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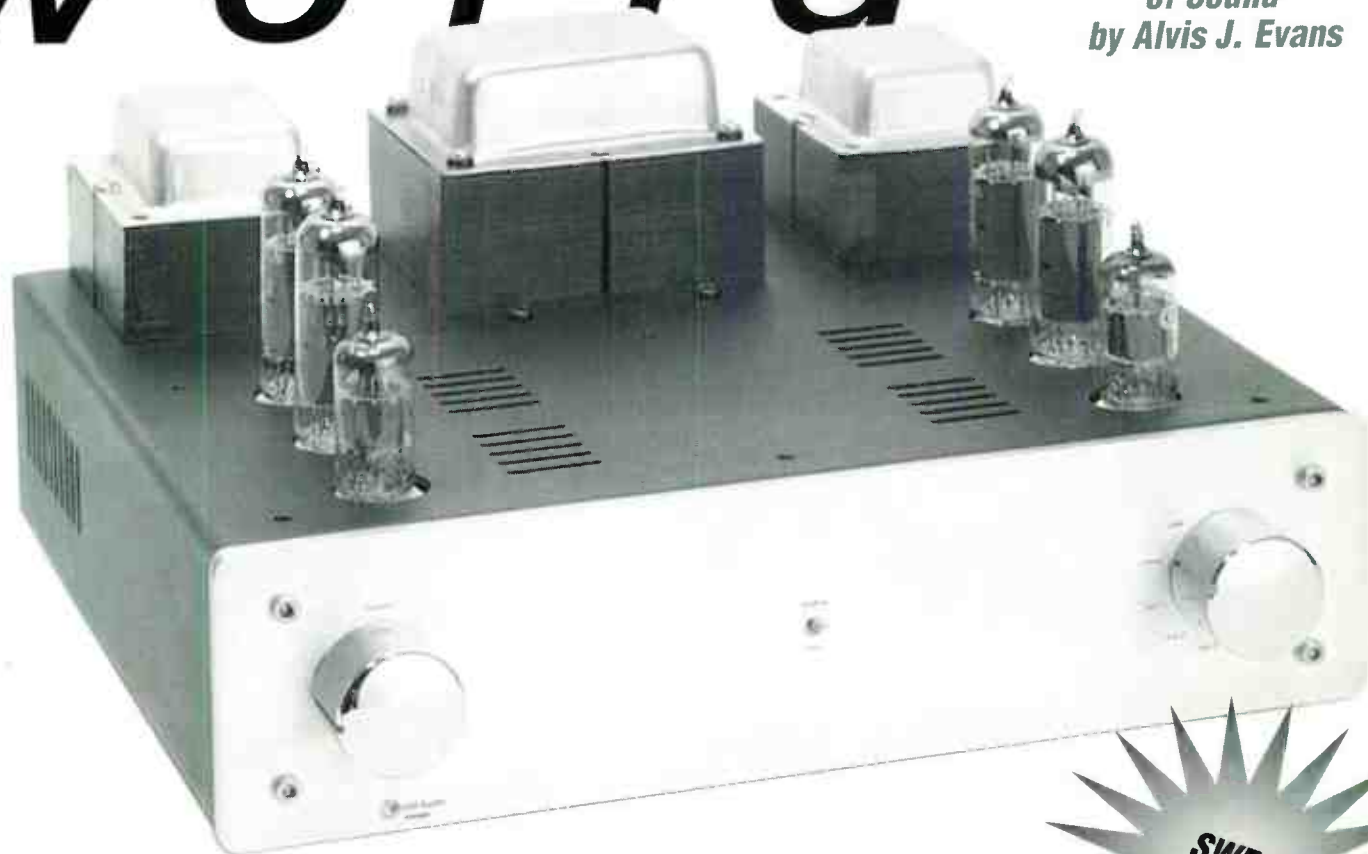
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DECEMBER 2000

No55



**THIS MONTH'S
BOOK REVIEW:**
*Making Sense
of Sound*
by Alvis J. Evans



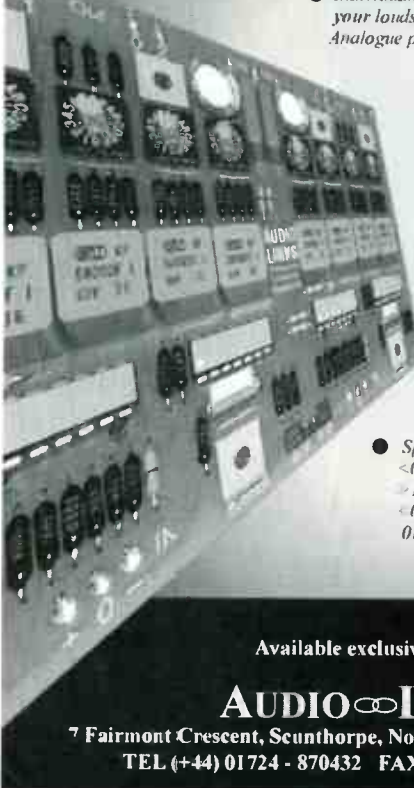
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PRICE VALIDITY TO END APRIL 2000 - ASK ABOUT ANY TYPES NOT ON THIS LIST



CHELMER VALVE COMPANY

for High Quality Audio Tubes

Everybody in the tube business knows that the justly famous Brand names of yesterday like BRIMAR, GEC, MULLARD, RCA & TELEFUNKEN Etc. Etc. are scarce and often very expensive. Although we supply all major brands when available (and have many in stock) our policy is to offer a range of tubes, mostly of current manufacture, the best we can find from factories around the world, which we process specially to suit audio applications. The result - CVC PREMIUM BRAND. Our special processing includes selection for LOW NOISE, HUM & MICROPHONY and controlled BURN-IN on all power tubes to improve STABILITY and select out tubes with weaknesses Etc.

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ECC82 5.20	EL34 (TESLA) 8.20	6X36A 46.00	B9A (Ch or PCB) G/Plated 3.00
ECC83 5.20	EL34GCA7 (Large Dia) 10.70	6X50A 11.00	Octal (Ch or PCB) 1.80
ECC85 6.00	EL84/6BQ5 4.80	6X50WA or WB 13.50	Octal (Ch or PCB) G/Plated 4.20
ECC88 5.00	EL509/519 13.00	7581A 11.00	4 Pin (For 2A3, 300B etc.) 3.30
ECF82 5.00	E94L/7189A 6.50	907 9.00	4 Pin (For 2A3, 300B etc.) G/Plated 5.00
ECL82 5.20	KT66 9.50	811A 11.00	4 Pin Jumbo (For 211 etc.) 11.00
ECL86 5.20	KT66R 22.00	812A 34.00	4 Pin Jumbo (For 211 etc.) Gold Plated 15.00
EF86 5.60	KT77 12.00	845 30.00	5 Pin (For 807) 3.00
E80F Gold Pin 10.00	KT88 (Standard) 12.50		7 Pin (For 6C33C-B) 4.50
E81CC Gold Pin 6.80	KT88 (Gold Special) 21.00	RECTIFIER TUBES	9 Pin (For EL, PL509, Ch or PCB) 5.00
E82CC Gold Pin 8.00	KT88 (GL Type) 30.00	EZ80 4.20	Screening Can (For ECC83 etc.) 2.00
E83CC Gold Pin 7.50	PL509/519 9.00	EZ81 4.70	Anode Connector (For 807 etc.) 1.50
E88CC Gold Pin 8.00	2A3 (4 or 8 Pin) 14.50	GZ32 12.00	Anode Connector (For EL509 etc.) 1.70
6EU7 6.00	211 22.00	GZ33 10.00	Retainer (For 6L6WGC etc.) 2.00
6SL7GT 8.50	300B 50.00	GZ34 8.70	
6SN7GT 4.60	6C33C-B 27.00	GZ37 6.50	
6922 5.50	6L6GC 8.50	SU4G 5.50	
7025 6.50	6L6WGC/5881 8.00	5V4GT 4.70	
	6V6GT 5.00	5Y3GT 4.20	
	6146B 10.50	5Z4GT 4.70	

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ECC85	RFT	5.00	E88CC/CV2492	BRIMAR	4.50	5U4GB	SYLVANIA	10.00	ECC82	RFT	5.00
ECC88	BRIMAR	4.50	E88CC/CV2492	MULLARD	8.50	5Y3 WGT	SYLVANIA	3.50	ECC83	RFT	6.00
ECC88	MULLARD	6.00	ECC81/CV4024	MULLARD	6.00	6BX7GT	GE	7.50	EF86	USSR	5.00
ECI81	MULLARD	3.00	ECC81/M8162	MULLARD	7.50	6B4G	SYLVANIA	22.00	EL84	USSR	2.25
ECL82	MULLARD	5.00	ECC81/6201	MULLARD	8.50	6FQ7	SYLVANIA	7.50	EL34G	SOVTEK	5.00
ECL86	PHILIPS	5.00	ECC82/CV4003	MULLARD	7.50	6L6GC	GE/SYL	17.50	EL34	E.I	5.00
EF86	MULLARD	15.00	ECC82/M8136	MULLARD	10.00	6L6WGB	SYL	10.00	6SL7GT	USA	5.00
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EZ80	MULLARD	5.00									
GZ33/37	MULLARD	15.00									
5Z4G	BRIMAR	5.00									
6V6GT	BRIMAR	6.00									
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13E1	STC	85.00									
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9.30am - 2.30pm
+44 (0)1923 270833

Private & Trade Classified Ads
+44 (0)20 7625 3134
Fax: +44 (0)20 7328 1844

Contact Numbers
9am - 5pm Mon - Fri

Editor
Nick Lucas
+44 (0)1908 218 836
nick@worldaudiodesign.co.uk

Sub Editor
Noel Keywood

Design & Production
Tyron Taylor
+44 (0)20 7625 3129
Fax: +44 (0)20 7328 1844

Contributors
Gary Devon

Photography
David Noble
+44 (0)20 7625 3134

Sales and Marketing Manager
Amanda Sweeney
+44 (0)20 8864 4760
Fax: +44 (0)20 8864 4780

Accounts
Michael Ogazi
+44 (0)20 7625 8032
Fax: +44 (0)20 7328 1844

Credit Control
Louise Palfrey
+44 (0)1923 270 833
Fax: +44 (0)1923 260 588

Publisher
Noel Keywood

**WORLD AUDIO
DESIGN**

Technical Manager
Nick Lucas
Tel/Fax: +44 01908 218 836
e-mail: nick@worldaudiodesign.co.uk
website: worldaudiodesign.co.uk

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Middlesex UB7 7QE
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diy supplement/contents

No55



DIY NEWS

15W AMPLIFIER FOR BEGINNERS

Gary Devon designs a great new amplifier that's easy to build and inexpensive

DIY ON THE INTERNET

There are some great sites out there, Jon Marks discovers

ADVANCED SPEAKER DESIGNS

Gary Devon reviews a book on sound and sound products

LETTERS

Queries from our technical postbag, answered by experts

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NEXT DIY SUPPLEMENT - WITH OUR FEBRUARY 2000 ISSUE

Watford Valves

7 DAYS A WEEK 9AM - 9PM THE AUDIOPHILES CHOICE
All output valves multi-tested and digitally matched
Full no quibble guarantee. Expert advice on all valve amps

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ECC82	Philips	5.00	GZ32	Philips	25.00
ECC83	Philips	7.00	GZ34	Harma	8.00
ECC83	R.F.T	8.00	KT66	Harma	25.00
ECC83	Tungram	15.00	KT66	GEC	80.00
ECC83	Mazda G	15.00	KT88	Sovtek	20.00
ECC83	Mazda S	25.00	KT88	Svetlana	34.00
ECC803S	Tesla	20.00	2A3	Sovtek	18.00
E83CC	Siemens	25.00	5687WB	Philips	5.00
ECC85	R.F.T.	5.00	5881WXT	Sovtek	5.00
E88CC/6922	Harma	12.00	6550C	Svetlana	18.00
ECL86	Harma	6.50	6550WE	Sovtek	16.00
EF80	Mazda	6.00	6AU6WC	Philips	3.50
EF86	Tesla	12.00	6B4G	Sovtek	28.00
EL34WXT	Sovtek.	6.00	6C33C-B	Russian	28.00
EL34EH	Sovtek	10.00	6CG7	EI	8.00
EL34	Svetlana	8.50	6CG7	GE	14.00
EL34L	JJ/Tesla	8.50	6GK5	GE	7.00
EL84	Sovtek	4.50	6L6GC	Svetlana	12.00
EL84	Telefunken	35.00	6SL7GT	Sylvania	8.00
E84M	Russian	6.00	6SN7GT	Philips	15.00
EL84	Philips	15.00	7119	Amperex	12.00
PL519	Mullard	12.00	7199	G.E.	15.00
EL519	EI	12.00	12AX7LPS	Sovtek	8.00

QUAD II KT66 SPECIAL OFFER

The Harma KT66 offers performance equal to the GEC KT66 at a fraction of the cost. Each valve undergoes a high plate volt test and comes digitally matched on plate current and transconductance. At only £25 each these KT66s really are an audio bargain. The good news is that our offer of buy 4 Harma KT66s and get 2 Harma GZ32s absolutely **FREE** has been extended for the Christmas period, so don't miss out - treat yourself!

