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THIS MONTH'S BOOK REVIEW:

Getting the most out of Vacuum Tubes & Sylvania Technical manual

TOTAL TWEAKS

Upgrading the KiT88/KaT88 Amplifiers



SEEING STARS

Wilmslow's Gemini Loudspeaker Kit

Plus: ● news, letters and more...





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All output valves multi-tested and digitally matched
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ECC83	Philips	7.00	GZ34	Harma	8.00
ECC83	R.F.T	8.00	KT66	Harma	25.00
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ECC83	Mazda S	25.00	KT88	Svetlana	34.00
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E83CC	Siemens	25.00	5687WB	Philips	5.00
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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
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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

300B JJ/TESLA RAVE REVIEW

In Stereophile's November 1999 issue Peter Van Willenswaard evaluated over fifteen 300Bs using the Audionote Kit 1 and the cost no option de Jong System Amplifiers. He said of the JJ Tesla 300B - 'Worked well in both amps, very good bass - real pressure there and very involving, even euphonic - almost as if trying to make things nicer than real. It has good dynamics, reasonably fine detail, and threw a remarkably wide stage with the Audionote'. He summed up by saying in short 'The JJ electronics looks a real bargain!'

We offer this great 300B at only £68 each making it an outstandingly good value upgrade.



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KIT & COMPONENT NEWS

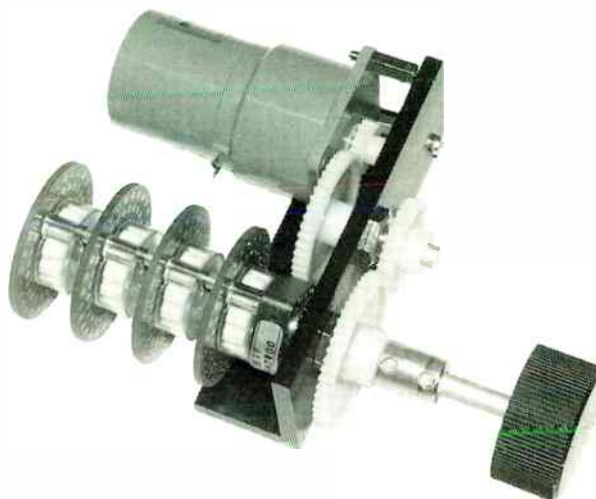
GET MOTORING

Audio-Links are now offering a remote control system for stepped attenuators. The system will allow remote control facility of their own series and ladder attenuators as well as controlling the Danish Audio Connect CT1. It uses a natty motor and a nylon gear drive to provide an alternative to manual control, as our picture shows - these days the preferred way of doing things.

tel: 01724 - 870432

fax: 01724 - 875340

e-mail: audiolinks@europe.com



DIGITAL AMPLIFIERS ARE COMING

Here's a press release from Zetex semiconductors. It offers an interesting insight into forthcoming digital amplifier technology, bringing new meaning to the phrase "We told 'em - Oldham!". It looks like they're making more than batteries up there now.

ZETEX

"Zetex has announced the first product in its new Class D audio amplifier family. The ZXCD1000 switching amplifier controller offers a winning combination of high efficiency, excellent audio quality, small size and low cost per watt. Zetex Efficiency is excellent at greater than 90%. This allows the amplifier to be offered in a compact package, and to generate much less heat than a comparable Class A/B linear amplifier - which would typically have an efficiency of only around 65%. The high efficiency also means that a smaller power supply is required."

"Aiming for world class performance, Zetex' ZXCD1000 offers 'best-

in-class' THD + N (Total Harmonic Distortion and Noise) of typically 0.2% open loop, or typically < 0.1% with a 10dB feedback loop. These measurements are taken at 90%-power, full-band, as opposed to the less representative figures quoted for some competitive products."

"Zetex is also offering a reference design, which removes the layout and

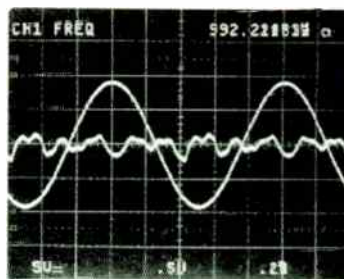
design difficulties traditionally associated with Class D amplifiers. The reference design includes custom

magnetics supplied by the company, specifically optimised to the system requirements. Overall solution cost has been minimised to offer a cost per watt that is substantially lower than competitive products."

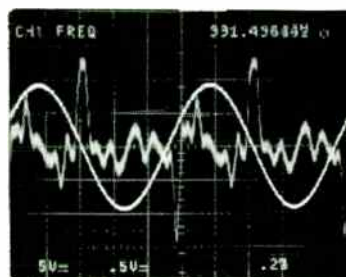
"Depending on the choice of output filter network, the ZXCD1000 provides true high fidelity performance at an output power of 25W or 50W. The amplifier can drive either a 4ohm or 8ohm load. Due to the design of the IC, no dead time correction is required. This means that there are no high order crossover artifacts, thus maximising audio quality. The new device is ideal for a wide range of audio applications,

including PC multimedia, automotive audio, PA systems, and minimicro hi-fi systems."

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Chadderton,
Oldham, UK.
tel. +44 (0) 161 622 4444
fax: +44 (0) 161 622 4420
www.zetex.com



ZETEX Class D Solution, 110W into 4Ω
Note lack of Crossover Artifacts



Typical Class D Solution
Note Large Crossover Artifacts

Ansar Supersound Polypropylene Axial Capacitor



Audio specific. For transparent & detailed sound with EXTREMELY low distortion. High purity imported material 47% polypropylene. Tol 5%

Part no	Description	L x D mm	Price
CPW100N	Ansar 100nF 630V	32 x 6.5	1.60
CPW150N	Ansar 150nF 630V	32 x 7.5	1.60
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
CPW100	Ansar 1uF 400V	32 x 12.5	1.80
CPW150	Ansar 1.5uF 400V	32 x 14.7	1.80
CPW220	Ansar 2.2uF 400V	43 x 14.8	1.80
CPW330	Ansar 3.3uF 400V	43 x 17.6	2.20
CPW470	Ansar 4.7uF 400V	43 x 20.7	2.50
CPW680	Ansar 6.8uF 400V	43 x 22.8	3.00
CPW800	Ansar 8uF 400V	43 x 26.5	4.00
CPW100	Ansar 10uF 400V	43 x 29.5	4.00
CPW150	Ansar 15uF 400V	55 x 34.1	5.50
CPW220	Ansar 22uF 400V	55 x 39.3	7.00
CPW330	Ansar 33uF 400V	55 x 42.0	7.50
CPW500	Ansar 50uF 400V	83 x 46.0	11.50
CPW600	Ansar 60uF 400V	83 x 51.7	13.50
CPW750	Ansar 75uF 400V	83 x 55.1	19.00
CPW800	Ansar 80uF 400V	83 x 56.8	19.50
CPW1000	Ansar 100uF 400V	115 x 55.1	20.00
CPW1250	Ansar 125uF 400V	115 x 60.9	26.00

Dual Polypropylene Smoothing Capacitors

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

Part no	Description	L x D mm	Price
CPW1616	Propax 16-16 400V	100 x 50	25.00
CPW3232	Propax 32-32 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
CPW47P	Propax 47pF 630V	0.40
CPW100P	Propax 100pF 630V	0.40
CPW150P	Propax 150pF 630V	0.35
CPW220P	Propax 220pF 630V	0.35
CPW330P	Propax 330pF 630V	0.35
CPW470P	Propax 470pF 630V	0.35
CPW680P	Propax 680pF 630V	0.35
CPW1N0	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	0.30
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 50V 87mm 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

Alcap Bipolar Electrolytics

Axial leads 50V Tol 10% Primarily for use in speaker crossovers.

Part no	Description	Price
CAB1	Alcap 1uF	0.25
CAB2U2	Alcap 2.2 uF	0.40
CAB3U3	Alcap 3.3uF	0.40
CAB4	Alcap 4uF	0.40
CAB5	Alcap 5uF	0.40
CAB6U8	Alcap 6.8uF	0.50
CAB8	Alcap 8uF	0.50
CAB10	Alcap 10uF	0.50
CAB16	Alcap 16uF	0.65
CAB20	Alcap 20uF	0.65
CAB25	Alcap 25uF	0.65
CAB35	Alcap 35uF	0.65
CAB50	Alcap 50uF	0.75
CAB60	Alcap 60uF	0.85
CAB80	Alcap 80uF	1.00
CAB100	Alcap 100uF	1.10

Monacor Air Cored Inductors.



