Announcing the availability of the original WE 300B electron tube.
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 Ey 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 double-diode 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 30309-3750
(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,
WD1 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
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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 5 minutes 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 £285 each, but for total orders over £400, they will be £190 each. The WVE300B 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 £22.75 each, the new EL34s are £9.99 each and their 6550s £18 each.

Also worth looking out for is Billington’s new 60-page 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.

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 65 watts and a maximum anode voltage of 800V, making it useful to be used as 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, say, is much more resistant to overload than those with oxide coatings. This is a directly heated valve - so there is 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) 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.
Tel (001) 205 882 1344
(Factory: St. Petersburg, Russia)

DIGITAL STORAGE OSCILLOSCOPE FOR THE PC
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.
Tel (001) 713 777 0401

O-Scope I
Allison Technology Corp
Houston, Texas, U.S.A.
18113 6441 53
O-Scope I
18113 6441 53
Floorstanders 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.

KLS7
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 HM130C0 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.
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 3.3\(\mu\)F capacitor and a parallel 0.5mH inductor to form a high-pass filter with its crossover frequency set at 4kHz. An L-pad 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 8\(\Omega\), 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 8\(\mu\)F capacitor. A 15\(\Omega\) resistor is used in parallel across the driver to damp impedance and keep it as smooth as possible and close to 8\(\Omega\).

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 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 4\(\mathrm{mm}\) plugs which can be inserted into a European mains socket. We suggest you use pin 1 for earth (black terminal) and pin 2 for +ve (red terminal).
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, an NPC 5813 digital filter, Analog Device's AD844 and 847 op amps implementing the Burr Brown 1702 DAC, a Crystal 8412 input receiver, and a custom potted toroidal power transformer.

Operating parameters easily adjustable and continuously displayed. Bandwidths to 22 KHz for the 0-Scope I and to 250 KHz for the O-Scope II which also features phase measurement and external trigger capabilities. DOS print screen or log to disk.

The parts quality is top notch. The board comes assembled and tested, and a Satisfaction Guarantee (return it within 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.

The only tools required are a pencil tip soldering iron, an NPC 5813 digital filter, Analog Device's AD844 and 847 op amps implementing the Burr Brown 1702 DAC, a Crystal 8412 input receiver, and a custom potted toroidal power transformer.

At $449 US, the Assemblage DAC-1 offers an outstanding value in digital conversion and comes with a Satisfaction Guarantee (return it within 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.

To order the DAC-1 kit or to order The Parts Connection 1994 Catalog (for £3), full of a lot of other exciting stuff (including a $10 US discount for £3), full of a lot of other exciting stuff (including a $10 US discount on your first order over $100 US), send us your request for full catalogue of high grade audio components. ASSEMBLAGE.

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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.

Excess glue that oozes from the joins can be wiped away lightly with a damp cloth. 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 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 1Ω and a likely problem if below 4Ω. Note that this DCR figure is not a measure of impedance.
Long known as specialists in rare tube brands, Billington Export provides a line of premium-grade valves to fill the increasing demand for hard-to-find tubes. BILLINGTON GOLD features specially tested valves selected for long life, low microphony and low noise. Versions with gold plated pins are available. BILLINGTON GOLD brand comes from a variety of countries around the world. We have carefully chosen the best manufacturer for each type, with an emphasis on the highest audio quality and product reliability.

We stock one million valves including: BRIMAR GE USA, GEC UK, MAZDA, MULLARD, RCA, RUSSIAN/SOVTEK, SYLVANIA, TESLA, TUNGSRAM and other rare brands, as well as sockets and CRTs.

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<th>BILLINGTON GOLD</th>
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<td>6L6WGC</td>
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<td>5751 (USE ECC83)</td>
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| 6C7 Yugoslavian      | 6AS7G                   | 300B Silverstone         |
| 6X4W Raytheon USA    | 6B4G                    | ECC88                    |
| 5751 (USE ECC83)     | ECL82                   | EL34                     |

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| 807 USA            |                         |                         |
| 5687WA RCA         | 6.45                    |                         |
| 6550A GE USA       | 33.00                   |                         |
| CV4003 Mullard UK  | POA                     |                         |
| CV4004 Brimar UK   | POA                     |                         |
| CV4024 Mullard UK  | POA                     |                         |
| DG-7 32 Tungsram Hungary | 32.48              |                         |
| ECC81 Mullard UK (CV4024) | POA              |                         |
| ECC82 Mullard UK (CV4003) | POA            |                         |
| ECC83/ECC803S Tesla | 13.13                  |                         |
| EF86 GEC UK (CV4085) | POA                   |                         |
| GZ32 Mazda          | 8.00                    |                         |
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BILLINGTON EXPORT LIMITED
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

MEASURED PERFORMANCE

KLS7 has a flat and smooth 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 warmish sound. Bass doesn't extend especially low because of its compact dimensions, but with rear wall reinforcement will go low enough to play fundamentals well.

