resistor along with plenty more hints.

The third chapter starts to investigate measurements and puts the multimeter to more serious use. Resistors come together in parallel and serial combinations, they even get variable, but that's not the biggest shock. We find out that the water analogy was wrong all along, for electricity (as in electrons) flows backwards, from negative to positive. It was all a historical mistake and so by convention going backwards is actually going forwards. Confused? The book makes sure you won't be.



Charge storage in the form of capacitors is the mainstay of Chapter Four, practical implementation being more the order of the day than theory. The important topic of measurements comes to the fore again, in the form of recording results, alongside the physical behaviour of the capacitor in the circuit.

Chapter Five is where the fun really starts. A 555 IC is used to build an astable multi-vibrator, which is a square-wave oscillator. This chapter consolidates everything that has been learnt in the earlier sections and brings them together in a real application. It then warms down with some basic first-order filter theory showing how to calculate roll-off frequencies and plot graphical results as proof.

The sixth chapter finds the text entering more complex active-component territory with the humble diode. Again real circuits are employed to show off the component's uses and behaviour, and measurement techniques are elucidated, leading to a little graph plotting. Zener diodes are given a hearing too, and the characteristics (both forward and reverse bias) are examined.

The next chapter attempts to shine a stronger light on the applied advantages of the diode's operation discussed earlier. The book does take a small sideways step into the mathematical arena at this stage and reveals the diode equation, having shown that the relationship between current and voltage in a diode is clearly non-ohmic (i.e., it doesn't obey Ohm's Law) over its entire range. This is followed by a discussion on the use of the diode in power supply rectification and regulation.

Transistors and integrated circuits are covered in the final two sections of the book. Transistor-wise the author concentrates on the bipolar junction type and leaves other forms for another book. The text does start to get a little more theoretical at this stage, although the general format is maintained with handy hints and guidance.

The integrated circuit section is much the same, with the focus, not surprisingly, on the ever-popular 741 operational amplifier. At this point you're encouraged to build one or two circuits including an inverting amplifier and a non-inverting version of same. A glossary of electronic terminology is added at the back to help you get acquainted with the jargon.

Certainly a welcome addition to a poorly-served sector of the book market, Starting Electronics is thankfully basic and will be a less daunting introduction to the keen pupil of the science than many a heavy-handed text I've come across. Those come into their own when it's time to blow up a few transistors!

Starting Electronics **£9.99**

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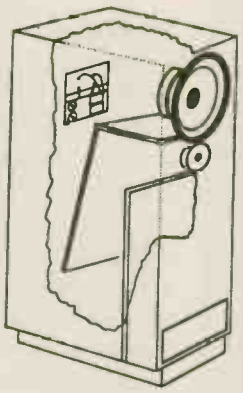

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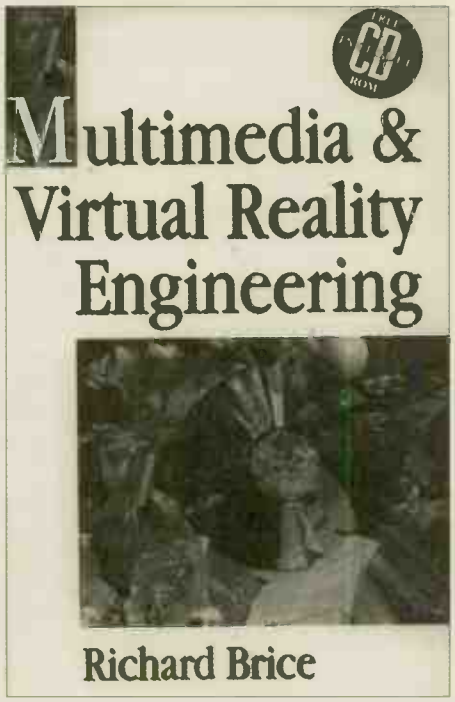
MULTIMEDIA & VIRTUAL REALITY ENGINEERING

by Richard Brice

Reviewed byNoel Keywood.