A range of professional air cored inductors for 80 or 10 crossover filters for use up to 300W. 1.2mm enamelled copper wire wound on air spaced plastic bobbins

Part No	Specification	Price
P15	15uH 0.150 8x19mm	£2.00
P22	22uH 0.150 48x19mm	£2.50
P33	33uH 0.210 8x19mm	£3.00
P47	47uH 0.250 50x19mm	£3.50
P68	68uH 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
6550C	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
GZ34	RECTIFIER	£3.50
KT88	OUTPUT VALVE	£20.00

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

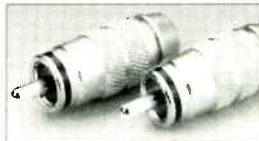
Part No	Description	Price
B9AC	RRA VALVE HOLDER CERAMIC	£1.50
B9AG	R9 VALVE HOLDER PORCELAIN PLUS GOLD PLATED PINS	£3.00
OCTC	OCTAL VALVE HOLDER CERAMIC	£2.00
OCTG	OCTAL VALVE HOLDER PORCELAIN PLUS GOLD PLATED PINS	£4.00

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
PPG6H2	GOLD PTFE PLUGS for up to 6mm CABLE	£3.50 pair
PPG8H2	GOLD PTFE PLUGS for up to 8mm CABLE	£3.50 pair

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



Highly flexible oxygen free cable with extra moulded-in control / grounding wire.

Part No	Length/Colour	Price
LPP10G	0.8 Metres/Green	£5.50
LPP20G	1.5 Metres/Green	£6.50
LPP50G	5 Metres/Green	£11.00

Bass Reflex Tuning Ports



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

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

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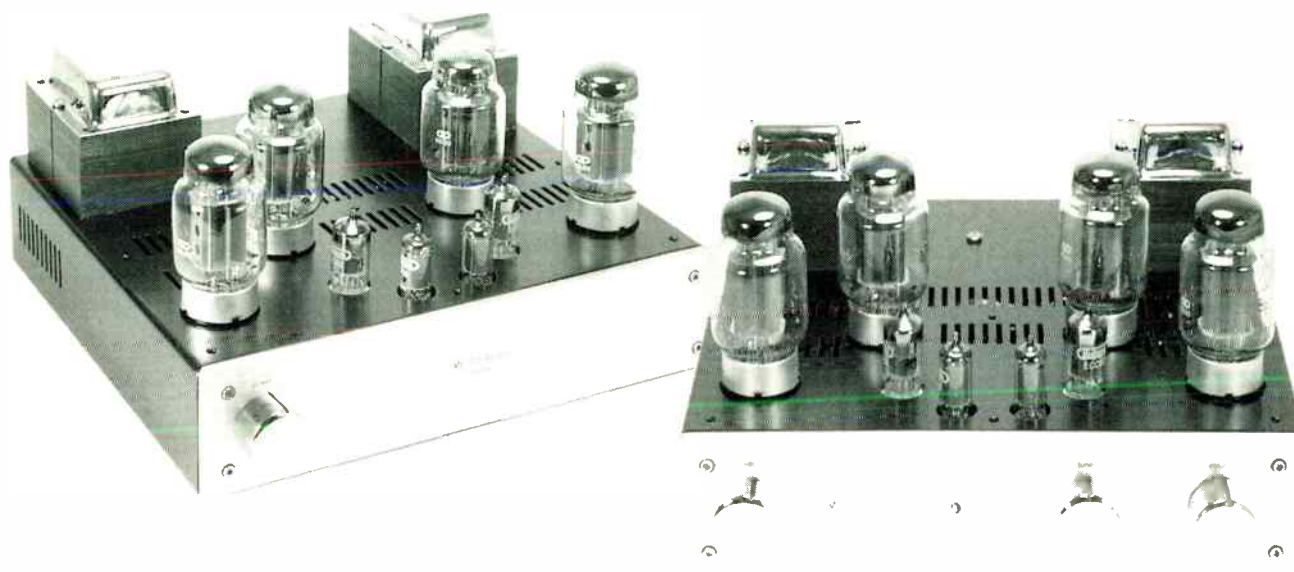
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TWEAKING KiT KaT

Here are some special tweaks for our KiT and KaT 88 amplifiers, by Nick Lucas.



We have scheduled in a series of upgrade kits over the coming year, starting off with our popular 88 amplifier series, namely the KiT88 valve integrated amplifier and its close relation the KaT88 valve power amplifier. Both feature the wonderful KT88, in push-pull configuration pushing out 36watts in Class A.

In our earlier Kel34 upgrade kit we substituted individual diodes for the original bridge rectifiers - an exercise that required the deftest of touches considering four bulky, static sensitive diodes had to be arranged within the space of a bridge package, space saving being one of the reasons for packaged bridge rectifiers in the first place.

This upgrade definitely produced an apparent difference. Because Kit88/KaT88 have similar circuit topology the modification was considered for this new upgrade kit, but installation complexity outweighed the sonic gains, we found. For this reason we decided to invest more heavily in the other components.

Compiling an upgrade wish list we instinctively hit the signal and cathode bypass capacitors, knowing from experience they make a major contribution to sound quality. We have played with various audio grade resistors, but it takes a lot of playing about to get balance. Capacitors bring about more than just a

change of tonal colour though, so we changed the capacitors. Hopefully in future we will be carrying out a detailed resistor comparison, using a range of resistors in signal key location and noting the sounds - so keep reading.

For our KiT88/KaT88 upgrade a whole different breed of components were ordered up, ones too esoteric for commercial products. Signal capacitors, C7, C8, C15 & C16 that feed the grid input to the KT88s were changed to Jensen's 'Paper in Oil' types.

Cathode bypass C17, C18 (6AU6) & C9, C10, C11, C12 (KT88) capacitors were Rubycon's amazing Black Gate range. These components feature in both upgrade kits, but for the KiT88 there is the need for a higher grade potentiometer (VR1). Here we chose the Alps Blue 100k. Together these items proved a winning combination.

JENSEN CAPACITORS

The Danish Jensen Company was founded in 1917 by Mr. Tobias Jensen. Over the decades they manufactured lots of different mechanical and electrical parts such as TIK radio, a well known Danish brand at the time. Capacitors have been the company's core business for more than 60 years. Since the 1980s they have been highly respected for their paper-in-oil capacitors intended for the high-end audio market. These capacitors have won interna-

tional recognition in tube amplifiers and speakers. Jensen also manufacture high voltage electrolytic capacitors and air-core inductors.

Jensen make a range of paper in oils. Our capacitors have aluminium electrodes, hermetically sealed in aluminium tube. The dielectric is paper, impregnated with oil under pressure, hence the name of this type of capacitor. It's a old, slow method that produces a bulky capacitor, but a carbon based, highly damped dielectric suits audio well. The terminal leads are tinned copper, solder-sealed to eyelets in the end-discs. The capacitor element is insulated from the tube and the terminal in contact with the outer foil (i.e. closest to the can) is always marked with a vertical line on the body of the capacitor. To ensure best performance, this terminal must be connected to the grid stopper end, R8, R10, R27 and R31 (a 4.7kohm resistor that feeds the input grid of the KT88 valves.)

BLACK GATE CAPACITORS

Rubycon are a huge capacitor manufacturing company based in Japan boasting a 3000+ work force world-wide. Like so many large Japanese companies they have an esoteric sideline. It's an absolute killer audio grade electrolytic capacitor - the Black Gate.

Many DIYers have heard of them because of world-wide acclaim in top-end audio.

Through superior construction techniques and the use of fine grained graphite particles in the electrolyte they are characterised by low impedance/E.S.R. (equivalent series resistance), very low noise, extremely low distortion and a greater power bandwidth than usual - plus a sound to die for!

ALPS POTENTIOMETERS

The Alps is an old favourite of ours that worked magic in our KLPI and KLPII all-valve preamplifiers. "This high-grade potentiometer offers comfortable operation and possesses high precision characteristics, ideal for audio applications" the manufacturer says. And they are spot on. High build quality includes a metal shaft that can be earthed. With a reasonable price as well, you cannot go wrong.

