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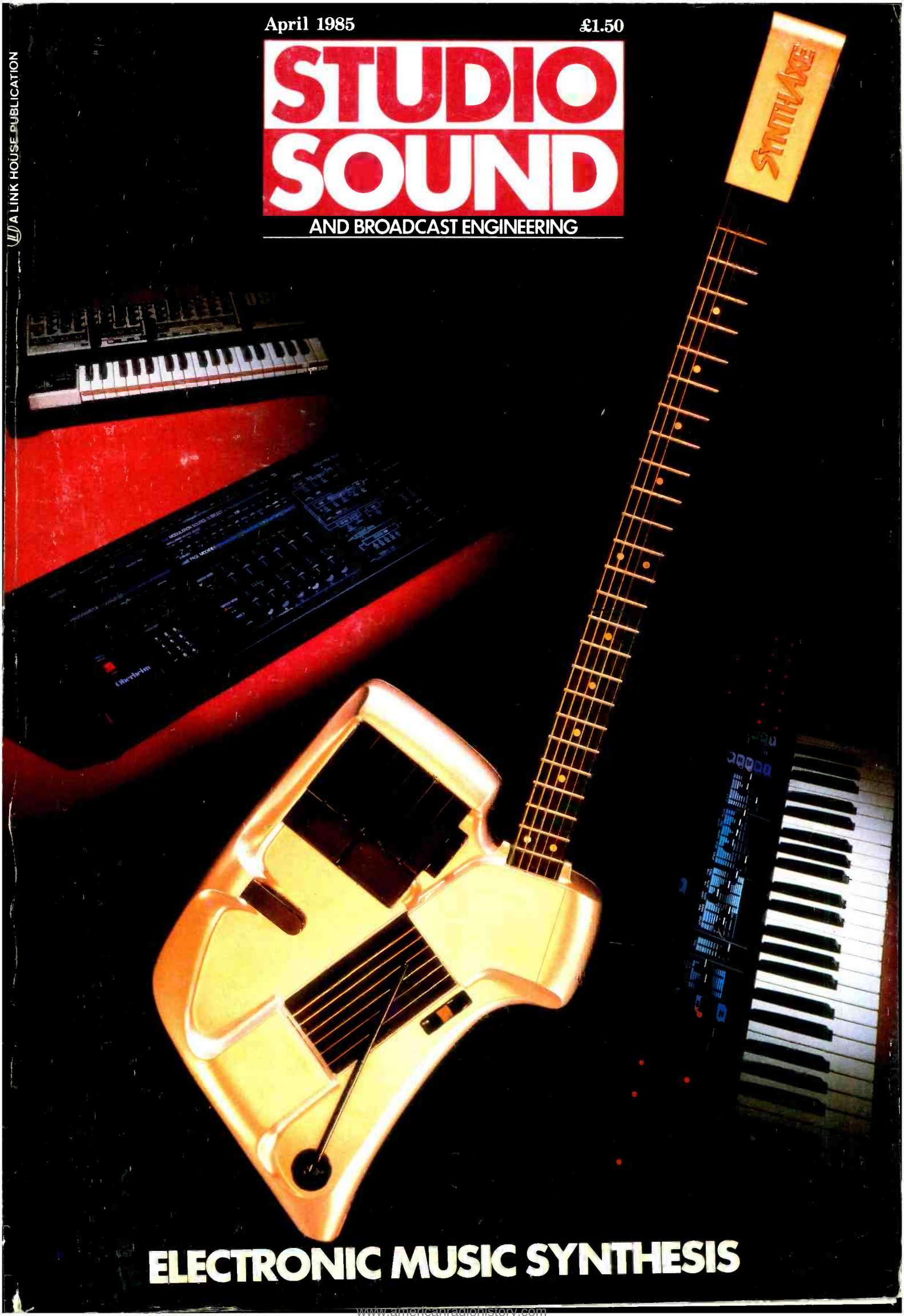
STUDIO SOUND

AND BROADCAST ENGINEERING

A LINK HOUSE PUBLICATION



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EDITORIAL

EDITORIAL

This month's comment from Keith Spencer-Allen

Electronic music synthesis

This month we turn our attention to electronic music synthesis or to be more precise, the hardware of electric musical synthesis. For starters we have Mark Jenkins' comprehensive update feature which unfortunately had to be written before the first of this year's European trade shows and therefore will almost certainly be out of date by the time you read this. Producing such an article at a time of ultra rapid development is always a thankless task.

We then gave Richard Elen the crystal ball gazing task of looking at the role of the synthesiser within the studio—now and in the future. If you are one of the decreasing number of facilities that doesn't find itself regularly recording or working with the larger computer controlled/assisted synthesisers, you may be unaware of the way in which some of the larger systems are making serious inroads into what was considered solely the province of the mixing console, the multitrack and the signal processing units. With full timecode sync and control, high quality sampling, resynthesis abilities with storage and complex waveform manipulation, some synthesisers are ready to develop in a number of ways—almost all of which will affect studio life even further. At a recent technical seminar, one manufacturer stated that they considered the removal of the recording engineer from the creative recording process to be part of their design philosophy. They were quite serious about this as well, not out of any malevolence towards the engineer but in an effort to reduce the number of stages between the creative musician and the recorded output. Within their own immediate applications they are very close to achieving this with a line of buttons with similar meanings to ≪ ■ ≫ > being found on part of the control section. Richard comes to one conclusion in his article although the opposite may be the final direction but whichever is the more correct, it is essential that we know how close vast changes could be.

The single greatest handicap that the synthesiser has laboured under is the undesirably strong attachment to the keyboard. Early synthesiser or more correctly electronic sound generators designers turned to the conventional keyboard as it was a quick and easy method of controlling pitch and other basic sound parameters. The relationship has survived far beyond its useful life and now it is a major problem in synthesis. There are of course other input methods but they are all difficult in real-time. So much electronic music often just sounds like a keyboard player trying to come to musical terms with an instrument capable of creating sounds and colours far beyond the imaginative abilities of the user. If it is not this situation then the synthesiser is being used to mimic sounds or patterns that would have originally been played on conventional instruments. There are truly very few musicians who can approach a synthesiser on equal terms without the machine taking the lead in the creative instinct.

A very good example of what is possible is the newish Wendy Carlos album *Digital Moonscapes* where the synthesiser was very much under control with imaginative use of depth and perspective in composition, arrangements and sound textures.

The arrival of controllers such as the *SynthAxe* is a great step forward. The stringed instrument family offers far more possibilities for control variations than a conventional keyboard, as well as allowing guitarists the freedom of the synthesiser, and will hopefully generate some fresh approaches in a field that has largely been becoming very dull in recorded output.

In the longer term, I would not be surprised to see the re-emergence of instruments similar to the Theremin and the Martenot. The idea of a synthesiser controller which is controlled itself by the movements of the musician's body without his physically touching the instrument, has certain attractive esoteric connotations that would seem to match the overall concept for performance requirements very well.

In a book entitled *Music For All Of Us* (Simon & Schuster, New York, 1943) by Leopold Stokowski there is a passage that reads 'When electrical instruments are relatively perfect, they will free musicians from our present constant preoccupation with the imperfections and technical difficulties of instruments. We shall be able to give all our feeling and thought to the inner essence of the music, because the instruments will respond with extreme sensitivity to every difference of feeling in the player and the music.'

Forty two years after that was written we are starting to realise some aspects of it—it just took a little longer than it needed to.

STUDIO SOUND
AND BROADCAST ENGINEERING

STUDIO SOUND is published on the second Friday of the preceding month. The magazine is available on a rigidly controlled requested basis only to qualified personnel (see back page for terms) or for an annual cost of **£18.00** UK, **$40** US surface mail, **$75** US airmail, **£24.50** overseas surface mail or **£46.50** overseas airmail to non-qualifying readers or where more than two copies are required in a studio or small organisation. *All* subscription enquiries, including changes of address (which should be *in writing* and preferably including an old address label or at least the 7-digit label code) should be made to the **Subscription Department, Link House, Dingwall Avenue, Croydon CR9 2TA, Great Britain.**

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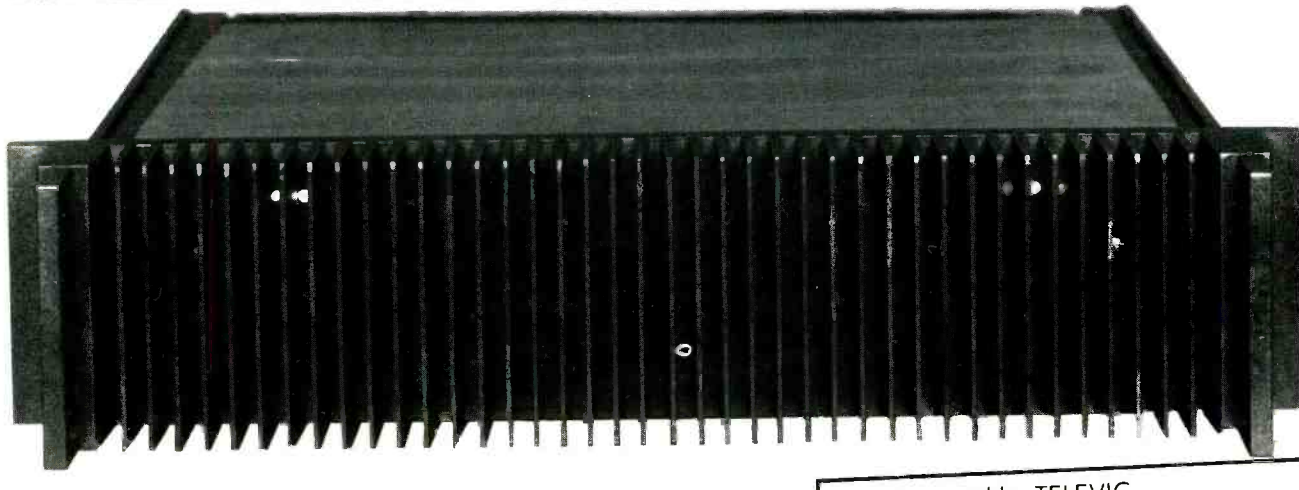

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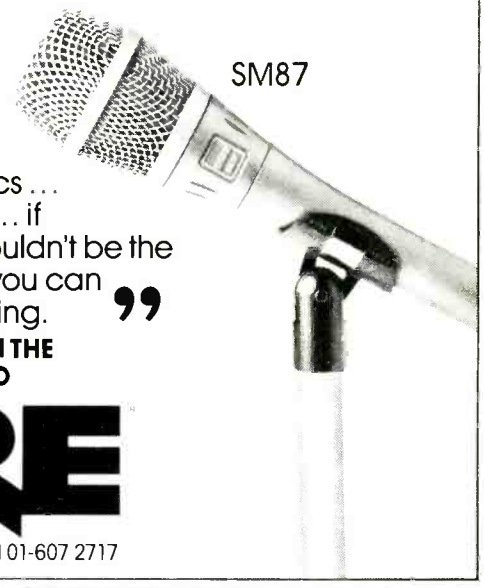

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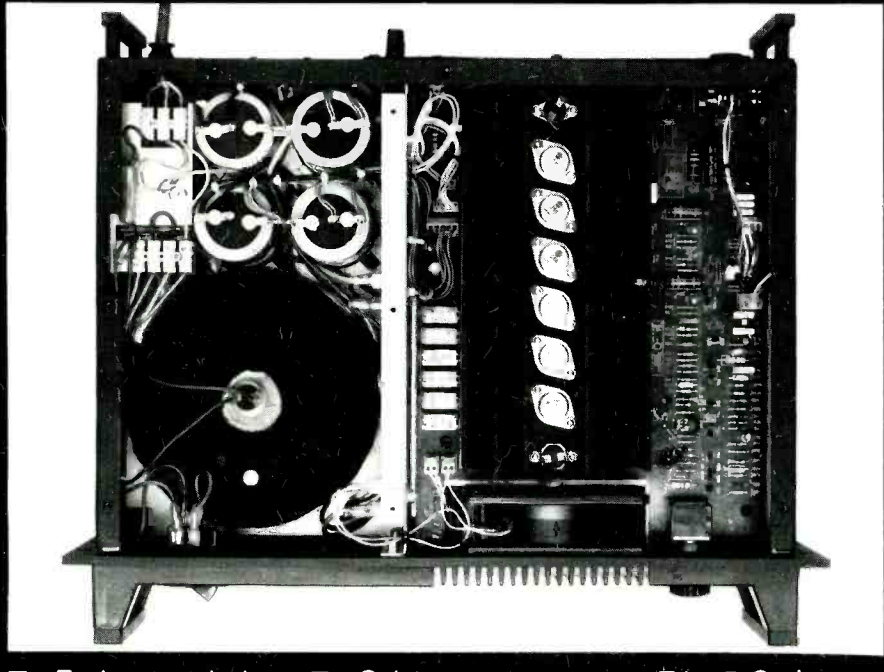

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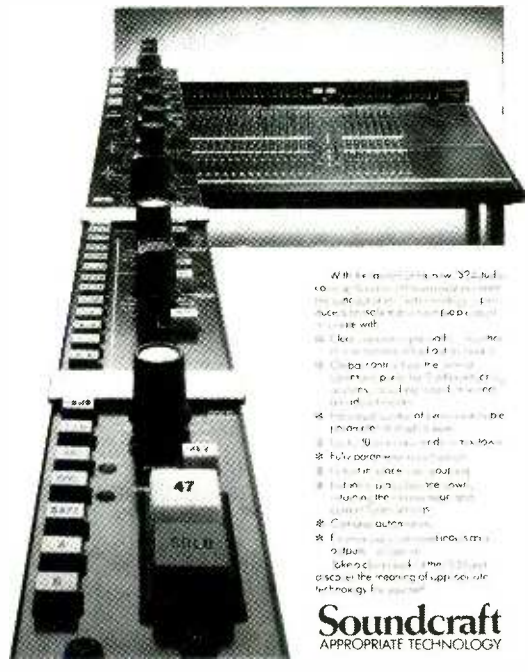

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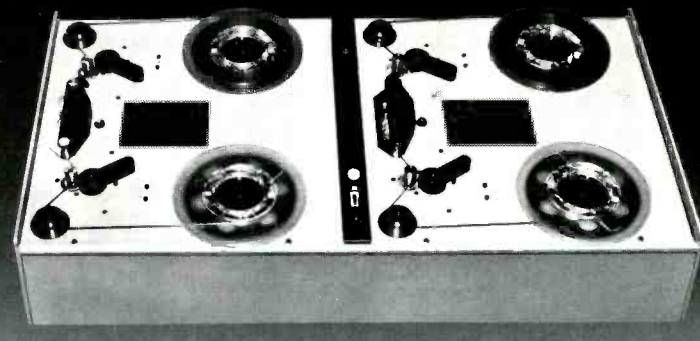

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We all know that most studio recordings will be made digitally in the not too distant future. Until that future arrives, the latest generation of recorders from Otari will bridge the gap.

ITA – for 12 years the first name for Otari – are proud to announce the availability of two important new Otari tape machines, the MX70 and the MTR20.

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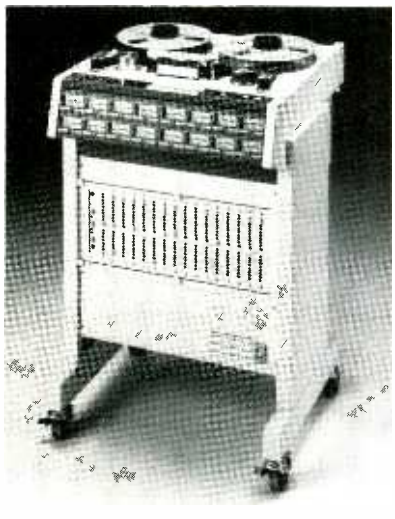
The MX70 is a completely new 1″ transport available in 3, 8-prewired-16, or 16 track formats.



The MX70.

½″ 8 track operation is also possible. The MX70 has been designed in the light of 5 years experience of the world-beating MTR90 2″ multitrack, and it features many of the larger machines superlative features and facilities. These include full reel servo control, gapless punch-in/out, single-card audio electronics, full synchroniser interface and total micro-processor control.

For those not requiring a 2″ machine, the introduction of the MX70 means that Otari multitrack performance and reliability are now available at a much lower cost than was possible before.

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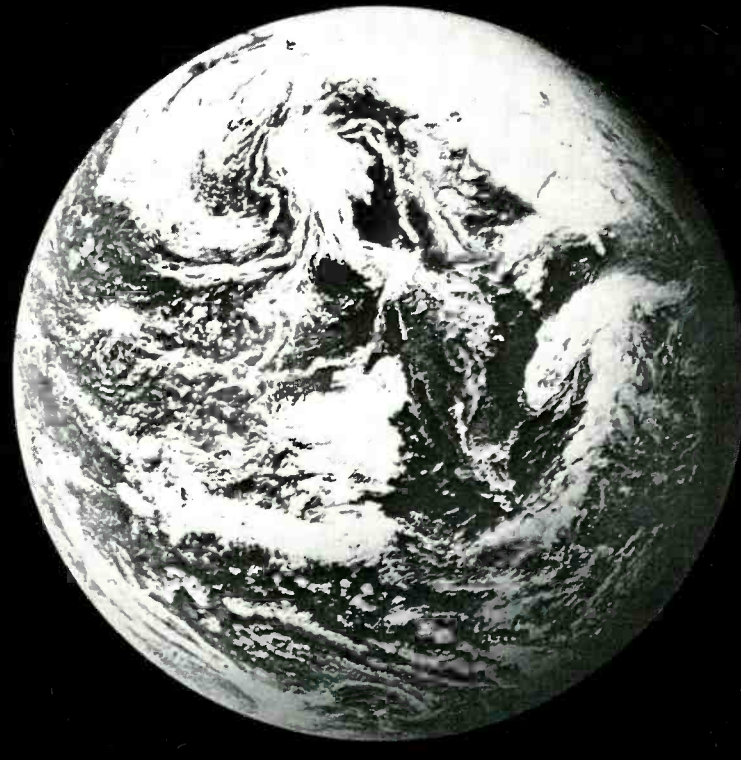

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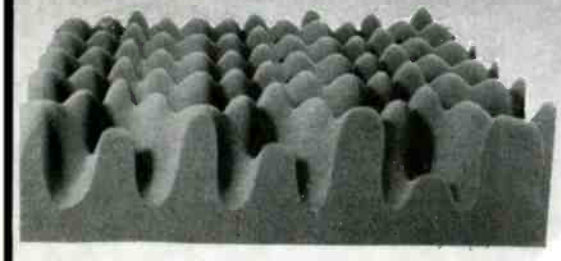

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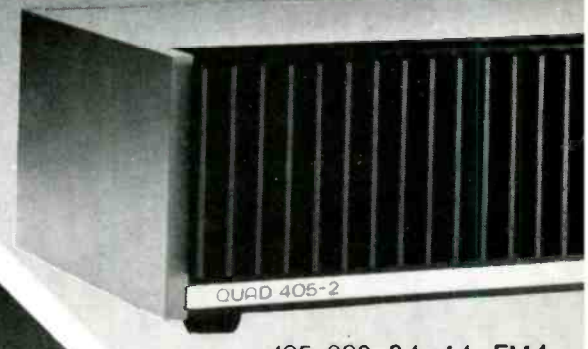

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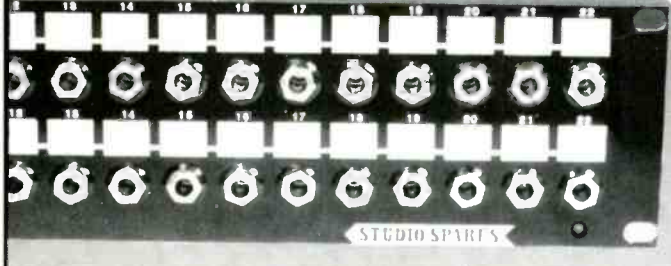

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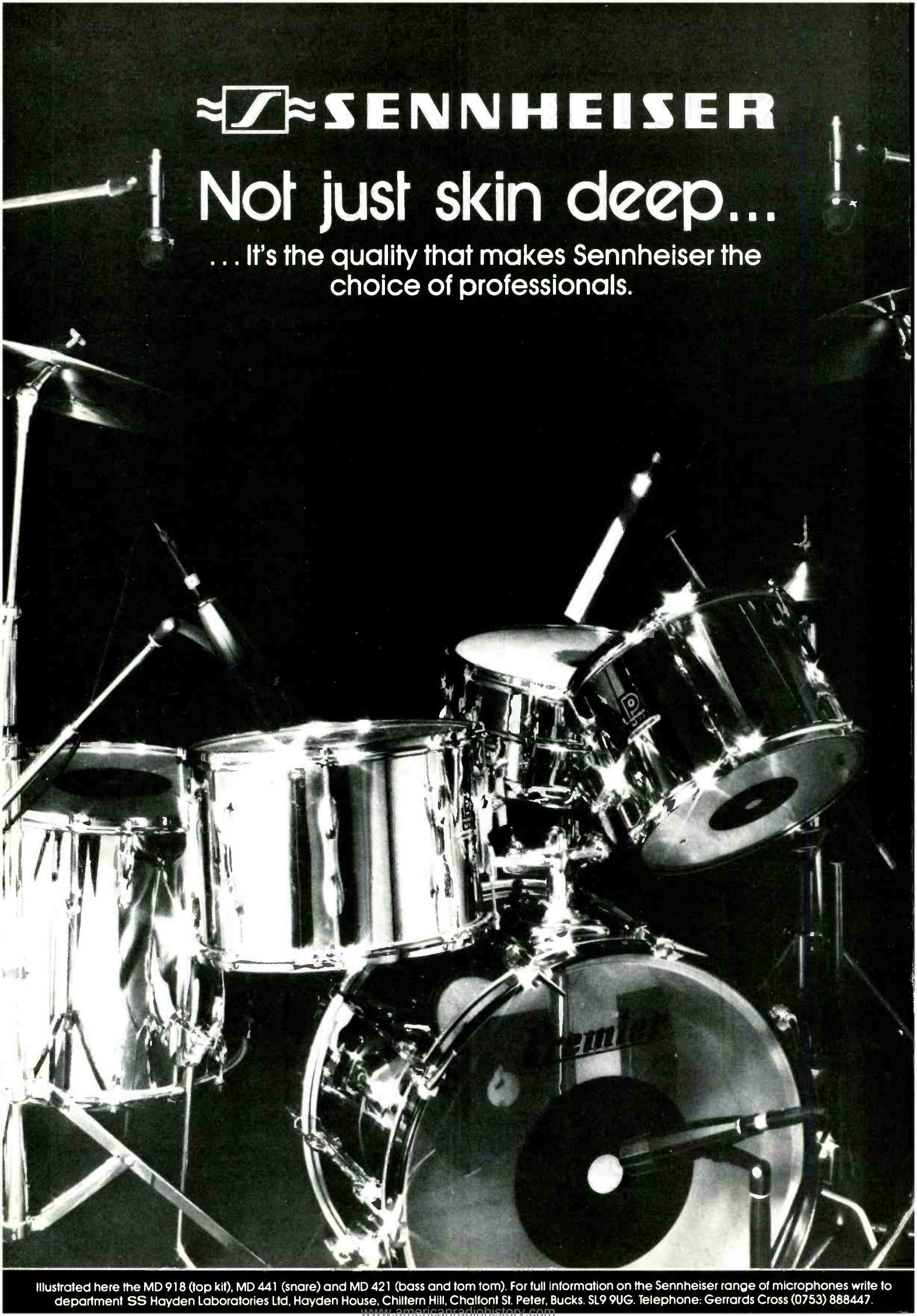

Illustrated here the MD 918 (top kit), MD 441 (snare) and MD 421 (bass and tom tom). For full information on the Sennheiser range of microphones write to department SS Hayden Laboratories Ltd, Hayden House, Chiltern Hill, Chalfont St. Peter, Bucks. SL9 9UG. Telephone: Gerrards Cross (0753) 888447.

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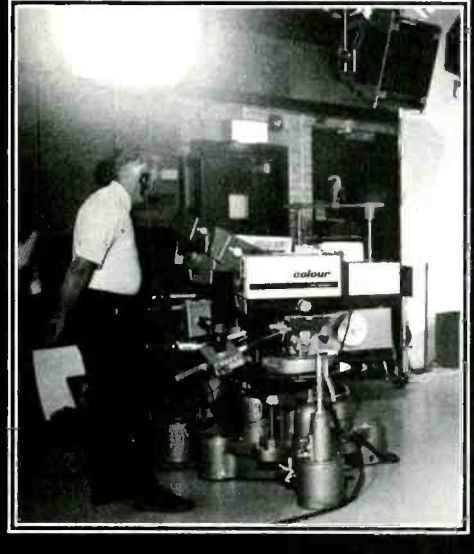

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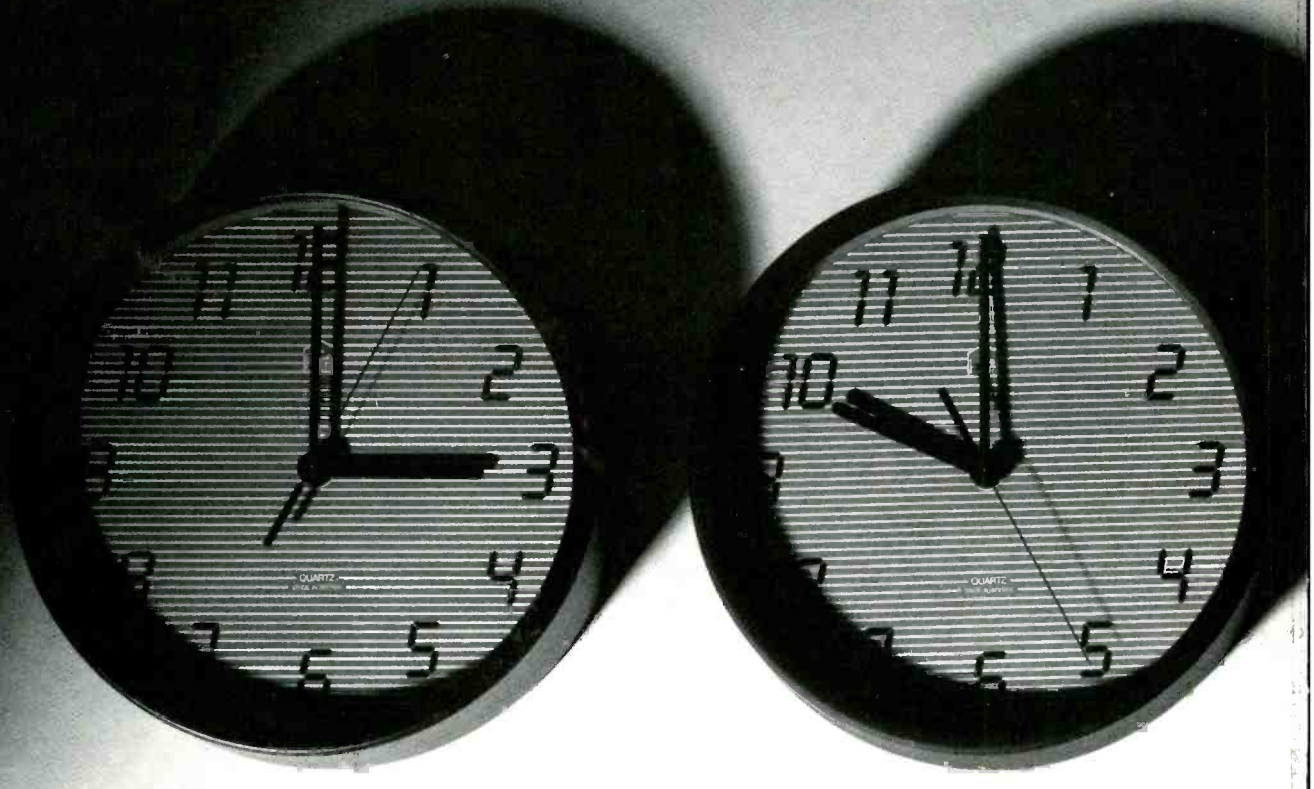

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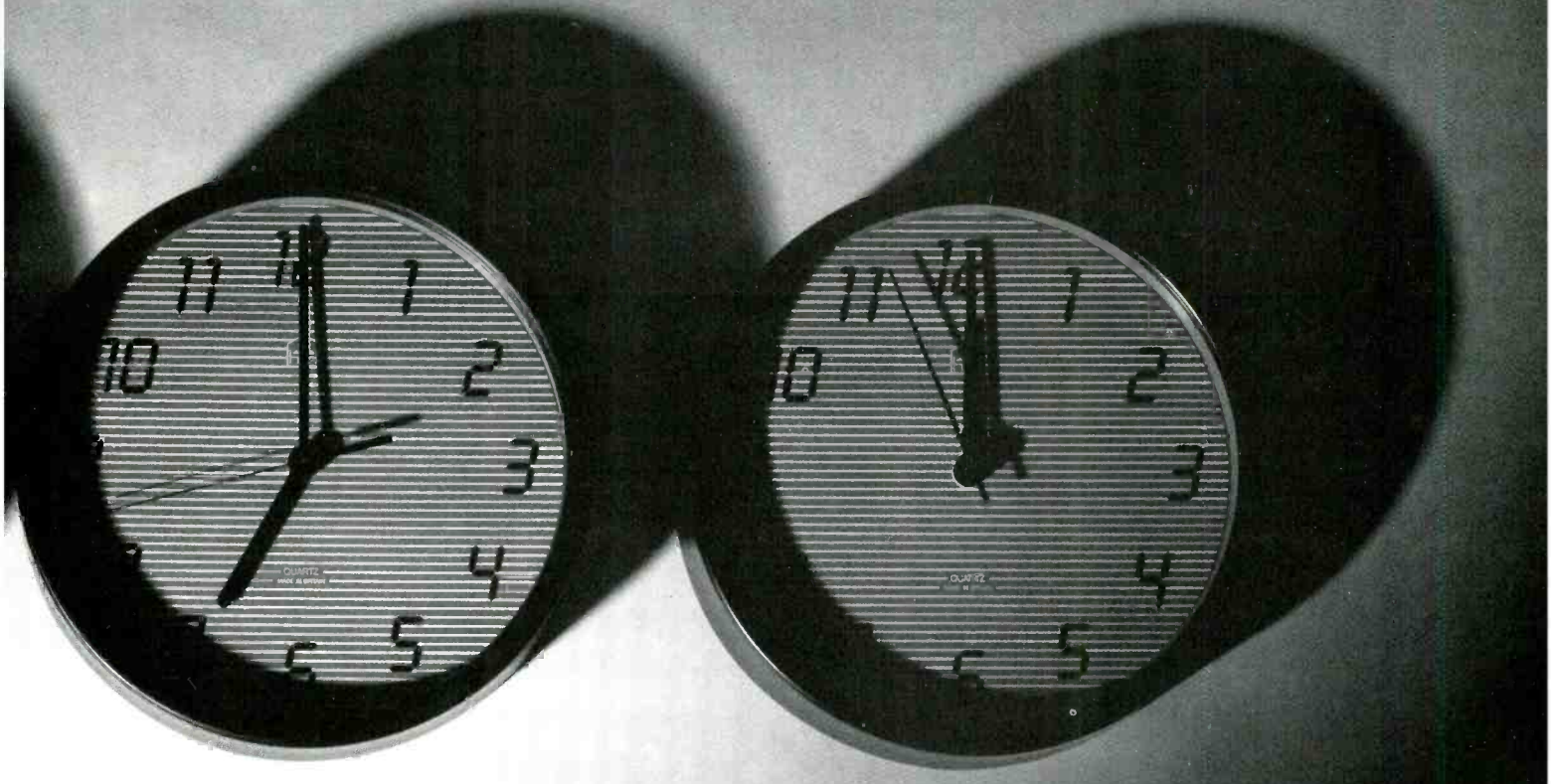

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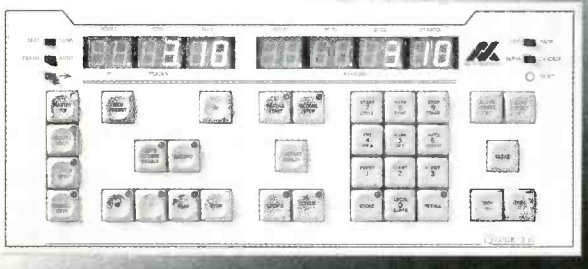

The ability to synchronise video and audio recorders is an increasingly vital facility required in studios all over the world. As much as three-quarters of today's audio recordings involve a visual aspect, and recording is more international than ever before. Basic tracks in New York, string and brass overdubs in London, dubbing in Los Angeles... modern international productions need an international standard for machine synchronisation, and there's really only one: Q-Lock by Audio Kinetics.

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DIARY

Developments, contracts, options

Denon digital

Nippon Columbia (Denon) in Tokyo has developed its own digital mastering console, and has been using it for compact disc manufacture since August 1984. The desk has four input channels, designed largely for Denon's 4-channel recording technique for classical music, and stereo outputs.

Nippon Columbia's involvement with digital audio goes back to the early '70s, following development work by NHK (Japan Broadcasting Corporation). As early as 1968, NHK's research department built a prototype mono digital recorder, and followed it with a stereo machine in 1969. During 1970/71, Denon hired the machine from NHK and made about 20 recordings. These early recordings, however, suffered from noise and clicks, and editing proved impossible. Only two of them were ever released on LP.

Meanwhile, Nippon Columbia engineers developed their own 8-channel PCM recording system, using a 2 in Ampex quadruplex video tape machine for recording. This machine was capable of operating at half speed for disc cutting, and was fitted with an advance playback head to enable varigroove operation. This system was used from 1972 for five or six years, and three identical such set-ups resulted in over 300 commercial releases. The system was eventually phased out because the machinery was too big and the tape too expensive.

By 1978, Denon had established a standard 4-channel recording technique for virtually all its classical music work. Two channels are used for a 'front' stereo pair and two for a rear 'ambient' pair of microphones. This allows the ambience to be adjusted in the calm of the mastering room rather than during the session.

