

Hi-Fi
W O R L D

Hi-Fi

W O R L D

NO.32 NOVEMBER 1997

SUPPLEMENT

**AWESOME ANALOGUE
ORIGIN LIVE'S TURNTABLE KIT**



**KLS3 GOLD MKII
OUR BEST SPEAKER
JUST GOT BETTER**

DIY BOOK REVIEWS



FREE D.I.Y. SUPPLEMENT No.32

PRICE VALIDITY TO END OCT 1997 - ASK ABOUT ANY TYPES NOT ON THIS LIST



**CHELMER
VALVE
COMPANY**

for High Quality Audio Tubes

Everybody in the tube business knows that the justly famous Brand names of yesteryear like BRIMAR, GEC, MULLARD, RCA & TELEFUNKEN Etc. Etc. are scarce and often very expensive.

Although we supply all major brands when available (and have many in stock) our policy is to offer a range of tubes, mostly of current manufacture, the best we can find from factories around the world, which we process specially to suit audio applications. The result - CVC PREMIUM BRAND.

Our special processing includes selection for LOW NOISE, HUM & MICROPHONY and controlled BURN-IN on all power tubes to improve STABILITY and select out tubes with weaknesses Etc.

A selection of CVC PREMIUM Audio Tubes

PRE-AMP TUBES	POWER TUBES	POWER TUBES	SOCKETS ETC.
ECC81 5.00	EL34G 7.50	(continued)	B9A (Chassis or PCB) 1.60
ECC82 5.00	EL34 (TESLA) 8.00	6336A 46.00	B9A (Ch or PCB) G/Plated 3.00
ECC83 5.00	EL34 (Large Dia.) 8.50	6550A 11.00	Octal (Ch. or PCB) 1.80
ECC85 6.00	EL84/6BQ5 4.70	6550WA or WB 13.50	Octal (Ch. or PCB) G/Plated 4.20
ECC88 5.00	EL509/519 13.00	7581A 11.00	4 Pin (For 2A3, 300B etc.) 3.30
ECF82 5.00	E84L/7189A 6.50	807 9.00	4 Pin (For 2A3, 300B etc) G/Plated 5.00
ECL82 5.00	KT66 9.50	811A 11.00	4 Pin Jumbo (For 211 etc.) 11.00
ECL86 5.00	KT77 12.00	812A 34.00	4 Pin Jumbo (For 211 etc.) Gold Plated 15.00
EF86 5.50	KT88 (Standard) 12.50	845 30.00	5 Pin (For 807) 3.00
E80F Gold Pin 10.00	KT88 (Gold Special) 21.00	RECTIFIER TUBES	7 Pin (For 6C33C-B) 4.50
E81CC Gold Pin 6.80	KT88 (Gold Lion Pair) 60.00	EZ80 4.00	9 Pin (For EL, PL509, Ch. or PCB) 5.00
E82CC Gold Pin 8.00	PL509/519 9.00	EZ81 4.50	Screening Can (For ECC83 etc.) 2.00
E83CC Gold Pin 7.50	2A3 (4 or 8 Pin) 14.50	GZ32 11.00	Anode Connector (For 807 etc.) 1.50
E88CC Gold Pin 8.00	211 22.00	GZ33 9.50	Anode Connector (For EL509 etc.) 1.70
6EU7 6.00	300B 50.00	GZ34 6.50	Retainer (For 6L6WGC etc.) 2.00
6SL7GT 4.50	6C33C-B 27.00	GZ37 7.50	
5SN7GT 4.50	6L6GC 6.50	5U4G 5.00	
6922 5.20	6L6WGC/5881 8.00	5V4GT 4.50	
7025 6.50	6V6GT 5.00	5Y3GT 4.00	
	6080 11.50	5Z4GT 4.50	
	6146B 10.50		

and a few "Other Brands" (inc. Scarce types).

5AR4/GZ34 MULLARD 20.00	6B4G RAYTHEON 27.00	6SN7GT BRIMAR 5.50	13E1 STC 110.00
5R4GY RCA, STC 7.00	6BW6 BRIMAR 5.00	12AT7WA MULLARD 5.00	805 CETRON 50.00
5R4WGY CHATHAM USA 10.00	6BX7 GT SYLVANIA 8.50	12AY7 GE-SYLVANIA 7.75	5842A GEC 15.00
5U4GB RCA or GE 12.00	6CG7/6FQ7 SYLVANIA 7.50	12AZ7 GE 7.50	6080W TUNGSTOL 12.50
5Y3WGT SYLVANIA 5.00	6CL6 RCA or GE 5.00	12BH7A GE or RCA 13.00	6550A GE 22.00
6AS7G RCA or SEIMENS 12.00	6CW4 RCA 11.00	12BY7A GE 9.00	6146B GE 17.00
6AU6WC SYLVANIA 3.50	6SL7GT STC 5.50	12E1 STC 12.50	

ALL PRICES IN U.K. POUNDS £

Please note carriage charge extra + VAT (EEC Only) - When ordering state if matching required (add £1.00 per tube).

Payment by CREDIT CARD (ACCESS, VISA, MASTERCARD) or BANKERS DRAFT, TRANSFER or CHEQUE (UK ONLY).

FAX or POST your ORDER - We shall send PROFORMA INVOICE if necessary.

Valve Amplifiers sound better still fitted with CVC PREMIUM Valves!

Chelmer Valve Company, 130 New London Road,
Chelmsford, Essex CM2 0RG. England.

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

Contents

All rights to the designs are reserved by World Audio Design Ltd. They are published for single use by private individuals. They are not to be used for commercial gain without prior permission from World Audio Design Ltd.
Audio Publishing Ltd and World Audio Design Ltd accept no responsibility for accident or injury arising from the construction or use of any of the designs published.
All of the projects in this supplement have gone through rigorous listening and test procedures. The performance and specification of these projects can only be guaranteed on kits bought directly from World Audio Design Ltd.

KIT NEWS

These pages contain the latest information concerning products and components in the world of DIY.

5

ORIGIN LIVE TURNTABLE KIT

£145 won't buy much in the way of quality vinyl spinners, but it will buy you this turntable kit from Origin Live which promises analogue bliss. Does it deliver, asks Jon Marks.

6

KLS3 GOLD GOES MkII

KLS3 Gold, our top of the range kit 'speaker, just got better. Noel Keywood guides you through the improvements.

13

BOOK REVIEWS:

ANALOG ELECTRONICS

In his book Analog Electronics, Analog Circuitry Explained, Ian Hickman is as good as his word, as Haider Bahrani found out.

21

AUDIO ELECTRONICS

Noel Keywood discovers what enlightenment well-known hi-fi designer John Linsley Hood can offer in his book, Audio Electronics.

23

DIY Q&A

Whether it's a simple DIY problem or a high-powered theoretical debate, Q&A can help.

25

α

Billington

Gold

Ω

Long known as specialists in rare tube brands, Billington Export provides a line of premium-grade valves to fill the increasing demand for hard-to-find tubes! BILLINGTON GOLD features specially tested valves selected for long life, low microphony and low noise. Versions with gold plated pins are available. BILLINGTON GOLD brand comes from a variety of countries around the world. We have carefully chosen the best manufacturer for each type, with an emphasis on the highest audio quality and product reliability. We stock one million valves including: BRIMAR, GE USA, GEC UK, MAZDA, MULLARD, RCA, RUSSIAN/SOVTEK/SVETLANA, SYLVANIA, TESLA, THERMIONIC, TUNGSRAM and other rare brands, as well as stockets and CRTs.

NEW IMPROVED QUALITY 300B

In July 1997 we were delighted to receive the first production of the latest design Chinese 300B with improved filament support, gold plated grid & graphite coated anode [our ref: VA/300B] Carefully tested, 90 day guarantee.

Billington OB...@ £54.00 each *

- 10 pieces @ £36.00 each *
- 20 pieces @ £35.00 each *

BILLINGTON GOLD

2A	17.25
6L6GC	9.50
6L6GT	6.45
6SL7GT	4.50
12AX7	4.50
50CA10	22.50
274B	12.00
300B/VA300B	
New improved version	54.00
807	9.95
811A	9.00
813	24.00
845	33.00
4300B	66.00
5881	8.00
6550B/B3	16.43
E81CC	5.25
E81CC-01	9.50
E82CC	4.50
E82CC-01	8.50
E83CC-01	8.50
E88CC	8.00
ECC81	4.42
ECC82	4.42
ECC83	4.50
ECC85	6.00
ECC88	4.50
EF86	9.90
EL34	7.50
EL84	3.60
GZ34	8.40
KT66	9.50
KT88 Special	
GEC replica	22.50
KT88	18.50
TT21 Chinese	27.00

TOPCAPS

For 2C34, 807 etc	£2.03
For 12E1, 5B-254M, PL519	£1.95

RARE BRANDS

3C24EEV	27.00	12BH7 Yugoslavian	6.90	E80CC Mullard	45.00
4CX250BM [EIMAC]	60.00	12BH7A RCA	13.50	E80F Philips	18.00
4250A/QB35750 Philips	90.00	12E1 STC TTT UK	15.00	E80L Philips	31.50
5R4GY RCA	9.00	12SG7	0.60	E88CC Tesla Gold pin	8.85
5R4WGB USA	9.00	12SN7GT	2.25	E180CC Mullard	5.40
5U4G Rogers	24.00	13E1 STC UK	120.00	E182CC Mullard	9.45
5Y3GT	7.50	85A2 Mullard	4.50	EB91	1.50
6AH4GT USA	7.50	350B Chinese	14.25	ECC81/CV4024 Mullard UK	7.50
6AS7G Russian	2.93	4UA	12.00	ECC82/CV4003 Mullard UK	10.20
6AU5GT GE USA	3.75	807 USA	10.50	ECC86 Mullard	5.93
6AU6WC ECG Philips	1.20	1625 USA	5.93	ECF80/6BL8	0.60
6AU8A USA	0.75	2050W RCA	8.25	ECH81 Russian	1.48
6BE6/5915 ECG Philips	0.90	5687WB Philips	5.93	ECL82 Tungstogram	2.93
6BH6 RCA	2.48	5751GE	3.90	ECL85/805	1.49
6BL3 USA	0.60	5755 Raytheon	2.63	ECL86	2.40
6C33CB Russian	29.25	5814AECG/Philips	2.70	EF3TA Mullard UK Grey	5.25
6CG7 USA	7.20	6028	0.99	EF39/CV1053	1.65
6CG7 Yugoslavian	6.75	6111WA Philips	1.50	EF86/CV4085 GEC UK	19.50
6CH6 Brimar	2.93	6336A Amperex	54.00	EF86 Russian/Svetlana	8.40
6CW4	7.80	6350 USA	1.50	EF95/CV4010 Mullard	1.95
6DL4/8255 Telefunken	4.50	6414 USA	2.99	EF184 RFT	0.99
6J4/CV5311	1.20	6463 GE USA	2.25	EL38	13.32
6J5 RCA	3.60	6550A GE USA	42.00	EL86 Russian	1.49
6J5GT Pinnacle	1.46	7119 Mullard USA	9.45	EL90 Brimar	2.25
6J7G USA	3.45	7308 ECG Philips	5.25	F2A Siemens	135.00
6L5G USA	2.70	7581A ECG Philips	25.50	F2A11 Siemens	120.00
6L6GA Sylvania	22.50	9002 [audio triode] RCA	1.50	GZ32 Philips	POA
6Q7G/CV587	2.99	A2293/CV4079	4.43	GZ37/CV378 Mullard UK	9.00
6SJ7 RCA	3.30	C3m Siemens	15.30	KT90 Yugoslavian	25.50
6SN7GT Ken Rad	5.55	CV4025	1.50	PCL82 Tungstogram	1.35
6SQ7	3.00	CV4062/E2134	5.25	PCL86 [ECL86] Russian	0.53
6U8A RCA	1.43	CV4068 Brimar	4.50	PL504	5.48
6V6 RCA Black Metal	15.00	DA42 GEC	28.50	PL519 Tungstogram	8.40
6V6GT MWT	5.85	DG7-32 Mullard	21.00	QQV03/20A GEC	5.25
6X4W Raytheon USA	3.00	E34L Tesla	12.00	S11E12/CV4060	43.50
12AZ7A USA	2.70	ESSL/CV5808 Mullard	37.50	Z2b	27.00

RUSSIAN/SVETLANA

6B4G	23.40
6550B-2	18.00
6550C	27.00
EL34 Svetlana	8.92
SV572-3	105.00
SV572-10	120.00
SV572-30	105.00
SV572-160	105.00
SV811-3	27.30
SV811-10	27.30

For orders over £600.00 please deduct 33%.

[Does NOT apply to items marked *]

WHOLESALE SECTION

6AL5/EB91 Mullard government box	100 pieces @ £ 75.00 [£0.75 each]*
6J5GT Russian	10 pieces @ £ 9.00 [£0.90 each]*
9002 RCA USA audio triode	100 pieces @ £ 60.00 [£0.60 each]*
E180CC/7062 Mullard UK box anode GVT	100 pieces @ £360.00 [£3.60 each]*
EF37A Mullard UK Grey	50 pieces @ £125.00 [£2.50 each]*
EF86 Russian, Identical to Svetlana EF86 but no logo	50 pieces @ £210.00 [£4.20 each]*
EL34 Chinese tested - guaranteed	50 pieces @ £200.00 [£4.00 each]*

RARE SOCKETS

47E [for 4212E]	ORDER CODE 47E	37.50
4B4/B5B [for PX4]	ORDER CODE 4B4/5BB	3.98
45DA [for DA100]	ORDER CODE 45DA	15.00
B5 [for ML4]	ORDER CODE 4B4/B5A	3.98
PO5 [for Aa, Ba]	ORDER CODE 5PO	11.70
Octal and B9A sockets IN STOCK...POA		
Side contact for AZ1 [CT8]	ORDER CODE 8P/8SC	10.43

All items in stock at the time of going to press. Prices in GB Pounds. Please ask for our free 50 page catalogue of valves. AMERICAN EXPRESS, MASTERCARD, VISA, accepted. MINIMUM ORDER: UK £50 + VAT & Carriage. Export £100.00 [US \$150.00] + Carriage. 3,000 OTHER TYPES OF VALVES IN STOCK! PLEASE INQUIRE FOR ANY TYPE NOT LISTED.



THE GILLMANS TRADING ESTATE
BILLINGHURST
WEST SUSSEX RH14 9EZ UK
TEL: (0)1403 784961 FAX: (0)1403 783519
 VISITORS STRICTLY BY APPOINTMENT PLEASE

KIT NEWS

BETTER CONNECTED

The Parts Connection, based in Oakville, Canada, has just released two new amplifier kits on the market. The first is a valve line-level pre-amplifier radically named the Assemblage L-1. This kit is claimed to be sonically reminiscent of the acclaimed Sonic Frontiers SFL-1 pre-amp and contains a hybrid FET/tube circuit. The Assemblage L-1 features a fully regulated power supply, four line inputs, one tape loop and two paralleled outputs. Zero global negative feedback is claimed for the design, which offers approximately 20dB of gain and good drive because of its low output impedance. The complete package includes all valves, pre-punched chassis, face plates, knobs, hardware and of course instructions. The price is \$499.00.

The second new arrival to be announced is a stereo power amplifier called the Assemblage ST-40PP. This uses a triode input stage followed by a long-tailed, differential-pair driver stage, which feeds matched pairs of EL34/6CA7s in a push-pull configuration. Price for the ST-40PP is set at \$699.00.

The Parts Connection
2790 Brighton Road,
Oakville,
Ontario,
Canada
L6H 5T4
Tel: (001) 905 829 5858

WEAVING A SPELL ON CD

Technical Wizardry, whose products are now being distributed by AudioCom (UK), have announced the release of 'The Clock' for use in CD players and transports. 'The Clock' incorporates separate high-grade regulators for the analogue oscillator section and digital sine-to-square-wave converter. Using Sanyo Os-Con

decoupling capacitors and surface-mount components, 'The Clock' provides a high-quality square wave signal which ensures accurate clocking of the player or transport. The price for this unit is £150.00. Further CD upgrades in the pipeline are a separate power supply, an analogue output stage, a digital output stage and a high-performance regulator board.

On another note, AudioCom (UK) have moved to new, larger premises, and can now be contacted at the address below.

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

NEW MAPLINS CATALOGUE

Maplins has launched a new edition of its bi-annual catalogue and in the

process introduced in excess of 2000 new products. The new catalogue covers audio-visual, computers, security, radio communications, electronic and electromechanical components. The catalogue also comes complete with a section of in-depth 'How To' guides on a wide range of topics from soldering to computer peripherals and networking.

Maplins MPS
PO Box 777,
Rayleigh,
Essex SS6 8LU
Tel: 01702 554002



REMOTE POSSIBILITIES

Scunthorpe-based component supplier Audio-Links have developed a module that will allow the owner of any pre-amplifier or integrated amplifier to have the luxury of adjusting the volume by remote control. The module comes completely built and tested. The price to bring all this control to your finger tips is £62.10 plus P&P.

Audio-Links
7 Fairmont Crescent,
Scunthorpe,
North Lincolnshire DN16 1EL
Tel: 01724 870432



GOING FOR A SPIN



If you're a vinylphile who's handy with a spanner and a soldering iron, Jon Marks reckons you owe it to yourself to check out Origin Live's Standard turntable kit and Rega RB300 tone-arm modifications.

Imagine the situation: you're trying to track down a kit for a turntable. The response from the suppliers you've tried so far will probably have been, "Amp kit, DAC kit, 'speaker kit, sir? We have those. No turntable kits, I'm afraid." Step forward Origin Live and their two kits for record decks, the Standard and Ultra.

We first took a look at Origin's higher spec. kit back in August 1993's Supplement where we went for the complete Ultra kit of parts which cost £350 back then. At the time, Jonathan Jordan thought this was money very well spent. Now we're moving into budget territory with the Standard kit where

novice constructors should find themselves more at home. This kit will set you back £125 for the bearing, platter, motor, belt and basic power supply.

THE TECHNOLOGY

The bearing itself is the heart of any turntable. Most lower-priced decks tend to have low-tolerance bearings where the cost-cutting shows up as play - if you grasp the spindle and move it gently from side-to-side, you'll notice some movement. The results this has on sound quality are usually fuzzy imaging and a general lack of crispness and definition; speed stability and rhythm can also suffer.

Origin Live win themselves brownie points for not skimping on bearing tolerance. Technologically, OL's bearing toes the traditional line with a non-inverted design, unlike, for instance, Pink Triangle's predominantly inverted designs (which can be more difficult to manufacture and lubricate reliably).

The main housing is actually a large engineering bolt with its head cut off and a shaft sunk down its centre. At the bottom sits a small ball bearing (replacements are available from bicycle shops at around 75p for a pack of 10). Rotating atop this ball is the shaft, made of case-hardened, ground steel, which supports the grey PVC sub-

platter. Finally, resting on the sub-platter is an 11mm-thick glass platter with three small felt discs glued on to it to decouple the record.

Driving the whole assembly is the sort of AC synchronous motor you'd expect to find in decks like Linn's LP12, Pink Triangle's PT Export and Systemdek's 2X2. This is good news for tweekers because it means Linn's own Valhalla power supply will work with the Standard kit, according to Mark Baker, director of Origin Live.

If you decide to opt for a ready-made plinth to get you up and running, OL do a simple, solid one for £20. This consists of a slab of MDF pre-cut and drilled to take a Rega RB250/RB300, which was supplied. But this is no normal RB250. Mark has modified this budget favourite and claims its performance would give even super-arms like SME's Series V and Linn's Ekos pause for thought.