DIFFICULT TO UPGRADE?

If you can build our kit, then you will have no

trouble upgrading:

The Alps 100k potentiometer has a slightly larger fitting hole (@1mm increase in diameter) than that pre-drilled into your chassis. The correct diameter can be easily obtained with the use of a reamer or a drill bit of 9mm diameter. Remember to remove your valves when carrying out any work, be it mechanical or electronic.

As both sides of the PCB need to be accessed, undo the PCB fixing screws. With the use of a desoldering pump remove all components to be upgraded, leaving the pin holes solder free.

You will find the pitch (the distance between component lead) of the Black Gates to be larger than allowed for on the PCB, so when fitting these components ensure the leads do not touch when bending them into place since this will create a short. With the KT88 cathode bypass caps. a short will make the anodes (the visible outer surface of the

electrode structure) glow bright red. This will damage the valve in the long run. As with the original components the Black Gates must be correctly orientated

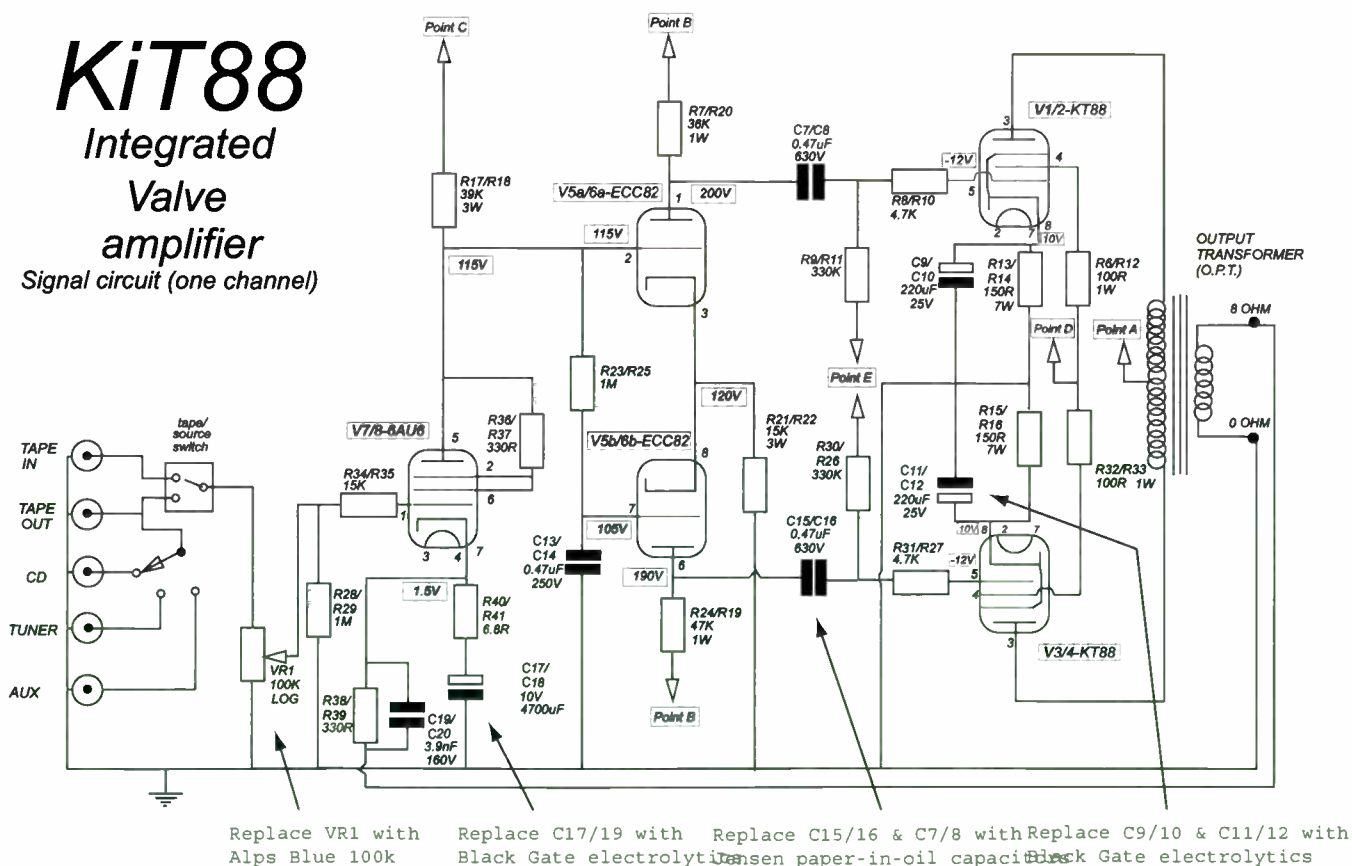
The Jensens are much larger than the original Philips 486 orange capacitors. Even though there is a lot of available space for fitting, you need to be able to get the iron in to solder component side without burning the cap's body. Plan it, before fitting. The capacitors outer foil end, signified by a line of the component body, needs to be soldered to the join that related to the 4.7k grid stopper that feeds directly into the grid of the KT88 - this ensures the best performance. Their long leads need to be isolated with rubber sleeving to avoid unwanted contact with other parts of the circuit.

Now over to Simon Pope for the sound quality.

KiT88

Integrated Valve amplifier

Signal circuit (one channel)



SOUND QUALITY by SIMON POPE

Listening tests for the upgrades turned out to be great fun and very enlightening, highlighting just how much a few tweaks and changes here and there can alter the sound, by changing phrasing characteristics or instrument timbres. Each upgrade has its own merits which we've highlighted below. Please note, for all sound quality reviews we have used a NAD SS00 Silverline CD player, Diapason Karis loudspeakers and in the case of the KaT88 power amplifier, a WAD Series II modular pre-amp.

KaT88 - 'Standard Model'

The KaT88 without any upgrades has a full and deep sound, with strong, bouncy bass and impressive detail.

KaT88 with Jensen capacitors

The inclusion of the Jensen paper-in-oil capacitors resulted in an extended and strengthened bass response. Massive Attack's 'Protection' literally had that - massive attack. The amp handled the low bass lines with grip and control and a velvety smoothness was added to Tracey Thorn's vocal lines.

In a spacious recording of Mahler's 'Das Lied Von Der Erde', the Jensens opened up the sound stage to create a wide palette for the vast orchestra, with dynamics and frequency range superlative.

KaT88 with Jensen and Black gate capacitors and Teslar valves

This top spec upgrade for the KaT88 power amp creates a full and cohesive sound with excellent detail to boot. Vocals in Massive Attack were warm and natural, whilst the intricate detail of the accompanying percussion was brought to the fore. Bass became taut, with unmistakable 'valve bounce' and the midrange sounded clean and open.

With the orchestral Mahler piece the sound stage was stretched back even further and opened wider to give as near a faithful representation of an orchestra as you'll find with hi-fi. Woodwind instruments took on a rich yet airy tone and strings became smooth, well balanced and detailed. The overall tonal balance was excellent and instruments realistic, with breathtaking transparency.

KiT88 - 'Standard Model'

The sound of the 'bare bones' KiT88 is both smooth and involving with a solid bass and deep, wide sound staging which encompasses all the best attributes of the valve sound.

KiT88 with Alps potentiometer

Adding an Alps pot brought a tighter and more concentrated bass line to Massive Attack making the overall sound well controlled and cohesive. Vocals were clean and warm, placed to the front of the deep sound stage. This was also the same in the vast orchestration of the Mahler piece. Every aspect of the sound had slightly more presence and general lift.

KiT88 with Alps potentiometer and Jensen capacitors

Adding the Danish made Jensen paper-in-oil capacitors resulted in a bigger sound with added detail and an overall richness adding smoothness to the vocal lines of Massive Attack's track. Intricate percussive details were brought out and a deepened sound stage was clearly evident.

In the Mahler, woodwind instruments took on a richer tone, whilst strings became polished and sophisticated.

KiT88 with Alps potentiometer, plus Jensen and Black Gate capacitors

This top upgrade combines the amazing detail that the Japanese electrolytic Black gate capacitors have with the rhythmic grip of the Alps pot and the richness of the Jensens. Everything sounded more coherent and 'whole'. Tonal balance was superlative, as was detail. The bass line in the Massive Attack track had a fast dead thump to it and Tracey Thorn's vocals sounded uncannily natural, as if she were standing in front of me.