This book covers an amazing amount of ground in an easily readable, original and fascinating manner. I went from being sceptical to becoming hooked as I read it. But whilst much of it is intriguing, equally a lot is highly specialised - more so than author Richard Brice realises, I suspect. All the same, Multimedia & Virtual Reality Engineering is an important book for many compelling reasons.

Is it the title, which uses two overworked terms, "Multimedia" and "Virtual Reality", the final chapter on "Cyberspace" or Richard's rather flimsy intro that made me initially sceptical? It got worse before it got better.

By p11 of this 300-page book, readers are introduced to the Fourier Transform. I tried to explain this to a computer expert recently. The incomprehension it caused reminded me of my own difficulties with this topic. An explanation demands careful writing and diagramming, but Richard dispenses with it in fourteen lines and no diagram. It is deservedly given an Appendix but this is no clearer.

Richard scores a bullseye on p13 though with some original and cogent observations about the enormous ability of the human hearing mechanism, pointing out that it has a wider range than Compact Disc. The popular perception that CD is perfect has only evaporated recently.

The appearance of circuit diagrams by p19 may be enough to convince the faint-hearted that this book is a hardcore engineering treatise. There are perceptive comments about the relative merits of valve and solid-state power amps, as well as Class A versus Class B, but this will go over the heads of most bar engineers.

Chapter 4, simply entitled 'Image', has broader appeal, at least in its opening stages. Then it dives into engineering again, with topics like genlocking, video switching with DC component restoration and transmission lines. It's all very technical. The book takes quick but informed peeks at certain critical areas which may suit boffs but will baffle newcomers. Richard Brice has perhaps been in the multimedia engineering world too long to realise that it is heavy stuff for the average mortal. Having said that, I found the book getting progressively more absorbing.

The book is split into three parts and Part I continues discussing engineering aspects of analogue video through to digital audio and video, ending with 'Computers' (Chapter 7). On this vast subject Richard is unusually brief: 'Computers' occupies 14 pages.

The second part of the book is entitled Media Production And Hardware. Superficially less technical, it is meant to deal with production techniques. Circuit diagrams soon start to appear though; I was taken aback to see nine consecutive pages of them devoted to a complete vision mixer. 'Multimedia Authoring' runs through current production techniques and, although I am deeply involved in HTML as a user, author and what have you, my interest wasn't especially gripped.

The book finds its second wind in Part III, Virtual Reality. The first chapter, 'Realistic Auditory Stimulation', was informed to the limits of our knowledge, fluently written and gripping to read. With references and discussions of all research into the creation of realistic sound through stereo and other methods reaching back into the 19th century and including the likes of Blumlein, Richard doesn't miss a trick.

When William A. Yost makes an appearance this section really starts motoring. Yost brings a rigour and insight to the subject traditional engineers completely fail to grasp, and by locking into this rich vein of cognitive research the book profits immeasurably. Chapter 12 alone justifies the cost of the book and should be required reading for everyone in audio. Until we understand the extraordinary non-linear schemes and complexities of the human auditory process we really possess no useful foundation on which to base all other knowledge of the subject. Richard has carried out a lot of original work in this area and it shows in his writing. But then again this is a book written from the top to engineers lower down the audio food chain.

With its CD ROM containing both data and surround-sound music attached, Multimedia & Virtual Reality Engineering is a tour de force of this subject, written by someone with unique research and practical experience. I can only be severely impressed, but I do doubt whether non-technical readers will get much further than p11 and the FFT before deciding tiddly winks is an altogether more amenable pastime.

