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FREE D.I.Y. SUPPLEMENT No. 17

Announcing the availability of the original WE 300B electron tube.

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KIT NEWS

KIT NEWS

NEW WESTERN ELECTRIC VALVES

Western Electric, part of America's giant AT&T communications company, has announced renewed manufacture of a super high power triode, the 212E. Standing no less than 13ins high, with a diameter of 3.5ins, the 212E is a monster. Designed originally for transmitters, as well as industrial amplifiers, everything about it is larger than life. Its filament alone consumes 84watts and its anode (plate) can dissipate 275watts. To swing this power the anode needs to be run at up to 3000volts.



Stunned by the re-emergence of this valve, which shades today's biggest such as the 845 - by a large margin, we contacted the President of Western Electric, Charles Whitener Jr. Asked whether it was to be used in a new EMP-resistant transmitter proposed by the US military, or something equally esoteric, he assured us it was in fact aimed purely at the audio world, especially Far East enthusiasts who seek to vaporise themselves. Tweaky as hell, Western told us the 212E was intended for "high power single-ended designs". With a typical efficiency of 30%, this means the 212E could be used to create an 80watt SE amplifier.

But don't get too excited! The output transformer will have to be able to withstand 5000volts between primary and secondary or the 'speakers will go into orbit.

Safety approval? - Forget it! Both mains and output transformers will have to be installed by crane and the standing dissipation of a stereo amplifier will be 560watts or thereabouts, so they'll stream heat. Then there's the insurance premium. You'll need this, because each valve costs \$750, or around £500 by the time it reaches the U.K.

I love the earnest explanation in the application notes that gradation into four impedance classes is "in no way a gradation of quality, but to facilitate parallel operation". Run in parallel matched pairs like this they'd produce more energy than the big bang at Los Alamos and even the U.S. Federal Reserve would be challenged by the price. Like it!

More prosaic is the re-emergence of the Western Electric 274B doublediode rectifier valve. Able to pass a reasonably high current of 225mA, this valve will withstand 660V rms volts input.

Westrex Corporation AT&T Promenade II, 1230 Peachtree Street, Suite 3750, Atlanta, Georgia 30309-3575 & (001) 404 874 4400

AFFORDABLE MULTIMETER RANGE

Maplin Electronics have introduced a new, affordable range of multimeters. The 'Academy' range consists of five meters, moving in price from £19.99 up to £44.99. Of particular interest is the PG012, which at £34.99 includes an autoranging frequency function and a capacitance meter. For full specifications, see pages 308-313 in the 1995 Maplin catalogue.

Maplin Electronics P. O. Box 3, Rayleigh, Essex. SS6 8LR & 01702 554161

NEW MAGNESIUM DRIVERS FROM SEAS

Seas, one of the major suppliers of drive units to the hi-fi industry, have recently introduced a range of magnesium cone drivers. There are four drivers available, two with 6.5" and two with 4.5" cones. All of the magnesium drivers feature heavy copper rings mounted above and below the T-shaped pole piece to reduce distortion and increase overload margin, a solid copper phase plug which improves heat conduction away from the pole piece and an injection moulded magnesium chassis.

These new drivers are only available to manufacturers at present, but it is hoped that they will be made available to home constructors in the early part of next year.

Radio Components Ltd 428 Whippendell Road, Watford, Herts, WDI 7PT. & 01923 250665

AUDIO FAIR

The 1st Egham Audio Fair will be taking place at The Egham Youth Centre, 185 High Street, Egham, Surrey on Sunday 1st October. Arranged by Graham



Hart Audio Kits and factory assembled units use the very west audiophile components in circuit designs by the renowned John Linsley Hood to give you unbeatable performance and unbelievable value for money

We have always led the field for easy home construction to professional standards, even in the sixties we were using easily assembled printed circuits when Heathlot in America were still using tagboards! Many years of experience and innovation, going back to the early Dinsdale and Bailey classics gives us incomparable design expertise in the needs of the home constructor. The current range of Hart lots is designed to give you all the components lor a matching ensemble of audio excellence



K1100 AUDIO DESIGN BO WATT POWER AMPLIFIER

This lantastic John Linsley Hood designed amplifier is the flagship of our range, and the ideal powerhouse for your ultimate hift system. This kit is your way to get EX performance at bargain basement prices Unique design leatures such an fully FET stabilised power supplies give this amplifier world Class performance with startling clarity and transparency of sound, allied to the tamous HART quality of components and ease of construction Useful options are a stereo LED power meter and a versatile passive front end giving switched inputs, with ALPS precision Blue Velvet low-mise volume and balance controls

Construction is very simple and envoyable 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 at £29.60 extra per

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K1400T Kit with Tri-range tone controls. £398.41



"CHIARA" SINGLE ENDED CLASS "A" NEADPHONE AMPLIFIER

First Module to appear in our new "2000 Range" of kits. This unit promides a high quality phone output for those many amplifiers that do not have one. Easily installed with special link-through facility the unit draws its power from our new Andarte Ultra High Quelity linear toroidal supply. Housed in the neat, black finished, Hart minibox it leatures the wide trequency response, low-distortion and 'musicality' that one associates with designs from the renowned John Linsley Hood Pre-terminated interconnecting leads and PCB mounted sockets prevent supply polarity reversal and on-board diagnostics provide visual indication of supply line integrity. Volume and balance controls are Alps "Blue Velvet" components Very easily built, even by beginners, since all components fit directly on the single prime circuit board and there is no conventional wiring whatsoever The kit has very detailed instructions, and even comes with a roll of Hart audicgrade silver solder. It can also be supplied factory assembled and tested. Selling for less than the total cost of all the

components, if they were bought separately, this unit represents incredible value for money and makes an attractive and harmonious addition to any

hili system K2100 Complete Kit. £109.50 K2100SA Series Audiophile verse in with selected audiophile £112 46 components

A2100SA Factory Assembled and Tesled "Chiara" £149 46

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K1450 MAGNETIC PICKUP PREAMPLIFIER KIT features a totally discrete component

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

A MOU CONTRACT ME						 2111.3
K 1450SA Audiophile Kit.	_	_	_	_	_	£133.9

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



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SOLDERING

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

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HART SUPER AUDIOGRADE SILVER SOLDER

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

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

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er Version with Hart Silver Solder.		£6.95

TECHNICAL BOOKSHELF

NEW! "AUDIO ELECTRONICS" And now, hot off the press, yet another classic from the pen of John Linsley Hood. Following the enormous ongoing success of his "Art of Linear Electronics" the latest offering is the all-new edition of "Audio Electronics", now entirely rewritten by the master himself

Underlying audio techniques and equipment is a world of electronus that determines the quality of sound. For anyone involved in designing, adapting or using digital or analogue audio equipment understanding electronics leads to lar greater control over the reproduced

The subjects covered include tape recording, tuners, power output stages, digital audio, lest instruments and loudspeaker crossover systems, John's lifetime of experience and personal innovation in this field allow him to apply his gift of being so familiar with his subject that he can write clearly about it and make it both interesting and comprehensible to the reader. Containing 240 pages and over 250 line illustrations this new book represents great value £18.99 * for money at only

THE ART OF LINEAR ELECTRONICS.

The definitive linear electronics and audio book by the renowned John Linsley Hood. This 300+ page book will give you an unparalleled insight into the workings of all types of audio circuits Learn how to read circuit diagrams and understand amplifiers and how they are designed to give the best sound. The virtues and vices of passive and active components are examined and there are separate sections covering power supplies and the sources of noise and hum. As one would expect from this writer the history and derivation of audio amplifier circuitry have an entire chapter, as does test and measurement equipment. Copicusly illustrated this book is incredible value for the amount of information it contains on the much neolected field of linear, as opposed to digital, electronics, indeed it must be destined to become the standard reference for all who work, or are interested in, this field. Latest reprinted edition with extended index. £16.95*

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ALL PRICES INCLUDE UK/EU VAT Tricker of GT Audio, the Audio Fair promises a wide variety of vintage and new audio equipment, electronic components, records and more.

The venue is just 5minutes from Junction 13 of the M25, making the Fair easily accessible to visitors. It will start at 10.30am and continue through to 4pm, admission costing just £1 for visitors, with stalls available at £15 for exhibitors.

For any further details, please contact Graham Tricker on **Tel/Fax:** 01895 833099

BILLINGTON TO SELL WESTERN ELECTRIC 300B

Billington Export hope to have the new Western Electric 300B valve available early in September. Retail price will be $\pounds 285$ each, but for total orders over $\pounds 400$, they will be $\pounds 190$ each. The WE300B is manufactured using the same original tooling, materials and manufacturing processes as the original now-antique 300B. Many expect it to be the best 300B ever made.

Billington also have in stock new valves from Svetlana. The 811A-3s and 811A-10s cost £22.75each, the new EL34s are £9.99each and their 6550s £18each.

Also worth looking out for is Billington's new 60page catalogue. Due to be published in September, it will feature around 4000 valves, including many antique items from Mullard, GEC etc., as well as their own Billington Gold brand.

Billington Export Units EI &E2, Gillmans Ind. Est., Billinghurst, W. Sussex. RH14 9EZ TO 01403 784961

SVETLANA DEVELOP NEW POWER TRIODE

Svetlana recently announced an all-new design, the 811 power triode. This is an interesting new design, being a modern, high tech. valve specifically designed for audio. It has an anode dissipation of 65watts and a maximum anode voltage of 800V, making it usefully beefier than a 300B, if a bit below the ratings of a 211 or 845. The 811 stands nearly 6in high overall and has a maximum bulb diameter of just over 2in.

Svetlana have given the 811 a thoriated tungsten filament which, they say, is much more resistant to overload than those with oxide coatings. This is a directly heated valve - there's no cathode - so it has a "soft glow", Svetlana tell us. Steadier emission over time from the filament gives a more stable sound too. Internal parts are supported by ceramic insulators and mica supports brace the electrode structure against the glass to minimise microphony.

A white ceramic base is used to enhance appearance and a matching ceramic valve holder is available. Two types of 811 are available, low mu (3.5)

DIGITAL STORAGE OSCILLOSCOPE FOR THE PC

KIT NEWS

The Allison Technology Corporation have recently introduced O-Scope, which converts your PC into a Digital Storage Oscilloscope. O-Scope comprises an interface which plugs into the printer port of your PC and dedicated software. Input ranges are from 50mV to 10V per division, and sweep rates from 500µs to 100s per division on a 6x10 division grid. The dual trace O-Scope II includes an external trigger and is priced at \$390 complete with software and instructions. The single trace O-Scope I is available for \$230, or \$190 in kit form. All prices are inclusive of air shipping to Europe.

> Allison Technology Corporation 8343 Carvel, Houston, Texas 77036 USA. To (001) 713 777 0401



and high mu (10). With a standard 6.3V heater and a low price of just £22.75, the 811 looks to be great value. The low mu version sinks more current and is most suitable for low-ish voltage working (say 450V), to stay within the voltage limit of electrolytic capacitors. The high mu suits higher voltages, where it should prove a little more linear; it is also easier to drive. On a price versus power handling basis, the new Svetlana 811 looks untouchable and should become popular.

