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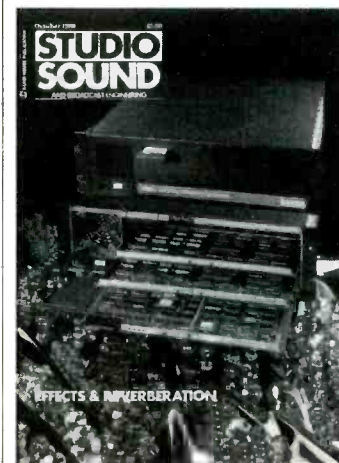
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EDITORIAL

EDITORIAL

This month's comment from Keith Spencer-Allen

You took the words right out of my mouth

As with most other areas in pro-audio at the moment, there is a divergence of development in the effects market-place. This issue is designed to show this as clearly as possible. For opens the Lexicon 480DL featured on the cover is one of the most advanced signal processing devices available—hardware and software updateable and with user programmable and removable cartridges for those personal programs. In the update article we look at recent effects and reverb processors introduced over the last year, and finally in the review section we look at a number of low end non-programmable units that will also have a lot of appeal to possibly the same users as the cover products but for completely different reasons.

This divergence has become well recognised but complicated by the ripples throughout the complete industry caused by the Yamaha SPX90 processor. I sense a realisation by the manufacturers and studios that they are going to have to keep right on their toes all the time with such changes occurring. One issue that has come to a head recently, however, is that of sampling. In terms of the recording studio and musicians' environment, sampling is a well established technique but with the customary time lag it is only now that the ethics and the copyright concerns are surfacing.

Copyright in performance and composition is well established in most countries throughout the world. Sampling of sounds from copyright works does, however, not contravene any copyright as a single sound cannot comprise a performance. The compact disc provides an excellent sampling source and we are now beginning to hear the apocryphal tales that nobody is doing any new sampling from real instruments and that every new recording just samples from a previous recording—Phil Collins' drums everywhere!

There is no way that ownership of samples can be proven unless we are going to encode frequency notches into all our recordings so that we can analyse everybody else's recordings to see who has stolen our sounds and this is not practical. I fully sympathise with the artist/producer/engineer who has spent days over creating a sound and then have it ripped off in seconds with no effort by an unscrupulous copyist.

Is this situation all that new? The answer has to be no. Tape loops have been an integral part of electronic music for many years and these were often taken from other sources. Successful sounds have been copied for years although it has admittedly never been so easy to copy.

There is really no way that there could ever be any copyright on sound samples from a practical point of view. For instance recording a TV interview in the street usually requires recording the ambience of that location to create the necessary atmosphere for the interview performance which is a kind of sampling or even worse—it is more than just a single sound sample—a continuous performance. Can you imagine the problem that there would be in collecting names and performance waivers from everyone whose feet made click clack on the pavement, cars that passed in the street, aircraft that passed overhead—let alone the costs that would be involved. This is the case as the news report would have copyright in its entirety and the ambient sounds become an integral part of the copyright—a situation I see as similar to the musical sampling issue. Apple Records placed ads in the UK music press in the late '60s for John Lennon and the Plastic Ono Band *Give Peace A Chance* single quite simply stating 'You Are All The Plastic Ono Band'. This of course generated the expected avalanche of letters—"If we are the Plastic Ono Band when can I expect my royalty cheque?" If you start playing that game, you have to be prepared for the consequences.

There is a serious side to this however. According to *Billboard*, August 2, the US musicians union has reported a drop in total musician sessions fees for the eighth successive year and they are claiming that the most recent drop in earnings is fairly closely attributable to sampling. There is also a case under consideration in the US at the moment involving a dispute between a conga player whose drums were sampled by Jan Hammer and used in the *Miami Vice* signature theme. The conga player is now after some form of remuneration for his 'work'. There has even been a suggestion that there ought to be a sampling union rate for sessions used for sampling. There is of course no way that such situations could be disciplined and they are therefore quite unworkable.

A personal suggestion would be that we encourage as much sampling as possible so that we get it out of our system and use it just as another tool. If all recorded sounds sound the same then there is only one way to go—try originality.

PS *Billboard* August 9 carries a feature in which the sampling issue was presented to nine US copyright experts; all but two were of the opinion that sampling contravened copyright and in particular section 114 of the USC 17 of the US copyright law covering derivative work! □

STUDIO SOUND

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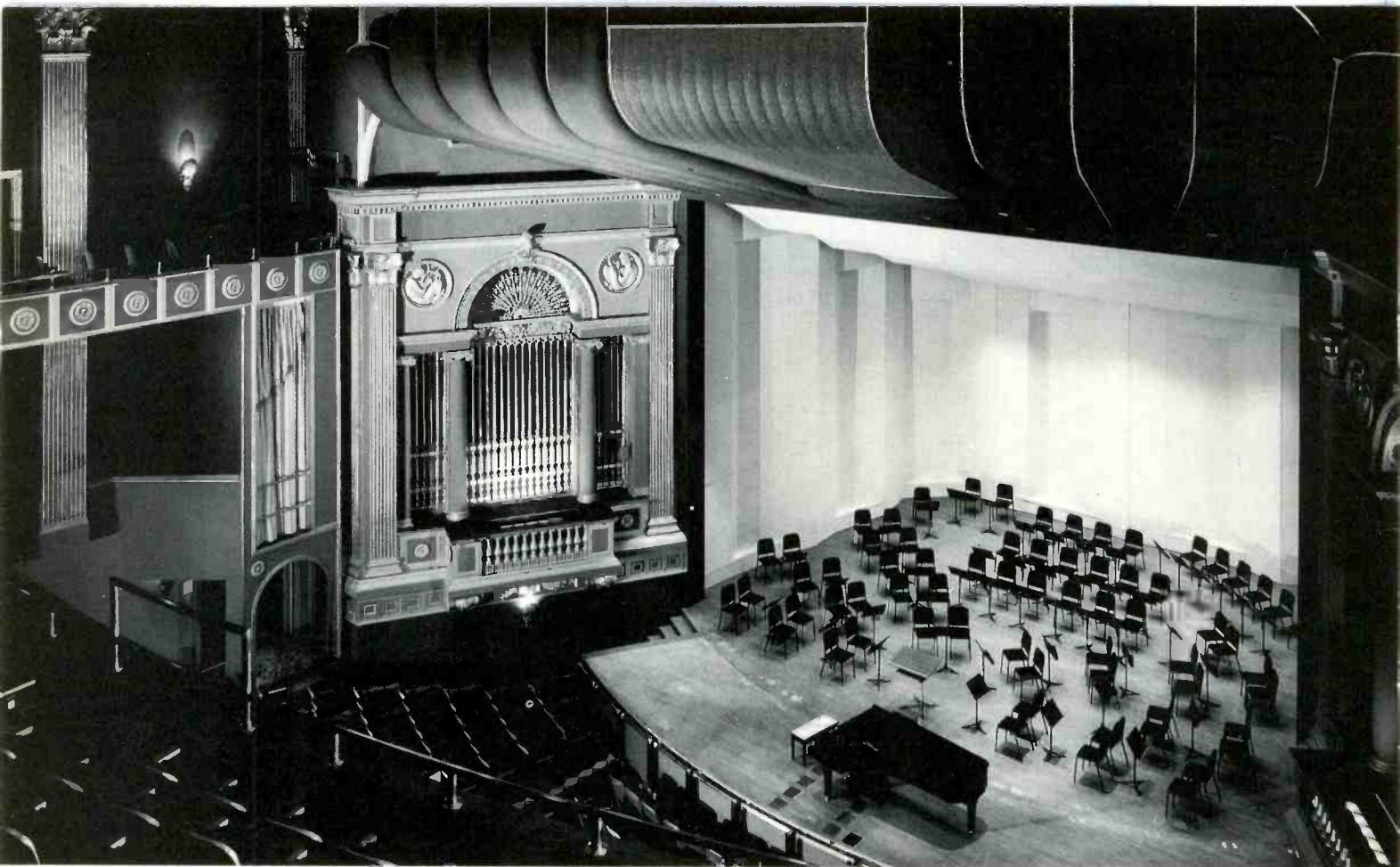
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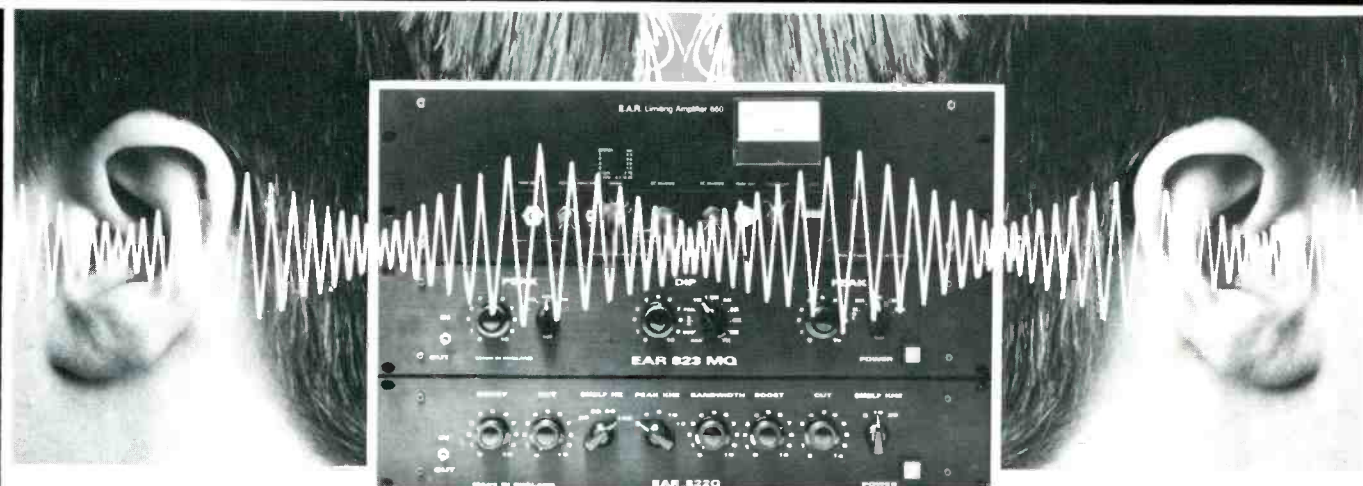
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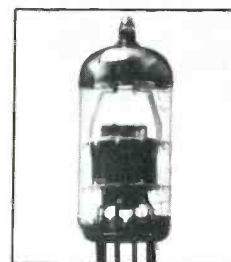
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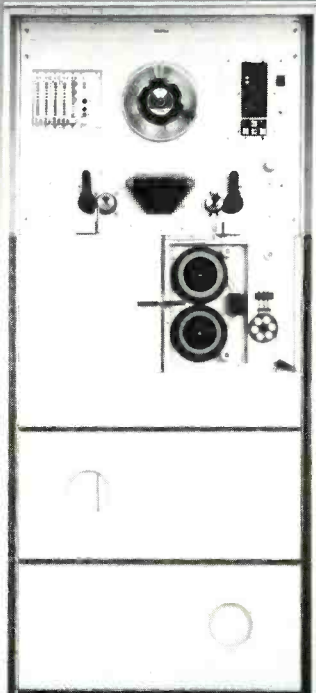


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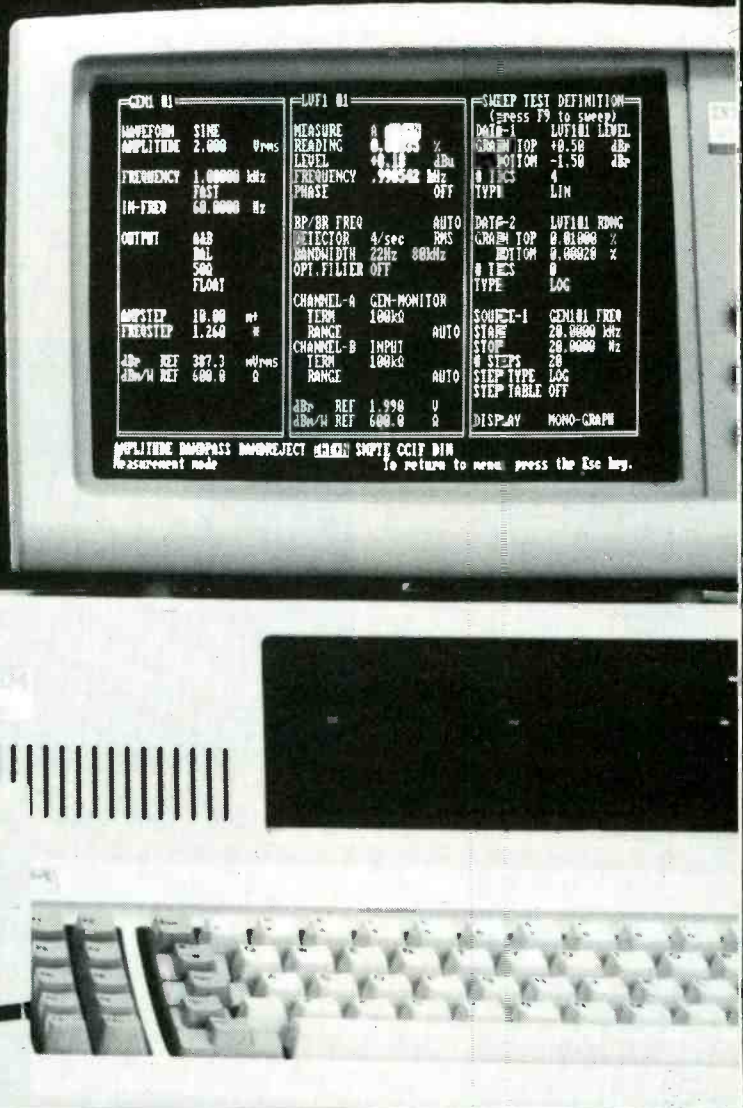
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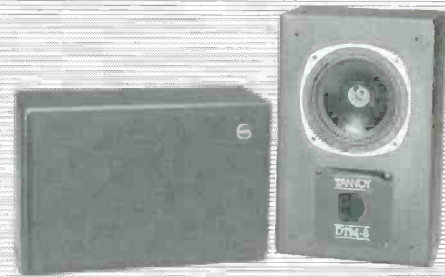


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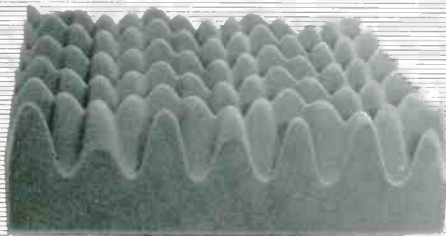
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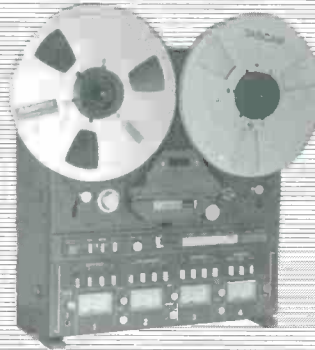
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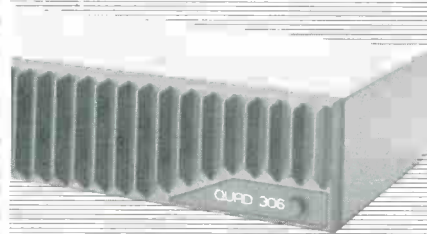
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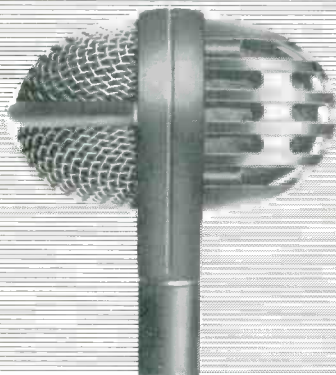
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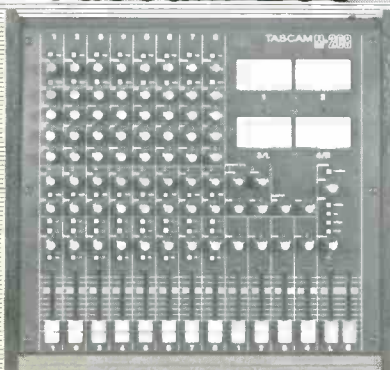


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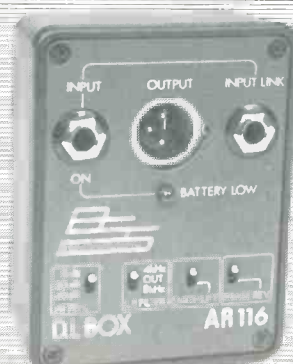


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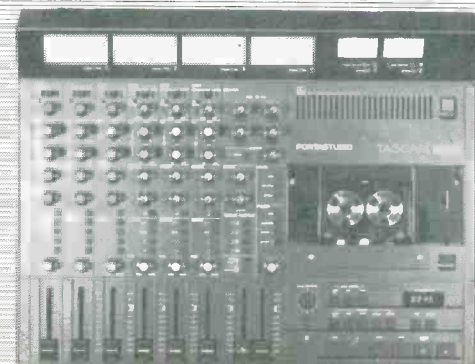
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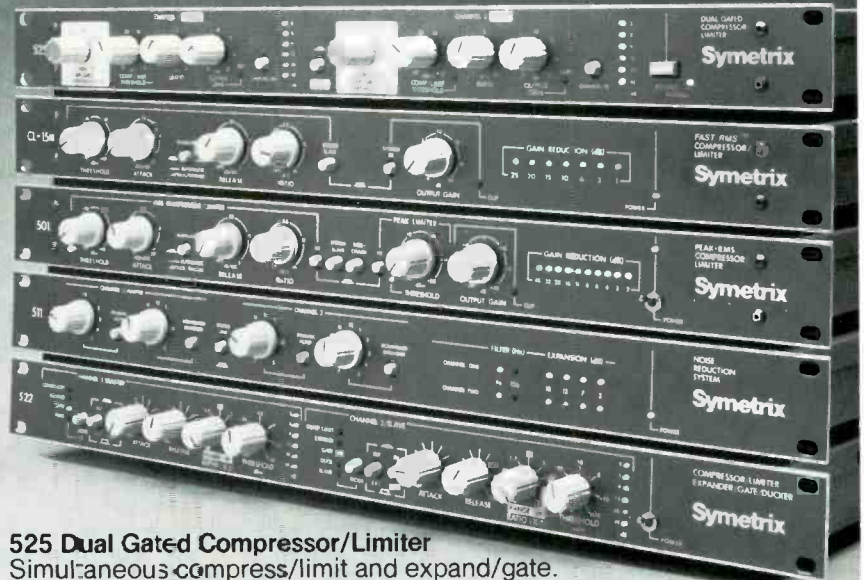
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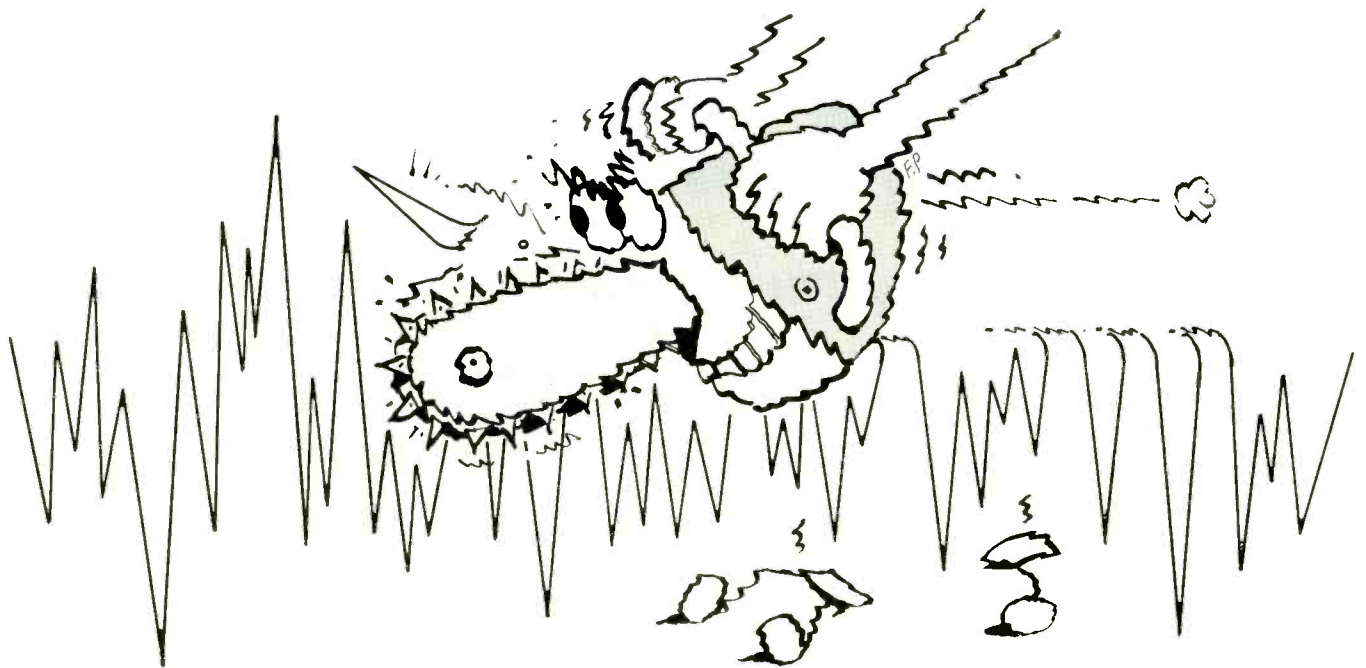
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You can run hotter levels to maximize signal-to-noise levels without fear of overloading your recording or transfer mediums.

The Dominator is ideal for *any* situation where clipping is a problem, such as digital audio, disc mastering, video post production and film. Stop massacring your sound. Ask your audio professional for a free trial of the Aphex Dominator. Once you've heard it, you'll never be satisfied with your old limiters.

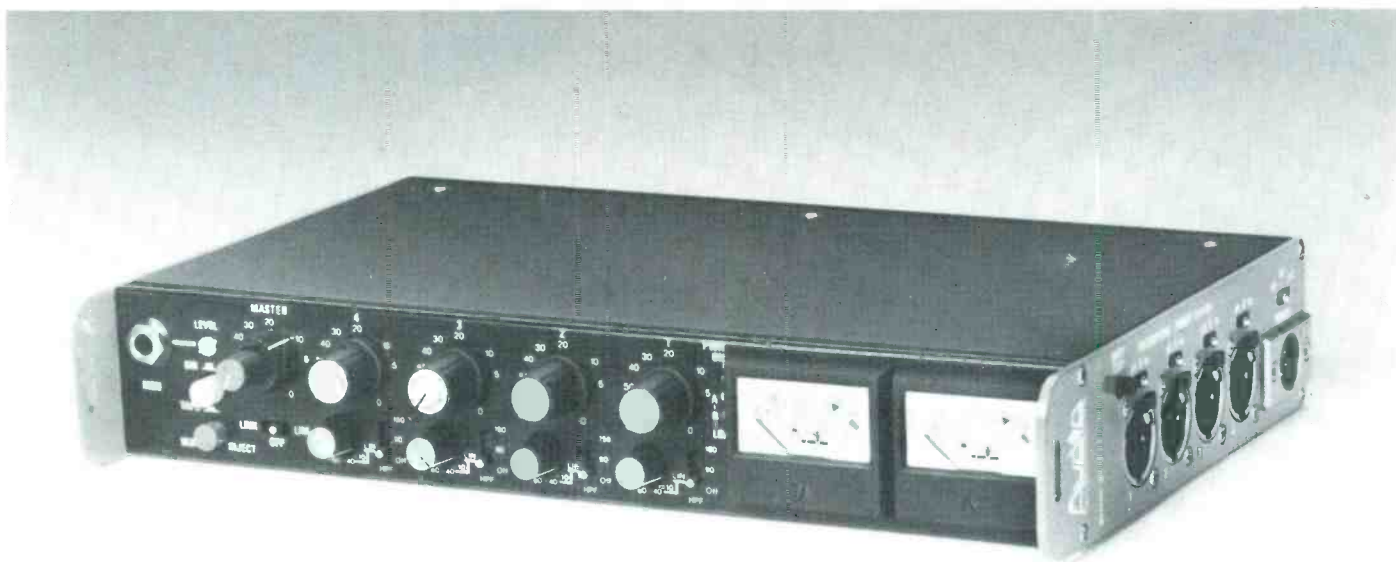
- Provides Absolute Peak Ceiling.
- Total transparency below processing threshold.
- Increased loudness
- Freedom from spectral gain intermodulation
- Minimal loss of transient feel
- High density capability
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- Multiple applications
- Made in U.S.A.



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Dominator is a trademark of Aphex Systems Ltd.

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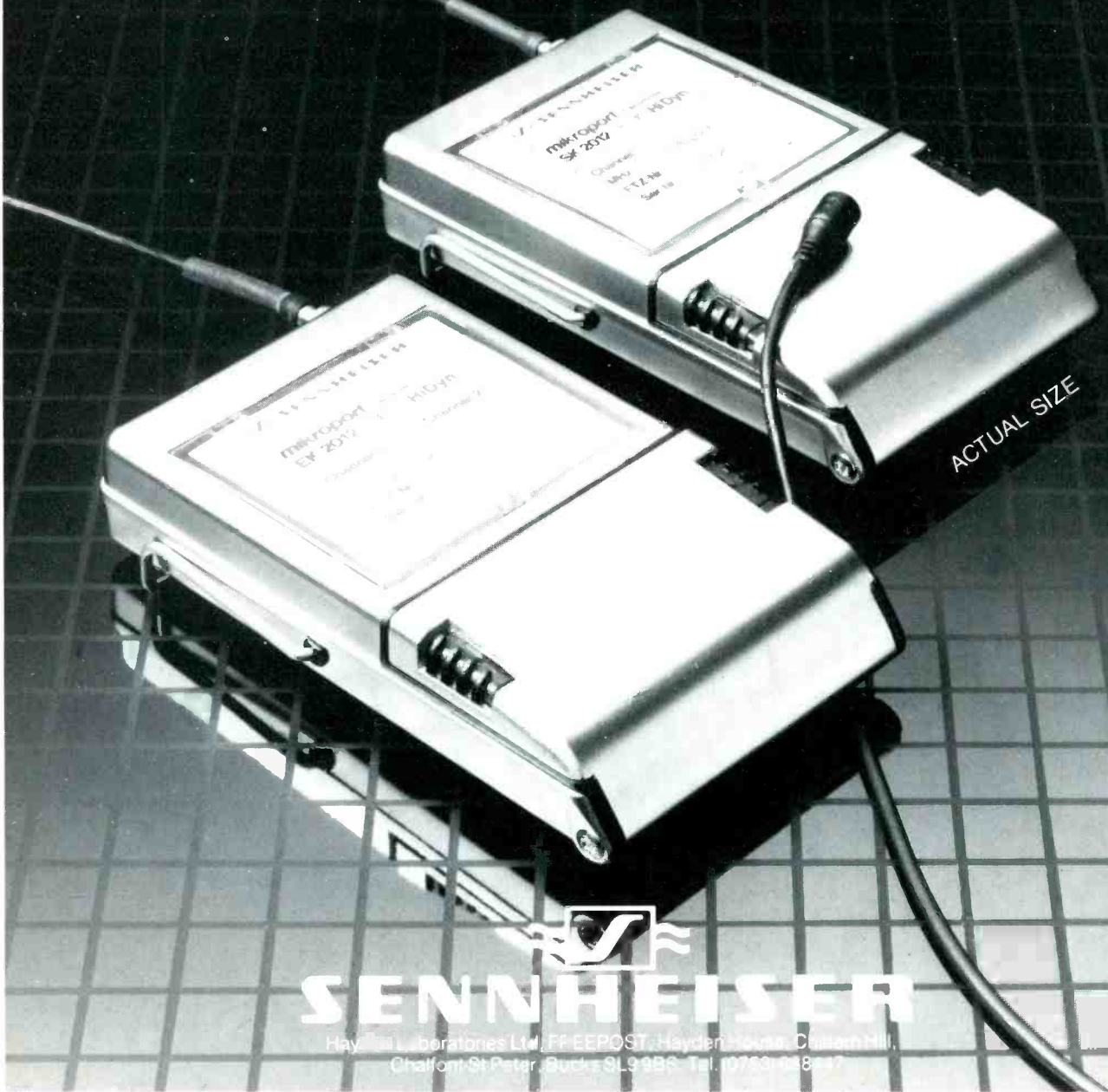
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Sennheiser manufactures an extensive range of Radio microphones and audio products. Please tick the appropriate box if you would like information on the following.

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SS/10/86



At Hilton Sound, we're ready to do battle with the roughest conditions to get the best in audio equipment to people who can appreciate service out of the ordinary.

Even to the hell of the French Riviera in July. The brave lads at Hilton didn't flinch when stout hearted volunteers were needed to truck a cargo of digital audio recording gear down to Jacques Loussier's Miraval Studios in le Val.

If Spandau Ballet want the best in audio equipment in the far wastes of the Côte d'Azur then who are we to complain? Must be downhill all the way to the South of France though,

because the lads seemed to take a lot longer getting back than they did going. Seriously though, the odd glass of Chateau Miraval beside the studio pool was well earned R & R after breaking our own records delivering and troubleshooting the installation.

That's the philosophy Hilton Sound's reputation is built on. Delivering the best service and equipment to our clients. Whenever,

whatever and wherever they want it. We could do the same for you. Ring Andy at Hilton Sound and find out how we can make your life easier, no matter where you want to send us.

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622B Parametric Equaliser

An exceptionally versatile EQ which has become the standard in studios, broadcast and road shows.

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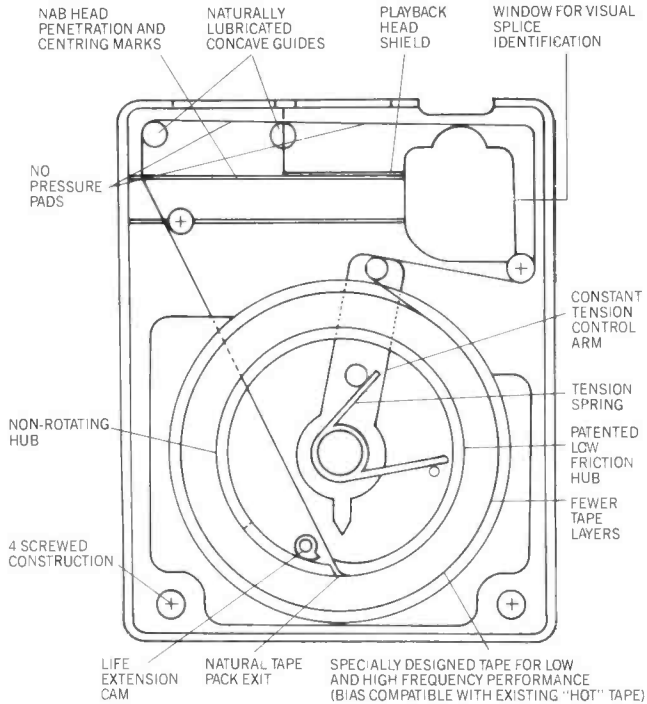


Scenic Sounds Equipment Marketing Ltd

Unit 2, 12 William Road, London NW1 3EN. Tel: 01-387 1262 Telex 27939

Belgium Trans European Music (Bruxelles) Finland Studiotec (Espoo) France 3M France SA, Mincom Div (Paris) Germany Estemac (Hamburg)
Germany Hausman Electronic (Berlin) Greece Audiolab (Hellas (Athens) Holland Cadac Holland (Hilversum) Italy Audio Products International (Milano)
Norway LydRommet (Oslo) Portugal Amperel (Lisbon) Spain Singleton Productions (Barcelona) Sweden Tal & Ton (Gothenburg) Switzerland Audio Bauer (Zurich)

ScotchCart™



the cartridge revolution

The ScotchCart from 3M brings a revolutionary new design and a new tape quality to broadcast cartridges. This double breakthrough means you can now equal the frequency response of professional reel-to-reel performance with a cartridge that lasts up to five times longer than conventional designs.

Cartridge design has no pressure pads and incorporates a non-rotating hub. This improves troublesome tape guidance, tape wear, modulation noise and eliminates hub rattle. It also minimises wow and flutter and over-shoot of stop cues.

The new lubricated studio quality tape offers high output and low noise for recording at high levels without performance loss.

For the full story, just contact F.W.O. Bauch Limited.

3M



F.W.O. Bauch Limited

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“Abbey Road Studios loved us, yeah, yeah, yeah.”

Abbey Road, probably the most famous studio in the world, chose the Calrec UA8000.

THE CLEAR SOUND CHOICE

“Puk Studios thought we were pukka.”

Puk Studios, probably the most talked about facility in Scandinavia, chose the Calrec UA8000.

THE CLEAR SOUND CHOICE

Now you've got a clear choice, which is great to hear.

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Calrec by ams, Calrec is a division of AMS Industries plc. AMS Industries plc, AMS Industries Park, Billington Road, Burnley, Lancs. BB1 1 5ES.

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Telex 63108 AMS-G Attention CALREC.



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In July 1985 Edendeck Ltd became AMS Industries plc

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The NFA-1 is the simple, easy and reliable way to do audio tests. 3C measurement modes, max. frequency 200 kHz.

High versatility: ★ selective and wide-band level meter ★ phase and frequency meter ★ noise level meter ★ distortion and difference frequency meter ★ wow & flutter ★ runup time and rumble-voltage meter ★ signal generator. No need to bother with piles of equipment and masses of cable.

