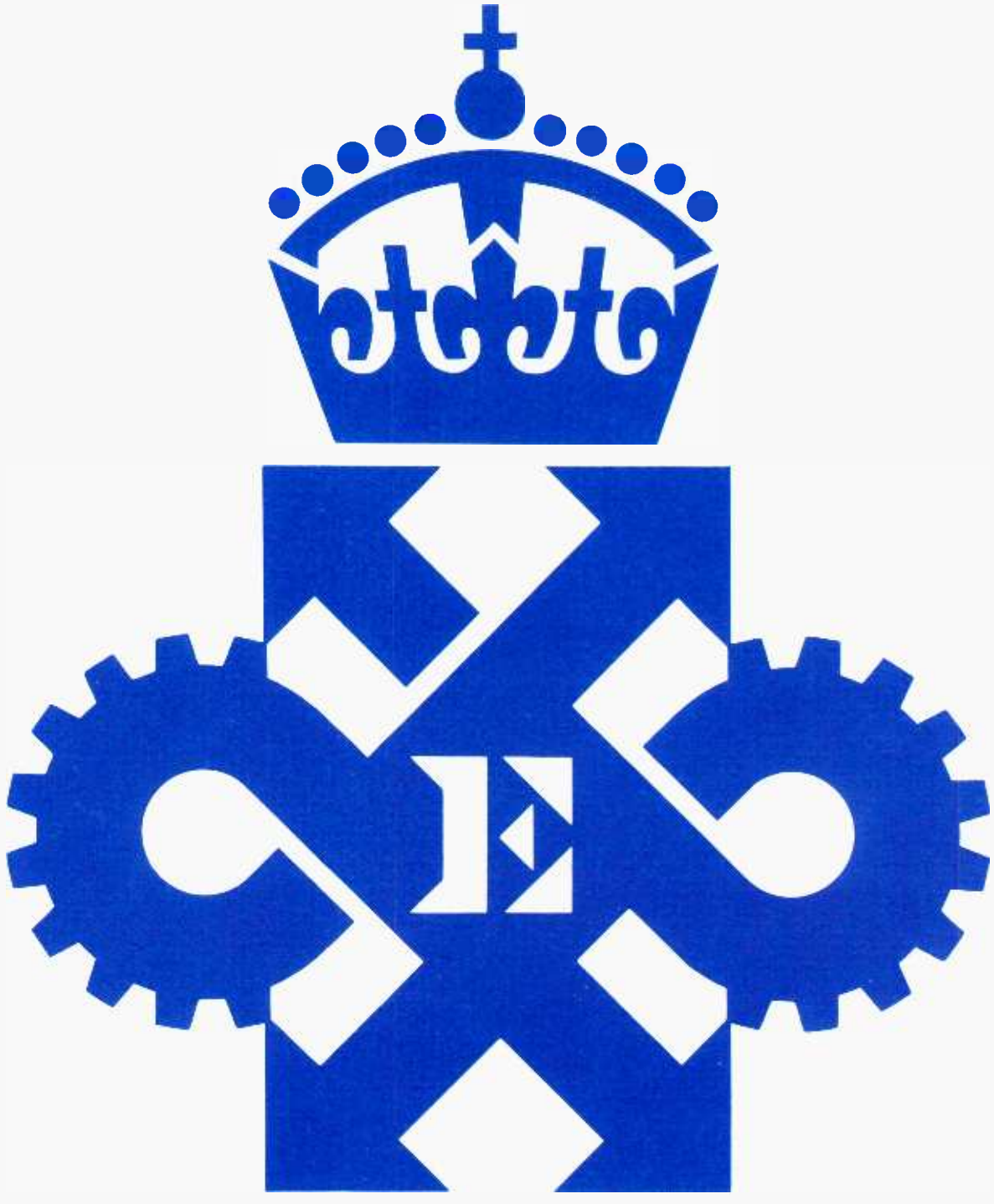
July 1985 £1.50

STUDIO SOUND

AND BROADCAST ENGINEERING

A LINK HOUSE PUBLICATION

AUTOMATION
APRS PREVIEW
SOUND TECHNIQUES



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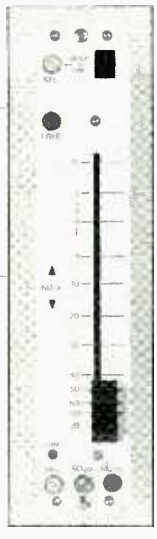

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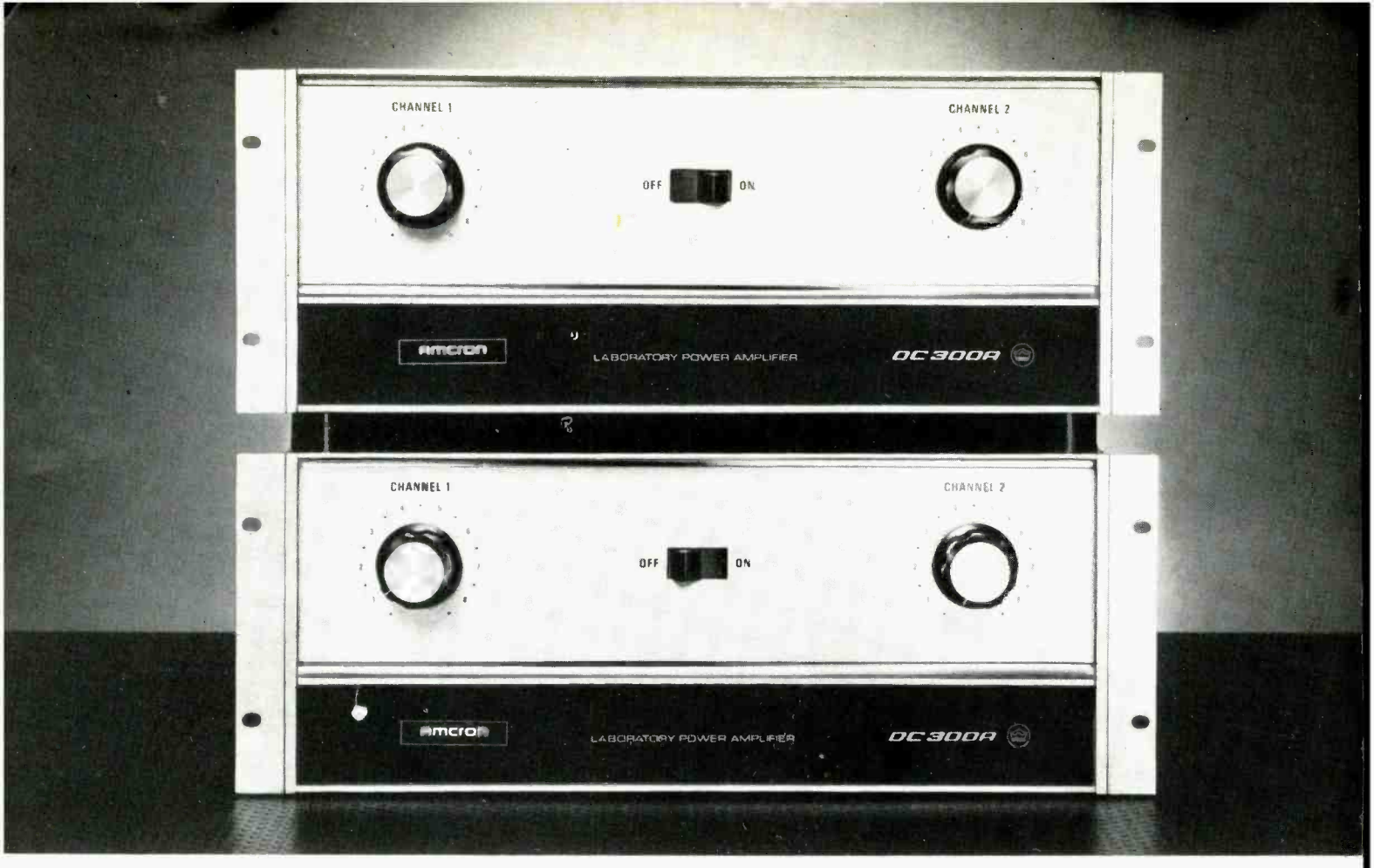

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EDITORIAL

EDITORIAL

This month's comment from Keith Spencer-Allen

Automate and communicate?

If I mention the word automation in connection with consoles (or maybe even without) most would assume that I am referring to level automation and in console terms they would largely be right. Currently automation *is* level for all intents and purposes. Automated routing is useful but in recording applications it is less useful than levels. It is worth noting how auto routing systems can now be found in relatively low cost systems where it is now cost-competitive with the switch/bus hardware alternative.

SSL has shown that there is a demand for consoles that look beyond just level and routing control with a number of other manufacturers introducing systems that have developed certain areas further. The Neve *DSP* boasts a *complete* console status reset although the current software development only allows automation in terms of 'snapshots' of console settings with full dynamic automation not yet ready. Amek is demonstrating consoles that have level control together with certain sections that reset from memory. Full dynamic automation is available nowhere.

Although automation of levels is currently the most important aspect, it might be logical to suggest that straightforward level control may become less important as some form of digital recording becomes more the norm, and lower noise floors free us from squeezing maximum levels on to multitracks—maybe even allowing recording with dynamics that are nearer to our final requirements for the mix. I believe that other requirements are likely to become just as necessary to the mixing engineer as level and we have seen the first steps in this direction with those systems I have mentioned and a number I have not. The full answer in terms of the mixing console must be a fully dynamically programmable console with areas such as programmable EQ, pan, foldbacks, sends and of course with our digitally recorded low noise floor signals, dynamic range control in the form of programmable compressors, limiters and expanders.

If we were to realise this fully-automated console it would, however, seem unreasonable not to control all the outboard devices that are used as part of the mix; these are just as much an important part as the desk although they are physically not part of the console—digital delays, reverb devices, flangers and other such processors. For a development such as this we are talking about an automation system whose control extends beyond the physical confines of the desk such as routing of the external effects paths or some way that the desk automation can tell what outboard processor it is talking to. There is for instance little point in having a system that configures itself for a mix including outboard control when it cannot link up the outboard gear unless the engineer plugs up manually and this defeats half the object. As a start in this direction Yamaha recently demonstrated a prototype system that placed the *REV-1* digital reverb, the *YDD-2600* digital delay and a multi-band digital parametric equaliser under dynamic control of a computer setting events against an SMPTE timecode input. The control was beyond that of a simple events controller with full manipulation of the unit's facilities being available rather than just a cue signal. If we are talking about this degree of control over external equipment, it is fairly obvious that we are not talking about control from a desk that is not quite in the form that we currently know.

Where should we stop? How about a record of the mic positions in the studio from the recording session? How about the lighting controls that created the mood for the recording or the temperature of the air-conditioning for that client together with the humidity (and ioniser on or off)? How about the acoustics in a variable acoustic environment or even your microprocessor controlled coffee machine?

The desk will become the centre of an automation system although just how far this system/desk will go is debatable. If we extrapolate from these suggestions, some form of digital processing system beyond the Lucasfilm *ASP* is logical. I make no claims about the wisdom or desirability of very comprehensive automation. I would very much like to know to what extent automation systems currently available are used by those who have them. I have a strange feeling that the results would be most illuminating.

The complex interconnecting systems that have been alluded to here are some distance into the future if even as close as that. Further, there would be little purpose in such a complex system if it was not to some degree compatible with other installations. We urgently need some consideration of compatibility in automation information so that clients are not necessarily restricted to a certain type of console or studio. At a time of rapid development standardisation is difficult and perhaps if too rigid can be restricting on progress although the signs for such eventual compatibility are not good.

There is one last point I'll throw in for comment—we are all human and make mistakes. In circumstances where the ego stakes are high such as for the record producer presenting album tapes to the record company, consider the following situation. The producer talked the record company into paying the slightly premium rate for the totally automated studio by saying that the recording would be perfect as there were no longer any variables that could not be honed to repeated perfection. If someone at the record company decided that the recording was less than perfect for some reason, what is there left for the producer to use to protect his ego?—if the equipment allows perfection to be realised all the errors must be human. If you doubt this, remember when the first reliable level-only systems were introduced and the way that certain producers avoided using them making statements to the effect that they (automation systems) distanced them from their craft and that machines could never mix music.

I can see that when we have the perfect automation system with full control of as much of the studio as we desire, that we have to design in a random human factor to allow us something to blame for our imperfections and live in peace with our machines.□

STUDIO SOUND AND BROADCAST ENGINEERING

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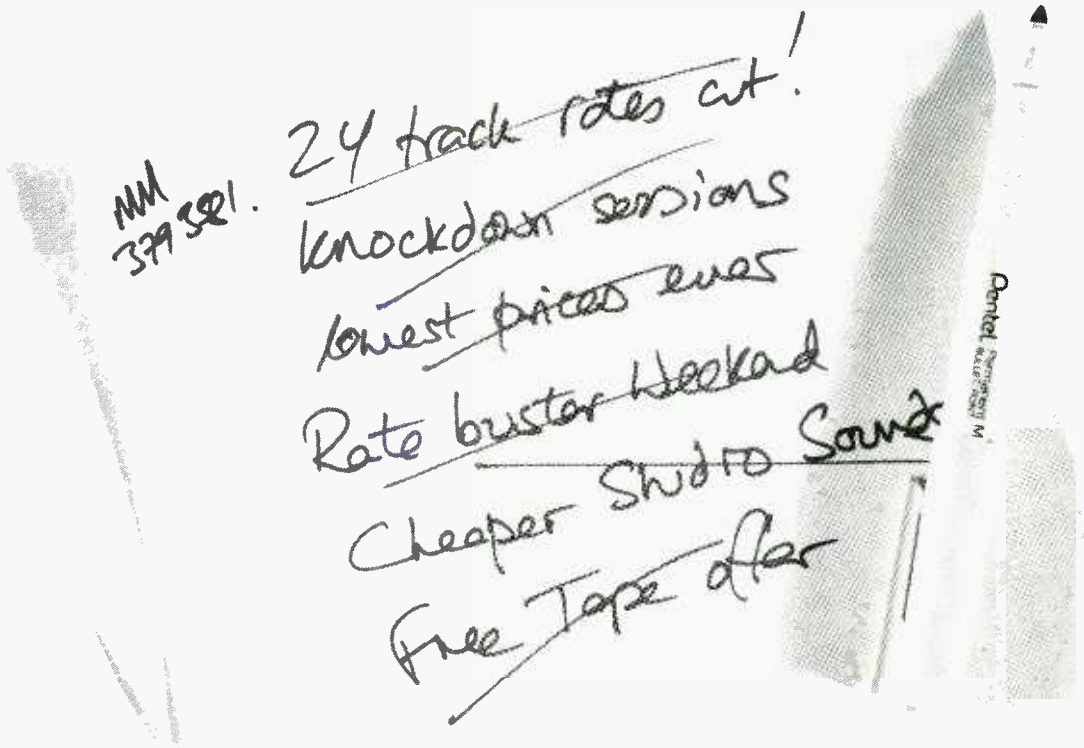

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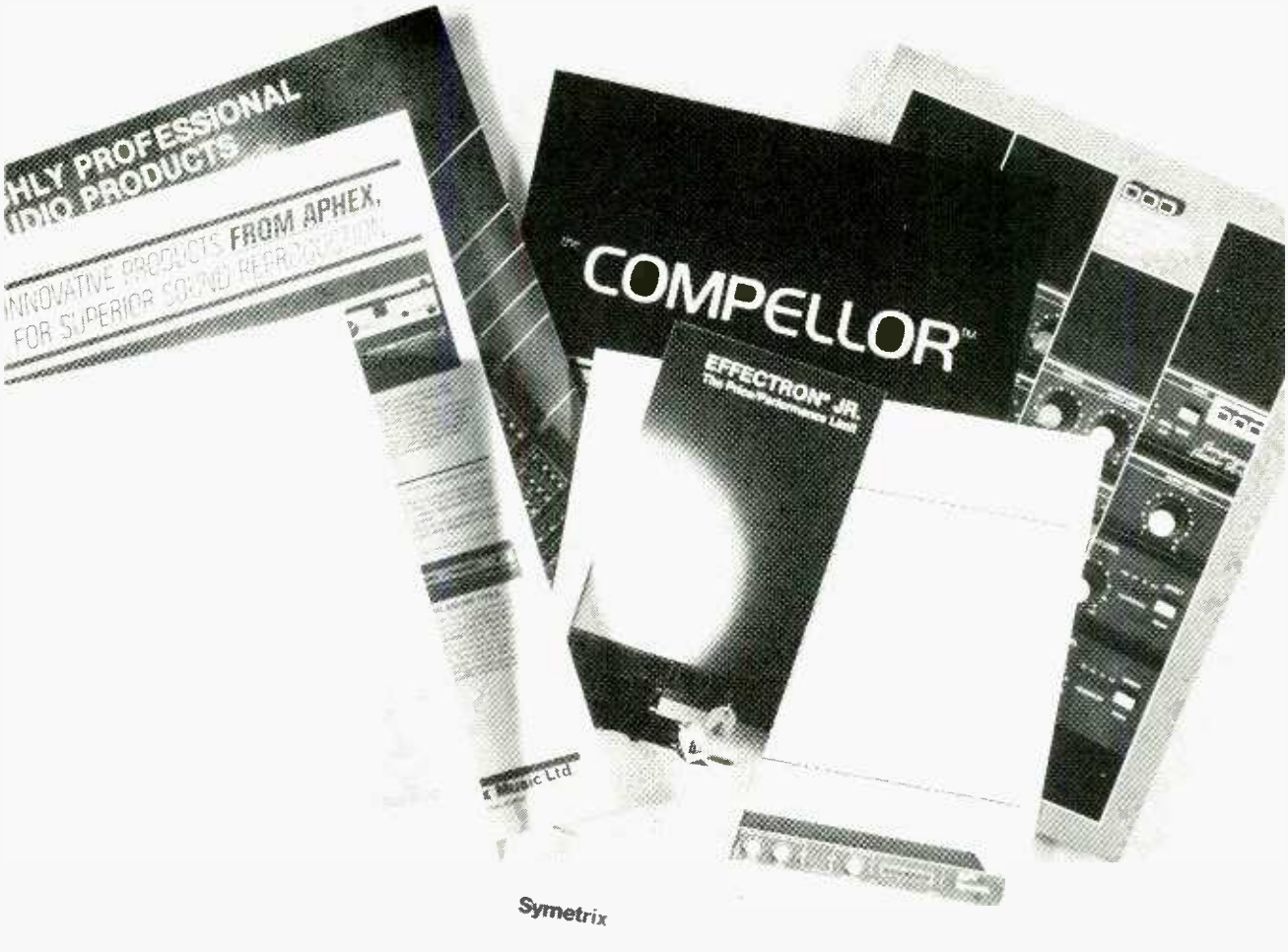

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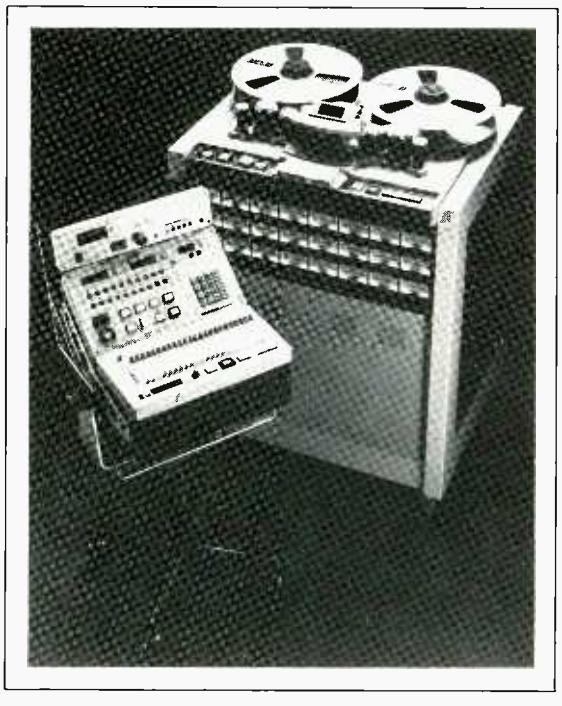

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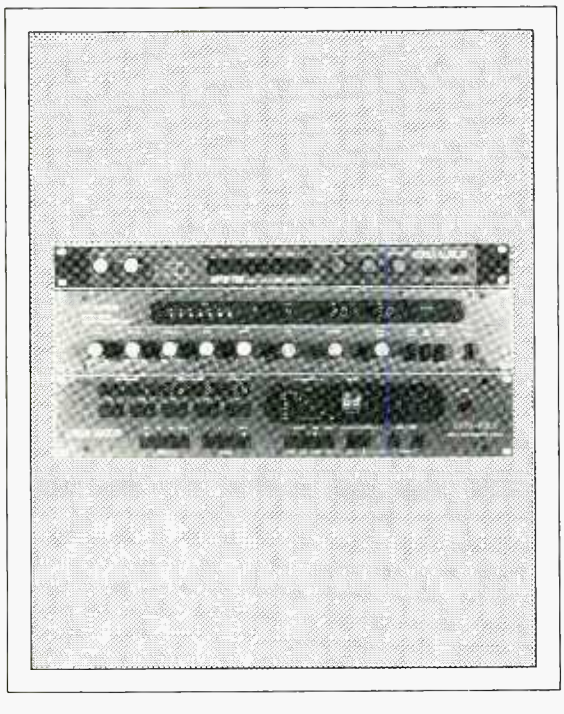

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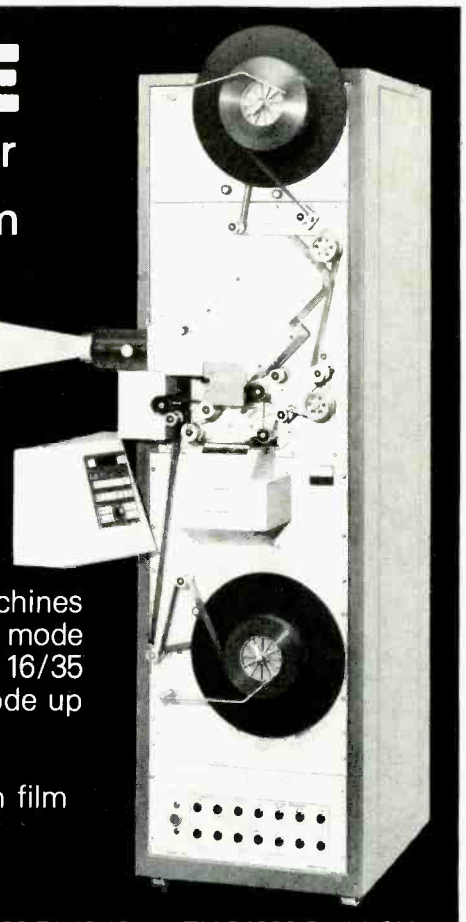

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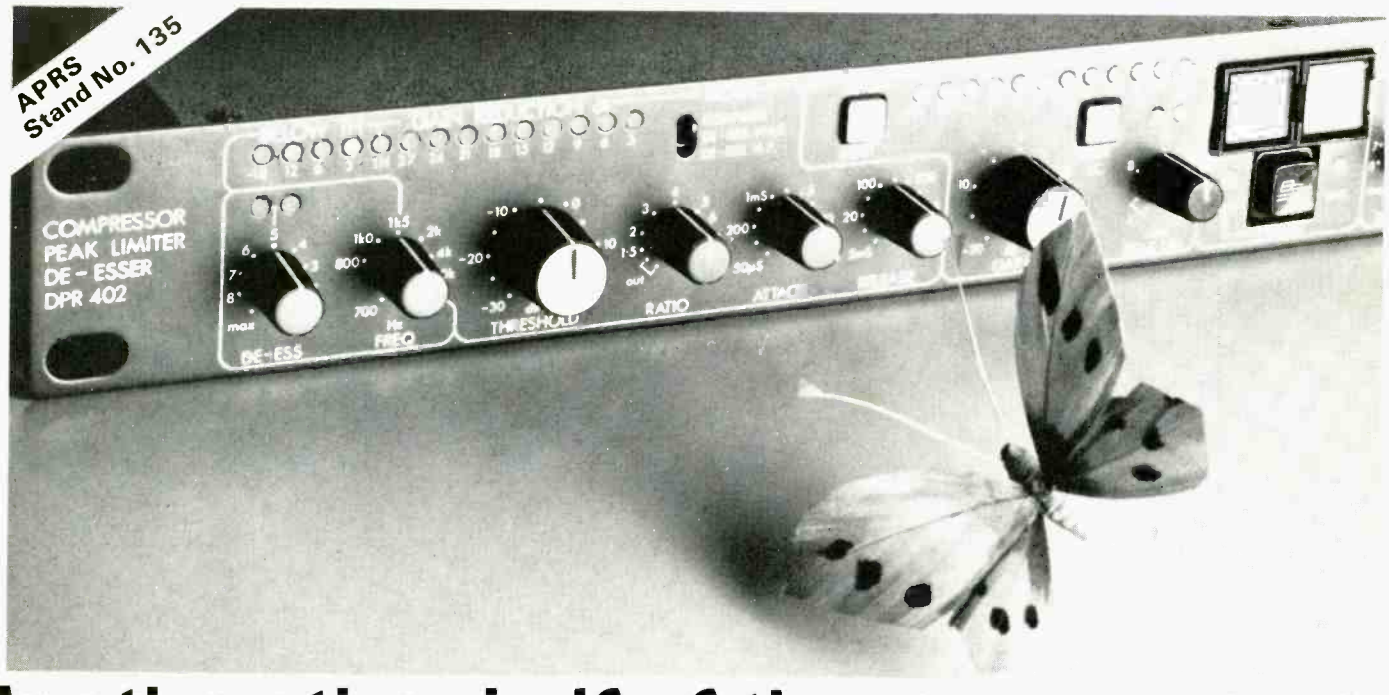

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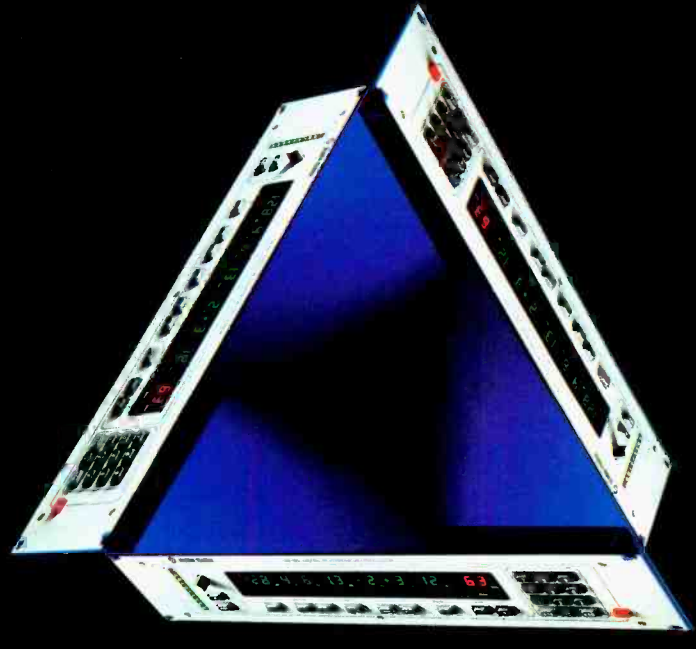

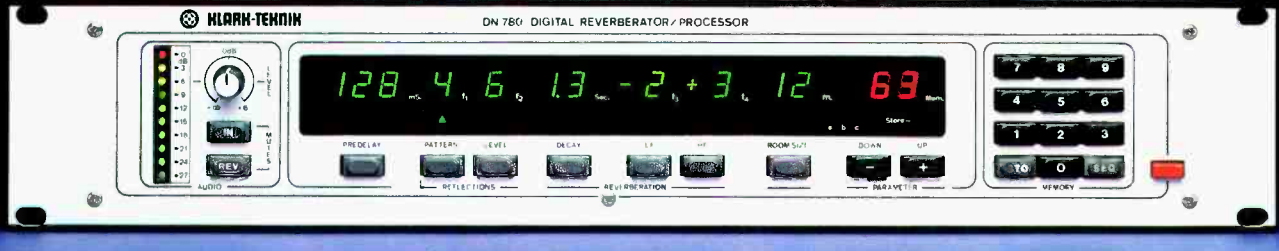

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Terry Clarke

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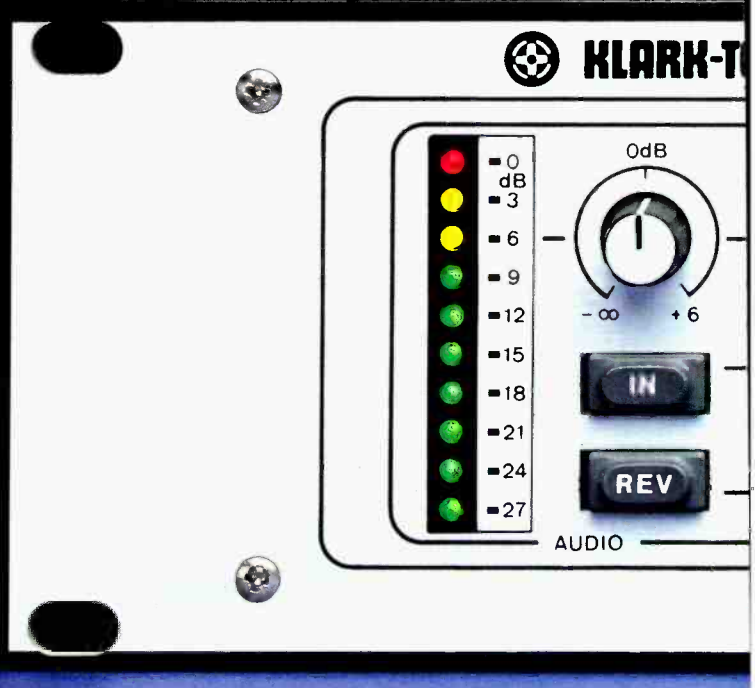
When the DN780 is first powered up a comprehensive self-diagnostic routine is automatically carried out, ensuring continuing accuracy in operation.



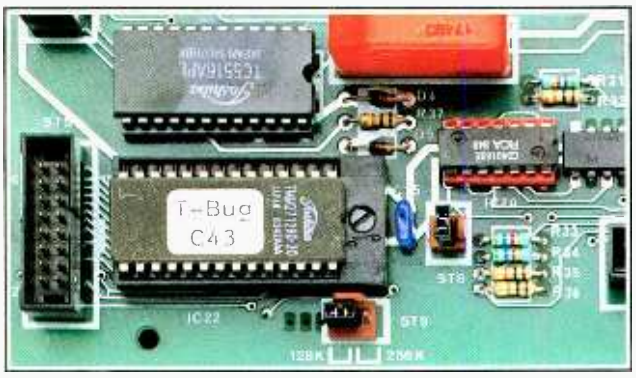
INput MUTE removes signal feed to the reverberation section, enabling the decay qualities of a chosen setting to be confirmed.

REVerb MUTE gives a rapid means of killing unwanted reverberant sounds.

Specification DN780

Input	
Type	one, electronically balanced
Impedance balanced	20k
unbalanced	10k
Output	
Type	two, fully floating transformer balanced
Min load impedance	600 ohms
Source impedance	<50 ohms
Max level	+21dBm
Frequency response	20Hz – 12kHz +1 – 2dB
Distortion	0.03% @ 1kHz
Dynamic Range	85dB typical
Digital	
A/D & D/A converters	16 bit linear
Arithmetic Processor	32 bit
Parameters	
Predelay	0-990msec
Decay Time	0.1-99sec
Room Size	5-100 metres linear dimension
HF/LF decay	Adjustable in 14 steps (relative to 1kHz decay time)
Early reflections	PATTERN, 5 Variations LEVEL, adjustable in 10 steps (0-max)
Power requirements	
Voltage	100/120/220/240V 50/60Hz
Consumption	40VA
Weight	
Net	7.5kg
Shipping	10kg
Dimensions	
Width	482mm (19 inch)
Depth	310mm (12¼ inch)
Height	89mm (3½ inch)
Terminations	
Input	3 pin XLR
Outputs	3 pin XLR
Power	3 pin CEE
Options	Transformer balanced input PFR – Remote control

As part of a policy of continual improvement, Klark-Teknik reserve the right to alter specifications without notice



VERSATILITY WITH PLUG-IN PROGRAMMES

Ingenious programming provides unique versatility with the most naturalistic ever factory-programmed hall, room, chamber and plate settings in memories 1-20. They can be called up by the keyboard, modified with the parameter controls, and any such modified programme can be stored for later use in one of the fifty user memories. Each memory stores all parameter settings and displays these when recalled.

HALL – memories 1-5
Early reflections of low density give depth and realism augmented by slow attack and smooth decay.

PLATE – memories 6-10
High initial density and diffusion leading into smooth decay – a bright, clean attacking sound ideal for percussion and most contemporary music.

CHAMBER – memories 11-15
The uneven moderately dense early reflections produce a bright, lively sound midway between 'hall' and 'plate'.

ROOM – memories 16-20
Short high density early reflections with medium to fast attack and high diffusion produce authentic room simulation for drama, film dubbing and ambience applications.

PLENTIFUL SPECIAL EFFECTS

Sraight 0-2 sec. DELAY
This can save the cost of extra equipment by allowing the DN780 to double as a high performance delay line with easy control and really long delay time. Add regeneration to create 'repeat echo'.

Multi-tap ECHO
A high performance version of a multi-head tape echo. With a choice of 'head spacing' patterns and the benefit of digital regeneration.

Uncanny 'INFINITE ROOM'
An electronic 'zero-absorption' space in which sound is continually reflected . . . fresh input can be added to build up background in stages.

Quality ADT
A high quality double tracking facility with precise control of delay and independent control of direct signal level. Extra taps may be added to create 'choir' effects.

Versatile SOUND-ON-SOUND
A digital tape loop simulation that gives finger tip control of loop length and erasure.

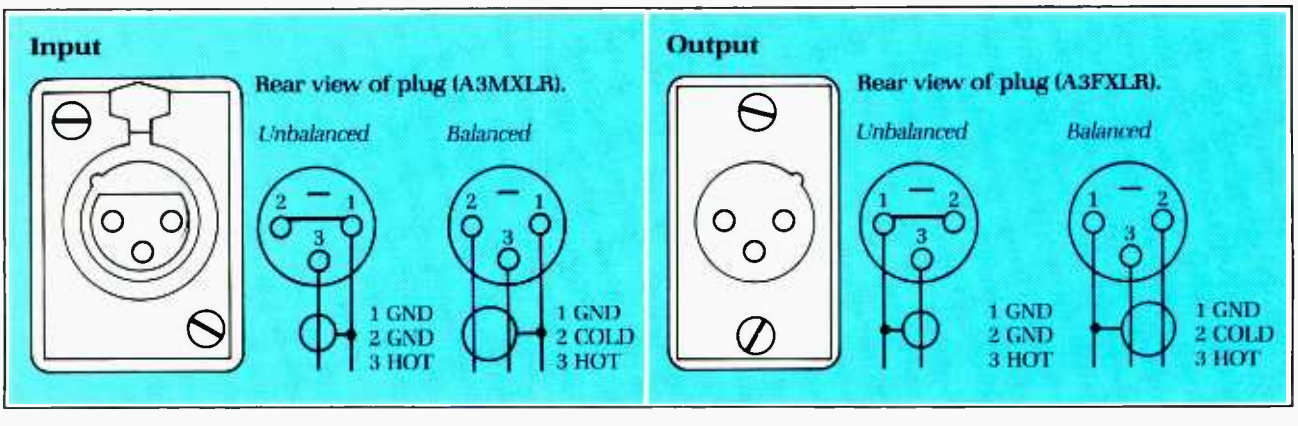
NEW PROGRAMME DEVELOPMENT

Programme development for the DN780 will be continuous over the next few years, giving even greater versatility in the future.

Purchasers of the DN780 are entitled to receive new programmes in the form of plug-in updates on an EPROM. Hinged circuit boards and a special 'zero insertion force' socket make it easy to fit the new programmes when they are received.

Update EPROM in position on a 'zero insertion force' socket.

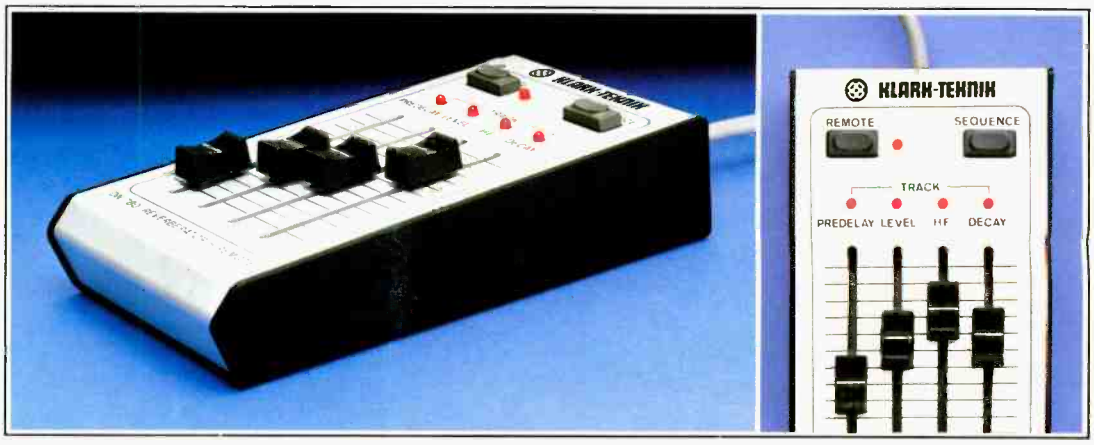
PIN CONFIGURATIONS



Remote Control

The compact Remote control unit can be located anywhere in the control room. Slider controls allow rapid adjustment of 'pre-delay', 'reflections level', 'HF' and 'decay time'. Each slider operates only when moved to coincide with the current setting for that parameter and this is confirmed by the appropriate **TRACK** LED illuminating. When running effects programmes all major parameters are also slider controllable.

A push button allows remote operation of the sequence control. The remote is enabled by the 'remote' push button. Pressing any parameter control on the DN780 front panel cancels remote 'on' status.



DN780 Applications

The Klark-Teknik DN780 offers many benefits for broadcast and recording studios – the most natural reverberation ever with easy control, the widest range of effects . . . and all at a cost lower than that of many less effective products.

For musicians and groups it offers the best of studio standards in reverberation plus digital effects processing.

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The DN780 is the latest in the Series 700. The right kind of digital technology at the right kind of price for a number of very different purposes, often with features never before available.

Klark-Teknik *'reliability control'* means that every Series 700 unit – including the DN780 – is aligned and bench tested before a burn-in period and final performance test.

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Other accessories available for the ASC Version PR99 include a sturdy, heavy-duty trolley with optional editing tray and flight case.

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C~duceable (c-diū·săb'l), *a*. Drums, Congas, Bongos, Timbales etc., Acoustic Guitar, Mandolin, Lute, Balalaika, Violin, 'Cello, Double Bass, Harp, Banjo, Piano, Harpsichord, Celeste, Dulcimer, Zither, Speaker Enclosures, Solid Electric Guitars et cetera.

C~ducees (c-diūsī·s), *n*. Dire Straits, Stevie Wonder, Chick Corea, Toto, Willie Nelson, Kris Kristofferson, Spandau Ballet, Grand Ole Oprey, Abbey Road Studios, PRT Studios, Lansdowne Studios, Olympic Studios, Limehouse Studios, Sydney Opera House, National Theatre, Royal Opera House, BBC Radio & TV, Danish Radio, Swiss Radio, German Radio, Dutch Radio, London Weekend Television, Anglia Television, Scottish Television, Mobile Studio, *et al.*

C~ducer (c-diū·səɪ). *n*. Studio quality contact microphones.

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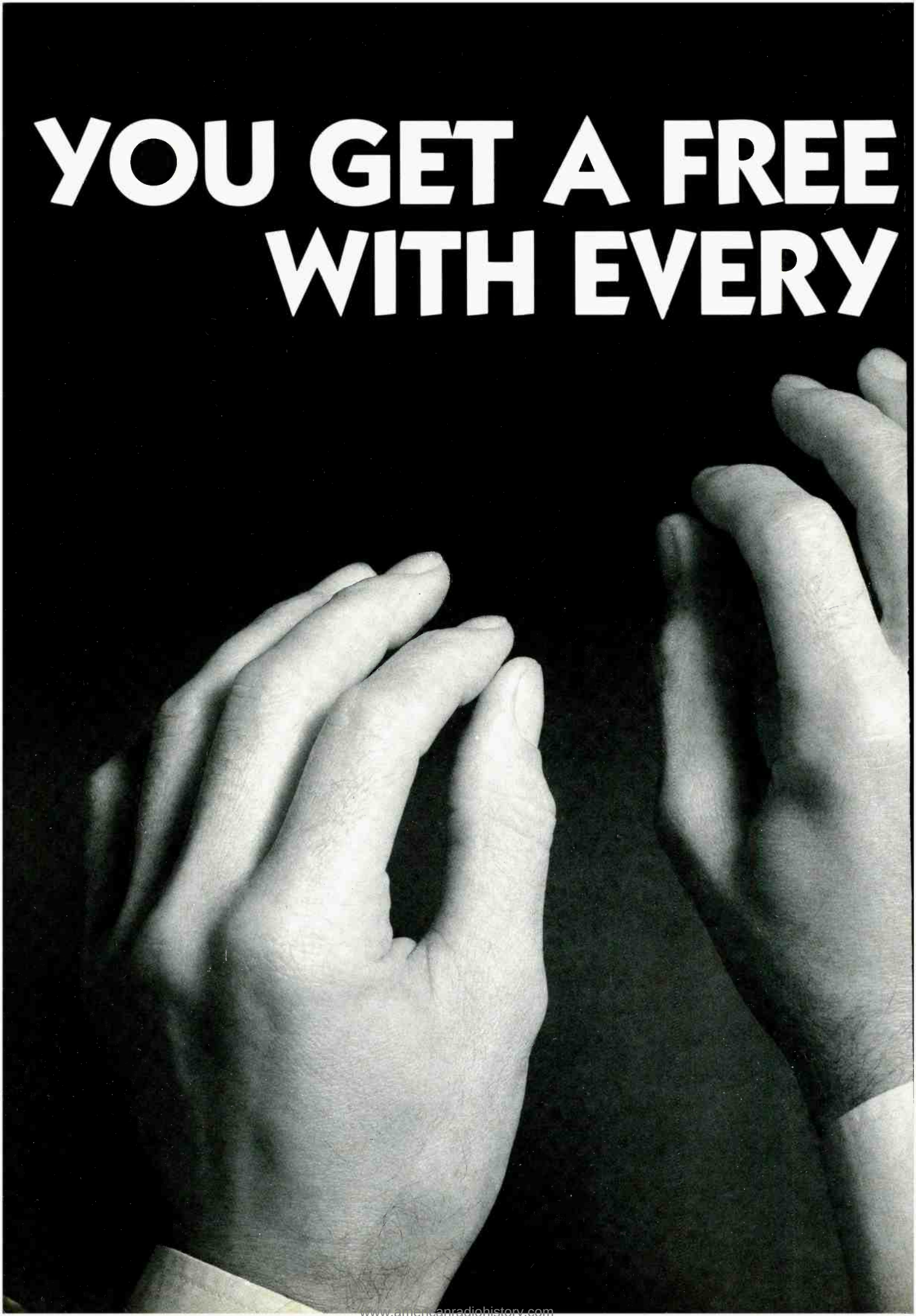

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Remember the old days? That homely atmosphere you got in the control room as the musicians and their roadies gathered round the console to help you with faders on the final mix? That wonderful sense of achievement that greeted you as, finally, the drummer's roadie managed to bring the brass section in on cue after the hundredth attempt? What you needed was an extra pair of hands – and that was on sixteen-track.

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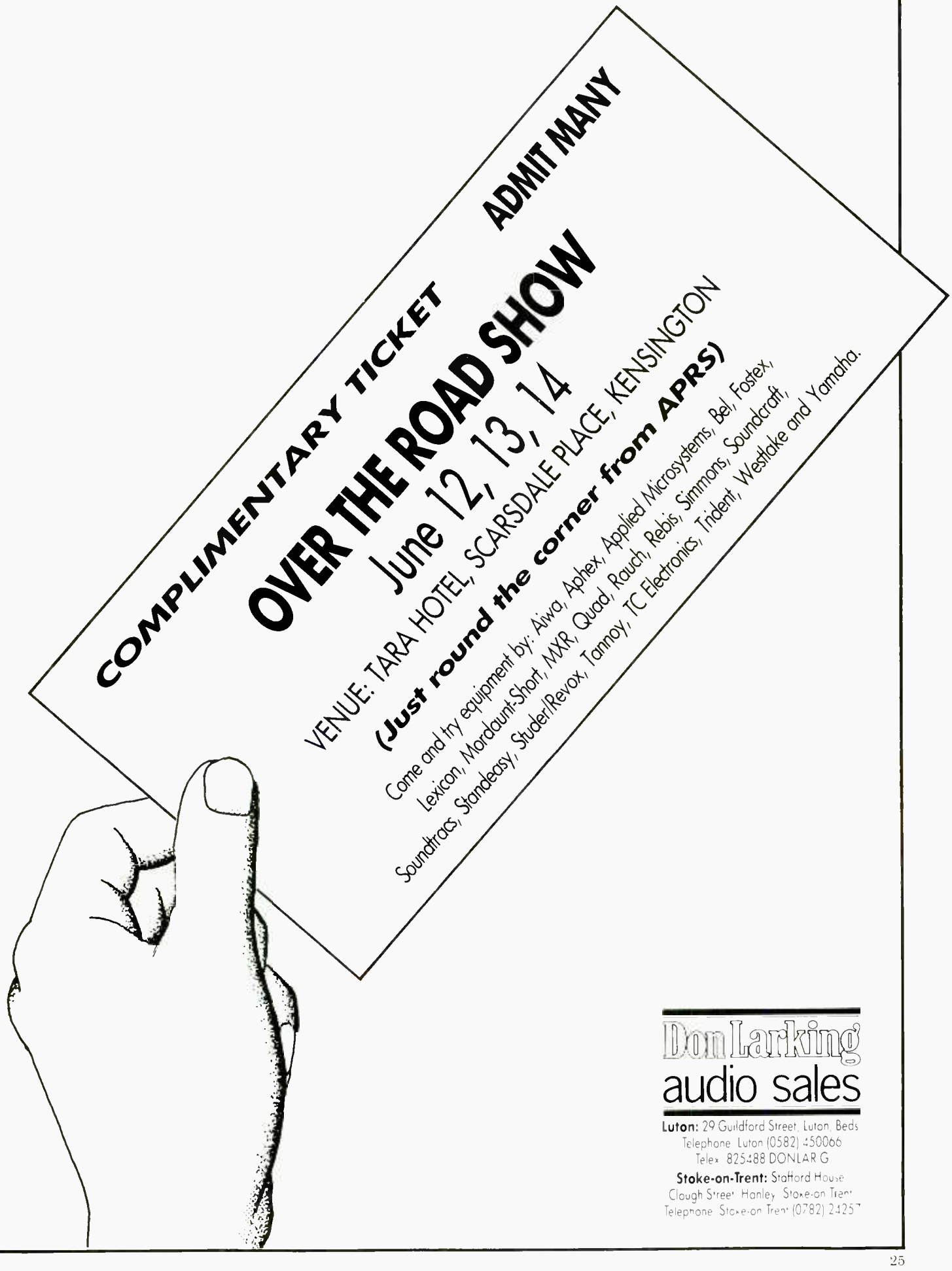

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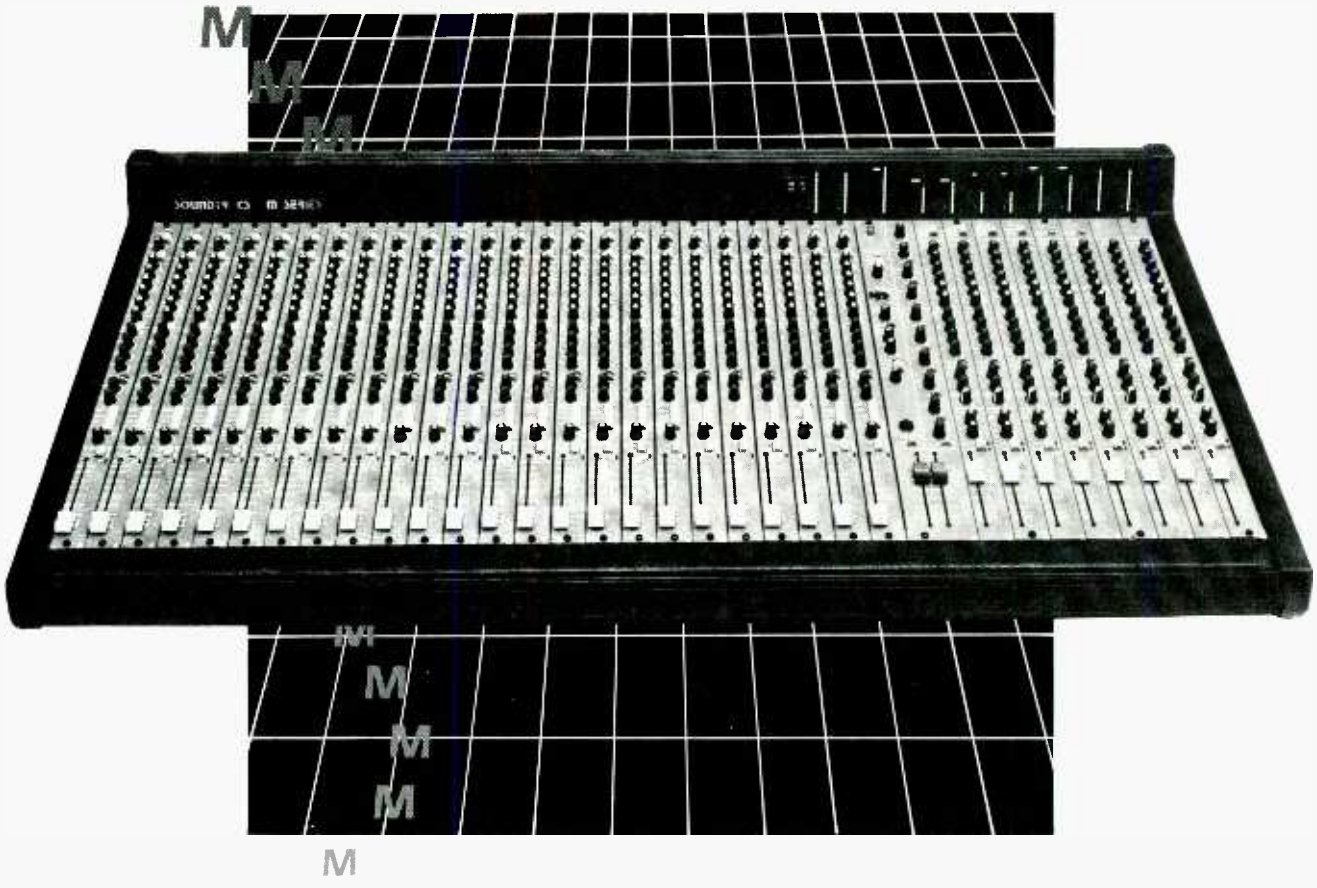

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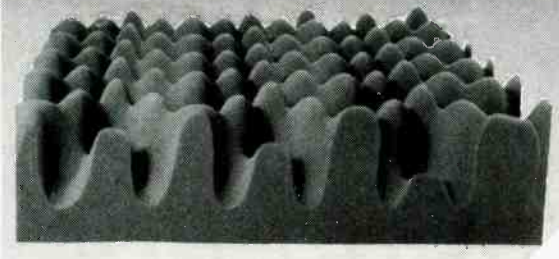

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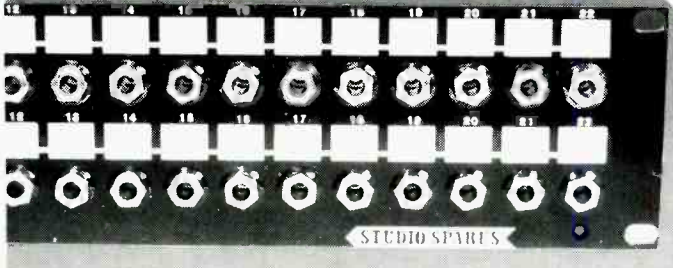

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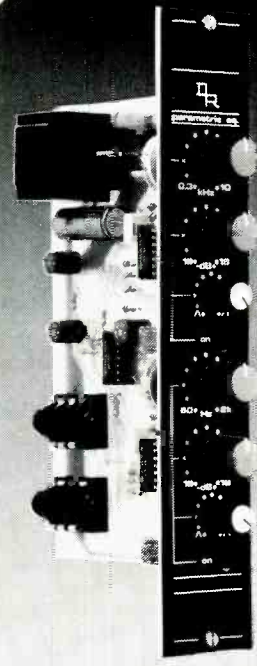

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Linear Integration Detection – Emulates the response of the human ear to maintain correct musical relationships in processed material.