Svetlana 8200 South Memorial Parway, Huntsville, Alabama. T (001) 205 882 1344 (Factory: St. Petersburg, Russia)



KLS7 LOUDSPEAKER



Hloorstanders are all the rage nowadays, and it is not difficult to see why. A slim floorstander has a footprint no larger than a standmounter and metal stand, but has several advantages. The increased cabinet volume available to the designer can be used to extend bass lower for a given drive unit, yielding better bass performance. Floorstanders can also be made to look more elegant than a standmounter plus metal stand, so they can be more domestically acceptable too.

So our latest KLS7 kit design loudspeaker is a simple and compact floorstander. Aimed at audiophiles wanting a high performance loudspeaker on a budget (you should be able to complete a pair of KLS7s for around £240), it uses a high quality Audax carbon fibre bass/midrange driver, along with an efficient polymer dome tweeter.

KLS7 is suitable for a wide range of amplifiers, including valve amps. It has been designed to be used near a rear wall - around a foot away works best and its compact dimensions make it ideal where space is at a premium.

A compact, floorstanding carbon fibre driver loudspeaker

designed & built by Dominic Baker.

THE DRIVE UNITS

THE TWEETER

Many of our long term readers will recognise the tweeter, which comes from our now-discontinued 94dB sensitive KLS2 2-way floorstander. It is an Audax 14mm Polymer dome tweeter, which we modify to give a smoother, more controlled response.

Audax's range of 14mm polymer dome tweeters use the same basic principle: the dome is a one-piece moulding onto which the voice coil is wound directly, giving super sensitivity. This also gives them a fast and clean sound, being driven direct, as it were.

Used carefully, this tweeter is a favourite of mine. It's affordable, and the magnet and diaphragm can be easily replaced by snapping the assembly apart, which makes them very easy to service. They can sound every bit as good as cheaper soft-dome tweeters.

THE BASS/MIDRANGE DRIVER

The 4" carbon fibre cone Audax HM130C0 has found favour in both our KLS3 and KLS4 designs for its clear and open tonal character. I wanted to squeeze this super little driver into KLS7 to give audiophiles on a budget a taste of truly top-end sound - and it has worked well. KLS7 has similar midrange qualities to our more expensive, and much bigger three-way KLS3.

In KLS7, the HM130CO driver is used in a 20litre, reflex-tuned cabinet, to give surprisingly good bass for its modest size. The cabinet was made to be a super slim floorstander that can stand discreetly against a wall.

OCTOBER 1995

World Radio History

KLS7 LOUDSPEAKER

THE CROSSOVER

Being a budget design, the crossover for KLS7 was kept as simple as possible. For this purpose, second-order filters are best, giving good control over the crossover point together with usefully steep roll-off rates. The second-order filter used is a simple two-element circuit, comprising an inductor and capacitor.

The tweeter uses a series 3.3μ F capacitor and a parallel 0.5mH inductor to form a high-pass filter with its crossover frequency set at 4kHz. An Lpad attenuator is used to reduce the sensitivity of the tweeter which is much more sensitive than the midrange driver, whilst holding impedance smooth and around 8Ω , very important for correct matching to a valve amplifier.

The carbon fibre midrange driver uses the opposite arrangement to give a low pass filter, that is a series 0.76mH inductor with a parallel 8µF capacitor. A 15Ω resistor is used in parallel across the driver to damp impedance and keep it as smooth as possible and close to 8 Ω .

In the crossover we chose Solen polypropylenes, even though this is a budget design. They make such a difference, allowing the qualities of the carbon fibre midrange driver through, that we thought it was worth the little



C1, 3.3μ F R1, 5.6Ω L1 0.5mH R2 5.6 Ω





extra outlay. The rest of the components are good quality audio grade, but low power to save cost. There isn't much point using super high power resistors and inductors, because KLS7 is quite sensitive and doesn't need much power.

The terminal used on KLS7, and all

of our kit designs from now on, is a single male XLR connector. This is to comply with new EC regulations due to start next year, which prohibit the use of 4mm plugs which can be inserted into a European mains socket. We suggest you use pin I for earth (black terminal) and pin 2 for +ve (red terminal).

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Connect the dots.



Introducing The Parts Connection's first complete DIY kit: the Assemblage DAC-1 Digital Processor.

It comes in a small package (24cm x 5cm x 18cm chassis), but packs a big punch and a very musical sound. Designed for the rookie or first time kit builder, the only tools required are a pencil tip soldering iron, a screw driver, a wrench, a pair of electronics pliers, and a wire stripper or hobby knife. With only 21 solder joints and a handful of nuts and bolts, this kit goes together in one evening (typically about an hour). It's as easy as connecting the dots.

The parts quality is top notch. The board comes assembled and tested, implementing the Burr Brown 1702 DAC, a Crystal 8412 input receiver, an NPC 5813 digital filter, Analog Device's AD844 and 847 op amps and a custom potted toroidal power transformer.

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2790 Brighton Road, Oakville, Ontario, Canada L6H 5T4 Telephone 0101-905- 829-5858 Facsimile 0101-905-829-5388 in 30 days of purchase for a full refund) and an Assembly Guarantee (if you can't get it running, we will!). We challenge you to find a DAC anywhere near this price with better measured performance, component quality, and most importantly, sound quality. Call us for more specific information on the performance or construction features.

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KLS7 LOUDSPEAKER





FRONT CONSTRUCTION

The cabinets for KLS7 are constructed from 12mm MDF to keep cost down. But to improve rigidity (and to help imaging) the cabinet has been made narrow and has two diagonal braces. It is easier and far quicker to cut all holes for drive units, ports, terminals, etc, before you start to glue the cabinet together. It also reduces the amount of dust inside the cabinets which can find its way into the open voice coils of the drive units.

The plans show the general construction. All of the panels, apart from the front baffle, can conveniently be built up on one side panel, laid flat. After the rear, top, bottom and diagonal braces were glued into position, I put on the other side panel and held it down with weights until the glue set. The crossover and carpet felt can then be fixed in place before the front baffle is attached. Remember to do a dry run first to check that all the panels fit snugly together. In my case, even though the MDF was cut by a professional woodworker, it had to be sanded to size for a perfect fit.

Using Evostick Resin-W, apply the glue to the edges of the panels. To hold the carcass straight whilst it dries it may be necessary to use 3/4" panel pins. Any excess glue that oozes from the joins can be wiped away lightly with a damp cloth.

SIDE

In addition to the panel pins, either place suitable heavy implements on top of the cabinet, or use thick, stretchy carpet tape wrapped around the cabinet to pull the pieces together.

Once the cabinets are dry overnight is normally enough for the glue to reach full strength - they are ready for the internal damping to be fixed into place. Carpet felt should be glued to the rear internal face of the cabinet and down the sides where the drivers are, with a double layer directly behind the drive units. This helps to reduce reflection off the rear of the cabinet which can be heard as a hardness or a 'clatter' through the midrange.

The long hair wool we use comes in knotted bundles: tease it out gently for best effect. If you just leave it loose in the cabinet you will find that over time it will work its way down towards the bottom. I secured a bundle of long hair wool in garden netting behind the driver to further reduce reflections.

Mount the crossover as shown in the diagram. Because inductors, being magnetic components, have a field around them, they need to be spaced well apart and at right angles to each BACK

BOTTOM

208 x 126

BOTTOM

208 x 126

other to minimise inductive coupling. Again, a recommended layout is shown. The components can be fixed to the upper internal brace. The components can be fixed to this with PVA glue or with a hot-melt glue gun.

The front baffle can now be glued into place. Once dry, wire the drivers to the crossover and screw them to the front baffle. The tweeter should have wires attached using slide-on terminals to prevent heat damage from a soldering iron. A foam gasket made from draft excluder (you can get it in any hardware shop) should be stuck to the rear of the drive unit frames where they mate with the cabinet, to give a good air-tight seal.

TESTING

A simple test to reduce the risk of any damage to your amplifier when you first plug in is to check the impedance of the loudspeaker using a simple multimeter. Using the resistance setting they should measure around 5.4Ω across the terminals. This simple test will indicate a short if the reading falls below $I\Omega$ and a likely problem if below 4Ω . Note that this DCR figure is not a measure of impedance.

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BILLINGTON GOLD		SOV	TEK	SALES IN
2A3 15.50 6L6GC 6.45 12AX7 5.25 300B 60.00 811A 12.00 845 33.00 6550A 11.50 E81CC 5.25	5U4G 6L6WGC 6SL7GT 6SN7GT 12AX7WA 12AX7WB 5881/6L6WGC	3.60 6.00 2.50 4.95 3.50 3.50 6.00	ECC83/12AX7WB EF86 EL34G EL84 GZ34 GZ34/5Y3GT	3.50 POA 6.20 1.99 5.40 2.90
E81CC-01 9.50 E82CC 4.50 E82CC-01 8.50 E83CC-01 8.50 E88CC 7.50 ECC81 5.25 ECC82 4.50 ECC83 5.25	6AS7G 6B4G ECL82	SSIAN 4.50 27.00 2.25 <i>L.Russian Valves</i>	CHINES 300B Silvertone ECC88 EL34	E 60.00 3.90 7.00
ECC88 6.90 EL34 9.95 EL84 3.60 KT66 9.50 KT88 18.50	6CG7 Yugoslavi 6X4W Raytheon 5751 (USE ECC	an 6.75 USA 3.60	6336A Penta USA ECC85 Tungsram ECL86 Tungsram	58.50 3.30 3.45
RARE BRAN	DS	STS STREET	SOCKETS	
3AMP1A Tungsram Hungary 5C-450A STC UK 5R4GY USA 5Y3GT RCA 6BH6 RCA 6L6WGB Sylvania 6V6GT STC UK 12BH7A GE 12E1 STC/ITT UK 13E1 STC UK 85A2 Mullard 807 USA 5687WA RCA 6550A GE USA CV4003 Mullard UK CV4004 Brimar UK CV4004 Brimar UK CV4024 Mullard UK DG7-32 Tungsram Hungary ECC81 Mullard UK (CV4024) ECC82 Mullard UK (CV4003)	32.40 259.35 POA 3.90 2.48 15.00 POA 11.40 POA 135.00 5.93 POA 6.45 33.00 POA POA POA 32.48 POA POA POA	- Ceramic , sl Ch Ru - PCB , gold j B9D Magnoval , cha	1,845,etc. Plated, for 211 , 811A, etc. Type for 300B or 807 chassis, skirted 34, EF86, etc, suitable for kirted, chassis, screening inese ssian pins issis, for PL519 for all valves listed in this a	can; 1.20 0.90 2.40 2.25
ECC83/ECC803S Tesla EF86 GEC UK (CV4085)	13.13 POA	For 2C34, 807, etc	TOPCAPS	1,20
GZ32 Mazda GZ37/CV378 Mullard UK	8.00 POA	For 12E1, 5B-254M	M, PL519	3.60
KT90 Yugoslavian PL519 ECG Philips	45.00 5.95	E2.00 Per Valve	TCHED TESTING (£4	.00 per pair)

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World Radio History



KLS7 LOUDSPEAKER

SOUND QUALITY

It's not the world's best kept secret that I'm a bit partial to the odd strand of carbon fibre in my 'speaker drivers, so I was particularly interested in the idea of a suitably coned super-budget floorstander. Just as I'd expected, KLS7 manages to combine a clean, polished sound with a rhythmic rightness that makes all types of music fun to listen to.