Having developed this 4-channel technique it was logical that Denon should develop a 4-channel PCM recording system to go with it. This equipment, which is still very much in use, was also developed in-house, and consists of a 4-channel coder/decoder, operating at Denon's original 47.25 kHz sampling rate, in conjunction with a U-matic recorder. Denon intends to change to the 48 kHz standard in the near future.

Nippon Columbia engineers have now completed the digital chain with the PCM mastering console. This has four input channels, matching the Denon recording system, and a stereo pair of outputs. As well as mixing the four channels into two, the desk offers very flexible compression/limiting and equalisation facilities. The output can either be recorded at 47.25/48 kHz for vinyl cutting, or changed to 44.1 kHz by a Studer *SFC16* sampling-rate converter for compact disc.

The desk was completed in July 1984, and has been in full operation since mid-August for both Denon releases and outside clients (notably RCA). Details of the system were not revealed until late October, when the desk was demonstrated working at the InterBEE exhibition in Tokyo.

Looking to the future, Nippon Columbia's development team of some three engineers intend to build larger desks for both Denon and anyone else who cares to buy one. **Richard Lamont**

In brief

Rose-Morris has announced a new separate division, Korg (UK) responsible for the whole Korg range as well as the EMR computer hardware and software and the Clarion home recording systems...

University of Miami's School of Music is offering a master's degree in computer and electronic music with emphasis on electronic and computer music composition, performance and research, computer hardware and software for music and analogue and digital synthesis techniques...Sony Corp has announced a $55,000 grant to SPARS to establish an educational testing programme for audio technicians.

Contracts

● Philadelphia's Kajem Recording has recently installed an SSL *4000E* 48-channel mainframe with primary computer. It is the first such facility in that area.

● Eastlake Audio have been completing studio projects all over the world including Singapore Broadcast Corp, Stereo West Studio Vienna, Sound Studio SA in Athens Trilion Video in London and Amazon studios in Liverpool.

More recently under construction are Townhouse Studio Four and a country studio for Big Note Music.

● Solid State Logic have their first Texas contract with the teleproduction facilities of the Word of Faith Television Ministries in Dallas: a 40-input *SL6000E* series Stereo Video System. Other Texan contracts have been the Dallas Sound Lab with, again, the *SL6000E SVS* and the recently relocated video production facilities of Tele-Image, which is based around an *SL4000E* with *Total Recall*.

● Streeterville Studios in Chicago have re-opened their remix room with its *SL6000E* with SSL integral synchroniser and master transport selector. Other equipment includes Sony *BVU-800 VTR*, twin MCI 24-track machines, Otari *MTR-10* 4-track and MCI 1 in audio layback machine.

Streeterville's SSL will be one of the first in the world to be fitted with the programmable EQ, providing two channels of dynamic parametric EQ and panning automation for dialogue and effects matching and special effects.

● A second mobile unit for the German Audicon has been fitted with a Harrison *MR-4* 36-channel console, two Studer *A80* 24-track recorders, Studer *B67*, *PR99* and two *A710* cassette machines all supplied by Studer International AG. Other equipment includes Sony *PCM F1*, JBL *4430* monitors with Amcron *PSA-2* amp and White ⅓-octave EQ.

● DDA has recently supplied two *S* series consoles to HTV Wales and a third to HTV Bristol; a pair of *D* series mixers to Capital Radio for their Duke of York Theatre, and a *36/8/2 Matrix* console for the Kallange Theatre in Singapore.

● News from Digital Entertainment Corp reveals several Mitsubishi *X-80* and *X-800* installations, Sterling Sound New York have purchased the *X-80* and Audioforce Inc audio equipment rental company has taken an *X-800* 32-track; Fantasy Studios in Berkeley, California has increased its digital facility to 64-track with a second *X-800* 32-track. Nashville's Soundstage is also now 64-track with two *X-800* 32-channel machines.

Masterdisk in New York have an *X-80* 2-channel which is the first to feature a new autolocator unit developed for the *X-80* recorder.

● Sony Corporation of America have announced the delivery of a *PCM-3324* digital multitrack machine to Glen Glenn Sound in Hollywood.

Eastlake Audio Quested option

The Quested *Q215* control room monitor will be available from Eastlake Audio as a retro-fit option for those rooms which have built-in Eastlake type *TM3* monitors.

The retro-fit operation can be carried out in one day and involves the following sequence:
Removal of the existing loudspeaker baffle-boards; modifying the interior of the Eastlake cabinet; fitting new baffle-boards containing the Quested drive components; fitting a new crossover unit.

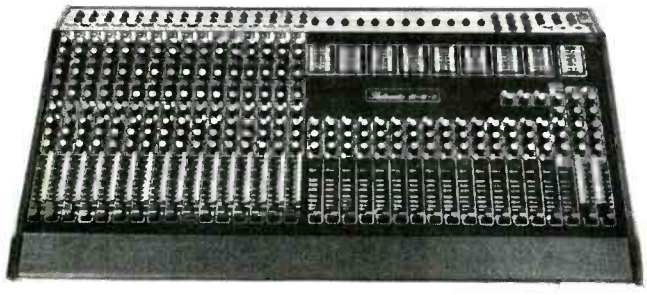
Thus Eastlake acknowledge the preference of some users for the soft-dome mid-frequency driver approach used in the Quested monitor.

The original Eastlake *TM3* solid wooden horned loudspeaker will continue to be available together with the recently developed *TAD* laminated horn with claimed improved dispersion.

Eastlake Audio (UK) Ltd, Unit 2, 10 William Rd, London NW1, UK. Tel: 01-262 3198. Telex: 27939. ▷

STUDIOMASTER

16-16-2

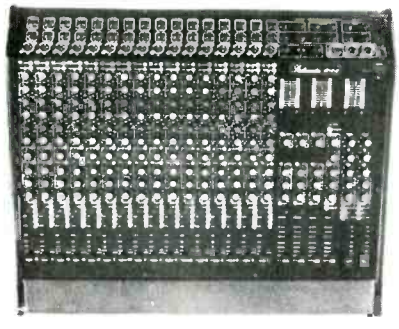


The 16/16/2 is designed to complement budget 16-track recorders. It features its own external P.S.U. which can supply even a fully expanded 16/16/2 (a 32/16/2!). All mic. channels have 48V Phantom Power, parametric E.Q. network, and 3 auxiliary sends. Full 16 channel monitoring is included in the 16/16/2 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. Uses 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

With distortion not exceeding 0.005% (1kHz sinewave at 200 watts/4ohms) this amplifier provides reliable amplification of outstanding fidelity in all applications. The extensive protection circuitry ensures failsafe protection against D.C., thermal overload and short circuit conditions. The front panel carries LED indication allowing instant monitoring of the amplifier's operational status. The Mosfet 500 is ideally suited to all professional applications requiring medium power, accurate reproduction.

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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DIARY

DIARY

Addresses, agencies, APRS

Address changes

● Tannoy's marketing and sales administration office has relocated at: The Bilton Centre, Coronation Road, Cressex Industrial Estate, High Wycombe, Bucks HP12 3SB. Tel: 0494 450606. Telex: 83251. The production, R&D, shipping and accounts departments remain at the Strathclyde factory.

● C-Tape Developments have expanded into larger manufacturing premises, prompted by increased demand alongside the recently acquired Cactus electronic percussion systems.

The new factory address is: Unit 19, Holder Road, Aldershot, Hants GU12 4RH. Telephone and telex numbers remain as before: Tel: 0252 319171. Telex: 858623/858393.

● The Trebas Institute of Recording Arts has moved to 410 Dundas St East, Toronto, Ontario M5A 2A8. Tel: (416) 966-3066.

● Tony Faulkner, the specialist classical recording engineer and occasional contributor to this magazine, has moved his base of operations from his Harefield cottage to Staines, just west of London. Recently added facilites include a Sony *DAE1100* digital editor, a wide selection of mics from Schoeps, Sanken, AKG, Neumann and Shure, long-crystal oxygen-free copper cables and a wide selection of monitoring speakers. The previous telephone number is now in use only after business hours.

Tony has recently been appointed President of the Federation of British Tape Recordists and nominated for a Grammy Award for a CBS recording with Wynton Marsalis.

Tony Faulkner, Unit A, Millmead, Staines, Middlesex TW18 4UJ, UK. Tel: 0784 58793.

Agencies

● The Mag A-V group of 3M has appointed Sound & Vision Workshop Ltd, 153a Victoria Street, St Albans, Herts. Tel: 0727 58977, to handle UK servicing and spare parts supply for the 3M *M81* digital mastering system as well as the range of *M23*, *M56* and *M79* analogue multitrack recorders.

● Music Lab Sales has been appointed exclusive UK distributor for the range of ADA DDLs including the *2FX Multi Effects* processor.

SSL goes West Coast

Solid State Logic has opened a sales, service and training facility in Hollywood, California, headed by Andy Wild recently appointed vice-president marketing for Solid State Logic Inc.

Equipped with an *SL6000E* series Stereo Video System, facilities include complete audio for video post-production and training. Client training is supervised by new West Coast sales engineer Dave Colley who has joined the company from Producers Color Services.

Carlton Blake is the new West Coast service engineer, previously chief engineer at Soundcastle Studios, LA. Grey Ingram, chief engineer for North America can also be contacted through the Los Angeles office: 6255 Sunset Boulevard, Suite 1026, Los Angeles, CA 90028. Tel: (213) 463-4444.

IPE new divisions

Independent Project Engineering Ltd has split into three divisions—all broadcast and audio products and services are now handled by IPE Broadcast Systems, headed by John Chalmers. The address and telephone number remain as before.

Soundcraft move

Soundcraft Electronics has moved its manufacturing division so it is all under one roof at Boreham Wood, UK. PCB work, previously sub-contracted, will now be automated as will certain other areas of production.

APRS COLUMN

All APRS 85 stand space was allocated within hours. This exhibition continues to grow in importance internationally—and it is still managing to grow in size, although it was only possible to increase stand space by about 5% for this year, after the big 20% increase achieved by taking part of another floor last year.

The APRS show is booked into the venue two years ahead, and so the 1985 dates were fixed before those of the Montreux ITS were announced. When the unfortunate clash was realised (APRS runs on immediately after Montreux) considerable efforts were made to change the APRS dates. This, however, proved impossible, but all evidence points to the fact that the UK show will suffer no adverse effects, in attendance.

The cost of space has been held down to £78 per m^2 maintaining the APRS show's position as the least expensive international pro-audio show as well as being one of the most successful.

After the second Digital Seminar it was noted with great regret that the level of attendance by record company A&R and marketing executives hoped for had not been achieved.

The APRS Executive Committee wrote to the BPI asking that the industry organisation should help in encouraging its member companies to take a greater professional interest in learning about all aspects of digital recording, in order that the music industry should take the fullest advantage of the available new recording technology. At the time of going to press it was learned that the APRS's offer to organise a special one-day seminar specifically tailored for record company personnel was to be discussed by the BPI Council.

A Producers' Guild is being set up with the help of the APRS, in response to the widespread interest shown by record producers in the possibility of some form of membership of the Association.

After discussions about the best way in which producers could be offered membership, it was decided that a Guild with close links with the APRS would suit producers' needs. An inaugural meeting has already taken place, attended by several well-known producers who have agreed to work out a proper structure for the Guild, and further meetings are being arranged. Details will be published as soon as they have been fully worked out.

The success of the first APRS business meeting to be held for some years led to the organisation of a second—which was held on February 12—and the intention is to serve what is clearly a great need for studio owners and managers to get together and discuss business matters by holding such meetings for members regularly in future.

Recent months have seen some effective reorganisation of the new maintenance engineers' course at Salford College of Technology (with help from the APRS Executive and in particular Phil Wainman of Utopia Studios) and the acquisition of more equipment for students. There have also been a number of applications for advice from other colleges wanting to serve the call for training studio work in one way or another, and Education Committee head Clive Green is visiting and reporting on these. There have been various applications for help or endorsement by commercial bodies attempting to set up short training courses in studio work, and these too are being carefully scrutinised by the APRS before any endorsement is given. But the Association is concerned about the uncoordinated approach to studio training, and particularly about the possibility of would-be entrants into the profession spending money on courses which do not train them properly, or result in no useful qualifications which are recognised by established professional studios. ▷

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DIARY

Books, brochures, CTEAP

AES loudspeakers

Loudspeakers Volume 2, an anthology of papers on loudspeaker technology 1978 to 1983 (vol 1 covers 1953 to 1977) is available from the AES. The 49 papers are reproduced from the *Journal of the Audio Engineering Society* and include loudspeaker design, construction and operation.

At a cost of $27 to members and $30 to non-members, the book may be ordered from Special Publications, Audio Engineering Society, 60 East 42nd Street, Rm 2520, New York, NY 10165, USA; or Ms T K S Bakker, Polygram BV, PO Box 23, NL-3740AA Baarn, The Netherlands where the cost will be the equivalent of 1570 BEF (members) or 1735 BEF (non-members). If ordering from the European address you will be invoiced in both BEF and your local currency and suggestions for suitable methods of payment will be made.

Synthesizer & Electronic Keyboard Handbook

Just published, this comprehensive book contains a brief history from the introduction of keyboards and synths to modern music followed with detailed sections on sound and electricity, the instruments, other types of keyboards, playing technique, and amplification and recording.

Complicated musical and technical terms are explained very simply and effectively.

Written by David Crombie, and fully illustrated, the work is published in the UK by Pan Books.

Sinatra's AKG auction

The gold plated and engraved AKG *C535EB* which Frank Sinatra used during a Vienna benefit concert was sold at auction on Christmas Eve—the proceedings being televised live. The auction was held in aid of the 'Light in the Darkness' fund for handicapped children.

Literature received

- The latest catalogue from Eardley Electronics and G E Electronics detailing their sole UK components agencies. Copies may be obtained from the Eardley organisation, Eardley House, 182-184 Campden Hill Road, Kensington, London W8 7AS. Tel: 01-221 0606/727 0711. Telex: 23894.
- Synchroniser manufacturer Adams-Smith have recently published an expanded version of the instructional manual for the *Model 2600SY* tape synchroniser. In addition to the *2600SY* sections, it contains a general information section on the problems and techniques of tape synchronisation. All current users will apparently receive a copy of the new manual and further copies will be available through Adams-Smith and their agents.
- Solid State Logic has published the second issue of its International Client Directory which lists studios with SSL consoles, their addresses, contact name with telephone no, and a listing of the precise SSL installation. Copies are available from SSL and their agents.
- From 3M *The Scotchflex System* lists the full range of Scotchflex IDC connectors and accessories.

CTEAP Convention, Paris

In the same manner that the AES and APRS have their regular do's, 1984 marked the 7th convention of the ATEAP (Association pour les Techniques Electroacoustiques et Vidéo Professionelles). Roughly translated this means the Association for Professional Electro-Acoustic, Electronic and Video Techniques, and the aims of the Society are very much along the lines of the APRS and AES in that they encourage the exchange and furtherance of ideas and techniques within the audio—and now video—professions.

The three-day convention consists of lectures and workshops plus, surprise, surprise, an exhibition of audio and, for the first time this year, video equipment. It also provides an opportunity to catch up with French products that one rarely has an opportunity to see at other exhibitions, and though all the familiar names were in evidence, I felt it would be more interesting to concentrate on products that we normally don't get to see.

The exhibition caters almost equally for the recording and broadcast industries and this year's entry of video into the exhibition reflected the growing preoccupation for the marriage of sound and vision, which can only be to the good of all concerned.

The lectures and workshops covered subjects ranging from broadcast sound techniques—both OB and studio—to developments in microphones, consoles, control room acoustics and new techniques for cinema sound.

And so on to the exhibition.

In view of the increasing studio involvement with synthesisers it would seem appropriate to start this report with news of software for the Yamaha *DX7*, the **FROG** *Musiciel DX-GT1* (FROG= French Research On Goodies). At present available for Apple *II* computers and soon to be joined by the Commodore *64* version, this software is the one "that takes the *DX7* seriously". A talk with the creator of the program, M Poncet, revealed that the *Musiciel* was developed after a vain wait for some 'sensible' software for *DX* synthesisers to appear on the market. The program can be said to have three main functions, viz:

Parameter display: total status including functions, graphic traces of envelopes and EQs, traces of LFO and envelopes only or traces superimposed over the full status readout, possibility of effacing redundant parameters (eg zero output of an operator) for greater clarity.

Patching: the *GT1* enables the setting up of patches composed of different sub-assemblies from existing sounds. Other sounds on disk can also be integrated into the programs together with functions, EQ and LFO.

Storage bank: various sounds coming under the same heading can be stored together with all parameters and functions. For instance, this permits the filing of all piano sounds in one group and puts them in alphabetical order. A complete editor program is also included.

FROG have said they will let me have a program for *C-64* to try out soon so I will be coming back on this one. Two further programs are in the process of being finished; one for note storage (sequencing) and the other for printing out the music. One important point is that the storage is real time with no correction to the nearest semi-quaver or whatever (this function is however available in the program if you want to use it). This means that the music will be played back faithfully, tempo variations and all, and even more useful, the program will pilot a drum synthesiser meaning that it can 'swing'! ie you are not tied to the drum synth's metronome but it follows you—just like a 'live' drummer. As I said, more on this when I have had a chance to use the *GT1*, but it does appear to be a step in the right direction towards integrating musicality with technology.

Syncode Electronic showed their *VMP* system for the first time and this has applications for audio mixing in music studios, video and film. Basically, the *VMP* system provides a visual display of recorded material on tape and thus acts as a prompter when mixing. Though not an automated mixdown system per se, it provides virtually the next best thing and at a reasonable price. There are two versions available at present, 8-track and 16-track, and as the system is designed to be evolutive no doubt 24-track is on the way. As might be realised, the *VMP* works in conjunction with SMPTE timecode (giving 7 or 15 audio tracks) and has three modes of operation:

Storage mode: when locked to ▷

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timecode, the *VMP* system memorises the positions on the multitrack where audio is present above a certain threshold (normally −30 dB though range is adjustable by 20 dB). These memory positions can then be displayed on a video monitor.
Mixing mode: the display of the system includes eight light bars that move from left to right across the screen, thus simulating the tape path, together with the timecode numbers and a stopwatch. A vertical black bar is placed to the right of the screen and represents the playback head. The L to R movement thus represents the timecode track together with the 7 or 15 audio tracks. When no audio is present there is a blank space in the light bar. In the mix mode the track number for each indicator flashes for 5 s before the appearance of the bar indicating signal present, and for another 5 s before the audio ends. The time taken for the bar to cross the screen before reaching the playback head indicator is 7 s thus giving 12 s of advance warning that audio will be present.
Display mode: here the contents of the memory may be quickly displayed (35 s). The memory can also be displayed second by second, together with timecode.

Though probably more suited to A-V and broadcast applications, the *VMP* system presents itself as a timesaver and enables the rapid assembly of a mix. The system is already in use with *FR3*, Antenne 2 and Tele Europe.

Following the launch at IBC, **Solid State Logic** were present with the *SL5000* modular console which is aimed primarily at the broadcast market. The console is very much a configure-it-how-you-want desk and can be built up from a variety of modules in a selection of frames to produce virtually a custom console.

Enertec-Schlumberger showed a demonstration version of their digital console (which was premiered at the Paris AES) but seemed content to garner interest and opinions rather than make a big fuss about it.

On the less well known front **SAJE** are a French company which is now gearing up to make itself a force to be reckoned with outside France. SAJE produces an interesting line of recording and sound reinforcement consoles.

Top of the line is the *ULN* recording console, with a standard configuration of up to 56 input channels, 32-track routing/monitoring, six auxiliaries, 11 VCA groups, plug-in compressor/gate module per channel, three choices of equalisation—Baxandall, 9-band graphic or 4-band parametric—and automation. The console features extensive microprocessor control with three basic modes of operation.
Total Program: a single keyboard permits instant selection of the three operational modes: record, overdub, mix.
Total Reset: when changing from record to mix, the console status automatically returns to zero.
Total Display: each input channel features a 16-function display strip alongside the channel fader, giving the channel status and functions in operation (input, monitor, status, cue, etc).

Other features on the console are six echo returns with routing to groups and or multitrack buses and cue, LED meters switchable peak or VU or spectrum analyser, LED and mechanical meters for the stereo buses and LED phasemeter. One novel feature is that the linear monitor return fader becomes the auxiliary master for that channel in mix mode, ie a mix can be set up on the echo effects sends for the channel with master level control by the monitor fader. In brief, *ULN* is well worth looking into.

The other studio console is the *Odyssey*. This offers up to 30 inputs, 24-track routing/monitoring, six auxiliary sends/returns, six VCA groups, 3-band parametric EQ and automation. Metering is by LED columns with VU characteristics and peak indication on the stereo outputs.

SAJE offers two consoles for sound reinforcement, the *Poly* and the *Auxy*. The *Poly* is fairly basic with up to 24 inputs into four groups, four sends and returns, 3-band EQ and master module with monitoring as oscillator. An 8/8 version is also available for theatre work and onstage monitoring.

The *Auxy* is quite a step up and is in some ways a hybrid console. Configuration is up to 48 inputs mixing down to four sub-groups and stereo outputs, with re-routing on groups. There are eight auxiliary sends switchable pre-post on inputs and groups plus eight echo returns with full EQ. The equalisation on the console is quite comprehensive with sweep high and low bands and parametric mid-band. So far so good and the console can be used for front of house alone or also for running stage monitors (this is quite common in France). In addition, each input can be routed separately to one of eight buses for simultaneous 8-track recording, the signal being switchable pre- or post-fader. Metering on the *Auxy*, as on the *Poly*, is by LED VU meters. The *Auxy* range also includes stereo line input modules and a 14-way matrix version also exists for theatre and monitoring.

SAJE's Memory Show

The latest development from SAJE is the SAJE *Memory Show*. This disk-based computer system allows the automation of certain console functions and the memorisation of control settings. Features include: a file of 30 titles, with 11 events per title; status or 'score' of each input and output module; sub-grouping; levels on 40 inputs and 20 outputs, mutes on inputs and outputs; eight remote control functions for external equipment such as tape machines.

All of these parameters can be called up and or used at any time with a minimum of fuss. The video graphics are very clear and easy to read. The system is based around five modes of operation:
Listing: this enables a choice between creating a program or sequence, updating or running the memories.
Score: memorises the instruments assigned to the inputs and the output destinations of the console.
Title file: memorises the list of titles for a concert. Each title file can be called up individually or sequentially from the first one.
Title events: calling up a title shows the events or sequences (up to 11) already programmed and running each event executes the mix, muting, grouping and remote control of machines. Manual override of any function is instantaneous.
Listing of levels: this calls up the levels, mute status and sub-grouping of the event or sequence in operation.

AGAP-ATEIS were showing a new console for theatre sound, also computer controlled. Whereas it is clear that the console can be used for general PA purposes, the ATEIS *DSAO* has been designed with the theatre specifically in mind and thus bears a closer look at its functions.

The console on show was 20/12 the maximum configuration being 32/16; the computer used is a *CBM* with disk drives, printer and monitor screen. From top to bottom the input module features six push switches for phase, mic/line, oscillator, 48 V phantom, 20 dB pad and 30 dB gain, two gain trim pots for the microphone and line inputs, insert on switch, four ▷

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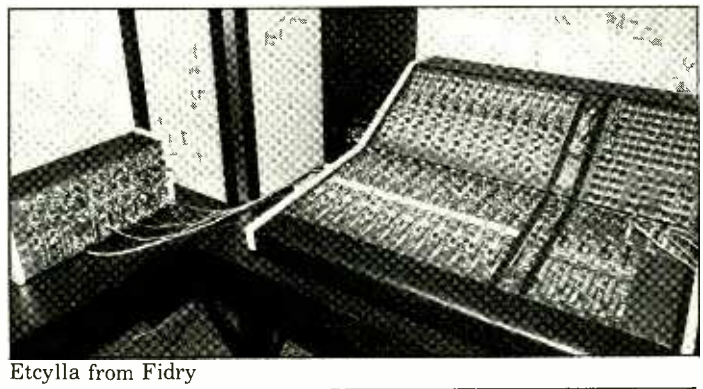
auxiliary send pots with pre/post switches, 4-band EQ section with two selectable frequencies for high and low bands and two fully parametric mid-bands, EQ in switch, two echo send pots (postfade) with on-off switches, panpot, PFL switches for left and right and channel on pushbutton incorporating overload LED. The fader module features 12 (up to 16) keypad-style pushbuttons for routing; in this case eight for groups and four for auxiliaries, the keypad being read by the automation system. Then follows a pair of nul LEDs, manual override touch pad and VCA fader with fader start microswitch.

The output module—group or auxiliary—features bargraph meter for output level, oscillator inject pushbutton, machine return level control with illuminated on-off switch and PFL, group insert on switch, 4-band EQ section as per the input modules, two echo return level pots with on-off switches, panpot (which we will come to in a moment), AFL and PFL buttons and group on pushbutton with overload LED. The fader module comprises six sub-group on-off switches together with pre/post switches, talkback button with LED and VCA fader. The group module thus feeds into its own matrix of six outputs with panning between odds and evens. The signal levels are controlled either by the input channels (pre) or by the group (post).

Apart from the computer interface keyboard, the remaining module strip concerns monitoring and communications. From the top down this incorporates a twin bargraph for left and right PFL/AFL plus LEDs, oscillator level with five switches for pink noise, 100 Hz, 1 kHz, 5 kHz, 10 kHz. The console has a built-in octave real-time analyser and switching on the pink noise source also turns on the analyser with the first 10 meters on the output modules forming the readout. The oscillator section is followed by the two echo send/return master level controls with return on switches and PFL. The final module houses the communications microphone with level control and switch, plus level controls and



Etcylla from Fidry

switching for studio monitoring and control rooms 1 and 2.

The menu proposed by the ATEIS *DSAO* consists of six courses:

Show identification: this gives show title and people concerned, such as author, director, sound engineer, etc.

Input sources: for programming signals present at the inputs, eg mic 3, input 5, cassette sound effects 2, input 17, etc.

Routing: for programming outputs, together with location of speaker source, eg output 1, stage right wings, output 2, centre stage rear, etc.

Events: programming of an events sequence.

Rehearsal mode: this is self-explanatory.

Run: runs the program for the show.

An important aspect of the system is that the automation works either in sequence, ie from one static mode to another, or in real-time. This means that 'snapshot' and dynamic mixes can be programmed; the latter either by the computer reading the operator's mix or by being programmed via the computer keyboard. As well as input and output levels and routing, the computer also controls the starting and stopping of tape machines and where the machine has the necessary microprocessor control, will wind the machine to the next cue point. In case the need arises, any input can be put into manual mode at any time.

Described as a console for stage, recording or music research, the **Fidry** *Etcylla* console was a last-minute find and provides some very interesting features at a very interesting price! The version shown was a 12/12/4 but the number of channel strips can be increased or decreased according to requirements. Each channel strip is split into two modules; the upper section housing input gain controls for the electronically balanced microphone input and unbalanced line input, 20 dB pad for mic input, phase switch (common), 48 V phantom, compressor/expander and gate controls (called/envelope follower on the console) and 4-band equaliser section with sweep mid-ranges. There is also a peak LED. The lower module is where things differ slightly from the norm. From the top down are three auxiliary sends—though this number can be increased to six or eight on demand—with Aux three postfade and one and two being individually switchable pre/post. In addition there is a switch Post 1+2 which we will come back to. Next is the monitor return level pot with a switch marked Mix-down, this routing the tape machine output into the line input of the channel. The following control is something we haven't seen for some time: a joystick quad panpot. This again we will come back to. Carrying on down is the group level control (multitrack bus output), complete with five LED peak level indicator. A switch marked Direct routes the signal into the group send post channel fader. An analogue and digital routing system will be available in 1985 for using the group control as a submaster for other sources besides its dedicated channel. The VCA fader is flanked by six buttons and their associated LEDs: solo, VCA controls to designate master or slave operation, master output routing (1+2, 3+4) and channel mute. When the channel is routed to all four main outputs, the joystick acts as a standard quad panner. If the channel is routed in stereo (3+4), the Post 1+2 switch that we touched on earlier comes into play. This switch routes all auxiliary sends that are in postfade operation into the front positions of the quad panner and thus allows stereo panning with variable mixes to echo effects, etc, in order to synthesise different acoustic 'depths'.

The master section includes the four master faders with LED metering to indicate prefade signal level and four echo returns. There is a comprehensive monitoring and communications module strip, together with LED meters for the master outputs. The console has an extensive patchbay together with control inputs and outputs from the console VCAs. This facility allows external control voltages to create such special effects as autopanning, envelope following, etc, from computers, sythesisers and the like. An interface module is also available should connection to the outside world give problems. The wide use of VCAs also means that the console can be automated.

The facilities available on this console—plus its sonic quality excited more than a few engineers. The demonstration model was hooked into a modular synthesiser and demonstrated the possibilities of fully integrating the console into and electronic music system. We may be hearing a lot more from the *Etcylla* in the future.

ATEAP, 17 rue Leriche, 75015 Paris, France.
SCOOP (Musiciels FROG) 350 rue des Pyrénées, 75020 Paris, France. Tel: (1) 366 2658.
Duplistore (VMP), 11 rue Moreau Vauthier, 92100 Boulogne, France. Tel: (1) 603 2898.
SAJE, 3 rue Verte, 95100 Argenteuil, France. Tel: (3) 961 1562.
A&A, 264 Avenue Ste Catherine, ZI Fontcouverte Sud, 84140 Montfavet-Avignon, France. Tel: (90) 311068.
Fidry, 6 Place Déliot, 59000 Lille, France. Tel: (20) 86 10 62. □

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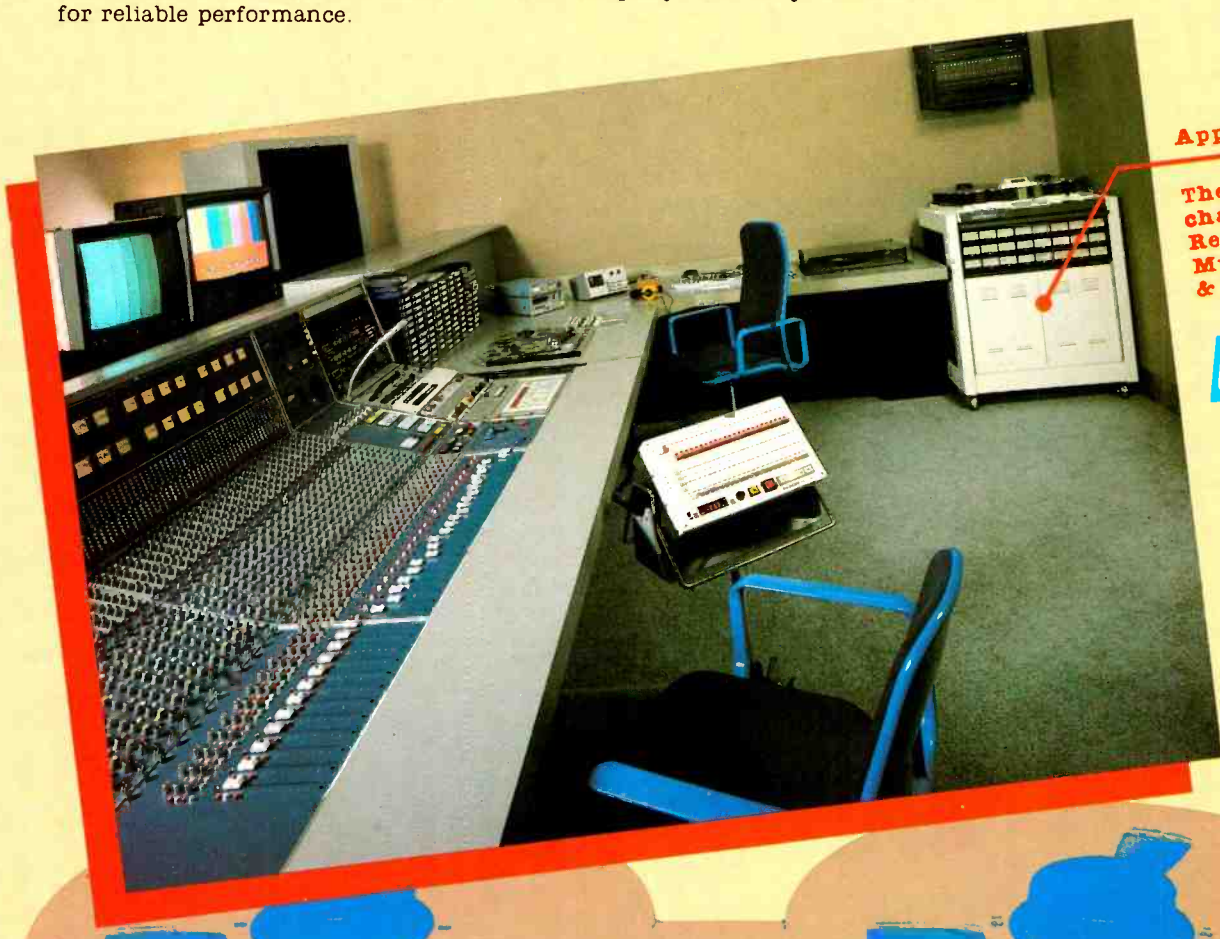

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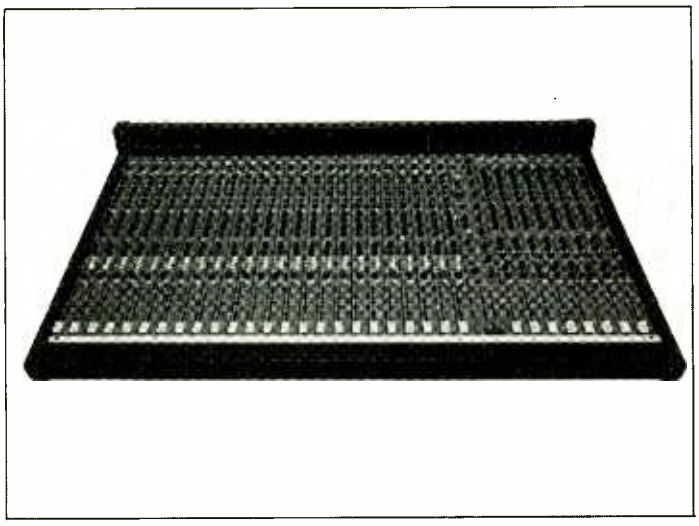


Soundtracs M series

A recent addition to the Soundtracs range of consoles is the *M* series of modular consoles for live sound use and 8-track recording. Mainframes are available to accept 16-, 24- or 32-input formats with eight subgroups and masters. The input EQ is 4-band with frequency sweep on the two middle ranges. The channels faders are 100 mm and each channel has six aux buses. There is a basic two-band EQ on the group returns that can be switched to the group outputs. The stereo masters return has a mon/mix switch that allows the use of the stereo tape returns to be monitored or the returns used as additional effects returns to the master group. Each of the subgroups contains a 4-way routing matrix.