What makes this arm special are three tweaks. The stub that carries the counterweight is unscrewed and replaced with one that is held onto the arm-tube with a high-tensile steel bolt. This is claimed to give a much more rigid structure than before and, because the stub no longer screws into the end of the arm-tube, improved decoupling between it and the arm tube.

The second change is threading the weight to take a grub screw to hold it much more firmly onto the stub than the rubber o-rings normally fitted. In maximising rigidity like this, OL's RB300/RB250 mimics SME's Series V, where rigidity is paramount. Finally, the Rega is re-wired with silver Litz cable.

To find out what the Standard kit and revamped Rega have to offer, we decided to try out the Standard kit in two guises: with OL's own solid plinth and AC motor, as well as with a battery-powered DC motor.

SOUND QUALITY

Since it's a solid-plinth deck, the Standard will need to be sited on something more stable than a bookshelf. A dedicated wall-shelf is one idea, as is a low coffee table like the Lac from Ikea.

Bearing a Goldring 1042 Moving



Here you can see the modification to the counterweight with its threaded hole to take the grub-screw.

Magnet cartridge and working into Audio Analogue's Puccini SE integrated amp, this vinyl front-end had my jaw heading towards the floor with the solidity and transparency of the music it was making. Spinning a copy of Ray Charles and Betty Carter running through a selection of classic numbers, the Standard came up with crystal-clear images set in a broad sound stage. Stage depth was a little disappointing by comparison, but that width really was an unexpected bonus. Another was the obvious rhythmic ability of this turntable/arm combination, with upper bass notes crisp as a freshly ironed £50 bill giving whatever LP was sitting on those three felt discs a pleasantly up-beat feel.

The flip-side of this presentation was that bass had a slightly lower profile than usual which could make music sound a tad insubstantial at times. This didn't stop the Origin Live putting together a captivating performance with Ray and Betty, the mellow orchestral backing and laid-back mood of this LP undiminished. From an emotional point of view, the Standard/RB250 left CD as dead as the

proverbial dodo - even our Teac P-30/Pink Triangle Da Capo, a communicative digital source, sounded lacklustre next to this analogue pairing.

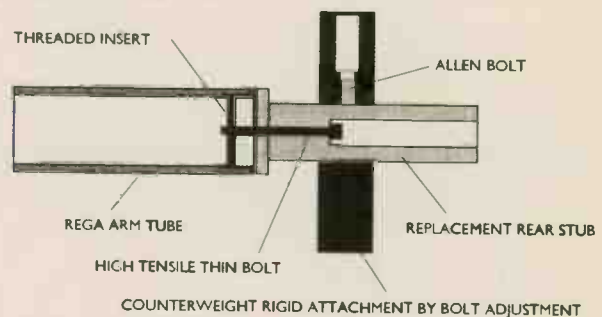
With a Mobile Fidelity Sound Lab audiophile pressing of Muddy Waters' Folk Singer there was that expansive sound stage and superb separation which made the Origin Live's imaging so convincing. Again, the only area not quite up to par was stage depth, which was mildly compressed. Still, for a turntable kit and arm that tip the scales at only £465 without a cartridge, this set-up

looks and sounds like great value for money.

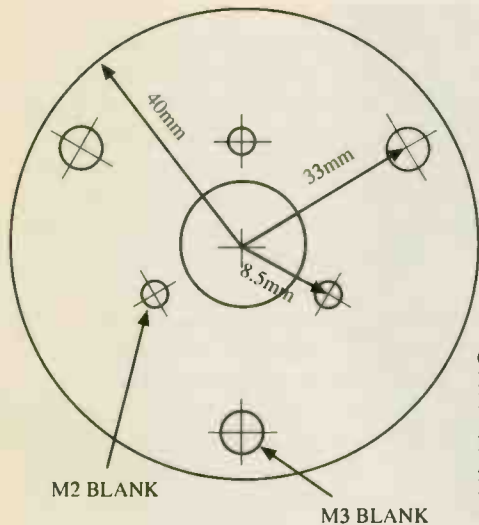
Sporting a cartridge of the Goldring's calibre, the Standard also proved that old maxim, "Less is more" by displaying a total lack of sibilance and dynamic compression. And with surface noise on an LP like the Muddy Waters' merely incidental, you can forget about it and concentrate on the music.

With its platter under Grace Jones' Warm Leatherette, the Standard continued on its roll. Again, in spite of the fact that basslines were a touch lightweight, their individual notes were just that, individual, making it possible to follow exactly what the bass player was doing. The powerful percussion on Warm Leatherette failed to provoke this deck into any brash nastiness, hi-hats remaining smooth and powerful in spite of a little groove damage on this old slab of the

CROSS SECTION OF ARM END



Inside the end of the arm tube a threaded insert holds the stub bolt in place under tension. This, along with the grub-screw mounting for the counterweight, gives a very rigid connection between arm stub and counterweight.



CENTRAL HOLE IS 11mm DIA

BOLT HOLES ARE EQUISPACED AT 120 DEG

The mounting plate is designed to work with OL's solid plinth.

black stuff. Even when faced by the Spice Girls on a rather rough pressing full of background warblings and clicks, the Origin Live showed its mettle by delivering polished results on a recording that can take your head off on the wrong turntable.

You can take things further than this with minimal outlay though. Try adding some mass to the counterweight, for example. You can do this by Blu-Tacking some small change to it and moving it in closer to the arm's pivot, which means the weight has less inertia as it swings around on the end of the arm, producing better perceived tracking, smoother treble and deeper, more precise bass.

Golden Oldie No2 is slipping a 20in. diameter bicycle inner tube (about £3.75) under the deck, sandwiched between two MDF shelves. This takes off a few remaining rough edges and yields truly three-dimensional imaging and sound staging. It can also lower background

dynamics have great speed and impact, and the sound stage is huge.

So, is there yet more quality to be squeezed from this kit? You bet!

MOTOR MANIA

The AC motor that comes with the kit is the same as the one used in Linn's LP12. The advantages of a motor like this are that it's easy to set up - it just takes a 0.15µF capacitor and two 6.8kohm resistors - and its speed stability is controlled by the mains, which gives fair if not amazing wow and flutter. The disadvantages are that you'll need a more complex power supply or a stepped pulley if you want to sample the joys of 45rpm, and that this basic motor puts out a lot of noise. The answer? Go

noise by reducing the amount of external vibration that gets into the deck.

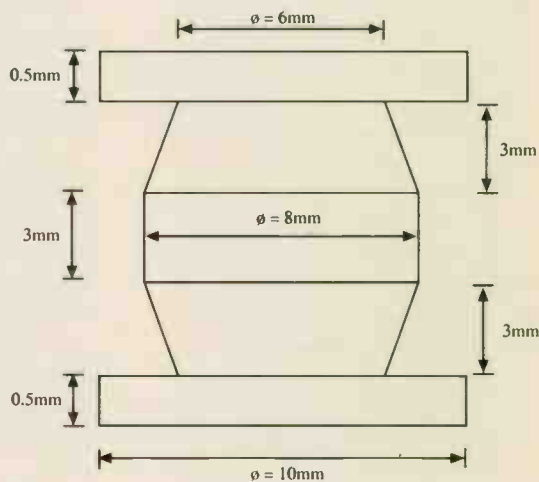
With all these mods in place, the Standard kit sounds good enough to worry some of the turntable/arm/cartridge competition at up to about £800. I have to say the Rega modifications turn this humble arm into a real giant-killer. Gone is the rather grey, sterile sound of the cooking Rega. Instead, tonal colour is fresh,

in Southampton. Stocks vary as most components are surplus, and once they're all sold, that's it.

If you're prepared to spend a bit more money on the motor - and motor quality is absolutely critical - I'd recommend splashing out on a costly but impressive motor from Airpax who also make the bulk of AC synchronous motors used in turntables. This Airpax is actually the non-tachogenerator version of the unit Pink Triangle rely on in their Anniversary deck. It's available from McLennan Servos of Camberley (tel: 01276 26146) for a price of £39.80 inclusive of VAT and P&P.

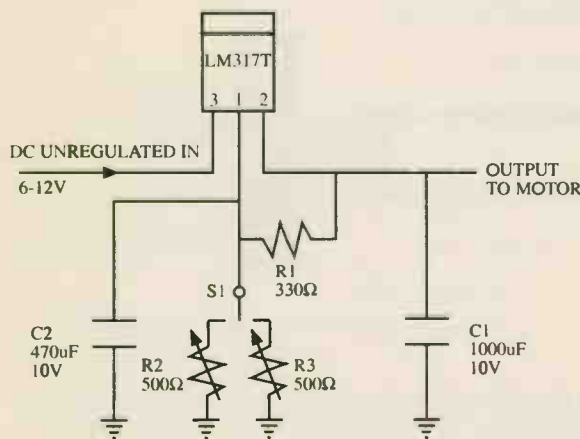
Please quote Hi-Fi World when calling as this price is set for the next few months in spite of currency fluctuations which normally affect pricing.

Be warned though. When fitting the pulley the end of the motor's shaft must



Ø=DIAMETER
CENTRE HOLE DRILLED TO MOTOR SPINDLE SIZE

The motor pulley only needs a tolerance of +/-0.1mm.



The heart of this simple PSU is the LM317T regulator.

DC, as Pink Triangle have done.

Finding a quiet, cheap DC motor is not always easy. I've managed to get some reasonable results from parts cannibalised from old record-sleeve-sized Midi-system turntables picked up for a few pounds because they're not otherwise working.

One company I've used in the past is Greenweld (tel: 01703 236363), who are based

be supported, otherwise the delicate commutators will either be damaged or destroyed. The same goes for removing the pulley - it mustn't simply be yanked off the end of the shaft.

PULLING POWER

You'll need to finish the motor off with a suitable pulley and mounting plate (see diagrams). Probably the easiest material to make these out of is brass. Take the motor with you when you get the pulley made (at a local engineering workshop) because it needs to be gently but firmly press-fitted onto the motor's spindle. The top-plate will need to be mounted on spacers to raise it about 5mm off the

plinth so the pulley sits at the right height.

A QUESTION OF SUPPLY

While an AC motor can work happily from an extremely basic PSU consisting of a mains supply, a capacitor and a couple of resistors, its DC brethren requires something a little more complex. A PSU for the Airpax can be constructed around the classic LM317T variable voltage positive regulator (see diagram).

Capacitor C1 acts as a storage device to help out the LM317T when current is

resistors (R2 and R3). Through S1, the switch, these give you separate pitch controls over each of the two speeds, 33rpm and 45rpm. If you're using an 8mm diameter pulley on the Airpax motor, you need to set R2 to 141-142ohms (33rpm) and R3 to 190-191ohms (45rpm).

Seeing as the motor draws relatively little current (40mA-50mA) heatsinking is not necessary. If the LM317T gets hot when you switch it on, check for wiring errors.

I wouldn't even bother thinking of

spinning for around 60hrs between charges. An appropriate charger would be the GU08J at £29.99. This adds up to a total of £43, which is less than the cost of the high-quality toroidal transformer, Schottky rectifiers, audio-grade reservoir caps and various regulators needed to come close to equalling a battery PSU's performance.

There's a few refinements you can make to the basic LM317T circuit. First of these is to bypass C1 and C2 with film capacitors to lower their impedance. 2.2µF to 10µF would be worth trying. Alternatively, you could make C1 and C2 Sanyo's Os-Con aluminium electrolytics which would give a clearer, firmer sound than industrial-grade types. Then there's Linear Technology's higher spec. version of the LM317T, the LT317AT which can be obtained from Audio-Links (tel: 01724 870432) and AudioCom (tel: 01834 814660). Going for bulk-foil resistors from the same two sources would also be a good idea. With all these goodies in place, the Standard would give turntables at the £1200-£1400 mark a hard time.

THE LAST WORD

And that's not all. While Origin Live's simple £20 solid plinth makes a fine starting point, there's vast extra untapped potential still in the kit. A four-plinth deck in Perspex or marble would offer outstanding sound. The motor could be mounted in a cylindrical block of marble or brass sitting on three spiked feet with their matching cups glued to the marble base plate. This method of decoupling motor noise from the plinth is similar to that used in Michell's massive £2000+ Orbe.

The main bearing could then be bolted to another larger slab of marble on its own spikes and cups, again sitting on the base plate. The arm gets its own spiked marble board as well. An arrangement like this would not only look gorgeous, it would sound it too, with very low background noise, razor-sharp dynamics and real rhythm and scale. The only limit is your imagination, and remember, hi-fi doesn't have to be a black box!

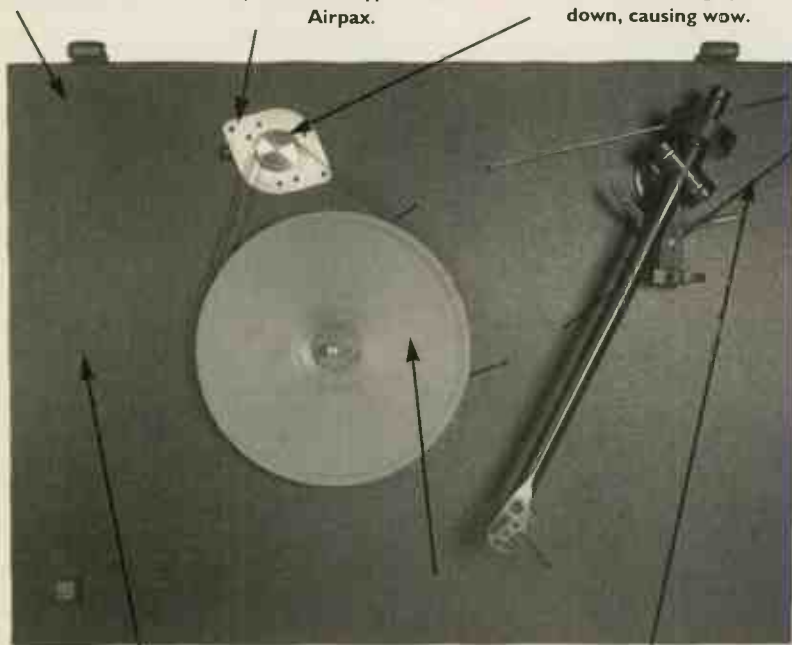
Origin Live
87 Chessel Crescent,
Bitterne,
Southampton
SO19 4BT
Tel: 01703 442183

THE STANDARD KIT

The plinth is a simple, solid slab of MDF.

The motor supplied with the Standard kit is an AC synchronous type from Airpax.

The pulley is machined from brass and has a curved crown which stops the belt wandering up and down, causing wow.



Set into the underside of the plinth is the power supply for the AC motor, consisting of a capacitor and two resistors.

The sub-platter is a disc machined from a chunk of PVC. It can be damped slightly with the addition of a thin sheet of Blu-Tack on its underside.

The plinth has cuts sawn into it to provide a certain degree of isolation for the arm and bearing from motor and external noise, a la Pink Triangle.

drawn from it, and it reduces the amount of ripple on the IC's output. C2 bypasses the adjust pin which sets the output voltage. With C2 in circuit ripple levels are further lowered. This is very important because the symptoms of excessive ripple are wow, flutter and raised background noise - three things you definitely don't want in your turntable.

R1 is one half of the potential divider that determines the voltage fed to the adjust pin and, therefore, the output voltage. The other half is a pair of variable

running the PSU from a mains supply - battery power is the only way to go. If you want to experiment you can actually run the circuit from a 9V PP9 for an hour or so before it goes flat.

A better bet because of its lower internal impedance and greater current capacity is a rechargeable 6V lead/acid type. You can get these from Maplin (tel: 01702 554000) or Electromail (tel: 01536 204555). For example, Maplins' XG70M costs £13.12 and is rated at 4Ah (Amphours). This would keep the motor

HART

The Home of *Hi-Finesse.*

"CHIARA" HEADPHONE AMPLIFIER.



Highest quality, purpose designed, 'single ended' class 'A' headphone amplifier for 'stand alone' use or to supplement those many power amplifiers that do not have a headphone facility. Easy installation with special signal link-through feature, the unit uses our 'Andante' Ultra High Quality power supply.

Housed in the neat, black finished, Hart minibox it features the wide frequency response, low-distortion and 'musicality' that one associates with designs from the renowned John Linsley Hood. Volume and balance controls are Alps "Blue Velvet" components. Very easy to build, or available factory assembled, the kit has very detailed instructions, and comes with Hart audiograde silver solder. A valuable personal listening option and an attractive and harmonious addition to any hi-fi system.

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

ALPS "Blue Velvet" PRECISION AUDIO CONTROLS



Now you can throw out those noisy ill-matched carbon pots and replace with the famous Hart exclusive ALPS 'Blue Velvet' range components only used selectively in the very top flight of World class amplifiers. The improvement in track accuracy and matching really is incredible giving better tonal balance between channels and rock solid image stability. Motorised versions have 5v DC motor.

MANUAL POTENTIOMETERS	
2-Gang 100K Lin	£15.67
2-Gang 10K, 50K or 100K Log	£16.40
2-Gang 10K Special Balance, zero crosstalk & zero centre loss	£17.48

MOTORISED POTENTIOMETERS	
2-Gang 20K Log Volume Control	£26.20
2-Gang 10K RD Special Balance, zero crosstalk and less than 10% loss in centre position	£26.98

ALPS PRECISION SWITCHES.

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.

HC5520, 4P 4W, Manual Control	£16.73
HC519, 4P 6W Manual	£17.95
HC5545, 8P 5W Flex Switch	£21.60
HC5560, 4P 6W Motorised	£29.80

SOLDERING

The size of modern components makes the right soldering equipment essential for good results. Everything we offer we actually use in our own workshop. See our Lists for the full range.

845-820 ANTEX 240v 25w Soldering Iron. This is the ideal Multi-purpose iron as the bit is designed to totally surround the element giving the best heat transfer. This excellent design also means that although it is small and handy enough for modern components its heating capacity is better than larger irons of conventional construction. Excellent Value. £12.43

845-080 ST4 Lightweight Soldering Iron Stand. This has provision for the classic damp sponge for bit wiping. £3.95

HART SUPER AUDIOGRADE SILVER SOLDER.

Hart Super Audiograde Silver Solder has been specially formulated for the serious audiophile. Not only does it give beautiful easy-to-make joints but it is designed to melt at normal soldering temperatures avoiding the possibility of thermal damage to components or the need for special high temperature irons. A very low residue flux makes perfect joints easy but eliminates the need for board cleaning after assembly.

845-007 3mtrs 22SWG in Hart Mini Tube	£3.90
845-008 100g Reel Special Valve Grade, 20swg	£12.90
845-009 100g Precision PCB Grade, 22swg	£14.75
845-110 100g Reel Superfine 24swg for ultra precise control and easy working	£21.45

PRINTED CIRCUIT BOARD SOLDERING PRACTICE KIT.

Unsure whether you can construct a HART kit? This is your chance to try! Your HART Printed Circuit Board Soldering Practice Kit comes with a range of modern components, a typical Hart quality PCB, a roll of the correct grade of solder and full instructions. It enables the enthusiast who is uncertain of his, or indeed her, ability to put together and solder a printed circuit to try their hand at minimum cost. The instructions explain the right technique and guide even an absolute beginner through the seemingly daunting, but in fact very simple, art of making a good soldered joint. Excellent value for money at only £4.99

Super Version with Hart Silver Solder £6.95

LINSLEY-HOOD 400 SERIES SUPER HIGH QUALITY FM TUNER.