With the Mahler there was a massive soundscape, with extended depth of stage and an overall sound that matches the best valve amps available, a very high end sound without the artificial over sheen that can come with such equipment.

www.jensencapacitors.com

www.rubycon.com

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SIGN OF A STAR

Jon Marks twins up with Wilmslow Audio's Gemini kit loudspeakers

If it's the soldering and potential hazards of working with electricity that put some people off building their own electronics, woodwork is the stumbling block when it comes to DIY loudspeakers.

Unless you happen to be a carpenter, or know someone who is, hacking a sheet of MDF the size of a squash court into accurately-hewn panels can be an uphill struggle. The fact that the dust from sawn MDF is carcinogenic is another highly persuasive reason for leaving all the hard stuff to the professionals. Allowing Wilmslow Audio to take the strain, I chose to tackle their £420 Gemini stand mounters, which come with complete with precision-cut 18mm panels flat-packed and ready for assembly.

ON PAPER

Hiding behind the slightly plain looks of the loudspeaker pictured on the front of the clear, concise manual is a rather more complex beast. The Morel mid/bass units which sandwich the soft-dome tweeter D'Appolito-style are loaded by their own individual ported chambers within the enclosure. These fire into a third volume behind the tweeter, which exhausts into your listening room via the main

port on the rear panel.

The driver credentials look promising. Morel's MW144s are Sincers rated for 150watts, thanks partly to an oversize 3in. voice coil wound with aluminium wire on a former of the same metal.

The kit uses Morel's MDT-325 tweeter. The hand-treated cloth dome fires backward into a plastic chamber damped and shaped to minimise vibration and internal reflections. Ferrofluid cooling provides the icing on the cake.

Linking the three units together is a PCB-mounted, bi-wire crossover built around iron-core inductors, electrolytic caps (which can be upgraded in the tweeter section to Hovland Musicaps for an extra £44.52) and wirewound resistors.

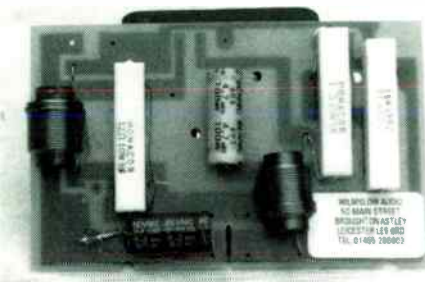
Step one with pre-fab cabs is to shuffle through the various MDF pieces to make sure you get the best fit. Then, reaching for a pot of Resin W wood glue (you'll probably need one 250ml pot and a 125ml pot in this instance), bond the



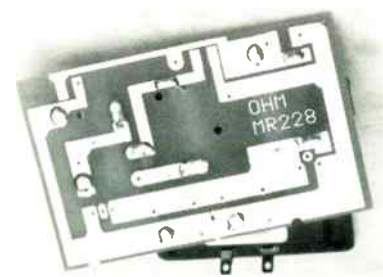
ports to their rear panels and build the cabinets - always fun. Fast forward 24 hours, the glue has dried and you should be the proud possessor of two extremely rigid, very inert cabinets.

This is probably the best time to apply the finish of your choice to the naked Geminis, that old favourite Hammerite, or a tempting shade of car paint, some sticky-back plastic with a wood-effect, or even real-life veneer.

SOLDERING ON



So much for the wood, now we come to the wiring. As the crossover PCBs have already been populated, all that remains is to cut the supplied 79-strand cable into the required lengths, tin each end, and solder them to the PCB. You should now be ready to face fitting the crossover boards into the base of each speaker with four self-tappers. However, attempting to force these screws into 18mm MDF in a cramped space with a stubby cross-head screwdriver is a complete non-starter unless your middle name is Hercules. I banged a 1in. panel pin into the MDF as a guide hole, but it was still a struggle. The holes need drilling first.



Prior to soldering the crossover cables to the relevant drive units, I had to cut to size several pieces of the BAF wadding supplied, and stuff them into the various parts of the cabinets. I initially followed Wilmslow's instructions to divide the main sheet into four equal chunks and place one in each bass chamber, but had trouble actually cramming that much wadding into the cabinets.

As you can see from the diagram, I ended up with considerably smaller BAF pieces and found that these yielded a more open and extended presentation in my room. However, as the size and positioning of this wadding plays a role in bass and lower-midrange quality, I sus-

pect most constructors will experiment to find an arrangement which best suits their listening room.

While the MW144s were an admirably snug fit within their superbly-machined rebates, I ran into a problem with the tweeters. The solder tags for these stick out quite prominently from the side of the main body and therefore wouldn't pass through the inner rebate. I had to file a rectangle about 6mm deep into the rim of the inner rebate, which accommodated the tags and the cable ends soldered to them with space to spare.

Having triple-checked my wiring and screwed the drivers and the bi-wire binding trays securely into place, I turned on my testing amp (a modified Mission Cyrus I, which is incapable of dumping much current into a speaker if things go wrong) and waited.

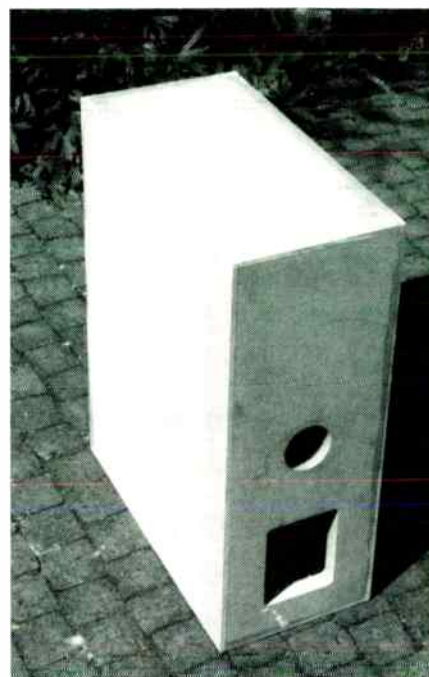
SOUND QUALITY



Success! The first few bars from the opening track of Beth Orton's *Trailer Park* CD emerged without any worrying pops, bangs or sizzles.

Although there was nothing overtly offensive about the Geminis at this stage, they needed running in. Over the following week, these speakers really began to open out and relax. No longer confined close to the boxes, the sound stage slowly expanded outwards. Bass became much more lithe, rhythmic and punchy. Both midrange and treble became more articulate and revealing without sounding edgy or clinical.

Since my initial encounter, the Geminis have clocked up the best part of three months' use and they're sounding very good indeed. With electronic music like Bjork's *Homogenic*, they produce nicely extended, tight basslines which are considerably firmer and more detailed than what you'd get from most commercial ported



speakers up to two or three times the Wilmslows' cost. Carry out the knuckle-rap test, and it's clear that the cabinets are contributing far less of their own waffle to the music than is usually the case. Of course, this is where DIY scores over commercial, as there are no cost penalties for assembly, finishing, transportation of bulky, fully-built cabinets, etc.

The performance on Miles Davis' *Miles Ahead* CD obviously benefitted from abundant low-level detail - the sound stage had impressive width and depth without any of the images in it being 'stretched to fit'.

Head-bangers of both the Electronica and Classical varieties should also feel well at home. In spite of being a fairly petite speaker, the Gemini can shift plenty of air when called on to do so, and there's no risk of them squashing the scale out of, erm, 'louder' compositions. This is true whether it's *Sound Garden*, *The Prodigy* or *Wagner* passing through the system.

Upper frequencies were mercifully free of screech, and were evidently not being relayed through cheap tweeters with their limited ability to reproduce harmonic subtlety.

The Geminis are highly musical, entertaining loudspeakers that sound completely at home whatever they're fed. A few very minor quibbles apart, they're just as enjoyable to build, and for the money, it all adds up to an impressive kit.

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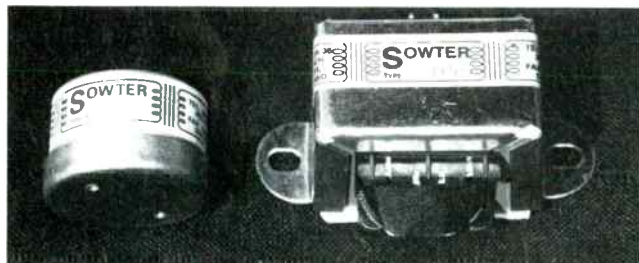
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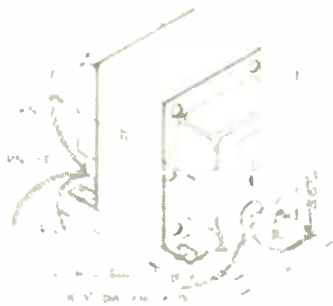
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Caught in the WEB

Jon Marks trawls the Internet for another haul of the best in DIY sites.