Soundout Laboratories Ltd, 91 Ewell Road, Surbiton, Surrey KT6 6AH, UK. Tel: 01-399 3392. Telex: 8951073.

USA: Soundtracs Inc, 262A Eastern Parkway, Farmingdale, NY 11735. Tel: (516) 249-3669.

STL test tapes standards

The Standard Tape Laboratory (STL) has recently introduced two new series of test tapes using internationally agreed test frequencies. This will allow direct comparison between test tapes manufactured anywhere in the world at these preferred test frequencies. The first new series is manufactured to IEC frequency characteristics while the second is to US NAB and AES characteristics. STL will still continue the existing series of NAB characteristic test tapes using the original STL programmes.

Standard Tape Laboratory Inc, 26120 Eden Landing Road, Hayward, CA 94545, USA. Tel: (415) 786-3546.

In brief

● *Walk-Overs* are a new range of rubber cable ramps designed to protect cables that have to cross floors in heavy traffic areas and prevent tripping on the cables.

They come in three sizes with *1* being suitable for protecting one cable of 10 mm diameter (or several small cables), *2* three cables up to 10 mm and *3* takes three cables of up to 21 mm diameter *1* comes in 2 m lengths while *2* and *3* are in sections 3 m long. Other dimensions vary with model type.

Walk-Overs, 29 Vicarage Lane, Poynton, Cheshire SK12 1BG, UK.

● Oberheim Electronics have recently introduced five new voice cards for the *DMX* digital drum machine. Now available are: Beat Kick, Beat Snare, Long Hi-Hat, Scratch and Click/Clap.

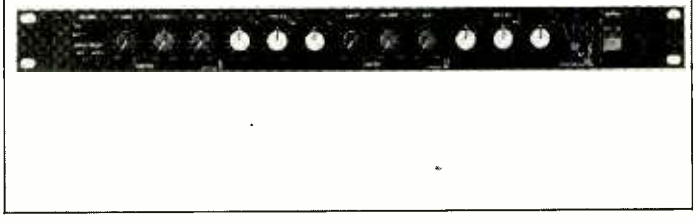
Octave-plateau IBM PC music software

Octave-plateau Electronics, makers of the *Voyetra 8* synthesiser, have released a music software package for the IBM PC. The first release is based upon a flexible 64-track 'digital tape recorder' designed for easy use with their synthesisers. Each of the 64 tracks may be independently looped, transposed and auto-corrected on either playback or record. Up to 60,000 notes can be recorded with high timing resolution with punch-in and out points being programmable and rehearsed in advance. Multiple takes may be kept and compared before making final choice.

The editor enables the user to look at individual notes, change them, change other MIDI events or enter them in 'step-time'. Up to 10 musical fragments may be kept in buffer memories and more be kept in 'phrase libraries'. Programmed material may be copied, moved, inserted, transposed, re-quantised and modified in many ways. Time signatures may be mixed in any fashion. Drum scores may be created for replay on MIDI compatible drum machines. Roland DIN drum sync and the FSK sync-to-tape tape is also provided. The OEI music software requires an IBM PC with 256 K RAM and uses the Roland *MPU-401* MIDI interface with an OEI PC interface card.

A second package based on the IBM PC in the form of a support package for the *Voyetra 8* gives the musician full and easy access to the *Voyetra's* steps and programs. The voice structure of the *Voyetra* is presented in a block diagram form showing all the signal paths and parameter settings. Using the cursor keys, signal paths and parameters may be changed at will with the resultant changes being heard instantly. Created programs may be saved to disk. The package is supplied with 300 sound programs which may be further modified. Hardware includes an IBM PC interface card and cable, and the software disk.

Octave-plateau Electronics Inc, 51 Main Street, Yonkers, NY 10701, USA. Tel: (914) 964-0225.



Vesta Fire RV-3

Shiino Vesta Fire have launched the *RV-3* dual reverberation unit, a spring line reverb intended to replace the former *RV-1* model and it offers greater facilities together with a reduction in price. Unlike the 'phase reverse stereo' of the *RV-1*, the *RV-3* is 'true' stereo and has a 3-band EQ on each channel. Both channels can be fed from input one or can operate as independent channels. There are limiters on the input to reduce transient upsets to the springs and the output has a noise gate adjusted to remove mechanical and hum-induced sounds from the reverb output.

Shiino Vesta Fire Corporation, 37-1, 2-Chome Kamiuma Setagaya-ku, Tokyo 154, Japan. Tel: (03) 412-7011. Telex: J32644.

UK: MTR, Ford House, 58 Cross Road, Bushey, Herts WD1 4DQ. Tel: 0923 34050. Telex: 925859.

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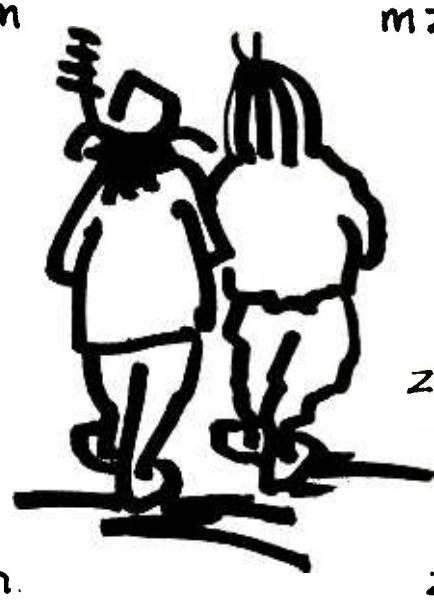
Zmm! THERE'S NOTHING ELSE COMPARABLE



mzzzmmm, zz!mm! zm
zm. .DAE-1100!
Mmmzzz mmm
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zzzmDASH FORMAT
Mmzzz mmm!
mmmzz, mmmzm
zzzm mm zzm
mm, zzmm Zmmm
mm, zzzmmm,zz?
Mmmm zzmmmz
zmmm zzmzz.

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NEW PRODUCTS

NEW PRODUCTS

Equipment, modifications

Furman rack accessories

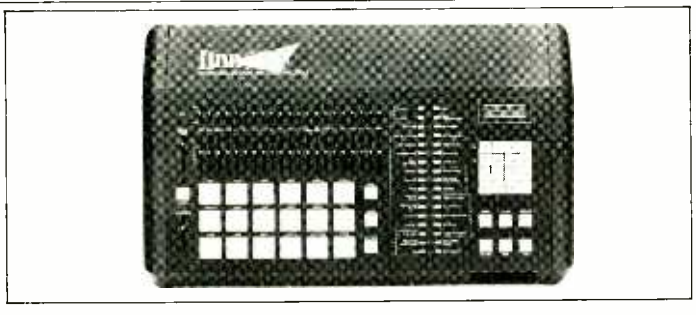
Furman Sound have introduced two new rack mount products, the *PL-8* power and light module and *Le Patch* modular patchbay system.

The *PL-8* is a 1¾ in standard rack mount unit intended for mounting at the top of a rack. The rear of the unit contains eight power outlets of up to 10 A in total with 10 A circuit breaker. The front panel contains two power switches—one for the rear panel sockets and the other for the front panel lights which are in the form of two slide-out light fittings that will illuminate the front of the other units in the rack below it. Due to the nature of the sockets (standard US power type) this product may only be available in areas using this type of socket although we would refer queries to the manufacturer to check this.

Le Patch modules come in standard 19 in rack widths. They are built up of small circuit boards with two ¼ in phone jacks in the front normalled to jacks in the rear which are either phone or phono. These are available in packages of four and fit into the special mounting rack that will accept 20 sockets width and two rows in a single U height.

Furman Sound Inc, 30 Rich Street, Greenbae, CA 94904, USA. Tel: (415) 927-1225.

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



Linn 9000

Linn Electronics have announced the introduction of the Linn *9000*, a unit that integrates a MIDI-compatible keyboard recorder and digital drum machine in one package with identical programming operation for both. The keyboard recorder section (or sequencer) memorises every performance aspect including dynamics, pitch bends, modulation and synth patches for as many as 16 MIDI-equipped polyphonic synthesisers simultaneously with a maximum of 32 tracks.

The digital drum machine section includes all the capabilities of the *LinnDrum* while introducing a number of new features including front panel velocity-sensitive rubber pads/and/or rear panel drum pad inputs; high-hat decay programming with a manual control; built-in mixer with separate fader for each drum sound with programming for volume, pan and tuning; a repeat function allowing quick programming of rolls etc; versatile tempo programming; 18 drums and percussion sounds. Recording and editing functions have been designed to simulate the operation of a multitrack tape machine with record, play, fast forward, etc.

Retrofitting options available soon will include an audio input circuit for on board sound sampling; a 3½ in disk drive to offer increased capacity over current cassette capability for loading and storing of drum and synth programs and sound samples; and finally another plug-in circuit board to implement SMPTE interlock.

Linn Electronics Inc, 18720 Oxnard Street, Tarzana, CA 91356, USA. Tel: (818) 708-8131.

UK: Scenic Sounds Equipment, Unit 2, 10 William Road, London NW1 3EN. Tel: 01-387 1262.

UK: Syco Systems, 20 Conduit Place, London W2. Tel: 01-724 2451.

Symetrix dual gated compressor/limiter

Symetrix Inc have just introduced the model *525* dual gated compressor/limiter, a 2-channel unit in a single U, 19 in rack mount format. Front panel controls for each channel include expander/gate threshold, compress/limit threshold, ratio, output gain, channel in/out, LED level indication and a stereo link select button.

The *525* is capable of simultaneous compress/limit and expand/gate functions and includes Symetrix's FAST RMS level detection circuitry offering elements of both RMS and peak detection. The separate side chains for the two functions provide programme dependent control for the attack and release parameters. The *525* also incorporates the new *TA-104* VCA from Valley People in the design. Both inputs and outputs are balanced and there is provision for side chain insertion of EQ, etc.

Claimed dynamic range is >100 dB with compression ratios variable from 1:1 to 20:1 while the expander/gate ratio 'approaches 2:1 through a soft-knee threshold'. There is front panel LED indication of the threshold points relative to the programme level.

Symetrix Inc, 109 Bell Street, Seattle, WA 98121, USA. Tel: (206) 624-5012. Telex: 703282.

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

Schoeps Collette capsule

Schoeps have recently added a new capsule to the *Collette* series of microphones which comprise of CMC preamplifiers with 11 interchangeable capsules. The *MK25* capsule has an omnidirectional polar response with a slight HF lift on axis. Schoeps suggest the primary application of the capsule is in situations where only a few microphones are used to record an entire orchestra—a possible alternative to the *BLM 3* boundary layer capsule.

Schalltecknik Dr-Ing Schoeps, Spitalstrasse 20, D-7500 Karlsruhe 41, West Germany. Tel: 0721 42016/42011.

UK: Scenic Sounds Equipment Ltd, Unit 2, Comtech, William Road, London NW1 3EN. Tel: 01-387 1262. Telex: 27939.

USA: Posthorn Recordings, 142 West 26th Street, 10th Floor, New York, NY 10001. Tel: (212) 242-3737.

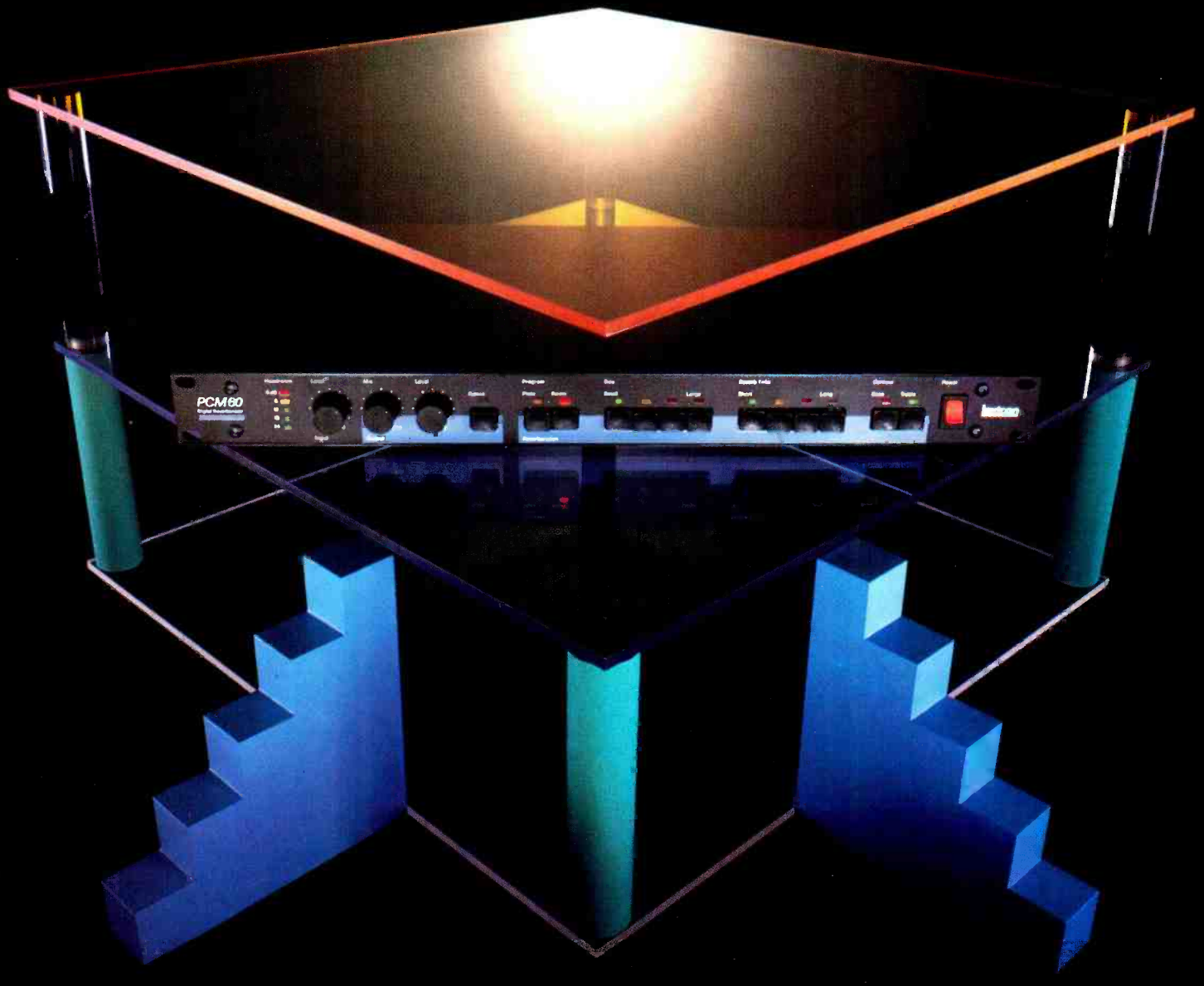
Rycote stereo windshield

The advent of stereo broadcasting by the BBC and the American broadcasting organisations has prompted Rycote to develop a new, larger diameter windshield to accommodate the double capsule stereo mics. It has a similar construction to the previous Rycote model, but with increased diameter of 5 in, giving a claimed improvement of 5 dB in windkeeping over the 4 in diameter model.

Rycote have also introduced a new microphone suspension assembly for the longer shotgun mics, which incorporates a block of specially formulated foam rubber to support the weight of the longer mics and protect from shocks during recording.

Rycote Microphone Windshields Ltd, Unit 6, New Mills, Slad Road, Stroud, Glos GL5 1RN. Tel: (04536) 79338.□

Presenting Lexicon's PCM 60



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Telex: 27939 SCENIC G

THE BLACK & WHITE S

The concept of playing acoustic or 'sampled' sounds on a keyboard, first introduced by Fairlight with the CMI in 1979, has now become a requirement of today's synthesiser users.

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The choice of the best sampling keyboards. The Fairlight CMI, the Emulator II and the Kurzweil 250. The Black and White Collection.

Fairlight CMI is much more than a musical instrument. It is an integrated music production system, expandable to cope with the ever-changing needs of today's musician. Consistently upgraded since its introduction in 1979, the CMI has become legendary for its compositional software. Now the largest selling computer musical instrument in the UK, the options arriving in the next six months will increase its already fantastic potential tenfold.

EII, successor to the popular Emulator, brings the power of high quality sampling within the reach of most professional musicians. Featuring a five octave dynamic keyboard with a variety of possible keyboard modes, the inclusion of filters, VCAs, envelope generators and independant LFOs allows you to extensively modify any sampled sound. An eight track sequencer with MIDI and SMPTE interfaces enables complex compositions to be recorded. These features, together with a dramatically increased sampling memory make the EII a powerful creative tool.

Kurzweil 250 features an 88 note piano-type keyboard. Utilising technology from the fields of artificial intelligence and pattern recognition it achieves extraordinary realism of sound with unprecedented expressive capabilities. It's supplied with thirty preset sounds, (expandable to 60), can accomodate up to 40 keyboards set-ups, and features a twelve track sequencer. Ideally suited to live performance and studio work, the Kurzweil 250 is the only viable alternative to an acoustic grand piano.

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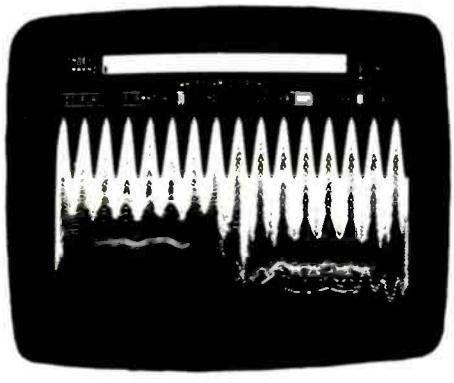
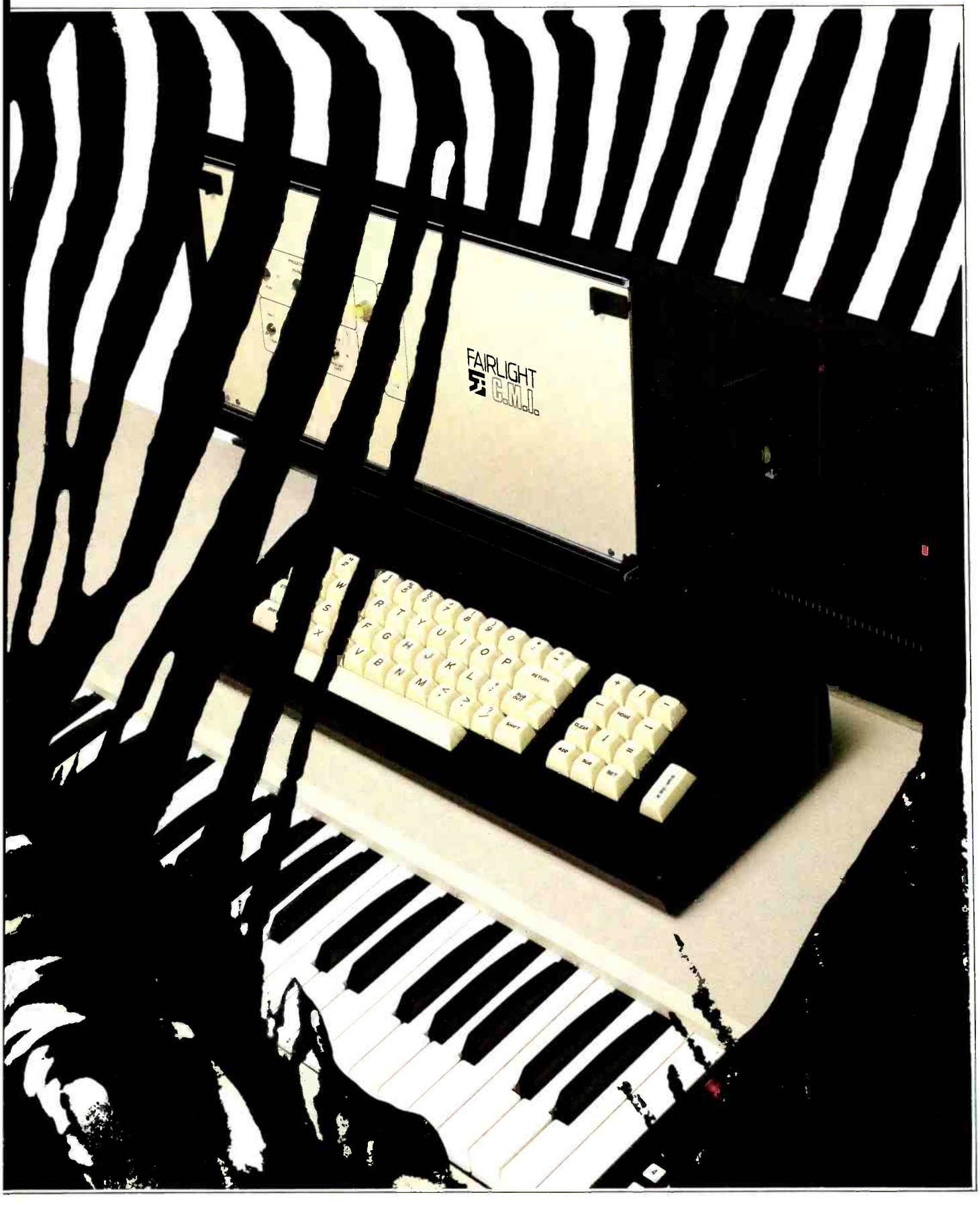


ELECTION FROM SYCO



Syco. We are

STRING CONTROL

The SynthAxe is a revolutionary new synthesiser controller which has been designed from the start with strict musical criteria in mind. It gets away from the conventional keyboard idea. One of its developers, Bill Aitken explains

Mention the word 'synthesiser', and most people will think of a musical instrument with a piano-style keyboard. Indeed, to many who are not given to thinking about what actually goes on inside a synthesiser, the keyboard itself appears to be 'the synthesiser'. Of course, the piano-style keyboard is only one of any number of ways to give a musician control over a synth—but it currently happens to be the most popular one.

To the synthesiser design engineer, the mechanical elements of a piano-style keyboard are a very convenient system on which to develop and evolve a variety of electro-mechanical switching and transducer systems for defining (among other things) the start, the pitch and the end of each note.

To the synthesiser marketing man, the keyboard presents the synth in a format which can be immediately assimilated by a significant group of musicans—keyboard players—instantly giving them a vast expansion in musical power and expression, and giving the marketing man a commensurate increase in his bank balance.

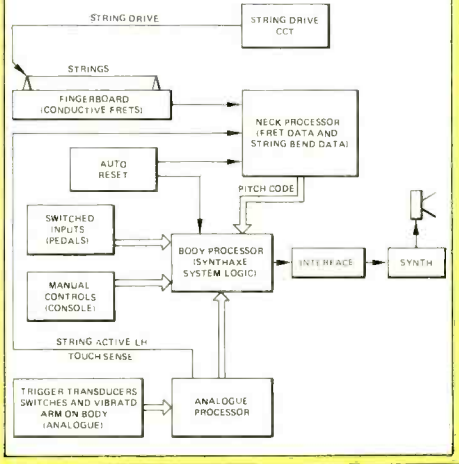
So far, this is great for the synthesiser design engineer, the marketing man and the keyboard player—but what about all the other musicians in the world? What's more to the point, what about all those musicians who play the most culturally significant instrument of the last 30 years? The guitar!

The *SynthAxe* is aimed at this market. This is not to say that no-one has tried to satisfy this market before, or that every idea on the *SynthAxe* is entirely new. However, there is no doubt that it gives a guitar player instant control over a synth using large chunks of his existing stringed instrument technique, and further allows him to explore and develop revolutionary new ways of creating music in a manner which is impossible on either a conventional stringed instrument, or a keyboard controlled synthesiser. There is also no doubt that it sports a number of sophisticated and innovative features—both musically and technically.

A control system

The first point to be noted is that the *SynthAxe* contains no sound-generating electronics of its own. It performs the same function as the piano-style keyboard on most current synthesisers; ie it is the man-machine interface which the musican manipulates to produce the control signals to make the synthesiser sound generating circuits (voices) make the music—except that this is for guitarists. It is, in fact, a telemetry system which analyses the guitarist's hand movements, and converts this information into streams of digital codes. These codes are sent via a suitable interfacing system to a target synthesiser to be interpreted and converted into the appropriate form within the synth in order to produce the required musical results from the sound generating circuits. Fairlight, Oberheim, Fender-Rhodes and E-mu are the current co-operating synth manufacturers who are providing, or working on interfacing systems—consequently giving guitar-players wider access to their products.

FIG 1



The *SynthAxe* system is controlled by a concurrent pair of *6809* microprocessors. The neck processor (see **Fig 1**) constantly monitors the player's actions on the fingerboard, and after processing this information, it passes the data on to the body processor. As well as receiving data from the neck processor, the body processor also receives data (pre-processed in analogue form) from other transducers and switches on the body, the pedals, and, if connected, the console. The body processor constantly scans and monitors the changes of state on all these inputs and is programmed to produce a variety of musical codes according to the way the player manipulates the various controls. This central module of the software is called the '*SynthAxe* System Logic', and it is this part of the system which defines exactly how the *SynthAxe* will react to the player's actions, and therefore defines its musical capabilities. Finally, the body processor outputs the codes to drive the target synth.

Most readers will be aware of MIDI (Musical Instrument Digital Interface). This system is now commonplace as a means of interconnecting and remote controlling electronic musical instruments. The *SynthAxe* can talk to a number of well-known makes of synth on MIDI, although MIDI is only one of a number of possible interfacing systems. Some of you will also be aware of anomalies which may arise on connecting different makes of synth via MIDI—not all manufacturers' MIDIs are the same! And although it calls itself a Musical Instrument Digital Interface, the MIDI system is, for historical reasons, heavily keyboard orientated. The implications are, therefore, that not all synths are capable of fully interpreting the complex MIDI codes generated and the *SynthAxe* has to carry a library of internally stored MIDI software packages—each package tailored specifically for the needs of each different model of target synthesiser.

I will refer to MIDI only when explaining how the *SynthAxe* uses it in ways which may seem obtuse to those

FIG 2

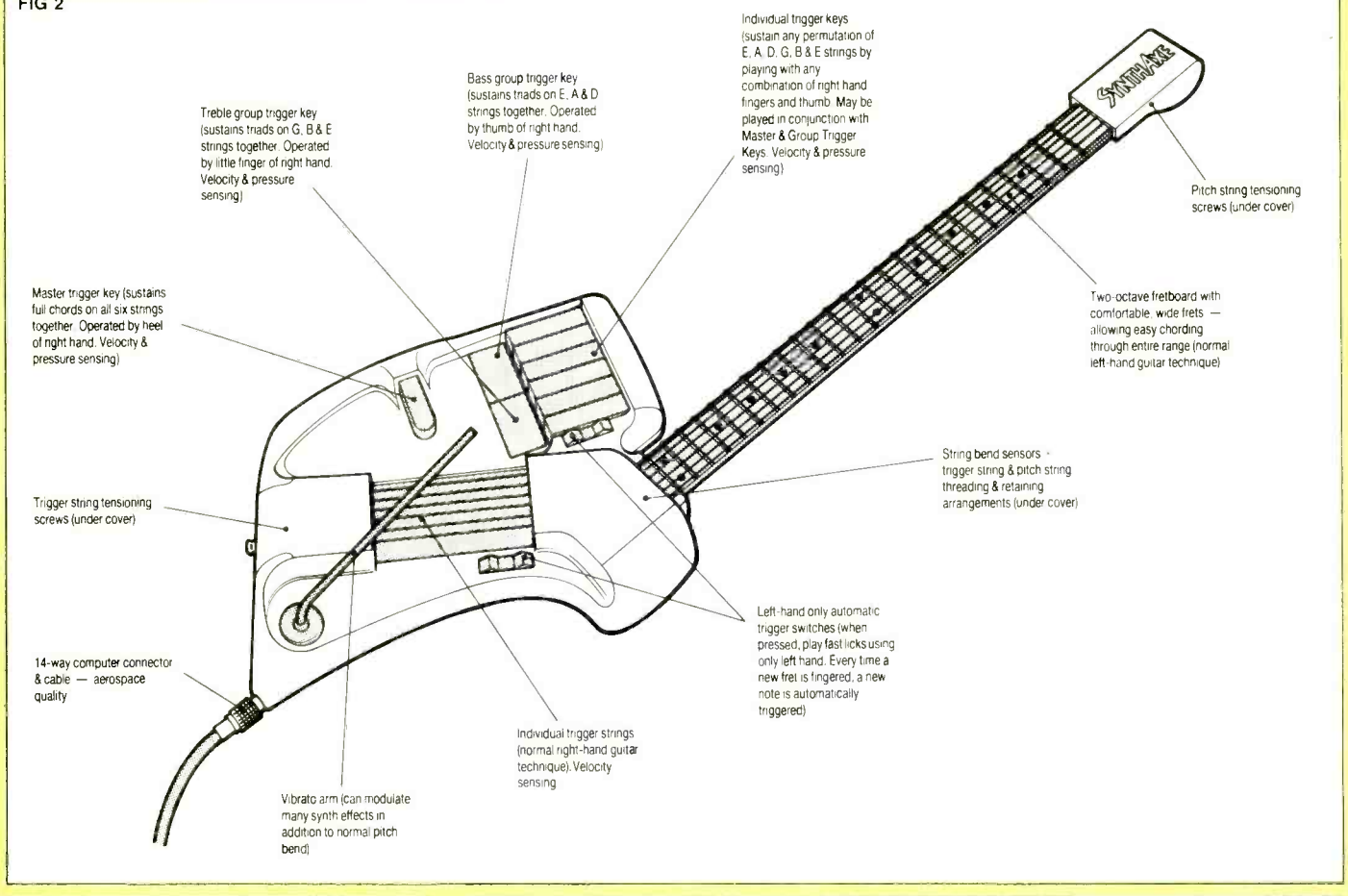


FIG 3 STRING BEND COIL FORMER

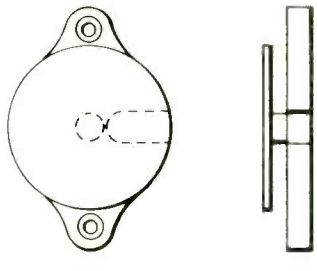
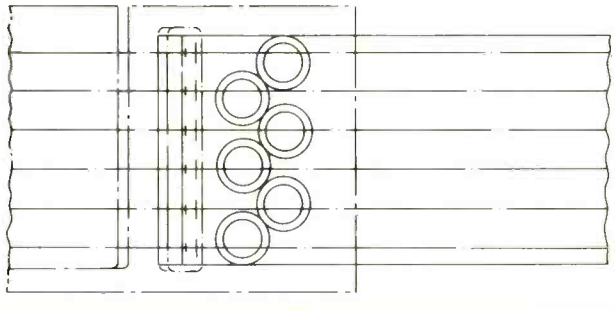


FIG 4 ARRAY OF SIX STRING BEND COILS PLACED UNDER THE PITCH STRINGS



familiar with keyboard applications of the system. Don't worry if you are not over-familiar with MIDI, as I shall explain things in functional terms as well as referring to the MIDI nomenclature.

Guitar-like features

When approaching the *SynthAxe* for the first time, the guitarist naturally wants to play it the way he plays a guitar. That is, he controls the pitch of a note by stopping a string on the neck with one hand, and picks or plucks a string on the body with the other hand.

On referring to **Fig 2**, the quick-witted will have spotted that someone has gone mad, bent the neck, and run the strings through a tunnel. This is not entirely as it appears. There are, in fact, two completely separate sets of strings; one for selecting the pitch of the note by stopping the strings on the neck, and the other set on the body which allow the note selected by the corresponding neck string to be 'triggered' by picking or plucking, and, if desired 'damped' by a second manual contact.

Before anyone asks, we do intend to produce a left-handed version, although we're not sure when we'll be able to afford the heavy re-tooling bill.

Pitch control

On an electric guitar, the player selects the basic note value he requires by stopping the string longitudinally at the appropriate fret. This gives him chromatic (semitone) control over the pitch of each string. If he wants to produce pitch bending effects of that basic chromatic note value, he can modulate the pitch at each fret by pushing of pulling ('bending') the string laterally across the fingerboard. This produces a continuously variable FM version of the basic fretted note—in musical terms a glissando or vibrato, depending on the manual technique used.

In order to simulate these effects, each neck string generates two completely independent sets of digital codes for pitch control. Fret codes are produced in semitone steps according to the longitudinal stopping point of each string, and are eventually output as MIDI key codes. String bend codes are also produced for each string in relation to the amount that each string is displaced laterally, or 'bent', across the fingerboard. These string bend codes are transmitted separately on MIDI via Pitchwheel or Modulation Wheel codes.

The neck *6809* processor continuously scans and monitors the point of contact between each metal string, and each conductive fret. Having analysed this data, it produces six separate fret codes—a semitone code for each string. The fret codes for each string are then passed to the body *6809*. The neck *6809* also scans and collects data from six individual pancake shaped coils, one placed under each string at the bridge (see **Figs 3 and 4**). These 'string bend coils' sense the lateral displacement of each string electro-magnetically, and, after this information has been processed ▷

by the neck processor, the string bend code for each string is also passed to the body *6809*.

