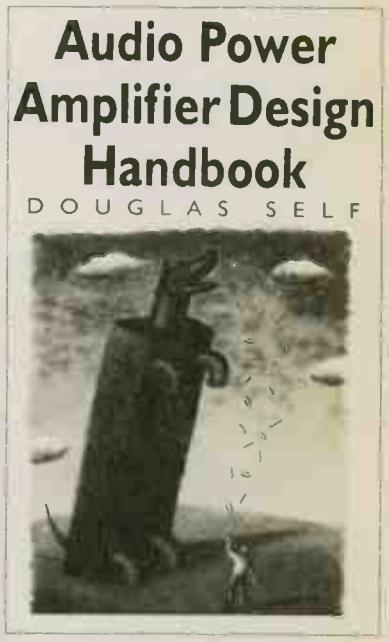
HI-FI WORLD

NO.27 FEBRUARY 1997 SUPPLEMENT

BOOK REVIEWS:

ACOUSTICS AND PSYCHOACOUSTICS
by Howard & Angus

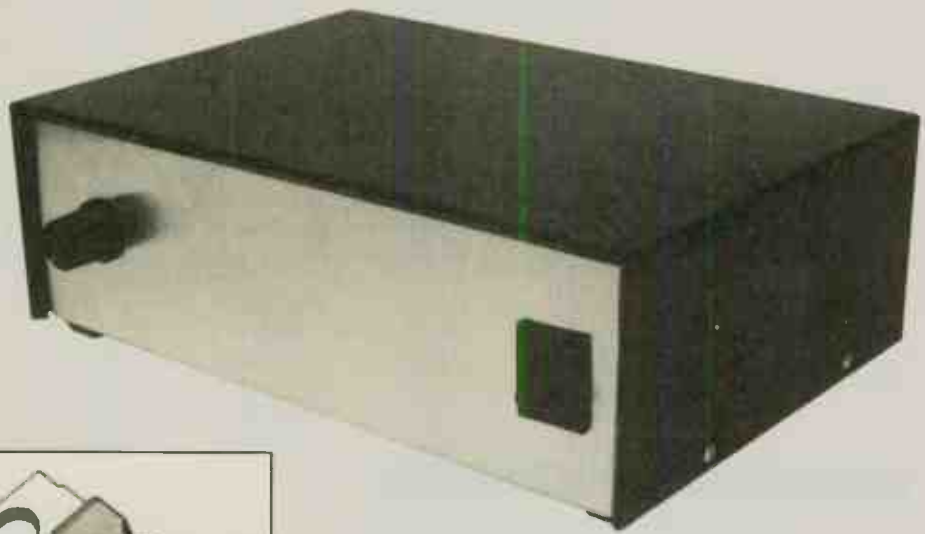
AUDIO POWER AMP. DESIGN HANDBOOK
by Douglas Self

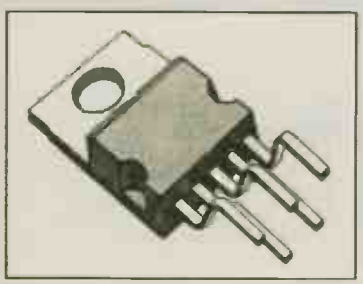


30watts/ch. FOR £60?
BUILD A GREAT CHIP AMP!

SGS-THOMSON MICROELECTRONICS

TDA2050
32W Hi-Fi POWER AMPLIFIER





(beginners will love this)

TUNING UP WITH SPECIAL COMPONENTS

FREE D.I.Y. SUPPLEMENT No. 27

The **Vintage Audio** Co

The Wall, West Drive, Lodge Road, Hurst, Berkshire UK, RG10 OSG
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VALVE TUBES

We have a large inventory of Valves/Tubes from original maunufacturere's as follows

POWER Tubes	£ Each	POWER Tubes	£ Each	POWER Tubes	£ Each	POWER Tubes	£ Each	POWER Tubes	£ Each	POWER Tubes	£ Each
EL33	12	EL34	30	EL335	12	EL37	30	EL84	6	EL88	10
2A3	34	6A3	32	6B4G	32	4300B	68	211	85	305	66
KT66	68	KT88	86	8550C	22	807	8	311	18	312	28
813	28	815	22	808	30	12E1	14	1LE12	36	1SE1	90
8L8G	12	7581A	15	7504	38	DA41	14	DA12	14	DA100	675
PX4	86	PX25	130	PT25	150	CV4060	38	CV6045	90	V1505	700
PRE-AMP Tubes	**£ Each**	**PRE-AMP Tubes**	**£ Each**	**PRE-AMP Tubes**	**£ Each**	**PRE-AMP Tubes**	**£ Each**	**PRE-AMP Tubes**	**£ Each**	**PRE-AMP Tubes**	**£ Each**
ECC81	5	ECC82	7	ECC83	18	ECC88	8	E8B	12	E180CC	8
E98CC	12	A2900	28	BJ5GT	5	BSN7GT	6	BSU7GT	12	ECC32	20
ECC33	20	ECC34	18	ECC35	18	M8137	22	CV4003	12	CV4004	14
EF86	15	6BP7	16	5814A	5	CV4122	5	12BH7	12	126Y7	9
RECTIFIER Tubes	**£ Each**	**RECTIFIER Tubes**	**£ Each**	**RECTIFIER Tubes**	**£ Each**	**RECTIFIER Tubes**	**£ Each**	**RECTIFIER Tubes**	**£ Each**	**RECTIFIER Tubes**	**£ Each**
5U4G	7	5R4	7	SZ4	4	U52	12	U19	10	GZ33	7
GZ34	14	G737	7	EX80	2	EZ81	5	EX90	2	866A	20

Order any 4 Power Tubes, 4 Pre-amp Tubes, and 1 Rectifier and get a 10% discount
Note! We have many thousands of other Tubes in stock, please call us with your requirements
We also buy valves for cash please call for immediate decision

COMPONENTS

Capacitors! All capacitors are Hand Made Specifically for us and are of the Very Highest Quality Bar None

Paper in oil Value	Voltage	Price £	Polypropylene Value	Voltage	Price £	Silvered Mica Value	Voltage	Price £	Electrolytic Slit Foil Value	Voltage	Price £
0.01 µf	600	£1.35	0.001 µf	1000	£0.58	68 pf	500	£1.63	16+16 µf	450	£7.10
0.02 µf	600	£1.49	0.002 µf	1000	£0.64	120 pf	500	£1.78	50+50 µf	400	£10.62
0.05 µf	600	£1.68	0.006 µf	1000	£0.77	220 pf	500	£1.88	220 µf	400	£18.40
0.1 µf	600	£2.17	1.0 µf	600	£2.18	470 pf	500	£2.10	470 µf	400	£20.18
0.22 µf	600	£3.12	20.0 µf	600	£5.43	680 pf	500	£2.18	1000 µf	400	£32.06
0.47 µf	600	£4.59	100.0 µf	600	£14.78 See Note	1000 pf	500	£2.23	6000 µf	350	£146.30

Note! This Capacitor comes in Aluminium Can only. Dic 65 m/m Len 95 m/m. This Capacitor is of superior quality to anything else available and has been designed by us for use in Tube Power Supplies.

Resistors! Made specifically for us in France with the following specification Metal Oxide File. Rate at 600 volt.

Value	Watts	Price £ per 10	Value	Watts	Price £ per 10	Value	Watts	Price £ per 10
1RO TO 1M	1	£2.20	1RO to 1M		£2 70	1RO to 1M	3	£3.43

OUTPUT TRANSFORMERS

Transformers! Output transformers are Hand Wound using the Very best quality OFC. Silicon steel and Silver wire lead outs. Shroudare supplied in Black Crackle paint finish upright of drop through mounting. Or special order Chrome, Copper, plated. (Please call for a quote) P/P push pull, SE. single ended.

Tube	Impedance	Taps	Sec Ohms	DC m/2	Watts	Type	Dimensions	Price £ Each
300B	2K5		4-6-16	90	8	SE	114x95x110	105
211/VT4C	9K2		4-8-18	60	20	SE	114x95x135	128
845	11K		4-8-16	80	30	SE	114x95x135	144
KT66	4K5		4-8-16	68	5.8	SE	114x95x100	95
KT88	5K	40%	4-8-16	90	50	P/P	114x95x110	108

CHASSIS

All chassis are made from solid copper 2m/m thick with welded corners and 5m/m flange for bottom plate

Sizes	L	D	H	Price £ each	L	D	H	Price £ each	L	D	H	Price £ each	L	D	H	Price £ each
	330x	200x	75	98	400x	250x	75	128	450x	350x	85	180	600x	300x	100	212

RADIO DESIGNERS HANDBOOK

We have re-printed the famous Langford-Smith Radio Designers Handbook 4th edition. We have only a few copies at £80 per 2 volume set. Bound in black imitation leather gold block A4 size, weight 4.8 kilo's. Only 18 copies left.

TERMS OF TRADE

All prices quoted are FOB UK. Delivery on some items is 10 to 14 days. Payment can be made by credit card, Cheque, or Telegraphic Transfer. Tubes are warrented as working 100% but not there visual appearance. Minimum order value £100. all prices quoted exclude delivery and VAT at the prevailing rate.

D.I.Y. Supplement

Contents

KIT NEWS

MISSING LINK

The latest audiophile catalogue from Audio-Links of Scunthorpe is now available. Priced at £2, it contains high quality resistors (running from Vishay bulk foils through to Holco's 0.5% H8 series), capacitors (Ansar Supersound and Silversound, Hovland Musicaps, Elna Cerafines and Panasonic Os-cons) and potentiometers (Alps Blue and Black Beauty as well as Panasonic).

There's also a range of switches, connectors (including gold-plated cartridge tags) and interconnects in addition to loudspeaker and mains cables. The bullion brigade get a look in with pure silver wire, from 36gauge to 14gauge, and matching silver-loaded solder.

Transistor fans will be happy to find Schottky and soft-recovery diodes, voltage regulators and low noise toroidal transformers as well.

Audio-Links
7 Fairmont Cresc.,
Scunthorpe,
North Lincs.
DN16 1EL
Tel: 01724 870432

RIBBON SINGS THE HIGHS

If dome tweeters fail to bring a smile to your face and ribbon tweeters are more your cup of tea, there's now one more to choose from with the arrival of the HRL-1s from Howard Dawson Audio. These are built around powerful ALCOMAX-3 magnets and an extremely

lightweight ribbon to maximise the driver's efficiency (90dB), speed and accuracy.

Given the fact that a pair of HRL-1s will set you back £300, replacing the ribbon element itself is reassuringly cheap (£10) and easy - owners can even make new ribbons themselves, according to Howard Dawson. And almost any impedance can be specified because the HRL-1's matching transformers are interchangeable.

Howard Dawson Audio
16 Copeman Road,
Aylsham,
Norwich NR11 6JL

ITALIAN TRANSFORMATION

If you're having a hard time making up your mind as to what output transformer to buy for that killer valve amp you've been slaving over, Bartolucci can help you out. This Italian company offers over 60 different output transformers to suit a range of valves. Power handling is between 10W and 50W for transformers aimed at single-ended amps, while push-pull versions run from 8W up to a healthy 140W.

All the above transformers are multiple section, multiple layer designs, hand-wound for accurate interleaving and correct wire tension. They come potted with micro-crystalline wax in a hand-made steel enclosure, with output taps that allow matching to 'speakers of 4, 8 and 16 ohms impedance.

Further broadening Bartolucci's brochure is a step-up transformer for MC cartridges as well as interstage coupling and pre-amp output transformers.

Helping out in the power supply department is a range of chokes, running from 10H at 400mA up to 150H at 50mA.

Audio Marketing
Via del Meridiano 38,
Domagnano,
47031 San Marino
Tel: (378) 906634

WHAT, MORE TRANSFORMERS?

SJS Electroacoustics are expanding their transformer goodie bag and now offer five interstage transformers (with prices from £149 to £189/pr) to complement their pre and power output transformers. Fans of single-ended will be happy to see

they're offered not only the Standard and Super range (with its superior windings) but also five 'state of the art' transformers. These all employ very complex winding techniques and high purity Oxygen Free Copper with PTFE-insulated, pure silver flying leads, and are potted in non-magnetic cases.

Occupying the catalogue's other pages are power supply chokes and capacitors (custom polypropylenes, Black Gates, Mallorys, Spragues and Hovland Musicaps), Holco H2 1W 1% resistors and silver cable.

SJS Electroacoustics
Ben-Dor,
Lumb Carr Road,
Holcombe,
Lancs. BL8 4NN
Tel: 01706 823025

YOUR FIRST DIY AMPLIFIER

Want to build your first amplifier? The simplest way is to use a dedicated silicon chip. The components shouldn't amount to more than £60 and there are no naughty voltages. Chris Found explains, step-by-step.

TV set manufacturers are just one example of those who use one-piece amplifiers on a silicon chip. There are plenty to choose from. These amplifier modules are not in the High End league but they certainly fulfill basic requirements well, giving lots of Watts per Pound.

For a student with very little money or someone who is just starting a course in electronics and needs to gather firsthand knowledge of building, these units are an ideal starting point. To build the units presented in these articles you need to be able to solder components to a board and want to do something you might never have done before.

When I looked at the data sheets, today's sophisticated chip amps look like an amazing bargain. We chose one that is easy to obtain, has been honed through useage and is, technically, easy to understand as well. It is the SGS Thomson TDA2050. A stereo amp. needs two of them, amounting to no more than £12. However, the mains transformer can cost up to £15, electrolytic capacitors £8 or so and a chassis / heatsink any price you choose. So it's impossible to put an exact price on this amp, but £60 should do it easily.

The SGS-THOMSON TDA2050

The TDA2050 is an Integrated Power I.C. built into what is normally called a Pentawatt package, in other words a T0220 transistor with five legs instead of three. Bear the package type in mind when selecting a heatsink.

It is capable of working on single or simple split rail power supplies. The split rail supply option is especially useful because it eliminates the output coupling capacitor, and its degradation of sound quality.

The 2050 can produce some 35watts into a 4Ω load (the limit being defined by 10% distortion) when using a supply of +/-18volts, or 32watts into 8Ω with a supply rail of +/- 22V.

SGS-THOMSON MICROELECTRONICS

TDA2050

32W HI-FI AUDIO POWER AMPLIFIER

- HIGH OUTPUT POWER (50W MUSIC POWER IEC 268.3 RULES)
- HIGH OPERATING SUPPLY VOLTAGE (50V)
- SINGLE OR SPLIT SUPPLY OPERATIONS
- VERY LOW DISTORTION
- SHORT CIRCUIT PROTECTION (OUT TO GND)
- THERMAL SHUTDOWN

The TDA 2050 is a monolithic integrated circuit in Pentawatt package, intended for use as an audio class AB audio amplifier. Thanks to its high power capability the TDA2050 is able to provide up to 35W true rms power into 4 ohm load and up to 32W into an 8ohm load.

Pentawatt

You might feel that 10% distortion is just a tad excessive, but it is merely a way of defining overload and maximum output. For most music applications such as an audio stage in a TV set, the distortion will be substantially lower than this, as our measured performance figures show. Performance is very good indeed for its low price and this chip is both robust and reliable - almost bombproof in fact.

Sophisticated circuit protection has been applied, as well as thermal limiting. This makes the TDA2050 an extremely reliable product for any manufacturer, but also for the DIYer.

Looking at the 2050's operational schematic diagram (Fig 1, p8) shows just how simple the unit is to construct. Just eight components per channel are needed, plus decoupling and power supply components. Providing you are careful

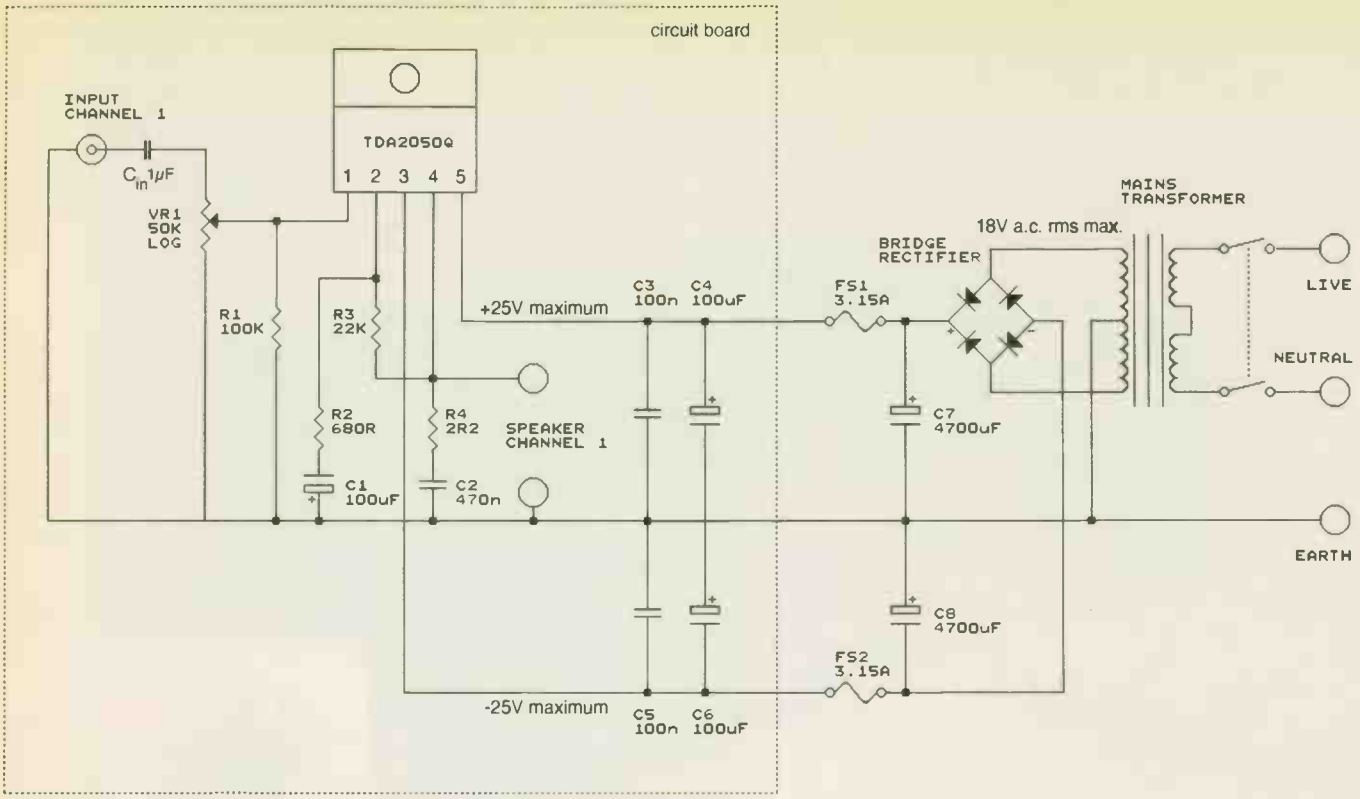


Fig 1 - Schematic of circuit

How the circuit works.....

The signal is fed in through Cin, which acts as a d.c. blocking capacitor. This should be left in for safety, since residual d.c. exists on many sources. Remove it if working from a preamp with an output blocking capacitor. Feeding d.c. in will otherwise produce d.c. on the output, which will offset the 'speaker cones.

R1 holds the non-inverting (+) input to ground with respect to d.c. conditions, should the volume control fail to do so. C1/VR1 form a high pass filter with a -3dB point around 4Hz. Lower Cin to 0.47µF and this rises to around 8Hz, which is where most designers choose to put the lower limit.

Feedback, both a.c. and d.c., is applied from output back to the inverting (-) input through resistor R3, set at 22k. Altering this resistor changes the amount of feedback applied, R3/R2 acting as a potential divider with respect to the a.c. (audio) signal being fed back. Reducing R3 increases the amount of feedback applied. This will increase bandwidth, decrease distortion and reduce gain. Go too far and the circuit will oscillate (i.e. become unstable). Increasing R3 will improve stability and raise gain, but increase distortion and lower bandwidth. Capacitor C2 ensures 100% d.c. feedback is applied. Ideally, this capacitor should comprise two back-to-back tantalums of 50µF-200µF, in order to produce a non-polarised capacitor.

Components R4 and C2 ensure high frequency stability. Capacitors C3 and C5 ensure power line decoupling is effective at high frequencies. These should be good quality polypropylenes. The chip has both short circuit protection and thermal shut down, so it's rugged.

The chip is designed to accept 25V maximum on its supply rails. We recommend using a mains transformer of 15V a.c. rms, but an 18V a.c. transformer can be used, which will give 23V-24V, taking into account regulation, bridge rectifier losses, etc. A rating of 50VA minimum should be used. Bigger VA ratings give better regulation and stronger bass. Chris Found lists Maplin's DH63T, which has two 15V secondaries, one 240V primary, is rated at 4A and 120VA and costs £18. Cricklewood Electronics (0181-450-0995, 40 Cricklewood Broadway, London NW2 3ET) is where we bought our parts and they can help too. NK

(more so, if you are a first time builder), you should be able to get this unit up and running in no time at all.

I decided to build the prototype amplifier on two separate pieces of 0.1" copper clad Veroboard. It allows the amplifier to be built in easy stages, replacement of one part is made easier, servicing is easier and Veroboard is best when circuits are kept small and simple. Large Veroboard constructions are prone to problematic mix-ups. Our Veroboard layout is very simple and providing basic procedures are adhered to, the units should work straight away.

FIRST TIME

The following list should be used when constructing anything for the first time. It safeguards not only your hard earned money but also ensures that you do not die in the attempt of building your first unit.

Build each board slowly and follow the drawings very carefully, checking every solder joint, component position and the polarity of the components. If necessary redraw the layout on a separate sheet with all the positions and their polarities.

Where mains voltages are concerned, use sleeved 'crimp on' spade terminals for the mains switch and the IEC mains connector. You can get these from any car spares shop and they are very cheap. Also use only the appropriate wire suitable for the job in hand. Do not use wire too thin for the mains linking, as this could overheat and cause a fire if left on for an appreciable amount of time.

Triple check everything in accordance to the information given. If you are unsure, ask a local repair shop or a knowledgeable friend to look over the unit. It may cost you a few quid but it's worth it.

Make a final check against

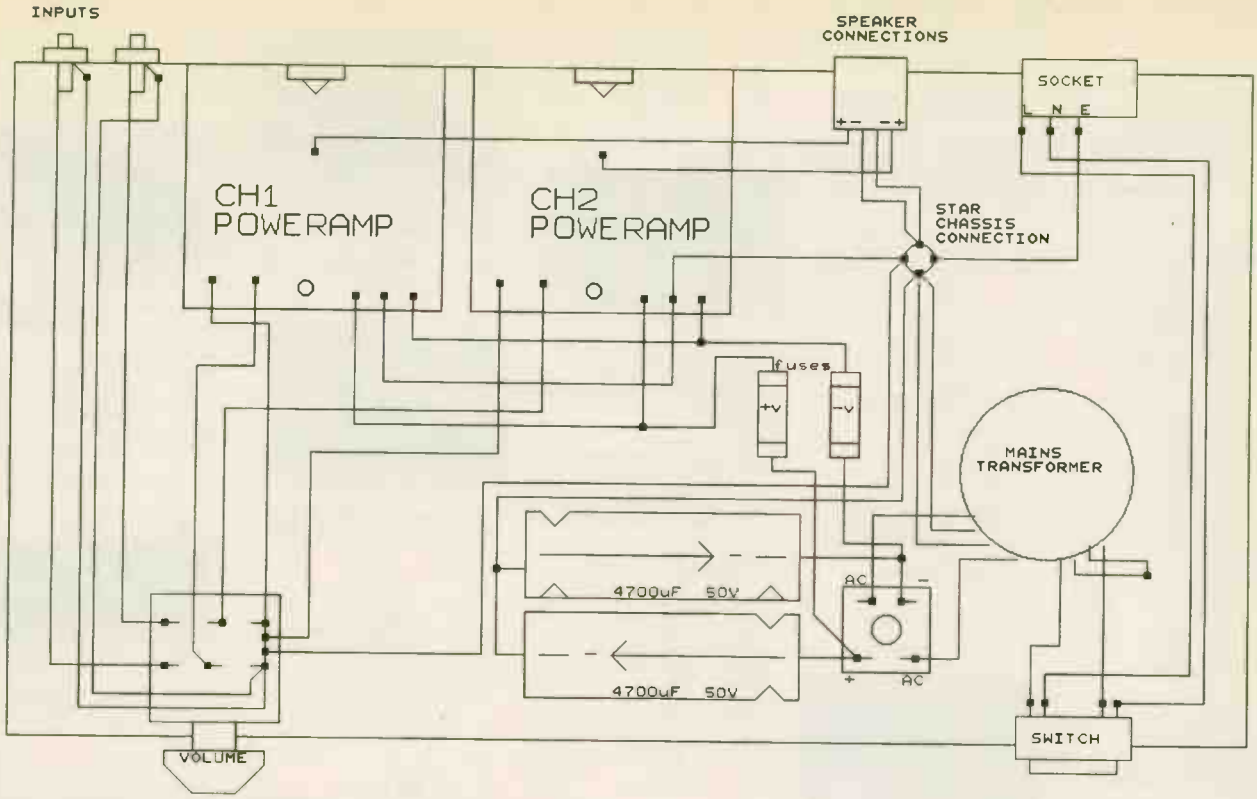


Fig 2 - Amplifier layout

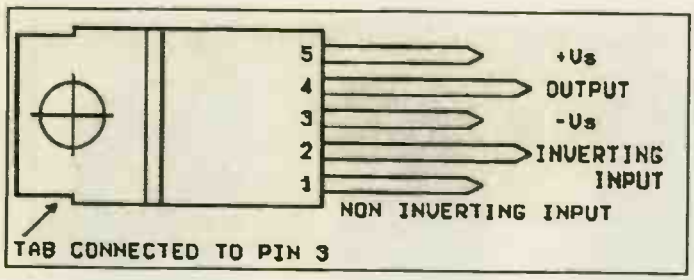
all of the drawings, ensuring the areas that require isolation, i.e. the heat sink and the tab on the devices, are electrically isolated from the chassis but thermally connected using the proper heat sink compound, thereby allowing heat to be dissipated effectively.