OUTPUT TRANSFORMERS

One area of valve amp DIY, which doesn't tend to feature strongly in current literature or Net sites is output transformer specification and design. You're more likely to find this sort of information in an electronics



design book from the Fifties or Sixties, covered more by equations and graphs than text, which can be daunting.

Two sites that attempt to demystify output transformers (amongst other worthy topics) are <http://www.diyaudio.8m.com> (run by Croatian Elvis Rakic) and <http://home5.inet.tele.dk/mcs> (run by Mikkel Corydon Simonsens, Denmark). While there's no escaping some mathematics in the calculation of parameters such as core area, number of primary turns, etc., both of these pages have boiled the number-crunching necessities down to a happy minimum.

If it's single-ended you're interested in, either site is a good place to begin your winding practice, whereas Mr Simonsens alone out of the pair covers push-pull.

A British site that handles the same topic can be found at

http://www.griffon.free4all.co.uk/transformer_design.htm, put together by Russell Sadd. His simple step-by-step guide will lead you through all the various calculations, and even includes a look at what goes into an interstage transformer (where things can get rather more complicated).

If you're dreaming of a 211 SE with a lower-frequency roll-off that starts at 20Hz, then you might want to give up your day job for a month or two, but producing lower-power and slightly less well-spec'd output trannies needn't be a nightmare. However, if there's a lesson to be learnt from these sites it is: get your transformers wound by a professional company, rather than going to the trouble of doing it yourself. Whilst a fascinating and crucial topic, even prototype winding requires machinery - then you have to choose and purchase core lamination and type. Not easy!

VALVES & SOLID-STATE

At <http://www.geocities.com/ResearchTriangle/8231/> you will find Andrea Ciuffoli's many and varied DIY valve and solid-state amplifiers, along with DACs and some loudspeaker designs. Once more, there's a healthy selection of original designs, including a 20watt push-pull amp with Svetlana KT88s and a 5842 with interstage transformer. This is an elegant piece of circuitry that uses

few components to achieve its aim. Of course, if you'd rather single-end, there's a couple of 300B amps as well as a PSE 2A3. And Output TransformerLess fans can feast their eyes on a 6C33C-B chassis whose circuit was originally based on a Technics idea but then evolved to become more of a Futterman.

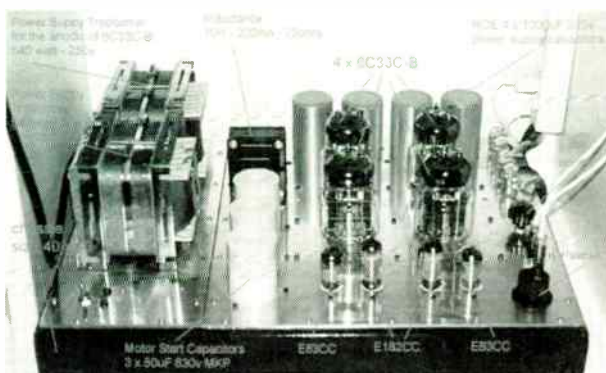
The solid-state section features a number of amps from Japanese DIY magazine MJ (from an extremely simple 5.5watt up to a 70watt class A/B design with a form of motional feedback control). There's a table of bipolar transistors and MOSFETs that are apparently the pick of the crop when it comes to specifically hi-fi use. And on the digital front, there's some very useful advice on transport and DAC chip selection (with some classics from Burr-Brown and Crystal), as well as sources for these parts.

TOM BROWNE'S SCHOOL DAYS

This Tom Browne is a student of software engineering at Sheffield University who's working on an interesting PC-based solution to the problem of creating an active speaker system with a digital crossover (<http://www.tbrowne.demon.co.uk/comp/projects/speaker.htm>)

In this case, after a close encounter with Meridian's DSP-5000, the result is an attempt to implement a similar system using (amongst others) a Hoontech DSP24 soundcard with 24/96 inputs and outputs in conjunction with a software crossover programme. This should allow the creation of crossover properties that would be completely impossible in the analogue domain.

After trying out a number of drivers, the current recipe is a pair of Morel MDT-33S



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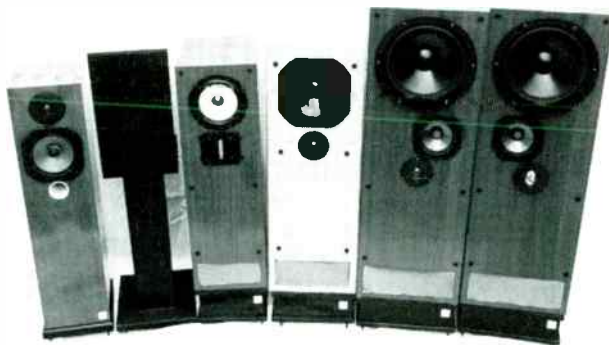
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INTERNATIONAL TRADE ENQUIRIES WELCOME

tweeters with Audax HMI30CO carbon-fibre mid/bass units in a small, sealed enclosure. The power amps are a pair of Arcam Alpha 8Ps. Thus far, the list of crossover types

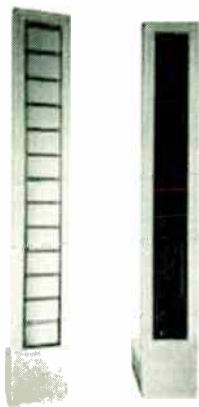


includes: fourth-order Linkwitz-Riley at 1200Hz, linear-phase FFT with subtractive low-pass, and brickwall with subtractive low-pass at 1000Hz. The code for all this processing has been written in C, but due to some interface problems with the soundcards, it still appears to be a work in progress. Preliminary sound quality results make for some engrossing reading if you're into crossover engineering though.

DYNAMIC 'STATICS

No difficulty can deter a DIYer - and there are plenty of them lying in wait for the electrostatic loudspeaker builder, including lethal voltages of course. Undeterred, these sites describe in detail how mountains are climbed. They offer a fascinating insight into the electrostatic loudspeaker as well as guidance and inspiration to anyone hoping to build one.

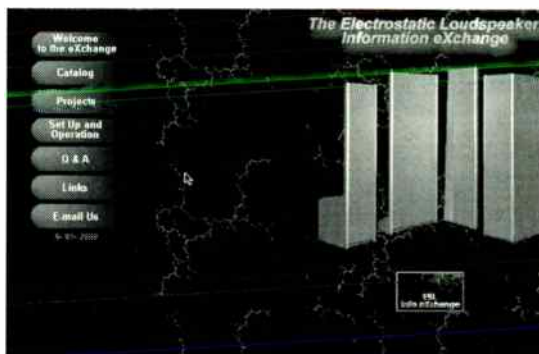
The first is <http://www.audiocircuit.com/9041-esl-circuit/9041/IMA1-DI.htm> wherein Hans Zeeuwe of the Netherlands relates his experiences



attempting to build a 1.5m near full-range ESL. Having initially come across DIY ESL information on Sheldon D Stokes' site, Hans then went on to build one of the three models in Elektrostatistische Luidsprekers by Eddie Fikier.

After a number of failed attempts - keep your workbench clean and never lose concentration are the messages here - and a couple of changes of HT PSU and input transformers, a workable set of speakers was finally produced.

For a more in-depth, from-scratch technical examination of what constitutes a successful ESL, another URL worth visiting is www.eskimo.com/~billb/esloud/eslhwt0.html (Mark Rehorst). <http://www.jps.net/eslinfo>, the



Electrostatic Loudspeaker information exchange, contains examples of work by respected designer Roger Sanders, well-known for both his ESLs and their matching Transmission-line bass cabinets, as well as plenty of other contributors' speakers. There's a wealth of information here on the various stator construction options, and it's all presented with the sort of enthusiasm that really makes you want to get up and build.