Peak Reversion Correction – Compensates for discrimination against low frequencies to eliminate "pumping" and "breathing".

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Gain Recovery Computation – Maintains a preset nominal output level under varying conditions of input signal level, ratio, and threshold settings in order to simplify set-up.

Interactive Expander circuitry in the Compressor section – To reduce residual noise which would otherwise be "pumped-up" or accentuated by the compression process.

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Dynamic Sibilance Processor – The **only** sibilance processor that can be used on mixed program material without subjectively affecting the tonal balance of the material.

Complete, Easy-to-Read Metering – Allows operator to simultaneously monitor limiter operation, compressor/expander operation, and input or output line level at a glance.

Stereo Couple or Master/Slave operation – At the user's option, two Model 440's may be linked in a Master/Slave configuration allowing one device's controls to operate both units, or may be stereo coupled to maintain a musically correct stereo image.

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Awards, events, tape levy

Queen's Awards

Several pro-audio companies have been successful in winning Queen's Awards this year. **Tape Automation Ltd** has been awarded the Queen's Award for Industry for achievements in exporting its range of high speed loading and duplication systems throughout the world. Over 50% of sales are export—the US being the largest export market...**Advanced Music Systems (AMS)** and **AMS Numerics** has been awarded the Queen's Award to Industry for its outstanding export achievements for the second consecutive year...The Queen's Award for Export Achievement was awarded to **Amek Systems and Controls Ltd** for their export of professional audio mixing consoles. During recent years the company has built an extensive worldwide network of representatives including creating its own distribution company (Amek Consoles Inc) and now enjoys sales in most territories throughout the world...**Soundcraft** have received the Queen's Award for Export Achievement for consistently exporting almost 90% of their total output (1984 turnover was £6.5m, £5.6m was export). With export in quantity going to Australia, Canada, India, Singapore, Hong Kong and South Africa, and new subsidiary companies in Japan and Canada, 40% of Soundcraft's total output went to the USA.

Forthcoming events

- June 12 to 14 APRS Exhibition, London
- October 8 to 10 Internepcon, Brighton, UK
- October 14 to 17 AES Convention, New York

In brief

Gaff Management and the Marquee Organisation have announced that they are having discussions with a view to Gaff taking a major interest in the re-development of the Marquee premises at 90 Wardour Street. This would involve major reconstruction of the present Marquee Club and a re-equipment programme for Marquee Studios. The discussions do not include the sound and light company Marquee-Entec, Marquee Electronics audio equipment hire and sales company or NJF/Marquee Presentations...Philips have announced that they are building a new modern audio equipment manufacturing plant in Beijing, China in partnership with the Beijing Radio and Television Industrial Corporation and the China Electronics Import and Export Corporation. Production capacity will be in excess of one million units of high quality domestic audio equipment for marketing within China. Of particular interest is that a certain proportion of this will be portable CD players!... Switchcraft has enlisted as a sponsor for Synergetic Audio Concepts, underwriting Syn-Aud-Con's educational seminars and workshops. Other sponsors include Bose, Community Light & Sound, Crown International, Emilar, HME, Industrial Research Products, Shure, Sunn Musical, TOA and UREI...Crown International has completed a 36,000 ft² extension to its manufacturing facility, expanding their square footage by 85%. Another 12,000 ft² addition to the engineering department is now under way...Neve reports worldwide orders of *NECAM 96* automation system have passed the $1m mark...Klark-Teknik *DN780*, distributed in the UK by Autograph Sales, is available from them from stock or on demonstration. So far the unit has been used on tour by Big Country, Meat Loaf, Roberta Flack, Paul Young, Dire Straits, Joan Armatrading and Howard Jones...Community Light & Sound Inc, manufacturer of professional sound system products has announced that it has been acquired by Whelen Engineering Co. Philadelphia.

TMG says tape levy unworkable

Government proposals for introducing levies on blank audio and video recording tape have been condemned as unworkable and unnecessary. The Tape Manufacturers' Group says that the introduction of a levy would represent a U-turn in government policy and would create more problems than it solved.

The TMG, which represents UK blank tape manufacturers, is commenting in response to a government 'green paper' discussion document called 'The recording and rental of audio and video copyright material', which suggests a levy of 10% on audio cassettes and 5% on video cassettes. The levy would be imposed irrespective of what the tape was actually used for. "It's like the government adding £50 to the price of all cars sold to allow for offences that the owners might commit," says Christopher Hobbs, Chairman of the TMG. He also says the scheme would be an "administrative nightmare, full of loopholes for the unscrupulous to exploit the public".

Tape manufacturers say the need for levies has not been proven. They point to a survey of video recorder usage in the UK carried out last year by Audits of Great Britain. This, says the TMG, showed that less than 1 percent of recorded material is kept for repeat viewing. The survey also showed that the majority of video usage is for timeshifting. "People receiving programmes had already paid for the privilege via their licence fee. A levy would force them to pay twice," says the TMG. It also claims that home taping actually helps commercial television because it boosts viewing figures. Film makers had two clear choices, "either to negotiate a bigger fee with the broadcasting company, or simply not allow their films to be shown".

The TMG also says that home taping of audio material is not as damaging to home sales as record companies claim; that a survey showed that less than 22% of the population buy blank tape for any purpose, whereas the record industry claims that 44% of the public home tape, that 70% of record taping is of the taper's own records and not 50% as a pro-levy survey showed, and that over 25% of home taping is done in order to preserve records in good condition. According to the tape manufacturers, this survey shows that home taping is less widespread than the government believes, and is not always done to avoid buying records.

The TMG is also criticising the government for 'skirting around' the question of the collection and distribution of levies. "The issue has been discussed for almost seven years but no-one has yet come up with a practical, economic and fair system. At best it would be an arbitrary method which would benefit those who are already rich.

"The levy, as proposed, would lead to major cost increases for manufacturers, which should either be reimbursed from collected levies or would have to be passed on to the public."

JBL Professional

JBL Professional is one of four units created by JBL. The consumer division is now known as Harman-America. The exporting group is JBL International and the manufacturing side is known as Harman-Manufacturing.

JBL Professional will operate its own finance and credit departments, purchase products from the manufacturing groups and maintain its own inventory as well as being responsible for development of new JBL professional and UREI products.

Ron Means is the president of JBL Professional and they are located at 8500 Balboa Boulevard, Northridge, CA91329, USA. Tel: (818) 893-8411. ▷

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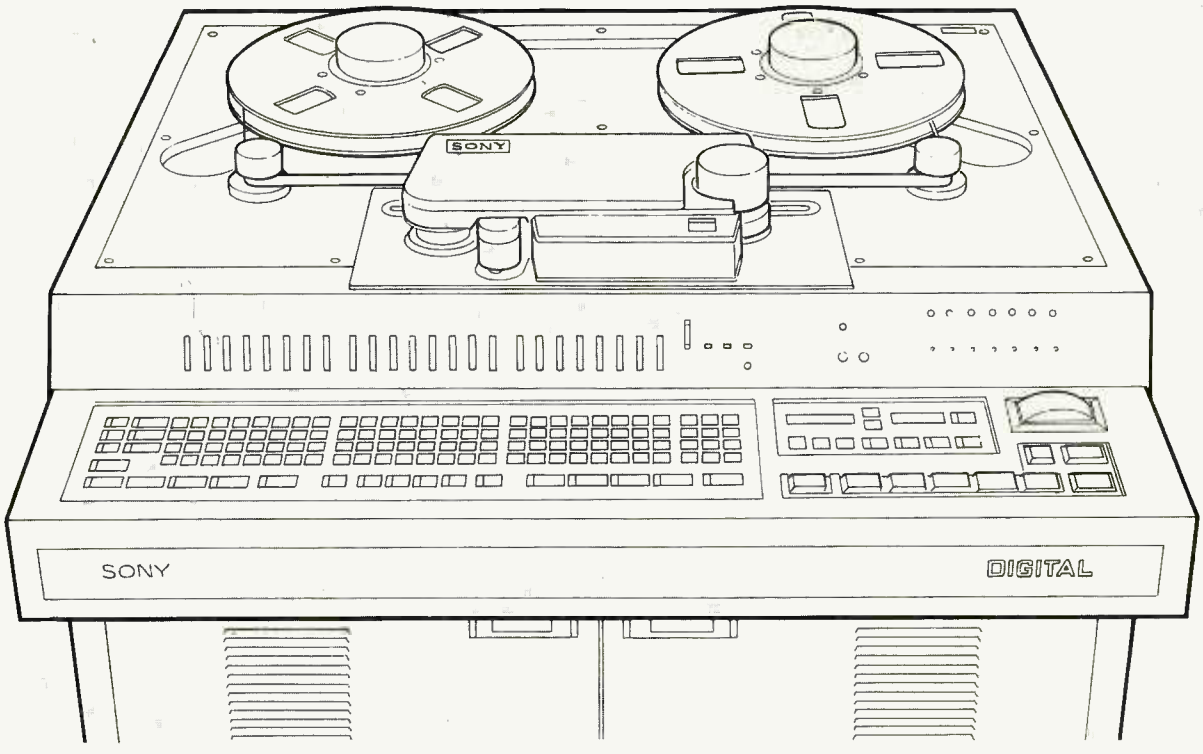

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DIARY

Companies, addresses

Literature received

● New catalogue from Rental Electronics based in Reading, Berks, UK. Specialising in scientific and technical instruments, the catalogue ranges from digital oscilloscopes to microprocessor development systems and 32-bit scientific computers such as the Hewlett Packard *500 Series*.

● Micro-Point bulletin is one of a series of technical papers issued by this manufacturer of recording styli and master records, covering topics related to disc recording.

● *Glossary of Audio Video Terms*, published by Philips Service. Copies are available in the UK from Mr Ron Pickering, Philips Service, 604 Purley Way, Waddon, Croydon, Surrey CR9 4DR at a cost of £1 including postage and packing.

● Linear Catalogue of Raytheon Semiconductor products from Semispecs (Semiconductor Specialists (UK)). More than 600 pages covering operational amplifiers, comparators, D/A convertors, V/F convertors, voltage references, voltage regulators and special functions components. Also information on concepts, manufacturing, test procedures and packaging.

Address changes

● HM Electronics Inc has recently moved to a new facility in the Scripp's Ranch area of San Diego, California. This has allowed increased production capability and a doubling in company personnel. The full address is now HM Electronics Inc, 9675 Business Park Avenue, San Diego, CA 92131, USA. Tel: (619) 578-8300. Telex: 350-771.

● Film-Tech, manufacturers of portable audio mixers and other audio products, has moved to new premises at Unit 5, Willowbrook, Crickhowell Road, St Mellons, Cardiff CF3, UK. Tel: 0222 777839.

● Serafine FX Inc, has moved from Lion's Gates to new premises which have a custom designed studio near the beach in Santa Monica. The full address is 438 Ashland Avenue, Santa Monica, CA90405, USA. Tel: (213) 399-9279.

● Phoenix Systems Inc has moved to the Atlanta area: PO Box 338-B, Stone Mountain, GA30086, USA. Tel: (404) 934-9626.

Todrank/Grant collaboration

Valley Audio's Bob Todrank and Discrete Research's Neil Grant have announced their collaboration to jointly pursue mutual interests in audio, video and broadcast facility design and consultation work.

Both companies have been completing the design and production details of a transatlantic monitoring system which Valley People will import into the USA. It is a large tri-amplified system using proprietary components that will be built in England. Both men are pioneers and supporters of the use of the Tecron *TEF-10* time delay spectrometry system and Syn-Aud-Con's *LEDE* design concept.

There are no plans for a separate company name, since the association will develop and function as an extension of both individual firms. Both organisations plan to work jointly on large scale projects and monitoring systems while still continuing their individual pursuits.

Bob Todrank, Valley Audio, Nashville, TN, USA. Tel: (615) 383-4732.

Neil Grant, Discrete Research Ltd, London, England. Tel: 01-900 0355.

City University Diploma

The Music Department of City University, London has announced a Diploma in Music Information Technology course. It will cover both practical and theoretical applications of computers and microprocessors to music. Subjects included will be the principles behind CD players and digital recording, current electronic synthesisers and computer MIDI interfaces. Students will be taught programming skills and essential background subjects such as acoustics, psycho-acoustics and artificial intelligence.

The course will be available in one year full-time and two year part-time formats and is designed to fulfil the needs of recent graduates, composers, engineers and teachers who are either seeking retraining or a way of keeping up with recent developments (for those already working in music). For further information contact The Administrator, Music Department, City University, Northampton Square, London EC1V 0HB. Tel: 01-253 4399

Sony renames MCI facility

The integration of the MCI manufacturing facility in Ft Lauderdale, Florida was completed with its renaming as Sony Professional Products Company. This took place shortly after the Florida legislature's decision to repeal the state's corporate-wide unitary tax. Under the unitary taxing system, corporate taxes are based on the worldwide earnings of a company and its units. Multinational companies with Florida operations, including Sony, fought vigorously for the repeal of the tax.

UK hire companies association

As the hiring of equipment plays an increasingly important role in the recording industry the ASCE has introduced the Association of Professional Entertainment Hire Companies. Their aims are "to represent a united front of hire companies, to promote the interests of members generally and to form standards and a code of practice for the industry".

There has been some concern over the need to introduce some control and standards in order to secure this side of the business.

More information is available from Ken Walker of ASCE, tel: (06286) 67633.

Gotham export becomes Gexco

All business activities of Gotham Export Corp have been turned over to the newly-formed Gexco International Inc.

The new company is owned by Paul Goldstein who was vice-president of Gotham Export Corp for over 18 years. Gexco will continue to export such manufacturers as Lexicon, Switchcraft, MRL and Valley People.

Gexco International Inc, 317 St Paul's Avenue, Jersey City, NJ 07306. Tel: (201) 653 2582.

Cadey info comes through

In the February issue we asked for information leading to the discovery of information, servicing details and spares for Cadey multitrack machines.

We have now heard from a company called K-Tek in Surbiton, Surrey who say that they have been dealing in Cadey tape recorders for three years and can supply all the custom mods (eg pinchwheels full width, power supplies, etc) as well as complete sets of circuit diagrams for the ranges of 16- and 24-track machines.

Although K-Tek are able to locate most spares they, too, would welcome news of a users' club. ▷

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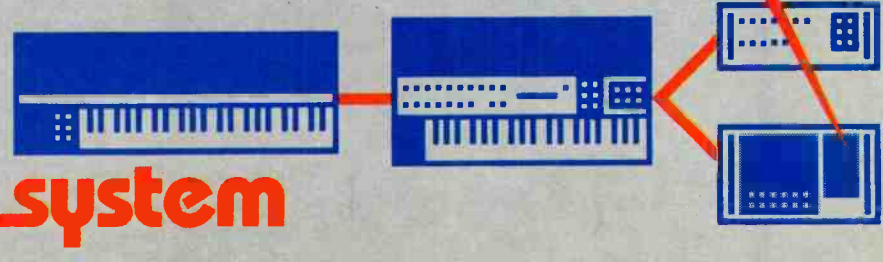
PPG system



DIARY

Agencies, people, companies

People

● Corney Webster, founder of Crow of Reading, has resigned from its board after nearly twenty years as the company's chief executive.

● Sony Corporation of America's professional audio division has appointed Gary Hall as digital sales engineer. He will be responsible for customer consulting and training. Hall's previous activities have been the operation of his own electronics service and consulting business, and designing and marketing positions at Lexicon in Massachusetts.

● Sid Price, designer of the *MasterMix* computer assisted mixdown system, has been appointed as development director for VAPP Systems at Audio Kinetics. Previously responsible for A-K automation systems, Sid will also be responsible for all synchroniser projects.

● Crown International has appointed Tim Kueppers as an engineer in the prototype engineering group. Tim will be responsible for working on microphone and electronics prototypes, preparing them for production.

● Platinum Australia has added engineer Chris Corr to its staff.

● Harman (Audio) UK Ltd have announced the appointment of Guy Hawley to the sales and marketing team where his primary interest will be JBL professional component sales. He was previously sales manager at Marquee Entec.

● Tres Virgos Studios, San Rafael, California have announced the appointment of Julie Stafford Straton as office manager. She was formerly with the Jerry Garcia Band. Also Doc Shaffer has been appointed science officer having had twenty years of technical experience with both studios and bands.

● Dave Scott has joined Studio Equipment Distribution in Luton, Beds. He was previously with Atlantex.

New plant for James Yorke

James Yorke has acquired a new plant in Cheltenham bringing together under one roof the sales, production and recording departments of James Yorke Ltd and further extending the manufacturing plant of James Yorke (Magnetics) Ltd. Head Office, sales and factory are at Yorke House, Corpus Street, Cheltenham, Glouces GL52 6XH, UK. Tel: (0242) 584222. Telex: 43269.

Lyrec UK

Lyrec, Danish manufacturer of professional tape machines and high speed cassette duplicators has restructured its UK distribution and marketing arrangements.

Scenic Sounds Equipment is distributing the professional 2-track and multitrack machines and offers full sales, service and spares support.

Dag Fellner is heading up Lyrec UK which is handling sales of the cassette duplication systems and certain broadcast products.

Scenic Sounds Equipment, Unit 2, 8/14 William Road, London NW1 3EN. Tel: 01-387 1262. Telex: 27939 SCENIC G.

Lyrec UK, 13 Hampden Hill, Beaconsfield, Bucks HP9 1BP. Tel: (04946) 4425. Telex: 838725.

Bayer Merlon for CD worldwide

West German Bayer AG has been producing a polycarbonate material for use in compact discs which has been selling in Western Europe. Now distribution will be worldwide and the product designated *Merlon CD 2000*.

Bayer reports that successful use of the easy-flowing engineering plastics for audio discs is likely to be followed by its use in memory disks for data storage.

Nimbus correction

Readers of the article entitled 'Nimbus CD manufacture' in the June issue may have noticed an error on page 46. Some copy in columns 2, 3 and 4 was transposed but fortunately nothing is missing.

We hope that you will have been able to put the pieces together and we apologise for any confusion this may have caused.

Agencies

● Bel Marketing have appointed Musimex as their sole export agent. Bel say that this will strengthen their overseas dealer network as well as increasing the number of territories that Bel products are available in. Musimex, 46a Marlborough Road, London N22 4NN, UK. Tel: 01-881 6060. Telex: 262284.

● Following the appointment of Industrial Tape Applications as their dealer for the UK and Eire, Ursa Major have announced their new dealers for France and Austria. They are respectively SCV Audio, 186 Allee des Erables, 95947 Roissy CDG, France; and Spectron, Rauscherstrasse 25, 1200 Vienna, Austria.

● Gauss has appointed Knight Sounds to represent them in the mid-Atlantic states. Knight Sounds is in Silver Springs, Maryland, and the telephone number is (301) 622-9545.

● Audio Video Marketing (AVM-Ferrograph) is the first company in the UK appointed outside London to market Otari recorders and duplicators. AVM Ltd, Unit 20/21, Royal Industrial Estate, Jarrow, Tyne & Wear NE32 3HR. Tel: (091) 489-3092.

● Aphex has appointed three new reps: New West Audio, 3620 Fredonia Drive, Hollywood, CA to cover Southern California, Clark County, Nevada and Hawaii; contact Tim Schaeffer. Pro Marketing Systems Inc, Indianapolis, Indiana, to cover Ohio, Kentucky and Indiana; contact Pete Finny and Shalco Inc, Ferndale, Michigan for the state of Michigan; contact Donald Jones.

Studio Equipment Distribution

A new UK based pro-audio distribution company has been announced to handle the exclusive UK distribution of Soundtracs, Bel, Standeasy and Applied Microsystems products through the existing dealer network as well as establishing new dealerships. Known as Studio Equipment Distribution Ltd and based at 27 Guildford Street, Luton, Beds. Tel: (0582) 452495. SED will also be introducing a number of new products ranges to the UK market.

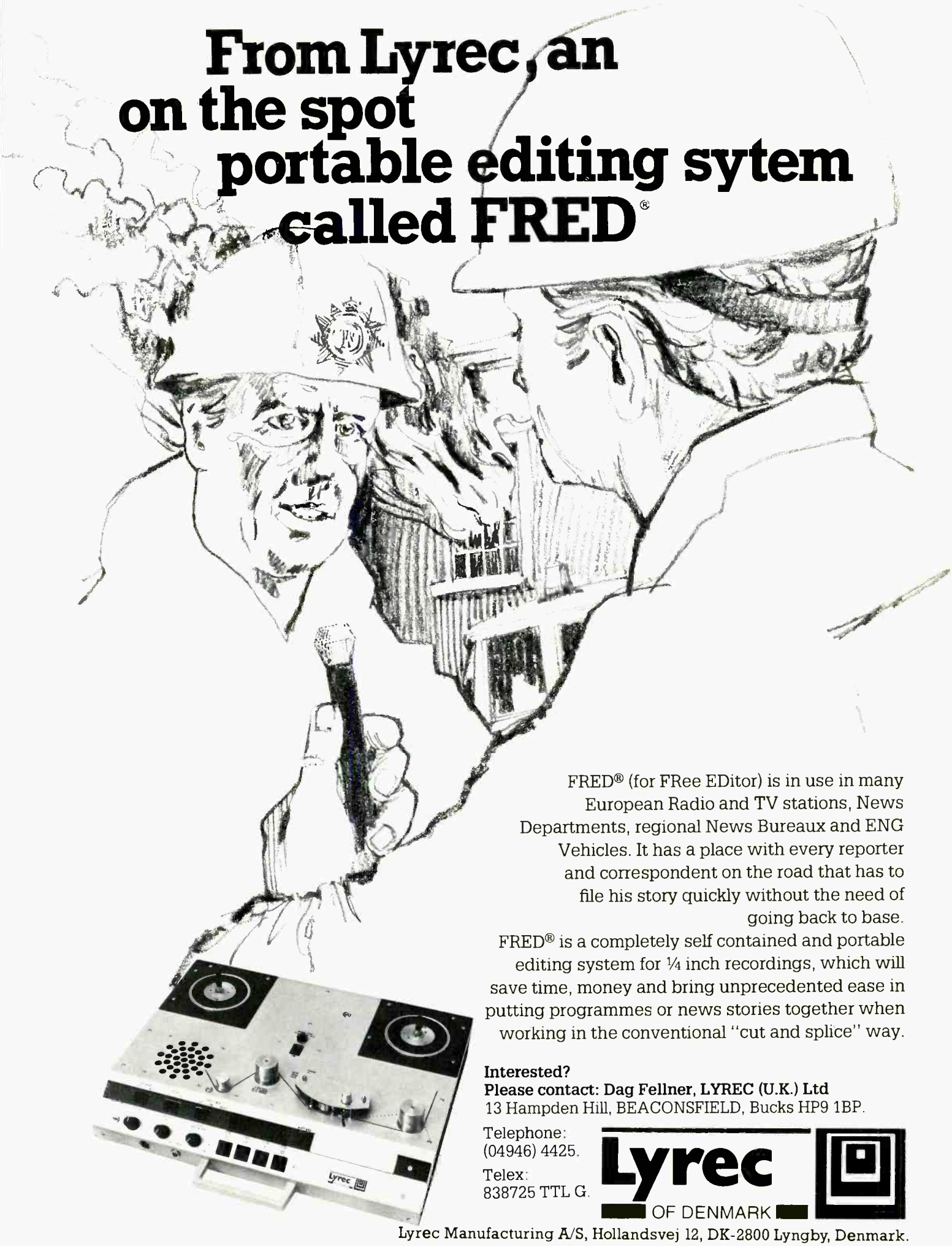
Lutz Meyer solo

Lutz H Meyer has left Sony Corporation to form his own company Omni Technology Inc to market the complete line of Sony audio equipment (including all the digital products), in Florida and Georgia. Meyer first joined MCI in 1970. Omni will provide sales and full systems design and service with a team of former MCI employees and the company hopes to add further lines.

APRS course

The 12th APRS Engineers' course dates are 13th to 20th September. The object and purpose of the course is to update the knowledge of participants by lectures and workshops using modern equipment lent for the occasion by manufacturers. Revision sessions start on 13th, and those participating only in the main section of the course should start on the 14th.□

From Lyrec, an on the spot portable editing sytem called FRED®



FRED® (for FRee EDitor) is in use in many European Radio and TV stations, News Departments, regional News Bureaux and ENG Vehicles. It has a place with every reporter and correspondent on the road that has to file his story quickly without the need of going back to base.

FRED® is a completely self contained and portable editing system for ¼ inch recordings, which will save time, money and bring unprecedented ease in putting programmes or news stories together when working in the conventional "cut and splice" way.

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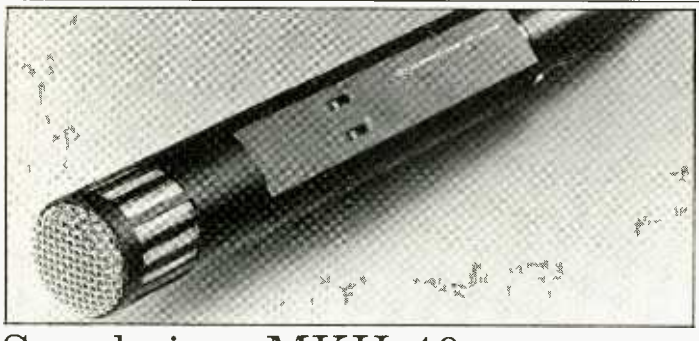


Sennheiser MKH 40

Extremely low internal noise and a high sound pressure level capability are claimed for the *MKH 40*, Sennheiser's new cardioid condenser microphone.

The manufacturer's specification states a frequency response of 40 Hz to 20 kHz. The sound pressure level for 0.5% THD at 1 kHz is 134 dB, or 142 dB at 3% THD in the −10 dB sensitivity position. The noise level is quoted as 10 dB equivalent sound pressure level (DIN 45 500, curve A, RMS), or 14 dB in the −10 dB position. The figures are 14 dB and 24 dB respectively when measured according to CCIR 468, peak. The sensitivity is 25 mV/Pa, or 8 mV/Pa in the −10 dB position.

As well as a sensitivity switch, the mic has a switchable bass roll-off characteristic. In the 'roll-off off' position the mic rolls off at 12 dB/octave, being −3 dB at 40 Hz. In the 'roll-off on' position the mic response drops by 6 dB/octave, with the −3 dB point at 250 Hz.

The output is balanced and has a nominal impedance of 150 Ω, for loads of 1000 Ω or greater, and the mic is powered by a 44 to 52 V phantom. The *MKH 40* is 25 mm×100 mm, and weighs approximately 100 g.

Sennheiser Electronic, D-3002 Wedemark 2, West Germany. Tel: 05130-583-0. Telex: 0924623.
UK: Hayden Laboratories Ltd, Hayden House, Chiltern Hill, Chalfont St. Peter, Gerrards Cross, Bucks SL9 9UG. Tel: (0753) 888447. Telex: 849469.
USA: Sennheiser Electronic Corp, 10 W 37th Street, New York, NY 10018. Tel: (212) 239-0190. Telex: 421608.

EAA Square 1000 power amplifier

The *Square 1000* will deliver a nominal 330 W/channel into 8 Ω, 660 W into 4 Ω and 900 W into 2 Ω. In bridged mono mode, the nominal power output is 1360 W into 8 Ω or 2050 W into 4 Ω.

The amplifier uses two 2 kVA windings on the mains transformer, which feed separate 'delta' power supplies with 35 amp rectifier bridges and 33000 μF cooled capacitors. EAA says this approach is more reliable than a switched-mode power supply.

An analogue computer measures the output current, temperature, 'velocity' and amplitude of signals, load impedance, and calculates a safe operating area for the transistors. A voltage controlled attenuator adjusts the level to suit. Front panel LEDs warn the operator if parameters are exceeded.

The manufacturer's specifications include nominal harmonic distortion of 0.007%, intermodulation distortion 0.04%, slew rate 40 V/μs, rise time 4.5 μs, damping factor (8 Ω) 800, gain 26 dB, offset 0 to 5 mV, signal-to-noise ratio 103 dB (A-weighted 115 dB), crosstalk (at 1 kHz) 94 dB, input impedance >5 k Ω, high pass filter 15 Hz 12 dB/octave, frequency response (−3 dB) 2 Hz to 80 kHz, mains 220 V 50 to 60 Hz 2800 VA, dimensions 483×455×132 mm (3 U rack height), weight 27 kg.

L'Electro Acoustique Appliquée, 4 Place de la Mairie, 91620 Nozay, France. Tel: (6) 449-05-42. Telex: 691 156 F.

Ursa Major StarGate 626

The *StarGate 626* is an improved version of the *StarGate 323*, with eight new reverb and effects programs in addition to the *323*'s eight 'rooms'. The *626* has the same 15 kHz bandwidth and 80 dB dynamic range specification. It also offers a 2 s delay time, by means of 256 k RAM chips which have only recently become available.

The eight new programs are: a fast-diffusing plate-type program with no discrete pre-echoes; two long 'space-reverbs' with smooth decays up to 15 and 20 s long respectively; a 'reverse reverb' with adjustable decay time and duration; three full-bandwidth delay lines with adjustable delay time and feedback gain (one program is mono, one stereo, and one produces alternating channel outputs); a 'dual echo' effect which starts as a distinct echo and gradually blurs into a reverb-like sound.

In addition, all 16 modes of the *626* have a 'freeze' feature, which can be externally controlled. This feature, which holds 2 s of sound, can be used in a variety of ways, from infinite reverb to looped delays.

Ursa Major Inc, PO Box 28, New Town Branch, Boston, MA 02258, USA. Tel: (617) 924-7697. Telex: 921405.
UK: ITA, 1 Felgate Mews, Studland Street, London W6 9JT. Tel: 01-748 9009. Telex: 21897.

Tapetalk The Box RSA 2

The *RSA 2* is a new professional model in *The Box* range of soundstage analysers from Tapetalk.

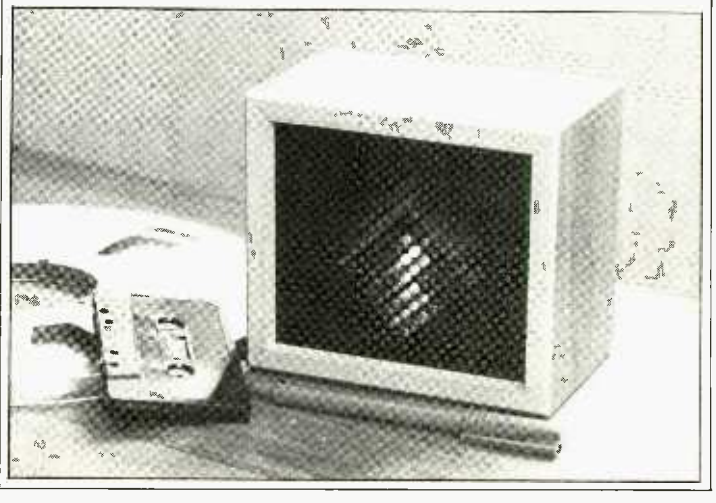
The manufacturer says that the diamond shaped display on the instrument shows, in real time, the absolute value of the L-R product of a stereo pair, giving the user an accurate and meaningful view of balance, width, position, mono compatibility etc.

Features of the original *Box* are retained: equal logarithmic scaling; wide, preset sensitivity adjustment; and a variable preset baseline threshold to allow a user-defined operating point to be set on the LED array.

Refinements of the *RSA 2* include: five rear-mounted rocker switches for half/full-wave operation, −10 dB attenuation, and one of four response curves: flat, 25/400 μs for digital recording, 50/400 μs for cutting engineers, or to give an additional safety margin when recording digitally, and 75/400 μs to give an extra safety margin when cutting.

The *RSA 2* comes complete with a 240 V AC to 15 V DC adaptor, which is connected via a 3-pin DIN socket, to allow the option of using an alternative local DC supply. Audio is connected via 2 metres of screened, unbalanced flying leads.

Tapetalk, 429 Whaddon Way, Bletchley, Milton Keynes MK3 7NR, UK. Tel: (0908) 77710.



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 ancilliary 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 HHB

HHB HIRE & SALES, UNIT F, NEW CRESCENT WORKS, NICOLL ROAD, LONDON NW10 9AX. TELEPHONE: 01-961 3295. TELEX: 923393.

THE SONY PCMF1 AND PCM701ES DIGITAL AUDIO PROCESSORS.

NEW PRODUCTS

NEW PRODUCTS

Equipment, modifications, options, software

Parabolic dish microphone

Elkom Design (EDC) has introduced a range of parabolic dish microphones available in 18, 21 and 24 in diameter dishes. Designed for applications requiring high level of forward sensitivity and good side attenuation, the PD mics are powered by using a balanced in-line adaptor to convert the element impedance (normally 3 kΩ) to 30 to 200 Ω balanced mic output. By plugging directly into an EDC *Pikamic* plug-in transmitter, incorporating phantom power, the mic is converted into a PD radiomic.

The 21 and 24 in PD mics are quoted as giving up to −35 dB off-axis attenuation and a range of over 100 m.

The dishes are non-reflective black glass fibre with virtually no vibration pick up being transmitted.

Elkom Design Ltd, 29a West Street, Wareham, Dorset, England BH20 4JS. Tel: (09295) 6050.

Rack mounting monitor

Audisar has introduced a small 3 U high 19 in rack mounting 4 in 2-way 'convertible' monitor system. Frequency response quoted is 68 Hz to 12 kHz ±3 dB with a power rating of 30 W (15.5 VRMS at 8 Ω).

The monitor's crossover network is a parallel 12 dB/octave type, specifically matched to the transducer's characteristics.

The network includes high frequency protection to prevent high energy burst burn out.

Audisar, PO Box 1561, Bellevue, WA 98009, USA. Tel: (206) 454-2040.

AMS AudioFile

AudioFile is a hard disk based recording and playback system, which can be configured in several different ways, allowing it to perform completely different functions.

In its simplest form, *AudioFile* can capture samples of sound, edit and store them. Complete files of sound effects can be recorded, edited and catalogued. Secondly, *AudioFile* can have samples assigned to any of its outputs for multiple synchronous triggering. This triggering can be done manually, by audio input, by an events controller or by the built-in timecode reader/generator.

AudioFile can also be configured as a multitrack digital recorder. It is, however, able to advance or retard an individual 'track' with respect to any other. A track on a multitrack tape machine is analogous to a file on *AudioFile*. Hundreds of files can be stored and delivered to any of the outputs on cue.

An advantage of using this unit in synchronism with another machine is that the 'elastic band' effect of having mechanical transports locked together is eliminated. On looping video, audio will be heard virtually as the video machine settles into play.

AudioFile can also be used as a digital stereo editing system. Because the editing is electronic and has random access, it can be conducted on a single machine with an accuracy of microseconds.

Using Winchester disks as the storage medium, at the moment it has up to eight audio outputs. 16-bit linear PCM coding is used, and the sampling frequency is switchable between 40, 44.1, 48 and 50 kHz. At 48 kHz, the frequency response extends to 20 kHz.

The system consists of rack mount units, each 5 U in height. There is a processor/first disk module, a disk expansion module and a display/control surface.

The controls include an 800×480 pixel graphic display, 13 software-definable function keys, two 'digipots' for parameter setting, reel rocking etc, and a built-in alphanumeric pad for quick titling.

Advanced Music Systems, Wallstreams Lane, Worsthorne Village, Burnley, Lancs BB10 3PP, UK. Tel: (0282) 57011. Telex: 63108.

USA: Harry Harris Sound Services, 7138 Santa Monica Blvd. CA 90046. Tel: (800) 637-5000.

Visonik grows

The Visonik *David 6000* loudspeakers have been replaced with the new 6001.

The 2-way system has a recommended power of 40 W into 4 to 8 Ω with a given music power handling of 60 W. Available in black, brown or white, the latter two have a delivery time of four to six weeks against order.

Visonik, NordKanalstrasse 46, D-2000 Hamburg, 1 West Germany. Tel: 040 232111. Telex: 02163961.

UK: Uher Sales & Services Ltd, Unit Q1, Cherrycourt Way, Leighton Buzzard, Beds. Tel: 0525 383277. Telex: 826717.

APR-5003

Sony APR-5000 series

The Sony *APR-5000* series is a range of analogue tape machines available in three types. The *APR-5001* is the mono version, *APR-5002* the 2-track version, and *APR-5003* the 2-track with centre-track timecode version. These machines will be produced in desk-top, console and rack mounting configurations.

Design features include: the elimination of trimpot adjustments by computerised alignment; a precision tape counter with a 30-location memory autolocator; no servo adjustment required with different reel sizes; rapid alignment using keyboard control panel; battery backed memory for three alignment presets for each speed and headblock. The computerised alignment provides multiple programmable presets, allowing alternative tape types, reference fluxivities, overbias and record/repro equalisation.

Sony Corporation, PO Box 10, Tokyo Airport 149, Japan. Tel: 03 448-2111. Telex: 22262/24666.

UK: Sony Broadcast Ltd, City Wall House, Basing View, Basingstoke, Hants RG21 2LA. Tel: 0256 55011. Telex: 858424.

USA: Sony Corporation of America, Sony Drive, Park Ridge, NJ 07656, USA. Tel: (201) 930-1000. Telex: 642065. ▷

Three leading microphones from Electro Voice that have become synonymous with the broadcast industry, all dynamic, and built to take years of hard work.

635A Dynamic Omnidirectional

The 635A is quite simply the most rugged, durable microphone Electro-Voice manufacture. A slow roll-off below 200 Hz (−8 dB at 50 Hz) with a broad rise of several dB from 2,000 – 12,000 Hz results in bright yet natural vocal quality without the low frequency noise pick-up problems that can plague microphones with flat low frequency response.

RE 20 Variable D Dynamic Cardioid

The sound of the RE 20 has made it one of the most coveted, unique microphones in the world, and it is still one of the few true multi-use studio microphones.

TOOLS OF THE TRADE

However, unlike many condenser microphones, the RE 20's dynamic element provides undistorted output at the high sound pressure levels found in up-close vocal and instrument miking (in excess of 160 dB), its Variable-D design frees it of any bass-boosting proximity effect.

RE 50 Shock-mounted Dynamic Omnidirectional

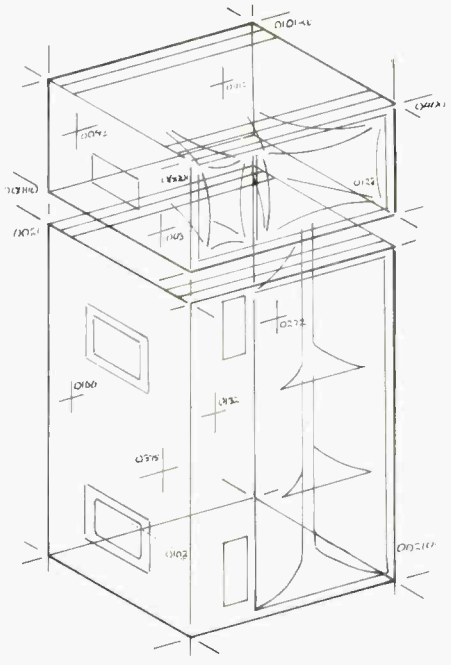
This mike was designed expressly for hand-held newsgathering work. It has the same tailored frequency response and high output level as the famous 635A. The RE 50's rubber shock-mount"mike-within-a-mike" design achieves a degree of shock isolation never before known in the industry. The construction is also highly resistant to damage from mechanical shock.

RE 50 RE 20 635 A

Many Electro-Voice professional product dealers can arrange hands-on trials at no cost to you. For further information please contact your E-V dealer or write to: Shuttlesound Ltd. Unit 15, Osiers Estate, Osiers Road, London SW18 1EJ. Telephone: 01-871 0966 Telex: 27670 Shutso G

SHUTTLESOUND

NEXT...



PROJECT: A SPECIFICALLY COMPUTER-DESIGNED INTEGRATED SYSTEM: COMBINING MAXIMUM ACOUSTIC OUTPUT WITH OPTIMUM FREQUENCY & DYNAMIC RANGE: COMPUTER-OPTIMISED BASS FREQUENCY EXTENSION:

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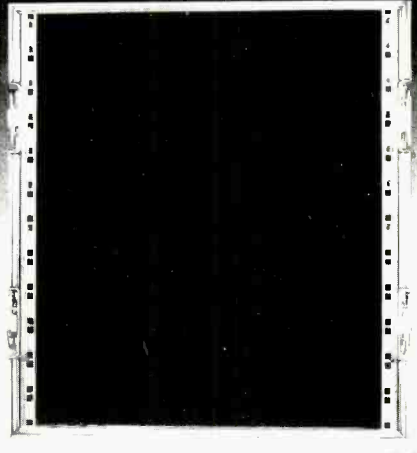

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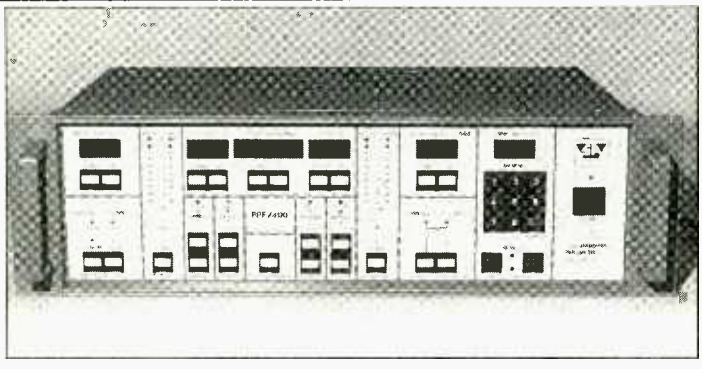
Mini vacuum cleaner

The *Minivac* is a miniature vacuum cleaner designed for microcleaning. Thus particles of dust etc may be removed rather than blown into the air as with the traditional compressed air blowers.

Designed primarily with photographic equipment in mind, this device will obviously have wide applications. It is manufactured by O&S Photographic Co.

O&S Photographic Co, South Block, The Maltings, Sawbridgeworth, Herts, UK. Tel: (0279) 722208.



Stage Accompany programmable parametric

The *SA PPE-2400* from Stage Accompany is a programmable 2-channel, 4-band parametric equaliser with digital control of all variable settings. The memory offers storage, recall and comparison of up to 64 different settings. Once a certain EQ has been programmed, it can be recalled at the push of a button.

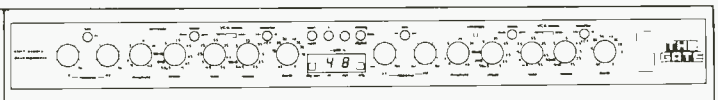
Centre frequencies are visible on 7-segment LED displays. By 'sweeping' a narrow boosted peak one can measure the frequency of resonances. LED displays are also provided for input gain, cut boost level, Q-factor, output gain and memory bank and address numbers. Input and output levels are displayed on LED bars, which have simultaneous VU and peak indication.

A serial data bus and interfaces, facilitating computer link-up and automation, are optional. A further option: remote control unit with memory, will carry EQ programs and link up to any *PPE-2400*. Settings can then be recalled in seconds.

The nominal four centre frequencies ranges are: 20 to 500 Hz, 68 Hz to 1.7 kHz, 240 Hz to 5.85 kHz, 800 Hz to 20 kHz. The Q-factor is adjustable from 0.3 to 30, and the maximum cut or boost is 16 dB in each band. The input and output are electronically balanced, and the maximum input/output level is +20 dBV. The unit is designed to fit in a 19 in rack, occupying 3 U of height.

The unit is intended to form part of a comprehensive computer-controlled sound system, centred on a *PMC-3212* programmable mixing console connected to a personal computer. Stage Accompany says that unlimited possibilities are created when you link up a complete digitally controlled sound system including mixing consoles, equalisers, reverb units, delays, electronic crossovers and power amplifiers, to a personal computer. Very complex, pre-programmed alterations of all function settings on all units are possible, whether in the studio or at a concert. The information can be stored and transported to program identical systems elsewhere: in live performances, this could reduce a soundcheck to merely adjusting to the particular acoustic. Remote control allows the signals to remain on stage, avoiding the use of long multicore audio cables.

Stage Accompany, Anodeweg 4, 1627 LJ Hoorn, Holland. Tel: (0) 2290-12542. Telex: 37989.



The Gate and the Strate Gate

The Gate is a new audio gate that consists of a pair of VCA-based gates, each with an advanced control system. One or both of the control voltages can be switched in or out by a programmable digital counting system which is triggered by the left-hand threshold detection circuit. It can count up to nine threshold transitions with the control voltage in, and a further nine with it out.

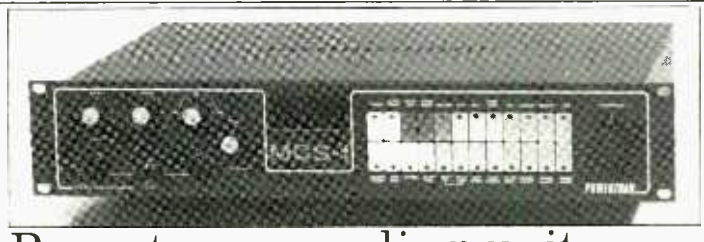
Features include the following: both left and right gates have a key source switch, for either internal or external key source; individually adjustable LF and HF key filters and variable threshold control for −50 to +20 dBm. Attack time is variable from 50μs to 1 s. For the longer attack times a 50% pre-delay is incorporated, ie the control voltage does not begin to attack until after the pre-delay has elapsed. Hold time is variable from 5 ms to 3.5 s and release time from 5 ms to 2.5 s. Each gate can be switched into the 'duck' or 'gate' mode, and there are two LEDs showing VCA status, and a further LED showing the control voltage attack/hold/release envelope.

The depth can be varied from 0 dB to −80 dB attenuation. Also, each output can be switched to monitor the key filters, the input or the VCA output. In addition, *The Gate* can switch the control voltages of the VCAs in or out. The threshold transitions are converted into trigger pulses. The number of trigger pulses required with the gate in is set on the left-hand display on the front panel using the toggle switch, and the same for the gate out display and switch.

There is a link switch to switch *The Gate* into 'analogue' or 'digital' link modes. In the analogue link mode the right hand VCA tracks the left hand VCA. In the digital link mode the right hand VCA obeys the control voltage parameters set up on the right hand side of the front panel, but the control voltage is switched in and out by the digital system.

A further new product is the *Strate Gate*, which is exactly the same as *The Gate*, but without the digital control system. Audio inputs and outputs are electronically balanced on *XLR*-type connectors, and there is a ground lift switch. Both units are housed in a 1 U high 19 in rack-mounting chassis, and are available for 110, 220 or 240 V mains supplies.

Britannia Row Ltd, 35 Britannia Row, London N1 8QH, UK. Tel: 01-226 3377. Telex: 268279.



Powertran sampling unit

The *MCS-1* is a new low cost digital sampling unit available either ready-made or in kit form.

The *MCS-1* can operate on either MIDI signals or a control voltage (1 V/octave). The unit can be used in conjunction with a BBC microcomputer and a special interface to save sounds permanently on floppy disk.

The unit may also be used as a delay line. A programmable sweep oscillator is incorporated and delays from 0.3 ms to 32 s can be used.

Powertran Cybernetics Ltd, Portway Industrial Estate, Andover, Hants SP10 3NN, UK. Tel: (0264) 64455.

IN PERSPECTIVE

IN PERSPECTIVE

Comment from Martin Polon, our US columnist

Let's sink the audio pirates

It is an interesting coincidence that the name currently applied to illegal duplicators and illicit vendors of all kinds of software is the same one used for seaborne plunderers of old: the parallels are numerous. Working from the relative safety of off-shore strongholds, software pirates threaten to flood the audio, video and computer world with cheap copies of successful hits. And like their namesakes, they threaten the livelihood of artists, studios and duplicators and the profitability of legitimate software merchandisers. Not only do pirates drain away an estimated 10 to 20% of all sales for a successful hit; they often 'poison the water' with bad copies that do not have the sound or visual qualities of the original. Such is the nature of the audio entertainment experience, that potential buyers invariably listen to marketplace rumours about 'bad sound', even though the problem is often one of poorly produced bootleg copies.

Despite expressed concerns from legitimate record and tape manufacturers, much of the large scale activity in illegal software replication is in the high technology third world rather than in the marketplace itself, ie the United States or Great Britain. The dynamics of having to work against the FBI or Scotland Yard and the corporate legal opponents fielded by the major record companies tends to reduce the scale of copying activities in the original marketplace.

Ditto, recent enactments of copyright protection for software and anti-counterfeiting measures by the American Congress. Most important, such activity can be countered domestically by both criminal charges and civil action in American, British and European courtrooms. Why risk prison sentences for staff and potential seizure of elaborate facilities by duplicating illegally in the country of destination? Much safer to ship in 'pirate' copies and risk only a shipment or two.

Not so easily blocked are the competitive efforts of Third World pirates, especially in Asia. The lack of identical legal systems or concepts of common law to apply US or British principles of software protection to, has made successful piracy control as much a port-of-entry situation dependent on local customs as anything else. Piracy of all kinds goes on in Africa, Latin America and even in European Economic Community members and affiliates such as Greece, Italy and Turkey. Pirates produce an extraordinary range of goods for world trade. Aircraft parts, automobile replacement parts, personal computers and their software, perfumes, pharmaceuticals, Scotch whisky, trademarked blue jeans, luggage, watches, etc, join audio and video software in being replicated. In Asia, however, the tradition of successful entrepreneurial activity in electronics based on a virtually inexhaustible pool of low-paid though highly skilled labour has blossomed out from legitimate to pirate operations; especially in Hong Kong, India, Singapore and Taiwan.

Compact disc, once touted as the greatest anti-piracy tool ever, has been used by pirates as an advanced mastering tool

India tends to be less of a problem since the government wishes to control all electronic hardware and software activities in this sector for the purposes of taxation. Taiwan's government, mindful of its need for strong legitimate commercial relations with the US and the rest of the Western World in lieu of other diplomatic ties, has begun to crack down on its illicit electronics infrastructure though still tolerant of its auto parts industry. Singapore has suffered from a lack of strong interest in solving its cassette problem at the highest levels, according to some observers. A volume of 'locally recorded' (pre-recorded) cassettes in excess of 60 million units a year is reported. However, Singapore is mindful of expanding a strong electronics industry (Hewlett-Packard, et al) further into computer arenas and may be exerting influence on pirate activities via new legislation. In Hong Kong, the sheer mass of all such counterfeiting activity (Louis Vuitton as well as Tina Turner) has hampered effective control. In addition, as a Hong Kong solicitor put it, "the perceived terminal nature of British control of the Crown Colony (to end in 1997) has already begun to erode normal marketplace checks and balances in Hong Kong. Many so-called responsible Chinese merchants are planning to move their finances to 'Chinatowns' in the US or the EEC. The remaining merchants are either more inclined to unscrupulous activity to fatten their 'nest egg' or less impressed with the threat of British colonial enforcement. And that's all for getting worse as 1997 draws nearer."

An audio and home video insider provided a bit of history on off-shore copying: "To some large extent, it is the same kinds of outside forces at work, if not the same individuals; in movie cassettes as well as audio tapes and computer programs. There is an apocryphal story about an American attorney specialising in piracy who diligently traced his record clients' illicit competition to a back alley factory in a very unsavoury section of the New Territories in Hong Kong. Fearing he would end up in a large order of Moo Shi Pork if he acted alone, the attorney called the police from a nearby telephone. From a hiding place, he observed that the pirates were somehow warned and quickly moved their operation out by truck. More startling was that some of the individuals he observed during the moving process were known to the attorney from a movie duplicating ring he had tracked down in West Beirut at the beginning of the '80s. The only thing that had stopped that operation was the Israeli army during the invasion of Lebanon."

Viewing piracy as a larger issue than just audio cassettes and LP records suggests some future dimensions of the piracy problem. The audio pirates can reach into any country and tailor their business to the specifics of that marketplace. If Customs are lax or bribable, then products are brought in already packaged. The packaging will be virtually undetectable from the original cassette or disc. If Customs, as in the US or Britain are preoccupied with keeping drugs out and computer technology in;

IN PERSPECTIVE

then the pirates will ship cassettes as blank media. No customs agency can play every blank cassette that enters in shipments numbering in the millions. These 'blanks' will be appropriately packaged inside the country and placed into the stream of commerce.

The advent of the compact disc, once touted by its backers as the greatest anti-piracy tool ever, has been used by pirates as an advanced mastering tool. A New Territories insider explained at a recent conference: "With compact disc, whatever the method of duplication to LP record or cassette tape, the quality of the master tape is there. In the old days, these people used to have to copy from commercial releases. The compact disc has increased quality on many pirate products by at least two generations. You could always tell a real issue from a counterfeit release by the aural quality. Not any more. Not since compact disc. In any small factory or house, cassettes are duplicated on high-quality cassette recorders. These machines are the pick of the litter from the Japanese hi-fi industry. The solenoid controls are all remoted allowing common start for 20-30-40 machines. Fed from a compact disc player, the quality is exceptional. There is no large investment for bulk duplicators and the whole thing can be moved to another location in 30 minutes. Unless the 'promoter' feels the need, no large bulk duplicators. But no problem, bulk duplicators sound better with compact disc too."