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 a sales engineer

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DIARY DIARY

People, events, services

China Stage & Sound Exhibition

Hosted by the China Council for the Promotion of International Trade (CCPIT) Beijing Sub-Council, the China Stage & Sound '86 will take place between December 1st to 6th, 1986, at the Beijing Exhibition Centre, People's Republic of China.

The exhibition will cover theatre, sound, lighting, film and television production equipment. According to the promoters, representatives of exhibiting companies will have the unique opportunity to meet key officials from China's most influential cultural organisation, in addition to purchasing agents and end-users.

The Ministry of Culture and

The Ministry of Television, Radio and Film have both officially endorsed the exhibition. These ministries are committed to the enhancing of cultural life through the upgrading of the technology of the 3,000 theatres and theatrical groups, 40 television stations and 80 radio stations that currently exist.

The exhibition is organised by the China Expo Management Corporation (6 East 39th St, Suite 700, New York, NY 10016) and co-ordinated in Europe by Nigel Clarke, Pressplan Marketing Ltd, 17 Verulam Road, St Albans, Herts AL3 4DA, UK. Tel: 0727 33291. Telex: 24492.

Agencies

● BASF has appointed GAB Studio Services, with offices in Ayr and Minishant, as Scottish distributor for professional tape products.

● Soundcraft Electronics Ltd has appointed Park Industrial Exports Ltd as their sole and exclusive dealer for Turkey, handling the entire range of Soundcraft mixing consoles, tape machines and power amplifiers. Contact Moiz Fresko, Park Industrial Exports Ltd, 73 Upper Richmond Road, London SW15 2SZ. Tel: 01-870 0051/3.

● John & Ivor Arbiter Ltd have been given exclusive UK distribution of Shiino Corporation products including the Vesta Fire ranges. They have also been appointed to represent Dynamix and RAM mixing consoles. John & Ivor Arbiter Ltd, JVC house, Eldonwall Trading Estate, Staples Corner, Priestley Way, London NW2 7BA. Tel: 01-452 1132.

● Harrison Systems Inc has appointed three new US dealerships for its broadcast console line. Bradley Broadcast Sales, MD; Broadcast Supply West, WA; and Crouse-Kimzey, TX.

● Elliot Brothers have been appointed UK distributors to theatres and broadcasters for the Renkus Heinz Smart loudspeaker systems. Elliott Bros. Ltd, Osney Mead, Oxford

OX2 0ER. Tel: 0865 249259.

● Pacific Communications Systems Ltd of Auckland, New Zealand has been appointed exclusive dealer for the Texan manufacturer Logitek's broadcast products in New Zealand.

● TracSystems, manufacturer of professional high speed cassette duplicators, has appointed Clyde Electronics Ltd as distributors in Scotland for the CD201 cassette duplicator. Clyde Electronics Ltd, Unit 45, 3 North Avenue, Clydebank Business Park, Clydebank G81 2LA. Tel: 041-952 7950.

● Audio Kinetics has appointed SCV Audio to represent their product range in France. SCV Audio, BP 50056, ZI Paris Nord II, 95947 Roissy Charles de Gaulle, Cedex, France. Tel: (1) 4863 2211.

AK has also been setting up a UK dealer network for the recently introduced *Pacer* chase synchroniser. Companies recently appointed include CTI, 118-120 Lower Rathmines Road, Dublin 6, Eire; Synchrotech, 66 Rochester Place, London NW1 9JX, a sister company of Multitrack Hire; Raper & Wayman, 34 Danbury Street, London N1 8JU and ITA, 1 Felgate Mews, Studland Street, London W6 9JT.

APRS news

● The APRS has completed its work on the design of colour-coded labels for tape boxes.

Working in conjunction with the Producers Guild the final designs are to be made available in the form of gummed labels in special dispensers. The new system is designed to avoid confusion between various 'masters' and production copies and the APRS hopes the system will be adopted internationally.

● The Technical Sub-Committee is to go ahead with the organisation of a series of new technology seminars. This will concentrate strictly on the latest technological developments and will only be open to APRS members. The first of these new seminars will be held towards the end of September and the first topic will be Dolby SR.

● Edward Masek has accepted an invitation from the Executive to retain his role as organiser of the APRS '87 exhibition. It is expected that he will assist the new secretary who is expected to be appointed in September or October.

● At the APRS AGM the APRS '86 show was acclaimed as the best ever and the move to Olympia 2 was voted a resounding success. The organisers felt confident that the show, which was fully booked in 1986, will continue to expand and the possibility of booking a further floor at

Olympia 2 if required would be considered.

● The next APRS show may be four days instead of three. A provisional booking for the Saturday has already been made at the request of some exhibitors and other APRS members. It will be confirmed if sufficient exhibitors agree to the change.

● At the 33rd Annual General Meeting held on July 8th, Phil Dudderidge, chairman and managing director of Soundcraft, was voted on the committee. He replaces Peter Tattersall, formerly MD of Strawberry Studios. Re-elected were Roger Cameron (representing Tony Faulkner's Green Room Productions), Bob Hine (BASF), Bill Foster (Tape One Studios), Tim Cuthbertson (Audio Rents), Ken Townsend (Abbey Road Studios) and Simon White (Marquee Studios).

● At an Extraordinary General Meeting which preceded the AGM a recommendation from the Executive that a division of the APRS should be created under the name British Record Producers Guild was approved. It is felt that this development will strengthen links with producers and will lead to an improved understanding of the relationship between rates charged in the studio and the capital costs involved.

Sony D³ Club

Sony Broadcast is setting up a UK digital users' group. The group's foundation, announced at the APRS, is in response to the growing number of UK professionals using DASH format recorders and CD mastering systems. The club takes its title from the three 'Ds'—DASH, DAT and Digital.

Initially the D³ Club will be limited to sound engineers, hire companies, producers and musicians based in the UK. Meetings will be based on informal forums that will include the presentation of new equipment and ideas, thoughts on how revisions and improvements can be made, appraisals of operational and service requirements and, significantly, the discussion of

studio techniques using digital.

It is anticipated that there will be two D³ meetings a year. The inaugural meeting which was in July will be followed by a second meeting planned for November 26th. In order to keep the emphasis on DASH it has been agreed that the club will be geared to large scale users of digital recording equipment rather than the ubiquitous *PCM-F1* and *PCM-701ES*.

Although the organisation of the D³ Club is initially down to Sony, it is planned that the group will eventually finance itself and exert independent pressure on the manufacturer as time goes on.

Low-cost digital audio comes of age.

The Sony PCM series has now been available for several years. In this time recording and broadcast organisations, government, educational and industrial establishments, as well as individual users have all acknowledged the unique value of these units, and made them a new standard. It is the superlative quality of Sony PCM digital, coupled with extremely low cost that has brought about this professional acceptance of the range. This is borne out by the number of new ancillary products from other manufacturers, that have further increased the flexibility and versatility of the range. Examples of these products are the 'CLUE' logging and editing system from HHB, as well as various interfaces which allow digital communication with the PCM 1610.

Sony has acknowledged that this acceptance by professional users necessitates a change of

policy towards these products. Accordingly they have upgraded them from the domestic catalogue, and, realising the need for professional support and all that that entails, have appointed HHB as specialist dealers to represent them in the pro-audio market.

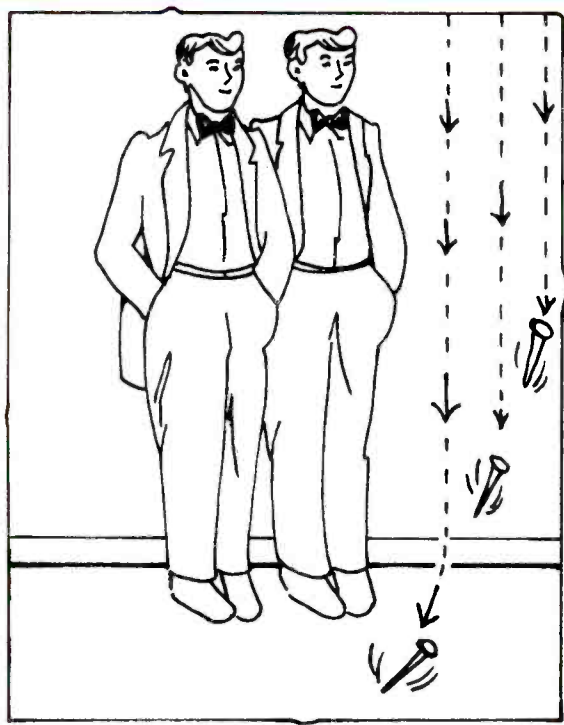
We are proud to announce this appointment, and happy to assure our customers of continued availability of the PCM range. The re-instatement of the PCM production line has been very largely due to pressure from end-users, who are after all the motivating force in the audio world. So if you are involved with audio recording and are still unfamiliar with Sony digital, then you owe it to yourself to call HHB – the No. 1 name in Digital Audio.

SONY FROM 

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We can supply all your U.K. audio hire needs from a noise gate to a complete multitrack recording pack. Our full range of equipment is also available in Europe, contact our new German office at the address below.

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DIARY DIARY

People, events, services

Contracts

● EMI Abbey Road studios has chosen a Calrec UA8000 music console for installation in Studio Three. This will be the first UA8000 console to be installed in the UK and the first delivered after the merger with AMS.

● As a result of efforts by Dr Martin Wesley-Smith, senior lecturer in composition and electronic music at the New South Wales State Conservatorium of Music, a Fairlight CMI has been donated to China's Beijing Central Conservatory as a cultural exchange gift. With

the help of the department of foreign affairs, the music board of the Australia Council and the Australia-China council, a substantial discount from Fairlight themselves and organisation effort of Musica Viva the exchange took place last June.

● Denmark's Puk Studios have decided to install Sony and Mitsubishi digital equipment. The facility now has two Mitsubishi 32-track and three Sony 24-tracks as well as two Fairlight CMI series IIIs.

People

● Audio Precision has appointed Adolfo Rodriguez as marketing product manager for the System One audio test equipment; he was previously responsible for marketing Tektronix audio test instruments.

● Audio Kinetics' Suzanne Foster has been appointed marketing co-ordinator whereby she will continue to work with David Neal administering advertising and organising exhibitions but will also be responsible for generating and co-ordinating the company's PR.

● John Kaposi has been appointed group technical

director at Vitavox where he will be responsible for creating a combined technical department for all three subsidiary companies.

● DeltaLab, pro-audio division of Analog & Digital Systems Inc has promoted James D Sullivan, formerly assistant sales manager, to director. He replaces Richard E DeFreitas who is to devote his time to engineering.

● Alpha Audio has announced the promotions of Carlos Chafin (formerly creative director) and Robert Tulloh (formerly director of R&D) to vice-presidents of the corporation.

In brief

Strand Lighting has a new telephone number: 01-560 3171. Other details including telex, fax, direct line numbers and address remain the same and other Rank trading companies on the Brentford site will retain the old number: 01-568 9222...

As of August 1 **Precision Instrument Laboratories** (PIL Ltd) ceased trading to become part of Instruments Electrical Co Ltd. IEC will then deal exclusively with the home market for both the repair and supply of test and measuring instruments. A new company called PIL International has been formed and will trade exclusively with the export market...

Cristofori Pianoforti, UK representative for Fazioli of Italy, has announced the availability of their pianos on a rental basis. Further details

from The Secretary, Cristofori Ltd, 20 Conduit Place, London W2. Tel: 01-402 4304...

Carlsbro has opened a new professional audio division in Mansfield, Notts. The demonstration room has been developed along control room lines. A 264-point jackfield allows access to around 50 outboard units including products from Drawmer, Bel, Lexicon, Symetrix, dbx, ElectroSpace and Aphex. CPA are also the sole Midlands representative for TAC consoles.

Calsboro Sound Centres Ltd, 182-184 Chesterfield Road North, Mansfield, Notts NG19 7JD, UK... **Studio 301** are now on electronic mail. They are the first Australian studio to sign on to the Australian Management Communications system of IMC/ESI. Their ID is EMI-STUDIOS-AA.

DIARY DIARY

People, events, services

Edge Technology buys Turbosound and BSS

The Edge Technology Group Ltd has acquired The Turbosound Group of companies and Brooke Siren Systems. The new holding company will be based in the UK with offices in New York and Tokyo. Michael O'Flynn has been appointed chairman and directors of Turbosound and Brooke Siren Systems are to be principals in the new company.

Although Turbosound and

BSS will be based at the same head office they will continue to operate as separate companies.

Edgetech, as the group will be known generally, will be making further acquisitions but as yet no specific indications of their interests have been hinted at.

The Edge Technology Group Ltd, 202-208 New North Road, London N1 7BL, UK. Tel: 01-226 0099.

AMS merger

AMS Industries plc has announced a proposed merger between themselves and Calrec Audio. Under Stock Exchange rules AMS are to call an Extraordinary General Meeting to consider, and if thought fit, pass an Ordinary resolution enabling AMS to acquire the whole of the issued share capital of Calrec.

At the present time AMS has offered £1,600,000 for Calrec, £360,000 to be satisfied by the issue of fully paid new Ordinary Shares of 5p in AMS and the balance to be paid in cash from AMS's existing cash resources. In addition an additional profit bonus may become payable under the service contracts for certain executive directors. The day to day activities of Calrec will remain under the control of three executive directors—K Farrar, D S Jagger and G M Waddington. C Beaumont and K Ellis are due to retire from the Calrec board in

January 1987 and March 1987 respectively. After the merger AMS will continue to trade as AMS Industries plc. All Calrec products will be promoted as 'Calrec by AMS'.

Both AMS and Calrec are currently heavily involved in research and development of digital audio techniques and a sharing of skills and understanding is felt to be beneficial to the group and for the industry as a whole.

In addition to the advantage of a shared research group the close proximity of the two companies should allow a trouble-free relocation of all Calrec operations in Hebden Bridge to the new AMS headquarters 14 miles from the existing Calrec premises.

Forthcoming events

September 19 to 23 International Broadcasting Convention, Brighton, UK.

October 1 to 2 Sound Comm 86, New Century Hall, Corporation Street, Manchester, UK.

October 28 11th Sound Broadcasting Equipment Show, Albany Hotel, Birmingham, UK.

November 6 to 9 Institute of Acoustics 2nd Annual Conference: Reproduced Sound, Hydro Hotel, Windermere, UK.

November 12 to 16 81st AES Convention, Los Angeles, USA.

November 19 to 22 14th Tonmeistertagung Munchen 86, Deutsche Museum, Munich, West Germany.

New address

• Vitavox has moved to Vitavox House, Elstree Way, Borehamwood, Herts WD6 1SF. Tel: 01-953 4151. □

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Audio Precision modules

Audio Precision has introduced new routing switcher modules for the *System One* audio test set. With the fully balanced switchers it is possible to automate testing of consoles, distribution amps, multitrack tape machines, audio routing switchers and multiple units of simpler audio devices.

Each module contains two 'common' and 12 switchable connectors. Up to 192 inputs and 192 outputs can be obtained by daisy chaining modules.

Four versions are available: *SWR-122M* output switcher (12 male/two female connectors); *SWR-122F* input switcher (12 female/two male connectors); *SWR-122P* patch point switcher (one generator connector/one analyser connector/12 5-pin *XLR*-type connectors) and the *SWR-122T* which uses terminal strips on the circuit board for customer connection of multiwire cables and connectors. Internal jumpers allow the *T* module to be used in any of the other

three configurations.

Brief manufacturer's specifications include crosstalk between any two channels of -160 dB at 1 kHz, -134 dB at 20 kHz and -120 dB to 100 kHz with 600 Ω source or load resistance on the measured channel. Maximum signal rating is 200 V peak with relay contacts rated to switch up to 60 W or 2 A. Series resistance and shunting capacitance are 0.5 Ω per side and typically 80 pF each side to ground.

Each module is 1U high and features high quality armature-style relays with positive wiping action and gold-plated bifurcated contacts sealed in a dry nitrogen atmosphere. Typical relay lifetime is 10 million operations.

Audio Precision, PO Box 2209, Beaverton, OR 97075, USA. Tel: (503) 297-4837.
UK: Scenic Sounds Equipment Ltd, Unit 2, 12 William Road, London NW1 3EN. Tel: 01-387 1262.

Crow T2-H7-AC tentelometer

The *T2-H7-AC* tentelometer measures tape tension on 1/4 in reel-to-reel machines and of NAB audio cartridges. Ideally audio carts should provide an optimum 1 to 3 oz of tape tension otherwise problems can occur. Low tension can cause poor head to tape contact and a higher incidence of tape destruction due to wrapping around the capstan. Too high a tension can cause splice failures, increased wow and flutter and faster wear both of the heads

and the tape.

The unit's ability to measure tape tension on 1/4 in machines can prove useful in diagnosing tape handling and wow and flutter problems. Also with 'constant tension' recorders this type of dynamic tension measurement is essential for proper alignment and maintenance.

Crow Broadcast Systems, Hudsons House, 264 Bath Road, Slough, Berkshire SL1 4EW, UK. Tel: 0753 31181.

Abacus ARTA 600 analyser

Abacus Electronics has developed a 1/3-octave audio analyser suitable for use with an external large screen X/Y monitor or DC-coupled oscilloscope. Specifications include 30 'single-pole pair' 1/3-octave filters on ISO centres (25 Hz to 20 kHz); a measurement range from -60 dBm to +20 dBm in five switched ranges; spectrally flat pink noise generator, unbalanced 700 mV max level. The display drive is variable up to ± 5 V with a 20 dB display range and the unit can display either energy levels, X/Y signals for phase comparisons or both simultaneously.

Inputs include *XLR*-type mic connector with 12 V phantom

powering and two unbalanced X and Y inputs on 4 mm terminals. Outputs are all 4 mm terminals and an optional rack-mounting kit is available.

Also available is the type 503 interface which links the *ARTA 600* to an Apple II computer. This allows measurements to be stored, averaged and displayed with other data, saved to and recalled from disk and printed out when required.

Abacus Electronics, 10 Barley Mow Passage, Chiswick W4 4PH, UK. Tel: 01-994 6477.
Studio Agent: Qusted Monitoring Systems Ltd, 59 Maltings Close, Bagleys Lane, London SW6 2BX, UK. Tel: 01-731 7434.



BGW SPA-1 and SPA-3 amps

BGW has introduced two new signal processing power amplifiers. The *SPA-1* is an integrated package designed to power sub-bass speakers in high quality sound reinforcement applications. In addition to two amplifier modules (which can be quickly removed for servicing) the *SPA-1* features a number of signal processing functions including Linkwitz Riley 24 dB/octave or dual slope 12 dB/octave electronic crossovers; minimum phase type parametric equaliser and all-pass filter delay for improved time alignment.

Other features include active balanced inputs, digitised stepped attenuators (claimed to be accurate to 0.10 dB), fan cooling and a cap screw security cover.

The *SPA-3* uses three BGW power amplifier modules and is designed to drive modern PA systems with midrange speakers and wide bandwidth compression drivers and horns. As with the *SPA-1*, the unit is packaged in a 5 1/4 in rack mounting chassis. Similar in

facilities to the *SPA-1*, the *SPA-3* also features 2-channel all-pass filter delay, a high frequency propagation loss compensation filter and a socket for plug in input transformer. System configuration is via a plug in jumper network.

Both amplifiers provide front panel LED indication of status, ie amplifier on, input signal present, output signal present and overload. Power output for the *SPA-1* is given as (dual channel mode) 250 W into 8 Ω , 400 W into 4 Ω or 600 W into 2 Ω . In bridged mono mode the output is 800 W into 8 Ω or 1200 W into 4 Ω .

The *SPA-3* has a total power output of 850 W (FTC) with 250 W into 8 Ω , 400 W into 4 Ω for the low section and 250 W into 8 Ω , 125 W into 16 Ω or 300 W into 4 Ω for the mid and high. Maximum gain for both amplifiers is 30 dB each channel.

BGW Systems, 13130 South Yukon Avenue, Hawthorne, CA 90250, USA. Tel: (213) 973-8090.



The music mastering machine by Revox.

The Revox PR99 MK II now offers features like an LED real-time counter for exact elapsed tape time in hours, minutes and seconds. An Address Locate button to automatically search for any pre-selected address point. A Zero Locate feature to bring the tape back to the zero counter reading. Auto Repeat to continuously replay a tape segment of any length. And built-in variable speed control to raise or lower pitch up to 7 semitones. Options include monitor panel, remote control, steel roll-around console, and carry case.

If you're serious about music recording, you'll want to make your master tapes on a professional open reel. And if you want the best sounding tapes, you'll use a tape deck from the world's most respected name in audio recording: Studer Revox. Audition the PR99 MK II today at your Revox Professional Dealer.

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49 Theobald Street, Boreham Wood, Hertfordshire WD6 4RZ
Telephone 01-953 0091, Telex 27502 Fax 01-2075970

NEW PRODUCTS

NEW PRODUCTS

Equipment, modifications, options, software



Goutam Aries console

Goutam has introduced the *Aries* 24/8/16 recording console featuring phantom power, 3-band EQ with swept mid and switched high and low frequency controls, channel mute, four pre/post aux sends, two returns with full routing and mutes, 100 mm faders and remote power supply for low noise operation.

The adjustable meter bridge contains 16 group meters, PFL

and stereo output metering. Other standard features include channel peak level LED, -20 dB pad, and headphone amplifier.

Goutam Electronic Products Ltd, 6-24 Southgate Road, London N1, UK. Tel: 01-249 5306.

UK: MTR Ltd, Ford House, 58 Cross Road, Bushey, Herts WD1 4DQ. Tel: 0923 34050.

Fostex E series recorders

Fostex is introducing two new stereo machines plus a replacement for the *B16* and an 8-track ¼ in recorder. Machines include full microprocessor control over functions and feature time/speed display, three motors, locate functions and edit and spooling modes.

A centre track for SMPTE is standard on the stereo machines. The new *E2* is a ¼ in, 7½/15 in/s machine, the *E22* a 15/30 in/s version using ½ in tape.

The new multitrack machines feature Dolby C. The *E8* provides eight tracks on ¼ in tape and *E16*, 16 on ½ in.

Fostex Corp, 512 Miyazawacho, Akishima, Tokyo. Tel: 0425-45-6111. Telex: 2842-203.

UK: Bandive Ltd, Brent View Road, London NW9 7EL. Tel: 01-202 4155.

USA: Fostex Corporation of America, 15431 Blackburn Avenue, Norwalk, CA 90650. Tel: (213) 921-1112.



Symetrix 528 voice processor

Designed for sound contractors and contained within a single U package, the Symetrix 528 is a dedicated unit for microphone signal processing. Various functions are provided including mic amp, phantom powering, compressor/limiter, downward expander, parametric equaliser and de-esser. Up to 60 dB of gain is available and although the 'normal' signal path takes in all five processing stages, provision has been made on the unit for bypassing sections or creating additional processing with each processor section having its own set of rear panel normalised patching connections. Individual processor bypass switches are provided on the front panel.

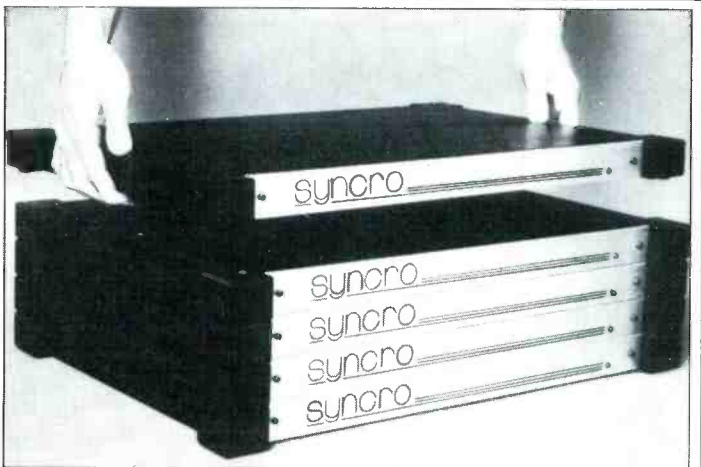
For normal applications the compressor/limiter and downward expander are interactive in order to provide the best signal to noise ratio under the given circumstances.

The parametric EQ provides 12 dB boost or 30 dB cut and has been designed to optimise the response from lavalier mics. In addition to equalising the audio signal the parametric section can also be used in the 528's internal control circuit making the interactive dynamics processor frequency dependent.

Finally, according to Symetrix the selectable frequency and range controls of the de-esser permit higher than average recorded levels to be used on tape and for this purpose they suggest the use of the de-esser outputs on the rear panel when a logger feed is required.

Symetrix, 4211 24th Avenue West, Seattle, WA 98199, USA. Tel: (206) 282-2555.

UK: Sound Technology Ltd, 6 Letchworth Business Centre, Avenue One, Letchworth, Herts SG6 2HR. Tel: 046 26 75675.



Soundmaster Syncro synchroniser

Soundmaster has introduced a new integrated editing system based around the *Syncro* and controlled by IBM PC-based Soundmaster software. The *Syncro* communicates with the host computer via a 5 MHz data bus and 'smart' machine-mounted interfaces allow for universal cabling. Each *Syncro* contains an 8088 and 8087 microprocessor and onboard RAM to support edit list multi-tasking.

Among the features are variable speed lock from ¼ to 3 times play speed, numerous

programmable closures for external equipment tripping, keyboard designation of master machine, simultaneous sync of all international timecodes and the ability to servo the master to an external sync source. The Soundmaster control software is also enhanced and includes significantly expanded edit list features.

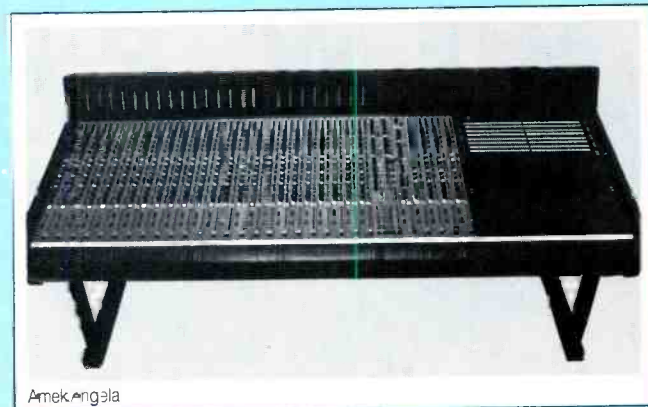
Soundmaster International Inc, 306 Rexdale Blvd, Unit 5, Toronto, Ontario, Canada M9W 1R6. Tel: (416) 741-4034.



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Amek Angela

The Amek Angela must be now nearly as well known as the MTR90. The attributes of the Angela are many and varied, but those most commonly-quoted are the highly musical eq section and general transparency of sound, the incredible flexibility of operation and the very high standard of mechanical construction.

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Otari TR90



Otari MX70

The MTR90, as the world's best-selling multitrack recorder, needs little introduction. Suffice to say the MTR90 is now the first choice of many of the world's leading producers and engineers.

The new Otari MX70 is a state-of-the-art 1" 8- or 16-track drawing on the advanced design ideas of the MTR90. The MX70 makes Otari performance and features available at a much lower price.

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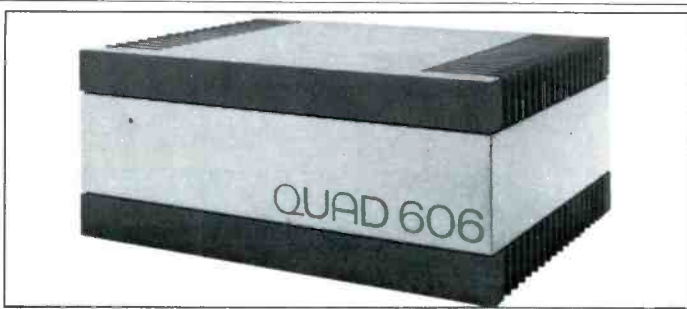


1 Felgate Mews, Studlard St, London W6 9JT. Tel: 01-748 9009 Telex: 21897

NEW PRODUCTS

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Equipment, modifications, options, software



Quad 606 power amp

A high powered version of the recently introduced 306 stereo power amplifier, the 606 has a maximum power output on music programme of 180 W/channel into 8 Ω falling to 140 W on sine waves. Roughly double the output is available when used with 4 Ω loads. Input level is 0.5 V for 140 W into 8 Ω . The 606 is claimed to be unconditionally stable into any load and with any signal.

The Quad 606 uses feed-

forward error correction (Current Dumping) with a separate power supply for each channel. Primarily designed for the domestic market the amplifier features standard phono connectors on the inputs and 4 mm output terminals. **Quad Electroacoustics Ltd, Huntingdon, Cambs PE18 7DB, UK. Tel: 0480 52561. USA: Quad USA, 695 Oak Grove Avenue, Suite 3a, Menlo Park, CA 94025. Tel: (800) 227-9985.**

Alesis Midifex

Following the success of the *Midiverb* is a new signal processing unit packaged along similar lines. The *Midifex* is a real time multiple effects processing device with 63 preset programs. User controls, indicators and rear panel connections are all identical to the original *Midiverb*.

The new programs feature single, double and triple-tap delays; classic echo effects; stereo synthesis; reverb programs with unique envelopes or panning effects and filtered settings with multiple high pass, band pass or low pass filters added to provide various colourations in the sound.

In all there are 21 echo driven presets, nine double-tap settings, six triple ones, six regenerated programs, five slap, seven reverb including reverse and reverse

regenerated, three multitap, two thickeners and finally four stereo synthesis presets.

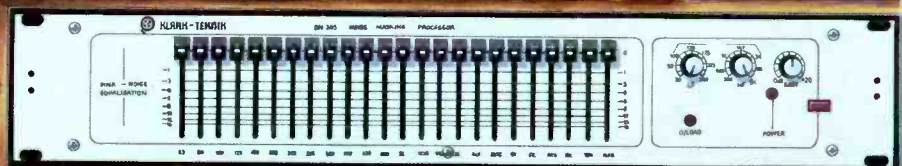
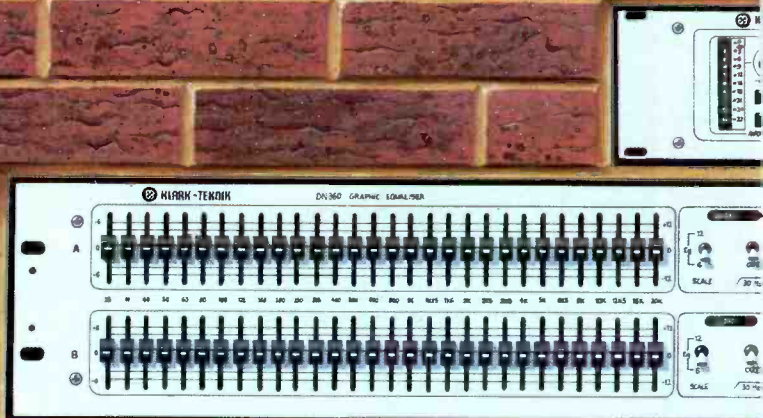
Many of the effects incorporated into the *Midifex*—which are available at the touch of a button—would require several digital multitap delays, a high quality digital reverb, a number of parametric equalisers and multiple channels on the mixing console to achieve conventionally, says Alesis.

Also new is a mounting adaptor which will enable two *Midiverbs* or two *Midifexes* to be installed in a 19 in rack.

Alesis, PO Box 3908, Los Angeles, CA 90078, USA. Tel: (213) 467-8000.

UK: Sound Technology Ltd, 6 Letchworth Business Centre, Avenue One, Letchworth, Herts SG6 2HR. Tel: 04626 75675.

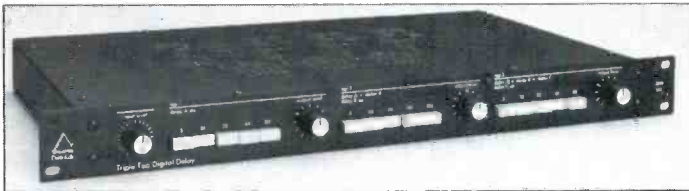
Sound architect



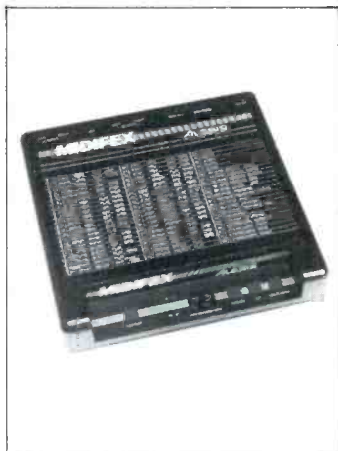
EQUALISATION/SPECTRUM ANALYSIS/SOUND CONDITIONING/DIGITAL REVERBERATION/DIGITAL DELAY

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Deltalab ADM 465 DDL



Alesis Midifex



Deltalab M1 monitor

Deltalab ADM 465 delay and M1 monitors

The ADM 465 is a triple-tap digital time delay designed for the sound installer. Features include a 20 Hz to 20 kHz bandwidth, 90 dB dynamic range, 155 ms of delay at each tap adjustable in 5 ms steps for a possible 465 ms of maximum delay. The 465 employs Deltalab's proprietary Adaptive Delta Modulation and comes with XLR-type connections and a tamper resistant, transparent security cover.