When you power up the unit for the first time, do not connect any speakers to the output terminals. Do not connect an input signal either. Instead very carefully look and smell for burning, but do not get too close just in case there is something wrong. Wear some protection for your eyes if you need to look closer than a few feet. Leave on for only two minutes and then switch off and leave the unit to cool down for at least 15 minutes. Please bear in mind that the large reservoir capacitors used need time to discharge.

Always remember, anything connected to the Mains supply is potentially dangerous.

MAINS VOLTAGES CAN KILL. *Use extreme care and follow all instructions to the letter.*

If you have a multimeter check the various test points for their correct D.C. voltages on the second test.



TOOLS

The following tools are required to build the amplifier.

Small wire cutters
Small and medium size pliers
Various screwdrivers
Files
Electric or Hand drill with assorted drill bits
15 or 25W small soldering iron, not the Weller Arc welding type
Spanners if you can borrow some

CONSTRUCTION

Cut a small piece of Veroboard 17 strips wide and 17 holes long and clean off the rough edges with a small flat file. Fig. 3 shows the placement of the components for each of the two pieces of Veroboard. You will notice that these two boards are identical. The remaining power supply components are hardwired. Each piece of Veroboard comes pre-drilled as standard with copper tracking strips to allow components to be placed in certain positions. I normally remove all the unwanted tracking to prevent shorts when soldering and put Vero terminal pins in the positions that require wire to be soldered to the boards.

On each of the two amplifier boards the TDA2050 is mounted as close to the far end of the board as possible, track side down. The TDA2050 chip connection pins go through the opposite side of the board. The metal tab of the 2050 is secured to the inside wall of the case and the optional outside heat sink.

To ensure the board stays rigid and cannot short to the metal case a plastic spacer is mounted at the opposite end to provide support. It helps when wiring up the boards later.

Construction of the power supply section is very simple. I used a large chassis-mounting bridge rectifier, which is marked on its body +,-, AC, AC.

WIRING THE POWER SUPPLY

First, mount the bridge rectifier to the case using an M3 screw and nut. Next, connect the spade connectors to the secondary wires of the mains transformer then push them onto the AC terminals of the bridge rectifier. They go on either way around; there is no polarity to be observed.

Fix the reservoir capacitors to the chassis, either with a clamp or using glue. Solder the positive wire of one reservoir capacitor to

CRICKLEWOOD ELECTRONICSANSAR SUPERSOUND
Audio Polypropylene 400VDC±5%

The secret's in the metallised film!

Manufactured specifically for high end audio, these polypropylene capacitors offer exceptional value for money as they use a specially imported high purity metallised polypropylene film, ensuring smooth, detailed and transparent sound quality and extremely low distortion, whether they are placed directly in the signal path such as in crossovers or for decoupling etc. Ideal for replacing old, stale and leaky capacitors.

Part no	Value	Price
CW100N	CAP PROPYL 100nF	£1.25
CW150N	CAP PROPYL 150nF	£1.25
CW220N	CAP PROPYL 220nF	£1.25
CW330N	CAP PROPYL 330nF	£1.25
CW470N	CAP PROPYL 470nF	£1.25
CW680N	CAP PROPYL 680nF	£1.25
CW1U0N	CAP PROPYL 1µF	£1.25
CW1U5N	CAP PROPYL 1.5µF	£1.50
CW2U2N	CAP PROPYL 2.2µF	£1.50
CW3U3N	CAP PROPYL 3.3µF	£1.85
CW4U7N	CAP PROPYL 4.7µF	£2.00
CW6U8N	CAP PROPYL 6.8µF	£2.50
CW10UN	CAP PROPYL 10µF	£3.50
CW15N	CAP PROPYL 15µF	£4.50
CW22U	CAP PROPYL 22µF	£6.50
CW50U	CAP PROPYL 50µF	£9.95
CW100U	CAP PROPYL 100µF	£20.00

Low value capacitors are extensively used in amps & preamps (especially in tone control, bass & treble etc) By changing to polypropylene you can enjoy an enhanced lighter - brighter sound especially in the treble and mid bass range and a transparent lower bass improvement. Close tolerance & high stability ensure that both channels can be very closely matched.

Part No	Value	Voltage	Price
CPP47P	CAP PROPYL 47pF	250V	£0.35
CPP100P	CAP PROPYL 100pF	250V	£0.35
CPP150P	CAP PROPYL 150pF	250V	£0.35
CPP220P	CAP PROPYL 220pF	250V	£0.35
CPP330P	CAP PROPYL 330pF	250V	£0.35
CPP470P	CAP PROPYL 470pF	250V	£0.35
CPP1N0	CAP PROPYL 1nF	250V	£0.35
CPP1N5	CAP PROPYL 1.5nF	250V	£0.35
CPP2N2	CAP PROPYL 2.2nF	250V	£0.35
CPP4N7	CAP PROPYL 4.7nF	63V	£0.50
CPP10N	CAP PROPYL 10nF	63V	£0.65
CPP22N	CAP PROPYL 22nF	63V	£0.85
CPP47N	CAP PROPYL 47nF	63V	£1.00

Low Impedence High Temperature (105° C) Radial Electrolytics ± 5%

Superior electrolytics at affordable prices. The low impedance and resistance maximises signal purity, whilst the superior temperature characteristics allow the capacitor to remain very stable under the most varying conditions.

Part No	Value	Voltage	Price
1H50	LO Z HI TEMP 1µF	50V	£0.25
2U2H50	LO Z HI TEMP 2.2µF	50V	£0.25
4U7H63	LO Z HI TEMP 4.7µF	63V	£0.25
10H63	LO Z HI TEMP 10µF	63V	£0.25
22H63	LO Z HI TEMP 22µF	63V	£0.30
47H63	LO Z HI TEMP 47µF	63V	£0.35
100H63	LO Z HI TEMP 100µF	63V	£0.50
220H50	LO Z HI TEMP 220µF	50V	£0.75
470H63	LO Z HI TEMP 470µF	63V	£1.25
1000H35	LO Z HI TEMP 1000µF	35V	£1.50
2200H50	LO Z HI TEMP 2200µF	50V	£2.25
4700H25	LO Z HI TEMP 4700µF	25V	£2.50

Elna Solder Lug Reservoir Capacitor 10,000µF 80V

Choosing the right electrolytic for power supply use is very important in keeping down hum whilst allowing maximum current flow for good transient & bass response. Elna capacitors are respected the World over for their exceptional audio attributes.

Part No	µF/Voltage	Price
10000C80	CAL ELNA10000µF/80V	£11.00

Monacor Air Cored Inductors

A range of professional air cored inductors for 8Ω or 4Ω crossovers/filters for use up to 300W. 1.2mm enamelled copper wire wound on air spaced plastic bobbins.

Part No	Specification	Price
P15	150µH 0.15Ω 8x19mm	£2.00
P22	220µH 0.15Ω 48x19mm	£2.50
P33	330µH 0.2Ω 8x19mm	£3.00
P47	470µH 0.25Ω 50x19mm	£3.50
P68	680µH 0.35Ω 59x19mm	£4.50
P100	1mH 0.4Ω 59x19mm	£5.50
P150	1.5mH 0.5Ω 70x30mm	£6.50
P220	2.2mH 0.6Ω 70x30mm	£8.00
P330	3.3mH 0.75Ω 70x30	£10.00

Monacor Ferrite Inductors

A range of professional high efficiency ferrite cored inductors with very low ohmic losses for 8Ω or 4Ω crossovers or filters for use up to 400W. 1.4mm enamelled copper wire (1.3mm on F1000) wound on plastic bobbin.

Part No.	Specification	Price
F220	2.2mH 0.15Ω 400W 55x31mm	£6.50
F330	3.3mH 0.2Ω 330W 65x39mm	£9.50
F470	4.7mH 0.25Ω 140W 65x30mm	£11.00
F680	6.8mH 0.35Ω 120W 65x39mm	£12.00
F1000	10mH 0.45Ω 100W 65x39mm	£13.50

Quality Valves
Affordable range of High Quality Valves

Part No	Description	Price
6550C	OUTPUT VALVE	£26.00
6L6GT	OUTPUT VALVE	£4.50
6SN7GT	OUTPUT VALVE	£4.50
6V6GT	OUTPUT VALVE	£3.95
ECC81	TRIODE	£4.50
ECC82	TRIODE	£4.50
ECC83	TRIODE	£4.50
EF86	LOW NOISE PENTODE	£3.50
EL34	OUTPUT VALVE	£8.50
EL84	OUTPUT VALVE	£3.50
GZ34	RECTIFIER	£6.50
KT88	OUTPUT VALVE	£20.00

Valve Holders - High quality valve bases. Chassis mounting with screw fittings

Part No.	Description	Price
B9AC	B9A VALVE HOLDER CERAMIC	£1.50
B9AU	B9A VALVE HOLDER CERAMIC	£2.00
CC	SCREENING CAN	£2.25
OCTC	OCTAL VALVE HOLDER CERAMIC	£2.00
OCTP	OCTAL VALVE HOLDER PHENOLIC	£1.50

Fully Gold Plated Phono (RCA) Plugs With spring coil cable grip.

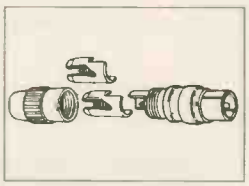
Part No	Description	Price
PPG5A2	PAIR GOLD PLUGS for up to 5mm CABLE	£1.50 pair
PPG8A2	PAIR GOLD PLUGS for up to 8mm CABLE	£1.50 pair

Very High Quality Phono (RCA) Plugs

Very high quality satin grey metal with heavy gold plated connections. Top violet cable grip & PTFE insulators. Very low noise.

Part No.	Description	Price
PPG6H2	GOLD PTFE PLUGS for up to 6mm CABLE	£3.50 pair
PPG8H2	GOLD PTFE PLUGS for up to 8mm CABLE	£3.50 pair

Neutrik Pro-Audio Super Quality Gold Plated Phono (RCA) Plugs



A superior pair of phonos each includes 2 cable grips pairs 3.5-5.5mm & 5.5-7.3mm making them suitable for a wide range of cables. These connectors make contact with ground first at insertion to eliminate pop.

Part No.	Description	Price
PPN2	NEUTRIK PRO AUDIO	£12.00/pair

Extra High Quality Gold Plated Phono Oxygen Free (RCA) Leads (pairs)

Available in 2 colours & 3 lengths. Highly flexible oxygen free cable with extra moulded-in control/grounding wire.

Part No.	Length/Colour	Price
LPP1QG	0.8 Metres/Green	£5.50
LLP1QV	0.8 Metres/Violet	£5.50
LPP2QG	1.5 Metres/Green	£6.50
LPP2QV	1.5 Metres/Violet	£6.50
LPP5QG	5 Metres/Green	£11.00
LPP5QV	5 Metres/Violet	£11.00

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A range of adjustable plastic ports for use in various sizes of loudspeaker cabinets. d=diameter L=adjustable length (mm)

Part No	Dimensions	Price
R35	d=35L=110-210	£2.50
R50	d=50L=150-280	£3.00
R70	d=70L=128-245	£3.50
R100	d=110L=160-122	£5.50
R85	d=85 angled 45° for narrow cabinetsL=210-310	£6.50

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All speakers have biwired crossover kits containing high quality components and terminals.

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TOTAL KIT £506.00

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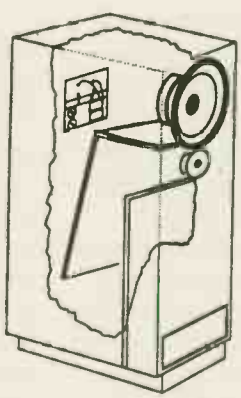

TRANSMISSION LINE
PLUS KITS .....£172.00 - £383.00

M3TL TRANSMISSION LINE

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TOTAL KIT £236.00

A2 H.D.A. AEROGEL KIT

PLUS KIT £187.50
TOTAL KIT £259.00

S3TLM METAL TRANSMISSION LINE

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TOTAL KIT....£302.50

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I.P.L. Acoustics, 2 Laverton Road, Westbury, Wiltshire, BA13 3RS. Tel: 01373 823333

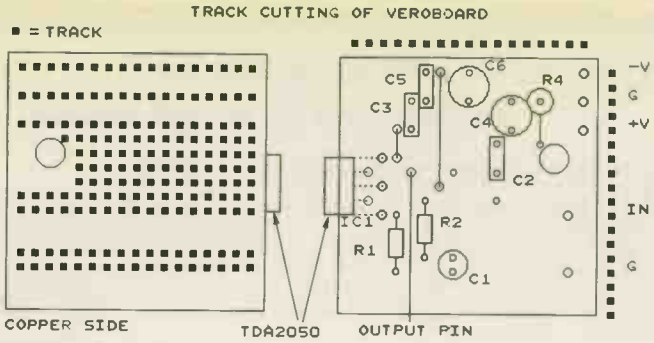


Fig 3 Amp board layout

the + connection of the bridge rectifier. Do the same for the negative wire from the second capacitor, taking it to negative on the bridge rectifier. Solder the free positive and negative capacitor terminals together and take them to the star earth through another wire. See Fig 2.

The bridge rectifier converts the AC voltage from the mains transformer into a DC voltage that powers the chip. The two reservoir capacitors hold the voltage stable during high signal levels, smooth out hum and ensure that the amplifiers do not effectively run out of steam.

BUILDING THE BOARDS

Mount the smallest components first. These are the resistors which are colour coded in accordance to the value and tolerance of the component. In the parts listing, the colour code sequence for each resistor is described, so that you can familiarise yourself with this coding. You will notice that R4 is mounted vertically.

Once the resistors are in place, you can now see where the tracks need cutting, with a specialist Veroboard cutter or a 3.5 - 4mm drill. Do not cut into the board too hard or it will break or the hole will be too big. Cut just enough to remove the copper.

Mount and solder the terminal pins to the board now, to save any damage later. These pins can sometimes be very stiff to put in the holes. Use either the special Veropin tool or a small pair of pliers on the edge of a hard surface, say a piece of wood.

Next mount the capacitors. All have their values and working voltages printed on the side of the part.

Make sure the electrolytic capacitors are fitted the right way round. The bar or dashed line usually corresponds to the negative terminal of the capacitor.

The low value polyester capacitors (the ones without a polarity marking) are non-polar and can be placed any way round without the need to observe the polarity.

Finally fit the TDA2050, making sure not to bend the pre-formed legs too far from their original position as they are quite fragile. They should easily fit into the 0.1" pitch of the Veroboard. Having built the first power amplifier board triple check everything and when you are sure that the board matches the drawing, use it as the reference for the next one.

BUILDING THE CASE

The case is purchased undrilled. Our photograph shows how the prototype was constructed. Drill the holes to accommodate the volume control and mains switch on the front panel. Drill the holes for the back panel second and, lastly, the holes on the underside of the case.

To form the square hole needed for the push-fit mains switch, measure the switch and mark the square hole with a felt pen. With an electric or hand drill use a 3mm drill bit to start the hole in the centre. Enlarge it with a 10mm drill bit, then with a small round file enlarge this hole until it is as close to the switch outline as possible. Use a small flat file to put in squared corners.

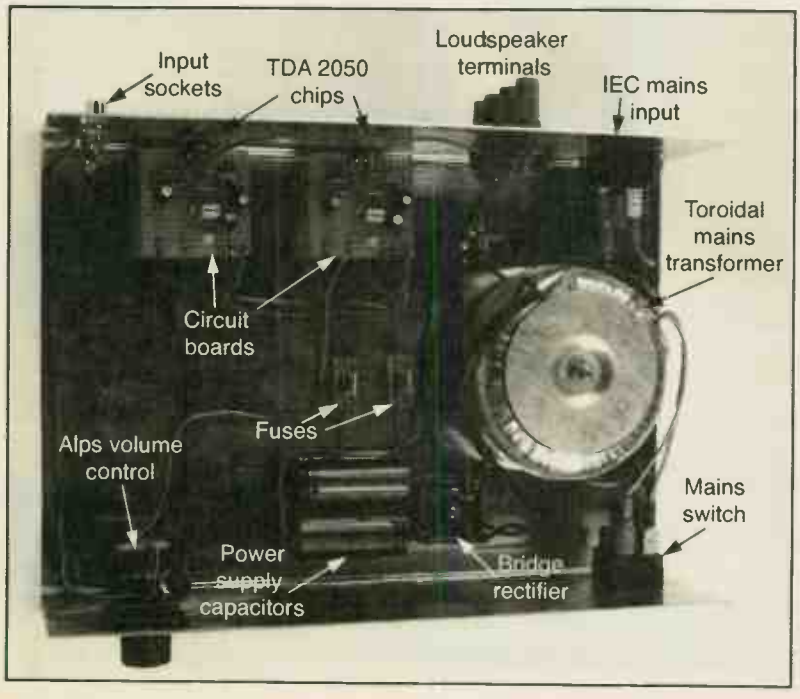
Use the same procedure for the Mains IEC socket on the rear of the case. This socket should be mounted in line with the switch on the rear of the case, so that you use the minimum amount of wire to connect these two parts together. The fixing holes for the socket are normally M3 (Metric 3mm).

Place the mains transformer inside the case on the switch side. Leaving 15-20mm gap from the side of the case mark the centre of the transformer and drill the M4 / M5 hole required for the mounting bolt. Do not fit the mains transformer yet.

Look on the mains transformer body and follow the instructions to connect it to the mains supply.

Fit sleeved spade connectors to the transformer primary leads, carefully cleaning the ends of the wires with a sharp blade just in case they are dirty. Make sure to crimp the connectors properly with a pair of pliers, so as to make the best connection and finish this area by making up the lead that links between the switch and the IEC socket. Check the connections to the switch with Fig 2, to make sure that these connections do not short the mains when the switch is activated. Fig 2 shows the normal connections for a standard double pole rocker type switch.

Finally connect the earth wire and secure one end to the case, using a solder tag and an M3 screw and nut to firmly fit it to the case. You can now fit the mains transformer to the case, using the supplied hardware. Lightly tighten the fixing bolt, but not too tight.



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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 £K 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 switched inputs, with ALPS precision "Blue Velvet" low-noise volume and balance controls, no need for an external preampl.
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
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2-Gang 10K Special Balance, zero crosstalk & 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

32W VALVE AMP TRANSFORMERS

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. Photocopies of Article by Jeff Macaulay. £2.00

JOHN LINSLEY HOOD SINGLE ENDED CLASS 'A' POWER AMPLIFIER

A new concept in amplifier design to meet the needs of modern users who want 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. Described in the September 1996 issue of EWW the new version retains the basic simplicity and purity of the original but with modern components and an increased power rating of 15W RMS per channel.
Full Kit in 3u high Rackmount Case. £388.25
Set of 3 PCBs only. £60.50

VISATON® SPEAKER KITS & DRIVE UNITS

New to the UK, VISATON offer a range of speaker kits and drive units that give the home builder access to units and designs that are unrivalled for quality, performance and value. Their designs are very well known in Germany, where they are based, and over 25 years they have built up an enviable reputation for high quality sound. All their designs come from a solid background of the best in design and research and their factory contains one of the largest anechoic chambers in the World, backed up by the very latest in computerised test equipment. This quality of research facility, added to design collaboration with major universities and high end magazines, produces products of impeccable performance and value that are the best available to the home speaker builder!. Their range of products covers the whole spectrum of sound reproduction and includes speaker kits for home cinema, hi-fi and car use. There is also a vast range of drive units from 15" woofers to ribbon tweeters. Speaker design software and database are available for the home user who wants to try his hand, or for commercial manufacture. A small selection follows, our lists will give you more!.

ASM100 ACTIVE SUBWOOFER MODULE

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

FIESTA 30

An Ultra High Efficiency speaker, specially suitable for Valve Amplifiers.
Specially selected as the ideal partner for the new John Linsley Hood 15W Valve Sound Amplifier, or indeed any actual valve amplifier, the FIESTA 30 features the astonishing efficiency and sensitivity needed to achieve a satisfying sound level from amplifiers of limited power output.
To complement the sound purity of such amplifiers a full three speaker system is used with a 300mm (12") woofer, 200mm (8") mid-range and high quality horn tweeter in a vented bass reflex enclosure.
All these drive units have been carefully selected for their individual virtues, and collective excellence, the tweeter for instance being a high end unit with exceptional pulse response as a result of its combination of Kapton former, aluminium diaphragm and aluminium voice coil.
Nominal Power Rating is 150W, Max. Music Power 250W, Impedance 8 ohm, Mean Sound Pressure 91dB.
Speaker kit comes with all parts to make a pair of speakers, but not the cabinet parts. Crossover units are factory assembled, ready to fit.

Kit No.LK5963 Per Pair. £424.93

HOME CINEMA SPEAKERS.

The VISATON range of speaker kits includes all you will ever need for your surround sound home cinema setup. The Hi-Tower Kit is ideal as a super luxury pair of stereo main speakers. The "Centre 80" uses special magnetically screened drivers to avoid picture disturbance and a pair of "Effect 80"s are used as rear speakers. Any of a range of sub-woofers then adds weight to the sound of the robot feet!. Centre 80 Kits include drive units, crossover, terminals and grille. (You make the box) Price each. £64.08
Effect 80, Rear Speaker Kits, per pair, ... £39.00

DRIVE UNITS.

BG30NG 30cm. (12") Woofer. High efficiency, (95db) for sealed or vented cabinets. Peak power handling 250watts. 8 ohm. **£69.61**

W200S 20cm. (8") Woofer. Long throw unit with rubber surround and extended rear pole to give no less than 20mm cone displacement. Ideal for compact sub-woofers such as ASM-W20. 8ohm. £36.68
NG8 Protective Metal Grille. £5.66

W100S 10cm (4") Low/Midrange. Coated paper cone, rubber surround, high temperature voice coil. Suitable as woofer in mini enclosures or midrange in 3-way systems. 4ohm. **£18.06**
NG4 Protective Metal Grille. **£3.20**

FRS8 8cm.(3.3") Fullrange driver. Linear frequency response between 200 and 20KHz. Large Magnet, 20mm voice coil and rubber surround. 8ohm. **£8.36**

DT2.5 10mm Polycarbonate Tweeter. High efficiency ferrofluid tweeter for use over 4,500Hz. Very good price/performance ratio. 8ohm. **£8.77**

SC5 10mm. Magnetically shielded Tweeter for use in surround sound centre speakers. 8ohm. £9.24

RHT12S High End Ribbon Tweeter. Superior double magnet construction gives an exceptionally low distortion and linear response from 4,000 to 30,000Hz. Cabinet cutout diameter 95mm. 8ohm. **£87.77**

DHT9AW-NG Hi-Tech, Hi-Fi, horn type tweeter. Frequency response from 3,500 to 38,000Hz and very good pulse response due to aluminium cone, Kapton voice coil and aluminium wire. Peak power handling 150W. 8ohm. **£31.99**

ASM100 and our 80 watt power amplifier are on demonstration at Wilmslow Audio's new premises at Broughton Astley near Leicester. Tel 01455 286603.

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Connect the linking wires from the power supply to each of the two power amp boards. Now fit the volume control and solder the two dual-screened wires to this and to the audio input sockets. The floating wires from the volume control connect to the amplifier boards.

Fit the speaker connectors to the rear of the case, making sure that the isolating bushes supplied fully isolate the sockets from the case and the sockets are secured tightly.

Wire up the speaker terminals with two short runs of either 49 or 72 strand speaker cable. The rib on the cable normally connects to the negative terminal, the other end of the ribbed wire going to the power supply board earth (Fig 2). The positive lead connects to the amplifier board output pin.

Now is the time to mount each of the two amplifier boards in turn. An isolating mica washer goes between the 2050 tab and the metal of the case; it conducts heat but not electricity. Apply heat sink compound to the device and to the mica. Fit the stand-off spacer to the case and carefully mate the board to the back panel. Push an M3 screw through from the outside. Fit the screw isolating bush (used with metal screws) and lightly tighten the securing nut. Once the board is secured on the back, gently push the board onto the stand-off. Finally, solder on all linking wires.

If you plan to use the optional heatsink, put some heat sink compound on the back and mount this to the rear of the case.

Once everything is fitted into the case, check all of the connections. Power up the unit and follow the instructions described earlier. Make final checks, connect everything up, put the 3.15A fuses into the internal fuse holders, switch on and try some music ●

HEATSINKING

Use as much heatsinking as possible to keep the chips cool. SGS Thomson recommend 60mm of a 4.2C/W rated profile, per chip. If the amplifier is not to be driven hard, then a thick plate of aluminium (12gauge) will conduct heat away adequately. If it isn't big enough the chip will simply shut down temporarily.