Individuals familiar with piracy fear that further advances in audio quality will also end up in the pirate's technology tool kit. Digital cassette recording is seen as a methodology for placing pirate copies of compact discs on home digital recorders. The proposed common computer bus for home audio devices will serve to simplify remote control of illicit copying systems, according to insiders. Some even expect a compact disc pressing capability to reach the hands of pirates before this decade is finished. One US specialist who values pirate skills pointed out: "Look at it this way. The Soviets want compact disc technology to increase their computer storage power. Once they have it by borrowing, buying or blackguarding they'll barter audio versions about the Third World. And that's assuming that the Asians don't knock off the system themselves. After all, two years after its introduction, perfect copies of the IBM personal computer were available all over East Asia."

No record manufacturer or performer or distributor of audio software in the United States or Great Britain can stem the tide alone; especially in terms of protecting software exports from illegal competition. EEC countries and especially Great Britain in conjunction with the United States have applied to the GATT assembly to tackle the problem of such piracy. Unfortunately, the agency has international responsibility for trade and tariffs. Its constituency includes the very same countries housing the pirates, whose diplomats frequently implore that GATT has much more important priorities than mere piracy.

The real solution to the problem is for software producers to pressure their State Department or Foreign Office for action. But record industry executives will have to relax their fixation with home copying by consumers and shift governmental lobbying to focus on off-shore pirates. To many government types, record industry leaders see illicit tape recorders copying in every closet. That may be part of the problem, but international pirates need to be stopped. The pressure of diplomacy can be a very substantial force on Third World countries otherwise dependent on the broad range of international trading services provided by the United States or Great Britain or via the EEC. Foreign aid and most favoured trading status are powerful weapons against countries that refuse to recognise the problem of piracy.□

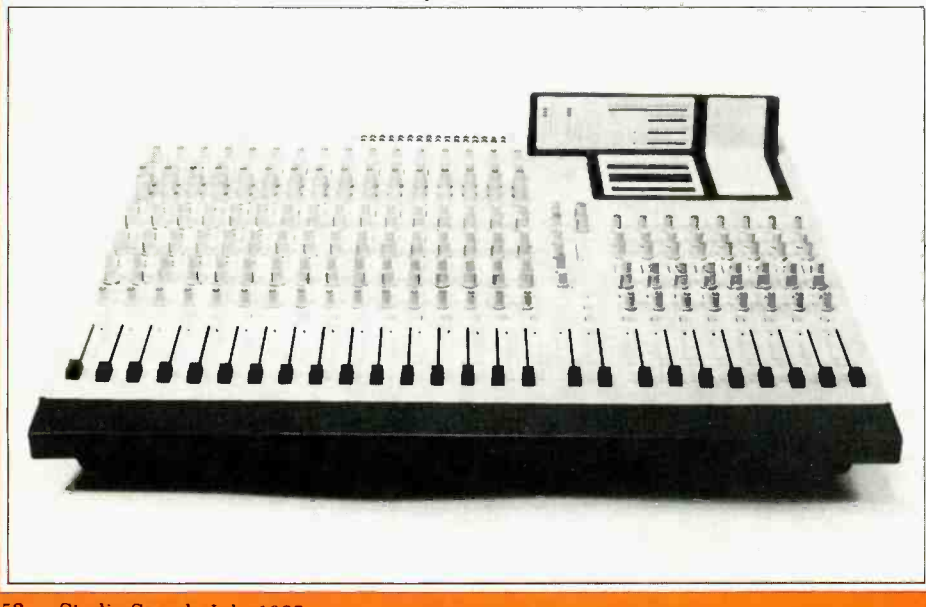
APRS PREVIEW

A

This year's exhibition will be held during June 12th to 14th at the usual venue: Kensington Exhibition Centre, Kensington, London. We have compiled a preview based on information which was available to us at the time of going to press

● **Ablex Audio Video:** cassette duplication plant, at APRS for first time. ● **ACES:** a wide range of equipment will be exhibited including a stereo ½ in master recorder, 16- and 24-track recorders, 18 and 24 bus consoles, noise reduction, the full range of ancillary equipment and a featured new item will be a 16-track on ½ in recorder. ● **Advanced Music Systems:** complete range of digital audio processors, featuring the *AudioFile*, shown in the UK for the first time—a hard disk based digital audio recording and playback system with linear 16-bit sampling and long maximum record time. ● **Agfa-Gevaert:** selection of recording tape including *PEM469, 428, 468, 297D* and *368*. Other exhibits are duplicating tapes and low noise polyester-based magnetic recording film. ● **AKG Acoustics:** the central theme will be microphones with featured items being the ultra linear *CK61* and *CK62* capsules for the *C460* preamplifier and the *CK1X, CK2X* and the *CK3X* capsules for use remotely from the *C460* with a fly lead. Other new items will include the *C568* short shotgun mic, the *K240* headsets, the very new *D321* addition to the *300* series mics, the *Amix* range of fixed and portable studio mixers and the *Uniton* range of PA and music equipment. Finally a unique new product will be the singing *Note Board*, an audio visual teaching aid that converts written notes to sound. ● **Alangrove Associates:** Studio designers and builders, and agents for Tom Hidley design. ● **Alice (Stancoil):** Selection of products including the established *828* series stereo mixer, *2000* series broadcast stereo mixer, and the *TBU-5 PROBE* radio reporter unit. New items will include the *3000* series budget on-air mixer for community/local/hospital radio studios, and the *TBU-5 SABRE* OB commentator unit. ● **Allen & Heath Brenell:** Full range of audio mixing consoles with the new *CMC* (with microprocessor control) and *SR* sound reinforcement desks. ● **Allotrope/ Future Film Developments:** Comprehensive variety of cables, cords, connector jackfields, wiring aids and associated components plus a wide range of audio accessories. ● **Alpha Audio:** Sonex open-cell urethane plastic acoustic foam designed to control reverb time, eliminate stray reflections and standing waves. ● **Amek/TAC:** Full range of audio mixing consoles. New products are the *Scorpion* PA and recording console, and the recently modified *Matchless* 24-track console. In addition to the consoles the George Massenburg Labs computer automation system will be displayed. ● **Ampex:** Full range of analogue and digital audio and video tapes and cassettes for professional recording applications. ● **Applied Microsystems:** On show for the first time will be the *CMX50* SMPTE compatible synchroniser. Also *Spin Time* add on tape timers for Studer/Revox machines and *CM50* autolocator. ● **Arny's Shack:** Tools for the recording industry. Large selection including a gas filled soldering iron which may be filled with cigarette lighter gas and the *Filofax* filing system which has not been shown at an APRS before. ● **Atlantex:** Several new products from the Fostex, Accessit and Seck ranges plus *Great British Spring*. ● **Audio+Design Calrec:** Products on display include the full range of Audio & Design products including the Ambisonic Mastering Package, the *PCM701ES* Professional and the *ADMIX* digital fader. Calrec's latest console technology will be displayed in the form of demo units of the Calrec assignable console and the *UA8000* music console. The mic range will also be on show with the *Soundfield* on demonstration live and from B-format tape. Also on show will be the ADC range of products. ● **Audio Developments:** New *AD260* stereo ENG mixer, *A* boxes series of battery-powered effects (compressor/limiter, EQ, line amp, mic amp, etc) and distribution amps. Also the *AD160, AD145* and *AD062* ranges of mixers. ● **Audio Kinetics:** *Eclipse* multi-machine controller/editor which will control up to 32 machines with full transport and record control of each machine, *Q.Lock 4.10* synchroniser with new facilities, *MasterMix* floppy disk based computer mixing system and *Timelink* electronic gearbox which allows reference frequencies to be changed from one standard to another. ● **Audio-Music Marketing:** Will be exhibiting the full range of Starsound/Dynamix and RAM Products. This covers a full range of consoles for studios, broadcast and video work from small to large together with ancillary items including amplifiers and graphic equalisers. ● **Audio Services:** Information on equipment and package deals. Hope to be demonstrating the new Tascam *MS16* in conjunction with TAC *Scorpion* 16-track mixer as an exclusive 16-track 1 in package. ● **Audio Systems Components:** range of broadcasting ▷

Allen & Heath Brenell's CMC 24/16 compact console



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PREVIEW

products including *Minx* mixer. ASC versions of *PR99* and Technics *SP10*. ● **Audio Video Marketing:** AVM-Ferrograph series *77* reel-to-reel tape recorders, AVM-Ferrograph audio test equipment and test tapes. Milab studio microphones, Otari tape recorders and cassette duplicators. ● **Autograph Sales:** Meyer Sound Laboratories *CP10* 10-band stereo parametric equaliser with five bands of EQ per channel and additional high and low shelving cut filter for each channel plus range of speaker systems. Representatives from Meyer will be on hand to discuss Source Independent Measurement (SIM) technique for measuring and correcting acoustic problems before and during performances via computer technology. Also equipment from Klark-Teknik including first software update for *DN780*; Brooke Siren Systems' *DPR402* dynamics processor; and new range of Micron radio mics. ● **Avcom Systems:** Exhibiting the Telex *6120* high speed audio tape duplication system.

B

● **BASF:** Range of multitrack analogue and digital audio tapes and loop master *920* chromium dioxide for high speed duplication. ● **FWO Bauch:** New Studer machines will be the *D820* 2-channel DASH digital recorder, *A820* analogue recorder, Revox *B215* cassette deck and *B285* receiver. Bauch are also introducing the *Omega* range of NAB cart players and recorders. Other exhibits will comprise a selection from the Bauch ranges including Studer *TLS4000*, Neumann condenser mics, EMT recorder, DDL digital reverb and turntables, Harrison automated mixing consoles and full range of Tannoy professional studio monitors. ● **Bell & Howell:** Selection of JVC products including first APRS showing of *DAS-900* digital audio mastering system which can synchronise with PAL/SECAM video systems. ● **Beyer Dynamic:** Full range of headphones, microphones and accessories. New items will include *MC 740* condenser mic with five different polar patterns, *M 380* dynamic mic with fig-of-eight polar pattern and a modular condenser mic. ● **Britannia Row:** Full range of products including Westlake Audio nearfield monitors, FM Acoustics high power studio amplifiers and ElectroSpace Developments *Time Matrix*, *Spanner* and programmable noise gate, *The Gate*. ● **Branch & Appleby:** Magnetic recording heads for all magnetic media plus replacements for most professional magnetic recorders. Range of fully compatible long pole heads for all Studer models, heads for Revox including logging and stereo, Sendust hard tipped heads for magnetic film. From Branch and Appleby Systems, a complete record and replay amplifier system for updates of existing ¼ in machines. Demonstrations of mixing desk automation from Optimix and Magna-Tech film dubbing equipment. From (gtc), synchronisers and audio to audio and audio to video, Editon lock up synchroniser, portable timecode reader, and footage counter. ● **Brooke Siren Systems:** Full range of electronic crossover/limiter systems and accessories including the *DPR402* dynamics processor. New products will be the *QuPlay* system—a hand-held remote unit for use with multitrack tape machines. The system has full transport controls and memory facility for drop in/out locations without the use of code or spare tracks. ● **Bruel & Kjaer UK:** Will display the range of studio microphones including *4003*, *4004*, *4006* and *4007* omnidirectional condenser mics.

C

● **Cadac:** Channel input and monitor modules from music recording console; complete theatre console for live mixing and reproduction; and 'belt packs' from a communications system recently manufactured for the National Theatre. ● **Canford Audio:** NEK cables, Neutrik connectors, Lynden Micros circuit boards, Illsonic acoustic tiles, HH power amps and more. ● **Cetec International:** Series *2400* high speed duplicating system with new electronic and mechanical breakthroughs in functions and design. Can be customised. ● **Clear-Com Intercom:** The Clear-Com distributed amplifier intercom system including multichannel main and remote IFB and intercom stations, interfaces for cameras, 'telco' lines, RTS type systems. Introducing *CP-300* Universal Clear-Com/RTS belt pac and *TW-12* Clear-Com/RTS interface. ● **Connectronics:** Full range of cables and connectors. New products will be the *VX1* and *VX2* ranges of video cables and range of pre-assembled audio interface cables. ● **Cunnings Recording Associates:** No information received.

D

● **DDA:** *AMR 24* multichannel recording console, *M* and *S* series 4-bus mixers, *D* series 8-bus mixer and *PMC 402* ENG/EFP portable mixer. ● **Discrete Research:** Computer-aided spectrum analysis and acoustic consultancy. ● **Dolby Laboratories:** Complete range of audio noise reduction equipment including units for A-type, B-type and C-type. First time showing of *DP85* digital system—a baseband digital coding system which uses improved delta modulation techniques giving high performance at relatively low bit rates. ● **Drawmer:** Full signal processor and dynamic control product range plus unveiling two new items.

E

● **Eardley Electronics:** Full range of Neutrik connectors and other audio accessories. ● **Electromusic:** No

Studer A820 analogue tape recorder

information received. ● **Elliott Brothers:** Information on new custom built mixer system service for broadcast applications and samples of current projects. Also showing selection of Tannoy, Rogers, Harrison equipment (with working VCA for the Harrison amp). ● **EMO Systems:** Full range of stage and studio ancillaries including DI boxes, mic splitters, power distribution systems and disc preamps available as standard or customised. New products will include a redesigned cable tester, additions to the range of power distribution panels and two power amplifiers for studio and installation use. ● **Ernest Turner Instruments:** Comprehensive range of VU and PPM meters in analogue, solid state or neon gas plasma formats.

F

● **Film-Tech Electronics:** Having moved into general equipment sales, Film-Tech will show products from Sony, HIT, Electro-Voice plus range of flightcases and racking systems. From the standard mixer range: *Compact 4-1*, *4-1* EFP and *3* ENG. ● **Formula Sound:** Full range of processing and mixing products. Details of services offered such as design, manufacture and installation of audio and allied equipment for applications including studios, theatres, mobile and static sound reinforcement systems.

H

● **Harman:** The current range of JBL monitors will accompany the new *4425* mini biradial monitor and two new power amps: *6230* and *6260*. The newly acquired UREI range will be shown of which Harman is now UK distributor. Tascam will be unveiling worldwide two systems: the *M246* advanced *Portastudio* which, running concurrently with the *244*, has extended mixer facilities. The *388* is an 8-channel *Portastudio* system and is based around flat bed 7 in spool ¼ in tape format reel-to-reel. Features include 8/8 bus mixing, dbx built in and full SMPTE controllability. ● **Harrison Information Technology:** New range of power amplification products. The *X-Series* products range from 75 W to 800 W per channel. The *SP2* preamp also has applications as disco and keyboard mixer. The *PA-Series* creative mixer amps combining echo/chorus/foldback and reverbs in 19 in rack mount module. ● **Hayden Laboratories:** Full range of Sennheiser microphones and Nagra-Kudelski broadcast sound equipment, with debuts from the Sennheiser *MKH40* microphone for digital recording and *M8* mixer for portable and studio recording. New Nagra-Kudelski equipment based round SMPTE timecode will be the latest Universal Synchroniser adaptation of the *T-Audio* with *IV-S* portable SMPTE recorder. Also launching new *T-Audio* console. ● **HH Electronic:** Having completed a year under their new management, HH will be showing the result of the new development programme in the form of seven MOS-FET power amplifiers which will be shown for the first time with features including electronic balanced inputs, high slew rate and improved heat dissipation. The existing range will also be on show. ● **HHB Hire & Sales:** Full range of products from Klark-Teknik, Sony PCM digital audio processors, the *CLUE* system now available with a SMPTE/EBU timecode reader card, Amcron power amps, Fostex *B16* and Allen & Heath *System 8*, Allen & Heath *CMC* console, TAC *Matchless* and the Studer *A80* MkIV 24-track machine. ● **Hidley Design:** At the APRS for the first time will be the specially-contoured Apitong-wood horn used in the new range of three 2-way monitor systems. Also plans of selected new acoustical design and construction projects. ● **Hill Audio:** Complete range of *000* series power amps, series *3* modular mixing consoles and a selection of sound reinforcement cabinets: *M4* full range flying cabs. Shown for the first time: *Stagemix* rackmounting 12/6 monitor mixer to complement the rackmounting 16/4/2 *Multimix*. ● **HW International:** New microphones will be *SM90/91* boundary effect; *SM98* miniature condenser MI mic and *520D* harmonica mic. New amps will be *FP12* headphone bridging amp, *FP11* mic to line amp and *FP16* distribution amp. Plus range of established microphone and circuitry products, along with Hafler amplifiers.

I

● **ICM:** C0s and cassette duplication sundries. ● **Industrial Acoustics Company:** Graphic display of selected turnkey projects illustrating the IAC modular design approach to studio construction. ● **International Musician:** Range of musician orientated magazines. ● **ITA:** Otari *MTR90* 24-track recorder, *MTR20* 2-track mastering machine, *MX70* 16-track 1 in, and the *MTR12 MkII* with centre-track timecode option.

APRS PREVIEW

Amek's new *Scorpion* console will be shown. There will be the new *Stargate 626* from Ursa Major along with *8X32* and *MSP126* multi-tap stereo processor.

J

● **John Hornby Skewes:** Audio-Technica *RMX64* 4-track recorder/mixer and Teczon *DUB* multi 4×4 personal recorder/mixer on show for the first time. Also range of Audio-Technica microphones and JHS digital delay units and accessories.

K

● **KEF Electronics:** Featured will be the *KM1* high power monitor system which is now in production form. Also on show will be the Reference series speaker system models *101, 103-2, 104/2* and *105.2* together with the *K-UBE* KEF Universal Bass Equaliser. ● **Kelsey Acoustics:** Full range of Psionics products including *NG4 MkII* quad noise gate, *EQ4* quad band parametric equaliser plus range of Kelsey custom cabling and microphone stands from Konig & Meyer, Atlas & Valan. ● **Keith Monks:** Ranges of mic stands, boom arms, accessories and other peripheral studio products. ● **Klark-Teknik:** Full range of signal processing equipment including series *300* graphic equalisers, series *700* DDL and *DN60* real-time spectrum analyser. For the first time: *DN780* digital reverb/processor featuring the *Added Density* program. The system offers 20 different factory set reverb and five special effects programs. All reverb and room simulation programs can be user modified and stored in any of the 50 user memories. Newly developed gated reverb sounds and several updated factory presets will be available for evaluation. New software also features user protected memory and assignable remote fader possibility. The newly formed Klark Acoustic division will introduce the *System 2.1* close source active music monitor. Products will be demonstrated in the Stones Mobile nearby.

L

● **Lennard Developments:** On show for the first time will be Woelke timecode stereo heads. Other items will include Woelke wow and flutter meters, and professional tape heads and the Asona cassette labeller. ● **Lindos Electronics:** Launch of two new microprocessor audio instruments which together supersede the *LA1* audio analyser: *LA101* oscillator and *LA102* audio measuring set.

The DN 780 digital reverb/processor from Klark-Teknik

Eventide's Harmonizer H969

M

● **Magnetic Tapes:** No information received. ● **Marquee Electronics:** Selection of products from Adams Smith, Eventide, Gold-line, JBL, Drawmer, Rauch and Brooke Siren Systems. First timers will be from Eventide, *H969 Pro-Pitch Harmonizer* and latest reverb and effects software for the *SP2016* signal processor; from JBL *SLT-1* mini speakers. ● **Michael Stevens & Partners:** Featuring Chilton mixers, Rogers monitors, Turner power amps, Technics turntables and new AEL NAB cart machine. Also information on design service. ● **Midas:** Audio consoles for theatre and live applications. ● **Minim Electronics:** Introducing the Presenters Clock enabling presenters on air to read the time easily along with prompter messages. Also showing digital timeswitches, television sound tuners and Ambisonics decoders. ● **Modutec:** Range of VU meters in a choice of up to 45 case styles. ● **Mosses & Mitchell:** Audio and video jackfields. ● **MusicLab:** Range of Rane audio processors, ADA signal processors, Galaxy Audio *Hot Spot* monitors and Annis demagnetisers, all shown for the first time. Other products will include QSC power amplifiers, *Stak Rak* range, Klotz cables and Drawmer, Teac and Soundcraft selection. ● **Musimex:** Three new products from TC Electronics: a dual in-line stereo chorus flanger which will produce a stereo output from a mono or stereo input; a dynamic digital delay, 20 Hz to 20 kHz bandwidth on all delay settings, 100 dB dynamic range, 100 programmable memories, five programmable effects loops and automatic stereo panner; finally, the modular broadcast mixer *6200* already installed in many of Denmark's new local radio stations. From Profel, the *Supershield* range of instrument and patch cables.

N

● **Neal:** Recording and replay cassettes —full product range with new modifications, extensions, improvements and options. ● **Neve:** APRS first time exhibit will be the *Necam 96* audio automation system for mixdown and post-production. The working display includes Last and Next Label in addition to complete status information, whilst lists of mixes, labels, mutes, stores and events are available at the touch of a button. Text pages provide for track lists, title lists, special memoranda, etc. Capable of up to 999 snap-shot static stores of faders and mutes, auto/manual crossfading, real-time *Necam* fader and mute grouping and up to 128 separate event switches. *Necam 96* will be shown incorporated into the *8128* recording and post-production console. Also on show will be *5116* multichannel mixing console, *51* series broadcast console and *542* range of TV audio editing consoles.

O

● **Otari:** *MX 70* 1 in 8- or 16-track recorder, *MTR 20* ¼ or ½ in mastering recorder, *BTR 5* ¼ in compact broadcast recorder, *MTR 12* series II ¼ or ½ in mastering recorder. Also *MTR 90* II multitrack, *MX 5050* series recorders and *DP 4050* series cassette duplicators.

P

● **Pangbourne Musical Distributors:** Full products range including Ampex professional audio tapes, editing sundries and accessories. Data Products disks and cassettes, Brady splicing and sensing

Here's to the next 100 units sold around the world

Sony Pro-Audio has good reason to propose a toast. After all the PCM-3324 DASH recorder has outsold all its rivals by a considerable margin and is in use throughout Europe, North America, Australia and Japan.

Despite all the words about formats we believe that the PCM-3324 is the best Digital Audio Multi Track Recorder in the world.

We're biased, of course, but countless top artists and producers keep telling us the same story.

So, we raise our glasses to them "Good recording, great chart success and here's to the next one hundred."

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APRS PREVIEW

tapes, Music Box C0s and floppy disks. ● **Peavey:** Range of mixers, loudspeakers, microphones and rack mounting equipment for live and studio use. Also from Audio Media Research *DCR 421* demo cassette recorder, *MPA 200* monitor power amp, *EQ 31* graphic equaliser, *PRM* studio reference monitors, compact demo mixers and *ERO-10* omnidirectional condenser and *ERC-12* cardioid electret condenser microphones. ● **Penny & Giles:** New motorised fader enabling console manufacturers to incorporate moving fader automated re-mix at a reasonable cost and without degradation of the operating feel of the faders. ● **Philip Drake Electronics:** New *6000* series of microprocessor controlled intercom systems, plus full range including *7000* series, audio jackfields and samples of talkback/intercom equipment. ● **Playback Studio:** As tape distributors this company will exhibit complete ranges of TDK and Maxell audio and video tape, with samples from Ampex, Sony and BASF. Emphasis will be placed on tape for digital. ● **Professional Recording Equipment Company:** Range of products including equipment from Capitol Magnetics, Enertec Schlumberger, Garner Industries, Leevers-Rich, Pacific Recorders, Perfectone and Sound Technology.

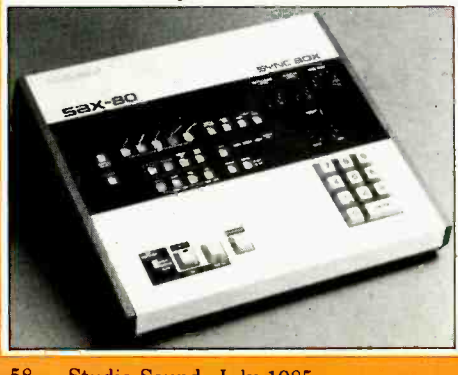
Q

● **Quad Electroacoustics:** The new *500* series of professional power amplifiers—*510* single-channel with isolated input and output providing 135 W into impedances between 2 and 75 Ω and the *520* twin-channel delivering 100 W into 8 Ω. Also on display will be the studio version of the *ESL-63* which is being used for classical music monitoring in a number of European studios. ● **Quested Monitoring:** Various monitoring systems will be shown including *Q215*, using two 15 in bass drivers, *Q212* (two 12 in), *Q115* (one 15 in) and *Q209* (two 9 in). Also rack with recommended amps, crossover, graphic equaliser and analyser.

R

● **Rebis Audio:** Full range of *RA200* series processors and effects with latest expanders, compressor/limiters and frequency conscious gates. There will be several new modules including automatic fader and a DDL. ● **Recording Studio Design:** New 16/12 monitor desk along with full range of mixers, power amplifiers and the *4/2* 4-track recorder. ● **Roland:** New products will include *SRV2000* digital reverb 24-memory MIDI controllable, 64-memory MIDI controllable *SDE2500* digital delay line, *SBX80* synchroniser which will sync any clock-based equipment, generating and reading SMPTE. Also range of Micro effects for home recording.

Roland SBX-80 sync box



S

● **Scenic Sounds Equipment:** Full range of equipment from Amek, btx, Orban and Publison. There will be demonstrations of the new dbx *166* compressor/limiter, the Lexicon *PCM60* digital reverb and the new software for the Lexicon *224XL* and *200*. ● **Sellmark Electronic Services:** Products on display will include the full range of rotary potentiometers and faders, pushbutton switches, jack and microphone sockets and a new addition—a range of 100 mm faders for professional uses. ● **Shuttlesound:** Introducing constant directivity horns and compression drivers from Electro-Voice along with rest of the range. Also showing new products from a number of manufacturers. ● **Sifam:** Range of PPMs and other audio metering products, electrical metering products and range of control knobs. ● **Solid State Logic:** Range of audio mixing systems, studio computer systems and machine control systems for music recording, audio for video post production, film scoring and broadcasting. *SL4000E* series master studio system, *SL6000E* series stereo video system, studio computer interfaces with all SSL consoles, optional sub-systems include *Total Recall, Events Controller, Real-Time* system, *Integral Synchroniser, Master Transport Selector* and programmable equaliser. ● **Sonifex:** Micro *HS* and new version of *CQ* series NAB cart machines. ● **Sony Broadcast:** Showing for the first time in the UK will be *APR-5000* series of mono and 2-track tape machines; *PCM-1630* digital processor, successor to *PCM-1610*; *DMR-4000* digital audio U-matic recorder with dedicated read after write facility, confidence replay head for disc mastering; *A-1115* multitrack bargraph remote meter display for *PCM-3324*; a new broadcast console; new lavalier mic series *ECM-66/77*; and *DTA-2000* digital tape analyser. Also on show will be *CDP/CDS-3000* compact disc player system, tape recorders, mixing consoles and digital equipment. ● **Soundcraft Electronics:** Will be featuring most of a rapidly expanding and diversifying range. The featured console will be the *TS24* with *MasterMix* automation. Other items on display will be the series *2400, 1600, 400B, 500, 600, 4* and *200* consoles; the *SCM 762* multitracks and the series

ELX-1 mic/line mixer from Electro-Voice

NOW AN INCREDIBLE EXPERIENCE IN SOUND CREATION...

THE MG1212 RECORDER/MIXER

If you're looking for a complete recording system – combining multitrack recorder and mixer into one – then look no further. You've found it in the AKAI MG1212.

Imagine a unique ½" cassette tape – the first of its kind – offering no less than 12 audio tracks (with dbx noise reduction) plus special sync and internal control tracks, with the ease and simplicity of a home video recorder. A sophisticated on-board autolocator with pinpoint accuracy. And much more. it's already exciting.

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But now imagine both these units – ½" 12-track recorder and mixer – together in the same machine. The result is a unique, compact, integrated package that no-one else can match. Its all-in-one concept eliminates tiresome multitrack wiring looms and brings you flexibility, versatility, ease of use and sensational sounds.

It's that special combination of versatility and ease of use that gives the MG1212, and the whole AKAI Micro Studio System, the edge. If you're looking for a new creative experience, AKAI's got your sound.

For stockists see facing page.

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A new world of sound creation

APRS PREVIEW

20 2-track; the *CD201* high speed cassette duplication systems and the full range of power amplifiers. ● **Sound Engineer:** Recording magazine. ● **Soundtracs:** Second European launch of the *M* series and debut for *M-R* series (16-track monitor version) PA and 8/16-track consoles. Brand new *T* series for 4- or 8-track home recording. The rest of the Soundtracs range will be present: *CM4400* (with SMPTE/EBU clock linking to 24-track tape machine), *M* series, *16/8/16* and *24/8/16*. *S*, *Omni* and *Monitor* series. ● **Space Logic:** First time exhibits for UK include Quark MIDI Link *999* and *448* MIDI switching units plus samples from Computer-Aided-Panel Artwork system. Selection of products designed for other clients, eg Seck mixers. ● **Studio Equipment Distribution:** Distribution company for Bel, Soundtracs, Standeasy and Applied Microsystems with full ranges shown and new product launches. The Bel *BD320* 32 s digital delay processor/sampler with CV interface and loop edit; Bel Mk IV *BF20* stereo flanger relaunch, full range of Soundtracs consoles and selection of Standeasy stands and screens. ● **Studio Innovations:** Technical details, photographs and drawings outlining the design and construction service plus displays of recent projects of unusual design and incorporating *qc* type rooms and the *QC* monitor speaker system. ● **Surrey Electronics:** Full range of products including stabiliser and frequency shifters, PPMs, stereo disc amplifier, moving coil preamp, broadcast monitor receiver and peak deviation meter and chart recorders. First time products are a 10-outlet distribution amplifier *4*, advanced active aerial and stereo disc amplifier *5*. ● **Swisstone:** Range of Rogers loudspeakers including *LS5/9* 2-way speaker with passive crossover and equaliser made under licence from the BBC for use where space is limited or where portability is important, *RM1* wedge monitor and *RM2* general purpose monitor. ● **Syco:** Featured new items will include the Fairlight *CMI series III* system, the Fairlight *CVI* (Computer Video Instrument), the Linn *9000*, the Friend Chip *SRC* with update software and hardware, and the Sycologic *PSP*. *M14*, *MX-1* and *AM1*. Also on display will be the complete range of digital synthesisers and signal processing devices including the Kurzweil *250*, E-mu Systems *EII*, Quantec *QRS* and *QRSL*, Yamaha *REV-1*, and Friend Chip *SRC* and *SRC²*.

T

● **TAM:** New cutting system for analogue records comprising new design of Phonotech cutting head with re-designed TAM electronics. Facilities include half-speed cutting, feed-forward high frequency head protection, add-on kit for preview tape machines running at ½-speed to correct EQ and improved head safety circuits. ● **Tandberg:** *TD 20 AL* 4-channel transmission logger, *TCD 910* professional cassette deck and *TCD 911* playback version, plus tape recorders, tuners and amplifiers. ● **Tannoy:** Selected models from the range of dual concentric monitors along with the *Wildcats* PA speaker system and *SR840* professional power amp. ● **Technical Projects:** Range of audio and acoustic measuring systems, cable and radio communications and live application mixers. Featuring *MJS401D* audio test set. Other exhibits will include HME wireless mics and three ranges of mixer for live and film/TV post-production. ● **TRAD:** A rest lounge with literature, etc, plus a free gift and cup of coffee for every visitor! ● **Trident:** *Series 75*, 24-track version of *Series 65* with 24 group outputs, EQ on monitors and integral patchbay. The *Series 65* will have new styling features. Also showing *Series 80B* and *t.i.l.* in-line console. ● **Tweed Audio:** Custom design for recording and broadcast as well as remotely controlled equipment for computer interfacing for automatic functions. Exhibiting a recent example of custom designed equipment with a standard portable mixer. ● **Turnkey:** Two main areas: Turnkey Direct products including Symetrix, Aphex, Ashly, ART and Studio Technology; and a keyboard exhibit with the Synclavier, Oberheim and PPG instruments. The Turnkey audio shop will be represented, and they plan to incorporate a complete studio system with Otari multitrack and Soundcraft console. The recently acquired Westec should be represented, if only with modules.

U

● **Uher:** New portable cassette recorder *CR1601* fully remote controllable, 3-speed 1⅞, 15/16 and 15/32 in/s. Following on from *4000* recorder, new fully remote controllable version designated Universal *6000* 4-speed 3¾ down. There will be new Visoniks with improved stereo image plus a UK manufactured (as opposed to German) 150 W power amp and 150 W integrated amp.

W

● **Wellard Research:** Launch of the *Middle Monitor*—a self-contained 2-way active loudspeaker which accepts line-

Above left: Sony's DMR 2000 digital master recorder. Above right: Trident series 75 mixing console. Left: Soundtracs M series console.

level input signals and is capable of reproducing programme at over 100 dB SPL in average sized control rooms.

Y

• **Yamaha-Kemble:** Introducing a whole range of effects, amps, monitors, etc, along with demonstrations of the already established ranges. The new products are *REV-7* digital reverb, *GC2020* comp/lim, *Q2031* dual 31-band graphic equaliser, and *GQ1031* 31-band graphic, *MT44D* 4-track cassette system, *RM602* 6/2 mixer *P Series* power amps, *MC 24/1608* monitor mixers, S20/S10X compact speakers and *S250B* woofer for *S250X*.

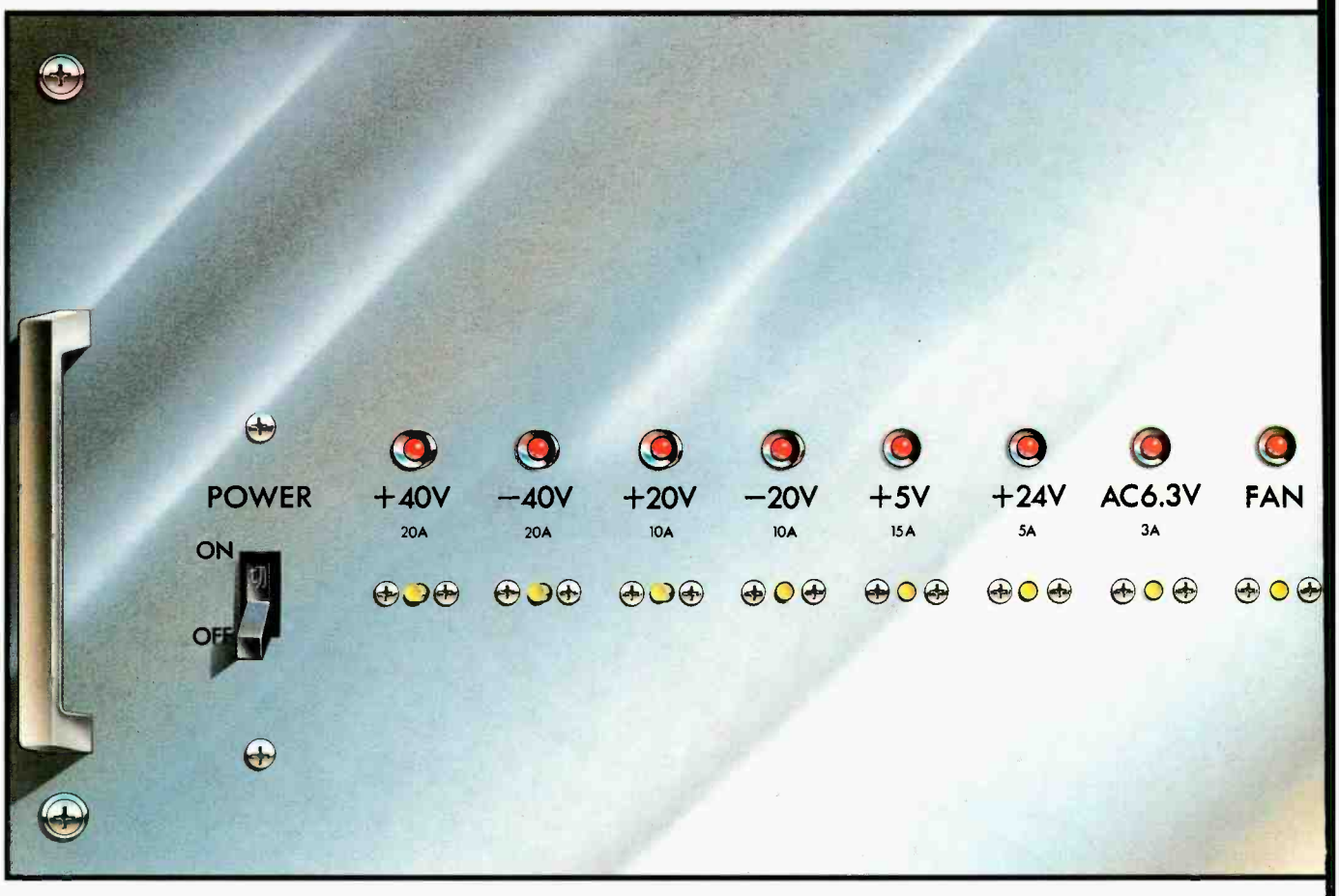
Z

• **Zonal:** Exhibiting the full Zonal range of professional recording media including 16 and 35 mm, ¼ in and multitrack tape, and Magna brand cassette products. Featured will be the *900* series 16 and 35 mm film which is available on both 75 and 125 micron polyester base with claimed good mechanical wear characteristic making it suitable for high speed operation.

●

As in previous years, **Don Larking Audio Sales** will be organising the Over The Road Show this time at the Tara Hotel, Scarsdale Place, Kensington, on the same days as the APRS with opening times of 2 till 8 pm on the 12th, 11 am till 8 pm on the 13th, and 10 am till 8 pm on the 14th. Among the equipment on demonstration will be products from Aphex, Applied Microsystems, Bel, Fostex, Lexicon, MXR, Quad, Rauch, Rebis, Mordaunt Short, Studer/Revox, Tannoy, TC Electronics, Trident, Teac/Tascam, Westlake and Yamaha. There will also be a number of other exhibitors.

Back at the APRS **Studio Sound** will be on stand No 108 from which we will be distributing free copies of the magazine and sister publication *Broadcast Systems Engineering*. Editorial and advertising staff will be around the exhibition and can be contacted through the stand.□



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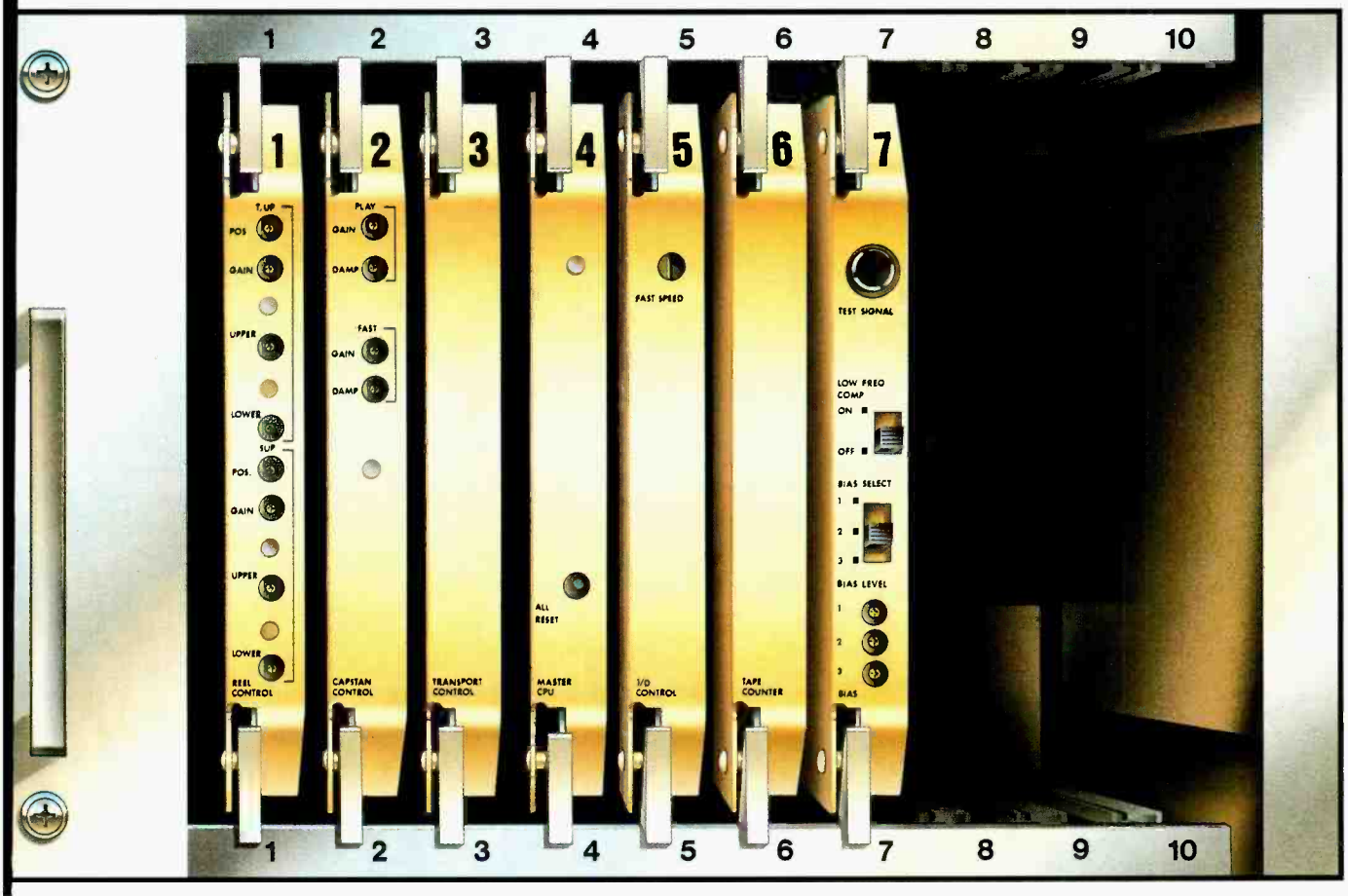

You're holding a picture of the MTR90's most remarkable feature.

A hole.

To be precise, the hole is located in circuit board slots 8, 9 and 10 on the Otari MTR90 Mk.2's transport and CPU cardframe.

That's the part of the MTR90 that does all the thinking.

On a mere seven cards is contained all the information the MTR90 Mk.2 user needs to create perfect master recordings, with microprocessor control to achieve ultra-fast, split second accuracy and total ease of operation.

But it says a great deal for Otari's vision that despite everything that seven cards can do, they've left space for ten.

What could the other three slots contain? An integral synchroniser? Something even more advanced?

The answer is that those slots will control the features that Otari users will be demanding from their MTR90s in 1986. Or 1987. Or 1990.

Those spare three cardframe slots may be empty now. But to Otari users, they're the future of multitrack.

Because the most important thing about that hole is the fact that Otari are looking into it.

OTARI®

For more information on the MTR90 Mk. 2 Series or other Otari products, contact Turnkey Studio Systems, Brent View Road, London NW9 7EL. Telephone: 01-202 4366
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Telephone: 01-748 9009

MIXING THE MEDIA

We gathered representatives from different corners of the media in London to discuss their common interests. Richard Lamont reports

There is a new buzz-word: convergence. It means, among other things, the trend for creative material produced for one medium to find its way into others. An obvious example is the promotional pop video, using music originally recorded for a single or LP. Does this trend make the recording engineer's job more difficult, or even different? To find out, we invited four engineers to converge at Air Studios in London one afternoon in April. Between them they represent records, radio, television and film, and related media such as cassette, compact disc, video cassette and video disc.

Introducing the four in no particular order: Ted de Bono is a balancer with BBC radio, and specialises in rock and pop for Radio One, the BBC's national pop/rock network. At the time of the discussion, his main work was with *Saturday Live*, a Saturday afternoon magazine programme featuring a live band. He also does a lot of soul music location work for BBC Radio London. Ted also does multitrack recording work at the BBC radio's main music studio centre, Maida Vale, for programmes such as the John Peel show, a late night rock programme renowned for its ability to spot new talent and trends.

David Woolley is with Trilion video, a London facilities company. He's concerned mainly with outside broadcasts, usually fairly large multi-camera productions, including live concerts from places like the Hammersmith Odeon. He is a graduate of the Surrey University Tonmeister course, and his first full-time job was at Air Studios. When he moved to Trilion he built the 46-track post-production studio, where he now spends most of his working time.

Next on the list is Nigel Walker, who is the chief balance engineer at Air Studios, and has been there for about 10 years. He has also done some live sound mixing. Sometimes he finds his work takes him and his multitrack tapes to places like Trilion to be mixed for video. Sometimes he finds himself at Maida Vale, when a band he knows well is doing, say, a John Peel session. Small world, this.

Finally, Mark Yonge spent over six years in the sound crew at Granada Television in Manchester, England, working on boom operating, live drama, live music and some recorded music. He then joined Dolby Laboratories, working on the Dolby Stereo film programme for three years. He is now the television projects manager at Dolby in London, and has been concerned specifically with television projects for four years: master generation, 'audio hygiene' for the broadcast chain, video disc mastering, video cassette mastering, and currently stereo TV programme production.

To start off, I asked, had any of them experienced problems when a tape produced for one medium found its way into another?

DW: What I think has happened over the last couple of years is that people are no longer prepared to specify any one medium that they want their programme to be suitable for. People want their programme to sound equally good whether it's on television, stereo VHS, compact disc or whatever. Whereas a few years ago we would hear people say, 'we want a mix and we are only ever going to play it on television', these days people are more open to trying to sell their product in many simultaneous areas. What that has tended to do, I think, is raise the overall level of mixes to the highest standard. Places which enjoyed a rather lower reputation for sound quality, notably television, have had far fewer corners to hide in.

TdB: Where does the pressure come from then? Does it come from production staff, or is it something that is feeding through from the end user, ie whoever is listening to or watching the programme?

DW: It comes from those two places, and I think it also comes from the studios, who find the quality of their work a selling point for their studio in general, which has happened with many studios buying new consoles. More studios have probably been buying new consoles than in any comparable period earlier.

TdB: Is it the console that produces the sound then?

DW: That, I think, is a tangible area where the studio's quality can be seen to be measured. Whether or not that is a real measure remains to be seen. But it is a tangible advertisement of quality.

TdB: So if you've sunk £120,000 in a console you obviously mean business?

DW: Yes, that's right. The pressure to improve quality generally comes from within the industry rather than from the end consumers.

TdB: One of my main bugbears about quality is not so much to do with my experience as a professional but more my experience as a consumer, that is, buying the black vinyl. As a schoolkid I used to ring up EMI and complain about pressings and return them. Correct me if I'm wrong but my experience says it has never really changed. They really don't care too much about quality. I think that's evidenced by the way that compact disc is being marketed, or not, as the case may be. The attitude towards compact disc, in general, in record companies, doesn't seem to be extremely positive. I would have expected a little more zap pow thwack! It comes more from artists, I think. A lot of artists are quite keen on having their material definitive and sounding great and 'available' to the public. But I'm not sure about record companies.

NW: There's a slight dishonesty in a way. Record companies sometimes give artists the feeling that they do have total control over their own stuff. If it's cut and it doesn't sound very good we do a re-cut. If we do a pressing and it's slightly dull then we press it again. All of these things make people feel very confident when they're mixing and getting to the end of a project. And then, once the tape is finished, suddenly there is a panic. The release date has been moved forward, or they need more time than they thought at the factory to prepare it, or you listen to a cut and it doesn't really resemble your finished mix. It's either dull or slightly distorted on some of the vocals. Then, suddenly, you are put in a position where you have to accept it. Otherwise the release date is going to get put back and everyone is going to get upset. That is really frustrating. You can spend weeks and weeks deciding how much treble you should have on a voice, or how bright a single instrument could be. Artists and engineers and producers are like this. They spend so much time getting everything so precise, and something can be 10% out when it comes out in the shops. There's no point in listening to a record if every time the guy sings it goes 'pttthht'. It's a complete waste of time. That is usually blamed on bad recording or something like that. Most record companies have to get it out as soon as they can, in order to get some money back from it. Some of them are worse than others, they really don't care too much.

DW: One of the things that I've learned since I've moved away from working in records, and been working with music for picture, is the disadvantage that we audio people have in being able to quantify and specify what we think is wrong with a cut or a copy. The video

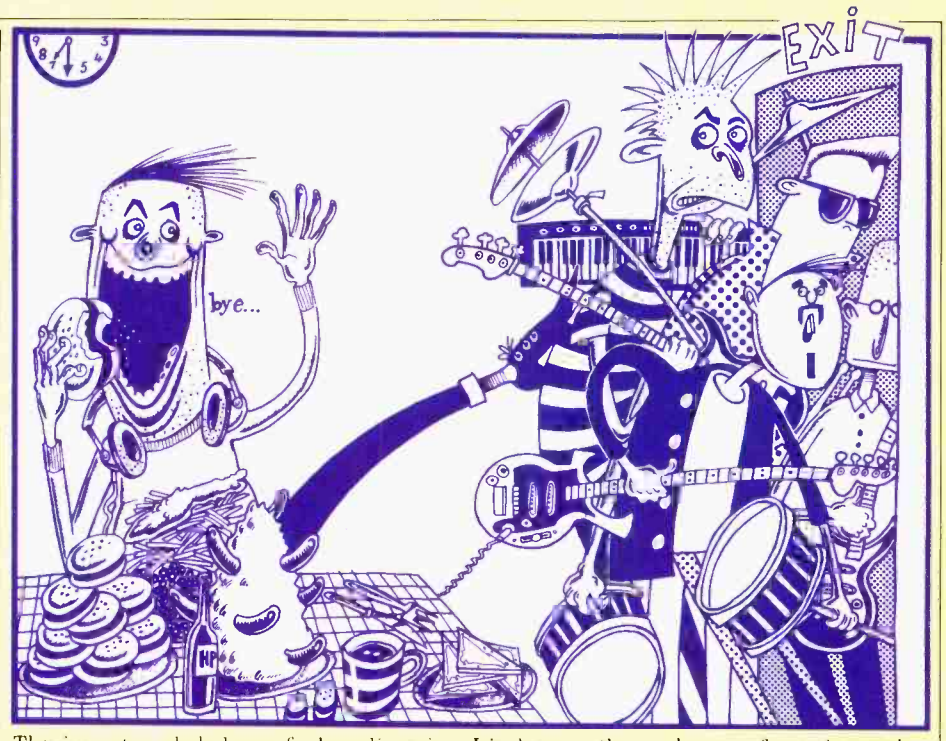
engineers, who have 'scopes and things, can point at something on a screen and say, 'that red is breaking up', or 'that chroma level is too low'. They are able, very precisely, to point the finger at somebody who has made a dub of one of their tapes. It isn't really possible, with black vinyl, to take the black vinyl back to somebody and say 'this is wrong because . . .'

MY: Surely, if you think this is incompetence on the part of the mechanical processes after the master tape, to what extent is it due to the fact that various areas of production are not aware of what other areas can do or should be doing? For instance, how many mixing engineers nowadays understand what you can get on to a vinyl disc and what is unreasonable to expect of it?

DW: I'm sure that that is quite a large point. Now that we do have better media, it does come very hard to say to a balance engineer 'you can't flange your hi-hat and put it over on one side', because for one medium that you're mixing for it won't transfer very well. I think the vinyl technology should either catch up or go away.

TdB: I don't think there's very much wrong with the vinyl technology. I think that what's wrong is in the process. You do something in the studio, listen to it on cassette, on ¼ in copies, in the car and all the rest of it, and you refine your perception of what you've got down there to the nth degree. Then you go and cut it, and you listen again, and you think, 'what's going on here?'. It's a black art. If you've got a good cutting engineer who is given the time to produce the end product then you stand a very good chance of getting something that transfers pretty well. I've got lots of records, and now that I've got into CD and can do an A/B comparison between something that is notionally untouched and something that has gone through the black art of vinyl, in general there isn't an awful lot to argue about between the two media, given that you've got a reasonable turntable, a reasonable stylus and a good pressing, and you can track the signal. The advantages of CD are signal-to-noise, rumble and mainly, clicks: imperfections due to pressing.

NW: I find that when you finish mixing on a Friday night, and maybe you're starting a project the next Monday, there's really another three weeks work that you have to put into the project you've just mixed before it's finished. You have to go down and do the cut, and maybe a recut. Then you have to listen to the pressings; then you have to listen to the cassette. The record company should in theory send you their version of the cassette, which, hopefully, is picking up a little bit now people are beginning to care about them. They're generally awful things to listen to, analogue cassettes. Then there's the CD to look after. CDs, for instance—there's a guy called Ben Turner at Tape One—he does all of my digital editing for me. Seldom does an engineer actually go down and visit him for the CD transferring. You finish your project and the record company want to release it on a CD. You've got an edited digital tape which resembles your album, which has been to the cutting room and has had various things done to it. If the engineer doesn't go down there, and he doesn't lift the same tracks, and he doesn't put the same care in it, you're going to find that when you listen to the CD that it could be much too bright, much too dull. I can give you some good examples but I really don't think I should.



Simon Cooper

They've got a whole buzz of adrenalin going. It's down to the producer to focus that and not smash it down by saying 'well actually chaps, if we don't finish doing the basic track by 7.30 the canteen's going to be shut'

Ben Turner knows exactly what to do technically but he loves having somebody to say 'I think it should be like that'. He shouldn't be put in a position where he's messing about with somebody's six months' work, thinking, 'that sounds bright to me, should I do anything?