Multimedia & Virtual Reality Engineering **£25**

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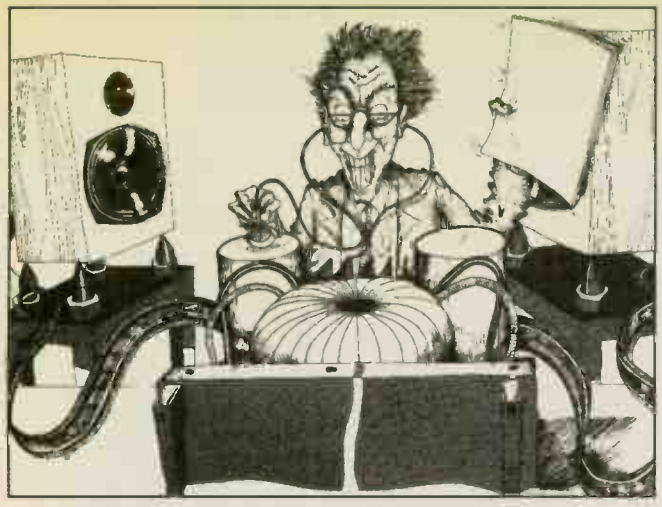

D.I.Y. Letters

BEST OF BOTTLES?

I read with great interest the article in your Supplement showing a design for a valve MM/MC cartridge pre-amp. I have been hoping to build one for a couple of years and am keen to give yours a try. One question bothers me and that is the choice of 6922 valves.

I see that these are identical to E88CCs which I have used in pre-amps before and experienced a lot of microphony problems with. When I asked around I was told the E88CC is really a Radio Frequency valve and not designed for audio use. Is this true? There is no discussion in the article about the choice of valve. Is the E88CC the best model? I would greatly appreciate your comments.

Ian Pearce
ianpearce@aol.com

The design used in the KPP1 valve phono stage relies on the paralleling of devices to reduce the noise level.

The 6922 is a high-grade E88CC and is renowned for its low-noise performance, especially in RF applications where they were used in tuner head stages. This is why they were chosen for the phono stage.

Microphony is a major problem with any valve and careful attention needs to be paid not only to the positioning of the phono stage in respect to the distance from the 'speakers but also to where the unit is situated with respect to mains cables, etc. However, as the microphony levels are minuscule and, in most applications, only heard when the volume control is at close to maximum, there should not be a problem.

There are quite a few RF valves that are capable of working in the audio domain if correctly biased and the 6922 is no exception.

The choice of this valve was purely down to its sound quality. I feel that the 6922 has a more detailed, open sound than the competition - ECC83 and others. It comes in several guises:
1) Standard 6922 (silver pins). These are the most open sounding valves of the 6922 variety but they suffer from higher noise levels and some can have a grainy edge to their sound.
2) Special 6922 (gold pins). These are the best 6922 valves around. The sound is very smooth but extremely detailed and I prefer these over any other type, but they are hard to get. CF

The 6922 valve may have been designed for RF circuits but it is perfectly suitable to audio use.

TRANSFORMER TRANSPLANT

I've acquired a pair of home-made vintage valve monoblocs, each of which has two EL84s, an ECC83 and an EZ81. They were made by a man called Dennis and based on a modification of a Mullard design. He built one around 1955 and the other around 1958 to make a matching stereo pair. Misunderstanding my enquiry about their power output as a vulgar modern consideration, Dennis told me, a touch defensively, that he had built the amps for sound quality. Through an early Brenell pre-amp he was unable to achieve a true stereo split and from his expression this was a big disappointment such, it is clear, was the anticipation for stereo. From there he went on to a Rogers HG88.

I took the amps to a valve radio enthusiast (boy, what a collection!), who checked them over for me and awoke them from a great sleep by means of a variac. Dave, who had made amps himself at the time, confirmed Dennis' claim about having built the amps for sound quality. They were, he informed me, made from the absolute best components available to home constructors: "Only the guys who didn't drink and smoke and were 100% committed to their hi-fi made amps like these", he told me.