Maplin stock a range of heatsinks for TO220 packages that will allow higher dissipation, like their KL-100-1, price £3.99.

PARTS LISTING

AMPLIFIER BOARD PARTS

Resistors	3 Band Colours	4 Band Colours	
R1 100KΩ 1/4W Metal film	Black Brown Yellow	Black Brown Orange Brown	Qty 2
R2 680Ω 1/4W Metal film	Blue Grey Brown	Blue Grey Black Black	Qty 2
R3 22KΩ 1/4W Metal film	Red Red Orange	Red Red Red Brown	Qty 2
R4 2Ω2 1/4W Metal film	Red Red Gold		Qty 2
VR1 50KΩ Stereo Log Potentiometer			Qty 1
IC1 TDA2050			Qty 2

CAPACITORS

C1 100µF Electrolytic 25V	marked on body of component	Qty 2
C2 0.47µF Polyester 63V	marked on body of component	Qty 2
C3 0.1µF Polyester 63V	marked on body of component	Qty 2
C4 100µF Electrolytic 25V	marked on body of component	Qty 2
C5 0.1µF Polyester 63V	marked on body of component	Qty 2
C6 100µF Electrolytic 25V	marked on body of component	Qty 2

POWER SUPPLY PARTS

Bridge Rectifier	KBP02506	marked on body of component	Qty 1
C7 4700µF	Electrolytic 50V	marked on body of component	Qty 1
C8 4700µF	Electrolytic 50V	marked on body of component	Qty 1

MISC. COMPONENTS

MainsTransformer	Maplins DH63T	Qty 1
Case		Qty 1
Mains IEC socket with internal fuse holder		Qty 1
500mA 20mm Anti-surge fuse		Qty 1
3.15A 20mm Anti-surge fuses		Qty 2
Chassis mounted fuse holders		Qty 2
DPDT Rocker mains switch		Qty 1
Red 4mm Banana sockets		Qty 2
Black 4mm Banana sockets		Qty 2
Sleeved spade connectors		Qty 7
Assorted colours of wire, including 12" of 3A mains cable		
Veroboard		Qty 1
Veropins		Qty 1 pack
Plastic stand-off spacers		Qty 2
Assorted length M3 screws, nuts and washers		

Most of the components were sourced from Cricklewood Electronics London, with the exception of the potentiometer which is from an ALPS dealer and the transformer from Maplins.

MEASURED PERFORMANCE

Frequency response was very wide at 5Hz-150kHz. The upper limit is arguably too high; we noticed slew rate limiting occurring. However, CD cannot deliver signals above 21kHz, so this should not be a problem in practice. There is plenty of leeway here for feedback reduction.

Power output depends upon supply volts. What you have to bear in mind is that the tiny Pentawatt package must have heat drained from it fast if it is to deliver full power without running into thermal shut down. This means mounting the 2050 tabs direct onto very thick aluminium (e.g. heat sink) or copper (acting as a heat conductor to a sink).

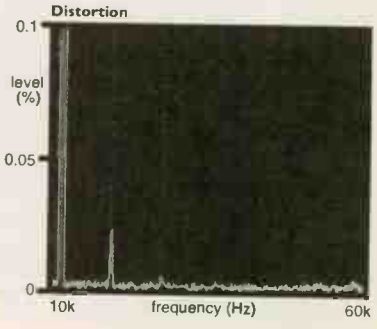
Distortion was low even at high frequencies, an impressive result. This really is a well worked out amplifier design. Distortion figures were low enough for some feedback reduction to be tolerable.

At 500mV for full output, sensitivity was high enough to suit most, if not all sources. Some budget cassette decks and tuners deliver just 300mV. Otherwise, most sources nowadays deliver 500mV-1V, CD delivering 2V of course. So this amp, as it stands, will match most sources. Sensitivity can be increased by reducing feedback.

There were no switch-on thumps and D.C. output offset measured a very low 1.7mV / 2.4mV, much like that of quality commercial amplifiers.

The TDA2050 offers a level of measured performance similar or better than everyday commercial designs. It's great for DIYers. NK

Power (8Ω)		32watts
Frequency response		5Hz-150kHz
Separation		85dB
Noise (CCIR)		-101dB
Sensitivity		500mV
dc offset		1.7 / 2.4mV
Distortion (8Ω)	1W	full o/p
1k	0.02%	0.04%
10k	0.01%	0.13%



AUDIO NOTE

AUDIO COMPONENTS PARTS & PRICELIST

GREAT NEWS!! AUDIO NOTE CAN NOW OFFER EXCLUSIVELY DESIGNED TRIODES FOR AUDIO AMPLIFIERS

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

Initially, we will only have a Super Linear version of the 300B available, dubbed the Audio Note AV300B SL it will be available in limited numbered samples at US$ 425.00 each either single or in matched pairs. We will follow this fairly quickly by a new very powerful power triode, the Audio Note AV929 SL with 120 watt dissipation for about 40 watt Class A in single-ended configuration, the most powerful and linear power triode available, at an expected price of US$ 750.00 each. it will help advance the case for SE operation despite the deplorable inefficiency of most modern loudspeakers! 1

For those of you who have already experiences the Vaic Valve VV30B and VV52B it will interest you to know that an Audio Note AV[illegible] SL and AV32B SL will be introduced when we have solved the problems of cathode crystallisation that the Vaic Valve VV30B and VV52B suffer from. The expected cost of the AV32B SL will be US$ 550.00 each and the AV52B SL US$ 650.00 each

All Audio Note triodes are available in Cobalt blue, Ruby Red, silver or gold glass on request at an additional US$ 125.00 per valve. delivery normally about 90 days as a special order

All Audio Note AV-type triodes will carry a real 2.000 hours or one year warranty, whichever comes first, we will be applying this warranty without discussion or delay. Specification sheets against stamped self addressed envelope with $ 3.00 or US$ 5.00 for copying. Available from all participating Audio Note distributors.

We have now settled in to our new factory unit and it is already turning out to be too small, such is life in a market where large parts of the specialist hifi industry is falling on harder and harder times (especially the high power, low efficiency crowd, what can I say, it could not happen to more deserving people!) Audio Note is finding that our market is growing ever more rapidly than we can reasonably deal with or supply, so as with most things good, you sometimes have to wait, which is not what any of us are particularly good at, having been brought up in a society that favours "instant gratification" above all else

In this society context, it is therefore very gratifying to see how many of you out there are educating yourselves to the benefits of "do-it-yourself" amplifiers, speakers etc., just another example of how society is changing, in this case definitely for the better, rather than passively buying or exchanging the latest greatest new "super amplifier" large numbers of our customers are now building better amplifiers themselves, learning to understand and appreciate the simple truth that the Single-Ended Triode output stage rules supreme where music reproduction is concerned

Participation is the name of the game and Audio Note is happy to provide a wide range of complete kits, output and mains transformers, chokes, paper in oil, aluminium, tin, copper or silver foil signal capacitors, Black Gate, Cerafine or standard electrolytic capacitors, tantalum, carbon and metal film resistors, silver wires, interstage and driver transformers, switches, balance controls, potentiometers, attenuators, chassis s and fittings for the quality oriented DIY er, whether you are beginner or hardened experimentor, male or female, we have the best (and not always most expensive) parts for most projects

I have commented on this before. It is most interesting to watch the scramble taking place amongst the existing valve amplifier manufacturers, most of whom have espoused the virtues of high power (and who still mainly make their living selling them, for how is a good question!) valve amplifiers, as many of them now embrace the low power single-ended triode amplifier as if they had never said anything to the opposite or even more interestingly, as one valve manufacturer, famous for the stainless steel chassis and very high power amplifiers says: "we only make SE amplifiers because people want them, we do not believe this is the best solution" interesting statement, is it not? This is what happens when all the manufacturers do is follow the lead of the market instead of taking the lead themselves, which is why the socalled "High End" (lovely American term for something that cannot reproduce music) but also quite and fortunately this is not an accusation that can be thrown at Audio Note, as we were first to introduce SE amplifiers into the worldwide commercial specialist market, and we still lead the way

The virtual flood of SE amplifiers that has appeared on the market over the past 3 years is no doubt confusing to most of you, it certainly seems to have bewildered most of the press and their reviewers, a great many of whom have yet to really understand what is happening, especially the fact that the grassroot support for SE triode amplifiers is so deep rooted and strong, seems to have bypassed the men in their ivory towers, most of who still believe that this is fad that will die away, as soon as the next great "achievement" of the traditional "High End" has been released. Oh, how little do they comprehend that the move away from the traditionally favoured high power, inefficient speaker technologies most of them have supported (and in many ways helped bring about, remember the rave reviews of the Apogee Scintilla or latest high power ML, ARC or Krell?) are now serious unwell and may well die over the next five years, already now the secondhand values of the products that contain these technologies are seriously low and still falling, consider that if any of you still one or more of these dinosaurs, unless off course you like collecting historical artifacts!

Attempts to make SE technology conform to current technological measurement dogma have sofar failed (thanks in no small part to many of you brave and persistent people out there, who have for yourselves experienced what happens to the sound of a good SE amplifier when you stick 24dB or more feedback across the circuit, an interesting, not to mention profoundly enlightening experience, that clearly demonstrates that low static distortion is not the "turn-all" that the transistor and high power brigade would have us all believe), and whilst attempts are being made to "upgrade" semi conductor circuitry with a Single-Ended flavour (how truly single-ended this type of circuitry really is, is highly questionable, since the transistor can only amplify one half of the waveform and needs a partner (in crime? it certainly sounds that way!) to wholly amplify the signal, semi conductor means what is says HALF, and that is what you get, half the signal, half the sound! Some people are satisfied with pseudo-solutions, the current "High End" is almost the rule rather than the exception

But as I said, this is all changing for the better, and if we can do anything to help, we certainly shall which is why we are introducing a number of new parts on the list, which will include the much-wanted very soon to be available, pre-amplifier kit, but equally importantly, a loudspeaker kit, sorry no parts for the cabinet, only the drawing, and the individual tested drivers, with either copper or silver voice coils, the speaker kit is modelled on our AN-E speakers, which are at about 93 - 94dB efficiency, with a very benign load behaviour, they are developed on SE triode amplifiers and are highly suited to the low power SE triode amplifiers that most of you have or are contemplating

The controversy surrounding what to use with the low power SE triode amplifiers is not solved with the speaker kit, so we have something else up our sleeve for later as well, watch this space!!

The increase in interest in all things single-ended, especially the triode non-feedback variety, is now so great that even the mainstream valve manufacturers are about to follow suit, so if you are looking for a single-ended product beware of the false prophet, who speaks of things he does not believe in, until it becomes financially expedient or downright necessary to have a single-ended amplifier in their product program. So whether you are building a single-ended amplifier yourself, or looking to buy a manufactured single-ended product, please remember that it was **AUDIO NOTE**, who, in the face of the usual industry hype about continual "progress", brought this technology to the attention of press, public and general audio industry alike, not because it would lend a quick buck to the purse, but because we firmly believe that it is a superior way of amplifying any music signal, and therefore deserves to be resurrected as the preferred technology for anyone who want the genuine aesthetics and beauty of real music reproduced in their home

Now that we stand on the boundary of this, the brave, new, world of 1920 s circuitry, we note with interest the number of manufacturers who have manufactured valve amplifiers for many years, but who only now have "discovered" the benefits of the single-ended stage, and who in the past 20 years or so have been the strongest proponents of the high power "high quality" valve amplifier, watch them, as they now, for commercial gain embrace the world of high loudspeaker efficiency and single-ended triode amplification and then draw your own conclusions about their sincerity, their commitment, market strategy and general competence in overall knowledge of the technology of Audio. **AUDIO NOTE** were the first and will remain the last word in sonic quality if you appreciate music properly reproduced

Another interesting aspect of the SE-revolution is the attempt to incorporate tenets of current technological dogma and beliefs into the SE performance envelope, we are already seeing low distortion SE, self-cancelling SE, transistor SE, soon to be joined by "high current SE" and "high power SE", don't be duped by these slogans, claims that you can get 56 watts SE Class A from one VT 4C/211 are utter nonsense, likewise 15 watts from a single 300B, these kinds of power specifications are no good unless they are accompanied by a distortion figure at the rated power. To give you an illustration of this, at 56 watts Class A SE a 211 has about 55% harmonic distortion, one has to question the sonic quality of any signal at that distortion level. If only the magazines spent as much time and energy on exposing the charlatans whose unjustifiable claims are pressed on an unsuspecting public, as they do trying to explain the benefits of DCC and whatever other new nonsense technology is being pressed into service as a music carrier, we would have a cleaner and more just market where being correct and honest would not be a marketing disadvantage

Back to the subject matter, all this talk about justice and correctness would be windy if not backed by action so inorder to enhance your ability to design and manufacture your own special version of any of the single-ended circuits being discussed, whether old or new, we will continue to expand on what is already the most extensive range of ultra high quality components that the discerning "do-it yourself" valve amplifier enthusiast can use to construct any single-ended or (shame on you!) push pull amplifier whether triode or pentode. All of these parts are used in various models of the manufactured line of the **AUDIO NOTE** amplifiers. These components include mostly specially made items like ceramic valve bases with either silver or gold plated pins, paper in oil aluminium foil signal capacitors, copper & silver foil signal capacitors, Black Gate graphite electrolytic capacitors, acid/chloride free silver solder, copper and silver wired audio output transformers, non-magnetic tantalum resistors, non-magnetic RCA and speaker terminals, valves and many other useful bits and pieces for upgrading old or constructing new valve amplifiers

AUDIO NOTE LOUDSPEAKER DRIVERS & KITS

We shall be offering the speaker drivers that we use in our own loudspeakers for general sale from now on, you can buy the drivers individually or together with a package that shows the crossover configuration and cabinet drawings, together with a pair of ports. We have spent far more time looking at the efficiency/speaker load issues in relationship to the low power SE triode amplifiers than anyone else, and I believe that our solutions are both original and effective, unfortunately nature is as cruel as she is kind, when it comes to efficiency, bandwidth, size and price

We offer our drive units with both copper and silver speechcoils, the measured difference is negligible but the difference in sound between the two is very great indeed, which again begs the question what it is we measure in relation to what we hear

ANYWAY! Here we go

Order Code	Driver Type	Crossover Range/Cone Material	Price Ex UK Vat
SPKR-031	1 inch dome tweeter copper coil	2 - 3 KHz/impregnated cloth	31.75
SPKR-032	1 inch dome tweeter silver coil	2 - 3 KHz/impregnated cloth	51.35
SPKR-082	8 inch woofer, copper coil	up to 3 KHz/Paper, coated centre	47.75
SPKR-088	8 inch woofer, silver coil	up to 3 KHz/Paper, coated centre	96.75

The above prices are per single driver

All our speaker cabinets are made from different materials, front baffle is either plywood or soft chipboard, the wrap is dense MDF and the back is again either plywood or medium chipboard, no damping materials are applied to any part of the cabinet, whilst we use some bracing to distribute the cabinet resonances. Do I hear cries of "cabinet colouration"?? Despite what you might think the guitar like structure of our cabinets greatly enhances efficiency, dynamics and sparkle

We also use only a minimal amount of wadding, and it has to be a specific type, preferably well cleaned sheeps wool, positioning is crucial and here experimentation is recommended. If you build the speakers yourself

We will sell you a basic kit of crossover parts, a cabinet drawing and a port tube, and then you can experiment with the cabinet itself to your hearts delight, alternatively we offer a complete tested kit of drivers and crossover, a cabinet drawing and the port tube, which, if you follow the directions carefully will insure a genuine Audio Note speaker

Order Code	Description	Price Ex UK Vat
SPKR-KIT-01	Kit of crossover parts, drawings, descriptions and port tube	100.00
SPKR-KIT-02	Tested and calibrated crossover with matched COPPER COIL drivers drawings, description, port tube	375.00

The price is for two speakers. If anyone wants mono only then halve the price, the speakers in question are similar to the AN-E/D which are close to be dB efficient in a cabinet 80x38x28centimeters, and are designed to stand close to rear and side walls

We will not be offering silver versions of these kits, as the time it takes to test, match and calibrate the crossover to the drivers is so great and the final testing is done in situ in the cabinet, all of which makes it impossible to offer a comparable quality to the AN-E/SE Silver speakers we sell finished, so do not ask!

Work is going on on a full range dual cone driver for quarter or half wave horn applications, so keep your eyes out for future announcements

ORDERING AUDIO NOTE COMPONENTS OR KITS

Apart from the kits all the prices in this list are excluding UK Vat of 17.50%, which, if you live inside the EEC, UK Vat will be added to your purchase, after the addition of postage and packing costs. If you live outside the EEC the price you see is the price you pay

We are introducing a completely computerised system as from September 1. 1996. (It remains to be seen whether this is a benefit or not, I personally have my doubts!), which should in theory reduce the lead times, minimise mistakes and allow us to quote prices to you quickly over the phone, plus make stock control more consistent. To help us help yourself we have now incorporated a product ordering code no. which we strongly recommend you use for all future orders, not using it will cause delays in processing your order, especially in a few months time when the system is fully operational

We accept VISA, Mastercard, Access, Diners, and Amex, to pay this way, we will need your address card no. with start and expiry dates, please note that we are no longer allowed to ship goods to an address that is different from the cardholders address, this is to protect you from fraudulent use of your card etc. You can also pay by bankers draft, Euro cheque or cheques drawn on a UK bank account.

Delivery is normally about 14 days from receipt of cleared funds, but please allow up to 60 days for some items, if not stock at the time or order

ITEMS SOUGHT

If any of you reading this have possession of any books which contain information relevant to the subject of Audio Design and which would be useful to share with others, please let us know either by fax or telephone. there is an award of £20.00 (payable in valves or other bits, postfree) to anybody who sends us a book which contains useful information about valve amplifier design or theory

Likewise, I am looking for a number of old valves to experiment with, so if you have any PX4 s PX25 s, DA30 s, ADI s, or any of the old triodes, I will be happy to buy or swap at a good price, likewise anyone of you know where to find old studio tape recorders, STUDER, TELEFUNKEN or AMPEREX or the like, record cutting, plating, processing or pressing equipment, or have books or information about building microphones, recording technique, LP-manufacture, then it will all be gratefully received. AUDIO NOTE has the intention over the next 2 - 3 years to set up recording and record manufacture and whilst we already have quite a lot of information, much more is needed

CIRCUITS, VALVEDATA & BASIC TECHNICAL INFORMATION

If you would like some suggestions which to base a future project around, then we shall be happy to provide you with a circuit pack containing good circuits like ONGAKU, KEGON/KASSAI, NEIRO, GAKU ON plus several other power amplifier circuits and the M7Tube pre-amplifier, which is the best pre-amplifier circuit we have come across. Just send a stamped self addressed A4-size envelope, together with 6.00 pounds in small denomination UK stamps, or if you live outside the UK US$ 15.00 in $ bills will do, please do not send Bankers Drafts in US$, International Response Coupons or International money orders, as they cost more to cash than their value.

We have a large number of requests for the circuits of the AUDIO NOTE UK-made amplifiers, like OTO Phono SE, MEISHU, MEISHU AURO etc. and since we (unlike the majority of our talented competitors) do not have any secrets in this department, and are only too pleased to help extend the envelope of knowledge in this much maligned field, we shall be happy to send you or any existing or prospective constructor one or more circuit diagrams they cost £ 5.00 each, or you can buy for example all phono-integrated amplifiers, for £ 30.00 ($ 50.00), or all Line integrated amplifiers for £ 25.00, all pre-amplifiers for £ 20.00 ($ 35.00), or simply a complete circuit pack for £ 50.00 ($ 80.00). All can be paid either by credit card, cash, bankers draft or cheque drawn on a UK bank, the cost includes postage

We can also supply a set of data sheets for the most commonly used valves, ECC82, ECC88/6922, 1 2AY7/6072A 7025/12AX7WA/ECC83, 6SN7, 300B, 211/VT4C, 845, EL84/6CA7, 2A3, 6X4, 5U4G, GZ34/5AR4, EL84/6BQ5, 6V6GT, 6L6G, 5881/6L6WGC/KT88. Again send a stamped self addressed A4 envelope together with £ 4.00 in small denomination stamps or if outside the UK another US$ 15.00 will suffice

Since nothing really exists which gives a reasonable background to the subject of valve amplifier circuit design, Guy Adams and I have written and assembled a number of articles and extracts from old books which give some background to the subject, do not expect to become an instant expert, but it will serve as a useful reference, for the beginner as well as the more advanced, we have expanded this info-pack to include even more useful information, so if you have already bought the old pack, just send £ 2.00 or US$ 5.00. For the full pack a small charge is required, this time £ 7.00, in small denomination stamps with a stamped self addressed envelope, or outside the UK, please send US$ 25.00

We do accept a UK cheque or bankers draft in Pound Sterling for the above charges as well, just convert the US$ amounts to Sterling at $ 1.70 to the Pound, after you have rounded up to nearest $ 5.00

[illegible] PRACTICES

If you are seriously interested in the subject of valve amplifier design, without the usual preconceived notions of what is "good" amplifier design and technology (the traditional view, which has brought us the blessings of the transistor amplifier, has obviously disqualified itself quite monumentally!), then SOUND PRACTICES is the magazine to read, here you will find articles about design parameters, DIY articles for amplifiers and speakers, reviews of new and old, in other words the very subjects that none of the selfserving, advertising led traditional press will touch as they do not enhance the business of their normal advertisers. You can buy SOUND PRACTICES from us at £ 6.00 per copy (there are currently 11 issues available) or by subscription from SOUND PRACTICES P.O. Box 180562, Austin, TX 78718, USA. A regular modern world bargain, and there are practically none of those in Audio today. With enough subscription support SOUND PRACTICES may just bring about the "sound practices" that the hifi industry has abandoned for so long. So get a subscription!! Our friend Joe Roberts is now able to take VISA and MC, so convenience is at hand at long last! Call or preferably fax Joe on 512 339 6229 with your card no. if you want a direct subscription

By the time you read this SOUND PRACTICES issue 12 will be HERE, so this should keep you off the street over the next couple of weekends! Buy a copy for £ 5.00 + postage (or self addressed envelope with order if you live in the UK), contains the following articles: Audio Note ANKORU parallel 845SE by designer Andy Grove, Lowther, Another Opinion by Marc Wouters, Tube User's Guide by Ludek Sibley, Meet the Tube: The 50, Herb Reichert on Reviewing Perspectives (a very good criticism of the current reviewing and measuring practices) and much much more!! Much good and informative reading as usual, again £ 5.00 + an A4 size, stamped self addressed envelope if you live in the UK or US$ 10.00 and a self addressed envelope if you live abroad

VACUUM TUBE VALLEY

Now I bet you have never heard of this one before, but demonstrating the strength of the revival in everything that has to do with valves, whether single-ended, push-pull or just old and good, Vacuum Tube Valley is a quarterly, high quality print and read, each issue focuses on a US brand of yesteryear in the current issue (Issue 2 Volume One) Heathkit is dealt with extensively. There is a long article by Eric Barbour about the EL34 (not a favourite of mine any longer, but a very popular valve nonetheless and an interesting overview of available and vintage types. The Audio Test Bench looks at tests and equipment for DIY amplification building, very practical and useful. Cathode bias, a great article about how to bias the VV52B and biasing and tubelife in general. Tube matching (valve matching to us Brits!) and much more. It is nice to see a magazine that takes a historical perspective. Well worth a read, available from us at £ 6.50 a copy or directly from VTV 1085, E. Duane Ave. Suite 186, Sunnyvale CA 94086, USA, $ 35.00 for foreign subscribers

4 issues now available

POSITIVE FEEDBACK

This is one type of feedback that we are not entirely against! Positive Feedback is the club magazine for the Oregon Triode Society with aspirations towards greatness, not unlike the great underground magazines of the 1970's. It is a quarterly publication of very controversial commentary by in-house writers, members, as well as various industry doyens on the subjects of music, audio, technology and the quest for musical satisfaction. I for one, think it is an excellent read and provides a good alternative view to most of the established press, which tends to view the world in the context of what new products is available right now, without giving much perspective backwards. We have several back issues available of Positive Feedback and the latest issue is just off the press and all are available at £ 7.00 per issue. Yours truly is a regular contributor to PF, what better reason to subscribe?

LISTENER MAGAZINE

Here is a review based music and hifi magazine that I really enjoy reading (together with R and Audio Adventure), the music reviews are amongst the very best in the business, the equipment reviews not far behind. This is worthwhile and exciting addition to the available opinions on music and equipment and at only £ 4.00 per copy a good investment. The Listener is a pocket sized quarterly publication. 4 issues are available at the moment

THE AUDIO ADVENTURE

Another good alternative to the established magazines, still developing and not afraid to take a controversial stance, has two of my favourite writers on their staff, Myles Astor and Dayna & the Hill Harpy, so get a copy and see for yourself!