TdB: Is that a reflection on the degree of importance that record companies give to quality? Why is it that a guy has to solve situations like that?

NW: Everybody thinks CD is brilliant, fantastic, it resembles the original recording. Of course it does, but, the same way that engineers and producers take so much care over cuts and listen to them, and they do them again if there's a slight bit of distortion, people should put the same amount of care into CDs.

TdB: I have a sort of analogy to that, which is relevant. I find I spend a lot of time refining what I do, and in many ways I've got limited time in relation to what Nigel's doing in the studio, because in a broadcasting situation we're very often talking about doing eight numbers live in three and a half hours—on the Radio 2 side (BBC MOR network).

NW: Is that because something's going to be broadcast once as opposed to a record which might be listened to many times?

TdB: Yes, the concept of definitive recording hasn't really caught on in broadcasting in the BBC or in this country as yet. On the other hand, the more technology we have, the greater the pressure is to make it better. Now that we've got 40-channel SSLs and *A800*s, people walk in, they see all this stuff, and they say, right, if we've got all this we've got to use it. And it becomes progressively harder, within a time frame of 14 hours, say, in a studio, to do four numbers and come out with a definitive recording. Less still eight numbers in three and a half hours.

RL: How much difference does that make to the result, having hours whereas Nigel might have weeks to record the same tracks?

TdB: It makes a difference, from my viewpoint, towards the priorities that you have. I always try and do something on a performance basis. I try and capture a mood, a spirit or whatever. Having said that, I've got no control over who comes in. If someone says to me I'm working in a certain studio at a certain time, I've got to do it. You can't say, 'Oh no, I'm going to have a migraine if I work with that swine.'

NW: From a musician's point of view, someone who gets the chance to work for the John Peel show for instance, that's their first big break, their first chance to get on the radio. Maybe they won't have too much studio experience. They'll be aware that people spend months messing around with one stupid snare drum sound but because they're not in that position themselves, they will make the most of it and get really excited about the job.

TdB: Sure, they've got a whole buzz of adrenalin going. It's down to the producer to focus that and keep it going and not smash it down into the ground by saying, 'well, actually chaps, if we don't finish doing the basic track by 7.30 the canteen's going to be shut'.

NW: It's like the first album syndrome. For the first album, the record company will probably choose what studio the band work in, and choose what producer they work with. If the first album is successful then they can take five times as long with the second one and work with anyone they want to produce them. What goes out of the window is the art of performing. And that's when having three months and millions of pounds worth of technical stuff becomes more and more important.

MIXING THE MEDIA

TdB: Is it going to change? The classic example is the Frankie goes to Hollywood syndrome, where you have a studio band, a production-oriented piece of product. To me it's great, I think that what Trevor Horn has done is fantastic. He's got amazing space, amazing clarity, amazing impact, blah blah blah. But is it rock and roll? Is that what it's about?
NW: Well I like it.
MY: I like it.
RL: I like it, but there's a limit to how much of that you can take.
RL: A lot of music lost its edge in the early '70s, about the same time that multitrack machinery became widespread. Is that purely a coincidence, or did the change in technique get in the way of performance?
DW: I'm sure that it does. Because on the show that I'm working on at the moment (*ECT*, a heavy metal show on UK Channel 4), which is a live performance show, the bands and their managers come in, and the first question they ask me is, 'what gear do you have? How many *Harmonizers* have you got? Are you using gates?' These aren't synth bands, these are 4-piece hairy rock and roll, big heavy metal bands. What I find fascinating is how that feeling of being a technology-based industry has permeated as far as the heavy metal people, whose sound can hardly be helped much by a lot of technology.
TdB: I think it can be. I think it's a case of garbage in, garbage out quite honestly, with everything. It doesn't matter whether you've got £6m of gear or a wire recorder somewhere! If it's good it's good, if it's bad it's bad. How you can maximise the impact of it depends on the technology, and how well you can produce it, market it and sell it.
MY: If you listen to some late '60s John Mayall stuff, which is I suppose early heavy metal, some of that stuff is recorded quite poorly. If you compare it with modern stuff of a similar kind, you say, 'well that's recorded poorly but it's still great fun'.

DW: One of the great truths that goes with performance being more important than the faders is that a good mix will transmit itself over many different media, better than a mix which relies on large speakers in order to sound good, or a mix that relies on being on a TV speaker to sound good.
MY: Do we mean here a 'good mix' meaning a mix that understands the kind of medium it's going to get put on?
DW: No, I mean a good balance in the first place will travel well. Like a good wine.
RL: A good balance from an artistic point of view, or a good balance meaning that the guy who balanced it was bearing in mind the limitations of the various media that the thing was going to go through?
DW: I think that the best balance engineers don't really think about that too much. It just comes quite easily to them. There are those people who push the faders up and it sounds great. It sounds great on the Dansette at home, it sounds great in the car and it sounds great on the radio and everything.
NW: I don't really think that people, when they mix in the studio, actually think, 'well, this is going to get transferred to video'. In the end I think there's only one good balance. In the end you look for something: there's a balance, and a feeling from that balance that you want to hear, whether it's the guitar being incredibly loud, or a voice being loud or whatever. I don't think nowadays people worry too much about 'will it sound good on the radio? Will it sound good at home?' In the studio, now, we use big speakers, incredibly small speakers, medium speakers, home speakers. We might mix on four different sets of speakers. So when we're actually doing the mix we try and make it sound good on all of them. Obviously you're going to get less bass if you listen on a small speaker. You're aware of all those things, but you're not purposely trying to do it so that when it's on the radio it sounds good. It's all part of the job now anyway. Everything should only ever get done once. When it's right everyone in the room is aware of it and that's it. There's no big thing about doing a separate mix for the radio.
TdB: Then it's taken away to be cut, and then it comes back to you, then you go, 'heh, what's this?' In my case, when I listen to some of my stuff that's transmitted, I hear the effects of pre-emphasis limiters and what have you. It's the stuff around it that I notice, grossly.
MY: This is what I was driving at. We (Dolby) have a case in point, where we're mixing a Dolby Stereo movie, and the music is submitted. The music arranger likes it, it's recorded and here it is on two tracks. You put it up in a movie-style theatre with movie-style monitoring, with big speakers behind a screen quite a long way away and comparatively close together, and it sounds quite different. It will always sound quite different. And unless the music mixer is braced, he get's quite upset.
TdB: What about theatres? I don't go to the cinema very often, mainly because they cost such an awful lot and the sound is abysmal as a general rule. It seems to me that in theatres very few chains or individual managers are terribly interested in investigating what it is that's sitting behind that screen with an inch of dust on it, driven by a 50 W or 100 W amplifier.
RL: Do cinema sound systems sometimes get the blame when the real culprit is lousy dialogue recording?
TdB: I'm talking about music!
RL: Well, the single most common complaint about cinema sound is that you can't understand the words.
NW: There was a particular project that I took to David for post-production. We had the film people down there all the time that we were doing it. We found that they basically didn't care about the sound. It was a music documentary with a live performance, but the sound didn't really mean much to them. Everything that they said related to the pictures.
TdB: How do you find it with television? Do you get a lot of that 'mix to picture' syndrome in audio?
DW: Most of the time I'm left on my own. I have the director and producer present on no more than 30% of occasions, which I think is a bit of a mixed blessing. At times I'm quite glad that there aren't people there wondering why I'm taking more than 10 minutes to do something. At other times it's nice to have a reference who says, 'heh, forget that, we're wasting time'. At other times I feel I'm putting a great deal of effort into the programme and there's never any thought of giving you a position as audio producer or anything like that. It's just 'someone in sound' they want, to ▷

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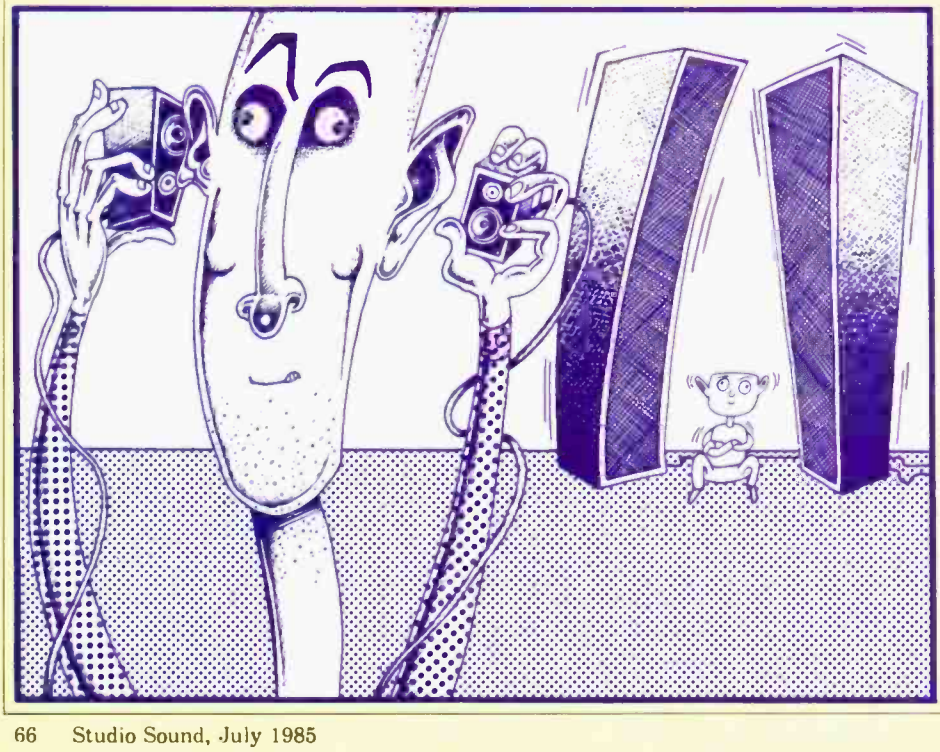

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sort it out. But most of the time I'm pleased that they're not there because it gives me the chance to input the ideas that I have, in trying to make sound for picture a bit more interesting than it was.

MY: It's most unusual to mix film music to fit the picture, in a detailed panning, image-location sense, which I think is what you're driving at.

TdB: I was thinking more along the lines of television experience where there's always this get-out, on the basis of working with my colleagues in television in one way or another. They will justify the sort of mix you get on TV sound on the basis of it must relate in some mysterious way to what is being framed up on the screen, like vocals being 8 dB up on what you think they should be if you shut your eyes and don't look at the picture. That's justified because you've got a close shot of the singer, and it's progressively pulled down when it moves to a long shot.

DW: I think it works backwards from that. The camera script for those kind of things does have all the lyrics printed on it, it has all the breaks printed on it. So when the director is calling the shots at the shoot, most of the time in close-up, the instrument in close-up is there because it's important for that part of the music. So I feel that if the triangle is an important part of the music, when there is a close shot of this one person at the side of the stage, then the triangle should be quite audible within the mix.

TdB: It should always be audible, but the level is dependent upon a sound consideration rather than a picture one.

DW: If the triangle isn't important to the music at that point why is it in shot?

TdB: Why have we cut to the bass guitar for the piano solo? I've seen a few of those.

MY: Mixing the sound so that it emphasises what the pictures are telling you is something that was a conception, certainly, when we started mixing stereo films. People felt that 'we're seeing it, why can't we hear it? Hit that triangle!' That was fairly early on, together with a whole load of other ideas that seemed rational but just didn't work aurally. Like panning dialogue on two-shots.

TdB: I'm curious, certainly. Looking at television, both ITV and BBC, that isn't happening. It seems to me that that old idea is still fairly prevalent in a large number of areas.

MY: There are a large number of sound balancers in TV stations up and down the country who are still going through that learning process.

DW: There is no real reason why the information on the sound tracks should mimic what's going on in the video channel. Here you have two channels; why are you trying to tell the same story in both?

MY: If they don't fit exactly then you get confusion. You suddenly break the thread of concentration.

NW: I find that when film people edit things out of sync it's incredibly annoying.

DW: Likewise.

TdB: Yes.

MY: Absolutely.

DW: Coming back to Mark's comment that things are always going to sound different in cinemas, there was a very

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interesting programme on television about colour constancy in vision. Where there was a non-white ambient light, your eyes compensated to make the light seem white. I'm convinced that the same thing happens when listening to different types of speakers. When speakers have a disproportionate amount of bass in them your ears gradually put in some bass roll-off, so that after a period of time you start to hear that pair of speakers as normal.

MY: Yes. The thing in cinemas is rather different to that. If you mix in a small room you come up with one set of evaluations as to the stereo distribution and the depth of the image that you are creating. If you then take that recording and play it in a barn the size of an aircraft hangar, with speakers fairly close together, a lot of natural reverberation, those assumptions will almost invariably turn out to be invalid.

TdB: So what do we do as far as film is concerned? Do we look at the theatres?

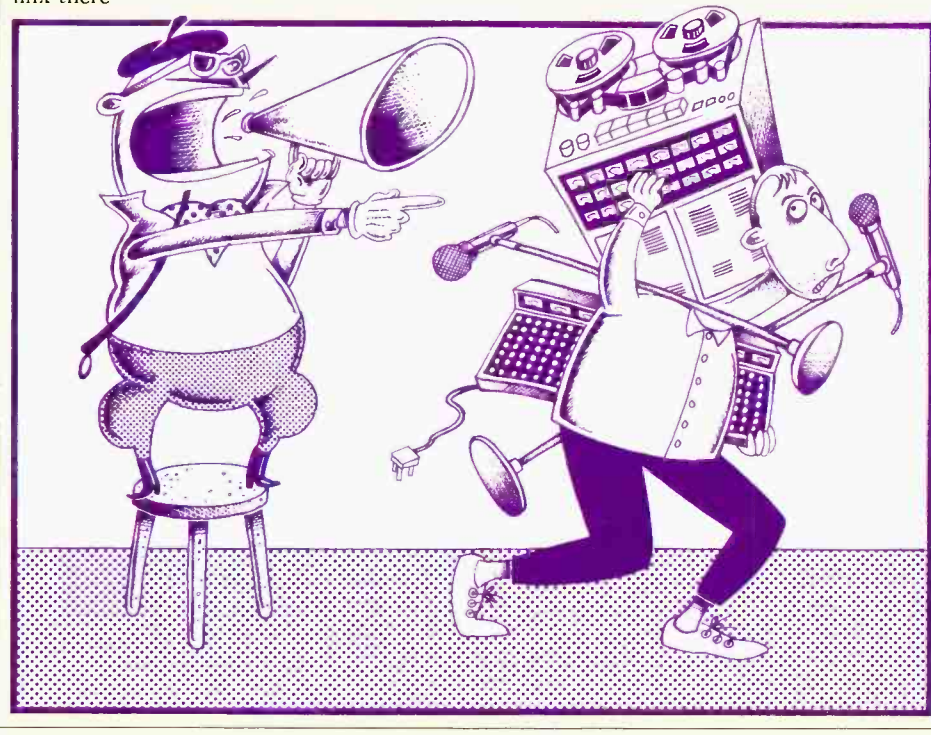
MY: You can't make them small enough. Even a small theatre has 200 seats, and a small theatre doesn't get enough people on seats to pay for any improvements. We look at the film dubbing areas. In a lot of cases music for film will be recorded in a studio which is aware of those limitations. You have a thing in the back of your mind which says, 'if we're putting in EQ at 18 kHz then we're probably not going to hear it, because it's going to be heard through 60 ft of damp air', which is a big limitation at high frequencies. You're aware that it's probably going to be narrower in terms of stereo width, so you mix it wider. You don't put on so much reverberation because the reverberation is supplied by the hall. Or, as is increasingly happening, you take a 24-track into the film studio and do a final mix there.

NW: There's a certain Paul McCartney film, where it was suggested that that was the right way to do it, and apparently there was some problem trying to get a 24-track in there and there was no way of plugging it in. So it ended up on three or four mags. Then it got dubbed down. So you could balance vocals and so on.

MY: Yes, you end up with a bunch of pre-mixes to give the mixing engineer sufficient flexibility to make it fit the new environment. That's very, very important. You don't cast your mould in concrete; 'these are the two tracks', because those two tracks will be useful on vinyl, providing you don't upset the cutting engineer, they'll be useful on CD, providing you don't crash the headroom, depending on the pre-emphasis that you're using, and they'll be useful on cassette. It might work on film but it's by no means guaranteed. It might work on TV although you could have a dynamic range problem.

NW: There's still more of a gap between recording in the studio and film people. Trying to put film people together with recording studio people seems much more difficult than it is with, maybe, people who work in video. Maybe that's moved in the last five years as well. Maybe with places like Trilion, and the fact that David used to do the same job as me before he moved over there, it's easier to do that now. In television, people really respect sound. But with film, the few attempts that I've made have been very difficult. To get film people to even understand some of the problems we're having—you say, 'this won't sound right', and they reply, 'so what? It's a film, after all, not a record'. They haven't the same feeling about it.

. . .as is increasingly happening, you take a 24-track into the film studio and do a final mix there



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RL: The sound is something they worry about when the budget has run out?
MY: Ten years ago that was very much the case.
NW: But there are places where they tread on it in the cutting room. And how long have I spent mixing it? That's my life on the floor!
MY: There are some good guys now, but you have to find them.
NW: Yes, I'm talking in general. There are two things that I've done. One was incredibly good, one was incredibly smelly. Obviously it's possible, but there's a mental block. Film people just won't accept that our sound is very important. Because it's us putting our sound on to their film. We feel about it the same way that they feel about the film.
RL: Presumably the problem here is directors rather than film sound people?
NW: Maybe. Maybe because the director spends all his time looking through a lens instead of listening to the sound. I've never been on a film set but I guess that the sound guy looks after the sound and the director only hears it when they're dubbing.
MY: I hate to point the finger, but there is a very old school that feels that film sound is film sound as it was originally conceived in Don Juan in 1928. It was a commentary, describing what was happening in the pictures. There was a man saying, 'Ah, here comes Romeo now'!

At that time it was seen as something you added to pictures, to expand what the pictures were telling you. The pictures were considered to be self-sufficient, but 'just for fun, here's some sound as well'. The whole business of cutting film and dubbing film was based around that. And it hasn't changed at all, the business of putting sound to film.
TdB: The mechanics of it, or the philosophy of how you make a film?
MY: I'm agreeing with you to a certain extent. There's still a feeling that sound is something you put on to film after you've worked the pictures out. Now, in a lot of cases, it's being handled in a very subtle way. They're using the industry and the tools that are there to do, in most cases, a very subtle, effective job. If they do a lazy job—the default mode is just to do a rat shit job—just throw some sound at the pictures. So in the worst case you'll end up with sound tacked on to pictures. It's much harder to do that in television.
TdB: I was just going to say that, because of the way it started, ie live TV, you had to do everything in real time. It implicitly went against the film mode of working.
NW: We're talking about music really. Standing 300 yds away with a rifle mic, I wouldn't have a clue. I'm not criticising those people at all. It's the quality of the music. We did this project where I really didn't want to have to mix it on to mag, I didn't want it to get chucked around the floor. I wanted it to be mixed onto digital tape or some sort of video. There was this big hoo-ha because they said, 'oh, just put it on 16 mm and we'll do the rest'.
MY: I spent my lunch hour rummaging through our vaults seeing how many different kinds of things I could find to record sound on. I couldn't find any

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16 mm mag because it's actually rather nasty. But we use a lot of 35 mm mag, which is quite good. It (Agfa 35 mm mag stock on polyester) is at least as good as ¼ in Ampex *406*.
DW: How many tracks would you get on to that?
MY: Three to six. With a very similar performance to stereo on ¼ in. There's nothing wrong with magfilm providing it's handled sensibly. I agree that 16 mm is horrible. It's very stiff, runs at 7.2 in/s, it's very 'dropouty'. But that's a personal opinion.
DW: But there is a different style of working in film and television that makes the job very much easier when you're handling a lot of play-in material. When you're handling 300 Nagra tapes, or loads of tapes with sound effects, it makes far more sense to do all the pre-dubs and try and condense from your rushes down to your used takes, and then do pre-mixes. It does significantly ease the task to use seven generations to get from your microphone to your final film. What can be improved is to use better copying at each stage, which is starting to happen in television. At Trilion, where we probably do three, four or five generations between microphones and the finished reel, each generation is probably done on PCM *F1*. So I'm quite happy to try and make my job easier by doing the copying.
NW: What I'm saying is that if I'm mixing 48-track down to some sort of digital to be transferred on to 16 mm, what's the point? And then that 16 mm gets transferred to another 16 mm: it's stupid, really annoying.
MY: What was going to be the release format of this film?
NW: Video. They wanted it shot on film for the quality of it, so the problem was they wanted to transfer their film on to video at the latest possible stage, and transfer my sound on to video. That was a big project with a lot of money in it.
DW: I think you could have done their 16 mm transfer as a scratch track. You could have relayed your master audio on to the video.
NW: I understand that, but they wanted to cut the 16 mm master once the sound track was there. They didn't want to have to re-edit the music or re-edit the picture once it was on video.
DW: There are quite a lot of studios who are starting to do sound post-production for pictures, and most of that is done to video. That is relatively easy to start doing from a hardware point of view—you only need a synchroniser and a video machine. Where most studios stop short, I think, is in the conforming of many different pieces into a final soundtrack master. Coming back to Nigel's comment about compact disc mastering, having to go through level changes and so on, now that you have a lot of readily available, easily useable PCM gear it is much more possible that the master tape is not necessarily a particular piece of stock. The master tape is now a master piece of programme, which you can dub, and tweak in the process.
TdB: You're not losing anything by doing that. Particularly if you can do it totally in the digital domain.
RL: Commercially, with the pressure of your time and release dates and so on, you won't be able to leave something for three weeks, then listen to it and notice there's something slightly wrong with it.
TdB: That's so, even with radio—there it is, mixed. You never see it again.
NW: In as much as digital mixing and compact disc is very popular, some people who I work with, who aren't necessarily old fashioned, don't like digital. They've got this thing about digital, where you still have to impress upon them the gains. They say, 'oh well, I tried digital once and it doesn't sound as good'.
TdB: There's a lot of things you can do with (analogue) tape which I don't see how you could do on digital multitrack. I've never used a multitrack digital as yet, but things like bending a snare for example, or burning a vocal in and just recording it with distortion, how are you going to do that?
MY: Build the software.
DW: Yes, if you can analyse the distortion then you can re-create it.
MY: And it takes most of the fun out of sound engineering.
TdB: You can't do it. People have difficulty just analysing a room and replicating it.
NW: It's a big question. Do we take it for granted that technology will allow itself to become more digital and less analogue as years go by? I see one side, where all these biffos somewhere are building all these wonderful digital machines, they're trying to get them in the studios, and 'everyone should record digitally and it's wonderful'. On the other side there are all these people saying, 'sod all that, I'm not interested, what a load of old crap'. I like editing the multitracks, and they're getting digital machines now that you can edit the multitracks on. But you can't join them back together again if you do a bad edit. It all seems so stupid.
TdB: I think a lot of it comes from the 'engineering' perspective. There are too many people in this world who are, if you like, hard core engineers, and not enough people who are users involved in deciding what it is that you need in order to do the job.
NW: Everything's built by biffos for biffos. Digital multitrack, OK, it sounds fantastic, but it's so expensive. How can a record company justify spending maybe two or three times the studio budget because you're recording on digital multitrack? It ends up on a bit of plastic, and you might have to release a cut that's a bit down because of the release date. What exactly do you gain? Recording on digital multitrack for six months, on a big project, it still ends up on the same piece of plastic and it still distorts. It's cost three times the amount of money: that money could have gone towards getting new bands in and making more records.
TdB: Never mind the bands, let's pay the engineers!□

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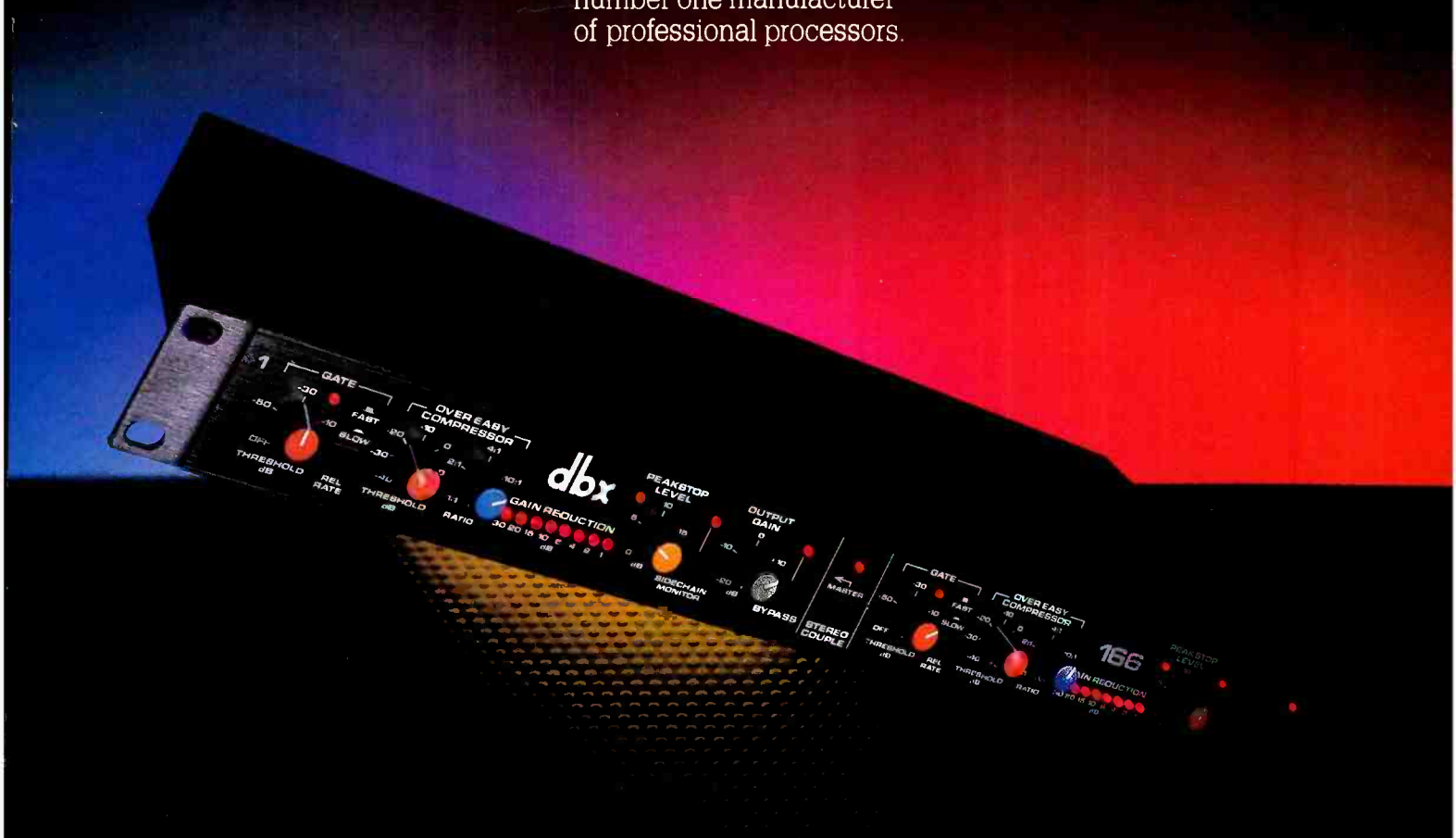

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DIGITAL WORLD RECORD

WW Communications is a small London based record company with a very specific planned output—in this case ethnic music from Africa and the Americas on CD only. Chris Warwick of WWC tells Tim Leigh Smith about the current projects and why they operate the way they do

The first release from WW Communications is a sampler type CD of many of the artists whose own releases will follow at a later date. Known as the *World Record*, it contains music recorded as digitally as possible, recordings made with Holophonic and *Soundfield* mic systems, in a wide variety of locations, making it a mine of information in both the recording and musical senses. To fully understand why WW Communications works the way it does we must look more specifically at Chris Warwick's background.

While still in his teens, Chris ran a company hiring instruments and PA for pop concerts. This meant working as balance engineer on live shows all over the place. His company built the first 26/8 desk for use on the road and when Mike Oldfield was on tour with the orchestral *Tubular Bells* in the mid '70s Chris recorded a concert performance in quad which still brings him an occasional peanut.

Striving for the highest possible quality Chris found that the sort of equipment he wanted to take on the road was straight out of a top line studio—which was a bit unusual at the time. He started working for Ian Dury and the Blockheads. They made an impression with their *New Boots and Panties* in 1978 and hit number one with their *Rhythm Stick*. This success allowed Chris to keep up with the latest technology.

The next move was to Kensal Rise where former Blockhead Chas Jankel had his Eastcote Productions studio. While he was here Chris joined Chas Jankel and Pete Van Hooke on the writing, arranging and production of *Ai No Corrida* which was a Top 20 hit for Quincy Jones in 1981. Working on the single in one of London's top studios Chris found himself wondering why it cost about £5,000 ($6,500) for each minute of the finished tape. Where did the money go? Was this the only way? The studio bought a new carpet.

Chris had one of the first Fairlight *CMI*s in Britain and used it to develop arrangements for brass, strings and so on. He became fascinated by the dynamic range possibilities of recording the digital output using a Sony PCM *F1* with an *SL-F1* portable Betamax VCR. The problems came when he tried to get his tapes cut to vinyl. There was no way that his material with a 90 dB *(-ish—Ed)* dynamic range would fit onto an analogue disc. That was almost the end for vinyl discs as far as Chris was concerned.

"I wanted to listen to everything on digital by then. I thought it was very good. Although it does have certain drawbacks, and I'm not actually a 'purist' because I listen to Charlie Parker on analogue albums. Well you have to; Charlie Parker isn't on compact disc and he's great! I just can't cut what I like on vinyl."

For a time Chris regularly got chucked out of pubs by analogue aficionados when he insisted that there must be a better medium. Then a contact at Sony mentioned the coming compact disc and Chris thought: "This is for me!"

Put your money where your ears are

It was to be two or three years before compact discs actually appeared and the banks seemed to agree with the bar room experts that it wasn't going to happen, but Chris Warwick and his partner Robert Langrish-Smith decided to put everything they had into research and development preparing material for the new medium. They came across Hugo Zuccarelli's Holophonic system, with its 'dummy person' pick up technique, and the versatile *Soundfield* microphone system from Calrec. Chris and Robert began to record live material and reluctantly, the Fairlight had to go.

Recordings were made using both the Holophonic and *Soundfield* systems. Mike Skeet of Whitetower Records contributed a wealth of experience with the *Soundfield* mic and became a very good friend. He engineered some of the tracks on *World Record*. The Sony *F1* was supplemented by one of the first digital multitrack recorders on loan from Sony Broadcast. This allowed simultaneous recording of music and effects using two channels for Holophonic sound and four channels for the *Soundfield* to be mixed down as stereo or Ambisonic.

One outcome of this experimentation was that they found themselves able to more or less duplicate the Holophonic effect using the *Soundfield* system. In fact Chris reckons that he gets better results with the *Soundfield* and it is much cheaper. Hugo Zuccarelli is not noted for his willingness to divulge the workings of the

Tito Puenté

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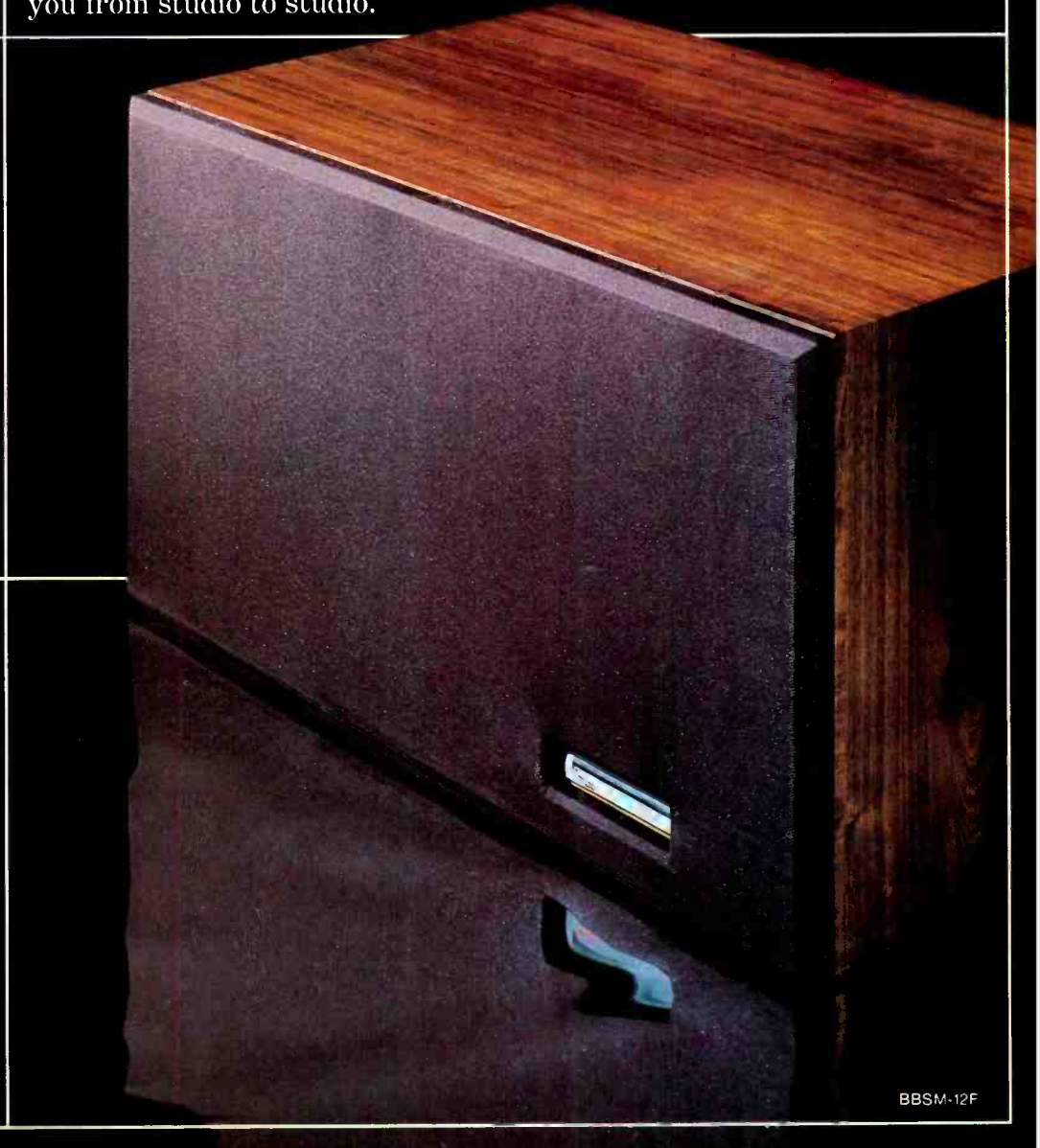

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DIGITAL WORLD RECORD

Holophonic system and insists on licensing its use rather than selling it. Chris has a lot of respect for Hugo's development of Holophonic sound but feels that Hugo should share his knowledge so it can continue to develop.

The only details which have been published so far came from a European patent application. This described a very accurately modelled human head with microphones where the ear drums would be and mounted on a dummy body; a filter system to correct the frequency distortion in the dummy's auditory canals; and playback requiring headphones or linear-phase speakers. The implication is that the shape of the 'standard' auditory canal acts as a reference to encode directional information for three dimensional sound. Whatever people think of the inventor's attitude, the fact remains that the system produces remarkable surround sound using just two channels.

With a recording system sorted out and the promise of CD to come there was the question of what to record. They decided to do something new, rather than compete with the big companies which do not encourage that sort of thing anyway. While Chris was travelling round the world with Ian Dury he had become interested in the traditional instruments, especially percussion, used by different cultures, and had begun to collect them. On a visit to New York he had been inspired by Moses Ashe of Folkways and his collection of indigenous music. So WW Communications started to develop by making contact with other independent researchers and experts, such as Lucy Duran at the National Sound Archive, who could help to establish a digital record of traditional music, the real music of the people, around the world.

Just for the record

Anyone who thinks that 'traditional' means 'old' or 'dull' had better get hold of *World Record*, turn up the level, and listen to the music. It is a treat for the ears and does things to the feet (not to mention other parts of the anatomy in between). The first two tracks feature the spicy sound of a 26-piece Salsa band with precision brass playing over potent Latin American rhythms. A powerful blend of Puerto Rico and New York performed by a group of very experienced musicians led by 67 year old percussionist Tito Puenté. The next two tracks are a complete contrast with the steel-strung pulse of Mexican harp and guitars. Other tracks which help to demonstrate the similarities and differences in the world's music come from the Ivory Coast, Nigeria and Cuba.

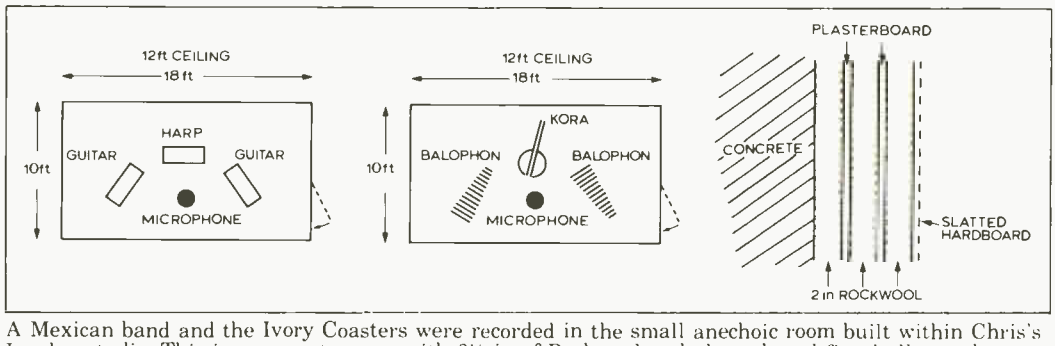
Using 'traditional' studio recording techniques there might have been problems with the wide range of musical instruments and styles involved. For example, where do you put the mics on a 300 year old gourd-resonated xylophone from the Ivory Coast? The simple answer is: you don't. Chris explains his basic approach:

"You go into a room and get the music sounding right for the ear. Then you put the mic where your head was. I've found it works best with quite a wide angle of pick-up on the microphone so that on stereo playback you are recreating what a person would hear if their head was in the microphone position. It's really easy but there are complications. I like the microphone to capture the spirit of the live performance with the ambience of the room. If you're in a bum room you've got problems. The spirit of the bum room will be brought out absolutely perfectly on the recording. You've got to do a bit of research because if you blow the session some of these guys could be 5,000 miles away so it's difficult to get them back for an overdub.

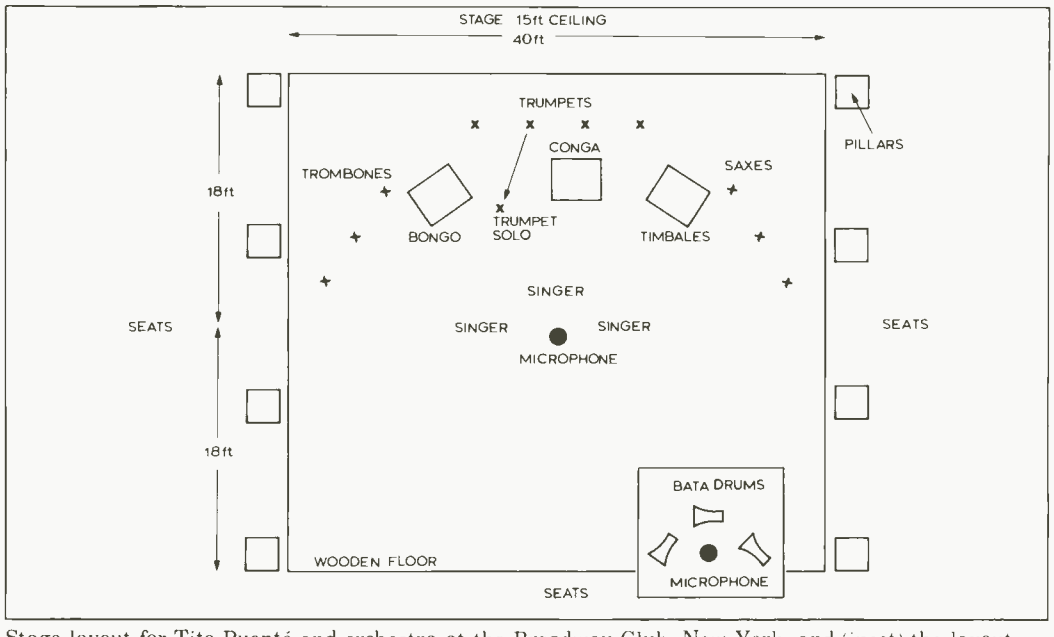
"After I discovered digital recording and the *Soundfield* mic my ears grew about 25 inches (625 mm). I was walking around, listening to every room I came across and logging it down. For percussion you want a wooden floor to make the congas and the wooden drums sound really good but a dead ceiling is quite nice because you don't want it too live. When we went to New York I found a club which was not a live room but had a wooden floor. We recorded a couple of hours there with Tito Puenté and his Salsa band. It saved me spending £1,200 ($1,500) a day on a studio—and the room was excellent. You don't have to go into a £750,000 ($970,000) studio to get an excellent room, I have 'studios' all over the world. I'd actually say, even if you've got a fully equipped multitrack mobile, if you don't like the acoustics of the place you should get out because you're not going to get it any better."

Some of the artists on the *World Record* had never been recorded before. This was really an advantage because they had no concept of recording, all their experience was in performing so they balanced naturally. Others like Tito Puenté and his musicians had experience of recording studios so Chris explained that this session was a bit different:

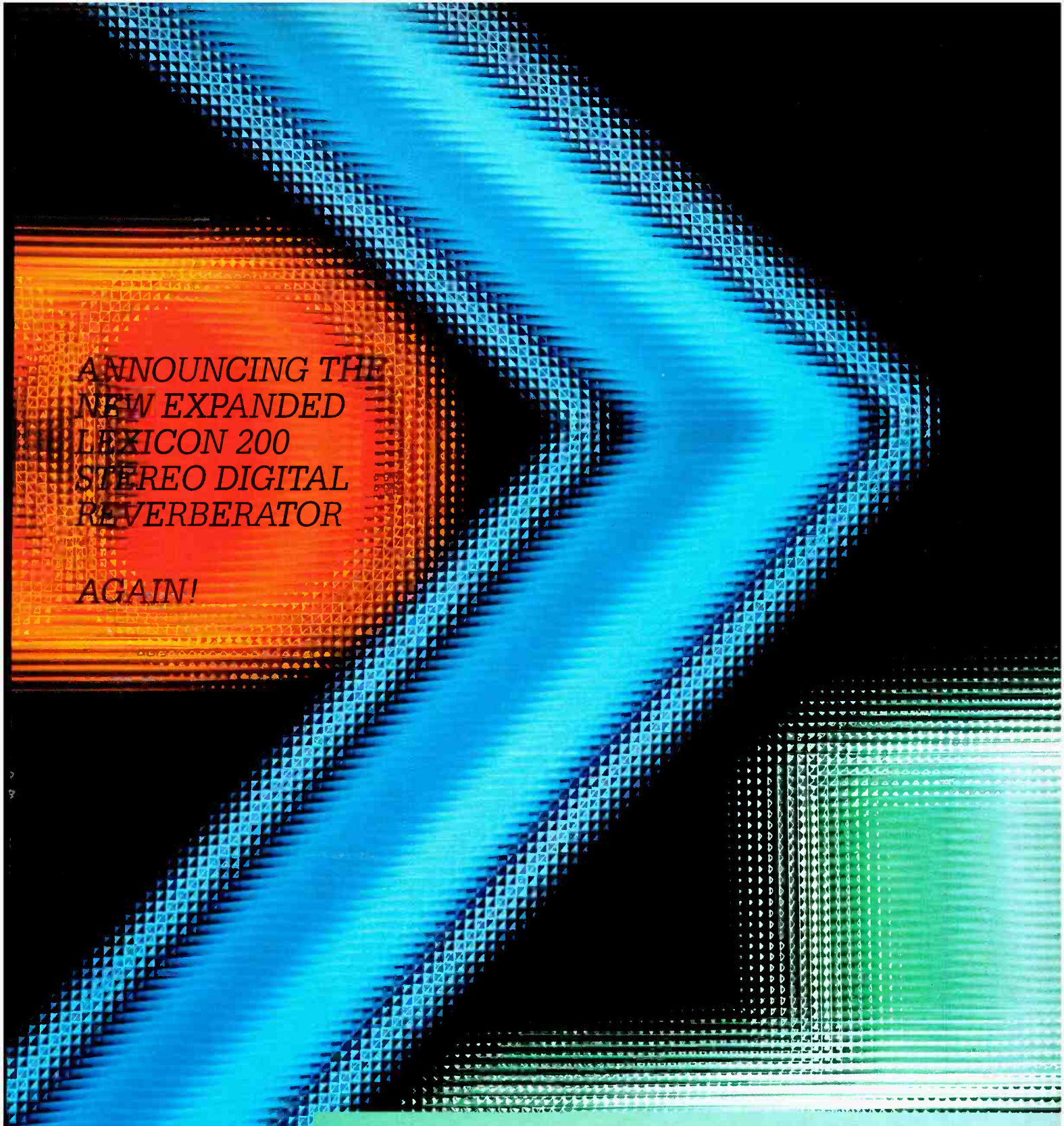
"Before we did any recording we said to them, 'All you've got to do is play your music for yourselves, you haven't got to project anything. The microphone is just going to sit there, a non-thinking, non-criticising listener'. So they set ▷



A Mexican band and the Ivory Coasters were recorded in the small anechoic room built within Chris's London studio. This is a concrete room with 6½ in of Rockwool and plasterboard fitted all round every surface with slatted Scandinavian hardboard to absorb all frequencies as if in the open air with no wind.



Stage layout for Tito Puenté and orchestra at the Broadway Club, New York, and (inset) the layout for Roberto Burrell's bata drums.



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DIGITAL WORLD RECORD

up all wrong and I had to change the band around. We had to convince them, but once they'd heard the playback for eight bars they really got into the dynamics and they were flowing nicely. That's a hot tape from guys who have the experience to change their dynamic level themselves.

"Usually they're thrown into studios, compressed to shit, bunched up in a stereo mish-mash and over-dubbed with no spirit at all. As a consequence their true knowledge and experience don't come out. I'm not into all the preconceived ideas of analogue production techniques: compression, EQ, reverberation . . . We don't bother with any of that. What we do is find the room, find the musicians, and bring them together. When I was a producer in vinyl all I wanted to do was get what I heard in the studio out to the punters. With analogue you've got no chance, you are flogging yourself to death, but with the digital you can do it."

Apparently word had gone out that Tito Puenté was recording and as the session progressed Chris and his team found themselves surrounded by some of the great names in Latin American music and jazz who had come to hear what was going down.

Making tracks

For most of the tracks the digital recording equipment was taken to the artists but some of the artists from Mexico and the Ivory Coast came to Britain. These recordings were done in a small anechoic room, like a large padded cell, that Chris had built in a basement near his home. Now we all know that musicans just hate performing in dead rooms, don't we?

"They thought it was really great. They didn't even notice the room. It was like being outside on a really calm day, right in the middle of nowhere. Perfect for these guys. That's where they'd been playing all their lives. For them it was like playing in the open air without the cicadas."

The Mexican harp and guitars have their own resonance; as does the West African Kora, a sort of 21-string lute and the Balo xylophone with its gourd resonators. Listening to these tracks there is no awareness of a room, only music, and the mind easily accepts the apparent outdoor setting. One of the Ivory Coast tracks has a particularly haunting quality; it is based on an ancient Moslem prayer, and has striking similarities to some of Ravel's music.

But what is this? One track has a touch of hiss and a faint hum. The liner notes assure us that no 'rusty plastic' was involved and these instruments are not amplified. Apparently the boiler in the room next door suddenly decided to start up and add a bit of 20th-century London basement to the proceedings. Once noticed it is quickly ignored. Chris was almost tempted to add a few cicadas to help maintain the outdoor illusion.

The Nigerian tracks were recorded on location in Nigeria using a special portable *Soundfield* devised for Chris by Mike Skeet. Once again a wooden floored room provides a very satisfying drum sound. This includes an almost tangible bass which was produced by striking a large pot rather than a drum. These tracks have the additional element of movement as the singers dance around the microphone placed in the centre of the room.

Although the equipment is nominally portable, Chris says that when you've got the *Soundfield* and two sets of *F1*s with all the necessary batteries, "You start out walking and end up down upon your knees" or was that Bob Dylan? Anyway, some recent sessions have been taken straight onto the Sony PCM *1610* system using U-matics and there is no question of carrying them about.

Plans for the immediate future include more discs by artists featured on *World Record* and by artists from other countries later this year. Some of these discs may be pressed in Britain but the initial pressing was done in Japan.

"The main reason for this is that two and a half years ago when I got my pressing agreement Philips didn't even want to say they were pressing and Nimbus were coming on line every March for the last five years. I'll be happy to press with Nimbus when they can do the business, but I needed a fast turnround CD production. CBS/Sony in Japan had it right together and they have given me the highest quality CDs I could ever come across."

Chris is inclined to listen to his recordings on speakers, although he's found there are definite advantages to using headphones.

"It does make this type of recording sound really good and it also cuts down on the Neighbours Against Compact Discs Society. When we do a recording we log the actual sound pressure level of the band so that when we play it back we can recreate that level. It's about 118 dB on the Salsa band with 26 musicians and that's a big sound. If the recording's really good you can recreate the sound of the actual performance. I like single-source speakers because the bass, mids and highs all come at you in phase so you get a lovely clear image. But only the very expensive single-source speakers will take that sort of level. Other speakers tend to blow up."

Even though WW Communications has kept its costs down and has produced a genuine *World Record* with international appeal, few people would regard it as a highly commercial venture. Chris Warwick is quite clear on this point.

"It definitely isn't commercial. I would be very disappointed if this disc turned out to be a commercial success and was a hit for nine days. Our intention is to start a comprehensive database of indigenous music from all over the world. We don't want it to be a nine day wonder. We hope to sell 100,000. We may not have a mass market but we're into 26 countries now and I hope it will be selling in 10 or 20 years."

World Record is certainly worth a listen to anyone who is interested in digital recording, Holophonic sound or the *Soundfield* microphone. Chris hopes that people will study the living history in the music rather than the technicalities. He doesn't feel that they are doing anything special:

"All I did was put the music and the medium together, anyone can do it. I'd like to hear other people's *Soundfield* recordings, I think they're great to listen to. I hope that more people will be buying *F1*s because they're really good. And I like it because the means of production can be in the hands of more people. There are big companies all over the world that mass produce this gear. Anyone can have a mobile recording system with top of the range equipment."

Perhaps the philosophy behind this project is best summed up by a quote from E C Ayangaor, Director of the Council for Arts and Culture in Benue State, Nigeria, which appears in the CD liner notes:

"We believe we can only contribute something to the world when we remain ourselves, even in the face of a Blitzkrieg of western mass media."□

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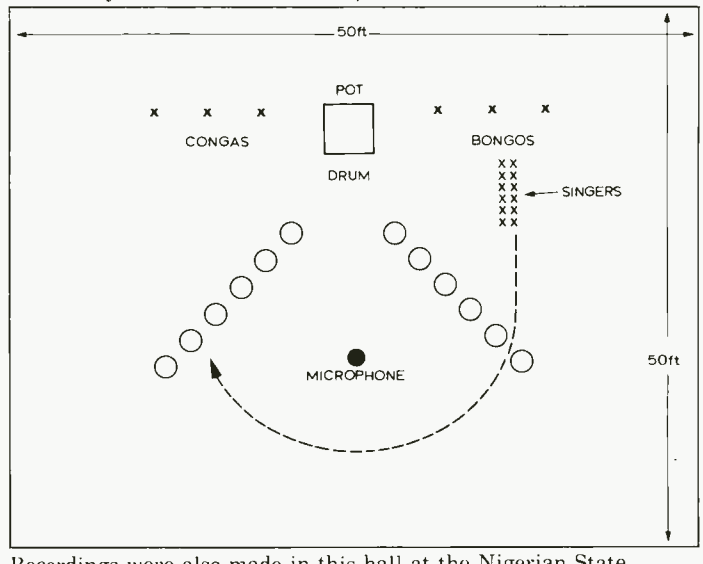

Recordings were also made in this hall at the Nigerian State Council for Arts and Culture. It is a slightly dead room with a 40ft ceiling and wooden floor. The lead voice dances all round the microphone and the singers start in the 'X' positions and dance into the 'O' positions.

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JUST ONE TOUCH.

BUSINESS BUSINESS

Barry Fox investigates the facts behind the industry news

Music for pleasure

I was involved recently in a seminar held by the National Music Council, to discuss the future of music in Britain. Some interesting points arose.