Massive Attack's 'Protection' came across with characteristic carbon fibre clarity, with Tracey Thorn's plangent tones carried in a satisfyingly refined manner. Imaging was very good, as you'd expect from a speaker barely wider than a Compact Disc, and rhythms were spot on - there are few budget speakers that carry rim shots with such speed and deft-footedness.

Bass was deeper than KLS7's

diminutive dimensions suggest, and remained tight and in control at all times. This said, low frequencies could have been more voluminous - reggae fans should look elsewhere. The midband was deliciously clean and clear and made a smooth transition to the upper regions. It was only with Bjork's 'Isobel' that the KLS7 started to intimate that they were a budget design, with the tweeter making its presence felt by lending a touch of hardness to her voice and strings. A switch from Audiolab 8000Ms to the more gentle climes of Aura's VA-80 cured this, suggesting KLS7 needs sympathetic partnering - it's more revealing than a budget 'speaker should be.

So, thumbs are pointed skyward for these dinky little floorstanders, which should provide surprisingly good performance, providing they're let loose in a smooth sounding system. **DP**

PARTS LIST

Drive Units	
Tweeter M	odified Audax 14mm
Polymer	
BassiMid	Audax HM130C0
Crossover	
RI	5.612/5W
RZ.	5.6Q/5W
我3	15.2/5W
CI	3 3µF Solen
C2	8µF Solen
LI	0 5mH air core
0.6	DDCR/071mm wire
12	0.76mH ferrite core
0.4	ODCR 0.56mm wire
Reflex port	
38mm diamete	x 35 will on th

MEASURED PERFORMANCE

KLS7 has a flat and amonth frequency response, seen in the 1/3 octave plot below. This should ensure a natural and smooth balance with all types of music. The response has a slight downward trend which will tend to give it a warmath sound. Bass doesn't extend especially low because of its compact domination, but with rear wall reinforcement will go low shough to play fundamentals will.

Like all of the kit loudspeakers we design, K157 has been engineered to have a flat and smooth impedance curve, making to suitable for valve amplifiers. Overall impedance measures 9.402, and the impedance curve shows that it doesn't wanider far from B12 across the whole audio band. Senalovity int's as high as some of our other kit designs, there is always a trade-off between trass power and sensitivity with compact enclosures. They produced 86d8 sound pressure level at 1m for a nominal watt (2.83V) pink noise. signal A 30watt amplifier should provide annuals power for good levels, aspecially in; the small rooms KLS7 was designed to work best in DB



Plat frequency response. Base breef is filled done predmity to a year walk.





Senseth impedance curve

WARNING

Be extremely careful when screwing drive units in and out of the cabinets. One slip with a screw driver and they're useless. We recommend using cross hill ad screws or Allen bolts, to reduce the chance of this happening.

Do not try and solder wires to the terminals on the tweeter. They are fragile and easily damaged and the fine wires connecting the diaphragm will vaporise, rendering the unit useless. Use small push-on receptacle clips

A pack of drivers for KLS7 costs just £110, or the KLS7C kit also including crossover components, terminals, spikes, silver plated copper wire, reflex ports etc is available for £195. See pages 82-85 in the main issue for further details.



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 the 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 aestetics and beauty of real music reproduced in their home.

Now that we stand on the boundry 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 value of the single ended stage, and who in the past 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 an competence in overall knowledge of the technology of Audio AUDIO NOTE were first and remains the last word in sonic quality if you appreciate music properly reproduced.

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 cerami valve bases with either silver or gold plates pills, paper in oil aluminium foil signal capacitors. Coper & silver foil signal capacitors, Black Gue graphite electrolytic capacitors, acid/con free silver solver, 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. All prices are excluding UK Vat at 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.

We accept VISA, Masterbard, Access, Dimers, and Amex, to pay this way, we will need your address, card no. with start and expiry dates, you can also pay by bankers draft. Euro cheque or cheques drawn on a UK bank account. Please note that there is a minimum charge on credit card transactions of £20.00.

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

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.

CIRCUITS VALVEDATA & BASIC TECHNICAL FORMATION

If you would like some suggestions which to base a futur 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 powe 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 5.00 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 th AUDIO NOTE UK-made amplifiers, like OTO Phono SE, M1Phono, MEISHU, SORO 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 competitor, 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, 12AY7/6072A 7025/12AX7WA/ECC83, 65N7, 300B, 211/VT4C, 845, EL34/6CA7, 2A3, 6X4, 5U4G, GZ34/5AR4, EL84/6BQ5, 6V6GT, 6L6G, 5881/6L6WGC/KT66. 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 into-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.

SOUND PR.,CTICES

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 SOUNO PRACTICES is the magazine to read, here you will find articles about design parameters, OIY articles for amplifiers and speakers, reviews of new and old, in other words the very subjects that none of the settserving, advertising led traditional press will touch as they do not enhance the business of their oormal advertisers. You can buy SOUND PRACTICES from us at £5.00 per copy (there are 5 issues available) or by subscription from SOUNO 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 subscribtion support SOUNO PRACTICES may just bring about the "sound practices" that the hift industry has

abandoned for so long. So get a subscription!! By the time you read this SOUND PRACTICES issue 8 should be HERE, so this should keep you off the street for the next weekend Buy a copy for £5.00 + postage (or self addressed envelope with order if you live in the UK), contains the following articles, Blue Thunder - OTY TAD and Focal Horn System from Zunch, The Lowther-Voiot Leoacy, Join the Club, Lowther Clubs by Joe Roberts The Reichert 3008 Amplifier, by none other than Herb Reichert!, Homebrew Gallery, Photos of Readers Projects and Systems lating Old Triodes, New Russian Triodes, A Screen Orive Oriver State, A Cathode Follower/Bridge Amolifier, and 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

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 zany, controversial commentary, by in-house writers, members, as well as various industry dovens 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. Positive Feedback latest issue is just off the press and is available at £6.00 per issue

FE OUTPLIT TRANS

We are in the process of building up four separate ranges of Audio Note output transformers, inorder to offer the best possit outputs at different oncepoints, they will fail into four categories.

A.) Economy range, where the price/quality relationship is carefully calculated to ensure audio quality in a compact package, initially will only be offering 3 single-ended output transformers in this range, push-pull outputs are under development, but do not expect to see any on this side of August 1995.

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 lis

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 initial

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 IE 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

quality and copper wire is the same Group B are typically 20Hz to 40KHz minus 1.5dB, IE cored with

high quality sificon steel laminations, wound with oxygen-free copper wire and supplied with either bell-ends or frames always with flying leads. Group C are typically 12Hz to 70KHz minus 1.5dB, 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 Audia Note silver wire, need I say more??

PP = Push-Pull. PPP = Parallel Push-Pull. SE = Single-ended PSE = Single-ended Parallet. 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 guality. ** 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 50% 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 mpetitions, 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

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(TUDESO	60 wills	463 - 44/16 Oh		125x140x113mm	机钾	0.002000
111.00*						0 0082mi
KT800550	100 mails	202 - 44/16 De		158x147x118mm		1.Haf
Preserve .	134.60*					0.015mF 0.022mF
Group C						0.017mF
Single-anded only						0.002mF
3000/243/6045	See.	215 - 4676 Ohmu	SOMA SE	360.00		0.1mF
211/074-08/5	59 mile	16E 4616 (http:	16x140x140mm		416.00	0.12mF
388	59 wills	1125 4/9/16 Ohms	165 z110x130mm	100mA PSE	396 00	8.15mF
						8.18mF
Anna A						1.22
Page Silver Wired Calgo						tal in
30002434646	20	205 - 48 Okm		SOMA SE	1,645.88	144
211/074-0845	Streets	10K - 68 Ches	112x134x158mm	150mA SE	1,975.00	0.00018

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, KAGEKI, 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 OF GAKU costs £18,500.00

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6.012m

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1

8.18uf 8.22uf

8.22

6.27 8.33mF 8.33mF 8.31mF 8.47mF

.....

0.22m

8.3haf 6.8haf 1.2mf 8.22mf

AUDIO NOTE CHOKES & INDUCTORS				
Yake	1 m	Press Ex. UK Vo		
0.5H#400mA		16.0		
34/100mA		14.0		
3H/250mA tor CNEAKLI/Co		24.0		
51/158mA		21.0		
SH400mA		31.0		
10H125mA	63x74z76mm	25.0		
104/200ml	Shift-Com	33.6		
2045BanA	Shábáðann	20		
Other values can be supplied to order, a	alt for quality.			

AUDIO NDTE MAINS TRANSFORMERS

This range	e relates to our finis	hed products, mains	
		ficult items to offer as	: the
		ind Heater voltages a	
		ransformers for maki	
eplicas of th	ne KASSAJ and ONG	AKU, as there has be	en
considerable	call for these, likew	rise we are preparing	
nainstransfe	ormers for the WF9	t described in Sound	Practices
		band the range as opp	
		quirements improve.	A A A A A A A A A A A A A A A A A A A
and our expe	Security of Walant	Sconday Hoder Windows	
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100/110/120	Br-250r at 40mA	12.8e-ee at 1.5k	26.00
v100v110v120v		Dr 6 3v at 300mA	
w100w110w120v	310x-244x0x-244x-310x al	3.15e-8e-3.15e at 4.5 Aug	72.50
ARMINET MERIN	Amilist	12.0val 1.5 Aug	
20/110/100/0	Dr-520r at 160mA	0-10r at 4 Junp, Dr-6.3r at	質節
ACTAR INDEX	150+150v at 50mA	15A, B+5+#25A	
20w110w100w0v	Among its role-of-reliable	3.15v-8v-3.15v at 1.2 Aug. 7v	86.70
576251104720	170r at 50mh	出版为建筑加速2 8	
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	350-0-350-st 200mA	3.15+4+3.15+at 758mA 178-8+at 58mA, 7.8+8+at	107.00
Shiri Mari 20a	TOTAL OF TOTAL & TOTAL	34.78-br # 36.5x-br #	MR TO
		28.215+0+215+#128.Fm	LASSAL maters
20v/110v/100v/0r	300- to 300r at 200ml	150e-Brat 150ml, 10e-Dr	132.00
		325A 10+0+#325A	
		5+8+23,5+ 8+23,fet	NGAQ: replice
			-

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 ur specification, as long as you order minimum 2 pcs, they can be supplied with soldertags, thying leads, frames or bell-ends. Ask

On a more general note, it is important to understand the ecialised 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 main also have to have good regulation under load, must run cool, 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 listening tests have shown these to sound less clear, than unpotted equivalents!

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 DTY 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 cooper 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 equalizing networks and the odd feedback loop!