Like all of the kit loudspeakers we design, KLS7 has been engineered to have a flat and smooth impedance curve, making it suitable for valve amplifiers. Overall impedance measured 9.4Ω and the impedance curve shows that it doesn't wander far from 8Ω across the whole audio band. Sensitivity isn't as high as some of our other kit designs, there is always a trade-off between bass power and sensitivity with compact enclosures. They produced 86dB sound pressure level at 1m for a nominal watt (2.83V) pink noise signal. A 30watt amplifier should provide enough power for good levels, especially in the small rooms KLS7 was designed to work best in.

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 head 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 classic tone feedback circuits, is so great that even the mainstream valve manufacturers are starting to follow suit. Every company, whether they pride themselves as being the world’s foremost manufacturer, who speaks of things they do not believe in, or they become followers of us, will have a single-ended amplifier in their product line. So whether you are including a single-ended amplifier yourself, or looking to buy a manufactured single-ended amplifier; there is something for you in this guide. Somewhere, in the face of the usual industry hype about an “original” product, brought this technology to the attention of the public, and every now and then, because we firmly believe that it is a subject of amplifiers that is often neglected, and therefore deserves to be resurrected as the best technique for anyone who wants the genuine acoustic and beauty of real music.
The samples silver foil caps will also have solid silver leads, to withstand the voltages, to be compatible with other high end components, and to be more amenable to the design of the amplifier.

**Hi-Fi, Graphite, Diamond Transfers.**

"Highly, I'd prefer to categorically date the alloy caps and rumours of the Black Caps are mere conjecture. Many thanks, audition."

Audio Note is currently the best source in Europe for NOS silver foil caps. Before the Silver Caps, there were only a few really high-grade NOS silver foil caps. When the best American audio companies in the world were seeking Black Caps that were different from our Chatham 5004, also supplied by Audio Note, they were often the only high-grade caps available.

**Black Caps.**

We have high-grade caps that promise a guaranteed improvement when replacing practically any other cap, but this is not a "Black Caps" cap. They are made in different countries, but the first such technology available now is described in your magazine. "Close Play" and can be obtained by sending a stamped addressed envelope to request a model sheet. Audio Note letter 28/11/89.

Remember, the alternative is a Black Caps or transistor or electronic capsule, because any electronic component anywhere in the circuit at an amplifier or in the crossover at all will generally improve sound quality. We have high-grade caps that promise a guaranteed improvement when replacing practically any other cap, but this is not a "Black Caps" cap. They are made in different countries, but the first such technology available now is described in your magazine. "Close Play" and can be obtained by sending a stamped addressed envelope to request a model sheet. Audio Note letter 28/11/89.

We are the only high-grade caps available and in calling your 'Close Play' and can be obtained by sending a stamped addressed envelope to request a model sheet. Audio Note letter 28/11/89.

**IMPORTANT NOTICE**

Please note: The DIAMOND TRANSFERS are only available to the continuous strengthening of one of the most important elements of our kits. It is impossible to improve on them or their prices, since we only have stock for four days for these parts, as we shall start offering a kit for 1995.

**The KIT FOUR is really our introduction to valve amplifier kit building, and circuit and power supply mounted on one single printed board component quality is similar to our Level 2 finished products.**

The KIT ONE costs £249.00. and is available from May, 1995.

**The KIT FOUR is available now.**

**KIT ONE**

This features 2 x 300B and stereo headphones running in Single Ended mode, packing some 37 watts of class A, valve rectified 115v for the output stage, stereo chassis, and 65v/220v input and 845/EC88/6SR4 driver stage, crossover and chassis as kit. The KIT TWO is currently unavailable due to the lack of supply of NOS 5656/6H4 tubes, we can offer in 115v voltages for £539.00. and £570.00 inel VAT if used with Chinese 6550's, no claims for faults in power supply or output transformers will be accepted.

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**KIT THREE**

Three features 2 x 300B and stereo headphones running in Single Ended mode, packing some 37 watts of class A, valve rectified 115v for the output stage, stereo chassis, and 65v/220v input and 845/EC88/6SR4 driver stage, crossover and chassis as kit. The KIT THREE is essentially a mini version of the KIT ONE with double the power, the same components as the KIT ONE but with 2 x 300B instead of one.