BIAS KING PRO

This device allows you to measure the current flow of your output valves, thus allowing you to correctly set up your amp. Suitable for KT66, EL34, 6550 and KT88. Special Christmas offer price £157 with **FREE DELIVERY**

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165mm	Mid:Bass/Mid	
172mm	Bass Long throw	
200mm	Bass:Mid/Bass*	
386mm	Bass	
Various	Ellipticals	
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KIT & COMPONENT NEWS

NEW MAPLIN CATALOGUE

Maplin Electronics has launched its new 2000/2001 catalogue with a huge range of electronics products, over £100 worth of money-off vouchers and many brand new lines.

The catalogue, now in its 28th year, contains products ranging from



individual electronic components to state-of-the-art electronic equipment. It will now be published annually and the latest edition is available in traditional or CD-ROM format.

New to the 2000/2001 catalogue are 'How To' guides which provide detailed explanations on how to complete tasks such as cable joining, installing PC memory or even choosing the right GPS system.

Mail order hotlines are open 24 hours a day, 365 days a year and orders placed before 7.30pm will be despatched the same day. A technical helpline for advice on any of Maplin's products is also available to customers.

Maplin's product range can also be found at 57 Maplin stores nationwide where specialist staff are available to help with technical and product enquiries.

The website at www.maplin.co.uk also features full product range details and a secure on-line ordering

service with up-to-the-minute stock checking facilities.

To receive a copy of the catalogue, which costs £3.99 or the CD-ROM for £1.99, visit your local Maplin Electronics store or contact

customer services 0870 264 6002
www.maplin.co.uk

DIGITAL AMPLIFIER ON A CHIP

American chip manufacturer Cirrus Logic announced the forthcoming introduction of a digital amplifier on a chip. They issued the following statement during September 2000.

"Cirrus Logic Inc., the world's market leader in audio chips, today announced a significant advancement in Crystal® audio technology incorporating Pulse Width Modulation (PWM)

that reduces power requirements for audio amplifiers, dramatically improves sound quality and reduces cost and complexity of design. Cirrus Logic's "true digital" PWM technology also solves many of the problems associated with electromagnetic and radio frequency interference (EMI/RFI) usually encountered with existing Class D amplifiers and hybrid analog/digital PWM technologies.

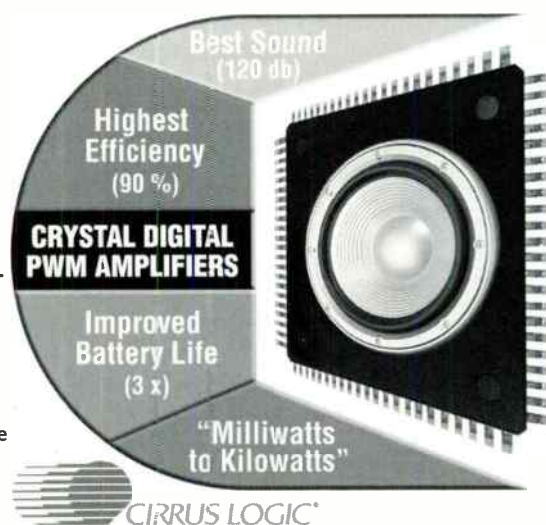
The new digital PWM technology increases the efficiency of amplifiers from the industry norm of approximately 50% to near 90%. Existing systems that require 1,000 watts input to the amplifier to deliver 500 watts to the speakers, for example, can now deliver 900 watts from that same

1,000 watt input with Cirrus Logic's digital PWM technology.

The fully digital PWM amplifiers also radiate significantly less EMI/RFI (electromagnetic interference and radio frequency interference) and because they are more power efficient, dissipate less heat (i.e. wasted energy).

Taken together, these advances mean that designers can reduce the size of a typical power amplifier by a factor of four, allowing the amplifier to be built into a speaker or other small enclosure. Increased efficiency also facilitates battery-powered amplifiers that can run up to three times as long per charge compared to conventional amps."

Although aimed at "OEMs" (Original Equipment Manufacturers)



keep an eye open for the appearance of such chips on the open market soon, through suppliers such as Maplin. DIYers can then knock up a quick digital amp. over the weekend, just to impress the neighbours.

Cirrus Logic, Austin, Texas.
<http://www.cirruslogic.com/>

Ansar Supersound Polypropylene Axial Capacitor



Audio specific. For transparent & detailed sound with EXTREMELY low distortion. High purity imported metalised polypropylene Tol 5%

Part no	Description	L x D mm	Price
CPW100N	Ansar 100nF 630V	32 x 6.5	1.60
CPW1150N	Ansar 150nF 630V	32 x 7.5	1.90
CPW220N	Ansar 220nF 630V	32 x 9.0	1.60
CPW330N	Ansar 330nF 400V	32 x 8.0	1.60
CPW470N	Ansar 470nF 400V	32 x 9.0	1.80
CPW680N	Ansar 680nF 400V	32 x 10.5	1.80
CPW110U	Ansar 1uF 400V	32 x 12.5	1.80
CPW115U	Ansar 1.5uF 400V	32 x 14.7	1.80
CPW210U	Ansar 2.2uF 400V	43 x 14.8	1.80
CPW310U	Ansar 3.3uF 400V	43 x 17.6	2.20
CPW410U	Ansar 4.7uF 400V	43 x 20.5	2.50
CPW610U	Ansar 6.8uF 400V	43 x 22.8	3.00
CPW810U	Ansar 8uF 400V	43 x 26.5	4.00
CPW1010U	Ansar 10uF 400V	43 x 29.5	4.00
CPW1510U	Ansar 15uF 400V	55 x 34.1	5.50
CPW2210U	Ansar 22uF 400V	55 x 39.3	7.00
CPW2510U	Ansar 25uF 400V	55 x 42.0	7.50
CPW3010U	Ansar 30uF 400V	55 x 44.7	8.50
CPW5010U	Ansar 50uF 400V	83 x 46.0	11.50
CPW6010U	Ansar 60uF 400V	83 x 51.7	13.50
CPW7510U	Ansar 75uF 400V	83 x 55.1	19.00
CPW8010U	Ansar 80uF 400V	83 x 56.8	19.50
CPW10010U	Ansar 100uF 400V	115 x 55.120.00	
CPW12510U	Ansar 125uF 400V	115 x 60.926.00	

Dual Polypropylene Smoothing Capacitors

To replace old electrolytics or for new designs. Wire tails.

Part no	Description	L x D mm	Price
CPW1616	Propyl 16x16 400V	100 x 50	25.00
CPW3232	Propyl 32x32 400V	115 x 61	30.00

Philips Polypropylene Axial 1%

Blue coated Film & Foil. Epoxy coated, low inductance metal foil & film. Supremely stable. Tolerance 1%

Part no	Description	Price
CPP47P	Propax 47pF 630V	0.40
CPP100P	Propax 100pF 630V	0.40
CPP150P	Propax 150pF 630V	0.35
CPP220P	Propax 220pF 630V	0.35
CPP330P	Propax 330pF 630V	0.35
CPP470P	Propax 470pF 630V	0.35
CPP680P	Propax 680pF 630V	0.35
CPP1N0	Propax 1nF 400V	0.45

Part no	Description	Price
CPP1N5	Propax 1.5nF 250V	0.45
CPP2N2	Propax 2.2nF 250V	0.45
CPP3N3	Propax 3.3nF 250V	0.45
CPP4N7	Propax 4.7nF 160V	0.50
CPP6N8	Propax 6.8nF 160V	0.50
CPP10N	Propax 10nF 63V	0.65
CPP22N	Propax 22nF 63V	0.75
CPP33N	Propax 33nF 63V	1.10
CPP47N	Propax 47nF 63V	1.30

Audio Electrolytics Radial

105 deg C +PLUS- low impedance.

These superior electrolytics offer a low impedance path to the signal, resulting in a very open & detailed sound. The use of high temperature materials ensure that these capacitors enjoy a long & stable life.

Part no	Description	Price
1Y50	Lo Imp Hi Temp 1uF 50V	0.25
2U2Y50	Lo Imp Hi Temp 2.2uF 50V	0.25
4U7Y100	Lo Imp Hi Temp 4.7uF 100V	0.25
10Y63	Lo Imp Hi Temp 10uF 63V	0.25
22Y63	Lo Imp Hi Temp 22uF 63V	0.30
47Y63	Lo Imp Hi Temp 47uF 63V	0.35
100Y63	Lo Imp Hi Temp 100uF 63V	0.50
220Y50	Lo Imp Hi Temp 220uF 63V	0.75
470Y63	Lo Imp Hi Temp 470uF 63V	1.25
1000Y35	Lo Imp Hi Temp 1000uF 35V	1.50
2200Y50	Lo Imp Hi Temp 2200uF 50V	2.25
4700Y25	Lo Imp Hi Temp 4700uF 25V	2.50

Trobo High Ripple Reservoirs

Excellent for Audio. Long life. High reliability 100VDC caps with screw terminals

10000uF: 50x87mm 8.97A ripple current
22000uF: 65 x 103mm 15.19A ripple current

Part no	uf/Voltage	Price
10000C100	10000uF 100V	20.00
22000C100	22000uF 100V	30.00

Aicap Bipolar Electrolytics

Axial leads 50V Tol: 10%

Primarily for use in speaker crossovers.

Part no	Description	Price
CAB1	Aicap 1uF	0.25
CAB2U2	Aicap 2.2 uF	0.40
CAB3U3	Aicap 3.3uF	0.40
CAB4	Aicap 4uF	0.40
CAB5	Aicap 5uF	0.40
CAB6.8U	Aicap 6.8uF	0.50
CAB8	Aicap 8uF	0.50
CAB10	Aicap 10uF	0.50
CAB16	Aicap 16uF	0.65
CAB20	Aicap 20uF	0.65
CAB25	Aicap 25uF	0.65
CAB35	Aicap 35uF	0.65
CAB50	Aicap 50uF	0.75
CAB60	Aicap 60uF	1.00
CAB80	Aicap 80uF	1.00
CAB100	Aicap 100uF	1.10

Monacor Air Cored Inductors.