The obvious application of the string bend data is to modulate the fret pitch (whole semitones) of a string with the string bend parameter (continuously variable modulation)—thus simulating pitch modulation effects in the same manner as on a guitar. However, it should be noted that the string bend parameter can be assigned to any number of functions within the target synth apart from pitch modulation. Filter frequency, filter resonance, amplitude, pulse-width and de-tune, are just a few of the options and the range of options depends on the internal control features peculiar to each make of target synth.

It should also be noted that the law and response of the string bend data is under very sophisticated software control. Indeed, if it were not, there would be some very strange results from the string bend system. As the string bend sensors are placed under the strings near the bridge, a given lateral movement of a string on a fret close to the bridge produces much larger string bend deflection values than if the same lateral movement of the string is made on a fret near the headstock. Consequently, the string bend software module is loaded with a table of correction factors—one for each fret position. This produces an even string bend response throughout the fingerboard.

Having equalised the lateral response of the string bend system for all longitudinal positions, the software has further controls built in to shape the law and the range of the string bend system. This means that the pitch modulation effect of a given physical bend can be as subtle or as wild as required, and the rate of take-off of the pitch change from the point of rest to the position of maximum deflection can be tailored exactly. There is also a variable guard band either side of the rest point of the string. Within these fine lateral boundaries, no modulation effects occur. This helps to minimise unintentional dissonances due to slight displacements of the strings during non-bending passages—particularly when the response of the system is cranked up to the maximum.

Dynamic control

The six shorter strings on the body are the trigger strings (see **Fig 2**). These are

STRING CONTROL

plucked, or picked in the same manner as a guitar. Each trigger string has two transducer systems associated with it: a pluck detecting system and a touch sensing system.

The pluck detecting system is as shown in **Fig 5**. The trigger string is attached to a piston within a barrel, and the tension of this system is controlled by the compression spring in the barrel. Embedded in the end of the piston is a magnet which is placed near a hall-effect IC. When a string is plucked, the string is displaced by the pick or finger, and when the required amount of tension has been applied to the string, the pick or finger slips off the string, allowing it to spring back to its normal state of rest.

When the *SynthAxe* trigger string is plucked, the magnet first of all moves relatively slowly away from the hall-effect IC during the tensioning movement and then, when the string is finally let go, moves sharply back towards the IC during the spring-back. The varying voltages output by the hall-effect IC are analysed and processed so that only magnet movements exceeding a certain threshold velocity in a particular direction produce a trigger pulse to activate the target synthesiser. In addition, the velocity of the magnet above the threshold is measured, and passed along to the processor, so that the player can apply a velocity modulation effect to his synth patch if he wants. For example, if he assigns the velocity parameter within the target synth to modulate amplitude and filter, then the harder he plucks the string, the louder and edgier the synth voice will sound. By correctly choosing operating thresholds and sensing the direction of the magnet movement, a predictable and accurate performance is extracted from the trigger string system.

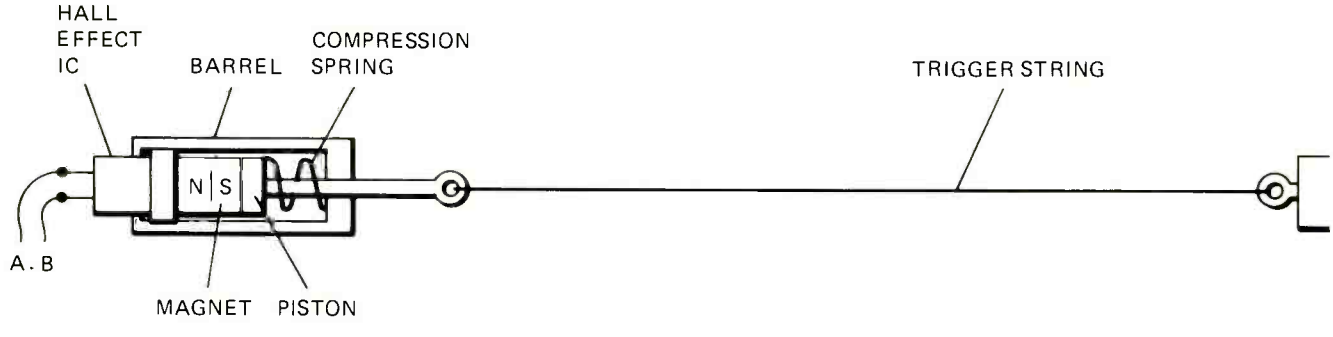
The other transducer systenm connected to the trigger strings is the touch-sensing system for string damping. This uses a mixture of two systems; resistive leakage (which works well when hands are sweaty and there is a good contact with ground) and 50/60 Hz AC pick-up (which works well when hands are dry, and there is no contact with ground). In order for the touch-sensing sytem to work, the trigger strings need to be conductive.

The reason for having this system is to simulate the damping effects available on a guitar. When a guitar string is plucked, it is the equivalent of an ADR envelope on a synth—the better the sustain of the guitar, the longer the R of the ADR. But when you put your hand on a vibrating guitar string, you damp the R, and shorten the note. A similar effect is produced with the *SynthAxe*/ Target Synth combination. When the trigger string is plucked, a MIDI Note On code is sent, followed almost immediately with a MIDI Note Off code. In conjunction with a synth patch having a sharp Attack and a long Release, (dynamically similar to a guitar, piano or harpsichord), the trigger string codes set off an ADR envelope, and the note remains audible according to the value of the Release time programmed on the synth patch. This Release characteristic will remain as patched on the synth as long as the string is not touched by hand. However, when the player touches the trigger string with his hand, the touch sensing system is activated, generating a Release Time Modulation code. This is sent to the synth as a MIDI Continuous Controller code, in order to bring the ringing note to a premature end by drastically shortening the Release characteristic of the synth voice. When the string is re-triggered after such a sequence, the Release characteristic of the synth voice must first be automatically re-set to normal so the next note can sound properly.

The neck (pitch) strings also have individual touch sensing systems, so that the player can damp equally well with both hands.

The system as described so far is modelled closely on existing guitar technique. Naturally so, since the prime aim of the instrument is to give a player of stringed instruments instant control over a synthesiser. But that is only part of the story. We decided at the outset that if we limited the design of a stringed synth controller within the known boundaries of existing guitar technique, then we would be ignoring much of the hidden potential of the synthesiser. It must also be stated quite firmly that wherever we saw a choice between making the *SynthAxe* more like a guitar or maximising the potential of the instrument in terms of synth control, we chose to go for synth control. Although designed for players of stringed instruments, it does not pretend to be a ▷

FIG 5



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guitar, and is uncompromisingly a synth controller. Consequently, we decided to include a number of innovative dynamic and pitch controlling elements, so that the guitar player now has a chance to develop and explore completely new techniques on a completely new instrument. First of all, there are the trigger keys.

In action, these are similar to piano keys. **Fig 6** shows the construction—once again using moving magnets embedded in the key close to a hall-effect IC. There are six trigger keys, and they are associated with the neck (pitch) strings in the same pattern as the trigger strings, ie E, A, D, G, B & E trigger keys. As with the trigger strings, the trigger keys are velocity sensing. Unlike the trigger strings they can hold, or sustain a trigger signal, and they are also pressure sensing. Whereas the trigger strings produce a 'plucked' trigger pulse, (MIDI Note On followed closely by MIDI Note Off), the trigger key produces a MIDI Note On when you press the key, and delays the Note Off until the finger releases the pressure on the key.

If your reaction to the above is 'what's the difference', then I suggest you take an analogue synth, and program a patch with a long Release, and an envelope modulated filter. Now compare the texture of the sound (a) when you keep your finger pressed down on the key (making the S of the ADSR long and constant) and (b) giving the key a sharp stab (making the S virtually non-existent in the same manner as the Note On/Note Off routine produced by a trigger string, and putting the dynamics directly into the R mode). As the *SynthAxe* is capable of hammering, trilling and other pitch changing ornaments during the time that the R is releasing on the synth, and as it is also capable of switching the Release time in conjunction with the string damping systems, these subtleties of the stringed instrument can now be applied to the synth. Together with glissandi and vibrato from the string bending system, these effects immediately give even the most synthetic sounds a human quality, and the listener instantly recognises that the sounds are being controlled by a stringed instrument.

Enough digression—back to key triggers. You will see from **Fig 6** that each key has two springs. The first, lighter spring is constantly in compression, and dictates the initial action of the key—from which is extracted the velocity information. However, having started a note by pressing the key fast enough to exceed the threshold velocity and initiate a trigger, the key comes up against a second heavier spring part-way through the throw of the key. Within the range of the second action, the hall-effect IC functions as a proximity sensor in relation to the magnet and this variation in voltage is used to generate after pressure data relative to how far the player pushes the trigger key down into the second spring action. The after-pressure threshold of the hall-effect system is adjusted to coincide with the mechanical range of the second spring, so that, if the player merely rests on the

STRING CONTROL

second spring (which is much stiffer than the first) then there is no after-pressure modulation—but if he presses firmly on down through the second spring action, the modulation effect increases with the pressure applied. Once again, the after-pressure codes are sent independently to the synth to be patched to create the desired effects in a similar manner to the velocity parameters.

The trigger keys allow completely new forms of pitch and dynamic control. If the player selects a note on the neck, and presses the corresponding trigger key, then he can sustain a note in the same manner as a keyboard with after-pressure, but he can update pitch in the same manner as a guitar—by hammering, pulling-off, sliding, etc. Note that this type of pitch updating is achieved in a 'legato' mode, ie moving from one fret to the next produces a change in the pitch of the note but does not interrupt the dynamics. This sort of effect is not possible on a polyphonic keyboard, as the effect of polyphonic assignment algorithms mean that playing a trill, or turn, on a polyphonic system always results in the new note being re-attacked every time a new key is struck. Also, some of these ornaments can sound a mess if the Release time is long, and the notes triggered by different keys run into one another due to the polyphonic assignment. It is for this reason that the *SynthAxe* operates the MIDI in Mono Mode. Those of you familiar with MIDI will know that the Mono Mode assigns a unique MIDI channel to each separate voice on the target synth. This means that each voice is effectively acting as a monophonic synthesiser—and each of the strings has its own individual synth voice to control.

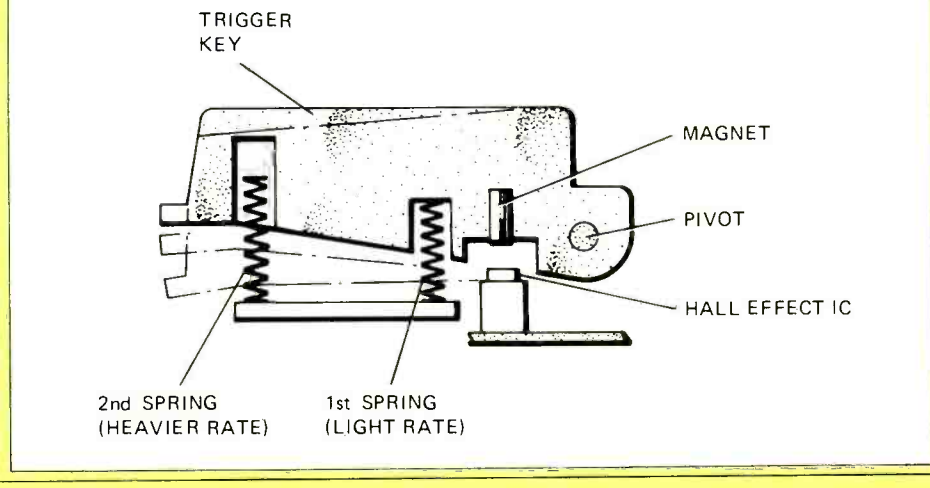
When using the trigger keys, pitch updating continues via the neck string so long as the string remains in contact with the fingerboard; but if the player takes the neck string off the fingerboard while keeping the corresponding trigger key pressed, then the pitch will freeze and sustain at the last note value fingered on the string. These facilities allow very complex counter-melodic and sustaining effects, with all the subtleties of trills, turns, mordents and other ornaments in a manner impossible both on a keyboard controlled synth, and a guitar.

The group trigger keys (see **Fig 2**) mechanically interlock the treble triad and the bass triad, allowing both of these to be played with only one finger—leaving the rest of the hand free to overplay on the other keys/strings. The master trigger key electronically gangs all six strings, allowing block chords to be fired off with the heel of the hand. You can still overplay individual and group trigger keys while sustaining master chords with the heel of the hand.

The other triggering system on the body of the instrument is the Left Hand Trigger system. There are two switches associated with this function; one by the trigger keys, and the other by the trigger strings (see **Fig 2**). Their function is identical. When pressed down, there is no need to use the right hand to trigger a note. Instead, the computer system enables automatic triggering. This means that every time a string is pressed down on the fingerboard, and a new fret/string contact is made, the appropriate note is automatically triggered. Very fast runs can be played in this mode using only the left hand. The reason for the duplicate switches is so that access is equally easy if you have been playing the trigger strings, or the trigger keys. If you wish you can press the other end of the Left Hand Trigger switch, and 'lock-on' this mode. You can now use two hands on the neck in a similar manner to *The Stick*, or akin to 'tapping' a conventional guitar neck.

The last control to mention on the body is the Vibrato Arm. This is also a hall-effect proximity transducer (see **Fig 7**). The magnet is attached to a bi-polar springing system (plastic bush) so that if the arm is waggled towards, or away from the body, the magnet moves closer to, or further away from the hall-effect IC nearby. This system works equally well anywhere in a 360° arc and doesn't suffer the tuning problems of the conventional device. In fact, like the string bend system, the range and law of the Wang Arm is adjustable in software. The Vibrato Arm code is normally sent via a MIDI Lever code, and like the ▷

FIG 6



A few words on microphone accuracy

from the people who specialize in it

The major contributor to a microphone's fidelity to the original acoustical event is the uniformity of its amplitude response over frequency. Indeed, the anomalies that give most popular microphones their characteristic coloration show themselves upon careful analysis to be variations from flat amplitude and phase response, especially those occurring in the middle and high frequencies.

Believing the best microphone must be an accurate one, Bruel & Kjaer designed the 4000 series of professional condensers to have virtually ruler-flat response through the middle frequencies, and worst-case deviation of ±2 dB from 10 Hz to 40 kHz. Not only are the amplitude and phase response uniform on-axis, but they remain remarkably uniform even off-axis.

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other controllers, it can be used, not only for pitch modulation, but also for any other assignable functions possible within the target synth.

Control variations and interactions

By now it will be obvious that the *SynthAxe* is a complex network of sensors and transducers, controlled by a pair of micros. To summarise, there are 25 conductive frets, six string bend coils, six neck (pitch) string touch sensors, six trigger strings (producing trigger and velocity data), six trigger string (picking hand) touch sensors, six trigger keys and one master trigger key (producing trigger, velocity and pressure data) and one vibrato arm (bi-polar controller).

The other controls on the pedals and the console are simply switch inputs to the body *6809* which call pre-programmed variations in sub-routines within the System Logic. According to the way this part of the software is defined, the *SynthAxe* can react in a number of different ways, depending on the various permutations of data from the sensors and transducers, and signals from the various switches. Consequently, its behaviour can be reconfigured instantly by the player in order to achieve a wide range of musical results at the synth.

For example, string damping data from the touch sensors can be overridden by the Undamp pedal, so notes that would normally damp in context with regular guitar technique can be left ringing

STRING CONTROL

while the players hands leave the fingerboard and strings completely, and move elsewhere on the fingerboard to overlay other parts on other strings. This effect is similar to using the sustain pedal on a piano. The Hold pedal inhibits MIDI Note Off commands, so that once you have played a string, it will keep sustaining indefinitely (as if you had your finger down on a key). Any combination of strings can be put on Hold, producing complex droning effects, which can be instantly reset either by a second press of the pedal, or by overplaying a held string to return it to manual mode.

As well as dynamic variations, there are pitch variations which allow instant reconfiguration of tuning and transposition. For example, when the player presses the capo pedal, the neck scanning processor reports which frets/strings are being contacted, and the body processor substitutes these fret codes in place of subsequent open string codes. This means that invisible capos can instantly be pedalled-in—but the player can still play above and below the capo fret—and the capo fret can be different for each string, so you can put in a chord-shaped capo. The *SynthAxe* capo is not just a means of transposition from one song to another but a real extension of a player's technique.

Also, simple offsetting of fret codes produces instant variations in relative string tuning (string tension is relevant only so far as the player can adjust it to feel how he likes) and the whole fingerboard can be transposed on a master basis.

In addition, the console can call up target synth patches remotely, so there's no need to be surrounded by a whole battery of synths, either on stage, or in the studio, as the console can remotely control up to eight synths on eight completely separate MIDI ports. (A *SynthAxe* needs six MIDI channels in MIDI Mono Mode to properly communicate with a synth—one MIDI channel for each string.)

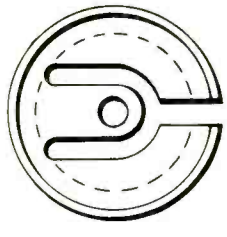
There is also a memory system contained within the console. The player can set up an entire combination containing not only the specific program patch required on any of the eight synths connected to the console but also the string tuning, fingerboard transposition, capo offsets and pedal settings he wants. About 50 of these memories are stored in battery-backed up RAM. With the aid of this system, the player can, for example, instantly switch from a Fairlight program patch using conventional tuning, to the next patch he wants for a solo from an Oberheim *Xpander*, together with all the tuning, transposition, capo and pedal variations for that part of the number.

We have aimed to make the *SynthAxe* as easy as possible to use on stage, and to make the task of marshalling and controlling an array of synths less of a ballache for players and roadies. Of course anything that saves time and effort is equally useful in the studio—but you don't get a second chance on a live gig.

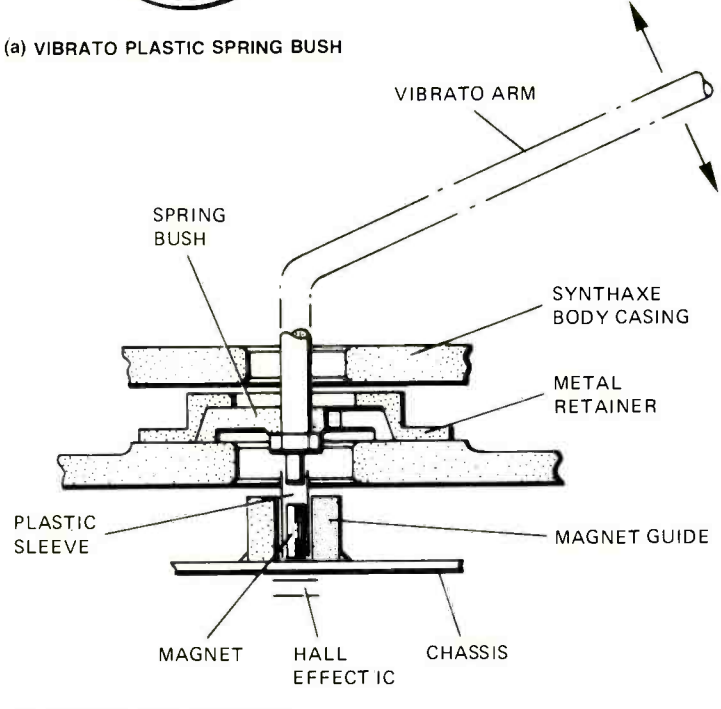
Although the *SynthAxe* is a complex piece of hi-tech jiggery-pokery, the player does not need to have a PhD in cybernetics to play it. That's not to say that the instrument suits everybody. A certain imaginative and adventurous mental attitude is required, and in the same way that many guitarists—quite rightly—saw no need to forsake acoustic instruments for the electric guitar, I am sure there are electric guitarists who will live without the *SynthAxe*. However, to those stringed instrument players who are fascinated by the possibilities of synths—and who appreciate the massive future potential of electronic sound generation, the *SynthAxe* will open many doors.

Finally, I would like to make the point that from the outset, the whole development team was determined that the *SynthAxe* should not be presented as yet another computer whiz-bang—the processors and other electronics within it are a means to an end. They are the means of interpreting the physical movements of the player, and transmitting the consequent data faithfully to the synth. The micros report the musician's live performance—they do not control it. They are links in the chain between the player's thought processes, and the sound he wishes to create. In other words, the SynthAxe is—above all other considerations—a musical instrument.□

FIG 7

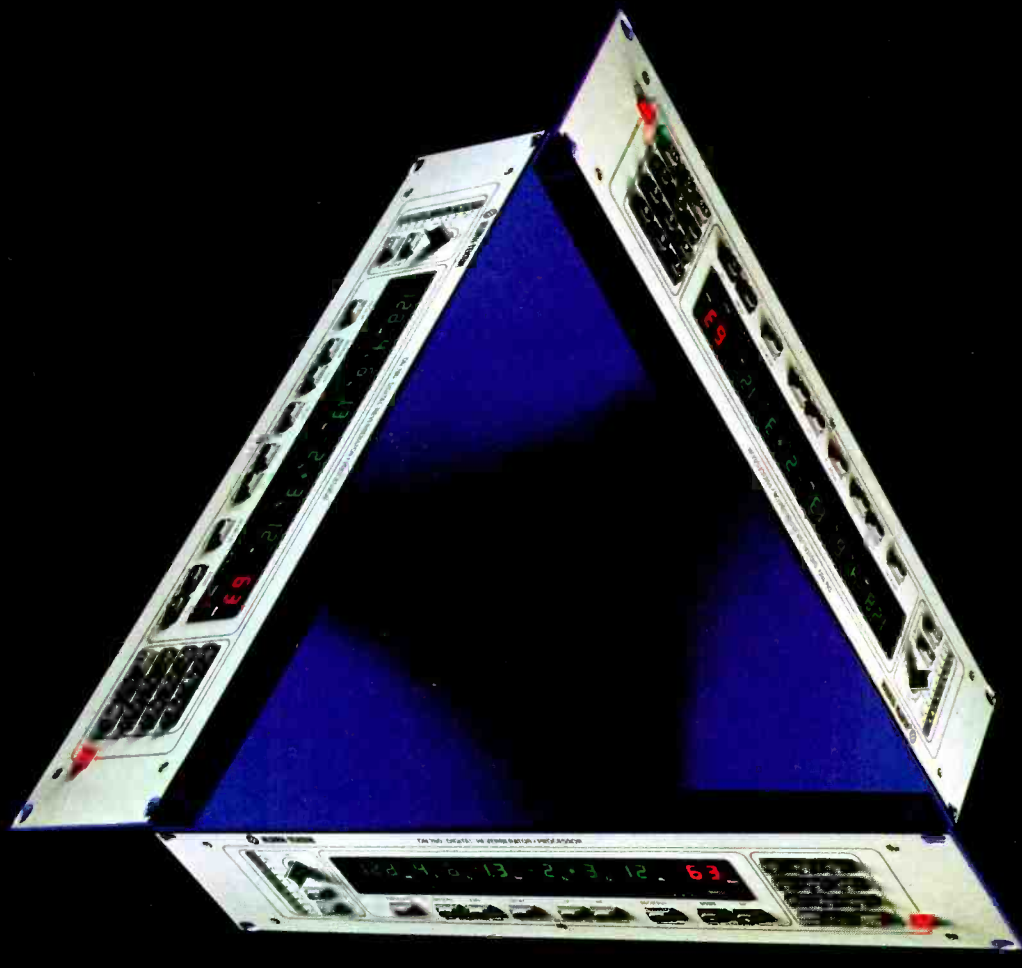


(a) VIBRATO PLASTIC SPRING BUSH



(b) VIBRATO ARM ASSEMBLY

A small universe



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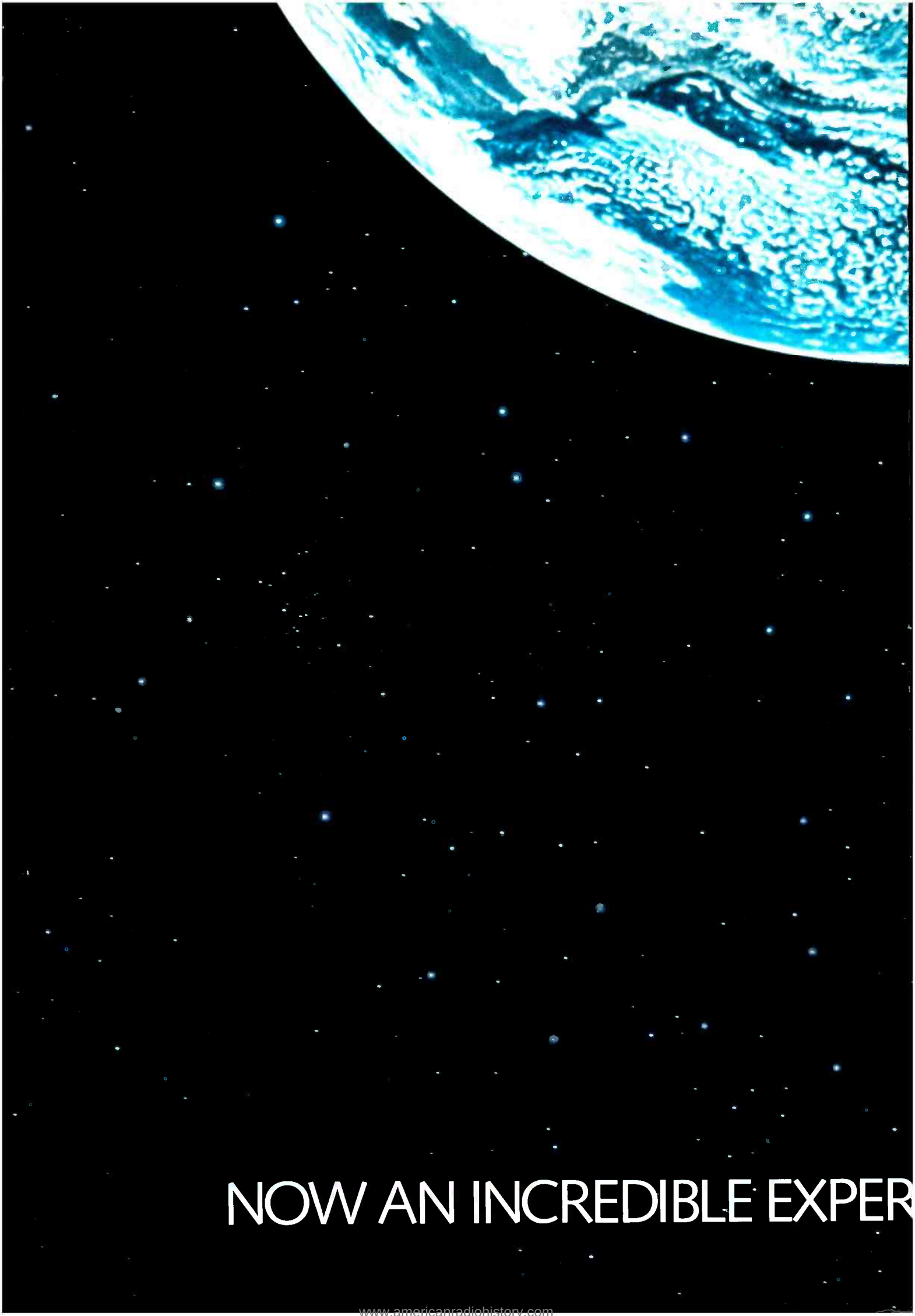

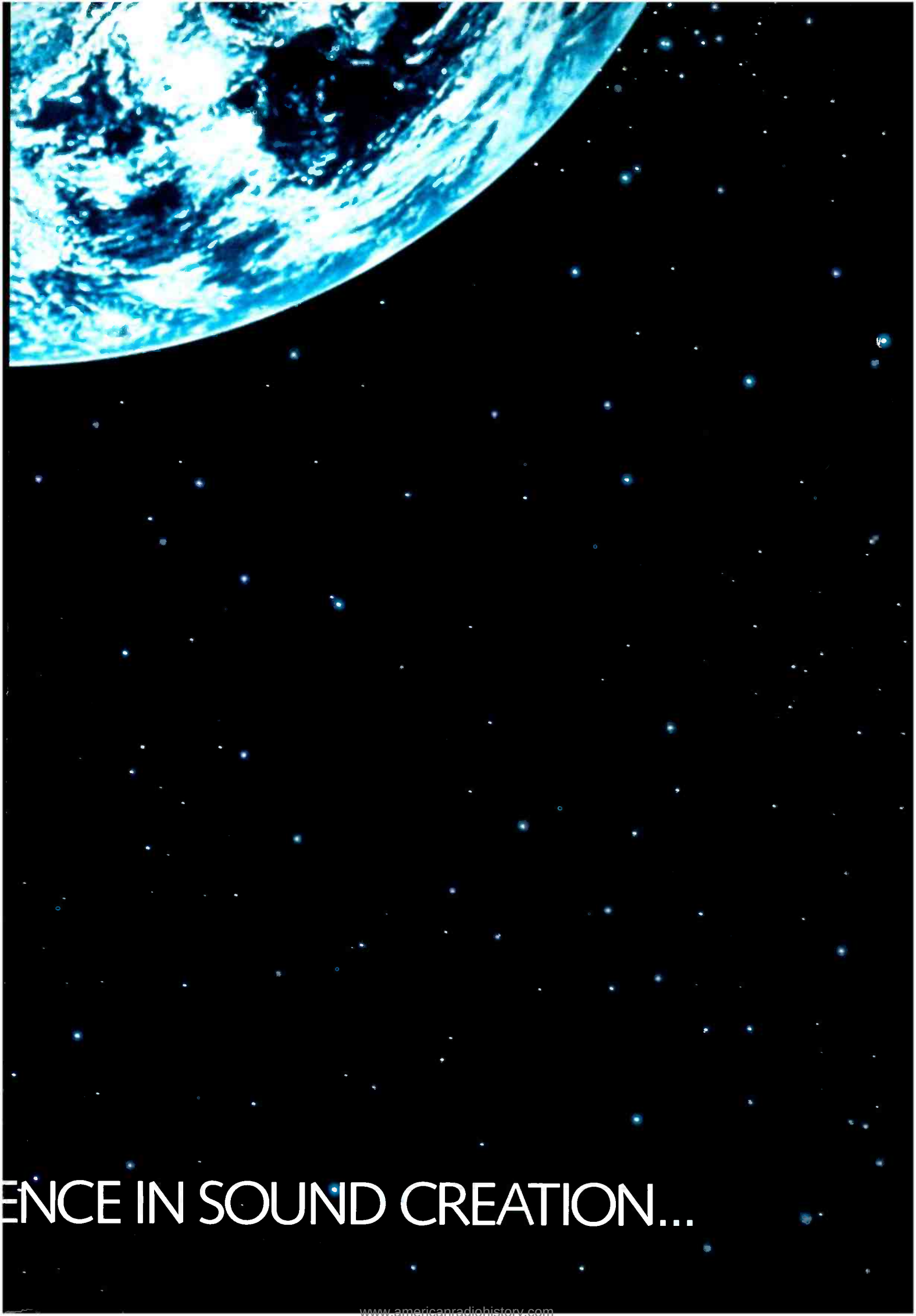

INSIGHTS

INSIGHTS

Recording industry observations by Richard Elen

Another look at home taping

After a period of decided inactivity, there is something happening on the home taping front. One of the main comments I've made in the past is how the BPI has taken a rather curious attitude to the subject. In the States, when this alleged problem came up, the first thing that happened was that some market research data appeared, in the form of the WCI (Warner Communications) report. This was a very respectable piece of work, which covered several aspects of the home taping phenomenon. It came out with a number of results, several of which backed the proposal that home taping was a serious problem, and others indicated, for example, that the people who taped things were also the people who bought records. Whatever the results, and their interpretations, it was an interesting document.

In the UK, however, we had no such luck. The BPI addressed the problem by calling unsubstantiated figures out of the air to back the suggestion that there should be a tax on blank tape, because the industry was apparently losing millions of pounds per year in sales due to people taping records (off the radio, or from their friends) rather than buying them. As a result, it probably came as no surprise that a number of people were rather concerned that there was no real factual basis for these suppositions. The Government didn't seem to think so either: they effectively rejected the idea.

Several journalists called for some figures to back up the allegations. They weren't forthcoming. Meanwhile, the Tape Manufacturers' Group emerged with the avowed aim of opposing the levy. Since then, neither side seems to have been very active, and the matter has fallen into relative obscurity.

Now, the BPI has commissioned some research, which has been carried out by British Market Research Bureau Ltd, and have published a Green Paper called *The Facts about Home Taping*. It has been widely circulated and was enclosed with every copy of a recent edition of *Music Week*. It makes interesting reading, as does the BMRB summary report.

On the face of it, it is exceptionally encouraging that the BPI has done all this work, and has sent it out to people in the business. What is quite obvious, however, is that the literature is aimed only at the few people who are in a position to do anything about home taping, namely the Government. The market research questions have undoubtedly been chosen, as has the way the green booklet has been prepared, with the intention of influencing MPs to be favourably inclined towards the idea of a levy on blank tape.

I wonder slightly about this. Probably it is fair to suggest that all market research is designed to prove a point to someone; that it is not intended to be truly objective. However, one would have thought that if home taping was such a major problem, the BPI would not *need* to angle the research: the truth would do quite well enough. It is a fact, however, that the BMRB report does give some useful information, sufficient to do two things: to cause people like myself (I have always been very much against a levy) to re-evaluate the topic; and to put pressure on the TMG to produce research of its own. The TMG has, in my opinion, been rather lax in its campaigning. I, for one, haven't heard anything from them for ages, despite the fact that they presumably have noted that I have been on their side in the past. In this case, the BPI has taken an initiative, and it deserves a response from the TMG. By the time you read this, I assume there will have been one. Time will tell whether or not it is good enough.

The BMRB report summary very clearly defines the basis of the research. It was conducted between 10 and 15 September 1984, and included interviews in the respondents' own homes with 1,020 people aged 15 and over in Great Britain. The summary is at great pains to point out that the results should be taken only as broad indications of national behaviour, since they are based on a person's *recall* of their own activity, and not on any *precise observation* (their italics).