If things go on the way they are, and British Governments continue to deter industry from researching and developing new technology, then by the year 2000 just about every piece of electronic hardware will come from abroad. It has already happened in consumer electronics, with calculators, digital watches, hi-fi and video and television sets. It is happening in professional video, with cameras and recorders. It is happening, though mercifully not so fast, in the professional studio world. If the trend continues then Britain will be left as a source of creative talent; talent to write computer software, music, lyrics and text, to play musical instruments and to mix the sounds they make in a studio. This situation will be helped because Britain's most consistently successful export is the English language. It is widely spoken in many countries now. By the year 2000 Britain could be just one large service industry island. Recording could still be a good industry to be in.

Towards the end of the NMC seminar, after a day spent discussing the financial predicament of the music and record industry, one elderly gentleman finally lost patience and got up. "What you all seem to be forgetting," he said, "is that the purpose of music is to give pleasure, not provide financial support for the music industry."

One in the eye

If some of the press attending the Neve and CTS official DSP launch earlier this year seemed a little quiet and subdued, perhaps I can help. It wasn't that they were bored. It was just that they had recently been present at a press demonstration where lasers had been part of the show. Normally lasers at light shows beam away from the audience. In this case someone had had the bright idea of pointing them at the audience. The assembled party of press were quite literally strafed, dead in the eye, with green laser beams.

It happened so suddenly that no one really woke up to what was happening until after it had happened. After the show everyone was asking the same question as Sir Laurence Olivier in *Marathon Man*: "Is it safe." It's the same question that people in the music industry have been asking for 10 years. And there still isn't a clear answer. Here for the benefit of anyone involved in shows that use lasers is a brief run-down on the current state of play.

In the mid '70s pop groups, notably The Who, had enough spare money to buy industrial lasers for dramatic light shows. Almost immediately the health authorities warned of the risks. The light from a laser is concentrated into a very narrow beam. Industrial lasers produce several hundred watts of power which, because it is all concentrated into a tiny spot, can cut through steel like butter. One of these systems can cost £100,000. This is the 'James Bond' laser which cuts off your legs.

Pop groups use much weaker lasers, running at a few watts. These can still burn flesh because all the energy is concentrated into a narrow pencil beam. It's like using a magnifying glass to focus a hot spot on a sunbather's back. "Lasers are quite safe," said an operator from one of the dozen or so firms in Britain now supplying laser displays on a sub-contract basis. "Look I'll put my hand in the beam." It was only afterwards that the health inspector to whom he was proving the point, noted that the operator's hand was covered in little black spots.

The real risk, however, is to eyes. If a laser beam, even of a few milliwatts power, hits the eye dead on, the eye lens focuses the tiny light spot (around 200 microns in size) on the retina. This can create a permanent burn in nanoseconds.

It's the same principle as focusing the laser on a videodisc. But videodiscs are made of tougher material than the human eye retina.

If the burn is round the periphery of the retina, it isn't a problem because it only affects peripheral vision. But if by bad luck the burn is on the central, super-sensitive fovea, which we use for reading, unlucky sufferers will notice a blind spot for the rest of their life.

In the '70s the GLC closed down several light shows because there was a risk of beams hitting people's eyes. Charlton Athletic, the football club on whose ground The Who used a spectacular laser show, were prosecuted by the GLC and fined for letting the operator take risks with a 15-watt laser while the public were there. A laser show at the New London Theatre in Drury Lane opened late and was toned down, because the GLC said there was a risk of beams hitting the audience in their eyes. In other parts of the country restrictions were much slacker. Confusion reigned. There was a running battle between The Who and the GLC. In 1980 questions were asked in Parliament. "What we need," said Tam Dalyell, now of Belgrano fame, "are clear guidelines."

"When you licence a circus with a knife thrower on the bill, you don't licence him to throw knives at the audience," said the GLC also calling for guidelines.

In January 1981 the Government's Health and Safety Executive (HSE) published what is now the laser bible. Its guidance note PM19, which ties in with the British Standard on lasers, BS 4803, was published the next year, much later than expected. That's why the note does not mention the standard.

The HSE documents do not make easy reading. That's one reason why there is still much confusion.

It was in Surrey and outside the GLC jurisdiction. There is a grey area between what is public and can be controlled and what is private and cannot be controlled because an Englishman's home is his castle. The HSE note is tied to the Health and Safety at Work Act. Its main concern is protecting people at work. The laser operators are supposed to satisfy the people who employ them that everything is safe. A local authority inspector gets involved when the premises needs to be licensed. The HSE gets involved when the local authority asks for help or there is a once-in-a-blue-moon spot check under the HSW Act. In Britain the HSE has around 700 inspectors, but only a couple are equipped with the hardware needed to check the strength of stray laser beams.

Out of all this confusion only one thing is clear. The onus is on the operator of the laser to ensure that no-one's eyes are at risk. Some operators take their responsibilities more seriously than others. There is always pressure from the advertising people to do something a bit special, like pack a bit more gunpowder into the fireworks. Everything always comes back to PM19. But the authorities can't even agree on how it should be interpreted!

The PM19 bible was drawn up by the HSE working with the local authority health inspectors and some grass roots laser operators. The idea was to be safe but not killjoy. It puts lasers into four classes. Those in Class 1 are regarded as 100% safe because the beam, however strong, can never get near a human eye. Class 2 lasers are low powered gadgets, like the new breed of laser blackboard pointers, which shouldn't hurt the eye because the lid can usually blink fast enough to protect the retina. To be within Class 3, the power of the beam must not succeed 2.5 mW/cm^2, which is equivalent to 1 mW over the average eye pupil size of 7 mm. Class 3 also puts a limit on total power output of 0.5 W. In a confusion of words the HSE guide-notes suggest that although people may be able to blink fast enough to protect their eyes, no-one should look straight into a Class 3 beam. Things get much clearer with Class 4. This includes anything more powerful than Class 3 and they should be used with 'extreme caution'.

The real problem is that PM19 nowhere prohibits direct and deliberate scanning of the audience by a laser beam. And that's what laser operators are now starting to do for special effect.

When quizzed, the HSE explained the problem. It all depends on how fast the

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beam scans the eye. Obviously the faster it moves, the less time there is for the retina to burn. But what happens if the same eye is scanned many times? Is there a cumulative risk! No one knows for sure. What happens if the scanning mechanism, usually a mirror driven by a galvanometer, fails and the raw beam comes to rest on an eye? All laser systems must have fail-safe shutters and their operators claim that the inertia in the galvo mirrors will keep the beam moving long enough for the shutter to close. But the dose on scanned eyes will increase as the mirror slows down. Also a fantail or conical scan may be putting more energy in one area of the audience than others.

There are so many variables that the HSE cannot know what the real risks are. So it approves audience scanning only when the beam is bounced off a rotating mirror ball after bouncing off the galvanometer mirror. This provides an extra safety link in the chain, because the ball attenuates the beam and it is highly unlikely to stop rotating at the same time as the galvos. If everything fails the ball will continue moving for quite a while because of inertia. Pushed further for an opinion the HSE says it would not want a Class 2 laser to scan the audience direct but it wouldn't stop an operator doing so, providing there was good safety protection. But the HSE would never want a Class 3 laser beamed direct into the audience's eyes. And Class 4? Obviously not.

The GLC has a much simpler approach. The GLC health inspectors have never allowed direct scanning or sweeping of the audience in the London area. They only allow audience scanning via a mirror ball which will bring the beam power down even if it stops rotating. The GLC is not impressed by reassurances that beams are safe if they move fast across an audience's eyes. "How can you possibly guarantee safety," asked an inspector, "when the stationary beam could do damage in nanoseconds?"

With this background, I took things one stage further. Let it be said straightaway that the company which organised the show co-operated fully. Also let it be said that no one was hurt because the beams never stopped moving. But they were directly scanning the audience. Oviously the company staff thought it was safe because they were sitting in the front row. They had checked the health and safety aspect and were given assurances. They referred me to the contractors who staged the show.

They were equally helpful and told me that the laser which had been used to scan the audience was an Argon ion rated at 18 W, but a double unit with beams coming out of each end so that they produced two beams of around 2 or 3 W each. This the operator told me quite openly, puts it in Class 4. He was well familiar with PM19, having been in on the original draft discussions. The beam, I was assured, was moving fast enough to be safe and the galvos had a safety mechanism which will shut down the beam if the patterns become too small or the scanners stop working. Inertia in the galvo mirrors would keep them scanning several hundredths of a second longer than it takes for the gravity shutter to cut off the beam altogether.

Fair enough, but what happens if a less responsible operator, and there are some cowboys around, tries to pack a little more gunpowder into his fireworks and make an even more dramatic show? Sooner or later someone is going to get an eyeball burn and sue. Privately, the HSE admits that there is a need to make its guidelines much clearer. Having tried to read them, I'll drink to that. In the meantime anyone even remotely involved in putting on a laser show, whether private or public, should do a little homework first—like perhaps re-reading this article.□

THE PRODUCER SERIES

CHRIS TSANGARIDES

Ralph Denyer finds out why a producer with such a wide range of musical tastes is best known in the heavy rock field

Chris Tsangarides' name has become synonymous with heavy rock music as a result of productions of and with acts including Gary Moore, Y&T, Thin Lizzy, Moma's Boys and others and at the time of our interview was mixing a track he was producing for the Comsat Angels' forthcoming album. At 27, he's worked on around 30 albums, all recorded over the past seven years. For three years his business affairs have been handled by the impressive Zomba management company, along with those of Martin Birch and several other producers, including the much revered Robert John 'Mutt' Lange.

Chris is easy to get along with and before we met, several people had already told me that he's just about impossible *not* to get along with. Though he's obviously serious about his work, he displays a keen sense of the humour and an appreciation of the irony underlying many of the day-to-day situations a record producer has to contend with.

From the Comsat's music which was coming out of the monitors, it was immediately evident that Chris certainly does not regard himself as exclusively a heavy metal/rock producer. So how did he become so involved with the music he's known for producing, that is: bands in the heavy domain?

"One of the very first things I produced was Gary Moore's first solo album *Back On The Streets* and there was a hit off that. Because he was a guitar supremo, as it were, very well respected in the business, all the up-and-coming guitarists were saying: 'Hey! This is the man!'

"They were all emulating his style, forming bands, getting record deals and I was getting calls to go and produce them. And so it carried on. And as we got successful with each one—there's the reputation. I'm not complaining at all because it's great to be known for something rather than nothing at all," Chris added.

"But from the A&R person's point of view, it's very hard for them to say, 'Let's get Chris in to do Mantovani,' or whatever. 'Oh no, you can't do that because all he does is loud guitars and he wouldn't understand.'

"That just isn't the case. So

when I get to work with different types of bands I'm learning from them—their new thoughts and new ideas, and they're learning from me, the styles I know, the marrying of the two styles is coming up with something a little bit different. That's good."

In the beginning, was being labelled as a particular type of producer a less important factor than making the transition from recording engineer?

"That's right. When I was an engineer for a studio I was recording all sorts of everything—orchestras, bands. I mean, the Argyle and Sutherland Highlanders? So you're experienced, you get to know all these types of music. I was working with different acts all the time—girls, boys, solo singers, bands, all sorts. And so as a producer, you draw on your experience. So that when I get a string section in, I know how to record it. Everything helps everything else in the future and you draw on it. It's all experience and it's all good."

And in the event that he deviates from the kind of music he's known for producing and the record does not sell, then the reason is of course: 'Well, Chris Tsangarides, he's really a heavy rock producer'?

"That's right. The producer will get the can. If the record is a success, it's in spite of him because the song was so good anyway. If it's a failure, it can't be the band or the song or the record company, it's the producer.

"You have to live with it really. But *normally* you find the good acts—the actual players and the good bands—if a record's a failure, they know what the reasons are. And normally, nine times out of 10, it's that the people didn't like the song or whatever. Because things have been recorded on cassette players and been released, recorded in dustbins and what have you. *Terrible* sounds by technical standards. Explain that? Why? The only common denominator in it all is the song. So if you have a great song, it doesn't matter who, where or how, it's great because of the song. It's even *better* if it's produced well, for those people who are inclined to listen to echos, sounds, stereos and hi-fis and what have you, great, all the better for them.

But at the end of the day, if the material is not there, it doesn't sell a light, it doesn't do anything.

Chris's parents are of Greek descent and he was born in Cyprus, though the family moved to London soon afterwards. While in his teens, Chris played a variety of musical instruments. He played trombone and later trumpet in a brass band at school, then had piano lessons before he 'discovered rock'n'roll', and subsequently played drums before moving on to organ.

"At 14 my ambition was to go to the Royal Academy of Music, taking trumpet and piano but—at 14 years old—I didn't quite make the high grades there. So I became a business student, doing economics and that sort of nonsense. I did my exams and while I was waiting for the results my best friend from school, who was already a tape-op, said he was going to be a recording engineer. That's what his ambition was. He said to me, 'It's great, you wanna' come here, they get all these groups coming in to the studio and it's marvellous.'

Chris confessed that at the time he really didn't know a great deal about making records but went for an interview at Morgan Studios where his friend was working. Almost effortlessly (and somewhat to his own surprise,) during 1975 he found himself in the recording industry, albeit on the first rung of the ladder.

"I became a tape-op. I didn't know what a record producer was—I really didn't. I didn't have a clue and I asked the engineer: Who is that man sitting next to you? What does he do?"

The engineer explained the producer's role but Chris admits he was still somewhat perplexed. The musicians played, the engineer worked the console and Chris received his instructions. Make the tea, start and stop the tape machine, do as he was told and keep his mouth closed. That was all quite clear. But what of this mystical 'producer' who had something to do with the record company, yet didn't seem to do anything much to speak of? Chris didn't think a great deal more about it and settled down to making the tea and doing as he was told for about six months. It was during 1976 that he became aware that the chap who sat next to the recording engineer on sessions could actually make a significant contribution to the creative

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process. The man whose work opened his eyes was Bob Ezrin.

"He really was the first one who made me realise how good a producer can be. This was on Peter Gabriel's first solo album. I must admit that I was at the studio and heard that it was all being done on 16-track and everything and heard what he was up to. I thought the sound was phenomenal. It was at the studios where I was working and I'd never heard the studio sound like that. Amazing. I became aware then and I thought: Wow! that's clever that, I like that.

"And I suppose I strive to make myself that sort of figure in a way. Because I'd played in the brass band at school, I knew about arrangements and things like that. I liked Bob Ezrin's productions, the sounds he got on Alice Cooper albums, Lou Reed, and the latest thing of his I've heard that I liked is Pink Floyd's *The Wall*. Great sounds on that. He's very very musical and he influenced me a lot. The big live sounds that he got. But each project he did was different in that the *sounds* were a bit different. He catered for whoever he was working with, he didn't make Alice Cooper sound like Peter Gabriel and vice versa. It was left to the artists to have their own identities on the records but you could still tell it was his production because of the arrangements, the way the brass came in somewhere, and the orchestrations. And that's what I try to do. I think to myself: right, this band is a heavy metal or heavy rock band. So they're gonna' be the way they are but when I put my thumbprint on there, it's going to be *them* but with me as well. But you won't hear me so much as you hear them.

"I'll make my own album one day," Chris said, underlining the point, "and indulge myself to kingdom come. My *job* is to make sure that whoever I've taken on, I can produce and bring out the best in *them*.

"That's what I liked about Bob Ezrin. So that was my barometer for productions, I became aware of what a producer can do. Before that, I just dismissed the producer as some idiot who was sent down by the record company.

Chris got to engineer his first session with Judas Priest. The scheduled engineer had to leave the studio to go and rescue his pregnant wife who was driving to the studio when her car had a puncture. Chris was conscripted to fill in.

"Then I started to engineer bits and pieces for the studio. In house cheapo demo sessions, 3-hour jingle sessions, something where the studio had reduced the rate to get someone in and they'd throw in a tape-op to engineer. It was good because Morgan had a great name, though I came in just as it had peaked really. They'd had all the Rod Stewarts, Cat Stevens, Jethro Tull, Yes, everyone, the biggest artists ever."

Chris recalled that the studio hierarchy was not exactly falling over itself to be nice to the staff, least of all newly employed tape-ops.

"No one really recognised that the *staff* really were the studios. That's who make a studio and give a studio atmosphere. There was good and there was bad. I was fortunate that I worked there because I got to work with great engineers and great people on the shop floor: like Martin Levan who was the studio manager. They were good studios because the engineers and maintenance people were great. I had a great time and it was a good laugh and I learnt everything in my early days there.

"It was an apprenticeship really and I was lucky to have an institutional type of education in recording because it doesn't happen so much now. Studios are so computerised and a one-man-job. There was a case recently—I don't know what studio it was—but a band came in and got out a drum kit and the engineer said; 'We'll have to get somebody in because I've never recorded drums before.' Now when an engineer turns round and says: 'what do I do with a drum kit?' that's not a very healthy state to be in."

In fact all the producers featured in this series of interviews so far—with the exception of the exceptional George Martin—have made the time honoured tape-op/engineer/producer progression through recording studios.

During Chris's time at Morgan, the winds of change were gusting through the industry. The studio administration seemed to have had difficulty in accepting the increasing importance of the studio staff as the recording process grew up. Talented engineers were attracting business, moving into production and playing a far more important role than just operating equipment. At the same time the recession began to bite and the competition increased. Morgan eventually sold up.

"All I can say is Morgan had four studios and it collapsed in a heap. Battery Studios bought them out and now it's the most happening complex in London. It's the same buildings and there's quite a few people at Battery—or associated with Zomba, like myself and Nigel Green—that were from Morgan. Zomba took over managing us and promoting us as producers and what have you. And Morgan could have had it all."

During 1977 Chris made his first effort toward producing with a new band called Money whom he thought had potential. He produced their sessions during free studio time for Morgan as an in-house project during weekends. During the same period he was the engineer assigned to a studio client, Gary Moore who was recording his first solo album.

"Gary turned round to me and said, 'You're producing this record with me.' I thought: yeah sure, great.

"Then after a week, I realised he was serious.

"It was very exciting because it was like that and then it was down to me to get the sounds, to get the effects and generally put it together. Then Gary went off on tour, he came back and got Phil Lynott from Thin Lizzy in and we did some more songs with him. Gary went off on tour *again*, and MCA Records said, 'where's the album?' There were about 15 songs. There were fusion songs, a punky type of song, a Blues song, all sorts. No direction specified."

Chris put together what he regarded the best compilation of nine of the songs and there was his first 'proper' foray into record production. Gary was off on tour and Chris had to literally *hope* the guitarist liked the album. Then after all the rush there was a delay of a year before the album was released. It sold well and when the track *Parisienne Walkways* was released as a single it made a healthy entry into the charts. But in a way, the delay in the release of the records worked to Chris's advantage, as he explained.

"It was over a year before the album came out and the hit, etc. And in the meantime I was engineering a hellova' lot of things which was quite good because it meant that I'd learnt a bit more because I wasn't an engineer for even a month or so when we recorded *Back On The Streets*, so I needed the experience."

And when Chris listens to the album now, retrospectively, what are his thoughts?

"I really like it. I still think it's a fine album. There's mistakes all over it that I never realised were there before, bits and pieces that make you cringe. But generally the feel of the album is fabulous. Loads of people, loads of guitarists really like that album and I still do. It's got the oldie kind of sound about it which is quite nice."

Chris agreed that the album has a very close, raw sound that if anything, adds to the album's feel.

"Oh yes, 40 W Tannoy *Golds* were the monitors that were used. In fact," Chris added with a smile, "on one of the overdubs we did, the guitars were so loud that we had to move studios because I couldn't hear the monitors because of the leakage through the glass, it was ridiculous. So that was that story."

> My job is to make sure that whoever I've taken on, I can bring out the best in them

Before the interview Chris had suggested the best albums to discuss. As well as *Back On The Streets* he mentioned *Thunder And Lightning* by Thin Lizzy, *Mean Streak* by Y&T and, mainly because it was a slightly different type of music, the single *Listen* by the Europeans.

Thin Lizzy's Phil Lynott also played bass and sang on Gary ▷

Moore's album. Moore was in and out of Thin Lizzy over the years and he and Lynott had worked together since their early days back in Ireland. Lynott's personality comes over through his bass playing, singing and songwriting. His bass playing on Moore's album is extremely powerful and effective. He seems to create instant atmosphere on the tracks he plays on.

"Yes, he does. On Gary's album it's basically a rhythm guitarist type of approach with the pick playing up-and-down strokes, so the way he plays the bass gives the drive, really. He's unique in the way he does things, I think. He's a very talented fella'. He has got a good feel, good emotion and it comes across."

Parisienne Walkways is a fairly short track but Chris explained that it actually was much longer but was faded on a solo.

"It was an instrumental at first and then Phil turned round in the studio one day and said, 'I think it would be more commercial if it had words. How about this?' He wrote the two verses and that was it, sang it—thank you very much and goodnight.

"Gary Moore was in Colosseum II before we did the album. It's basically Colosseum II playing on *Back On The Streets*, except that Simon Phillips was the drummer instead of Jon Hiseman. Gary started to get friendly with Phil again and Thin Lizzy asked Gary to guest on one of their tours, which he basically did. Phil came down to the studio, I met him then as a youngster because when I did that album I was twenty years old."

Chris recorded two further albums, *Dirty Fingers* and *Live At The Marquee* with Moore. He went on to work with the Tygers of Pan Tang and then had a call from Thin Lizzy's management asking how he would feel about working with the band. *Renegade* was the first of the two albums which he worked on with them but the album was a bit of a mixed bag. He was, to a large degree, called in to do a patch up job. The band had recorded a series of songs in different studios over a longish period of time.

"They brought me in and said 'well, what can you do with it?' It was a real mess. The direction on that was all over the place. Well, whatever happened," Chris added, obviously avoiding unnecessary negative comment, "we had an album at the end of the day with it."

Chris went off to produce the band Anvil in Canada and then to America to product Fortnox in Atlanta. While there, he got another call from Lizzy's management asking him to produce their next album. He came back to the UK ready to get down to work but the volatile Lizzy were once again going through personnel changes, resulting in a general state of commotion.

"We finally got the album out. It was recorded over a period of about six months at Eel Pie Studios, the first time I'd used SSL consoles, *A800*s, 46-track, the whole bit; loved it all. Great old album, straight into the charts at Number 4, thank you very much—world tour sold out. Then," Chris added with a laugh, "they split up. Great."

The tracks *Sun Goes Down* and *Cold Sweat* were both hits as singles before the group finally disbanded. Listening to *Back On The Streets* and *Thunder And Lightning* there was a marked difference in the sound.

"Oh yes, definitely. We're talking about a difference of five or six years between Gary and Thin Lizzy. And as I say, I'd learnt a lot more by the time we did *Thunder And Lightning* and I'd started to develop my sound and my style, whatever that is. Being honest with myself, I improved. I had to because I learnt new techniques as I went along. There's no substitute for experience. On *Thunder And Lightning* there's a different style of music. It sounds different: Thin Lizzy, an established act, they have a certain type of sound. I come along and that album sounds totally different to anything they've ever done before. But it still sounds like Thin Lizzy and it still sounds like me. Maybe only to me and them but nevertheless, that's how it really works."

American band Y&T, were already established in America, particularly their home state of California, when Chris worked with them on *Mean Streak*. He has considerable regard for the band and says: "they're a fine American band who should have been English," as they are very much in the style of music forged by Led Zeppelin.

A point of maintaining certain musical traditions and styles arose in an interesting way during the recording of *Mean Streak*. Y&T's previous producer had insisted that they were a heavy metal band and therefore mustn't have any vocal harmonies on their records. Chris begs to differ.

"My attitude is totally different. If they sing good harmonies, it's going to enhance the music even more. That's how I think. They heard *Thunder And Lightning*, we met and got on and I did the project with them. I like the album, it's a different sound to *Thunder And Lightning*, it's a harder kind of sound."

Chris agreed that there is a mistaken tendency, particularly with some embryonic heavy rock bands, to feel that their music will be softened and not be 'raunchy or heavy enough' if they are too melodic or sing vocal harmonies. But while any of the sounds of the instruments or voices on the Y&T album can be cited as good examples of classic heavy rock sounds. *Thunder And Lightning* has a more seductive, personal and somewhat slicker overall sound.

"That's right. The different style of the songs, you see. Again, that's another very valid point. The type of song will determine the type of sounds. Generally, the slower the song the better it will sound. That's a fact because of the space. For instance you can hear a bass drum, with all its resonances, before the next beat comes in. It's the same with the snare drum, the guitars, everything."

You have to have melody; if there's no melody then it's just noise

Melody in rock music came under discussion and the fact that bands sometimes underestimate its importance. Bruce Springsteen's *Dancing In The Dark* is a good example of strong melody within a rock context and going back to Phil Lynott, he certainly has no fear of melody.

"Oh yes, you have to have melody, without a doubt. If there's no melody, then it's just noise.

"With the best bands that survive and make it to the top, you will always find melody there, no problem. That's one of the prime things when I listen to new heavy rock and metal acts. Where's the melody? Can they sing? Can they play their instruments? Magic. If they have all those ingredients, great, let's go in the studio."

Chris had seen the Europeans play a couple of times and though he liked the band hadn't any thoughts about working with them. They were signed to A&M Records with whom Chris has enjoyed a particularly productive working relationship. He's produced Y&T, Lords Of The New Church, Rock Goddess, Spider and others for the company. When the Europeans needed a single A&M suggested that Chris and the band might make an interesting pairing. On a fairly speculative basis, musically speaking, they went into the studio together.

"Nobody really knew the arrangement or anything, it was just a couple of chords, a melody and what have you. We threw it around for a while and came up with that song. A different style for them because we got a heavier kind of sound than they normally get, and we had a great time. It was a different thing for me because it was the new style of music, if you like."

Chris finds that the advantages of his association with Zomba management are numerous, even excluding the obvious point of having all his business affairs handled by them, leaving him free to devote his time to musically creative pursuits. There are little touches as well; like receiving all the new entries into the Top 100 singles on a weekly basis.

"They are very aware, being a management company, a video company, music publishers, book publishers, all sorts of things—they know what's going on in the music world: who, where, how and what. They're trying to get me away from the heavy metal tag into other areas of music that I quite enjoy. If I like a band I'll work with them, it doesn't matter who, what colour or how. That's the idea and because they are who they ▷

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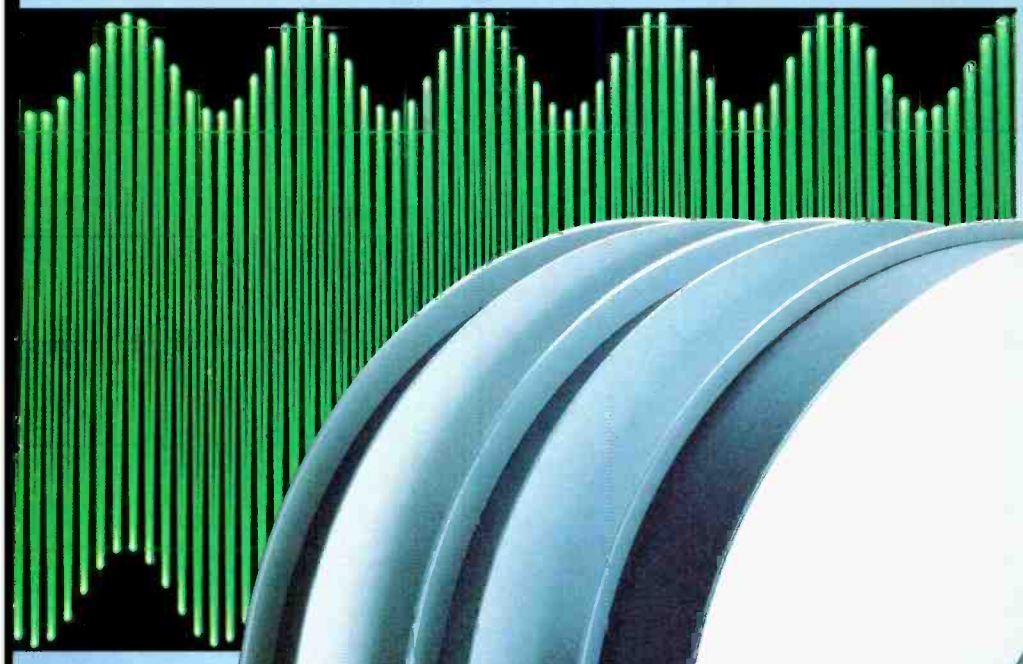

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are, people will listen to them. But having said that," he added with a smile, "there's nothing at all wrong with heavy metal. You know, I still enjoy doing it. I'm not ashamed of it, not at all."

In general, what was Chris's opinion of current record production and music?

"I think we have a very very high standard of production at the top end of the market in England—pretty much the leaders in the world in a way. I think London is the centre of the recording world. It always has been, to be honest. There's nothing you can't get. You pick up the phone and get whatever you want.

"There are different types of production. I have great respect for the modern producer who knows how to program Fairlights, synthesisers, how to work drum machines: how basically to make up a song out of a bunch of machines and then get a singer to sing over the top and give it some feel and character. Very hard to do, I think, because you're dealing with machines. They're not supposed to have emotions. So really it gets emotions from the singer, perhaps. That's a marvellous thing to do.

"I also like traditional recording where everybody plays, you record it and you get a feeling of excitement, which on record, you have to exaggerate a bit to make it come across because there's no visual, there's no artist in front of you going through the motions.

"I think record production is in a very healthy state, that a producer has a more important role in making records now."

Does Chris prefer to work with people actually playing musical instruments, with the resulting human chemistry?

"Yes I do. I much prefer a real drum sound, a guitar sound, a vocal—yes, I do. I like hearing the techno stuff as well because I admire the way it's done and I know how hard and difficult it is to get all that, I've done that kind of thing myself and it's fun. It's great, you press buttons and all these sounds come out. But music came from acoustic instruments—you know logs and voice and what have you—and I don't think we should forget that, that doing it yourself is what it should be rather than letting machines do it for us."

Chris feels that the art is in marrying new technology with human musical input. "Then," he continued, "you've got pretty much the ultimate sort of thing. That is what I'd really like to see and I hope music goes like that.

"It's much better to have the musical ability, the performances and also all these nice new technological advancements. *Together*, it really does do it."

At the time of the interview, the Moma's Boys' second *Power And Passion* album (their first album release in the UK) was just making an early entry into the British charts, something which Chris regarded as a bit of a surprise bonus in that America is where the band have previously done best and their record is really tailored for that market. In America, MTV have taken a liking to the band who, according to Chris, have been supporting headlining American rock acts and have, "completely and utterly devastated them all." The album is very much an in-house project and is released in the UK on Zomba's own Jive Records.

Generally Chris sees the act/producer relationship as one in which he is quite willing to put in considerable musical input playing guitar, keyboards, vocal backings and arrangements. Generally with a new band, he plays keyboards if they don't have a keyboard player, as he does with Moma's Boys. There is a particularly successful blend of voices on the vocal backings on *Power And Passion*. Chris explained that they were all sung by the group's lead singer/bassist John McManus and himself.

"The only one of Moma's Boys who really sings is John. The way the backing voices were done—we expanded to 72-track and multitracked a lot—was basically with John and myself, which is quite a standard thing nowadays. A lot of producers do get involved musically, it just seems a natural thing to do. The vocals only work because our voices blend on those high end harmonies, I don't understand why it works, it just does."

They wanted a vocal sound in the Sweet/Slade chant or anthem-like tradition but also with an individual sound or trademark. They used an extensive layering technique, giving variation to the vocal sounds in different ways. They used varispeed to slow down and speed up the tape, sang in different vocal textures—from virtually talking to falsetto—and Chris miked the voices at various distances.

Chris went on to explain some of the details of how he currently goes about recording his basic tracks.

"As you can see from this project with the Comsat Angels—and generally everything, the Moma's Boys and even for the *Thunder And Lightning* album from those days—I tend to use real drums and get the drummer to play to a metronome or click. That means that for later use we can use the click to trigger off the Fairlight if we want to program it to make some weird and wonderful sounds, or for syncing up or whatever.

Chris and Pete Harris at the Fairlight

When I come to mixing I put on the Simmons bass drum as well as the Simmons snare, keyed off by the actual instruments by taking off a gated feed, spiked, heavily compressed, etc.

"So when the bass drum plays on tape, it triggers off the Simmons bass drum. You mix the two together and get the kind of bass drum sound that I like *now*, this is my preference at the moment. It works really well. I don't know why, but obviously there is a slight delay between the recorded drum sound and what is going on with the Simmons—it tends to make it sound a bit more live. It's quite strange; an electronic sound making a drum seem more natural.

"You can get the white noise on a snare drum from a Simmons to make it sound like the snares rattling when a drummer is playing live. It just adds a little more depth—or if you like you can make it more upfront because it's a DI kind of sound. It just gives you a little bit to play with.

"Also in the beginning, the whole drum kit is recorded up on a drum riser to help it resonate a bit more, in a live room with stone all over the place, hopefully if I do it here at Battery."

Chris uses vintage Pultec valve (tube) powered equalisers specifically for the individual sound they give, in preference to non-valve mixing console EQ. As far as drums are concerned, he prefers the resulting "bright sizzly cymbals that don't hurt", as well as the "nice heavy duty bass end which is low, deep and rich".

Having used the Pultec valve equalisers during recording, he'll then hire them in again for the mix-down and possibly add further final touches of EQ.

"But I use them on guitars, bass guitars, everything. So by the end of it, everything that is on the 24-track *lately*, has been through a Pultec equaliser."

Chris added that there is the option of mixing in the normal fashion and then to EQ everything through two Pultec equalisers but he prefers the one track at a time approach, allowing him to adjust each valve Pultec for each instrument, "to avoid using the desk EQ and just get something a little more pleasant to listen to. At home my hi-fi is valve powered. I like the old type of sound, the softness, because it seems to sound a bit more natural. I like to hear natural things and if the music is good, it sounds even better to me with a natural kind of sound. My preference—and I'm fortunate enough that the people I work with love it as well." With a ▷

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smile he added, "that's why I get to work, I suppose."

The main point being that he uses the Pultec equaliser both as an EQ and an effect? "Oh yes, definitely for the effect of it, just listen to the Moma's Boys. There's Fairlights, keyboards, all sorts of things that you hear after a while and it adds to the whole thing. When you first hear the record it sounds like three guys going for it, a real solid, Heavy band. Essentially, there are only two guitars playing—the solo and the rhythm guitar—yet it sounds massive and it's all these devices and things. To make things sound natural nowadays, you have to go right round the houses by using all this stuff."

An important point with Chris's approach with rock acts like Moma's Boys is that he's not trying to add depth and dynamics to music which is cultured in the studio. His starting point is the sound and excitement that the bands generate at a live rock venue. He agreed that a major factor is that at a live concert, many thousands of watts of power are exciting and moving a very large volume of air.

"That is it exactly. The air is not being moved by your Grundig hi-fi or whatever. So that's what I try to do with this type of band."

Chris was at the final stage of mixing the Comsat Angels track. Again, though the track initially sounds fairly basic, when I glanced over at the tape machines—two 24-tracks in sync—I could see most of the VU meters moving. As they mixed I could see that there were various tones and textures being mixed in that would not all be immediately apparent on the final mix.

"That's right. You think there's a keyboard player, a drum pattern, bass guitar, guitar, then a solo and then voices. But every now and then there are these little overdubs that we've put in certain places."

Many of the overdubs were in the bass end, including a bass drone and a bass synth triggered by the bass drum.

"The drone happens all the time and so does the bass synth but the bass guitar doesn't. It's all in one kind of tonal area and that's what we were sorting out. But yes, you see the amount of tracks used to make it sound like that."

Chris's Fairlight programming is all taken care of by Pete Harris.

"Pete Harris is very well known as a Fairlight programmer. He's a musician and he knows how it all works and everything. He's on the Moma's Boys album and he does all my Fairlight programming when I can get hold of him. He's very good. He's also started producing in his own right, he's just finished Tangerine Dream's new album. At the moment we're also working together writing some songs."

I like to set up loads of amplifiers—all makes, all sizes, all over the place

Ten or so years recording experience cannot be conveyed in every detail in interview form but what is Chris's general approach to recording rock guitar?

"Basically, I don't think there's too much difference between recording rock guitar and any other sort of electric guitar. You go for a certain kind of sound relating to the song you're doing. For instance, if we're doing a hard rock act and we're going to go for a basic rhythm guitar sound, I like to set up loads of amplifiers. All makes, all sizes, all over the place and then spend a long time getting them all linked up together, getting rid of all the earth hums and what have you. Then I like to put the amps in various positions in the studio and screen them off from each other."

Essentially he sets up a block of amplifiers in the studio facing various directions and works on the positioning to utilise the studio acoustics until he feels happy with the results.

"Then I'll use effects on each one—maybe a chorus on one, a distortion on another, a delay on something else. Then I get a picture from all that lot once it's all set up, then listen to it with the microphones in close and distant positions. As a rule I put all the close mics on one side of the stereo and all the distant mics on the other side, then I mess around with those microphone levels just to find the sound that I wanted.

"If I use eight amplifiers in the studio, I might only put close mics on two. But I wouldn't turn off the others because I'd let the spill from those go down the ambient microphones. So it all adds to the cacophony."

Apart from the stereo placement, basically the only adjustment to the sound made in the control room is with Chris's old favourites the valve Pultec equalisers—to brighten the sound, accentuate the bass end or, "whatever takes my fancy." For the next track, he then experiments with the relative balance and positioning of the amplifiers, working on a sound to suit the song. Though it may take some time to set up initially the multiple amplifier arrangement, Chris says he finds he can adjust the sound quite quickly from track-to-track.

A fundamental point is that he is simply working on the amplified sound at source in the studio, rather than re-shaping it in the control room. "Therefore," he explained, "the guitar player feels like he's adding to the sound as much as I am, if you see what I mean. And it tends to work a hellova' lot of the time. It's really a massive sound, because there's the different phase characteristics between the microphones, there's spillage going down each mic, the whole hubbub generally makes it sound all marvellous. With guitars, the secret is getting a decent sound in a good sounding studio really and using nice quality microphones. A very simple experiment. Take a Shure *SM58* and a Neumann *87*. Put them on the same speaker, the same cabinet, just push the levels up and see the difference. The Shure is a tiny dirty kind of sound, the *87* is a clearer open sound. So that's another important part of it, the microphones you use and the placement of them. The majority of rock guitarists that I've worked with find that the best way to do it to it. It's a killer sound.

"When you use the experience with different types of music—that you don't normally associate with that type of guitar sound—you get a different hybrid of rock music, if you like. With *Thriller*, Eddie Van Halen started a whole new trend when he did that solo on *Beat It*. People forgot, with their synths and what have you, there was real music being made outside. On *Beat It* they just married the two together and that's what you got.

"At the moment I'm seeing more and more record companies about this sort of thing: they're asking how I can get the guitar up on certain acts that have already been recorded *and produced*, but now the trend's changed a bit with the Bruce Springsteens and the Bryan Adams. So it's now: *'hey! Guitar! Yeah! Wow!'*

"They're tripping over themselves. They don't know what the hell's going on—but they know they need to hear some more guitars. So they look down the lists. 'Ah! That long-haired Herbert! Get him!' I've been getting all these telephone calls and I can't believe it really."

Is there a similar general approach with vocals as with guitar?

"Yes there is. In the past few years I've had the pleasure of working with people who can sing in tune—roughly—and have some sort of character to their voice. When you've got someone like that who knows how to sing and isn't a complete Charlie, then it makes the job a lot easier. I like to get a nice valve Neumann *47* or *67* or whatever I can get at the time. I like harmonies, so if the song lends itself to them, then we'll go for it. You need to get character, melody, the whole bit, regardless of what type of music it is. It doesn't matter to me if it's a rock band, a reggae band or whatever. If the fella can't sing, he has to have something else to make up for it; the character, the lyric or approach. And there's quite a difference between not being able to sing and having that character. Unfortunately, a lot of people used to get signed up—it doesn't happen so much now—but they thought they were good because they had green hair or wore baggy trousers or whatever. But they never made it.

"You have to make sure the melody comes over and that's that. As raunchy as possible for vocals—obviously if it's a ballad it is another matter. But if a person can sing, expose the vocal for all it's worth: that generally—in rock music anyway—carries the melody."□

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STUDIOFILE

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The Barge, Little Venice, London

Control room Studio One

London's Little Venice, with the sun basking on the canal and its sleepy barges, the moorhens and ducks with their young charging round the various obstacles in their path and the occasional water traffic drifting slowly past is the last place in the world you would imagine to be the location of a Virgin studio. Nevertheless it is. The Barge Studios, one mile from Marble Arch is more or less tranquility personified. That is, until you actually get in to the studio proper where the work goes on with an intensity and 24-hour regularity which many a central London studio would be forced to envy.

The idea of building a recording studio on a barge may perhaps initially strike you as slightly eccentric, and you get the impression that this is indeed the case. The object appears to have been prompted more by a sense of fun than Abbey Road pretensions. This said, the Barge is an extremely busy facility with two studios which regularly work round the clock—obviously not as silly as all that.

The concept was that of Tom Newman who was tied up with Virgin at the time (back in the mid '70s). Studio Manager John Rowland told the tale: "Tom decided he wanted to row his own boat and that's exactly what he did. So he took over the Barge and turned it into a 'spit and sawdust', rather shabby, rather smelly place. He ran it as a hobby but in the end found that it was costing him too much."

Meanwhile, in 1976, John had arrived from Australia with experience as an engineer in recording studio, film, TV and location sound and was working at Studio G in London.

It didn't take long for him to decide that owning his own studio was the direction in which his ambitions lay, although the slight problem of money did seem to be a drawback.

"In 1977 I went into partnership with Tom Newman who had a boat, but terrible equipment. We had to gut the boat and start again. We even sold the 16-track and went 8-track—pulled the ad agencies and started to make quite a good living."

This state of affairs lasted for about two years when Tom Newman finally wanted to get out completely. The Barge was sold to Virgin in 1980. "I had my bags packed and everything, and was just leaving with a 'Oh you won't be needing me then' sort of thing, and they said 'hang about we will'!" So John stayed on as studio manager.

Once again the boat was re-gutted, re-designed and refitted. The reason for this was that although the previous changes had resulted in a great deal of business, the type of studio that they were had since become more popular and there were many other facilities which had subsequently sprung to life making the competition fiercer. In order to keep their full cut of the market, changes had to be made. The principle thing was to move up: "We became much more kosher; we went from Soundcraft to MCI. The Barge was originally founded on very little money and what was required now was a huge cash injection. Virgin had the money and it was a project worth investing in."

John sees the Barge as a 'cottage industry'; they are small and self-contained and although part of the Virgin corporation, they do not seem to have a corporate identity. One of the factors which appealed to him when Virgin actually took it over was that Richard Branson was living on a barge himself in Little Venice at the time and the arrangement they came to was that John would be directly answerable to Richard, thus cutting out the bureaucracy inevitable in a company the size of Virgin. "We've been improved without being swallowed up into the rest of the company. We are completely separate. For example we are the only Virgin studio, I believe, which is a member of the APRS. We just do our own thing."

There is a small voiceover studio with associated control room (Studio 2). The recording area doubles up as an isolation room for the main Studio, if and when required. The main recording area is fairly live, surprisingly roomy and houses a Bechstein 5½ ft grand piano.

Having travelled virtually the length of the barge you come to the control room for Studio 1. The treatment to ceilings, walls and floors is more or less the same throughout. "Because it is a boat there is no room for trapping etc. You just had to look at a confined space and work it best to suit clients.

"We're not like the Manor, but then we're not doing their kind of work.

"The first thing we did was to install skylights," of which there are two: one in Control Room 1 and one in Studio 1. Bringing daylight in was of optimum importance to John, not only to reduce the fatigue factor but also to bring in the Little Venice atmosphere. The walls are well padded with a pure wool covering. It was an exercise in sound-proofing rather than acoustics. The Barge simply doesn't allow room for trapping and all the usual gubbins.

"Normally building a studio you have to float a room within a room to achieve isolation, but we're floating already—the London Underground goes practically directly underneath us but you wouldn't know it. The water acts as very good isolation, and we have very little disturbance from the outside world."

The bottom of the boat was filled with 50 tons of concrete for two reasons: the curvature was setting up a resonance which had to be killed and it also acts as a stabiliser. Once on board, if you hadn't seen the water for yourself you wouldn't really be aware that you were on a boat.

The lower half of the control room walls beneath the water line is cut away for machine storage and seating, and covered in plasterboard. The ceiling is 8 in thick comprising grille cloth/glass fibre/chipboard. The upper half of the back wall is covered with mahogany panelling and there is access to kitchen facilities located directly behind here: fridge, cooker, expresso coffee machine, et al.

The Tannoy Lockwood monitors are bricked in with breeze blocks covered in sculpted plaster, on either side of the double sliding glass doors which give on to the studio area. The daylight, of which there is plenty coming from the skylight, is further enhanced with a few thoughtfully placed spotlights.

The control room is approximately 13×14 ft and the centrepiece is the MCI *400* series mixing console partnered by an Otari *MTR90 MkII*-multitrack machine. Mastering is catered for by three Studer A810 machines and for copies, two Aiwa *F770* cassette machines and an ITC triple stack NAB cartridge machine for broadcast cartridges.

Plenteous effects, housed in a rack beneath one of the monitors include an Eventide *H910 Harmonizer*, dbx *160* compressor/limiter, a pair of Audio + Design *F760 Compex* limiters and an *E560* selective limiter, AMS *DMX15.80S* digital delay processor, Eventide *Instant Phaser*, two Kepex noise gates, a *Scamp* rack with six noise gates and ▷

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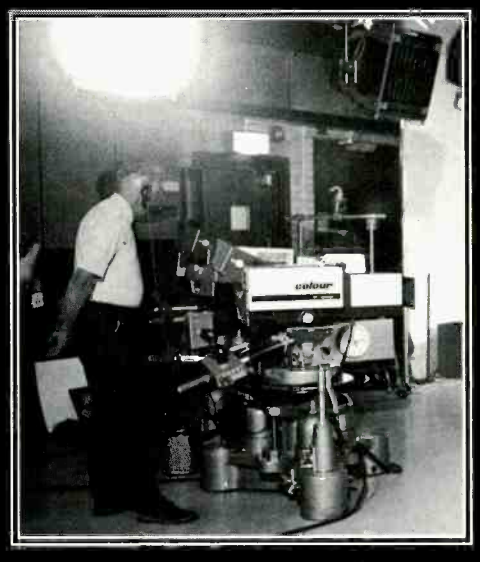

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STUDIOFILE

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The Lockwoods are powered by Amcron *DC300A* and reference monitoring is on Auratones. "We've also got a Technics turntable and a Chubb fire extinguisher, and we have stabilised mains throughout," concluded John. The equipment is maintained one day a week by John Rutledge who is also, naturally, on call for emergencies.

Control Room 1 is divided from the recording area by double sliding glass doors which are approximately 2 ft apart and between which the Beyer *DT100* headphones are stored. The studio has received much the same sound-proofing treatment as the control room. The 18 in chipboard/glass fibre walls are cut away beneath the water line, for storage of mic stands and the like. Overall the room feels fairly live, although the piano end is dead. "The skylight and the glass doors combination actually give an incredibly live sound. If you move the mics back 2 ft it sounds like eight.

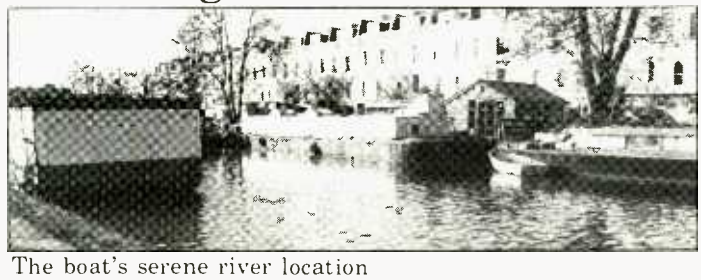
"Because it is a boat we don't have much room for isolation screens and the like, so we don't bother." Fair enough.

This area has had various changes over the years culminating with it going back to its original form. The voiceover/Studio 2 room was at one time extended using locking glass doors "which were guaranteed soundproof—they weren't, and that's why we took them out again". There is, however, a floor to ceiling glass window in the smaller room allowing clear visibility into Studio 1 if and when required.

The boat has thick carpet floor covering throughout its length and the studio is given a nice touch with the spotlights assisted by ornate wall lamps which you would be less surprised to find in a Victorian drawing room.

"I think we've made good use of the space. Yes the studio is small, but other studios are small too. We've recorded a 45-piece orchestra in here." Sorry? "Yes, of course. We just bring them in in groups of five, one after the other!"

The Barge continued



The boat's serene river location

The corridor on to which Studios 1 and 2 and Control Room 2 all open, with its mahogany panelled walls with Piranha pine trims, has a mic box so that it may be utilised as an extra isolation facility for vocals and guitar. The only slight drawback is that the 'bathroom facilties' also give on to here. "This corridor is so that people don't get embarrassed when they go to the loo. We're famous for the grafitti in there by the way—for example Gordon Jackson wrote Love You All. The rest are maybe a bit more risqué. But we encourage all our clients to write something in there." I decided I wouldn't risk a look!

Control Room 2 is approximately 9×6 ft with a recess to one side for the tape machines. Featuring porthole with in situ duck and moorhen this is a small but comfortable workplace. It is used for the bulk of the Barge's commercials, radio plays, talking books and copying (broadcast cartridges and protection copies) type work and has facilities to suit.

The desk is a very simple Alice broadcast console with two mic and three tape and three cartridge stereo channels. Tape machines are three Studer *A810*s and two Aiwa *F770* cassettes. Monitoring is on Tannoy *Devons* ("which are really domestic speakers" but then the room is very small) powered by a Quad *405* and reference monitoring again on Auratones. Ancillary equipment consists of two Rebis *RA402* parametric equalisers, four Audio + Design *F760 Compex* limiters and there is also a Thorens record deck.

Capital Radio makes a lot of use of this studio, not having a drama department of their own as such, they put a lot of their drama recording work out. The monthly play is usually done at the Barge, 50 per cent of the soap opera Nicola Johnson was recorded here. Other drama type work has included the Dan O'Hara series which was syndicated worldwide.

Other clients include the ad agencies: "We also do a lot of commercials work for abroad. I did a whole commercial in Gurkhali once." What? "The animation companies come here quite a lot too, for instance we did the soundtrack for Henry's Cat, a BBC cartoon."

The main point about the Barge is that it is a unique facility—fun while extremely professional. "If we had been setting about building a studio with acoustics and everything in mind we would never have done it on a boat in the first place. If you start bringing analysers and all that in, or people who are used to The Townhouse and places like that, and start saying 'Why haven't you got an SSL?'. . .forget it! We're not that kind of act.

"The kind of thing the Barge is best at is today's music: so much of it is DI'ed or recorded one thing at a time with a mic up against it as opposed to full orchestra, and the studio doesn't really seem so small. It's just comfortable. We are not concerned so much with high dynamic range, but then commercial radio tends to be more compressed anyway. We took it up river once to record the organ at St Mary Magdalene Church."

The studio operates on a staff of four: John as studio manager and engineer, Jill Landskroner, engineer, Cathy Hodges reception/bookings/administration, and Francois Taviaux, "resident French person and assistant engineer". In addition there is a band of freelance engineers. The business is split practically 50:50 between music and other and it is by the implementation of a rather novel psychology that the Barge regularly works around the clock. Rates are reasonable for London per hour during the day. However, in the evening when recording studios would normally go up to fifth gear and overtime, the Barge changes down to third. The result—a lot of work.

"Advertising people are prepared to pay the going rate and they are essentially morning people, so they come during peak hours. Music people are fundamentally night people and they are usually the ones who are working within a restricted budget anyway. It seemed silly to have the Barge sitting empty for 16 hours out of every 24 and just servicing the advertising industry, so that's what we did, and we work a 24-hour day. For the 'out of hours' sessions we use freelance engineers.

"We started out doing demos and the balance has swung much more to doing masters now, with a lot of music work. We are sort of grown up now. Quite a lot of mixing is done here too—it's an emotionally nice outfit, not part of a large complex. We even get snowed in in the winter when the canal freezes, and the ducklings come strolling by in the spring."

The piano does get used regularly and is tuned once a week by Roger Pick of Studio Piano Services.

The area beyond the confines of the canal is not altogether without its attractions either, the grand buildings and plentiful foliage. Amenities are also in abundance—you can go on a boat trip up the canal and there are lots of restaurants and pubs.

"We have barbecues on deck when it's sunny. It's just more casual and peaceful than in the West End. It's friendly not a factory," he alliterated, and amidst amused chuckles at the attempted seriousness of this article, John brought the interview to a close.