ON A PLATTER

If it's turntables of the belt-driven variety that set your head spinning, an expression of no-compromise DIY can be found at http://reality.sgi.com/cbrady_denver/audio/teres/teres.html. Acrylic seems to be the platter material of choice for many companies these days and, at three inches thick, you won't see many bigger chunks of it than the one that forms part of the Teres kit.

To support a mass of this magnitude takes a rather special

bearing, in this case a precision-machined stainless steel shaft three-quarters of an inch in diameter with a hardened ball bearing in the tip. Support comes in the form of a solid brass housing with a Delrin plate at its base (Teflon was considered but dismissed as not being sufficiently tough to handle the weight of the platter).

DC was seen as the only way to go when it came to motor choice, with Swiss firm Maxon providing the goods. The pulley is an aluminium confection formed to accept both belt and string transmission, its rotation steadied by a rather nifty regulator: "The output voltage is controlled by a micro-controller (Atmel 89C2051) and a serial 12-bit DAC. The controller measures the

rotational speed via a stroboscopic disc that's attached to the platter. Two control algorithms have been implemented. The first is a relatively fast PI controller that brings the platter up to speed quickly. After the speed

has stabilised the controller automatically switches to a very slow integrative algorithm that holds the desired speed. This second algorithm can only change the output voltage at a rate of some tens of millivolts per minute."

On the site, pictures demonstrate how a number of DIYers have approached the problem of mounting the Teres' parts on a plinth, with a couple of superbly professional examples.



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THE SOUND OF KT88

KT88 & 6550 valves reviewed by Gary Devon and Simon Pope.

Valve enthusiasts soon find that each make has its own sound. Our KiT 88 uses the Czechoslovakian Tesla KT88, which has a good reputation. We were interested in how the more economical Chinese KT88 and the Russian Svetlana 6550C compared. This latter valve is not exactly a KT88, but it is a direct equivalent - and a fine one at that.

The system comprised NAD's S500 Silverline CD player, our Series II Modular preamplifier, our upgraded KaT88 and UKD's Diapason's Karis loudspeakers.

Tesla, JJ branded KT88 price -£21.00 exc VAT

JJ Electronics are located in the Slovak Republic. They produce around 15 different valves, all geared to the hi-fi market, and are a good make of tube. Many companies use JJs, such as Quad in their new Quad IIs. Tesla produce all the familiar valves, ECC81 - 83s, E88CC, EL34, 6L6G, 300B and a few other less known types such as ECC832, ECC99 and 7027s. JJ are well represented through the world with many distributors. They also manufacture general use high voltage capacitors and a couple of hi-end valve amps, namely their JJ 322, 300B PSE monoblocs and their JJ253 pre-amplifier.

With the Tesla JJ branded KT88 valves in KaT88 there was a well balanced sound. Massive Attack's 'Protection' remained laid back (in the style of the track) but had an extra sense of immediacy due to the extra presence that the Teslas created. The bass had depth and slam when necessary. The balance between rhythm and phrasing was very impressive. Acoustic orchestral music in the shape of Mahler's Das Lied Von Der Erde sounded very intimate and realistic, with the emphasis on phrasing and line creating a musical reproduction.

Chinese KT88 price -£18.00 exc VAT

China is still a great user of valves, not just within the realm of audio. Their military is a great user of thermionic tubes, as is the communication's industry. Throughout China there are numerous factories. Some British companies have even invested in some of them. They all operate as private ventures, but the Chinese government, a large buyer of tubes, do have a certain amount of power over some of these factories. In fact, in order to purchase tubes in China you first have to pass through a government agency - unless you are truly in the know and can deal direct with the factory.

The USA has a lot of influence over Chinese valve production. The Chinese emulate EIMAC, one of the USA's largest valve manufacturers, when it comes to which tubes, which method of manufacture, etc., to use. Chinese valves usually cost less and I know they are selling well.

Partnered with our WAD Series II preamplifier, the KaT 88 amp with Chinese valves offered an extra ounce of richness to the sound. With Massive Attack's 'Protection' there was a firm and full bass line combined with good rhythmic control. Vocals became warmer and fuller whilst the backing accompaniment supported with an openness rarely found with solid-state amps. Orchestral music in the shape of Mahler's Das Lied Von Der Erde was spacious and clear with smooth strings and good transparency. **SP**

Svetlana 6550C price -£21.00 exc VAT

Svetlana Electron Devices, Inc. manufacture many valve types in St. Petersburg, Russia. They have a very good reputation and are represented throughout the world. Here they have incorporated the improvements from their original 6550B into one product, the new 6550C. It boasts:



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KaT 88 with Svetlana 6550c valves

The Svetlana valves found the KaT88 showing excellent detail and presence, mixed with a neutral transparency. Massive Attack had greater depth and depth and weight with the vocal line sounding exceptionally clean. The sound was slightly less rich than with the Chinese valves but more detailed and open. This was exemplified in the Mahler piece, as the sound stage extended further to the rear and an excellent stereo image was present. This extra space resulted in a more natural sound with high register instruments in the woodwind section, giving a more ethereal presentation.

All prices were provided by Edcoron they are subject to fluctuations.

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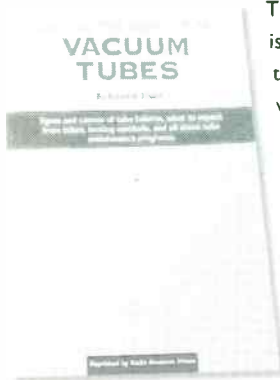
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BOOK REVIEWS

Getting The Most Out of Vacuum Tubes

by Robert B Tomer.

Reviewed by Gary Devon



This little book is unusual in that it is about why valves may fail in a given application, rather than why they work. It consists of ten chapters, plus a glossary of

terms.

The first three chapters plumb the mysterious depths of valve failure. Firstly catastrophic failures are examined, where the valve suddenly stops working, which as we know is quite often accompanied by a blue flash. Next are degenerative failures, which are those where the characteristics of the valve deteriorate over time in use. And lastly comes subjective failures which are hum, microphonics and noise. These are the most difficult to quantify.

Each of these opening chapters is concise and written in a logical and easy to understand way, with charts illustrating failure

against time for certain given conditions.

The next two chapters are concerned with valve characteristics, standardisation and valve selection. The statistical processes which are (or were) used to ensure reliability are explained in a very intuitive way. Today's manufacturer's would do well to read and digest this part of the book.

Another related subject is that of valve selection and military type marking. This is covered in an amusing way in chapter five, and especially chapter six. There are some valves which have a super-fantastic military number, including all sorts of W, A, B and C suffixes but which are EXACTLY the same as the commercial type. People say how much better the military version sounds than the commercial version, when in fact it's the same. Or, from another angle, there are newly manufactured valves out there which are marked up with the same markings as Mullard's absolute best, some including the 01 suffix, but which are of similar quality to those Mullard threw in the bin. These chapters will open the eyes of who read them, and may well protect the wallet as well.

Chapter seven is entitled "Predicting Tube Performance" and runs through the general, common sense principles of trying to figure out how long a valve is going to last in a given application. Of course it is impossible to come up with an exact figure, but understanding the different stresses put upon a valve in

different circumstances will avoid disappointment. There is an interesting chart in the book that relates lifetime to application. The following chapter is an overview of valve testers. In general what the readings mean and how to take them. No specific testers are mentioned.

Chapter nine is probably of minimal interest to the hi-fi enthusiasts since it covers thyratrons and such like. However chapter ten will be of the utmost interest, "Methods for Lengthening Tube Life". This is quite a short chapter but all of the advice is well founded.

Overall, this book is an excellent addition to the library. It will help hobbyists to understand why the anode voltage is 99.5V when the circuit diagram shows 100V, and it will help designers to ensure longevity of their products. It would also help today's valve manufacturer's offer a better product if only they would read it!

Getting the most out of Vacuum Tubes by

Robert B. Tomer

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see p76/77 for order form

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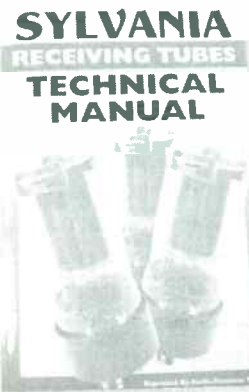
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Sylvania Receiving Tubes Technical Manual

Reviewed by Gary Devon



There isn't too much to say about this book because it is purely and simply a data-book.