This ultra high quality analogue tuner system is the ideal companion to the 80W Audio Design Amplifier in any ultimate hi fi setup, with case size, front plate layout and even control pitches unified for stacking. Like the 80W Audio Design Amplifier this is your route to ultimate performance at incredibly modest cost! Novel circuit features include ready built pre-aligned front end, phase locked loop demodulator with a response down to DC and advanced sample and hold stereo decoder together making a tuner which sounds better than the best of the high-priced exotica but, thanks to HART engineering, remains very easy to build and set up. Since all components are selected by the designer to give the very best sound this tuner is not cheap, but in terms of its sheer sound quality it is incredible value for money.

K400 Complete Kit	£256.82
RLH8 Reprints of 3 articles covering the FM tuner.	£3.70
CM400 Construction Manual	£4.95

'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.

If you would like to hear this incredible amplifier in action then arrange a visit to Wilmslow Audio's new premises at Broughton Astley, near Leicester. Their phone number is 01455 286603, speak to Shaun or Terry.

All amplifiers are available in kit or factory assembled form.

K1100 Complete STANDARD Amplifier Kit	£415.21
A1100 Factory Assembled version	£515.21
K1100S Complete stereo SLAVE Kit	£353.62
A1100S Factory Assembled	£522.22
K1100M MONOBLOC Amplifier Kit	£271.20
A1100M Factory Assembled	£351.20

Super Audiophile (SA) Versions of all the above come with selected audiophile components at an extra cost of only £39.30 per channel. 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.

Reprint of Article	£2.50
CM4000 Construction Manual	£5.00

MAINS LEADS & POWER DISTRIBUTION.

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.

SHUNT FEEDBACK PICKUP PREAMPLIFIER



If you want the very best sound out of vinyl discs then you need our high quality preamplifier with Shunt Feedback equalisation. The K1450 also has an advanced front end, specially optimised for low impedance moving coil cartridges as well as moving magnet types. Selected discrete components are used throughout for ultimate sound quality. The combination of John Linsley Hood design, high quality components and an advanced double sided printed circuit board layout make this a product at the leading edge of technology that you will be proud to own. A recent review in "Gramophone" magazine endorsing this view. Bought in kit form our step by step instructions it is very easy and satisfying to assemble, or you can buy a factory assembled version if you wish.

This magnificent kit, comes complete with all parts ready to assemble inside the fully finished 228 x 134 x 63mm case. Comes with full, easy to follow, instructions as well as the Hart Guide to PCB Construction, we even throw in enough Hart Audiograde Silver Solder to construct your kit!

K1450 Complete Kit	£116.58
K1450SA Audiophile Kit	£138.94
A1450SA Factory assembled Audiophile unit	£188.94

"Andante" Linear Technology AUDIOPHILE POWER SUPPLIES



The HART "Andante" series power supplies are specially designed for exacting audio use requiring absolute minimum noise, low hum field and total freedom from mechanical noise.

Utilising linear technology throughout for smoothness and musicality makes it the perfect partner for the above units, or any equipment requiring fully stabilised $\pm 15v$ supplies.

There are two versions, K3550 has 2 $\pm 15v$ supplies and a single 15v for relays etc. K3565 is identical in appearance and has one $\pm 15v$. Both are in cases to match our 'Chiara' Headphone Amplifier and our K1450 'Shunt Feedback' Pickup preamp.

K3550 Full Supply with all outputs	£94.75
K3565 Power Supply for K1450 or K2100	£84.42
A3550 Factory Assembled Full Supply	£147.25

Send for Your **FREE** copy of our **LISTS**

All Prices include **UK/EC VAT.**

Its not what you do, its HOW you do it that counts!.

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. Pl. No. V7000 £185.29
W 200 S 20cm Long Throw Drive unit for use in ASM - W20 cabinet £36.68

VISATON HI TOWER SPEAKER KIT

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



EXPERIENCE V20



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

SPEAKER DESIGN SOFTWARE

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 acquired in tests in VISATON's own anechoic chamber. This is the essential tool that turns you into a speaker designer! £45.51
Full Version (3") £45.51

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. £17.95
SOF-HOR £17.95

X*OVER 2.0 for WINDOWS. Harris Technologies. This package helps in the design of two and three way passive dividing networks as well as load compensating circuits and calculates values for first, second, third and fourth order networks. Same computer requirements as above but only needs 1.5MB disk space. £27.90
SOF-XOV £27.90

"QUICK & EASY TRANSMISSION LINE LOUSPEAKER DESIGN" Larry D.Sharp. Explanatory booklet plus computer disk that requires Lotus 123, or equivalent spreadsheet software on your machine. 1993. 22pp. 215 x 280. Spiralbound. £8.95
SOF-QET £8.95

REPLACEMENT CASSETTE HEADS.



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.

HC80 R/P Head, Std Mtg £11.70
Special Offer. 2 for £17.60

HRP373 Downstream monitor combi head.
SPECIAL OFFER HALF PRICE £29.50
HQ551A 4-Track R/P £14.60
HQ551S Sony Mount 4-Tr. R/P £14.90

REEL TO REEL HEAD 999R 2/4 R/P 110mH £16.84

PRECISION DIGITAL Triple Purpose TEST CASSETTE TC1D. Are you sure your tape recorder is set up to give its best? Our latest triple purpose test cassette checks tape speed, head azimuth and VU level without test equipment. Ideal for machine testing or when fitting new heads. A professional quality, digitally mastered test tape at a price anyone can afford.

TC1D Test Cassette. Our price only. £9.99.

CD3 "Stereophile" TEST CD. 27 Tracks for testing loudspeakers and rooms.
COSTPH3 £8.75

PROFESSIONAL PHONO AUDIO LEADS



Super High Quality stereo phono to phono audio lead featuring gold plated screened phono plugs with split outer contact shell ensuring positive connection to phono sockets. Plugs have red and black polarity bands. Sky blue multistrand oxygen free copper cables with independent braided screens give minimum signal loss and crosstalk with maximum musicality at a sensible price. Directional arrows indicate preferred signal direction.

An excellent high quality lead ideal for interconnection between professional audio equipment or for use in high end domestic hi-fi systems.

4ft long £14.98

MAKE YOUR OWN AUDIO INTERCONNECTS.

Using our High Quality Audiophile Grade double screened signal cable. Linear crystal oxygen free copper with outside diameter to match our T711G Teflon insulated plugs.

780-911 Audiophile Signal Cable. Per metre £3.98
T711G Plugs, Red or Black ring £3.25
T711G 10 or more, mixed OK £2.75

780-803 Speaker Cable. 322 x 0.1 OFC. Mtr. £5.42
780-804 Speaker Cable. 511 x 0.1 OFC. Mtr. £8.90

TECHNICAL BOOKSHELF

Bigger Range of Books. Better Prices. No "28 Day" Wait!

New Titles.
"A BEGINNER'S GUIDE TO TUBE AUDIO DESIGN" Bruce Rozenbit. A practical book that does exactly what its title says and takes a modern look at valve amplifier construction. 132pp. ISBN 1-88280-13-3. £18.20
"HIGH PERFORMANCE LOUSPEAKERS" Edn.5. Martin Colloms. Latest edition, just out. A really in-depth coverage of the whole World of speakers and high quality sound reproduction, but entirely readable in style. Just reviewed in "HiFi World". 478pp. ISBN 0-4719-7089-1 £24.95*

NORMAL STOCK RANGE
"AUDIO ELECTRONICS" John Linsley Hood. £18.99*
"THE ART OF LINEAR ELECTRONICS." John Linsley Hood £16.95*
"THE ART OF ELECTRONICS" Horowitz & Hill £35.00*
"DIGITAL AUDIO AND COMPACT DISC TECHNOLOGY" 3rd. Edn. 0-240 51397 5 £19.95*
"INTRODUCING DIGITAL AUDIO CD, DAT AND SAMPLING" ISBN 1870775 22 8 £7.95
"ACTIVE FILTER COOKBOOK" Don Lancaster £19.95
"THE ART OF SOLDERING" 0-85935-324-3. 0 £3.95
"HOW TO USE OSCILLOSCOPES & OTHER TEST EQUIPMENT" R.A.Penfold. BP267 £3.50
"LOUSPEAKERS; THE WHY AND HOW OF GOOD REPRODUCTION." G.Bnggs. 1949. £8.95
"THE LS. DESIGN COOKBOOK" Vance Dickason. (5th Edn.) £22.95
"ELECTROSTATIC LOUSPEAKER DESIGN AND CONSTRUCTION" Ronald Wagner. BKT6 £15.95
"THE ELECTROSTATIC LS. DESIGN COOKBOOK" R. P.Sanders £24.95*
"BULLOCK ON BOXES" Bullock & White. £8.99
"AN INTRODUCTION TO LOUSPEAKERS & ENCLOSURE DESIGN" V. Capel. BP256 £3.95
"LOUSPEAKERS FOR MUSICIANS" BP297 £3.95
"THEORY & DESIGN OF LS. ENCLOSURES" J.E.Benson. £21.95
"THE COUPLED CAVITY HANDBOOK" David Purton. £4.90
"VISATON. HOME HI FI CATALOGUE." Specifications and Thiele Small Data on all Drive Units £4.50
"VISATON. CAR HI FI CATALOGUE." In car guide £3.50
"VISATON. CABINET PROPOSALS" Book 1. In GERMAN £6.50
"VISATON. CABINET PROPOSALS" Book 2. In GERMAN £6.50
"VALVE AMPLIFIERS" Morgan Jones. 1995/6 £24.50
"THE VTL BOOK" David Manley 1994. BKVT1 £17.95
"MULLARD TUBE CIRCUITS FOR AUDIO AMPLIFIERS" BKAA27 £11.95
"THE WILLIAMSON AMPLIFIER" 0-9624-1918-4 £6.95
"AN APPROACH TO AUDIO FREQUENCY AMPLIFIER DESIGN" GEC 1957. £13.95
"AUDIO ANTHOLOGIES", articles from Audio Engineering. Six volumes covering the days when audio was young and valves were king! BKAA3/1 to 6. Price Each All £12.95
"THE RADIOTRON DESIGNERS HANDBOOK" (CD) £49.00
"PRINCIPLES OF ELECTRON TUBES" H.D.Reich PH.D. £25.95
"POWER AMP PROJECTS" Anthology. 1970-1989 £15.50
"WORLD TUBE DIRECTORY" 1996-7 Sourcebook £5.95

Don't forget, No waiting at HART!. All listed books are normally in stock. Postage, unless stated, only £2 per book, maximum £4.50 for any number, any size!. Starred items are heavy books costing £3.50 to send.

Postage for kits and other items is £2 for orders up to £20, orders over £20, post £4.50, Courier £10. We accept all major credit and debit cards, including Switch Diners and Amex.

DEMONSTRATIONS
The ASM 100 and our 80W Power Amplifier Range can be heard at Wilmslow Audio's new premises at Broughton Astley near Leicester.
Tel 01455 286603

24 Hr. ORDERLINE 01691 652894 Fax. 01691 662864

HART
HART ELECTRONIC KITS LTD.
2 Penylan Mill, OSWESTRY,
Shrops. SY10 9AF.
UK

KLS3 GOLD MkII

It uses a unique piezo-electric gold-dome tweeter and high-tech. carbon-fibre drive units. This is our top loudspeaker - and we've improved it again. Noel Keywood cranks up the FFT.

The beauty of this loudspeaker remains untouched. It lies within the sweet sound of the high-technology Audax carbon-fibre drive units we use, topped off by the superb Audax HD3P gold-dome piezo-electric tweeter. It delivers treble that I can only describe as liquid honey, as pure and fast as the beautifully incisive Tonigen ribbon tweeter, but without reminders of Wilkinson Sword.

So why am I improving this combination? Broadly I decided to reconfigure the crossover in light of experience and others' views, as well as to tune the HD3P into the HMI30CO carbon-fibre midrange even more tightly in terms of phase response - a minor obsession. KLS3 remains an elegantly proportioned large floor stander, however, using separate bass and midrange units, plus what is arguably the world's best tweeter. Like any good three-way it has a sublime midband - great for vocals, which are projected right out of the 'speaker. It remains sensitive, needing little power and, as always, impedance has been kept under tight control to make sure it gets the best from any amplifier, transistor or valve.

The revised HD3P tweeter is still expensive, but at £130 apiece much less so than before. Audax tell us that enough are now being purchased to warrant full production, replacing the specialised assembly methods used initially. High price makes the HD3P a rare bird in commercial loudspeakers, where drive units are usually budgeted to cost no more than £10 or so, but it is appearing in up-market French loudspeakers (Audax are French) costing around £5000 or more.

THE MODIFICATIONS

There's nothing like a good three-way. My

ideal conception for this arrangement is to view the midrange unit as the bit that does most of the work and which must be, therefore, top quality. Small cones reach higher up the audio band more smoothly than the bass/midrange of a two-way loudspeaker, which must have a cone at least 6in.-8in. in diameter to produce decent bass. Trouble is, large cones 'break up' lower in the audio band, making vocals, violins, etc sound coarse.

The compromise between satisfactory bass output and clean midband behaviour faced by two-way loudspeakers is avoided by a three-way design. The HMI30CO midrange unit of KLS3 uses a 5in. cone (130mm) made from woven carbon-fibre mat impregnated with a polymer resin that is baked hard. This light but very stiff cone, with its polymer dust cap, reaches smoothly up through the part of the audio band, 2kHz-6kHz, in which bass/midrange drivers 'break up'. So the HMI30CO has a critical and important task to perform.

A couple of experienced industry engineers have suggested that it would benefit from handling less low-frequency content, for in the original design we decided to rely only upon an acoustical roll-off of low frequencies. This made the crossover simpler, which DIYers appreciate, but drives the HMI30CO harder and can produce a little chestiness, according to the effectiveness of damping used in the midrange chamber.

The MkII now has electrical attenuation in the form of a first-order filter to reduce this effect and to lessen cone excursion. Seeing as it's a bass/midrange with edge-wound, high-temperature Kapton voice-coil former the driver itself has no difficulty handling power, by the way. Audax rate it at 50watts - high for a midrange unit.



Arcadia Valve Amplifiers



New Line Level Pre-Amplifiers

Two Models Available.

6 line inputs, 10dB of gain, zero feedback
finest quality components, musical results

Model 1 £995, Model 2 £1995

"There's none of the wispy airiness and soft, slow bass that one associates with the breed - just consistently fine tone, edge-of-your-seat dynamics and effortlessness."

Jason Kennedy on the Model 1 in Hi-Fi Choice
Sept '97

OEM, TRADE AND RETAIL ENQUIRIES WELCOME

Ben-Dor, Cumb Carr Rd, Holcombe, Bury, Lancs BL8 4NN, England

Tel/Fax: +44 (0)1706 823025

EMAIL: SJS@AUDIOPHILE.COM

HTTP://WWW.NETFORWARD.COM/AUDIOPHILE/SJS

SJS Electroacoustics

HAND WOUND INTERSTAGE. OUTPUT AND MAINS TRANSFORMERS FOR VALVE AMPS



Liberty Audiosuite v 2.2

the PC based DOS and WINDOWS audio measurement and analysis system for loudspeaker and electronic circuit development and test

Now includes support for the **Turtle Beach 20 bit Multisound Fiji professional audio DSP soundcard.**
(external mic/probe preamp not required with Turtle Beach card)

*** Distortion levels to below 0.003% can now be measured ***

HIGHEST CAPABILITY

M/S, SINEWAVE, PINK and WHITE NOISE
THIRD and SIXTH OCTAVE REAL TIME ANALYSER
DISTORTION ANALYSER, and VISUALISER
THIELE SMALL PARAMETERS, and much more

STRAIGHTFORWARD OPERATION

using the built-in EASY SCRIPTS

DOWN-TO-EARTH PRICE

Obtain the complete system with Software and manual, Probes,
Turtle Beach Fiji soundcard, Calibrated mic and cables for

£696.00 excl VAT

for FREE DEMO DISK, contact

Tony Seaford

MARTON MUSIC

phone/fax 01282-773198

e-mail 106505.251@compuserve.com

Full details available on <http://www.libinst.com>

also demonstrated at IPI. Acoustics, Westbury, Wilts 01373-823333
Horsham Hi-Fi, Horsham, W Sussex 01403-251587
other locations--please call me

AUDIO LINKS

1997

SPECIALIST COMPONENTS CATALOGUE

£2.00 PER COPY

7 Fairmont Crescent, Scunthorpe
North Lincolnshire DN16 1EL

TEL/FAX (+44) 01724 - 870432

Falcon Acoustics Ltd

Incorporating Falcon Electronics Falcon Components

New:- Tapped Inductors.
0-10mH in 1mH steps & 0-1mH in 0.1mH steps
New and updated FOCAL 'State of the Art' Kit Designs
& JMLab Speaker Systems.

Increased range of SOLEN 630v Polypropylene capacitors.

DRIVE UNITS: by FOCAL and SCAS, and a pick of the best from other manufacturers.

CROSSOVER NETWORKS: - Active & Passive, Components, Accessories.

Large range of Capacitors + Falcon Custom-wound Inductors.

AUDIO AMATEUR PUBLICATIONS

Loudspeaker Design Cookbook, NEW - A Beginners Guide to Tube Audio Design, plus lots in PL.
Back year sets of Speaker Builder, Audio Amateur & Glass Audio, plus the Audio Anthology Set.

COMPUTER PROGRAMS

Large selection of Programs available from the very comprehensive Liberty AudioSuite test program
via AIRR, LoudSpeaker Ver.6, BassBox 5.1, to the basic Bullock/White Boxresponse.

Also the IMP FFT Test Kit, the Mitey Mic Kit and Mic/Preamp kit for Audiosuite or AIRR
See us at the Audio Crafts Fayre, CHESTERFIELD 25th & 26th October



52litre Column, 91dB/watt system with a -3dB, point of 42Hz
One of the comprehensive range of Focal kits from an even wider range
of High-Tech Loudspeaker units

Send for our FREE price list PL26: Just send a large S.A.E. (38p stamp) or US\$2 bill overseas.
Europe US\$1 bill or 3 International Reply Coupons (IRC) to:- (Dept HFW) Tabor House,
Norwich Road, MULBARTON, Norwich, Norfolk. NR14 8JT Tel. (01508) 578272

BASS UNIT

We originally used the HM210CO bass unit as a fill-in driver working only below 100Hz. This under-utilises its abilities, because the 8in. carbon-fibre cone reaches up to 5kHz. I rearranged the low-pass filter feeding the bass unit, rewinding the bass inductor to reduce its value from 12mH to 2.7mH in order to make the HM210CO work up to 400Hz. The inductor required becomes more manageable and less deleterious in other areas. The 12mH used previously had a resistance of 0.45ohms, whereas the 2.7mH now required has a resistance of 0.21ohms, which will improve bass control a little with low output impedance solid-state amplifiers.

I should point out that the importance of damping and DCR often becomes over-inflated in discussion. Most damping is

applied acoustically by the cabinet, but mechanical damping exists too. Electromagnetic damping makes a contribution, but it is not great - putting foam in the ports has more effect.

I simply unwound the original inductor to achieve the new value, so there's no need for KLS3 owners to throw the old item away, providing an inductance meter is to hand of course. If not, let Falcon Electronics supply new items, because they are not expensive.

By running the HM210CO further up into the midband, cabinet behaviour becomes more critical. Ensure the rear wall behind the driver has a double layer of carpet felt, with the upper layer bunched up to dissipate sound waves, in order to prevent coloration occurring. If you cannot obtain natural carpet felt, use Deadsheet or Deflex Panels.

