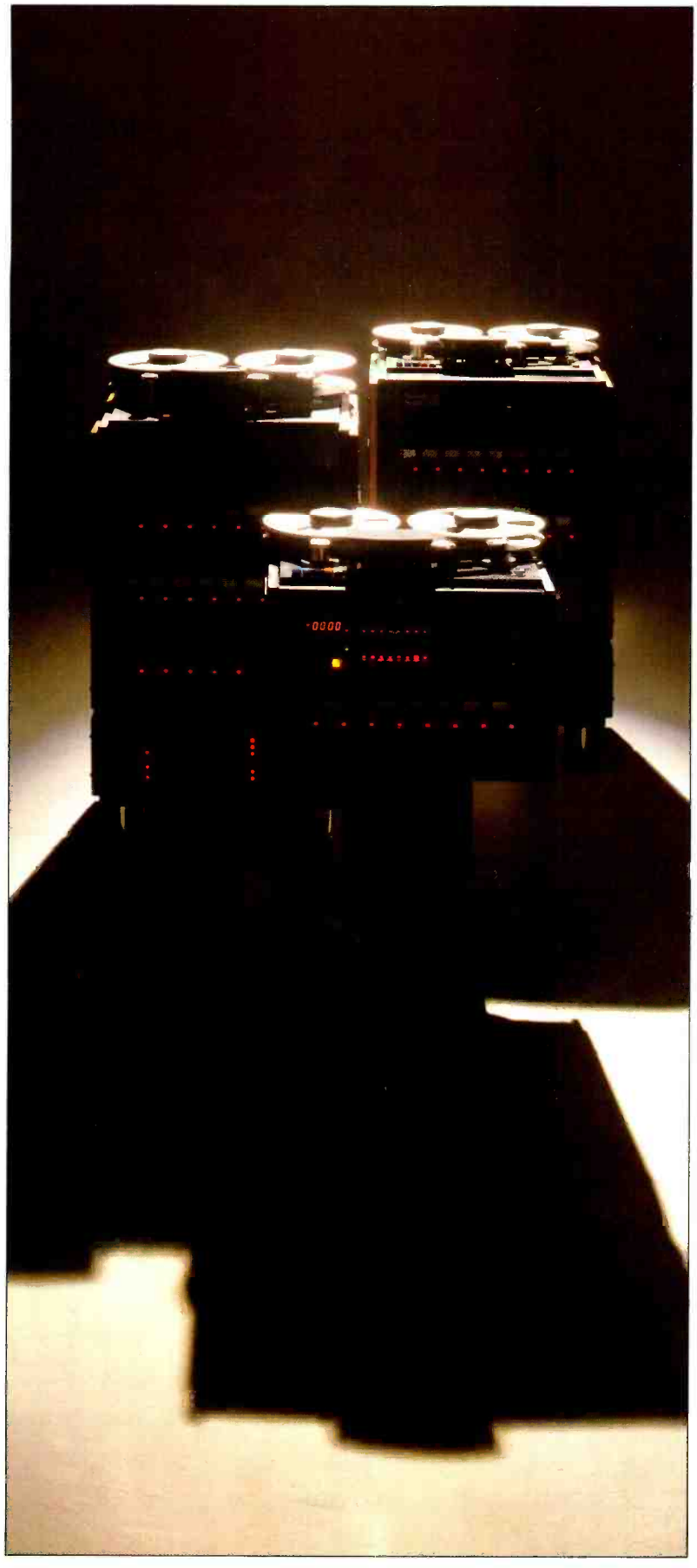
December 1985 £1.50

STUDIO SOUND

AND BROADCAST ENGINEERING

DIGITAL IN AUDIO MIXING CONSOLES

A LINK HOUSE PUBLICATION



THE MAKING OF A TRACK RECORD.

Choosing a multitrack is one of the toughest decisions you'll have to make.

Its sound quality will play a large part in your studio's output.

Its features and expandability need to be taken into account, and weighed against cost.

Reliability is even harder to assess.