COMPLETE KITS

KIT ONE 300B single-ended, 8 watts Class A, stereo chassis, cost £ 799.00 incl. Vat. Order Code AN-KIT-001

KIT TWO 6550 single-ended, 15 watts Class A, on a stereo chassis, cost £ 899.00 incl. Vat. Order Code AN-KIT-002

KIT THREE 300B parallel single-ended, mono chassis, 16/17 watts Class A, cost £ 1.550.00 incl Vat. Order Code AN-KIT-003

KIT FOUR 6V6 push pull, 10 watts Class A, stereo chassis, cost £ 249.00 incl. Vat. Order Code AN-KIT-004

KIT FIVE will be respecified, it has proven impossible to release a 211/845 kit due to the high voltage problems

KIT SIX 300B single-ended 7/8 watts Class A, stereo chassis, expected cost £ 449.00 excluding valves and Vat, this will be our "entryscale" or "gateway" to single-ended triode bliss or rock and roll, if you prefer. Expected available October 1996

If you are in doubt as to whether a kit project is suitable for you, we suggest you spend £ 10.00 on buying the instructions for the kit ONE, single 300B amplifier, this will give you a good idea whether a kit project is for you. If you decide to buy a kit then the £ 10.00 will be refunded against the cost of the kit. As the other kits become available their instruction manuals will also be available at £ 10.00 each. We have the Kit One instructions available in English, German and Italian, please specify when ordering

AUDIO NOTE OUTPUT TRANSFORMERS

We are in the process of building up four separate ranges of Audio Note output transformers, inorder to offer the best possible outputs at different pricepoints, they will fall into four categories

A.) Economy range, where the price/quality relationship is carefully calculated to ensure audio quality in a compact package. Initially we will only be offering 3 single-ended output transformers in this range push-pull outputs are under development as well

B.) Mid-price range, which are the output transformers already on offer, we have made a couple of additions to this range, since the last list

C.) High Quality range, this will be a range of double C-core outputs for single-ended circuits exclusively, no push-pull outputs will be offered, unless demand requires it. Again 3 offerings initially

D.) Super High Quality range, all-silver wired outputs of the best possibly quality, when I say best possible, I do not mean to say that these silver outputs will be as good as the silver output transformers handwound by Audio Note in Japan, they won't. But then again they do not carry the price tag either!

The quality criteria for group A are 20Hz to 20KHz, 1 to 1.5dB, they are E cored with silicon steel laminations and are supplied with frames and solder tags, which will allow good audio quality at the cost. The main cost saving being the use of a smaller core, specified to the exact power level required rather than overspecifying by 50 or 100%, as we do on Group B, the winding quality and copper wire is the same

Group B are typically 20Hz to 40KHz minus 1.5dB, E cored with high quality silicon steel laminations, wound with oxygen-free copper wire and supplied with either bell-ends or frames always with flying leads

Group C are typically 1.6Hz to 50KHz minus 1.0dB, stripwound double C-cores made from the best available silicon steel lamination, these outputs will compare more than favourably with the best available types from days gone by and from other current sources like Partridge, Tango, Tamura etc.

Group D use Audio Note silver wire, need I say more??

Specifications

PP = Push-Pull, PPP = Parallel Push-Pull, SE = Single-ended, PSE = Single-ended Parallel, UL signifies 43% ultralinear taps, as a general rule we do not condone the use of UL-taps, as we consider these detriment to sound quality. * * Dynaco replacement

All primary impedances are calculated for Class A operation, with the main consideration given to maximum dynamic power transfer ability and minimum distortion, rather than meaningless steady state sine- or squarewave conditions.

All our single-ended output transformers are airgapped, and the maximum standing current allowed before saturation is shown in column 5.

All our output transformers are tested to insulation levels of minimum 3.000 volts, all 211/845 outputs are insulated to 5kv flash, every transformer is tested to this level of insulation.

We generally overspecify our transformers by 60% power in Push-Pull (which means that a transformer stated as 25 watts will allow about 35-38 watt peaks, our single-ended outputs are generally over specified by 100%, which means that they will instantaneously allow peaks of double the given maximum power through undistorted, this is necessary due to the better clipping behaviour of the single-ended stage

We do not give any further technical information on our output transformers, as we do not wish to take part in technical competitions, our products are designed to criteria which are and will be understood once they are listened to!

In addition to the output transformers offered below, we offer a design service, where we can supply almost any requirement for wideband transformers, whether for microphones, moving coil cartridges, line input, phase splitter, interstages, driver or power output, we design and manufacture prototypes in-house. The cost for the paper design is £ 200.00, prototype cost is calculated on a per case basis. We can also produce production quantities. Sizes are given as Width/Height/Depth, where depth is the depth of the coil itself and width is the length of the core

AUDIO NOTE AUDIO QUALITY OUTPUT TRANSFORMERS

Group A

Single-ended Outputs

Order Code	Recommended Valves	Max Cl. A Power	Primary/Secondary Impedances	Size	Max Current	Price Ex UK Vat
TRANS-144	300B/2A3/6B4G	15 w	2K5 - 4/8 Ohms	80x67x68mm	90mA SE	44.00
[illegible]	801A/VT62/845	20 w	6K - 4/8 Ohms		100mA SE	73.00

Group B

Order Code	Recommended Valves	Max Cl. A Power	Primary-Secondary Impedances	Size	Maximum Current	Price Ex UK Vat
TRANS-150	EL84/ECL86/6V6	20w	2K8 - 4/8Ohms	117x80x90mm	110mA PSE	67.00
TRANS-152	300B/2A3/6B4G	25 w	2K5 - 4/8 Ohms	117x80x90mm	80mA SE	81.00
TRANS-130	EL34/6CA7	30w	1K5 - 4/8Ohms	115x[illegible]mm	180mA PSE	113.00
TRANS-115	2A3/6B4G	30w	1K25-4/8Ohms	98x82x95mm	120mA PSE	113.00
TRANS-135	5881/KT66	30w	2K0 - 4/8Ohms	118x80x95mm	140mA PSE	106.00
TRANS-205	211/VT4C/845	50w	10K - 4/8Ohms	112x134x150mm	150mA SE	124.00
TRANS-120	300B	50w	1K25 - 4/8Ohms	136x115x125mm	180mA PSE	151.00
TRANS-140	845	50w	2K5 - 4/8Ohms	137x114x130mm	180mA PSE	172.00
TRANS-180	211/VT4C	75 w	6K - 4/8 Ohms	137x115x145 mm	240mA PSE	237.00
TRANS-153	EL34/6550/KT88	20w	3K - 4/8Ohms	117x80x80mm	130mA SE	104.00
TRANS-188	300B/2A3/6B4G	25w	2K5-4/8/16Ohms	117x80x90mm	90mA SE	102.50
TRANS-155	6L6G	20w	3K - 4/8Ohms	118x80x80mm	140mA SE	107.00
NEW SE Product						
TRANS-138	6550/KT88	60 w	2K3-4/8 Ohms		1[illegible] PSE	123.00

Group B

Push-Pull Circuits

Order Code	Recommended Valves	Max Cl. A Power	Primary-Secondary Impedances	Size	Maximum Current	Price Ex UK Vat
TRANS-200	EL84/ECL86/6V6	15 w	8K-4/8 Ohms	80x67x80 mm	PP	42.00
TRANS-185	EL34/6L6G/5881	25 w	6K-4/8 Ohms	88x72x80 mm	PP	58.00
TRANS-175	2A3/6B4G/300B	30 w	5K-4/8 Ohms	88x75x80 mm	PP	63.00
TRANS-190	KT88/6550	50 w	6K6 -4/8 Ohms	108x81x80 mm	PP	73.00
TRANS-160	EL34/KT88/5881	50 w	3K -4/8 Ohms	98x82x83 mm	PPP	74.00
TRANS-195	845	80 w	6K6 -4/8 Ohms	108x81x80 mm	PP	114.00
TRANS-170	KT88/6550	60w	4K3-4/8/16Ohms	125x100x80mm	UL PP	*111.00
TRANS-137	KT88/6550	100w	2K2-4/8/16Ohms	130x47x80mm	UL PP/PPP	*134.00

Group C

Single-ended only

Order Code	Recommended Valves	Max Cl. A Power	Primary-Secondary Impedances	Size	Maximum Current	Price Ex UK Vat
TRANS-300	300B/2A3/6B4G	25 w	2k5 - 4/8/16Ohms		90 mA SE	300.00
TRANS-310	211/VT4-C/845	50w	10K 4/8/16Ohms	165x140x140mm	180mA SE	410.00
TRANS-305	300B	50 w	1K25-4/8/16Ohms	1 60x1 0x1 30 mm	180 mA PSE	300.00

Group D

Pure Silver Wired Outputs

Order Code	Recommended Valves	Max Cl. A Power	Primary-Secondary Impedances	Size	Maximum Current	Price Ex UK Vat
TRANS-400	300B/2A3/6B4G	25 w	2K5-4/8 Ohms	117x80x90 mm	90mA SE	1.645.00
TRANS-410	211/VT4-C/845	50w	10K 4/8Ohms	112x134x150mm	150mA SE	1.975.00

The **AUDIO NOTE** silver wired outputs listed here are designed and made in the UK, we can supply the **AUDIO NOTE** Japan manufactured outputs for the **ONGAKU**, **KASSAI**, **GAKU-ON** or the **KEGON**, but they are exceptionally expensive, as you would expect from items that take upwards from 100 hours each to make, for example an output transformer for an **ONGAKU** costs £ 16.500.00

AUDIO NOTE CHOKES & INDUCTORS

Order Code	Value	Size	Price Ex. UK Vat
CHOKE 100	[illegible]H/400mA		18.00
CHOKE 120	3H/100mA		14.00
CHOKE 125	3H/[illegible]mA for ONGAKU/Cs		24.00
CHOKE 140	5H/150mA		21.00
CHOKE 145	5H/400mA		31.00
CHOKE 160	10H/125mA	63x74x76 mm	26.00
CHOKE 165	10H/200mA	98x65x63 mm	33.00
CHOKE 180	20H/50Ma	68x50x58 mm	24.00

Other values can be supplied to order, ask for quote

AUDIO NOTE MAINS TRANSFORMERS

This range relates to our finished products, mains transformers are notoriously difficult items to offer as the number of permutations of HT and Heater voltages are almost endless. We have added mainstransformers for making replicas of the KASSAI and ONGAKU as there has been considerable call for these, likewise we are preparing mainstransformers for the WE91 described in Sound Practices issue 1, we shall continue to expand the range as opportunities and our experience with your requirements improve

Order Code	Primary Voltages	Secondary HT Windings	Secondary Heater Windings	Price Ex. UK Vat
TRANS-020	0v/100v/110v/120v 0v/220v/230v/240v	0v-220v at 200mA	0v-12.6v at 1 Amp 3.15v-0v-3.15v at 4 Amp	34.00
TRANS-080	120v/110v/100v/0v 0v/100v/110v/120v	0v - 230v at 0.4 Amp	0v-12.6v at 1 A 3.15v - 3.15v at 4 Amp	41.00
TRANS-010	120v/110v/100v/0v 100v/110v/120v	300v- 0v- 300v at 60mA	12.6v - 0v at 1.5A 6.3v - 0v at 800mA, for M7Tube Pre-amp with 60H choke input filter	46.00
TRANS-085	0v/100v/110v/120v 0v/100v/110v/120v	0v - 290v at 40mA	12.6v-0v at 1.5A 0v - 6.3v at 300mA	26.00
TRANS-088	0v/100v/110v/120v 0v/100v/110v/120v	310v-244v-0v-244v-310v at 320mA	3.15v -0v-3.15v at 4.5 Amp 12.6v at 1.5 Amp	72.50
TRANS-090	120v/110v/100v/0v 0v/100v/110v/120v	300v-0v-300v at 200 mA 170v at 60mA	3.15v-0v-3.15v at 1.2Amp 7v at 3A, 7v at 3A, 5v at 2A	86.75
TRANS-030	120v/110v/100v/0v 100v/110v/120v	425v-0v-425v at 220mA	3.15v-0v-3.15v at 2.5A, 7.0v-0v at 2A, 7.0v-0v at 2A, 5.0v-0v at 3A, 3.15v-0v-3.15v at 750mA, for KIT ONE & KIT THREE MONO channel, 300B output valves	95.00
TRANS-080	120v/110v/100v/0v 100v/110v/120v	300v-0v-300v at 200mA	170-0v at 60mA, 7.0v-0v at 3A, 7.0- 0v at 3A, 5v - 0v at 2A, 3.15v-0v-3.15v at 1.2A, For KASSAI replica, 300B output valves	107.00
TRANS-081	120v/110v/100v/0v 100v/110v/120v	300v-0v/300v at 200mA	150v-0v at 150mA, 10v-0v 3.25A, 10v-0v at 3.25A, 5v- 0v at 3A, 5v - 0v at 3A, 5v - 0v at 3A, 5v - 0v at 3A, 6.3v - 0-6.3v at 1.25A, For ONGAKU replica, output 211 valves	137.00

We also have a mainstransformer/choke kit for the WE91 power amplifier as shown in Sound Practices this combined with our single-ended output transformers with 3KOhm primary impedance, will make a very fine replica of this classic amplifier total cost £ 420.40 per set. We now also have the facility to make any mainstransformer to your specification, as long as you order minimum 2 pcs, they can be supplied with soldertags, flylog leads, frames or bell-ends. Ask for quote.

On a more general note, it is important to understand the specialised nature of the design and manufacture of transformers for audio equipment, in most industrial applications the main criteria are cost, weight or longevity, an audio mainstransformer also have to have good regulation under load, must run cold and generate no mechanical noise or vibration, produce no excessive stray magnetic fields etc. etc. a pretty tall order, when one considers that the cost also has to be reasonable. So no matter where you order your mains transformer remember that it should conform to the above criteria so specify this when you order. As a general rule we do not recommend potted transformers, as all our listening tests have shown these to sound less clear, than unpotted equivalents! I know it does not look as good, but to us sound quality is everything

AUDIO NOTE DRIVER, INTERSTAGE & PRE-AMPLIFIER OUTPUT TRANSFORMERS

Here is a product group that you do not see advertised every day! As usual we start small with the intention to grow quickly

On offer initially is a pre-amplifier output transformer, it should be usable in my friend Diego Nardi's WOT (With Output Transformer) pre-amplifier from Sound Practices, we shall be using it in the forthcoming M3 pre-amplifier. Silver wired versions with nickel cores are under preparation, as are more interstage and input transformers

Type	Order Code	Primary Impedance	Secondary Impedance	Standing Current (where applies)	Suggested valves	UK Retail Price Ex. Vat
Pre-amplifier output	TRANS-011	10.000 Ohms CT	600 Ohms CT	30 mA for Paralleled operation	5687, 6SN7, E182CC, 12BH7	98.00
Driver transformer	TRANS-012	10KOhm SE Centre tapped	10KOhm	60mA	2A3, 300B	117.00

AUDIO NOTE PAPER IN OIL SIGNAL CAPACITORS

These handmade signal capacitors are sonically superior to any of the plastic or other paper types we have come across. If you have never experienced the difference that a really good paper/oil capacitor can make in a valve amplifier, then you really should try. Our specially made paper/oil caps have a life, colour, lack of harshness and evenness of dynamic behaviour across the frequency range, which is guaranteed to brighten up your day! Recommended as replacements in old and new valve amplifiers alike (and even in the odd transistor amplifier), and essential for DIY projects. In line with environmental standards, all **AUDIO NOTE** paper in oil capacitors contain only non-toxic, biodegradable vegetable oil the paper is a specially treated and impregnated by a method that enhances longevity and sound quality to ensure optimum performance all round. As you will see, we are slowly incorporating solid 99.99% pure silver leadouts on this range of paper in oil capacitors as well, in common with the copper and silver foil types. There are several new values available, including the 2.2mF/50 volt caps made for speaker crossovers and the 0.56mF/200 volt suitable for solid state amps, we have also added some values suitable for RIAA equalising networks, and the odd feedback loop! Unfortunately new EEC environmental laws are pushing up the cost of manufacturing all the paper in oil capacitors, and we have had to increase the prices by between 20% and 90% to compensate for this, in a few cases more than that, the smaller values are hardest hit as you would expect when you levy a standard charge per capacitor, due to necessary but not inexpensive "clean environment" requirements

I am all for protecting the environment and not just against bad sounding amplifiers (!), so we have to live with the increases, however regardless of these, the Audio Note paper in oil capacitors remain the premium choice for single-ended triode amplification

To bridge the price and performance gap between the aluminium foil and copper foil capacitors we are introducing a range of tin foil paper in oil capacitors, available from now

Order Code	Value	Maximum DC Voltage	Size	Price Ex. UK Vat
CAP-6004	2.2mF	50 volt	21x9 mm	11.85
CAP-6804	0.1 mF	200 volt	32x11 mm	9.87
CAP-6808	0.56mF	200 volt	25x30 mm	1[illegible].83
CAP-6110	0.001mF	400 volt silver leadoutwires	21x9 mm	8.14
CAP-6130	0.0028mF	400 volt silver leadoutwires	21x9 mm	8.14
CAP-61[illegible]	0.0082mF	400 volt silver leadoutwires	21x9 mm	8.14
CAP-6210	0.01mF	400 volt silver leadoutwires	21x9 mm	8.14
CAP-6230	0.015mF	400 volt	21x9 mm	8.14
CAP-6255	0.022mF	400 volt silver leadoutwires	35x10 mm	8.14
CAP-6268	0.033mF	400 volt silver leadoutwires	20x11 mm	8.14
CAP-6280	0.047mF	400 volt silver leadoutwires	32x11 mm	8.14
CAP-6737	0.082mF	400 volt	33x14 mm	8.14
CAP-6806	0.1mF	400 volt silver leadoutwires	33x14 mm	8.14
CAP-6820	0.1[illegible]	400 volt	33x14 mm	8.14
CAP-6830	0.15mF	400 volt silver leadoutwires	34x16 mm	8.14
CAP-6840	0.18mF	400 volt silver leadoutwires	32x18 mm	8.14
CAP-6852	0.22mF	400 volt silver leadoutwires	35x18 mm	8.14
CAP-6860	0.33mF	400 volt	43x18 mm	8.14
CAP-6862	0.[illegible]mF	400 volt silver leadoutwires	43x18 mm	10.85
CAP-6828	0.47mF	400 volt silver leadout wires	38x25 mm	11.75
CAP-6842	0.68mF	400 volt silver leadoutwires	53x22 mm	13.26
CAP-6252	1mF	400 volt silver leadoutwires	53x24 mm	14.85
CAP-6870	1.4mF	400 volt	78x24 mm	16.80
CAP-6008	0.00018mF	630 volt	17x9 mm	8.94
CAP-6020	0.0004mF	630 volt	20x9 mm	8.94
CAP-6181	0.[illegible]	630 volt	20x9 mm	8.94
CAP-6120	0.0015mF	630 volt	17x9 mm	8.94
CAP-6150	0.0047mF	630 volt	20x9 mm	8.94
CAP-6220	0.012mF	630 volt	21x11 mm	8.94
CAP-6235	0.015mF	630 volt	21x11 mm	8.94
CAP-6257	0.022mF	630 volt silver leadoutwires	20x10 mm	8.94
CAP-6270	0.033mF	630 volt	32x11 mm	8.94
CAP-6275	0.039mF	630 volt	32x11 mm	8.94
CAP-6283	0.047mF	630 volt	33x14 mm	8.94
CAP-6288	0.056mF	630 volt	33x15 mm	8.94
CAP-6290	0.058mF	630 volt	33x14 mm	8.94
CAP-6295	0.068mF	630 volt	33x14 mm	8.94
CAP-6705	0.068mF	630 volt	33x18 mm	8.94
CAP-6715	0.071mF	630 volt	33x18 mm	8.94
CAP-6720	0.072mF	630 volt	33x18 mm	8.94
CAP-6722	0.073mF	630 volt	33x16 mm	8.94
CAP-6724	0.074mF	630 volt	33x16 mm	8.94
CAP-6725	0.075mF	630 volt	33x16 mm	8.94
CAP-6730	0.078mF	630 volt	33x18 mm	8.94
CAP-6741	0.082mF	630 volt	33x18 mm	8.94
CAP-6808	0.1mF	630 volt	34x16 mm	8.94
CAP-6832	0.15mF	630 volt silver leadoutwires	42x18 mm	8.94
CAP-6840	0.18mF	630 volt	43x18 mm	8.94
CAP-6854	0.22mF	630 volt	52x8 mm	7.75
CAP-6858	0.22mF	630 volt silver leadoutwires	52x8 mm	10.85
CAP-6875	0.27mF	630 volt	53x22 mm	10.85
CAP-6882	0.33mF	630 volt	52x22 mm	13.85
CAP-6880	0.36mF	630 volt	43x25 mm	10.85
CAP-6900	0.38mF	630 volt	52x26 mm	10.85
CAP-6922	0.47mF	630 volt silver leadoutwires	52x26 mm	11.85
CAP-6944	0.68mF	630 volt silver leadoutwires	71x25 mm	13.85
CAP-6980	1 mF	630 volt silver leadoutwires	70x30 mm	16.75
CAP-6245	0.018mF	1000 volt	32x11 mm	11.85
CAP-6864	0.22mF	1000 volt	56x28 mm	13.85
CAP-6906	0.3[illegible]mF	1000 volt	61x26 mm	15.85
CAP-6945	0.68mF	1000 volt	52x32 mm	17.15
CAP-6985	1.0mF	1000 volt	72x40 mm	21.25
CAP-6858	0.22mF	1600 volt	60x28 mm	18.45
CAP-6860	0.22mF	2000 volt	70x28 mm	18.75
CAP-7610	0.1mF	4000 volt	Square can with porcelain insulators 45x45x[illegible]mm high	28.75

All **AUDIO NOTE** paper in oil signal capacitors are axial type. We are continually widening the range and are preparing to introduce more choice in the range of very small picofarad value paper in oil capacitors at the moment in addition to the above

AUDIO NOTE PAPER IN OIL TIN FOIL SIGNAL CAPACITORS

To compliment the range of paper/oil signal capacitors we will be offering an increasing range of tin foil values, starting with the values listed below, I feel that the tin foil is better than alu-foil for most applications, and I recommend that you try them. All Audio Note tin foil signal capacitors have pure 99.99% silver leadout wires

Order Code	Value	Maximum DC Voltage	Size	Price Ex. UK Vat
CAP 5001	0.01mF	630volt	21x10mm	11.85
CAP-5068	0.047mF	630 volt	33x14 mm	11.85
CAP-5080	0.1mF	630 volt	34x18 mm	12.95
CAP-5120	0.15mF	630 volt	42x18 mm	12.95
CAP-5150	0.22mF	630 volt	52x20 mm	14.38
CAP 5200	0.47mF	630 volt	52x26 mm	18.75

AUDIO NOTE PAPER IN OIL COPPER & SILVER FOIL SIGNAL CAPACITORS

We are continuing to develop the copper and silver foil ranges of paper in oil capacitors where instead of using aluminium foil as in the above paper caps. In the first range we use an oxygen free copper foil with 99.99% pure solid silver lead out wires. These copper/foil paper signal capacitors are considerably better than both the the standard offerings and the tin foils. Secondly to "bridge" the price-quality -gap between the more standard paper/oil caps and the Japanese handmade Silver foil signal capacitors, we will be offering our own 99.99% pure silver foil signal capacitors, which are pretty staggering in quality even if I have to say this myself the silver foil caps also have solid silver lead-out wires. To start with there will be a few values/voltages of each available and we shall expand as fast as we can to cover all the popular values

AUDIO NOTE COPPER FOIL PAPER IN OIL CAPACITORS

Order Code	Value	Maximum DC Voltage	Size	Price Ex. UK Vat
[illegible]	[illegible]001mF	630 volt	22x9 mm	15.85
CAP-7610	0.0028mF	630 volt	23x9 mm	15.85
CAP-7620	[illegible]0082mF	630 volt	22x9 mm	15.55
CAP-7630	0.01mF	630 volt	23x9 mm	16.15
CAP 7640	0.022mF	630 volt	30x9 mm	17.75
CAP 7660	[illegible]047mF	630 volt	28x16 mm	19.35
CAP 7660	0.1 mF	630 volt	33x22 mm	20.85
CAP-7670	[illegible]1.5mF	630 volt	26x22 mm	22.15
CAP 7680	0.22mF	630 volt	56x25 mm	28.45
CAP-7690	[illegible]33mF	630 volt	36x30 mm	30.85
CAP-7700	0.47mF	630 volt	56x38 mm	35.06
CAP-7710	1mF	630 volt	60x44 mm	54.15

AUDIO NOTE SILVER FOIL PAPER IN OIL CAPACITORS

Order Code	Value	Maximum DC Voltage	Size	Price Ex. UK Vat
CAP-7802	0.047mF	630 volt	14x46 mm	45.00
CAP-7804	0.1 mF	630 volt	18x46 mm	76.00
CAP-7806	0.15mF	630 volt	22x38 mm	105.00
CAP-7810	0.22mF	630 volt	18x46 mm	130.00
CAP-7820	0.47mF	630 volt	25x46 mm	200.00
CAP-7840	1mF	630 volt	33x43 mm	400.00

AUDIO NOTE SILVER FOIL SIGNAL CAPACITORS

Best signal capacitors available, quality really speaks for itself, used in amplifiers like ONGAKU, KEGON, GAKU-ON and M7Tube Silver, handmade in very limited quantities at Audio Notes facility in Tokyo Japan. These capacitors use a fine mylar film dielectric, and are manufactured using considerable tension on the foil and dielectric to give the best possible mechanical contact and the least scope for internal resonance, terminated with braided, polyurethane coated Audio Note silver wire

Order Code	Value	Maximum DC Voltage	Price Ex. UK Vat
CAP-8005	0.01mF	500 volt	177.00
CAP-8010	0.02mF	500 volt	211.75
CAP-8015	0.05mF	500 volt	346.75
CAP-8020	0.1mF	500 volt	645.75
CAP-8025	0.2mF	500 volt	995.75

AUDIO NOTE PAPER IN OIL RESERVOIR CAPACITORS

Mainly for use in choke coupled LC power supplies, but have other uses.