A range of professional air cored inductors for 80 or 40 crossovers/filters for use up to 300W. 1.2mm enamelled copper wire wound on air spaced plastic bobbins.

Part No	Specification	Price
P15	150uH 0.150 8x19mm	£2.00
P22	220uH 0.150 48x19mm	£2.50
P33	330uH 0.20 8x19mm	£3.00
P47	470uH 0.250 50x19mm	£3.50
P68	680uH 0.350 59x19mm	£4.50
P100	1mH 0.40 59x19mm	£5.50
P150	1.5mH 0.50 70x30mm	£6.50
P220	2.2mH 0.60 70x30mm	£8.00
P330	3.3mH 0.750 70x30	£10.00

Monacor Ferrite Inductors



A range of professional high efficiency ferrite cored inductors with very low ohmic losses for 80 or 40 crossovers or filters for use up to 400W. 1.4mm enamelled copper wire (1.3mm on F1000) wound on plastic bobbin.

Part No	Specification	Price
F220	2.2mH 0.150 400W 55x31mm	£6.50
F330	3.3mH 0.20 330W 65x39mm	£9.50
F470	4.7mH 0.250 140W 65x30mm	£11.00
F680	6.8mH 0.350 120W 65x39mm	£12.00
F1000	10mH 0.450 100W 65x39mm	£13.50

High Quality Valves

Part no	Description	Price
6350C	OUTPUT VALVE	£26.00
6L6GT	OUTPUT VALVE	£4.50

Part no	Description	Price
6SN7GT	OUTPUT VALVE	£4.50
6V6GT	OUTPUT VALVE	£3.95
ECC81	TRIODE	£4.50
ECC82	TRIODE	£4.50
ECC83	TRIODE	£4.50
EF86	LOW NOISE PENTODE	£9.90
EL34	OUTPUT VALVE	£8.50
EL84	OUTPUT VALVE	£3.50
6X4	RECTIFIER	£6.50
KT88	OUTPUT VALVE	£20.00

Valve Holders - High Quality Valve Bases. Chassis Mounting With Screw Fittings.

Part No.	Description	Price
B9AC	B9A VALVE HOLDER CERAMIC	£1.50
B9AG	B9 VALVE HOLDER PORCELAIN PLUS GOLD PLATED PINS	£3.00
OCTC	OCTAL VALVE HOLDER CERAMIC	£2.00
OCTG	OCTAL VALVE HOLDER PORCELAIN PLUS GOLD PLATED PINS	£4.00

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



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

Very High Quality Phono (RCA) Plugs



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

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

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



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Part No.	Length/Colour	Price
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LPP2QG	1.5 Metres/Green	£6.50
LPP5QG	5 Metres/Green	£11.00

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Part No.	Dimensions	Price
R35	d=35L=110-210	£2.50
R50	d=50L=150-280	£3.00
R70	d=70L=128-245	£3.50
R100	d=100L=160-122	£5.50
R85	d=85 angled 45° for narrow cabinets L=210-310	£6.50

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Valves for Beginners

Gary Devon designs a budget 15W valve amplifier using the sweet sounding EL-84 output valve. It's a beauty for beginners.

KEL-84 designed by Gary Devon
Introduction by Noel Keywood
Sound quality by Simon Pope
Kit information by Nick Lucas

Valve amplifiers offer superb sound quality. They have a sweetness and lucidity that defies transistor amplifiers. Trouble is, commercial valve amplifiers are expensive, whilst building one at home seems a daunting task to many people.

Here is an inexpensive, easy to build design that has enough power to go loud with modern, sensitive loudspeakers. It's aimed at enthusiasts and beginners who want to experiment but fear committing sums of money and time on the unknown.

KEL-84, as we call it, produces 15W per channel, has choke smoothing and is as quiet as a dormouse, when there's no music playing that is. With a printed circuit board (PCB) to minimise wiring errors, this one easy amplifier - easy to build, easy on your wallet and on your ear!

Powerful valve amps of 40W or more run at very high voltages (500V+), demanding expensive transformers and capacitors. High power output valves are costly too and, eventually they need replacement. Here in Hi-Fi World towers, where enthusiasm overcomes fear, we've had plenty of experience with esoteric high voltage designs. Our masterpiece was a 211 amplifier running at 1200V, with transmitter rectifiers in the power supply. This is something we would never commercialise though, for

safety reasons. The output transformers were wound by a power line transformer company solely for their knowledge of safety requirements at such high voltages. We provided the winding instructions; they worried about the insulation (so did we!).

KEL-84 is a kitten by comparison but at the same time nearly every valve enthusiast started out building a design like this, thinking 'wow!' and going on to build bigger and better designs. High voltage triodes like the 211 and 845 are amplifying devices to aspire to, or expire to if you touch the wrong pin.

Within the worldwide hi-fi industry there are plenty of valve enthusiasts, old and young, who entered hi-fi by first building a modest valve amplifier like KEL-84. The internet, that wonderful place where individual talent shines so bright, is another testament to the valve's (or 'tube' as it is more commonly known) wonders and mysteries. Yet it is not easy to find a starter design, especially one from a uniquely talented engineer like Gary Devon prepared to address real life wants. Simple designs are often rather esoteric, such as low power (3W) single-ended types that offer great simplicity but also very little volume from everyday hi-fi loudspeakers.

KEL-84 will go loud and it will give the same basic tonal balance and intrinsic accuracy as a solid-state amplifier. By this I mean it is fundamentally accurate. Vintage amplifiers were commonly unable to swing full output at high frequencies, a large reason for their comparatively soft, warm sound. It did not matter so much in the early days of the LP but CD and

DVD produce a lot more energy up to 10kHz and slowly declining energy levels that extend past 20kHz our measurements show. KEL-84 can swing full output at 10kHz and reproduce harmonics out to 50kHz (-2dB), the limit of DVD video sound track (24bit at 96kHz sampling rate) audio. It is a modern design that meets today's requirements. Distortion is low, through the use of Ultra-Linear working that requires output transformer taps. Noise is minimal too, with one of the lowest hum levels ever from a valve amplifier through the use of DC heaters. So although KEL-84 is a budget design, it isn't a cost cut design, nor an unsophisticated one. What you do get though is that wonderful sweetness, lucidity and naturalness that only valves provide.

Why do they sound different? We are not certain. Most of the theories, like the presence of second harmonic distortion, are a bit simplistic. Valve amplifiers with almost no distortion, like our Kit/Kat-88 designs, still retain all the clarity and freedom from harshness that is the hallmark of a valve amplifier. It seems likely that their sound is a function of many beneficial properties. It is rarely stated that transistor amplifiers are so inherently poor (i.e. distorted) that they must have feedback applied. It is not possible to design a solid-state audio amplifier without feedback (local or loop).

By way of comparison, valve amps are so inherently good that they do not need feedback. It is of arguable benefit.

There is a paradox in the use of feedback: the more it is needed the **(cont. on p10)**

KEL84 CIRCUIT

by designer Gary Devon

KEL84 uses a very simple circuit, possibly as simple as is possible for a push-pull amplifier. The signal first passes through the input switching and volume control network then via a grid stopper (R4/5) to the input stage of the amplifier.

This first amplifying stage uses the pentode section of an ECF80 triode / pentode valve. Here, a pentode is used with associated components to get sufficient gain to enable some overall feedback to be applied, while retaining the sensitivity needed for an integrated amplifier.

R10/R11 is the anode resistor, whilst R6/R7 and C4/C5 form the voltage dropper and decoupling network for the screen grid (pin 3). R8/R9, C6/C7 and R32/R33 form the cathode / feedback network with compensation capacitor C16/C17 to ensure a clean square wave.

R34/R35 and C16/C19 form a step network across the anode load resistor of the input stage. These components are necessary in this circuit to form a well defined open loop response ensuring stability when the feedback loop is closed.

The voltage amplifier formed by the pentode feeds directly into the phase splitter which is of the Concertina type. This phase splitter uses the triode section of the ECF80 with equal anode and cathode resistors, R12/R13 and R14/R15. The DC potential from the anode of the pentode provides the necessary DC bias point for the Concertina.

The ECF80 is a commonly available valve. It was used extensively in televisions and radios of a bygone era. It's a shame this valve isn't used more often because it has a super smooth, colourful sound quality.

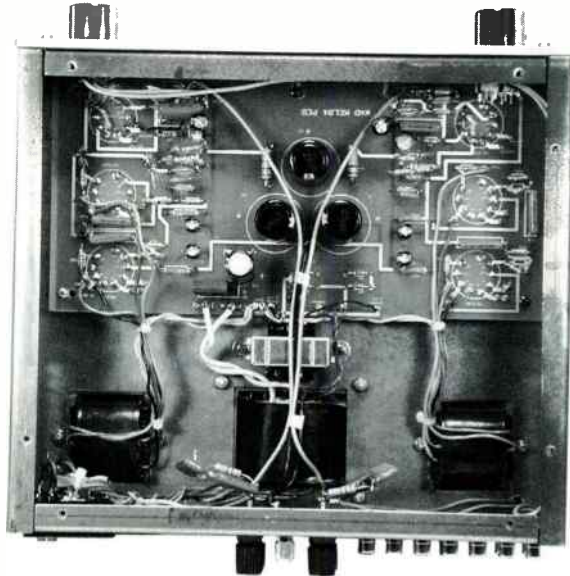
C8/C9 and C10/C11 are the DC blocking/coupling capacitors from the phase splitter to the output valves, a pair of EL84 pentodes. The EL84 really is an excellent little valve, one of the best sounding output valves available. It has a warm and sweet sound together with superb micro and macro dynamics which

believe it's relatively small power rating.

Also, modern EL84s are rugged little valves, especially the Russian EL84M which has an increased anode power rating of 14W as compared to the 12W of Mullard's original.

In KEL-84 they are operated with cathode or automatic bias. The cathode resistors R24/R25 and R26/R27 develop the bias potential and decoupling is performed by C12/C13 and C14/C15. R16/R17 and R18/R19 are the grid resistors and R20/R21 and R22/R23 are grid stoppers.