10 000	DC William	See Pr	ice Ex. UK. Val
	50 vali	21x8mm	11.65
	200 vill	2stime	2.85
	200 vell	Zidim	4.95
	400 will ofter instantores		4.95
F	400 will ofter instruments		4,55
	422 will play insistences		5.45
	400 will play insistences		\$6
	(ID vol)	21x3mm	125
	till vill play instantions	Xx10mm	5.45
	400 well offer textenteres	32x11	6.15
	400 vell	33x14mm	425
	400 will play indepindent	33c14mm	625
	400 well	33x14mm	475
	200 voli piter insistense	34x16mm	6.05
	400 will play budgetailing	32x16mm	\$15
	420 volt ofter instantores	25x1dmm	5.85
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	400 voli	7b24mm	14.95
£.	600 voli	17dmm	2,95
	630 vali	20cm	2,95
÷	630 vill	Zhime	2,95
	630 vali	17xBaat	2,95
F	630 will	20dmm	2,55
	630 will	21x11	16
	630 will	21st Tuine	145
	630 vill play indepining	Ziction	545
	630 will	32/11	175
	600 will	12h11	195
	630 will	Xir/4	6.85
	630 vell	33x15eem	425
	630 will	33x14mm	425
	633 vill	33x14mm	425
	630 will	33x 16mm	425
	600 will	33cHimm	435
	630 mil	32x30eee	435
	630 vali	23cHour	4.35
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	630 vali	Xin Vistor	4.35
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	630 mil	Grillen	5.45
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	510 vali alter instantanon	52/7	9.05
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	1000 will	Sizema	6.95
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	100 10	52x12mm	13.65
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	1600 mill	Ob.25mm	9.85
		76/2000	11.55
	Clinet	Sealer can with	375
	10.50	paralise in the second	Ca14
		mains -	

All AUDID NOTE paper in oil signal capacitors are axial type. We are preparing a range of very small picofarad value paper in oil capacitors at the moment in addition to the above. The range of AUDIO NOTE paper in oil signal capacitors is steadily expanding, so ask for values that you do not see.

SIGNAL CAPACITORS

We are currently developing a two further ranges of paper in oil capacitors where instead of using aluminium foil as in the abo paper caps, in the first range we use an oxygen free copper foil with 99.99% pure solid silver lead out wires, these copperfoil paper signal capacitors are considerably better than the standard offerings. 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 (as I am the only one who have

heard the samples sofar) the silver foil caps will also have solid silver lead-out wires. To start with there will be a tew values/voltages of each available.

Alber .	DC Welcope	500	Price En. UK Va
3.001mf	630 voli		11,9
1 0028mf	630 voll		11,9
0082wf	630 velt		11.5
Litter	630 velt		12.1
072=	630 veit	30-9000	13.7
047mf	630 wet	28x16mm	15.3
L1mF	630 velt	33x22mm	16 8
L15mF	630 vell	35x22mm	18.1
22mf	630 velt	56/25	22.4
33mf	630 vet	35x30mm	26.6
A7 mF	630 408	Station	31.0
and the second sec	630 web	65arl-Anna	50 8

values, which are extremely costly, as a rule we do not stock every single E12 value in stock, this cannot be guaranteed. be very long indeed, however, since most are used in our production of finished products, there will generally be stock

AUDIO NOTE SILVER FOIL SIGNAL CAPACITORS

16-16au

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 dialectric, and are manufactured using considerable tension on the foil and dialectric to give the best possible contact and the least scope for internal reconsport

630 vali 630 vali 630 vali 630 vali

8.1mf 8.15m 8.22m 8.42m

Value	DC Volage	Proze Est. UIX Val
0.01 mF	500 voli	177 00
1.00	500 vell	211 75
1.50	588 voli	346.75
8.1=F	500 vet	6675
6.20	500 welt	985.75

AUDID NOTE ACID & CLORIDE FREE SILVER SOLDER.

The best solder we have been able to find, does n contaminate the junction, which over time increases junction resistance. Used in all our amplifiers from OTO to the GAKU-ON. met er skaat it makes i men de 216.85

AUDID NOTE HIGH DUALITY CERAMIC VALVE BASES.

All of our valve bases are of the highest possible quality, made from steatite and using the best metal parts from alloys wh 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. Proce Es

Type	biouseing	Planning	FIRE EL
			UK Vir
4-gen LIX4 for 3035-243(00)	Changes	Geld	1.25
4-gm L014 for 3008/2A3/801A	Chesses	Techni	7,25
4-pm UX4 WE type for 3005/243401A	Chasses	Stee	14.75
4-pen LEA WE-type with inspecial mounting	Changes	Silver	455
4-pm Junite 4 lar 211/074C/045	Changes with payment	Sherichreme	158 95
5-per LIY5 for 887	Chargest	Gell	\$75
7-pp 87 for 654, 042	PCB	Silver	6.15
7-pp 87 fpr 6M, 042	PC8	Gald	7.85
7-pm 87 kgr 634 042	Changes from above	Silver	6.75
7-per B2 for B34 CA2	Channel Steen above	Geld	7.95
8-pen UBX for EL34 (6560, 5U4G, GZ34, 6L6G, etc.	Chasses	Shur	5.85
8-per UEX for EL34 6550 5U46, 6234 81.85, etc.	Channel	Gald	1.65
9-pen 609-ter ECCRIS ECCRIL 5687, 6350. etc.	103	Silver	1.85
9-pm 89 lar ECC83, ECC88, 5687, 6358, etc.	108	Gald	5.75
9-per 99A for ECCRI. ECCRI. 5887, 6356 etc. etc.	Channes from above	Silver	4.45
9-pen H5A for ECCH3 ECCH4, 5687 6350, dx. dx.	Changes from above	Gald	6.75
9-pm 894 for ECCR1, ECC88, 5687, 6358, etc. etc.	Change from below	Silver	455
9-pen Hillis for ECCES. ECCES. 5687 6358 eds. eds.	Channes from below	Gatel	715

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 catagorie standard production items and rare, mostly NOS (New Old Stock) valves which are no longer in production. We have compiled a special list of the NOS items which is available against a stamped self addressed envelope, if you live outside the UK, send US\$ 2 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 airforce type, 845 Westinghouse, VT25/10/10Y, VT62/801A, WE300B, STC4300A. Mullard GZ34/CV1377, Tungsol 5U4G (best sounding 5U4G I have ever heard!), Chatham 5R4WGY and many others.

Standard Stock Henry,		
Type Ro	Type	Proz Ex. UK Val
EDDIES/12/UL/WW/7825	dealer trade	2.95
Emportanza/00/000/000/7308	dealds trade	16
FILES 7/172	pasiade	245
ECC82/12/02/5814a	deuble truck, mil spec	595
658/761	dauble bopils, LIEX base	15
6SL761	develop temple, UEX hour	2.65
5687MM	dealing trade very powerful driver	8.75
6250WA	double trude	675
ELANGEO5	seal prov patiets	1.55
ELIMMARCONA	small percer postante, nell spec version	4.51
OVEGT	small perver postacia	245
6.66	maine pres palate	2.75
SEELATERIA PARC	maken prov televie	4.51
GCAT/EL34 Fai Bull?	permit halrode	8.85
ELM6	prever passingle	6.45
6550/KT26	large power talmade	12.6
6033	preserved respectator and reactly baseled travely	24.65
SAST BORD	strong regulator, entructly lamited trade	645
2A3 4-pm	directly landed small power track	17.95
3008	dencily landed power trade	57.95
VAIC WOOD	directly basing power trute	258.01
\$946	Hi-actilur	3,25
51367	Hi-addia	225
9MGT	HT-rection	2.25
6/34/5484	HT-receiver	875
644	HT rectilies very good for pre-amplifiers, 7-pin fem	2.65
6 15	off-rectiles for pre-amplifiers & power amplifier to	

2.65 Please note, our 3008's are manufactured in China by Gold Dragon/Shuguang, but are tested in-house under real working conditions to parameters somewhat more stringent than is otherwise done. No, they do not sound guite as good as original

WE 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 affic, 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. A pair of original WE 300B's cost at least £1.200.00, on a good day. think in terms of an overall price compromise, you can get some fabulous sounding passives for the difference in cost between a pair of Chinese 300B's and the original WE's, and in many cases the improvement in sound quality is greater than the WE 300B's will contribute, AND the contribution to sound is permanent. consider that when you plan your project.

Resistors

74 50

135.00

486.65

We endeavour to stock the entire E12 range of all the different makes of resistors that we stock, except the very lowest ohmic values below 1D Ohms or above 3M3. Whilst we always try to have delivery, especially on the Holcos and tantalum film resistors can available within 4 weeks

We offer three quality levels of resistor quality, all are 1%, starting with the Beyschlag metalfilm, which are slightly magnetic (as are the vast majority of other makes of metal film resistors), but nonetheless very good sounding, as used in all our UK-made amplifiers, up to and including quality Level 3, the MEISHU/P3/P4, 300B no-feedback triode amplifiers.

Beyschlag 1 watt, 1% resistors up to 500KOhm, £ 0.11, above 500K0hm € 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" metaffilm resistors available. They have one small

drawback, as they are quite fragile, and require careful handling, do not bend the leas too close to the body, they may become

HOLCO resistors type H2 50PPM cost, C3.06 each from 1R0 to 5R0, £0.89 each from 5R1 to 19R9, £0.36 each from 200hm to 230K0hm, £0.41 each from 231K0hm to 1M0hm, £1.02 each from 1M1 to 2M0, £1.24 each from 2M1 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 £4.60 each, list of stock available

AUDIO DOTE 1 WATT TANTALUU RESISTOR

Up to now the tantalum film resistors have been extremely difficult to get, however, after much persuasion and against a minimum quantity guarantee from Audio Note UK, the manufacturers have agreed to widen the range of 1/2 watt and reintroduce the 1 watt range which becomes an exclusive range for AUDIO NOTE , we consider this to be major breakthrough since without a reasonable range of values at the 1 watt rating it is pretty difficult to get the very best out of the best circuits. As with most handmade specialist items, which covers most of this list, delivery can be quite long on some values, so be prepared to wait if the value is not in stock. The AUOIO NOTE 1 watt 1% tantalum resistor values are £3 70

each We shall now be working on getting 2 and 3 Watt tantalum resistors made available 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 goldplated carbonfilm resistors, in many cases the carbonfilm resistor is preterable if you are building an amplitier 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

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

£ 6.89 each

HIGH WATTAGE WIREWOUND RESISTORS.

	_			
	As a new	item we shall start	offering a range of 2	- 15 watt
			e starting with a sma	
			the moment the folio	
949	ilable, all	these resistors are	5% tolerance and gl	
The state	e	Mate	Telecater	Price Es. UK Va
6 88	1	478	9%	1.05
60		NOR	5%	0.05
6.00	1	470R	5%	6.0

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

202 151

BLACK GATE ELECTRON TRANSFER

High Performance, Graphile 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, 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 asto 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 CO-Player" and can be obtained by sending a stamped addresse envelope to us requesting this leaflet. All AUDID NOTE Level 2 Signature products use Black Gate Electron Transfer in critica signal/power supply junctions.

It is very important to note that all BLACK GATE capacitors take time to charge-up or stabilize, 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 "idling process", see enclosed list of available values. We feel, however, that this process takes longer, ho hum!

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

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-OATE PRICES MONTHLY, SO ASK FOR PRICE WHEN YOU ORDER.