Janet Angus

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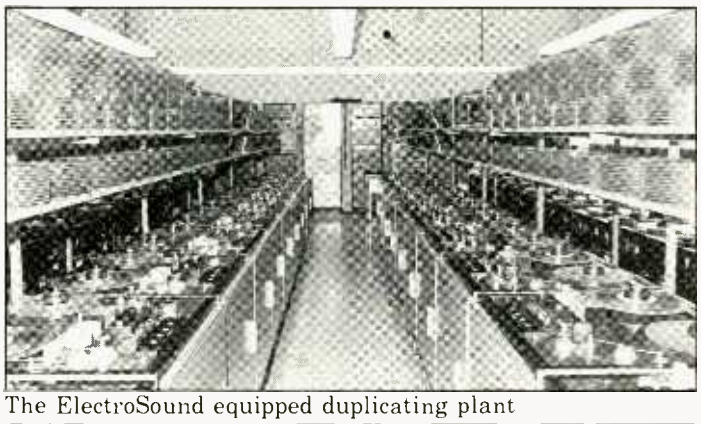

The ElectroSound equipped duplicating plant

While in England talking book and story cassettes are enjoying a new found popularity, as a quick look in any newsagent or record shop will show, in Germany sales for this type of programme material exceed 5% of total record sales which in terms of volume is over 10 million units per year, the majority of which will be on cassette.

This success is due largely to the efforts of one company, Miller International. Located near Hamburg in West Germany they produce 12 million cassettes a year of which 70% contain spoken word material, 20% is budget music and the remaining 10% German folk music.

The Miller catalogue, which is released under the Europa and Signal labels, contains children's favourite fairy tales and stories including Alice in Wonderland, Heidi, Pinocchio, Popeye, Sinbad the Sailor etc. The list of authors reads like a 'Who's Who' of the publishing world including Enid Blyton, Edgar Wallace, Dan Shocker, Perry Rhodan and so on. At any one time the catalogue contains about 450 titles with 100 new titles being added each year and less popular ones deleted.

The company was started in 1961 by Dave Miller (an American who had already gained a reputation for producing budget records in America), in partnership with Dr Andreas Beurmann and Dr Wilhelm Wille both of whom had degrees in music and were experienced recording engineers. From the very beginning the company, under the commercial direction of Harald Kirsten, adopted an aggressive marketing policy and produced programme material which reflected the average German taste at a price the consumer could afford. But it would be wrong to assume that the success of the company is due just to commercial ability for behind the scenes lies a wealth of talent in the fields of recording and duplicating.

Back in 1961 the initial releases were culled from Dave Miller's USA catalogue while Drs Beurmann and Wille began to record local product designed to suit German taste and giving the company a unique product to sell. The company owns two 24-track studios and today you will find that the majority of the Miller catalogue has been recorded in their own studios.

Most of the spoken recordings are produced at the Hamburg studio by Dr Beurmann's wife Heikedine using well known German actors and children from the local drama school. The studio is situated in a large terraced house close to the Aussenalster lake near the centre of the city, with the top two floors being used as a flat by the Beurmanns.

Considering the number of programmes being produced each year the size of the studio and control room is modest, each room measuring no more than 6×6 m. Small it may be, but no space is wasted and everywhere you look you come across innovation in one way or the other.

A bank of Uher reporter tape recorders are set up on a high shelf so they can provide sound effects using tape loops of various lengths. Dr Beurmann explained that the more usual cart machines were not being used because with the open loop one could edit faster, thus speeding up production, the quality was higher and at the time of purchase the Uhers were cheaper.

Incidental music for the story cassettes is composed and created by Dr Beurmann himself who, in addition to his activities at Miller International, is a lecturer in music at Hamburg University and an acknowledged expert on synthesised music. Despite the size of the house, one of the reasons that the speech studio is so small is because a large part of the building is taken up by a large collection of computers, synthesisers and some rare musical string instruments, yet another love of this versatile composer, lecturer and musician.

While he was studying at Gottingen and Köln universities Dr Beurmann earned his keep by building tape recorders and selling them to the university who could not obtain them elsewhere at that time.

Shortly after leaving university Dr Beurmann set up a recording studio in the Hamburger Musikhalle which has superb acoustics and began to record the music that was performed there. The culmination of this work was a series of records entitled *101 Strings* which he recorded in collaboration with Dave Miller whom he had met after a lecture in Hamburg. The recordings proved to be very popular, especially in the USA.

Like her husband, Heikedine Korting is a very talented lady, having sold 100 million records and cassettes including 50 gold records since she started producing for Miller. To demonstrate their gratitude the directors of the company presented her with a Golden Europa Statue at a special ceremony at Hasselburg last year.

Back at the present studio you will find an abundance of instruments which are capable of producing a wide range of electronic music including a *Synclavier II* complete with 20 Mbyte Winchester, expandable to 80 Mbyte, Kurzweil synthesised piano, 16-track analogue recorder, etc. Dr Beurmann can enter into the computer and print out at will thus allowing the composer to concentrate on the music while leaving the computer to get on with the donkey work.

In many ways the studio is more akin to a radio studio although it has been used from time-to-time to record small music groups. As for the list of artists who have passed through its doors it would seem that anybody who is anybody in German radio has either recorded a story, told a fairy tale or recited a nursery rhyme for the Europa label at one time or another and while they may not be well known outside German speaking countries, many of them are household names in Germany.

A few years ago Dr Beurmann bought an old castle in Holstein and started to renovate it. Today the great hall of Hasselburg Castle is used as a concert hall and as the second recording studio for the Miller organisation and it ▷

WHO'S USING SOUNDTRACS CM4400?

Steve Glen chose the CM4400 for his studio 'The Chateau'. Some of the artists which benefitted from his songs and productions are: Hot Chocolate, Sad Cafe, Suzi Quatro, Phil Fearon & Galaxy, Bucks Fizz and Roger Daltry. Steve's experience in recording led him to the obvious choice, the CM4400.

SAV Studios using the CM4400 in a commercial situation, Tony Frossard and Marc Lacome use the 'Q' Lock Events Controller to trigger the 30 routing patches of the CM4400 speeding up complicated mixes often used in their type of work.

Richard Harvey owner of the Snake Ranch Studios. Richard chose the CM4400 for his own private studio. He found the internal computer which can be used to route and mute the equalized section of the monitors, as well as the channels, into the mix made the CM4400 the most advanced console available even at 3 times the price.

Blue Weaver As a member of the Bee Gees, Blue has recorded in studios all around the world and definitely knows what he wants from a mixing console. Blue uses a Fairlight Computer Synthesizer and finds the CM4400 not only complements his electronic instruments but also has a great sounding E.Q. for the vocal overdubs.

The CM4400 features:
Internal computer allowing 30 different mixes to be pre-programmed.
Pre-programmed triggerable routing patches.
RS 232 Interface for personal computer to display routing.
Up-dateable software.
The CM4400 is always up-to-date.

THE CM4400 BY SOUNDTRACS

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STUDIOFILE

is here that some of the music recordings are produced. The list of performers and audience members is long and famous; performances have been given by Hermann Prey, Rene Kollo, the King's Singers and the Warsaw Chamber Orchestra all of whom have played to a wide variety of politicians, film stars and on many occasions performances have been televised.

The plan for this former stately home is renovation of the old barn to turn it into an opera house. The Beurmanns do not lack ambition and it shouldn't be long before we hear Dame Kiri Te Kanawa at Hasselburg Castle. And I wonder if Miller International will add opera to their repertoire at the same time.

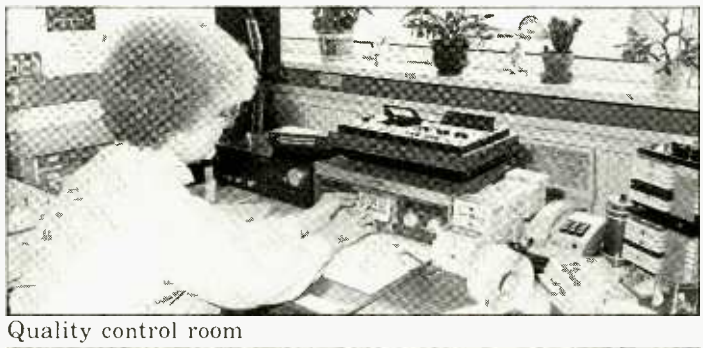
In 1967, after outgrowing the original production facility in Hamburg, the company moved into a new factory, offices and warehouse in Quickborn which is some 14 miles north of Hamburg and by 1969 (the year MCA bought the company) they were producing 10 million records a year from 20 Tracy-Val presses.

Cassette production started in 1970 and Miller soon realised that this should be their direction. As the demand for cassettes increased so the demand for vinyl decreased and by December 1983 with record sales having fallen to below 1% of their total output, the last few record presses were removed.

High speed duplicating is carried out on 50 Electro Sound *6000* slaves which run at 32 times normal speed from six loop bins. The system is set up so they can duplicate up to five programmes at once with a maximum of 20 slaves from one bin. Hans Jahn, operations manager, explained the slow duplicating speed (most modern systems run at 64:1) by saying that with this system they had a good quality level and in his opinion the lower speed was better for the tape.

The recording begins its journey through the manufacturing process at the mastering stage where the ¼ in stereo master is transferred to the 4-track ½ in loop bin master which is recorded on Scotch *256* tape. If necessary the mastering

Miller International continued



Quality control room

Hans Jahns and Uwe Carteus in the mastering room

engineer, Uwe Carteus can treat the recording as it is transferred although in practice he prefers to avoid any form of treatment apart from Dolby *B* noise reduction.

The mastering room is well equipped and uses a Telefunken *M21* for the stereo masters and *M15* for the loop bin master. The room itself is not quiet but this is on a par with other duplicating establishments. (Personally I find it useful to have the noise floor of the mastering room and the quality control assessment room at least 50 dB below the normal listening level which in practice would equal about 30 dBA.)

Also in line with many other duplicating houses Miller are currently evaluating digital recording for transfer and long-term storage of their stereo masters and to this end have purchased a Sony PCM *701* and RTW PCM *AD2* digital/analogue interface.

Once the loop bin master has been made and checked the recording is ready for duplicating at high speed. For all the Europa product and a large proportion of the Signal work Miller use Agfa *PE 619* with BASF chromium dioxide being used for the highest quality classical recordings.

The all-important record heads used on the slaves are of the mono crystal type, made by Saki of California and are quite capable of achieving enhanced results when using chrome tape. The duplicating room is air-conditioned and the temperature is maintained at a constant 20°C and at 50% relative humidity.

While the bulk tape is supplied on the narrow hubs it is transferred to NAB spools after duplicating and the engineers at Miller are currently in the process of designing and fitting packer arms which will allow them to wind hub to hub.

After duplication each pancake is checked for audio quality on a Studer *A80* QC machine, which can play the tape back in either direction, then the pancakes are sent to the winding department so the tape can be loaded into cassette housings.

For this part of the process the factory uses 24 King *760* and four King *790* cassette winders which load the tape into ICM or Oberramstadt housings. The winders are arranged in banks of five using one person to operate the machines while a second checks quality on a continual basis.

Next comes the printing stage where the cassettes are passed through an Apex printing machine, which will print details of the recording directly on to the label area of the cassette. This system offers several advantages over the more traditional paper labels such as shorter setting up times and increased security because the special ink etches itself into the surface of the plastic.

Following printing the cassettes are sent to the finishing department where the Illesman boxing machine places the cassettes inside a library case with an insert card and a leaflet giving the end purchaser details about the rest of the range, plus a self-adhesive sticker which can be placed on the outside of the library case. The whole finishing operation takes just over 0.5 s. A second machine wraps the library case in a plastic film.

A great deal of care and attention is given to presentation. For example the library cases are coloured to indicate different classes of product.

Two new product ranges have recently been introduced to supplement the Miller catalogue, the first is the combination of a children's reading book and audio cassette which is also becoming increasingly popular in the UK, and the second is games for the Atari *8000* and Commodore *64*, the two most popular computers in Germany, with both versions of the same programme recorded on the same cassette.

Miller International has a team of highly skilled people with many diverse talents who work closely together towards a common purpose—to produce the right product at the right price and at the right time. 180 million products later and an annual expansion of above 5% says that they are still getting it right and all without relying on orders from the major record companies.

Mike Jones

Miller International, Quickborn, Hamburg, West Germany.

June 1985 Number 5

ECHO TIMES

THE STORY SO FAR...

A.M.S. (Advanced Music Systems) is a company well recognised for providing the professional audio and broadcast industries with one of the most comprehensive range of digital sound processing systems available. Within the product range already marketed by A.M.S. exist both hardware and software which have made possible the sampling, editing and transposition of audio material. These basic facilities have already had a significant impact on popular music production as well as on film and video post production. The attractions of being able to sample either live or prerecorded sounds digitally, then rapidly and easily to electronically edit that information are obvious. In popular music, any sample whether drum beats or even complete backing tracks, can be captured, edited and triggered on demand by such external sources as programmable music computers or simply by an audio input.

In the case of film or video, either the existing soundtrack or an events controller can be used to accurately synchronise a sampled and edited sound effect to the picture. These techniques are being employed now and are considered highly effective – in addition to providing significant time savings over conventional methods. This particular sampling technique, has been pioneered by the LES (Loop Editing System) on the A.M.S. DMX 15-80S.

MULTI-SAMPLE RESEARCH BEGINS

In late 1982 A.M.S. completed development on a Digital Preview Editor, the DMX 16E. This system was originally designed to work in conjunction with digital audio recorders to allow trial edits to be performed at variable speed, or by reel rocking, with programmable cross-fades.

These trial edits would be performed with the magnetic tape stationary.

The DMX 16E could support over 30 seconds of audio storage, and with the growing interest in LES experimental work was carried out on the system to investigate multiple sample storage and cataloguing. In June 1983 a highly modified DMX 16E was demonstrated to capture, edit and trigger multiple samples stimulating yet further interest in a

Digital Recording on Hard Disc – from the pioneers of Loop Editing.

product which was rapidly turning into a solid state digital audio recorder.

A.M.S. AUDIOFILE IS BORN

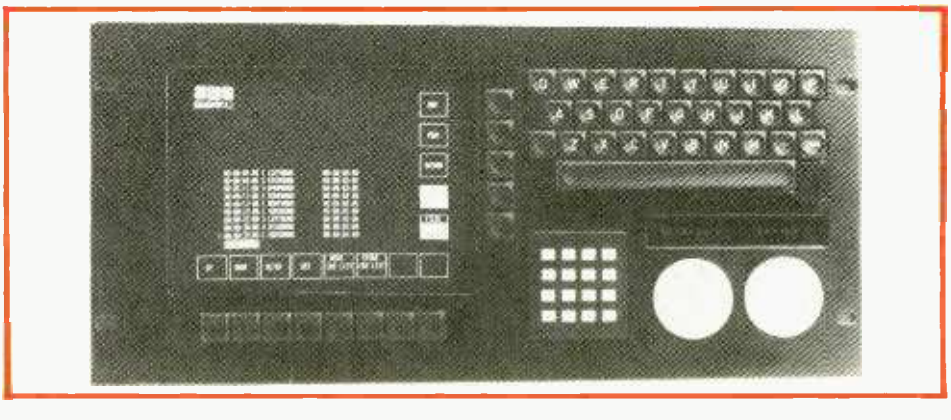
AudioFile was shown in prototype form for the first time at the AES in Hamburg and the NAB in Las Vegas and is the result of over three years' research and development at A.M.S. into a hard disc based digital recording and playback system. AudioFile is capable of being configured in several different ways allowing it to perform completely different functions.

In its simplest form, AudioFile can capture samples of sound, edit those samples and store them in a non-volatile form for recall and playback at any point in the future. This is the first major difference from the DMX 15-80S where samples are lost on power-down. Complete stores or files of sound effects can be recorded, edited, catalogued and saved within the AudioFile memory.

Secondly, AudioFile can have samples assigned to any of its outputs for multiple synchronous triggering. This triggering can be effected either manually, by audio input, by an events controller or by using AudioFile's built in SMPTE time code reader/generator. AudioFile can also be configured as a multitrack digital recorder – however, in this form it offers significant advantages over the conventional magnetic tape machine in that it is able to advance or retard any individual "track" with respect to any other. Tracks on a conventional multitrack recorder become digital files on AudioFile and the storage capability of AudioFile means hundreds of files may be stored at any one time and delivered to any one of AudioFile's outputs on cue. AudioFile can run independently against its own internal clock or it can be locked via its timecode reader/generator to film, video or other magnetic tape recorders.

THE TIMECODE DIMENSION

A main advantage of using AudioFile in synchronism with any other machine is that the "elastic band" effect of having mechanical tape transports locked by a synchroniser is completely eliminated. On looping video, the audio will be heard in exact time with the picture virtually as soon as the video settles into play. Although the number of simultaneous tracks available in the "multitrack" form is limited at present, AudioFile with its eight existing outputs has many immediate applications. Once the fundamental attractions of AudioFile have been accepted, it is possible to see that the system can "invisibly" provide additional digital audio "tracks" by locking it to a conventional analogue or digital recorder. Alternatively, with specialised



software, AudioFile can eliminate the need for a multitrack recorder, synchroniser and desk automation system when track laying audio against video.

DIGITAL EDITING MADE EASY

Audio File can also be used as a digital stereo editing system. Because this editing is fully electronic and has inherent random access it can be conducted on a single machine with an accuracy of microseconds with totally unprecedented speed and flexibility.

AudioFile is working now and Winchester Disc Storage of audio is here to stay. A.M.S. with their successful range of digital audio processors have long understood the advantages to customers of updatable hardware and software – the absence of second hand A.M.S. units of any kind speaks for itself. A.M.S. are committed to making AudioFile the most versatile and upgradeable audio production workhorse available.

Specifications:

ELECTRICAL:

Digital Coding:	16 bit linear PCM
Sampling rate:	48kHz standard, (switchable 50/44.1/40kHz)
Frequency response:	20Hz to 20kHz (48kHz sampling)
Dynamic range:	Better than 90dB/ ref full output at 1kHz
Inputs:	10K electronically balanced
Outputs:	100R compensating electronically balanced

MECHANICAL:

Processor/first disk module:– 5U rack mounting
Disk Expansion module:– 5U rack mounting
Display/control surface:– 5U rack mounting

CONFIGURATION:

Inputs:
Modular/ 2 inputs per module
Outputs:
Modular/ 4 outputs per module

INTERFACES:

RS422 control for peripheral equipment
SMPTE reader/generator
Optional control for AMS audio processors (Reverb, etc.)
RS422 control of all AudioFile functions

CONTROLS:

High resolution (800 x 480 pixels) graphics display
13 function keys/ software definable
2 digipots for simple parameter setting/ reel rocking, etc.
Software/ application dependent starburst LED labelling for digipots
Built in alphanumeric pad for quick titling

CTS.! DSP.! AMS.!

CTS studios in London became fully operational with their Neve DSP console earlier this year. The console is digitally interfaced to the Sony PCM 3324 and as can be seen from the photograph opposite, CTS's choice of digital audio processors is A.M.S. When questioned as to why the DMX 15-80S and the RMX 16 ended up mounted in the DSP chief technical engineer Henry Edwards commented – "They are used all the time so it is the most natural place for them!"

Tony: "The great thing about the A.M.S. is that it's here to stay."

Peter Buick of Sound Engineer Magazine talking to Tony McGrail of Terminal 24 Studios.

PEOPLE IN THE KNOW

R-e/p (SB): I'm curious about one snare drum sound in particular: the title track of Springsteen's Born in the USA. *It has the impact of a .38-caliber revolver going off. How did you capture that?*

BC: What I did for a few songs on that album – and I think that was one of them – was to use the great sound I'd got from the stereo overhead mikes. The snare sound was amazing, for one thing because Max (Weinberg) tunes his drums really well. The snare drum mike itself wasn't happening, maybe because it was too close, but the overhead mikes were picking up this "Glyn Johns" kind of snare sound. So I just sampled that into an A.M.S., and it became the predominant snare drum sound, although it is mixed in with the original snare drum track. It was easy to do because there are no other drums playing during the intro part.

R-e/p (ML): So you're triggering that sound out of the A.M.S. DMX 15-80 for each snare beat?

BC: Yes, any signal you feed in will key it. You can also put little vocal snippets into the A.M.S. and key it off something like a bass drum. On the intro of the Hall and Oates album, there are some vocal bits, singing some Spanish words. By keying one off the bass drum and one off the snare, we have these little vocals answering each other exactly in time with the Linn Drum.

Bob Clearmountain, interviewed by Mel Lambert and Sam Borgerson for R-e/p.

"If I walk into a studio and I don't see an A.M.S. digital reverb and an A.M.S. digital delay, I start having my suspicions about the place. I use the harmoniser function on the A.M.S. DMX 15-80S delay system, plus delays and I always use their reverb if I can't use natural reverberation. Other ones are good, but they always sound a bit plonky – they've got a sort of tone on them that I don't like. The A.M.S. one is superb – fully equalised top and bottom."

Colin Thurston, interviewed by Jane Angus in HSR Magazine.

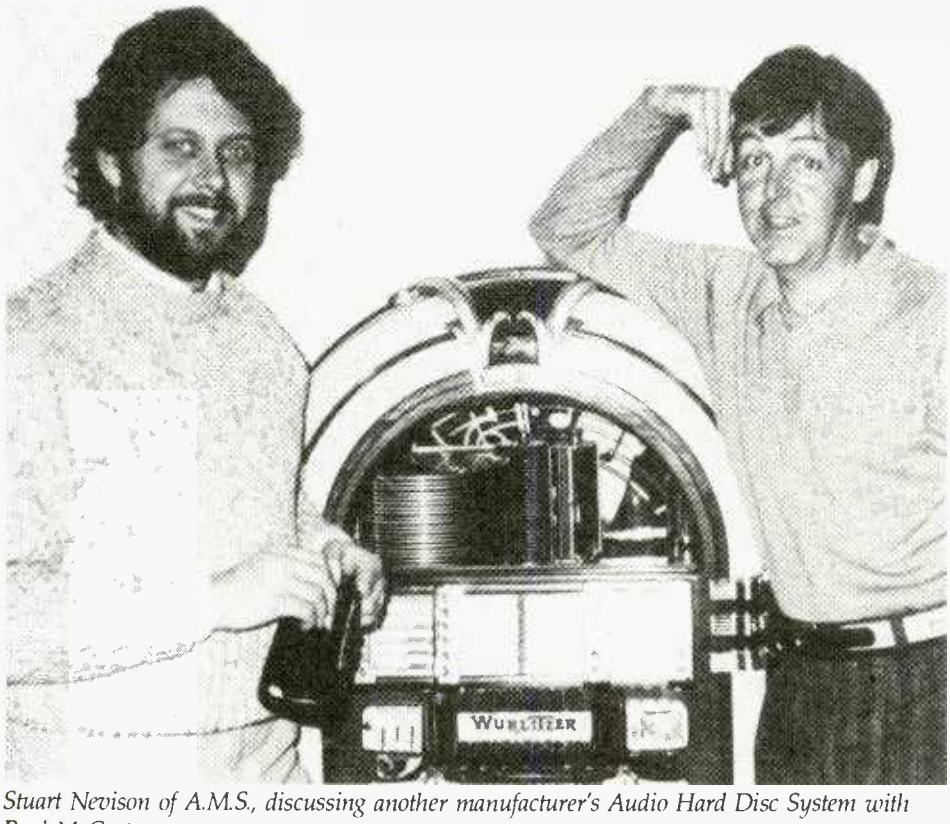
On the effects side they bought a 6½ second A.M.S... They chose the A.M.S. because it was the only one which would do the job they wanted.

A.M.S. would like to take this opportunity of passing on their sincere congratulations to Humberto Gatica on winning his recent Emmy. Humberto was interviewed in Echo Times No. 4 and we believe since then he has purchased a further RMX 16 digital reverberator.

1985 QUEEN'S AWARD

Advanced Music Systems are very pleased to announce that on the 21st. of April 1985 they were advised that they had won a further Queen's Award to Industry. This award is made to fewer than 100 companies each year to recognise significant levels of export achievement. A.M.S. wish to take this opportunity of thanking all their overseas distributors whose individual efforts have resulted in this extremely prestigious award being bestowed on the company again.

Paul McCartney



Stuart Nevison of A.M.S., discussing another manufacturer's Audio Hard Disc System with Paul McCartney.

Paul McCartney needs no introduction, however, one of his lesser claims to fame is that he owned probably the third unit ever manufactured by A.M.S. Although Paul still maintains he is not technical I do believe that it is obvious from this interview that he understands how to get the best out of his A.M.S. units.

Paul McCartney now owns a DM 2-80, an RMX 16, and two DMX 15-80S systems. One DMX 15-80S is fitted with 14 seconds of delay and a keyboard interface whilst the second has 6.4 seconds. Both units have dual pitch changers and the de-glitch option as standard.

Paul McCartney: It's great though! It's fabulous! – We've just been talking about A.M.S. before you arrived, it's really a fairy tale in a way.

A.M.S.: Do you remember that first DM 2-20 Flanger?

P.M.: Oh yeh and I remember our first meeting at Abbey Road. We were very busy and I think you had explained that you had this Flanger that did this and that to a couple of the roadies. You were in studio two and I remember coming down the big stairs in 2 to see what was going on. I'm not technical and I'd just used equipment for what it would do but it did seem that the prototype you'd brought down looked and sounded good and had something together. So I thought the best I can do to give this fellow Northener an "in" is announce in a loud voice whilst other Abbey Road staff were around that I was having one and hope they'd do the same for you.

A.M.S.: Well, if we didn't say thank you at the time we had better say it now – because that certainly worked and I think EMI Abbey Road had the fourth DM 2-20.

P.M.: The next time I came across A.M.S. was when I realised people were using this thing and when I said whats that and got the answer – it's an A.M.S. – I said I know that don't I? Oh it was them!!! Much more recently I've got into 12" dance version singles and that's when it's become really interesting. When we had an original recording that lasted for 4 minutes but we needed 8 what we would do is invent something that could fit in, lock it in the A.M.S. and finally feed it in. We were creating new bits of tape with the A.M.S. It was great, what I would do is if I wanted to ad-lib a bit of blues singing over some chords I'd just have a mic run out into the studio and sing what I felt like and lock it into the unit – edit the sample and trigger it out wherever I wanted it in the mix.

A.M.S.: Did you use any of the other functions of the DMX 15-80S?

P.M.: That's another great thing you can do. By using the pitch changers you don't even have to have samples of the correct tempo. We lifted vocals from ballads that were made up of swimming big block harmonies that were completely the wrong tempo for where we wanted to drop them in, so we'd use the pitch changers in the 15-80S to correct pitch and then drop them in. You can even do that if you find that you've got a set of complicated harmonies early in a song that you just can't get exactly the same feel into later in the song. In fact I recently did that with an American producer on a complicated guitar part – the first verse was really where I'd hit it, other verses although good we both knew just weren't up to the first – so we lifted the first verse.

A.M.S.: That's using A.M.S. units as a pretty clever production tool but did you use it purely for effects at all?

P.M.: Oh yeh, I had a lot of fun using timecode and noise gates to trigger edited samples from the unit. That can be used to do something that people have always been doing in pop music production and the "hit record scene" – and that is generating something that catches your attention. The sort of thing Trevor Horn is doing now, the Beatles did ages ago the difference being that in the early days we did it with rubber bands and sealing wax and now as we move further into the computer age a lot more possibilities exist.

A.M.S.: So how do you see A.M.S. systems fitting in?

P.M.: In truth George Martin and I have just worked on three albums together – Tug of War, Pipes of Peace and Give My Regards To Broadstreet. The last thing we did out of all that recording was the 12" single of No More Lonely Nights. What was really great was that working with A.M.S. units I certainly felt as excited with the kind of possibilities as we had in the very early Beatle days because we thought anything was possible. We used a lot of sampling, resampling and even sampling material from other tracks. I think it is fair to say that out of all those three pieces of work I found that 12" version the most exciting and that did coincide with the fact that we got most heavily into the A.M.S. on that particular single ■

Not too many years ago Hugh Padgham was driving a van for a hardware store when he made a delivery to what is now Farmyard Studios in Little Chalfont. To say this delivery and chance meeting with Rupert Hine and Trevor Morace of Farmyard changed Hugh's life is something of an understatement. Hugh Padgham's career has now been in full swing for quite some time and his mark has been left on many of rock's major works, including material by Peter Gabriel, XTC, David Bowie, Hall and Oates, The Police, Genesis and Phil Collins. As this article is being written Hugh's most recent piece of production is at number 1 in the UK album charts – No Jacket Required, by Phil Collins.

Hugh Padgham: My first job was as a tape op at Advision Studios in 1973/1974. I really didn't last long and I was laid off for being incompetent – but that was fair enough because there just wasn't anybody to teach me the ropes. I then got a job at Lansdowne Studios where I stayed for 5 years and looking back that period was very beneficial for me because I got involved in every sort of recording – from Jingles to Jazz, pop, rock, strings and even small orchestras. The team at Lansdowne were fastidious in their approach to recording and that definitely rubbed off on me. In my summer holidays I did live sound on tour for Rupert and Trevor's band Quantum Jump and that was a lot of fun. I eventually got a job at Townhouse during its very early days – I always feel very good about that late 70's period when the Townhouse had the first SSL in London and probably some of the first A.M.S. units as well.

A.M.S.: So was the Townhouse the first place that you came across any A.M.S. equipment?

H.P.: Yes it was. This was even before the DMX 15-80S had been introduced and I can remember using the mono DMX 15-80. That very unit is still sitting in the rack at Townhouse and I still use it. I love the regeneration filter that was on the old mono units. For me, probably one of my most exciting uses of an A.M.S. delay line was during sessions with Hall and Oates on the Maneater track. There was a sax solo in the middle that I didn't like – there was the odd sax phrase and then a huge gap till the next phrase. I thought, I know how to sort this – Electric Lady had a good amount of delay in their A.M.S. so I fiddled around with the first sax phrase and got it to repeat in the gap. I think the result was really great.

A.M.S.: Is it possible to say exactly what it is you like about the DMX 15-80S?

H.P.: What's so wonderful about using an A.M.S. is you do get out exactly what you put in. On the new Phil Collins album most of the vocals employ the 15-80S with a 1.007 pitch change and an 11 or 12 millisecond delay – it's clean and it really suits his voice. The unit is brilliant for turning something mono into a big fat stereo sound. Again with reference to the No Jacket Required album we took the Earth Wind and Fire horn section and placed the original sound in the centre and the two outputs of the DMX 15-80S panned left and right. You end up with a really fat sound with the same quality of sound in the centre and on the right and left – you can't do that with any other system. I must admit, it is horses for courses and I can still find uses for tape delay when even analog degeneration can be appealing.

A.M.S.: What are your feelings about the RMX 16?

H.P.: What I love about A.M.S., and also SSL, is they do seriously consider the "art" side of the business and it isn't just white coated people inventing a piece of equipment that they haven't a clue personally how to use. It is refreshing to feel that there are people genuinely interested in the art and I remember a phone conversation with A.M.S. who quizzed me about the now legendary "Intruder" drum sound on Peter Gabriel III. The result of that call was obviously the Nonlin program in the RMX 16. I would say A.M.S. has influenced modern day music to a very great extent with the RMX 16 – particularly with the Nonlin and Reverse programs. Those programs are so recognisable and you hear them everywhere – a lot of people would be very lost now without an RMX 16 I can tell you!

A.M.S.: Does that mean you'd be lost without an RMX 16?

H.P.: I certainly couldn't do a session without A.M.S. units! I couldn't walk into a studio if they didn't have A.M.S. – it would be like someone taking off one of your arms! A.M.S. have undoubtedly changed the face of modern music.

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A CUSTOM MOVING FADER SYSTEM

N P Petersen of NP Elektroakustik AS describes the development of a moving fader automation system for the Danish film industry

As a manufacturer of professional sound equipment for radio, TV and film studios, a potential client asked us to develop and build a large console for the processing of film sound. A basic requirement was that three operators should be able to work side by side as music, dialogue and effects are processed simultaneously in the final mix.

Film sound is often prepared by using the so-called rock-and-roll method. The synchronised film and the sound tapes are rewound and played again and again over sequences of maybe five or 10 minutes in real-time. During these sequences the sound image is mixed and balanced until the desired result is achieved.

The final result is obtained by an almost endless number of trivial operations, the main job being the repetition of numerous fader settings—and such a task urgently calls for some kind of automation—if at all possible.

Due to the obvious weaknesses found in the VCA-based solutions, our proposal to use motor-driven faders was gladly accepted if it was possible to avoid the former disadvantages of restricted movement and lack of speed and precision.

Part of the philosophy was also to build a system where the user is allowed to concentrate on his creativity and not be forced to think or act in a 'computerised' manner. This meant the absence of keyboard and VDU as the intention was to exploit the benefits of advanced automation in such a way, that normal handling of faders and knobs would be sufficient communication between the operator and the system. For this reason we chose the following way of developing our own automated fader system.

With a system requirement of up to 64 addressable positions of which 62 may be motor-driven faders it was evident that severe time problems would occur if use of a single processor system for total control was contemplated. Sixty four positions needed to be addressed and a full range of control data read in and out for each film frame at a rate of 25 to 30 per second. The calculation and control of motorspeed and acceleration as well as the actual and the new position of every fader must be handled within a period of 0.5 ms in total—not long when dealing with a mechanical system demanding a 100% control of all parameters.

To cope with the problem we have developed our own method, demonstrated in **Fig 1**. The following units are shown:
(a) fader module used in channels and as a group and master fader;
(b) unit processor attached to each addressable position;
(c) interface unit joining the system processor to the system;
(d) status unit controlling main functions of the system;
(e) timecode generator;

FIG 1

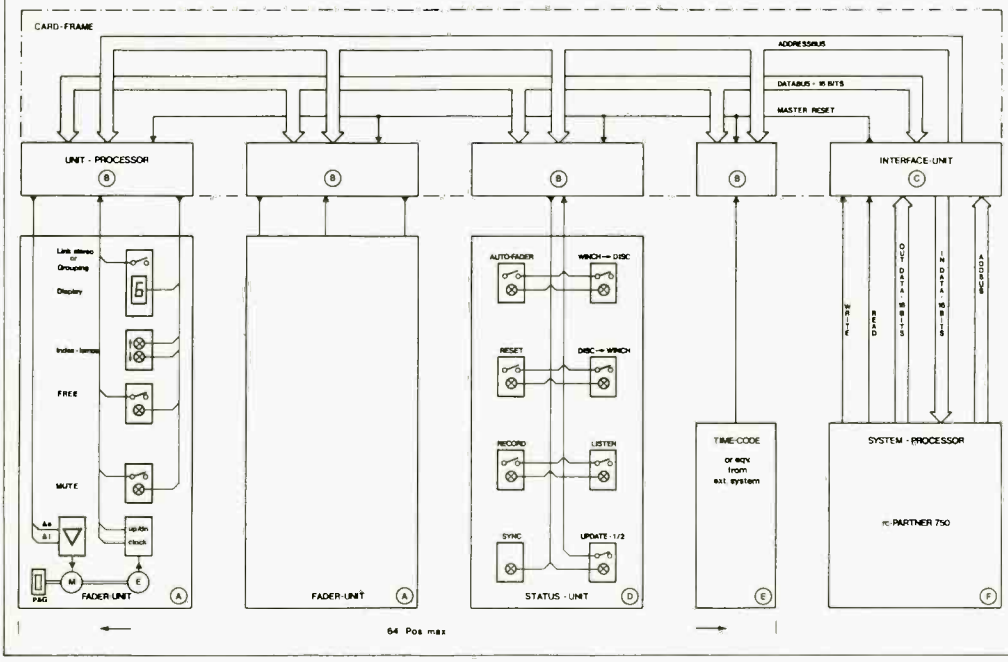
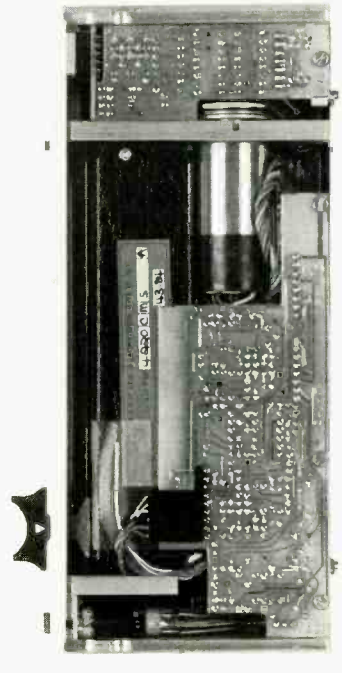


FIG 2



(f) system processor—here the Danish rc Partner 750.

The system processor (f) addresses, receives, stores and sends information on the positions of all faders at a rate of 25 to 30 times per second. Communication takes place via a 16-bit databus to each fader where the unit processor (b) deals with the 'local' calculations needed. The combination of (a) and (b) forms an intelligent fader. The unit processor (b) is also used as a link between the system and other types of components such as the status unit (d) and the timecode generator (e).

The interface unit (c) connects the main processor (f) to the system and assists the main processor in executing very fast and flexible addressing.

It should be mentioned, that the unit processors and the interface unit are designed for Eurocards and mounted in a card frame within the console. The main processor however is situated outside the console—some 10 m away.

Fader unit

The fader unit is shown in **Fig 2** and measures 205×40×85 mm. A standard P&G fader is used as a regulating element—in this case type *4000*, but a type *1900* or a special model may be suited as well. The fader is slightly modified with a cord clamp on the slider to work with the motor drive via a tension loaded cord, running on ball bearings. A small motor—an ESCAP DC, 23 mm in diameter and with an integrated opto-encoder for position and direction indication—moves the linear fader 104 mm by 1.57 revolution of the rotor. During the full travel, 126 pulses are produced by the encoder and this number is doubled electrically to 252 which may be described by an 8-bit format. The result is a system resolution of less than 0.5 mm and the full travel may take place within 130 to 150 ms—totally controlled.

Due to the easy-running and very direct mechanical solution it is not possible to determine the added load from the motor when the fader is operated in the normal way.

The fader unit is of compact design and contains the following:

- Driver stage for the motor;
- Decoding electronics for the encoder;
- Segment driver for the grouping and linking display;
- Drivers for the indicator lamps;
- Anti-bounce electronics for the pushbuttons;
- Detector for the touch-sensitive fader knob;
- Post fader buffer (+10 dB);
- Muting circuitry with fast regulation—system controlled;
- Pushbuttons PFL, SOLO and MUTE;
- Pushbutton FREE used to release the fader from following the present content of formerly stored data but still the fader will follow a group fader and/or the master fader when these are operated, also updating will take place as usual when the fader is moved;
- Pushbutton SEL—selects group of stereo linking to neighbour;
- Display indicating group selected or 'L' for stereo linking;
- Index indicators relate stored and actual fader position—higher or lower;
- Overload indicator 'max' shows level 3 dB before clipping.

Unit processor

This device makes the addressable units intelligent which is a must when 64 units need to be controlled and governed with the required speed and precision.

Making a mechanical movement fast and precise—or slow and precise—as a function of an electrical control places a hard demand upon the electronics, and the problems are compounded as we are able to reverse the process so that a mechanical movement is converted into a control signal to be stored for the later exact reproduction of all parameters.

With the demand of high or low speed and a totally controlled start/stop acceleration—obtained by rotation of the motor through 365°—it takes considerable control to make certain that the movement is slowed down and comes to a full stop before the physical limitation of travel is reached. This means no overshoot even at maximum speed/stop rate.

Voltage and current to the motor has to be controlled very carefully and quickly because theoretically more than 2,000 pieces of information may be presented per second from each of the faders concerning their positions. We cannot rely upon normal calculation methods because of the time it takes, so to speed things up pre-calculated tables are used, stored in PROMs, for which the coefficients are variable and easy to change quickly. Communication to the central processor is in dB, so there is also a dB table stored in a PROM, according to the fader specifications of log behaviour.

The unit processor opens up a number of advantages:

- a flexible construction and architecture of the system is achieved, and there is a clear and logical dividing line between the fader system and the main processor;
- optimisation of refined motor control;
- a minimum of data flow between the system and the main processor is needed, and the software is logically split into two parts namely the system program and the individual fader program;
- introduction of an intelligent update function;
- easy linking between the system and several input/outputs from operational data encoders and indicators can be effected;
- an advanced grouping system.

The system only calls for a single piece of position information per fader/per frame as the unit processor 'finds' the correct parameter value from the tabulated selection and keeps the motor under exact and constant control concerning position and movement between positions. This is carried out by digitally controlling voltage and current.

The intelligent update mode works in the following manner. If a fader is under control of the system—moving or steady—it may be updated by the operator if he stops the movement, takes it to another position from a steady state or if he changes the relative speed of a movement. The unit processor will detect this external influence and define it as an update order by comparing the present and the new position information.

Depending upon a selection of update modes—chosen centrally for the total console and activated from the status unit—either the normal touch sensitive method may be selected or the intelligent update mode can be used. In the touch sensitive mode information on the index point is only given by the index indicators lighting the up or down signs, which the operator must follow visually when returning to a former position. With the intelligent mode, however, the fader knob will present a directional force against the operator's fingers thus telling him, whether the new position, or the movement, differs from the former and in what way, higher or lower, faster or slower. This means that the operator may concentrate fully on the film screen and his primary work as he is not dependent on the visual information from the index indicators although this information will also be available.

When the fader knob is left in a new position the system accepts the off-set and takes over control again in accordance with the previously stored data. During the next replay the operator may compare the original movement of the fader and the movement containing the last update and thus make a judgement. If none of the results is accepted another attempt can be made immediately.

Grouping may take place at two levels: channel fader to selected group fader or on to the main or master fader, the latter controlling all others. When grouping fader channels the selected group number must be set on the individual channel fader(s) by activating the SEL button and reading the display. The display will start flashing as will the similar display for the group fader. Grouping is executed by pushing the SEL button in the group fader which will turn all displays into a steady state thus giving constant information about the grouping status of the console.

All fader units are identical but group and main faders may be considered only as motor-driven knobs when mounted in their respective positions in the console. Faders in the group fader positions will display their correct numbers when mounted. If stereo grouping or linking is required the SEL button has to be activated until an 'L'—for Link—shows in the display. This is only valid for the left fader in the chosen stereo pair and this left fader will now be linked to its neighbour to the right when the SEL button of the right fader is activated. The right fader's display will start flashing when L is selected in the left fader but will return to steady state when the SEL button in the right fader is activated. If the right fader was previously linked to a group fader, the stereo pair will also act in this way. When stereo linking is used the left or the right fader will control its neighbour as well as being mutually dependent on each other.

The fader displays will show the digits 0 to 7 or L but another activation of the SEL button will not light the display. This indicates also that the fader is no longer under the superior control of the master fader. This situation is not valid ▷

for group faders—only channel faders.

If grouping is selected with the group and/or main faders closed, a resistance is felt in the channel fader during movement but updating will take place and the upper position will be recorded by the system. When the channel fader is released it will travel back to the closed position and stay there until the group and main faders are opened. If they are both set to 0 dB the channel fader will return to the previously registered point of the scale. With group and main faders opened before the channel fader is taken up it will of course stay in the position where the operator left it.

This operational behaviour is introduced in order to obtain the normal console functions where nothing comes out if group and/or main faders are closed. Here the signal from the channel will of course be present as long as the operator holds the channel fader open because no physical group can be found but the channel fader will close automatically when left and thus make the console act in a logical and familiar way.

Grouping and linking are functions controlled by the system processor but the action is carried out by the unit processors.

Inputs and outputs from pushbuttons allow recording of their time status for later reproduction. Grouping, regrouping and indication of former and present fader positions are all stored functions which may be put to work next time a given sequence is repeated. The same is valid for the update modes earlier mentioned.

Interface unit

The interface unit connects all unit processors with the system processor and allows the latter to be physically separated from the console itself. It also assists the system processor by establishing a very fast addressing procedure when information from the group faders and the main fader is transmitted to the individual channel faders.

The addressing procedure is executed via a 16 k RAM matrix with the format 256×64. Setting-up or coding of the RAM matrix is done by the system processor, depending upon how grouping is selected. The system processor communicates via an 8 bit code with the RAM matrix and here 256 addresses may be set up accordingly, 64 of which are reserved for the addressing of 64 unit processors respectively, each being addressed by a 1 bit write signal.

The remaining information (256−64=192 addresses) may be used for grouping at will and totally free grouping is possible where any fader might act as a group or main fader if so decided. We have however decided against this solution in order to keep the overall view as clear as possible but we have still achieved a very fast addressing procedure to be used within the given limits.

Status unit

This component takes care of direct communication between the operator and

A CUSTOM MOVING FADER SYSTEM

the system and its layout is dependent upon the client's requirements. It may be quite simple in an effort to reduce the impression of 'computerisation' and furthermore it represents another logical and clear dividing line between the system and the 'outside'.

Eight pushbuttons are present in **Fig 1** (there should be nine) with the following functions:

- Auto fader selects automation in or out;
- Winch to disk and vice versa for filing and/or loading jobs;
- Reset resets all fader positions and clears the storage;
- Record and Listen control the function of the total system;
- Update 1/2 selects former or present update;
- Sync indicates that synchronisation is obtained;
- Update Mode (the pushbutton not shown) centrally selects the touch-sensitive or the intelligent update mode.

At high speed—during rewinding of tapes and film—all fader positions are locked and stay so until speed has returned to within the limits of operational speed. When this happens a total repositioning and synchronisation will be accomplished within about 120 ms for the total system.

Timecode

The timecode block represents the outside world with which the system functions be it a multitrack machine, a film or video machine or even a real-time clock controlling 'on air' transmissions. A standard timecode or a frame or picture counter may be used.

System processor

The last important component must be chosen with utmost care as it determines the specifications of the system in respect of speed, facilities and volume. Its primary job is the collection, storage and transmission of all needed data for the unit processors. It must reach synchronism with an external clock function which may be a picture counter at a rate of 25 to 30 beats per second. At beat 'n' the processor must collect information on all intelligent faders' positions, B(n), and transmit information about wanted positions at next beat, n+1 as F(n+1):

$$F(n+1)=G(n+1)+B(n)\div G(n)$$

Where 'G' is the function one wants reproduced or an expression of the update.

If no update is detected then B(n) will equal G(n) which gives:

$$F(n+1)=G(n+1)$$

If grouping has been selected the system processor must collect information about this and communicate grouping data to all faders involved.

These three operations must be executed immediately after each beat of the clock and, when time allows, data blocks must be transferred to the Winchester disk when, and if, the available RAM storage comes to a limit.

Of course system expansion possibilities exist with a keyboard and graphics and character VDUs where interactive programs would open the way to extremely advanced editing of the sound mix. Mixing lists with all information of programme running, actors and artists contributing, time and place would be easy to realise along with the graphic presentation of console status.

When we reach the stage where it becomes necessary to incorporate a computer just to register what the operator has done with about 4,000 different knobs each of which must be adjusted by hand, the problem simply calls for another philosophy of console configuration—but that is a different story.

Coming back to the subject, by installing a keyboard in the console for direct communication with the system processor, very complicated mixing and switching procedures could be carried out over shorter time periods than is possible by regular manual operation if several faders are involved but this and other features have been left out of this project which reflects the client's wishes.

The operational storage time of the system is estimated at about 30 min under full load in respect of the installed 10 Mbytes hard-disk. But full load has not yet been verified and the practical use might indicate that 20 or 30% of the estimate will come closer to reality which means that the effective operational time will be almost endless when compared with the treated sequences of 5, 10 or maybe 15 min of real-time. It should be mentioned that the system is fitted with sufficient storage capability for two complete updates which allows selection of the better parts from each.

This is a limitation for the described installation only and storage of data will not create any problem at all. So should another client want to store n updates (n for any number) there is only a decision to be taken and as the installed computer power is more than sufficient—it just came with the fast rc—PARTNER machine—many individual wishes may be met.

The described system automation is totally designed, developed and built by us and integrated in a large console for the Danish film industry. We simply had to develop the system as we had happened to sell the idea beforehand, subsequently finding ourselves in the situation that no existing systems were available for sale for inclusion in this console.

Our achievement is also—and mainly—thought of as a step towards the above mentioned new philosophy around the configuration of sound processing systems but of course the solution will be available in other respects.

We did not exactly think of it as a 'do it yourself retrofit kit—easy to handle' but still there might be a potential interest for application in the more sophisticated areas of the professional field.□

As a final comment to this 'case story' we would like to express our thanks to Mr. Kurt Andersen, Department of Computer Science at the University of Arhus. Kurt is head of the electronics lab there and gave much good advice and hints to us. Thanks again, Kurt.

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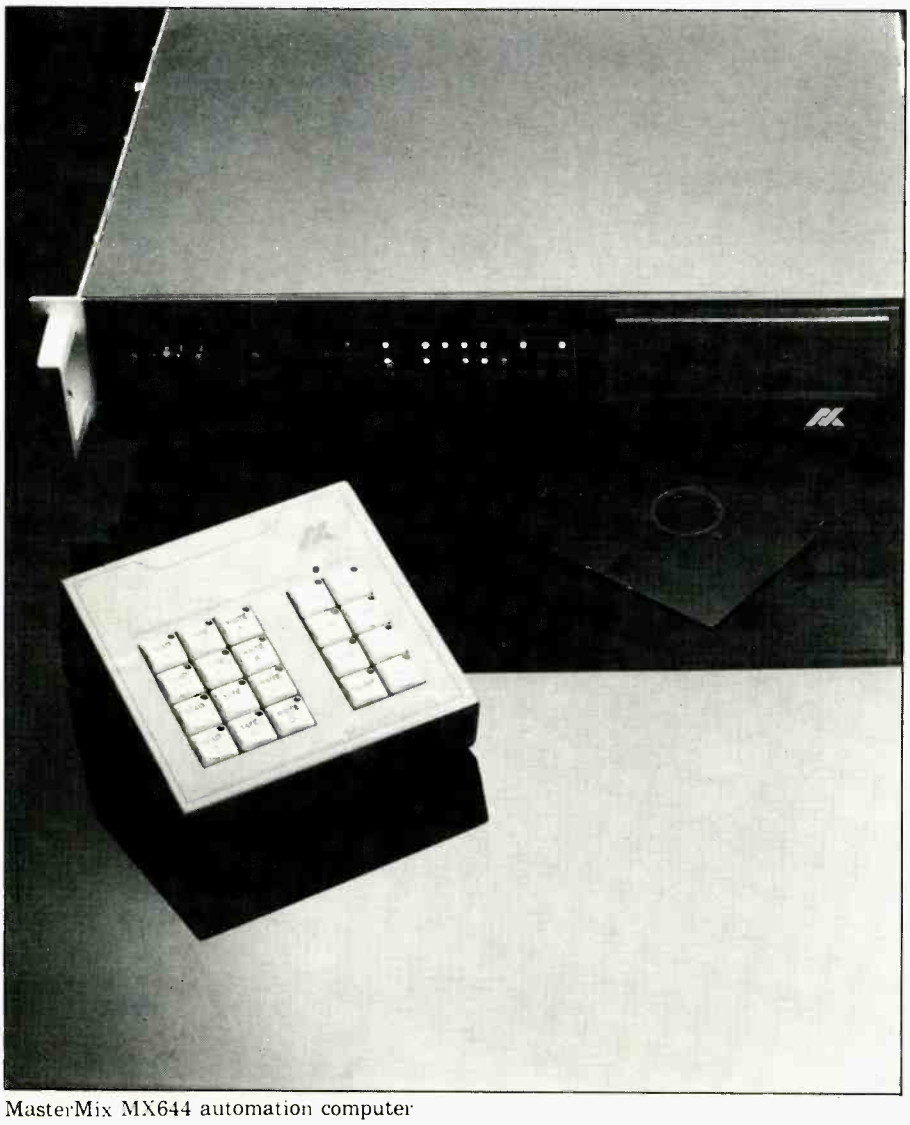
AUTOMATIC AUTOMATION FOR SOUND MIXING

Sid Price of Audio Kinetics describes the MasterMix automation computer and console interface

In the modern control room there is now a bewildering array of high technology equipment, each with its own operational procedure which must be learnt and integrated into the working environment. Some of this equipment forces new work habits on engineers, which may result in the equipment being either under utilised or even not used at all. It is human nature to take the line of least resistance, and this will often mean doing it the way you're already familiar with. It was with this in mind, together with an acute awareness of the tremendous financial strains being placed upon studio facilities by the very competitive nature of business these days, that *MasterMix* was conceived. In addressing the problem of operational simplicity the prime objective was to minimise the number of new controls and let the computer make as many of the decisions as possible without the engineer feeling he was in any way 'out of control' of the computer.



MasterMix MX644 automation computer

The control functions can be split into two categories: audio and computer.

On the VCA fader we have buttons for control of both the level and muting sections separately. This gives the engineer complete freedom of access to levels and mutes without redundant key operations on a master control or even worse a computer terminal.

The level section has four modes of control for the VCA: isolate; write; read; update.

Isolate provides a useful way of rehearsing the level control of a channel without the movements being recorded by the computer.

Write is the mode used to generate first pass data or to re-write a section on subsequent passes.

Read is the mode where complete control is given to the computer and all manual fader movements have no effect on the audio signal path.