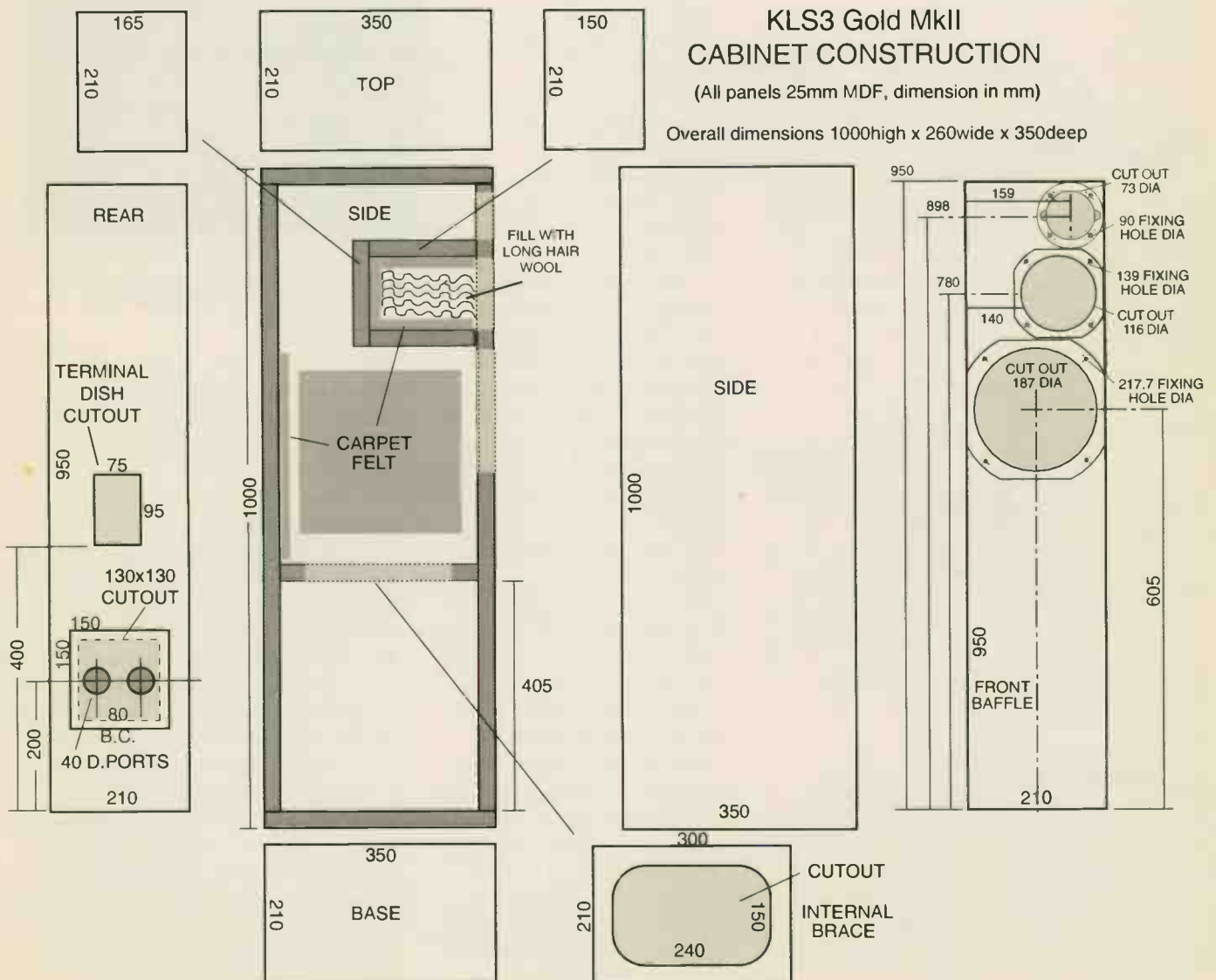
CROSSOVER

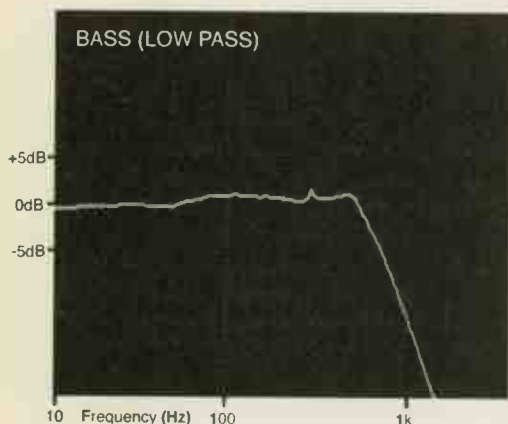
The electrical response curves show that the filters used were, by and large, well damped, having smooth rather than peaky roll-off characteristics. This helps keep the loudspeaker's overall impedance curve smooth, because filters that lift response do so by demanding energy from the amplifier over a narrow frequency band, lowering impedance to achieve this. The result is a wildly gyrating impedance curve with steep slopes and high reactance. Loudspeaker manufacturers largely remain oblivious to the fact that this exacerbates differences between amplifiers. We have found through experience that KLS3 tends to get the best out of amplifiers, flattering them you could say. Funnily enough, for this reason we never use KLS3 for amplifier assessment, because it gives better results than will be

KLS3 Gold MkII CABINET CONSTRUCTION

(All panels 25mm MDF, dimension in mm)

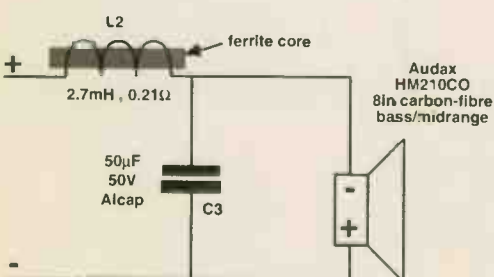
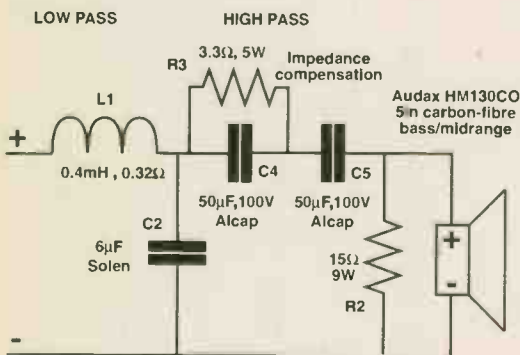
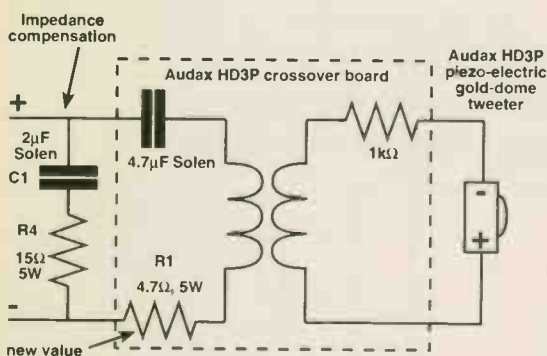
Overall dimensions 1000high x 260wide x 350deep





The bass section rolls down above 40Hz at -12dB/octave, shown by our analysis here.

KLS3 GOLD MkII CROSSOVER

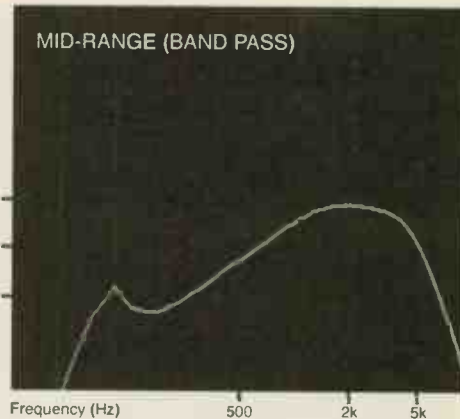


encountered with most commercial loudspeakers.

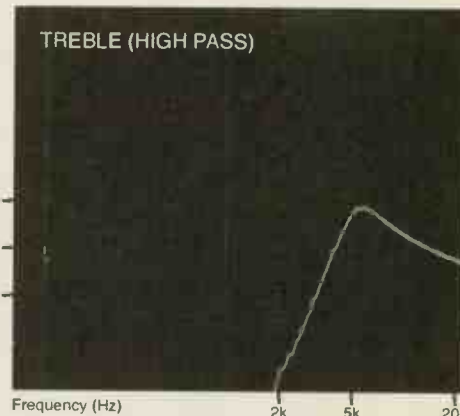
I reworked the crossover with inter-driver phase-angle matching and overall impedance characteristics very much in mind. It takes a number of passes to get the approach right, but there's always a solution that gets all factors into balance - and that's the right one.

There are so many variables in the three-way system it has to be fine tuned by trial and error, using a fast test system, for which we rely upon the real-time display of our Fast Fourier Transform (FFT) analyser. It shows frequency response, impedance, electrical response and inter-driver phase matching, allowing them to be balanced against each other. Unfortunately, there's no way you can do this at home, until FFTs and measuring microphones become more affordable and common.

The impedance curve is now flatter than before, as our analysis shows, being very flat by the standards for any loudspeaker, but especially a three-way. It has dropped to around 5ohms which, with the inevitable rise at low frequencies caused by bass unit resonance, measures out at 6ohms overall. The crossover needed a few tweaks to achieve this result, including the split high-pass capacitors feeding the HMI30CO with a resistor across one, and the resistor/capacitor network across the HD3P tweeter. This tames a rapid impedance rise above 10kHz, characteristic of the tweeter crossover network. It also rolls down high treble above 12kHz, which softens out the tweeter's sound a little. If desired, it can be removed or lessened in effect by increasing the resistor value (try 20ohms-30ohms). An alternative is to



The midrange section rolls out bass at -6dB/octave below 1kHz, and treble at -12dB/octave above 5kHz.



The treble unit filter rolls out all frequencies below 5kHz at -12dB/octave.

reduce the value of R1 to 2.7ohms, but then a resistive attenuator is needed to reduce tweeter sensitivity. This solution will, however, maintain output flat up to 20kHz.

CABINET PLANS

For those of you lacking KLS3 Gold cabinet plans, published in our December 1996 Supplement (No 26), we are reprinting them again here, with a few modifications. The twin front ports now move to the rear of the 'speaker and are mounted on a removable panel. This allows them to be changed and tuned for length more easily. The 150mm x 150mm mounting panel also gives access to the loudspeaker and the crossover network, which can be screwed down onto the base. However, it is better to have an external crossover network, bolted onto the rear panel. This removes it from acoustic vibration (important) and makes experiment easier (I'm likely to mod KLS3 again!) Although we specify the

terminal dish cut-out dimensions here, get the dish before cutting the hole because items like this can suddenly change in size or mounting method over a production run.

I will also re-tune the ports in future, showing the differences between small and large. By the way, there is no 'correct' port size, as some readers are wont to argue because an equation gives a set of dimensions.

Port equations make many assumptions about working conditions and damping. The ports on KLS3 were dimensioned to suit most rooms, a factor, like impedance, little considered by loudspeaker engineers (see our Group Test this month) and not reflected in port equations. I hope to look at alternative ports and what they offer next month. A removable panel makes port size experiments easy to carry out of course and this is probably the best way of tuning a reflex loudspeaker in any case, using listening tests, because it takes room excitation and personal taste into account.

DETAILS

Here are some important constructional details.

The tweeter board is modified by removing the green Seta R82 (0.82ohm) resistor and replacing it with a 4.7ohm resistor, 5W. The capacitor remains standard; do not add 2 μ F in parallel as before. This raises the crossover frequency a little. The resultant electrical response, with impedance compensation in place, clearly shows a steep roll-off below 6kHz.

Note also that the tweeter has its phase reversed. You can do this by connecting the tweeter unit the 'wrong' way around (i.e. positive to negative), or the input to its crossover board, but not both. The positive terminal of the tweeter is the lower terminal when looking from the rear with terminals at left. A red sticker is used to identify polarity, but it can come off.

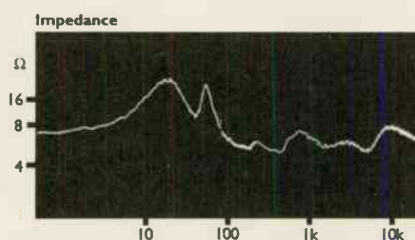
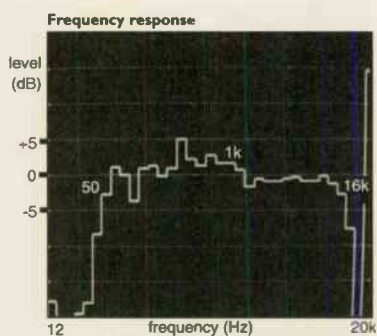
I re-tuned the low-pass section of the band-pass filter feeding the HMI 30CO midrange unit to improve its phase matching to the tweeter. This was aided by a new inter-driver phase measurement technique I have developed for the FFT. The phase matching was close before, but has now improved. The ear is very sensitive to

MEASURED PERFORMANCE

KLS3 Gold MkII remains as sensitive as before, giving 90dB Sound Pressure Level (SPL) for one nominal watt input power (2.84V).

Impedance averages out at 6ohms, but the loudspeaker consumes less bass power than before, the impedance over the bass region having risen considerably through decoupling of the midrange unit by a high-pass filter. The loudspeaker's DCR is now 6.8ohms, being that of the bass driver alone. The absence of steep slopes in the impedance curve indicates very low reactance (energy storage), which helps make the 'speaker amplifier friendly - transistor or valve. KLS3 Gold MkII can be run from as little as 10watts, but will accept up to 60watts.

Frequency response has been engineered for a slight lift below 1kHz to make sure there is plenty of 'body' in the sound, but the characteristic remains flat within 2dB limits. The ports operate around 40Hz to reinforce bass and the tweeter cuts in high up, above 5kHz. Removing the zobel network C1/R4 increases treble output above 16kHz. **NK**



phase in this region and I've noticed that instruments like bells, triangles and cymbals sound more solid and life-like as these drivers move more closely into phase. It's worth wringing every last ounce of performance from the HD3P and HMI 30CO combination because there's little that can match them. They are technically very advanced but also too expensive to be found in commercial loudspeakers. It would be a shame to just throw them together, which is why a lot of fine tuning work has gone into this crossover. The low-pass inductor decreases in value from 0.5mH to 0.4mH and the 8 μ F capacitor decreases to 6 μ F; small but useful changes. Again, you can just take turns off the original inductor if you have the ability to measure inductance.

The HMI 30CO midrange was also closely matched into the HM210CO bass unit. Note that the bass unit has its phase reversed too. To determine bass or midrange unit polarity, use a small 1.5V battery. When connected such that the cone moves forwards, by convention the positive terminal of the battery is connected to the positive terminal of the loudspeaker.

POWER HANDLING

This is purely a function of durability, mostly thermal, sometimes mechanical. It is not a measure of efficiency or maximum loudness, as many seem to think. The maximum power handling capacity of KLS3 is determined by the HM210 bass unit, rated by Audax at 70watts, so that is what we recommend as a limit for the entire loudspeaker. The HMI 30CO will not see its rated maximum of 50watts and the HD3P also has plenty of spare capacity.

You can use an amplifier of any power, but if, say, it is rated at 100watts, don't run it flat out. Because KLS3 delivers 90dB SPL from 1 watt, it will deliver around 110dB SPL from 70watts, which is very loud. Loudspeakers of this sensitivity in practice need no more than 60watts to suit most rooms and needs.

The Audax drive units are beautifully made and very tough. All the same, KLS3 Gold MkII is not a party machine and was not designed to generate continuous high sound-pressure levels

LANGREX SUPPLIES LTD

DISTRIBUTORS OF ELECTRONIC VALVES, TUBES AND SEMI-CONDUCTORS AND I.C.S.
 1 MAYO ROAD • CROYDON • SURREY CR0 2QP
 24 HOURS EXPRESS MAIL ORDER SERVICE ON STOCK ITEMS

PHONE
0181 684 1166

FAX
0181 684 3056

A selection of our stocks of New Original Valves / Tubes.
 Many other brands available.

STANDARD TYPES			SPECIAL QUALITY TYPES			6L6WGB		SYL	
ECC88	BRIMAR	4.50	A2900/CV6091	GEC	17.50	12AX7WA	SYLVANIA	6.00	
ECC88	MULLARD	6.00	E88CC/CV2492	BRIMAR	4.50	12BY7A	GE	7.00	
ECH81	MULLARD	3.00	E88CC/CV2492	MULLARD	8.50	5687WB	ECG	6.00	
ECL82	SIEMENS	5.00	E88CC	SIEMENS	7.50	6072A	GE	6.00	
ECL86	SIEMENS	5.00	ECC81/CV4024	MULLARD	6.00	6146B	GE	15.00	
EF86	MULLARD	10.00	ECC81/6201	MULLARD	8.50	6336A	RCA	35.00	
EL36	MULLARD	5.00	ECC82/CV4003	MULLARD	6.00	6550A	JAN GE	25.00	
EL84	PHILIPS	6.00	ECC83/CV4004	MULLARD	10.00	7027A	GE	25.00	
EZ80	MULLARD	3.50	ECC83/CV4004	BRIMAR	6.50	7581A	SYL	15.00	
GZ33/37	MULLARD	6.00							
GZ34	MULLARD	15.00	AMERICAN TYPES			OTHER TYPES			
5Z4G	BRIMAR	5.00	5R4GY	RCA	7.50	ECC82	RFT	3.50	
6V6GT	BRIMAR	4.25	5U4GB	SYLVANIA	10.00	ECC83	RFT	5.00	
12E1	STC	10.00	5Y3 WGT	SYLVANIA	3.50	EF86	USSR	5.00	
13E1	STC	85.00	6BQ5	RCA	5.00	EL84	USSR	2.25	
807	HYTRON	7.50	6B4G	SYLVANIA	22.00	EL34G	SOVTEK	6.00	
811A	RCA	25.00	6FQ7	SYLVANIA	7.50	6SL7GT	USA	5.00	
6080	MULLARD	10.00	6L6GC	GE	15.00	6SN7GT	USA	5.00	

THESE ARE A SELECTION FROM OUR STOCK OF OVER 6000 TYPES. PLEASE CALL OR FAX FOR AN IMMEDIATE QUOTATION ON ANY TYPES NOT LISTED. WE ARE ONE OF THE LARGEST DISTRIBUTORS OF VALVES IN THE UK.

SAME DAY DESPATCH VISA/ACCESS ACCEPTABLE. OBSOLETE TYPES A SPECIALITY.

CREDIT CARD MIN ORDER £10.00.