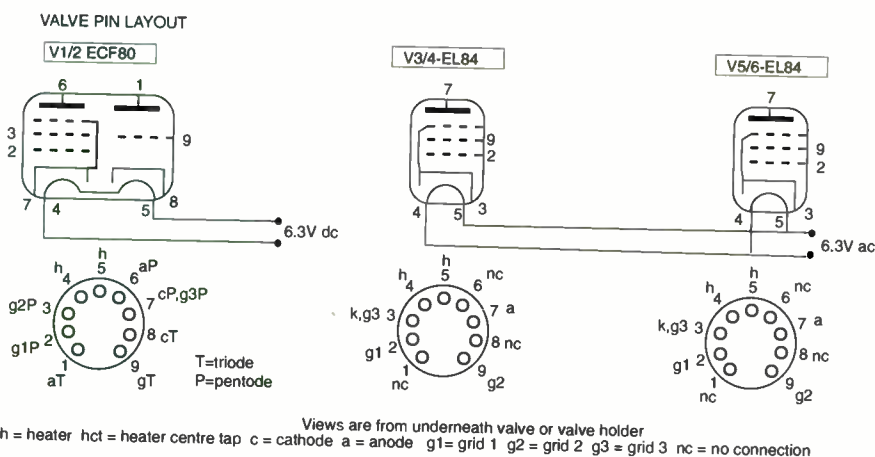
Linear mode takes the screen grid to a tapping point on the output transformer primary which is somewhere between the triode and pentode extremes, giving a similar power output to the pentode condition but with the triode's mainly second harmonic distortion structure. It is entirely possible for the experimenter to change the operation of the output stage of KEL84 by moving the screen grid connection around. The kit is supplied wired for Ultra Linear, but by changing the screen grid connections of the output valves Triode,



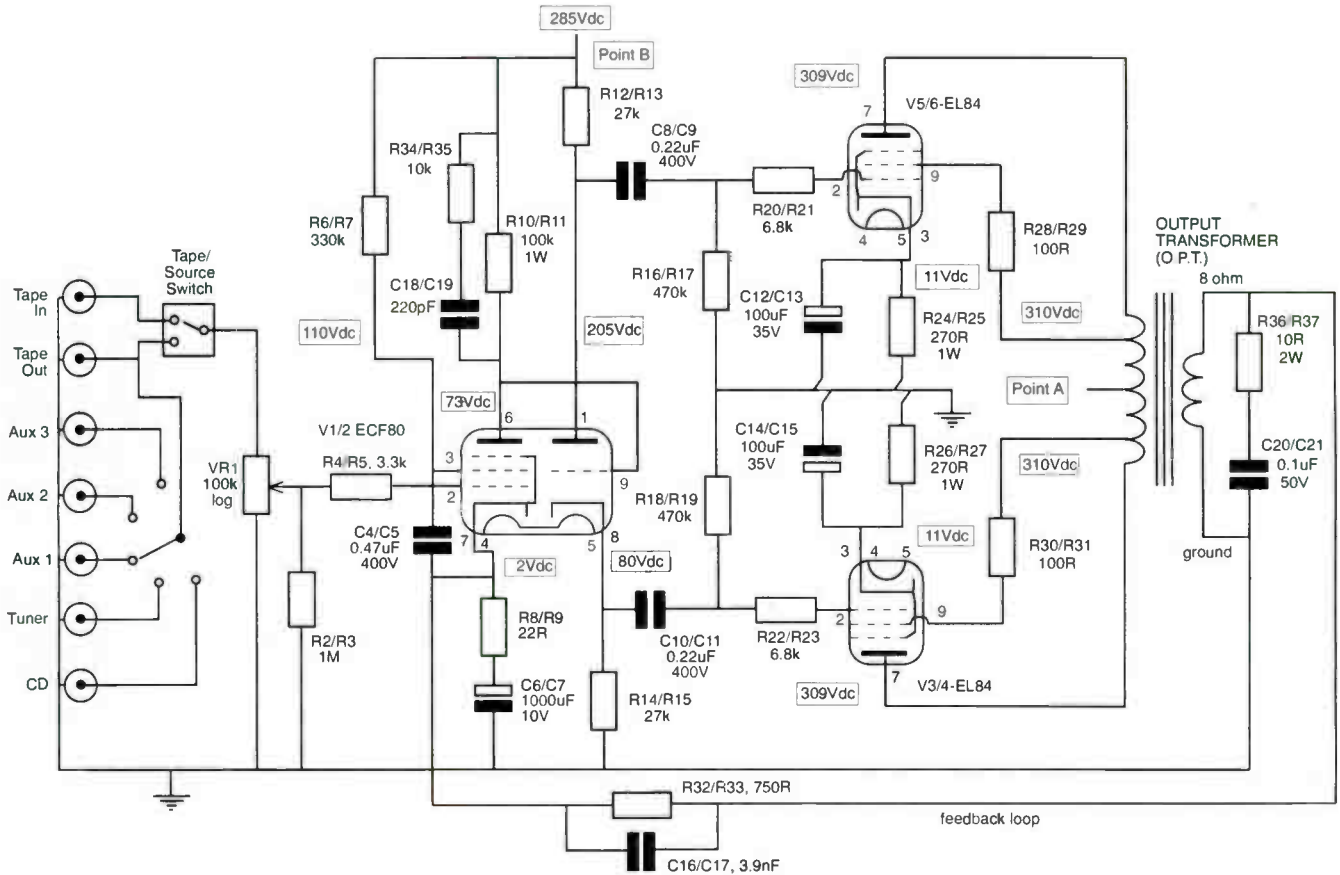
The output transformer has Ultra Linear taps to allow experimentation with this mode of operation. These taps are at 12.5% of the total primary winding which is a little less than that used in vintage amplifiers, where 15% to 20% was commonly used for the EL84. Ultra Linear operation attempts to convert the pentode's characteristic to something similar to that of a triode. Hence Ultra Linear's other commonly used name which is "partial triode operation". If one could imagine the screen grid being connected directly to the anode, then the valve would operate as a triode. At the other end of the scale, with the screen connected directly to the H.T. line then we have pure pentode operation. Ultra

Pentode and Ultra Linear operation can be tried. With triode operation the power output will drop drastically however. We didn't get enough time in the lab to get measurement results for all these operational modes, but we will try to publish results and modification tips in the next supplement.

The power supply is a semiconductor rectified unit with capacitor input. The H.T line is further smoothed with an inductor and capacitor combination for the output stage. Further decoupling is achieved by R1 and C3 for the input stages. **GD**



ONE CHANNEL OF THE KEL-84 AMPLIFIER



GRID STOPPER

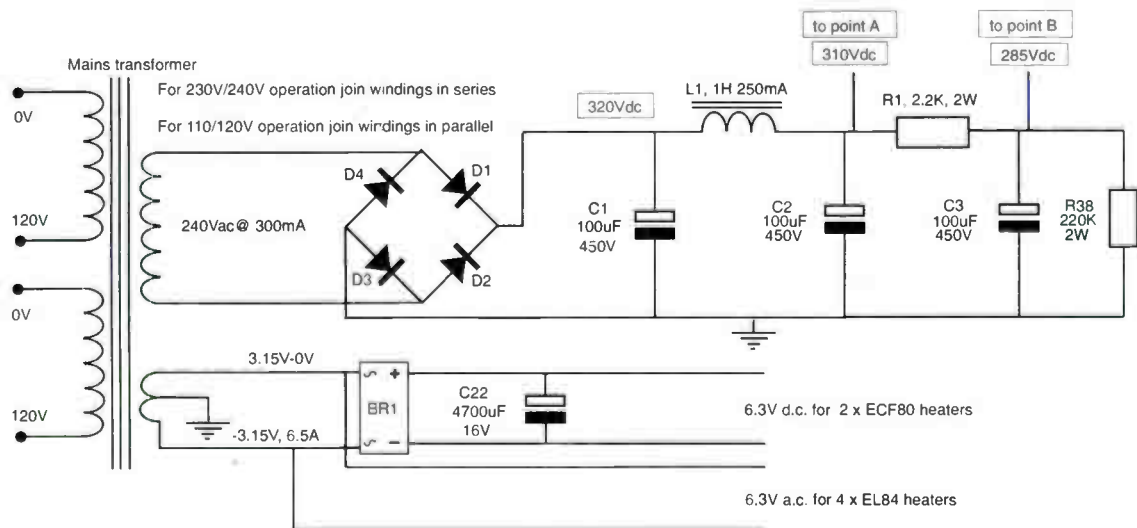
A 'grid stopper' is a resistor used to prevent oscillation. It is wired hard up against the input of a valve by cutting the resistor's lead as short as possible.

Grid stoppers range in value from 1k-5k usually. You can see them in the diagram above as R4/5, R20/21 and R22/23. They do not attenuate the signal since they are working into a high impedance of megohms.

LOUDSPEAKER MATCHING

Valve amplifiers are 'load matched' sources. Ideally, they should see an even 8ohm load (or 4ohms with a 4ohm tap). Very large load variations affect frequency response slightly, power decreasing where there's a large mismatch. The effect is not great and feedback in KEL-84 minimises it. A sensitive loudspeaker with an even impedance characteristic is the best choice. We designed KLS-14 as a good match, and our bigger KLS-9 floorstander is also very suitable. A good commercial floorstander would be the Acoustic Energy AE2 or Quadral tested in this issue (p11).

POWER SUPPLY FOR BOTH CHANNELS



MEASURED PERFORMANCE

KEL84 produces 15W into an 8ohm load, which with a sensitive loudspeaker will give good volume levels in the average room. Some of the floorstanders we test this month, especially the sensitive Quadral with its flat impedance curve, are a good match for a small amp like this, although in practice valve amps are far more able to cope with difficult loudspeakers than theory suggests. Alternatively, our KLS-14 kit loudspeaker is a good match, or for those with the floor space KLS-9 is also suitable.

Frequency response extends from 17Hz up to 30kHz (-1dB) with a smooth roll-off above this frequency, so KEL84 covers the audio band and beyond quite confidently.

The use of d.c. heaters keeps hum down to a very low 0.4mV on each channel, making it virtually inaudible even at the loudspeaker. We usually aim for 1mV, which is inaudible at the listening position, but can be heard as a gentle hum at the loudspeaker. Some find this disconcerting, even though it does not affect sound quality. Directly heated triodes like 300B and 211 produce 2-3mV of hum even with hum bucking, yet have a reputation for superb sound quality, so hum is no arbiter of quality. However, it is satisfying to produce a

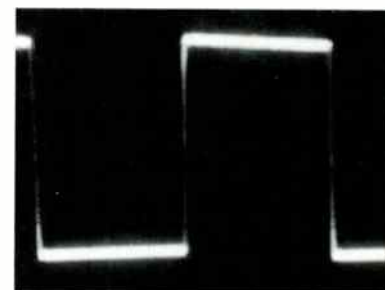
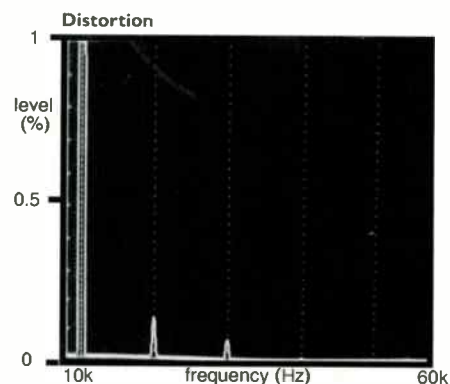
silent amp and KEL84 manages to be supremely quiet. Hiss is just about inaudible at -98dB CCIR weighted.

The use of ultra-linear operation where the screens work from primary tapings contributes to a low distortion figure of 0.02% at 1kHz, 1W output. Distortion rises to 0.15% at 10kHz, 1W output, comprising second and third harmonics only. At full output distortion rises to 0.3% in the midband and 1% at 10kHz, but again low-order harmonics only appear. This is a good, clean performance, free from the high order harmonics that add roughness and grittiness to an amplifier's sound. Indeed, a valve amp's sound usually thickens up and gets muddled at overload, rather than producing the ripping sound of solid-state, mainly due to the lower levels of feedback used. This is why valve amps seem to go much louder than their power output suggests.

KEL84 measures well in all respects. It's a quality design for beginners that offers a sweet alternative to solid-state, since the EL84 valve has a great reputation for sound quality. **NK**

At right: a 1kHz square wave with clean leading edges, free from ringing.

Power	15watts
CD/tuner/aux.	
Frequency response	17Hz-30kHz
Separation	70dB
Noise	-98dB
Distortion	0.02%
Sensitivity	380mV



SOUND QUALITY

The quality that can be gleaned from this amp is a fine introduction to the joys of the valve sound. The KEL84 will highlight all the intricacies and depth of detail in your favourite recordings whilst retaining a warmth and fullness. This combination of both detail and warmth is almost the exclusivity of pure valve amps and is rare at this price point.

Playing an Opus3 recording of Eric Bibb's 'Good Stuff' highlighted just what this amp is capable of. Using our own KLS14 high sensitivity, infinite baffle standmount KEL-84 revealed a delicate yet controlled sound. This recording is all-acoustic and guitars had ambience and an luminosity that was very involv-

ing, with details such as hand movements along the bridge as clear as a bell. Eric Bibb's plaintive voice was positioned nicely forward of the 'speakers, with a touch of warmth added to the slightly dry voice. This amp excels with this type of fare.