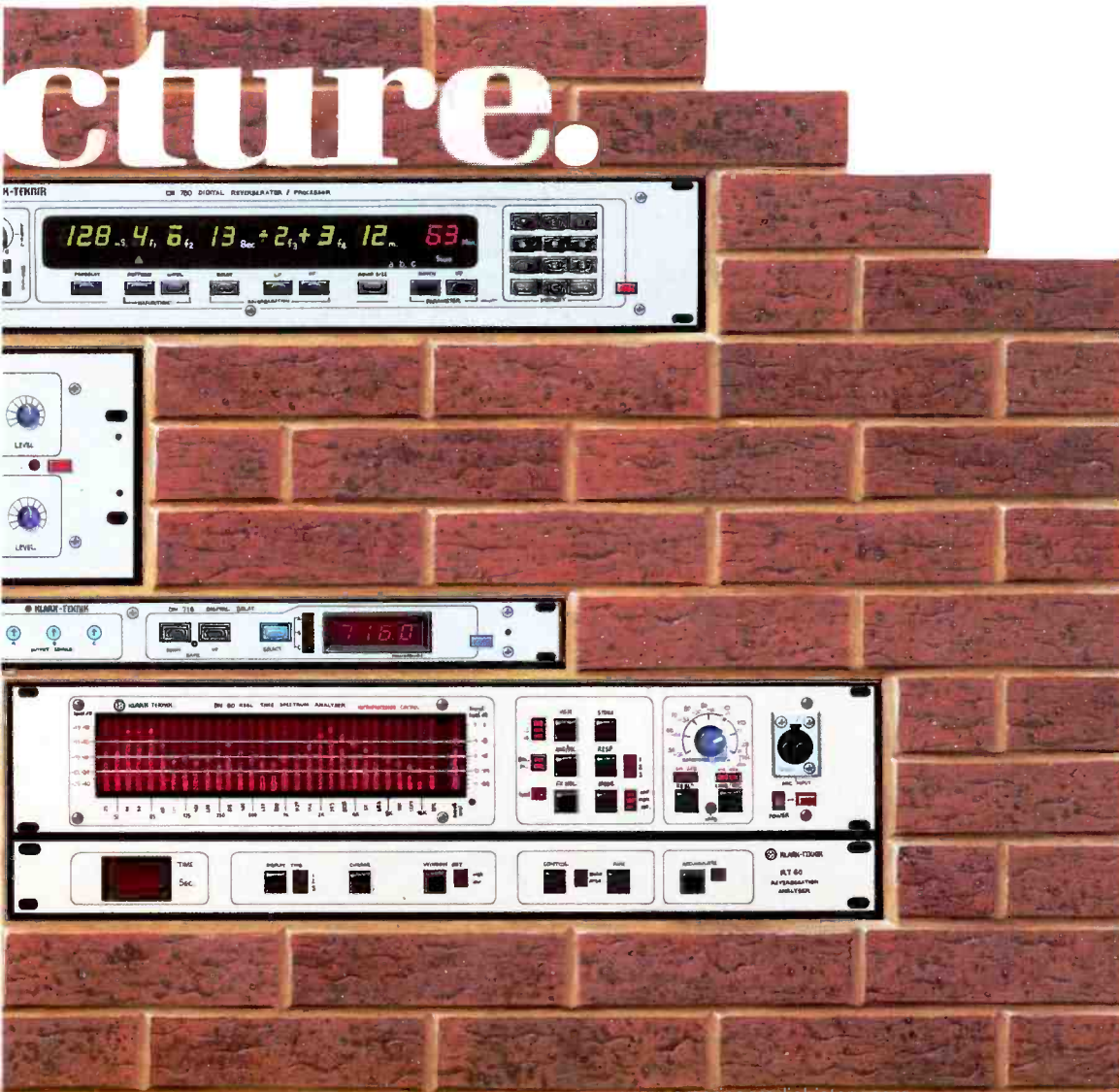
The M1 represents a new extension of Deltalab's product range. A 2-way nearfield monitor with drive units and crossover developed and manufactured at Deltalab, the M1 has a frequency range from 85 Hz to 20 kHz, a power handling capability of 30 WRMS (150 W peak) and

has a sensitivity of 88 dB (1 W/1 m).

The speaker uses a 1 in soft dome tweeter woven from polyester fibres and a 4 in bass driver with a rigid yet light Stiffite cone and butyl rubber surround. The M1 is protected from thermal or electrical overload with auto reset restoring the signal approx 20 s after the amp gain is reduced. The cabinet is aluminium with a textured grey finish and perforated steel grille.

Analog & Digital Systems Inc, Pro Audio Division, One Progress Way, Wilmington MA 01887, USA. Tel: (617) 658-5100.

UK: Sound Technology Ltd, 6 Letchworth Business Centre, Letchworth, Herts SG6 2HR. Tel: 0462 675675. □



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MUSIC PAGE

MUSIC PAGE

Studio synthesis including new releases from the British Music Fair, by Mark Jenkins

Many of the most exciting new introductions at the British Music Fair had already been seen at the APRS show, since several companies such as Roland, Yamaha, Akai and Sound Technology now fully recognise the links between pro audio and instrument marketing.

Simmons

Simmons launched half-a-dozen new electronic percussion products at Frankfurt but had two more for the BMF. MIDI-compatible units now include the *MTM* (MIDI-Trigger-MIDI) interface which allows you to connect MIDI and non-MIDI percussion and synths, while the *DSM* (Dual Sample Module) allows you to double the sound potential of the existing *SDS9* drums.

SDS1000 is a rack mounting sampled kit with a wide variety of familiar and more exotic sounds, while *TMI* is a trigger-to-MIDI interface which copes with up to eight pad inputs and effectively adds MIDI to the unit.

SDC200 is Simmons' new dedicated electronic percussion combo amp with wide-ranging response for sharp percussion transients, and the *SDE* expander allows you to load pitched percussion sounds such as marimbas and glockenspiels from cartridge for playing from Simmons pads.

The new *MTX9* is a 3-channel expander primarily for the *SDS9* which accesses sampled tom, timbale, cabasa and other sounds, mixing the *SDS9* sounds programmably with 20 memories accessible through a footswitch, and adding digital delay effects.

The *SPM8:2* is a rack mounting programmable mixer with 30 memories for HF, LF, two effects, pan and fader on each channel. Dynamic pan and a DDL make it possible to select complete changes in dynamics, stereo positioning, mix and EQ instantaneously.

Simmons Electronics, Alban Park, Hatfield Rd, St Albans, Herts AL4 0JH, UK. Tel: 0727 36191.

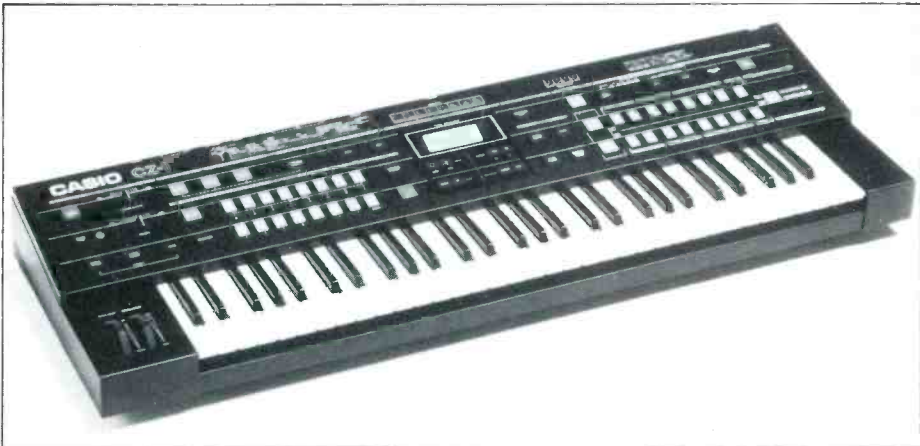
USA: Simmons Group Center Inc, 23917 Craftsman Road, Calabasas, CA 91302. Tel: (818) 884-2653.

Casio

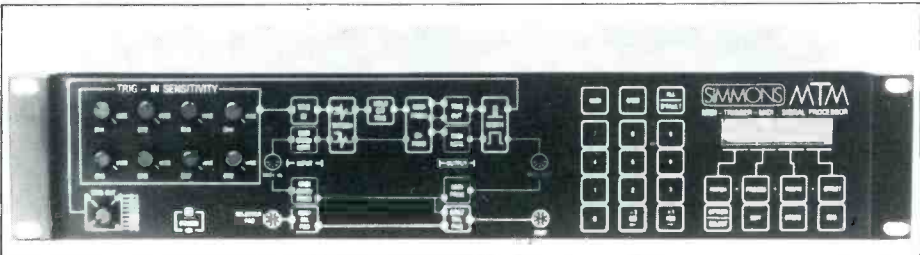
Two major introductions for the BMF included the *CZ-1*, a velocity and pressure sensitive Phase Distortion synthesiser with fully programmable memories and keyboard split memories.

The *CZ-1* is Casio's first fully programmable synthesiser (the previous *CZ* models all feature some preset sounds) and has 64 memories, 64 'Operation Memories' for split and layered sounds with 64 more memories available from cartridge.

Casio's other main introduction is the *AZ-1*, a portable remote MIDI keyboard with guitar-like styling. Its velocity,



CZ-1 synthesiser from Casio



Simmons MTM signal processor

pressure sensitivity and extremely light weight means it can be operated from batteries or mains transformer. Programmable functions include two wheels, one slider, two switches and two alternative or simultaneous MIDI transmission channels.

Assessment

The *CZ-1* indicates that Casio has been listening to advice from musicians. All the sounds can be reprogrammed and envelope parameters can now be copied to make this easier. The LCD display is well lit and the velocity and pressure response are highly versatile. The basic sounds are the same as those on the *CZ-3000* but the fact that split and layered pairs of sounds can now be instantly recalled is invaluable.

UK: Casio, Unit 6, 1000 North Circular Road, Staples Corner, London NW2 7JD. Tel: 01-450 9131.

USA: Casio Inc, 15 Gardener Road, Fairfield, NJ 07006. Tel: (201) 575-7400.

Guitar converter

Marketed in the UK by Barnes and Mullins, *Shadow* is a 19 in mounting unit which converts signals from a special guitar pickup to MIDI. The pickup requires only a stereo socket on the guitar and the converter includes a polyphonic sequencer, individual string sensitivity controls, mono mode option for a different sound on each string and tuning, pitch bend and control options.

UK: Barnes and Mullins, 155 Grays Inn

Road, London WC1X 8UF. Tel: 01-248 4631.

Seiko

Harman Audio has launched a range of MIDI processor units manufactured by Seiko. The range includes a programmable patch storage system complete with footswitch selector, a channel filter, a MIDI matrix, a Merge box, and a MIDI effects loop switcher. Also from Seiko but with different styling is a deceptively simple-looking MIDI sequencer at a budget price.

UK: Harman Audio, Mill Street, Slough, Berks SL2 5DD. Tel: 0753 76911.

USA distribution details not available.

Fender

'Genuine' Fender guitars will be increasingly in evidence now the company has announced the restart of production at their US factories. The *Vintage Replica* series guitars are complete "down to the last winding and piece of wax on the pickups" and include '57 *Stratocaster*, '62 *Stratocaster*, '52 *Telecaster*, the '62 *Jazz Bass*, the '57 *Precision Bass* and '62 *Precision Bass* models.

UK: Arbiter, JVC House, Eldonwall Trading Estate, Staples Corner, Priestley Way, London NW2 7AF. Tel: 01-452 1132.

USA: Fender Musical Instruments, 1300 East Valencia Drive, Fullerton, CA 92631. □

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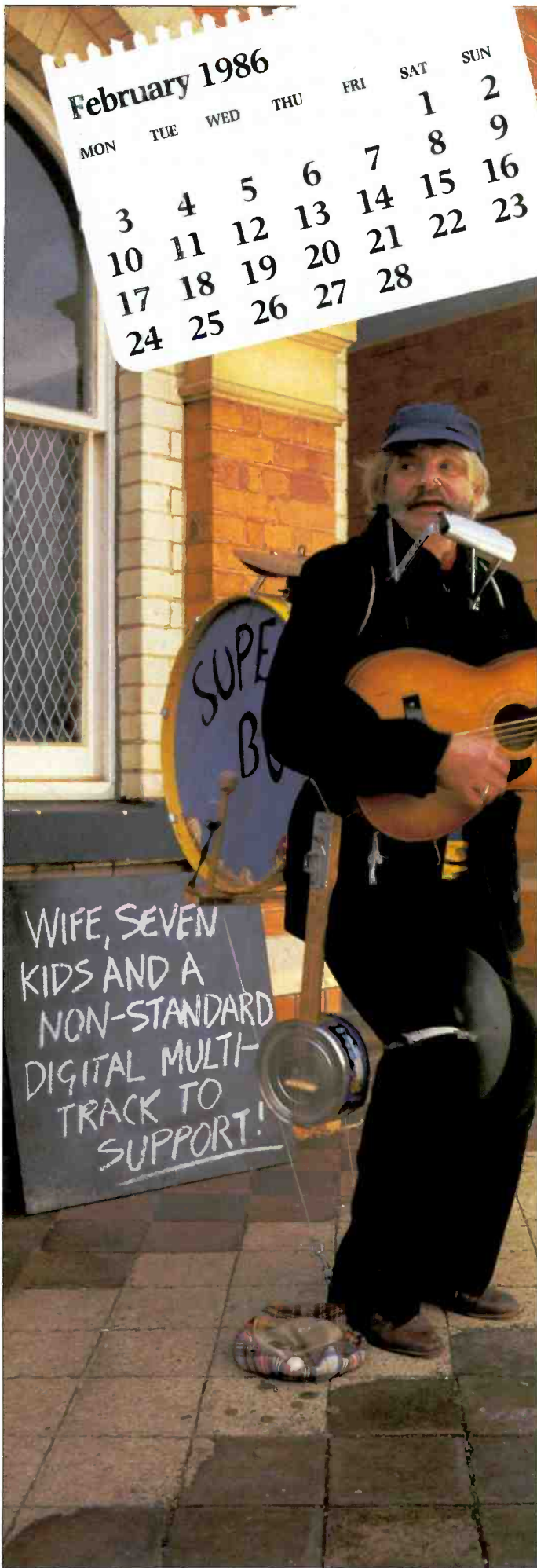


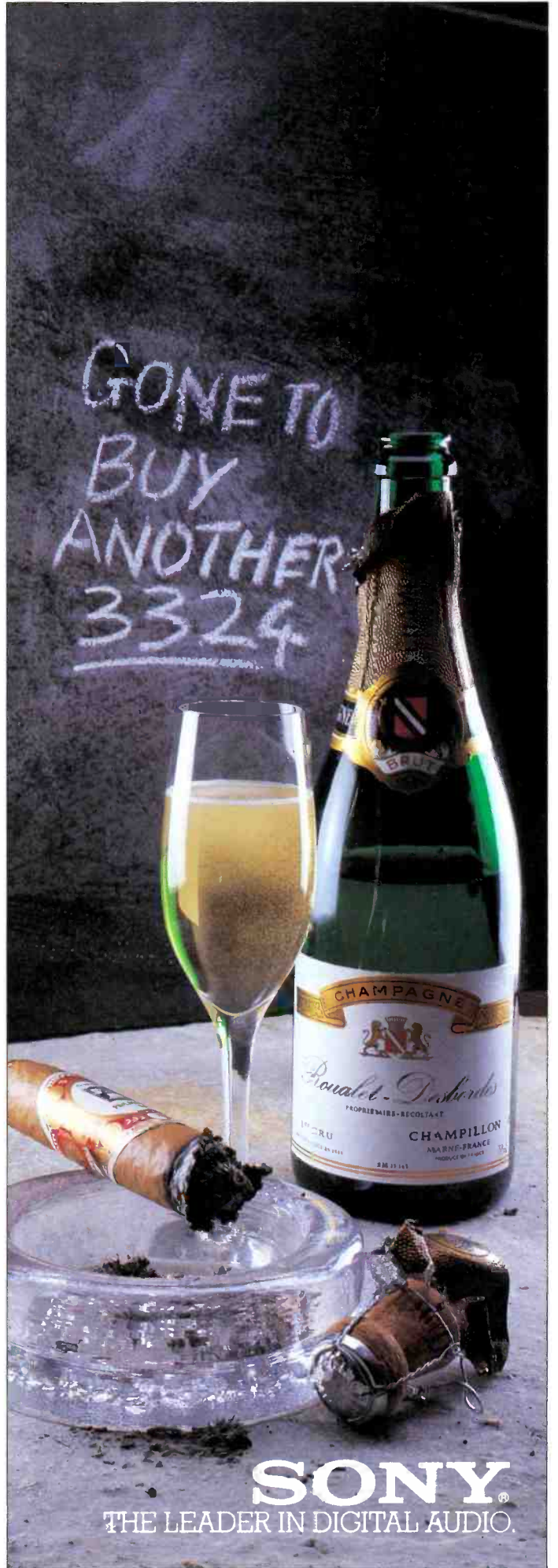
dbx PO Box 100C, 71 Chapel Street,
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EFFECTS AND REVERBERATION

Now is not the time to be envious of manufacturers of effects and reverb. Viewed from the most negative angle, all effects devices are only some permutation of signal level, EQ and time delay—this is perhaps not totally true. With these limited physical tools we expect an ever increasing breadth of effects and reverb possibilities. Also manufacturers with software based equipment have difficulties attracting non-owners of their hardware to look at new software in units that look the same externally. The software may change the function of the unit completely but if the front panel looks the same as it used to, then even the possible attractions of *Rev 3.4* will not make any difference to the majority of those who looked at the unit when it was first launched. With more and more effects and reverb devices being under software control and capable of handling a wider range of processing within the same box, this is going to be more of a problem—both for the manufacturer and for the studio which was used to accessing units just the once and memorising the capabilities. Who is going to take kindly to having to look at the unit all over again with each release to software? The situation is, however, here for keeps and we will have to learn to live with it.

Another area that both manufacturers and users are going to have to live with is that of paying for software and the difficult role it can play in equipment design. It is now not uncommon to have equipment shown in 'final' physical form 18 months before the software reaches a stage that the complete unit can be marketed. We are now seeing units appearing on the market long before the software is fully ready; the manufacturer counters this by supplying software updates free as they are ready. However, we are also hearing complaints about users expecting software updates for free all the time while the manufacturers running into escalating software development costs are trying to make the users adjust to the concept of paying for the software. The concept of selling the hardware long before the software is ready and then supplying the software as it is developed for free until the unit then does everything it was originally meant to do, is likely to mitigate against the acceptance of such a change.

A look at equipment currently available. Although to a degree a question of semantics, we have considered sampling devices to be short term digital stores and as such will be covered next month.

If we have to look at market type changes over the last few years we can see two major developments. The first

has of course been programmability. The most logical step in effects development is of course to give the maximum control to the user, particularly in the area of reverb type effects. This absolves the manufacturer from getting the effects 'exactly right' and allows the precision user the ability to exactly tailor to their needs. This trend has been happening over the last five or six years and it now seems incredible that aside from the odd bit of delay and EQ that we used to accept the limited abilities of the plate or chamber as the norm. Could many of us function in a creative sense in the studio today if we have to return to just the processing tools of 10 years ago?

The other major trend has been almost a reaction to the above. There are many users who are more interested in the musical aspects of recording and who do not have the inclination to fiddle and



Ursa Major ADR68K—now the AKG ADR68K following purchase of company

perfect an effects signal or maybe even the ability to understand the processing on some of the high order effects systems. Although most of the signal processing systems have had a limited number of preset programs, the concept of the non-programmable unit offering a wide range of preset memories is a new development. The marketing of such devices and the development has normally been aimed at the low end and semi-pro area although in certain applications such units will be equally at home in any facility as long as the use of the units is within their 'fully pro' capabilities. Although such devices can be very useful in offering the ability to process as many of the less critical signals as necessary, studios which are selling their more sophisticated reverb units to purchase half a dozen of a cheaper unit are really doing themselves a disservice which they will understand in the future, although if you have an undemanding clientele the temptation is understandable.

MIDI has also made quite strong inroads into pro-audio and making its effect felt. Aside from the specific areas of application, MIDI can allow control of devices as effects even though the units themselves are really not effects devices. For example, the Stage Accompany PPE-2400 2-channel 4-band programmable equaliser now has the ability to accept MIDI control data from a keyboard, sampling system or computer terminal. This aspect of the unit together with its own programmable memory will allow the user to select completely different EQs as easily as any other effect and the possibilities for such a system are wide. There will shortly be another interface available to allow SMPTE timecode control from external equipment.

On the subject of non-effect units being used for effect, another very good example of this is the ElectroSpace *The Gate*. This is a full function noise gate but it has the ability to count beats before gating or releasing the gate. Up to nine beats can be counted and there is full provision for slaving other effects units that could accept the keying signal.

Centralised control of effects or switching is becoming a point of interest. At the moment there is no agreed standard to allow a computer to talk to any effects unit—we will be stuck with numerous control systems controlling their own effects units for some time. There are, however, a number of manufacturers who are developing their own interfaces. Quantec have developed a system to control the QRS in the form of a hardware and software package to run on the IBM PC, Apple MacIntosh or an Atari computer. No modification is necessary to the QRS as the remote socket is used. Integral is a timecode reader enabling the systems to adjust front panel functions and memories against timecode. The computer screen will show full front panel information including the memories.

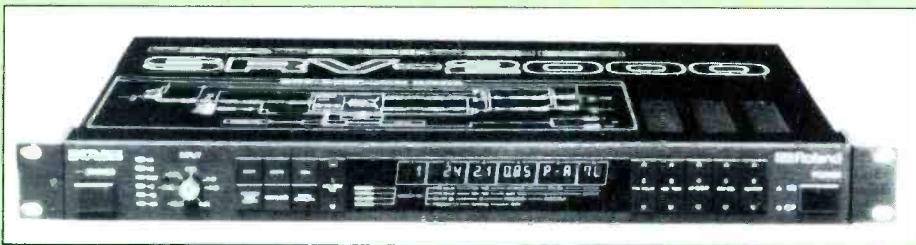
The last year has seen a number of software updates and new releases for effects systems although we as a magazine find this rather hard to monitor as the manufacturers tend largely to run a 'closed loop information circuit' with their registered users which means that only users are aware of the new software. Software releases that we are aware of, however, over the last year include #2.00 from Klark-Teknik for the DN780 reverb—mainly enhancements for the existing programs with gated versions of the 'Alive', Non Lin, Reverse and Infinite Room programs; from Lexicon, enhanced software and new

programs for the 224XL and the 200; major new software for the Eventide SP2016—this is part of the standard *Generation II* release and includes programs such as *RMX Simulation Plus* which simulates the AMS *RMX* digital reverb with its reverse, non-lin and gated effects. The update software is free to existing users. Additional software includes the Automatic Panner which is available as an option together with the Channel Vocoder ROM which enables the SP2016 to function as a full 18-band vocoder. In the last couple of months engineering staff from the original SP2016 development team formed a company called First Order Effects and they are developing a completely independent source of software for the unit. Scheduled for release are programs including a variety of reverbs, an LPC-based vocoder, psychoacoustic exciter, stereo compressor/gate, sympathetic string resonator, controlled filter programs, binaural panner and multiband filtered delays. Some of the programs are structured as splits allowing the SP2016 to execute different programs in the two channels. MIDI control will also be possible on suitable units.

AMS made several new enhancements last year for their products. The *RMX 16* can now be supplied with a memory expansion to increase the number of factory presets available to a size capable of accommodating all factory presets available at one time. New programs will continue to be made available on bar code for those users suitably equipped.

In the area of simple non-programmable units Alesis has led the field so far. Last year saw the introduction of the *XT*, a simple digital reverb that is fairly basic but of a relatively high quality. Towards the end of last year, an improved version—the *XT:c* was added. The main new introduction was the *MidiVerb* in the spring of this year. This is reviewed in this issue together with the *MidiFex*, a similar type of unit. These boxes have 63 programs in each and there are no programmable aspects at all apart from the ability of the user to step up or down in program selection over the 63 presets. Although such a unit sounds limiting there are a wide range of possibilities. The *MidiFex* has some programs that could tie up a large number of other effects units to create a similar effect. Again MIDI is featured, although they work quite well without any form of MIDI connections. Still waiting for launch is the top of the range Alesis product, the *ai* which is a very comprehensive reverb system with a quite unique hand remote that also contains the manual and stores user defined programs. The delay on this system is the availability of the chips and because of this no dates have so far been set.

This year saw the end of a name very much associated with effects and reverb, Ursa Major. They have been acquired by AKG Acoustics. The major staff of Ursa Major are still working from the same premises as the North American digital R&D Dept of AKG. This change has meant the demise of products such as the



Roland SRV-2000 digital reverb



Publison Infernal Machine with IM90 remote

STUDIOMASTER

12M



SPECIFICATIONS

FREQUENCY RESPONSE: 10Hz - 20kHz \pm 3dB. TOTAL HARMONIC DISTORTION: Typically 0.01% @ 1kHz (Input 0dBV, Output +4dBV). HUM & NOISE: (20Hz - 20kHz, input termination 150ohms) Equivalent input noise - 126dBm, Residual output noise (all faders down) - 86dBV. MAXIMUM VOLTAGE GAIN: 88dB. CROSSTALK: Input to input - 60dB. DIMENSIONS (LxHxD): Of flight case (incl. wheels): 1651x337x1068mm. Of 24-channel mixer: 1218x207x870mm. Of 32-channel mixer (1 add-on fitted): 1540x207x870mm. WEIGHT: 24-channel 12M in flight case (incl. PSU) 75kg, 32-channel 12M in flight case 85kg. ACCESSORIES: External Power Supply, DC lead, AC lead.

THE STUDIOMASTER 12M MONITOR MIXING CONSOLE

This exciting new mixing console from Studiomaster gives the smaller bands and P.A. companies the opportunities to possess monitoring facilities and sound quality previously beyond their means.

The 12M comes as standard in 24-12 format but the flight case in which it is supplied has provision for a further 8 inputs to be added - so if the time comes when you want to expand your monitoring capabilities, then your 12M can expand with you.

The 12M has too many features to list here, but they are all to achieve the same result: total sound control of a very high standard. In particular, Studiomaster's acclaimed EQ facilities have been expanded up to FOUR bands on the inputs and the output 4-band EQ has FULL-PARAMETRIC mid-bands. The flexibility of this EQ can even render on-board graphics unnecessary.

Studiomaster have positively attacked the problem of feedback with a number of features which will eliminate it at the desk: every input channel has a notch filter which, by turning an infinitely variable rotary control, will cut the feedback frequency with a very narrow "notch" in the frequency response. Also, "Q" control on the output equalisation can be used to create another notch filter effect.

Input and output connections are XLR type. All inputs are electronically balanced, high impedance for minimum interaction with the front-of-house desk. The inputs also have a parallel out socket. The outputs are unbalanced, low impedance with a transformer option for complete ground isolation.

A 12 segment display on every channel, combined with the built in monitor output (for headphone or amplifier listening) allows the monitor engineer to constantly check the mixes he creates. The 12M also has a talkback system which allows him to communicate with the artists on stage, particularly useful during soundchecks.

The 12M is not only electrically superb; the chassis is built with quality materials and careful consideration of the ergonomic aspect has resulted in a logical channel layout which combined with detented rotary controls and 100mm ALPS master faders makes for confident, precise adjustments.

With all these features and versatility though, the 12M is still very affordable. State-of-the-art design has made it possible to offer no-compromise performance at a price which puts it in reach.

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EFFECTS AND REVERBERATION

Space Station, the StarGates 323 and 626, and the 8X32. The MSP-126 stereo processor will now continue under the AKG name as will the ADR68K, a sophisticated effects system introduced in the spring. Based on a 68000 processor, the unit has 16 bit A/D converters and 32 bit internal processing. Processing capabilities include reverb, sampling, special effects and EQ. Other features include the ability to run two independent programs at the same time, switchable bandwidth, full MIDI implementation, 'soft labelled' controls on the remote panel and a removable RAM cartridge that doubles parameter memory and can be used as a portable storage medium.

Lexicon introduced the 480DL digital effects system. This is a processor that allows a wide range of effects and reverb with sampling, 2-channel independent processing, hardware and software updatable, digital inputs and outputs (PCM 1610 compatible and slaveable to 48, 44.1 or 44.056 kHz external word clock), extended frequency response and dynamic range. The unit is controlled from the LARC as used with the 224XL and there is front panel provision for the use of a non-volatile memory cartridge. The unit has not so far been demonstrated publicly with all software up and running such as the Dynamic MIDI, although we understand that this is very close. The other Lexicon product

released in the last year was the PCM 70. This is a digital effects system with initial software derived from the larger Lexicon units. There are 90 accessible programs of which 50 are user assignable. The front panel features dedicated keys and a 'soft' knob that can be assigned to up to 10 different control parameters. All these patches can be assigned internally or via MIDI—with the unit containing Lexicon's Dynamic MIDI system.

A company called Clarity is now marketing a unit by the name of the MIDI/XLV which allows MIDI control of the Lexicon 244XL—program change and continuous change of all LARC parameters from a MIDI keyboard or other data source. The LARC controller itself remains on line. In addition there is provision for eight control voltage outputs.

The Publison *Infernal Machine 90* has expanded rapidly with much new software in the last year. Software releases 863 and 863L have added improvements since version 855 of vibrato for functions 4 and 9 with four variable parameters; the addition of arpeggio feedback to function 4 giving auto arpeggio; the addition of a third language for the operator—Italian; new software for the aux key, memory out key, MIDI control software; memory security; optional SMPTE pitch tracking that allows the unit to compensate for a recording running faster than the recorded speed by using timecode. Multisampling has also been added. The addition of a remote control unit duplicating many of the front panel controls has expanded the possibilities of the IM90 considerably.

The last year has also seen the introduction of a number of mid-price ▶



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EFFECTS AND REVERBERATION

digital reverbs from Roland, Yamaha, Ibanez, ART and Furman. The Roland *SRV-2000* is a 16 bit reverb with 32 programmable memories for all front panel settings. Reverb time can be varied from 0.1 to 99 s with a bandwidth of 10 kHz. The unit has full MIDI control. More recently Roland has introduced the *DEP-5* digital effects processor set slightly below the *SRV-2000* in performance but with capacity for 90 stored settings, full MIDI control and the ability to handle digital reverb, chorus, parametric EQ and initial delay all at the same time.

The Yamaha *REV-7* was launched last year and was covered in more detail in our last look at reverb but it has become a very popular unit and has appeared to take sales that would have previously gone to more expensive units. Yamaha have created another major impression this year with the *SPX90* digital multi-effect processor. This unit has 30 ROM presets with nine controllable parameters. There are also 60 memories in RAM for storage of settings. The range of programs includes reverb, vibrato, autopan, reverb and ADR gating, pitch change, freeze, compression and parametric EQ. The capabilities of the unit are wide and although there has been adverse comment about some of the unit's capabilities, its sheer versatility is the first sign of a new generation of processing units with multiple functions.

Ibanez has made only a limited impression on pro-audio so far but the new *SDR-1000* reverb has some interesting features. It is a 2-channel unit and the two channels can be programmed independently with different modes or identical. There are 30 presets and 70 user stores with a wide range of general characteristics. Other facilities include 4-band EQ, 12 edit modes and three MIDI parameters,

and a provision for comparison of new sounds against sounds already in memory.

ART has launched two new reverbs this year. Last year saw the release of new software for the *01* and the *01a* although the emphasis this year has been on the *DR1* and the *DR2a*. The *DR1* has 40 factory presets and 100 user stores with a wide range of adjustable parameters on the front panel including pre-delay, diffusion, dynamic decay, HF damping, position, MIDI programming and programmable preset sequencing. The *DR1* also has a remote control unit. The software release *1.2* has recently added a chorus/flanger algorithm and Performance MIDI. This allows the user to control and change any two *DR1* reverb functions from any MIDI control device. The system also allows MIDI slaving, preset dump and reload, and external sequencer or computer control. The *DR2a* is a low cost reverb with nine different room types accessible as three banks of three rooms. There are seven adjustable parameters with provision for three user preset stores.

The Furman *RV-3* is a fairly new product. Front panel controls include rotary pots to give access to major program type and decay times with pushbutton control of pre-delay, room position and filtering. Bandwidth is quoted as 14 kHz.

In the area of psychoacoustics Apex has launched two new products. Firstly the *Aural Exciter* is now available in a modular version to fit the dbx *F900* rack or the Apex *R-1* rack system giving nine or 10 channels in a rack respectively. More recently the *Type C* has been launched. This is very similar to the *Type B* but with a slightly improved specification and with a reduction in price.

A company new to this type of effect is the Dutch company D&R Elektronika. The *Aurex* is a compact stereo processor which D&R claim brings clarity and brightness to all signals without lifting the HF end of the frequencies or increasing overall level.

The Barcus Berry *BBE 202R* is a 2-channel processor unit that the manufacturers claim restores the natural harmonic balances present in the

original sound. To do this it divides the audio spectrum into three bands and then applies phase correction across the full spectrum and HF amplitude compensation as required. The unit continuously samples the relationship between the mid and HF frequencies and corrects automatically. Front panel controls are simple allowing only LF control and a control for the amount of HF amplitude correction. The unit is gaining a fair amount of interest and is now available in the UK.

In the area of delay based effects, Bel has launched a number of new units. The *BD* series has been increased to include the *80*, *240* and *320* models. These come with standard memory capacity of 2, 6 and 8 s respectively which can be doubled by halving the bandwidth. There are also optional memory boards that allow expansion up to 8, 24 and 32 s respectively which may also be run at half bandwidth doubling memory. All the units have sample editing, audio trigger and modulation control. The *240* has a full 18 kHz bandwidth while the other units are 15 kHz. Newer units are the *BDE* series available as the *2400* and *3200*. On the straight delay side they have similar facilities to the *BD* series but have the full memory capacity, 99 memory store, programmable sequencer memory patterns, MIDI control, front, back and window editing and the option of remote control and floppy disk drives. Lastly, the original *BF20* stereo flanger has been restyled to a single U size and relaunched as the Mk IV.