The first area of the report covers the ownership of tape recording gear. It establishes that over 75% of adults have a recorder, and that the 15 to 24 age group is the most likely to own one. It also establishes that most people use their recorders for taping music—85% of 15 to 19 year olds use their machines for this purpose. Like the WCI report, the BMRB summary indicates that the people who regard music as important are the people who tape.

The next thing that the report covers is the frequency of recording from the radio and from records: 40% recorded from the radio, on average 34 times per year; 34% record albums, on average 15 times per year. Figures are also given for the recording of singles (24% recorded them, about 35 times a year). From these figures, the report gives rough estimates of the number of taping occasions that happen per year in the UK. The numbers are massive (1.5 million occasions *per day* from the radio, 230 million albums per year, and about a million singles per day), but it is a bit difficult to work out how these numbers are derived. On the face of it, it looks like a pretty big problem.

The report then goes on to look at the numbers of blank tapes sold each year in the UK. The BRMB report says industry estimates suggest that between 80 and 90 million blank tapes are sold each year. This is interesting. The figure is apparently based on Customs and Excise figures, but the ETIA reckons it's around 55 million. The BMRB report doesn't make any reference to this whatsoever: that it is by no means established what the exact figures are. Equally, I have yet to see TMG figures: they just quote the ETIA estimate, and don't have any statistics of their own.

The BMRB report finds that 87% of the blank tape market is accounted for by people who make home recordings of music. The suggestion is that 87% of the tapes sold are used for copyright theft, but this isn't the case as the earlier figures testify. The real figure is something like 40% of that at the most. And we don't know anything about those blank tapes sold. It isn't just good quality C90s: it's *all* of them. How many of them are C30s and smaller tapes used for home computers?

The age-groups who do most taping are also those into home computers, and computer manufactuers have reckoned that the market for cassettes for home computers is larger than that for music-recording cassettes in the UK. This clashes with the next item in the BMRB report: nine out of ten blank tapes that are used in the home are used for recording music. No references are given for this, the figures are simply stated. I think they could have done better here.

The next section, however, is one of the most contentious. It investigates the likelihood of a user buying the last record he or she taped, had they not taped it (well, I think that's what it means: it isn't very clear). The results are tabulated under headings for radio, singles and albums, and they are listed against categories of intention: definitely would have bought; very likely; quite likely; not very likely; very unlikely; definitely not and so on. What we don't have access to here (or virtually anywhere in the report) is exactly what the question was. It must have been a pretty difficult and tortuous question.

The report looks first at the definitely would have bought category (8% from the radio, 16% albums, 18% singles) and suggests that we consider these responses as representing a lost sale. They reckon as a result that 30 million radio tapings, 37 million album tapings, and 66 million singles tapings resulted in a lost sale in one year. They then suggest that these estimates are conservative, as adding in the very likely and quite likely categories, the numbers increase by a factor of two or three.

This is obviously quite absurd. The report makes no attempt whatsoever to indicate what the correlation is between an intention to buy—in any of the likely categories—and an actual purchase. It's a notoriously difficult thing to do. In some

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cases, the correlation is virtually non-existent. It also depends a lot on how you ask people. None of this do we know here, and it rather invalidates the numbers. The BPI could have done better than this.

The next section is less contentious. We are even given the question that respondents were asked: It now seems that many people use blank cassettes for making their own recordings either from the radio or from records and tapes. Do you think it would be fair if some payment were made to record producers, artists and composers for this use of their work?

Interestingly, the general response was yes—58% of all adults thought it was fair. Even 53% of tape buyers thought it was a good idea. Most people thought it should be the tape manufacturers who paid the money, of course, rather than the tapers, retailers or equipment manufacturers—although it is hard to see how a contribution from the tape manufacturers wouldn't be passed on. People were also asked whether they would be prepared to pay an extra £1.00 for a tape. As you might expect, a small majority (56%) of tapers would not, but most other people were split 50:50.

The respondents were also asked about a levy on recording equipment, whether they would be prepared to pay an extra £10 for a machine. Interestingly, the breakdown was 44% yes, 10% maybe, 41% no, and 4% don't know. I would have thought that most people would imagine that they'd use 10 tapes or more: why didn't more people say yes?

The final question in the survey was whether or not people believed that record companies lost sales because of home taping. Hardly surprisingly, put like that, more than six out of 10 people thought they did, whether they were tapers or not.

The conclusions of the report are worth stating. They say: The majority of the population believe that record companies are losing sales as a result of home taping, and that some form of compensation would be fair. However, they would on the whole prefer not to be the source of this compensation themselves but to see blank tape manufacturers making a contribution. Even so, a third of all blank tape buyers said they would be prepared to pay as much as £1.00 a tape more if the extra money was to go to record producers, artists and composers.

Let's look at those conclusions in more detail. The majority of the population believes that record companies are losing sales as a result of home taping. Well, obviously they are. If *one* person was to tape a record and not buy it, they'd be losing a sale. The real question is, is it significant? I have always tended to believe not, primarily because the BPI had not come up with any chapter and verse on the subject. Now they have, and while there are some contentious suggestions in the report, I can only conclude that the problem *is* significant, if not exactly quantified. This represents a fundamental change of view for me.

Some kind of compensation would be fair. That, equally, is a reasonable assumption. The questions are, how much? and how do you administer it? If it's going to work out at £1.00 or so on each high-quality C90, fine. But not so fine if it's also £1.00 on a tacky C45. Surely it should be a percentage of the manufacturer's price rather than a flat rate or a levy per minute. And overall I would have thought that if you must have a levy (and there doesn't seem to be much of an alternative) then it would better placed on recorders than on tape. It would be less noticeable.

They (the tapers) would prefer . . . to see the blank tape manufacturers making a contribution. Of course they would, but it comes to the same thing in the end: the consumer pays more. If the blank tape manufacturers want to be awkward, they'll get the bread back by upping the price of professional tape, claiming it back from the industry they might feel has robbed them. It would be a bit silly.

Another thing I had against the idea of a levy was that I didn't see how non-music users would be exempted from payment. I was thinking here of Talking Books and the like, journalists and especially home computer users. I now gather that at least the BPI is aware that this needs to be considered. It all sounds horribly impractical unless the levy is imposed at the retail end.

There's another thing too: I own a personal stereo unit and a car cassette player. I also buy loads of records and CDs. *No way* will I buy tacky, low-quality pre-recorded cassettes *of albums I already own* when I can make far better recordings myself. At the very least, it should be allowable to copy your own material for personal use. The vast majority of computer software publishers allow the making of backups for personal purposes, and this seems wholly reasonable. Doesn't it? The report suggests that only 17% of occasions involve taping a copy of an owned album, a figure I am very suspicious of. I really can't believe that me and most of my friends are that unusual. Maybe it's because neither I nor my friends are teenagers any more . . . ?

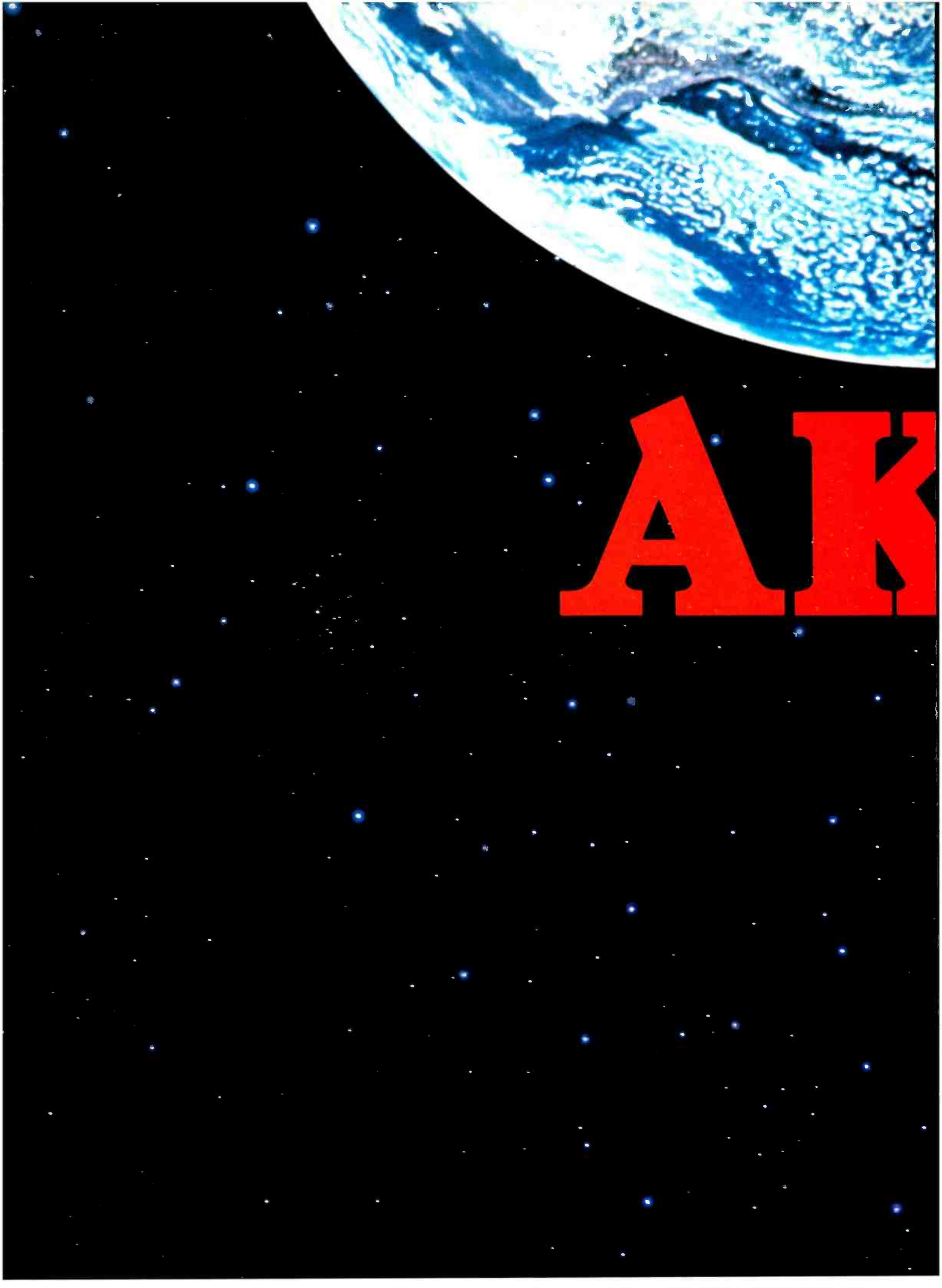
But overall, the one thing that can be derived from the report is that home taping *is* hitting sales. The real question, that I currently see as being unanswered, is what do you do about it? The BPI suggest that a blank tape levy is the fairest method. It should be remembered, though, that *it is by no means fair*, it's just that the other options are worse. My own scheme—that there should be a royalty charged on *pre-recorded material* that allowed you to do what the hell you liked with your records and pre-recorded tapes—is impractical too. But copyright theft is going on, and you can't just leave the thing alone.

The onus is now on the Tape Manufacturers' Group to produce some figures: the BPI got there first. We can criticise the way the survey was approached, the lack of detailed information, the bias (especially evident in the green booklet, which is what most people will see), but the work has been done. The BPI represents the copyright owners who, it must be said, have a *real gripe*.

The trouble is, of course, that the TMG will be equally biased, if and when they do their own research. What else could one expect? But the group will be hard put to make a case which isn't based solely on loss-of-business considerations.

What is really needed is obvious: an industry-wide research and discussion project on the subject; jointly-funded *truly* independent research, and a committee to discuss the implications for *all* facets of the industry and to work out the best course of action.

It won't happen like that, of course. A pity, really.□



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SYNTHESIS PRIMER AND UPDATE

With the distance between the studio and the synthesiser decreasing, a knowledge of what were previously musician's matters is very important. Mark Jenkins reports

In the good old days, the studio manager and engineer took care of the recording equipment and the musicians brought along the instruments. Obvious exceptions were the acoustic piano and perhaps the Hammond organ, but clearly times change. Studios which own items like grand pianos, find them sadly under-used, since over the last few years there's been a trend for musicians to bring along their own *Prophet* synths or, latterly, Yamaha *DX7*s.

The trend has begun to reverse though. Electronic instruments began increasingly to resemble computers a few years back, and to have massive capabilities with price tags to match. The result was that individual musicians could neither afford them nor gain access for long enough to learn how to use them. Result—the recording studio is once again called upon to provide in-house instruments, although now there's a large degree of specialist operating expertise expected as well. No-one would think of taking a three-day booking if the band have to spend two days learning how to self-op the latest digital gadget.

Studios, then, are expected to come up with the high-tech goods. In the last year there have been some major developments in the field, and it's fair to say that the choice is wider than ever before, if no easier to make. Electronic instruments have become increasingly powerful, but the first generation is clearly nearing the end of its lifespan and the second generation is not quite with us yet.

Over the next couple of pages we'll take a look at recent developments in the field of electronic instruments, their applications, synchronisation and possible potential.

Fairlight Computer Musical Instrument

The Fairlight, as it's generally known, is one of the most popular large-scale studio tools, and one which is frequently hired along with one or two operators for all kinds of sessions. There are a few independently owned Fairlights in the UK—Peter Gabriel, Kate Bush, Steve Levine and Mike Oldfield all have one, as do commercial composers David Vorhaus (Kaleidophon studio) and John Lewis (Electrophon studio). Some music libraries own Fairlights, as do many educational institutions and, of course, commercial studios.

The Fairlight's forte is holding in memory (sampling) real acoustic sounds, and allowing the user to play these back polyphonically from the keyboard. The standard Fairlight has eight voices and the maximum sample length with reasonable fidelity is around 2 s. In 1983 an output modification was introduced to increase the maximum frequency to above 16 kHz, and this improvement applied to many of the existing user Preset samples as well as to any made by the individual owner.

As an option, the Fairlight's software can include the Rhythm Page (Page R). This allows you to create extremely long sequences using real-time entry from the keyboard and the facility to chain short sequences into lengthy songs. This facility is much more frequently used than the simple Realtime Sequencer which is part of the standard software.

The *CMI* also has another method of musical entry, the Music Composition Language (MCL) which is a numeric/alphabetic code specifying notes, durations and placement. This language is particularly useful for placing exact cues for video work, and can even avoid the necessity of physically locking instruments to the videotape using *Q.Lock* or a similar system.

The Fairlight is capable of synthesising sounds, but this isn't its main purpose—the synthesising process can be slow, but this is partly because there are so many options open to the user. Combining sampled and synthesised sounds is possible however, and the experienced user can benefit from many 'tricks' such as programmed echo effects and pitch shifting. The Fairlight is capable of controlling analogue electronic instruments through eight independent outputs.

Apart from the output update mentioned, the Fairlight is just about due for a large update. Previous updates have been easily fitted though, and several companies have marketed accessories to fill in the gaps left by Fairlight themselves. Syco Systems have developed the *Conductor* card, which fits inside the Fairlight to synchronise it to a *LinnDrum*, and another popular add-on is the SRC *Friend Chip*, an SMPTE Reading Clock which interfaces the Fairlight to almost any other electronic instrument.

The coming update is expected to give the Fairlight 16 voices, 16-bit (as opposed to 8-bit) sampling and vastly increased memory functions. One recent option has been the use of a Winchester disk drive to store very large numbers of sounds with an access time of around 1 s.

NED Synclavier

The *Synclavier* was designed as a powerful digital synthesiser with FM capabilities. Intended to have large numbers of voices as an option, it was equipped with a minicomputer which allows it to carry out impressive feats of computation and analysis which include loading new voices while replaying a sequence and reproducing changes to a patch while still retaining the original sound in memory.

The *Synclavier* can have up to 128 voices, although an average model would have 16 or 32. It's just been updated and equipped with a new keyboard adapted from the *Prophet T8*—like the *Prophet*'s, it is wooden, weighted, and responsive to velocity and after-touch. The new *Synclavier* has a 32-track onboard digital recorder with overdub, fast forward and 'rewind' facilities, and loads 64 sounds in sets of eight from a floppy disk.

The *Synclavier*'s response to the Fairlight's sampling capability was more in the line of digital recording, with a direct dump to Winchester drive making exceedingly long samples of very high quality possible. These could be played back monophonically under keyboard control, and can now be combined with a synthesised sound.

To overcome the limits of monophonic playing, NED have developed the Re-Synthesis option, which is an analysis routine for samples which allows the *Synclavier* to imitate them using its own voices in an optimum alignment. Apart from the possibility of polyphonic playing, this gives much greater scope in editing sounds than would the Fairlight or other purely sampling instrument, but the complexity of the re-synthesis routine would tend to limit its use to simple pitched sounds.

NED also have a 'genuine' polyphonic sampling package on the way. Since this will involve a hardware update, they'll

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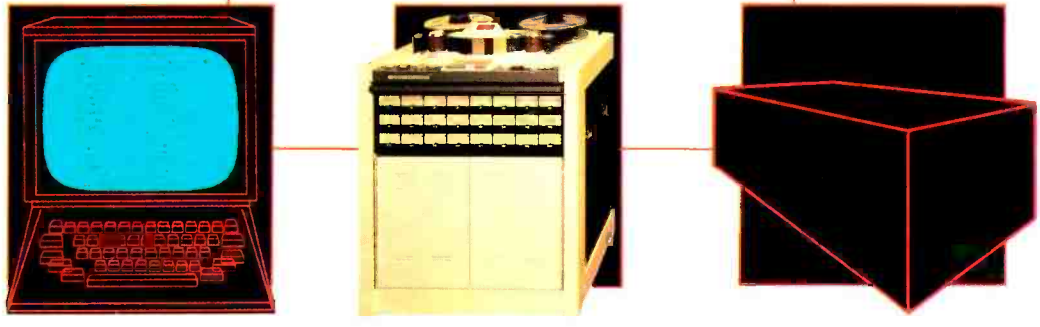

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SYNTHESIS
PRIMER AND UPDATE

PPG's Waveterm system

also take the opportunity to include a multiple output option—the major drawback of the *Synclavier* having always been monophonic or, more recently, programmable stereophonic output.

There is a powerful guitar interface but as yet no MIDI facilities. The Fairlight will eventually have MIDI as standard, which means it can be played by the *SynthAxe* MIDI guitar controller. Both machines have seen some live use, but are generally confined to a studio setting.

Kurzweil 250

A new contender in the high-tech stakes, the Kurzweil looks set to establish itself in many studios over the coming months. Basically it's a sampling machine, developed as an offshoot of Ray Kurzweil's interest in reading machines for the blind using artificial intelligence techniques.

The *250*'s sampling function is not dissimilar to the Fairlight's, but it uses artificial intelligence to 'fill in the gaps' between samples and so improve sound quality. It also extrapolates harmonic information over a period of time and over the length of the keyboard, and so the effects of 'munchkinization' (speeding up of sampled sounds played higher on the keyboard) are very much reduced.

The standard Kurzweil is a 12-voice model with a velocity-sensitive weighted keyboard and a simple but powerful real-time sequencer built in. If more than 12 voices are sounded, the quietest one is dropped, and there are many other examples of 'artificial intelligence' at work in its functions. The initial set of sounds includes a complete drum kit, strings, brass, a wonderful grand piano, organs, sound effects and much more; the second issue of voices includes choirs and woodwinds.

The Kurzweil is a little limited for its price despite its excellent sound quality. However, all this will change very soon as the link to the Apple *MacIntosh* computer is completed. This will allow very complex multitrack composition and synchronisation, sound synthesis and more. If Kurzweil can deliver, the system promises to be the most important of the next year.

PPG Waveterm

Although it has some eccentricities, the PPG system is very widely respected among those who've had the opportunity of becoming closely acquainted with it. The basic *Wave 2.2* or *Wave 2.3* keyboard is a velocity- and touch-sensitive synth which uses tables of waves held in memory to produce very distinctive digital sounds or very familiar analogue synthesiser sounds. The synth has an onboard multitrack sequencer and is generally 8-voice polyphonic.

This can be expanded greatly with the addition of the *Waveterm* sampler and *Expansion Voice Units*. The 'term allows polyphonic sampling and very complex sequencing, although it conspicuously lacks anything as approachable as the Fairlight's Page R display of musical staves.

The PPG's sampled sounds are of slightly higher quality than the current Fairlight's and the system is considerably cheaper. MIDI is now standard and the PPG is able to filter samples (like the *Emulator 2*), combine them with synthesised sounds (like the Fairlight) and arrange them in lengthy songs (like the *Synclavier*). Recent additions to the range have included a wooden weighted velocity-sensitive keyboard, the *PRK*, which can hold its own sampled sounds on ROM, and the *EVU*, a keyboardless 8-voice expander for sampled or synthesised sounds.

Other sound samplers

Most promising of the 'cheaper' samplers is the *Emulator 2*. Like the old *Emulator* it can have a single or multiple keyboard split, but it has higher frequency response, a longer velocity-sensitive keyboard, many synthesiser-like parameters which allow a sampled sound to be modified by envelopes and filters, expanded sequencer functions, MIDI, SMPTE and individual outputs. It's an 8-voice machine suitable for stage use which loads from floppy disks—a huge library of factory disks is available, but it's a very rapid process to do your own sampling. The *Emulator*'s multiplicity of synchronisation methods is rapidly making it a studio favourite.

The 360 Systems digital keyboard isn't strictly speaking a sampling machine—it replays factory chips of samples, so although there's a very large range available at the moment you are limited to certain sounds. It's considerably cheaper than the *Emulator* though, and while it hasn't got its synthesiser functions, it does have MIDI and very comparable sound quality.

The cheap way into polyphonic sampling is the Greengate *DS3*, discussed in the September 1984 issue. It's based on the Apple computer and offers 4-voice sampling with 15 kHz frequency response for around 1.6 s, 8 kHz for 3.2 s. Designed as a substitute for a digital drum machine, it can be used for instrumental sounds with or without a keyboard and has recently been updated to include an 8-way multisample or keyboard multisplit facility. Some preset sounds are provided, but comprehensive facilities exist to sample and waveform edit your own sounds.

A powerful real-time sequencer/song composer is part of the package, and numerous hardware and software updates have been or are about to be announced. These include MIDI interfacing, a dynamic drum controller input, sustain and program step footswitches, improved keyboard connections, vastly expanded sampling time at 15 kHz and more.

The Greengate can very much be regarded as a 'mini-Fairlight', and seems to be the ideal introduction to sampling for the small studio. It operates with an Apple disk drive(s) and monitor. No knowledge of computer operation is necessary to use the *DS3*.

Spectacular developments are inevitable in the sound sampling field over the next year or so. The *Mirage* from Ensonig is claimed to reproduce 8-note polyphonic sound loaded from

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SYNTHESIS
PRIMER AND UPDATE

disks from a velocity-sensitive keyboard, with up to 16 sounds played across the keyboard, programmable split, 77 sound parameters including filtering and envelope shaping. Doepfer in West Germany have a modular sampling system based on the Commodore *64* home computer which builds up to perform waveform synthesis as well as polyphonic sampling. There are several monophonic sampling systems available for home computers including the Spectrum, Commodore *64* and BBC, but most of these are far from professional quality. Although work on sampling is continuing, it may be that the NED system of Re-Synthesis will begin to catch on instead—anybody for a Yamaha *DX7* re-synthesis system?

Synchronisation

As previously mentioned, some interfacing is often necessary to use the larger electronic instruments in conjunction with other equipment. The SRC *Friend Chip* seems to be the most popular at the moment—apart from generating and reading SMPTE code it has multiple pulse outputs at different rates and versatile offset functions to compensate for any timing problems.

One recent problem has been the synchronisation of MIDI-equipped instruments to tape. Sequencers such as the Roland *MSQ 700* can control synthesisers on all 16 MIDI channels independently and sync to tape very efficiently, but the MIDI code itself can't be recaptured from tape directly.

Several manufacturers have approached this problem and come up with relatively inexpensive solutions. Garfield Electronics, the manufacturers of the *Dr Click* and *Mini Doc* (in themselves highly versatile clock dividers) have produced the MIDI adapter, which deals with 24, 48, 96 pulse and DIN sync signals as well as MIDI and tape sync. Korg's *KMS 30* handles tape, MIDI and DIN sync at 24 and 48 pulses. An even cheaper alternative is to use MPC's *Sync Trak*, which is around £20, to tape sync a drum machine has both 24-pulse synchronisation and MIDI, and sync other equipment to that.

Perhaps surprisingly, the SMPTE timecode is becoming cheaper and more popular as a synchronisation method. Roland have just introduced an SMPTE box which syncs to MIDI and to various other clock pulses—the most interesting fact is that it has a Tap function which allows you to enter synch pulses in real-time. Subsequent performances can then follow the earlier tracks perfectly even though there was no timecode initially laid down.

The lack of standardisation even of timing pulses between different electronic instrument manufacturers has led to a thriving trade in clock interface devices. Foremost among these is Garfield's *Dr Click*, which will produce almost any clock pulse from any other. More cheaply, the *Mini Doc* will divide down pulses (say from Oberheim's 96 pulses per quarter note to Roland's 24) and so allow you to synchronise a Korg drum machine to an Oberheim sequencer and synth or an SCI *Drumtrax* to an *Emulator 2*'s sequencer.

Non-MIDI equipment

Strange to relate, there were experiments with electronic instruments before MIDI was introduced, and any of these instruments which haven't already been consigned to the junk heap can now be rescued using various analogue-MIDI interfaces.

Syco Logic's *AMI* accepts up to eight varying analogue inputs and converts them to MIDI signals. Therefore it's ideal for use with Roland's *MC4, MC8* or *MC202* microcomposers, the Roland *TB303 Bassline*, ARP *Sequencer* or almost any other analogue-output sequencer which would otherwise be incompatible with MIDI equipment. The *AMI* can also accept signals from pedals, breath controllers and other sources, and one advantage is that it automatically quantises input values (since it can't transmit non-chromatic pitches) so making tuning of notes on analogue sequencers much easier.

Coming up next from Syco Logic is the Pads-to-MIDI interface, which allows a set of drum pads, such as Simmons, to control MIDI drum machines such as the SCI *Drumtrax*, Roland *TR909* or *TR707* with dynamic sensitivity. In production now is a MIDI switching matrix which can assign control of synthesisers to other keyboards, to sequencers or to guitar synthesisers at will.

Rosetti Music software have a CGX interface which converts signals in the opposite direction—from MIDI to analogue. This means that a MIDI sequencer could be used to control a *Minimoog* or other analogue synth, which will be a great boon since the *Minimoog*'s rich sound is still very much in demand for bass patterns. Velocity information can also be conveyed separately and applied to the analogue synth's amplifier or filter inputs.

Keyboards and synthesisers

The trend in the last year has been away from analogue keyboards, not because they don't have their uses, but because there are two alternatives—Yamaha's FM system and the concept of synthesiser expanders.

Yamaha's *DX7* in particular has had a huge impact, having the ability to cut through other layers of sound unusually well due to its sharp FM tones. Yamaha now have a whole range of FM products—the *TX816* is a racked set of *DX7*-like modules which can be controlled individually for multiple sequences or together for very complex sounds. The *TX216* simply contains two modules rather than eight, and additional TF1 modules can be added as desired.

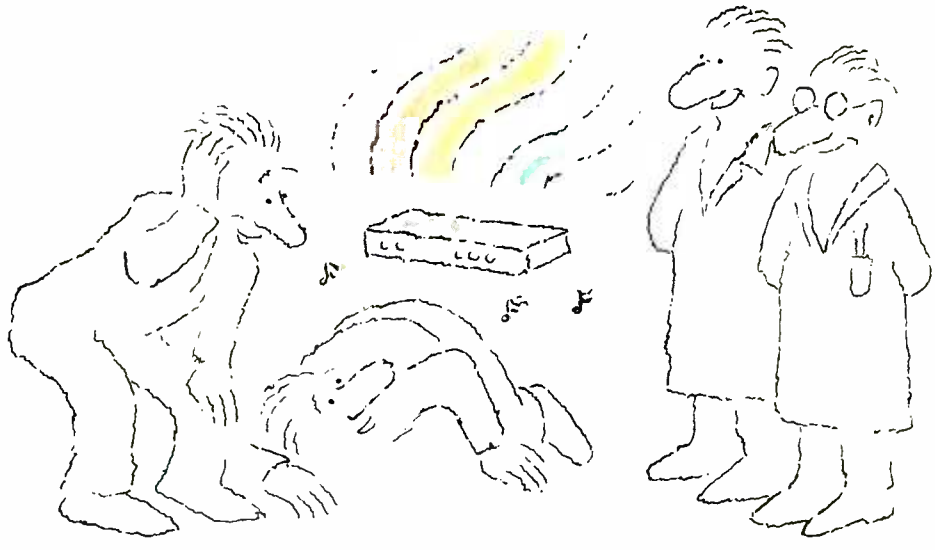
The *QX1* sequencer can record 80,000 notes with velocity information and can address all MIDI channels individually. It's ideal in conjunction with the *TX816*, although it could control virtually any MIDI equipment. Also recently launched by Yamaha were the *TX7*, a small expander for the *DX7* which contains similar circuitry but which lacks editing controls and so depends on a *DX7* or *CX5* computer to alter its sounds, and the *QX7*, a budget version of the *QX1* sequencer.

The *QX1*'s major rival is going to be the Linn *9000*. It includes a 32-track digital MIDI recorder and a digital drum machine, and has SMPTE, disk dump and the option of adding a do-it-yourself percussion sampling board.

Yamaha have recently launched some new keyboards which look like keyboards—the *DX5* does (it has circuitry of two *DX7*'s) and the *KX88* does, although it's not actually a synth—it's a voiceless mother keyboard for other MIDI synths. Roland also have two mother keyboards, and seem to be going for the concept of keyboardless expander synths in a big way, even launching expander versions before (instead of?) conventional synth versions of new products.

The appeal of the expander is obvious. You only need one keyboard with a split at any one time (you've only got two hands) and so anything else is a waste of space. Given a high-quality mother keyboard, preferably with touch and velocity-sensitivity, all others can be relegated to 19 in racks in a corner of the studio. New patches can be called up remotely and changes to the sounds can even be made via MIDI's system exclusive codes. Obviously any system which saves space in studios should be roundly welcomed.

Expanders on the market at the moment include three from Roland (a piano, a digital polysynth and a more powerful analogue-type polysynth), the Yamaha models mentioned, the Korg *Poly 800* which is very inexpensive, the Oberheim *Xpander*, which doesn't fit into anything like a 19 in mounting, and a SIEI version of their *DK600* velocity-sensitive synth which is also a little larger than 19 in. Many companies are known to be working on expanders however, including Crumar for the *Bit One* series, and this seems to be a major trend for the future.□



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Lion Share, Los Angeles

Engineer John Guess and producer Michael O'Martian in Studio A

Although in operation for only about three years, Lion Share has taken its place among the venerable giants of the Los Angeles studio scene. Owned by superstar singer Kenny Rogers, the recording facility shares a large West Hollywood complex with Rogers' publishing company, his fan club, the headquarters for his clothing line, and sundry other executive offices.

Plush carpeting and mirrored walls with brass railings greet the visitor to Lion Share. On a walk around the facility, one is likely to encounter a workman or two replastering, resurfacing or repainting a stairwell or hallway. The care and expense evident in the building décor are reflected in the studios themselves, which are continually being upgraded. "When we took over the property, Kenny told me that he wanted to make this studio better than any place in town," recalls studio manager Terry Williams. "Even though the facilities were quite sufficient for making records, they were a bit behind the times, and were going to take some work."

The building that now houses Lion Share has had a long and eventful history. It started life as an apartment house, but was purchased by ABC Records in the early '60s, and became their recording studio. In subsequent incarnations, it was Concord Recording Center, and Scott-Sunstorm Studios.

Terry Williams, too, has quite a bit of his own history: about 18 years ago, he and Kenny Rogers performed together in the New Christy Minstrels, and founded the First Edition a few years later. This long-term association, coupled with the engineering credentials Williams has acquired since the disbanding of the First Edition in 1975, make him the ideal master planner for what will be Rogers' Los Angeles high-tech showplace.

The first step in the reconstruction process was to totally gut the least-used room, remodel it geometrically, and install all the latest equipment. That room became Studio A, but not without some fancy figuring. Once the old equipment was removed, the area proved to be relatively small. "The building wasn't stressed properly to increase the ceiling height," remembers Williams, "and we couldn't change the square footage at all, because the only direction we could expand was out and over the alley (an option not allowed by the Los Angeles building codes). So we tried to optimise the area we had by making the room as flexible as possible sound-wise."

The plan called for using an abundance of hard surfaces for maximum ambience, and constructing an extensive louvre system, which is controlled from the console in the control room. When the louvres are open, they absorb a great deal of the top end so the engineer can 'tune' the room to sound really dead or as expansive as a barn.

Part of the available space in Studio A was turned into a marble-floored isolation booth. The area can be isolated completely via a sliding glass door, and the acoustics are altered by adding or removing carpet surfaces from the floor. A second small iso booth accommodates vocals, acoustic guitars, etc. Both booths and the main room are fitted with ceiling-mounted talkback mics, which save on set-up time, and occasionally double as ambient room mics.

At the present time, remodelling is underway on Lion Share's Studio B, a room known for classic sessions during the ABC days with the likes of Tommy James and the Shondells, and the Grass Roots. In that studio, however, refurbishment is confined mainly to the control room. A new console will be installed, along with some extra tape machines and specially selected pieces of outboard gear.

"The control room in Studio B is a little smaller than those in our other studios," says Terry Williams. "We're trying to get as much room as possible to handle all the keyboard work that usually goes on in there. David Foster, Michael O'Martian and several other producers, who tend to use a lot of keyboards, prefer that room for synthesiser overdubs. We're also spreading out the monitors a little more laterally to get the optimum stereo image."

The remodelling planned for Studio C will be the most ambitious project the studio has undertaken to date. "We have a small building next door that's not doing anything for us now," says Williams. "We're literally going to turn the existing studio westward, and build up over the top of that building. That way, I can get the kind of ceiling height and room size that I want. When the room is completed, it will be able to seat 60 or 70 people."