Teaming them up with my Audio Innovations Series 800 pre-amp, Cambridge 200 CD player and a pair of Mission 760SE 'speakers I was compelled to step back into the room (I was about to make a cup of tea) as 'Have I Told You Lately' by Van Morrison was playing. The piano solo had just begun. Each note was as vivid as life and I could hear the great care the soloist was taking in the execution and selection of these notes.

For the first time I could hear how hard Earl Klugh worked to sustain the movement of a piece called 'The Highway Song' and how graceful a dance was his piece 'Winter Rain'.

The downside was that the bass seemed cut-off and at best stodgy. Which brings me to my question about impedance matching. I was using these amps set at 15ohms (only one output transformer has taps - 3ohms, 7.5ohms and 15ohms, which is the rub) with the Missions which are 6ohms.

Now some people say I will simply lose a couple of watts of power. The pre-amp has high gain in any case. However, I have read that impedance matching is about maximising audio frequency power and that pentodes are very exacting in their

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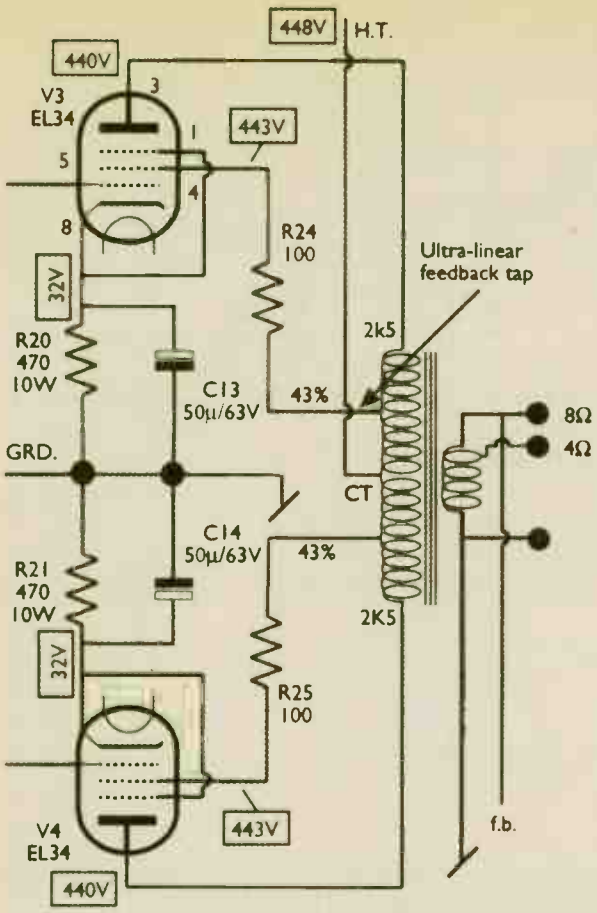


If your output transformer has more than three wires on its output, it's likely to be an Ultra-Linear type connected in the way above (Mullard's 5-20 design) to give low distortion from high levels of feedback.

requirement of a correct match whereas triodes are less so (this in an old hi-fi book). So I am still wondering if the impedance mismatch is responsible for the bass not being able to get down, as it were.

It seems, output transformer transplant not withstanding, I'm stuck with 15ohms. Can you suggest a small 'speaker (my listening room is a bit of a shoebox) that might be suitable; nothing too expensive, I'm a house daddy. Finally, the second amp is not earthed. Dave says it will be through the pre-amp. Is this good practice?

Gilbert Akingele
Wallington,
Surrey.

From your letter it would seem that Dennis was an avid home constructor with a purist touch. The combination of valves suggested was, and still is, very acceptable in terms of sound performance, but the matching between output transformer and 'speaker is critical.

My best recommendation for a 'house daddy' is to get the output transformers replaced with something that would work to an acceptable level with the 'speakers that you have. You can always replace one transformer first and the second when more funds are available. These units should not break the bank in cost terms but expect to pay around £50-£75 for one.