DOD launched the *1900* (reviewed in this issue) and the *RDS3600* units. These are low cost delays with pushbutton selection of delay ranges. There have been many other additions in this area from other manufacturers but space precludes covering all.

TC Electronic of Denmark has produced two new units. The *TC 1210* Spatial Expander+Stereo Chorus/Flanger is a single U rack mount unit offering effects such as delay, doubler, delay panning, exciter, chorus, flanger and spatial expander. This is an analogue unit capable of creating a slightly different range of delay based effects.

Slightly newer is the *TC 2290* Dynamic Digital Delay & Effects Control Processor. This is a comprehensive device with 20 kHz bandwidth offering dynamic delay, pan, sampling, modulation, 99 store preset memories with MIDI access etc. Dynamic delay allows control of the delay parameters such as volume, feedback with the possibility of using an inverse envelope to the signal to control parameters. Pan has four modes with possibilities of panning direct and/or delay signal. Max delay will be 32 s with full memory and future generations of software will allow full sample editing.

ADA Signal Processors have just announced the *Pitchtraq*, a pitch transposer capable of producing transposition effects within a two octave range including harmony lines, octave shifts, synthesised textures, de-tuned chorusing and harmonic alteration. The unit has 16 preset programs and there are 16 stores for user settings. Bandwidth is 15 kHz and there is an optional foot switch controller. □



TC Electronic TC 1210



ADA Pitchtraq with memory

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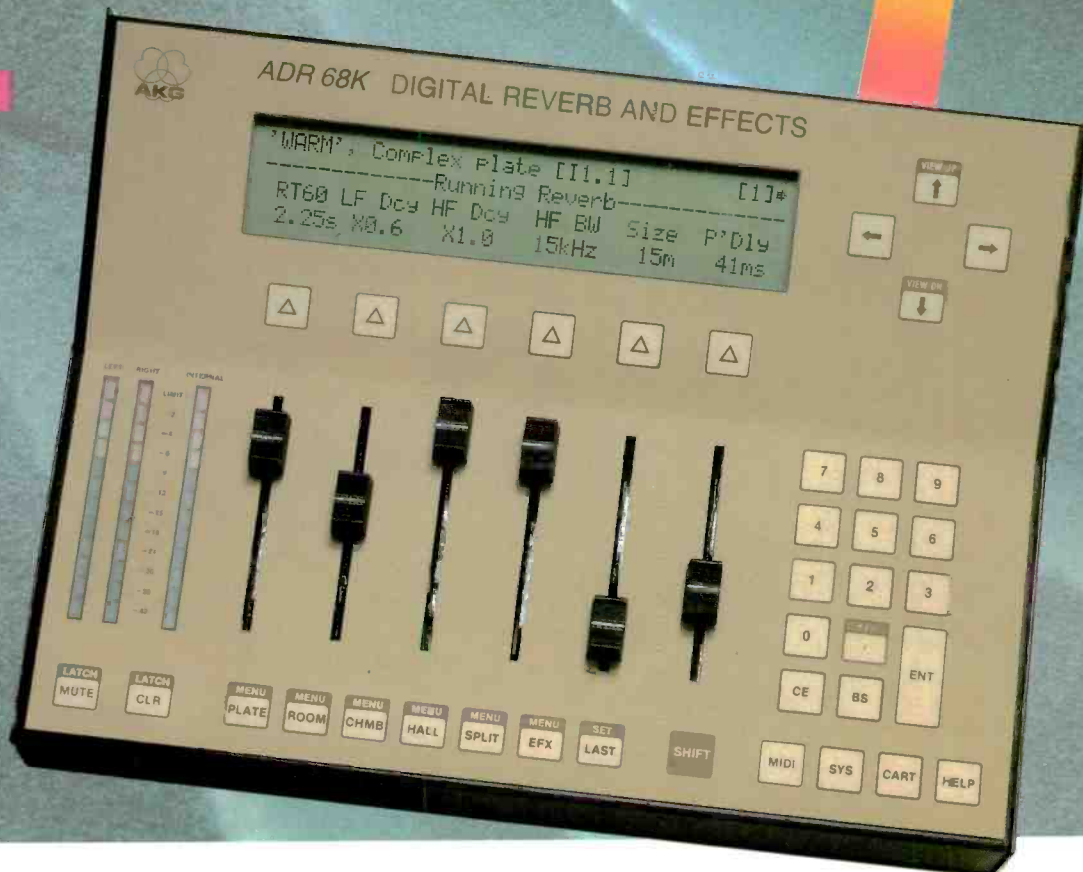
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IN PERSPECTIVE

IN PERSPECTIVE

Comment from Martin Polon, our US columnist

R-DAT is coming; R-DAT is coming. Digital audio tape recording for the home and beyond. Brought to you by over 80 manufacturers worldwide; more than 50 of them in Japan. Is R-DAT the ultimate home audio gadget? Just the thing for the world's ultimate consumers, the 20 to 34 year old YUPIES (Young Urban Professionals) and the 35 to 54 year old COPIES (Crisis Orientated Professionals Inexorably Searching) and the over 55 year old WOOPIES (Well Off Older People)? Will R-DAT challenge the compact disc as a provider system for digital audio software? Will jaded audio columnists (present company of course excluded) stop using DAT as a kind of digital double entendre? Will the broadcast and recording community show interest? Will the International Association of Automotive Audio Requisitioners and Resellers (IAAARR) vote R-DAT the car audio system most likely to be stolen?

The R-DAT technology is the result of the 1983 digital audio tape (DAT) conference organised by the EIAJ (Electronic Industries Association of Japan). The conference looked at two technologies: R-DAT with its rotating magnetic head helically scanning the tape and S-DAT with a stationary head operating longitudinally. Although the conference did not have the goal of setting standards, it became clear that the R-DAT system with its additional 300 kbytes of data for graphics, timecode, contents and cueing information offered considerable advantages in the short term from a product development point of view. The 16 bit R-DAT system uses a miniaturised $2.875 \times 2.167 \times 0.375$ in tape cassette filled with a highly coercive tape somewhat similar to the formulation of 8 mm video tape. The format has been 'premiered' during 1986 at several important shows, with 1987 targeted for consumer roll-out. R-DAT units are expected to be in the \$1,000 price range, at least initially.

The problem that is immediately apparent is the ease with which the record industry is dismissing R-DAT technology as a consumer innovation and little else. The most obvious analogy and the one frequently heard is between the LP and the analogue Philips cassette. R-DAT is supposed to do for the CD what the older cassette did for the LP. Such a comparison immediately brings to record company minds the threat of digital piracy. Despite the most obvious mental image of a pin-striped Hong Kong Captain Hook riding off into the Asian sunset perched high astride an IBM system 3083 slaved to a hold full of digital duplicators. That threat has not been ignored in Tokyo. It has been strongly suggested in several quarters in the USA that the various Japanese companies have unofficially agreed amongst themselves to implement anti-copying features in the R-DAT

R-DAT is that you?

format to forestall any legal problems with at-home digital copying.

Whether or not Tokyo has heard the hue and cry, the design concept for R-DAT does make use of different speeds and sampling rates for pre-recorded materials and CD copying. The R-DAT format as currently envisioned in the pre-production plans of the Japanese electronic giants, will handle pre-recorded tapes in playback at a speed 50% faster than self-recorded material, with 1½ hr capacity for pre-recorded as opposed to 2 hr for self-recorded materials. More important, there are currently no plans from most R-DAT recorder makers to provide any kind of digital to digital capability. Without a digital 'bus' of some kind, copying tape to tape would mean digital to analogue conversion (D/A) and the obverse analogue to digital conversion (A/D). At present therefore, any copying would have to undergo the obvious degradation of double conversion in the D/A/D domain. Further, R-DAT's 32 kHz and 48 kHz sampling rates are incompatible with CD's 44.1 kHz rate. So even in the unlikely circumstance of enterprising electronics wizards 'tapping' into their R-DAT recorders and CD players to find the digital signal, there would be the need for a sophisticated standards converter to connect the units together!

Clearly, these intended solutions to R-DAT copying will thwart the vast majority of home copiers. It may not affect the pirate copiers of Asia, who will modify existing hardware and create their own technology as well to cash in on the R-DAT pre-recorded boom. But, one observer of the coming decantment of Hong Kong suspected, "Only the fear of the agreed to coming of the Chinese government to the nigh-on-to-anarchy of the business world of Hong Kong will eventually thwart digital piracy. Like many other Hong Kong business types interested in long term profitability, only short term investments appear to be attractive now to the pirates. 1998 is coming much faster than any of us thought possible. And, you have to believe with absolute faith that a future British government facing yet another fiscal crisis will not acquiesce to the siren song of fiscal savings by releasing the reigns of government to the Chinese gradually, beginning in the early 1990s. Many Chinese here do not have that faith; they believe that a gradual takeover is virtually inevitable—the pirates most of all. Considering the multi-million dollar investment and the 10 years needed to amortise a CD plant even for pirate operators, CD in its current production guise will probably not appear in Hong Kong. Even major investments in R-DAT piracy will be thought out very carefully in the same way, despite its much lower initial cost."

Yet the real threat that R-DAT poses to the world of commercial recording is legitimate and open. Some engineers in Japan are already pointing out that R-DAT is superior to most professional 2-track digital systems and that editing is an inevitable consequence down the road for a system supported by nearly 100% of Japan's 50-odd consumer equipment makers. To some observers of the consumer marketplace, the R-DAT system is seen as potentially competitive to the continued success of the compact disc. Sony's enthusiastic and relatively public unveiling of R-DAT at the Consumer Electronics Show (CES) in Chicago in June 1986 and previously at the Dallas NAB (National Association of Broadcasters) meeting in April, only confirms that view for many.

The potential for success of R-DAT in the home may well be equalled by automotive R-DAT. The public's sense of comfort with cassettes in the car will render R-DAT appealing.

If the R-DAT indeed clouds the future for CD, the problem appears to be the recurring one of shortages and high cost for CD software. R-DAT is a digital tape cassette system, using a metal particle tape similar to some current video tape formulations. The cassette mechanism could be produced with some modifications of existing production systems. It could well have the same potential for contact 'printing' by high magnetic level saturation at high speed already pioneered in Japan by Matsushita and others for the evolving VHS formats. The R-DAT system is becoming an 'instant standard' with little left to chance. The obvious economies of scale not available to the manufacturing of CDs are in place in Japan and elsewhere for the production of the blank digital tape and cassette packaging. So, it does not seem unlikely that pre-recorded digital R-DAT software will be available to consumers in 1987 or 1988 at prices considerably lower than that of the \$15 or \$10 retail on the compact disc. It also does not seem unlikely that R-DAT could achieve depth in the historic software catalogue and commodity numbers in current releases in a fraction of the time needed for CD if the equipment makers and record companies decided to implement the format for reproduction as well as for recording.

An insider at a major record label commented guardedly, "CD could be in for a real run for its money from R-DAT. One problem is that CD software production numbers may never catch up with user demand. The Japanese and Koreans are cranking out the CD players at an amazing pace. In the US alone, sales of CD players have moved from 200,000 units in 1984 to a projected 2 million plus units in 1986. CD players have been selling this year for as little as \$150 even with the rise of the Yen.

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IN PERSPECTIVE

IN PERSPECTIVE

The traditional monthly Schwann record and cassette catalogue in the US is being phased out in lieu of a monthly CD and a quarterly LP catalogue. Industry experts are telling consumers that the LP will be all but invisible in five years. Expect 3 to 4 million CD players from manufacturers in 1987. The same kind of thing is happening in the other three big CD markets: Europe, the UK and Japan. The US record companies backed away from the big investment of a \$20 million plus CD plant for the last 10 years. Now they are convinced CD is here to stay they are all scrambling to build or obtain the use of production facilities domestically. Add the needs of pressing CDs with information—the CD ROM or

CDI. Plants in Europe and Japan can no longer meet their own burgeoning demand and provide capacity for the US.

"Every time the record companies issue a prognosis, the timeframe for projected stasis between CD demand and CD production slips another notch. First it was the end of 1986, then mid-term 1987, now it's the first quarter of 1988 and still counting. The only thing the record companies can deliver is the 'promise' of software from factories yet to be built or still a-building. It takes six months to get a kitchen remodelled in America, let alone build a CD plant. So I persist that CD software production seems to be following the 'Photomat School of Management'—someday my

prints will come.

"Record retailers certainly echo my feelings. They keep hearing about promises from Sony, from Denon, from Warners, from Philips-Du Pont but none of the promises will take the place of stock in the store that they can sell today. And last but not least, the most significant piece of data on the CD shortage comes from the law enforcement officials who have recently placed CD records high on the list items desired by so-called 'commodity' gangs. These gangs steal and fence desirable consumer goods in short supply ranging from Gucci bags to fur coats. Now they want CDs."

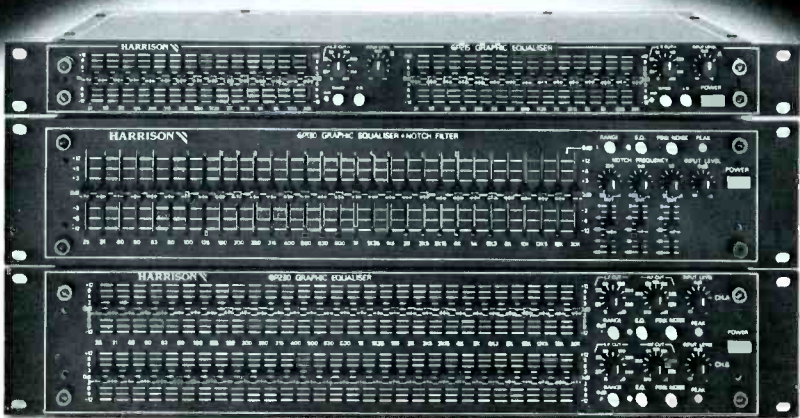
The ultimate blurring of consumer and professional audio will occur as the R-DAT system begins to impact professional applications. Editing systems will probably not come with the initial technology but few observers doubt that they will indeed come. Some versions of the R-DAT will reach professional audio users in the next several years, if only as a digital 2-track replacement for the analogue cassette recorders. Certainly, the world broadcasting community will also embrace an inexpensive digital audio recorder with the potential for extraordinary cueing accuracy—as will audio-visual, instructional and other media producers. It is also quite conceivable that such professional R-DAT machines would eventually take the place of encoders and U-matic VCRs for final 2-channel tape transfer in CD mastering. The R-DAT standard is capable of 44.1 kHz sampling as well as the 32 kHz and 48 kHz envisioned for consumer products. The presence of digital busing also seems inevitable in professional products. That of course could muddy the digital piracy waters.

The contrast between the promises for CD software production and the potential for easy duplication of R-DAT tape software does seem to confirm the image of R-DAT as a definite contender in the world of digital release formats. Its professional implications cannot be ignored. Yet it truly is not clear that the R-DAT system was intended as anything more than the digital equivalent of analogue cassette recording. Like the Philips cassette of 1960 that R-DAT could replace eventually, evolution and market forces will govern its progress and permutations rather than the visions of the system's designers.

And what of YUPIES, COPIES and WOOPIES—will they want R-DAT along with the breasts of thousands of slaughtered ducks and raspberry vinegar? Which digital system will succour the listening needs of deceased audio enthusiasts? And will enthusiastic automotive audio reclaimers shun the by-now passé CD in favour of R-DAT systems? Whatever the outcome, consumer and professional audio will never be the same. □

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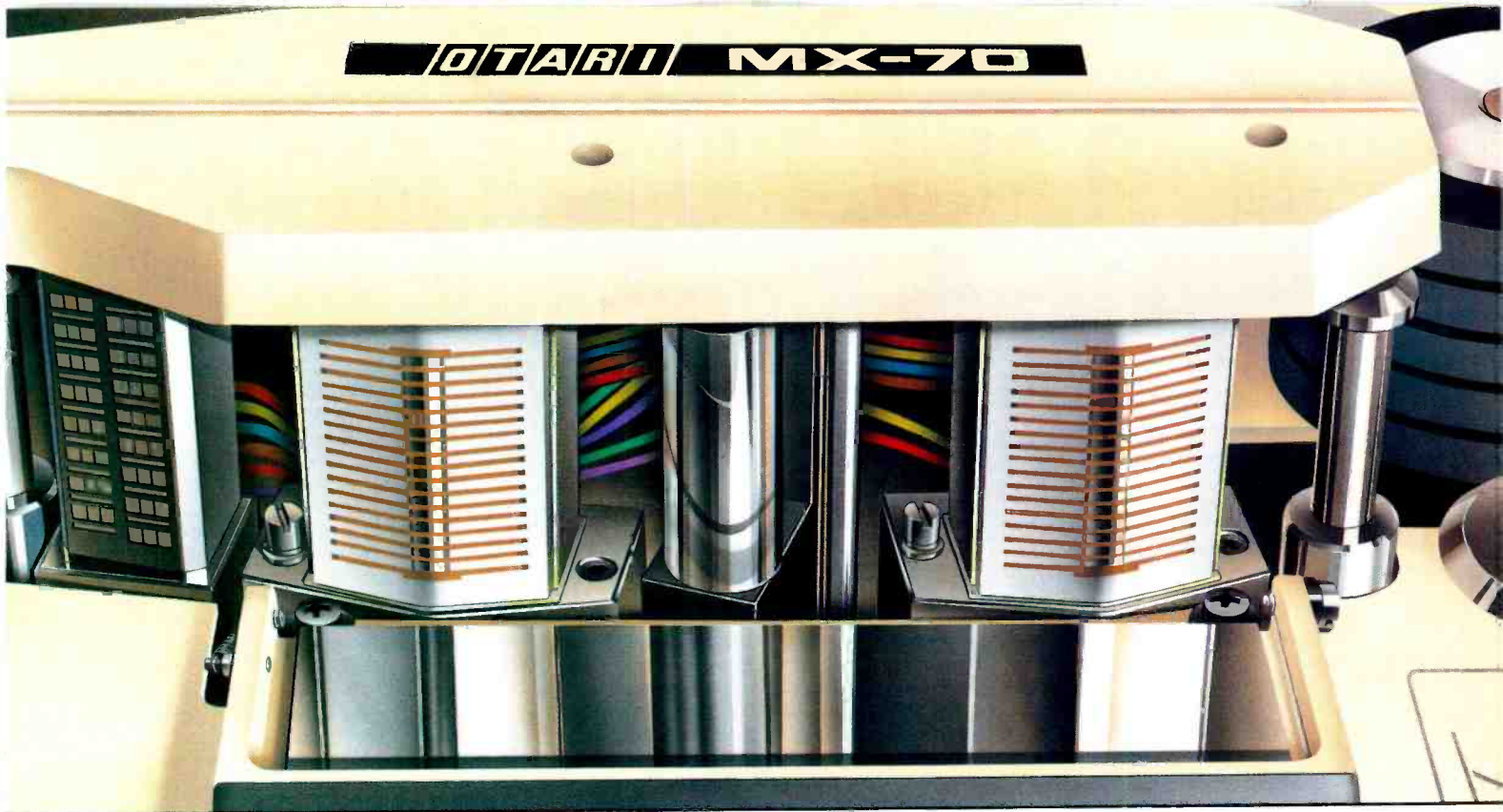
The GP130 Model also includes a 3 band tuneable sweeping Notch Filter set which is a really cost effective means of getting up to +10dB more system gain from your sound system. This means that at last annoying feedback can be "notched out" and you can get more sound level without sacrificing quality.



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BUSINESS BUSINESS



Barry Fox investigates the facts behind the industry news

Tapeless tape

It sounds like common sense to use computer disks for recording audio. Access time from disk is far more rapid than from tape. And the domain is all-digital. Computer technology is getting cheaper all the time through mass production. Erasure and re-use is a standard procedure. But there are snags.

Computer disks can store large quantities of text and program data because this soaks up relatively little storage space. When the same disk is used to store digital audio in 16 bit code sampled at 44.1 kHz (or faster) real time recording looks very greedy in comparison. Also computers do not write and read a continuous stream of data to and from disk. They do it in chunks with gaps between. This doesn't matter for text but for audio (or video) memory buffers are needed to bridge the gaps.

"The age of true digital audio began today," pronounced US company Compusonics at a New York press conference in May 1984. A month later at the Chicago Consumer Electronics Show Compusonics showed the *DSP-1000* and said it heralded "the arrival of a new age in the industry's history... consumers (can) make home digital recordings from any digital or analogue source... storing it in a digital format on a high capacity floppy disk".

Compusonics filed a US patent which was granted (4 472 747). Bear in mind that the grant of patent is no guarantee that an idea works—only that the claimed idea is new. The patent describes a recorder which takes acoustic snapshots of the audio signal, at a rate of 100 a second, compares them and records just enough information to describe the differences. This, claimed Compusonics when the system was launched and investors were sought, could give 45 min of digital stereo on a single computer floppy.

In July 1985 a US newsletter announced that Compusonics had begun pilot production of a version for radio stations, and promised deliveries of a consumer version in the fourth quarter of last year. A deal was announced with Siemens (Germany and Austria), AVM-Ferrograph (Britain) and NIAC (Japan).

"We shall be manufacturing a Ferrograph product using the Compusonics information compression system," said Ferrograph. "We hope to get into production early in 1986... 5 min of stereo or 10 min of mono is achievable. It is hoped that the prototype 45 min recorder will be tested and proved by the end of 1985."

Wisely Ferrograph then switched to talking about selling the machine as an alternative to NAB cartridge players, as used by radio stations for jingles. Then there was silence from Ferrograph.

From Compusonics came news of another US patent, this time on a new

magnetic storage system, which increases the recording density on floppy disks from less than 100 tracks per side to more than 1,000.

Conventional disks record digital data in narrow concentric circular tracks. Each circular track is divided into smaller areas called sectors. The tracks are numbered (eg 1 to 40 or 1 to 80) and so are the sectors (eg 1 to 8 or 1 to 9). This pattern is laid out on a blank disk when it is formatted. A stepper motor moves the recording and playback head across the disk to find selected track sectors. Compusonics argues that a large proportion of the disk capacity is wasted because it is used to record guiding information. Also the relatively coarse servo cannot cope with very narrow track spacing. The new idea is to record locational information on the disk at the time of manufacture, using a different and more robust technique from that used to record the data.

Extra concentric tracks called 'magnetic walls' are recorded between concentric data tracks; alternatively the magnetic walls and data can be recorded as a double spiral like a gramophone record with two grooves. The magnetic wall tracks are pre-recorded at the manufacturing stage, permanently charged to the highest level which the special high coercivity magnetic medium can sustain. A coercivity of 1200 Oe is suggested, so that the locational information is not erased by the data heads. Also, the location tracks are recorded vertically and the data tracks horizontally, or vice-versa, so their fields do not interact. The strongly magnetised locational guide tracks provide servo information for the read-write head. But additionally they provide a reaction force. The servo system generates a magnetic field which interacts with the magnetic wall field so that the head moves across the disk surface. This interaction provides precise alignment, after coarse movement controlled by a conventional stepper motor. Hence more tracks per inch and denser recording. All this comes from the patent.

But Compusonics now says that the *DSP-1000* "is being held back while we test higher density disk drive/diskette sub-systems".

Investment bankers Blinder, Robinson & Co, of Colorado, sent me their information kit on Compusonics. It includes over 40 enthusiastic press cuttings but some interesting explanations and admissions.

David Schwartz began research in 1981, raising \$100,000 from private sources. In November 1983 his company Compusonics sold 32,500,000 shares to the public at \$0.02 per share. In April 1985 Compusonics sold another 9,275,000 shares at \$0.16 per unit.

The *DSP-2000* series is a professional system for studio recording and mixing; the *DSP-1000* series is the consumer

system. The *DSP-1500*, is intended for professional broadcasters as a replacement for loop cartridges and costs (with record facility) \$2,995. It was conceived "because of the inability to obtain a floppy disk for use with the *DSP-1000* series with sufficient record and playback capacity". It uses 5¼ in disk with a claimed 6.6 Mbyte capacity; this gives 4 min of stereo, or 8 of mono, with 32 kHz sampling and 16 bit linear coding. Quite a step back from the 45 min originally promised! I heard it at NAB and it sounded rough to me.

The Colorado bankers explain that "the company continues to incur expenses in connection with the development of its products and has not received significant revenues... past projections for the availability of the *DSP-1000* series for marketing have proved premature". The October 1985 financial results for Compusonics show the recorded net loss for the quarter as \$2,309,227 on total revenue of \$41,430.

At APRS in June a *DSP-1500* was on demonstration at the AVM Ferrograph stand—overstuck with a Ferrograph label. The publicity literature was similarly stickered. Ferrograph now says it will start selling the *DSP-1500* in September for between £3,500 and £4,000. Playing time is still 4 min of stereo per disk. Compusonics people on the Ferrograph stand now admit that the disks have 3.3 Mbyte capacity, not 6.6 Mbyte as claimed in the brochure. The only music for demonstrations was pop and rock—nothing subtle like piano, speech or natural woodwind.

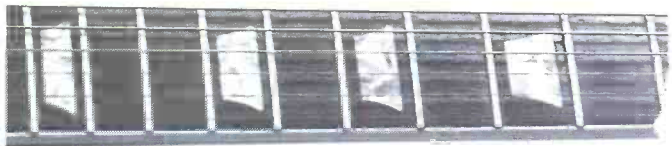
The brochure quotes sampling rate at 32 kHz with 16 bit linear coding, it certainly doesn't sound that way. "That's because there is heavy data compression. The data rate off disk is only 156 kbit/s" explained the Compusonics demonstrator.

However clever it is to record a few minutes of digital audio on floppy disk, it seems a pretty pointless exercise when DAT is so close to launch. DAT promises cue and access time and genuine CD quality. The Compusonics demonstrator at APRS knew little about DAT.

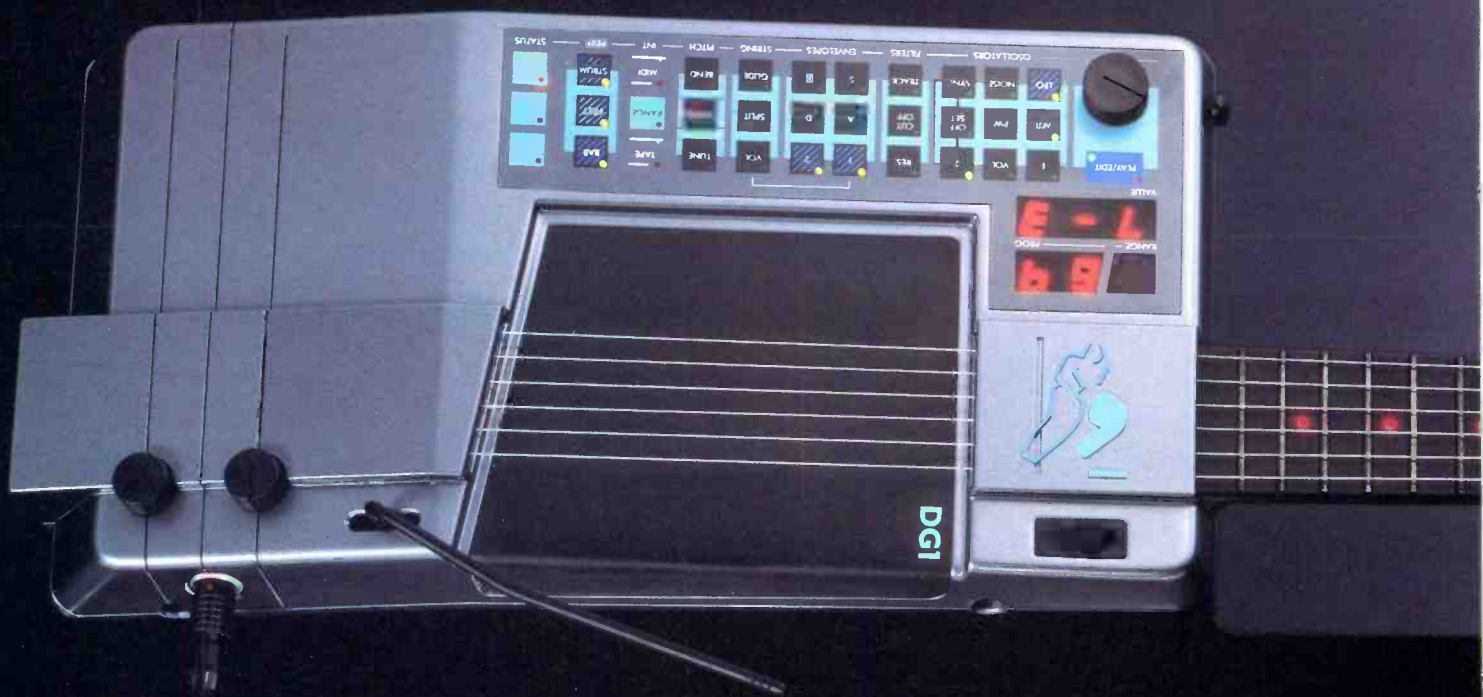
The hard disk systems offer rapid access in full bandwidth audio but at a higher price. The technology is new and in some cases quite secret. AMS (Advanced Music Systems) of Burnley in Lancashire sells *Audiofile*. AMS is cagey about the technology wanting to keep ahead in what it sees as a competitive industry.

The price of PPG hard disk system (from Germany), by professional standards, is surprisingly low—a little under £10,000.

One company is willing to talk technical details—New England Digital. NED's *Synclavier* is a spin-off from work done at Dartmouth College in New Hampshire where the BASIC computer language originated. Some hard facts on NED technology soon. □



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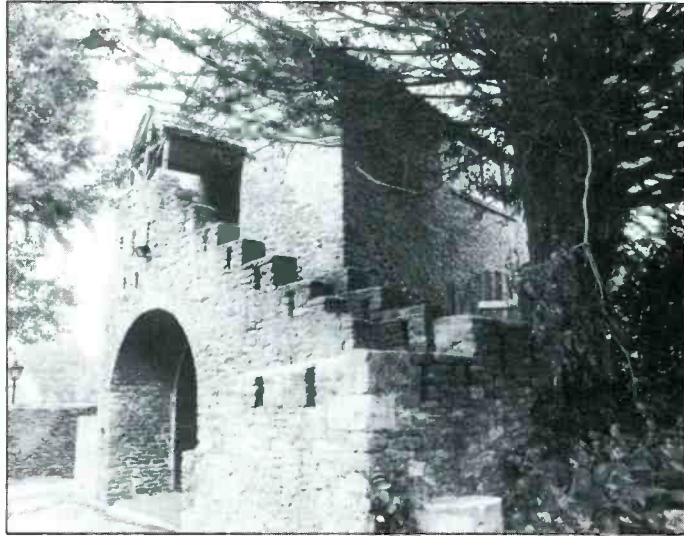
Had Alfred Watkins, discoverer of 'ley' lines and author of *The Old Straight Track*, been a musician, then it is highly probable he'd have been more than inspired to perform music in Wool Hall Studios, Beckington. For, give or take a megalithic metre or so, the studio stands on that most famous 'alignment' which intersects the great stone circle of Avebury, the Glastonbury Tor and St Michael's Mount in Cornwall. Whether the studio is permeated with anything other than sonic vibrations from this coincidence is ne'er our quest but from the historical point of view it has an even more interesting and factual claim to uniqueness. The building stands adjacent to a rather awesome and spooky, large manor house called The Castle which has the air that its original occupant popped out for a bottle of milk 600 years ago and never returned and now awaits the adventurous curiosity of Indiana Jones. Having its origins in the 11th Century it is probably the oldest building that a recording studio has ever been installed in.

Mid-1984 saw Tears for Fears' Ian Stanley and Roland Orzabal recording the *Songs from the Big Chair* album in the front room of Ian's house in Bath, using a Soundcraft desk and Otari MTR-90 and various outboard equipment, Chris Hughes producing. Looking for somewhere to install the equipment as a modest recording facility, Ian and Roland acquired Wool Hall, so named because during the mediaeval period it housed a wool market. They brought in an old friend of Chris's, Pete Dolan, to manage and oversee the development of the site, which also comprises stables, a barn and a large farmhouse.

Pete Dolan's roots are firmly in the music business, a necessary requirement to foresee the succession of changes which have overtaken the studio in the relatively short time it has been open, mainly due to the band's success.

"The situation was ideal for me. I wanted to stay in the Bath area and having worked with Virgin Records and Music Market on the expansion of their retail outlets, had

Wool Hall Studios, Somerset



experience as a musician since treading the boards at the Cavern Liverpool when it was still electric with Beatlemania, touring Europe and being involved with several record labels such as Ork in New York and Do It in London, I had the necessary experience to draw upon. It also meant getting the architectural and building schemes together, a practical side of recording studio installation which I'm particularly fond of. I co-ordinated the building with Ian's father Eric, who has been a tower of strength when making sure the builders were working to specification was concerned."

It was Pete's foresight which got the scheme off to a good start by ensuring that the heart of the development, the Wool Hall studio didn't present any major problems, acoustically or otherwise, in the future. Architecturally the building is of basic format: a large room above a hall which is entered through an arched double doorway; above this stone steps access the upper room. All too often buildings are purchased for conversion to recording studios and the owners forget to consider exactly what is involved when those precarious jumps are made from 16- to 24- and 24- to 48-track. Computers and power supplies end up being shoved in cupboards in the office with all the attendant noise problems for other personnel. And that's just one of the problems.