Order Code	Value	Maximum DC Voltage	Size	Price Ex. UK Vat
CAP-7515	2mF	400 volt	30x40x56 mm	28.75
CAP-7518	2mF	630 volt	35x45x72 mm	33.05
CAP-7520	2mF	1000 volt	46x45x72 mm	41.75
CAP-7530	2mF	1500 volt		43.25
CAP-7540	2mF	1800 volt	80x70x72 mm	46.95
CAP 7550	4mF	600 volt		44.15
CAP-7551	4mF	1000 volt	45x45x120 mm	49.85
CAP-7553	4mF	2500 volt	70x70x120 mm	285.75
CAP-7560	8mF	800 volt		61.05
CAP-7570	10mF	1000 volt	70x100x100 mm	98.75
CAP-7575	12[illegible]	1000 volt	70x100x[illegible] mm	108.95
CAP-7577	12mF	1600 volt	100x100x[illegible] mm	136.75
CAP-7580	1[illegible]	2000 volt	100x100x220 mm	150.75

AUDIO NOTE ACID & CLORIDE FREE SILVER SOLDER

The best solder we have been able to find, does not contaminate the junction, which over time increases junction resistance. Used in all our amplifiers from OTO to the mighty GAKU-ON

Order Code	Weight/Length	Price Ex. UK Vat
AN-SOLDER-01	80 grammes or about 9 meter 1 mm diameter	19.95
AN-SOLDER-02	1 kilo roll of 1 mm diameter	210.85

AUDIO NOTE CABLES & WIRES

We are proud to offer the **AUDIO NOTE** range of high quality copper and silver coax, speaker and wiring cables, which depending on the overall price of the project, will do justice to any hifi system, regardless of price.

Solid 99.99% Pure AUDIO NOTE Silver Wire

Order Code	Wire Gauge	Insulation Material	Price Ex. UK Vat
AN-WIRE-005	[illegible]	Polyurethane	18.75
AN-WIRE-01[illegible]	[illegible]2mm	Polyurethane	22.75
AN-WIRE-015	0.35mm	ML	24.95
AN-WIRE-020	0.5mm	ML	27.85
AN-WIRE-025	[illegible]6mm	ML	31.75
AN-WIRE-030	1mm	ML	36.75

The above solid silver wires are suitable for low level interstage transformers, output transformers power supply chokes, inductors for speaker crossovers, both active and passive or for internal wiring in tonearms, amplifiers etc. A wider range of gauges is stocked, so enquire about required gauge, it may well be stock. Serious trade discounts available on larger quantities.

AUDIO NOTE Silver Wiring Wire

Order Code	Wire Gauge/Strands	Colour	Insulation	Price Ex. UK Vat
AN-WIRE 100	0.08 mm 15 strand	RED	Polyurethane 8 coats	24.46
AN-WIRE 110	0.08 mm 15 strand	WHITE	Polyurethane 8 coats	24.46
AN-WIRE 120	0.08 mm 15 strand	GREEN	Polyurethane 8 coats	24.46
AN-WIRE 130	0.08 mm 15 strand	BLACK	Polyurethane 8 coats	24.46

This is the wiring recommended for all hardwired topflight projects, the same wire is used in the AN-V interconnect and as signal wiring wire in all Mr. Kondos amplifiers and pre-amplifiers, available in red, white, green and black. We will sell as little as 20cm of each colour, so buy a little and see if it makes a difference to your amplifier, a good place to start is on the Phono or CD input.

AUDIO NOTE Internal Tone Arm Silver Wire

The ultimate wire for rewiring your tonearm, made from 3 individually insulated strands of 0.08mm Audio Note 99.99% silver wire, this is not just the best sounding internal wire, it is also the most flexible, so why not upgrade the sonic performance of your tonearm dramatically with a rewire?

Order Code	Wire Gauge/Strands	Colour	Insulation	Price Ex. UK Vat
AN-WIRE 300	0.08 mm 3 twisted strands	Clear/Silver	Polyurethane 8 coats	33.61 price per meter

AUDIO NOTE Coax Interconnect Cables

Order Code	Type/Colour	Construction	Price Ex. UK Vat
AN-CABLE-100	AN-A yellow	symmetrical 6N copper litz coax	15.32
AN-CABLE 150	AN-C red	symmetrical OFHC copper litz coax	29.75
AN-CABLE 200	AN-S dark grey	symmetrical 99.99% silver litz coax 15 strands 0.08 mm	94.25
AN-CABLE 250	AN-V silver grey	symmetrical 99.99% silver litz coax 15 strands 0.08 mm	152.35
AN-CABLE-300	AN-Vx silver grey	symmetrical 99.99% silver litz coax 28 strands 0.08 mm	282.98
AN-CABLE-400	AN-Vz silver grey	Dual symmetrical 99.99% silver litz coax 80 strands	1.174.47

All Audio Note interconnect/coax cables are priced per stereo meter

AUDIO NOTE Speaker & Wiring Cables

Order Code	Type/Colour Code	Construction	Price Ex UK Vat
AN-WIRE 500	AN-D green or red	single conductor OH copper speaker wiring	6 86
AN-WIRE 550	AN-B blue white writing	double strand, screened OH speaker wire	12 34
AN-WIRE 600	AN-L blue black writing	double strand, screened 8N litz copper speaker wire	25 11
AN-WIRE 650	AN-SP silver	single core 15 strand 99.99% litz silver speaker wire	106 38
AN-WIRE 700	AN-SPx silver	single core 20 strand 99.92% litz silver speaker wire	382 98
AN-WIRE 800	AN-SPz Brown	Single core 4 [illegible] 99 strand 99.99% silver speaker wire	2,085 11

All Audio Note speaker cables are priced per mono meter

PTFE Insulated Silver Plated Copper Wires

We can also provide less expensive wiring wires for hard wiring circuits. These PTFE insulated silver plated copper wires are 19 strand of 0.15 mm wire and come in brown, black, blue, pink, red, green, orange, violet, white and red/white. they cost £ 1 80 per meter in any colour

AUDIO NOTE HIGH QUALITY STEPPED ATTENUATORS & SWITCHES

These handmade attenuators and switches are manufactured by a friend of Mr. Kondo of AUDIO NOTE and represent the best available volume controls and switches you can use in your pre-amplifier. the attenuator is 48 steps and with silver/[illegible] plated contacts/brushes made with an array of tantalum film resistors. The switches feature silver plated contacts and self cleaning action. Used in the newly released M10 pre-amplifier, serious stuff!

Order Code	Type	Value	Price Ex UK Vat
SWITCH 260	Stereo Potentiometer Attenuator	[illegible]	221 75
SWITCH 265	Stereo Potentiometer Attenuator	[illegible]	221 75
SWITCH 270	Stereo Potentiometer Attenuator	[illegible]Ohms	237 75
SWITCH 270A	Stereo Potentiometer Attenuator	250KOhms NEW	282 53
SWITCH 275B	Stereo Potentiometer Attenuator	[illegible] NEW	287 45
SWITCH 280	2 Channel switch	6 way adjustable	98 75
SWITCH 290	4 Channel switch	6 way adjustable	124 75

AUDIO NOTE HIGH QUALITY CERAMIC VALVE BASES.

As all our valve bases are of the highest possible quality, made from steatite and using the best metal parts from alloys which retain their spring tension around the valve pin for longer. They are recommended as upgrades to most old valve amplifiers and should be an essential part of any DIY project.

Order Code	Type/Valve	Mounting	Pin Contacts Plating	Price Ex. UK Vat
VBASE 165	4-pin UX4 for 300B/2A3/801A	Chassis	Gold	8 25
VBASE 160	4-pin UX4 for 300B/2A3/801A	Chassis	Nickel	7.25
VBASE 170	4-pin UX4WE type for 300B/2A3/801A	Chassis	Silver	14 75
VBASE 175	4-pin UX4 WE type with bayonet mounting		Chassis	Silver 48 95
VBASE 190	4-pin Jumbo for 211/VT4C/845	Chassis with bayonet	[illegible]	159 96
VBASE 150	5-pin UY5 for 807	Chassis	Gold	9 75
VBASE-100	7-pin B7 for 6X4 OA2	PCB	Silver	6 15
VBASE 105	7-pin B7 for 6X4 OA2	PCB	Gold	7 86
VBASE-110	7-pin B7 for 6X4 OA2	Chassis from above	Silver	6 75
VBASE 115	7-pin B7 for 6X4 OA2	Chassis from above	Gold	7 86
VBASE-180	8-pin UBX for EL34 6550 5U4G GZ34	Chassis	Silver	5.86
VBASE 185	8-pin UBX for EL34 6550 5U4G GZ34	Chassis	Gold	6 55
VBASE-005	9-pin B9 for ECC83, ECC88, 5687, 6350 etc	PCB	Silver	3 86
VBASE-010	9-pin B9 for ECC83, ECC88, 5687, 6350 etc	PCB	Gold	5 75
VBASE-015	9-pin B9A for ECC83, ECC88, 5687, 6350, etc. etc	Chassis from above	Silver	4 45
VBASE-020	9-pin B9A for ECC83, ECC88, 5687, 6350, etc. etc	Chassis from above	Gold	6 75
VBASE-025	9-pin B9A for ECC83, ECC88, 5687, 6350, etc. etc	Chassis from below	Silver	4 95
VBASE-030	9-pin B9A for ECC83, ECC88, 5687, 6350, etc. etc	Chassis from below	Gold	7 15
VBASE-000	Topcap	For 807 pentode etc	Nickel	9 75

You may want to start your project with less overall cost, and for this purpose we can offer the following "industrial grade" ceramic valve bases

Industrial Grade Valve Bases

Order Code	Type/ Valve	Mounting	Price Ex. UK Vat
VBASE 216	4-pin for 2A3, 300B, bakelite	Chassis below, solder eyes	2.25
VBASE 215	7-pin for OA2, 6X4	PCB	2.56
VBASE 205	8-pin for EL34, 6550, KT88, 6L6G	Chassis with bracket	1 46
VBASE 3001	9-pin for ECC83, ECC88, 5687, 6350	Chassis with shroud	1 86

AUDIO NOTE CERAMIC STAND-OFFS

In most hardwired valve power amplifiers it is frequently difficult to get the HT and heater rails properly suspended and separated, safely and neatly from the chassis. this especially applies when building amplifiers using the really high voltage directly heated triodes like 211, VT4-C, 845, 849, 304TL, DA100 etc. When planning designs like this, it is important to incorporate suitable layout from the start, and the **AUDIO NOTE** stand-offs should be more or less mandatory in that context. They are screw-in type with steatite insulator and either a wrap-round turned "head" on the single way version or separated solder slots on the multi-way versions.

Order Code	Type No	No Of Tags	Height Length	Connection	Chassis Fixing	Price Ex. UK Vat
CON-800	AN-421	1	25.5 mm	Wrap-round	Screw-in bolt	1 41
CON-801	AN-422	1	17.4 mm	Wrap-round	Screw-in bolt	1 41
CON-802	AN-423	1	22.8 mm	Solder slot	Screw-in	1 41
CON-803	AN-424 NEW!	1	21 mm	Wrap-round	Screw-in	1 61
CON-805	AN-425 NEW!	1	12 mm	Wrap-round	Screw-in	1 71
CON-806	AN-426 NEW!	1	23.4 mm	Wrap-round	Screw-in bolt	1 86
CON-807	AN-427 NEW!	1	17 mm	Wrap-round	Screw-in bolt	1 71
CON-810	AN-452	2	Adjustable 17mm	Solder slots	Dual bolt screw-in	[illegible] 42
CON-811	AN-453	3	Adjustable 24mm	Solder slots	Dual bolt screw-in	3 06
CON-810A	AN 454 NEW!	4	Adjustable 31mm	Solder slots	Dual bolt screw-in	4 13
CON-813	AN-456	5	Adjustable 32mm	Solder slots	Dual bolt screw-in	4 91
CON-817	AN-458	6	Adjustable 38mm	Solder slots	Dual bolt screw-in	5 78
CON-823	AN-460	10	Adjustable [illegible]	Solder slots	Dual bolt screw-in	7 31
CON-832	AN-472 NEW!	2	Fixed 8mm	Solder slots	Dual screw-in	3 07
CON-833	AN-473 NEW!	3	Fixed 8mm	Solder slots	Dual screw-in	3 39
CON-835	AN-475 NEW!	5	Fixed 8mm	Solder slots	Dual screw-in	4 31
CON-836	AN-476	9	22mm/45mm	Solder slots	Screw-in bolts	5 36
CON-838	AN-479	9	25mm/38mm	Solder slots	Screw-in bolts	7 [illegible]
CON-841	AN-481 NEW!	11	Fixed 8mm	Solder slots	Dual screw-in	8 31

AUDIO NOTE SELECTED AUDIO VALVES

Our valves are selected from the best available sources and are tested to the same stringent standards that we apply in the production of our own amplifiers. They fall into two categories: standard production items and rare, mostly NOS (New Old Stock) valves which are no longer in production. We have compiled a special list of the NOS items, which is available against a stamped self addressed envelope, if you live outside the UK, send UC$ 2.00. You should be aware that the valves on this list are NOT cheap, but we have stock of original GE, RCA and United Electronics 211, both standard versions and reinforced anode type for the US airforce, 845 Westinghouse, VT25/10/10Y, VT62/801A, WE300B, STC4300A, Mullard GZ34/CV1377, Tungsol 6U4G (best sounding 5U4G I have ever heard!), Chatham 6R4WGY and many others.

Standard Stock Items

Order Code	Valve Type	Description/relevant variations	Price Ex UK Vat
VALVE-0020	E83CC-1 2AX7WA/7025	Sovtek double triode	2 [illegible]
VALVE-0040	E83CC super1 2AX7WB	Sovtek, high gain super low noise	3 96
VALVE-0080	E83CC01 12AX7WXT	Sovtek, super low noise, low microphony audio version of WA	2 86
VALVE-0080	6072A	General Electric USA, double triode, low gain ECC83 type, exceptional sounding used in ONGAKU, M7Tube Silver, KEGON probably best sounding ECC83	11 46
VALVE 0081	12AY7	GE, Ultra low microphony version of 6072A	13 45
VALVE-0100	E88CC/6922/6DJ8WA/7308	Sovtek double triode, low microphony	4 75
VALVE 1230	6DJ8	Philips/ECG USA, low microphony 6 noise, good sound	5 46
VALVE-0120	[illegible]/5687/Z729	Russian made version of the small pentode	6 46
VALVE-0143	ECC82/12AU7/5814a	Philips/ECG USA, double triode, mil spec	5 86
VALVE-0142	ECC82	Yugoslavia, best ECC82 available from new production	4 86
VALVE-0160	6SN7GT Russian	double triode, UBX base	3 75
VALVE-0180	6SN7WGTA [illegible]	double triode original [illegible] made [illegible] sounding	16 95
VALVE-0200	6SL7GT	Russian double triode, UBX base	3 [illegible]
VALVE-0210	[illegible]	[illegible] USA Small signal pentode	7 75
VALVE 0220	6350WA	US-made double triode, fine driver	10 35
VALVE-0240	5687WB Sylvania USA	double triode, powerful driver used in ONGAKU, [illegible] etc	9 86
VALVE-0260	E182CC/7119/7044 General Electric USA	double triode very powerful driver, pin-equivalent of 5687WB	14 75
VALVE-0280	ECL82/6BM8	Sovtek triode-pentode	2 86
VALVE-0300	EL84/6BQ5	Russian small power pentode	1 56
VALVE-0320	EL84M/[illegible]WA	Russian small power pentode, mil spec version	4 51
VALVE-0340	6V6GT	Sovtek small power tetrode	2 43
VALVE-0360	6L6	Russian medium power pentode	2 75
VALVE-0400	5881/KT66/6L6WGC	Sovtek medium power tetrode	4 61
VALVE-[illegible]	6L6WGC	Philips/Sylvania, the real McCoy!	16 75
VALVE-0420	5881WXT	Sovtek medium power tetrode, standard base	5 56
VALVE-0440	6CA7/EL34 Fat Boy	Sovtek power tetrode	8 86
VALVE-0460	EL34G	Sovtek power pentode	[illegible] 46
VALVE-0231	6550WA	Russian power tetrode	14 75
VALVE-0232	6550WB	Russian power tetrode	16 75
VALVE-0236	KT88 Tesla	Slovakian power tetrode	16 75
VALVE-0238	KT88 Tesla	Czech power tetrode	19 95
VALVE-0239	KT90	Yugoslav power pentode	21 85
VALVE-0480	300B	power triode, Audio Note branded and tested to our specification, Chinese manufacture	58 45
VALVE-0482	300B	Sovtek, this is a seriously good 300B version, both in terms of bench performance and sound	66 15
VALVE-0500	UV211	power triode, Audio Note branded and tested to our specification, Chinese manufacture	25 46
VALVE-0520	AN 845	power triode, Audio Note branded, tested and tried, Chinese made	33 45
VALVE-0540	6C33	powerful Russian made regulator, indirectly heated triode	24 85
VALVE-0560	6AS7/6080	sturdy Russian regulator, indirectly heated triode	6 46
VALVE-0580	2A3 4-pin or 8-pin for Audio Innovations Second Audio Amplifiers	directly heated small power triode, Chinese made	17 95
VALVE-0600	5U4G Russian	HT-rectifier	3 25
VALVE-0620	5Y3GT Russian	HT-rectifier	2 25
VALVE-0640	5Y3GT Sylvania	HT-rectifier	3 35
VALVE-0680	GZ34/5AR4 Russian	HT-rectifier	6 75
VALVE-0700	GZ34/CV1377 Mullard	HT-rectifier	49 95
VALVE-0720	GZ37/CV378 UK made	HT-rectifier, equivalent to GZ32/34, but better sounding in my opinion	9 56
VALVE-0740	[illegible]WGB Cetron USA	Very powerful HT-rectifier, 2,500volt at 100mA!	24 56
VALVE-0760	6X4	HT-rectifier, very good in pre-amplifiers, 7-pin base, Russian reverse pin version	3 75
VALVE-0780	6X5	HT-rectifier, for pre-amplifiers & power amplifier front-ends, UBX base, Russian made	4 25

Please note, our 300B s are manufactured in China by Gold Dragon/Chuguang, but are tested in-house under real working conditions to parameters somewhat more stringent than is otherwise done. So, they do not sound quite as good as original Western Electric or RCA 300B s or STC 4300A s, nor do they carry the same premium price. please consider the following, unless you have absolutely tons of money or you happen to have them in your attic, do not consider original 300B s. it is in most cases far better to invest the money in more permanent features of the amplifier project, like better output transformers, better signal caps or resistors or the like. valves wear out, better quality passive components last much longer.

A pair of original WE 300B s cost at least £ 1 200 00, on a good day, so instead of being obsessed by getting the best valves at any price, think in terms of an overall price/performance; you can get some serious sounding passive components for the difference in cost between a pair of Chinese or Russian 300B s and the original WE s, and with the Audio Note / VAIC AV300B s which in most circuits sound much better than even the oldest WE s it becomes even less advantageous to use original output valves. So for the sake of priority, first look to improve the permanent side of your amplifier, then invest in the best valves available in current supply, and then if you win the lottery revalve with originals if you are truly desperate to find out what they sound like! One thing is guaranteed: the permanent improvement in sound quality from the best passive components is always far greater than what even the best WE 300B s will contribute. Always consider that when you plan your project or revalve your existing amplifier.

Resistors

We endeavour to stock the entire E12 range of all the different makes of resistors that we stock, except the very lowest ohmic values, which are extremely costly. as a rule we do not stock values below 10 Ohms or above [illegible]. Although we always try to have every single E12 value in stock, this cannot be guaranteed, delivery especially on the Holcos and tantalum film resistors can be very long indeed. however, since [illegible] are used in our production of finished products, there will generally be stock available within 4 weeks.

Beyschlag

We offer three quality levels of resistor quality, all are 1%, starting with the Beyschlag metalfilm, which are slightly magnetic, but are the equivalent of other makes of metal film resistors, but nonetheless very good sounding, as used in all our UK-made amplifiers, up to and including Level 3, the M5/MLR/PCPA, 300B no-feedback triode amplifiers.

Beyschlag 1 watt, 1% resistors up to 500KOhm, £ 0 11, above 500KOhm £ 0 13 each. HOLCO

Better sound quality can be achieved with the H2, 1 watt, 1% non-magnetic resistors, which we regard as the best "industrial grade" metalfilm resistors available. They have one small drawback, as they are quite fragile, and require careful handling; do not bend the legs too close to the body. HOLCO resistors are [illegible] and [illegible] very easily. The HOLCO resistors values in stock are: [illegible]

HOLCO resistors type H2 50PPM [illegible]

£ 3 06 each from 1R0 to 5R1, £ 0 66 each from 5R1 to 1R0, £ 0 38 each from 2Ohm to 230KOhm, £ 0 41 each from 231 KOhm to 1 MOhm, £ 1 08 each from 1M to 2M0, £ 1 24 each from 2M to 4M0, and £ 2 21 each from 4M1 to 5M0

SHINKOH Tantalum Film Resistors

This is definitely the best sounding resistors available, forget the VISHAY, which may be ok in high feedback transistor amplifiers, but in our opinion quite uncomplimentary to the qualities of real Audio Amplification i.e. directly heated triode amplifiers running feedback free in single-ended Class A, this is where you will need the tantalum film resistor for the best results

The 1/2 watt Shinkoh tantalum resistors are non-magnetic and cost £ 2 26 each. Some values are available in 1 watt from Shinkoh at £ 4 80 each, list of stock available

AUDIO NOTE 1/2 WATT TANTALUM RESISTORS

With our in-house usage of tantalum resistors increasing all the time, and Shinkoh becoming less and less able to supply, we have found it necessary to second-source the 1/2 watt value in addition to the 1 watt already offered. the AN Tant are non-magnetic and share all other aspects of the Shinkoh, except the copper. they will be available by the time you read this in the following values: [illegible]

The 1/2 watt Audio Note tantalum resistors cost £ [illegible] each

AUDIO NOTE 1 WATT TANTALUM RESISTORS

Up to now the tantalum film resistors have been extremely difficult to get, however, after much persuasion and against a [illegible] quantity guarantee from Audio Note UK, the manufacturers have agreed to widen the range of 1/2 watt and reintroduce the 1 watt range which becomes an exclusive range for AUDIO NOTE. we consider this to be a major breakthrough, since without a reasonable range of values at the 1 watt level it is quite difficult to get the very best out of the best circuits. The 1 watt Audio Note tantalum film resistors are available in the same values as the 1/2 watt, with the addition of the 1M0 and [illegible].

The AUDIO NOTE 1 watt 1% tantalum resistor values are £3 73 each

AUDIO NOTE 2 WATT TANTALUM RESISTORS

Firstly to compliment the range of Audio Note 1 watt tantalum resistors we have started stocking a limited number of 2 watts, namely 1 Meg, 1M5 and 2Meg

The **AUDIO NOTE** 2 watt 1% tantalum resistors cost £ 5.86 each

We shall now be working on getting a fuller 2 watt range and start stocking a 3 Watt range of tantalum resistors as well, and who knows perhaps we will be able to build amplifiers in a year s time that have all tantalum resistors in all parts of the circuit!

AUDIO NOTE PRECISION CARBONFILM RESISTORS

In addition to the non-magnetic tantalum resistors, we are going to stock a range of precision gold-plated carbonfilm resistors. In many cases the carbonfilm resistor is preferable if you are building an amplifier based on an old circuit, like for example the WE91 or another circuit of similar vintage. We shall be stocking values suitable for projects like the WE91 in 1/2 and 1 watt values. These resistors are made especially for us by a major manufacturer.

They cost for the 1/2 watt £ 3.30 each 1 watt £ 4.85 each 2 watt £ 6.60 each

ALLEN BRADLEY 1 Watt 5% Carbonfilm Resistors

Due to popular demand, and a general lack of other sources, we have started stocking a range of Allen Bradleys carbonfilm resistors. Many experienced DIYers, like my friend Herb Reichert, consider these the very best sounding for many applications. Available in the E12 range of values, the 1 watt cost £ 1 43 each.

HIGH WATTAGE WIREWOUND RESISTORS

As a new item we shall start stocking a range of 2 - 15 watt wirewound resistors, we shall be starting with a small range and expanding it as we go along. at the moment the following is available, all these resistors are 5% tolerance and glazed

Order Code	Wattage	Value	Tolerance	Price Ex. UK Vat
[illegible]	6 watt	47R	5%	[illegible]
[illegible]	6 watt	100R	5%	0.88
[illegible]	6 watt	470R	5%	[illegible]
[illegible]	6 watt	1 [illegible]	5%	0.88
[illegible]	6 watt	[illegible]	5%	0.88
[illegible]	6 watt	[illegible]	5%	1.32
[illegible]	6 watt	[illegible]	5%	1.32
[illegible]	9 watt	[illegible]	5%	1.24
[illegible]	9 watt	[illegible]	5%	1.24
[illegible]	6 watt	[illegible]	5%	1.24

More values will be added over the next 6 months, together with some non-inductive wirewounds!