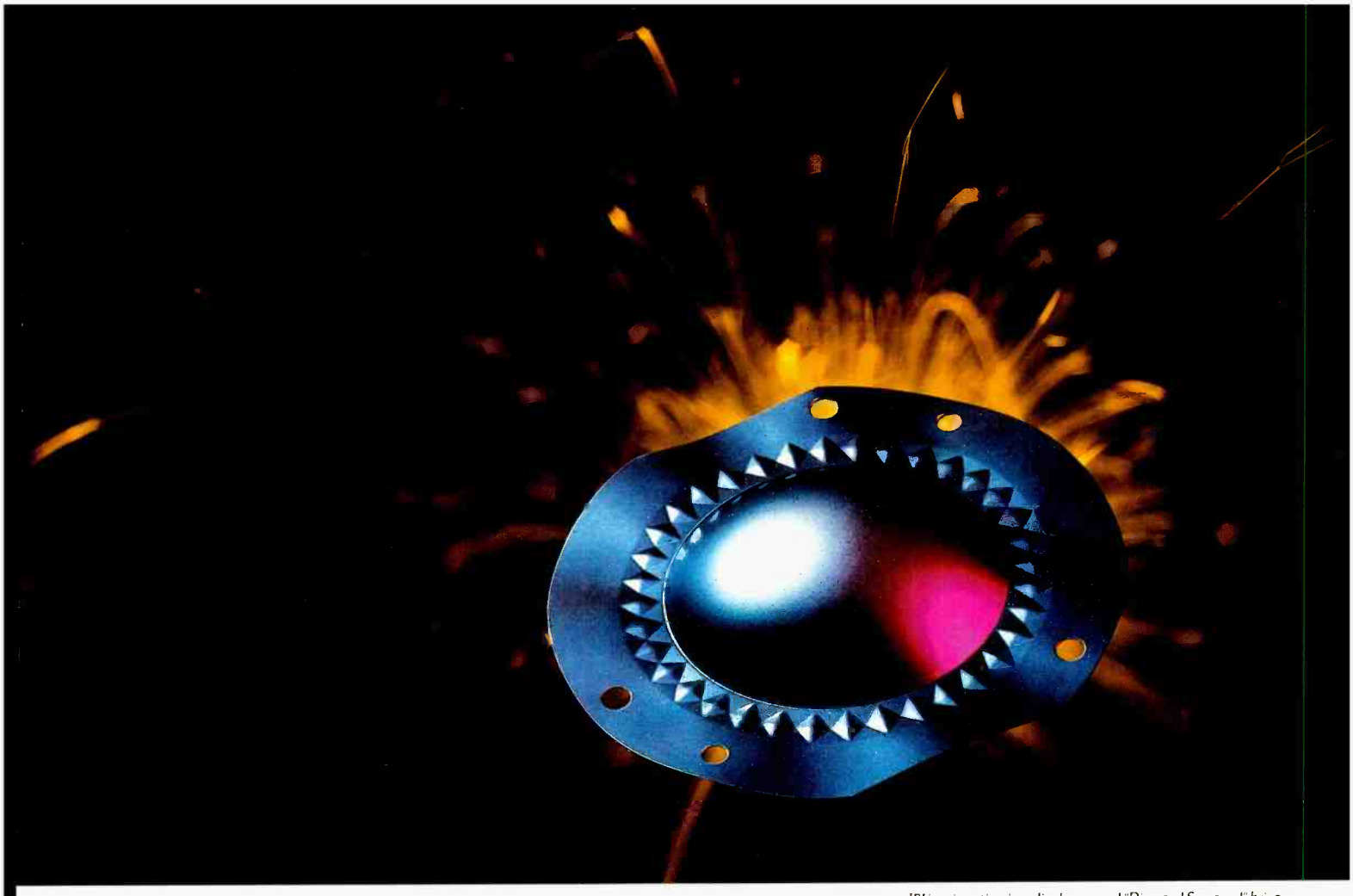
Update is a combination of computer data and fader control. Here an arbitrary point is chosen by the engineer as his 'no change' point (by simply selecting update mode); movement from this point will cause a relative change to the computer data by the amount of movement from this 'no change' point. This new data is then recorded by the computer.

Write mode should be considered for gross level changes, while Update is for the fine tuning or 'tweaking' of fader movements.

VCA mutes are controlled by the two bottom buttons, one for the selection of the mode of the mute system and the other for control of the mute status of the channel.

It is worth noting at this point that the mute control of the VCA is totally separate from the level control and that written mutes do not overwrite any VCA level data that may have been previously recorded.

Master controls are also provided for selection of the *whole* console into any of the above modes. There is also a control ▷



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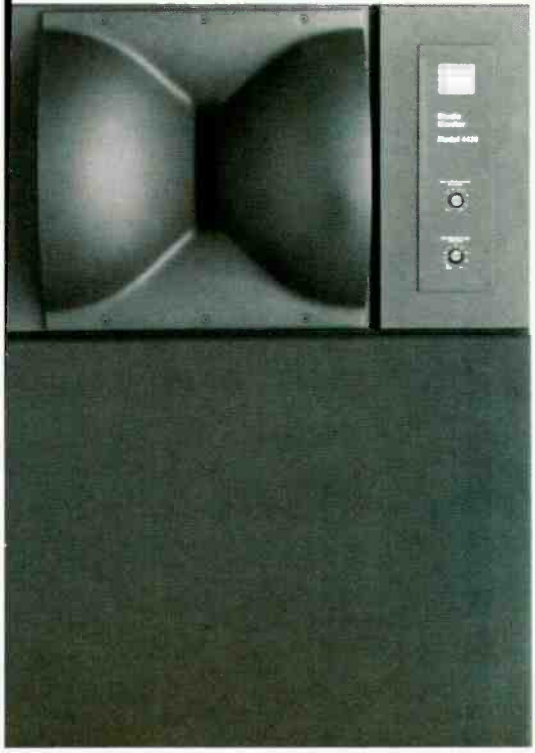

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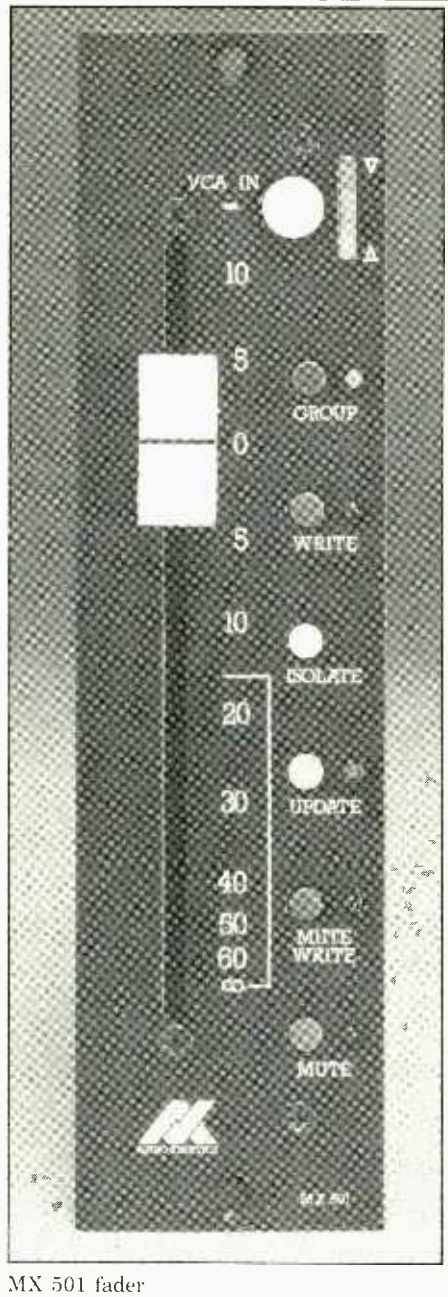
for entry into the group setup mode for the creation of Master Groups.

These operate rather like the normal DC groups of other VCA systems with a couple of notable differences. Firstly, any channel may be nominated as a master and there may be any number of masters defined for use. Secondly, all grouping is performed by the computer in the console interface which has distinct advantages over the dedicated DC bus type of control used in some other systems. In both types of system the 'no effect' point for the master fader is usually chosen to be the 0 dB mark on the fader scale, which since the DC bused systems generally have no way of storing the channel fader's position means that the channel itself must be mixed within the 'group' at that point. With the *MasterMix* system the computer in the interface is able to remember where the channel fader was and thus it is not necessary to follow the above procedure.

It is also possible to shift the master back to channel control during the mix if the level of the audio on that channel needs re-balancing with respect to the other 'group' members. The muting control is also reflected through the system's grouping set-up.

The area of data storage is where *MasterMix*'s major advances are seen. The storage and manipulation of the data generated by the interface computer is almost transparent to the engineer operating the system. This is perhaps the area of concept which is most different to all other systems. *MasterMix* uses a 'whole mix' concept; that is each of its memories is capable of holding a complete head to tail version of the current mix. Further it maintains this mix regardless of how much of the current material was played to achieve the last update pass. In this way we have our concept of 'automatic automation'. Although only 20 s of a 5 min track may have been played the next free memory in the system will receive a complete version of the mix with the new movements automatically edited and merged into that data which was not modified. This means that the so called 'merge mix' operation is performed automatically without need for operator input. Future software options will provide a facility for post production applications where unrelated audio segments must be 'conformed' to an edited video or film master using an 'off-line' editing package, but for most music recording applications the *MasterMix* 'on-line' editing system is more than adequate, in fact its more immediate nature is better suited to the creative needs of the process.

The system's floppy disk can be thought of as having five distinct memory segments. With the *MasterMix* Controller the user has direct access to four of these memories, labelled A, B, C and D. The fifth memory is transparent in use to the engineer, it is used as a scratch or working memory for each update pass as it is made. At any time the engineer has up to three past attempts at the mix ready for recall. The system automatically allocates the next free memory to be used as the 'home' for the next mix pass. When the fourth update pass is made the first mix recorded will be over-written and the use of memories will continue in a cyclic fashion with no engineer intervention at all. Should the engineer want to keep a particular version of the mix he can nominate that memory as 'safe'. From that point it will not be possible for either the system or the engineer to select that memory as a 'write' memory.



MX 501 fader

Other functions which may be selected from the Controller include mix copying to a master or backup disk, real-time (on-line) comparison of two of the four memories. The 'cut' between the two versions is within one SMPTE frame of the selection.

Technical description

MasterMix can be considered to have three major sub-systems all of which are microcomputer based. The interface between *MasterMix* and tape system is made through the SMPTE timecode reader. There are no transport functions required. This makes installation with various tape, film and video machines quite easy. Since *MasterMix* is so dependent on the reliability of the timecode input special attention was paid to the code recovery circuitry. The code first passes through an adaptive comb filter and then to the MPU for decoding. The timecode data is fed from the reader system to the Console Interface using an *RS422* data link. This type of asynchronous link is balanced and shows great noise immunity over considerable distances.

In the Console Interface not only are the A/D and D/A conversions done but also the conversions of data and control formats for the various types of consoles to the internal *MasterMix* format. This approach means that the *MasterMix MX644* computer (the third element of the computer system) is a standard sub-system with no hardware or software differences that are console dependent. All input and output for the console is handled by the 4-channel Direct Memory Access (DMA) system which is the heart of the Console Interface. The Interface MPU plays no direct roll in this process, indeed as far as the MPU is concerned the console is placed directly in its memory. This technique has two main advantages, firstly it is much more efficient to have dedicated hardware handle I/O transactions, secondly, and perhaps more importantly for this application, it enables the system software to be structured in such a way as to make the design of the many different console interfaces much easier.

The system Controller is attached to the Console Interface in order that the amount of wiring between the interface and the *MX644* computer could be kept to a minimum. The control data is passed along with the mix data, down an *RS422* link to the *MX644* computer. Data for the console from the *MX644* and control data is returned using another *RS422* link.

The *MX644* computer manages the data flow to and from disc. It is based around the Microware Inc *OS9* operating system. The task of an operating system is to manage the resources of a computer and to provide the user with a unified interface with these resources. Using such an operating system can make not only the front end design of a new product much quicker but also enable future software or hardware updates to be made most efficiently. An example would be the substitution of another type of disc system, say a micro-floppy disc, for the present mini-floppy. This would not require any changes to the *MX644* main programs, but merely to the description of device to be used and the addition of a 'driver' for that device.

Once again a DMA system is provided to handle the disk system data. The MPU has 64 kbytes of read/write memory and up to 32 kbytes of EPROM

The division of tasks between the three MPU systems provides an extremely powerful system, this together with a sound ergonomic design provides the engineer with a versatile, easy to use tool.

Also, the flexibility of the system architecture has proven itself already with feedback from an installed system count to date of over 40 units being used to extend the facilities available, by software updates only.□

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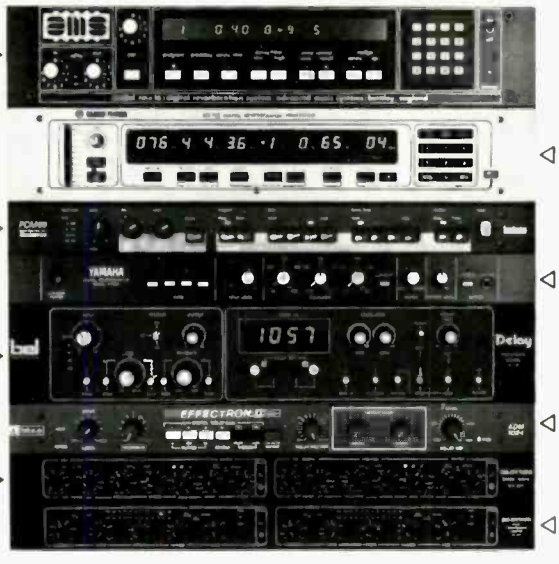

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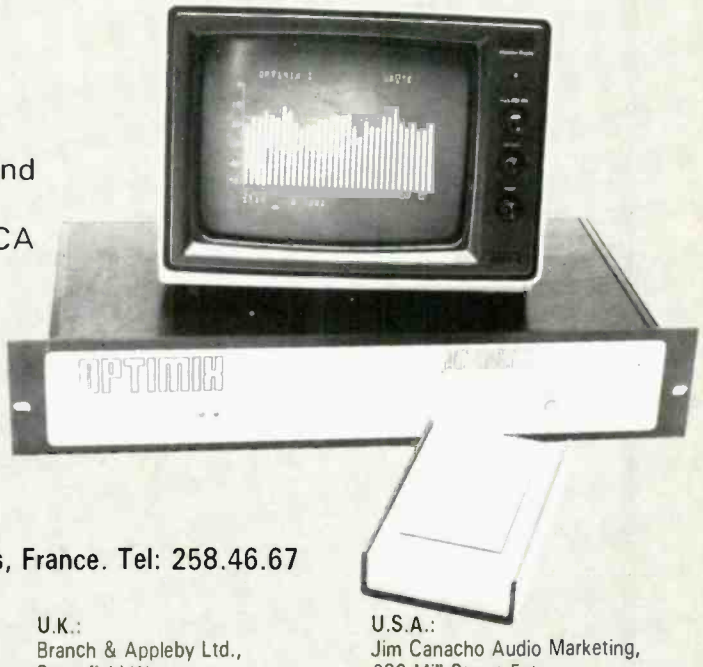

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DISC CUTTING SYSTEM IMPROVEMENTS

Tony Batchelor of Tam describes a disc cutting system that maximises analogue disc performance

In 1983, Ortofon of Denmark, made a commercial decision to cease manufacture of their own disc cutting system, comprising various models of head and the associated electronics. In August 1983, Tam took over stocks and designs for the system's electronic units and shifted production to the UK. Later, in March 1984, Ortofon handed cutting head manufacture over to Phonotech in Denmark and since then Tam and Phonotech have been consolidating design and marketing of the equipment, and researching both the commercial and technical aspects of the ex-Ortofon designs. As part of this consolidation, we have had to look to the future for analogue disc cutting, and these are our conclusions.

In all our collaborations with disc cutting facilities around the world, two inescapable conclusions emerge. Firstly, compact disc, or a successor, will eventually supplant the analogue disc for all but the veteran hi-fi enthusiast. Secondly, this will not be for some years, and in the meantime disc cutting facilities will need to maintain their competitive edge by improving quality, thus making further improvement in the pressing of the 'black vinyl' record possible.

Returning to the first of these points, various questions immediately come to mind. The most obvious, of course, is the most difficult to quantify: when will manufacture of the black vinyl record eventually cease to be a viable commercial proposition? Taking the easy way out, one could simply invent a convenient time, such as 'when 90% of all record sales are CD and only 10% black vinyl'. However, this is still rather vague and also totally ignores the expanding sales of records in areas of the world such as South America, Africa and the Indian sub-continent. In these areas, the technology of the CD is many years away. Generally then, the time scale we are talking about can stretch from five years to 25 years, and your guess is probably as good as mine.

Regarding the second point, many efforts are being made to improve the existing technology, witness the *Apollo* lacquer by Capitol and the recently introduced up-graded lacquer by Transco. Still other innovations are being added and extended, such as the increasing popularity of the disco single, which has led to increasing technical demands at all stages of the record manufacturing process. With the increasing awareness by plating and pressing plants that there are many improvements still to be made in product quality and with the continuing improvements being made in cartridge, tonearm and turntable design. In the cutting equipment business we must look to our laurels. The recent introduction in several countries of the Neumann *DMM* system has answered part of the demand for continuing improvement at the disc cutting stage, but demands a total change of every part of the system, including the materials and other parts of later processes.

Therefore, bearing these points in mind, Phonotech and Tam have put together a package of improvements to the ex-Ortofon designs, and will shortly be showing the complete system. In general, we have found that the original Ortofon designs were more than adequate to handle the majority of cutting requirements and hence all the changes are fairly minor, and can be retrofitted to existing equipment.

System outline

Fig 1 shows a block diagram of the units that comprise the complete cutting system as far as the cutting head and cutting electronics are concerned. The cutting lathe itself, ie the mechanical part of a cutting facility, will generally be of either Neumann or Scully manufacture and both are completely compatible with our electronics. You may also meet the older Lyrec lathes or the Cybersonic lathe introduced a few years ago. Another part of a complete facility is of course the master reproducer. This may be of the standard reel-to-reel tape type, with preview head for lathe control; the same type but with digital delay to achieve the same result as two heads, or some form of digital tape machine, again with digital delay.

From the reproducer, the signals are processed by our first unit, the *CPS 852*. This unit takes the music signals and provides control of cutting level, equalisation and monitoring. Various other functions are also performed in this unit, such as keeping lathe control in step with cutting level and automatic control of the cutting power amplifiers in step with the lathe control systems.

Inserted between the reproducer and the *CPS 852* is a new unit, the *TEM 851* but this is not in use for standard cutting procedure.

Following the *CPS 852*, is the *STL 852*. This unit performs two important functions, but for straight cutting, can be switched to bypass mode. In use, it is a dynamic treble limiter, or de-esser with threshold level, attack time and release time all being variable to suit the programme content. This characteristic protects the cutting head against high frequency (hence high energy) overload and ensures that the programme as cut, is playable by a cartridge on the finished pressing.

The last item in the electronics chain, is a pair of cutting amplifiers *GO 851*. Although basically a pair of power amplifiers supplying driving power to the stereo head, the amplifiers are specialised. Capable of 500 W RMS per channel, they can deliver enough energy to burn out a cutting head in less than a millisecond. Thus very effective protection circuits acting at high speed are an integral part of the design. Also necessary for the system, is accurate control of the RIAA equalisation curve, pick-up amplifiers for test and monitoring, and monitoring circuits working from the head feedback circuits. The feedback circuits give a signal for motional feedback control of the cutting head and continuous monitoring of the cutting stylus movement. This is like monitoring a tape recorder from the replay head, but with no delay as there is no physical separation.

Finally, the cutting head, type *DDS 822*, is a very small electro-mechanical unit, containing a powerful magnet system, two driving coils, two feedback coils, a stylus holder and an accurate lathe mounting. To give some idea of scale each driving coil is about 5 mm in diameter and must be able to dissipate 500 W of electrical energy on maximum (very short) peaks. To assist this, the head is normally filled with helium gas, as it conducts heat twice as fast as air can. The heat is transferred to the metal mass of the polepieces.

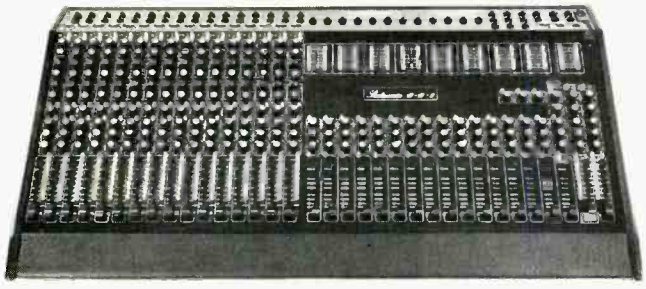
FIG.1 SIGNAL PATH

Design requirements

Our objective (at Tam and Phonotech) was set by ourselves to try to meet all the ▷

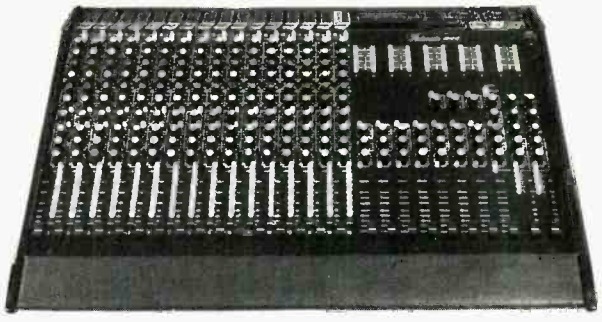
STUDIOMASTER

16-16-2



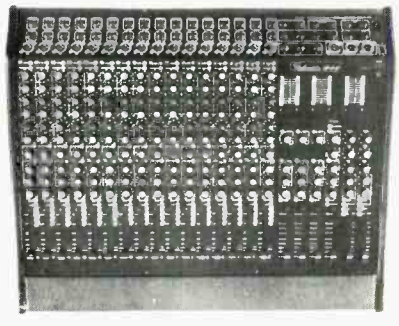
The 16/16/2 is designed to complement budget 16-track recorders. It features its own external P.S.U. which can supply even a fully expanded 16/16/2 (a 32/16/2!). All mic. channels have 48V Phantom Power, parametric E.Q. network, and 3 auxiliary sends. Full 16 channel monitoring is included in the 16/16/2 package. 12 segment 2 colour bargraphs are fitted to the 16 sub-mix stages and the master output which is also fitted with 3 band E.Q. As well as optional expander modules for the mic. channels, a double patch bay is available.

16-8-2



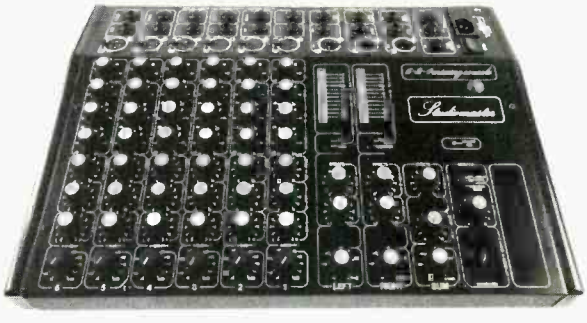
The 16/8/2 is compatible with 8-track recorders and has all the versatility of the 16/16/2, like optional expander modules for the mic. channels (an extra 16 mic. channels may be fitted without altering the unit's P.S.U.) and a double patch bay. Mic. channels feature 48V Phantom Power, parametric E.Q. network, 3 auxiliary sends and 90mm faders. Full monitor and foldback systems are included. Master outputs have 3-band E.Q. and 2 colour 12 segment bargraphs. These bargraphs are also fitted to the 8 sub-mix stages. Applications for the 16/8/2 include small 8-track studio mixing and live sound reinforcement.

16-4-2



The 16/4/2 is the mixer that the 16/8/2 and 16/16/2 developed from and consequently contains all their superb features. It is expandable to 32/4/2 on its existing P.S.U. and a patch bay is also available. Mic. channels have parametric E.Q. network, 48V Phantom Power, 3 auxiliary sends and 90mm faders. Full monitor and foldback systems, 3-band E.Q. on the master outputs and 2 colour 12 segment bargraphs are all supplied on the 16/4/2. Usec of this mixer include live sound reinforcement and for use with 4 track recorders in small studios.

6-2-1



The STUDIOMASTER 6-2-1 mixing console offers features and performance normally obtainable from mixers costing twice the price. Mic. channels feature three band e.q., effects and monitor sends as well as the usual gain and pan controls. 2 colour, 12 segment bargraphs allow monitoring of channels, auxiliaries and both stereo and mono sum outputs. This outstanding specification makes the 6-2-1 ideal for sub-mixing, P.A. and recording.

Mosfet 500

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Mosfet 1000

This high power amplifier delivers twice the power of the MOSFET 500 with the same 0.005% distortion (1kHz sinewave at 400 watts/4 ohms). This amplifier has already proved itself under the most stressful of applications and is fast becoming the standard against which all other amplifiers are measured. The Mosfet 1000 delivers high power with total fidelity in all applications.

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**** ****

DISC CUTTING SYSTEM IMPROVEMENTS

requirements given to us over the past year or so by the various cutting facilities throughout the world, with whom we are in almost daily contact. In this we were helped by the fact that we run our own cutting facility, handling all types of programme material. We were helped, too, by consultation with Sean Davies, who has worldwide personal contact on an engineering and consultancy basis with cutting facilities and engineers. The prime objective was the design of one system that could handle any type of programme material and be capable of a higher specification than any current analogue disc replay units. Our existing designs met most of the limits set by these objectives but experience had shown that there were certain areas where we fell short of our targets. Three main areas were identified as needing improvement: cutting level and transient response; head life under continuous cutting of extreme programme material; protection of the cutting head in handling while setting-up and electronically cutting each affecting, and being affected, by the others.

Cutting level and transient response

By the nature of its design, the Ortofon type of head is capable of an extended frequency response, so much so, that it has been used to cut most of the quadrophonic catalogue throughout the world. It only needs replay speed to be cut by half, to achieve a flat response right up to the carrier frequencies required in this form of 'surround sound'. To achieve this, the design of the head and amplifiers is such that the frequency response is flat to beyond 25 kHz and the transient response is correspondingly fast. However, in order to achieve the cutting of the very high energy transients that much of today's music demands (eg heavy cymbal work and particularly synthesised music where high frequency energy content does not fall off with increasing frequency as in conventional acoustic based instruments) there is no way of avoiding the simple physical fact that such frequencies need very high electrical power to be fed to a cutting head. As some engineer pencilled in the margin of one of our technical manuals: High Power, High Heat, Smoke, Flames, Bang! We can, however, overcome this problem in a very simple way. If cutting is done at half-speed, then all frequencies are reduced by half and the power required for the same cutting level at the high frequencies is also reduced by one quarter. Or conversely, given the same equipment, half-speed cutting gives twice the energy when played back at normal speed and hence four times the level of conventional cutting when the record is played back. Absolutely ideal for short length sides at very high levels such as disco singles and modern synthesised instrumentation. Particularly so, of course, when the original is a digitally recorded master. In the Tam amplifiers, half-speed cutting has always been an available option, and in the new design it is included as standard for no extra cost. In practice, there are some problems with the response on tape machines playing back low frequencies at half-speed, and this is where the *TEM 851* unit comes in.

Cutter head protection

With the increasing demand for high level cuts, particularly at the bass end, the excursions of the mechanical system are greater than ever before. The new head (*DDS 822*) has a 50% increase in allowable excursion before the integral mechanical stops come into play. The increased strain, mainly metal fatigue, on the internal connecting wires has been greatly reduced by specially forming them along their supports. Internal clearances have been re-toleranced to ensure that the bridge spring links can stand up to the higher internal stresses. Helium cooling is now, of course, obligatory. Additionally, examination of the various safety circuits in the power amplifiers, has shown that under the new limit, the amplifiers themselves could produce unexpected severe transients that could shorten head life. This problem has now been eliminated.

The main safety circuit in the power amplifiers has already been mentioned in the previous section. The new high levels of which the head is capable have required changes to the electronics of which this item was just the first. All the basic circuits and controls were found to be more than capable of meeting the new requirements. Some refinements have been added to cope with the extra high frequency energy demands of synthesised instruments as well as the insistent bass rhythms of disco music. The main change has been in the way that the *STL 852* treble limiter is controlled from the programme content.

It has been found that under certain conditions, stress imposed on the bridge and stylus holding point while changing styli, has been exaggerated by the greater excursion allowable. Although this could be claimed to be a user problem, we preferred to tackle this ourselves by introducing a new fixture to aid stylus changing and thus prevent unnecessary stress. This will delay the possible onset of fatigue to give extended life under higher level cutting conditions.

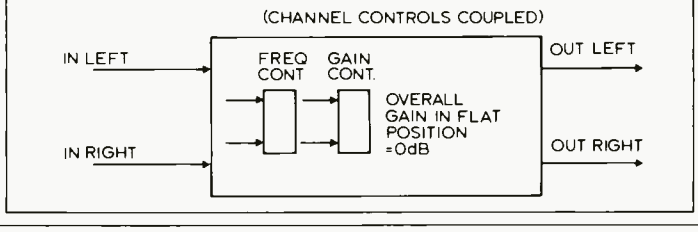
Technical details

The preview unit is a standard machine supplied by several well-known manufacturers. It can be a reel-to-reel with preview head, a reel-to-reel with digital delay, a digital (stationary or rotary head) with digital delay. In the second and third types, the digital delay is necessary to allow the initial signal to control the lathe pitch and depth parameters in advance of the programme being cut. The first type can be run at half-speed with the electronics appropriately switched to the correct time constants. Type two is similar to type one as long as the digital delay has an extended LF response, ie down to at least 10 Hz. (Incidentally, the old wives' tale that records cannot be cut with a response below, variously, 50 Hz or 30 Hz depending on the story teller, is totally untrue. All current equipment is usually flat down to 20 Hz.) Type three machines are not currently able to be run at half-speed and we would be interested in manufacturers' comments on the feasibility of design changes to enable this to be implemented.

Type one and two machines however, suffer from a normally unrecognised problem in half-speed playback: any analogue tape machine is a subtle blend of science, mathematics, manufacturing technology, compromise and art. Several compromises have to be made in the design of recording and playback heads, and of particular concerns here, are the dimensions of gaps and pole pieces. Too large or small in either respect will give trouble in the design. Thus compromises are made to ensure that playback on different machines will work to standard reference tapes and equalisation curves. However, if the effective dimensions are changed by playing back at half-speed, then, although the playback amplifiers time constants can be changed, the effective dimensions are now outside the design criteria. Particularly, there are wavelength and fringing effects which cause a major change in response at low frequencies. This change will vary depending on the machine (both manufacturer and wear being factors) and cannot readily be calculated in advance. We are not aware that any analogue tape machine manufacturer offers any modifications to cover this problem. The effect can generally be of the order of ±6 dB at 30 Hz (real-time). Such an effect is of course very noticeable and explains why listeners often complain that there is 'something wrong' with the bass of many masters cut at half-speed.

To take care of this problem, we have introduced the tape equalisation modifier *TEM 851* (**Fig 2**). This is a 1U rack mounting 2-channel device. It ▷

FIG. 2 TEM 851 TAPE EQ MODIFIER



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DISC CUTTING SYSTEM IMPROVEMENTS

is intended to go into the programme chain before any noise reduction unit and consists of a coupled frequency selector and a coupled gain control. By reference to an appropriate test tape, an individual machine can have the wavelength effect compensated. The unit is switched to bypass mode for normal speed playing, and the switching can be coupled to other units so that monitoring in set-up conditions can be carried out at normal speed and EQ. It is advisable to have the tape machine switchable in and out of half-speed time constants as well as any noise reduction device, which must be after the *TEM* unit.

The unit is supplied in 2-channel configuration only, as just one is needed for a reel-to-reel with digital delay set-up. A type one set-up, ie with preview head, may also prove satisfactory if the lathe pitch and depth control is adequate under half-speed conditions. If not, a second unit, identical to the first, can be installed in the preview chain.

Dolby *A 301* units can have half-speed cards manually interchanged, or the necessary components can be piggy-backed for auto switching. For units using *Cat 22* cards, the *Cat 40* half-speed cards can be obtained from Dolby for manual interchange. Dolby cannot directly switch standard *Cat 22* cards into half-speed mode and they suggest the best way of handling the requirement for auto switching is to have four channels of playback only, relay switched to channels equipped with *Cat 22* or *Cat 40* cards. Dbx and Bel are possibly not suitable systems for half-speed playback, although Bel is actively looking into the necessary modifications.

Transfer consoles for disc-mastering are usually custom built by most standard console manufacturers or are standard units modified for disc mastering use. However, there are very few units in the world that can monitor while setting-up in standard mode and then switch all equalisation curves to half-frequency and Q for half-speed cutting. We have therefore taken an older Ortofon design *CPS 741*, and modified it to include auto switching of all cards. This unit, the *CPS 852* (see **Fig 3**), is a 3U rack-mounting unit which contains two by two channels of audio control for programme and preview. Within the chains, control is given of: low and high frequency gain; selectable mid-frequency and gain; treble and rumble filters; elliptical equalisation; cutting level; monitor and metering outputs with monitor gain control; stereo balance and width controls; automatic switching to and from cutting lathe and cutting amplifiers and switching for half-speed use. A tape copy facility is also provided.

To enable eventual playback of a pressing whose music content contains heavily stressed voice and some types of instruments, it is essential to be able to exercise some dynamic control over the treble frequencies, eg speech sibilance, so we have developed the stereo treble limiter *STL 852* (**Fig 4**). Many synthesiser tracks are also difficult to cut, purely due to the high energy levels needed. Although this latter problem is taken care of by half-speed cutting, the STL is still necessary in the programme chain so the cutting room can still cut at normal speed.

The STL has a second function which is equally important for both types of cutting. This is as part of the complex control of HF energy through the cutting amplifiers, to the cutting head, for protection of the head against overload. The STL design has been used previously to sense the head current at dynamically variable treble frequencies and, hence, maintain control of that current and energy dissipation. Although such a sensing system has been satisfactory in the past, mainly for the odd transient, the HF energy present all the way through much modern music, means that the delay between head current increase and control causes problems. Effectively, we are talking about a servo system. In a servo control loop, hunting can never be zero, otherwise there would be no control signal to sense. For the odd high current peak in a cutting head, this slight overshoot is tolerable. With high current peaks in the head throughout a whole record side, the cumulative effect on a cutting head leads to fatigue failure well before its design life.

The reconfigured STL is still a 1U rack mounting unit with the standard threshold, attack and release time controls, but now additional switching has been added to allow three control modes. Head current sensing control is still available but now a 'feed-forward' option has been added. This means that the programme source itself (from console or CPS) is used to control the limiting action. In the STL there is a 20μs delay between the input stage of the circuit and the circuit point at which limiting control is exercised. The limiting control voltage is delayed less than this amount, so limiting action in the feed-forward mode starts before the signal to be limited reaches the limiting circuit. There can, therefore, be no overshoot and peaks at the head are fully controlled. The feed-forward option has two different actions. The normal use includes an inverse RIAA filter to match the pre-emphasis applied in the cutting amplifiers, and this can be switched out to give a flat response when the unit is involved in making loop-bin masters where feed-forward is the norm.

The cutting amplifier *GO 851* (**Fig 5**) has needed little redesign. Two major features ▷

FIG.3 CPS 852 TRANSFER CONSOLE

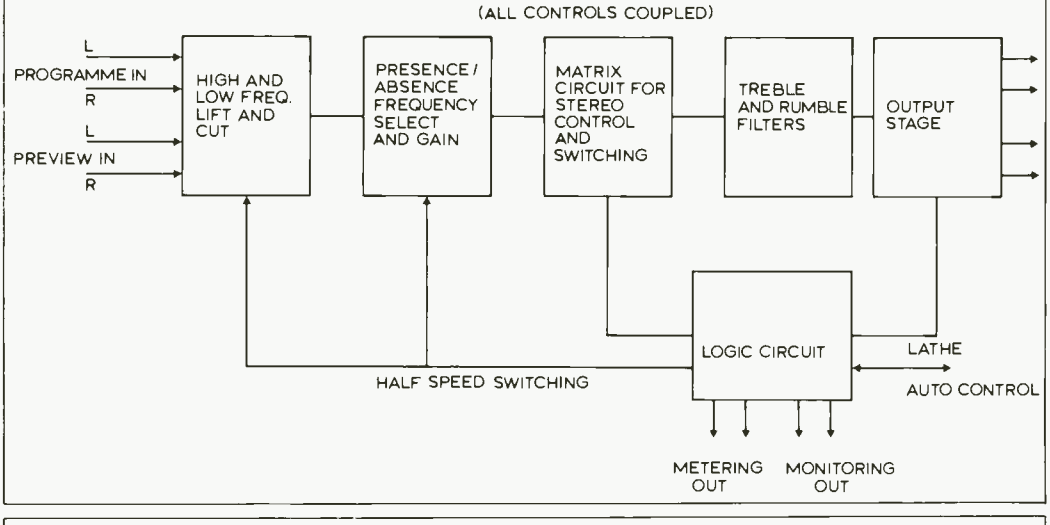
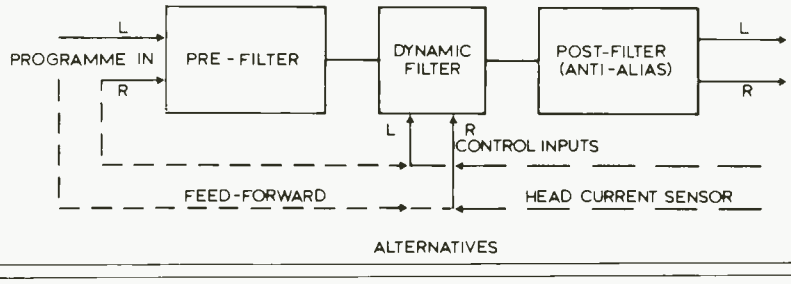
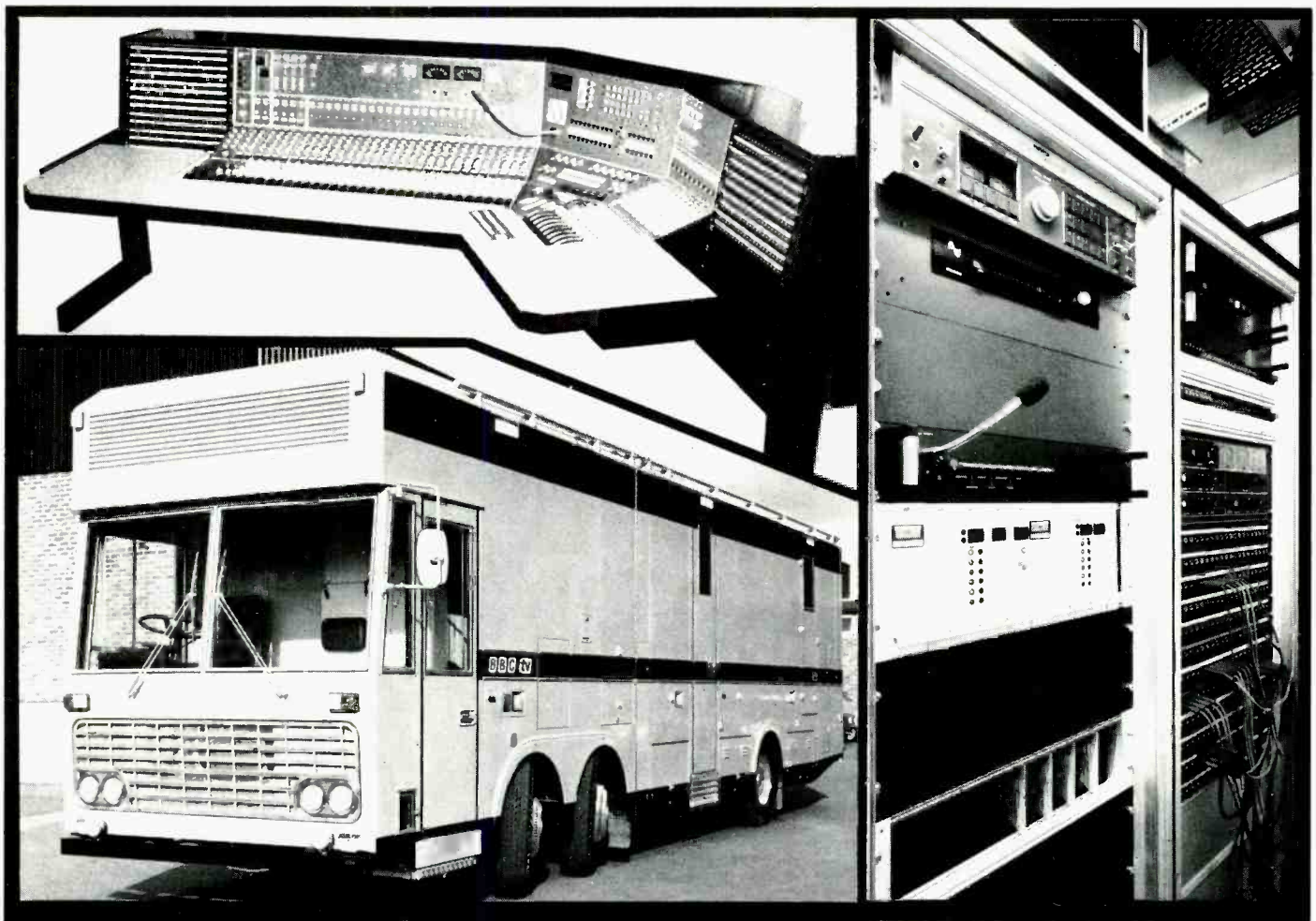


FIG.4 STL 852 STEREO TREBLE LIMITER





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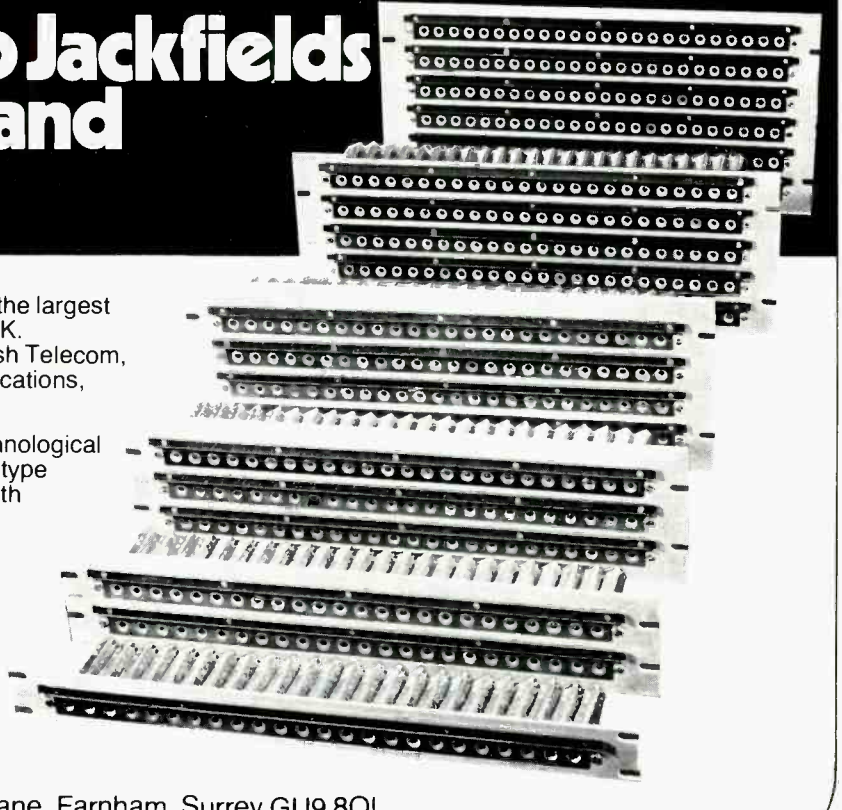

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DISC CUTTING SYSTEM IMPROVEMENTS

are now included in new units for user convenience at no extra cost and a better circuit has been designed for the head protection part of the units.

All components are included for the half-speed option, and this is now part of the overall auto switching arrangement for the whole programme chain. Thus, test cuts and dry runs can be carried out at normal speed with full monitoring, including motional feedback monitoring, and then no changes are needed anywhere in the chain other than simply operating one switch to achieve half-speed cutting.

A second feature is related to monitoring overload conditions. These will inevitably occur and in the past, the cutting engineer has had no positive indication of the frequency of overloads—apart from head failure! Now two LEDs are provided, one for each channel, which respond whenever the internal overload limiting circuit comes into action. As overload depends on each cutting head's parameters, a visual indication directly on the cutting amplifiers provides an immediate indication to the cutting engineer of the effect of the programme material on the head.

In the final output stages of the amplifiers, head protection is achieved in two ways. Continuous current overload will cause the cutting head to rise in temperature and this is continuously sensed. At a set point, depending on head type, a high speed relay disconnects the head from the amplifier, until manually reset. Programme material disappears from the groove. For peaks, the protection is achieved at an earlier stage. Peak voltages are detected prior to the output stages and over-voltages switch clamping transistors while the peak lasts. The clamp was achieved by use of a pair of diodes, but this 'crow-bar' type of clamp meant that the action was very audible. This was manifested by, for example, a heavily plucked guitar note cut at high level sounding an additional click. More importantly, from the head protection point of view, the squarewave produced by diode action, introduced additional transient signals in a damaging part of the audio spectrum. The latest design of clamp no longer employs diodes so the limiting action is much softer and the squarewave transients do not appear.

Ortofon introduced its most important design of cutterhead in 1973, which was modified in 1982. Phonotech has now further modified the design to make the head, the *DDS 822* (see **Fig 6**), specifically suitable for the present demands made by cutting engineers.

Firstly, the head has had its maximum stylus excursion (limited by mechanical protective stops) increased from 106 microns to 170 microns in the 45° direction; this gives an extra 5 dB of level which is of particular value at low frequencies. Secondly, the earlier head had a frequency response only 2 dB down at 5 Hz and 25 kHz, essentially designed for quadrophonic, half-speed cutting. To give improved reserve and extended fatigue life, this response has now been changed to 2 dB down at 7 Hz and 23 kHz. This, of course, produces no audible difference and even further modification is possible before audible differences are noticed, such is the flexibility of the basic design.

Other changes have been made to extend life such as the method of forming and affixing the wires from drive coils and feedback coils. Experiments are continuing with respect to the magnetic field obtainable with different and newer materials, although the stability reserve is already more than adequate for the design.

Finally, it has been found that it is possible to stress the spring links connecting the drive coils to the stylus bridge when changing a stylus. This, it must be emphasised is not a problem under normal circumstances but with an inexperienced engineer it may happen. A new fixture has been designed which positively prevents such stress.

Conclusion

We shall be showing the complete system of units and head at APRS 85. Most of the changes in design specified are obtainable on a retrofit basis and we shall be making those available after a few months. We (Tam and Phonotech) believe that we have significantly extended the capability of analogue disc mastering, and look forward to several more years of servicing the industry, before the digits take over entirely.□

FIG. 5 GO 851 CUTTING AMPLIFIER

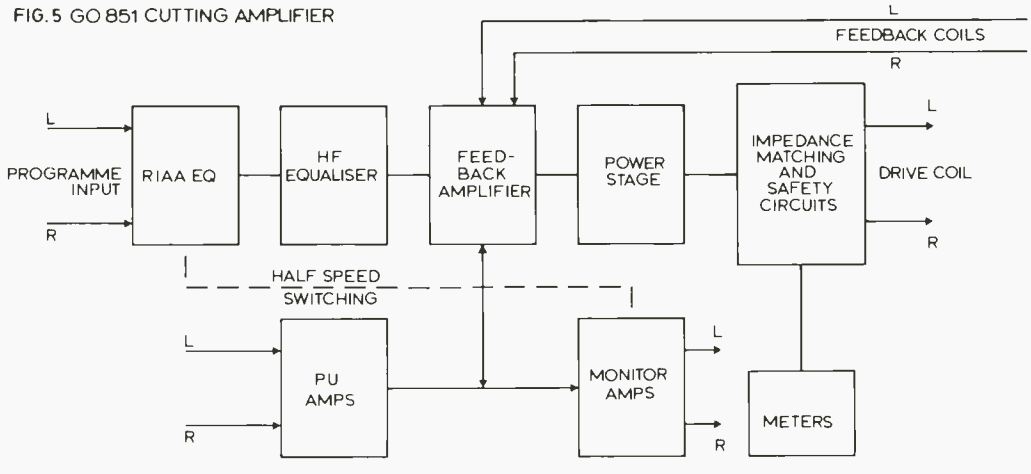
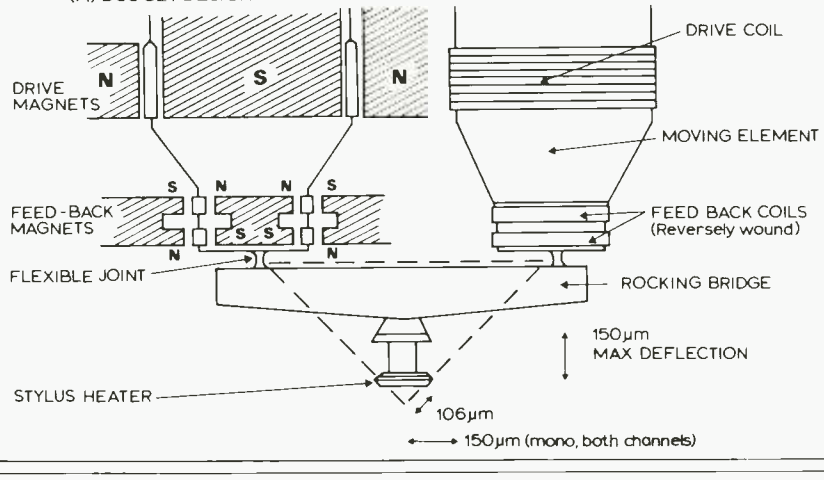
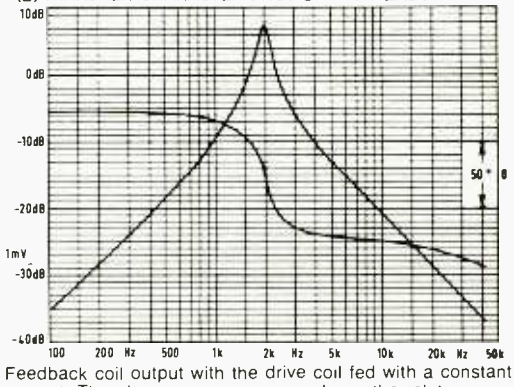


FIG. 6 DDS 822 CUTTER HEAD

(A) DSS 821 DESIGN



(B) TRANSFER CHARACTERISTICS OF THE HEADS



Feedback coil output with the drive coil fed with a constant current. The phase response curve shows the relation between drive current and feedback voltage. The phase changes sign through the resonance and in the high range, it turns into a straight slope representing the acoustical delay from drive coil to feedback coil.

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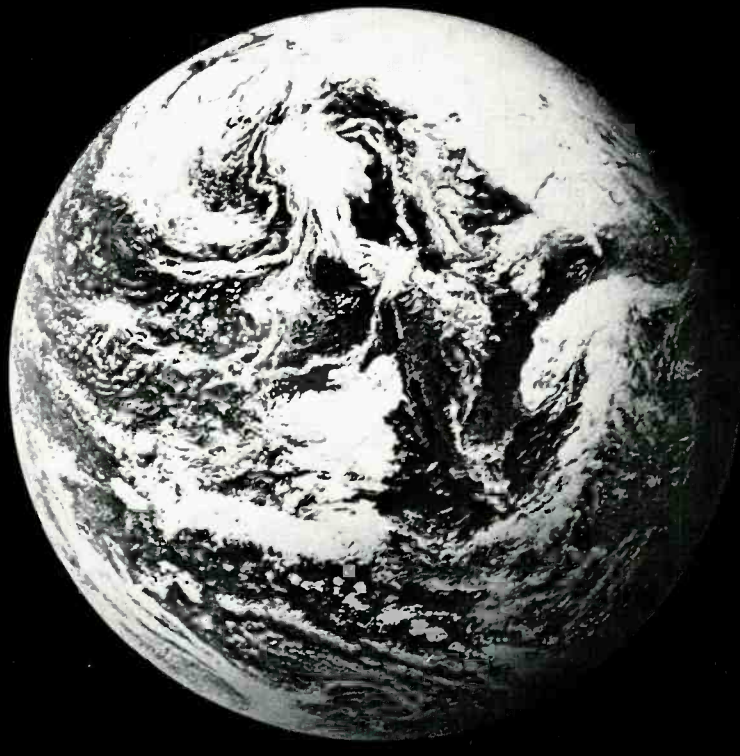

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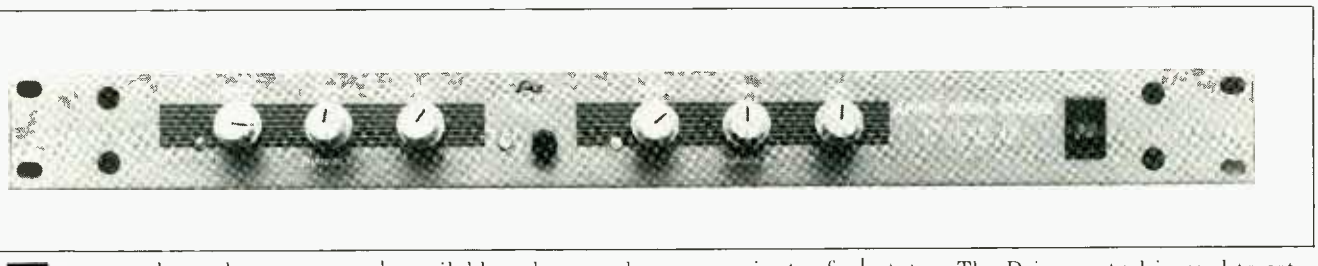
REVIEW

REVIEW

A user report by Ben Fenner

APHEX AURAL EXCITER TYPE B



Most people are by now familiar with Aphex processing. The basic principle of operation (without delving too deeply into the realms of psychoacoustics) is the synthesis of high frequency components of the incoming signal, harmonically related to that signal. Since the output of the processor section consists only of high frequency information it has relatively little energy, so when added to the original signal there is no significant change in actual level, but due to the increased clarity of the sound there is a perceived increase in presence and audibility. Sounds that may have lost some of their high frequency content through the recording process may therefore be restored to their original brilliance with the Aphex. This is, of course, different to using high frequency equalisation which acts only to boost or cut frequencies that are already on tape—it does not recreate the high frequency information lost.