Pete called upon the expertise of Andy Munro of Munro Associates, London:

"When we first went to look at the place it was just a very, very old building but nevertheless the walls were in surprisingly good condition for their age. The floors were also still remaining though not in such a good state, downstairs was virtually just an earth floor with a few rotted floorboards, and the first floor, though still intact, was very thin and had little capability of sustaining the proposed control room. As the control room had to be above the studio it also offered very little isolation. So, what we did was construct a steel subframe which then enabled us to 'float' the control room entirely separately from the rest of the building. What you've got in fact is a 'raft' which is floating on isolation mounts on the original structure but not structurally supported by the original structure. It's all quite elaborate. The idea is basically that any vibration in the control room doesn't get transmitted through to the original floor and walls of the building.

"What we did was for load-bearing reasons, normal structural considerations and also to get the maximum amount of isolation. The result is good within the limitations of the design, ie we couldn't use concrete or anything like that. It all had to be lightweight. The floor itself is

actually a sandwich of chipboard, sand (6 ton) and a damping membrane of heavily doped PVC sheet which is in effect like lead but a lot cheaper and much simpler to use. Between the layers is Rockwool."

The upper floor was destined to become the control room and the hall below a very ambient studio constructed of wood cladding and reconstituted stone facing. Andy continues: "The liveness was very much a requirement. These days if someone is going to record anything in the studio, it's because they want it to have a very high degree of natural ambience to counteract all the electronic instruments."

Supported by a lighting grid approximately 4 or 5 m above the studio floor is a pair of speakers specifically for the playing and subsequent re-recording by live mic of electronic sounds in the natural soundfield. Had the positioning of the speakers been worked out beforehand?

Andy: "Trial and error basically, although you can calculate the reverberation time. It's really a question of microphone positioning, and juggling around with the positioning of the speakers themselves. Moving the mic a few inches may make a great deal of difference, especially in a live room that is not massive. If you go into a concert hall or a very large studio, by large I mean 20 m square by 10 m high, then the soundfield will be very even. In a smaller studio, however, the soundfield will not be constant by any means and what you have to do is find the best spots within that soundfield for the recording of particular instruments. You can equalise the sound by moving the microphone but that technique seems a little lost these days. The walls in Wool Hall are splayed at an angle to direct the early reflections upwards, the idea being that the sound has to go up before it comes down so that the amount of early reflections coming back on the microphone are reduced. This gets rid of any mid-frequency standing waves which are a problem in so-called 'live' rooms which actually sound 'honky' and unpleasant."

“The main thing has been an AMEK M2500 desk, which has been fantastic—I can't say how good it's been.

We bought the first one, and amongst those who came to see it were Genesis, and they bought one as a result.

Then Jo Julian from Musicworks bought one as well.

Lots of people have bought them as a result of seeing this one.

I'd very much like to get their latest desk, which I think will wipe the floor with any opposition.

People love AMEK desks because of the EQ and the routing.

The EQ on this desk is the best I've ever worked with, and I've worked on a lot. It just sounded better than any of the others we tried out. It emerged with flying colours then, and it's still the best now.

If it wasn't the best, I wouldn't have it.

There's no-one more demanding than producers and clients, because they won't use it if they don't like it.

The studio has literally been built up by client demand—they've said what they wanted and

we get it for them. And it all started, of course, with buying the AMEK with the proceeds of my recording career.

Jon Foxx

Owner

The Garden Studios



The Garden chose AMEK

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The speakers are sited approximately a quarter of the way along the room diagonals (which, if I remember my BBC Studio Manager's Handbook, is the correct place to record someone to avoid standing waves).

Although there are large windows in the hall, metal halide lighting units provide ambient lighting of the same colour temperature as natural daylight to in-fill the shadow areas thus reducing eye fatigue. Installed by Lighting Design Partnership of Edinburgh who recently worked with the Royal Shakespeare Company, the arrangement also maintains a clearer picture for the closed circuit video installation which overcomes the line-of-sight problem between the control room and studio. A video camera is set up in one corner of the hall at head height so that performers appear in natural perspective on the video monitor above the mixing console in the control room. Also, they may look straight into the camera and thus give the impression that they're looking through a window at the viewer. "There's nothing more disconcerting than talking to someone on a video monitor who is looking anywhere other than at the camera." Facial expressions are as important in the interpretation of someone's ideas, especially in the difficult area of the translation of musical ideas, as the spoken word.

The lighting grid also supports a tungsten halogen uplighting system for 'bounced' ambient lighting at night-time and various coloured lights, on dimmers, for atmosphere and mood control.

For 'drying' up the liveness of the studio, heavy curtains and carpets are easily brought into operation and for total separation an isolation booth, constructed of wood and glass, stands in one corner. Large enough for a full sized drum kit it also features guitar lead connections trunked in giving the musician total flexibility as to where he plays regardless of where the speaker cabinet has been miked up. It's worth noting at this point that every room in the whole complex, apart from the bedrooms, has mic and video tie lines

Wool Hall, continued

trunked in.

A sitar, providing undeniable proof of Pete Dolan's former incarnation as a '60s hippy, lies sedately beneath the stairs which lead from the reception area adjoining the studio to the 'Keyboard Club', machine room and control room upstairs. The Keyboard Club is a room full of just about every keyboard any electronic musician could desire to explore his imagination. In undisturbed solitude, sounds may be sampled and pre-programmed in readiness for their application to the tracks. The particular keyboard or keyboards involved may then be moved the short distance through the machine room to be installed conveniently on shelves behind the mixing console or alternatively the sounds may be piped from the room into the console via line feeds. MIDI is also fed to in/outlets all around the trunking.

Although all the multitrack and mastering machines are sited away from the control room in a longish attic-type room entered by a door between the monitoring speakers, for the benefit of engineers and producers who like to be reassured they're not overloading the system, a video camera with zoom lens may be directed to image any of the VU meters and switched into the left hand video monitor above the console. In fact, all the working areas may be viewed on the left hand monitor by way of a video patching system. The

right hand monitor image is switched from the video panel on the SSL console and also shows *Total Recall*, etc.

A 56-channel series 6000 Solid State Logic console is large enough to dominate even the most spacious control room and Wool Hall is not large by any means. Not large enough to allow Andy Munro the space for a full *LEDE*-type design. What trapping there is had to be around the main monitors (UREI 813As) and in the ceiling. But it was felt that the atmosphere created by the original nature of the room was just as important to the character of the studio and its marketability as a perfect acoustic environment. The whole development has been careful to preserve the historic feel of the place and this policy is carried on right through to the control room where mullioned windows either side of the console provide a vista of the lush Somerset countryside and bring natural daylight, also in-filled with metal halide units, to create an expansive and airy freshness. The control room and studio, however, are both air conditioned by entirely separate systems.

Why had the SSL been chosen?

"At the time we made the decision there wasn't anything else available with that sort of track record that could reliably deliver the goods. Which is not to say we're blinkered; we did look at *Westar*, we did look at *Neve*. I even went to see the *Neve* desk at *Air* and for us,

being one studio, we couldn't afford to make a commitment to an up and coming equivalent desk. We do envisage rethinking the situation in three or four years time when the new desks have gone through the teething problems. The SSL series 6000 has already gone through all that. I praise and admire someone like *Air Studios* who can take a chance on a new system. Thank God there are people like them that can do that, to allow technology and industry to progress."

What about tape machines?

"We're 48-track at the moment, that's two Otari *MTR 90s*. For *Tears for Fears* in December we brought in a *Mitsubishi X850* and had it running side-by-side with the Otaris. The results were convincing enough and later in the year we'll be looking at what's available. We're very interested to see how the new Otari performs. It's too early for us to leap straight into digital with only one set of clients but we can hire it in anytime, we're all geared up for it.

"We're looking to provide an alternative big monitoring system. On the smaller front we've recently got in some *NS-20s* which haven't really been seen here yet.

"Mike Shipley, who's been working here for the past five months, has probably worked 95% of the time on the *Yamaha NS-10s*. Some people don't like big monitors. There might come a day when speakers develop so much that it's realised there is no longer a need to listen at ridiculous levels. Most punters listen on small speakers anyway and they're what we're all here for.

"Generally speaking most bands tend to work with electronic instruments these days and use the studio only occasionally. Much of the design work was fashioned around *Tears for Fears'* own requirements as they will be using it quite extensively but their success has taken them more and more out of the country so it's necessary that the facility becomes self-supporting. It was embarked on as a commercial venture anyway and the band's success has provided us with a lot of credibility when we've gone from one stage to another in

Control room



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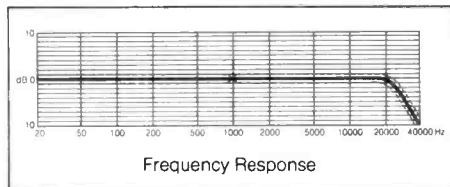
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STUDIO FILE

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the development, which isn't finished yet. Although we seem to cater primarily for the electronic bands, most of what you see in the way of keyboard stands and shelves is entirely removable for the more conventional band type format, for instance, Green on Red who were working here recently and really loved the live studio downstairs."

The window to the left of the console looks over some of the other buildings in the complex which forms a sort of double quadrangle. By the entrance gate to the yard is a large Elizabethan farmhouse which has been converted to six bedroom accommodation. The lounge within features an enormous fireplace. All meals are provided and the cook, who is half Indian, specialises in Continental as well as Oriental menus.

"When a band books this place, it's theirs for the duration, it's their home and they may live here and do as they would if they were at

Wool Hall, continued

home (within reason of course). Any type of pastime, we'll cater for it. We've got a multi-gym going in here (a row of outbuildings) with a 'stone-room' for natural reverberation. We're also going to put another Keyboard Club in here too. But forgetting recording for a minute, a swimming pool will be sunk into the field by that big oak tree. Anything, even hot air ballooning. They say the word, they've got it."

A special room was built on just to house the full-size snooker table. Between the reception area and room with a cue is another lounge/relaxation area also with a dining table, interesting circular fireplace, video and colour TV. The walls throughout the studio reception and relaxation areas are decorated with the work of local artists and shelves adorned with large pots, full of beautifully arranged flowers.

To lessen the mystique that surrounds a recording studio for the local inhabitants of Beckington, Wool Hall engaged in several activities to 'break the ice'.

"At Christmas we had all of the local schoolchildren in and recorded them singing carols. Each one of them was given a cassette of the recordings and some were sold for local charities. Then a barbecue was organised for anyone from the village to attend. A great time was had by all. But what it achieves is that, if say Joni Mitchell is working here and would like to nip out for a drink in the local pub, you're able to sit in there, and as everyone knows who you are, where you're from, you don't get any disturbance. The local villagers and planners have all been terrific. They were OK once they saw that we were going to great lengths to get the appearance of the place in keeping with all the other

buildings around here, and also that we weren't a mob of mindless yobbos, that we cared about what we were doing, really cared about how it was going to affect them—and that a lot of money was involved."

Spacewise, the studio has expanded probably as far as it can in the present building and the equipment has reached a penultimate configuration. However, plans are afoot to convert the barn and stables on the opposite side of the complex into a pre-production room, Keyboard Club and stone live room but still all capable of being hooked into the present system.

It's mind boggling to meditate on what might be the outcome when all those MIDI'd keyboard computers and *Total Recall* start 'talking' to each other once the line is 'leyed'.

David Hastilow

The Wool Hall, Castle Conner, Beckington, Somerset BA3 6TA, UK. Tel: 0373 830731.

There are times when the best form of advertising is no advertising at all—assuming, of course, that you discount the studio credits on high-selling records. The moment a studio acquires a certain mystique there are generally two roads to follow: throw open the doors and let everybody in on the secret or shroud the mystique even further by being secretive. The latter course has been chosen to a great extent by the Power Station in New York.

Owned by Bob Walters who is also studio manager, and Tony Bongiovi, who designed the studios, the Power Station has acquired a fairly enviable reputation as 'the place to be'. The studio dates back to January 1978 when Studio A was opened and the first success was the Chic album *Dance, Dance, Dance* although mix and overdub sessions were already going on from 1977 when the building was acquired.

Prior to this the building had been the Edison Power Station (hence the name) and it was built to house extremely heavy machinery. This means the basic structure is very sound and high isolation between the rooms was easily achieved. "The floors here

The Power Station, New York

start off with 1 ft thick poured concrete," explained bookings manager and technical engineer, Barry Bongiovi, "and isolation between studios has never been a problem. We did float a new floor for Studio B but with the massive construction of the place it was probably just a luxury! The building was a great find in itself as to build to these standards today would be prohibitively expensive and whereas lots of studios have to worry about interior acoustics and isolation, we were able to just concentrate on the acoustic response of the different rooms."

The Power Station has a fairly central position in Manhattan island but nudging into the West Side so that mundane things such as parking are not likely to cause hours of frustration! There is a large freight lift with its entrance at street level so you can drive straight into it and unload on any floor.

"As you can see, we have lots of room for expansion," continued Barry. "It really is handy to have a 'parking lot' on each floor. It also means that equipment can be brought

straight into the studios without bothering about stairs. It's convenient and saves time and hassle."

Staff includes six recording engineers plus six to eight assistants. Maintenance is very important here and the 24 hr schedule requires six people to keep the place running smoothly.

The Power Station has three studios in operation—A, B and C and the control rooms have been built as near identically as possible.

First impression was 'Nashville in New York' and the low key atmosphere was very much at odds with the central Manhattan reality outside. The reception décor consists of low lights, comfortable sofas, walls of unfinished wood and a fair sprinkling of flowers. In addition there is a separate intimate lounge on the third floor. There are also several TV sets around the room and catering facilities.

Studio A was the first studio to be completed and is equipped with a Neve 8068 40-channel, 16-bus console. The tape machines are all Studer with ½ and ¼ in mastering.

The console was rebuilt in 1984 by Neve, "...to give us the console we wanted but using the guts of the original in order to preserve the sound of the control room".

Anybody expecting a modern hi-tech look to the control room will be disappointed as the finish is essentially narrow wood panelling. In fact, one could almost say it looks old-fashioned! The room had a very pleasant sound on speech which is usually a good indication of how the room will respond. The 'retro' look of the room is further implied by the flown Altec 804 monitors "...that work very well with the room and the console". There is also a selection of nearfield monitors.

The rear half of the control room is slightly raised to give a view from the console down into the studio for better visual contact with those on the other side of the glass.

A central feature of the room—literally—is the double rack of 24 Pultec programme equalisers behind the console: "We scoured New York and around everywhere to get enough of these so that each room could be equipped with 24 of them." Though this may seem a little excessive clients certainly seem to like the idea. ▶



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Other outboard gear in the racks was more than a sprinkling of UREI LA-3A limiters, Lexicon *Prime Time 2* and PCM-42 digital effects units, Eventide DDL and H910 *Harmonizer*, dbx compressors and Neve equalisers and compressors.

"These are standard pieces of equipment that we find everybody likes, whereas the new sophisticated stuff is often very much a matter of personal taste. It also means that clients can work between the different rooms and not lose a sense of continuity. We aim to have a basic complement of equipment for each control room plus a pool of equipment that can be patched in when it is needed."

The control room is quite spacious with plenty of room to move around in. As the console and rear half of the room are raised people can be seated in the front and out of the way, leaving the production team to work unhampered.

Studio A is a large room that has been designed with strings and wind instruments in mind, though full orchestras have been fitted in with a bit of a pinch. There are two large isolation booths at the rear which can be open to the studio or closed off by sliding glass doors.

The studio is very live and has an exterior finish of spaced rough wooden planking and solid wood floor. The floor plan is asymmetrical with large rounded corners making it almost circular to avoid standing waves. From the amount of bass and low middle being pulled out of the room, there is obviously some heavy absorption going on behind the panelling with the high mids and trebles being diffused by the wood surfaces. The room in fact has a very pronounced presence peak which is no doubt attenuated the moment it is full of musicians. This all gives the room a very definite character which may not always suit one's requirements. Reverberation time is approximately 0.75 s—lots of attack and short die-away—though again this will vary depending on numbers present.

The shape of the room can most be likened to that of a vault with the walls raking in to a centre section—which is,

Power Station, continued



in fact, off centre—that looks like a large oval barrel reaching up into the ceiling. A feature of the room is that the acoustical balance changes from bottom to top and some quite dramatic 'EQ changes' can be made simply by raising or lowering the microphones.

"We have a pair of PZMs strung up permanently in the centre section where the ambient sound gets funnelled up, so to speak, and they give a very interesting effect. However, they can be dropped down so that they are away from the ceiling if the sound needs to be changed."

The two large rooms are well separated from the main studio floor. The left booth is intended more for quiet solo instruments when the studio is being used with a large orchestra, and retains a very agreeable acoustic. Should complete separation be required, full height glass doors recessed into the wall can be pulled across. This also increases the overall liveness of the booth—and the studio. "However, it's very seldom the doors are closed," said Barry. "The separation with the booth open is more often than not sufficient. Also, even though 100% visual contact is maintained through the doors, the musicians definitely feel much more part of the band with them open."

The right booth features a very dead though unmuffled

sound. The acoustic treatment is fronted with spaced wooden slats providing an extremely short decay whilst retaining a good attack. The floor is also wood, though carpet can be laid down if the sound needs to be damped down further. Again, the degree of separation is very noticeable; a dramatic change in the acoustics can be heard stepping from the booth into the studio.

Control Room C is very similar to A with the console—this time an SSL 4000E with 48 channels—raised on a dais and an overall finish of wood on the floor, walls and ceiling. The rack with its 24 Pultecs was in evidence together with the basic equipment roster previously outlined. Monitoring is a pair of UREI 813Bs driven by a Yamaha 2200 power amp. As in Control Room A, the monitors are flown from a track mounted in the ceiling, enabling them to be moved in an arc about the listening position. Why flown monitors?

"It means the monitor bridge is done away with and we have encountered no problems with this set up. We found that the 813Bs work better with the SSL console than the 804s. It would be an interesting analysis job to find out why but as the combination works it would be purely academic!"

In addition to the Studer recorders was a Mitsubishi

digital multitrack, so had the Power Station gone digital?

"It's here on rental for Bryan Ferry at the moment but we are obviously considering the purchase of digital machines. At the moment we hire them in as required.

"One problem that has to be considered is the fact of two digital standards. Some clients like the Sony, some the Mitsubishi and it would be expensive, to say the least, to have both machines here. Rental seems the best way to do things until the market settles into a more set pattern."

On the SSL consoles Barry had this to say: "It was a bit strange but our engineers had a hard time getting used to them at first. The concept of the SSL was different to what they had been used to. The EQ section was, we felt, very clinical and took some getting used to. We had a good dialogue going with the company as regards some modifications that we wanted done and were partly instrumental in the realisation of the 'P' EQ modules from SSL."

(The 611-EQP equaliser simulates the characteristics and sound of valve (tube) units such as the Pultec programme equalisers.)

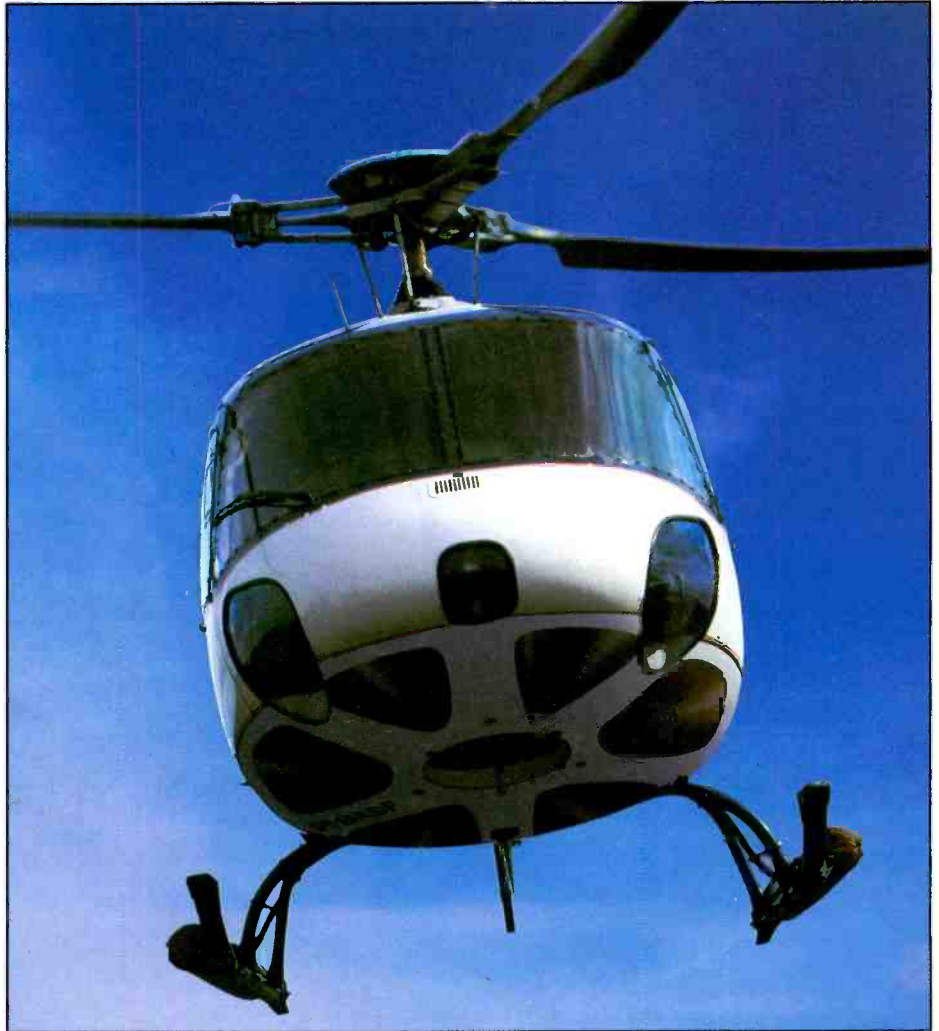
"We also have an SSL in Studio B—a 48-channel 6000E. We put in a 6000E for its better suitability for audio/visual work though it is useful to have the two types of console within the building depending on the projects in hand. Both consoles feature the SSL Studio Computer with *Total Recall* but the Neve is strictly manual—no automation. It keeps engineers on their toes and reminds them what it was like in the good old days!

"Studio B is the same as C here, with the exception of it being used more for A/V work. Tony used the same design for each control room so that clients could move around the building without worrying about the sound changing. It's an idea that sounds great in theory but can give problems in real life situations. However, it has worked out very well here at the Power Station."

Studio C floor area is far more rectangular than A and, though it has basically wood

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surfaces throughout, is a lot smoother in its response. The shape here is more barn-like, with vertical walls and sloping ceiling on both sides with a flat central roof section.

"We did a lot of experimentation here," explained Barry, "and the result is the end product of a lot of work. Studio A had a great sound but it could tend towards being a bit limiting so Studio C had to be designed to be a lot more flexible."

The room has none of the peakiness of the first studio and has a much more airy atmosphere compared to the almost 'gothic' feel of A. Another valuable commodity is daylight!

"When we were building the studio we weren't too sure whether to leave the windows in or not. In the end we decided to keep them and installed shutters for those people who insist on keeping their studio tans! More often than not though we work with daylight here as it has proved

Power Station, continued

very popular. There aren't many studios here in New York where you can see outside!"

The studio also features three isolation booths along one side with the left booth having large windows for good visual contact when it is closed off.

This completes description of the studios and a conversation with Bob Walters reveals some background and philosophy.

Bob Walters led the career of a club bandleader, also playing trumpet and singing, until 1968 when Media Sound studio was founded.

"I played music for a living and also dabbled in a travel agency for a bit. The latter experience was very good as I learned a lot about business from it. The combination of being able to understand musicians and business is a good asset for me in my position here as studio

manager. However, to be frank I never did like the term businessman and much prefer to think of myself as the guy who takes care of business.

"Tony walked into Media Sound in March 1970 looking for a job. He had just been fired from the Record Plant and wanted employment. Something clicked—I found him very sincere—and I hired him on the spot. When I left Media in 1976 Tony came with me and we started up the Power Station."

The Power Station has a very protective attitude towards itself and no photos of the studios were allowed for security reasons (or to put it bluntly, for fear that people might steal their designs).

"One reason we don't get involved in sharing technical ideas is because my partner, Tony Bongiovi, did the designs and he decided—no photos. People can look at the studios

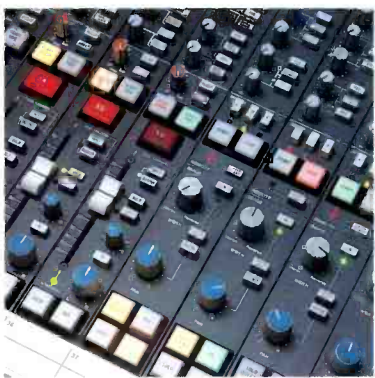
but won't understand why the acoustics work, how the wood is treated, etc.

"I consider the Power Station to be a combination of proper design and construction together with the proper installation of the right type of equipment. Apart from such things as the installing of AC power, heavy plumbing, etc, all the studio construction was done by the staff. That way they got involved in the place and wanted to see it properly done. We are very much a team here where everyone is important."

A self-confessed management freak, Bob Walters feels that the sign of a well-run organisation is that people are given responsibility. "As an administrator you have to be able to delegate—you can't do it all yourself and you shouldn't have to. Intelligent people should be able to make quick decisions and not wait for someone else to decide. It is very much a team effort here and we have very little

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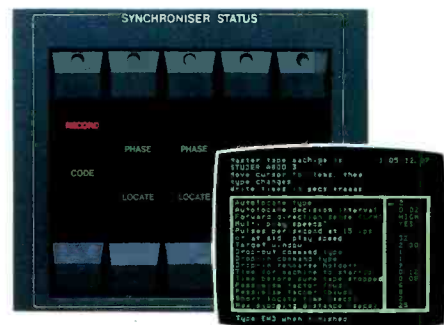


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turnover of staff. Attitude, energy and knowledge are the three things here that make the place click.

"So far we have had seven of our engineers go independent and we are glad that their careers are prospering. We are also glad that they very often like to come back here to work."

Discussion turned towards the studios themselves.

"The Power Station has never advertised—the place sells itself. We hire very good people, buy the best equipment and put out a proper product. Our trade comes from number one people who listen to records that have come out from here or who are recommended by producers and musicians.

"The advantage of having someone like Tony here is that he understands the various sectors of the business. He started out as a sound mixer and then became a producer which means he knows the needs of engineers, producers

and musicians.

"Another thing is that the sound we get in the studios here is the sound you get at home. We have never had a client take away a copy of a mix and come back saying that it sounds different away from the studio."

Bob touched briefly on the Power Station winning a *Mix* magazine TEC award in 1985. "I think of awards like that being mainly political but it's still thrilling to be recognised by our peers."

With the studios often working round the clock, maintenance is a high priority and Bob Walters runs a 'tight ship'.

"Ed Evans heads the maintenance staff and it is what I would call 'intelligently done'. I definitely think that the technical staff—both in maintenance and design—are the lifeblood of our business and that cutting back in this area virtually amounts to commercial suicide. Even with the best of care, equipment can

break down and it's always at three o'clock in the morning! If the client sees a maintenance engineer come in straightaway to fix the problem, he feels cared for but when there's nobody... well, you get my point."

Moving on to the studio's relationship with artists: "We very much believe in going out into the clubs and looking out for new talent—because that's where you are going to find it! That's how it used to be done and it's still relevant today. You need to find people who have performing experience and if we see anyone with potential we bring them in, develop them and generally just help them along. At the moment we have four artists that we are working on and we look forward to them being successful. However, this does not mean that we call all the shots. There should always be one or two people in a band who can make decisions when recording—they should be able to say when it's the band's

music and when it's not."

With the name Bongiovi in evidence was there any link with the group Bon Jovi?

"I would just like to say this: John Bongiovi, the lead singer, is Tony's cousin. We trained him, gave him singing lessons, recorded him, got him a deal with Polygram and, in short, invested in him." End of quote!

In keeping with its low profile image, the Power Station has no rate cards, promotional material or equipment lists. Rates do exist, of course, and these are fixed for 24- and 48-track recording as well as for dubbing and rentals. Whether there is a secret to the place apart from good equipment and people is up to the individual but the mystique is there that creates a certain type of success. And no-sell can often be a very successful 'hard sell'.

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A

CLASSIC CASE TONY FAULKNER

Over the last few years Tony Faulkner has been recognised as one of the leading classical recording engineers. Janet Angus discussed classical recording and the influence of digital audio and found some positive opinions.

Tony Faulkner is one of a new breed of classical recording engineer in that he is independent of any particular label. He has his own purpose built facility for Green Room Productions, designed with the help of Munro Associates. This is located at Henry Wood Hall in the Waterloo district of London—a charitable trust which is used by most of the London orchestras for rehearsal and recording.

When, towards the end of the 1970s the record industry began to experience diminishing returns and therefore budgets, one of the first areas to suffer was that of classical music because the market was that much smaller. At the time Faulkner was working for Enigma Records which WEA, having purchased, proceeded to close down.

He decided to take a gamble and see if he could make it to Christmas without actually trying to get 'a job'. To his delight business took off in a big way and he has never looked back. With less and less money to lavish on classical recordings, record labels naturally found it attractive to hire Tony to effect a recording and then go away when he had finished. When he embarked on this new career he expected to be working for small independents whereas a very large proportion of his work comes from the major record labels.

Having already experimented with prototype Sony and JVC equipment as far back as 1977 at Enigma, it was only natural that he should continue.

"I'm just not interested in old technology. I'm not a very nostalgic person. I like valve microphones for voices because they sound nicer but I wouldn't want, just for old times' sake, lots of valve microphones and analogue tape machines because I don't like the sound very much. I think things have moved on and it's foolish to pretend that they haven't. I don't like analogue. There's no bass, it's 'pitchy' and boomy."

He invested in digital equipment as soon as he could, albeit with relatively humble beginnings.

"I invested in digital equipment because it is much better than analogue equipment. When I started up, the analogue equipment I had was a Revox G36—and old valve thing that I paid £40 for—and a C37 valve machine which I bought from Morgan Studios. I had a PCM-1—the old Sony quasi-domestic

thing and one U-matic. I used to take the hi-fi apart at home for the monitoring and had to hide the Sansui tuner/amplifier underneath the table on location and have the Spondors from home for the monitoring, that's how I made my first 50 records.

"People get very nostalgic about the sound of analogue but the fact is it's nothing like what goes into it. Maybe what comes off sounds nice but to my ears it is a fairly gross distortion of what goes in in terms of things like pitch. I get this terrible feeling of seasickness when I hear a piano off analogue just from the way the pitch seems to wobble; to my ears digital audio is a much more stable sound. From the stereo image point of view and perspective I find I can do much more with digital in terms of precision of stereo placement, particularly around the centre of the image. I have much less problems convincing clients that a minimalist technique will give them enough seconds (violins and violas, woodwind and timps now that I'm using digital equipment than I ever did using analogue with Dolbies on the front. The middle of the image always seemed to wander around with analogue but it doesn't with digits.

"The other big plus, which is away from sound quality, is editing on classical music. Often you have to do a lot of nit-picking editing on things like harpsichord recitals where people are bothered about squeaks or fluffs, and with digital it is much easier to edit. Operationally it is not easier in terms of the fact that you've got to push lots of buttons rather than use a razor blade but you've got second and third chances to fine tune things and often rhythm is disturbed by joins. Being able to trim off a few microseconds at a time means that you can fine tune it so that disturbance in the thrust and direction of the performance, is minimised."

Although impressed with the JVC sound, he has decided to remain exclusively Sony for reasons of compatibility.

"The JVC DAS900 does sound very sweet, very clean, and it doesn't have the glassy top that some of the earlier machines had from just about everybody—most of them squeaked like the door hinge needed some 3-in-1! But it's still an old format this idea of recording on to video

tape. I think R-DAT will change a lot of the rules when it comes through. Not as a storage system for compact disc, tape exchange, things like that but for sessions something like an R-DAT machine or these new erasable disks is definitely the direction I can see."

Green Room have done a lot of modifications to their digital equipment, mainly to the analogue circuits in order to sweeten the sound.

"A lot of digital audio's criticism is to do with the high frequency quality and looking through the circuits it is because of pretty lousy analogue design—the sort of thing that turned up in applications books when I was at university too many years ago."

They have tweaked their Sony 1610s and the F1 which they use for a lot of sessions running on DMR2000s; thus they are then able to direct edit on the DA1100 by having those tapes on the player and recording direct on to 1610 on the recorder. They use the Harmonia Mundi BW 102 to take out the DC offs. ts. Tony likes the sound of the tweaked F1 and feels it is preferable to investing in a 1630 which he doesn't feel sounds any better.

The classical music market has become used to the sound of digital recording and now expects it.

"There is no reason why anyone would want to record classical music analogue—there is no market for it and it is noisy. Once you get used to how quiet digital recording is on large symphony orchestras, there's just no way you can go back to recording analogue. I haven't got an analogue machine anymore; I haven't made an analogue album since 1980 and I've probably made 350 classical ones since then. None of my clients are interested in it. I've forgotten how to edit with a razor blade and I don't really want to learn again."

Microphone techniques also changed due to digital audio.

"The main way in which digital has affected my own microphone technique is with the big symphony orchestra. I can rarely get away with using just, say, a coincident pair of directional microphones having crossed figure-eight Blumlein style, or a pair of near coincident cardioids—not because of any stereo effect or musical balance problem but purely because the microphones don't sound very nice.