Moving on to the excellent SACD/CD hybrid disc of Faure and Ravel's piano trios on the Hyperion label, the KEL84 demonstrated its deft and graceful handling of the music. The imaging and depth in this recording is near perfect and KEL-84 made the most of the simple but effective mix. Balance between the piano and strings was perfect - the piano placed, with the right amount of sonic weight,

slightly to the back right whilst the string soloists bowed with dexterity in front. The KEL84 handled the dextrous playing deftly and gracefully, bringing a high-end sound to the performance.

This amplifier manages to combine presence and depth to recordings, matched by a smooth and rounded overall sound which simply defies it's humble price tag. It has good, controlled bass weight and an exceptionally sweet sound in upper frequencies. It's a great introduction for those uninitiated to the valve-sound world, a subtle and sophisticated performer for those who crave more presence from their music. **SP**

(continued from p7) worse an amplifier must be. That it works is unarguable; that it is the real solution is arguable. If amplifiers were better in the first place they wouldn't need something to make them work properly.

Although KEL-84 has feedback applied it is a relatively small amount, enough just to 'tiddle' the performance figures so they are modern and appropriate, as people expect.

Then there's the sheer simplicity of valve amplifiers. Fewer components and fewer amplifying devices make for a cleaner, less coloured sound. They are very transparent sounding and particularly amenable to tuning by

the addition of special high quality components.

Simplicity makes assembly easy for beginners, and valves are robust too. They will survive abuse. They are well suited to DIY.

Valves do wear out of course, having a life of a few thousand hours. The EL-84s used in this amplifier are plentiful though and cheap. Our use of auto-bias means bias re-adjustment is unnecessary when a valve is changed.

With 380mV input sensitivity KEL-84 will match any modern source, be it MD, CD, DVD or tuner. So it can form the centre of a system. It's always satisfying to build your own kit and this is a great way to start out. The amplifier's

easy going, fluid sound will make it all worthwhile.. **NK**

SAFETY

Although KEL-84 is an easy build we do not recommend you tackle it if you lack simple basic skills, such as the ability to solder, and are unacquainted with electricity. Exposed electrical connections inside carry potentially lethal voltages (320V).

Safety gloves (650V DC rating) are necessary when testing, since they make electric shock impossible. See p11 for price.

THE KIT

KEL-84 is compact, with a footprint not much larger than a piece of A4 paper. Although designed for the budget conscious, we have given it a classy look with a 3mm anodised front panel and custom made chrome knobs.

The main chassis is constructed from 2mm mild steel with a durable black powder coat finish. It is sturdy, giving KEL-84 a good solid feel, just how a quality valve amp should be!

Being an integrated amplifier it will accept five line level inputs, plus one tape monitor input, with a tape out included, all controlled from the front panel.

The phono sockets provided are all gold plated, as are the speaker output sockets, which accept 4mm banana plugs as well as bare wire.

The mains switch is positioned at the rear of the amplifier and is easily accessible. This avoids problems with hum pick-up from the mains wiring passing close to the input valve a potential problem when the mains switch is located at the front panel. The mains is received via an IEC lead and the back panel sports an earth post.

The KEL-84 weighs in at 10kg. External dimensions with valves are 300mm(w) x 270mm(d) x 150mm(h).

SOLDERING

The kit is based on a printed circuit board, since this reduces wiring errors. We find the biggest problem constructors experience are errors caused by bad solder joints. These generally have the appearance of a dull ball bearing of around 2-3mm diameter and are known as 'dry joints'. The main reason is constructors using a low wattage soldering iron with high temperature solder as thick as a pencil lead. All you need is an Antex 25 watt soldering iron that plugs straight into the mains, available from Maplin code No. FR12N. An ideal solder to use is their 10m 22swg

pack, code No. FR21X. Both can be purchased for just over £12.00. Maplins can be reached on 01702 554000.

Our instruction manual includes a 'How to solder' section. To further assist in a successful build we have included in the instruction manual a pictorial reference of the kit in certain stages of build so you can make that all-so-effective visual check.

We also have a help-line that is manned 9.00am to 5.00pm Mon-Fri and a back-to-base repair facility if the worst comes to the worst.

The kit is based on a printed circuit board to facilitate construction. This is electronics by numbers in a sense. All external connections are made via PCB terminal pins once the board is in place. The trickiest part is the wiring of the signal inputs to the selector, tape source switch and volume control potentiometer. As long as you work methodi-

cally and identify each wire you will have no problem.

The amp requires no set up, you just turn it on. It is self-biasing too so valves can be changed without any need for adjustment. We hope KEL-84 marks the start of 'the beginners' entry into the wonderful world of kits, since you cannot beat the satisfaction of building it yourself. **NL**

Gary Devon is a professional designer who has worked for UK and Japanese amplifier manufacturers. He produces commercial designs for UK companies, as well as World Audio Design kits.

Gary has been designing valve amplifiers all his life and is acknowledged as one of the world's top experts.

PARTS LIST

RESISTORS:

R1	2.2K, 2W	1
R2/R3	1M, 0.5W	2
R4/R5	3K3, 0.5W	2
R6/R7	330K, 0.5W	2
R8/R9	22R, 0.5W	1
R10/R11	100K, 1W	2
R12/R13	27K, 0.5W	2
R14/R15	27K, 0.5W	2
R16/R17	470K, 0.5W	2
R18/R19	470K, 0.5W	2
R20/R21	6.8K, 0.5W	2
R22/R23	6.8K, 0.5W	2
R24/R25	270R, 1W	2
R26/R27	270R, 1W	2
R28/R29	100R, 0.5W	2
R30/R31	100R, 0.5W	2
R32/R33	750R, 0.5W	2
R34/R35	10K, 0.5W	2
R36/R37	10R, 2W	2
R38	220K, 2W	1
VRI	100k, log pot	1

CAPACITORS:

C1/C2/C3	100uF 450V	3
C4/C5	0.47uF 400V	2
C6/C7	1000uF 10V	2
C8/C9	0.22uF 400V	2
C10/C11	0.22uF 400V	2
C12/C13	100uF 35V	2
C14/C15	100uF 35V	2
C16/C17	2.2nF	2
C18/C19	220pF	2
C20/C21	0.1uF, 50V	2
C22	4700uF 16V	1

DIODES & BRIDGE RECTIFIER

BR1	KBU4D	1
D1/D2/D3/D4	BYV96E	4

TRANSFORMERS

Choke, L1		1
Output transformer		2
Mains transformer		1

KEL-84 INTEGRATED VALVE AMPLIFIER is available as a kit from World Audio Publishing Ltd

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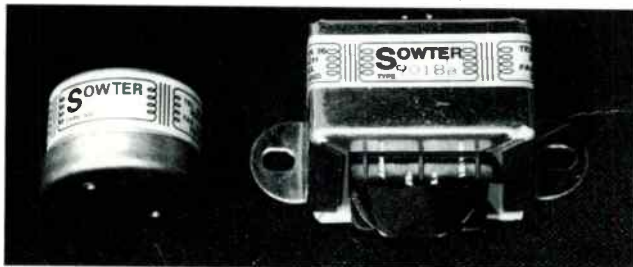
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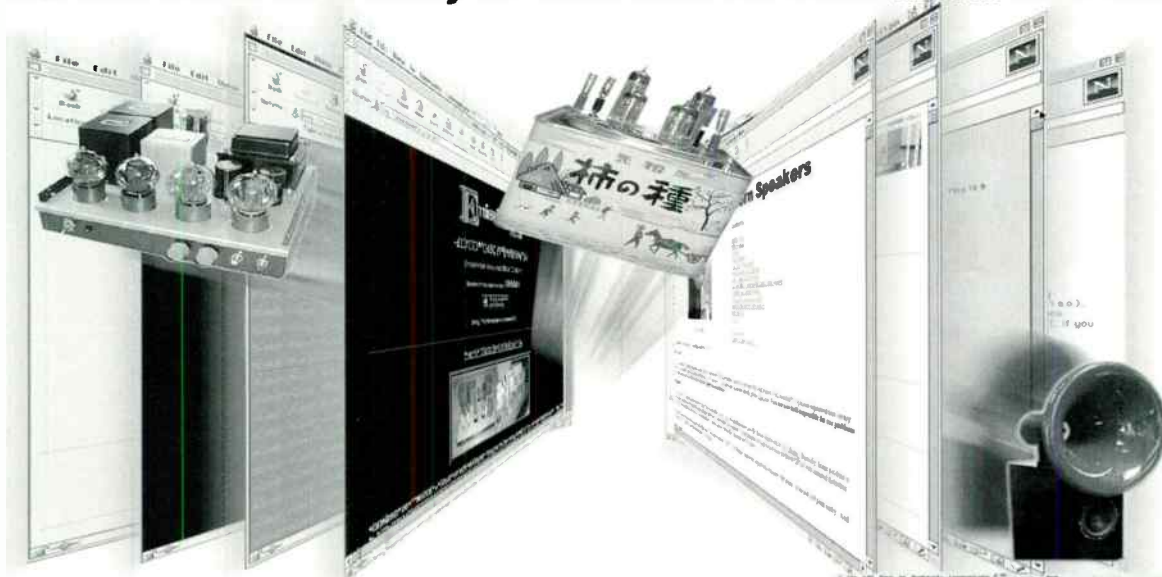
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Caught in the WEB

The world wide web is full of wacky DIY audio sites. Jon Marks checks out a few.

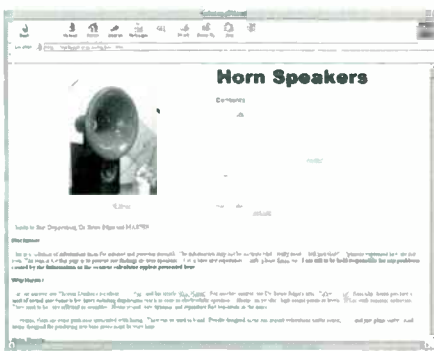


There's a place for everyone on the web. It's a world where Sony rub shoulders with DIYers - and the latter look more interesting! At least, to anyone reading this. The web is where exotic hi-fi interests can be given full expression, a place for tube amps and horn loudspeakers, a place where special interests and dedication shine brightly. There are some great DIY sites out there, caught in the web. Here is a small but interesting selection. Check out their links to move further afield.

choice of drive unit.

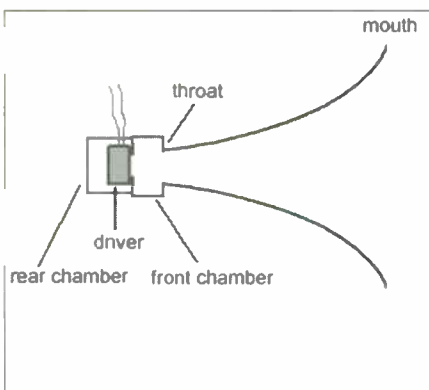
There is a list of horn drivers on this site, amongst which are Babb Speakers, Diatone, Furuyama Audio Laboratory, JBL, Manger (bending wave transducers), Roiene.

So you know how to house such drivers, pages on enclosure construction include open baffle, sealed enclosure, tapered quarter-wave tube (AKA Voigt pipe) and horns both front and rear-loaded.



MELHUIH HORNS <http://melhuish.org/audio>

Here's an interesting corner of a personal-interests site by New Zealander James Melhuish, situated in Massachusetts, USA. Ignoring the cats, car and rock climbing, the audio interest section covers both horns and full range drivers in useful depth. What makes sites such as James Melhuish Horns refreshing is a huge number of reliable links which add up to an extremely broad knowledge base when it comes to hands-on construction, theory and



When it comes to horns, there are lucid, informative discussions covering all stages of speaker construction, from choosing how low you want the speaker to go, through equations for throat area and flare expansion rates for exponential, hyperbolic and tractrix horns (usefully number-crunched by software on the site) to materials, assembly and measurement.