Receiving Tubes means those that would be used in

equipment found in the home rather than industrial military or transmitting valves. This covers Audio, Radio and of course T.V. receivers. There is an

alphanumeric index of types at the front, but the American system is totally non intuitive when compared to the European (6BL8 gives no clue, whereas ECF80 does). This is of little consequence as you will probably be looking for a specific part number. The sheer number of valves in the book gives an indication as to the size of valve production in its heyday, this is just one manufacturer, and this is just the receiving manual....

The book contains data on most of the valves in common use today such as 6L6, 6DJ8, 5U4, 6AU6, 12AX7, 12AT7, 12AU7 and so on, but the amount of data is sometimes limited to a few lines of printed text rather than full blown characteristic curves. There is, of course, a myriad of other valves in there if you want to lie in bed checking out their figures. If all of the valves in the book had full curves attached it would be three feet thick

at least!

One interesting series of valves in this book are the Compactrons. They were rarely seen in Europe - check them out. Nuvistors are also in there, which have popped up in recent designs.

Receiving Tubes should be added to any serious valve-head's library not only for practical purposes, but also interest value.

Sylvania Technical Manual

by

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D.I.Y. LETTERS

Here are letters about the wonders of DIY, trying to make loudspeakers sound smooth enough to reproduce violin and why transistors are better than valves (eh?). From the World Audio Design Bulletin Board comes a serious study of over-weight electrons.

THERE'S MORE!

In his column last month Noel Keywood set out the principal benefits of DIY. He discussed how we can gain by using better components and techniques, but moving beyond this, DIY is more than the result of a cost / benefit analysis. DIY gives me a very active role in what would otherwise be a passive pursuit, and this activity actually brings about some important learning.

You learn about how things work, you develop an understanding of which things are critical (to you), and once you have developed this then you can tweak along more logical and potentially rewarding lines than say, adjusting the lay of your cables across the carpet?

My DIY interest is mainly loudspeaker building. Here, with a little understanding of how a passive crossover works, both major and minor changes to your loudspeakers' performance can be achieved. For less than five or ten pounds, a whole weekend can be spent experimenting with tweeter level setting! Few other interests give such a high level of reward for such a trivial outlay.

But as I said, there is more than just the cost / benefit thing. As you learn, your critical faculties grow too. If you have spent hours and hours adjusting this value and that of your collection of capacitors, inductors and resistors you become very sensitive to subtle changes.

There is a risk though. In my experience, by continually adjusting and re-adjusting your loudspeakers you can lose sight of

what you are aiming for. Your reference point drifts; I have found that almost all minor adjustments you make appear to offer improvements at first. So it's not long before you have moved quite some way from accuracy or neutrality (not that the search for absolutes in this area is necessarily of the greatest value).

So stay in touch with what you are searching for. As well as live music, visit all the hi-fi shows you can get to; re-establish a reference sound that you, as an individual, can work to. Get your mates in too, but don't accept everything they say because it's YOUR system, and YOU decide how it sounds - and with DIY you're in control.

Derek Rumble

Thanks for your reply Derek - I could not agree more. I deliberately covered just one particular benefit of DIY: the fact that you can rise above the quality level of anything commercially available, by using special components beyond the budget of commercial manufacture.

As you say though, DIY is an absorbing, educational and rewarding pastime too. Most hi-fi companies have been started by engineers/enthusiasts, so it can become a lifetime's vocation too.

On the subject of a reference point, it is true that some absolute standard is needed. This is one reason we are so keen on measurement. Our loudspeakers are fine tuned to a particular balance, but fundamental accuracy is a base value. **NK**

VIOLIN BLUES

I am writing to ask your advice as to whether it would be possible to replace the tweeters in my existing speakers (Rogers LS55) with Audax HD3Ps. I am very happy with the sound they make in the mid and bass, but have noticed that the high frequencies can be rather bright (I play the violin for a living and find a lot of hi-fi too hard sounding). Longer term plans are to go for valve amplification (hopefully one of your kits, if I feel brave enough to try and build it), but for the moment, funds don't allow. I'm using Arcam amps at present (Alpha 7 and 8P).

Obviously, I don't have the means to test the existing tweeters to see whether the Audax units would be similar enough to use. If I sent you one, would you be able to do this? If they are, could you sell me a couple of HD3Ps on their own? As my

essay.

The efficiency figure for my speakers is 90dB for 1.93V@1m. Is this another way of saying 1W@1m? If so, they are the same as your KLS3, which may help, although I don't know whether mine or yours use any resistors to control the tweeter. Crossover frequency response of the Rogers is quoted as 3kHz (18dB/octave). I haven't got inside the cabinets yet to have a look at them, as there's no point in pulling things apart until I know whether the ideas feasible.

I appreciate that I will probably have to suck it and see to some extent, but I'd like to know whether it would be worth trying before I spend any money.

Yours sincerely

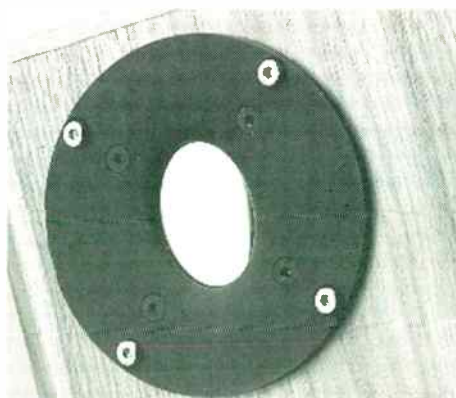
Laurie Harper

The bad news is that you cannot use HD3Ps in place of a normal tweeter, when the

crossover frequency is 3kHz (as it is in 99% of loudspeakers). The HD3P reaches down to 4.5kHz and must work with a midrange driver able to reach this far up the frequency scale, smoothly. It takes either a dedicated midrange unit to do this or

a high quality bass/mid, like the Audax HM170CO carbon fibre unit I used in KLS10 (DIY Supplement No37, June 1998).

The 18dB/octave roll-off of your Rogers is quite fast, so



'speakers have split crossovers for bi-amping, it occurs to me that I could buy the high frequency crossover components (assuming they are also split) from your KLS3 or 10 kit with them if nec-

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there would be definitely be a gap between the two. Subjectively the loss might not be great. You might only notice some slight softness and loss of detail, but it's a lot of money to pay for an imperfect match.

The HD3P comes with its own crossover, shown at right, and can simply be connected in. It is quite sensitive, so should just about match in this area. As you guess, 90dB at 2.83V (1.83 is a typo I suspect) means 1W input. The main design aim of KLS10 was to offer really smooth, sweet treble from a small, reasonably easy to build loudspeaker, but because the tweeters cost so much the final cost was high for a small 'speaker.

It might be better if you try and tame the Rogers a little by taking a look at the tweeter feed. If the tweeter is, say, 6ohms then a 1ohm resistor in series will introduce just over -1dB drop in output. Use a 1ohm, 3-5W carbon film type, placed in the lead to the tweeter. Do not solder direct to the tweeter; a push-on connector is usually used. Remove this and solder to it. See the diagram at right.

You can also try adding different capacitor values across the tweeter to roll off upper treble, starting with 0.47µF in series with a four ohm current limiting resistor. This rolls down the top end only.

You might also consider bi-wiring with one of the Van den Hul carbon based cables, like Royal Jade, since these smooth things out a bit.

I think we would all endorse your view that most commercial hi-fi is too hard and bright sounding,, and also rather monotonic, for lifelike reproduction of violin. Hard treble gives a fast, incisive sound that enhances Rock, a property that's beneficial in the view of many.

Quad electrostatics handle violin better than conventional loudspeakers. Otherwise, as you guess, the best solution is to use ultra high quality drive

units and a very smooth valve amplifier. **NK**

TRANSISTORS ARE BETTER!

I have never been able to understand how a valve amplifier with capacitors and transformers in the signal path can be considered to be more accurate and sound better than a solid state amplifier that has DC coupling throughout, and no capacitors or transformers in the signal path.

Single ended Class A should have no crossover distortion compared to push pull output stages. However a company known as Analogue Devices manufacture instrumentation grade operational amplifier chips for use in audio preamps which have push pull output stages. Their performance is exceptional and suitable for the most demanding professional audio applications. How can this

be as they are not made from valves and have class A/B push pull output stages?