BLACK GATE ELECTRON TRANSFER High Performance Graphite foil capacitors

Firstly I would like to categorically state that any rumours about Black Gate capacitors being unavailable or discontinued are totally misguided, malicious and incorrect. AUDIO NOTE is currently the sole source in Europe that holds any significant range of values in stock, we use literally 1000 s in production, as we were the first company to realise the tremendous benefits that Black Gate capacitors offer, and we are to date the only high-end audio company in the world to incorporate Black Gate capacitors consistently in our finished products. There are very few audio parts that promise a guaranteed improvement when replacing practically any other part, but this is what the BLACK GATE capacitors actually do. Exchanging any electrolytic capacitor anywhere in the circuit of an amplifier or in the crossover of a speaker will greatly improve sound quality. We are working on some guidelines into where, how and which types of Black Gates to use in different circuits, the first such technical guideline is available now and is called "Improving your CD-Player" and can be obtained by sending a stamped addressed envelope to us requesting this leaflet. All AUDIO NOTE Level 2 Signature products use Black Gate Electron Transfer in critical [illegible] positions. It is very important to note that all BLACK GATE capacitors take time to charge-up or stabilise, when first put in circuit, depending on type and application this "maturing" time can be between 100 and 300 hours. Black Gate call this the "Tohru process", see enclosed list of available values. We feel, however, that this process takes longer, ha ha!

We are about to stock the entire range of values on the enclosed list, as a separate product is attached to the list of Black Gate programme available. Ask us to send you this list as it is too long for an advertisement or to incorporate in our standard component list, whenever it is not included in full. Again, as always, we appreciate a stamped self addressed envelope, it greatly influences the expediency this end.

The high voltage power supply capacitors type SKz have been replaced by an even better version, the WKz-Type, unfortunately the price has increased substantially as well, we have purchased a large back-up stock of the SKz s, in fact most of what Black Gate in Japan had left in stock!, so I am leaving the SKz Type on the pricelist until we run out of stock of each SKz item. Meantime we have introduced the Cerafine high voltage capacitors as a cheaper alternative

IMPORTANT NOTICE!

PLEASE NOTE: THE PRICELIST FOR BLACK GATE CAPACITORS IS A GUIDELINE ONLY, DUE TO THE CONTINUOUS STRENGTHENING OF THE JAPANESE YEN, IT IS IMPOSSIBLE TO PRINT UP-TO-DATE PRICES MONTHLY, SO ASK FOR PRICE WHEN YOU ORDER

Order Code	Value	Voltage	BG Type	Recommended Use	Price Ex UK Vat
CAP-0000 47mF	[illegible]	PK	Anywhere		1.95
CAP-0005 33mF	[illegible]	PK	Anywhere		1 75
CAP-0010 0.47mF	[illegible]	PK	Anywhere		1 36
CAP-0015 1mF	[illegible]	PK	Anywhere		1 12
CAP-0020 2.2mF	[illegible]	PK	Anywhere		1 23
CAP-0025 3.3mF	[illegible]	PK	Anywhere		1 38
CAP-0030 4.7mF	[illegible]	PK	Anywhere		1 66
CAP-0035 10mF	[illegible]	PK	Anywhere		1 87
CAP-0040 22mF	[illegible]	PK	Anywhere		2 66
CAP-0045 [illegible]	1.0volt	Standard	Anywhere		2 82
CAP-0050 33mF	1.0volt	Standard	Anywhere		3 42
CAP-0055 47mF	1.0volt	Standard	Anywhere		4 11
CAP-0060 [illegible]	1.0volt	Standard	Anywhere		6 66
CAP-0065 10mF	50volt	Standard	Anywhere		2 67
CAP-0070 47mF	[illegible]	Standard	Anywhere		4 47
CAP-0075 100mF	1.0volt	Standard	Anywhere		4 73
CAP-0080 100mF	50volt	Standard	Anywhere		6 47
CAP-0085 220mF	[illegible]	Standard	Anywhere		[illegible] 41
CAP-0090 10mF	100volt	Standard	Anywhere		3 71
CAP-0095 22mF	100volt	Standard	Anywhere		6 31
CAP-0100 47mF	100volt	Standard	Anywhere		8 54
CAP-0105 100mF	100volt	Standard	Anywhere		7 75
CAP-0110 220mF	[illegible]	Standard	Anywhere		22 18
CAP-0115 1000mF	16volt	Standard	Anywhere		8 22
CAP-0120 [illegible]	[illegible]	Standard	Anywhere		[illegible] 56
CAP-0125 220mF	1.0volt	Standard	Anywhere		4 35
CAP-0130 470mF	[illegible]	Standard	Anywhere		6 [illegible]
CAP-0135 [illegible]	[illegible]	Standard	Anywhere		13 45
CAP-0140 10,000mF	80volt	Standard	PSU [illegible]		234 86
CAP-0145 [illegible]	[illegible]	Standard	Anywhere		14 [illegible]
CAP-0150 47mF + 47mF	500volt 550v surge	SKz Type	PSU filter capacitor		85 95
CAP-0155 100mF +100mF	500volt 550v surge	SKz Type	PSU filter capacitor		101 86
CAP-0160 100mF	500volt 550v surge	SKz Type	PSU filter capacitor		72 75
CAP-0165 220mF + [illegible]	[illegible] 400v surge	SKz Type	PSU filter capacitor		[illegible]
CAP-0170 100mF + 100mF	[illegible] 400v surge	SKz Type	PSU filter capacitor		75 35
CAP-0175 100+100mF	[illegible] 400v surge	WKz Type	PSU filter capacitor		195 33
CAP-0180 47+47mF	500volt 550v surge	WKz Type	PSU filter capacitor		15[illegible] 85
CAP-0185 100mF	500volt 550v surge	WKz Type	PSU filter capacitor		144 [illegible]
CAP-0190 100+100mF	[illegible] 400v surge	WKz Type	PSU filter capacitor		151 74
CAP-0195 220+220mF	350volt 400v surge	WKz Type	PSU filter capacitor		181 95
CAP-0200 22mF	350volt	WK Type	Decoupling or filter capacitor		18 86
CAP-0205 100mF	350volt	WK Type	PSU filter capacitor		41 23
CAP-0210 0.47mF	50volt	F-Type	Low ESR, Low impedance use anywhere		1 11
CAP-0215 22mF	6.3volt	F Type	As above		1 22
CAP-0220 100mF	6.3volt	F Type	As above		1 56
CAP-0225 220mF	6.3volt	F Type	As above		2 11
CAP-0230 2200mF	6.3volt	F Type	As above		4 76
CAP-0235 47mF	1.0volt	FK Type	Ultra low ESR version, comparable to film caps		7 15
CAP-0240 [illegible]	16volt	FK Type	Ultra low ESR version, comparable to film caps		13.71
CAP-0245 220mF	1.0volt	FK Type	Ultra low ESR version, comparable to film caps		19 95
CAP-0250 1[illegible]	25volt	FK Type	As above		14 38
CAP-0255 220mF	25volt	FK Type	As above		21 43
CAP-0260 100mF	50volt	FK Type	As above		15.71
CAP-0265 1000mF	50volt	FK Type	As above use anywhere		56 71
CAP-0270 [illegible]	25volt	FK Type	As above use anywhere		56 71
CAP-0275 1000mF	63volt	FK Type	As above use anywhere		101 43
CAP-0280 [illegible]	[illegible]	FK Type	As above use anywhere		32 86
CAP-0285 [illegible]	50volt	C-Type	For circuits with DC potential difference		2 07
CAP-0290 4.7mF	50volt	C Type	For circuits with DC potential difference		3 36
CAP-0295 6.8mF	50volt	Bipolar	For loudspeaker crossover networks		12 85
CAP-0300 10mF	[illegible]	Bipolar	as above		16 86
CAP-0305 22mF	[illegible]	Bipolar	as above		23 95
CAP-0310 47mF	[illegible]	Bipolar	as above		38 95
CAP-0315 [illegible]	50volt	BG-N Type	For PSU decoupling		12 38
CAP-0320 [illegible]	6.3volt	BG-N Type	For super low noise PSU s		11 86
CAP-0325 100mF	16volt	BG-N Type	For super low noise PSU s		24 86
CAP-0330 470mF	16volt	BG-N Type	as above		26 95
CAP-0335 4700mF	25volt	BG-N Type	as above		210 45
CAP-0340 1mF	50volt	BG-N Type	as above		5 45
CAP-0345 4.7mF	[illegible]	BG-N Type	as above		6 85
CAP-0350 10mF	[illegible]	BG-N Type	as above		7 56
CAP-0355 47mF	50volt	BG-N Type	as above		13.75
CAP-0360 100mF	50volt	BG-N Type	as above		20 36
CAP-0365 1000mF	[illegible]	BG-N Type	as above		98 95
CAP-0370 2200mF	[illegible]	BG-N Type	as above		423 36

In our component list you will find a listing of all available Black Gate values, together their sizes, best usage etc.

Lastly, we can supply a range of more modestly priced components, still good quality, but more industrial grade, if possible

CERAFINE Powdered Ceramic Electrolytic Capacitors

We have at long last secured a reliable source for these fine power supply filter capacitors, a must in any single-ended project of NOTE! We will start with two values, at 350 and 500 volt, 100+100mF each, as these cover Black Gates where the prices for the BG s are prohibitive. We have increased the range of Cerafines we stock quite recently, and strongly recommend the Cerafines as a far superior replacement or substitute for ordinary electrolytics, and at the prices offered that should be within most budgets. All power supply Cerafines are supplied with a capacitor clamp and are upright mounting

Order Code	Value	Voltage	Recommended Use	Price Ex. UK Vat
CAP-0740	100+100mF	350 volt	Power supply filtering	19 95
CAP-[illegible]	[illegible]mF	350 volt	Power supply filtering	29 95
CAP-[illegible]	47mF	500 volt	Power supply filtering	12 86
CAP-[illegible]	47+47mF NEW	500 volt	Power supply filtering	19 95
CAP-[illegible]	[illegible]mF	500 volt	Power supply filtering	29 95
CAP-[illegible]	[illegible] NEW	500 volt	Power supply filtering	29 95
CAP-[illegible]	[illegible]mF NEW	500 volt	Power supply filtering	38 95
CAP-0770	220mF NEW	500 volt	Power supply filtering	34 95
CAP-0780	[illegible]mF	100 volt	Power supply filtering	34 95
CAP-0800	4,700mF	6.3 volt	Heater filtering	4 95
CAP-[illegible]	[illegible]	100 volt	Bypass anywhere	2 96
CAP-[illegible]	[illegible]	[illegible] volt	Bypass anywhere	1 96
CAP-[illegible]	[illegible]mF	100 volt	Bypass anywhere	6 96
CAP-0850	220mF	[illegible] volt	Bypass anywhere	2 95
CAP-0870	470mF	[illegible] volt	Anywhere	6 55
CAP-[illegible]	[illegible]	50 volt	Anywhere	1 15

We shall continue to expand the range of Cerafine electrolytics over the next few months, so keep an eye on this space

POTENTIOMETERS

Best available from sound quality - price viewpoint, made by Noble in Japan, high quality conductive plastic [illegible]

Volume Controls

Order Code	Impedance	Construction	Price Ex. UK Vat
SWITCH [illegible]	[illegible] Stereo, logarithmic	Frame type, PCB mounted	4 95
SWITCH 271	100K[illegible] Stereo, logarithmic	Encapsulated type, PCB mounted	18 86

A better alternative is the KO-ON volume controls which are used in pre-amplifiers like the M7Tube Line, and in a mono version on the input on the NEIRO, KASSAI, KEGON and GAKU-ON, these are very good sounding pots by any standard

Order Code	Impedance	Construction	Price Ex. UK Vat
SWITCH 271	100KOhm Stereo, logarithmic	Encapsulated	22.25
SWITCH 272	100KOhm Mono, logarithmic	Large Encapsulated	70 86
SWITCH 273	100KOhm Stereo, logarithmic	Large Encapsulated, high quality	107 45

Balance Controls

Order Code	Impedance	Construction	Price Ex. UK Vat
SWITCH 265	100K[illegible]	Frame type, PCB mounted	5 45
SWITCH 2[illegible]	100KOhm	Encapsulated type, PCB mounted	19 25
SWITCH 274	100KOhm, KO-ON	Encapsulated, PCB mounted	32 26

STANDARD TYPE SWITCHES

Order Code	Type	Construction	Price Ex. UK Vat
SWITCH-020	[illegible] 10-way, 2 channel adjustable	PCB mounting	6 95
SWITCH [illegible]	KO-ON, 5-way, 2 channel adjustable	PCB mounting	30 86

This switch is adjustable 2 - 6 - way, it has gold plated contacts and a stainless steel ball for best possible corrosion protection and contact. The KO-ON offers a very nice quality sealed switch, 6 way 2 channel at £ 90 [illegible] each.

STANDARD ELECTROLYTIC CAPACITORS Good quality standard industrial types

Order Code	Value	Voltage	Size	Price Ex. UK Vat
CAP 1080	100mF	10volt	16x[illegible] axial, 8x7mm radial	[illegible] 23
CAP 1040	100mF	16volt	15X8 mm axial	[illegible] 29
CAP 1060	220mF	16volt	11X8 mm radial	0 31
CAP 1120	220mF	40volt	[illegible] radial	[illegible] 42
CAP 1150	[illegible]	[illegible]	13x1[illegible] radial	047
CAP 1080	4700mF	10volt	36x18 mm radial	0 82
CAP 1120	1000mF	[illegible]	36x16mm radial, 41x16mm axial	0 87
CAP 1200	1000mF	16volt	15X1[illegible] mm radial	0 56
CAP 1241	10mF	[illegible]	25x12 mm radial	1 46
CAP 1280	22mF	450volt	41x1[illegible] axial	1 98
CAP 12[illegible]	47mF	350volt	25x21 mm radial	2 46
CAP 12[illegible]	50mF	400volt	30x21 mm radial	2.87
CAP 1284	[illegible]mF	400volt	30x22 mm radial	2 98
CAP 1297	100mF	400volt	35x25 mm radial	3 76
CAP 1280	220mF	450volt	40x30 mm radial can	6 86
CAP 1[illegible]	1220mF	[illegible]volt	112x[illegible]mm radial screw terminals	27 86
CAP 12[illegible]	470mF	350volt	56x35 mm radial can	5 86

RCA, BNC, BANANA PLUGS, RCA SOCKETS, SPEAKER & GROUND TERMINALS & LOUDSPEAKER SPADES

RCA Plugs

Order Code	Type Description	Price Ex. UK Vat
CON-000	[illegible]	1 86
CON-002/008	AN-C [illegible] plug	3 86
CON-310/311	AN-[illegible] AUDIO NOTE gold plug	6 61
CON-307/308	AN-P AUDIO NOTE Solid Silver plug, teflon insulated, non-magnetic	25 53

RCA Sockets

Order Code	Type	Mounting	Price Ex. UK Vat
CON-[illegible]	RCA socket [illegible]	Chassis mounted	[illegible] 41
CON-[illegible]	RCA socket gold plated	Chassis mounted	0 85
CON-034/038	AN CS AUDIO NOTE non-magnetic, teflon insulated socket, gold plated	Chassis mounted	3 96

BNC Plugs & Sockets

Order Code	Type	Price Ex. UK Vat
CON-050	Standard BNC plug	3 46
CON-051	BNC Silver plated socket chassis mounted	2 96

Banana Plugs, Loudspeaker Cable Spades, Chassis Loudspeaker Terminals

Order Code	Type/Description	Price Ex. UK Vat
CON-080	AUDIO NOTE Banana plug, gold plated, spring loaded tension	2 45
CON-085	AUDIO NOTE Loudspeaker Cable spade, silver plated, non-magnetic	4 65
CON-0[illegible]	AUDIO NOTE AN-ST Speaker Terminal, chassis mounts, nickel plated, red or black	1 86
CON-0[illegible]	AUDIO NOTE AN-STG Speaker Terminal, chassis mounts, gold plated, red or black	2 75
CON-[illegible]	AUDIO NOTE AN-STR Speaker Terminal, chassis mounts, fully gold plated, non-magnetic, red or black	4 73
CON-015	Ground Terminal, chassis mounted and nickel plated	1 45

Our range of components is constantly expanding, as we find new or better suppliers, so stay in touch by reading our adverts in Hi-Fi World and Hi-Fi News

FERRITE RINGS

In many systems, especially ones using transistor based amplification, there is often a problem of incoming RF mixing into the feedback loop, especially from connected CD-players, clamping a ferrite ring around the cable between the CD-transport and the DAC or the output of the DAC or CD-player and the pre-amplifier input yields surprising results. A set of two Ferrite rings costs £ 6 50

ORDER CODE CON-016

AUDIO NOTE Moving Coil, CD Line & Input Matching Transformers

I have received many requests for moving coil, CD and input matching transformers, and since we already make and use these, it might be a good idea to offer them for general sale. Common to all of these single [illegible] transformers is that they come in a mumetal screening can with a threaded spindle with a nut for mounting

Order Code	Type	Colour Code	Primary/Secondary Impedances	Main Use	Price Ex. UK Vat
TRANS-465	TT7[illegible]	Brown	3 & 1[illegible] : 100KOhm	copper wired MC matching	51 50
TRANS-470	TT7[illegible]	Red	15 & 60Ohm : 100KOhm	copper wired MC matching	51 50
TRANS-460	TT7[illegible]	Yellow	3 & 12 Ohm : 100KOhm	copper wired High Quality MC matching	78 20
TRANS-465	TT7[illegible]	Green	15 & 60[illegible] : [illegible]Ohm	centre tapped copper wired High Quality MC-matching	78 20
TRANS-450	TT7[illegible]	Blue	150 & 600Ohm : 2[illegible] & 10KOhm	copper wired High Quality line matching	78 20
TRANS-475	TT7[illegible]	Violet	25 & 100Ohm : 2[illegible]	copper wired High Quality line matching	78 20
TRANS-41[illegible]	TT7[illegible]	White	150 : 150Ohm	copper wired High Quality line matching	101 50
TRANS-415	TT7[illegible]H	Clear	150-600Ohm	copper wired High Quality line matching	101 50
TRANS-[illegible]	TT7[illegible]	Silver	150 : 150 Ohm	silver wired High Quality line matching	378 80
TRANS-476	TT7[illegible]	Black	3 & 12Ohm : 100KOhm	silver wired MC matching	378 80

The moving coil matching transformers are suitable for all moving coil cartridges, the low impedance versions are suitable for cartridges like the Audio Note IOs, most better Ortofons, the Goldbug, Koetsu s and some Kiseki s, the high versions are meant for Goldring Eroicas, most Denons, Clearaudios, Van den Hul cartridges, the Ikeda and a few higher output Koetsus.

The line matching transformers can be used in a number of applications, inter-component isolation and matching (as we recommend between CD-Player and pre-amplifiers, to separate earth planes and RF transfer), as pre-amplifier input or output transformers or whatever else you can think of.

We shall expand this range to include more types as we go

AUDIO NOTE Chassis Sets

We have decided to offer for sale the two standard chassis, that we use for production of the OTO/CORO/DAC range of UK-made AUDIO NOTE products. Chassis s are notoriously difficult to get on a one-off basis, so here you are. We will only sell the chassis that we have rejected for production, due to minor failures in the finish, they still look alright, but are not strictly of a flawless, finished product quality.

Order Code	Type	Width/Length/Height	Price Ex. UK Vat
MWK-005+010	Chassis 1 Aluminium	437x398x[illegible] 25mm	£ 84.50
MWK-[illegible]+084	Chassis 2 Aluminium	294x[illegible]x[illegible]mm	£ 66.50
MWK-006+[illegible]	Chassis 1 Copper	437x[illegible]mm	£ 190.00
MWK-026+010	Chassis 2 Copper	294x[illegible]	£ 165.50
MWK 300 +305	KIT ONE/KIT THREE Chassis, mild steel, black paint	[illegible] mm	£ 75.00
MWK 301 + 305	KIT ONE/KIT THREE Chassis mild steel, polished chromed	400x300x50 mm	£ 116 [illegible]

You have to specify, when you order, whether you want chassis 2 for pre-amplifier or power amplifier use. the pre-amplifier has inputs on the side of the top cover, the power amplifier has many more ventilation holes, top and side. If you want a PCB with the input sockets included with the pre-amplifier cover, add £ 18.75 to the cost of the chassis and remember to specify this when you order. Please note that no copper pre-amplifier lid is currently available for Chassis 2. From time to time we will have more damaged or scratched chassis s, if you are not bothered about the finish or general appearance, or you intend to refinish the chassis anyway, you can have one of these for 60% of the above prices. just thought you should know, so inquire if this is of interest.

AUDIO NOTE COMPLETE KITS

As mentioned earlier, we are developing a range of complete kits, to give those of you who have the ability, but do not have the time to develop a project from the ground, so to speak. In order to be able to offer the best possible quality price relationship the kits we offer will be good basic circuits, with no-frills power supplies and components. all kits have input volume control to allow use of a single source, like CD-player direct in.

The AUDIO NOTE KIT ONE

Based around the justly famous 300B directly heated triode, we see this kit as the introduction to real Audio Amplification, as it covers all the important aspects of design necessary, Single-Ended, No-Feedback, Class A, Directly Heated Triode, to become a member of this exclusive club of amplifiers.

Kit One has one 300B per channel running at 430 volts with 75mA current giving 8/10 watts of the cleanest power you will ever hear. the input stage consists of a 6SN7GT with a 5687 double triode driver stage running in SRPP. The power supply is a capacitor-choke-capacitor with a 5U4G HT rectifier. the heaters are AC heated. Component quality is similar to our Level 2 finished products. AUDIO NOTE paper in oil signal capacitors, Beyschlag 1watt 1% metalfilm resistors, good quality electrolytics (sorry NO Black Gates!) and a simple, attractive stereo chassis in grey paintwork. Protecting cover is extra. We have several upgrade kits available for Kit One, ask for details

Price £ 799.00 incl. Vat. which includes all valves (yes, also the 2 x 300B needed) but not postage/packing which to UK customers is £ 12.00. topcover is £ 98.00 extra. Kit One is also available with a polished chrome chassis and chromed transformer bell-ends. this makes the Kit One a real "stunner!" Add £ 220.00, to total £ 950.00. The Kit One is available now

KIT ONE ORDER CODE: AN-KIT-001

The Kit One has recently been awarded the title "The Greatest Audio Bargain of the Twentieth Century" by Dick Olsher (ex-Stereophile) in a review on the internet, not bad!

The AUDIO NOTE KIT TWO

Kit Two features a single 6550 tetrode running in Single-Ended mode, yielding some 17 watts of pure Class A, valve rectified HT for the output stage, stereo chassis, and 6SN7GT input and 5814a/ECC82 SRPP driver stage, componentry and chassis as Kit One. Kit Two is currently only available without valves for £ 570.00 incl. UK Vat. If used with Chinese 6550's no claims for faults in power supply or output transformers will be accepted!

Price £ 580.00 incl. Vat. includes valves, but not postage/packing, cover is extra at £ 90.00. With polished chrome chassis and chromed bell-ends on the transformers, £ 799.00

KIT TWO ORDER CODE: AN-KIT-002

The AUDIO NOTE KIT THREE

Kit Three features 2 x 300B per channel running in single-ended parallel yielding 16/17 watts in pure Class A, this kit is on two mono chassis, with valve rectified HT supplies, no signal feedback. It uses a 6SN7GT double triode as input valve and a pair of 5687 double triodes running in SRPP as drivers. The KIT THREE is essentially a mono version of the KIT ONE with double the power, the same component choices and on two chassis, instead of one

The KIT THREE costs £ 1 550.00 and is available now. Cover is £ 99.00 extra per chassis (£ 198.00 for two). Polished chrome chassis and bell-ends is also available at £ 400.00 extra. Several upgrade kits are available for Kit Three as well, ask for details

KIT THREE ORDER CODE, AN-KIT-003

The AUDIO NOTE KIT FOUR

The KIT FOUR is really our introduction to valve amplifier kit building. circuit and power supply mounted on one single printed circuit board, with two OTO - type push-pull output transformers, all mounted in a small PI SE type chassis, covering everything, so nobody will be able to see that you have succumbed to the lure of the valve amplifier, which is sweeping the world. The circuit consists of two 6V6GT tetrodes running in Push-Pull class A, yielding about 10 watts, driven by a 6SN7GT and a ECC83 input stage. Easy to build, even for the beginner.

The KIT FOUR costs £ 242.00, as of March 1st, 1996

KIT FOUR ORDER CODE: AN-KIT-004

The AUDIO NOTE Pre-Amplifier Kit

A kit loosely based on the **AUDIO NOTE** M7Tube pre-amplifier circuit is now available, actually we offer it in 3 versions, with the basic version, Version One consisting of only the instruction manual, the trackless PC boards for hardwiring the circuit, the mains transformer and the choke costing £98.00 inclusive of UK Vat. The trackless PC Boards are available at £ 48.95.

Version Two, includes version one with the addition of a set of basic components, Beyschlag resistors, Roederstein Polyester signal caps, standard electrolytics, standard valve bases but no valves, Noble frame volume and balance controls with PCB, input sockets with PCB, output sockets with PCB, but no chassis, at a cost of 199.00

Version Three, adds the valves (4 x ECC83/12AX7WXT, 2 x ECC82 and 1 x 6X4R) and the chassis, and upgrades the volume and balance pots to Noble encapsulated types. A complete pre-amplifier kit of the highest quality at £ 298.00 inclusive of UK Vat at 17.5%.