Yalas .	Voltage	96-Type PK	Suggested Law	Proce Es. UK. Val 1.85
47mf	Zini	R	Angestern Angestern	175
33mf 8.47mf	Treat Sheet	8	Anywheet	1.05
1.4/107	Street	8	Any store	112
2.2mF	Sheet	8	Jayahara	173
11	50val	R.	Japatara	135
42mE	Strat	R	Anyolan	1.00
thef	Shell	8	Japaters	1.87
72=	Stheet	8	Impeters	2.00
72=	West	Standard	Jayahara	2.62
33mf	West .	Standard	Japaters	1.9
47mf	Vival	Standard	Anyohan	411
330mf	The .	Standard	Anyohare	6.00
the contract of the contract o	Shall	Standard	Anymhan	2.97
Qué	Street	Standard	Anyolan	4.41
100mF	10vall	Sector	Jayahara	473
100mF	Strail	Standard	Japakan	547
220 m i	50vall	Standard Standard	Anyoham	18/1
thuế Xhuế	NECtrali 13Book	Standard	Angestern .	631
12m	100vol	Standard	Japakara Japakara	8.54
100-0	Tilled	Standard	Asymptote	175
228	18bell	Standard	Anyohere	27.18
YODDaaf	The	Standard	Augustant	6.22
Tilling .	Shull	Standard	Angelent	21.55
220mf	Yest	Standard	Japatere	4.15
476mF	Yest	Standard	Impatent	6.35
2200mF	West	Standard	Angelen	13-65
18,000mF	(Dist.	Standard	FSU secondaria	234.65
4700mf	10x8	Standard	Japatan	14.25
42mE + 42mE		SIL Type	1986 Mar capacitor	85.55
	500vol - 558v surge	SK Type	PSU liter capacitor	101.55
100mF	500xol - 258v surge	SK lype	PSU liter capacity	72,75
220mi + 220mi	25kml - 40kmap		FSU film capacity	12.65
		SK Type	PSU Wer capacity	75.85
Z2mi 150mi	25feet	W. iype W. iype	Decoupling or filter capacitor	11.55 41.23
47mF	200ml	HL-Type FL Type	PSU filter capaciter Ultra laur ESR version.	7.15
4/88	Territor	en cype	comparable to the cape	1.12
100	Negli .	Fil Type	Ultra Igur ESIT version,	13.71
-		A CONTRACTOR OF	comparable in this cape	10.01
220mi	The l	FK Igen	Ultra laur ESP vontion.	9.95
L2 dem			comparable to the caps	
100-6	Znel	Fit Type	As above	14.28
220mf	Zivel	FK Type	As above	21.43
100mf	Street	FIL-Type	As above	15.71
1000mf	Shull	FK Type	As above one anywhere	58.71
2200mf	Zout	FE Type	As about the anywhere	55.71
2200mF	Det	FK. Sygn	As above use anywhere	101.43
10865	300mil	FK-Type	As above our anywhere	12.65
22mF	Stret	C-Type	For cotals with DC patential	2,07
	1.1		dileman .	
4.7mF	90m8	C-Type	For concells with DC patential	3.35
6.0mF	Shull	Bester	filment For landquaker crosserver	12.65
6.000	2040	1000		12.00
100	50vet	Bester	As done	16,85
72mi	SOvel	Banker .	As about	71.95
Com.	Shell	limite.	As above	36.55
10	Shell	BG-Itx Type	For PSU decoupling	12.35
22 8 -	£3wR	No.4te Type	For super law same PSUs	11.85
100mf	Yout	NG-II Type	For super law again PSU's	21,85
47tmf	Neal	BG-II Type	As above	28.95
4700mf	Set	NG-II Type	As above	218.45
1mF	Shull	BG-II Type	Autom	5.45
4.7mF	50vet	BG-N Type	Autore	8.85
18mF	Sthet	NG-N Type	As above	7.95
47mF	Shell	BG-N Type	As above	13.75
188mF	Stivat	DG-II Type	Acabere	29.35
1000#7	Shet	NG-N Type	As above	99.95
2200mi	10bat	NG-10 Type	Action	423.35
			a listing of all ava	Hable Black
Gate valu	es, together th	eir sizes, best	usage etc.	
Looth.	·····		na modarthu pricar	

Lastly, we can supply a range of more modestly prices components, still good quality, but more industrial grade, if you like

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. Inorder to

be able to offer the best possible quality - price relationship the kits we offer will be good basic circuits, with no-frills power

KIT FOUR The KIT FOUR is really our introduction to valve amplifier kr 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 P1SE type chassis, covering everything, so

nobody will be able to see that you have succumb 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 £199.00, and is available from May, 1995

Pre-Amplifier Kit.

A kit based on the AUDIO NOTE M7Tube pre-amplifier circuit is under development, it will be offered in three/lour versions, with the basic version using cheaper valves, expected cost £299.00 incl. Vat, etc. More details available later.

Write to

AUDIO NOTE (UK) Ltd. Unit 1, Block C. Hove Business Centre, Fonthill Road, Hove, East Sussex, BN3 6HA, England.

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supplies and components, all kits have input volume control to allow use of a single source, like CD-player direct in.

KIT ONE

Based around the justly famous 3008 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 420 volts with 75mA current giving 9/10 watts of the cleanest power you will eve hear, the inputstage consists of a 6SN7GT with a 5687 double triode driver stage running in SRPP. The powersupply 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 twatt 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 £99.00 extra. Kit One is also available with a polished chrome chassis and chromed transformer bell-ends. makes the Kit One a real "stunner!" Add £200 00, to total £999.00 The Kit One is available now.

KIT TWO

Kit Two features a single 6550WA Sovtek tetrodes 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 unavailable due to the lack of supply of Soviek 6550WA's, we can offer it without valves for E570.00 incl. UK Vat. If used with Chinese 6550's no claims for faults in powersupply or output transformers will be accepted!!

Price £599.00 incl. Val, includes valves, but not postage/packing, cover is extra at £99 00. With polished chrome chassis and chromed bell-ends on the transformers, £799 00.

KIT THREE Kit Three features 2 x 3008 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 MT supplies, no signal feedback it uses a 6SN7GT double triode as input valve and a pair of 5687 double thodes running in SRPP as drivers.

The KIT THREE is essentially a mono version of the KIT ONE with double the nower, 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 hell-ends is also available at £400.00 extra. Several upgrade kits are available for Kit Three as well, ask for details

MAPLIN NEWTON VALVE PREAMPLIFIER

MAPLIN NEWTON PREAMPLIFIER

Nick Lucas builds Maplin's Newton valve preamplifier kit.

di.

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TRENLE

Imost two years after the launch of their Millennium 4-20 valve power amplifier, a repackaged Mullard 5.20, the house of Maplin have put together another kit, the Newton stereo valve pre-amplifier.

The Newton comprises a power supply unit (PSU), a line/RIAA phono module and a tone control section. The PSU is housed in its own 8"x6"x2.5", Imm thick aluminium chassis. This is supposed to be bolted to a similar chassis used for the line/RIAA, and another housing the tone control module, to form a three-chassis unit. The phono and tone control modules are separate units and can be run on their own, albeit with external power. Each chassis is supplied blank, so it is up to the constructor to get a coping saw, drill and hole punch out to make the cut-outs for valve bases, sockets and hardware.

Most of the wiring is printed circuit board (PCB) based. The boards are of good quality and have solder resist layers on the track side. This makes it relatively fast, accurate and easy to build. The cost of this kit is very reasonable, but you do need metalworking tools for chassis preparation and there's a fair bit of work involved in this respect. Prices are as follows: the PSU costs £44.99, the line/phono module £34.99 and the tone control unit £39.99. All valves are included, but if you want to complete the preamplifier to be fully finished, as shown in our picture, there are a number of extra components such as

phono sockets, control knobs and selector switch needed. The complete price of the kit supplied by Maplin for this review was £159.31. If you purchase the kit mail order from Maplin's catalogue, there is an additional £7.50 charge for post and packing.

Even though the Newton preamp was intended to go with Maplin's Millennium amplifier, it can be used with both solid state and valve power amps. The end product looks smart enough for the price, with adhesive labels supplied for front and back panels to identify the controls and sockets. All five valves are exposed on the top, along with a transformer protection cover on the PSU side. The PSU is not, therefore, a stackable item unless it sits at the top of the castle. This kit is flexible in that it

NEWTON

World Radio History

allows the constructor the option of tone controls, and Maplin give several different switching arrangements for sources. Clarity made the instructions easy to follow.

> POWER SUPPLY UNIT

> > The PSU is a

standard solid-state design, with no valves unfortunately - but you can't have everything for such a low price. The fused mains input socket is filtered to reduce mains spikes. The 350volt H.T. line is supplied by a bridge rectifier with a \prod filter comprising twop 47µF capacitors and a 10Henry choke, which gives good smoothing. There is a 6.3Volt, I.5Amp AC winding on the transformer secondary to feed the heaters of the tone control valves and the buffer valve on the phono section. There is also a regulated 12.6Volt DC supply for the valve heaters of the phono stage to ensure that it doesn't hum.

CONSTRUCTING THE PSU

Constructing the PSU is relatively straightforward, with the extensive instructions provided. All components, bar the transformers, sit on a printed circuit board (PCB). You do need to know what capacitor types look like (e.g. Mylar, disc ceramic and polypropylene) and how to position an electrolytic capacitor the correct way round. Transient suppressors are used to limit power surge at switch on, so do not get them mixed up with the disc capacitors which look very similar. The 12Volt regulator, L7812CP, must be bolted to the chassis which acts as a heatsink, or it will shut down. Once constructed, test the voltages under no load conditions to make sure you have built it correctly.

MAPLIN NEWTON VALVE PREAMPLIFIER

RIAA PHONO MODULE

The second unit of the Newton package is the RIAA phono module. Each phono pre-amplifier circuit uses a complete

ECC83 double-triode valve with a stereo line driver sharing one common ECC82 double triode valve. The circuit comprises two identical triode amplifier stages in cascade, based on an RCA circuit, with each stage using Mullard's recommended standard circuit configuration and component values. Both stages have a signal gain of 34dB.

Following the first stage is a passive RIAA equalisation network, an optimised version of a Wireless World circuit. The initial 34dB gain of the first stage is now lost through equalisation, so the second stage boosts it by a further 34dB to get enough gain. Both of these stages use the regulated 12.6Volt DC supply for their heaters to minimise hum.

The line driver/buffer portion is a cathode follower circuit using an ECC82. This configuration is non-inverting with unity voltage gain. The output is derived from the sizeable voltage swing developed across a $16k\Omega$ cathode resistor, through which passes a high anode current of 7mA. This gives a low output impedance and a good, clean signal. In this form the line driver is able to drive loads down to IK ohms before bad signal distortion sets in. The buffer can be used to drive the output signal if you are not incorporating the tone control. If you are using the tone control, the buffer is used to give a clear signal to the tape output, which you can listen to via the monitor switch. The reason for using the buffer here and not at the output is because there is a buffer in the second stage of the tone control.

CONSTRUCTING THE RIAA PHONO MODULE

Cutting the chassis was simple enough, as is stuffing the PCB. The phono socket inputs are connected up to the selector switch using wire of your choice, since none is provided. For the phono inputs, screened cable is provided. The sockets are high quality gold plated types, insulated from the chassis.