**The KIT THREE is essentially a mini version of the KIT ONE with double the power, the same components as the KIT ONE but with 2 x 300B instead of one.**

**The KIT THREE costs £1,550.00 and is available now.**

**The KIT FOUR costs £1,999.00, and is available from May, 1995.**

Pre Amplifier.

A kit is available for the Audio Note NATIVE pre-amplifier kit circuit and power supply mounted on one single printed board component quality is similar to our Level 2 finished products.**

Please note, our 5004's are manufactured in China by Dragon Tiger, and are engineered to focus some critical features- such as leading-edge conditioning; parameters somewhat more stringent than otherwise done. They do not sound quite as good as original Tungsol 5U4G (best sounding 5046 I have ever heard); Carbon 5004's and many others.

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Almost two years after the launch of their Millennium 4-20 valve power amplifier, a re-packaged 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", 1mm 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
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 π filter comprising two 47μF capacitors and a 10Henry choke, which gives good smoothing. There is a 6.3Volt, 1.5Amp 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.

**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 16kΩ 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 1K 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 C116, 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 pre-amplifier. 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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A selection of our stocks of New Original Mullard - Brimar audio types made in UK.
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 Stone Roses' Good Times' on vinyl, I was ready for switch on.

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OCTOBER 1995
DO YOU NEED AN F.F.T.?

If 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 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.

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 or 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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Lynn Olson, Positive Feedback. Vol 5, No 4

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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 pseudo-random 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, 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.

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First 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 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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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, 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 predate 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.
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TO RECEIVE YOUR COPY OF THIS SECTION FRACT AS LITTLE AS £30 A MONTH CALL 0171 289 3533 OR 01245 443555
Letters

A CHANGE OF STYLE FOR KLS3

I plan to make a pair of loudspeakers, and think the KLS3 will fulfill 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)
Ilkley,
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 Eoede Resin W should do the trick. I would suggest you build 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.
The problem seems to be
the DCR, those that
Wilsmslow 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

Letter of

BURN OUT
I have in my possession a
Leak Stereo 20 which
until recently, gave me a
lot of fun. However, the
main transformer shorted out (the old
‘heart’ stopped) and now I
am in dire straits. Where
can I get as good a heart.
. . . etc . . . 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
thanked my humble set-
up 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.
I know there are a
lof 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 1.

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 haven’t heard as good
since.
I 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
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 mid-
range units.

FASTER DIY
LOUDSPEAKERS
I have swapped to your mag
from Hi-Fi News after about
28 years as I enjoy it much
better, (Hi-Fi News has lost
its way from when John
Loudspeakers
Faster DIY

CHASING Inductors
I am attempting to build your
KL4 loudspeaker and have
drawn a blank trying to get
hold of the inductors you
specify for the crossovers.

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
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

Valves used: EL 84 x 4,
ECC 83 x 3, and GZ 34 x 1.
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.

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: 0903-39950 or 213192 in the evenings. Mike Pointer of Station Sounds can also help with problems like this, readers might like to know. NK

WIN A MAPLIN SOLDERING IRON KIT COMPLETE WITH A LENGTH OF SILVER SOLDER

The writer of the most interesting DIY letter each month will receive a superb Maplin soldering iron, stand, booklet on good soldering practice and a length of high quality silver solder.

Write in to: Hi-Fi World DIY letters, 64 Castellain Rd, Maida Vale, London W9 1EX.
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 pre-power 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 KT77's, Tube Technology suggested, that as no genuine KT77's are available I should use 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 KT77's were warm, lush and very very 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, I 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.

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.

ROBERT BAKER

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 Svetlana. The latter has a heat activated getter actually strapped to the anode. This absorbs the occluded gas as it is released, potentially extending valve life and reliability, AG.

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CHELMER VALVE COMPANY
for
High Quality Audio Valves

We offer below a selection of our CVC PREMIUM range of audio valves. These CVC BRAND valves are from selected world wide sources, processed in our special facility to provide low noise/hum/microphony PRE-AMP valves and POWER VALVES burnt-in for improved stability and reliability. Use this sheet as your order form. If you require matched pairs, quads or octets etc. Please allow £1.00 extra per valve for this service and mark alongside the valve type number ‘M2,M4, M8’ etc as required.

Price list and Order Form for CVC PREMIUM Audio Valves

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| MATCHING CHARGES | £ |
| POST & PACKING (UK) | £3.00 |
| TOTAL EXC VAT | £ |
| VAT @ 17.5% (UK/EEC ONLY) | £ |
| TOTAL TO PAY | £ |

Please make cheques payable to: ‘CHELMER VALVE COMPANY’ or pay by ACCESS/MASTERCARD/VISA Please give details:

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ADDRESS: .............
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