Versions offering more sophisticated components will be introduced when we have enough parts in stock to support them, the most obvious upgrade would be to replace the Roederstein polyester with **Audio Note** paper-in-oil caps, either aluminium foil or copper foil and combine that with **Audio Note** tantalum film resistors, **Audio Note** silver wiring wire, change the RIAA valves to 6072A/12AY7 s or use 6SN7WGTA Sylvania (Philips/ECG) instead of the ECC82 s (please note that you need a different line board for this), further improvements can be introduced with Cerafines or Black Gates, silver signal caps, copper chassis etc.

Order Code	Pre-Amplifier Version, as per above description	Price Incl. UK Vat at 17.5%
	Version 1	
	Version 2	
	Version 3	
	Version 4	

Write to.

AUDIO NOTE (UK) Ltd. Unit C, Peacock Industrial Estate, Lyon Close, 125-127, Davigdor Road, Hove BN3 1SG, East Sussex, England Telephone 01273 220511 (6 lines), fax 01273 731498. Direct line to sales 01273 770778

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DENMARK please contact Audio Consult, H. C. Orstedsvej 42, 1879 Frederiksberg C. Denmark, Tel 35 37 35 80, Fax 35 37 35 84

RUSSIAN FEDERATION please contact **ESOTERICA Ltd**. Tel 095 917 4385, Fax 095 917 8782

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USA please contact **Angela Instruments**, 10830 Guilford Road, Suite 309, Annapolis Junction, MD 20701, Tel 301 725 0451, Fax 301 725 8823

ITALY please contact **AUDIO NOTE ITALIA Srl**, 7/A Via F. Caselli, 20014 Nerviano (MI), Tel 0331 415 430 Fax 0331 587 661

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BELGIUM please contact, Tube **Audio Philosophy BVBA**, [illegible] 101, 2630 Aartselaar, Belgium, Tel 03 458 4848, Fax 03 457 8820

CANADA, ONTARIO please contact Barry Folsom, **Folsom Audio Electronics**, 7723 Yonge Street, Olde Thornhill, Ont. Canada, L3T 3M1, Tel 905 881 5290, Fax 905 731 9708

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YUGOSLAVIA contact **KORATO Systems**, [illegible] 36, 11000 **Belgrade**, Yugoslavia, Tel/Fax 011 [illegible]976

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TWEAKED! - WITH SPECIAL COMPONENTS

Around the world, high quality electronic components for audio work are being produced by specialist manufacturers. Noel Keywood and Jon Marks review some esoteric capacitors and resistors from this field.

Component quality is ever more widely being identified as an issue affecting sound quality. But prices remain a barrier to widespread commercial usage of the most esoteric items. But not to DIYers, who can upgrade 'at cost'.

Proper audio grade components are truly esoteric items, often with peculiar descriptions, complex performance claims and high prices. They're great for DIYers, providing an opportunity to step up in quality to a level beyond the reach of the mass audio market.

Component quality has always been an issue at Hi-Fi World. We have our own transformers and capacitors made for us and through practical experience have become well aware of the sonic signature of many components, both general purpose and audio grade. And the character of a component invariably comes through irrespective of working conditions.

But this business is complex. Many budget components sound quite good - carbon film resistors for example. High grade components not meant specifically for audio work do not always sound better - some polypropylene capacitors for instance.

And it can be disastrous to populate an amplifier with a component having a particularly strong signature. One time, every resistor in a K5881 amplifier was misguidedly changed to metal film - it sounded awful, hard and clattery. So this is a mix 'n' match business too.

It is also a decidedly subjective business where notions of absolute correctness are hard to support. Quite often, however, there is a broad consensus, but that's very different to total agreement. A 'hard sound' can suit vinyl, but not CD.

My experience is that differences in component sound quality are easier to discern on a valve amplifier than a solid-state amplifier. This view arises from changing components in a 300B alongside our 36watt Class A design. So we used a K5881 MkII for this report, changing the components shown in the circuit diagram.

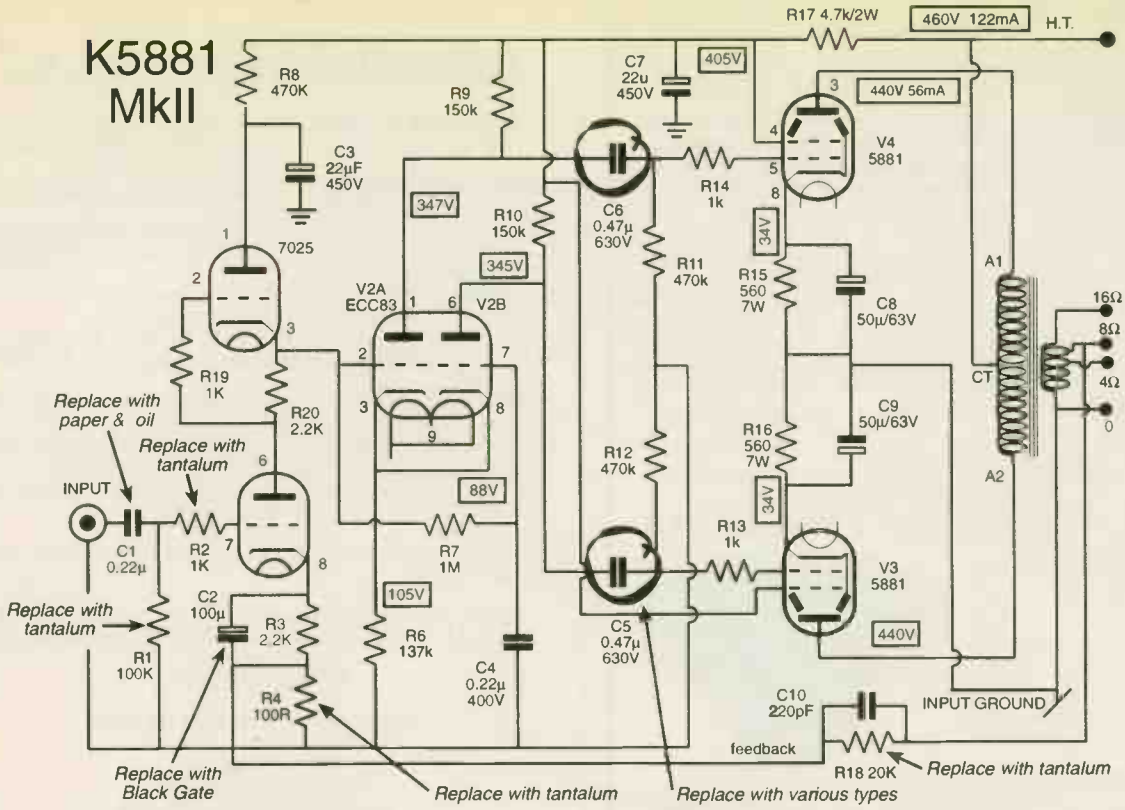
Modern plastic capacitors use a film metallised on both sides. It can be polyester, polycarbonate or polypropylene. The film is usually aluminium, its thickness determining the voltage rating. The Wondercaps tested in this report use metallised film construction.

Audio grade capacitors sometimes use a foil and film construction, which is much bulkier.

Then there's paper-in-oil. This is a rare dielectric type nowadays - we've found one manufacturer in Britain who produces it for military purposes. These capacitors are made by forcing oil into paper under pressure and heating in a sealed tank. It's an old-fashioned method that yields variable results. Paper-in-oils can leak (electricity - not oil!) but they have a good reputation for sound quality.

Electrolytics provide very high capacitance from small size, but have mediocre performance in most other areas. There are legions of special types as a result. Rubycon make various audio grade specials, like the famous Black Gate. This reputedly uses an electrolyte with a graphite additive, developed by Japanese manufacturer Jelmax.

Carbon film resistors are most common and usually sound pretty good. Metal film types such as Holcos are considered a step up, but for this report we tested tantalum film resistors, manufactured in Japan and imported into Britain by AudioNote.



THE COMPONENTS WE TWEAKED

COUPLING CAPACITORS C5 & C6 - In this position the K5881 kit's standard capacitor is a 0.47µF metallised film polyester capacitor with 400V across it. In its place we soldered in: HOVLAND MUSICAP 0.47µF 600V film and polypropylene foil capacitors; TRT WONDERCAP 1µF 425V metallised polypropylene film capacitors; AUDIO NOTE paper-in-oil 0.39µF 600V capacitors.

INPUT CAPACITOR C1 - This was replaced with an AudioNote 0.22µF 400V paper-in-oil.

FEEDBACK BYPASS CAPACITOR C2 - This was replaced with a 100µF 6.3V Rubycon Black Gate electrolytic.

INPUT AND FEEDBACK RESISTORS - These were replaced with tantalum resistors.

STANDARD POLYESTER CAPACITORS (56p each)

JM - Tori Amos' vocals and harpsichord were both powerful and smooth, integrated within an acoustic whose size was clearly audible through the Sextet IIs. The grungey electric guitars which join the song in its second half had an attractive 60-a-day roughness to them, which is just as it should be. Individual images hung together in a cohesive sound stage, good tonal balance leading to an even-handed presentation.

The ebb and flow of piano and strings showed that dynamic contrasts posed these caps no problems, with further proof in the weight of the piano's bottom end and the expressiveness of vocals. Extra bass brownie points were garnered for the focus and impact of the conga on 'Talula' and the drum machine on 'Professional Widow'.

The acoustic was once again well fleshed out on Vivaldi's Four Seasons, where imaging was stable, separation good and detail fine. Rhythm and timing were also present and correct, as I found out with the 'Danza Pastorale', its violins tripping along, joined by the drive of the well defined cellos.

NK - Very clear and precise. Typical film capacitor glassiness, close to audio grades but a little less insight, fine detail and smoothness.

AUDIONOTE PAPER-IN-OIL CAPS (£12.75 each)

Bass immediately stood out for its extra detail, speed, impact, extension and focus. It was as if someone had hit the loudness switch, but instead of fat, bloated lower registers, there was suddenly another octave of hard-hitting bass on tap. As a self-confessed bass-head, the AudioNotes produced the kind of taut, tuneful bass that put a grin straight on my face - the groove factor in the music had just risen a couple of notches on the shake-your-booty meter.

The sound as a whole opened out, different layers within the sound stage becoming more obvious - individual images were now easier to make out within the larger acoustic these capacitors developed. They also showed an overall control and grip which never quashed the vitality of the music, instead enhancing it by making the music easier to listen in to.

There was greater detailing to images as well, giving them a fuller, more three-dimensional feel and knitting them more convincingly into the sound stage. This detailing extended to the treble, with cymbals and strings benefiting from

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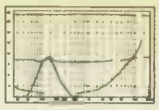

As Featured In the Hi-Fi World DIY Supplement No,s 22 & 23 (June, August 1996). Still available to Hi-Fi World readers at the Reduced price :- **£89-00 Inc Plus £5-00 P&P**

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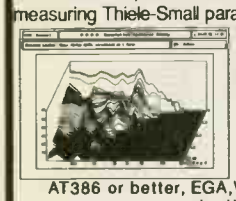

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impressive tonal subtlety and insight.

One major difference between the AudioNotes and the standard capacitors was a softer midrange that was less forward and incisive, giving Rock a mellower character.

NK - Always different from synthetic film capacitors, these paper-in-oils soften out the mid-band a little but give enormous amounts of clean high frequency detail. Most surprising was their significant extra bass extension, with improved impact and raised level.

HOVLAND MUSICAPS (£12.86 each)

The Hovlands' midrange is similar in presentation to the standards' in its forwardness, but has a delicacy of detail closer to the paper-in-oil capacitors. Tonally, the Musicaps had a wider palette to paint from as well, with violins and cymbals in particular coming across more realistically.

While the Hovlands' bass was tight, detailed and fast, it lacked the sheer weight and impact that the AudioNotes possessed. This meant that acoustics were rendered on a smaller scale, the sound stage missing out on some of the width and depth that had been discernible with the paper-in-oils.

The overall balance of the music tipped away from the visceral of the AudioNotes towards the analytical, becoming a little less engaging in the process. Rock fans

might well go for this approach with its crisp, precise speed though. And the way images stood out cleanly in the acoustic means that these caps will never sound confused, even on the heaviest of mixes.

NK - Similar in basic presentation to the standard polyesters, but with stronger outlining, more detail and more upper midband projection.

TRT WONDERCAPS (£5.50 each)

These capacitors continued the plastic family tradition of forward and incisive midrange, as the likes of Grace Jones, the Chemical Brothers and Vivaldi proved. With the latter there was a broader sound stage and deeper bass than had been the case with the Musicaps. The music flowed along rhythmically, these caps showing off their prowess in the timing area with an impressively foot-tapping rendition of 'Setting Sun'. Detail was abundant - I had no problem homing in on the individual samples plastered all over this song. While the TRTs' bass plumbed greater depths than the Hovlands, it didn't go as low as the AudioNotes.

Vocals proved the

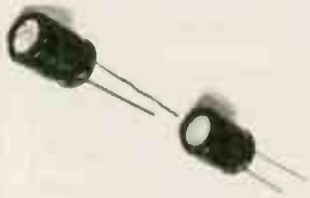
smoothness and power of these caps, with the expression in Tori Amos' singing particularly impressive. Backing violins and harpsichord were less glassy due to a broad tonal range that fell halfway between the paper-in-oils and the Musicaps. Images were properly detailed and proportioned and sat within an attractively transparent sound stage. The TRTs seemed to combine the incisive, forward midrange characteristic of the plastic caps in this test with some of the broad tonal range and low-level detail retrieval of the paper-in-oils.

NK - A little less extreme in upper mid-band glassiness and projection than the Hovlands, a little better in overall balance due to stronger bass too, although not a match for the paper-in-oils. Very good.

JELMAX BLACK GATES (£1.83 each)

The effect these tiny electrolytic capacitors had on the sound quality was far from small. From the first moment that music started coming through the Sextet IIs, it was obvious the Black Gates had cleaned up the overall sound, removing a layer of grunge from the amplifier's presentation.

Tori Amos' piano and vocals were now firmer as well as more dynamic and realistic, their images packed full of a subtle detailing that never became overwhelming.



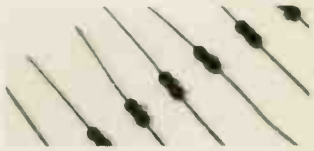
The band members were solidly positioned in an acoustic made recognisable thanks to the transparency the Black Gates brought to the proceedings. With the extra breadth and width the sound stage now possessed, music took on life-like proportions and was much more involving.

The Black Gates seemed to have a similar affect to the paper-in-oils where bass was concerned. They removed the mush that normally obscures the cues in the lower octaves that build up an acoustic and add space to the sound stage. But they also tidied up the performance of midrange and treble, with greater insight and detail, especially obvious on strings, lending Vivaldi's Four Seasons a realism that made listening addictive.

NK - Phew! The Black Gate lived up to its reputation, one little capacitor immediately improving image body and solidity right across the audio band. This component change was the best we made in my view.

AUDIONOTE TANTALUM RESISTORS (£1.99 each)

NK - These were added into the circuit in the positions shown in the circuit diagram. Their effect was quite obvious, being not too dissimilar to that of metal film resistors. They brightened and hardened up the sound, adding some high frequency



'hiss' to cymbals that warned there was now a little too much emphasis on high frequency retrieval. Our overall view here was that these resistors need to be used with care and according to conditions. The Tonigen ribbon tweeter of the Heybrook Sextets is one of the most revealing going; others may make more or less of the effect. Also, what comes over as extreme glassiness and hardness with CD sounds far more acceptable with LP, posing the question: are these components simply revealing more of CD's problems?

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

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

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

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

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

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

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

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

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

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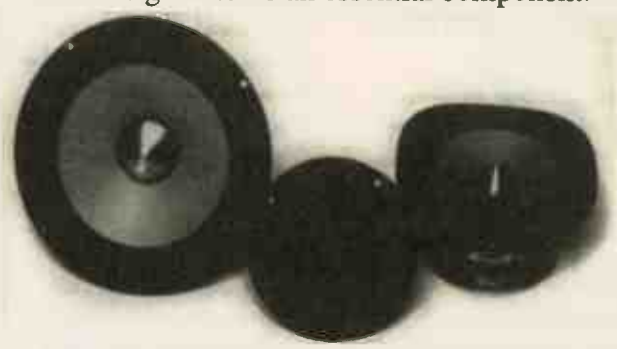

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ACOUSTICS and PSYCHOACOUSTICS

by David Howard and James Angus.

Reviewed by Noel Keywood.

Books on acoustics are becoming more common, but each has its own particular approach to the subject. Traditionally, the area has been split between two camps: musicians and architects. Seashore's Psychology of Music (McGraw Hill) is an early example of the first and Beranek's Acoustics, available from our World Library (p58), an example of the second.

Both are what I would loosely term 'mechanistic'. There is another emergent camp that approaches the subject from the other direction, looking at audible perceptive strategies from the biological viewpoint. It seeks to understand our hearing function in evolutionary (Webster, Popper and Fay) and psychological developmental terms. This approach concentrates on our interpretations of what we hear, is a branch of medical science and is producing, in parallel to the mechanists, a large body of fascinating information. As Yost says, "in the past a distinction has been made between sensation and perception", perception being treated in vague terms.

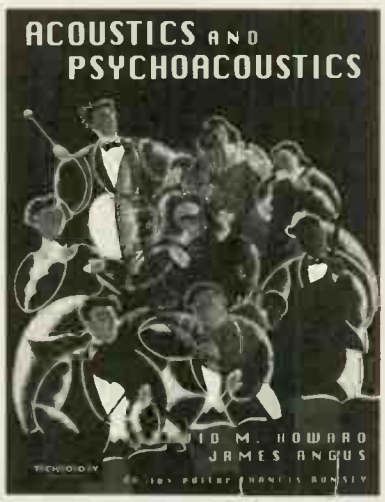
The traditional mechanistic approach to psychoacoustics is under fire from others in the field, who feel its explanations either don't go far enough or are just plain useless. "A number of investigators have argued that audiogram thresholds and other psychoacoustic measures correlate poorly or not at all with those measures attempting to tap a listener's ability to function acoustically in daily life".

I mention all this to get Acoustics and Psychoacoustics into perspective. It comes firmly from the mechanist camp. And it does a good job. But when I see the word "psychoacoustics" I do rather wonder whether I've got to plough through dense paragraphs and complex diagrams of hairy cochleas, of more use to a surgeon than someone, like myself or a potential purchaser of this book, who needs to make sense of our senses.

In this case, the cochleas have it, together with the conchas, incus and all manner of auditory bits and pieces, from page 66 onward. However, that is not to deny that the book covers valuable ground. It is written by and aimed at those interested in music recording and performance.

Early chapters cover the usual ground, considering air speed, wave compression, reflection, refraction, resonance and various other physical phenomena. There is a useful number of equations, but the authors have tried to make the book easy to comprehend. The explanations are nonetheless comprehensive and detailed.

After talking about the physics of sound and the biology of the human auditory system, the book moves in apparently logical progression to Notes and Harmony. Here we are getting firmly into music theory and some of it I found fascinating. I had always thought that the good Dr Ohm was an expert on



current through resistors, but it seems he also developed an acoustical law. Coverage of psychoacoustics from this point of view, namely how we perceive groups of tones and such like, is thorough and well supported with references, both within the chapter and at its end.

The arrival of Chapter 4 clearly signals which way this book is heading. Entitled Acoustic Model for Musical Instruments it explains how musical instruments work, including human vocalists. The subjects of Timbre and Masking follow, with the inevitable reference to 'deception' that engineers make when discussing masking effects. I'm sure Yost would see 'deception' more as a sophisticated biological form of 'optimisation'.

The penultimate chapter considers rooms, studios and acoustics. It covers basic theory more than practical acoustics solutions, although I was amused to see the use of side wall absorbers to produce a reflection-free listening zone in a room, since we regularly recommend this. However, the influence of the rear wall, and of diffraction as an alternative to adsorption, are not discussed. The book quite often resorts to theoretical generalising where, I suspect, the authors have little practical knowledge. And finally, in the last chapter, electronic sound processing, including equalisation, phasing, reverberation, compression and other studio effects are covered very quickly.

Leaving me to categorise this book as a good choice for music students - and ear surgeons. Its approach is more theoretical than practical, but for anyone studying acoustics for the first time the explanations are about as easy as they come and the coverage wide too. But everyone in audio ought to be aware that human auditory perceptive strategies are not as simple and mechanistic as traditionally presented in books like this. Making the scope of the 'psychoacoustic' contribution a bit limited and limiting. I would like to have seen a bit more breadth of discussion in this important and profound area ●

Acoustics and Psychoacoustics

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AUDIO POWER AMPLIFIER DESIGN HANDBOOK

by Douglas Self.

Reviewed by Andy Grove.

The Audio Power Amplifier Handbook follows from a series of articles by Douglas Self published in Electronics and Wireless World, but of course the book allows the author to cover the subjects in greater depth. Mr Self is a respected audio engineer and currently designs professional equipment such as consoles for the Soundcraft Electronics company.

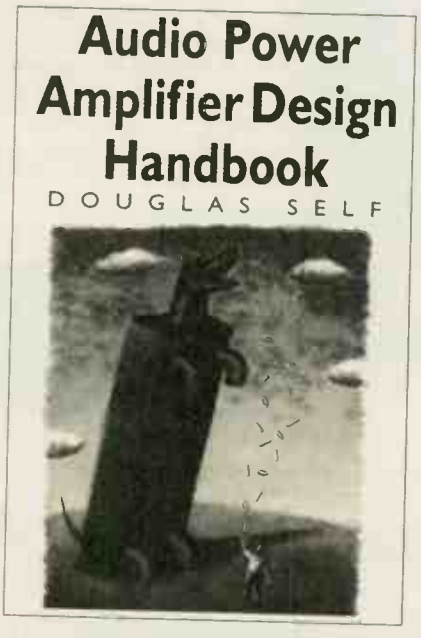
Douglas has analysed the distortion mechanisms of the various stages of the amplifier and presents methods for their reduction or elimination. In the opening chapter Doug attacks the subjectivist movement with a vengeance. It's all done very logically and the arguments presented seem valid. Here also the general requirements of power amp performance are laid out, with safety and reliability first and foremost, progressing through well known lab test parameters such as damping factor and distortion.

The second chapter gives the reader a quick overview of two possible amplifier topologies. The different classes of operation such as A, B, and H are described quite briefly, but the book really concentrates on Class B output stages. A 'for' and 'against' list of features for AC and DC coupled amplifiers is also presented. From there Self goes on to justify the use of negative feedback, his argument mainly hinging on how it reduces distortion. But he also points out that the distortions produced at each stage can be minimised before feedback is applied, maximising its effect.

In Chapter 3, Self's eight distortion mechanisms are introduced. These are distortions which he seeks to reduce to make an amplifier more linear, before feedback is applied. Here also the 'generic amplifier' is introduced. This is the almost universally used three-stage circuit with input differential pair, voltage amplifier and output buffers.

The next three chapters offer a step-by-step analysis of the generic circuit, starting at the input differential pair and proceeding through the voltage amplifier to the output stage. The analyses are in depth and Spice models are used to predict behaviour, together with some real-world prototype circuit tests. All kinds of goodies are described, such as current mirror loading of the input pair, constant current sourced VAS stages and the innumerable different output stage types from the simple emitter follower to complex triplets.

Chapter 7 covers the issues of



stability, compensation and slew rate in great detail and Self illustrates the various effects of the amp's set-up, such as input stage operating current on its high frequency and slewing performance.

The following chapter investigates the power supply and its effect on performance. Even the wiring and earthing of the circuit is taken into account. This is valuable for less experienced engineers. Self concludes that the best approach is to maximise the amp's power supply rejection ratio rather than making the supply super stiff and quiet.

Chapter 9 is all about Class A amplifiers. They are introduced as a way to decrease distortion from the output and driver/voltage amplifier stages. In this chapter there is a very novel output stage quiescent current monitor and controller and the 'Trimodal' amplifier which can be a Class A, B or AB.

In Chapter 10 the FET output stage is explored, but Douglas is not a fan of the FET, mainly due to its lower transconductance manifesting as higher distortion when used as a follower, so this chapter is quite brief.

Chapter 11, entitled 'Thermal Dynamics of Class B Output Stages' addresses just that, and Self uses Spice modelling techniques to predict thermal performance by converting various thermal elements to electrical ones. The thermal issue is a very important one, not only for the purpose of reducing distortion but for the practical reason of avoiding thermal runaway and output stage self-destruction if you get it wrong!

The final three chapters are practical and down to earth. Covering protection circuitry, mechanical design including PCB layout and final testing.

For those who want to build a reference quality solid-state amplifier this original book is essential. But it should form part of a library and not be taken as the bible of power amps because it is very specific in its coverage. There are numerous other topologies, apart from the 'generic amplifier' topology, which may or may not offer advantages.

Douglas Self has made it a personal quest to perfect this particular amp topology, something I thought Hitachi did back in the Seventies with their super high feedback MOSFET amps. Self's criterion of amp goodness is to have the maximum amount of zeroes before the one in the distortion figures. It's like trying to characterise a car from the engine's power output or wheel diameter; it's all just specs in the end.

This is an original and informative book written in a very easy to understand style, which indicates that the author knows what he is talking about. But I wish Douglas would discard his Paisley shirt and psychedelic kipper tie, put a little more faith in his senses, and a little less in his test gear.