If you really want to delve deep into the theory, the Resources section covers printed matter as well as electronic. All in all, a superb site that oozes the enthusiasm that'll have you heading for the work bench to assemble your next killer prototype.

KBAPPS HI-FI <http://www.kbapps.com>

This is another US site where there's a broad spectrum of hi-fi information, albeit with less in-depth, practical knowledge than you'll find on James Melhuish Horns. Again there are non-audio topics such as cooking, currency conversion and song lyrics, all putting in an appearance alongside guitar amps.

This site scores is for its on-line calculators that cover a wide range of enclosure and crossover types. If your maths isn't up to turning Thiele-Small parameters into box and port dimensions, let these little programmes take the strain instead. The subsequent advice regarding materials, driver placement, damping and cabling is all fairly basic, but for the beginner, these pages are a fine starting point on a DIY career.

If you're more concerned with bottles than boxes, there's a couple of interesting sections on valve theory, construction and care penned by R Aspen Pittman, head of Groove Tubes. Although the bias is towards the musician rather than the audiophile, there's still a lot worth reading here. The same goes for the sheets of specs provided for a range of common tubes like the 12AT7, 6L6, 5AU4, EL34 and EL84. Also to be found on Kbapps hi-fi is another handy links list.

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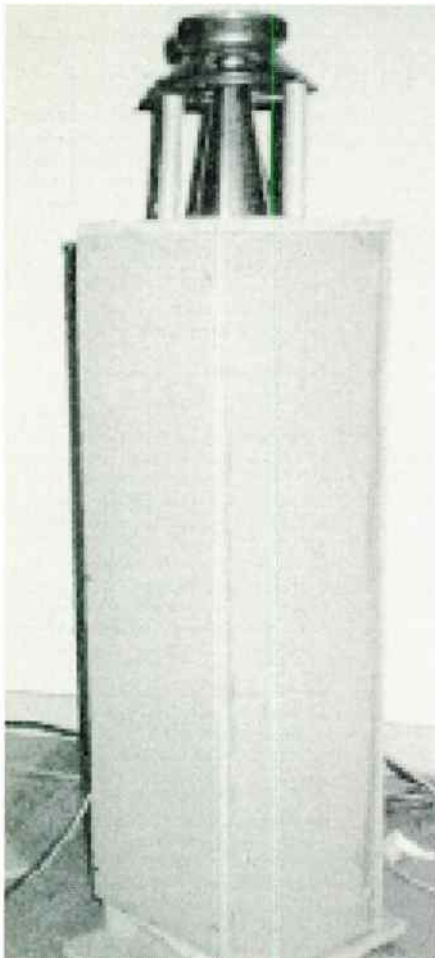
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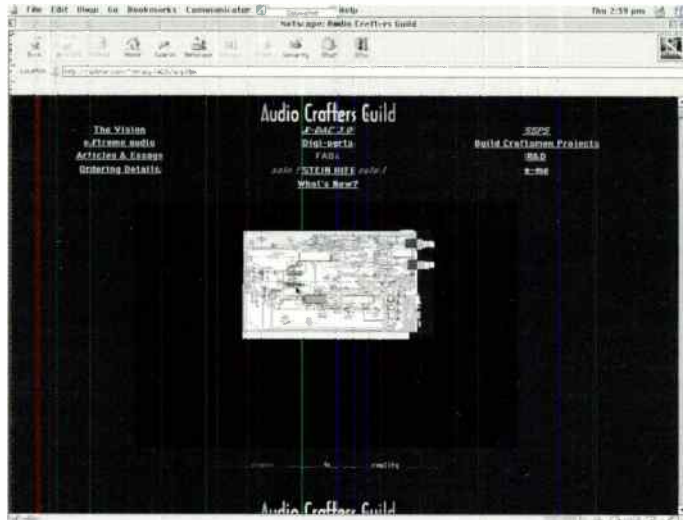
CONE-CENTRIC

<http://www.agora.dk/users/ole.thofte/conus1.htm>

A trip well off the beaten path this time, with an illuminating design by Ole Thofte, of Denmark. The subject is a full-range loudspeaker drive unit again, but this one is DIY and requires a little, erm, 'inventive cannibalisation' of widely available parts. The transducer in question is omni-directional. Ole explains: "This project is inspired by the Walsh driver from the Seventies and especially by the DDD driver from German Physiks. This driver is very good, but expensive (about 2000\$ per driver). Conus 1 will not ruin you since it will cost you 500 Dkr (85\$) a pair to build, cheaper if you use recycled materials".

What follows is a concise, well-illustrated guide to producing this unusual driver and housing it in a tapered quarter-wave tube. In rough précis, take one full-range driver (preferably inexpensive if this is your first time!), remove the standard cone and replace with a much longer one made, in this case, from metallised paper. To whet the appetite for this weird and wonderful creation, there are two pictures of the finished device.

What appeals on this site is the imaginative design allied once more to an infectious passion for hi-fi and the desire to share discoveries.



DIGITAL DOMAIN

<http://galstar.com/~ntracy/ACG/acg.htm>

If your heart lies with the silver disc, one site you shouldn't miss is the Audio Crafter's Guild, from Tulsa, Oklahoma. The overall thrust is very much DIY, the practical side being backed up by technical essays and a full links list.

A list of projects runs from an article on supply decoupling by Guido Tent (as published in this very Supplement last year) via a number of sections on reclocking and modifying commercial DACs and integrated players. There's also a very interesting suggestion for a DIY implementation of the S/PDIF interface between DAC and transport, which has only been tried commercially by Audio Alchemy and Sonic Frontiers (in their top £14000 DAC/transport combo) as far as we're aware.

As ever, chief bugbear is jitter as contributed primarily through poor clocking and noisy supplies, but tube DACs and sampling-rate converters get a look in too. This site should definitely be on the favourites list of any digitally-minded audiophile.



AUDIO ASYLUM

<http://www.audioasylum.com>

Audio Asylum is a discussion group with a wide range of topics, including those beloved by DIYers, such as Tubes, High Efficiency Speakers and Single Ended Triodes. There's a Tweaks/DIY

section and although this doesn't sound promising, tweaking being less ambitious than full on design and construction, in fact it's as varied as the interests of the contributors. From the mundane through to the highly expert, people e-mail the Asylum with their DIY concerns and anyone listening who can help posts up a reply. With feedback coming in from around the world the responses can be quite unexpected. It's always worth checking the Asylum if you have a problem.



CIRCUITS

<http://www.schaltungsdienst.com>

This is a commercial site that sells circuit diagrams. Schaltungsdienst Lange o.H.G. is a Berlin based company with an on-line database possessing over 260,000 documents, they claim. Amongst all the dotcoms this is a rare service and potentially a very valuable for anyone stuck for information. Most of the supported brands are modern day commercials, like Aiwa, Sony and Philips, but there are also lesser known German makes like Korting. Schaltungsdienst haven't located the U.K. or U.S.A. yet it might appear, with major brand names like Quad conspicuously missing. Yet there are some surprises, like Garrard and MacIntosh. And they do have an English language pages. For anyone wanting to repair or tweak Japanese product this site may well hold invaluable information.

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GOING JAPANESE

If you're into valve amplifiers in a major way one particularly rich vein to mine is the Japanese sites. The problem is access, as this can be alien territory unless you happen to read Japanese and have a computer with a Japanese character set. A number of sites have parallel English/Japanese text, but they are exceptions.

On Japanese sites hi-fi often shares with ham radio. A huge variety of pre and power tubes are in use, which can make the 'standard' selection seen in the West look very limited at times.

Finally, don't expect to see DIY equipment lashed up – Tango output and interstage transformers rule the roost, paper-in-oil caps are de rigueur and build quality is unbeatable. Output power rarely gets into double figures, and partnering speakers are high-sensitivity horns or the ubiquitous Tannoy dual-concentrics. On the other hand, if circuit diagrams are what you're looking for, scanning the oriental Web can be a rewarding experience.



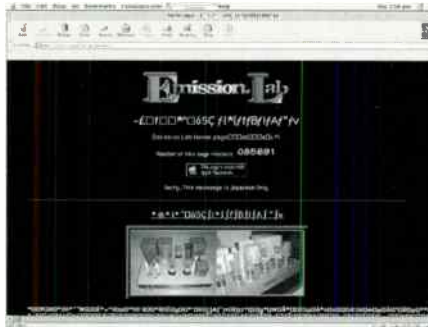
ELEC LANDY

<http://www2s.biglobe.ne.jp/~ja3wzt/>

Presumably christened roughly after an album release by one Jimi Hendrix, Elec Landy is a site constructed by Yoshikazu Tanabe. Hogging the limelight is small power amplifier using

Western Electric's globe-shaped 205 directly-heated triode fronted by WE102s. The design (for which the circuit is provided) is naturally single-ended and the output is well down in single figures.

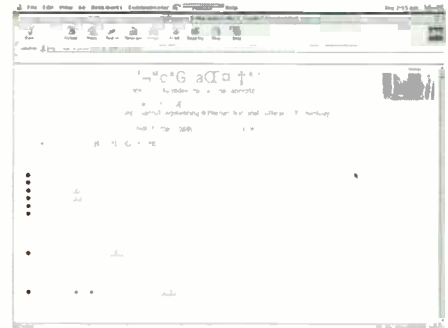
Keeping the 205 company is a so-called 'universal amp'. This has a removable panel which allows the power valves and their associated components to be changed in one easy operation while leaving everything else untouched – a great way of checking out the sonic characters of various valves without major surgery each time.



EMISSION LAB

<http://www.macnet.or.jp/pa/upi-k/>

At this URL, Kishimoto-san has assembled a fine spread of amplifier pictures and circuit diagrams, including a 6GB8 push-pull by Toshiba. Although this might be an English-free zone, the pages covering the 2A3 and 300B are well worth a glance, as is the gallery of cartridges like Accuphase's AC-3.



MACHIDA LABORATORY

<http://sun1.maizuru-ct.ac.jp/control/machida/>

Another decent amp menu will greet your browser at this site. There is some basic English commentary and matching circuits, but the best part of these pages is a link to www.nora.to/VT/, which is a large library of specs and pictures for valves rare as well as common.



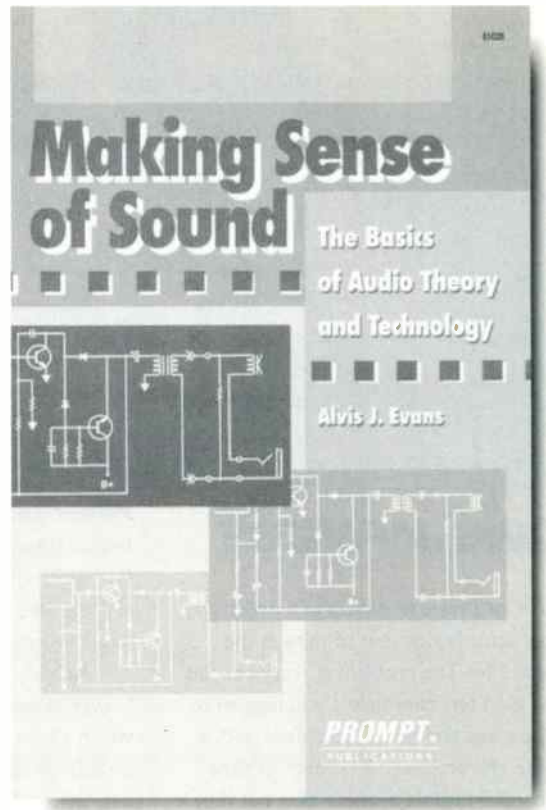
BISCUIT BOX

<http://plaza28.mbn.or.jp/~6bm8/index.html>

Not the name of the site, but one of its more entertaining inhabitants. Mr. Tamura and Mr. Uda have established a small DIY audio club where brief English explanations outline a couple of amps and circuits, with a 6BM8 design built into a biscuit tin.