The plans for upgrading Studio C also may include a new Neve DSP digital console. Lion Share was among the first studios in Los Angeles to make a serious commitment to digital recording. They purchased a Mitsubishi *X-800* 32-track digital recorder some time ago, and to date, have completed notable projects with Donna Summer and Barbra Streisand (the latter for the *Yentl* film soundtrack with producer Phil Ramone). Terry Williams has expressed an interest in making Lion Share the first American facility to have an all-digital recording chain, but naturally the cost of such an undertaking is something to consider carefully. "We're doing some serious contemplating right now," he says.

In terms of clientele, the emphasis at Lion Share is squarely on record dates. A list of recent credits comprise albums by Germaine and Michael Jackson, Rod Stewart, Kenny Loggins, Kenny Rogers, Donna Summer, Julio Iglesias, Tubes, Chicago, Christopher Cross, Jeffrey Osbourne, Deniece Williams and various recording projects involving Stanley Clarke and George Duke. "I really try to cater to the upper echelon of Top-40 clients," says Williams.

The studio's record orientation is reflected in the thorough inventory of musical instruments that Williams keeps on hand, such as a wide selection of acoustic and electric guitars supplied by Ovation, one of Kenny Rogers' favourite brands. Keyboard options include a Yamaha *DX-7, Prophet 10,* Wurlitzer electric pianos, Hammond *B-3*s, two Steinway grand pianos and one Bosendorfer grand.

To complement the strong record emphasis, Lion Share offers comprehensive video facilities as well, which are available in 1 in, ¾ in, VHS, and Beta formats. One of their recent projects was a massive four-part, cable television special highlighting last year's US Festival in California. Although the analogue audio portion of this project was only mixed to 1 in video using NECAM automation, the studio is equipped to record and/or mix digital- or analogue-domain audio tapes to 1 in, or ¾ in video format via the NECAM computer system. In addition, stereo digital mix-downs for video soundtracks with timecode may be performed using one of the facility's Mitsubishi *X-80* 2-track recorders. "Each room is pre-wired so we can do ▷

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STUDIOFILE

music to video in every studio," says Williams. "We're primarily a record house, but we're not limited with what we can do video-wise. If someone needs audio sweetening on a piece of videotape, we can handle it."

Naturally, Lion Share's fairly extensive list of equipment and the policy of perpetual upgrading has led the studio to implement an exhaustive maintenance routine. Under the supervision of chief engineer/chief maintenance engineer Jay Antista, technicians Paul Basset, Howard Weiss and James Goforth supply 24-hour, in-house maintenance service. "If there's a date here, there's a maintenance technician on the premises," says Terry Williams. "It's expensive for us to provide that service, but we feel it's a kind of insurance programme for the artists, engineers and producers that really saves them money in the long run.

"This is still a service business," Williams continues. "When you compare electronics, the available rooms are very similar, especially right here in Los Angeles, where there are some fine studios. The real difference between one studio and another is the people. In my experience, the favourable comments we get centre on the staff, and I have no doubt that they and the clientele we've attracted have really been the

Lion Share continued

decisive factors in our success."

On the subject of equipment, "We're pretty much entirely a Studer house now," says studio manager Terry Williams about Lion Share's collection of tape machines. When alterations to the facility are completed, each room will have two Studer *A-800* 24-track analogue recorders (that's already the case in Studio A) and *A-80* 4-track, ½ in and ¼ in machines. In addition to the three main studios, Lion Share maintains a production room for handling tape edits, sequencing of albums and making tape copies. Like the main tracking rooms, the production area is equipped with a generous supply of Studer reel-to-reel recorders and cassette machines.

The exception, of course, to the all-Studer rule at Lion Share is the Mitsubishi digital equipment, which includes an *X-800* 32-track digital recorder that 'floats' from room to room as needed, and several Mitsubishi *X-80* digital 2-track machines to handle most of the mastering work. According to Williams, the studio chose the Mitsubishi line for a number of reasons, "The rapid punch-in feature on the *X-800* and the razor-blade editing capability on the 2-track lets engineers feel comfortable with the new digital format," says Williams. "They don't have to mess with electronic editing units for simple edits; they just use a razor blade as they have for years with analogue-tape. In fact, very few people are using the ½ in analogue machines for mastering; everybody wants to use the *X-80*s. I almost don't order ½ in tape anymore."

The console in Studio A is a 56-input Neve *8108* with NECAM automation. Although currently equipped with a Harrison board, Studio B will have a 48-input Neve *8128* with NECAM, when the revamping of that room is completed. Studio C is presently operating with an API DeMedio desk. The Lion Share management is in the process of deciding on a new console for Studio C, with Neve's DSP digital model as a strong contender.

SMPTE timecode synchronisation is provided in Studio A by a Studer *TLS 2000*. Studio B has a btx *Softouch* synchroniser. Discussion as to a synchroniser for Studio C is being handled with care: "Picking a synchroniser is one of the toughest jobs we've had," says Williams. "We've had a lot of bad luck with a few of them."

The principle monitors in each studio are JBL-loaded (George) Augsberger enclosures. Monitor and headphone amplification is provided by a combination of Studer and Bryston power amps. All the rooms are outfitted with a thorough array of outboard gear, including a Marshall *Time Modulator*, Quantec *Room Simulator*, AMS and Publison pitch changers, Massenberg and Sontec equalisers, several Lexicon units—models *93, 224, 224X*—and an EMT *251*. Limiting is done by a combination of UREI *1176, LA-4A*, and *LA-2A* limiters along with Massenberg and Neve models, the latter being particularly favoured by clients, according to Williams.

Echo effects are generated by six EMT plates plus three live chambers of varying sizes, which date back to the ABC days. Adjacent to the production studio is an 'echo central', where all signal flows are co-ordinated so any combination of echo sources can be patched into any studio.

Also next to the production studio are Lion Share's video decks—an Ampex *VPR II-B* 1 in machine, Panasonic VHS equipment and Sony ¾ in and Beta decks. For maximum flexibility, these machines can be interfaced with any of the studios, which are all equipped with Sony *Trinitron monitors*.

Lion Share Recording Studios, 8255 Beverly Boulevard, Hollywood, CA 91356, USA. Tel: (213) 658-5990. **Bob Anthony**

Milano Studio, Milan

Ariston are a well known record label in Italy, with their own cutting and pressing plant and, until about a year ago, their own studios. However, the studios are now under new ownership and have been updated and renamed.

The 2-studio complex is situated away from the hustle and bustle of the centre of Milan and entering into the buildings is very much akin to entering a factory yard. This means that parking is no problem and access is easy from the motorways and associated ring roads. The pressing plant is still very much in existence and turns out records for the Ariston group. The studios are situated on the first floor of a large building and there the old ties end. Once on the first floor—either via stairs or lifts—a wide corridor opens into a large hall area along one side of the building and this serves as a lounge/waiting room/rest area, with refreshments and snacks available from a large bar in the true Italian style.

The first studio visited was the main room or Studio Prua, where a mixdown session was in progress. This houses a 32/32 MCI *536* console fitted with MCI automation. The desk configuration is slightly unusual in that the master section is in the centre of the console, flanked by 16 channels on either side. Multitrack recording is also MCI in the shape of a *JH-24*. Two-track recorders are not in short supply, either, and consist of two Studer *A80* and a *B62*. The machines are all lined up next to each other in a soffit at the rear of the room, thus blending acoustic requirements with ease of operation. Two cassette machines are also in evidence plus a Quad *33* preamplifier for playback facilities.

Monitoring consists of JBL *4343* vertical mounted speakers which are bi-amped via a JBL crossover and BGW power amplifiers. Final equalisation is applied with UREI ⅓-octave graphics. The monitor rack is placed in a little room situated to one side of the control room, together with the console power supplies and Revox amplifiers for the headphone and foldback lines. There is also daylight available from the outside window!

Outboard equipment is ranged in portable wooden racks and includes Kepex I gates, Eventide *Instant Flangers* and *H949 Harmonizer*, Ursa Major *Space Station* echo and reverb unit, Lexicon *Delta-T* DDL with four lines, UREI *1176* limiters and *545* stereo parametric EQ, Orban *672A* stereo 'paragraphic' equaliser, Roland *RE 501* tape echo and an AEC *EA75* spectrum analyser. Further digital reverberation effects are supplied by an EMT *252* with mechanical reverberation available from an EMT plate and AKG *BX20* and *BX20E* systems.

The control room acoustics were designed by Alberto Albertini of TDS and employ a number of proven techniques. The rear and middle sections ▷

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STUDIOFILE

are wood panelled, the latter being in the form of angled slats in front of trapping, with Sonex-type foam filling in the rest. The ceiling is also quite heavily trapped and is fabric covered for the most part, the main hard surface being a lighting fixture over the length of the console which does not apparently cause any reflection problems. The floor is carpeted meaning that the mid and high frequency reflections come mainly from the side and rear walls. The monitors are semi free standing, being firmly fixed on separate brick pedestals. The room was designed for maximum control of the bass end in order to have a solid and distinct sound. The results appear to have made the effort worthwhile and the stereo image throughout the frequency range is more than satisfactory. In a talk with Signor Albertini he expressed the feeling that it is often the bass frequencies that tend to be the most troublesome, due to reflections and cancellations coming from the relatively long wavelengths, and that a good low end is more of a rarity in control rooms than good middle or high frequency response. The sound of the mix in progress was certainly very clear and uncluttered, the character of the sound staying much the same when heard over the Auratone nearfield speakers.

The studio is capable of handling all styles of music though in general things tend to be in the pop, disco and hit parade styles rather than rock. Space is not a problem as the floor area of 70 m^2 can comfortably house 80 musicians. In addition there are four isolation booths of differing depths at the far end of the room. Access to the studio is via the main corridor so tramping through the control room is avoided. The acoustics are deceptively simple and effective. The floor is carpeted, with a dais in front of the booths, while the ceiling consists of concave pyramid-shaped acoustic tiles. The most interesting aspect is the walls. These are brickwork with each brick pierced by about 20 holes—rather like air bricks. Although the general construction is vertical, there are enough variations

Milano continued

horizontally and vertically to provide an irregular surface that diffuses well in the upper frequencies and stops the lower ones from rumbling around too much. Because of the acoustic, the sound is clear and quite bright with a pronounced reinforcement in the first reflections giving a lot of body and depth. However, the reverberation time is short for a room of this size, being in the region of 0.8 s so separation is not much of a problem

Instruments in the studio include a Steinway grand piano, Hammond *M100* with a pair of Leslie *251* cabinets, Pearl drum kit, celeste, clavichord and various percussion. In addition to headphone lines, there are four Siemens 2-way monitors that can be placed around the studio as required.

Microphones are a selection from Neumann, Schoeps, AKG and Calrec, with the choice of microphone during sessions depending largely on what kind of sound is required for a particular situation. This said, a Neumann *U89* is frequently used for voice with Schoeps *CMT 541* and AKG *C414* sparring it out for the piano.

Milano Studio have a second facility, Studio Poppa, which is used primarily for tracking. Following the update to Prua at the end of 1983, the original Argentini console was moved into this second studio and has a configuration of 32 inputs, 8 groups and 24-track monitoring. Channels 1 to 24 also have direct outputs to the multitrack for basic tracklaying. Other facilities on the console are 5-band EQ, four auxiliary sends and, in addition to the VU meters for groups and sends, a 24-track TV colour bar meter display. Recording is with a Studer *A80* 24-track machine and if 2-track is required, one of the mastering machines from Prua can always be wheeled in. The two studios are also linked for 24-track copying/recording for full flexibility between the rooms.

Another feature I noticed in both control rooms was the installation of DIN multiconnectors in the floor next to the consoles. These are for the connection of the various effects racks to the desk patchbays and provide a quick and very convenient way of setting up outboard gear as required for either studio. The rack in Poppa during my visit was quite basic with two UREI *LA-4* limiters and a pair of Klein+Hummel *KH200* 7-band equalisers (plus high and lowpass filters).

A Roland *RE 501* tape echo was also in evidence and both control rooms have access to the AKG and EMT reverberation units. Monitoring in the control room is with self-powered Klein+Hummel speakers with Gauss drivers. These may not be the latest in studio monitors but they still give a good account of themselves.

The studio has a capacity of 25 musicians and features a more irregular floor plan than Prua. The construction is identical in both studios with a subsequent continuity of sound. There are also two isolation booths and various screens.

The rest of the instrument collection was in Poppa during my visit and this consisted of a Steinway baby grand, Hammond *C3* with *760* Leslie, Rhodes and Hohner pianos, Roland *Jupiter 8* and *Minimoog* synthesisers, Eminent *310* organ, Premier vibes, Ludwig drum kit, tympani and Roland *TR-808* drum machine. Various guitar amplifiers are also available.

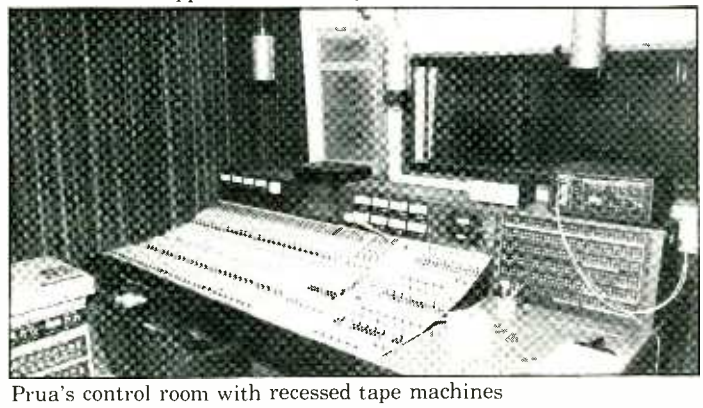
As well as the two recording studios, there is also a comprehensive copy room with a Studer console and a selection of machines from the same stable

Milano Studio enjoys a steady clientele and a slow but sure progression in turnover. Most styles of music are catered for, though the bulk would appear to be firmly entrenched in the hit parade and disco-type tradition. However, for rock bands who like to go for a 'live' feel, the larger studio has a lot to offer and Studio Poppa is also very suitable for a good rhythm sound. Planned updates include refurbishing the Poppa control room and replacing the Argentini with the *JH 536* from Prua, and installing a 40-input Sony/MCI console in the larger studio.

Terry Nelson

Milano Studio snc, Via Massimo Gorki 21, 20098 S Giuliano Milanese, Italy. Tel: (2) 984 3501. □

Control room Poppa houses an Argentini console



Prua's control room with recessed tape machines

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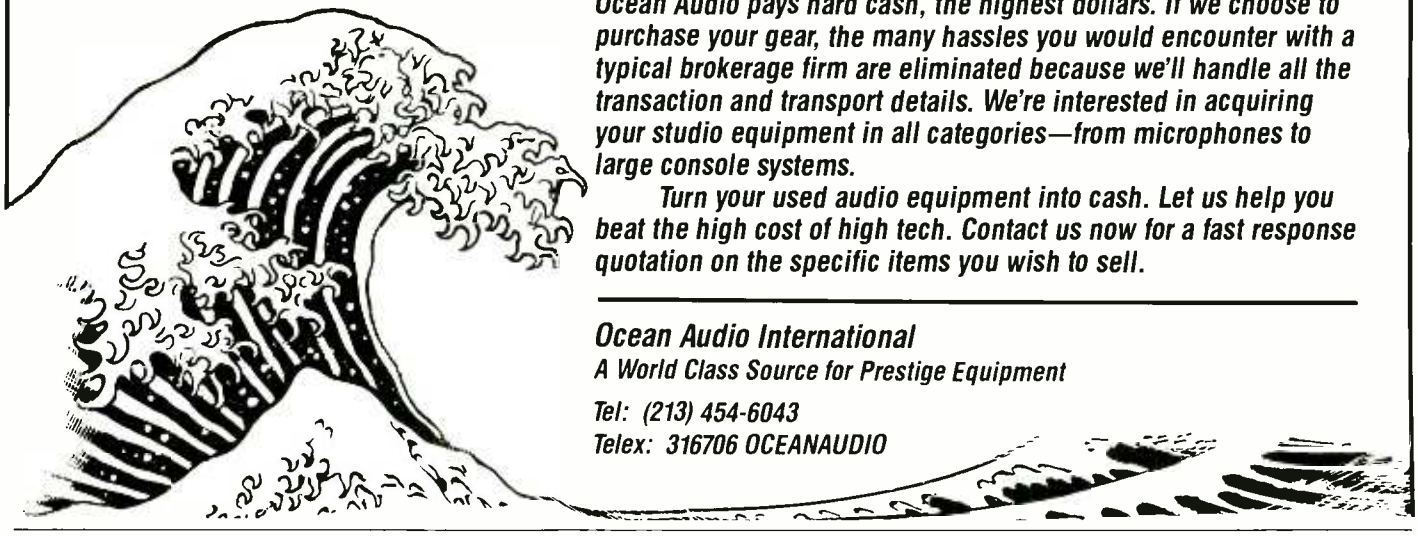

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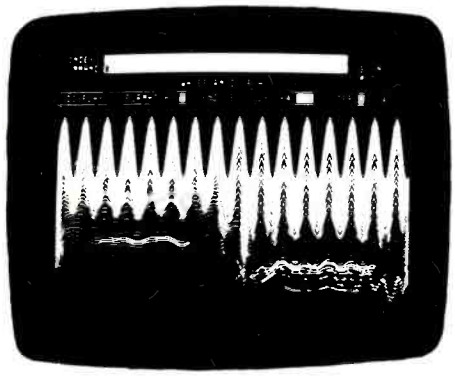

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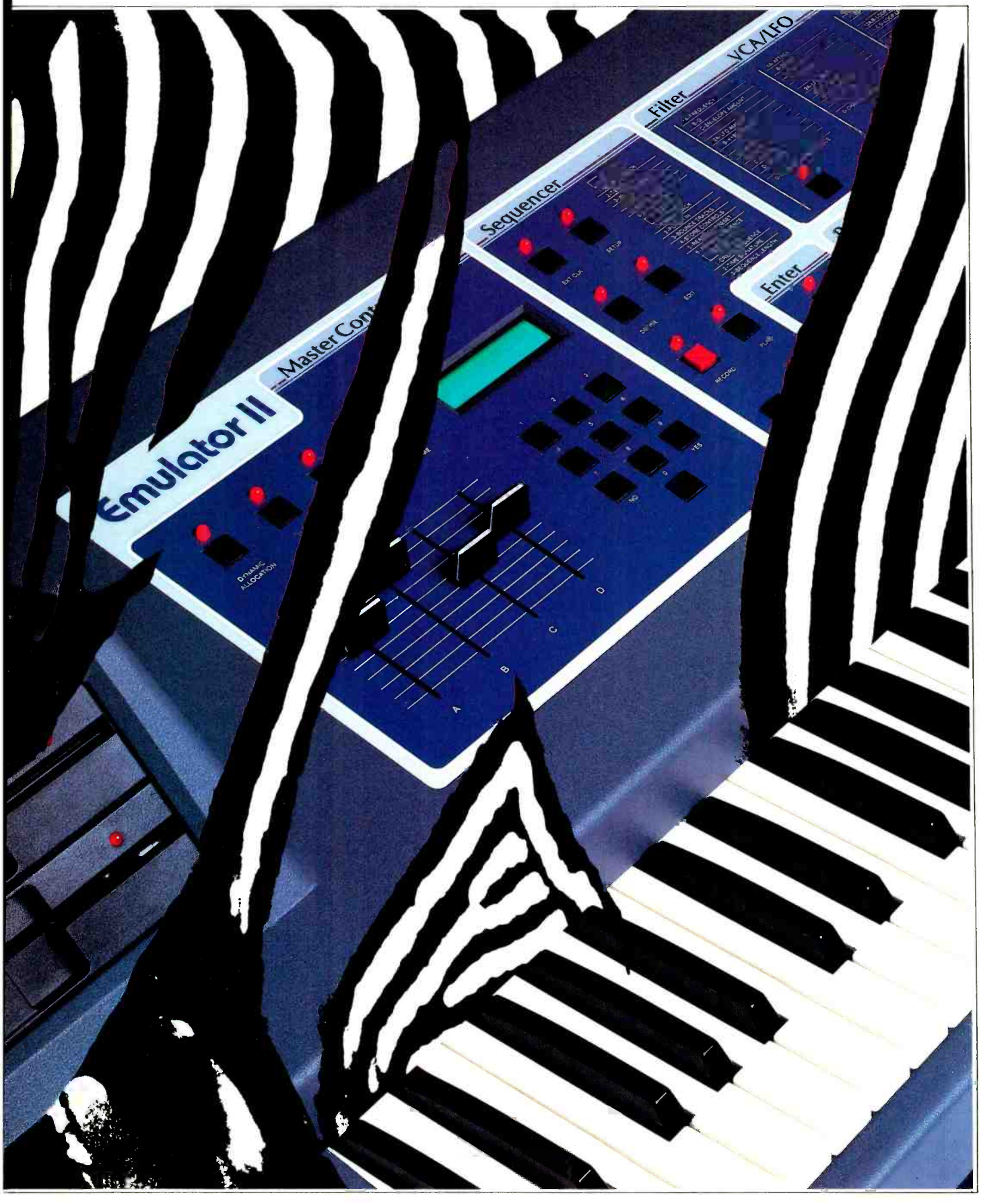

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SYNTHESISERS THE WAY TO GO

Electronic instruments and the systems that complement them are an increasingly important aspect of the recording studio scene. Richard Elen looks at the way the field is going, and its impact on studio practice

Few people, I suspect, imagined the impact that Robert Moog's first voltage-controlled synthesiser and its descendants would have on music and recording, back in the late '60s. The early Moogs and their relatives were often cumbersome beasts—like the Moog *IIIP* that Carlos used to produce the landmark *Switched-On Bach* album on 8-track in 1968. This consisted of three interlinked cases full of gear plus a keyboard and ribbon controller, patched with ¼ in jack cords like an old-fashioned manual telephone exchange. Others, like the British machines from Electronic Music Studios (EMS), were more compact. All of them suffered from the same tendency to drift, and were more-or-less equally difficult to tune.

What they represented was not so much a new approach to sound generation (the idea of electronic oscillators producing sound was by no means new) as an attempt to make electronic sound generation more sophisticated and practical. One would like to suggest that they were more approachable to the musician, but unfortunately that would be stretching the facts a little: it took some time for synthesisers to become really 'musician-friendly'.

Synthesisers were, however rapidly picked up and used by rock, pop and MOR musicians, as well as having a certain influence on the 'serious' electronic music of the time. Many musicians integrated these new, monophonic keyboards with their existing setups, using them largely for lead lines and the like. As time went by, new, smaller and more convenient units came on to the market which were aimed specifically at performance applications rather than educational or studio-based sound synthesis.

By the mid '70s polyphonic instruments were starting to appear, along with some devices designed for specific applications. I remember seeing and hearing a Freeman *String Synthesiser* in the studio I worked in around 1974. Its appearance, along with devices like the *Mellotron*, began the so-called 'great debate' about imitative synthesis versus conventional instruments, which rattled on in one form or another until moderately recently. All these units used the now conventional voltage-control techniques which have lasted a surprisingly long time considering the great advances that have gone on in musical electronics. As time went by, they drifted less and behaved more reliably. At the same time the systems became more sophisticated, and the sound possibilities more varied.

It had always been suggested that 'the synthesiser' had infinite sound generation capability: the only limit was the player's imagination. This was of course true in the sense that the majority of controls were infinitely variable, but in a realistic, musical sense the capabilities were very severely limited—the majority of the sounds you could produce were either very boring, sounded like half a dozen other sounds, or were simply nasty and unlistenable. In a sense that is still true today: there are a great many sounds that you can produce on a modern system which are absolutely useless in anything like normal music.

As electronic music systems became more reliable, flexible and more easily programmed (or, in some cases, allowed the user to access more presets), so there grew a tendency towards music that used electronic instruments almost exclusively. Bands like Kraftwerk had been pursuing this course since the late '60s, with varying degrees of success, but the commercial acceptance of this kind of material did not start until the mid '70s, and its success could hardly have been called widespread. Kraftwerk have, of course, had a great influence on more recent 'electro-pop', it's only surprising that it took so long.

It took some time for synthesisers to become really musician-friendly

Another important technical development was the increasing influence of digital technology on synthesiser design. This came in the obvious areas of microprocessor control and preset memory storage, but also in the development of much more stable oscillators and more sophisticated control functions. It was also digital techniques, of course, that made fundamentally new electronic instruments possible, as much landmarks in themselves as the original Moog systems: notably the Fairlight *CMI* and the New England Digital *Synclavier*. These two systems seem to have followed parallel courses since their inception, each spreading out and overlapping the other's territory, but representing fundamentally different approaches to sound synthesis, if not to other aspects of the field. On the face of it, it would seem that the NED system is more hardware-intensive than the Fairlight, but this is probably not the case. What is interesting is to consider the use of the systems in a real environment—for example, a recording session. Both systems have their proponents, but I have a nasty suspicion that if you wanted to construct a sound of similar complexity it would take about the same time on either machine. I further suspect that the difference would be that you would start off faster on the *Synclavier*, with the 'fine tuning' taking the time, while on the *CMI* you would spend more time getting the basic structure together and things would move faster as you got further down the line. You pays your money (rather a lot of it in either case) and takes your choice.

At the other end of the scale there has been another development: highly sophisticated, compact polyphonic keyboards, at very cost-effective prices. Digital techniques again, either employed in a straightforward but rather enterprising fashion (eg in the little Casios) or with the advantages of techniques like FM algorithmic synthesis (eg in the Yamaha *DX* series). I don't know many keyboard people who don't have a *DX-7*, and it's hardly surprising. Yet the developments right at the bottom end of the marketplace are nearly as remarkable.

Digital techniques have also given us sampling, be it on the Fairlight or the Greengate *DS:3*—opposite ends of the price spectrum but with at least two areas of common ground: computer-based, and able to sample 'real' sounds and replay them up and down the keyboard. Sound sampling is definitely the in thing at present, and great fun it is too, despite the fact that sampling sounds and playing them back is about 0.05% of what a Fairlight is capable of (this week).

To me, the nice thing about sound sampling is that the sounds *don't* sound like the 'real thing': unless you're using an *Emulator* in multi-sample mode, the average sampled instrument will sound almost entirely unlike itself beyond half ▷

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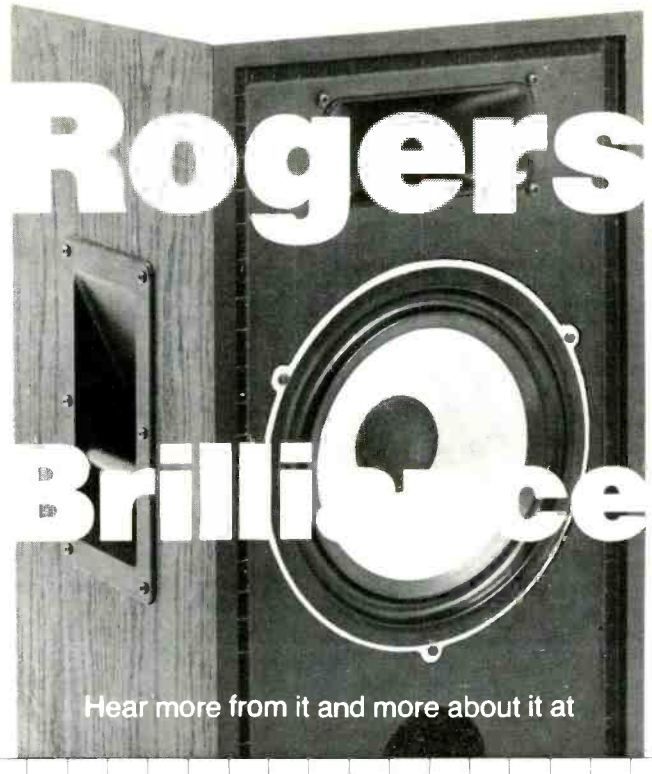

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SYNTHESISERS THE WAY TO GO

an octave away from the original pitch. I like it. It's more fun that way. If you want the original sound, employ the original session musician: it's cheaper. Apart from anything else, music technology facilitates *new* areas of expression, *new* sounds and treatments, not merely the ability of keyboardists to play brass instruments (or whatever), or an ego-trip for the programmer. I think it is about time that we put the 'can-you-tell-the-difference-between-these-and-the-original-sounds' philosophy behind us. Imitative synthesis is fun when it *isn't* a perfect imitation—deliberately.

Actually, of course, any discussion of those sorts of areas is asking for trouble. Yes, it is quite permissible in my view to use *accurate* imitative synthesis if you feel that you need the control that playing it yourself offers, and they don't happen to make trumpets with black and white keys on them; or it is an unfortunate fact that crumhorns just don't *do* those particular notes. Equally, it is probably fair to suggest that nobody should have the right to tell an artist what tools he or she should or shouldn't use in the creation of art. It would also be reasonable to expect artists to have some kind of personal conception of how much damage to other people's livelihoods is permissible in the cause of art, too. Reach your own conclusions. The more you think about it, the worse it gets.

While we're on the subject of philosophy, there's the question of whether or not we're actually talking about music and musicians at all, when we look at some of the gear that's around. There are a large number of machineries these days, either internal to a synth or external to it, which are capable of playing bits of music for you. One really interesting area is the use of home computers with sequencing and sound-generation programs on them. Remarkably sophisticated music systems can be based around BBC *Micro*s, or Commodore *64*s, or Apple *II*s, or virtually any self-respecting machine that isn't a jumped-up pocket calculator (or even one that is; it's just that there, it isn't worth the effort: if you want a lump of electronics that is to computer literacy what the same gentleman's electric car is to road safety, that's your problem).

Up the other end of the market, there are Linn *9000*s and various other MIDI sequencers. And Roland *Microcomposer*s and the like. If you sit down and key in numbers, or press keys in step time, and then press the 'play' button, who is playing what? Are you a 'musician' if you perform such antics? Yes, of course you are. So am I (it may have taken the Musician's Union several months to decide, but I have my card). There is as much 'musicianship' involved in pressing the right numbers as there is in pressing the right black and white keys: it's the technique alone that is different, and so what?

In fact, that's perhaps one of the most important things about music technology. Today's systems are often very cheap, and yet capable of excellent results. One of the big things they offer is the chance for virtually everyone to realise what exists in their musical imagination. You can produce passable results, technically, very simply. You don't need a great deal of 'technique' to make a musical idea sound halfway decent. But if you want to make *great* music, I would suggest that you need as much command of technique as any 'conventional' musician, and maybe a touch more than some. Suggesting that no true expertise is necessary, that there can be no such thing as a 'virtuoso' in this field, is like saying that you can record masters just as well on a Portastudio as you can in a full-blast 24-track studio (including personnel). Well, it is *possible* to record masters on a Portastudio. I suppose it might help the budget...

All this starts one wondering about what will happen next. Will the Japanese produce a Fairlight look-alike for £400? (No, but it's an interesting thought...or, yes, they will *make* it for £400, but it will *sell* for 4,500...) More realistically, we might consider the present and future relationship between the recording studio and modern examples of music technology. Today, we record synthesisers more-or-less the way we record any DI'd device, straight into the board. Some studios have built extra-large control rooms so that they can set up synths in there instead of out in the other room ("That place? Oh, we just put *drummers* in there...and even then only when they insist on playing the round things rather than the hexagonal ones." "Ah, well, we use it for *ambience*. Couple of speakers and a stereo pair, and a bit of AMS *Non-lin* on the returns..."). At our place, we have the ability to install a couple of shelves at the back of the control room, where we can put synthesisers, and we have lines from there into the desk, for example. But after that, it's pretty normal: console, tape machine, overdubs, normal.

One interesting area is computers with sequencing and sound generation programs

In theory, we should be able to make more use of the digital storage capability of these synths, and hook them all up together, let them play at once, and balance it down to stereo digital. I seem to remember that Giorgio Moroder did that with his $E=mc^2$ album. Or we should be able to use the multitrack simulation capability of some of the bigger systems to build up the track as we would on 2 in tape, but without the accoutrements. With all the benefits of being able to record on track 6 without erasing what was there, or change the trumpet part into a bird tweeting, or copy letter A instead of having to play it again, and so on. Then we tell *that* to go into play mode and catch *that* on digital stereo. Funny we don't seem to do that very much, isn't it. The only time I've ever heard such multitrack functions used is at demonstrations.

Why is this? Why are we wasting all these lovely facilities? Surely we have spent money on them? Why are we building conventional-ish control rooms to put synths in, when we should be making the recording bit and the music bit the same machine? Perhaps it's because we audio people are all conservative and hate change. That's why we didn't like alphanumeric keyboards on SSLs, and why we had such infernal trouble learning how to follow the flashing lights on a *DAE-1100*, despite the fact that the average video editing person would have taken one look at it and asked where the other 400 special function keys were.

Perhaps it's because the average MexaMegalon *MultisynthComputer* manufacturer is very good at making 16-track data storage systems that behave like tape machines, but is *really awful* at getting the noises out of the box in stereo. If you have separate outputs, you have to stuff them onto a multitrack machine anyway; if you don't it's probably in mono or, worst of all, it's in stereo, and you can program the *exact* level and pan position of *each* note on *each* of the 16 data tracks with a resolution of 4096 steps—indeed, you have no choice in the matter. The music took you thirty minutes to put down, and balancing it took you the rest of the day...

Actually, to be fair, I'm sure that many supercomputersynth owners use their multitrack data-recording capabilities. I expect they use them for demos. I'm putting a system like that (but cheaper) together for a colleague, so that he can try ideas out: it makes plenty of sense. I would like him to hang on to the diskettes, as well, so he doesn't have to play the nice bits again when we go into the studio to do another album. But when it comes to actually recording the stuff, it will be done very ▷

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SYNTHESISERS THE WAY TO GO

conventionally. That's because we will not be doing it on either (a) one super synthesiser/computer musical instrument/whatever-it-is (we can't afford one); (b) many synthesisers, small and large, some hired and some our own, all MIDI'd into each other and rattling away at once; or even (c) all the above, but largely *not* MIDI'd together and thus *not* all playing at once. The reason is that, in fact, what we will be doing is to use Conventional Instruments Too. And we can't stuff *them* into the data recording system, even if we had one.