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D.I.Y. Letters

Andy Grove (ex-Hi-Fi World, now Audio Note) says -

You could do quite a lot to increase the sonic performance of your head amp. You could upgrade the electrolytic capacitor to Black Gate types and possibly fit tantalum film resistors, but you seem to be concentrating on the power supply and it's quite often a good place to start.

Ideally you would use a choke input filter and low noise shunt regulator. We've got some high current chokes for filament supplies at Audio Note. Using a large capacity mains transformer and reservoir caps could work quite well. Linear Technology make high performance regulator ICs. Check the audio parts guys' catalogues.

One tip is not to put a super large capacitor on the output of the regulator chip; the data sheet will advise. Also, it may be worthwhile putting a small resistor between the output of the chip and the cap, 10 ohms say.

Another way of making a super cool regulator might be to use a high performance power op-amp IC and a voltage reference IC for each rail. Make sure the power op-amp has a good frequency response, and again be wary of using large capacitors on the reg's output.

A word of warning, shorting the regulators output may result in instantaneous destruction of the op-amp unless it is internally protected. Of course this is only likely to happen if you are careless with the meter probes. There are various circuits around in the reference books from Maplin and so on, for discrete and IC regulator circuits, check them out. AG

Noel says

There are many forms of power supply, each with its own strengths and weaknesses, as well as

POWERING UP

I am looking to squeeze a bit more performance out of your phono head amp, and am considering building a beefier power supply. My inspiration is the Michell ISO, which sounds much better with its Hera power supply.

Would this be a worthwhile proposition? If so, how far should I go? If I follow the Russ Andrews school I would end up with a 200VA or so transformer and 20,000µf reservoir caps on each rail. While I would be prepared to build something along these lines, I assume that something smaller would fit the bill. Can you suggest something?

Also, if I do uprate the power supply should I also replace the voltage regulators with something rated a bit higher, say 1 amp or so?

Steve Hall
East Carleton,
Norfolk.

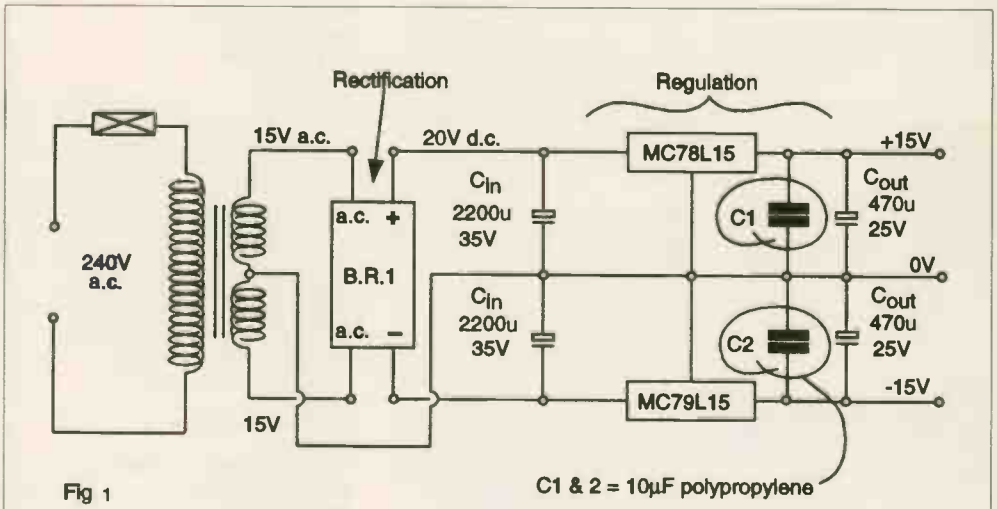

Fig 1

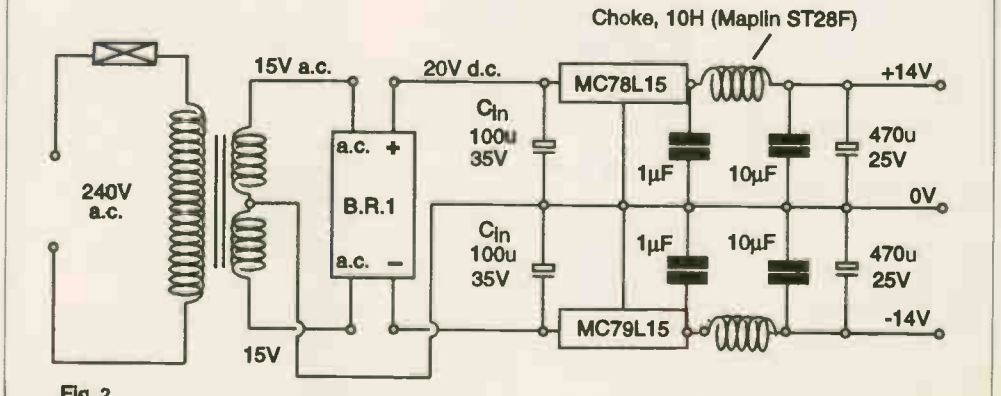

Fig 2

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adherents of course. Here are some options, that relate to power supplies in general, you might like to consider.

Note what Andy says here.

Furthermore, looking backward from amplifier into power supply, the amplifier sees a solid-state power output stage. Since the amplifier effectively routes the power supply current through the load, the sound of the power supply, as determined by its dynamic behaviour, noise etc will influence the load. So, in effect, you end up listening, in part, to the voltage regulator. That is why Andy recommends using a high performance audio power amp as a regulator; it is also why valve regulators are best.

Generally speaking, solid-state voltage regulators work best at low frequencies and invariably give tight sounding bass, but they are less pleasant across midband and treble. If you increase input capacitor Cin you pulse the transformer and mains supply more heavily, as transformer volts rise above Edc to Epeak (top trace in Fig 3) which is not a good idea in principle, although in this case little current is being drawn, unlike a power amplifier.

Increasing the output capacitor, Cout, will have little effect, because of the voltage regulator's low output impedance. All the same, you will find a large value polypropylene across the output 470µF electrolytic, as shown in Fig 1, cleans the treble.

The best way to decouple the power supply from the amplifier, and to draw current more smoothly from the transformer, is to use a choke. It might seem daft to put a choke after a voltage regulator, since the DC resistance (150Ω in the Maplin choke) destroys the regulation, but in this case the regulators are there only to guarantee the lines can't rise above 15V. A large value choke (3-10H) decouples the amplifier stage from the supply effectively and makes the output capacitor more influential. Use a 470µF/25V Cerafine or Black Gate as an output capacitor, optionally bypassed by an audio grade polypropylene - experiment to see what you prefer.

Providing the input capacitor is kept low, around 100µF or lower if hum is not a problem, then current draw from the transformer is smooth over the whole of a voltage cycle, as shown by Iavge in the bottom diagram.

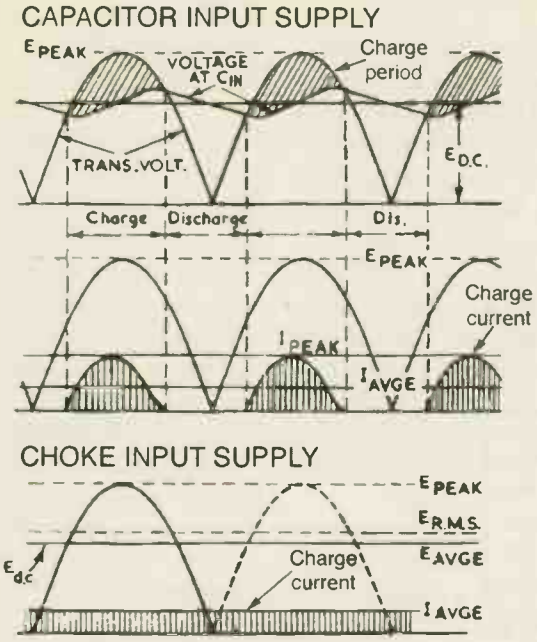


FIG 3

Our phono stage power supply uses a normal capacitor input topology where rectifier BR1 charges 2200µF 'input' capacitors. This provides a fairly hum free 20V that feeds the MC78L15 (+ rail) and MC79 L15 (- rail) voltage regulators. These hold the output voltage steady irrespective of input voltage (i.e. mains) fluctuations or output current variations. It's simple and it guarantees DIYers a 15V line free of hum, since both the capacitors and the voltage regulator act to smooth the supply. The AD797 supply voltage is rated at 15V maximum and running the chip at full line volts gives maximum signal output swing of around 10V rms.

This is a safe, cheap and reliable supply, of a sort much used generally. However, chip voltage regulators have a very low output impedance that defies the efforts of output capacitors to swamp their influence. I've experimented with many such regulators and find they are noisy, about which little can be done.

In effect, the choke, being a reactance, stores energy, releasing it into Cout and the load, during the discharge period. This will improve sound quality. You might be interested to note that Cin should be made as small as possible in this arrangement, and Cout made large. This arrangement approximates to a choke input power supply, considered something ideal, although a pig to implement I have found.

Another option seriously worth considering with a high gain, sensitive preamp in particular, is to go battery. Use two 12V sealed lead acid types, which have a very low output impedance, one for each rail. Recharge them over night. The Yuasa XG74R from Maplin at £18 apiece will suit. **NK**

QUICKSILVER MESSENGER

In Australia I have just obtained a copy of your October '95 issue and I think I can help Andrew Footman from Wolverhampton, who asks for information on the Quicksilver amplifiers, in particular the 8417 valves.

Note that the ratings for the KT88s are for genuine GEC M.O.Valve Co. By all accounts, the Chinese derived KT88s (currently available through PM Components, Golden Dragon, Billington Gold et al.) are better run at considerably lower plate voltage to avoid flash-over problems.

Typical operation points for all the valve types listed at a B+ of 450V are almost identical - around 50mA standing current per tube, with a grid 1 bias of -15V to -20V. In fact, the 8417 needs a slightly lower bias voltage, which means it is very easy to drive.

Based on these ratings, Andrew could directly (well, almost directly - see info on pins below) substitute a KT88 or 6550 and be well within the design centres for any 8417 circuit.

RATINGS	8417	6550	KT88	EL34
Anode volts	500V	660V	800V	800V
Screen volts	500V	500V	600V	425V
Anode power	35W	42W	42W	26W
Screen power	5W	6W	6W	8W

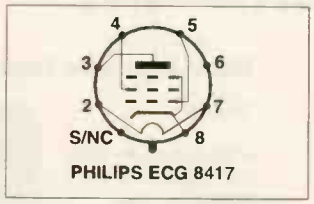
The KT88 and 6550 can be directly substituted for the 8417, with one ESSENTIAL check needed. I have a base diagram for the 8417, which shows their plate internally linked to both pins 3 and 1. Andrew would need to check that the Quicksilver plate leads go only to pin 3. If so, the following pins apply for the three types:

Pin 1. no connection
Pin 2. heater
Pin 3. plate
Pin 4. screen
Pin 5. grid
Pin 6. no connection
Pin 7. heater
Pin 8. cathode

My info. on the monoblock Quicksilver is that they are 100W ultralinear amplifiers. I don't have any info. on their HT, but I suspect it would be about 450V, with a standing current of about 55ma per valve. See sketch of circuit.

If the B+ measures less than 430V, the EL34 could be substituted, provided that pins 1 and 8 are linked. The other pins are identical.

My recommendation would be to find a decent set of KT88s, join pins 3 and 4 together with a 100 ohm resistor, and run them as triodes (disconnect the screen taps on the output transformers). Andrew would then have 50 watts of class AB1 triode power - a real challenge to the Audio Research Classic 60s. If the EL34s were strapped as triodes, he would get about 35W.



PHILIPS ECG 8417

I hope this is useful information for Andrew, if he hasn't already had help from elsewhere.

Andrew Neale
Modbury Heights,
South Australia.

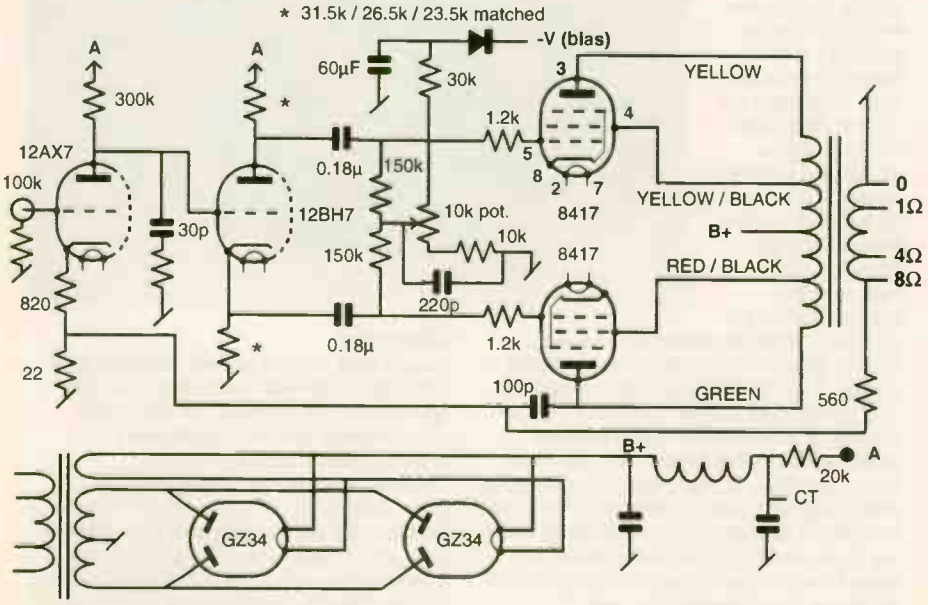
Thanks. We have reproduced your circuit from fax and hope it is correct, since some values were not clear and B+ is commonly on the output side of the choke. Our base diagram for the little mentioned 8417 comes from the Tube Substitution Handbook. Here, the plate (anode) goes to 3 alone and 1 is either an optional Screen (not an electrode) or No Connection, according to the manufacturer. **NK**

ULTRA-LINEAR

I was most interested to discover your magazine last year as one which treats valves and vinyl seriously and I found your comments on valve amplifier design in the November supplement most interesting particularly your rejection of ultra-linear operation for your K6L6 and K5881. Following the Mullard and GEC treatises I had been brought up to think of this as the 'be all and end all' of amplifier design.

I do however have a couple of queries. Firstly much has been written on the superiority of triodes over pentodes as output devices but I have never seen any comments on their pros and cons in earlier stages of power amps or as preamps: do similar comments apply? The Mullard power amps all use pentode inputs whilst GEC go for triodes and Quad seem to have taken the GEC design and replaced two triodes with a pentode. For preamps all three use a mixture of triodes and pentodes.

In my own aged equipment all except outputs are triodes. Rogers for example in my Cadet 3 drives the output pentodes from a



QUICKSILVER AMPLIFIER (one channel)

single triode anode/cathode phase splitter with gain provided by a preceding triode voltage amplifier. In the preamp section he uses a further 3 triodes to get from the MM phono input giving 5 triodes in all per channel the first 3 being the now rare ECC807, designed specifically for this application as a superior low noise ECC83. Going further back to my state of the art domestic audio of 1950 (a KB radiogram) the output tetrodes are driven by an amplifying phase splitter using two triodes (GEC's 'floating paraphase phase inverter') preceded by a voltage amplifying triode for the detected radio signal. A fourth triode is brought into use for phono for the weaker signal from the Decca XMS variable reluctance pickups.

Neither piece of equipment uses UL output and seems to manage well enough without: QED I suppose. Indeed I imagine I would have to expend a fair amount of cash to better the musical quality of the Rogers on my preferred (classical) listening. How would your K5881 or K6L6 compare I wonder?

Secondly, I find that in general I get a more immediate, lively and atmospheric sound from LP than CD making music more involving with the former. With the Rogers I use a Goldring-Lenco GL75/Shure M75ED T2 combination and a Technics SL PG 460A CD player. Speakers are Wharfedale Lintons I 're-engined' a year or two back with Audax I" soft dome and 8" paper cone/foam surround units and 4 new element crossovers. I thought I perhaps had a bright cartridge and dull CD player but the Technics got excellent reviews and when I bought it I also auditioned the much lauded Marantz CD63 but thought that sounded rather dull and didn't like it.

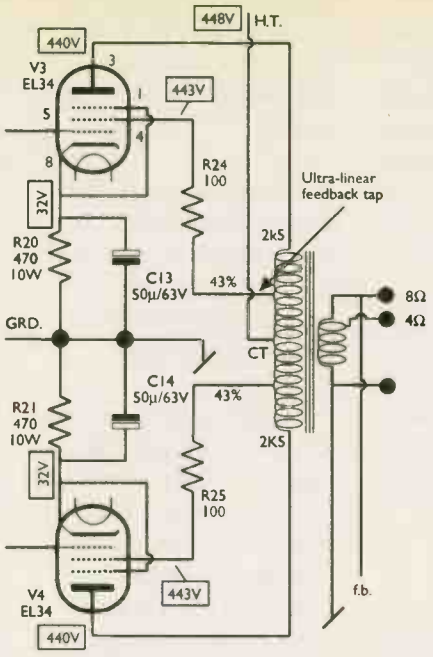
Would upgrading to a better CD player give me a more LP like sound? I suspect not and that the problem lies in the nature of the medium itself. When I have heard new DDD CDs which I also posses on the radio they have the same rather anodyne sound and yet with the odd disc the Technics shows it can provide a lively sound. Mercury 'Living Presence' CDs seem sharpest (perhaps due to their careful remastering, playing the mastertapes on the original valve recorders on which they were made). In one case where I have the same item on Mercury LP and CD the sound is virtually indistinguishable; in other cases where I have the same recording in both formats LP is always more immediate.

Finally I note that the distinguished audio panel in the magazine 'International Classical Record Collector' in their camparisons of a CD with various different LP cuts from the same master have so far always placed the CD last for audio quality. Enough said?

I would be interested in any comments you may have.

Nicholas Coleman
Newton-le-Willows,
Merseyside.

The output transformers of our K5881 amplifier have a high primary impedance, which helps keep the output stage intrinsically linear. It offers better measured performance, I found, when using the linear 6L6 valve (in rugged 5881 form) than an EL34 working in ultra-linear mode. Feedback skews an amplifier's transfer characteristic and did so when applied from a transformer with ultra-linear taps. Distortion changed in its harmonic structure as level rose. What this means is that the pattern of distortion becomes modulated by level, not a good sign. So in my experience the complexity of ultra-linear is unnecessary; better basic design is the answer.



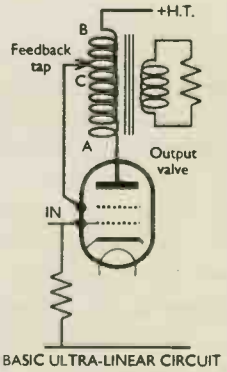
MULLARD 5.20 ULTRA-LINEAR OUTPUT STAGE

Andy Grove is happy with it though. He says "I have found that ultra-linear does seem to work, electrically at least. It makes a pentode operate halfway towards a triode and produces more even order distortion. Of course, ultra-linear is not the same as true triode but it offers efficiency in between pentode and triode. There are problems with ultra-linear in that unless the output transformer is very special the screen tap will not be coupled to the anode at high frequencies and instability results. This made the old designers put caps and resistors all round the transformer to stop oscillation. Also, the commonly used 43% is not correct for every operating condition or valve. The tapping point has to be designed in."

Running the K5881 output stage 'straight', with the 5881 screens just a few volts below the anode produces just a small amount of second harmonic distortion, an innocuous characteristic. However, this is specific to the 5881 valve, which draws little grid current due to the electrode alignments. Generally, the advice is to run the anode of a tetrode at as high a voltage as possible and the screen at half anode volts, from a 'stiff' supply (i.e. one that is regulated). The ideal is postulated as a 50% tap on

ULTRA-LINEAR OPERATION from AMPLIFIERS AND SUPERLATIVES by D.T.N. Williamson and P.J. Walker.
If the tap is affixed to point A, giving a coupling factor of unity, the stage behaves as a triode, if at B as a simple tetrode. If now the screen is tapped at intervals between point B and point A there will be a progressive inclusion of the load impedance in the screen circuit and a progressive change from tetrode characteristics at B to triode characteristics at A.

In the case of the single valve there would appear to be little gained from this circuitry. With push-pull the reduction in distortion is greater than the reduction in gain, because of the cancellation of second harmonics. This "something for nothing" is small, however, and can be lost or even reversed if there are any appreciable departures from precise balance at any frequency.



BASIC ULTRA-LINEAR CIRCUIT

the mains transformer secondary, regulated to keep within the screen voltage rating - often 300V or so. A common approach is to use a potential divider to establish this voltage. Such an approach maximises power output and keeps screen current down.

However, I have to say that with K5881 this approach was tried and did not work, reducing power and increasing distortion, showing that much depends upon individual circumstances and components.

Recently, I reduced feedback in K5881 as far as possible (to 18dB) consistent with an upper bandwidth limit (-1dB) of 20kHz. This has helped open up the sound, improving depth perspectives in particular.

It's probably best to say that CD and LP are just 'different'. By and large, cheap CD players do a better job than cheap record decks, as well as being more convenient of course. The situation changes as price goes up, because CD is performance limited by its old 1970s digital coding system, whilst LP, being analogue, is not. So the more money you throw at it, the better it gets. **NK**

Andy Groves says -

There are four fundamental differences between triodes and pentodes;

1. For a given transconductance a pentode will generally give higher gain than a triode due to its much greater internal impedance.

2. The positive potential on the screen grid allows a pentode to sink more current at low voltages than a similar triode, this equates to higher efficiency in output stages.

3. For a given transconductance a pentode will create more noise than a triode due to the random distribution of currents between the anode and grid screen.

4. Pentodes are easier to drive at high frequencies, in a triode the Miller Effect loads the input capacitively at HF, but the screen grid in the pentode prevents this.

There is possibly a fifth and that is that pentodes tend to produce a more complex harmonic distortion pattern than triodes, but it does depend on how the pentode is being used. In output stages pentodes do usually produce higher order harmonics than triodes. So the pentode is more efficient power wise, has higher gain and is easier to drive at high frequencies thereby making wide bandwidth more easily achievable. The triode however is quieter and generates simple low order harmonic distortion and its low impendance helps with speaker damping. These criteria are important for audio quality amplifiers and for the best amps triodes are usually chosen throughout.

In output stages one would ideally want the high efficiency of the pentode and the low distortion of the triode. There have been several attempts at achieving this performance and Ultra-Linear was one of them. To make a pentode operate as a pure pentode the screen grid is held at a rigidly fixed voltage. If however the screen grid is connected to the anode, the pentode starts to operate like a triode. Engineers thought that if they could connect the screen to a voltage which was somewhere in between they might get some of the advantages of both the triode and pentode. They connected the screen grid to a tap on the output transformer so that a percentage of the anode swing was fed into the screen grid. A 43% tap (a commonly used value) feeds 43% of the anode voltage swing into the screen grid. They found that it was possible to make a mutant hybrid of pentode and triode which gave good efficiency like the pentode but which also gave more even-order distortions which would hopefully be cancelled by the push-pull operation.

Unfortunately, they soon discovered that just bringing out an extra wire part along the main primary winding caused stability problems and so resorted to adding extra components around the output transformer or making very complex windings. It seems that Ultra-Linear fell from grace due to it being a bit of a pain in the butt. **AG**

DIPOLE DYNAMICS

Your article on the equalised dipole subwoofer was extremely interesting, since I have been working on this very topic for almost two years now.

I substituted your equalisation circuit for my own, which incidentally had the same equalisation minus the 140Hz peak. The benefits were immediately noticeable - much improved transients and a feeling of increased speed at low frequencies.

Increasing the peak slightly to 3dB improved things even further, although there was an increasing need to move the dipoles even further away from the rear walls due to an excitation of room/boundary at 140 Hz.

It may have been due to my hurried construction but I could not achieve stability with the subsonic stage and had greater success with the circuit below, which I modelled on my own PC

I did find that I much preferred (on my dipoles) no subsonic filter at all. You say that you feel it adds to the subjective speed at LF. I must confess I cannot detect this. However, for those using vinyl it will be necessary to prevent excessive cone movement.

Yes, without the filter there is tremendous presence of low frequency energy which is readily felt, particularly on organ and bass synthesiser.

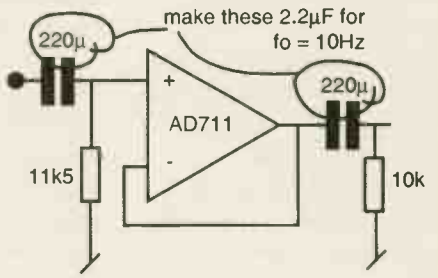
Hope this is of interest to you.

David Huckle
Cambridge.

We're always glad to hear of people achieving success with interesting and advanced acoustic techniques beyond the understanding of the general hi-fi business. Proves how strong DIY can be.

I never encountered instability in the crossover, even when tuning in outrageous peaks, but layout and power supply decoupling (especially) do need to be attended to carefully.

Cone excursion is a problem with a dipole trying to produce high level subsonics and for safety, as well as for LP warps, I gravitated toward using a second order high pass filter at 20Hz, forsaking the delights of experiencing structural re-assembly of the brickwork around the listening room.



Your circuit comprises two passive high pass sections with the op. amp. acting as a non-inverting stage between them. The right capacitor value is 2.2µF for a 10Hz turnover frequency, not 220µF. **NK**

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