We welcome any tips and links from readers who've been impressed by the audio credentials of the pages they've visited (e-mails to jon_beardy@yahoo.com)

MAKING SENSE OF SOUND



Gary Devon reviews a book by on sound and hi-fidelity, written by Alvis J. Evans.

This concise little book, written by Alvis J. Evans, is an overview of what sound is, as well as a general guide to sound recording and reproduction technology. Mr Evans is a lecturer and author in the electronics field, based in the U.S.

The book comprises 9 chapters, the first of which introduces the basic concepts of sound itself, such as sound pressure level and how tones relate to frequency. This leads to the introduction of what a stereo system does and how it works.

Chapter 2 gets more into hi-fi hardware, discussing amplifiers and how they work. Active devices such as FETs and Bipolar transistors are introduced, but in a simple way. There is a very basic discussion on the various amplifier topologies such as complementary output stages and the various classes of operation.

Chapter 3 covers distortion in its many and varied forms. Harmonic distortion is covered well with various diagrams relating a device's transfer characteristic to the generation of distortion. There is also a small piece on how harmonic and intermodulation distortion affects sound. The other main type of distortion is that of limited frequency response and associated phase response and this too is

covered.

Chapter 4 covers the various sonic transducers used in recording and reproduction. Of course this is a very wide ranging subject and the coverage in this book is limited. However, the basics of how microphones and loudspeakers work is here. There is also a little on tape recording and CD replay mechanisms and how they work.

Chapter 5, entitled New Sound Concepts covers the various gizmos and gadgets used in the recording studio and what they are used for. For example compressors and expanders plus the various forms of frequency equalisation. Towards the end of the chapter there is a discussion on how sounds are electronically synthesised.

Chapter 6 gets a bit more meaty as the essentials of recording and reproduction are brought in. The largest chunks are about CD and digital recording, which is most relevant today. The advantages and pitfalls of digital recording are discussed in a practical way without becoming overly technical.

Chapter 7 is all about noise. The basic electronic principles are covered in a concise way. As with the rest of the book the relevant equations are explained in a no-nonsense fashion.

Chapter 8 covers the principles of radio transmission and reception and is quite comprehensive. How a signal is used to modulate a carrier and then how it is detected and the receiving end is given a good treatment. There isn't too much mathematics but the concepts involved do require some prior mathematical and electronic knowledge.

The same applies to the final chapter, entitled Video and TV Stereo. Here the concepts of transmission and reception are expanded into the A/V arena. Finally there is a short appendix and glossary.

Making sense of sound is a compact introduction to audio technology in all its forms. It seems to be aimed at someone who already has some understanding of basic mathematic electronic principles. The mathematics used in the equations is far from mind boggling but as the book is short at 108 pages there isn't much space to be led by the hand. If you want a handy no nonsense introduction to modern audio techniques this book would be a good place to start.

Making Sense of Sound by Alvis J Evans paperback 108pp 225mm x 150mm Available from our World Library p76 & 77 Book Code 1690 UK price £12.99 + £1.50 p&p

D.I.Y. LETTERS

Nick Lucas looks at the new World Audio Design Bulletin Board

I want to introduce you to the wonderful world of the internet Bulletin Board and Chatroom. It's an internet letters page that allows people to communicate with each other, world-wide of course. We have started one on our website - www.worldaudiodesign.co.uk.

It is meant primarily for WAD kit builders to communicate with each other, but chat rooms are an open forum when unmoderated, like ours.

Our chatroom is simple and free to use. Ask questions or engage in discussion about your concerns. Our room is a live and informative place where 30 days worth of conversations are stored on line. All you have to do is click on the "Bulletin Board" icon on the home page to find



this page.

If you wish to pose a question, enter "Post Message". The open message will sit on the site and likely attract an answer. The next time you enter, login and use the "Find" facility to locate responses to your inquiry.

You can also enter the "Chat" pages and have a live chat to anybody else who is there at the time.

To demonstrate this communication I have lifted some interesting strands for your perusal.

I registered onto the chatroom, and posed this question:

Future Projects

Posted by Nick Lucas, Oct 02, 2000, 15:29

I would be interested to hear what you would like us to do next in the DIY Supplement? Any kit type you would love to see?

We had six responses in one day alone. Thank you all for your ideas, which have been carefully noted. Here are a few.

Re : future projects — Nick Lucas

Posted by Paul Pieroni, Oct 02, 2000, 16:29 Post Reply Top of thread Forum

Hi Nick,

Good of you to sound us out on this. I'd like to see some of the following ideas:

Valve/solid state hybrid power amp. Sort of triode/FET thing.

Generic article(s) about replacing Op. Amp CD outputs with valve stage.

Upgrades to KiT/KaT, drawing on the ideas on this forum and any others.

Active crossover using valves, maybe to feed something like KEL80 driving LF and a nice

little SE triode job feeding a tweeter. Whole thing driving WAD speakers of course! Also makes central heating unnecessary!

Bench PSU for valve nuts.

Regards

Paulo

- or -

Re : future projects — Nick Lucas

Posted by John Caswell, Oct 02, 2000, 21:41

Hi Nick,

Many thanks to you, Gary et al for the excellent range of DIY kits and articles over the past few months,

culminating in, for me at least, the KiT/KaT88.

Requiring extra bits and pieces for my KiT now a Kat plus "passive pre-amp" and having knocked it together I have to agree with Richard that a "passive pre-amp" would be an excellent next project for the supplement, particularly given the disparity between the sensitivities of the KiT88 and the 300B PSE with feedback.

I have offered to do something on the bulletin board but don't have the publishing and of course production facilities

I think it would be very useful to (possibly) feed readers the ideas of what and maybe how to do it, but also offer a complete kit with the various upgrade options, i.e. more inputs, better switches, 2 tape loops, switched/motorised volume controls, switched loudspeakers for different rooms etc, either listed or available from WAD.

Regards

John Caswell (Uncle John)

Some people have used the Bulletin Board to get a second opinion on our kits:

Can I build it? — Jiten Tolia

Posted by Jiten Tolia, Oct 03, 2000, 21:41

I am interested in building one of the amplifiers. I have modest "A" level knowledge of electrics, good manipulative skills (consultant ophthalmic surgeon) and don't want to injure my hands (reason - see above!). I could buy one but it would not be as much fun. At the same time I don't want to throw away hard earned cash on an uncompleted project. If buildable, which would be the best to try?

Many thanks.

Jiten.

Re : Can I build it? — Jiten Tolia

Posted by Richard, Oct

03,2000,23:47 Post Reply Top of thread Forum

Hi Jiten,

Could you build it? Absolutely no problem at all. The only skill you may not have and which you may want to practice first is soldering. To this end arm yourself with something like a 25W Antex iron from the Maplin catalogue No. FR12 £13.99 inc., but buy a smaller tip with it. The reasoning is that you will need the heat reserves of a larger iron for wires and valve sockets but the ability to control it for the smaller components.

Alternatively go for the luxury of 2 or 3 irons, I use 18W with a tiny tip, 25W with standard and 40W with chisel depending on the job.

Also treat yourself to a decent digital multimeter. Again, Maplins are good on these. Something like WGO20 no. GW26 at £59.99 inc. would be good. I've had an earlier version for years and it's both excellent and easy to use. Their Universal Cable Strippers MCS1 £7.99 inc. look gimmicky until you try them.

They strip everything including the input wiring and would keep your hands away from a craft knife.

KEL34 or KiT88 are the easiest to build as they are both a case of soldering components by numbers then coloured leads to the board.

The other power amps are hard wired with components on tag boards. Easy enough if you've some experience. The trickiest part is the input wiring. I've built both. They took far longer than anyone else writing has admitted to!

Take your time. If you are line level only, i.e. no vinyl, KiT88 is wonderful. KEL34 is way ahead of the likes of Quad331405, Audiolab, Pioneer A400 etc. but cannot match the sheer refinement of KiT88. Buy it with valves and build totally standard if you think you may want to tweak later. That way you've got a working starting point. If you are of a controlled disposition, unlike me,

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and simply want to build and play music then buy the Panasonic or Alps Blue pot with it from WAD, fit from the first because it is a definite improvement, and enjoy.

Testing will be no trouble as you're used to the rubber gloves.

Just shout on this Bulletin Board if you're not sure about anything and I'm sure someone will help. In fact, the only danger may be of too much information flying around here giving the impression the job is harder than it actually is!

Kind regards,
Richard

Our Bulletin Board is used as a forum to document the experiences of kit builders and their voyages beyond the standard kit:

Posted by Richard, Aug 31, 2000, 22:01

Hi John, John, Hugo and All,
I made up KiT88 a few months ago. Below is a letter I sent to Nick Lucas copied in full - forgive me not editing or retyping it - hope it is of interest. The valves used make a huge difference to the sound of these amps. Since the letter I have tried Sovtek KT88s and Svetlana 6550Cs, along with the GE 6550As. The Sovtek's sounded poor - flat, small soundstage and muddled bass. They also measured badly - a near short between Heater/Cathode and Rest when hot. Has anyone else tried these?

I had several e-mails with New Sensor on the subject if anyone's interested. The Svetlanas are both cheap and wonderful - very open and sweet - loads of detail but they never hurt your ears - and a weightier bass than the GEs. The GEs are for Rockers and do come into their own at higher volume levels! I've still not tried the JJs.

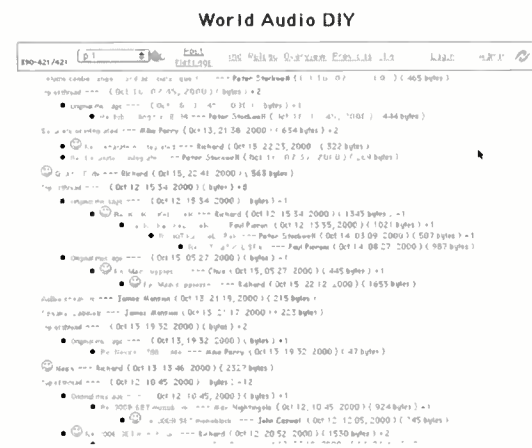
Letter follows;

Hi Nick and All,
I've had my KiT88 up and running for the last 2 months and thought I'd drop you a line to say thanks. It really is superb. I had KEL34 for over a year and was so pleased with it that I was a little doubtful about changing. I shouldn't have worried though. Suffice to say that KEL34 now has a new owner who took one

listen, had a quick look under the bonnet, and bought it on the spot. I'm sure he'll be as happy as I was.

One of the nice things about building KiT88 was that I was able to incorporate a few things I had learned with KEL34. Anyone considering a build might be interested in my experiences and subjective comments.

Cabling up the inputs is the longest and most tedious part of the build. The supplied cable does the job but this twin core with overall screen allows cross-talk between the channels. (Unplug one CD input then listen to the disconnected speaker if you want to hear this.)



Stereo imaging is formed by two separate signals. Mixing these signals leads ultimately to mono sound reproduction. To prevent this I used individually screened single cable for all inputs. Nothing fancy - there are a lot of cables and you'll struggle with anything over 3mm diameter - but RS367246 is low capacitance, physically strong, and easy to work with. Maplin's XR13 is similar.

At the same time consider the volume pot. The supplied carbon pot is warm and full bodied but a little coarse sounding and lacking fine detail. I tried a £2.00 low noise plastic film type. It was horrible, flat, lifeless and sterile sounding. Then an Alps carbon "Blue". This is lovely, like a refined version of the supplied carbon pot. It is warm but more detailed and sweeter sounding than the cheaper unit.