I recently designed a Hi Fi preamp using these operational amplifiers and used a very simple method to assess their performance. I simply had the preamp in circuit and had several people listen to the sound quality. I then

by-passed the preamp and tried to detect any difference in the sound quality. No difference whatsoever could be detected by myself or anybody else despite exhaustive efforts.

Perhaps I have somehow designed the perfect preamp which seems to be as good as a piece of wire with gain ! This being the case how could it possibly be better if I designed the pre-amp using single-ended valve stages?

Is there a possibility that valve amplifiers produce distortions that are somehow pleasing to the human ear, but which are not true reflections of accuracy? If this is the case then perhaps accurate solid state amplifiers should incorporate a "niceness" control to make them sound more valve like by introducing a variable amount of this pleasant sounding distortion. More details of my seemingly perfect Hi Fi preamp and other designs can be found at www.g8rfd.freemove.co.uk.

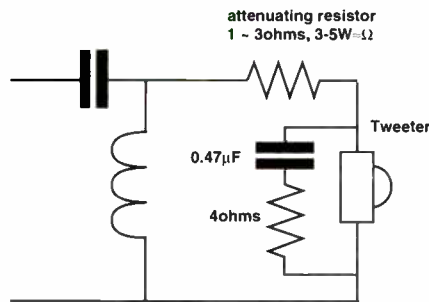
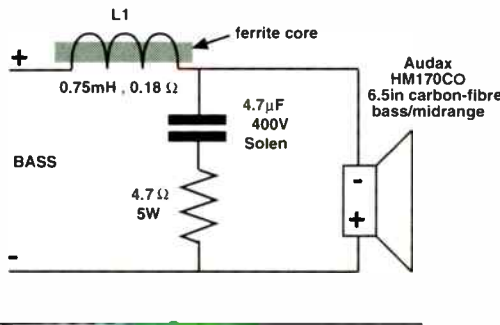
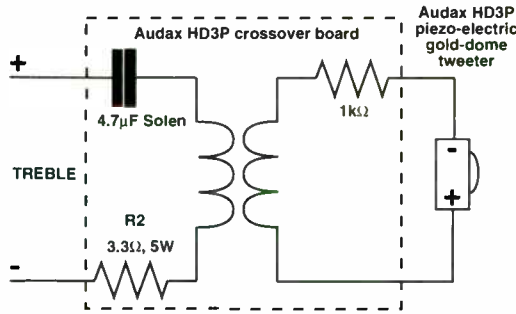
Cheers,

Phil Short

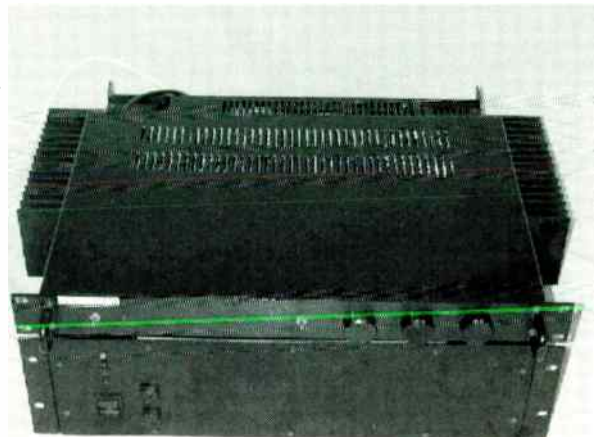
As readers will find by going to the web address, this letter was written to publicise your solid-state amplifiers, shown below. So it worked! You raise some points that are worth going over, even though they have been doing the rounds for over twenty years now.

Your words are those used by one of the first exponents of solid-state perfection, Peter Walker of Quad, who likened their amplifiers to "a piece of wire with gain". That was back in the 1970s. Quad were happy

KLS10 CROSSOVER



Filton Acoustics Hi Fi Products



to use integrated circuits, as are so many hi-fi amplifier manufacturers, Audiolab being another that comes to mind. They, like you, argued that these ICs have no affect upon sound quality. The trouble was, not every one else agreed.

The problem comes in listening tests. Your own are not very rigorous, and they are affected by your own interests and pre-conceptions. There are some intractable problems here that have lead to a lot of argument in the hi-fi business. To make tests more rigorous they become ever less realistic, with A/B/X switching, listening groups, listening sessions and what have you. I have conducted these and have taken part myself and well know that they place listeners under constraints, pressures and circumstances that are totally unlike normal listening conditions.

Back in real life there is relatively good agreement between people about how products sound, and it is dangerous to ignore the general experience. So, in a nutshell you really need to ask a few dedicated and independent listeners what they think of your pre-amp, ensuring they use reasonably balanced and revealing hi-fi systems. A local hi-fi dealer is a good first stop.

My own view is that the coarseness and granularity of solid-state devices comes from their essential non-linearity,

very high current densities stimulating colouration from both conductive and insulating layers, in much the same way cables affect sound quality. Then, of course, there are many more transistors than valves in an audio amplifier, to develop the feedback that's needed to correct their problems - not quite the rosy picture you paint is it?

If an amplifier needs feedback then by definition it isn't good enough in the first place, a logical paradox solid-state

devices cannot escape.

Valves, by way of contrast, conduct through a vacuum, so there's no contribution of noise or colouration here, and they have a very low current density. As our 300B amplifiers have demonstrated valves do not need feedback to make their performance acceptable for audio purposes. Your integrated circuits do, even from Analogue Devices, so by definition they are unsatisfactory for audio work. It is transistors that suffer distortion, not valves. You

forgot about feedback.

But let's be pragmatic. At the end of the day, if others like the sound of your preamps then they'll sell. Deltec (DPA) amplifiers were solid-state and sounded good. Just bear in mind that there's a bit more to hi-fi than soldering chips to a board. That's not the way you'll get the success you need to take over the now-abandoned British Aircraft Corporation works in Filton (where I studied engineering). **NK**

FROM THE WORLD AUDIO DESIGN BULLETIN BOARD

www.worldaudiodesign.co.uk

SUBJECT: FAT ELECTRONS

Posted by **Paul Barker** , Dec 11, 2000, 19:38

The following came up on a Lowther group, thought we could boost our discussion with these truth's, Lowther people don't lie!:-

"As everybody knows high power amplifiers use larger electrons to achieve this high power. The bigger electrons don't start or stop as fast as normal electrons resulting in much heavier, less nimble Watts. So high power amplifiers can never have the finesse of low power amplifiers. High sensitivity speakers only work with the smaller electrons (the smallest are produced by tube amplifiers). Thus if you use a high power amplifier with sensitive speakers you need a transformer that slims down the electrons and makes them swifter. Such transformers are available from Jenny Craig Audio Inc., Phenophile Corp. and the US Nuclear Agency."

Re: **Fat electrons**

Posted by **Richard** , Dec 11, 2000, 23:39

Makes sense but there's an easier way of doing it than using a transformer to match a big amp to sensitive speakers. You can use a "potential divider" which, as everyone knows, is made of a big resistor and a smaller one. The small resistor only lets through the little electrons to the speaker whilst the big one lets the fat electrons through to earth where they can't cause any trouble. To decide whether you need a PD or transformer use the formula for relative watts, W_r,

W_r = (Cabinet volume x amp watts)²/number of valves
Any result over 400 is serious.

Audio Link	IFC	Cricklewood Electronics	6	Sowter Transformers	12
Audio Xpress	4	Falcon Acoustics	12	Sugden	IBC
Billington Export	IBC	Glass Audio	6	Technical & General	12
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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
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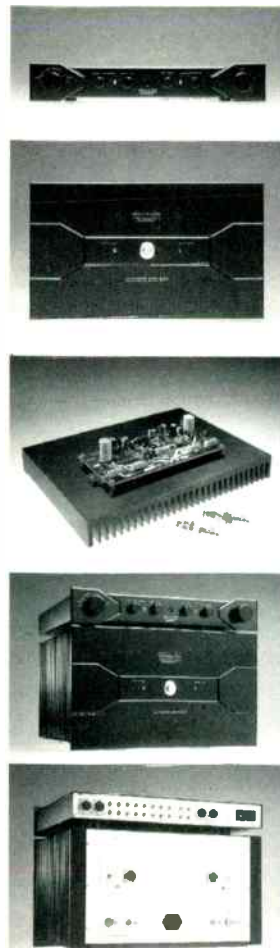
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