I certainly used to think that we would be able to do a great deal of music with a whole load of machines all talking to each other, or even one big machine, and that what we were really heading for was the integration of the recording studio with the instrument(s). I seem to remember that one Mike Thorne, once upon a time Editor of this journal, presented a paper on this subject to an AES group in New York the other year—but unfortunately I never saw it. I am afraid that it is not to be. I think we have probably got as near to that goal as we are likely to get. We are swinging back towards attempting to integrate 'conventional' and electronic instruments. This was once about as likely to succeed as a Concerto for Rock Band and Orchestra of the late '60s, but it's a good deal better now. For some reason, modern synths and the like integrate better with traditional noise-making devices than their ancestors did. The reasons are, in fact, several. First, the chances are that at least some component of the synth sound was a 'real' instrument once anyway. This helps. Then, it is a fact that modern techniques can generate richer (dirtier?), more complex sounds, perhaps approaching the complexity of natural instruments. That will help too. Modern synths have better control of dynamics, too. Hmm, there's a point...

It seems a pity that we all got stuck on keyboards for so long

I sometimes wonder if the *worst* thing ever to happen to synthesisers was when Bob Moog's co-worker in the early days (I can never remember his name) said something along the lines of "How about sticking this keyboard on the end of it?" I quite like keyboards myself, but I still wonder. Can you *imagine* what synthesisers would be like today if people had put the same energy into developing a 'something-else' controller instead of a keyboard? If the amount of development money over the past 15 years on keyboards had been put into 'something-else's'?

The trouble is that keyboards are easy. Lots of switches. One degree of freedom, very straightforward. That's why the first big-selling synth album was *Switched-On Bach* and not *Switched-On...er...Somebody Else.* Because there was a keyboard on the end of the cable, and *not* a ribbon controller, *not* a Theremin attachment, guitar-like thing or ESP receptor.

But seriously, it seems a pity that we all got stuck on keyboards for so long. Music keyboards as they are used in the synth world—or at least *were* until recently—must be the least expressive of anything (that's why we got 'performance controls'). They didn't have to be, of course: the dreaded Ondes Martenot decades earlier had enough performance controls to keep most people more than happy, and the keyboard itself had at least two degrees of freedom. Now, at least, we are getting touch and velocity sensing, 'after-touch', breath control and the like, and Dr Moog is producing keyboard-like machineries which have enough degrees of freedom to scare a Theremin virtuoso. But guitar synths, for instance, are several years behind, with the possible exception of the *SynthAxe*, which is rather the opposite.

Things are getting better in this respect today. Most people can have access to something familiar in the form of a synth controller, even if it doesn't *quite* work as well as a keyboard. But I would really like to see more electronic instrument designers building boxes with a socket on the front labelled 'controller input'—and more people designing things labelled 'controller' which don't have *n* black and white keys.

On the subject of control, that's the final thing. Inter-instrument control and interfacing. There's MIDI, of course, and there are the people who think the standard was established too early and thus isn't good enough, and the people who want to establish a 'super-MIDI', and the people who want to let the market decide (ho ho, like AM stereo, huh?). A bit like digital audio, really. I suspect MIDI will prove to be as useful a 'standard' as the Sony *1610* format: in other words, pretty useful. Whatever the limitations of MIDI, the ability to get the machines talking to each other, controlled from each other, hooked into computers (or even phone lines)—networked, basically, locally or otherwise—must be one of the most important developments in the field, and the one which holds the greatest Promise of Unknown Things.□

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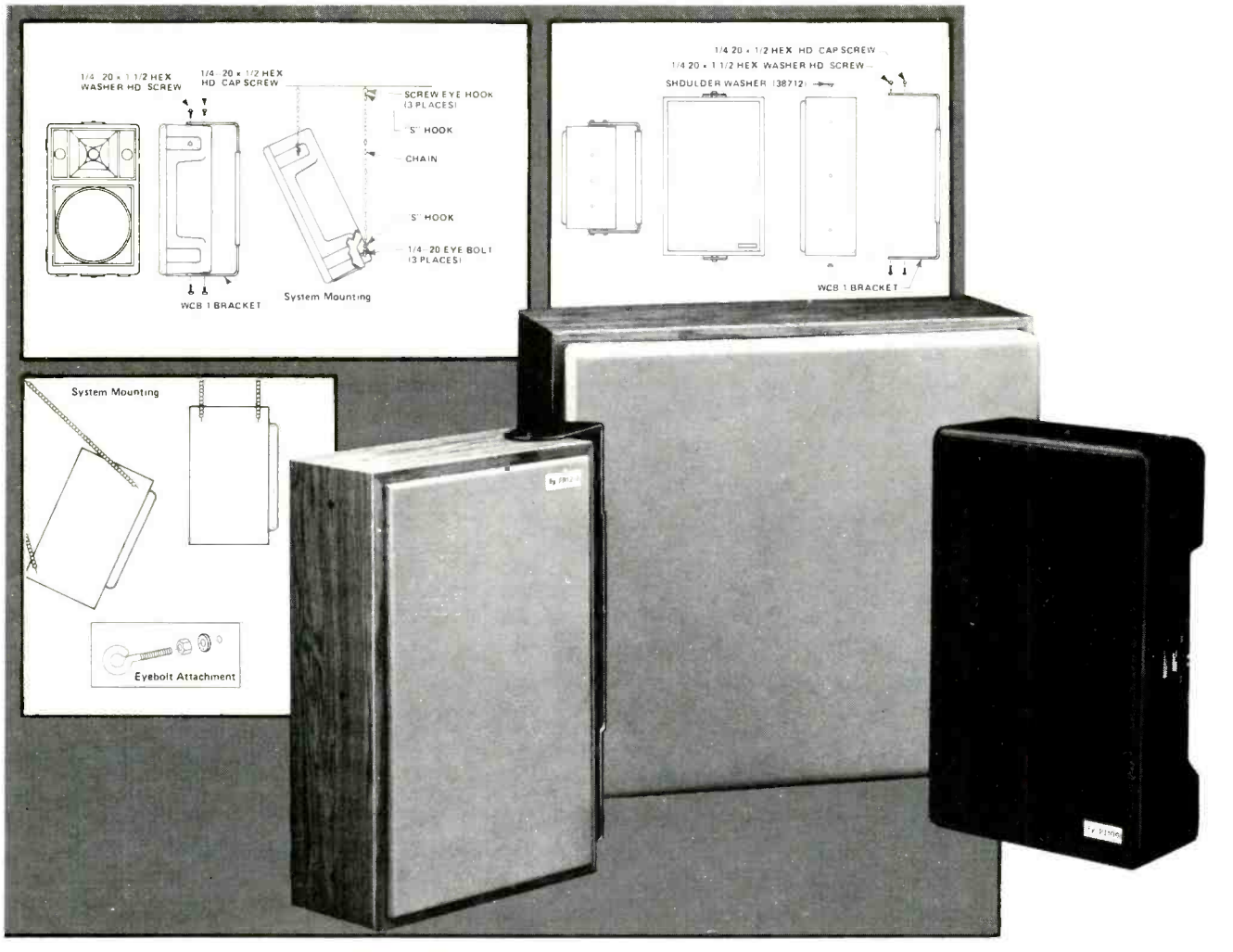

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LETTERS

LETTERS

Letters should be marked 'For Publication' and sent to the Editor at the Croydon address on page 3

Matchless review

Dear Sir, With reference to Hugh Ford's review of the TAC Matchless *console we have two comments that we wish to make.*

● *Firstly with regard to his comments on the EQ noise, it is of course normal to expect an increase in noise when an equaliser is inserted and the increase that he measured is as would be predicted. In Table 2 showing equaliser noise, no mention is made of the actual input or fader gain settings which we would consider of critical importance in making his measurements and which should be reported along with the rest of the figures quoted.*

In a mix situation with line input at unity gain, a typical noise measurement with the EQ in, ie −88 dBv, 20 Hz to 20 kHz, true RMS weighted at the channel insert point.

● *With regard to Hugh Ford's comments that the low and high frequency cut and boost are excessive, we disagree. The decision to provide this degree of range is based upon 12 years of console manufacturing experience for numerous clients. We find that one of the main reasons that people buy our consoles is due to the effectiveness of the equaliser. Whilst theoretical considerations might suggest that we are wrong our sales and response of our customers within the commercial environment shows that we are not.*

Yours faithfully, Nick Franks and Graham Langley, Amek/TAC, Islington Mill, James Street, Salford M3 5HW, UK.

The editor replies

This letter from Amek/TAC was taken from a telex that was unfortunately received too late to place at the end of the *Matchless* review in the February 1985 issue. The table mentioned shows the difference between noise at channel outputs from line inputs at unity gain. The critical measurement is of course the difference between noise figures for equaliser in and out.

Audiograph improvements

Dear Sir, It was with great pleasure we read Mr Hugh Ford's most competent review of our Audiograph 3300 *'measuring machine' (January 1985). Please allow us to make just a few minor comments and inform you about improvements we have accomplished in the meantime.*

The 700 kHz output signal stems from the Phase-Module and has been filtered out with the most recent series.

The unbalanced input impedance remains always as high as 1 MΩ independent of the input-impedance switch which controls the balanced input only. We still consider this as a logical and practical approach.

The 'small degree of instability' in the reverb mode is in fact a slight overshoot (max 0.15 mm) with the high writing speed in this mode of operation without any significance to the measuring results.

The ratio between 3.127 V (actual output voltage) and 3.16 (specified max output) is 0.09 and not 0.9 dB.

It is true that there is no internal connection between the Phase-Module and the oscillator. The reason for that is that we wanted to make sure that the phase is compellingly measured between in- and output of the device under test, in other words no additional phase-shift between output amplifier and DUT can occur.

The 3381 *(½ in) microphone is unbalanced, only the* 3382 *(¼ in) is balanced.*

Present Input Modules 3312 *are provided with a monitor output for headphone monitoring the amplified measuring signal which allows also use of this module as a microphone preamplifier, eg for the Phase Module.*

The Automatic Distortion Analysing Module 3337 *available late summer will incorporate an independent but still bus-controlled generator with max +26 dBm open circuit output and a THD content of less than −86 dB.*

New modules available in the near future are:

Synchro Module 3360 *for automatic in-sync-plotting or recording of test-tapes or test-records with the* 3302 *Mainframe or to synchronise two* 3302*s over long distances.*

Compressor Module 3323 *for microphone measurements also without anechoic chamber.*

Frequency Expanding Display Module 3335 *which allows to 'magnify' any preselected portion of a graph in any scale up to 1:99, measures also frequencies up to 2 MHz.*

Yours faithfully, B Weingartner, President, Neutrik AG, Obergass 16, FL-9494, Schaan, Liechtenstein.

Bose purpose-designed loudspeakers

Dear Sir, I have only just stumbled upon John Andrews' letter (Feb issue) and I wonder if I might address the few objective points raised in it?

To begin at the end, the reason there are few Bose 901*s in recording studios is simply that they are not designed for that application. Like our other direct-reflecting speakers they are designed to operate best in living rooms. I haven't seen any studios that remotely resemble few homes that looked more like recording studios.*

Studios are working rooms and should always show a preference for purpose-designed equipment. There are Bose monitoring speakers in widespread use, but they are direct-radiating speakers not direct-reflecting ones.

Moving to the Blumlein versus 'spaced mic' argument, I cannot accept this either. Conventional loudspeakers are designed to be directional and as a consequence of this can deliver a narrow stereo image over a narrow area. They can and do however give a superior impression of depth. Direct-reflecting speakers give a superior impression of width and can therefore deliver left-right stereo images into a much larger area of the room. So there is a trade-off and it boils down to personal preference, or application. Why then attempt to disguise a personal preference by attempting to debunk one perfectly valid and reasonable theory by reference to another perfectly valid and reasonable theory, when in fact there is no relevant conflict between them?

As for the 901 *theory being patently nonsense, it is indeed patent and has become over its 12-year lifespan easily the world's best ever selling loudspeaker model. Bose equipment does generally sell well, because it is purpose-designed for its application and so for its market. I am sure Stancoil know this, and as equipment manufacturers themselves fully realise that you need more than a good line in bull to be successful. Shame on you, John—stop mixing it and stick to mixers.*

Yours faithfully, Walter Mirauer, Bose UK Ltd, Trinity Trading Estate, Sittingbourne, Kent ME10 2PD, UK.

Maintenance support

Dear Sir, I am writing to you in response to an article by Peter Clark in your January 1985 issue regarding studio maintenance. Our studio is a 48-track facility that caters mainly for album orientated projects. Relying heavily on client satisfaction for repeat business it was great to read an article that deals with maintenance in such a proper and well deserved manner. The article is currently being photo-copied and placed on each one of our engineers daily work orders. Again just a brief note of thanks to Peter Clark for writing such a delightful and enlightening article.

Yours faithfully, Andy Holland, Assistant Studio Manager, The Metalworks Studios, 3611 Mavis Road, Unit 5, Mississauga, Ontario, Canada L5C 1T7.□

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AN AMERICAN IN LONDON

American correspondent Paul D Lehrman gives us his impressions of the London recording scene and compares attitudes in the USA

The recording industry is about as international as an industry can get. American, British, European, Caribbean, even South American and African acts freely travel to each others' countries to make tracks. Ambitious album or film projects may have the basics recorded in France, extra rhythm tracks in Kingston, horns in Tennessee, and strings in London, and then be mixed in New York. Equipment manufacturers make sales projections not only for their own countries, but also for Hong Kong, Czechoslovakia and Australia.

Of course, to make all this work, certain standards must be adhered to the world over. But even in this day of overnight international deliveries, instantaneous satellite computer hookups, and records that sell out in five countries before they're even pressed, there remain significant differences in the way that studios in different parts of the world operate.

To try to see what some of these differences might be, I spent a few days in London at the beginning of November, visiting a couple of major studios and talking to people in the industry.

Is it possible to understand a country—one that seems to have more first class recording studios than hamburger joints, one that despite its waning political influence continues to set the standards for music production throughout the world, and one that has a proud 100 year old tradition of recording that runs all the way from Sir Thomas Beecham, through the Beatles, to Big Country—in a week? To put it bluntly, no way. But a few important characteristics of what makes the scene in England, and London in particular, unique can be gleaned on even a short visit

I spent most of my time at two studios: Sarm West and EMI Abbey Road. As representatives of the London recording scene, these two couldn't be more different—one is a rock studio, recently refurbished with a cool-blue high-tech environment, dedicated to pushing out the frontiers of pop music, while the other is a somewhat stodgy-looking rambling old house that maintains an image of a recording institution as old and as stable as the royal family. Yet there were similarities between the two that made it clear to me that these were not American studios.

Sarm West was very busy when editor Keith Spencer-Allen and I came by to visit. Studio One was hosting a 40-piece string section, while in Studio Two a British rock band, Go West, was taking a sleep break in the middle of an extended lockout session. Studio Three, formerly the control room for one of the other studios, was still in the building process, and scheduled to open at the end of November. Engineers, office workers, salesmen and assorted other types who consider themselves so essential to the recording industry were scurrying all over the place, from the Coca-Cola-decor kitchen to the spiral staircase leading to the music-publishing offices. Engineer Nick Froome, who was supposed to show us around, called in at the last minute that something else had come up, and so our conversations were with one of the studio's managers Carole Cook and former staff engineer, now freelance, Keith Finney. Ergo, we were not given the 'official' low-down, but rather the impressions of two people who were involved in the working end of the studio on a daily basis.

On the surface, Abbey Road was a completely different story. We were greeted and given the grand tour by Francis Dillnut, administrative manager of the complex, who introduced us to general manager Ken Townsend in the studio cafeteria, and later to staff producer Tony Clarke. Things looked relatively quiet; Studio One, which is one of the largest recording rooms in the world, was empty save for the forest of microphones set up in preparation for a Neville Marriner orchestral session the next day. Studio Two, where a rock band was working, was likewise empty, although the control room was buzzing. In fact, Abbey Road was quite busy, although most of the work was going on behind closed doors, so there was not the atmosphere of freneticism prevalent at Sarm.

To start with, I found that the differences that do exist between the US and UK recording businesses seem to be more ones of attitude, rather than equipment or studio practices. While the American recording industry has never fully recovered from the conservativism inspired by the doldrums of the late '70s, studios in England appear much more willing to take chances and experiment.

"Americans are doing things the way they've been done for the past 10 years," says Keith Finney. "The English are not afraid to go over the top occasionally."

Go West is signed to an American label and their A&R man is spending a lot of time on the sessions.

"He seems very different from our A&R types," says Finney. "When he hears something unconventional, even if we like it, he says it doesn't fit, that it's too strange. He also says we're spending a lot more time fine-tuning stuff than they do in the States."

Yet the actual studio practices don't seem that different. No American engineer would quarrel with Finney's statement that two or four hours to get a drum sound is too long. There seems to be more use of room sound than is typical of the States. The rooms at Sarm have been redesigned to be relatively live, and have adjustable LF and HF traps. A lot of the emphasis on live sound has to do with the fact that the studio takes 48-track work a little more in stride than its American counterparts might, which gives a lot more freedom when it comes to laying tracks.

"We record close mics and ambient mics at the same time on separate tracks," says Finney. "We don't want to leave everything to the mix—we want to get it down as close as possible to the final sound." In addition, straight tracks and effects are recorded separately, "in case something turns up later that sounds better".

Dexy's Midnight Runners were in recently doing a live recording to multitrack, an idea that has been born and died in the States so many times that I've lost count. "It's got a good feel," says Finney, "But it does make things difficult if someone makes a mistake. It's tough to overdub and keep the live feel."

At Abbey Road, whose reputation is based heavily on the sound of its rooms, the idea is even more pronounced. "Each studio is totally different." says Tony Clarke, "because we've always considered natural acoustics and room sound very important. All of the digital reverbs now have the characteristics of our rooms—which proved our case. We've never considered digital delays as paramount. If someone wants to get a different perspective, they wait until midnight and put their guitar amp into another studio."

Sarm West, being the home of Trevor Horn and Frankie Goes to Hollywood, moves very fast to keep up with the edge of the recording industry. Abbey Road, being under the auspices of a multinational corporation, of necessity moves much slower. But both studios feel they are keeping up. Take digital recording for example: both studios are committed to digital 2-track, but are reluctant to jump too fast on

to the digital multitrack bandwagon. Sarm is host to a Sony *3324* in Studio One, and several *PCM-F1*s (which are Horn's personal property), while Abbey Road has three digital editing suites equipped with *PCM-1610* and JVC systems and a dedicated digital copying suite to feed EMI's international branches that is in use 75 hours a week. The *3324* at Sarm is controversial according to Finney, "Some producers just don't like it."

At Abbey Road, according to Ken Townsend, "We've used the Sony, 3M, and Mitsubishi digital multitracks, but I don't really see the sense in buying one until the price is reasonable and there's some sort of standardisation and interchangeability. We're seeing the way the wind blows."

Tony Clarke, nonetheless, is very much looking forward to embracing digital totally. "It will free us to record anything we want to," he says with undisguised enthusiasm. "There will be no dynamic limitations on the music any more."

The same eagerness to keep up with the latest in hardware prevails when it comes to consoles. If one is not careful, it's easy to get the impression that there is only one manufacturer that UK studios take seriously these days: Solid State Logic. "We've got them coming out of our ears," says Carol Cooke. Abbey Road has SSL and Neve *8208* to replace the ageing *8108*—"Some people just have to have the Neve sound," says Townsend.

"There are over 60 SSL desks in London alone," Townsend explains, which is about the same number as are in all of North America. But at the same time, the studio is reluctant to go 'all the way' and put in a Neve digital desk. "It's not proven enough for a session with a 100-piece orchestra and a 100-voice choir," he says.

Some of the enthusiasm for SSL equipment is based on the fact that it is one of the few homegrown products that the English can be rightfully proud of, in an industry that has become increasingly dependent on the US and Japan over the past decade or so. But more important is the need to have as attractive a facility as possible for drawing clients. Competition in England is fierce—given the size of the country and its population, it would seem much harder for a studio to gain a foothold than in the US.

"There are now 200 24-track houses in the UK," says Townsend. "Unlike the '60s, no one studio can dominate the scene." And even though Abbey Road is part of a much larger corporation, it is not immune from the exigencies of competition. "We're not subsidised by the label," says Townsend.

In contrast to the uniformity of consoles (and of tape machines—except for the odd Ampex 2-track, every tape deck I came across was a Studer), monitoring and room design at London studios are very much a matter of individual taste. While US studios by the dozen are still hiring big-name consultants to make their rooms look and sound just like everybody else's, in England each studio seems to strive for its own identity. Although the Westlake/Eastlake influence seems to have been big here during the mid '70s, apparently few such rooms still exist in their original form.

When Sarm West was Island Records' Basing Street Studios, for example, the control room for Studio One was a 'Lake' room. Since then, however, the studio has undergone several transformations, the latest under the direction of Sean Davies. The main monitors in both control rooms are Davies' custom *LS821*s with dual 15 in bass drivers, driven by Studer power amps.

The aim, according to Keith Finney, is "uniformity of sound anywhere in the room, at any level", so that producers and engineers, no matter how many of them there are or where they're sitting, will hear the same thing. "It still needs some work," he admits. "The level-related differences are too apparent." Also available are *AR-18*s and Yamaha *NS-10*s, with the 'tissue-paper treatment'. There is a pair of Auratones, but they live most of the time in the glassed-in tape operator's room off the side of the control room.

"Custom monitoring is very big in London," says Finney, "but it makes for problems for people who go from room to room." At Sarm West, at least, an effort is made to make the several control rooms work and sound the same but at Abbey Road, where no two rooms—be they for studio control, editing, cutting, or duplicating—were built at the same time, it's almost a lost cause. "We've made a slight attempt to make the rooms compatible," says Francis Dillnut, "but there's no overriding design principle."

But even though the current monitoring situation at Abbey Road can almost be described as anarchic, the studio is aware of the problems and is working to solve them. Because of its corporate parent, Clarke says, "change doesn't come that easy". Only now is the 54 year old Control Room One being redesigned so that more than one human being can fit in it comfortably. ("It used to be half that size," says Dillnut. "We were recording on to wax and we had to keep the temperature constant, which was easier with a small room.") But, Clarke says, "When we do it, we do it right. The whole world has been experimenting with control room sound for the past five years, and now we're on the edge of putting in all new monitoring."

Despite the technology, costs for studio time in London seem low. No doubt the tough competition has something to do with this, but there's a more important reason. The book rate at Sarm West runs about £85 to £100 per hour. Back in the days when the sterling was worth $2, this would have placed the studio in the running with New York or Los Angeles' best, although still on the cheap side. But with the current value of the pound (thanks to the huge budget and trade deficits being run up by the present administration in Washington) floating around $1.10, studio time in London seems like a steal.

Besides being very successful, and being located within a couple of miles of each other, Sarm West and Abbey Road have another thing in common: they are both primarily music studios.

Sarm is a producer-run studio. Since he took over the operation two years ago, Trevor Horn has been very much in charge. The studio reflects Horn's, and not some accountant's, attitude towards the recording industry. Horn's tastes, as anyone who has heard Yes, the Art of Noise, and Frankie, are best described as catholic (in the original sense of the word) but he is interested only in producing music—not commercials, industrials, or A/V soundtracks.

"We had the facilities for A/V," says Keith Finney, "but Trevor and John Sinclair decided to scrap them. They turned the projection room into an office. We're a music studio. We fit in the odd jingle, but we're mainly doing record albums and singles."

To this American observer, this is a remarkable concept: a studio that is highly successful, and yet does not have to take in advertising accounts to pay the bills; a type of facility, it seems, that has all but disappeared from the major recording centres of the US. And the lack of three piece suiters in the place shows—although Sarm West is as busy and professional a studio as you'll see anywhere in the world, there's a very refreshing hip informality that permeates the place.

Abbey Road is even more remarkable. This, too, is mainly a music studio, although it handles a large share of film work as well, thanks mostly to the size and sound of Studio One. In the US, almost all the major-label studio complexes have closed down, as record companies tightened their belts. The loss to the recording industry has been immeasurable—CBS Records' studio in Manhattan, for example, was the finest room in the city for recording orchestras, and it has never been equalled. By surviving, even thriving, into the '80s, Abbey Road has proven that a great studio with a long history can meet the changing demands of a volatile industry with grace and style. And it reflects a certain English attitude about the universality of music.

"It's terrific that so many people are in one place doing so many different types of music," says Tony Clarke. "You can walk in the cafeteria and see the first-desk violinist from the London Symphony having lunch with a rock drummer."

For Clarke, who has worked in such places as Greece and Nigeria, music recording should know no boundaries. "There's still a strong distinction in the industry between rock and classical, but I feel that's changing." What is important to him is to have a place where music can be put on tape, pure and simple. "Abbey Road," he says, "doesn't stamp out any particular form, it's up to you to make it what you want. When Stephane Grapelli and Yehudi Menuhin came in to do an album together, we set up for noon, fired up a 2-track digital machine, and by midnight we had a record. For me, that is the meaning of the word recording."□

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SYNCWRITER

Richard Lamont describes a novel aid to writing music to picture developed by the BBC Radiophonic Workshop

Timing and synchronising music to fit pictures has been a problem for many years. A composer of electronic music, writing for film or television, has to spend a lot of time doing mental arithmetic and thinking about machines rather than actually creating music. Although it would be second nature, he (or she) might go through a process something like this to fit a piece of music exactly between two points on the picture:

- Make a note of the timecode or film footage on the picture at the point when the piece is to start and finish, and calculate the duration in frames.
- Decide what kind of beat rate he wants.
- Count on a stopwatch how many beats he will get in, say 10 seconds, and calculate the speed of the music in frames per beat, and adjust the answer so that it fits.
- Generate a click track at the frames/beat repetition rate.
- Record the click track, getting the first click to fit the exact start point on the picture.
- Think of a tune and write the music.

The BBC Radiophonic Workshop in London has developed a computer-based system which completes the first five steps in about 10 seconds. It's called *Syncwriter*, and consists of an Acorn/BBC microcomputer with a monitor and dual floppy disk drive, and add-on box of hardware, and about 20 kbytes of machine code software. Since the BBC chose the Acorn for a series of educational programmes it has become one of the 'standard' microcomputers in the UK. The *Syncwriter* add-on hardware was developed by the Radiophonic Workshop's senior engineer, Ray White, and the software by the Workshop's organiser, Jonathan Gibbs.

Before going into detail about *Syncwriter*, some information about the Radiophonic Workshop itself seems in order, especially as it has changed a lot since *Studio Sound*'s last visit several years ago. The Workshop is a BBC department which provides specially written electronic music and effects to programme departments. Its most famous single 'customer' is BBC Television's *Dr Who*, which accounts for about 20% of the workload, but there are 150 or more others each year. There are six full time composers working on music and effects, who normally work in individual studios. Whatever techniques they've used in the past, now nearly everything is done with synthesisers of various sorts. Most of the studios are equipped with Soundcraft desks and 16-track and 2-track Studer *A80*s. There are plans to upgrade to 24-track as soon as the budget permits.

Jonathan Gibbs started the *Syncwriter* project about two years ago, originally just for the Workshop's own use, now, however, he would like to make the system generally available. Usually a specialist piece of recording or broadcasting hardware is 'licensed out' to a specialist manufacturer but the BBC microcomputer is a mass-produced consumer item. In many ways, *Syncwriter* falls between the two categories and the Workshop is currently deciding how best to market it. The add-on hardware, described later, is not particularly complicated and Jonathan envisages that it will be produced in a 1U high rack mounting box.

Music to picture

The main purpose of *Syncwriter* is to help musicians write and perform music in synchronisation with an edited video tape or film. Jonathan Gibbs demonstrated a practical example of some recent work—a cliffhanger scene from an episode of *Dr Who* which was transmitted in the UK in late January. If you don't live in one of the many countries where *Dr Who* is shown it's a sort of science fiction soap opera. (*Dr Who* fans please forgive me.) The hero, the Doctor, travels in a time machine called the Tardis, accompanied by a girl.

The action in this sequence has the Doctor in a fight with the chief villain, the Master. Meanwhile, some other baddies push the Tardis down a mineshaft. After that, the Doctor is strapped to a trolley running out of control down a hillside. There are lots of cuts in the picture, all timed by a film editor wanting to get the best dramatic effect.

Jonathan Gibbs was standing in on this episode as the composer for this programme was ill. About a fortnight before transmission he had only done the incidental music for the first six minutes of the programme. He'd been unable to get into the studio during the day because someone else needed it and was working at night.

Jonathan describes the problems: "You've got Dr Who kicking the Master at one time, which you want to react to in the music. And then something else happens. All those points have got to be 'hit' with the music. And they are all happening at whatever is right on the picture, not what's going to be right for 4/4. So you need some way of translating what's on the screen into music.

"What we do here is to lay timecode on to track 16 of our 16-track tape. *Syncwriter* will read that timecode and then present a display which 'conducts' the music."

Perhaps the best way to explain *Syncwriter*'s operation is to describe each of its modes in turn, using the Dr Who sequence as an example. There are six main modes or 'pages', namely Page List, Page Display, Page Command, Page Files, Page Print and Page Regenerate.

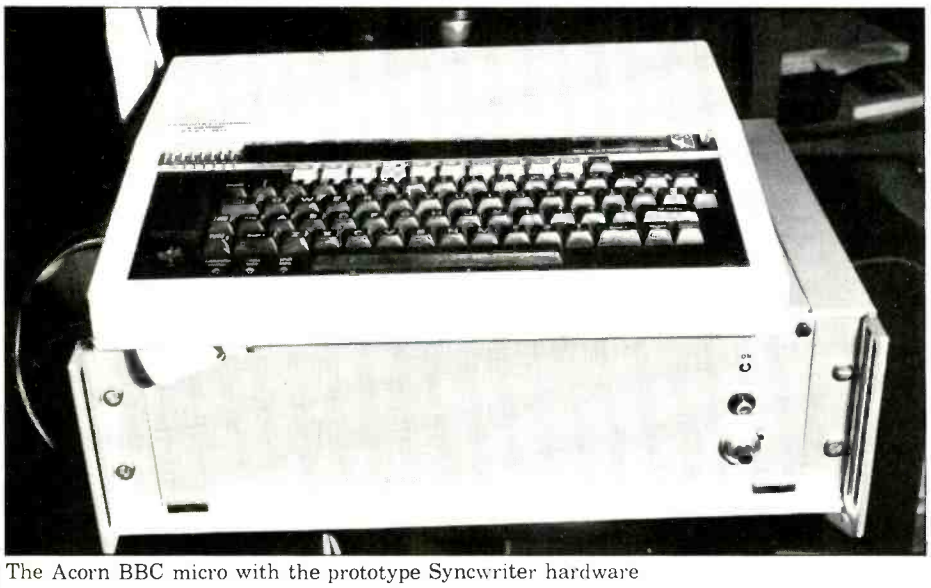
Page list

Assume that the composer is starting with an edited video cassette with timecode inserted on the bottom of the picture and dialogue on the soundtrack. Music and effects will be added later, after the composer and others have done their stuff, in a dubbing session.

The first step is to go through the cassette making a list of timecodes when something has to happen in the music. The most important thing is to decide when the music should start and stop! Then the composer lists all the timecodes where he wants something to happen in the music. For instance, he may want to start a bar on a cut in the picture, or where someone gets hit if the actors are fighting. These 'sync points', and any other cues that the composer may want, are edited on *Syncwriter* in the Page List mode. The screen shows one sync point on each line, with the lines in chronological order. The information displayed includes the timecode and a reference name of the composer's choice for each sync point.

Jonathan explained while he played the *Dr Who* video cassette from the start of the sequence he is currently working on. "This is quite a nice cue to show *Syncwriter* on, because it's got several

Syncwriter system in practical use within a Radiophonic Workshop studio



The Acorn BBC micro with the prototype Syncwriter hardware

elements in it as far as music is concerned, which show exactly the kind of problems we keep coming up against.

"The beginning is going to be quite slow stuff. It's 'general threat'. Since it's the Tardis that's about to get zapped, I've used the 'Ooeoo' theme from the main sig. and built round that. All the music for this is fairly stringy and kind of English Pastoral.

"Then you've got several specific hits: when he kicks the gun out of the Master's hand, and when Peri (the Doctor's assistant) 'animates' and gets him pushed. Then he starts moving and then you've got straightforward driving rhythm stuff, for when he's going down the hill.

"So there are three elements that cause problems for the composer. You've got free-rhythm stuff, where you are not interested in working to click tracks and so on. You've got specific hit points, and then you've got straightforward pushy rhythm. "You could mark hit points on the tape and watch for the white line coming. Or you could use *Syncwriter*. You start off with Page List. Watch the screen for timecodes, and enter them on the keyboard. The start point in this case is fairly arbitrary, just from the speech. But take as an example when he kicks the gun," said Jonathan, freezing the frame on the video. "There—42:03. You simply enter it as 42:03, and call it something—in this case 'kick'. It'll then go into the list.

"Once you are into a particular minute, you are probably going to enter quite a few cues in that minute. With this you don't have to enter the minute every time. You can just enter seconds and frames and it will default to the 'working' minute. The display will also show the number of frames since the previous sync point."

It is also possible to search through the list by typing in a timecode. *Syncwriter* will come back with the sync point nearest to it.

"The point called 'string' is the point where we cut from the scene with the Doctor to the men who are pushing the Tardis. That's the first sync point, at that scene change. I want fairly loose music for this, but I want to know when several instruments come in, so I've entered three other cues marked 'Tr1', 'Tr2' and 'Tr3' for three trumpet sounds. 'Ooeoo' is the final statement just before the Tardis dies. 'Hole' is where it actually falls down the mineshaft. Then you've got 'Snap' when he kicks him, 'Push' when Peri starts pushing the trolley, 'No' when you realise that she's pushing the wrong way and 'Ohno' when she gets worried and starts chasing after it. It goes terribly rhythmic from then on. 'Move' is when those men stop, see him and start to move off. 'Peristop' is when Peri realises and stops.