The anode-to-anode impedance of a transformer for a pair of EL84s is 8kOhm. If the primary winding has more than three primary wires, it is fairly safe to assume that the amplifier is connected in Ultra-Linear mode and you will require 43% taps on the new transformer primary to suit. Please check this before committing any cash.

Some transformer manufacturers have the ability to copy a ready-made unit, so the choice is up to you. And all power amplifiers, especially of the valve variety, must be earthed. CF

FOLLOWING UP A LEAD

I have been trying to improve on the rather cheap looking tone-arm lead that came with my turntable, with variable results. Cables which work well with a CD player seem to reduce the treble, and deaden the overall sound when used with a tone-arm.

Having done what research I can it seems that the capacitance and resistance of the cable may be the key factors in producing this result, with both needing to be as low as possible for a tone-arm given the nature of the signal from the cartridge (MC in my case). Unfortunately cable manufacturers do not give figures for these characteristics on their packaging, so it becomes a question of trial and error.

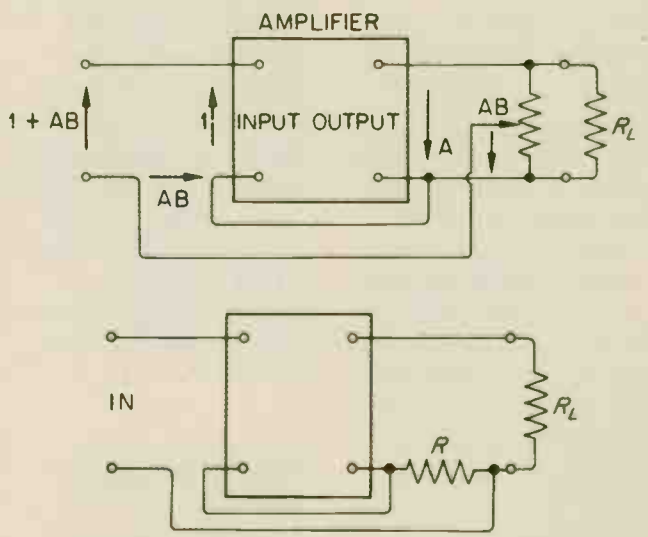
My conclusion is that I am unlikely to better the lead supplied unless I invest in a silver-wired cable. Am I on the right track, or have I misunderstood the technical information I have read?

Having become interested in the subject I have also considered a separate phono stage as an upgrade to my Audiolab 8000A. There seem to be two types of equalisation, R.I.A.A. and shunt feedback, and a need to balance the impedance of the cartridge, but I am beginning to suffer from information overload. Can you supply a simple explanation?

Paul Beevers
100522.737@compuserve.com

Cables can be such a terrifying thing - you can spend obscene amounts of money in this direction and every manufacturer states theirs is the best.

Moving-Coil cartridges require a certain load impedance and capacitance, so the cables carrying these signals must be of a different construction from normal interconnects. The



Shunt feedback (below) and series feedback (above) are both used in phono stages.

standard input impedance for a moving -coil pre-amplifier is around 100ohms with a capacitance of around 100pF.