"The usual way the colouration from a directional microphone shows itself up is you'll get a bass roll-off akin to the second order Butterworth high pass filter, which means first of all you get no bass and secondly it sounds a bit 'megaphonic'. So most of my clients tend now to expect the sound to be less coloured and, because of digital recording having this extended bandwidth, it means that I have had to move to microphone techniques that use pressure microphones or omnidirectionals and trying to work out various deviations of mic technique that will give me the sort of stereo that I'm used to from a coincident directional microphone technique; trying to get that kind of stereo image using omnis.

"It isn't easy because the basic idea of coincident technique is that you have two microphones very close to each other, angled away from each other.

Being directional they will pick up the directionality of the sound coming towards them so that what's coming from the left only goes into the left microphone and isn't picked up much on the right one. Well, doing that with omnis normally means that you either space them a lot (traditional technique being 10, 15 or maybe 20 ft apart from each other) but if you do that you don't get the sort of stereo spread or perspective that you used to as a recording engineer trained in using coincident techniques. So I've been working out all sorts of peculiar deviations for near coincident omni microphones.

"The theoretical idea of an omnidirectional microphone picking up all frequencies equally from all directions isn't actually a practical possibility and because of the nature of a pencil microphone for example it's much better at picking up high frequencies in front than it is from behind (because there's a great lump obstructing the sound from behind from reaching the front of the capsule). So most real omnidirectional microphones are actually quite directional at high frequencies, particularly the large capsule ones. But you can use those irregularities to try and get some stereo."

Many of the microphone set-ups Tony and his associates use at Henry Wood Hall retain as the main pickup, a pair of omnidirectional microphones placed only a few inches apart from each other and angled out.

"The main difference in the last five years is that people expect an omni sound quality with the bass extended and just generally a bit sweeter and warmer. If you use directional microphones they tend to sound hard and brittle and, particularly with a big orchestra, anything with an organ or any information below 100 Hz, musicians feel that it's gone, it's missing and I couldn't argue with them."

The other effect has been that it is no longer possible to get away with using old noisy microphones and duff mic cables because the distortions now are above the threshold of audibility at the end of the chain. In the old days it was possible to hear the difference between microphones in the control room but when you played the tape back in the control room you probably couldn't hear them.

Green Room's backbone microphones are Schoeps: *MK2* omnis, *MK4* cardioids, *MK41* hypercardioid, *MK5* switchable omni/cardioid ("they are my favourite in the range"); *MK6* 3-way changeable and *MK8* fixed on figure-of-eight ("if we feel like going back to basics we stick those up").

"Other microphones include Sanken *CU41s* and Bruel & Kjaer *4006s*. We've got a lot of Shure *SM81s* and *SM80s* which are very under-rated microphones—very, very good, particularly the omni which has got a nice capsule size halfway between the two B&Ks. In many ways they offer the advantages of both the B&Ks because with them you either have a very ultra low noise with the coloured capsule or



(Left to right) Mike Hatch (recording manager), John Boyden (producer), Tony Faulkner

else you have a very noisy one with an uncoloured capsule, and the Shure combines fairly low noise with fairly low coloration and in real operational use that's often more helpful.

"We've got some old Neumann *KM53* valve microphones and some *KM84s*. Some people get frightfully enthusiastic about the *KM84*; it's a very good workaday microphone but it's got all the usual directional microphone problems: it's squeaky and it hasn't got much deep bass. I find it a bit bland but a lot of engineers are very familiar with them which means they know how to use them to get the sound they want. If I've got foreign producers or foreign engineers who don't know anything about Sankens or Shures or Schoeps, it's nice for them to have something they recognise and know what they can do with. A lot of microphone technique comes down to familiarity with the particular tools in your mic kit and there's no point in saying that one microphone is globally better than another one because one engineer's meat is another engineer's poison, they don't like them."

The idea of recording orchestral music on multitrack had its pros and cons. When you are working in a venue you are not familiar with in a control room which is quite likely just to be the vestry of a church or a similar type room with an unsympathetic acoustic, it was quite useful to be able to mix tracks after the event.

"Maybe from a sonic point of view you can justify the idea of laying the individual component microphones on to separate tracks so that you can fine tune it later. But the real problem with multitrack is that you end up with thousands of wires everywhere. It gets very complicated and confusing and nobody knows quite what you can get right afterwards—particularly the musicians."

Faulkner favours straight to stereo technique because everybody goes away knowing what has been achieved and there are no illusions.

"But I can see why people want to work multitrack and it's not purely so that they can make the sound when they get home; that's a fairly naive attitude that some of the hi-fi types come up with, this idea that people walk into a studio and say 'gosh, how can we muck it up today? Let's do it multitrack and twiddle the knobs so that everybody finds it unrecognisable when it comes out'. That's just not the case; people don't think like that.

"Multitrack can, however, in my limited experience, lull you into a false

sense of security that you can sort it out on the mix, and you can't. There is no way in a mix you can move a microphone 6 in up, down, left, right, backwards or forwards in the way that you should have done it in the session when you were listening to it in stereo."

Another argument for multitracking is that singers and soloists sometimes need the reassurance of hearing a good representation of their performance, and in a bad control room it can be an advantage to be able to put up a convenient mix for this purpose, safe in the knowledge that you haven't sabotaged your recording.

One of the key factors to the different approach required for miking an orchestra brought about by digital recording is the way in which analogue covers the seams of multiple mics. This is a good reason for using minimalist techniques.

"Analogue covers the seams because everything's got a very nice sort of romantic mist over it which some people enjoy. In that one regard the lies that analogue's telling are lies that you like to hear but I'm not interested in the business of peddling lies."

Microphone set-ups will obviously depend largely on the size and ambience of the hall. At Henry Wood a typical orchestral microphone set-up will probably consist of an ORTF pair or widened ORTF pair of *MK5s* or Sankens with another pair—'American' style—of *MK5s* or B&Ks in front of the second and third desks of violins and the second desk of the cellos, which will be brought up a bit to bring the sound out and to give a little bit more room tone. In addition to these there may be some woodwind microphones if the orchestra has been set very deep. Often when recording an orchestra will spread themselves out over quite large area—they want to put their feet out and put their newspapers beside their chairs, etc.

"If you have got woodwind on the flat behind a sprawled bunch of string players they are far enough back but the overall pickup is going to be very light on woodwind. In concert halls, the reverberation time can be affected by the lack of an audience and you can find that the woodwind sound will be much more laid back. So quite often we will put a pair of microphones up high over the woodwind and in front of them a bit, something like the Sankens just to put a little bit more front edge on the sound. It's not actually a balance thing; if you listen in mono we're not actually making the flute or the clarinet sound any harder, just somehow or other there is

A CLASSIC CASE

more front edge to the sound; more 'presence', to use a musical word. It's not in terms of some EQ on the presence knob; musicians have certain words like ambience, or air, that mean different things than they would to a mixer manufacturer. If you talk about presence, most people just think it means pull it forward, make it sound a bit harder, but musicians don't mean that. Generally they mean more ambience but then more clearly defined within the ambience, they don't mean closer but more feeling of the hall to give more front edge to them. That sort of presence you can get, if you want it on woodwind, on a high pair of *KM84s* or *CU41s*.

"We prefer the Sankens because you tend to pick up all the rest of the orchestra and the timps will come through on that rather than having to put a microphone on them uniquely to make them sound like steel drums. If, however, you leave it on overall pickup with the very deep set up orchestra, the timps can end up sounding like they're unloading coal outside or slamming a door in the car park. Although I believe in minimalist microphone techniques I'm not going to make rotten records just to prove that you ought to. A lot of minimal miking gets a bad name from people who shoot their mouths off and say it's the only way you can possibly record. It isn't the only way—there are a heck of a lot of good records that have been done in lots of different ways."

Solo piano is one area where engineers have vastly differing ideas how to go about setting the mics up. "Some people tell you put two omnis down the bottom, about a foot apart from each other; other people tell you put an ORTF pair in the arc of the piano and then put two omnis further back spaced apart; another person will tell you you can only do it with a *C24*, somebody will tell you you can only do it with pair of Sankens."

Tony's own technique generally is to use a pair of Sankens, not very far apart from each other, angled out a bit: "Much higher than you would normally expect to use them and much further away. That happens to suit my idea of what I want a piano to sound like. I wouldn't dream of telling everybody else to rush out and do this because it's going to change their lives because they would come back with something that perhaps they would hate. Piano is the most extraordinary thing for a classical engineer because I've been on quite a few set-ups with different engineers and I've never found two engineers with the same idea about how to record a piano; they may well end up with a similar sound in the finished product but they are arrived at in completely different ways.

"We were working in Berlin last September—one of the big companies was just moving out of the same location and they had been recording Beethoven piano sonatas with a *KM84* at one end, very close to the high frequency strings, a *KM84* down the bottom end very close to

the left hand strings and a pair of *PZMs* on the floor stuck down with masking tape, which is a way I wouldn't dream of recording a piano but I must say it sounded very good. We all start from different starting points and they get their very good results by their own methods."

Faulkner will instinctively work further away from instruments in order to avoid problems with buzz and peculiar squeaks, ringing and modulation noises coming from inside pianos and other instruments that would not normally be heard by an audience anyway.

"My background was in recording Renaissance polyphony music. The first stuff I ever did was Byrd and Tallis masses, things like that where my main interest was clarity of the details of the words while still managing to get the ambience of the location you are recording in. That starting point has really coloured my whole attitude to recording since then. I am very interested in trying to reproduce the ambience and the atmosphere of the location, not just the individual strands of the performance."

For things like string quartets the main two starting points will be either an American oriented one or a European oriented one. A lot of Green Room's business is with American labels working in London or on the continent. An American based technique will probably start with two or three spaced omnis.

"It is still the same basic technique always that you try and arrive at an overall balance from either two or three

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microphones that contain 80% at least of what you want to hear on the final record. You might do a little embellishment with some spot microphones or some space microphones but your starting point must be a set of two or three microphones which pick up most of what you want to hear. That's the so-called minimalist philosophy. It doesn't mean you have to do everything with a crossed pair of figure-of-eights or two omnis or whatever; the basic idea is that you have an overall pickup from one set of microphones not too far apart from each other and then maybe you need to polish that up. But if you work that way then you're leaving the balance of the different instruments essentially to the artists and the composer rather than twiddling the knobs and confusing what the performers are trying to do for themselves."

Opera calls for an altogether different

approach. There is not really very much room for manoeuvre. Standard practice calls for a set-up whereby the singers are stationed on scaffolding behind the orchestra each with a microphone from which you "add enough of that to keep them happy and not enough to make it completely phoney". There is a particular type of sound which people have come to expect of an opera recording which was laid down by things like the Solti recording of Wagner's *Ring*; and that is a large boomy symphony orchestra with very close voices. Being realistic, says Tony, there is not a lot else you can do anyway.

"In many ways opera is the most frustrating thing to record because you are locked into a certain style of sound, with the voices very forward, the orchestra a bit laid back and very wide; you usually don't have very much time on the session to do anything other than

work the way that worked last time. It costs a fortune to have all these big time singers flying in and out on Concorde and a big symphony orchestra and choruses all hanging around, and they try to get everything done in the minimum number of sessions, purely because of the costs.

"The only other way you can do it really is to go to live performances and put some mics up but that requires a lot of planning and organisation and usually it's an impossibility."

As for miking up singers, Tony was a bit hesitant. "This is where I'm going to get branded as a freak. I rather like valve microphones on vocalists but I don't have very many of them and usually have to hire them in. Something like a *U67* or a *C12* if you have got to use a microphone close. All my microphones are ones that most pop engineers wouldn't necessarily have much experience of using. They are microphones used at a distance and in a pop studio that's about the last thing you want."

The Green Room philosophy is to use an eavesdropping technique where you stand at a distance away from the performers and in order to be at that distance you need microphones that are capable of reaching into the orchestra or ensemble.

"The problem with opera is that you actually need a microphone close to the vocalist so that it doesn't pick up the bassoonist who is sitting in front of

Henry Wood Hall with City of London Sinfonia recording Schubert 3 & 8



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where the soprano is. The traditional microphone to use these days would be something like a *U87* or maybe *TLM*. But my favourite is to use these old valve things.

"The main disadvantage of valves—things like noise and reliability and whatever, those don't apply quite so much with opera because they are only add-on microphones and the noise floor isn't going to be enough to give the same away. Somehow it's a warmer sound.

"We did *South Pacific* here with some valve microphones—they gave a much warmer sound than the other microphones we tried; somehow or other something like an *84* just sounded a little squeaky and thin and very 1-dimensional when you used enough of it to hear the words, and then if you laid it back you could hear this funny sort of double attack because it was coming in on the overall microphones as well. You can get over that particular thing if you use delay lines but I think the answer is really to find a microphone that flatters the voice well."

Resolutely pursuing the idea that you can get at least 80%, if not 90% of what you want from an overall set of microphones, Green Room Productions does not have any outboard effects as such.

"You hope that anything else you're going to have to add in to the main microphones will not be adding enough that the time delay is going to ruin the sound. It is quite a complication hooking all that sort of thing up. Generally our approach with equipment here is that everything is minimalist, not just in the sense of not using too many microphones but in terms of signal path so that if, say, we're doing a multitrack thing for CBS, the actual number of components between the mic input socket and the A/D converter will be small. Once you start using delay lines and things like that it tends to make the signal path complicated."

The advantage gained by putting 10 ms of delay in between the main pick-up and the wind microphones in terms of stereo may actually be lost in terms of the effect of the extra toys on the sound quality. Faulkner prefers to add delay, if necessary, in the digital domain, eg on the Neve DPS console at CTS which has assignable delay for the different tracks.

"So if we record with a clean feed going straight on to individual tracks then delays can be put in on the mixdown rather than guessed at the time. You have got too many other things to worry about on the session to go out with a tape measure and work out you need *x* number of milliseconds. If you start relying on toys too much it means you have probably got a problem with your basic technique."

The console installed at Henry Wood Hall is by DDA. "DDA consoles are transformerless which is a particular paranoia of mine."

Another matter for particular concern is types of cable—a matter sometimes thought to be of more



Same Henry Wood Hall session with clearer view of mics

concern to the hi-fi enthusiast than your average recording engineer. Cables at Green Room include a selection of oxygen-free linear crystal interconnects in the studio and control room.

"What you ought to ask me is 'is it bullshit or not?' and the answer is no...but sometimes!

"People want to try listening with their ears rather than pre-judging these things. Cables do make a difference—not as much difference as changing between the RPO and the LPO, it's not that sort of difference. And it's not the sort of difference you are going to hear after two or three glasses of wine but the fact is if you've got a choice of getting things right or nearly right you might just as well try and get them right. The cost of the new cables isn't that great and if it makes your recording better what's wrong with that? In my experience the people who are most vociferous about saying there is no difference between cables are the people who have had the least experience of trying it and with the most closed minds because they have some kind of peculiar idea in their head that they understand how the cosmos works and that their understanding of the cosmos doesn't include the possibility that one cable might be different from another.

"Cables make a difference in terms of subtlety; it is a subtle difference but a whole lot of subtle differences added together make a big difference. I was always told that all power amps sounded the same and that all speakers sounded the same, and everything sounds the same. The fact is they don't.

"We've got fancy interconnects between microphones and mixer for the overall microphones which is what we generally use them for. We have got all the usual 'cooking' cables and multiways, and there are tie-lines in the hall using cooking cable and they work perfectly well. For the main microphones we have some Monster, some linear crystal oxygen free van den Hul cables and some linear crystal oxygen free star quad Hitachi cable. I wouldn't rush out and burn all the old cable just to replace

it with the new stuff—it's very expensive and not really worth all the huge amount of bother but for main microphones it is worth the bother. The sound has got more impact, it sounds cleaner. I don't make a big marketing hooah about it—I would rather keep quiet because I don't want to be branded as too much of the hair shirt type engineer. I'm not here making one record a year and spending 12 months fine tuning it, I'm in business. But if I can use tools that will give me better results, make my clients happier and make them tell their friends then obviously I ought to; I do."

Green Room's biggest investment in the last couple of years was not, as you would expect, in digital equipment, but in their Threshold \$1000 power amplifiers.

"Just having power amps that are actually capable of reproducing what you put into them. Listening when you are recording on location, often the control room is big and people want to listen loud and often speakers like the B&W 801s are quite insensitive and need some driving. Put all that together and you end up with a demand on a power amplifier which isn't the same as in domestic circumstances.

"We bought the big Threshold amps on the insistence of one of my clients and he was completely right. It was as big a difference as buying new microphones or a new mixer. Although monitoring may seem an indirect part of the chain, it is still a major part of the feedback network and if you've got a good representation of the sound you're making, then you can fine tune things in a much better way and just get it sounding a bit nicer. I am very happy with these and I'm just sad I wasted so much time believing people who told me that amplifiers didn't make a difference, because anybody with a pair of ears on his head can hear the difference they make.

"What I have discovered is that things like the difference cables make and

absolute phase—whether the overall phase is the right way up or not—if you haven't got it right the losses you get are what quite a lot of fussy engineers try to sort out with EQ and compressors and effects boxes, whereas if they had actually got the cable right and the phase the right way up and kept their signal paths short enough they wouldn't have needed to putz around with lots of EQ and effects. What they're trying to put back in is what the cables and phase problems have taken out. Absolute phase is a particularly difficult thing to try and correct in any way other than turning the signal the right way up."

Working on location is virtually a way of life with classical music recording. There are precious few studios around that are big enough to take a large orchestra, let alone with sympathetic acoustics for the types of sound required. Churches and large halls play a major role and these are fraught with practical problems.

Henry Wood Hall is popular because these problems are minimised. The hall is dedicated to rehearsing and recording, and the facilities even include a restaurant in the crypt. Green Room Productions therefore jumped at the opportunity of installing themselves in one of the 'control rooms' which the various record companies used, and treating it to be acoustically acceptable for monitoring.

One of the worst problems is

disturbance from outside which is often insurmountable and therefore costly in terms of lost session time. Many of the popular locations are actually in use as places of worship and there is nobody prepared to fork out the capital required in order to provide sound isolation.

"Usually in that order of priority unfortunately. You would think that sound quality would be the first one but it isn't always. Henry Wood Hall is quieter than most of the other locations you go to work in. We have just been over at St Barnabas Church, Finchley, trying to do Mozart violin concertos. It took us over a session to record the cadenzas because of people mowing the lawns and the blimp flying over and the trains. It was just endless interruptions."

The 'glorious' acoustic does not always make up for the problems. "It is all edited around the noises rather than the musicality. It doesn't put artists at their ease and you end up sitting there writing on the score 'quiet end' or 'quiet here' or 'use this take because no train'. The acoustic at St Barnabas is lovely but the noise is sometimes unbearable and really the best thing to do is get back in the car and go home but it costs you a fortune just paying people off. One time last year when we were there somebody was demolishing an air raid shelter with

pneumatic drills!

"You have to try and identify with what the artist is trying to achieve and the last thing he wants to do is sit in a noisy hall doing the same bit again and again and again known that the one take that'll be used on the record won't be because he phrased it nicely or because it was perfectly in tune but because there wasn't a dog barking. That's not right."

Tony Faulkner sees Green Room's immediate future securely tied in with the increasing demand for budget classical CD. At the time of this interview they were making one recording a week with major artists.

"I think some of the smaller labels, particularly the British ones, feel almost ashamed when they sell more than a few copies. They must think they've done something wrong if it's popular; it's vulgar—if you've actually succeeded in reaching the public!

"All our best selling records have been the ones with no technical gobbledegook about them at all but ironically a lot of them have been done with very simple microphone techniques.

"One of our clients commissioned an independent survey of CD sales earlier this year and out of the Top 30, we recorded 12 of them. Of those, 10 had been done with *PCM F1* or *PCM 100* and all of them with strict minimalist microphone techniques. But there was no technicalia about it on the sleeves. That sort of thing appeals to me." □

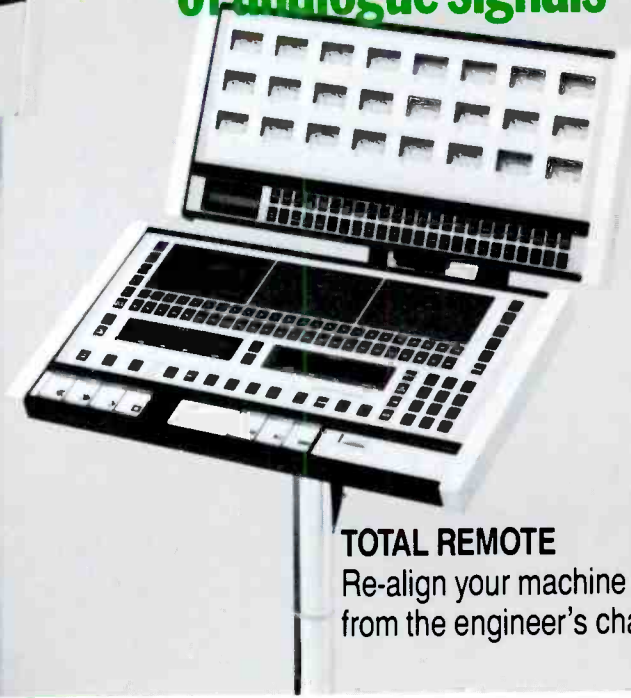


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AIR CONDITIONING

Air conditioning is a phrase that is frequently quoted as necessary for a studio environment and the first question must be—what is air conditioning? The true definition of air conditioning covers the filtering, cooling, de-humidification, re-heating and humidification of air to achieve specific conditions within a particular environment. Under the terms of this definition it would be difficult to find a studio that has true air conditioning, rather than comfort cooling.

Most studios require filtration, cooling and de-humidification but the latter is not generally controlled. Heating is occasionally required. In the opinion of most studio users a successful system should be unnoticeable and reliable.

Start of a project

The ideal time to involve an air conditioning consultant in a new project is at the time of investigating premises. I would rather give somebody some good advice at the risk of losing a job than have him find a building and then come back for us to sort out the air conditioning. If the client has the right building, the design time is far shorter and there are cost savings although unfortunately we are not usually involved at such an early stage.

I know it is often very hard to find any premises at all in specific required areas, let alone those that meet ideal air conditioning requirements, but to illustrate I recently investigated one building with an acoustic consultant and estimated that in this particular case air conditioning would have cost nearly three times the norm. It goes further than cost because in some cases the wrong building may

Stuart Bailey, an air conditioning consultant working with Asadul Ltd of Colchester, Essex, looks at an important area of studio design that is a less obvious component but important in its own way.

As air conditioning design is related to local climatic conditions, it is possible that some aspects of this UK-based article may not apply in all locations. It should, however, be possible to relate the facts to your local conditions.

mean that no matter how much money you throw at the project, you may never have a good job.

From the air conditioning aspect I look

for buildings with headroom such as old warehouses (or new ones), power stations, cinemas, etc. Ideally a minimum height of four metres.

System design

I have always believed in the concept of one plant per area, therefore a typical installation would have three independent plants serving the studio, control room and machine room although sometimes there are budgetary or other limitations which prevent this. With the removal of equipment from control room to machine room, this is becoming more important.

There are two main reasons for separate plants and if you were to do a true comparison in terms of temperature control and crosstalk, the cost of independent systems will always be cheaper.

Taking a typical studio, the loadings presented by each area could be: control room 4 to 5 kW; machine room 8 to 12 kW; studio 3 to 7 kW.

If the total load is handled by one plant there are only two ways to maintain independent room control: run the cooling cycle continuously and reheat the air to each area controlled via a room sensor or each area can call for the cooling cycle and reheat the air to each area via a room sensor. In either case the result is that the studio will run for considerable periods on reheat, a lesser degree in control rooms, but in both instances the humidity levels will drop below acceptable levels, causing stringed instruments and pianos to require frequent tuning. To overcome these difficulties we add the humidification plant but now costs are escalating.

Regrettably in many studios great attention is made to plant and airborne noise, but crosstalk is totally neglected. With a common air distribution a greater degree of attenuation is required and again costs escalate.

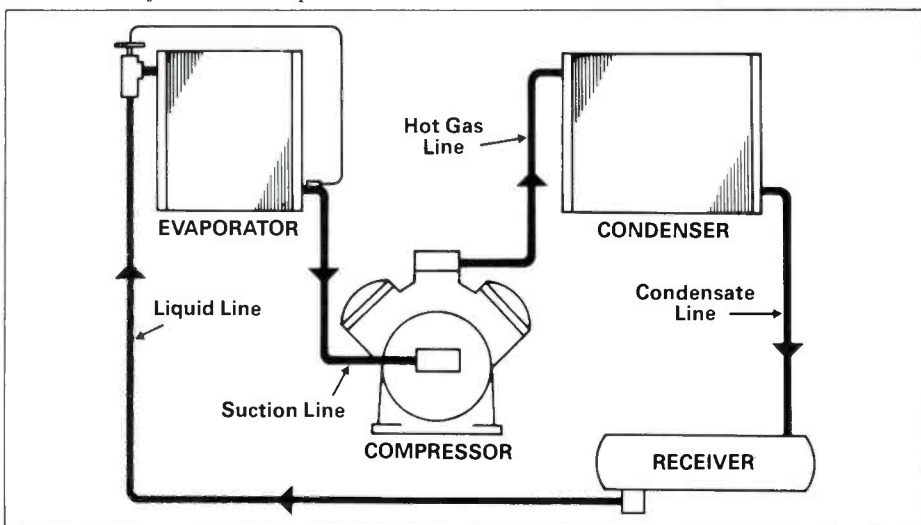
Those studios with a common installation continually suffer from poor air conditioning, high running costs and costly down time. A good system can give many years' unnoticeable service.

The design begins with basic information on the studio—the minimum and maximum occupancy, lighting load and the electrical load of the equipment. The latter is undoubtedly the most difficult to procure, manufacturers continually quote and convert power consumption to heat output but this is only accurate on 100% inefficiency. This accounts for the number of studios built in the past with oversized air conditioning installations and as a result a loss of temperature control.

When a plant is oversized there are severe control problems. As the temperature rises a sensor calls for cooling; the oversized plant starts and the temperature decreases rapidly and you will most certainly notice it, a chart of the space temperature will give high peaks and troughs. On the other hand marginally undersized plant will result in a gradual rise in temperature over a period of time without this stepped pattern. For this reason it is preferable to err towards undersizing but matching the load is very important.

For the studio air conditioning designer

Room air passes over the evaporator coil
The heat is rejected to atmosphere via the condenser coil



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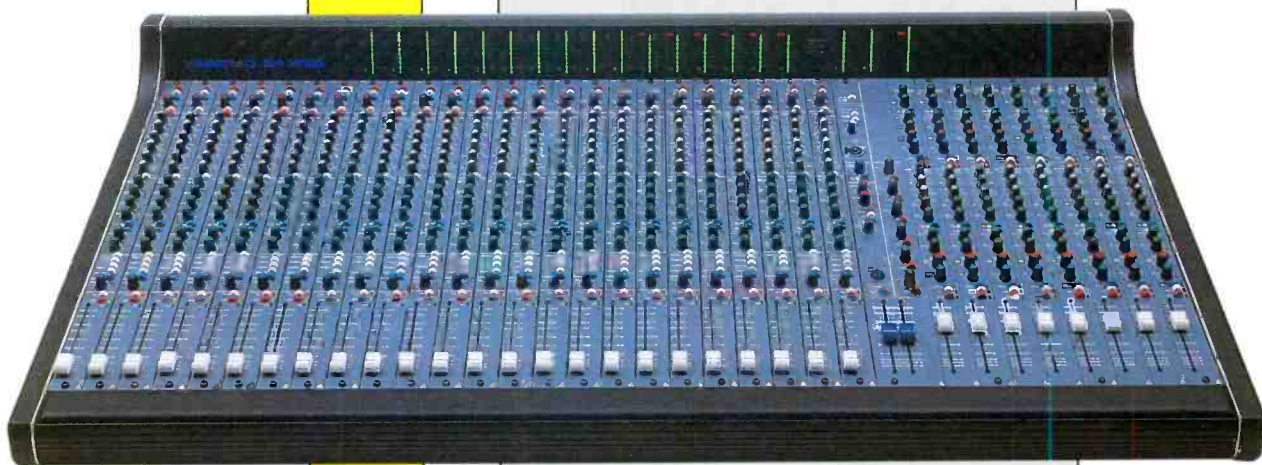
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the problem is understanding the particular requirements of a studio environment and obtaining the correct design parameters. From the client's standpoint there are advantages in using contractors who are familiar with studio operations as the air conditioning requirements are highly specialised, although the duties are low, and packaged equipment is not always suitable for the application.

A large percentage of our work is studio related and many of the standard products that we use are modified to our own specification. We have also found it necessary to design and build all our own air handling plant and attenuators as available equipment did not suit our requirements. Due to the volume of work, we have been able to standardise our products so we can provide service back-up and manufacture at an economic level.

We, of course, also need to know the details of the structure itself and the

AIR CONDITIONING

internal capacity of the different areas. The capacity of the areas is always measured from the acoustic treatment inwards. Unfortunately, at the early stages of the design it may not be possible to obtain these figures from the acoustic consultant but we have learnt to estimate fairly accurately. Luckily we do not really need to know the type of treatment used within the areas.

Optimum environment

Air conditioning in the UK is designed to achieve:

Space conditions

Temperature—21°C 50% relative humidity.

Ventilation rate—34 m³ per person per

hour.

Sound levels—NC20 across 63 Hz to 8 kHz.

External conditions

Summer ambient—30°C DB (dry bulb), 22°C WB (wet bulb).

Winter ambient—1°C saturated.

An installation can be sub-divided into four areas, in order of priority they are: air distribution; noise; controls; refrigeration.

Air distribution

Air is extracted from the area via grilles and passed through ductwork, then mixed with a quantity of fresh air. This quantity is determined by the room occupancy. The next stage is to filter the air to remove dust particles and pass it over a cooling coil to transfer the heat. A secondary action of cooling air is to remove moisture. The cooled and filtered air is then circulated via ductwork and grilles to be circulated within the room, and the process repeated. The air circulation is via a centrifugal fan, and the filter, cooling coil and fan in one package referred to as an air handling unit.

It is the air distribution which has the greatest single influence on the efficiency of the system and the one that can, but should not, make the user aware of a conditioned environment.

Air at 10°C (approx) is supplied into the space being maintained at 21°C. This must be distributed through the room without regenerating noise and without creating draughts. In order to prevent these problems care must be taken when selecting grilles; those which will induce a secondary airflow are preferable. The outlet locations must be positioned in order to provide optimum room flow without exposing ankles, necks, ears and wrists, which are the most temperature sensitive areas to cold draughts.

The air distribution chain is a source of noise, ie fans, but via ductwork and attenuators this can be removed. It cannot be overemphasised, however, that regenerated noise must be designed out.

Noise

Noise from an air conditioning system is caused by three elements: mechanical noise from the fan; the motor and its bearings—the fan motor creates most of the problems; air generated noise within the ductwork which frequently cannot be designed out as there are always physical restrictions on duct paths; and most frequently forgotten about—crosstalk. The first two problems are generally solved by running fans at low speed with low velocity air flows, some attenuation and ductwork lining.

The area where many systems fail, if they are measured, is crosstalk—sound travelling through the ductwork from one area to another. One way to solve this is to have the silencer immediately above the outlet or inlet grille and deal with that problem at source. It is surprising how many studios have appalling isolation in this way and just ignore it. The low frequencies are the problem areas. Independent systems rarely suffer this fault but on common installations the problem is rife. This is

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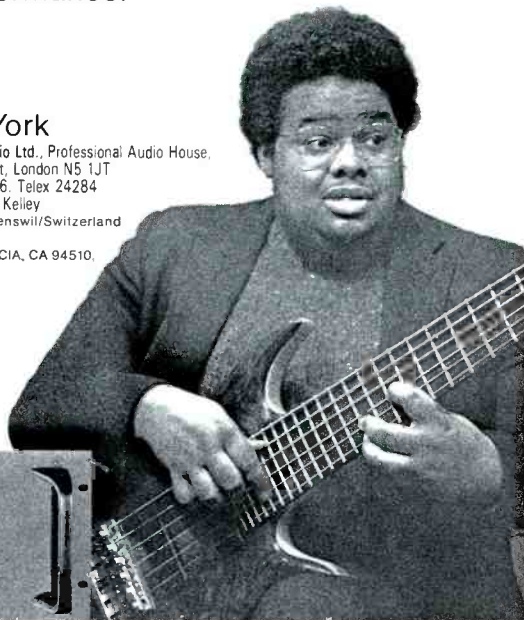
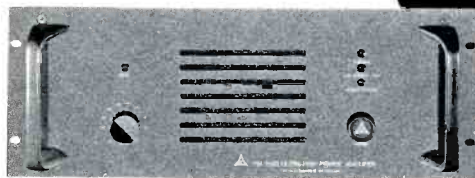
"There is nothing to compare to lifting the lid on a piece of equipment and realising that it has been designed and constructed with no regard to cost."

"I've owned many power amps, and heard and played through many more, and as far as I am concerned, the search for the ultimate has stopped here. Thanks for your most inspiring performance!"

Anthony Jackson

Anthony Jackson, New York

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AN INTEGRATED APPROACH TO THE DESIGN OF A STUDIO MONITORING SYSTEM

In recent years recording techniques have changed dramatically, placing many new demands upon control room monitor loudspeakers. The advent of digital recording has maintained transient responses and dynamic range from the original performance, to the final mixdown... and now beyond. Where once, only during the original performance, could the full dynamic range be experienced, now, playback after playback, the same transients make their punishing demands on the monitor loudspeakers.