OPEN TO CALLERS MON.-FRI. 9AM - 4PM. CLOSED SATURDAY

U.K. P&P 1-3 VALVES £2.00, 4-6 VALVES £3.00 ADD 17.5% VAT TO TOTAL INC P&P. O'SEAS P & P PLEASE ENQUIRE



CUSTOM INTERCONNECTS

'SELECT' CUSTOM INTERCONNECT
 FROM £16.99 PER PAIR

We are proud to announce the new SELECT version of our famous Custom Interconnect. Hand built to the same exacting standards the SELECT incorporates a new premium grade connector. Only made to special order, the SELECT CUSTOM INTERCONNECT still provides the same remarkable value at just £16.99 for a pair of 50cm leads and £1 for each additional 50cm. e.g 1.5 metres £18.99. 2 metres £19.99, 3 metres £21.99, 6 metres £27.99



AUDIO GRADE CAPACITORS

AUDIO GRADE RADIAL 85°C TARGET
 Oxygen free copper radial wire ended capacitors. Constructed using a 50mm cathode foil and a specially formulated electrolyte that minimises internal defects that will produce molecular distortion. Ideal for audio amplifiers which demand high performance with minimal distortion.
 Tolerance ±20% Temperature range -40°C to +85°C, Leakage current:

1mA-0.01CV or 3mA whichever is greater

STARGET AUDIO GRADE RADIAL					POLYPROPYLENE AXIAL CAPACITORS					
Voltage	Value	Length	Diameter	Price	Film foil polypropylene capacitors	Value	Length	Diameter	Price	
16V	470mF	20mm	10mm	£1.97		1000V	0.001mF	20.5mm	9mm	£0.53
16V	100mF	25mm	12.5mm	£3.46		1000V	0.0022mF	20.5mm	9mm	£0.53
16V	2,200mF	25mm	16mm	£4.97		1000V	0.0047mF	20.5mm	9mm	£0.60
35V	10mF	11mm	5mm	£0.58		1000V	0.01mF	20.5mm	9mm	£0.71
35V	22mF	11mm	6.3mm	£0.86		1000V	0.022mF	28mm	9.5mm	£0.92
35V	47mF	11.5mm	8mm	£1.01		1000V	0.047mF	28mm	12mm	£1.09
35V	100mF	12.5mm	10mm	£1.46		1000V	0.1mF	33mm	14.5mm	£1.70
35V	470mF	25mm	12.5mm	£3.50		1000V	0.22mF	33mm	20mm	£3.69
50V	4.7mF	11mm	5mm	£0.58		1000V	0.47mF	46mm	24mm	£6.88
50V	10mF	11mm	5mm	£0.58		1500V	0.01mF	28mm	10mm	£0.72
50V	22mF	11mm	6.3mm	£0.86		1500V	0.022mF	28mm	13mm	£0.84
50V	100mF	16mm	10mm	£1.54		1500V	0.047mF	33mm	15mm	£1.10
						1500V	0.1mF	34mm	22mm	£2.46

PLEASE ADD £1.50 POST AND PACKING TO EACH ORDER

STRACHAN ELECTRONICS
 9 CROALL PLACE, EDINBURGH, EH7 4LT

Tel: 0131 556 9549 E-mail: strachan@ndirect.co.uk

<http://www.ndirect.co.uk/~strachan>

TECHNICAL & GENERAL

SOME NECESSITIES - FROM THE ORIGINAL CLASSIC TURNTABLE SPECIALISTS

CONNOISSEUR		P&P
BD1/2 Drive Belt	£10.55	£1.85
BD1/2 Motor Suspension kit	£13.95	£2.45
SAU.2 Headshell	£16.75	£2.55
SAU.2 Connecting Lead	£15.95	£3.55
GARRARD Standard Models		
Wired arm tubes	from £12.75	£2.5
Cartridge carriers (sliders)	£10.55	£1.85
Idler wheels	£9.85	£2.25
301/401 Transcription models		
Original Thrust pad assembly	£10.85	£2.25
Original Idler tension spring	£2.95	£1.85
Original Brake pad	£2.20	£1.85
Xeroxcopy Owners Manual 301 incl. full size mounting template	£8.85	£1.85
" " " 401 " " " " " "	£6.70	£1.85
Replacement Intermediate drive wheel	£19.95	£2.85
Replacement 301 control knobs On-Off/Speed select pair	£20.25	£2.55
Replacement 301 suppressor unit	£5.65	£2.25
Replacement 301 motor pulley (-2%), (-1%), (Std), (+1%) each	£15.65	£2.25
Replacement 301 Chrome plated mounting bolts set	£5.70	£2.25
Recommended Lubrication set - early 301 or 301/401 (specify)	£5.60	£1.85
GOLDRINGLENCO		
Idler wheel (lock-nut or clip fixing)	£19.95	£2.85
Arm pivot bearings with instructions	£8.55	£1.85
Spindle/Main bearing assembly complete	£24.85	£3.85
Headshells	from £21.95	£2.55
Instruction books	from £4.20	£1.85
THORENS		
TD.124 series		
Idler wheel original	£27.50	£2.85
Idler wheel our redesigned replacement	£15.35	£2.55
Drive belt	£15.25	£1.85
Chassis spring suspension (replaces 'mushrooms')	£15.85	£2.55
TD.150/160		
Drive Belt	£10.55	£1.85
Suspension springs (-1%), (Std), (+1%) set	£12.85	£2.55
Suspension bushes (set of 3)	£12.50	£2.55
Armboards for most models	from £16.90	£2.55
CECIL WATTS Dustbugs/Parastats/Spares - incl. Preener wicks		

Cartridges and styli for 78s and Mono LPs in addition to current Stereo LPs

TECHNICAL & GENERAL

PO BOX 53. CROWBOROUGH, EAST SUSSEX. TN6 2BY
 Telephone: (01892) 654 534

as a primary objective. If you listen very loud and find you blow loudspeakers, the best solution is to get a large multi-driver 'speaker from one of the major manufacturers, because the in-going electrical power and out-going acoustic power are spread over many drive units, lessening the load on each. Continuous high levels produce hearing damage, by the way, which in turn demands high levels - a vicious circle.

SOUND QUALITY

These modifications reduced a little chestiness that could sometimes be heard from the midrange unit, according to the effectiveness of the damping used in the midrange chamber. It also lessens cone excursion and Doppler distortion. Power handling is not really an issue, since the HM130CO can handle 50watts.

The bass unit now works further into the audio band. It is coupled more tightly to the driving amplifier and its efficiency has increased markedly, since SPL output remains the same whilst the impedance seen by the amplifier has increased. This has improved bass quality. Be aware only that rear-wall damping behind the HM210CO now needs to be paid some attention to prevent a coloration from this source. It is easier to apply damping here than in the

KLS3 Gold MkII PARTS LIST (per loudspeaker)

L1	0.4mH, 0.32Ω, air cored, 1mm wire (Falcon: Bobbin 3)
L2	2.7mH, 0.21Ω, ferrite cored, 1.25mm wire (Falcon: Super Super Power, or SSP)
C1	2μF, Solen (400V)
C2	6μF, Solen (400V)
C3	50μF, 100V wkg. min. Alcap
C4	50μF, 100V wkg. min. Alcap
C5	50μF, 100V wkg. min. Alcap
R1	4.7Ω resistor, 5W
R2	15Ω resistor, 9W
R3	3.3Ω resistor, 5W
R4	15Ω resistor, 5W

Input	bi-wire input terminal panel
Damping	long-haired wool (1lb)
Panel damping	natural carpet felt (or deadsheet)
Wood glue	Evode Resin W
Wood	25mm MDF
Wire	silver-plated copper, single strand

PORTS (2off/spkr.)

38mm internal diam.x 80mm long/40mm fixing hole
(35mm internal diam., 110mm long can be used)

limited space of the midrange chamber, one reason the crossover was reconfigured.

The tweeter's contribution has been softened. I have always been in two minds about this, in subjective terms. It is

necessary with most fabric-dome tweeters, which commonly sound coarse if extended up to 20kHz. With clean sounding ribbons like the Tonigen or the even more impressive HD3P used here, there's an option between total smoothness and apparent integration as given by the rolled-down response, and a pleasing shine and presence from a flat, extended response. Generally, the former sounds better initially but the latter is more engaging over a period, with some acclimatisation. The quality of the source will influence matters here too.

Otherwise, KLS3 remains big and easy sounding, with superb midrange clarity and projection - especially with vocals. Very few drivers can handle the human voice as well as Audax's HM130CO. The other strong feature of carbon fibre is that it possesses an innately sweet, amenable delivery. Couple this with the extraordinarily fast yet clean and sweet tweeter and you have a loudspeaker that is a delight to listen to. It is also technically better phase matched and has a flatter impedance than most commercial loudspeakers. It was once the most sensitive too (90dB SPL from one watt) but I'm glad to

say that now this sort of sensitivity is becoming less rare.

NEXT MONTH: Port tuning KLS3 Gold MkII.

UPDATING KLS3 GOLD TO MKII STATUS

It is possible to insert the high-pass filter (C4, C5, R3) for the HM130CO, and the low-pass filter comprising L2, C3 for the HM210CO bass unit without making any other changes. The HM130CO low-pass section and HD3P mods apply to the latest version of the HD3P, identified by the absence of hex screws on the front.

An upgrade kit will be available by the time this is in print. Please phone/fax Nick Lucas at 0171 221 0691 for details.

UPGRADING KLS3 TO GOLD MKII STATUS

We will be offering kits for this purpose too. Again, phone/fax Nick Lucas at 0171 221 0691 for details.

We do not supply cabinets, but we do supply all drive units, special long-haired wool, wire, components as specified and input terminal dish.

We do not supply natural-fibre carpet felt though, because it has become impossible to get in quantity. Try a carpet fitter or carpet warehouse.

KLS3 Gold MkII is available as a kit from Hi-Fi World.

Kit comprising all drive units, crossover components, etc (no wood) now just £575! See p74/75/77. Drive units only £450. Also there's an upgrade kit for KLS3 owners.



TOWERING INFERNO

**WHAT ELSE SETS YOUR MUSIC
COLLECTION ALIGHT?**

**BLOW YOUR MIND
TAKE THE TUBE**

GOLDEN DRAGON TUBES ARE AVAILABLE FROM:

P. M. Components
Springhead Enterprise Park
Springhead Road
Gravesend
Kent DA11 8HD
Tel: 01474 560521, Fax 333762,
e-mail: 101650.2424@compuserve.com

Analog Electronics - Analog Circuitry Explained

by Ian Hickman

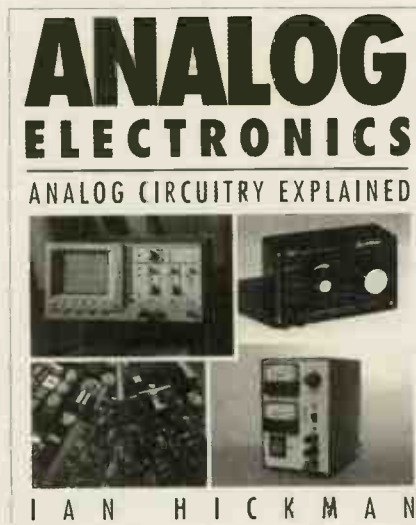
Reviewed by Haider Bahrani

Ian Hickman is a man after my own heart. His expedition through the analogue jungle begins with a quote from the inventor of the smart card, Roland Marenco: "Digital is easy. Analog, that's professional." As a mainly 'professional' engineer, I certainly feel quite at home with this tome. The book, as you might surmise from the subtitle, is a series of technical papers detailing the topic at hand.

The 11-chapter extravaganza kicks off with two chapters covering the three main passive components - resistors, capacitors and inductors - and circuits built from them. The descriptions of the components are certainly thorough, leaving the reader in little doubt as to the nature of each. Chapter Two stretches the boundaries of its brief a little to cover time and frequency-domain analysis, introducing the reader with a baptism of hot solder to several forms of the graphical representation of circuits and systems. Responses such as pole-zero diagrams, Bode plots (gain and phase representation in the frequency domain) and circle diagrams are dealt with too. Not only is the reader given a crash course in lead and lag networks (phase delay and phase advance compensation networks) but resonant circuits are thrown in for good measure. The author has thankfully avoided a complete Bode analysis (maths, maths and a little more maths).

Chapter Three takes us into active territory where valves, diodes, transistors, thyristors and op-amps are given the full monty. If you are not daunted by pages and pages of text written in a narrative fashion, then this chapter is a good way of brushing up and will suit the learner who has stamina and good concentration.

Chapter Four focuses on audio-frequency signals. It starts with basics like the gain of a single-ended Class A circuit and moves on to such things as amplifier efficiency, distortion, negative feedback, the Nyquist stability criterion and so on.



There's a quick glance over loudspeakers and signal sources too, although the latter is given more comprehensive coverage in Chapter Nine.

The following three chapters are devoted to signal processing and transmission. The first of these deals with passive components. From telephone cables across the ocean to the connection between a CD player and an amplifier, the principles are the same and are well explained here. Capacitance, inductance and aspects of delay and filtration are brought into the frame.

Chapters Six and Seven tackle active signal processing in the frequency and time domains respectively. The former concentrates on the use of operational amplifiers in active filters of various kinds, including Chebyshev, Butterworth and Sallen and Key.

Chapter Seven on the other hand is less concerned with frequency response than it is with wave shaping. In this section there is more than a little crossover into the digital domain, which, after all, uses a great deal of analogue circuitry to achieve its ambitions. A vast array of circuit types (those involved in common-mode rejection, noise shaping, integrators, constant-current sources and even low-frequency harmonic generators for putting the harmonics

back into audio distortion) is examined. The only straying from the 'official' analogue field is in the interfacing of the digital domain with analogue circuitry, hence some light is shed on ADCs (Analogue to Digital Convertors) and DACs (Digital to Analogue Convertors).

The eighth chapter of this book is devoted to radio-frequency circuits, the uses of which stretch far beyond its original brief of information transmission, and include cancer treatment, plastic bag sealing, frequency modulation, amplitude modulation, the super-heterodyne receiver, and those are just for starters. There is actually more coverage of correlated topics here than in most texts and it's more coherent too. Again there is a lot to read through with little opportunity to pause for mental breath.

Ian Hickman returns to signal sources in Chapter Nine. Voltage reference sources, sinusoidal and non-sinusoidal wave-form generators are looked at, as are noise generators and voltage-controlled oscillators. This is followed by a chapter on power supplies, stopping off to dwell on batteries, AC supplies, DC supplies and power converters.

The final chapter, 11, is given over to explaining some 'tricks of the trade'. These are partly theoretical and partly practical - all in all a very useful section.

Analog Electronics appeals to me greatly as a source of invaluable information, but my approach is from a position of familiarity with the subject. Refreshingly unconventional in its approach, this book is highly recommended for the serious electronics enthusiast ●

Analog Electronics - Analog Circuitry Explained £19.99

ISBN: 0-7506-1634-2

Customer Service Dept.,
Heinemann Publishers Oxford,
PO Box 382,
Oxford OX2 8RU
Tel: 01865 314301
Fax: 01865 314029



SERVICE FOR ENTHUSIASTS

High quality Push-Pull or single ended
Output, Mains, Chokes, Interstage, Input and
Cartridge Transformers



Choose from our catalogue or specify a custom design at no extra charge. Range of package options: full or half shrouded or open frame. Encapsulation, as illustrated for our popular size "P+" for output or mains. All transformers built to order by our craftsmen. Usually 6-8 weeks delivery. Free technical support for all our products (Phone, Fax or internet). Free catalogue. Competitive prices.

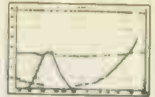
E A Sowter Ltd
PO Box 36 IPSWICH
IP1 2EI England
Tel: (+44) (0) 1473 252794
Fax: (+44) (0) 1473 236188

E-Mail: sales@sowter.co.uk
techsupport@sowter.co.uk
Catalogue and overseas
agents on our Website:
http://www.sowter.co.uk

**£89-00
INC VAT**

AudioCad Pro

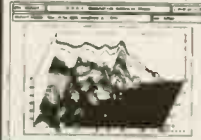
A Computer Aided
Loudspeaker Design Software



As Featured In the Hi-Fi World DIY Supplement
No.s 22 & 23 (June, August 1996). Still available to
Hi-Fi World readers at the Reduced price :- **£89-00 Inc**
Plus £5-00 P&P

DAAS3L+ Digital Audio Analyser System

DAAS3L+ is amongst the best Audio Analysers on the market today. It offers an excellent price performance ratio as it comes complete with calibrated microphone, G UI software, full manual and includes a PC half Card. DAAS3L+ is capable of measuring Thiele-Small parameters, Frequency response near and far field, Phase, Distortion and much more. This versatile piece of test equipment will analyse most audio signals enabling the user to test Amplifiers, crossover Etc. Ideal For Schools, Colleges, Universities, R&D, & Production Line testing.



Price **£586-33 Inc**

Plus £5-00 P&P

System Requirement

AT386 or better, EGA,VGA, 2MB RAM,4MB of hard disk space. Will run under Windows 3.1 OS/2 in DOS window

12" Hi-Fi Sub Woofer Driver Elite 12-100

100 Watts RMS 8 Ohm

As used in an **AWARD WINNING**

Hi-Fi Sub Woofer system.

Oms: 3.03 Vas: 260L

Qes: 0.364 Pwr: 120W

fs: 0.32 Re: 6.7 Ohm

Mms: 38.4g Sens: 90dB

Fs: 27Hz Fmax: 1319Hz

Freq Response: 30 - 2500Hz

Magnet Weight: 730g

Coil Diameter: 50.5mm

Price: £23-50 Inc

Plus £5-00 P&P any Quantity

The above items may be ordered by post, fax or telephone and payment is welcome by cheque, draft, postal orders, Mastercard or Visa. Additionally, Official Orders are welcome from schools, colleges, government departments etc.



B.K. ELECTRONICS



Unit 1 Comet Way
Southend-On-Sea Essex SS2 6TR
Tel: 01702- 527572 Fax: 01702-420243

Colomor (Electronics) Ltd

170 Goldhawk Road, London W12 8HJ Tel: 0181 743 0899 Fax: 0181 749 3934 E-MAIL - giacomelli@colomor.demon.co.uk

Celebrating 30 Years 1967 - 1997

Over 6,000 Types of Valves In Stock, Please Ask For Quote

£ p	£ p	£ p			
ECC81	2.50	EL84 Sovtek	2.50	6L6GC Sylvania	17.50
ECC81(CV455)	5.85	EL84 Mazda	6.00	6L6GT/C	2.95
ECC81(CV4024)	8.85	EZ80	2.20	6L6WGA Sylvania	14.10
ECC82	2.90	EZ80 Mullard	7.05	6L6WGB	14.10
ECC82 Bnmar	8.50	EZ81	2.85	6SL7GT	2.75
ECC82 Mullard	9.41	EZ81 Mullard	7.05	6SL7GT Bnmar	9.40
ECC82 (CV4003) Bnmar	11.75	GZ33 Mullard	15.30	6SL7GT USA	5.30
ECC82 (CV4003) Mullard	14.70	GZ34	4.05	6SN7GT	4.20
ECC83 Sovtek	3.90	GZ34 Mullard	17.65	6SN7GT Bnmar	9.40
ECC83 Mullard	11.15	GZ37 Mullard	8.25	6V6	9.45
ECC85	2.70	KT66 Matched Pair	61.00	6V6GT	6.00
ECC85 Mullard	4.70	KT88	20.95	6V6G	7.65
ECC88 Tesla	2.30	VT4C-GE	141.00	6X4	2.35
ECC88 Siemens	5.80	5R4GA	7.20	6X4WA	3.85
ECC88 Mullard	11.75	5R4GY	6.80	12BY7 RCA	9.95
E88CC Telefunken	11.75	5R4WGB	7.65	12BY7A GE	9.95
E88CC Mullard	11.75	5R4WGY	7.65	12E1 STC	9.00
E88CC/01	11.75	5U4G	8.40	12E1 Black Anode	15.00
E88CC/01 Mullard	19.90	5U4G Bnmar	8.40	12E1 Old Shape	14.00
ECH81	1.90	5U4G	5.80	13E1 STC, UK	90.00
ECH81 Philips	4.10	5U4G	7.05	85A2	2.60
ECL82	1.80	5Z3GT	8.80	85A2 Mullard	5.80
ECL82 German	5.30	5Z3GT	4.20	807	4.80
EF86	5.10	5Z4G	2.25	807 USA	8.80
EF86 Mullard	12.95	6B4G Sylvania	34.00	6072A	8.75
EL33/CV1438 Mull	15.00	6B4G Shouldered	41.15	6146	16.25
EL34 Sovtek	7.10	6BH6	3.05	6336A USA	57.55
EL34B	7.20	6F07	11.10	6550A	11.20
EL34 GE, USA	41.15	6L6G (CV1947)	35.25	6550-B2 Svetlana	15.00
EL37 Mullard	35.25	6L6 Metal	11.50	6550A GE	28.35
		6L6G Colomor	7.50	6550A Svetlana matched pairs	37.60

Valves Wanted - New & Boxed

KT66 - GE	£40.00 each	4212E - STC, UK	£150.00 each
KT88 - GEC	£60.00 each	PX25 -	
EL34 - Mullard	£15.00 each	Globe shaped	£100.00 each
EL37 - Mullard	£12.00 each	PX4 -	
DA30 - GEC	£80.00 each	Globe shaped	£60.00 each
PT15	£10.00 each	ECC83/EF86	£3.50 each
DA100 - GEC	£100.00 each	V503	£100.00 each

Also available

Oil filled transformers, chokes, block filled capacitors, diodes, ICs, transistors, etc.