Finally, I took note of your own upgrade choice and went for the Panasonic for Audio pot. As a move from the Alps it is very much more open, detailed and sweeter still. The

only negative is that it sounds a little thin on first hearing - the Alps is warmer sounding. Once I became accustomed to it I had no thoughts of changing back.

On the board I went for Audio Note paper-in-oil coupling capacitors. These are huge so slip some plastic sleeving over the leads and hang them clear of the board. They also sound awful for the first hour of listening - all wispy and, well, papery sounding - honest! I confess I actually removed them and went back to the supplied polyester caps in disgust. Trying again a few days later I realised they improve rapidly for the first few hours and then

seem to keep getting better all the time. They are singing now and really are open and detailed but not harsh. I have also tried Ansar polyprops here. They are amazingly detailed and sharp and may suit some listeners but I found them uneasy and somewhat lightweight sounding.

The chosen valves make the biggest difference to the overall sound. I have listened at length to the supplied ones and many new 'old stock' types. My favourite 6AU6 is the Sylvania 6AU6WC - natural, full, open. The GE 6AU6WA and WC run close, being a bit brighter sounding. The ECC82 makes more difference than I expected and here the Mullard M8136 is the very best by a long way. I tried Mullard's own ECC82 (a bit flat) and Brimar's 12AU7 (a bit sibilant). Amperex's 12AU7 (orange label) is super sharp and open, but not sibilant. It is in the same quality league as the M8136 but tonally balanced to the other extreme and may well suit some systems. These preferences were arrived at with KEL34 and confirmed with KiT88.

I'm still saving up to try a few different output valves for KiT88! Here I hold my hand up and say that having tried the Tesla E34L in

my KEL34 amp I wasn't impressed - a bit flat with a small sound stage. So, although I know Tesla's KT88 is a completely different valve, for right or wrong I decided to try the GE6550A for KiT88. The completed amp has a huge soundstage. It is open and lively but not at all harsh. Just occasionally, on certain tracks, a voice sounds real - I mean REAL - my eyes flick to the point of origin and the hairs stand up on the back of my neck. After 20 years the hi-fi carrot still dangles!

A note on valve plate dissipation would not go amiss for anyone wanting to use other than the 35W rated Teslas. As worked out with your good self, changing the cathode resistors from 150R to 220R will set the valves to dissipate around 32W and allow the use of any standard rated KT88 or 6550 types.

If you're still reading, sources are Pioneer PD91 CD and F91 tuner. Speakers are Chris Rogers Pro9TL transmission lines, tri-wired with separate crossovers hard wired in 6 boxes outside the cabs with Solen caps.

Please feel free to call in any time you are up this way and have a listen.
8 May 2000
rjmaile@aol.com

If you want to get a view of how a kit sounds then the Bulletin Board can again help:

**KaT88 Power Amp kit
Posted by John Morgan, Aug 18, 2000, 10:37**

I will be making up the KaT88 power amp kit. Has anyone made this kit and what does it sound like?

**Re : KaT88 Power Amp kit —
- John Morgan**

**Posted by Hugo Cass , Aug 20, 2000, 12:44 Post Reply
Top of thread Forum**

I too am interested in the KaT88, following very good experiences with the KEL34, to which it is related. Like the KEL34, I assume that the KaT88 responds to tweaking, and substituting audiophile parts at the very beginning is probably a good idea (see KEL34 upgrade article in HFW). The kit is easy to make, provided that you are calm, organised

nd with a soldering iron. The
ons are well structured and
generally clear. My amp worked fine
from first fire-up, which did surprise
me, but provided that you double
check every component before sol-
dering, I don't suppose that anyone
would have great problems.

If the KaT88 is at least as good
as the KEL34, then it's got to be a
winner. I've played around with dif-
ferent valves on mine, after failures
in both types of the Ei valves sup-
plied - I now use NOS RCA 6AU6s
with NOS Telefunken ECC82s. The JJ
power tubes have been fine, so the
KT88s supplied with the KaT88
should be too.

In summary, get the kit, build it
with care, and enjoy it. You won't get
better value for money anywhere
else, and if you like tweaking, there
are hours of further fun to be had,
which take the sonic performance
much, much further.

You can use the Bulletin board
for 'speaker stuff too. Note that
one of its facilities is the ability to
add links to other interesting
sites. Just type in the website
address and a link is automatically
created.

KLS9 Ports

**Posted by Paul, Sep 09, 2000,
12:13**

I have been reading the June '97 Hi-
Fi World Supplement re: tuning
KLS-9 ports and it gives three
alternatives:

1. Short - 8 cm dia. x 19mm long
2. Ideal - 6.6cm dia. x 6 cm long

3. Long - 6.6 cm dia. x 19cm long

And in a web article I obtained in
1997 from the site the port was 6
to 8 cm dia.

My question is that the latest
article I got on the web says 8 cm
dia., has anyone found it to be
unsuitable, or should I go ahead
with this size, and what length?

Thanks
Paul

**Re : KLS9 Ports — Paul
Posted by Hapien, Sep 11,
2000, 12:26**

Hello!
I also have KLS9-speakers under
work. I'm going to use 50 litres
enclosure tuned with port 7cm
diameter and 11cm length. It's
hopefully going to provide somewhat
flat response down to 42Hz (-3dB).
WinISD is a nice freeware that is
very useful with enclosure calcula-
tions. Related link: [www.lineart-
eam.org/winisd.html](http://www.lineart-
eam.org/winisd.html) (WinISD)

Or for assistance in fault finding,

KLPP1 faulty

**Posted by Archie Hunter, Sep
19, 2000, 14:27**

Anyone able to help me. I built it
O.K. but now it's broke I can't fix it!
It's about 2 years old and has
worked fine until now. On switch on
I get a VERY LOUD crackling on the
right channel only, after about 30
seconds the crackling reduces to just
loud. Volume and source selector
have no affect, and I have swapped
the left and right valves again no
affect. HEEEEELP!

Here's Archie's response to
replies

**Re : Re: KLPP1 faulty
Posted by Archie Hunter, Sep
26, 2000, 14:22**

Hi John. Thanks for your help. I have
managed to trace the problem to
the Anode resistor which was actual-
ly open circuit! I am back listening
to music again. Only problem is I
have discovered another problem
which is only on the Phono I/P, it is a
crackle on both channels which gets
louder as the volume is turned up.
From your previous advice it looks
like I could have a problem on the
power supply to the Phono section.

Again thanks for your help and I
will let you know how I get on.
Regards,
Archie

Or maybe you need to find
something.

Nakamichi

**Posted by Bob Beckman ,
Aug 25, 2000, 06:53 Post
Reply Forum**

Is there anyone out there who
knows where I can obtain a repair
on a Nakamichi
700ZXL cassette
recorder? I am also
looking for a
Nakamichi Dragon 7
disc CD player. I
believe Nakamichi
manufactured a high-
end
CD transport with
companion DAC at
one time. I would like

to obtain whatever information is
available on these units.

I am a Nakamichi collector.

**Re : Nakamichi — Bob
Beckman**

**Posted by Paul Blackman ,
Sep 05, 2000, 21:18 Post
Reply Top of thread Forum**
My Nak was repaired by Nakamichi
service 01903 695695
very satisfactorily.
More info. on www.naks.com

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acts as an internet telephone
exchange connecting all DIY peo-
ple together in a very live and
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NICK LUCAS



Nick Lucas working on KEL34

Audio Link	IFC	Cricklewood Electronics	6	PM Components	BC
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BK Electronics	4	IPL Acoustics	14	Technical & General	I2
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5755 Raytheon	£2.63	£2.63	£2.63	£2.63	£1.75
7327 Sylvania, may be similar to ECC82	£1.35	£1.35	£0.90	£0.90	0.90
ECL86/6GW8. Try PCL86 which is a similar valve at an amazing low price! Data available					
EF86. Use EF95 which is a similar valve. EF95 is P7G base. EF95 is recommended in Glass Audio. Data available.					
EF95 Mullard UK	£1.95	£1.95	£1.95	£1.95	£1.30
EL34 see 3D21 possible alternative					
EL84 near equivalent try 6CH6	£1.95	£1.95	£1.40	£1.30	£0.80
6CH6 Brimar UK, similar to EL84 Mullard but different pin out.					
No discounts possible. Data available.	£1.95	£1.95	£1.40	£1.30	£0.80
PC86 Zaerix East Europe	£3.68	£3.68	£2.45	£2.45	£2.45
PC900/4HA5 East European	£1.72	£1.72	£1.15	£1.15	£0.90
PCC84/7AN7 Mullard UK	£1.50	£1.00	£1.00	£0.90	£0.80
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PCL86/14GW8 Polish or Russian made using					
Philips technical expertise	£0.53	£0.53	£0.53	£0.53	£0.37
SV811-3 Svetlana	£19.50	£16.00	-	-	-
TT21 Billington Gold Chines	£27.00	£18.00	£18.00	£16.00	-
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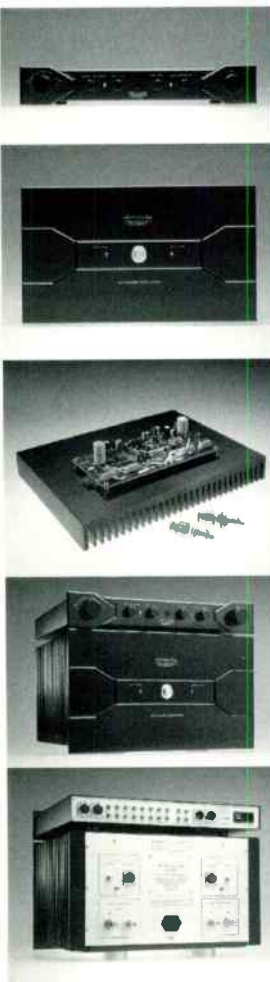
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Golden Dragon Power Tubes

	Matched Pair	Matched Quad	Matched Octet
EL34 Super	£25.00	£50.00	£100.00
EL34M	£25.00	£50.00	£100.00
E84L (special quality EL84)	£12.50	£25.00	£50.00
EL156 Octal	£75.00	£150.00	£300.00
6L6WGB	£25.00	£50.00	£100.00
KT66	£25.95	£52.00	£104.00
KT66 Super	£65.00	£130.00	£300.00
KT88	£57.95	£116.00	£232.00
KT88 Special (Gold plated)	£67.95	£136.00	£272.00
KT90	£65.00	£130.00	£260.00
KT90LX	£75.00	£150.00	£300.00
350B	£29.95	£60.00	£120.00
6L6GC	£19.95	£40.00	£80.00
6550A	£42.95	£86.00	£172.00
6550A Special (Gold plated)	£64.95	£130.00	£260.00
50CA10	£84.95	£170.00	£340.00
807	£25.00	£50.00	£100.00

We have a vast range of tubes available from manufactures all over the world including rare and vintage types. an 80 page booklet of valves available is updated monthly and can be provided at a cost of £2.50 per copy U.K. £4.00/\$7.00 rest of world or you may telephone our Sales Desk for a prompt quotation.

Prices exclude VAT and Carriage. Please add carriage charge of £2.50 for UK orders and VAT at 17.5%

P.M. COMPONENTS LTD, Selectron House, Jenkins Dale Industrial Estate, Chatham, Kent. ME4 5RD
Tel 01634 848500, Fax 01634 848676, e-mail: 101650,2424@Compuserve.com

The Valve. Golden Dragon



Simply, The Best.

For more information contact:

PM Components Ltd, Selectron House, Jenkins Dale Industrial Estate,
Chatham, Kent. ME4 5RD

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