I fixed the PCB into place in the chassis and wired up the terminal pins, but did not wire up the HT line or heaters as I had to fit the tone control PCB first. I noted that the pins of the source / line / monitor switch lie in close proximity to CII6, a polyester capacitor which has HT across it, making it possible to short this voltage to earth and blow a fuse.

It's important to pay careful attention to earth wiring. Valve phono stages are very prone to hum, often a baffling problem even for more experienced kit builders.

The components in this phono module are of good quality. The resistors are mostly 0.6 watt, 1% metal film for a clear sound. The electrolytic capacitors are high frequency types and the polystyrenes are good quality with 1% tolerance. The signal coupling capacitors are large polypropylenes, which tend to give a crisp sound.

TONE CONTROL

The tone control module uses one ECF82 valve (containing a pentode and one triode) per channel. The first stage uses the pentode, providing 29dB of flat gain from the line level input. This gives sufficient amplitude for the tone controls. There is some local negative feedback as the cathode resistor is not decoupled to ground.

Tone control is carried passively, based on a circuit by Baxandall which he produced for the Mullard two valve preamplifier. A balance control is situated in the tone network. A triode is used as a cathode follower output buffer and a stereo ganged logarithmic volume control is connected across the output. Component quality is the same as the phono module and the potentiometer is of standard quality.

I found the tone control module straightforward to build as it is all on a PCB. So it's just a matter of wiring up the heaters and H.T. lines of both



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ECL82	MULLARD	3.50	ECC81 - 6201 / GOLL	PIN MUI	LARD	8.50
EF86	MULLARD	10.00	ECC82 - M8136 / CV.	4003 MUI	LARD	6.50
EL33	MULLARD	10.00	1 O.OO ECC83 - M8137 / CV4004 BRIMAR			
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HI-FI WORLD SUPPLEMENT

MAPLIN NEWTON VALVE PREAMPLIFIER

boards, wire their signal connections and I was ready for switch on.

NEWTON SOUND QUALITY

Stone Roses' 'Good Times' on vinyl, with its bluesy, moody intro. lacked the real bass power and depth I know it's capable of, leaving the overall balance a touch on the thin side. Further up, the midrange was commendably smooth, if a little short on clarity and projection. Here you can definitely hear the valve like qualities; an absence of grain or hardness, but vocals were a little recessed with it.



Treble was clear and open with cymbals, only occasionally becoming bright and glassy in character when strong. For the money, the Newton's phono stage turns in a fine performance, and if a little more weight could be added to lower frequencies, it would be a tough one to beat at twice the price.

Using CD through the line stage, the Newton turned in a far more competent performance, with a fuller, deeper bass and a greater sense of detail. Steve Earl's 'Copperhead Road' showed good speed and attack from its steel string guitar transients. Vocals were smooth and open and projected well, giving that classic naturalness and warmth associated with valves. Cymbals still had a glassy quality, which could make the treble a little hard - well worth bearing in mind if your 'speakers have cheap metal dome tweeters.

The Newton made a good stab at Bjork's 'Army Of Me' too. This complex and heavily processed track often causes budget design's problems. The Newton did become a little confused, but only marginally so, and even then it was revealed as a softening of dynamics and a blurring of image focus, both fairly innocuous.

At under $\pounds 170$ the Newton is super value, providing good sound quality and an entertaining project for enthusiasts.

CONCLUSION

At switch-on the tone control worked first time, as did the line stages, but I experienced motorboating from the speakers when I switched to the phono input. This is a well known problem, caused by instability. I had a look at the circuit diagram and saw immediately the lack of grid stopper resistors. After placing a 100Ω resistor on the first grid and $|k\Omega$ on the second, standing off the PCB and against the valve base pins, this instability was cured. Mike Holmes told me he had not experienced this problem with the prototype. In practice, to ensure stability across a wide range of valves, it is necessary to fit grid stoppers. This is now included on the Newton kits.

After approximately ten hours of

PARTS SUPPLIED BY MAPLIN FOR THEIR NEWTON PREAMPLIFIER

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Steel Nut M3	JD61	1	010/10
M3 10mm Steel Screw	JY22	E	0.16/10
Postage & Packing			6.00 + 1.50
Total Cost			£166.81

work the Newton was up and running, and it's a fine kit. I found it trickier to build than their Millennium power amplifier, but all you DIYers out there should manage, all the same, and get a lot of fun and satisfaction out of building your own valve amplifier

MEASURED PERFORMANCE

The line stages overloaded early, producing no less than 8% distortion at 2V input - the maximum from a CD player. Since valves can swing endemotia levels and are consequently resistant co overload, this was unfortunate. At normal levels, distortion measured 3% very high Levels of 0.2% or less are easily achievable.

The overload problem affected phono, gring it an input overload figure of just 5mV for 9% distortion, it should manage 30mV or more.

The RIAA equals alon had too little basis boost below 200Hz, giving a frequency response that reached his lower than 180Hz (-1dB). The 750S treble characteristic was poor too, although output reached 20kHz within 1dB limits. Maplin's RIAA E Q was inaccurate by hi-fi standards. I'd expect light basis and roft creble. I was turprised that their published curve clearly shows these errors, as if they were unaware of them.

Noise and hum were low and channel separation good.

This preamp is a pretty approximate design, falling below hi-fi criterion, something Mapin may be unaware of its saving grace is low price **NK**

TEST RESULTS

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86.48
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SOOmV
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LIBERTY AUDIOSUITE PART 2

Our in-house Hewlett-Packard FFT Spectrum Analyser costs £9,000. Liberty's Audiosuite is available to hobbyists for

less than £500.

DO YOU NEED AN F.F.T.?

f you are a serious hobbyist, electronics student, small manufacturer (or big one), or school/university science department, an FFT (Fast Fourier Transform analyser) is something to think about. Yes, I know it sounds complex and obscure, but I bought one ten years ago and well know how valuable an FFT really is. Mine cost £9000. These days computer power comes a lot cheaper. At £460 the new Liberty Audiosuite add-on FFT processor for a (powerful) PC computer is an absolute bargain.

"What the hell is an FFT?", you may well ask. Good question. It's not so common that a complex instrument like this is explained in simple terms because they haven't, until recently, been affordable and potentially available for widespread use. Put simply, an FFT analyser is a computer based measuring instrument that by mathematical processing can analyse and reveal the frequencies that make up a complex signal. Let me give you a simple example.

Speak into a microphone and it will deliver an electrical signal that contains all the components of your voice, from (It's not available on the National Health but all the same, you may need one. Noel Keywood explains why)

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deep resonant bits associated with your chest cavity, to high treble bits that come from sibilance. The balance of these components changes in a complex fashion as you speak. An FFT can capture the signal from the microphone and, as engineers say, convolve it to reveal the frequencies and levels of the components and the way they change with time. It can tell you everything about the voice, the main limitation being understanding and interpreting the huge amount of information it provides over any appreciable length of time.

C 1 20 A DVALUE DE

With further signal processing, an FFT can measure frequency response, distortion, noise energy, frequency, modulation and heaven know what else - there's virtually no limit. All you need is a few support instruments, like a low distortion signal source when measuring distortion, for example.

One FFT can do almost everything and better. It can give a "real time" pictorial insight that aids intuitive understanding and comprehension (great for schools, colleges and universities). It can also be used throughout engineering, to study sound, vibration, electrical signals and most other things, the only drawback being that FFTs come with their own language and complexities.

HOW THE FFT WORKS

The difficulty in getting to grips with the FFT is in realising that what appears to be a single signal does in fact comprise many signals of different frequency (unless it's a sine wave). The analysis of a signal from amplitude-time form to frequency-amplitude (and time in a 3D waterfall plot) is called convolution and is what the FFT analyser is all about.

This is a universal notion: it's the same whether we are talking about variation of air pressure with time, variation of electrical level with time of variation of road surface height with time as a car moves over it. Transducers can convert acoustic and road signals into an equivalent electrical signal and the FFT can analyse the result to reveal all the frequency components. This makes an FFT something of a universal signal analyser able to provide a theoretically complete picture of many situations.



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



20 OCTOBER 1995

World Radio History



Audiosuite generates its own white noise signal which gives a flat energy spectrum for use with the Spectrum Analyser instrument.

MEASURING

Although we reviewed the Liberty Audiosuite last month, we said little about how it can be applied. At present, FFT analysers have been embraced enthusiastically by loudspeaker engineers and this includes the Liberty package.

Using a variety of internally generated signals, sine, impulse or pseudo-random noise (in a Maximum Length Sequence burst), the Audiosuite can measure frequency response to 22kHz. The lower upper-frequency limit, which gives better resolution at very low frequencies, is 2.5kHz and the lowest measurable frequency about 3Hz. Windows available are None, Blackman, Hamming, Bingham and 'right side' half windows. Liberty suggest a pseudorandom noise burst through a speaker is the best way of measuring its frequency response (we use pseudo-random noise and pink noise).

The frequency scale can be displayed linear or log. (octave down to 1/12octave), as can the vertical scale. Repeated analysis over time gives a waterfall plot, much beloved by 'speaker engineers for revealing resonances. They look good, but interpretation can be a problem, so we rarely use waterfall.

The instrument will also produce an energy-time curve (log vertical scale) over a limited or full frequency range to show how energy decays, so for example the reverberation time of a room can be assessed. The Hilbert Transform can be applied to show equivalent minimum phase response of a system.

In Scope mode the package acts as a display of signal amplitude against time,

LIBERTY AUDIOSUITE PART 2

but can generate sine wave signals to act as a stimulus.

In Spectrum Analyser mode resolution is a (high) maximum at 8192 lines on the frequency axis and averaging can be used, which is always useful. The instrument also generates a white noise signal, which gives a flat energy spectrum

in an FFT constant-bandwidth analysis. Dynamic range is around 80dB.

The package will display and compute harmonic distortion (down to 0.03%), with up to 9 harmonics displayed; this is a very useful and powerful FFT function for audio.

Of special interest to 'speaker engineers is measurement and determination of Thiele-Small parameters of a drive unit. Measurement of loudspeaker impedance modulus, with real and imaginary parts (X & R) determined, plus capacitance and inductance measurement. Cepstrum analysis is possible too, a double convolution which identifies resonances beneath a frequency response curve. This is at the forefront of what an FFT can do and although described as a form of analysis by Bogert way back in 1963, has yet to reach common currency. It's notionally a little complex, revealing resonances seen otherwise only as blips on a frequency response. Powerful stuff, as are cross-spectrums and such like (we use them for tape frequency response), all of which an FFT can perform.

Most of these measurements are way beyond the scope of conventional test equipment. Many, admittedly, provide vigorous mental exercise and remain little understood or used. Frustratingly, there seem to be precious few books around offering lucid explanations and comprehensible guidance. Most come from America, like the Liberty Audiosuite. So using an FFT analyser has its problems, but in my experience it solves more than it creates - I wouldn't be without one. I hope this little piece explains why an FFT analyser is an invaluable tool - now available at a bargain price

Liberty's Audiosuite is available from: Marton Music, 5 Masterson Ave, Read, Burnley, Lancs. BB12 7PL. & 01282 773198



Either the MLS or Sine instruments of Audiosuite can be used to measure the Thiele-Small parameters of a drive unit. This is extremely useful, giving a set of accurate figures for the

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22

World Radio History

BOOK REVIEW

Hirst released in 1941 as a textbook, Principles Of Electron Tubes is an excellent introduction to the operation of valves of all types and their associated circuits. There are exercises at the end of each chapter with answers at the end of the book, for those who wish to test themselves.