"That's just putting the stuff in. The important bit is Page Display. This is where it all actually happens."

Page display

Imagine a single horizontal line representing a manuscript with, say, four bars of music. There are marks on the line representing each beat and the beginning of each bar. Below the line ▷

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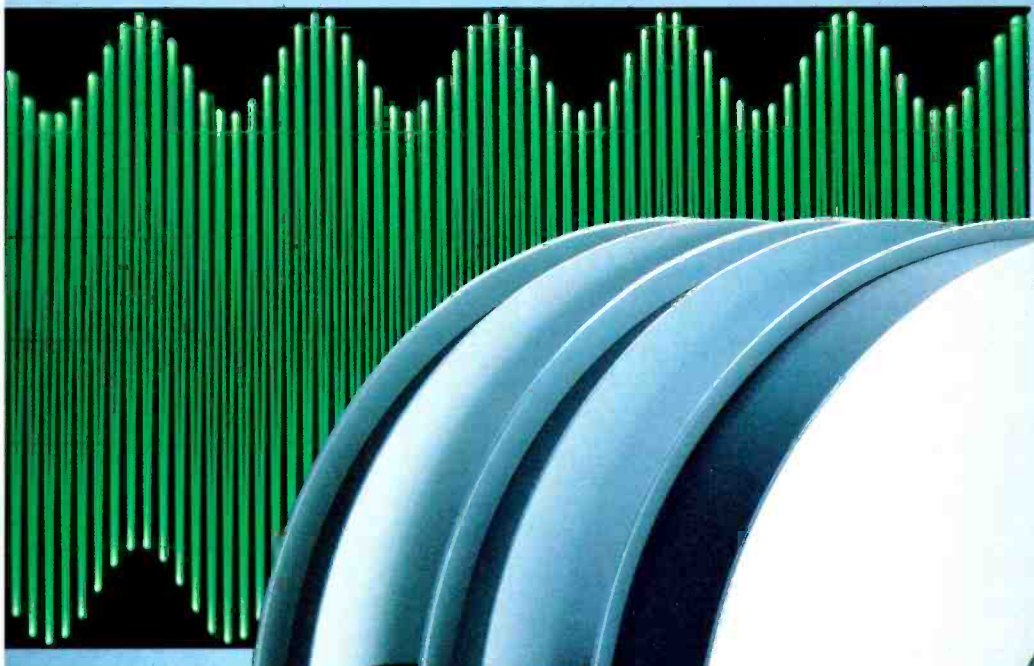

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SYNCWRITER

there is an arrow corresponding to each sync point entered in Page List. Above the line there is an arrow-shaped cursor which moves along under the control of timecode from the multitrack tape machine. The system displays three such lines at a time, with the top line being the 'current' line and the middle and bottom lines being 'future' ones. When the cursor gets to the end of the top line, the lines scroll up and the cursor starts again at the left hand side of the new top line. The screen also gives a continuous readout of the bar number and timecode.

So what you get is a continually moving graphic display of the time relationship between the present and future events in the music. This benefits the performer in several ways. First, it provides a kind of 'visual click track' for synchronisation. This is better than an audio click track because it doesn't click at you in a domineering fashion when you are trying to create music.

By representing several bars of music on the screen, the system enables the performer to see sync points coming up well in advance of their actual arrival, and play up to them with suitable expression.

Jonathan plays the music he has already recorded for Dr Who, and with the display in the 'smooth' mode, the cursor slides along the line. The beginning is fairly slow and not rhythmic. "On this hit I just want to know where I am—I'm using it as a glorified timecode reader. The fun comes, though, when we go back to Page Command. We can prescribe, exactly, how that display is set out."

Page command

Page Command allows the user to specify the number of beats per bar, and the number of bars to be represented by each line on the screen. Each beat is indicated by a short vertical line above, and butting on to, the horizontal one. It looks rather like the markings on a ruler. Alternatively, for arhythmic work, the beat markings can be switched off. Then the cursor, instead of jumping from beat to beat, will slide smoothly through the bar. (To be precise, it only appears to do this. The software pretends that there are 120 beats/bar, giving the appearance of continuous movement.) Even the bars can be switched off, and the cursor will slide along the whole line.

Another facility of Page Command allows the user to edit the music. If he finds that a sync point occurs at an awkward time in the music, he can adjust the number of bars between two sync points so that the music will fit between them exactly.

Still in Page Command, the user can use the system to measure the tempo of a piece of music before writing it. The user plays the tune 'in his head', and hits the BBC micro's copy key in time with the music. The micro will then average and display the speed, very conveniently, in frames per beat. Not only that, but the user can choose whether to hit the copy key on every note, twice a bar or once a bar!

Page files, page print and page regenerate

These modes are not as interesting as the others, but nevertheless useful. Page Files is about storing information on floppy disk. A complete set of sync points, entered by the Page List and Page Command modes, can be stored in a disc file and retrieved by using the commands 'Save' and 'Load'. One file can store about 100 sync points.

Syncwriter can copy files from one disk to another. As with the original Acorn/BBC operating system, 31 files can be stored on one disk. The file management facilities are pretty standard stuff.

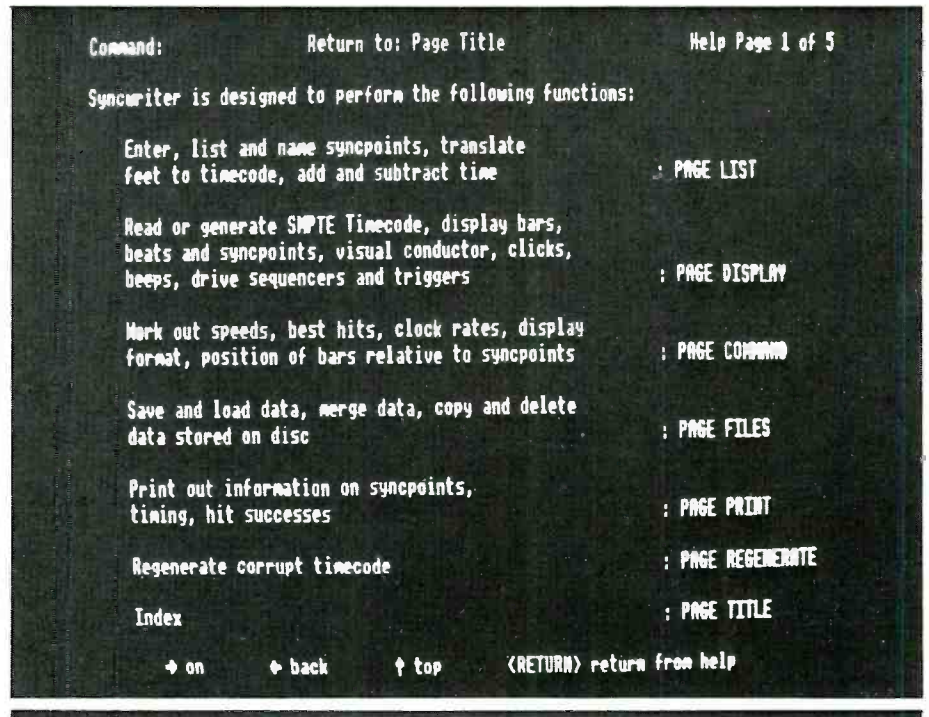
Page Print allows all the sync points to be listed on a printer. This listing gives each sync point a 'star rating' according to its timing: **** means the sync point coincides with the beginning of a bar; *** means it coincides with a beat; ** means it comes half way between two beats; * means it doesn't coincide with anything in particular.

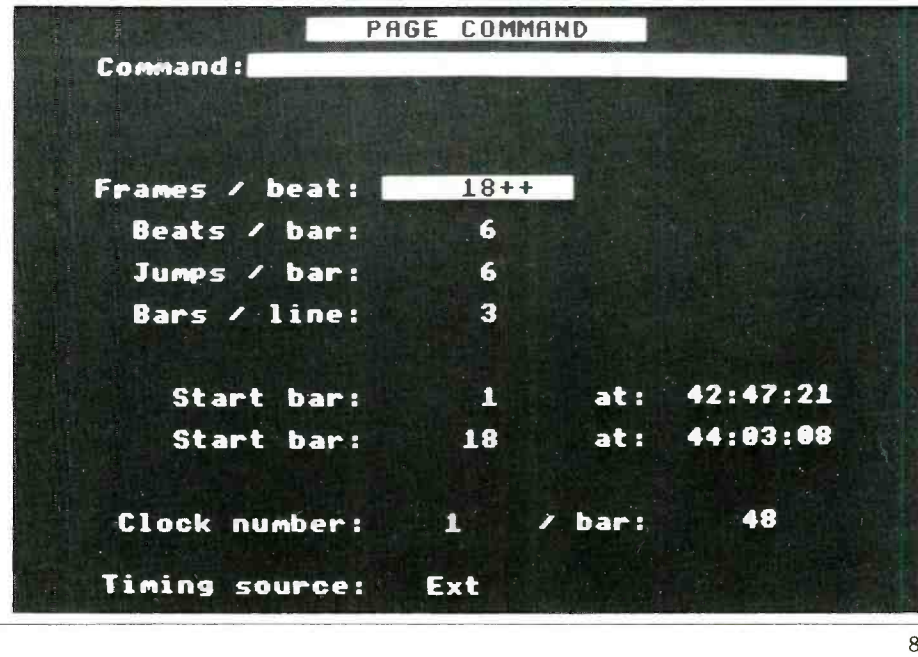
Page Regenerate cleans up a poor quality timecode signal before re-recording it. *Syncwriter* also can generate fresh timecode if necessary, under control of the BBC micro's internal crystal clock oscillator. The software has a programmable clock division ratio to adjust the timecode to the correct speed.

Sequencers

Syncwriter does not just produce a graphic display to help humans. It can drive machinery too. There are four clocks in the add-on hardware unit which can produce squarewave pulse trains to ▷

Syncwriter screen displays





SYNCWRITER

synchronise sequencers. These clock outputs can be started and stopped by a sync point, simply by starting the sync point's reference name with a number between 1 and 4. Thus a sync point labelled "3TEST" would start clock 3 when its timecode is reached.

The four clocks can operate at independent speeds. Normally standard MIDI speeds would be used, eg 48, 96 or 384 pulses per bar. Any speed can be used, but *Syncwriter* will question it if any two clock speeds do not have a simple ratio and are likely to get out of step.

As well as the four clocks, there are on/off trigger outputs which can be used, for example, to remote start a tape machine. This is programmed by starting a sync point's name with the symbol "@".

The sequencer clock outputs appear as jack sockets on the back of the box, as do the triggers. There are also 'click' and 'beep' outputs on 3-pin *XLR*-type connectors. The click output is a straightforward click track signal which clicks once per beat. It can be turned on and off from the keyboard.

The 'beep' output produces, as one might guess, a beep every time a sync point is reached.

Hardware and software

The prototype of *Syncwriter* has a fairly large blue box for the add-on hardware with not a lot in it. There is a timecode reader which converts timecode into binary-coded decimal (BCD) form for the BBC micro. The blue box communicates with the BBC micro via a ribbon cable plugged into the 1 MHz bus. Inside the blue box there are several versatile interface adaptors (VIAs) that interface the timecode reader, the sequencer clocks, the trigger outputs and the click and beep generators with the 1 MHz bus. The BBC micro does contain its own peripheral interface adaptors, but not enough for all of *Syncwriter*'s facilities. Jonathan Gibbs chose the BBC microcomputer largely for its interrupt circuitry, which is fairly easy to get at; via the bus, that is. No modifications are needed.

The timecode reader in the box produces interrupts, enabling the software to keep up with the timecode updates accurate to within 10 ms—a quarter of a frame.

The BBCs micro's own operating system is too slow for *Syncwriter*, so a stand-alone machine code program is used instead. Most of this—about 16 K—lives in a sideways plug-in EPROM, which has just 13 bytes of unused space! The rest of the software—some 4 K—is kept on disk and is brought in and out of RAM as necessary.

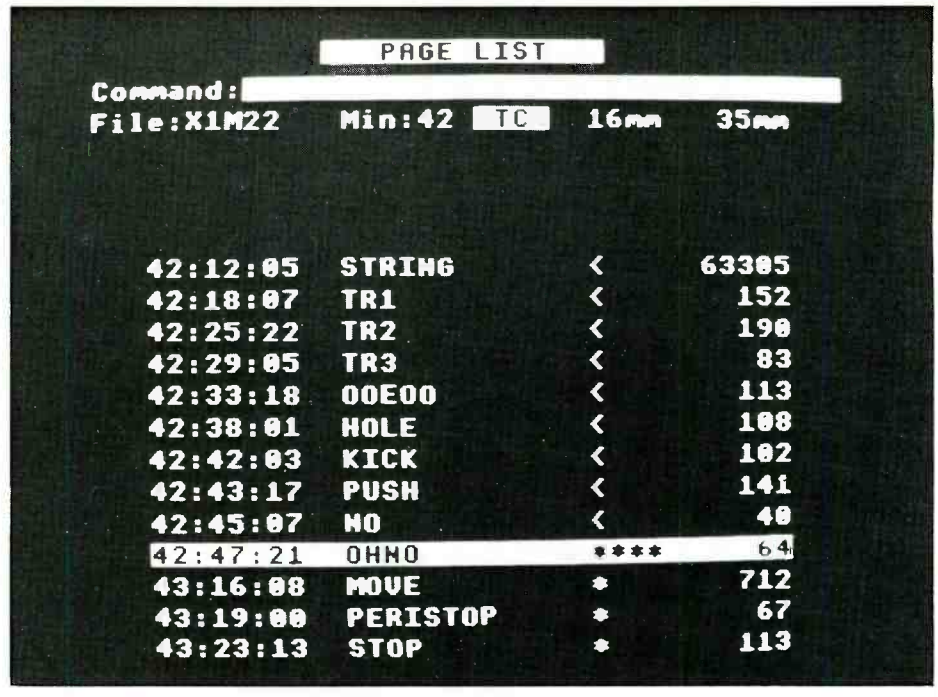
Conclusions

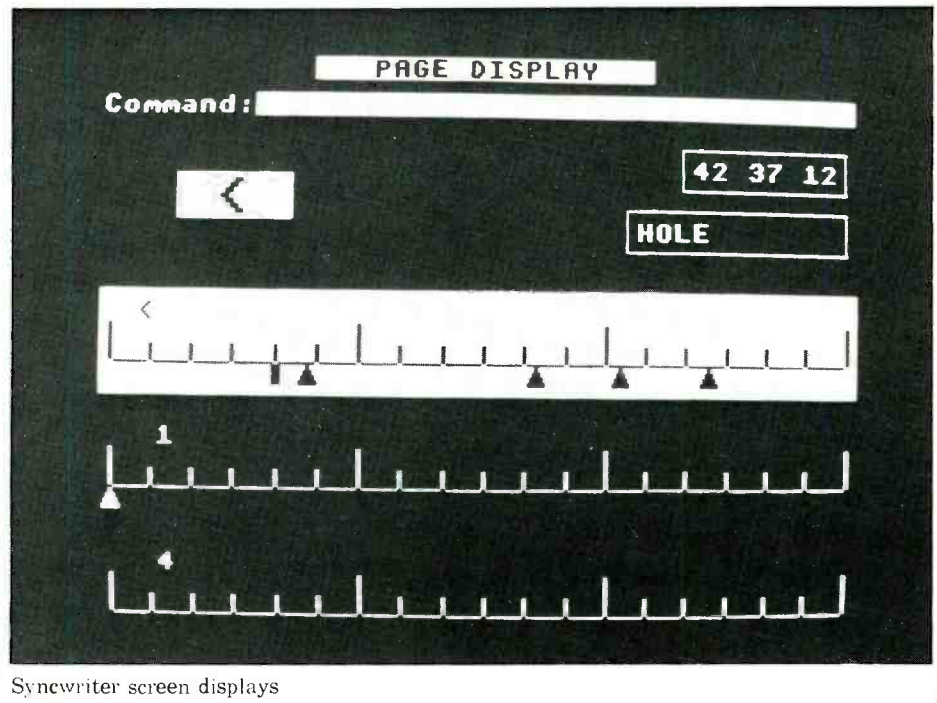
One of the most significant things about *Syncwriter* is the time it saves—Jonathan Gibbs reckons it saves him about 30%. There are other benefits. "For certain things you have to get locked to click tracks, which means that the music you are writing is determined not by what the picture says and what you feel but by what the click track is saying. This way, you can have 15 different click tracks on the same cue. You can set up what you like. You are not tied to the clicks.

"The other thing is, frankly, for an awful lot of music it is really rather ridiculous that when you're composing the stuff, you hear something going click, click, click in your ear. It's the last thing you want. *Syncwriter* takes you back to being conducted, by a conductor. You've got anticipation—you can see the thing coming up and put expression in. It does encourage much more expressive writing and expressive playing. In fact, if you analyse what we do, quite often it's nowhere near the beat, and therefore we are an awful lot better off without the click track."

The system is simple to use: it is clearly designed to be a workhorse and not just a technoflash toy. It can help performers playing manually as well as driving sequencers, and can help conductors of live musicians. The system is also based on a microcomputer that is well-known and popular, at least in the UK.

Maybe the last word should go to Brian Hodgson, head of the Radiophonic Workshop. "All the time our attitude has been 'let's get the machines under control', so that we can concentrate on the music. Let the machines look after themselves. If we can achieve that for, say, 98% of the time, then we're doing very well. The problem with electronic music is that you spend 50% of your time worrying about the machines. We've now got that down to a very respectable figure."□





Syncwriter screen displays

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Barry Fox investigates the facts behind the industry news

Round the houses

I've had some hard words to say about the BBC over the years, but credit where it's due. I was booked at short notice to do a live broadcast for Welsh radio. A taxi came to pick me up and take me to Broadcasting House. But the taxi driver was told by his radio control to go to the BBC's parliamentary broadcasting studio near Westminster instead. Thanks to the extra distance, and heavy traffic, we got there five minutes before live air time. Of course the parliamentary studio staff knew nothing of the booking but with just a couple of minutes to spare, they called up a studio quality line to Cardiff and plugged me in. So a big thanks to the BBC's Westminster studio.

The incident prompts two thoughts. Firstly, now that parliamentary debates are recorded for broadcasting, there is an enormous, and constantly growing, stockpile of tapes. Sooner or later someone is going to have to decide what to erase and what to keep.

The other thought is rather more trivial, though perhaps not for whoever may be involved. If my taxi took me to the Westminster studio reserved for famous politicians and MPs, what famous politician or MP was whisked to Broadcasting House only to find that no-one there had heard of them?

Blumlein preserved

At last, at last, at last. Thorn-EMI has finally, after the best part of 10 years of being nagged, preserved around 1,000 ft of nitrate film shot by Alan Blumlein in the early '30s. So what's so special about this film? It has a stereo optical soundtrack, almost identical in format to that now made standard by Dolby Labs.

An excerpt was screened at the National Film Theatre, as part of a joint lecture on film sound by John Aldred and Mark Yonge of Dolby Labs. It was shot in 1931 and features three people at left, right and centre of the screen counting numbers and chanting days of the week. Blumlein's aim was to get the sound from the screen to track a moving source. In this he seems to have succeeded pretty well. There is also, as yet unscreened, a playlet put on by an amateur dramatic society. Blumlein's wife has previously remembered how he used to talk at the time about a film sound system which would "make it possible for a blind person to go to the cinema".

Modern thinking in the film industry is that sound should *not* follow a moving source round the screen, and most dialogue should stay firm at the centre front. Otherwise the effect can be very distracting, especially for people in side seats. It's what made some of the early magnetic stereo films sound so odd. But in Hollywood recently I met a film mixer from the old school. "I don't like all this modern Dolby stereo business," he told me, "what I like to hear is real stereo, with the sound moving around."

He had just had an odd and interesting job to do. The film *Ghostbusters* was due for release in South Africa. But the South African censors took exception to that famous phrase "I've seen shit that would turn you white." The actors had to come back into the studio and record something less racially meaningful for South Africa. As they say, it takes all sorts.

Cellular radio

In January, UK sound engineers got something they didn't know they needed so badly. It's UHF cellular radio, a new technology that means you really can have a dial tone in a car or field, without waiting years for a subscriber number, and when you get it queueing on air for an hour to get a free channel. This was the situation with VHF radio phones in London. New VHF subscribers are not even able to take incoming calls on their car phone.

Chicago has had cellular radio now for over five years, first as a trial and then as a commercial service since October 1983. It has changed life for the people who use it. Imagine making all your bread and butter fixit phone calls from a traffic jam on the way to work; you can phone from location work, without searching the neighbourhood for a call box that works.

Cellular radio works as well from a battery-powered portable, as it does from a radio phone fixed in a car. But the bad news is that as usual Britain seems to be getting a good idea wrong.

Cellular radio relies on the short reach of low height, low power UHF transmitters. Short reach enables re-use of the same frequency over and over again, in different parts of the country, or even different zones of the same city. The area to be covered is divided up into a honeycomb of hexagonal cells. These naturally fall into seven cell clusters and up to 39 duplex channels can be used in each, provided the same frequency is not used in any two cells with adjoining boundaries.

Each cell has a fixed UHF transmitter and each mobile radio, whether in a car or carried in a briefcase, continually sends out a check signal that tells the transmitter system where it is. To make or receive a call the mobile locks onto a spare frequency of the local cell transmitter. When the mobile moves into another cell, control signals switch the frequency and transmitter in a 'hand off' which takes just 300 ms. With memory buffering to bridge these gaps, you can even use the system to send electronic mail messages to and from mobiles.

The cock-ups will come from the British Government's obsession with generating free market competition. I'm all for kicking British Telecom into the 20th century. It's just taken BT a full three months, and several chase letters, to fit me a single extension phone. But the cellular radio scheme sounds crazy. The Government has licensed two rival consortia to provide rival systems, that cover exactly the same areas of Britain.

The UHF TV coverage scheme works because the BBC and IBA share transmitters. It would be prohibitively expensive for them to play selfish and use only their own. Local radio suffers because VHF FM transmitters are not shared. That is why there are so few simulcasts on ITV. It's almost impossible to tie up identical radio and TV coverage on the commercial networks. Now exactly the same thing is happening with cellular radio.

One operator, a joint venture between British Telecom and Securicor, is building one set of transmitters and computer control centres to provide *Cellnet* service. The other operator, Racal, is building another set of transmitters and computer control centres to provide the *Vodafone* service. Inevitably this is going to inflate the price. It also cuts the channels available; 17% are lost because of the extra data control channels needed to run two systems instead of one.

Neither rival company will undercut the other during the first few months of cellular radio, because that is the time that everyone who knows about the system and wants a mobile phone will pay whatever the asking price is to get one. After that, a price war may develop. Also once cellular radio is under way the existing VHF radio phone services may start to look more attractive, and cheaper. Outside London there are no waiting lists and the VHF services may cut their tariffs to compete with cellular. Whatever happens, it has to be good news for engineers who work on the run.

By the way, don't blame me if you try and phone Cellnet, and can't get through. At a clumsy press conference, where Cellnet fooled journalists by demonstrating cellular radio from a single high power transmitter without any hand-offs, they gave out bumph with a Cellnet phone number. It was only because I went for a private dem that I know hand-off works. Later, when I tried to follow through on the story, I couldn't get any reply. I checked with the press office of British Telecom, who part-own Cellnet. They gave me a number that didn't answer either. Subsequently I found out why. Cellnet had changed its office telephone number, without telling anyone, without hooking up an answering machine and without arranging for an operator-intercept. Let's hope they run their radio phone service a bit better than that. □

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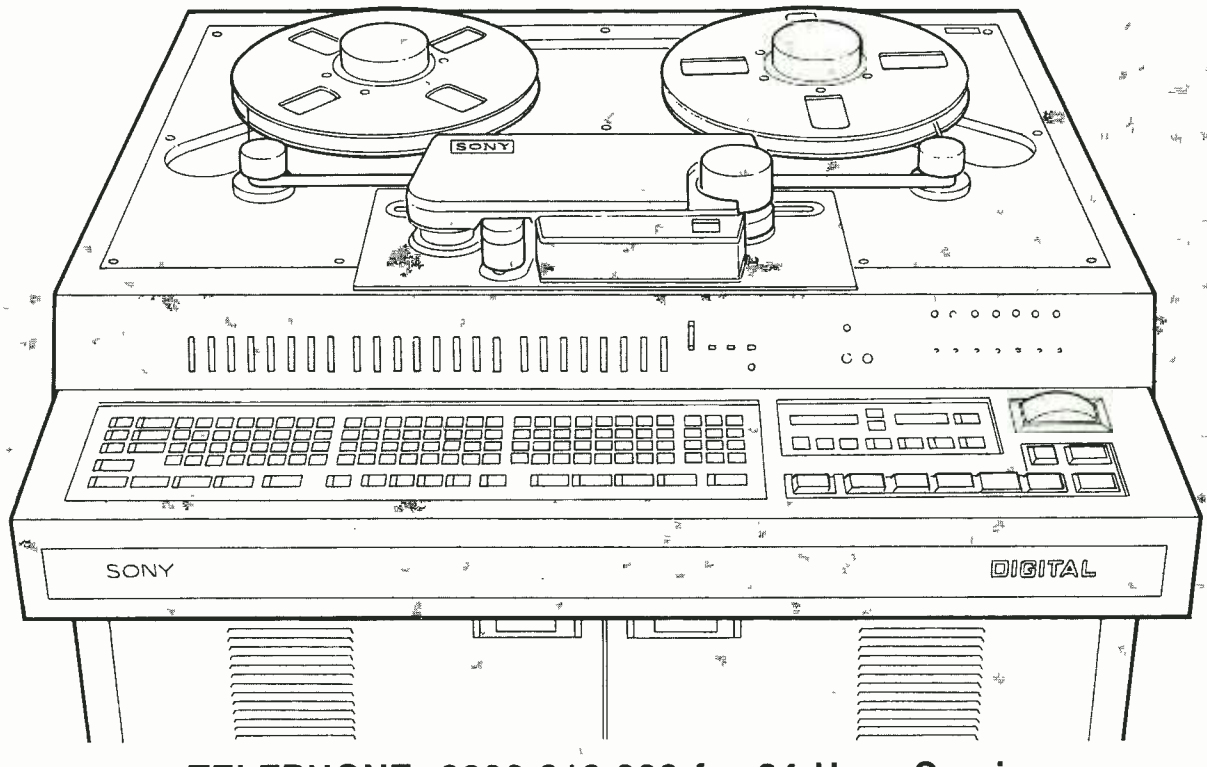

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REVIEW

REVIEW

A user report by Keith Spencer-Allen

CROWN DELTA OMEGA 2000

This short report is based on practical experience of the Crown *Delta Omega 2000* power amplifier over a period of a couple of weeks in the studio with a selection of monitors (all passive) from JBL, UREI, Tannoy and a custom-designed system. Tests of this nature inevitably have to come down to personal opinion in the final analysis with there always being too many variables to be able to pronounce authoritatively about the various qualities of certain power amplifiers. Yes, of course, it is possible to hear differences between some amplifiers but great care has to be taken over the causes of these differences. It could be the amplifier or some outside factor that is almost impossible to quantify such as the speaker/amplifier interface and the various creative effects that certain combinations of amp and monitor produce.

As the Crown *Delta Omega* is designed to try to optimise this amplifier/speaker interface it seemed worthwhile taking a practical look and reporting the findings to supplement Hugh Ford's review (March 1985) which by its nature was not able to cover these aspects.

To provide a reference for comparison of the *Delta Omega*, a Crown *PSA2* amplifier was used. This was necessary as I wanted to have a reference power amplifier of a similar power rating to the *Delta Omega* or certainly far closer to it than the standard power amplifier being used in the studio and so avoid any differences in observed performance being caused by a unit with a larger power rating.

These amplifiers are true monsters in the physical sense and are not designed to be moved without prior thought. Crown quotes weights of 92 lb per amplifier and I'm certainly not about to dispute that. For the time they were in the test studio it was decided against mounting them in the lightweight racks where space was available as they really require a heavier frame and quite possibly some rear support in addition. The user manual covers the physical mounting requirements in some detail, some serious attention has to be given to it. The front panel carrying handles are robust enough to carry the power amplifier by. As the amp's centre of gravity is only 5 in behind the front panel, carrying the unit with your hands under the sides is tricky. Although, again if I had read this part of the manual before unpacking the amp, rather than just the electrical section I would have been wiser.

My only other comment on the installation aspects is that the tag strip connections for the in and outputs are rather fiddly although hopefully this is something that will not require wiring more than once.

For a detailed description of the *Delta Omega* controls, I would refer you to Hugh Ford's review. The power switch, attenuator control and AC/DC coupling switch are self-explanatory. The set up procedure, however, revolves around the mode switch. This has three positions ON/ADJ/OFF. In the off position the *Delta Omega* acts as a conventional voltage amplifier. The ADJ position is the set up mode for the *Delta Omega* and the on position is *Delta Omega* operation.

There are three methods of optimising the *Delta Omega* settings—a squarewave set up procedure; the power efficiency transfer ratio and effective radiated distortion methods. We chose to use the power efficiency method that allows the user to set up the monitoring without any other test equipment than a pair of ears. Crown imply in the manual that there is little to choose between any of the methods provided the correct procedure is followed.

Power efficiency transfer

Using this method, and indeed all the others, the mode switch is set to ADJ. Just to the right of the switch a recessed screw adjustment marked $+\Omega$ to $-\Omega$ (the *Delta Omega* control) is covered by a metal screen in all modes except ADJ as tampering with this preset in any other mode could lead to serious monitor damage. In this mode the loudspeaker load is protected by an internal energy limiting circuit which allows full rotation of the *Delta Omega* control from positive to negative ohm settings. This control is set fully anti-clockwise to start and the attenuator control set to a level that allows a healthy output on a programme signal. I found that the best set up material was full range except with 'musical space' in the LF areas for reasons that will become obvious. If the *Delta Omega* screwdriver control is slowly turned clockwise it apparently increases the load power transfer characteristics. As this is turned, the amplifier sound subtly changes until a point is reached where the programme signal starts to ring and then go into oscillation. The screwdriver should then be backed off until the signal is clean again; this is the point of maximum coupling efficiency. The mode switch is then turned to ON which removes the load protection and the full amplifier power is available.

This method works quite well and the point at which the ringing commenced obviously varies from monitor load to load although the onset of ringing was fairly clear to detect however a signal source that was too dense in LF information did make this ringing less easy to detect at its early stages. There was a slight difference in the two units under test as I found one very easy to set up with precise clearly defined ringing points but the other was slightly less positive and took longer. There is, of course, always the worry that you may not have backed off the control enough to clean up the sound completely and it is in this aspect that one of the measuring methods might prove more

REVIEW REVIEW

See the March issue for Hugh Ford's technical review

useful although there is no reason that the described method should be less satisfactory with time taken and the right programme material.

Sonic changes

Subjective impressions were noted at various times starting with the referencing against the *PSA-2*. With the *Delta Omega* mode switch in the OFF position there is very little to choose between the two amplifiers although with some monitors it was felt that the *PSA-2* had the slight edge on the *Delta Omega*.

As the *Delta Omega* recessed screw was adjusted in the ADJ mode, the programme signal gained firmness and depth in the low frequencies and there was an increase in detail on the mid-range frequencies. While monitoring at comparatively low levels and adjusting this control I was at first rather concerned as these sound changes were causing an apparent change in the musical balance accompanied by some mid-range coarseness or trace of distortion. My fears were however unfounded as the subjective changes in overall LF and MF levels were temporary psychoacoustic effects only noticeable for the short time while adjusting the amp at low levels and were certainly not obvious during the other aspects of the test period except that perhaps instruments that might have been previously mixed higher in level to cut through were now audible far more easily. The MF distortion was to my surprise something that was there in the original programme material but was exposed more clearly by the *Delta Omega*.

Throughout the test period it was felt that the *Delta Omega* produced a desirable improvement on all of the monitors used with perhaps the best description of the sound being 'under control' particularly in the bass regions. The mid-range improvements together with the effortless sound quality that is only possible with a really big power amplifier made the monitoring system very impressive. The differences that we are talking about are less than night-and-day although are *easily* noticeable particularly if you have any sort of reference.

One very interesting test tried, involved switching one of the *Delta Omega* power amplifiers to normal (ie non-*Delta Omega*) operation while the other remained in. On percussive material with the signal routed equal amounts to the left and right channels, there was a feeling that the sound was slightly panned to the monitor powered with *Delta Omega* operation switched in, although non-percussive signals and tones sounded dead centre in the stereo image. Exactly how this should be interpreted I am not willing to commit to print although I think that it is very positive for the *Delta Omega* mode.

One noticeable effect was the way in which the amplifiers were able to reduce ringing in low frequency percussive instruments such as drums and it becomes clear to what extent some troublesome drum sounds might be being aggravated by the amplifier/monitor interface.

Summary

Practical experience with the *Delta Omega* amplifier has led me to believe that the amplifier/monitor interface is a very much under considered phenomenon. Tackling the problem in the way that Crown have by producing the *Delta Omega* is not a cheap way out and will require some commitment by the studio to invest in these units. I have to admit to being very impressed with these amplifiers which appear to offer an edge over 'traditional' units and I would urge anyone anxious to squeeze a tighter impressive performance out of their monitors to at least try them and see if they can deliver these improvements with your monitors.□

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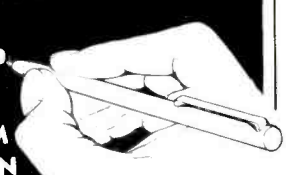

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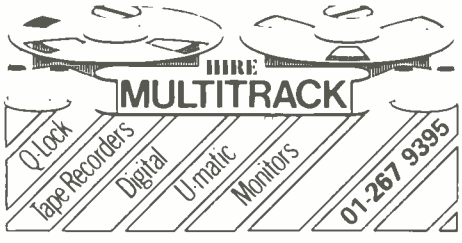

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