As keyboard rigs are ever more frequently to be seen in the control rooms, not the studios, larger control rooms have become the order of the day. These larger rooms, together with the need to produce "live" volume levels for the performers, have led to monitor power levels hitherto unheard of. As many musicians "play off the volume" for inspiration, the on-stage monitor levels of a large concert may be required from the control room monitors. This is in order to create the appropriate feel for the musicians. Turning it up afterwards won't help. It's the frame of mind of the musician at the time of the recording, that determines the feel of the track.

if you're over equalising something on the console, it's not masked by unnatural, equalised monitors — try it!

In terms of tonal characteristics, analysers really don't help. Even when set flat in the same room, Altecs, Tannoy's, JBL's, EV's etc. still have their own individually recognisable sounds. You can't (as yet!) make a cheap violin, sound like a Stradivarius just by equalising the resonances and reverberations. Similarly, different loudspeakers cannot be made to sound the same, purely by electronic means. Despite the reading on the analyser, acoustically we would quite categorically NOT have a flat response in the room. Equalisers also tend to introduce phase shifts, especially when we're getting the alternating up/down pattern. This makes a mockery of achieving minimum phase shift in crossovers, or "time aligning", of drivers. There's even more! While it is true that two or more entirely different settings of the analyser can achieve a flat response on the analysers, clearly they can't all be right. In all probability none of them are; they never accurately correspond with what's really happening. To cap it all, even the different makes of

can be made to relatively small frequency bands by adjustment of gain controls only. To the ear, this seems to sound much more natural and lifelike, and much less fatiguing than correction by means of equalisers. The system is produced with enormous power handling capability, removing the need for monitor limiting and protection circuits. Since the first system went into commercial operation in March 1984 the number of systems has been multiplying rapidly, both in Reflexion Arts designed control rooms and also as free standing systems.

Accepting that not all control rooms can accommodate monitor loudspeakers of the size of the 235's, two variants are available. Model 233 is a similar, 4-way system, but with only one 15" bass driver, as opposed to the two of the 235's. The reduction in the required internal volume of the cabinet, together with a re-location of the bass and lower mid drivers, enable a considerably smaller cabinet to be used. The 233's are supplied in left and right handed pairs, for control room symmetry.

A more compact model, the 238, dispenses with the 10" loudspeaker and operates as a three way system.



Limiting is dangerous on monitors; what's limiting, your monitors or your mix? It may well be imprudent to mix at ridiculous levels, but occasionally, in practice, that may be what the circumstances demand. Even if it's only on peaks, monitor limiting will suppress transients and you may find yourself putting too much top on tape to help compensate for the lost peaks.

The whole subject of monitor equalisation is a minefield. Has anyone yet seen a monitor graphic which truly reflects the inverse of the room/loudspeaker combination? Switch out the equalisation and see just how much more natural and clear, things sound. You can actually hear



analyser rarely correspond. Put the equalisers back where they belong; in the mixing console's effects rack!

What do we need? A system capable of high output, fast response to large transients, relative indestructibility to cope with keyboard "accidents" (they don't always put out the level that you were expecting), flat acoustic output to the extremes of the audio spectrum, low distortion, and a well balanced tonal character, independent of level.

The culmination of this overall design philosophy was the Reflexion Arts model 235 monitor system. It is designed to be used with 4-way multi-amplifier systems and a suitable crossover so that smooth adjustments



While not having the extreme ruggedness of the larger models, in the less punishing situations envisaged for the 238, it is a truly excellent unit.

As a further option, a cone mid range unit can be fitted to any of the systems by means of a quick and simple conversion. While the cone driver is less efficient than the compression horn, by means of pre-set amplifier gain control levels, the system can be set up for rapid interchange. For orchestral music, or situations where the full output potential of the system is not required, this option may be considered desirable where cone drivers are preferred. With this flexibility, the possibilities for further mid range options are considerable.

**To arrange a demonstration or for further details please contact:
Reflexion Arts, 15 Grandison Road, London SW11 6LS, 01-350 1208**

A CLOSER LISTEN

NEW TECHNIQUES IN DIGITAL ROOM SIMULATION AND SPATIAL EFFECTS.

Digital technology raises the standards

Digital audio places strict requirements on every link in the signal chain. From input transformers to monitor speakers, the tools of modern audio production are being re-examined in the unforgiving light of digital recording and playback.

To re-evaluate digital reverberation and effects, Lexicon engineers went back to actual rooms and concert halls. Since the design objective of digital reverb is the simulation of natural ambience, they reasoned that a closer look at the real thing could generate useful insights.

The first practical result of their research is Lexicon's versatile new 480L Digital Effects System. Computational power contributes to its superior performance of multiple audio tasks. However, its innovative software also reflects a more accurate model of the acoustic and psychoacoustic phenomenon of reverb. The 480L's capabilities include time-based effects and sampling as well as plate, gated and ambient reverb sounds in a variety of blends and combinations.

Why digital reverb sounds artificial

Recent research has shown that the initial buildup and decay of reverberation are critical to the perception of ambience. Echograms of some of the recording industry's favorite halls reveal a *gradual* buildup of energy from the direct sound's arrival to maximum reverb density, with complex, uneven buildup and decay profiles. Pre-delays were used in earlier reverbs to increase effective audible reverb time and apparent room size. Because their sharply defined attacks do not occur in nature, pre-delays give the sound an unavoidably artificial character.

A more natural sounding digital reverb

Lexicon's engineers have taken a different approach. Instead of using pre-delays to change apparent time and size, the 480L employs SHAPE and SPREAD parameters to emulate the uneven profile of natural reverb.

SHAPE affects the contour of the initial reverb envelope, SPREAD determines the time over which that contour is active.

Increasing SHAPE values lengthen the initial buildup and introduce a sustain before the decay. SPREAD interacts at this point to control the length of these segments. Carefully used and balanced with the SIZE (reverb density) and RT60 MID controls, SHAPE and SPREAD create warm, spacious and deep ambience without excessive RT60s. In addition, different envelopes can be set up for high and low frequencies (with a variable crossover point) to simulate room absorption characteristics.

Higher levels of SHAPE produce a secondary sustain in the envelope, simulating the diffuse reflections from the back wall of a hall. At very high SHAPE settings the envelope inverts to create special effects. With SHAPE at minimum the reverb builds very quickly and decays at a smooth exponential rate; the typical sound of small chambers, plates and first generation digital reverbs.

Typical digital pre-echos coarsen the sound

Pre-echos are conventionally inserted between direct sound and pre-delayed reverberation in an attempt to simulate early reflections. Because pre-echos are discrete delayed versions of the original sound, transients are clearly heard as distinct reflections. This produces a harsh, grainy sound. The same reflection pattern is applied to every instrument, so the overall sound acquires the timbre characteristic of those pre-echos.

Complexity pleases the ear

The complicated reflective surfaces in the best halls produce smooth, diffuse early reflections that are more interesting and tolerable to the ear, in part because they are less readily isolated and identified. Because each instrument has a different set of pre-echo delays and a different timbral shift, the overall sound is basically unchanged by actual early reflections.

The 480L approaches this natural complexity by generating *clusters* of pre-echos, with density set by the DIFFUSION control. Some of the hall programs, such as "Carnegie" and "Concertgebouw," even allow the omission of pre-echos, emulating engineers who record in the center of the hall to minimize the muddiness of early reflections.

Creative power for the next stage in audio production

The 480L is engineered for the emerging all-digital audio production environment. Its unique 18 bit linear A/D and D/A converters produce a dynamic range of 98 dB in the wet signal — this is the only digital reverb available that *doesn't raise the noise floor of a digital master*. And the PCM 1610/1630 compatible *digital I/O* interface lets you add true stereo ambience and sample *without leaving the digital domain*.

Lexicon's work on more accurate room simulations has produced a digital effects system that suggests a multitude of new approaches to ambience, imaging, sampling and spatial enhancement. Controlled from the LARC (Lexicon Alphanumeric Remote Console) familiar to owners of the 224XL Digital Reverberator, the 480L's two high speed processors can operate in a variety of configurations. Samples can be processed with reverb or time-based effects, all in the digital domain. One 480L can serve two control rooms. Or two 480Ls can be connected through their digital I/O ports for even wider creative horizons. The 480L can even be connected to a 224XL and both units operated from a single LARC.

The present software is powerful and complex, a dramatic step forward in digital signal processing technology. Yet it hasn't explored the limit of the 480L's architecture, which is itself configured for future hardware expansion. In the current glut of 'throw-away' digital devices with ever-cheaper versions of the same sounds, the 480L takes the long view. It makes a powerful case for continually expanding creative options.

This discussion has been brought to you in the interest of furthering advances in audio technology by GEXCO International Inc., worldwide distributors of the Lexicon 480L and other high quality products for the recording, broadcast and post-production industries.

GEXCO
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days regular maintenance is essential. It may be very difficult to arrange time for servicing around bookings but it is not quite as simple as this. The main refrigeration plant of an air conditioning system will give about five years life if serviced about four times a year. We have, however, some installations that have been running non-stop since 1975; these have been well looked after and regularly serviced. I think 10 years is generally the maximum life expectancy and then it is borrowed time. If regular servicing can gain you twice the lifetime of the plant then this must also be costed into the down time equation.

Other techniques and machine rooms

I am sometimes asked why we can't just take the hot air from the back of the equipment and simply throw it away. The problem is that you have to make up that volume of air in the room. The

AIR CONDITIONING

air has to come from outside at ambient temperature. As soon as the external temperature goes above 21°C you are going to want a proportionate amount of cooling and so we have not really saved anything. There is a narrow band of air temperature in the UK that means if the outside air temperature is within 5° or 6° C of the temperature you get off the cooling coil, then you could use the outside air to give free cooling but only when operating between 42° to 48° F. Once the air temperature goes below that you will have to start heating the air which costs proportionately as much as cooling it. The gains are therefore small and the concept not worth use.

We have, however, often linked up external effects racks. When it was popular to put outboard gear in the

upward slope of compression ceilings we often used to put conditioned air to them, sensing off a common point. This requirement has died with the advent of machine rooms.

The trend for machine rooms started modestly and is now almost the norm in current installations. We have felt that it generally wasn't economic from the client's point of view to install a ducted installation—the costs are just too high. We have been using a split system which basically comprises a fan coil unit and an external refrigeration plant with pipework between the two. This system generates a much higher level of noise but within a machine room this has not been a problem.

One problem exists in that clients have assumed use of only one digital machine. We know of many instances where three have been in operation and as a result the plant is now undersized—once again correct design information is essential.

Further, we may see a similar situation developing as happened in control rooms—air conditioning plant increased in cooling capacity to cope with heat from consoles, they in turn became cooler running leaving oversized installations with all the control problems previously referred to. It should therefore be seen that air conditioning often requires updating to match electronic trends.

Future developments

As specialist air conditioning contractors we can see definite trends in studio development and the way they affect air conditioning requirements. We have seen the effects of changing mixing console design and the removal of computers from within the console itself, increasing use of digital tape machines with their far higher heat load than analogue machines and the move towards machine rooms to lower the noise floor within the control room.

The question must be—are current basic air conditioning techniques capable of delivering future low noise requirements? I believe they are. In many ways I have felt that air conditioning has been further ahead in noise requirements than the control rooms themselves. We have been designing to NC20 in control rooms for some time now. When walking into a control room in the past I have noticed instantly the fans on the tape machine; we have been aiming for NC20 for some while, somewhat ironically the ambient level with the equipment running has been higher.

For the future we would have no problem going down to NC15 which I think is more than adequate—we can design lower, although costs escalate.

In general terms air conditioning standards can and are rising but it is probably true to say that optimum result can only be obtained by close co-operation between air conditioning contractor, acoustic designer and studio owner right from the project inception, saving money but almost always giving a far better end result. Perhaps studios themselves should place more emphasis on air conditioning with regard to maintenance and servicing. □



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The Soundcraft SCM762 Mk III recorder comes complete with remote control, varispeed, zero locate

and cycle functions. It will run at 15 or 30 ips and is widely used by many professionals in master recording and video post-production work.

Package consists of:

Soundtracs CM4400 – 32 input mixing console.

Soundtracs CMS2 – automation system.

Soundcraft SCM762 Mk III 24 track recorder.

Commodore PC and disk drive.

Video monitor.

Set of interconnecting cables.

Please ring for a full demonstration.

REVIEW REVIEW

A user report by Patrick Stapley

ALESIS MIDIVERB & MIDIFEX

Alesis introduced the *Midiverb* in February. This has now been followed by the *Midifex*. Both units share the same appearance, operation, number of programs and price—which at under £400 each in the UK, make these some of the cheapest pieces of quality outboard equipment available. It is also refreshing to find that they are not Japanese!

Layout and operation

Each unit consists of a shallow black moulded plastic square box measuring 8×8×1½ in with a cut away section at the front housing the controls. The overall appearance of the units is rather basic but this has had a lot to do with keeping the price down. On top of each box is a list of 63 preset programs accessed by the Up and Down buttons at the front. There is a display that reads the program or MIDI channel number depending if the MIDI channel button has been selected; there is also a Defeat button that kills all effected output. The input level is read by a green and a red LED and it is recommended that the red LED should flash briefly for transients only. On the rear panel is a mix control for wet and dry output signals which in normal studio operation would be set to wet; also at the back are stereo inputs and outputs on phonos and MIDI In and Thru connectors on DIN sockets. Although there is a stereo input, this is only used to supply the wet and dry mix control, and signal going to the effects circuitry is in combined channel mono. The units respond to one of 16 selectable MIDI channels and any MIDI controlling device can operate program step and Defeat On and Off functions. Alesis have just designed a special 19 in rack mounting adapter that allows a pair of units to be mounted side by side in a single rack space otherwise they can sit on any convenient flat surface.

Midiverb programs

As mentioned, each unit contains 63 preset locked digital programs which cannot be altered in any way. In the

MANUFACTURER'S SPECIFICATION

Frequency response: 30 Hz to 10 kHz ± 2dB.
Dynamic range: 75 dB (typical reverb programs).
Programs: 63 fixed.
Input level: +6 dBV peak, one input driven; 0 dBV peak, both driven.
Output level: +6 dBV peak.
Input impedance: 50 kΩ.
Output impedance: 600 Ω.
Audio connectors: RCA phono jacks.
Power requirements: 16 V centre tapped, transformer, 800 mA.
MIDI connections: In and Thru.
Manufacturer: Alesis Corp, PO Box 3908, Los Angeles, CA 90078, USA.
UK: Sound Technology Ltd, 6 Letchworth Business Centre, Avenue One, Letchworth, Herts SG6 2HR.

Midiverb, the first 50 of these are various ambient spaces arranged in order of reverb time, which is between 0.2 and 20 s. Apart from reverb time each

program is defined by Size which can be Small, Medium, Large or Extra Large, and by the Decay Contour which can be Bright, Warm or Dark. Bright programs allow high frequency content to pass through the duration of the decay; Warm programs cause the high frequencies to be attenuated as the reverb decays, and Dark programs implement a quick high frequency roll off leaving a bass dominant decay. Although these are the only parameters listed, there are other differences between programs—most noticeably the introduction of pre-delays on some of the larger reverbs.

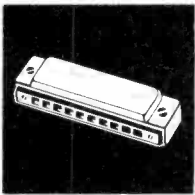
There is a good selection of ambient spaces from a tiny intimate room to an enormous concert hall. The spatial imagery is excellent with different stereo perspectives between programs and a



So you thought Shure only made vocal mics

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SHURE SM98 DRUMS AND BRASS

The SM98 utilizes a high performance, low noise, low distortion preamp, allowing it to be used for close miking of drums, brass instruments, and other high SPL sources without danger of overload problems. Extremely smooth frequency response for accurate, faithful reproduction of acoustic instruments and near perfect cardioid polar pattern at all frequencies for superior source isolation.



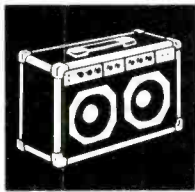
SHURE SM10A/12A/14A HEADSET

The hands-free operation drummers and keyboard players demand. The noise-reducing cartridge in the SM10A, SM12A and SM14A gives you high output for punch in live vocal situations, and a crisp, clean, balanced midrange. In addition, these microphones reject background noise and minimise leakage from other sound sources on stage. The microphone in each model is unidirectional and close talking.



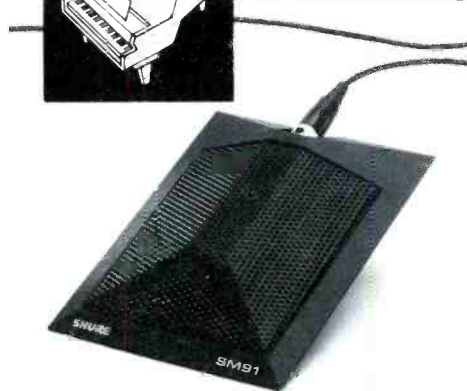
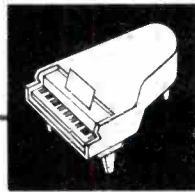
SHURE SM94 GENERAL INSTRUMENTS

The SM94 is an excellent instrumentalist's microphone with performance that compares favourably to many more expensive studio units. Flat frequency response with no troublesome "spikes" or "icicles", very uniform cardioid pattern does not "collapse" at high frequencies for highly controlled off-axis performance, internal battery takes over if Simplex power fails, low handling noise.



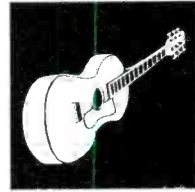
SHURE SM91 BOUNDARY EFFECTS

The SM91 is a surface-mounted permanently biased condenser microphone with a half-cardioid directional pattern. Because of this unidirectional pattern, the SM91 discriminates against sounds originating from the rear and permits the microphone to operate with much less reverberant pickup and muddiness than omnidirectional models. Applications include piano, stage work and conferencing.



SHURE SM57 GENERAL INSTRUMENTS

Offering wide range reproduction of music and voice, this dynamic microphone features an exceptionally uniform and effective unidirectional pickup pattern. The performance characteristics and unique construction make it ideal for both studio and remote use. The SM57's mid-range presence peak and good low-frequency response make it an ideal microphone for use with a wide variety of instruments.



SHURE®

HW International, 3-5 Eden Grove, London N7 8EQ. Tel: 01-607 2717

REVIEW REVIEW

good feeling of depth in the larger spaces. For basic reverb requirements I think one would be hard pressed not to find something suitable amongst these 50 programs.

Programs 51 to 59 are devoted to Gated Reverbs ranging from 100 ms to 600 ms. These are not as 'aggressive' as some of the non-linear sounds I have come across but they can be enhanced with EQ to produce some good results, particularly on drums.

The last four programs are Reverse Reverbs ranging from 300 ms to 600 ms. I was impressed with these and they did produce a convincing backwards effect which some other units fail to.

The overall operating noise level of the units is very low. The units are both 12-bit and I found two slight problems that are probably largely tied to this fact. Firstly, on programs with long decay times there is sometimes an abrupt end to the reverb decay rather than a total decay into system noise, rather like a noise gate although there are no compander systems used I am informed. Secondly, if sending an extremely dynamic signal to a short ambient program, it was possible to hear clipping when the input signal mix was low. It must be stressed that both problems are only noticeable with isolated signals and in most circumstances one would not be aware of them. The same situation existed with both units and for those of you with 'Golden Ears' it may be relevant.

Midifex programs

The programs in the *Midifex* are based around time, stereo, EQ and reverb. Programs 1 to 21 are echoes divided into Long, Medium, Short and Extra Short delays, and are arranged in order of length with program 1 being the longest at 600 ms. There may be high or low pass filters added to the programs and where they are combined, band pass filter will be listed. These filters add a distinctive colouration to the echo and can be used to feature frequencies, bringing out a particular instrument or vocal in a mix. Most of the echoes are in stereo, either Wide spread or Ambient, which gives a subtle feeling of space around the sound. The thick setting creates a narrow stereo image.

Programs 22 to 30 are 2-tap programs, and 31 to 36 are 3-tap programs. Again, these are arranged in decreasing lengths of delay starting at Medium and ending in Extra Short. They are treated with various combinations of filters and stereo perspectives, including a pan setting for programs 27, 31 and 32 that puts Tap 1 to the left, Tap 2 to the right, and Tap 3 to the centre. Next are six Regenerating Echo programs ranging from medium to extra short delays. These are followed by the Slap-Back programs which are flat and in mono. They give five lengths of extremely short delay starting at a few

milliseconds and working up to extra short.

Programs 48 to 54 are Reverbs providing a short gated reverb, a medium sized warm reverb, a long reverb with HPF and a reverse reverb; although these are all programs that appear in the *Midverb*, they sound different—which, if you have both units, is a bonus. There are also some interesting reverb effects like program 50 Reverb Medium Bloom which has a slow attack time and an 8 s decay producing the effect of swelled, delayed reverb although there is no added pre-delay. Reverb Medium Pan creates a subtle left to right movement and works best with sparse inputs as does Reverb Reverse Regeneration which is an effect that should be used in small doses.

The next three effects are Multitap programs: Multitap Pan is quite a quick 3-tap delay panning right-left-right; Multitap Reverb has a very quick succession of taps with a short reverb characteristic which worked better with sharp, percussive sounds creating a nice 'bounce' effect on snare drum; and Multitap Reverse Pan which has such close taps that they sound almost joined together. This latter program has a reverse characteristic panning from left to right in about 600 ms and requires space to be at its most effective.

Programs 58 and 59 and called 'Thickeners' and are designed to give body to thin sounds. They performed well on guitar and piano with 58 producing an ambient effect whilst 59 tended to be more up-front.

The last four programs create varying degrees of stereo spread; the extra wide

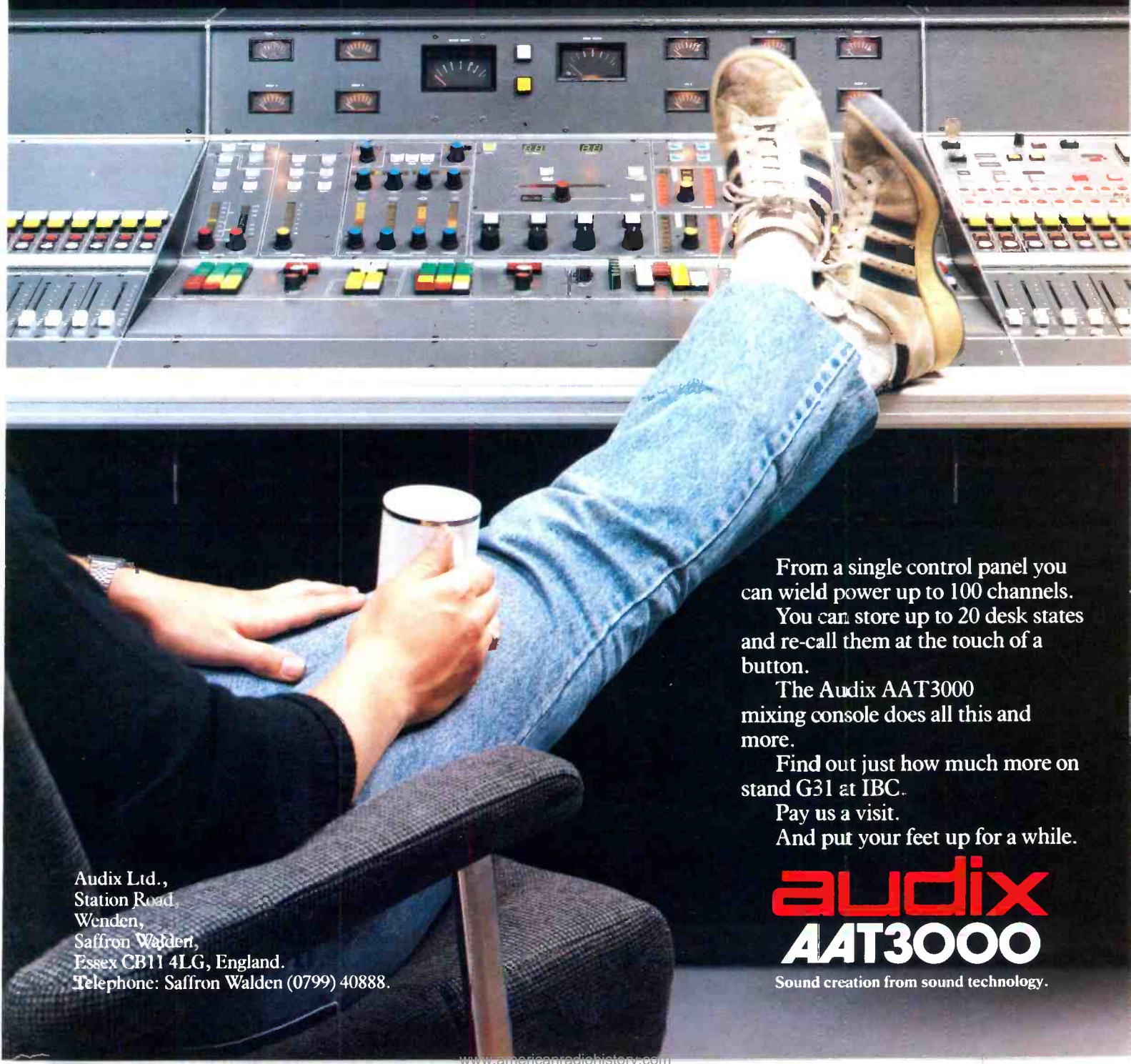
setting is impressive, really opening the sound and creating some interesting 'outside of the speakers' effects. The *Midifex* houses some complex programs which to recreate would involve a lot of ancillary equipment, mixer space and labour. One does, of course, have to consider how useful some of these programs will be and whether the lack of control over individual delay time is going to be a problem. I tend to feel in these days of musical precision within the studio that some of these effects may prove a little hit or miss. For example, if I were setting up a selection of echoes for a particular piece of music, I would be basing most of them around the BPM value of the track and the chances of finding an accurate interval in *Midifex* would be slim. However, this applies more to the programs incorporating longer delays; the shorter echoes and slap programs will always be useful. As for the more involved programs, a lot is down to individual taste and perception but one thing is certain: there is bound to be something in this unit for everyone.

Conclusion

These units will appeal to all levels of user. The important factor is that for the price these units are amazing, and for that reason they will appeal to the budget studio market. While the fact that the programs are locked makes them restrictive to the more innovative user, the sheer convenience of having some quite complex sounds, plus some useful everyday ones at the press of a button, makes these units a *most* likely addition to many of the more extravagant outboard racks. □



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REVIEW REVIEW

A user report by Dave Foister

DOD RDS 1900

In the apparently bottomless market for outboard effects devices there seems to be a trend for manufacturers to move up from an established range of stage effects pedals to rack mount units aimed at the budget conscious studio.

Dod's range of delay lines (the Digitech name has been dropped in the UK because of the clash with JHS's Digitech) would seem to fit into this category.

The RDS 1900 provides 1,900 ms of digital delay with most of the modulation and mixing facilities found on more expensive gear and although the parameters are not programmable, Dod has tried to make it as easy as possible to get to most of the standard delay-related effects quickly. One feature which has this in mind is the use of four pushbuttons to select the basic delay range of the unit, labelled Flange, Chorus, Double and Echo. Unfortunately, this might mislead the first time user into thinking that these were preset effects but this is not the case; all it means is that the four coarse delay settings have been chosen as useful starting points for the named effects, namely 14, 56, 224 and 1,900 ms. The Delay Time knob gives fine control over an 8:1 range, with the pre-selected time being the maximum available value rather than the mid-point of the control. Modulation width and speed are variable over a considerable range but the law of the width control seems a little odd—a lot happens in the first quarter of a turn or so with changes becoming less marked after that, which can make setting up a subtle chorus more of a chore than it needs to be.

Level, mix and feedback controls are all on the right of the unit, with the input level knob being the furthest right, which seems a little illogical; the LEDs next to it are labelled 'headroom' although in fact they're calibrated in terms of signal level and do little more than show the thing's working. I found some signals could keep the +3 light on with no ill effects while others produced curious grating effects while hardly reaching '0'. Input and output controls will cope with studio levels (although don't expect it to handle +22 dBm) as

well as lower-level home studio gear.

The feedback control has a centre detent at which the feedback is off; turning it clockwise adds progressively more in-phase feedback, while anticlockwise adds reverse-phase feedback. This presumably saves a switch somewhere but it means that it's impossible to compare instantly the 'positive' and 'negative' versions of the same effect without losing the feedback setting. It also means that there is no way of inverting the phase of the first delay—only the feedback can be inverted, so straightforward negative flanging can't be done. However, it seems curious to come up with an idea which was supposed to improve the ergonomics but actually reduces the usefulness of the device.

There is a useful repeat hold function, which repeats indefinitely what's in the memory at the moment it's switched in; on the RDS 3600, the 1900's big brother, the memory can then be triggered by external pulses such as a drum machine to give basic sampling facilities. As you would expect, there's also an effect bypass switch.

Dod has obviously realised that engineers often have their hands full of faders and that musicians tend to be cluttered up with instruments so they've added a couple of footswitch connectors on the back. The Repeat Hold function can be activated by a pedal—useful as there's no editing facility on the memory

so timing is crucial—as can a 'Delay Kill' function which does just what it says. I would have thought this could usefully have been duplicated on the front panel.

The audio quality from the delay line is extremely good. With a good digital signal fed into it the output was virtually indistinguishable from the original even at maximum delay settings. No figures are quoted for clock speeds, memory size or even the number of bits used but I would imagine they're a bit higher than might be expected for the price. There is a slight trace of hum on the output but the bandwidth is excellent. There are no audible noise breathing effects and very low distortion provided the input control is sensibly adjusted.

All in all, the unit is simple, logical and pleasant to use. The layout is good apart from one or two small points, the controls (apart from the feedback and mod depth knobs) are well designed to give useful ranges and fast access to effects, and the sound is excellent. What does rather give its price away is the quality of construction. The poor little mains transformer seems to be struggling badly; the case resonates at mains frequency with a loud mechanical hum when the unit is switched on, and the top panel where the transformer is mounted soon gets quite hot. (*The review unit was a UK 240 V 50 Hz version. The review of the larger 3.6 s unit had to be shelved when the power transformer primary went open circuit. This transformer was marked 110 V in a 240 V unit.—Ed.*) The front panel doesn't exactly look tacky but it's functional rather than sleek.

The RDS 1900 is the middle of a range of three Dod delay lines. The RDS 900 has exactly the same facilities but only 900 ms maximum delay, while the RDS 3600 has a couple of extra features, such as the trigger input already mentioned and a digital readout of the delay time, and a maximum delay of 3.6 s, extendable to 7.2 s at reduced bandwidth. They may not do everything but they do a lot for the price and what they do do they do well. □

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REVIEW REVIEW

Hugh Ford's technical review of a power amplifier

CAMCO LA 801



Camco's LA-801 is the big brother of the LA-401 and LA-601 which offer lower power outputs of 250 W/channel or 450 W/channel into 4 Ω as opposed to the 700 W/channel specified for the LA-801.

All models are based on a 1.25 mm thick steel case finished inside and out with black paint. The case forms the four sides and bottom cover of the amplifier with a perforated vertical division across the width of the case separating the power supplies at the rear from the signal electronics. A steel cover is secured to the top by 16 machine screws which fit into inserts in the main case. The 6 mm thick black anodised front panel is held in place by four bolts which secure the substantial carrying handles. The unit can be mounted in a standard 19 in rack. The top part of the front panel has multiple perforations through which air is expelled during operation of the rather noisy cooling fan.

At the bottom of the front panel is the heavy duty rocker power switch; separate detented potentiometers control the sensitivity of each channel. Recessed screwdriver operated potentiometers adjacent to each level control set the operating point of internal limiters. These protect against amplifier clipping or may be set to provide loudspeaker protection.

Between these there are two vertical arrays of four LEDs. For each channel two green LEDs illuminate for power on and signal present and two red LEDs indicate when the limiter is activated or if clipping occurs.

To the rear the mains lead is well secured and correctly colour coded and next to this the unfiltered cooling fan draws air into the amplifier. The fan is controlled by temperature sensors on the

heatsinks which switch the fan on/off electronically to avoid clicks. At the other end the electronically balanced audio inputs are at XLR sockets in parallel with $\frac{1}{4}$ in jack sockets. No provision is made for daisy chaining amplifiers in a rack mounted configuration.

The loudspeaker outputs are at banana sockets/terminals of adequate dimensions on the standard $\frac{1}{4}$ in spacing.

Three recessed slide switches allow the

MANUFACTURER'S SPECIFICATION

Output power: (specified with both channels driven, by a 1 kHz sine wave) 2x700 W min on 4 Ω load, 2x420 W min on 8 Ω load, 1x1400 W min mono bridge 8 Ω .

Signal/noise ratio: better than -106 dB.

Total harmonic distortion: (250 mW nominal power output) maximum 0.02%.

Channel separation: better than 70 dB.

Frequency response: (from 1 W to full power) 5 Hz to 70 kHz -3 dB, 10 Hz to 40 kHz -1 dB.

Slew rate: better than 30 V/ μ s.

Damping factor: better than 350:1.

DC offset: maximum 10 mV.

Features: clip-limiter, power-limiter, options for active operation (two print-plugs per channel), option for input-transformer use, ground lift, mono-switch.

Input sensitivity: 1.55 V.

Input impedance, electronically balanced: 20 k Ω .

Input impedance, unbalanced: 20 k Ω

Voltage gain: 33.5.

Indicators: LEDs for indicating power on, signal present, limit, clip.