Electronic Universal Vade-Mecum Books (Audio Valve Data Book) Buy 2, get 1 free £50.00 ea.

Oil Filled Transformer Gardeners
Primary 110-240V, Secondary 250-0-250 180mA 6.3V, 7A, 5V, 3A £58.75

New Mains Isolation Transformers
250V, 50Hz, 1 to 1.3kVA, 13A fused class F, 13A Skt & Plug £112.00 ea

240V Transformer, output 0 18.5V, 26V, 29V 35A and 26V, 5A £32.25 ea

Oil Filled / Chokes by Parmeko / Gardeners

Block Capacitors by TCC

Dublner

.5µF, 600V £7.05 ea

1µF, 600V £7.05 ea

2µF, 600V £7.05 ea

4µF, 600V £7.05 ea

8µF, 600V £9.40 ea

.5µF, 1KV £9.40 ea

1µF, 1KV £9.40 ea

2µF, 800V £9.40 ea

4µF, 1KV £9.40 ea

8µF, 800V £11.75 ea

1µF, 1KV Axial TCC

super metal pack,

ceramic end plates, oil

Visconol £4.00 ea

Valve Holders

B7G -

unskirted £0.31 ea

B7G -

skirted £0.65 ea

B9A -

unskirted £0.75 ea

B9A - skirted £1.05 ea

B4 - Paxolin £0.60 ea

B5 - Paxolin £0.60 ea

Octals - ceramic, E F

Johnson £4.00 ea

Other types also in stock

Telephone or Fax list for offers. Please quote ref HF
P&P - Orders up to £3.00 @ £1.95, £3.00 - £5.00 @ £2.25, £5.00 - £15.00 @ £2.50,
£15.00 - £20.00 @ £3.35, Over £20.00 @ £4.55. Over 2 Kg. at cost.

WANTED
Quad II Amps - up to
£150.00 each

VAT included in all prices.
Please ring for availability and price.

AUDIO ELECTRONICS

by John Linsley Hood

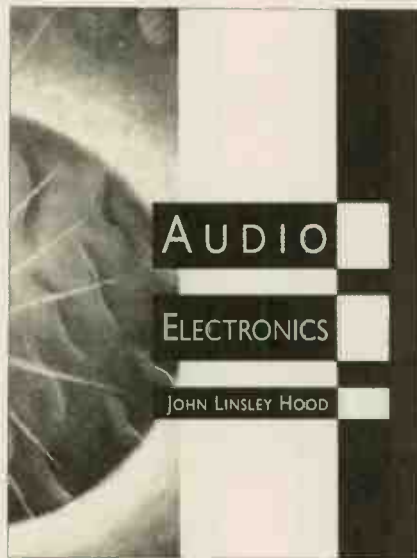
Reviewed by Noel Keyword.

I enjoy John Linsley Hood's writing and Audio Electronics proved no exception. It is as clear and forthright as *The Art Of Linear Electronics*, also by Hood, but aimed at a different need. Where the former is a bof-up for design engineers or anyone contemplating a bit of audio design work, Audio Electronics is a resume of the whole field. It seeks to provide background on all subjects, from tape recording through radio to Compact Disc. And who better to put them across; Hood has been designing, arguing and writing about audio all his life and his fluency in the subject shows.

One example of this is an easy writing style suffused with confidence, reminiscent of audio's greatest writer, M. G. Scroggie. Hood knows his stuff, like Scroggie, and having designed innumerable circuits for enthusiast consumption, also knows he knows - that's where the confidence comes from. The result is a book freer from obfuscation and technical gobbledegook than most. Witness Chapter 6: The Compact Disc And Digital Audio.

By the third page of this chapter (p235) Hood has reached the horrors of quantisation error produced by digital sampling and the coarse sounding noise it produces. Over the page he quickly identifies the need for no less than 1.4MHz of transmission bandwidth for a two-channel, 16-bit stereo signal that reaches just 20kHz. In other words, digital in this form needs 70 times more bandwidth than analogue, a little-known fact.

It is this ability to alight on crucial underlying principles that distinguishes Hood's writing from most others'. It comes across as lucid exposition free from the irritatingly naive, "Isn't digital wonderful" approach that always suggests to me the author is simply re-writing corporate product data, as so many do. There's no substitute for long-term, hands-on experience; it usefully illuminates Audio Electronics in a way that is becoming increasingly rare.



Chapter 6 on CD is short but succinct and probably one of the best introductions to digital I have read. This underlines the strength of Audio Electronics as an excellent introductory book. It covers a wide range of topics, although some are looking a bit peripheral to high-fidelity these days. Analogue tape recording occupies the first chapter, covering the basics as well as the arcane side of this subject, such as tape MOLs (Maximum Output Levels). A few pages at the end touch on digital recording systems, but not in any detail.

Tuners and radio receivers occupy the second chapter. There's plenty of information on modern synthesiser tuning systems using phase locked-loops and such like, but this chapter remains analogue, not touching DAB. The current view amongst many in audio is that because DAB offers little perceivable benefit over conventional VHF/FM it stands little chance of success, so this is perhaps not a consequential omission, but a few words would have been useful.

Hood is an amplifier specialist, so it is hardly surprising that Chapter 3, entitled Pre-amplifiers And Input Signals should be followed by Voltage Amplifiers And Controls and then Power Output Stages, all amplifier-related topics that together

cover a fair expanse of paper.

Practising audio engineers have to get into Test Equipment. Measurement is a whole area of theory in itself, and a vital one, if tests are to clarify rather than confuse issues of performance. Audio Electronics moves its appeal toward engineers here though. I have seen more useful and illuminating explanations, as far as the average experimenter is concerned, about using multimeters and modern budget test equipment, than Hood's explanations of diode stabilising circuits and such like. There's a missed opportunity here, because modern test instruments, including computers, offer incredible ability at low cost compared to that available a decade ago. Only the oscilloscope, with its expensive CRT and power supplies defies this trend, but LCD displays are slowly becoming more common. It might have been better to devote more space to this topic, because there is a lot of important basic theory to be covered when measuring voltages, currents, inductors, capacitors and resistors, etc (as Scroggie well knew). In my view Hood wastes his talents by diving off into circuits here again.

Audio Electronics ends with a short chapter on loudspeaker crossovers, followed by power supplies. Neither are very comprehensive. The book has lost its focus by this stage and peters out. There's room for improvement in a second edition here. This apart, I found Audio Electronics strong in its coverage of audio theory and basic working principles, John Linsley Hood showing his talents and experience here ●

Audio Electronics £18.99
ISBN: 0 7506 2181 8

Customer Services Dept.
Heinemann Publishers,
Oxford,
PO Box 382,
Oxford OX2 8DP
Tel: 01865 314301
Fax: 01865 314029

THE Service Specialists

From **Classic Valve** to **Digital LaserDisc**...

You supply the Problem, We supply the Solution!

QUAD • GRANT • LEAK • RCA • REVOX • ALTOBASS • RADFORD • PIONEER • LUMLEY • TEAC • YAMAHA • AVANTIC etc.

For over 20 years we have provided un-matched technical services to Enthusiast and Pro. alike. We've satisfied customers at all points of the compass - even in Australia!

What makes us so popular? Simply, we're the best!

RESTORATION. Messrs, Leak, Walker, Radford *et al.* got it right! Yesteryear's great designs are, in the main, fine. They certainly don't need converting into something else, which seems to be a current trend. We will carefully restore your classic using modern high-quality components; this alone frequently improves the sound quality enormously. We will not, though, alter the original design in an attempt to "improve" it. Enjoy owning and listening to a Classic... not a latterday fad.

REPAIR/CALIBRATION. Even the finest equipment's will suffer an occasional breakdown and need meticulous repair, calibration and alignment. The only standards we recognise and work to are Manufacturers Original. Our Test & Measurement facilities are probably the best in this sector of the Industry... and we know how to use them!

KIT-BUILDING. There are numerous kits around nowadays. They all require skill/experience to build satisfactorily and, in the case of valve equipment, safely. Some designs are good, otherswell, let's just say their 'designers' would benefit from a sojourn on that celebrated desert island with only Terman and Langford-Smith for company! **Whichever kit you choose, though, it will benefit from a professional build.** We will build it, de-bug it and give you a set of Final Test figures from your sample.

KIT-RESCUE. In trouble? It won't work? *Nil desperandum.* Contact us about a rescue/re-furbish.

For more details of our comprehensive services, 'phone or fax:-

(0113) 244 0378

AUDIO LABORATORIES (LEEDS)

Watford Valves

3 Ryall Close
Bricket Wood,
St Albans
Herts AL2 3TS
Phone: 01923 893270
Fax 01923 679207

FREE MATCHING - NO MINIMUM ORDER REQUIRED

KT66 GEC ORIGINAL £60.00

6922 SOVTEK This month only £3.00

300B SOVTEK In Stock now £65.00

PHILIPS/G.E

ECC81/12AT7

£4.50

ECC82/6189W

£4.50

ECC 83

£5.11

ECC88/6922

£6.00

KT66/7581A

£20.00

SVETLANA/TESLA

EF86 Original Tesla

£9.00

EL34

£8.50

E34L

£8.50

6550C GOLD

£16.00

PCC88

£3.00

NEW OLD STOCK

ECL 82

£3.00

ECL 86

£4.00

EL84 TUNG

£6.00

EL509/519 E.I

£12.00

5687WB PHILIPS

£5.00

5842 WA RAY

£6.00

6SL7WGT

£8.00

6SN7 WGTA

£8.00

6072A/12AY7

£9.00

6550A GE

£30.00

7308/E188CC Phillips

£8.00

SOVTEK

12AX7/WA/WB

£3.25

12 AX7 PREMIUM

£4.50

EL34WXT NEW

£6.80

EL84

£2.00

5U4G

£5.00

6C33C - B

£25.00

6EU7

£8.00

6L6/5881

£4.90

6SL7GT

£4.00

6SN7GT

£4.00

7199

£8.00

Open 7 days a week 9am - 9pm.



Fast & Efficient mail order service. All valves are new, boxed and guaranteed. Prices exclude VAT and carriage.



Vacuum Tubes for Audio Are Back!

Glass Audio brings together yesterday's tube with today's improved components, voltage control, and the exciting new Soviet tubes, to make smooth sound in your livingroom possible again!

YES!

Please send my first issue of *Glass Audio*. I'll pay just \$45.00 for six issues (1 year); \$80.00 for 12 issues (2 years) of the best information on tubes to be found anywhere. I understand that my satisfaction is guaranteed!

Name _____

Street & Number _____

City _____ Postal Code _____

Country _____

REMIT IN US \$ DRAWN ON A US BANK ONLY. PRICE GOOD THROUGH DECEMBER 31, 1995.

We Accept MC/VISA.

Glass Audio

PO Box 176, Dept. HFWS, Peterborough, NH 03458-0176 USA
Phone: (603) 924-9464 or FAX 24 hours a day (603) 924-9467



D.I.Y. Letters

SIZE IS EVERYTHING

I am constantly amused by your references to such things as, "very sizeable 500VA" toroidal transformers (p13, Sept 1997). I thought that you'd like to see a really sizeable transformer. Its 90000000VA and supplies half of Norfolk with electricity. The voltage? 132000V stepped down to 33000V!
Nick Sheldon
Norwich.

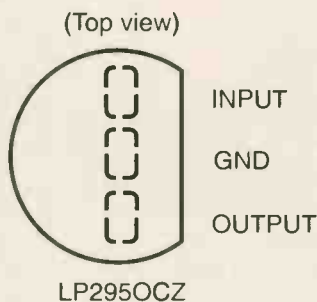
TWEAKING TECHNIQUE

As an owner of the Technics SL-1000/MkII turntable and plinth combination featured in July's Hi-Fi World second-hand feature, I was very interested in the power supply upgrade. Is there any possibility of supplying details of the modifications in the magazine?
David Fellows
Cheltenham,
Glos.



Putting hi-fi in perspective - if a 500VA transformer sounds chunky, then try 90000000VA as used by electricity companies!

There's a lot that can be done with the SP-10MkIIP (note the "P" suffix. These mods don't apply to "A" suffix versions) motor unit and outboard power supply unit to improve their performance. One of the cheapest, swiftest and most effective mods is to fit the main ICs in the crystal oscillator section of the PSU with their own regulators. You don't need to do this for all the chips, as beyond the five marked in diagram No1 there's



National Semiconductor's LP2950C 5V regulator may be more expensive than standard 7805 ICs but it brings a higher level of performance for the extra outlay.

little or no improvement when extra regs are added.

You can get good results with regs like National Semiconductor's LP2950C 5V low-dropout voltage IC. At £1.99 from Maplin (order code: AV35Q) it's considerably more expensive than standard 7805 chips which normally cost about 30p a throw. Then again, it sounds considerably better in this application.

To fit the LP2950C you need to cut the tracks on the Technics' PCB which supply +5V (see diagram No1) and then solder the output leg of the new reg directly onto it. Sanyo's Os-Cons make excellent PSU decoupling caps and are available from Audio-Links (tel: 01724 870432). Don't worry if you forget to cut one of the tracks,

you're unlikely to do any damage - the new reg will just work alongside the Technics' own. In any case, the motor unit and PSU are fairly tolerant of wiring mistakes, unlike my Pioneer PD-91 CD player which recently went up in a puff of smoke.

The other areas ripe for regulation are the control and drive circuits within the base of the motor unit. Remove the unit's bottom cover and you'll see the control, drive and logic circuits in front of you. The drive board is numbered SFDP102-02A and carries the three pairs of drive transistors bolted onto a small aluminium heatsink.

The drive and control sections run from 32.5V DC supply provided by the main regulator in the PSU case. There is very little decoupling between stages in the motor unit. While the Technics' original regulator is pretty good, the circuitry really benefits from separately regulated supply lines.

This part of the mod is a bit more complicated than the previous one and, if you forget to cut the right tracks on the PCB, you can end up with a platter that's either gathering speed as it heads towards about 100rpm or hunting around left and right for the right way to rotate. Both are quite frightening to watch because the Technics' high-torque motor can spin the 2.9kg platter extremely quickly.

LM317T positive variable voltage regulators work well in this application. Again, these can be bought from Maplin (prices vary with manufacturer, Sanyo's version retailing for 80p, order code: AV30H). As bypass and output decoupling caps on the IC's adjust pin tantalum capacitors are a good

KIT & COMPONENT SUPPLIERS

LOUDSPEAKER KIT SUPPLIERS

Wilmslow Audio, 50 Main Street, Broughton Astley, Leicester LE9 6RO
Tel. (01455) 286603
Fax. (01455) 286605

UK distributors of Drive Units from ATC, COLES, DYNAUDIO, KEF, MOREL, PEERLESS, RCL, SEAS, SCANSPEAK AND VOLT. Comprehensive range of high quality crossover components, acoustic damping products, connectors and veneers. Over 20 different D.I.Y. loudspeaker kits on demonstration, including ATC 50 & 100.

B.K. Electronics, Unit 1 Comet Way, Southend-On-Sea, Essex, SS2 6TR
Tel. 01702 527572
Fax. 01702 420243

Bringing you the Audiocad Pro - a computer aided loudspeaker design software package as featured in Hi-Fi World DIY supp. Nos. 22 and 23 (June, August 1996). Find out information on this plus our other products in our main 1/4 page advert in this month's supplement

European Precision Mouldings Ltd Highwyh, Sawbridgeworth, Herts, CM21 0JS
Tel 01279 600428
Fax 01279 723846

Manufacturers of the Red Scorpion range of loudspeaker terminals and binding posts.

Falcon DIY Speakers Falcon Acoustics Ltd., Tabor House, Norwich Road, Mulbarton, Norfolk NR14 8JT.
Tel. 01508 578272

UK distributors of FOCAL drive units, Kits, In Car and JMLab speaker systems plus SOLEN (SCR - Chateauroux) polypropylene capacitors and the largest audio inductor manufacturer in the UK. Stocking Audio Amateur Publications and Computer software.

Comprehensive range of D.I.Y. Speaker kits, Parts, Accessories and Books. Please send large SAE (36p) for free price list. "Everything but the wood"

IPL Acoustics, 2 Laverton Road, Westbury, Wiltshire BA13 3RS.
Tel. 0373 823333

IPL supply a range of eight speaker kits using drive units from SEAS, Morel, Audax, Visaton etc. including four transmission lines to suit all room sizes. We also supply a full range of drive units, capacitors, and cabinet accessories as well as silver plated P.T.F.E. insulated cables.

South Coast Speakers Ltd 326 Portwood Road, Southampton, Hampshire.
Tel 01703 559312

UK suppliers for High-Quality Driver Units from: SEAS VOLT VISION SCAN-SPEAK also MOREL RCL & many more. Accessories / Components all of the Highest Quality inc. ProAudio MKT Capacitors, Inductors wound to order for any values. Many DIY Kits always on demonstration in our comfortable listening area. Custom design services & friendly advice!

VALVE AND OUPUT TRANSFORMER SUPPLIERS

Wilson Valves, 28 Banks Avenue, Golcar, Huddersfield, West Yorks HD7 4LZ.
Tel. 01484 654650
Fax. 01484 655699

E-mail: wilsonvalves@surflink.co.uk

We stock over 2,500 different types of valves, N.O.S. and New. Please send a S.A.E. for full list. No charge for matching. Most major credit cards accepted.

Langrex Supplies Ltd 1 Mayo Road, Croydon, Surrey CRO 2QP
Tel. 0181 684 1166
Fax. 0181 684 3056

One of the largest distributors of electronic valves, tubes and semi-conductors in the UK by original UK and USA manufacturers. Obsolete types are a speciality. Telephone or fax for an immediate quotation.

Billington Export Ltd. 1E Gillmans Trading Estate, Billingshurst, West Sussex RH14 9EZ
Tel. 01403 784961
Fax. 01403 783519

Billington Export Ltd. holds large stocks of audio valves including many obsolete brands such as Mullard, GEC, Brimar etc. as well as Sovtek, Thermionic Gold Brand and the recently introduced Billington Gold range. Also Cathode Ray Tubes (eg. used in Marantz tuner 10B). 50 page catalogue available, tel or fax for a quotation. Minimum order £50.00 UK, £100 export.

Watford Valves 3 Ryall Close, Bricklet Wood, St. Albans, Herts AL2 3TS
Tel. 01923 893270
Fax. 01923 679207

Specialist in new old stock and current production valves. Sole UK distributor of the Harma Diamond range selected for their superior performance. Huge range held, stockists of Mullard, GE, Phillips, National, Brimar, Sylvania, Telefunken, RCA, MOV and many more. All valves are new boxed and guaranteed. For free price list and specialist advice call or fax Derek Rocco, Watford Valves.

PM Components Springhead Enterprise Park, Springhead Road, Gravesend, Kent DA11 3HD
Tel. 0474 560521

P.M. Components Ltd are the specialist component company for High End Audio enthusiasts. We have a design and manufacturing base for audio valves and associated products and have a capability to produce custom tubes for major manufacturers. Our 70 page catalogue is available at £2.50 including U.K. postage. P.M. Components are major stockists for Golden Dragon, Mullard, GEC and Teonex valves and have a vast archive of vintage tubes gathered from every manufacturer in the world.