The reader is assumed to have a reasonably firm foundation knowledge of physics and mathematics, as it is on this foundation that the author builds the book. The first chapter is in fact called "Physical Concepts" and covers exactly that, ionization, electron dynamics and so on, the very cornerstones of valve operation. The next chapter is devoted to thermionic emission, and describes how it takes place and the different types of cathodes used. The operation of the vacuum diode is described in detail and is used as a tool to illustrate concepts of thermionic emission.

The following chapters continue with the introduction of grids to the diode to form the triode, tetrode and pentode, three of the major valve types, with diagrams showing the flow of electron streams and the various electrodes interacting with them. Mathematics is extensively used to model valve and circuit performance and load lines are introduced to predict stage amplification, power output and distortion graphically, using the valve's characteristic curves. The subject of amplification using valves is covered comprehensively but in a theoretical sense, good for the engineer, student or manically determined hobbyist but you couldn't go out and design a TL12 straight after reading the book (give it a few days to sink in).

"Modulation and Detection" and "Vacuum Tube Oscillators" are the subjects of chapters 7 and 8 respectively. These chapters are again for those with an interest in valves which passes beyond the norm. However the principles of modulation and oscillation presented are still valid today and the modern student may find the lucid and down-to-earth manner in which this book is written easier to understand than the sometimes overly abstract textbooks currently available.

Things really get hair-raising in chapter 9 with the introduction of "Glow and Arc Discharge Tubes". Covering gas stabiliser tubes, thyratrons and all types of gas filled valve, the best thing about this chapter is the picture of a 9ft tall rectifier valve! Apart from the important, too often equations and formulae are dished out "cookery book style"- you plug the numbers in this end

PRINCIPLES OF ELECTRON TUBES by Herbert J. Reich.

Reviewed by Andy Grove.

small section on stabilizer tubes there is very little for the audio enthusiast here, however thyratrons and ignitrons are still used in industry and there MUST be a way to use one in an amp...

Chapter 10, covers light sensitive valves and their theory and application, hmmmm...

The penultimate chapter covers power supplies and although rather short it is very informative. Rectification systems and simple stabilizer and regulator circuits are described, with the

relevant design equations for each. The final chapter (12) is a short section on valve instruments with very basic circuits for test equipment such as VTMs and using the cathode ray tube to display Lissajous figures. The appendices contain a reactance chart and a decibel chart, but more importantly characteristic curves for some of the valves used in the examples.

For those interested in valve technology, or electronics as a whole, Principles Of Electron Tubes is a very good starting point, but to make the most of the book the reader should have a grasp of algebra, graphical analysis and differential equations or at least know what they are. The author presents a concept in words first and then transforms the argument into a mathematical equation making the process easy to follow. I think this aspect is vitally and the answer magically comes out the other.

Electronics is all about a lot of very simple things all going on at the same time and this book describes those simple things in a detailed and comprehensive manner. Principles of Electron Tubes is an excellent textbook for the electronic neophyte **AG**

WARNING exposure to valve circuits is known to be addictive, and can lead to actual use of valves.

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World Radio History

BOOK REVIEW

carrying a complete chapter on horn equations - a litmus test of dedication but it is also broad in coverage, moving beyond audio into today's concerns, such as factory and community noise, for example.

Acoustics is for those with a professional interest and, preferably, some fluency in mathematics. So whilst it covers horn design, most of it comprises equations for each type of horn flare. There are references to original theory papers, although not so many (this is a well researched field in America, but not Britain), but little coverage of practical considerations. Enthusiasts will not find cutting plans here!

For audio engineers however, Acoustics is something of a cornucopia, because its coverage is so great. It deals in drive unit design and goes on to cover all enclosure types, giving equivalent electrical circuits, design equations and approaches. On this matter, I was fascinated and pleased discover a whole chapter (3) on equivalent electrical circuits, with references to original papers, such as Firestone's from 1938. It is such coverage of crucial basic theory, with extensive discussion of mechanical and acoustical circuits for example, that marks this book out as valuable. Beranek, as an academic, seems happiest with such subjects, devoting chapter 5 to Acoustic elements, which includes radiation impedances and such like.

After loudspeakers and microphones, the book moves onto domestic rooms, then large auditoria/studios and finally to sound transmission through structures. Having covered all this it moves to treatments and measurements.

The final part of the book covers hearing, speech, intelligibility, factory/office noise and community noise, the latter in no great depth.

Acoustics is an American book, so its many references (Journal of the Acoustical Society of America, etc) and much of its bibliography, including a booklist, is not easily available to the UK reader. Also, much of the research referred to predates the first edition (1954), although it was updated in 1986. In spite of this, I've seen few books as comprehensive as Acoustics, and few so concerned with high fidelity. I'd recommend it as an essential reference work for any serious library •

ACOUSTICS

Leo L. Beranek

ACOUSTICS by Leo Beranek

Published by the Acoustical Society of America. Reviewed by Noel Keywood.

The subject of acoustics - the study of sound and its transmission - can be more than a little baffling, yet it is becoming progressively more important. Anyone interested in the subject from a hi-fi viewpoint, however, will be disappointed to find that most books are aimed at professional studio and auditoria treatment, microphones and what have you. The following observation from Leo Beranek, in the preface to his book simply titled Acoustics, will rekindle hope! "My primary desire was to help the student, engineer and acoustical consultant visualise better how to design an audio system to achieve the elusive goal of high fidelity sound reproduction".

With names like Villchur, Thiele and Small mentioned, it's obvious where Beranek's interests lie, and why we've alighted on this book as an important addition to our library. But Acoustics is no parochial treatise on barmy hi-fi ideas. Not only is it comprehensive to the point of being definitive in audio,

World Radio History

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D.I.Y. Letters

A CHANGE OF STYLE FOR KLS3

I plan to make a pair of loudspeakers, and think the KLS3 will fulfil my requirements. It is important to me that the loudspeakers are as good to look at as they are to listen to, so I would like to make some modifications to the cabinets. Unfortunately, I know a lot more about woodwork than I do about loudspeaker design. Is MDF used for most loudspeakers primarily because of cost, or primarily because it is acoustically inert? I have a large stock of well seasoned and well figured hardwood that I would like to use, but does the fact that solid wood is naturally resonant make it unsuitable?

How much latitude would I have with the overall dimensions - is it the overall capacity of the enclosures that is the important thing and can I be reasonably flexible so long as the final volume remains the same?

Finally, I have read that the surface of the cabinets should be as plain as possible. Do you think the addition of a simple moulding at the top and bottom would materially affect the sound quality? **R. W. Shillitoe (Dr) Ilikley,**

W. Yorkshire.

Medium Density Fibreboard (MDF) is used mainly because it tends to resonate less than, say, chipboard or plywood. It is also cheap, consistent and easy to work and finish.

You can certainly use hardwood and it will give you a superb finish of course. Many hardwoods are unlikely to be resonant, but consider the possibility of using sandwich construction to damp down any possible panel resonances. Glueing a thin panel of 3-ply to the inside with Evode Resin W should do the trick. I would suggest you bui!d the cabinet first and add these panels later.

The KLS3 cabinet is so large that you'll need to use cross bracing in any case, best achieved by internal MDF shelves, with large centre holes for unrestricted air movement/zero vent effect, glued into place. A good rap with the knuckles is enough to check for panel resonances. Go for the largest panel first, since this is usually the most resonant.

In simple theory, all you need worry about with regard to bass behaviour is cabinet volume. However, cabinets do have other effects, some quite serious, that must be considered. Firstly, if you make the front wide and/or attach any form of moulding around the edge, you'll degrade stereo imaging because of interference effects caused by the surface plane wave. Ideally, keep the front narrow, recent research suggesting head width is ideal!

Chamfer the cabinet edges too, so edge diffraction is controlled and you could even try a rough-ish front covering to absorb/disperse the plane wave. One reader used chamfered hardwood side fillets for the corners, which is a great idea, since it adds visual interest and gives a smooth look.

Once upon a time, a thin layer of black acoustic foam was glued to loudspeaker front panels to disperse the plane wave, but it would gather dust and peel away in time, making the speaker look shabby. You might try, say, green baize (billiard table covering), thin dense carpet, or whatever, but I'd suggest you experiment. Whatever you do, do not allow the drivers to sink below the front cabinet surface - ideally, they should be flush or raised. If you don't want a rough front surface, don't worry, 'cos this isn't as critical.

We've found that high frequency surface waves (i.e. above about 2kHz) in particular reflect off surface discontinuities to cause complex cancellation effects. These aren't disastrous by any means, but smoothing all contours using a modern mastic (i.e. an equivalent to putty/BluTak) or perhaps Polyfilla, is surprisingly effective in preventing this.

Floorstanders, including KLS-3, are usually dimensioned to put the point between the midrange and tweeter at ear height when seated. This is approximate of course. It's usually better to sit below tweeter axis than make the 'speaker stumpy and sit above it, but KLS-3 was engineered to have wide dispersion, so its sound balance and perceived phase coherence change little with variation of ear height.

Ultimately, if you must have an edge moulding though, Edwardian broom cupboard style, then have one! You'll still perceive most of the benefits of the design. NK

FASTER DIY

I have swapped to your mag from Hi-Fi News after about 28years as I enjoy it much better, (Hi-Fi News has lost its way from when John at KEF some years ago so my Lowthers went for KEF104s, then got the ab modification, and I have not been really happy since! Heavy, Bextrene cones just don't have the transient response of the Lowther's paper cones/massive magnets and I miss this!

Listening to reasonable headphones reveals the effect of crossovers - I hate them and I recently read a review of some RATA 2 'speakers which look like what I'm after, very fast, but unfortunately very expensive

It's interesting they use a 10" mid/bass unit presumably to get the mechanical roll-off in the treble and not use an inductor. I'm thinking of getting some new 'speakers and wish to use a subwoofer so need some really fast midrange units.

fast sound, which sounds exactly like what you are looking for. There are very few drivers with a flat enough response to be used without a crossover, so perhaps your best bet would be to go back to Lowther drivers in a modern DIY cabinet of your own. As you recognise, their light paper cones have a very neutral tone, and the massive magnets give them super sensitivity. You can contact Lowther on Tel: 0181 300 9166. DB

CHASING INDUCTORS

I am attempting to build your KLS4 loudspeaker and have drawn a blank trying to get hold of the inductors you specify for the crossovers. Wilmslow Audio have also checked with their supplier and have also drawn a blank (none out of 250!).

The problem seems to be the DCR, those that Wilmslow can supply of the correct inductance have much lower DCRs than those you specify. Can you suggest a supplier? If not, how important is the DCR value? Can an inductor of lower DCR be "padded up" with a series resistor? If so, of what type? Dr. Jonathan Iggo

Oxton, Birkenhead.

The inductors come from Falcon and are standard items in their range. You can pad up an inductor of lower DCR if you wish, but you'll need to use very low value resistors. The



Crabbe was Editor).