Finish: front plate 6 mm aluminium, black anodised case 1.25 mm steel, sealed with special black paint.

Input connectors: Switchcraft XLR-type and $\frac{1}{4}$ in jack.

Output connectors: 5-way binding posts, gold plated, according to MIL specifications.

Usable temperature range: -20°C to +65°C.

Power consumption: maximum 2500 W.

Power requirements: 190 to 250 V (90 to 130 V).

Dimensions: (whd) 483x177x345 mm/

19x7x13 $\frac{1}{2}$ in.

Weight: 24.2 kg.

Manufacturer: Camco-Audiotechnik, D-5910 Kreuztal 9, Brucherweg 38, West Germany.
UK: Shuttlesound Ltd, Unit 15, Osiers Estate, Osiers Road, London SW18 1EJ.

amplifier to be floated from ground, switched between stereo and bridge modes of operation and ground one side of the inputs for unbalanced operation. No front panel indication is given for any of these conditions.

Within the case the large toroidal power transformer is mounted just in front of the cooling fan and is thermostatically protected. Primary tap changing is by push connectors with an unidentified $\frac{1}{4}$ in fuse providing primary protection. Separate secondary windings feed bridge rectifiers for each channel. The smoothing capacitors are also in the rear compartment of the case.

A small printed circuit board secured to the rear panel contains a power line input filter, an unidentified 20 mm fuse and various other components which are directly connected to the incoming power line. None of these components is protected from contact during servicing and the manufacturer should insulate this part of the amplifier in addition to giving warning of the serious danger of electric shock.

Connections are by slide connectors or plugs and sockets to ease servicing, with the exception of the ground connections to the power amplifier modules. As the manufacturer has been unable to find a suitable connector, these two are soldered.

Each power output module with its 12 output transistors in a complementary configuration is mounted on a single printed circuit board which is fixed directly to a large heatsink located behind the perforated part of the front panel and extending the full width of the amplifier. One section is mounted above the other with four M4 screws extending vertically through the heatsinks securing the output sections to the chassis. Removal of these allows output sections

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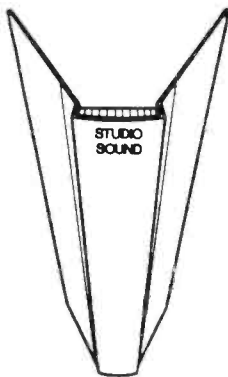
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Frequency Range	20-20kHz	20-20kHz	30-20kHz	20-20kHz	20-20kHz	300-3k4Hz	20-20kHz
Performance	±0.1dB Over above Range	±0.25dB Over above Range	±0.5dB Over above Range	±0.3dB 40-15kHz ±0.5dB 20-20kHz	±0.5dB Over above Range	±0.5dB Over above Range	±0.2dB Over above Range
Maximum Level	7.75V P.M.S. on Secondary	7.75V P.M.S. on 600 Ω	on 5kΩ 3.4V P.M.S. at 30Hz	26dBm at 30Hz	2-3V P.M.S. at 30Hz	0.6V p-p on Py	2-0V P.M.S. on Py at 30Hz
Maximum Distortion	With 10V P.M.S. at 40Hz only 0.12%	on 600 Ω Low source Ω 0.1%	Less than 0.1% at 1kHz	<0.1% at 30Hz and 26dBm	Negligible <0.1% at 1kHz	Negligible	0.1% at 20Hz
Shielding	Electrostatic Screens & Mumetal can	Mumetal can if desired at extra cost	Mumetal Can	Toroidal Can	Mumetal Can Rigid Fixing Bolts	PCB Mounting	Mumetal Can
Dimensions	33mm diam. x 22mm high	36mm high x 43mm x 33mm	33mm diam. x 22mm high	53mm diam. 36mm high	33mm diam. 37mm high	11mm high 19mm x 17mm	33mm diam. 22mm high
Price each at works	1-5-£10.83 50-£9.77 100-£9.27	1-5-£9.67 50-£8.89 100-£8.69	1-5-£9.67 50-£8.67 100-£8.41	1-5-£17.12 50-£15.69 100-£15.35	1-5-£14.59 50-£13.37 100-£13.08	1-5-£3.89 50-£3.55 100-£3.29	1-5-£11.38 50-£10.12 100-£9.92

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REVIEW REVIEW

to be removed for servicing whilst still connected to the remainder of the amplifier.

Mounted in the amplifier's base below the output sections are two further printed circuit boards: the input and limiter section and the loudspeaker protection board.

Within the input and limiter section a potentiometer and a variable capacitor set the optimum common mode rejection with pin connections being provided for fitting transformer coupled inputs. In either case the inputs are DC isolated. Further connectors allow the insertion of optional filters which include equalisation modules for horn drivers, 18 dB/octave crossover filters, or high and low frequency protection filters to guard against RF or infrasonic inputs which may damage loudspeakers.

Within the loudspeaker protection board relays are used in series with the loudspeakers with a separate secondary on the protection board power transformer via two unidentified fuses. These relays disconnect the loudspeaker outputs in the event of DC at the outputs and provide a turn-on delay.

Whilst the finish and layout of the printed circuit boards is good and the integrated circuits are socketed for ease of servicing, there are no component

identifications, no fuse values are identified and no layout diagrams are included. In fact the service manual only includes circuits and component listings and lacks any other servicing information.

In fairness it must be said that these complaints are easily rectified by the manufacturer and that this is a well made amplifier with a good overall finish in all respects.

Inputs and outputs

The input impedance of both channels was constant with gain and closely matched at 19.6 k Ω in the unbalanced mode or 26 k Ω in the balanced mode with the maximum sensitivity being 1.775/1.78 VRMS for delivering the rated power of 420 W into 8 Ω . The maximum voltage gain for 8 Ω loads was 30.45/30.33 dB for the two channels showing a well-matched gain.

Gain steps on the detented potentiometers were sensible: around 0.5 dB down to -15 dB gain and then increasing to less than 1 dB to -20 dB below which the steps became coarse.

The maximum input that could be handled for less than 0.1% total harmonic distortion was 7.08/6.17 VRMS (+19.2/+18.0 dB.7 V) which may be on

the low side for some applications with distortion becoming greater than 1% above 10 VRMS input (+22 dB.7 V). These levels were independent of the input configuration.

Common mode rejection for each channel was similar; Fig 1 shows how good the performance was on the worst channel. At the outputs the impedance remained constant with output current and Fig 2 shows the relation between the modulus of the output impedance and frequency for both channels where the damping factor is >400 up to 1.5 kHz.

The DC offset at the outputs was -30/-54 mV effectively constant with temperature, which whilst not being excessive, was greater than the manufacturer's specification of less than 10 mV.

Frequency response and noise

The frequency response of both channels was measured at the rated power of 420 W into 8 Ω and in five -2 dB increments to produce Fig 3 which shows that power output has little effect upon the frequency response. Approximately 0.5 dB difference between the two

FIG. 1
CAMCO LA 801
COMMON MODE REJECTION OF CHANNEL A

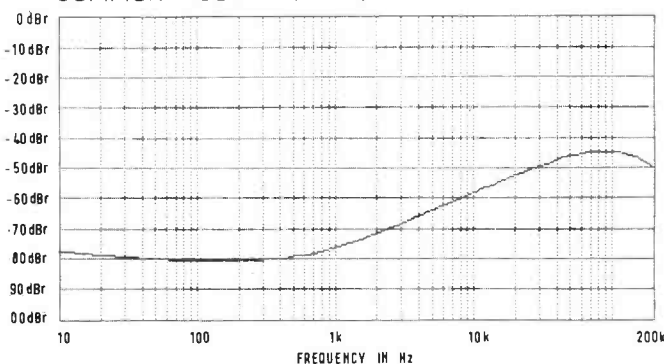


FIG. 3
CAMCO LA 801
FREQUENCY RESPONSE OF BOTH CHANNELS
IN 2 dB STEPS BELOW THE RATED
POWER OF 420W INTO 8 Ω

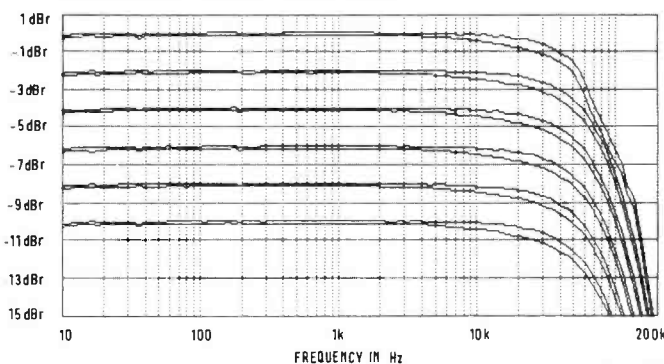


FIG. 2
CAMCO LA 801
MODULUS OF OUTPUT IMPEDANCE
OF BOTH CHANNELS

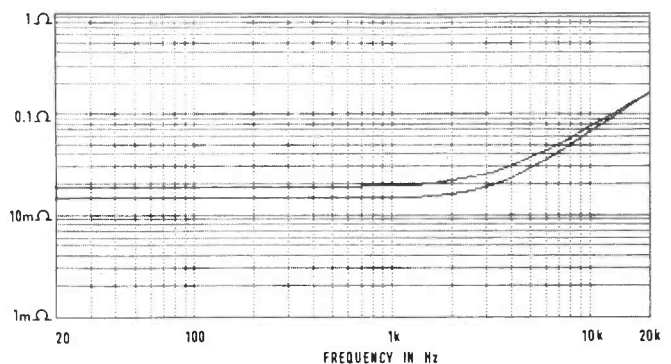


TABLE 1
Measurement method

	Noise referred to 420 W into 8 Ω			
	Minimum gain		Maximum gain	
	Left	Right	Left	Right
22 Hz to 22 kHz RMS	-104.1 dB	-102.6 dB	-99.6 dB	-99.6 dB
A-weighted RMS	-108.6 dB	-107.1 dB	-102.4 dB	-102.7 dB
CCIR-weighted quasi-peak	-95.6 dB	-94.3 dB	-91.0 dB	-91.3 dB
CCIR/ARM ref 2 kHz	-116.0 dB	-115.2 dB	-102.1 dB	-102.1 dB

TABLE 2a

Condition	Left channel	Right channel
Single channels into 8 Ω	470 W	473 W
Both channels into 8 Ω	442 W	447 W
Single channels into 4 Ω	846 W	847 W
Both channels into 4 Ω	773 W	780 W

TABLE 2b

Condition	Burst power output	
	Left channel	Right channel
8 Ω loads	576 W	564 W
4 Ω loads	1.06 kW	1.04 kW
2 Ω loads	64 W	64 W



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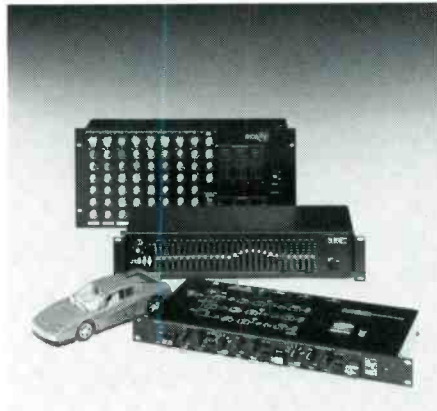
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REVIEW REVIEW

channels is apparent at 20 kHz where the response is $-0.5/-1.0$ dB relative to 1 kHz falling to -3 dB and 70 kHz. At low frequencies the response extended to -1 dB at 2 Hz but the output level is limited by the loudspeaker protection circuitry.

Noise in the outputs was measured at minimum and maximum gain with

respect to 420 W into $8\ \Omega$. The maximum gain setting was the worst and power line hum was at a very low level at all gain settings.

Table 1 shows a good noise performance, however, the large difference at minimum gain between A-weighted noise and CCIR/ARM noise seems peculiar. This was checked several

times using separate noise meters but all measurements remained in close agreement.

Power output and distortion

Whilst the amplifier was supplied for 240 V UK use it was marked for 220 V

FIG. 4
CAMCO LA 801
THD+N AND POWER OUTPUT INTO $8\ \Omega$
VERSUS INPUT LEVEL
BOTH CHANNELS SHOWN WITH SINGLE
CHANNELS DRIVEN

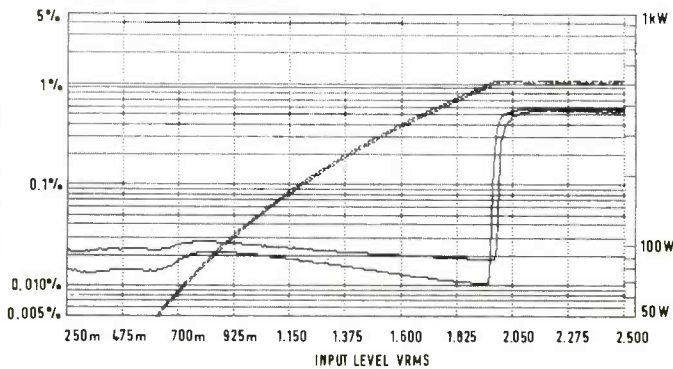


FIG. 5
CAMCO LA 801
THD+N AND POWER OUTPUT INTO $4\ \Omega$
VERSUS INPUT LEVEL
BOTH CHANNELS SHOWN WITH SINGLE
CHANNELS DRIVEN

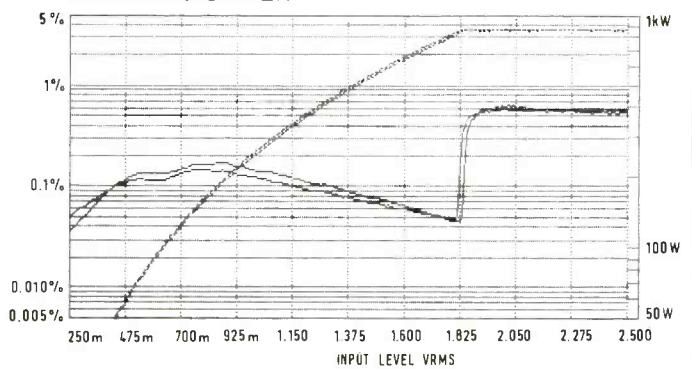


FIG. 6
CAMCO LA 801
THD VERSUS FREQUENCY AT 420W INTO $8\ \Omega$
BOTH CHANNELS SHOWN OVER
10 Hz TO $80\text{ kHz}</math> BANDWIDTH RMS$

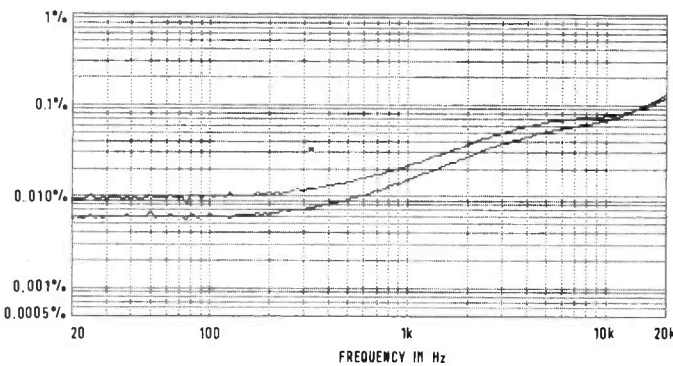


FIG. 7
CAMCO LA 801
HARMONIC DISTORTION AT 100W INTO $8\ \Omega$
VERSUS FREQUENCY FOR CHANNEL 1

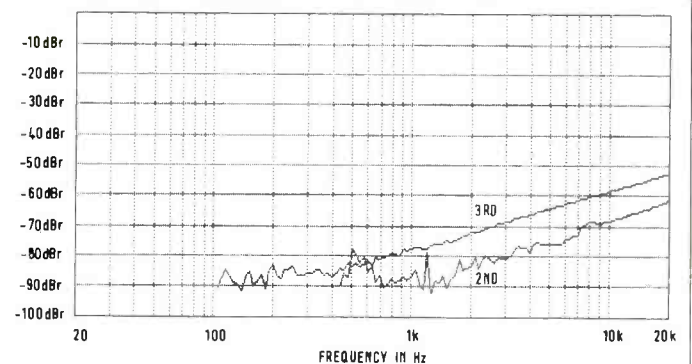


FIG. 8
CAMCO LA 801
CCIF IM VERSUS FREQUENCY AT 420W INTO $8\ \Omega$
PEAK EQUIVALENT
BOTH CHANNELS SHOWN WITH 80 Hz
FREQUENCY SEPARATION

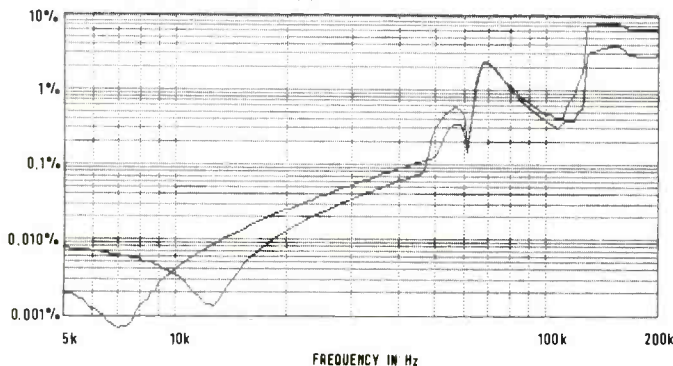
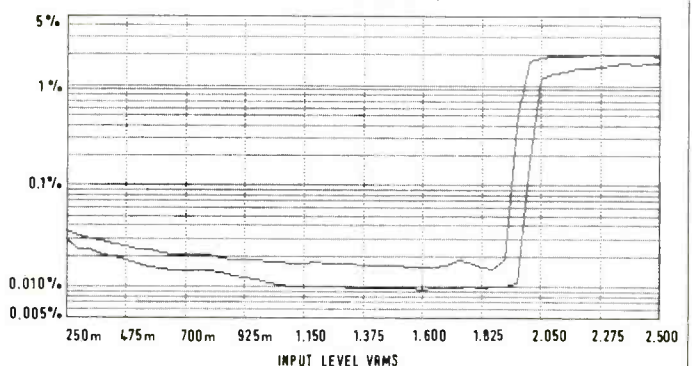


FIG. 9
CAMCO LA 801
DIM 30 INTERMODULATION DISTORTION VERSUS
INPUT LEVEL (BOTH CHANNELS)



REVIEW REVIEW

supplies thus it was not clear which setting was in use and the instruction manual made no reference to tap changing.

Table 2 shows the available power output at 1 kHz when fed by 240 VAC stabilised at the onset of a rapid rise in harmonic distortion. A very accurate digital voltmeter was used to determine the input and output voltages. If operated from 220 V mains these results are 5% lower so the amplifier remains within the manufacturer's specification of 420 W into 8 Ω or 700 W into 4 Ω . Using 10 ms bursts of 1 kHz tone every 100 ms, considerably more power was available into 4 or 8 Ω but the amplifier current limited when driving 2 Ω so some care is needed when selecting 4 Ω loudspeakers to make sure their impedance does not approach 2 Ω .

Fig 4 shows the relation between input voltage and on the X axis power output and THD+N when working into 8 Ω at 1 kHz. The distortion, as usual, rises rapidly but then flattens out at around 0.5% as a result of the use of the internal limiter.

The results working into 4 Ω are similar as shown in Fig 5, however, it will be noted that whilst the distortion is around the specified 0.02% when loaded into 8 Ω there is a considerable rise when the load is reduced to 4 Ω .

The relation between total harmonic distortion and frequency is shown in Fig 6 for 420 W into 8 Ω where distortion rises at high frequencies. The distortion products were a mixture of crossover products and harmonics; Fig 7 shows the typical second and third harmonic products at 100 W into 8 Ω .

Intermodulation distortion to the SMPTE or CCIF twin tone methods versus power output followed a similar pattern to the harmonic distortion (Fig 4). The CCIF intermodulation distortion versus frequency at 420 W peak equivalent sine wave was less than 0.1% up to 40 kHz as shown in Fig 8.

Use of the dynamic intermodulation distortion DIM30 test—when a sine wave is superimposed on a 3.15 kHz square wave band limited to 30 kHz in a 1:4 peak amplitude ratio—produced Fig 9. This shows distortion versus input level when using a 15 kHz sine wave probe tone such that the fourth and fifth order products (4th 3.15 to 15 kHz and 5th 3.15 to 15 kHz) were measured.

Overshoot of a 1 kHz square wave when feeding 8 Ω in parallel with 2 μ F is shown in Fig 10 to contain little ringing or droop.

Limiters and indicators

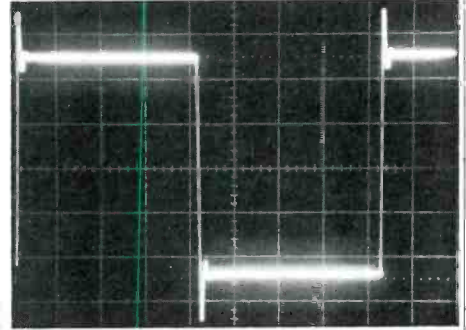
The individual channel limiters could be set to limit the output power to between 18 W into 8 Ω and the full rated power output. Irrespective of the potential overload of the limiters the attack and release times appeared to remain

constant at 3 ms and 400 ms resp.

Harmonic distortion during limiting depended upon frequency and did not exhibit wide variations with the degree of limiting. It was less than 0.3% above 250 Hz and increased at lower frequencies. This showed up in the SMPTE intermodulation testing where 1.5% distortion was recorded using 50 Hz and 7 kHz tones.

All the LED indicators on the front panel were rather dim and not always easy to see. The signal present indicators became illuminated at 160 mV input at maximum gain corresponding to an output of 3.5 W into 8 Ω . As expected the

FIG 10
Overshoot of 1 kHz square wave



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FIG. 11
CAMCO LA 801
PHASE RESPONSE WORKING INTO 8 Ω

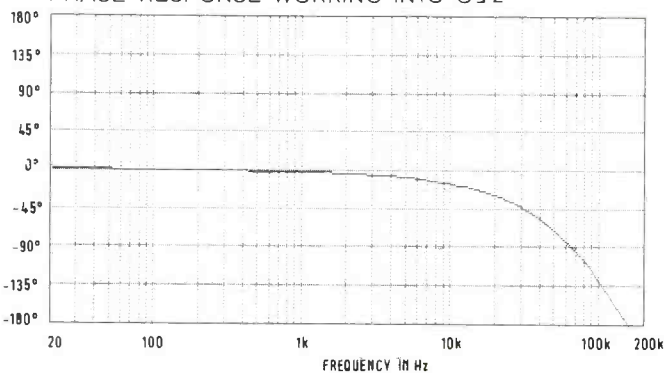
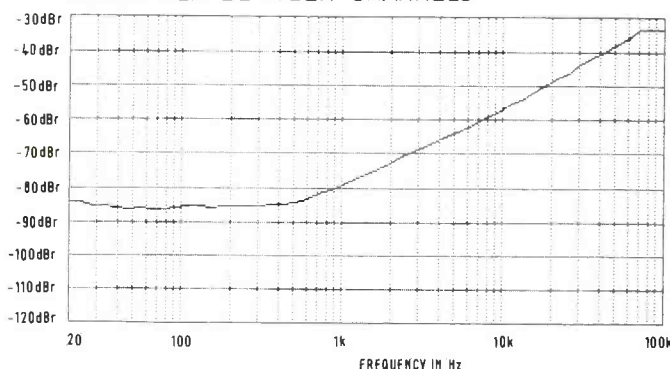


FIG. 12
CAMCO LA 801
CROSTALK BETWEEN CHANNELS



limit indicators operated at the onset of limiting; the clip indicators aligned with the onset of clipping at 1 kHz.

Other matters

Fig 11 shows that the phase shift is not insignificant in the audio band, also the overall amplifier was phase inverting—a matter that could be troublesome in some circumstances.

Interchannel crosstalk was low as shown in Fig 12, being better than

-80 dB below 1 kHz. The rise and fall times were symmetrical at 4.8 μs for one channel and 5.2 μs for the other with a maximum slew rate of 25 V/μs.

Summary

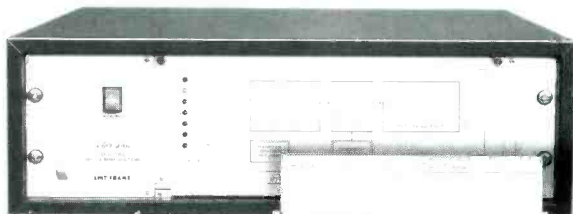
This is a well made amplifier which is capable of delivering a considerable power into 8 or 4 Ω loads but I do have some reservations about the current limiting into lower impedances.

The internal limiter is a useful feature where it is desirable to limit the output power either for loudspeaker protection or to limit possible sound levels. The amplifier trips at excessive low frequencies and disconnects the speakers until the offending input is removed.

Whilst the distortion performance and some other matters do not exactly compare with a straight wire, the Camco LA 801 is a very robust unit that can take considerable punishment with no untoward effects. □



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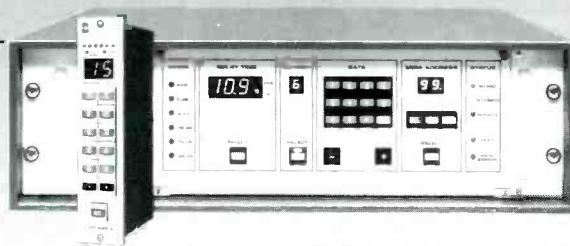


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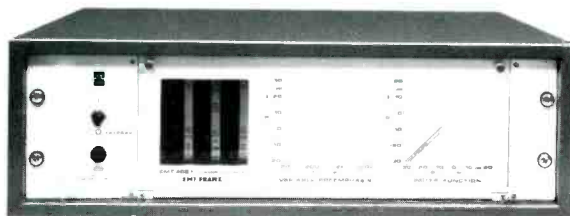
"sound" of the reverberation is freely adaptable due to the adjustments in bandwidth, pre-delay, level of early reflections, as well as frequency content of the reverberation. In spite of the abundance of parameters, operation of the unit is quite simple, even if things should become hectic. And, if need be, one of the 190 (!) program memories may be of assistance.



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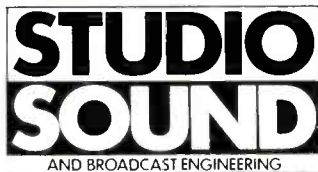
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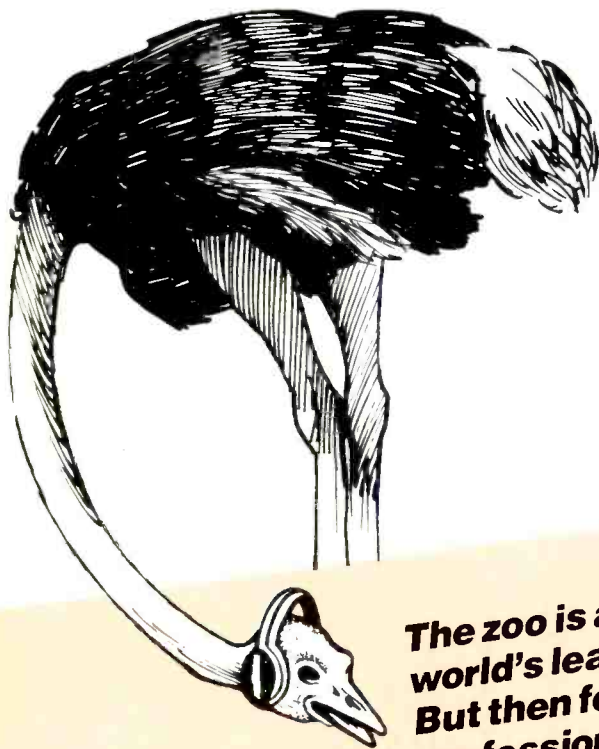
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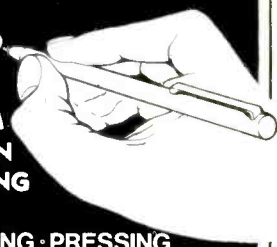
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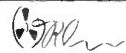
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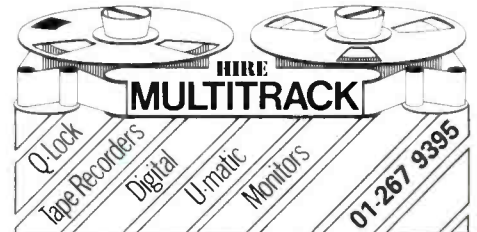
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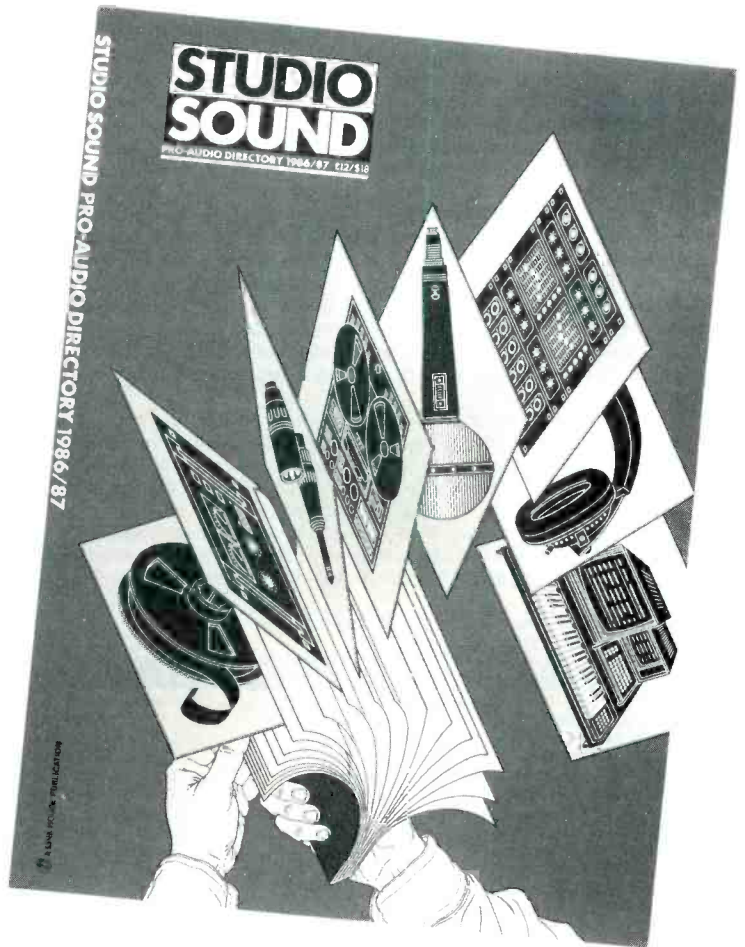
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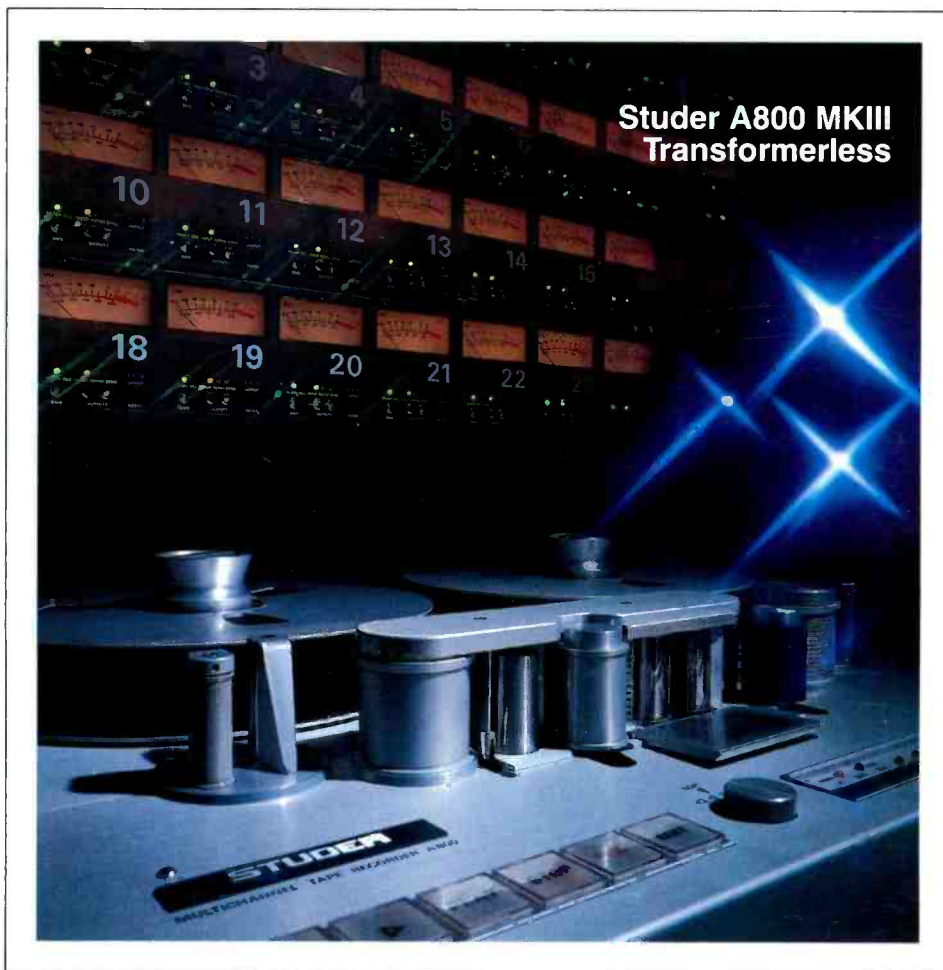
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