Chelmer Valve Company 130 New London Road, Chelmsford, Essex CM2 0RG.
Tel 01245 265865 Fax. 01245 490064.

Supplier of premium range of audio valves, other valves and components also available. (Please see our main advertisement in this supplement).

Woodside Sound Engineering, Arfryn, Llanboidy, Whitland. SA34 0EY
Tel: 01994 448271 Fax: 01994 448665
E-Mail: woodside@arfryn.demon.co.uk

As well as producing transformers for our own products, we can now offer an expanding range of audio transformers for new ventures and Renovations. We can wind transformers for most RADFORD amplifiers to original specification. Contact us with your requirements or a list of standard items is available on request.

COMPONENT SUPPLIERS

AudioCom (UK), Unit 6, Tindle Enterprise Centre Warren Street, Tenby Pembrokeshire, SA70 7YJ
Tel 01834 842803
Tel/Fax: 01834 842804

E-Mail: audiocom@connect-wales.co.uk
AudioCom are suppliers of Premium Grade components, including: Alps, BHC, Burr Brown, Caddock, Danish Audio Connect, Elna, Holco, Linear Technology, MIT Multicap, Nichicon, MUSE, Silver Wire (99.99% 4N), Sanyo OS-con, Sfernice, Vishay, WBT... plus many more products at very competitive prices. New 1997 Audiophile Parts Catalogue now available on request.

Audio-Links 7 Fairmont Crescent, Scunthorpe, North Lincolnshire DN16 1EL.
Tel./Fax: 01724 870432

Large range of specialist electronic components and accessories for solid state and valve enthusiasts. Mail order and a friendly service. Monday to Saturday, 10am - 7pm. Catalogue - £2.00

Hart Electronic Kits Ltd Penylan Mill, Oswestry, Shropshire SY10 9AF
24 Hr sales/enquiries Tel. 01691 652894

A range of Audiophile kits for 80 watt Power Amplifiers, Tuners, Pre-Amps and Moving Coil/Moving Magnet RIAA Pickup Preamps. All kits are fully engineered, with our thirty years design experience, for easy constructions from circuits by John Lindsey Hood, the most respected designer in the field. Send for lists.

V.R.R. 30 Melbourne Avenue, Worthing. BN12 4BT.
Tel: 01903 501158

Vintage Radio Restoration
Bespoke output transformers for most valves, push-pull and single ended. Components and circuits provided to construct high quality valve amplifiers. Mains transformers "C" core ideal for pre-amps. Call for spec.

AP Electronics 20 Derwent Centre, Clarke Street, Derby, DE1 2BUT

Check out the AP ELECTRONICS catalogue. It's free with every order of over £40.00 or can be purchased for a £4.95 cheque payable to 'AUDIOKITS'. Over 80 pages include pre and power amplifier kits, high grade audiophile resistors, capacitors and semiconductors, audio and mains cables, gold and rhodium plated connectors and COMPONENT NOTES on using high grade parts. A quarterly newsletter 'AP PERFORMANCE AUDIO' has been recently launched and your first issue is free.

Cambridge Scientific Supplies 12 Willow Walk, Cambridge CB1 1LA.
Tel: 01223 811 716
Fax: 01223 501 833

Specialist wire products for the knowledgeable audiophile including:- Silver wire (>99.99% purity, stress free) unique quadruple PTFE insulated Silver wire, Silver loaded solder, PTFE sleeving and Nylon braid sleeving, premium Gold plated connectors and plugs. Custom assembly available. Call Peter Bullock for a catalogue and application note.

Russ Andrews Audiophile Components Edge Bank House, Skelsmergh, Kendal, Westmorland. LA8 9AS
Tel. 01539 823247
Fax. 01539 823317
Technical Helpline. 01539 823036
Order Line. 0800 373467 (UK only)

World leading supplier of the highest quality premium grade components. If you want the very best sounding resistors, capacitors, inductors, volume controls, wires etc. send for our Catalogue. We also have a range of equipment upgrade kits and guides covering most popular makes of amplifiers, CD players, speakers etc. To receive your copy of our Components Catalogue and our new 1997 Accessories Brochure just mail, phone or fax the address above.

RESTORATION

Audio Laboratories (Leeds) 3, Kildare Terrace, Whitehall Road, Leeds, LS12 1DB
Tel: 0113 244 0378

Have your pet hi-fi project professionally done. With over 20 years experience in factory-grade kitbuilds and overhauls, to both valve and solidstate equipment, our good reputation stems from meticulous engineering coupled with superb measurement facilities. See our main ad. in this supplement - it tells you in greater detail how we can help.

VINTAGE DIY

Loricraft Audio 4 Big Lane, Goose Green, Lambourn, Berks RG16 7SQ.
Tel. 01488 72267

Specialist restoration of 301's and 401's using genuine spares and re-manufactured parts to original pristine standards in our newly built workshops designed primarily for these purposes.

CLASSIC TURNTABLES

Technical & General P.O. Box 53, Crowborough, East Sussex TN6 2BY.
Tel. 01892 65 45 34.

The original specialist source of spares, replacements and expertise for the classic turntables. Years of actual experience and comprehensive range of parts (originals and re-manufactures), manuals, ancillaries, No dubious 'improvements' - no harmful 'modifications'. Our specialities: Connoisseur: Garrard; Goldring; Lenco; S.M.E.; Thorens; Watts; Ortofon; Shure; Cartridges and styli for 78s, Mono LPs, Stereo LPs.

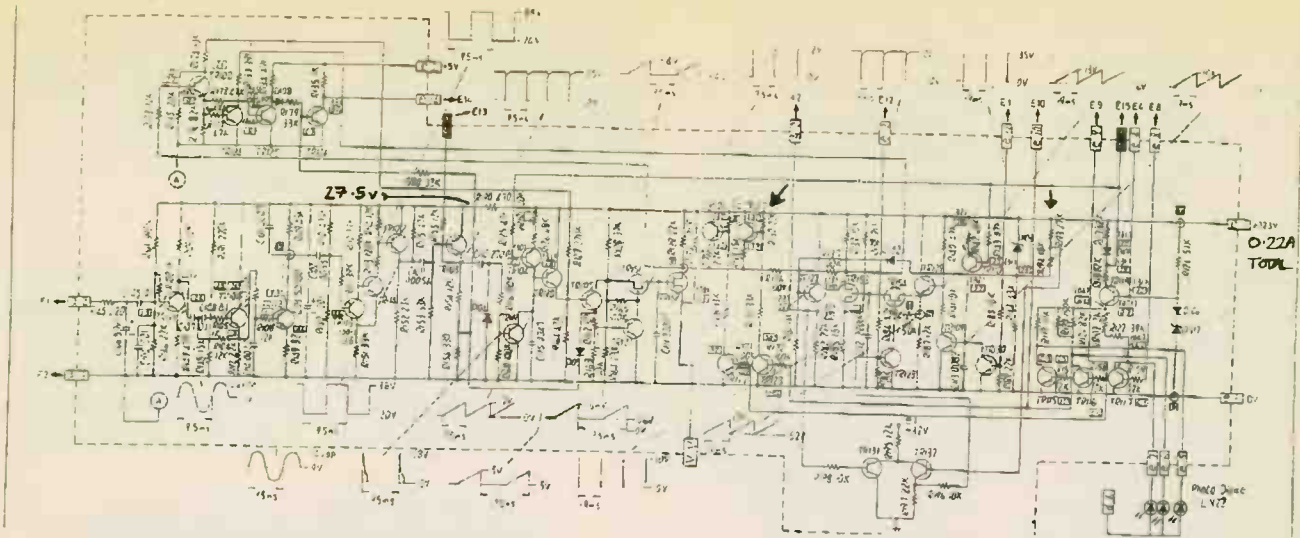


DIAGRAM NO1: fitting extra regulation to the crystal oscillator board at the points marked X boosts sound quality dramatically.

choice. These are widely available in 35V ratings up to about 22µF. You can also try larger electrolytics, like

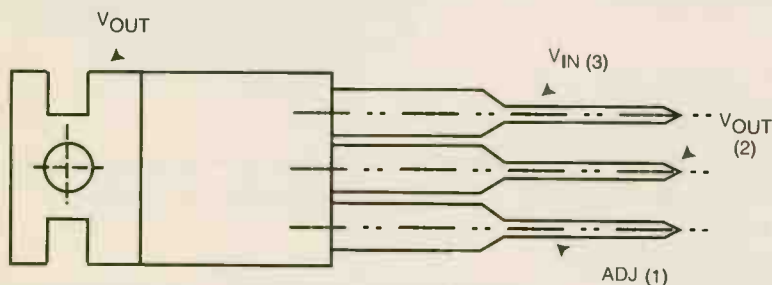
unit's cover and are actually easier to work with in this case than non-surface-mount types. And if you choose to opt for the

modifications in place, the SL-1000/MkII produces a much more dynamic, involving and rhythmic sound than before.

to-back depth you could almost step into. **JM RADFORD REVAMP**

I read your article in the August issue on the Radfords with interest, having a SC22/STA25. Only one aspect of the design was sometimes considered inferior; the use of solid-state devices in the power supply instead of valves. Despite this I still think it is as good as or better than the Quad valve amp.

However, my STA25 needs a rebuild. Is there



National Semiconductor's LM317T regulators can be used to improve the performance of Technics' SP-10MkIIP direct drive motor unit.

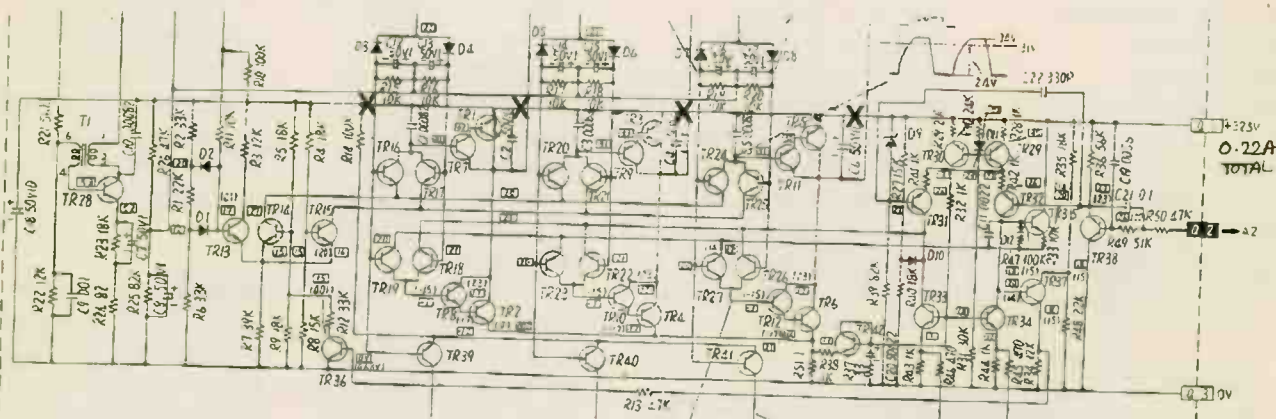


DIAGRAM NO2: LM317T regulators can be inserted at the points marked X to reduce interstage interference in the drive circuitry and improve sound.

Rubycon's YXB, at about 470µF.

The only other parts you'll need are a 180R 1% metal film resistor (R2) and a 5kohm variable resistor (R1) to trim the output voltage for each LM317T. Small surface-mount variable resistors fit easily under the motor

LM317T in any other circuits, the output voltage can be calculated from: $V_{out} = 1.25 \times (R1 + R2/R2)$ where R2 is connected between pins 1 (adjust) and 2 (output) and R1 is connected from pin 1 to ground when the IC is viewed from above.

With these

Background noise is also considerably lower, and there's a solidity, smoothness and definition to music which many belt-drive decks have a hard time emulating. And if you're using an arm like SME's Series V, sound staging is truly holographic, with a front-

anyone who offers a kit of components for this purpose, as there was 10 years ago? I can't see any obvious ones in your ads. I am quite capable with a soldering iron and circuit diagram. Otherwise, as I have reservoir capacitor induced noise, can you suggest a source of suitable smoothing capacitor

replacements? I think that other components are probably easily available from Maplin or similar suppliers.

By the way, mine runs with KT77s, rather than EL34s, which, on listening, I thought better. It's quite possible that I was replacing old with new valves, or that I have cloth ears. Not that KT77s seem available nowadays.

Finally, can you give me the name of a supplier of your recommended (World favourites) Ortofon VMS-2E cartridge? I am overhauling a Thorens TD150 turntable for someone with a CD-only system, who is reluctant to spend money, and wants one to put in it. I am fed up with going into hi-fi shops of varying poshness and being treated like an amusing idiot when I ask for one.

By the way, the Thorens TD150 is a good boot-fair buy, at around £5 or less, though the standard arm is dubious. Do you have any tips, ideas or simple mods for this basically well-designed turntable? I put STP in the bearing which should help with its reputed rumble potential (anachro-tip?)

Chris Wigzell
106201.666@compuserve.com

Because your Radford uses solid-state rectifiers the first thing to do is replace the standard diodes with Schottky rectifiers. There's

basically a trinity of rectifier diodes: bog standard, fast recovery and Schottky. Because Schottkies don't produce switching spikes like the other diodes they tend to produce a smoother, cleaner sound.

The STA25 uses a twin-section main reservoir capacitor of 100µF + 100µF at 500V which is very prone to failure. Following this is another 8µF 500V cap. These should be replaced with new electrolytics bypassed with 1µF and 0.1µF film caps. This will give you sound quality close to that you'd get from a polypropylene at a lower cost. Try Electromail (tel: 01536 204555) for these caps.

Henley Designs stock the entire Ortofon range of cartridges, with a brand new VMS-2E costing £13.95. You can contact them on tel: 01753 889949.

If you picked up a copy of the September issue you'll have seen Haden Boardman's recommendations on tweaking Thorens' TD125. Replacing the TD125's original rubber mat with either a glass mat or a cork one worked well and will do so on the TD150 too. You can also try the old stalwarts of damping the plinth and sub-chassis with car-body damping

panels (check this won't over-stretch the springs though). JM

TACKLING TRANSFORMERS

I write with reference to Mr Sirignano's question about measuring the impedance of output transformers in Supplement No30, the August edition.

The output transformer is only an impedance-matching device. The anode load is

25 years and with so many excellent transistor designs about I don't see the point of using them anymore.

Ron McQuade
Heywood,
Lancs.

If "I haven't used valves for over 25 years" equates to "I haven't listened to valves for over 25 years" then you certainly owe it to yourself to hear a well-



Finding out the impedance of an unmarked output transformer is easy with the advice above.

derived from the valve's load lines or manufacturer's data. The important factor is the turns ratio of the transformer. This is equal to the square root of the impedance ratio it is matching. For a 6k anode load to a 15Ω 'speaker it would be $\sqrt{(6000 \div 15)}$ to 1, which is a 20:1 turns ratio. For a 3Ω or 4Ω 'speaker it would be 40:1

Mr Sirignano would have to determine the turns ratio of his transformers. This could be done by applying a low AC voltage, say 3 volts, to the secondary and measuring the primary voltage (or a higher voltage to the primary and measuring the secondary). The turns ratio would be equal to the voltage ratio (ignoring losses).

I am amazed by the current interest in valve amps. Over 30 years ago I built practically every Mullard design and designed many high-powered amps myself. I haven't used valves for over

designed valve amp working with modern loudspeakers of useful sensitivity, which are thankfully becoming increasingly common. This combination possesses the kind of powerful, seductive sound that rarely emanates from a solid-state amp. JM

SUGDEN SOUP-UP

I read with interest the article in the June '97 issue about Sugden amplifiers by Haden Boardman. I have owned a CS1/A51 combination for the last 25 years and while on a 'speaker upgrade quest (to Castle Chesters) have had the opportunity to listen to a number of modern amps.

Although many were highly recommended and one was even in the £2000+ bracket, the Sugden compared very well. As stated in your article, the bass is weak - I find that a bit of bass boost (HORROR!!)



The reservoir caps in Radford's vintage STA25 power amp often fail and should be replaced with modern equivalents.

improves things. But this is still the area I wanted your advice on. Would it be possible or practical to replace the output capacitors

These could then be bypassed with smaller value polypropylenes (say, one at about 10uF and one at 1uF for each Cerafine).

Audio-Links, tel: 01724 870432). With these mods in place your Sugdens should sound superb. JM

lines, GEC must have been anxious to phase out the 'obsolescent' members of the KT range since the well-known 'Approach To Audio Frequency Amp Design' relegates KT61 to a brief mention whilst EL84, a miniaturised near-equivalent, is plugged unmercifully! Leak himself later produced the TL12+ amp which uses EL84 in an otherwise very similar circuit to the TL10.

BLAST FROM THE PAST

In response to Matt Rowland's letter published in Supplement No28 (April) about KT61 valves and the

What Matt's enquiry really highlights is the growing difficulty in servicing equipment not 'dead-centre' in the mainstream of vintage audio. Looked at uncharitably, the suppliers seem to have no problems with components still manufactured or those so plentiful that you can



With a little tweaking to bring them up to date, Sugden's C51 pre-amp and A51 power amp can sound impressive.



with better-quality modern components?

My second question concerns my CD player which is an Aura CD-50. As you know the standard CD output is 2V and this is enough to drive the power amp directly without the help of a pre-amp. Can you give me a design using a minimum of components, say a volume pot, perhaps an Alps, and a few resistors to match impedances, or is this too simplistic?

Following your advice I have used Brasso on all the sockets - as you can imagine they were unbelievably dirty after 25 years. The difference was amazing! I've also put the amp as close to the 'speakers as possible and then bi-wired. Both these changes gave a better sound. My main source is a Rega Planer 3 with the original S-shaped tone-arm.

**Mike Noble
Silksworth,
Sunderland.**

After 25 years' use the output caps on the power amp are likely to be in a real state - electrolytics aren't like wine, they don't improve with age. You could really push out the boat and go for a pair of Elna Cerafine caps which can be bought from either Maplin or Electromail.

These should prove a massive improvement over the caps currently resident in your Sugden.

CD players are designed to be able to work into impedances as low as 10kohm so the Sugden C51's 50kohm impedance shouldn't prove a problem for the Aura.

If you want to take your tweaking a level higher, replace the Sugden's volume potentiometer with a better one like Alps' Blue or Black ones (prices about £15.20 for the former and £27.60 for the latter from

Leak TL10 I've a little more information to add.

The TL10 is historically interesting, being an early example of a high-quality, commercial ultra-linear amp. In choosing the KT61 for the driver stage, Leak no doubt adjudged the superiority of the beam-power valve for audio. Uniquely, the service sheet does not give alternatives. Although details are given for modifications to allow use of the 6L6, and it is possible to use EL33, 6P25 and CV2938 as alternatives, as JM rightly says, they do not sound the same.

Reading between the

practically find 'em in the nearest skip. But just try finding the 'rarities', once-common components made by the million - where have they all gone? I've rung many firms ostensibly catering for vintage needs and finished up doubting my own sanity! 5Mohm stereo pot? . . . 600pF 5% caps? . . . 100kohm volume-with-mains switch? . . . KT61? . . . No mate, sorry!