When the Aphex *Aural Exciter* first appeared it was met with mixed feelings by engineers. For some it was a kind of magical panacea, a black box with which they could make muddy vocals cut through the track, give distinction to acoustic instruments, etc, whilst others met it with some scorn, saying that it was 'cheating'—if you couldn't get a good sound without it, then you weren't worth your salt as an engineer, and if you could, then why bother? In the early days of Aphex, studios were spared the decision whether to invest in 'aural excitement' or not, since the unit was available only on a charge-per-minute-of-song basis, but this did create a lot of paperwork (not least for the tape-op having to write down exactly when it was being used) and also meant that there wasn't usually a unit lying around during dead studio time for house engineers to play with. This rental system was dropped with the advent of the Aphex *II*, and an Aphex could then be bought or rented just the same as any other piece of studio equipment.

The cost of an Aphex *II* is, however, relatively high, and since the attitude of engineers to 'aural excitement' is still fairly divided (despite wider acceptance of the system in studios), most medium range studios with tight budgets and narrow profit margins do not have the money to spend on a device that will in all probability only be in use half of the time. It is to fill this niche that Aphex have introduced the Aphex *B*, which offers similar processing to its bigger brother at a significantly lower price, albeit at the expense of one or two features.

The Aphex *B* is, like the Aphex *II*, a dual channel unit, but is considerably smaller, being only 1 U high, and is 19 in rack mountable. All the controls are on the front, the back panel consisting of a ¼ in jack input and output for each individual channel and the mains input. The front panel controls for each channel are identical, consisting of Drive, Tune and Misc reading from left to right, and in the middle of the unit between the two channels is a pushbutton in/out switch to AB between Aphex-processed and straight signals, with a green LED to indicate the switch status. The Drive control is used to set the optimum operating level for the processor and has its own associated dual colour green/red LED to indicate to what extent the incoming signal is driving the processor circuitry. The Tune control determines the frequency range of the Aphex processing, and can be adjusted to suit the frequency content of the signal being processed. It covers a very useful range, full counter-clockwise rotation of the control putting emphasis on the upper mid frequencies, whilst clockwise rotation places the emphasis of the processing increasingly towards the high end of the spectrum. The mix pot is self-explanatory, adjusting the balance between direct and processed signal, but there does seem to be a particularly large omission here, in that it is not possible to have the Aphex signal alone without any unprocessed signal mixed in, (as is possible with the larger Aphex unit), and this does limit the flexibility of this unit somewhat. Aphex recommend that in a mix situation the unit should be connected to an auxiliary send, returning back on to the mix bus, and any signal that needs processing should be first disconnected from the mix bus itself and then sent to the Aphex via the auxiliary send, the balance between direct and Aphex signal being carried out on the unit itself. This does not take into account the fact that different signals require different amounts of Aphex processing and what is a good balance for one instrument (as set by the mix control) is not necessarily ideal for another. *(A case for more channels of Type B?—Ed).*

This is a shame since I would not have

thought it difficult to extend the range of the Mix control to include the 'Aphex-only' facility, thus giving the engineer the opportunity to adjust the Aphex/direct mix with the auxiliary send levels.

Setting up of the unit is very simple, the Drive control being adjusted so that its associated LED is showing a reasonably continuous green, the odd red peak being acceptable. Incidentally, it should be noted that while the Aphex *B* does have a very generous operating range, it seems intended for use at operating levels around the +4 dBm mark; attempts to use it with equipment with lower operating levels (eg −10) resulted in only sporadic illumination of the drive LED, ie there was not sufficient signal level to drive the processor properly.

As a starting point the Tune control should be set to around 2 o'clock—this gives the characteristic 'Aphex-top' sound—and the mix control then adjusted to give the required balance between direct and Aphex sound, the In/Out switch being used to monitor the degree of effect being implemented. In use, the Tune control proved to be a very important parameter, giving the ability to fine tune the Aphex processing to the instrument being processed. I found, for example, that the sound of the unit with this control set in the range between 7 and 12 o'clock lent presence and attack to brass, electric guitars and many synthesiser sounds, but applied to vocals and natural acoustic instruments gave a rather hard and 'middy' sound. However, once the control is past the 12 o'clock position, the sound of the processing becomes ideal for vocals and acoustic instruments, lending to vocals in particular a very pleasing breathiness and clarity. It is, however, in processing vocals that the lack of a de-essing facility as found in the Aphex *II* becomes noticeable, although it has obviously been omitted to keep the cost of the unit down. In most situations this does not present too much of a problem, but if the need arises to use more of the processing signal than normal, eg when a vocal has been badly recorded on the multitrack and requires a large amount of processing to make it cut through the backing track, then large amounts of sibilance can be generated along with the useful processed sound, and the use of a separate de-esser is to be recommended.

A very useful application of the Aphex *B* as suggested in the operating manual, is the processing of programme material that is being copied on to cassette, thus compensating in advance for the high frequency losses inherent in this recording medium. Very high quality cassette copies are possible with this setup, being very close to the master in terms of sound, and the need to use noise reduction to compensate for poor cassette quality is greatly reduced. Conversely, it is also possible to process a cassette on playback with similar results, and record the processed programme on another cassette machine, the resulting Aphex-processed cassette copy often sounding better than the original cassette!

Overall, the Aphex *B* is a well-made, clean-sounding unit, capable of a wide range of 'aural excitement' processing possibilities. Due to the limitations already mentioned, it does not seem to be intended for use in the same way as the full-blown Aphex *II*, rather it would appear to be limited to a one-instrument-per-Aphex-channel mode of operation. Despite this it still offers good value for money and is worth consideration by studio owners who wish to be able to offer Aphex processing to their clients without the outlay necessary to purchase the larger system.□

Aphex Systems Ltd, 13380 Saticoy Street, North Hollywood, CA 91605. UK: Atlantex Music, Brent View Road, London NW9 7EL.

REVIEW

REVIEW

Mark Jenkins looks at a semi-automated desk

AHB CMC 24

A degree of earnest thought has gone into the inclusion of the *CMC 24* in these pages. Automation for under £3,000? It seems unlikely, even in the current climate of rapid digital development. Of course the *CMC* is not fully automated, but it is very much a serious mixer, although squarely aimed at the budget 16-track market—specifically at the ½ in Fostex *B16*. The *B16* itself is now installed in a good few professional studios and is a favourite of composers for TV and radio jingles, but of course the *CMC* is suitable for use with many other 16-tracks as well, operating at −10 dBV (0.30 V) for 0VU (the Fostex/Tascam standard).

The *CMC* has a high input impedance of around 500 kΩ and a low output impedance of (typically) 22 Ω, which can drive most inputs (including 600 Ω) without loading problems. Connectors are a mixture of balanced *XLR*-type with phantom power on mic inputs, mono and stereo ¼ in jacks for inserts, unbalanced line inputs and headphone and footswitch sockets and RCA phonos for group outs, tape ins, line ins, monitors, grams in (RIAA) and patch bay parallel connections.

In fact the *CMC* packs an enormous number of facilities into a very small space. This is largely due to the use of in-line design and digital rather than mechanical routing for channel-to-group assignment. This use of digital routing inspired the design of the desk's computer-based automation features.

Assignment of channels to groups is carried out using a small switchbay to the top right of the desk; it's possible to define 32 complete 'patches' which consists of all channel routings and their mute status (on or off). You can select a new patch instantly, by hand or with a footswitch; two banks of LEDs indicate which channel is being edited and which group it is about to be assigned to. Setting up a complete new patch could typically take about 5 min. Patch storage is increased immensely using a Commodore *64* microcomputer.

Sixteen of the *CMC*'s 24 channels are on the left-hand side of the mixer, with stereo faders towards the centre and eight simplified input channels on the right, ALPS faders being used throughout. All rear panel connections on the mixer are accessible from the front, so the unit can be operated right up against a wall, a great potential space-saver. Construction is not particularly similar to AHB's popular *System 8* mixers, with less modular design in evidence, although there is an internal harness system for wiring and each channel is on an individual PCB. 16, 8, 2 and 32-channel models are in the pipeline, with provision in the computer's operating software already having been made for their use.

Each channel has an additional jack socket input on the underneath of the front panel intended mainly for the insertion of instruments such as guitars, but carefully balanced in level for many possible inputs. Each of the main channels (1-16) has 3-band EQ with a variable shelf on the top and bottom bands and a simple sweep on the mid. This is obviously a little basic, but the bands are well positioned and the EQ effects smooth. EQ can be bypassed, and the total specification of each main channel is as follows.

Gain: sensitivity of mic/line input, level when in Tape mode.
Mic/line: selects *XLR* in or jack in.
I/P/TAPE: selects mic/line or Tape input; in Tape mode, routes line input to monitor section.
EQ in/out: bypasses EQ.
Aux A pre/post: changes mode of auxiliary send A.
Aux bus routing: assigns Level controls A and B to the six Aux outputs 1 and 2, 3 and 4 or 5 and 6 respectively.
Aux bus routing: as above for Level controls C and D.
Aux level A/B: send level controls.
Chan/mon: assigns Aux Level controls C and D to channel or monitor sections, with C always pre-monitor in Mon position.
Out/tape: selects monitor source, output to tape or return from tape.
Norm/mix: assigns channel routing to memory control or to stereo mix out.
Monitor level
Monitor pan
Monitor mute LED: activated by memories or by solo system.
Pan control: selects odd or even outputs under memory control, feeds stereo mix in mix mode.
Channel mute LED: controlled by memory or solo system.
Channel solo: selects channel for solo-in-place, enabled by Master Channel Solo Enable.

This is a very comprehensive specification for a relatively inexpensive desk; the remaining eight channels 17-24 are rather simplified, having only 2-band EQ and lacking for instance, Aux sends C and D and associated routing controls, *XLR* inputs and EQ bypass. Channels 17-24 are of course suitable for use as effects returns.

The Master section has the following specification:
Aux O/P masters 1-6: output level of Aux sends.
Headphones: level on two stereo headphone jacks.
Monitor: output level of monitor section at RCA phono outputs.
Monitor select: from stereo mix, Aux outputs in pairs, or either of two stereo tape machines (eg ¼ in and cassette).
Phantom power: 48 V on/off at all *XLR*s.
Mono solo enable: allows monitor solo switches to control Solo bus.
Solo link: links monitor and channel Solo buses.
Chan solo enable: allows channel solo switches to control solo bus.

There are several user options on the *CMC 24*; these include links to disconnect phantom power on any *XLR* socket, and pre/post fade options on the Aux sends. These options are as follows.
Link 1: position A—Aux send B is post fade; position B—Aux send B is switched via pre-post switch.
Link 2: position A—Aux send C is post-monitor with Chan Mon switch at Mon; position B—Aux send C is pre-monitor with Chan/Mon switch at Mon.

Other options refer to the wiring of some input and output leads—for instance, each channel has an insert point which can be worked in either 'break' or 'borrow' mode depending on the wiring of the stereo jack used.

An RIAA stereo amplifier is built-in for routing of a Gram input to any channel, and a footswitch is provided to step along the route and mute memory patches. A meter pod is optional; this clips magnetically to the left-hand side of the desk's rear edge and is connected with a single multiway lead. Peak reading LED or VU ballistic LED options are available and the pod features a double socket for a cheap cassette player-type microphone with on/off switch which provides a talkback facility without using up a channel.

At first the *CMC 24* can appear cluttered, but in fact its compactness makes it very rapid and efficient in use. Switching from record to overdub to remix can be very easy once familiarised with the layout of the desk, and the very high accessibility of all inputs and outputs is an enormous advantage.

However, the *CMC* doesn't fully come into its own without the addition of a Commodore *64* home computer, AHB's *CMI 64* interface a monitor/TV set and a

disk drive. The *CMI 64* interface permanently contains the operational software (more accurately, firmware) for various patch storage, editing and sequencing functions; the computer controls all these operations, the disk drive stores information on floppy disks and the monitor gives a constant display of the various options and memory contents. The use of firmware means that the operating system is available as soon as you switch on, so you need only enter the time and session number before starting, rather than laboriously loading the computer's program.

A multiway connector in the side of the *CMC* gives control over to the computer. The first display on the TV monitor asks you to enter the model of mixer used and the mains frequency (50 or 60 Hz) for the real-time clock functions described below. Entering date and time leads you to a channel index with these details displayed at the top of the page; the index is simply a space for you to list what instruments or musicians are connected to each channel.

The Commodore's four large function keys lead you to the track and take index, which is similar to the channel index, and then to the important route patching page. There are 56 route patch memories available in seven banks of eight pages, initialising with all channels self-routed. Computer keys A to G select the page, odd and even routes being listed beside each channel. Pushing the computer's CLR (Clear) button self-routes all channels. Mute patterns are listed on another page; 1023 patterns can be stored, with "/" representing 'channel on' and "-" representing 'channel muted'. The computer's space bar toggles the channel selected between on and mute, and a copy function allows you to transfer large numbers of mutes to a new patch if you only want to make a few alterations.

All patches can be named and saved on disk or cassette (the cassette system would be painfully slow though) and the software automatically identifies files as channel, track, route or mute information with the subscripts C, T, R and M. For instance, if you have defined all the routing options throughout a song called 'Summer Holiday' which you wish to work on the following week, simply select save, type 'Summer Holiday', and the information will be saved and indexed on your floppy disk as Summer Holiday R. The most exciting part of the *CMC* software, however, is the sequencer, which stores information with the subscript S.

The sequencer allows you to enter a chain of events (complete mute or route patches) and step them along manually, from an internal or external clock, or from a tape sync signal. If you have an accurate tempo for your piece you could enter your time signature and beats min and the mixer can automatically step to a new route mute patch at any bar and beat (and also cope with changes of time signature during the piece). Synchronisation to a drum machine is even more reliable, but this requires the use of another interface, the *CMS 64* which connects into the computer. It has phono in out sockets for a FSK tape click, a Roland DIN sync socket for drum machines, a metronome click output and a footswitch stop-start socket.

Less sophisticated than SMPTE (since it uses a simple clock pulse rather than a timecode), the *CMC* system nevertheless allows you to define and edit complete new route and mute patches for any bar and any beat of a piece with perfect synchronisation. Of course, it's impossible to produce a smooth fade automatically since the desk is not automated in the full sense; however, it is possible to switch an input temporarily to a louder or softer channel for the duration of a solo, for instance, and then to switch it back or mute it completely. Level fades can still be carried out manually.

You can program the route and mute patches for an entire piece, or just for a short section which presents unusually difficult mixing problems. In the latter case, it's possible to start the patch sequencer with a footswitch and it will stop automatically once it's gone through the appropriate selection of patches.

All indicator LEDs on the *CMC* respond to the patch sequencer's control, so the mixer is at the very least visually spectacular in this mode! In fact it's highly impressive for anyone familiar with manual mixdown—patch changes are of course totally silent, and the monitor display constantly updates the operator as regards beat and bar number, tempo, patch number and so on.

Of course the lack of automated fading is a disadvantage, and one which the *CMC* design as it stands is hardly equipped to overcome. However, with an increasing use of synthesisers and sequencers running throughout a piece on backing tracks, much mixing is now a matter of selecting On or Mute rather than of gradual changes in volume.

The *CMC 24* is now widely available and the supply of computer and tape interfaces should be complete by the time of publication. AHB seem pleased with and committed to the design, and development and expansion is likely.

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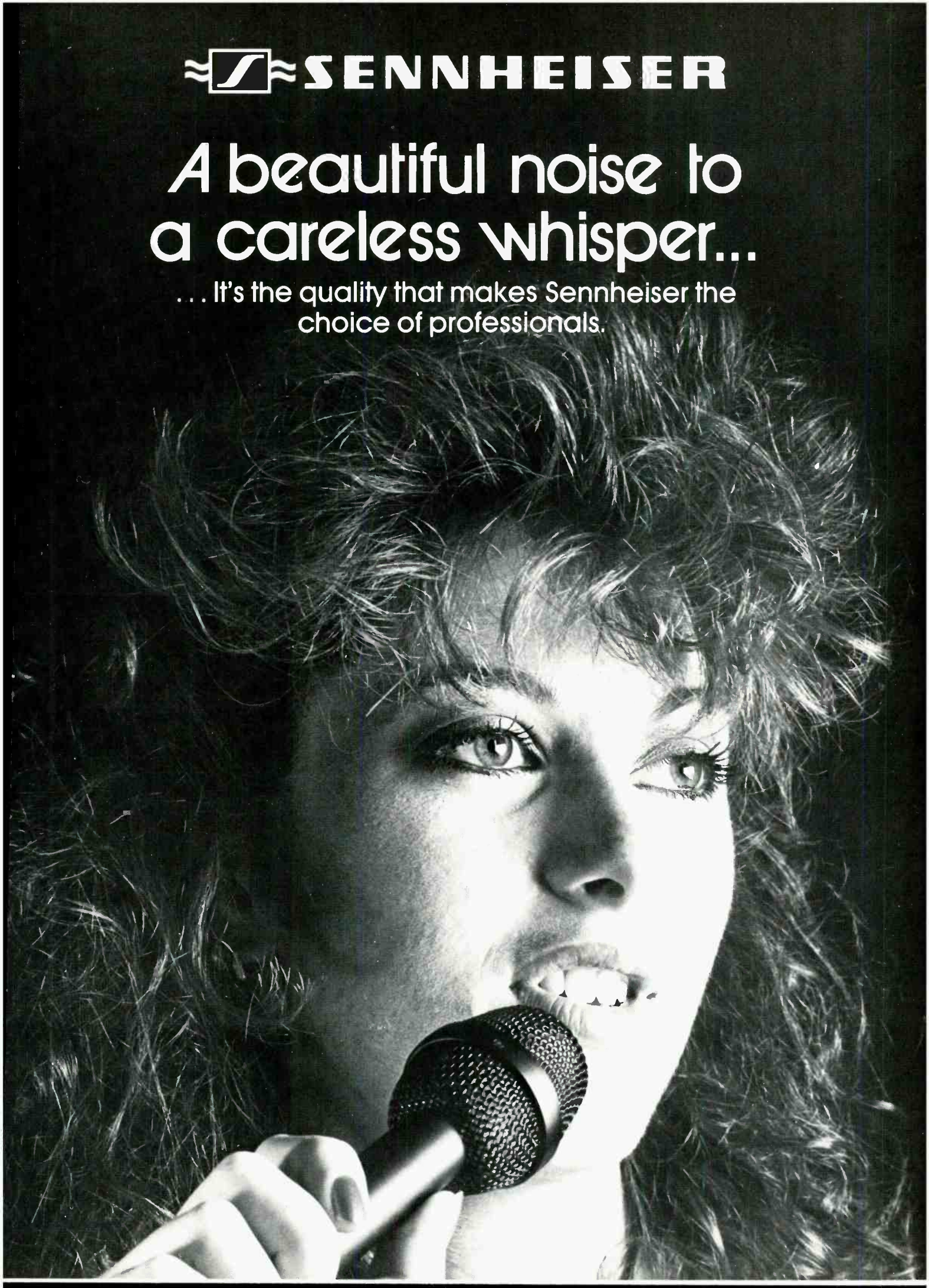

Illustrated here the MD 918. For full information on the Sennheiser range of microphones write to department SS, Hayden Laboratories Ltd, Hayden House, Chiltern Hill, Chalfont St. Peter, Bucks. SL9 9UG. Telephone: Gerrards Cross (0753) 888447.

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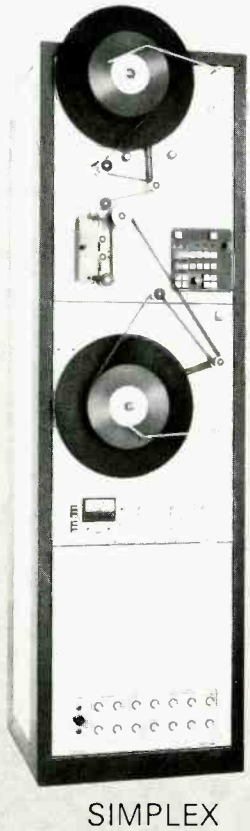

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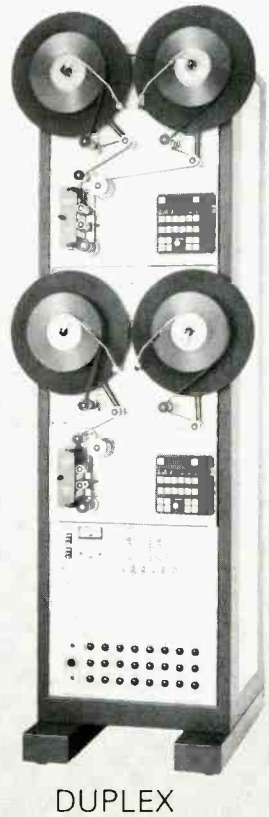

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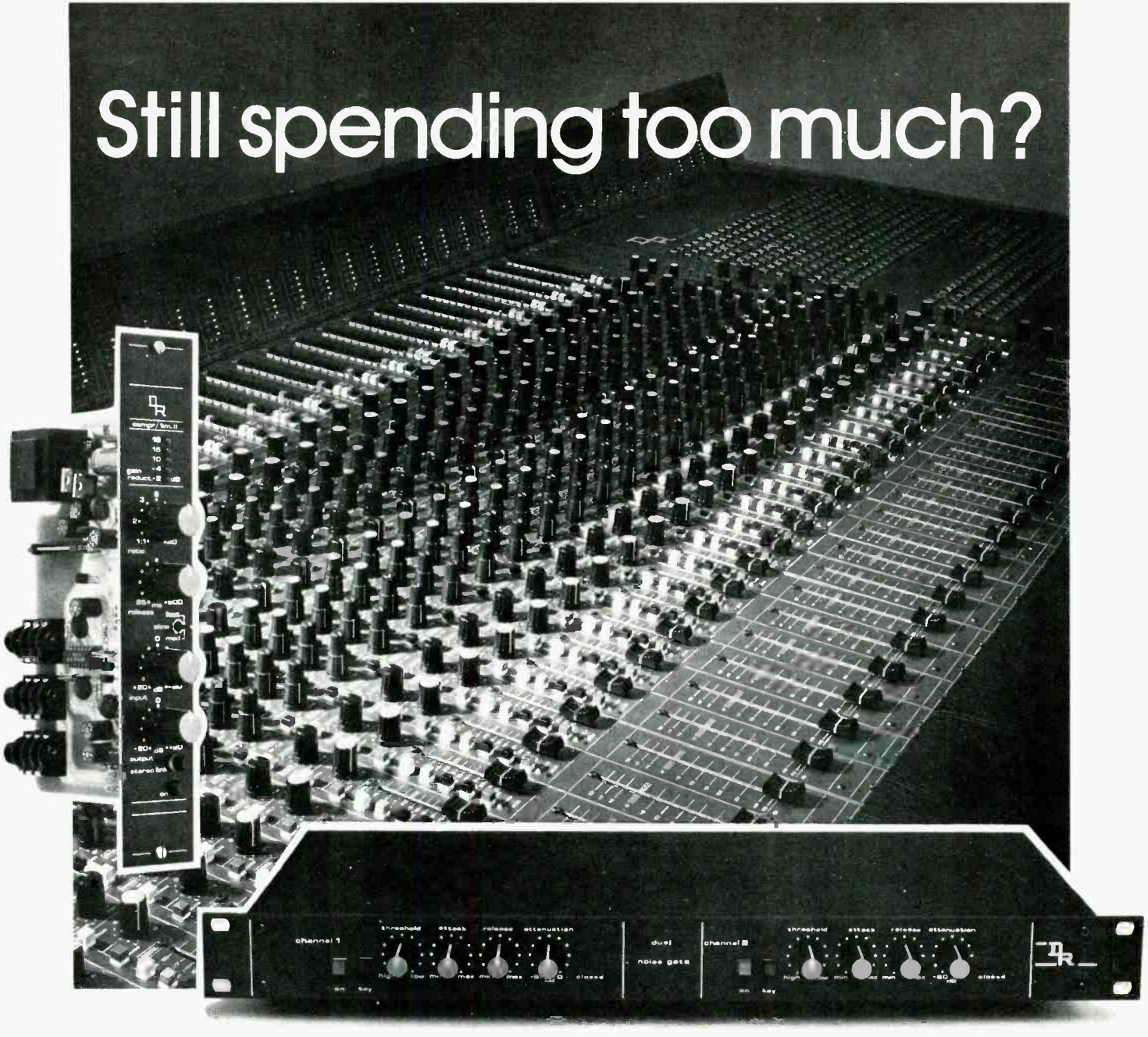

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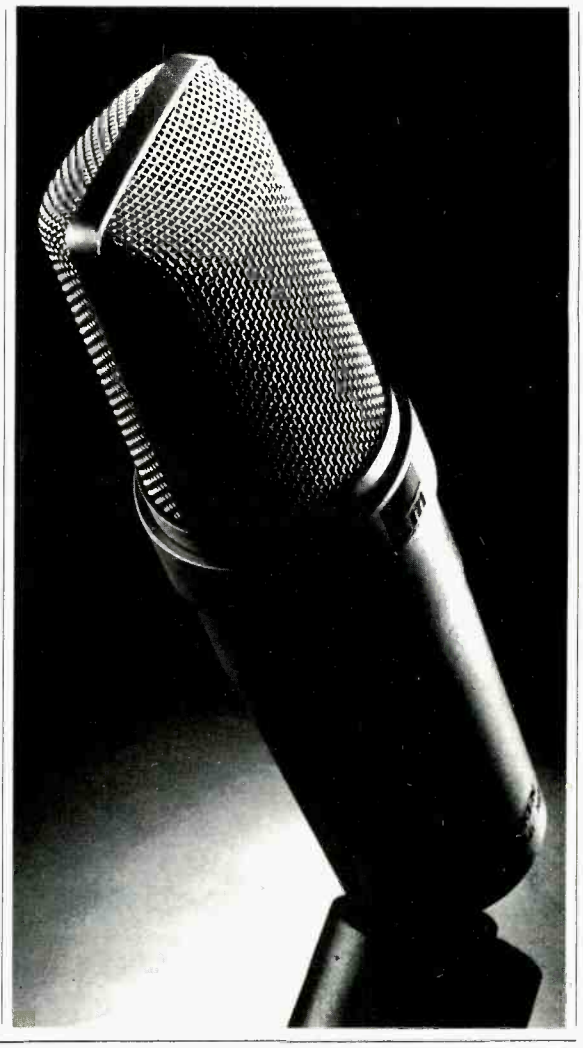

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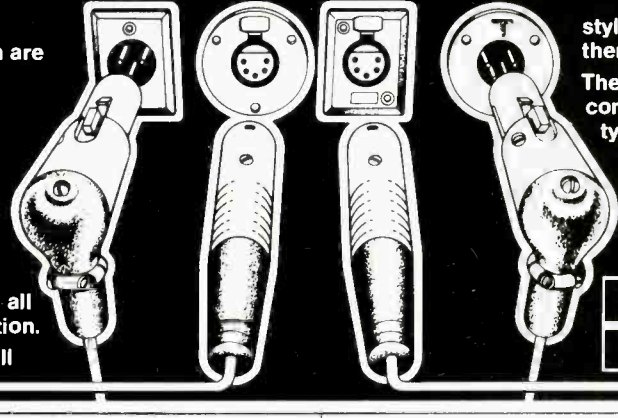

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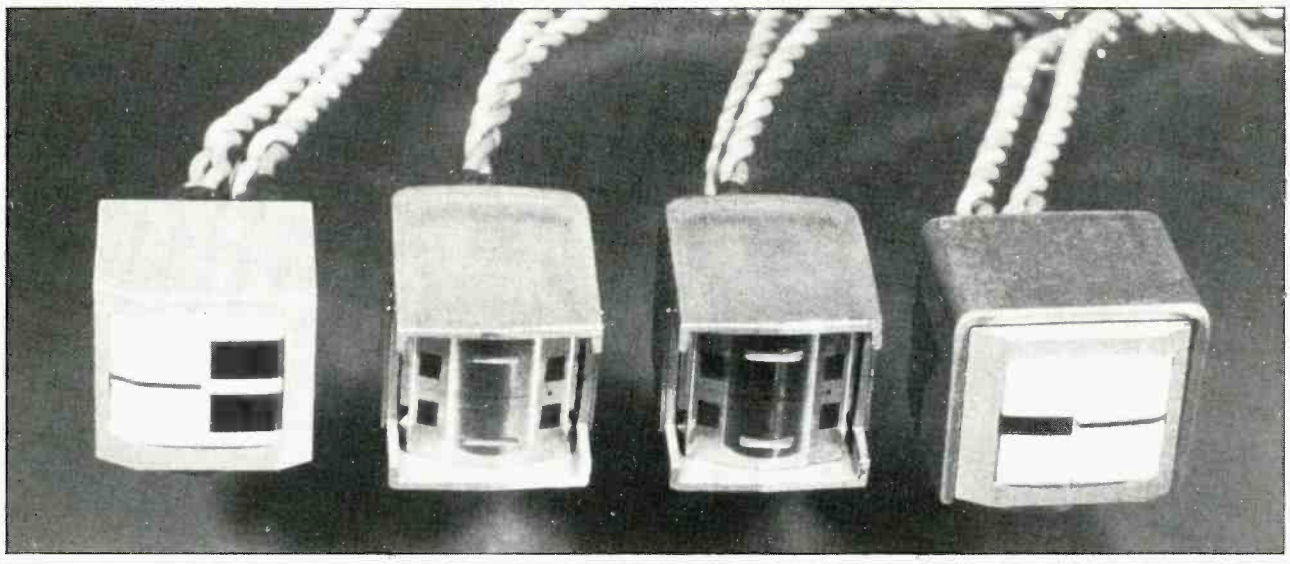

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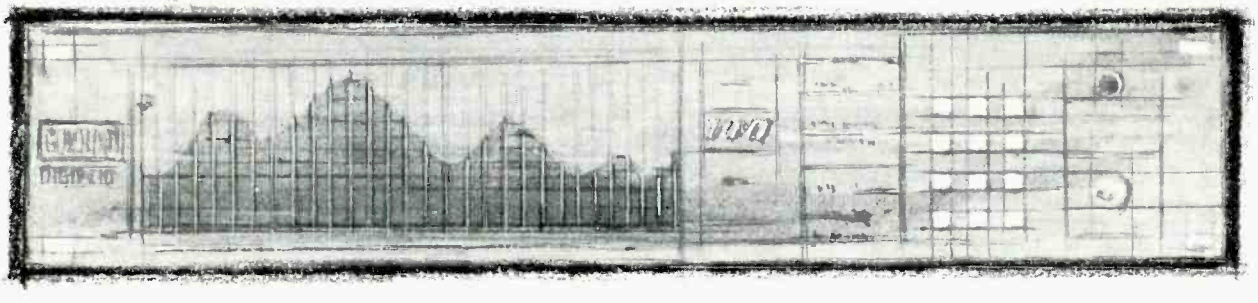

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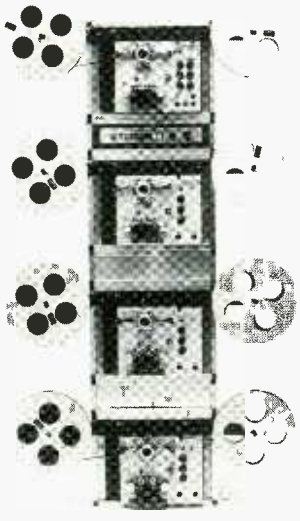

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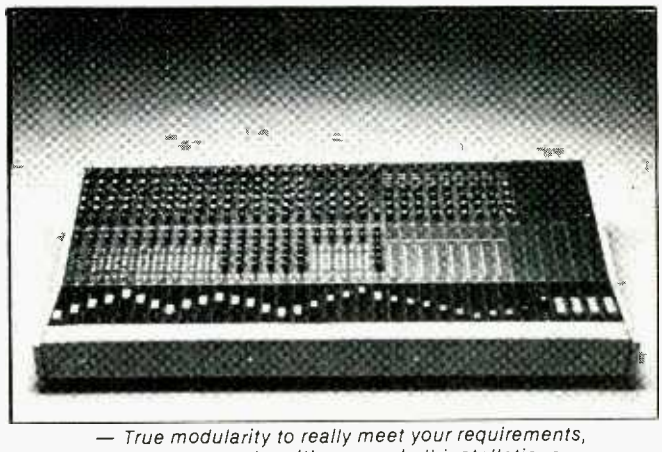

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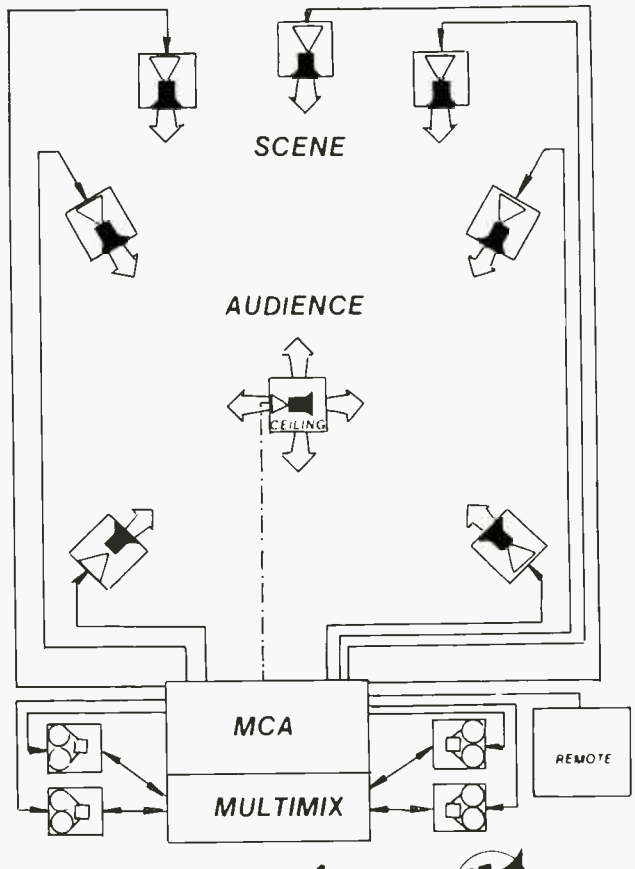

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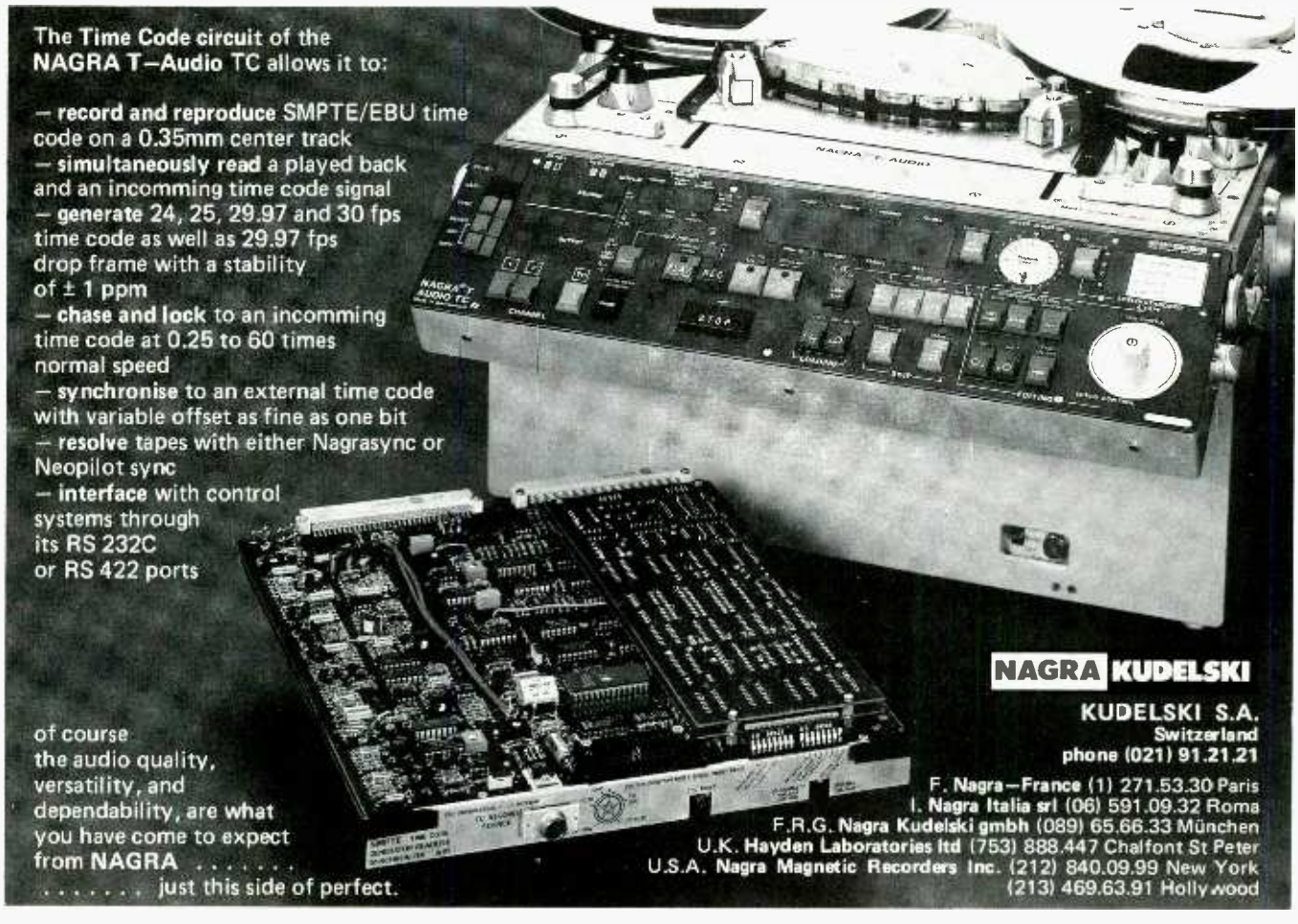

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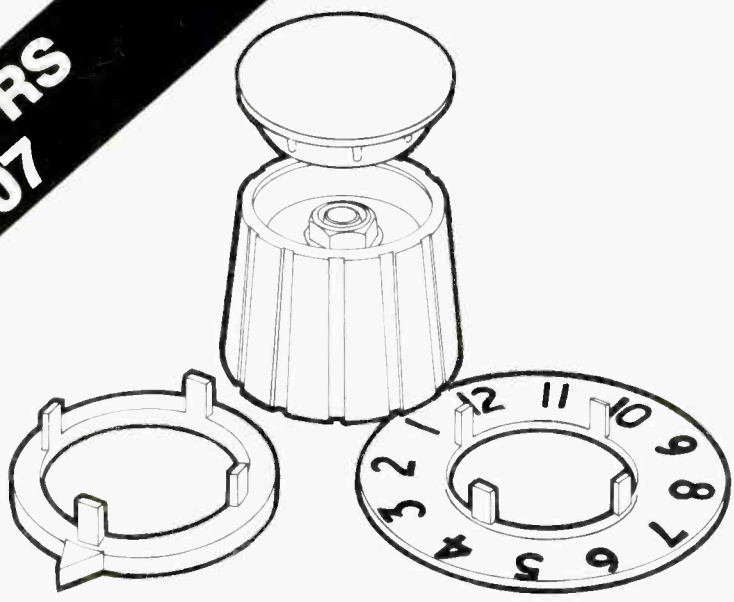

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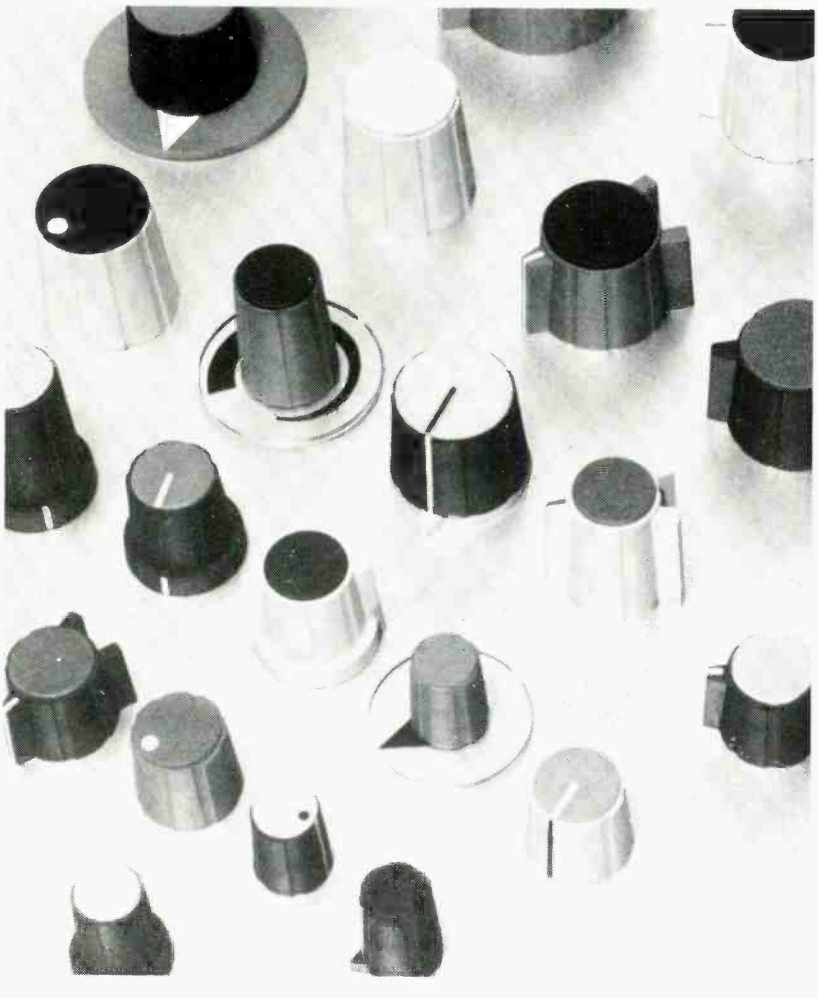

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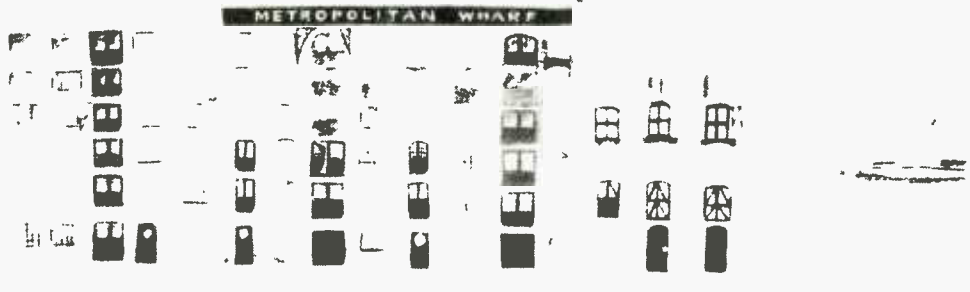

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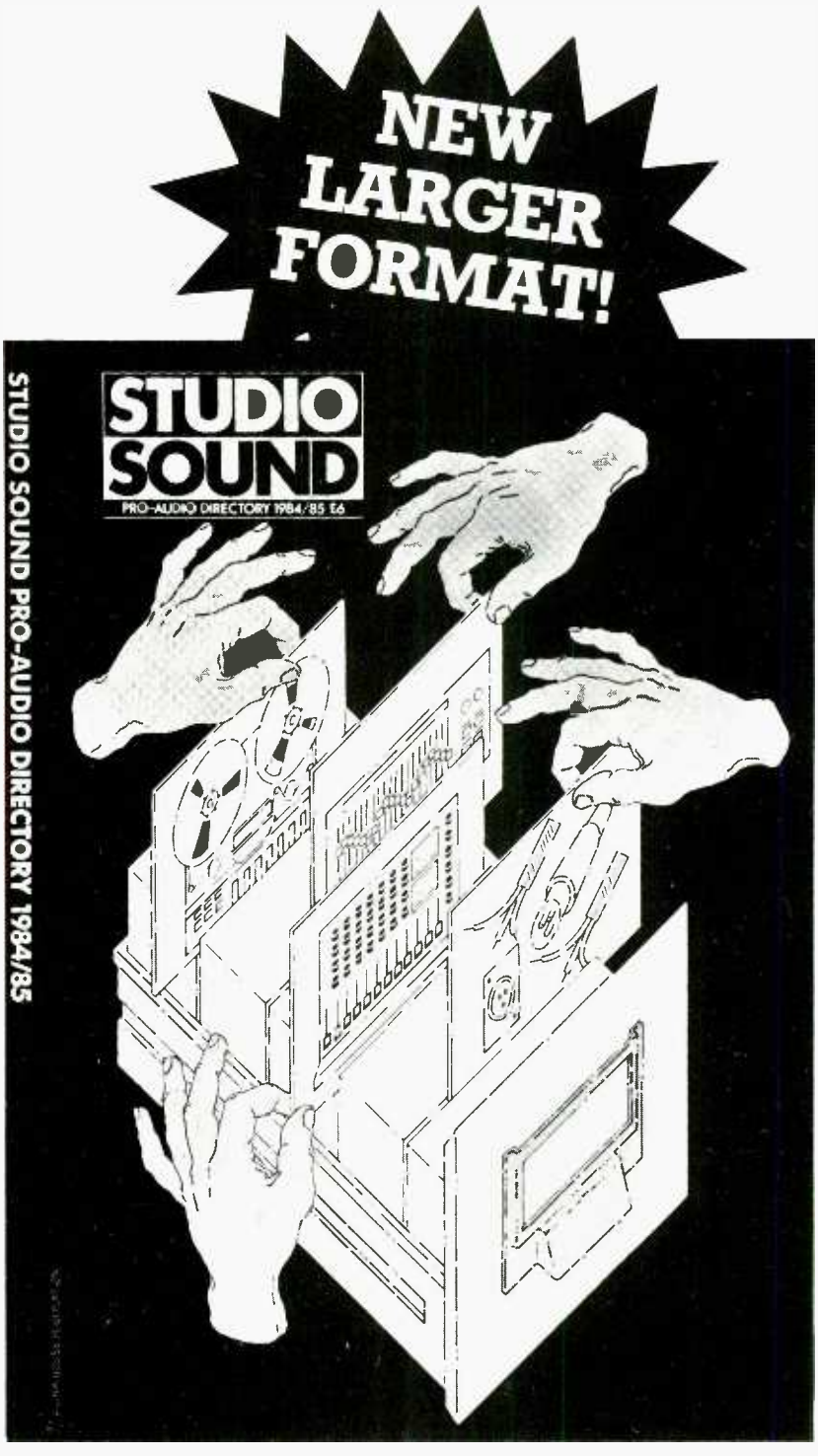

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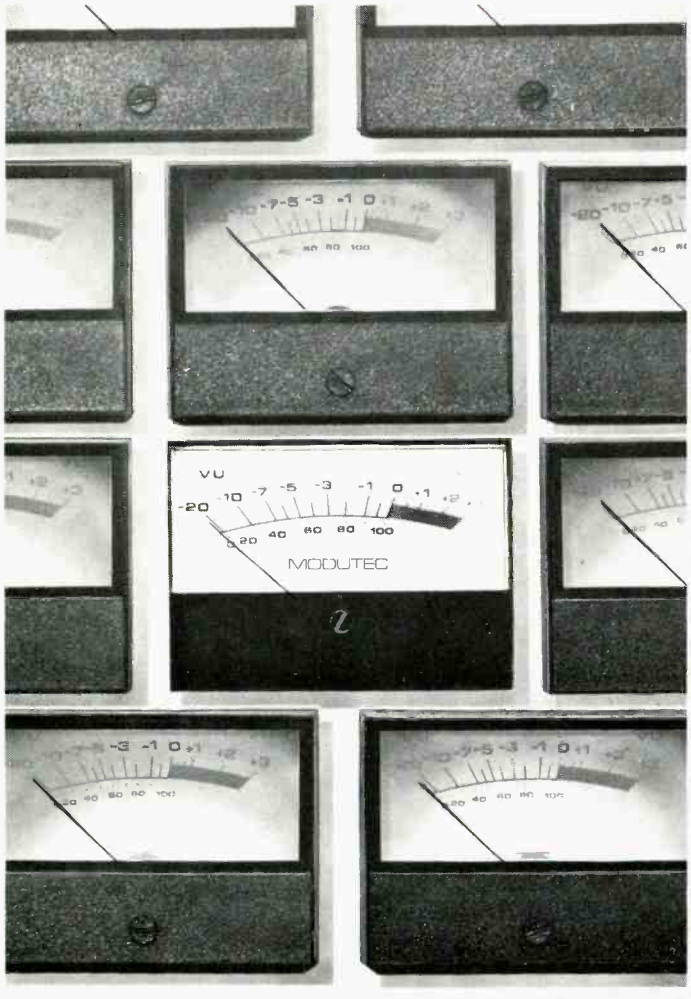

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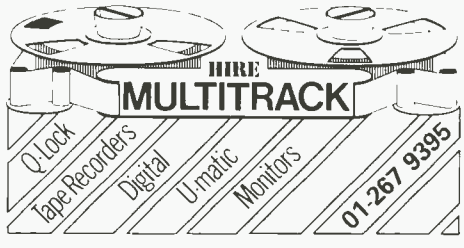

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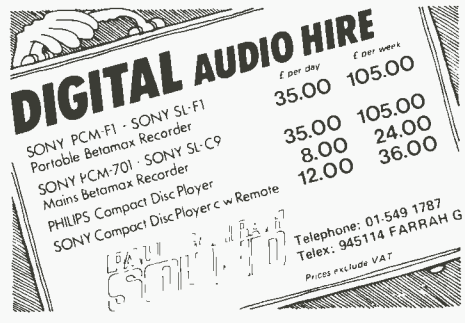

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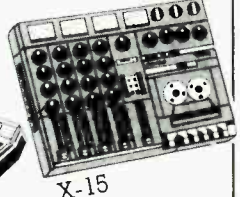

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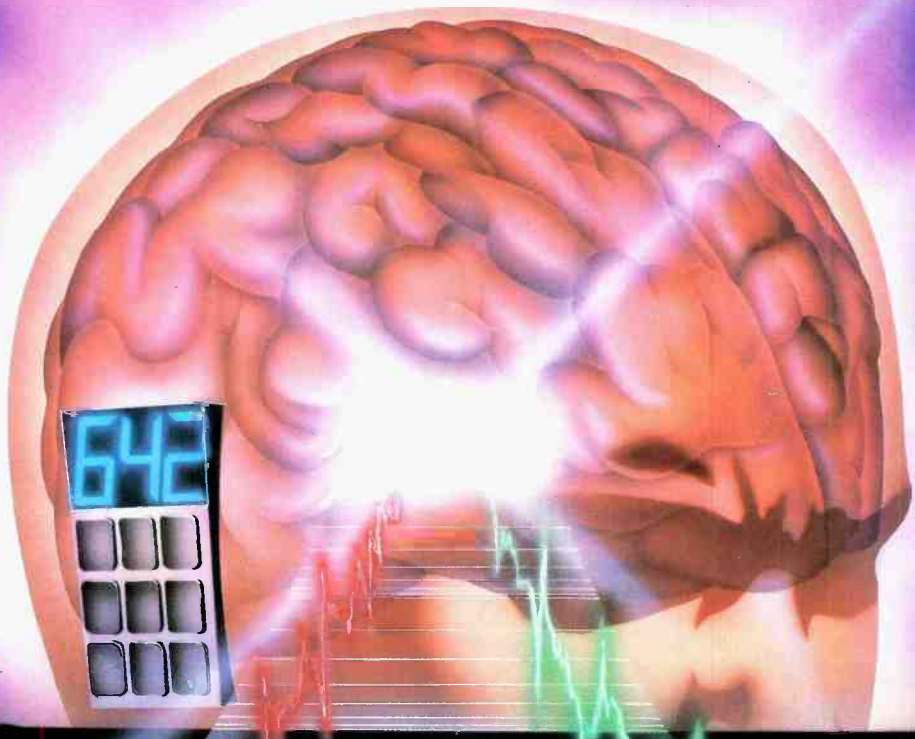

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