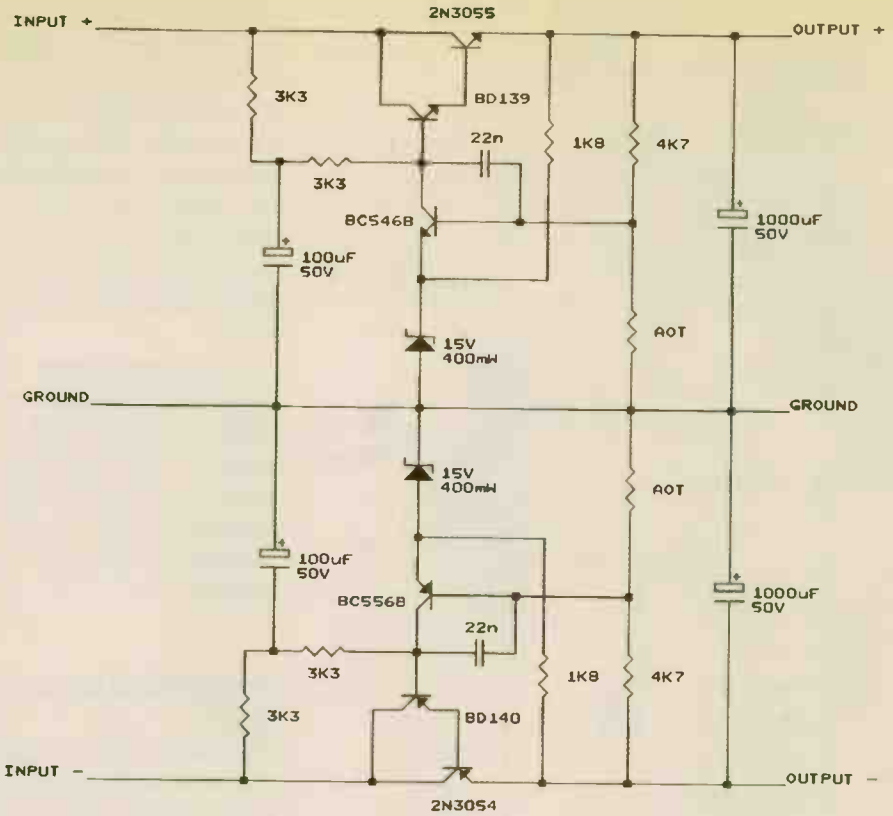
My own preference on cables of this nature is for silver-plated or oxygen-free types. These provide good sound but may not be to everyone's taste.

I would recommend that you look through either a Maplin, RS Components or Farnell catalogue and choose a double-lap screened cable (microphone cable) with a low to medium impedance (about 100ohms) and a capacitance of about a hundred pF, then adjust the loading capacitance on the MC input according to the manufacturer's figures minus the cable's capacitance. Bear in mind that the specification for the cable is for a particular length and this has to be taken into account to get the final value.

You seem a little confused technically. R.I.A.A stands for Recording Industry Association of America and their curve is a group of parameters that were set for the equalisation of records.

The R.I.A.A . curve was specified initially in 1955 to standardise the recording industry, who at that time used many different curves which depended on the manufacturer of the record. This standard allowed a full frequency response (20Hz-20kHz) and the reduction of surface noise to an acceptable level. The way it works is as follows: the record is equalised in the cutting room with an attenuation in the low frequencies and a boost applied to the high frequencies. The equalisation network in the phono stage applies the inverse of the R.I.A.A. curve to the cartridge's signal to give a net flat response. Although some of the specifications were changed a few years later, the basic characteristic of the original exists to this day.

Shunt feedback and Series feedback are two types of feedback used in phono stages. Early Cambridge Audio amplifiers used the shunt variety in their designs to achieve to what Stan Curtis described as a 'perfect curve', or one which very closely mimics the R.I.A.A. equalisation curves, while Audiolab use Series feedback in their phono stage. The choice is purely down to the designer, though in theory Shunt feedback is best. CF



If you're after high-current regulation, discrete circuitry is the best way to go. Just make sure you use adequately large heatsinks for the 2N3054 and 2N3055 transistors.

POWER IN SHORT SUPPLY

I have built the IC power amplifier featured in the February 1997 Supplement and have added extra line sources and LM317T voltage regulators in the PSU. I also used a transformer with 18V AC secondaries to compensate for the voltage drop through the regulators. The problem is that the amplifier produces a lot of treble distortion at high volumes and I can't pin-point the problem. I've tried reducing feedback by replacing feedback resistor 3 (22kOhm) with one of 27kOhm but this didn't help much. Your advice would be much appreciated.

The rest of my system consists of Mordaunt-Short MS10i 'speakers and a Kenwood DP-3080 CD player.