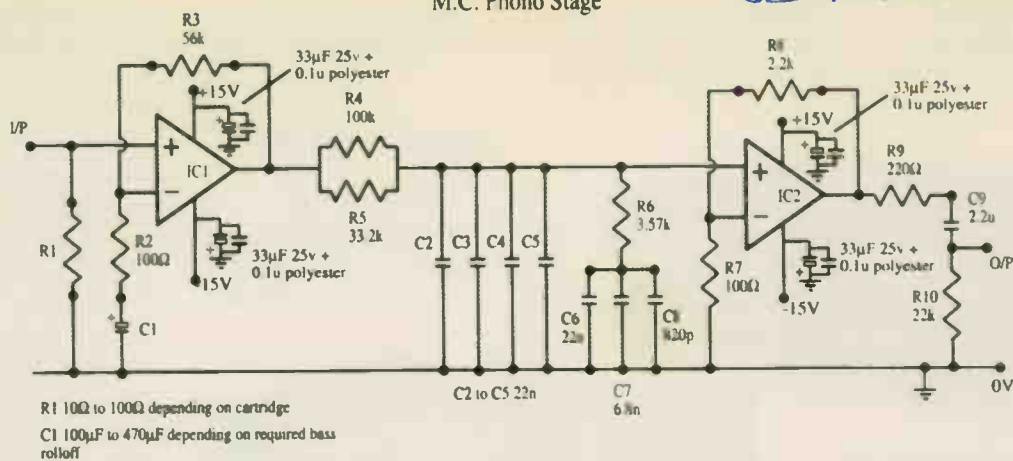
While I accept the fact that large-scale manufacturers cannot be expected to slew their output for a handful of retro-thinking idiots, 'specialist' ought to imply a recognition that many very



As the EL84 power pentode replaced the KT61, so the TL10 was phased out and the TL12+ introduced.

M.C. Phono Stage

WRONG CURRENT
SEE APRIL 1996



By changing ICs to an OP37 and an OP604 our solid-state phono stage can be operated from power supplies with a higher output voltage than the specified +/-15V.

worthy bits of equipment pre-date the preferred-value system that covers components. Such items might just be worth the odd limited-batch, premium-price production run.

I can foresee this letter drawing a righteously indignant response from the new SE class-A-only school; the new-style circuits are admittedly superb and it is indeed unfortunate that high-end makers were sidetracked by Ultra-Linear working and whacking negative feedback as 'the way forward' all those years ago. They did, however, manage to produce some very charming sounding amps which are certainly well worth preserving.

As I listen to these old fossils of a vanished audio civilisation, I wonder if I and any other users should really be obliged to scabble for ever-dwindling supplies of KT61 and (for God's sake!) 57kohm resistors, not to mention pots with 3/16in. shafts. Perhaps I am insane! Be that as it may, I still don't want to compromise the gear for want of such a little thing as a non-preferred wire-wound! (System: two Leak TL10s, Vari-slope stereo, Lenco L75. . . God! What a loony!)
Richard White
London.

A STEP UP

After many years of relying on the MM stage of my Hafler pre-amp and Lentek MC stage for amplification of an Audio Technica AT-F5 (now the last one of a batch bought cheaply when the model was discontinued) I bit the bullet and decided to have a go at building your disc pre-amp.

It has been constructed on a budget of less than £45 using components available from Maplins and the results are stunningly solid, with real attack and tonal colour to the music.

Fortunately the Hafler was designed to have its own optional internal MC stage with power supply capacity for it. Unfortunately it's +/-18V so the ICs used had to be able to withstand the higher supply voltage. I settled on the OP37 and OPA604 op amps, which, according to the Maplin catalogue, are capable of running off up to +/-20V and +/-24V rails.

The circuits were built on Maplin's plugblock YR87U, one per channel, and the whole housed in their aluminium extruded box YN51F (there is no sign of any RF interference or hum). The circuit boards were laid out with the assistance of TurboCad.

Because of the greyness of the previous sound I had

decided to rewire my Rega using van den Hul internal arm wiring, taking the opportunity to fit a socket at the base of the arm so that various leads could be plugged in. As a result of this the silver-plated copper leads from the arm were soldered direct to the PCB so as to have as few connections as possible.

On first powering up the phono stage its sound was fine but there seemed to be too much gain and at high levels there appeared to be overload. So R7 was replaced with 470 ohms to reduce gain through IC2 by about 12dB (there is still really too much gain for many cartridges) but it is quiet with no discernible hiss.

Thanks for an excellent project. I can now hear every instrumental line of my old Captain Beefheart LPs projected with superb clarity! My listening extends to Jazz and 20th-century Classical and the overall effect is much the same for all genres - the impact on the likes of Varese is stunning!

PS - The Hafler has an Alps volume control with improved socketry and capacitors and will probably soon be fitted with better switching!

L. Hopkins
Billesley,
Birmingham.

If you want to go beyond the standard Alps' blue and black potentiometers, there's a couple of options. The first is Panasonic's For Audio pot from Audio-Links (tel: 01724 870432) which sells for £64. Alternatively, AudioCom stock Danish Audio Contact's CT1 switched attenuator, which is built up from surface-mount resistors. We hope to review the CT1 within the next couple of months. JM

SUPPLEMENT ADVERTISERS' INDEX

Audio Links	14
Audiolab Leeds	24
Billington Export	4
BK Electronics	22
Chelmer Valves	IFC
Colomor	22
Cricklewood	12
Falcon Acoustics	14
Glass Audio	24
Hart Electronics	10, 11
Hart Electronics	IBC
Langrex Supplies	18
Marion Music	14
PW Components	20
Silvernote	12
SJS Electroacoustics	14
Southcoast Speakers	OBC
Sowter Transformers	22
Strachan Electronics	18
Technical & General	18
Watford Valves	24

HART

The Home of *Hi-Finesse*. Its not what you do, its HOW you do it that counts!.

Hart Audio Kits and factory assembled units use the unique combination of circuit designs by the renowned John Linsley Hood, the very best audiophile components, and our own engineering expertise, to give you unbeatable performance and unbelievable value for money.

We have always led the field for easy home construction to professional standards, even in the sixties we were using easily assembled printed circuits when Heathkit in America were still using tagboards! Many years of experience and innovation, going back to the early Dinsdale and Bailey classics gives us incomparable design background in the needs of the home constructor. This simply means that building a Hart kit is a real pleasure, resulting in a piece of equipment that not only saves you money but you will be proud to own.

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.



This fantastic John Linsley Hood designed amplifier is the flagship of our range, and the ideal powerhouse for your ultimate hi-fi system. This kit is your way to get UK performance at bargain basement prices. Unique design features such as fully FET stabilised power supplies give this amplifier World Class performance with startling clarity and transparency of sound, allied to the famous HART quality components and ease of construction. Standard model comes with a versatile passive front-end giving 3 switched inputs, with ALPS precision "Blue Velvet" low-noise volume and balance controls, no need for an external preamp. Construction is very simple and enjoyable with all the difficult work done for you, even the wiring is pre-terminated, ready for instant use! All versions are available with Standard components or specially selected Super Audiophile components and Gold Plated speaker terminals and all are also available factory assembled.

- K1100 Complete STANDARD Stereo Amplifier Kit, £415.21
- K1100S Complete SLAVE Amplifier Kit, £353.62
- K1100M Complete MONOBLOC Amplifier Kit, £271.20
- RLH11 Reprints of latest Amplifier articles £1.80
- K1100CM Construction Manual with full parts lists £5.50

ALPS "Blue Velvet" PRECISION AUDIO CONTROLS.



Now you can throw out those noisy ill-matched carbon pots and replace with the famous Hart exclusive ALPS "Blue Velvet" range components only used selectively in the very top flight of World class amplifiers. The improvement in track accuracy and matching really is incredible giving better tonal balance between channels and rock solid image stability. Motorised versions have 5v DC motor.

MANUAL POTENTIOMETERS

- 2-Gang 100K Lin. £15.67
- 2-Gang 10K, 50K or 100K Log. £16.40
- 2-Gang 10K Special Balance, zero crosstalk and zero centre loss. £17.48

MOTORISED POTENTIOMETERS

- 2-Gang 20K Log Volume Control £26.20
- 2-Gang 10K RD Special Balance, zero crosstalk and less than 10% loss in centre position £26.98

TOROIDAL MAINS & OUTPUT TRANSFORMERS for EL34, 32W VALVE AMPLIFIER

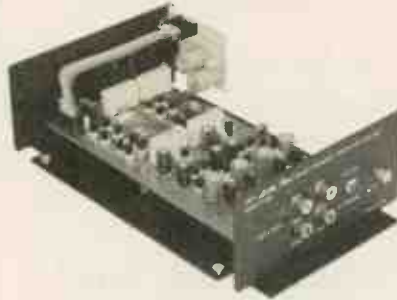
Special set of toroidal transformers, 2 output & 1 mains for the "Hot Audio Power" valve amplifier design described in the Oct. 1995 issue of "Wireless World". Total Wt 4.8kg. Special price for the set. £99. Post £8

RJMf. Photocopies of the Article by Jeff Macaulay. £2

PRECISION Triple Purpose TEST CASSETTE TC1D.

Are you sure your tape recorder is set up to give its best? Our latest triple purpose test cassette checks the three most important tape parameters without test equipment. Ideal when fitting new heads. A professional quality, digitally mastered test tape at a price anyone can afford. Test Cassette TC1D. Our price only £9.99

SHUNT FEEDBACK PICKUP PREAMPLIFIER



If you want the very best sound out of vinyl discs then you need our high quality preamplifier with Shunt Feedback equalisation. The K1450 also has an advanced front end, specially optimised for low impedance moving coil cartridges as well as moving magnet types. Selected discrete components are used throughout for ultimate sound quality. The combination of John Linsley Hood design, high quality components and an advanced double sided printed circuit board layout make this a product at the leading edge of technology that you will be proud to own. A recent review in "Gramophone" magazine endorsing this view. Bought in kit form our step by step instructions it is very easy and satisfying to assemble, or you can buy a factory assembled version if you wish.

This magnificent kit, comes complete with all parts ready to assemble inside the fully finished 228 x 134 x 63mm case. Comes with full easy to follow, instructions as well as the Hart Guide to PCB Construction, we even throw in enough Hart Audiograde Silver Solder to construct your kit!

- K1450 Complete Kit £116.58
- K1450SA Audiophile Kit £138.94
- A1450SA Factory assembled Audiophile unit £188.94

"CHIARA" HEADPHONE AMPLIFIER.



Highest quality, purpose designed, 'single ended' class 'A' headphone amplifier for 'stand alone' use or to supplement those many power amplifiers that do not have a headphone facility. Easy installation with special signal link-through feature, the unit uses our 'Andante' Ultra High Quality power supply.

Housed in the neat, black finished, Hart minibox it features the wide frequency response, low-distortion and 'musicality' that one associates with designs from the renowned John Linsley Hood. Volume and balance controls are Alps "Blue Velvet" components. Very easy to build, or available factory assembled, the kit has very detailed instructions, and comes with Hart audiograde silver solder. A valuable personal listening option and an attractive and harmonious addition to any hi-fi system.

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

"Andante" Linear Technology AUDIOPHILE POWER SUPPLIES

The HART "Andante" series power supplies are specially designed for exacting audio use requiring absolute minimum noise, low hum field and total freedom from mechanical noise.

Utilising linear technology throughout for smoothness and musicality makes it the perfect partner for the above units, or any equipment requiring fully stabilised $\pm 15v$ supplies. There are two versions, K3550 has $2 \pm 15v$ supplies and a single 15v for relays etc. K3565 is identical in appearance and has one $\pm 15v$. Both are in cases to match our "Chiara" Headphone Amplifier and our K1450 "Shunt Feedback" Pickup preamp.

- K3550 Full Supply with all outputs £94.75
- K3565 Power Supply for K1450 or K2100 £84.42
- A3550 Factory Assembled Full Supply £147.25

ROARING SUBWOOFER!

Ever heard, or rather felt!, a speaker that is still only -3dB down at 15Hz? Normally you would expect to have to move out of the house and live in the speaker, but no, this one is in an enclosure only 380 x 335 x 335mm, that's about 15" x 13" x 13" in old money. Clever electronics and a pair of GF250 Visaton drivers with a 35mm maximum cone displacement combine to really kick some air about and bring some real presence to the hi-fi experience. Send for further details.

SPEAKER DAMPING MATERIALS

Polyester Wool and Pure Lambs Wool both have optimal damping properties and are pleasant to handle. Standard 125g bag is sufficient for 20 litres enclosure volume.

- 5070 Polyester Wool. 125g £3.20
- 5069 Pure Lambs Wool. 125g £6.73

SPEAKER DESIGN SOFTWARE.

VISATON "Speaker Pro 6" is a complete speaker design program for use on IBM machines. Covers cabinet and crossover design and contains a full expandable database of drive units. Earning a "most recommendable" accolade it tests this program is ideal for the professional speaker builder or serious audiophile.

- 0303 Speaker Pro 6. 3.5"Disk £45.51
- 0309 Demo Version with Database £9.28

HART TECHNICAL BOOKSHELF

Try us for: Bigger Range of Books, Better Prices, NO "28 Day Wait"

- "AUDIO ELECTRONICS" John Linsley Hood £18.99*
- "THE ART OF LINEAR ELECTRONICS" John Linsley Hood. 1994 £16.95*
- "THE ART OF ELECTRONICS" Horowitz & Hill £35.00*
- "DIGITAL AUDIO AND COMPACT DISC TECHNOLOGY" 3rd. Edn. 0-240 51397 5 £19.95*
- "INTRODUCING DIGITAL AUDIO CD, DAT AND SAMPLING" ISBN 1870775 22 8 £7.95
- "ACTIVE FILTER COOKBOOK" Don Lancaster £19.95
- "THE ART OF SOLDERING" 0-85935-324-3. 0 £3.95
- "TOWERS' INTERNATIONAL TRANSISTOR SELECTOR" 0-572-01062-1 £19.95*
- "AUDIO" F.A.Wilson. BP111 £3.95
- "HOW TO USE OSCILLOSCOPES & OTHER TEST EQUIPMENT" R.A.Penfold. BP267 £3.50
- "THE HART PRINTED CIRCUIT BOARD CONSTRUCTION GUIDE" £2.50
- "A SIMPLE CLASS A AMPLIFIER" J.L.Linsley Hood M.I.E.E. 1969. RLH12 £2.75
- "CLASS-A POWER" Single Ended 15W Amp. J.L.Linsley Hood M.I.E.E. 1996. RLH13 £2.50

LOUDSPEAKERS; THE WHY AND HOW OF GOOD REPRODUCTION. G.Briggs. 1949. £8.95

- "THE LOUDSPEAKER DESIGN COOKBOOK" Vance Dickason. (5th Edn.) £23.95*
- ELECTROSTATIC LOUDSPEAKER DESIGN AND CONSTRUCTION Ronald Wagner. BKT6 £15.95
- "THE ELECTROSTATIC LOUDSPEAKER DESIGN COOKBOOK" Roger P.Sanders. 1995 £24.95
- "BULLOCK ON BOXES" Bullock & White £10.95
- "AN INTRODUCTION TO LOUDSPEAKERS & ENCLOSURE DESIGN" V. Capel. BP256 £3.95
- "LOUDSPEAKERS FOR MUSICIANS" BP297 £3.95
- "THEORY & DESIGN OF LOUDSPEAKER ENCLOSURES" J.E.Benson £21.95
- "QUICK & EASY TRANSMISSION LINE SPEAKER DESIGN" Larry D.Sharp £8.95
- "THE COUPLED CAVITY HANDBOOK" David Purton £4.90
- "VISATON. HOME HI FI CATALOGUE." Full Specifications and Thiele Small Data on all Drive Units £4.50
- "VISATON. CAR HI FI CATALOGUE." In car guide £3.50
- "VISATON. CABINET PROPOSALS" Book 1. In GERMAN £6.50
- "VISATON. CABINET PROPOSALS" Book 2. In GERMAN £6.50
- "SPEAKER PRO 6." VISATON Cabinet Design Software. £45.51
- "SPEAKER PRO 6." Demo Version with drive unit database £9.28

"VALVE AMPLIFIERS" Morgan Jones. 1995/6 £24.50

- THE VTL BOOK David Manley 1994. BKVT1 £17.95
- MULLARD TUBE CIRCUITS FOR AUDIO AMPLIFIERS BKAA27 £11.95
- "THE WILLIAMSON AMPLIFIER." 0-9624-1918-4 £6.95
- AN APPROACH TO AUDIO FREQUENCY AMPLIFIER DESIGN. GEC 1957 £17.95
- AUDIO ANTHOLOGIES, articles from Audio Engineering. Six volumes covering the days when audio was young and valves were king! BKAA3/1 to 6. All £12.95 each
- "THE RADIOTRON DESIGNERS HANDBOOK" (CD) £49.00
- "PRINCIPLES OF ELECTRON TUBES" H.D.Reich PH.D. £25.95
- "POWER AMP PROJECTS" Anthology. 1970-1989. £15.50
- "WORLD TUBE DIRECTORY" 1996-7 Sourcebook of valve related products £5.95
- Fuller descriptions of the contents of all our books is given in our full catalogue, price £4.50

Postage on all books, unless starred, is only £2 per book, maximum £4.50 for any number, any sized. Starred items are heavy books costing £3.50 to send.

Don't forget No waiting at HART! All listed books are normally In stock! Just ring with your Credit Card Number for instant despatch!

POSTAGE on UK Orders up to £20 is £2. Over £20 is £4.50.

OVERSEAS Please Enquire.

Fuller Details of ALL kits are given in our List, FREE on request.

Send for Your FREE copy of our LISTS

24 Hr. ORDERLINE 01691 652894 Fax. 01691 662864

All Prices include UK/EC VAT.

HART

HART ELECTRONIC KITS LTD.
2 Penylan Mill, OSWESTRY,
Shrops. SY10 9AF.
UK

HAND-MADE LOUDSPEAKERS

At **South Coast Speakers** we now have our own range of hand-made loudspeaker systems available. Individuality is our stronghold! All our loudspeakers are hand-made which means that we can offer you, the customer, a wide variety of beautiful real-wood finishes, including: Cherry, Pine, Walnut, Rosewood, Oak, Ash, Teak.

Every care is taken in the construction of our high-performance loudspeaker systems, which ensures that our cabinets and crossover network deliver the optimum results that the driver units can provide. The end result is that **South Coast Speakers** offer more than a beautiful sound with its unique range of loudspeaker systems tailored to your individual requirements.

VISATON® Loudspeaker Kits!!

We stock a large range of **VISATION** loudspeaker kits, suitable for enthusiasts of any experience. Home-building is a great way to cut the cost of a new loudspeaker system, without losing quality or performance. From the traditional all round speaker, to the top-class high-end systems, home-building will help you realise your own ideas of sound & design, being easily adapted to your living environment and your budget.

All Kits are supplied with simple instructions and cabinet dimensions. No soldering is required as the crossover comes ready wired & fixed to gold plated connection terminals.

Kit prices from £119.00



Design Services!

At **South Coast Speakers** we want to help you realise your own ideas. Our design team offers a Theoretical Crossover Design Service as well as a Cabinet Design Service. So if you need some assistance with your own ideas we are able to help.

Listening Room!

South Coast Speakers has a comfortable listening area, modelled on the average family living room, giving you, the customer, a realistic idea of how your loudspeakers will sound when you plug them in at home. We have 10 kits on demonstration as well as our own range of loudspeaker systems. There is ample free parking, so bring along your favourite CD/record for a listen.

Suppliers of Driver Units

VISATON®
VISION OF SOUND

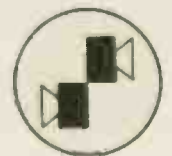
seas
HOYTALERE - LOUDSPEAKERS

scan·speak

R.C.L

VOLT

morel



— PRECISION DEVICES —

For a free catalogue/price list please contact:



SOUTH COAST SPEAKERS LTD.

326, PORTSWOOD ROAD, SOUTHAMPTON, HANTS. TEL/FAX: 01703-559312