I was bought up on Paralines (1/4wave loaded 'speakers designed by Rex Baldock) Tricolumns and Leak Cadets and ended up with Lowther PM6 drivers. These were loaded in home made 1/4wave 'speakers and they sounded really good, but they had a resonant peak which on my system coincided with record scratch frequencies and was never really cured. Hendrix sounded fantastic though, in fact I havn't heard as good since.

l recently read Noel Keywood's excellent reply to a letter in Readers Queries 'Where's Lowther in the UK', which really summed up the current hi-fi 'speaker scene. My brother-in-law got a job I've read that to get a 'speaker to mechanically rolloff the treble while maintaining a flat frequency response is very difficult, but it's time this problem was solved. I notice Audax do a 6.5" High Definition Aerogel unit, what's the frequency response of that like? It seems to have a large magnet and high sensitivity. Nick Rolls Berkhampsted, Herts.

The Audax HDA driver you are referring to is the HM170Z0, but like many of the Audax drivers we stock, it needs a series inductor to flatten the rising response. However, the HDA cone material does have a very clean and



BURN OUT

I have in my possession a Leak Stereo 20 which until recently, gave me a lot of fun. However, the mains transformer shorted out (the old 'heart' stopped) and now I am in dire straits. Where can I get as good a heart . .er. . . transformer that will sound just as good? It is near impossible to get one here in Singapore or even across the border in Malaysia, much less another Stereo 20!

I am writing to you because this magazine seems to be the only one that really caters to classic hi-fi and the DIY nut-cases (I am one, unfortunately). I have been reading Hi-Fi World since the October 1993 issue. Because of your gentlemen, I have tweaked my humble setup till it sounds beautiful. Thank you. Now back to the pressing issue.

I could have one locally wound, but it won't sound the same neither could I relegate the old thing to scrap heap. I know there are a lot of Stereo 20s running around still, but I have yet to see one here in Singapore.

I know this is not a tall order for you chums to fulfil but I do fervently hope that you can get me in touch with someone who can help. Thank you very much for listening to my plea.

Transformer specification: Year built circa 1962. Primary 220V/230V. Secondary 0-280V 150mA, 6.3V 4A, 5V 2A. Valves used: EL 84 x 4, ECC 83 x 3, and GZ 34 x inductors needed are a) 0.9mH air cored, 1.2Ω DCR, 0.56mm wire b) 0.5mH air cored, 0.3Ω DCR, 1mm wire

Contact Valerie Jones, Falcon Acoustics Ltd., Tabor House, Norwich Road, Mulbarton, Norwich NR14 8JT, Tel: 01508-578272; fax: 01508-570986. Falcon can supply a wide range of special crossover components, as well as long hair wool and bitumen pads. NK

CURING CLUCK

I have been making my own speakers now for some fourteen years using various drivers; sometimes the same drivers in as many as four different cabinets using a wide variety of materials with improvements all the way based on what's gone on before.

Here are some conclusions:-

M.D.F. is cheap, easy to obtain, good to machine & paint etc. but it's no good as the sole speaker cabinet material - it has what I call a 'cluck' (a coloration on vocals and general wooliness to the sound). It is also used as braces, which is next to useless.

Manufacturers have cost restrictions etc. 'DIYers' are not as limited. Try VIROC it's a board like MDF, in the same thickness but much harder, heavier and better damped - harder to machine and saw, but worth it!

Now braces. Most people use ramin or beech which are OK, but try ash or oak; both are more rigid. The ultimate

though is WENGE - very rigid and strong, it has a marvellous tone when tapped.

Air flows next. Some speakers use a series of flat cross braces which make up compartments with holes in them which are then stuffed with wadding. This is hopeless for reflex designs. Just think about it - air is pushed into the enclosed compartments and starts to dissipate very quickly, by the time it has reached the port you've lost a lot of power and speed of the bass notes. After all, an electronic signal is faster than moving air. You need to position the braces so there's a good and quick air flow to the port.

Another area for concern is front baffles. A few manufacturers and, I'd bet, a lot of DIYers, use thick front baffles: Here, the driver is at the end of a deep hole (the driver cut out). When the driver moves it causes turbulence in the cut out you've all heard of it in ports over the years. So imagine how the driver is being affected. In theory you must only be using part of the cone area. Try chamfering the inside edge and sanding it.

These are just a few ideas I've come up with over the many years of designing and building speaker cabinets. I've used solid hardwood with good results, but care is needed. Nearly all hardwood sold today contains between 5 and 12% moisture, so when you bring it into the house it starts to curl and crack as it dries out, but there are ways around this of course.

Whatever material you are thinking of using, try tapping it and listen to see if it sounds soft or dull - it will probably sound the same when you've made your speakers; hard sounds best, faster, cleaner etc. M. A. Siddle Blyth, Northumberland.

Sound propagates as a wave through air, much in the way waves move across the ocean's surface, whilst the water that supports them may or may not be moving. The behaviour of the wave is not necessarily the same as that of the medium and it's here that your analogy of air movement and the conclusions you draw about baffle holes is imprecise. So long as they are large enough not to act as venturis or ports, in which the air acts as a discrete mass, they work satisfactorily.

You've left the problem of hardwood moisture and contraction in the home unanswered. How is it tackled? I left a stack of new floorboards (pine) to dry for six weeks, separated by blocks so air

The Month

P.S. Could you please get me the address of Station Sounds, please, as you can only have their phone number listed? Sanjay Nambiar Singapore.

I spoke to Kevin Arnold, of Majestic Transformers about this one. Majestic can rewind old transformers, mains or output, or manufacture new equivalents. For authenticity, do not throw away the transformer, because its laminations and shrouds are probably not available today. Majestic will remove the bobbin, strip it and rewind to original specification. If you have discarded the original transformer they can provide a

replacement with the same type of laminations, but covered by pressed steel shrouds, where Leak used cast shrouds. So your Leak Stereo 20 can be restored to working condition.

Contact Kevin at Majestic Transformers, 245 Rossmore Road, Parkstone, Poole, Dorset BH12 2HQ, Fax: 01202-733793. According to his information, you need Leak Transformer Reference 8162.

Station Sounds' address is Down Platform, Worthing Station, Sussex, Tel: 0903-39980 or 213192 in the evenings. Mike Pointer of Station Sounds can also help with problems like this, readers might like to know. NK



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could circulate - and still they shrank after being laid and clamped. I asked Moss & Co, a Central London supplier of hardwoods, for guidance. They told me that hardwoods are commercially kiln dried to 12-15% moisture and it's unrealistic to go much lower. A dry, centrally heated home may reduce this to 8% or so. Rather than force the wood to this level in a kiln, they said the best cabinet makers usually let their wood air dry in the rafters of their workshop for three months or so. The timber is cut and worked after it has dried. not before.

A hardwood like mahogany is stable and affordable and can be used for loudspeakers. Beautiful woods like Ash are so hard they burn out machine steel drills, routers and saws, needing carbide tipped tools. If you want to use a hardwood, contact Chris Vaughan at Moss & Co., 104 King Street, Hammersmith, London W6 0QW, Tel: 0181-748-8251. They have the machinery to cut panels, but remember that hardwoods are not cheap.

As you say, the sonic signature of a wood or enclosure can be gauged by giving it a rap with the knuckles. Hard, snappy materials do give precisely this sort of sound, if not swamped by other effects of course. NK

BIASING THE KT77

I recently joined the happy band of valve enthusiasts after becoming increasingly disillusioned with my hi-tech, hi-spec multi-amp active system. My first foray into valve amplification was with a Croft Micro A/Series V prepower set up, but after a short time I realised it was somewhat underpowered for my room. I have now acquired a second-hand Grant Lumley valve power amp, about which I know very little, except that in my set-up, a Quad 67 CD player, QED Vector passive preamp and a pair of Ruark Talisman II speakers, it sounds superb, surpassing all that has gone before it, with ease.

I have been having trouble identifying the valves it uses, so I spoke to a very helpful gentleman at Tube Technology who kindly identified the unmarked valves.

The power tubes were Golden Dragon KT77s, Tube Technology suggested, that as no genuine KT77s are available I should fit Gold Aero EL34Ls, so I purchased a full set of valves comprising 4 x EL34L and 4 x ECC82. It was also suggested that I replace the short length of coax cable from the amp's input sockets with Sonic Link violet, which I did before fitting the new valve's.

The improvement was dramatic, the KT77s were warm, lush and very valve like, the EL34Ls where crisp, clean, dynamic and very musical, I just sat back for the next six months and enjoyed the music. Unfortunately a couple of weeks ago one of the EL34Ls started to distort, so Tube Technology replaced it along with its partner, and suggested as the valve had failed so quickly that I should check the biasing on the amp.

I have no manual or any information about the amp, however with some assistance from PM Components and Tube Technology, I worked out how to check the bias settings, to assist with this I replaced the short wires from pin 8 on the EL34Ls to the chassis with wire-wound 10 ohm resistors. There are 2 pots controlling the bias settings so I marked them before adjusting. It was suggested that 500 - 600 milliVolts across the resistor was the correct value so I adjusted the settings,

unfortunately the amp ran very hot and the sound deteriorated, so I returned the settings back to the marks, which now read just under 400 milliVolts.

The sound quality has been restored but I am concerned about valve life, can you help or put me in touch with anyone familiar with this amp, so that I can set the bias?, I would be very grateful for any help you could provide. **Robert Baker Wrexham, Clwyd.**



EL34 IN FIXED BIAS - Standing current through valve is Iv, determined by Volts across measuring resistor Rs (100 meter shunt), or a d.c. milliammeter. An output valve like the EL34 typically passes 50mA or so in Fixed Bias. Fixed bias gives more power, but output valves must be individually balanced like this.

The EL34 and it's derivatives were rated for a maximum anode dissipation of 25W and exceeding this rating will drastically shorten valve life because the excess heat will cause the anode to release what is known as "occluded gas" which damages the delicate cathode coating, reducing electron emission. Modern Chinese types (such as the Golden Dragon and, I suspect, Gold Aero) will have to be treated with special care. Some types may also have a low emission to start with and cranking up the quiescent bias current could cause the valve to saturate on

peaks, causing distortion. I suggest that if you are after extended output valve life you don't run them at over 20W total dissipation, lessening the heat generated inside the valve.

To check this, measure the anode-cathode voltage between pins 3 and 8 on the valve base using the 1000V range on your meter (you only need too check one valve, the others will be very similar). Measure the voltage across the 10Ω resistors and using Ohm's

law (I=V/R) calculate the cathode current. The valve dissipation is the product of cathode current x anode-cathode voltage; adjust the bias pots for each valve to set the current within the desired range. Your amp will now be set up for good valve life.

You may also want to try the new Russian EL34 types from Sovtek and Sovetlana. The latter has a heat activated getter actually the strapped to the anode. This absorbs the occluded gas as it is released, potentially extending valve life and reliability. AG

Your amplifier has a fixed bias topology, similar to the GEC 100W design I believe, shown in the diagram. If you insert a 10Ω (Rs) shunt resistor in the cathode for balancing, and adjust grid bias to get 500mV across it, then the EL34 will be passing a reasonable 50mA. With 440V H.T. or so across pin3-pin8, anode dissipation will be 23W. which should not overheat EL34s. You may have a higher HT, or you have error in Rs or the millivolts reading across it. Check carefully. NK

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