Gareth Ogden
jlo2@student.open.ac.uk

Your modifications to the 30watt chip amplifier are worthy in concept but have fallen down in practice.

The chip amplifier draws up to 2.5A of current from each rail of the power supply. The exact amount is dependent upon the 'speaker impedance and the regulator used - the LM317T/LM337T voltage regulators you've used are only rated at 1.5A max.

What you are hearing is the regulators being pushed beyond their limits and there is nothing that you can do with them to overcome this problem.

If you really want to regulate the power supply, you must have regulators that are capable of handling the maximum current demanded by the amplifier and the only way to solve this problem is to go discrete. CF

MEASUREMENT BLUES

I have recently started customising my loudspeakers (a two-way stand mounted design). First the crossovers came out of the cabinet, then the throwaway internal wiring was replaced, and finally those crossover components which had clearly marked values were swapped (capacitors were upgraded to polypropylenes,

resistors to high-power metal films).

Each change resulted in a small improvement in the sound, the most noticeable

An LCR meter like this one from Maplin will allow you to completely revamp your loudspeakers.

change being the capacitors and resistors. Unfortunately, the inductors in the crossover (two air-core, one ferrite-bobbin) have no values indicated and there is, I think, a small electrolytic capacitor also with no value printed on it. I contacted the manufacturer who, despite the fact that the model is discontinued, was reluctant to give the values of the components.

How can I find the values of the remaining components if I have a multimeter?

Alan Zoric
Alan.ZORIC@BXL.DG5.cec.be

Easier than fiddling with a volts/ohms multimeter which won't directly measure these values is to buy one of the low-cost LCR (inductance, capacitance, resistance) meters on the market that will measure these parts. You can get them from Maplin or RS Components (Maplin's cheaper LCR, order code YB82D, costs £45.89 and will measure up to 10H, 100uF and 1MOhm).

Please note that some components used in 'speakers are sometimes adjusted for the specific drive unit tolerances and therefore close-to-exact replacement values are very important. CF

WIREY ENQUIRY

My system includes a Rotel RCD-965BX, Naim 32.5/Snaps/160 (32.5 is 72 spec with CD boards), Wilmslow Audio Studio Monitor II loudspeakers and two 7.5m runs of Cable Talk Talk 3 bi-wire. (I also have two sets of 4 metres of Naim NAC4 cable, a bit of Vecteur bi-wire solid core and quite a lot of QED 79-strand lying about not in use right now). The music I listen to is mainly Pop/Rock/Motown.

I have recently made a change to my system and have gained a considerable improvement in so doing. The change was from Epos ES14s to the Studio Monitor IIs. Having taken the plunge into building my own loudspeakers (inspired by your feature on KLS9 in April 1997's Supplement), I am looking to carry out some fine tuning. This is where I would appreciate your advice.

A couple of months ago, as an experiment, I removed the crossovers from the loudspeakers and put them into a bit of a lash-up container as a temporary home. The improvement was staggering! I have now decided to do a proper job on this tweak by buying decent binding posts and building a nice looking box.

Having made a couple of phone calls I established that Naim advise at least 3.75m of cable from the amplifier to the crossover, whereas Wilmslow recommend placing the crossover close to the amplifier if removed from the enclosure. Naim do not recommend bi-wiring, although I am currently ignoring that because I perceive a clear improvement in sound quality by doing so.

What I would like is an impartial opinion on types of cable for doing different parts of this job. The loudspeakers are positioned 7m away from the power amplifier and I do not want to change this.

1) Where do you recommend I put the crossover?
2) What cable do you recommend from the amplifier to the crossover?
3) What cable do you recommend from the crossover to the loudspeaker?
4) What cable do you recommend for internal wiring of the loudspeaker (currently 79-strand)?

Thank you for an enjoyable read.

Name and address withheld by request.

Ideally, you want to put the crossover as close to the amplifier as is practical. Passive crossovers are easier to drive for an amplifier when there isn't a long length of 'speaker cable making the job even more difficult.

For the cabling between amp, crossover and loudspeaker, that comes down to a matter of taste and the consideration that Naim amps can be a bit fussy over what cable they're driving. Cost obviously enters into the equation as well. We've had good results from DNM's Reson (£6.96/m) and Pentacone's loudspeaker cable (£243 for a 7m bi-wire set).

While 79-strand is a bargain cheap cable, you're better off lashing out on something superior. The easiest option is to use your chosen 'speaker cable inside the cabinet as well as out. If you fancy mixing and matching brands there's no reason not to,

The idea of outboard crossovers for loudspeakers has been around a while but is not widely used. B&W and QLN have gone this route though, with their Signature loudspeakers.

and it should allow you to strike exactly the sonic balance you're after. JM

DIY IN DEPTH

As a long-standing Thorens TD125 owner (over 18 years) and self-confessed tweaker, I was very interested to read Haden Boardman's feature article on this turntable in your September 1997 issue. I have spent quite some time modifying and improving mine and I thought your readers might be interested in further modifications to really get the most out of this excellent machine.

First, as Haden suggests, throw away the mat and tone-arm. I have tried a glass mat with good results, but have found an acrylic mat to be MUCH better. The spindle on the 125 protrudes only 10mm above the platter, and with my 10mm thick acrylic mat I have had an extension piece turned up which is a sliding fit over the existing spindle and a very tight press-fit into the acrylic. The mat is fixed to the platter using a number of very small blobs of Blu-Tack, which also help to damp out any resonances.

A very useful improvement can be had with a record clamp - mine's a GB clamp, which grips the spindle and screws down onto the record forcing it to bend slightly over a 1mm thick shim placed over the spindle. This brings the record into contact with the mat.

It is important for the suspension to move freely, and I believe it is worth spending some time to ensure that it only moves in the vertical plane. Any sideways skewing will be detrimental to the sound. With the added mass of the acrylic mat, I actually had a spring maker manufacture three new springs - total cost $8, and money well spent. Removing any mechanical grounding of the tone-arm wires also improves the performance. I have found that the low-mass Mission 774 arm is a very good match for the turntable.

Another remarkable improvement can be made by modifying the plinth. These two alternative tweaks are very worthwhile:

1) Remove the hardboard bottom from the plinth and throw it away. Make a new one from MDF, fix three spikes to it and screw it firmly back onto the plinth. This will give an all round improvement in sound, particularly in the bass where it yields more definition and slam. Siting the whole lot on a concrete paving slab, which is spiked onto the equipment stand, will improve the sound stage too adding space in all three dimensions.

2) Remove the turntable from the plinth and make a new two-piece plinth from something solid (I have used 25mm thick nylon sheet, which has good vibration-absorption properties). A template can be drawn from the existing metal base. The new plinth should be made in two pieces, one to support the turntable on its springs, with locator pins, and the other to support the motor only. These two pieces should be fitted with three spikes each which will allow adjustment of their relative heights and levelling of the turntable.

A sub-plinth is also necessary. I have used a concrete paving slab. The motor wires need to be extended back to the speed control PCB which is now remote from the turntable and still mounted in the old plinth. A cosmetic wooden surround can be made if you want to hide the guts, but ensure that it does not come into contact with the new plinth or turntable.

The improvements are staggering; an extra octave of bass, infinitely more detail, wider and deeper sound staging and quieter silences are just some of the gains.

I have been very well rewarded for my efforts and have spent little money in achieving these results.

The rest of my system comprises Benz Micro Glider cartridge, Plinius Jarrah phono stage, Naim NAC102/Hi-Cap/NAP140 and Mordaunt-Short Performance 860 'speakers, with Chord Solid and Naim interconnect and Naim NAC5 'speaker cable.

Scott Roberts
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Boost the performance of Thorens' much-loved TD125 turntable with the modifications mentioned above.

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