The Soundcraft Series 760 Mark 3 multitracks are acquiring an enviable reputation among producers and artistes with private studios, for those very reasons.

Dave Stewart and Annie Lennox recorded their last two albums on a Series 760 with Autolocator and a 2400 console.

Thomas Dolby and Tom Robinson own Mark 3s, as does Tony Visconti (who knows a good sound when he hears one).

At London's Easy Street, a 24 track Series 760 and a TS24 have hosted chart albums from Wang Chung to Dennis Brown, from Heaven 17 and The Pretenders to Sly and Robbie.

Leading Indie studio Woodbine have averaged a chart single a week for the last year with their 762 Mark 3.

Why did they choose Soundcraft?

Most importantly, the audio quality is often compared to the highest priced machines on the market.

Many of our clients say we're more pleasing on the ear, thanks to lower colouration; our Mark 3s' square waves are square, our LF response is flat and you can't hear the noise for silence.

We suggest you listen, and compare.

The revisions for the Mark 3 were more than cosmetic, as they've proved in practice. They include a new DC servo-controlled transport, modular wiring layout and a flat-wired self-contained headblock assembly.

They're built to keep performing – and they do.

The Mark 3, in fact, represents the chance to acquire a much higher standard of audio quality and engineering for the price than ever before.

So you can see why so many great names have decided on the Series 760 Mark 3.

Because they know a great track record when they hear one.

Soundcraft

760 SERIES MK 3.

Soundcraft Electronics Ltd., Unit 2, Borehamwood Industrial Park, Rowley Lane, Borehamwood, Herts WD6 5TZ. Tel: 01-207 5050. Facsimile: 01-207 0194. Soundcraft Electronics USA, 1517 20th St., Santa Monica, California 90404. Tel: (213) 453 4591. Facsimile: (213) 453 5634. Soundcraft Japan, 4F Yoyogi Living, 12-21 Sendagaya 5, Shibuyaku, Tokyo 151. Tel: (03) 341 6201. Facsimile: (03) 341 5260. Soundcraft Canada Inc., 1444 Hymus Blvd., Dorval, Quebec, Canada H9P 1J6. Tel: (514) 685 1610. Facsimile: (514) 685 2094.

STUDIO SOUND

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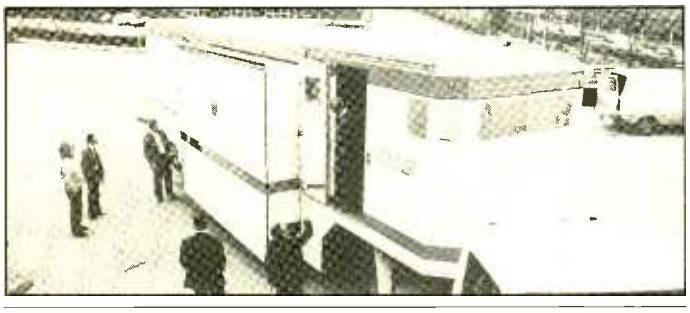
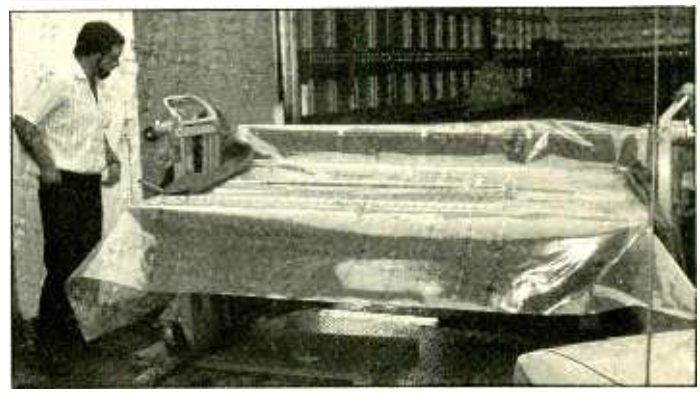
REGULARS



SPECIAL FEATURES



FEATURES

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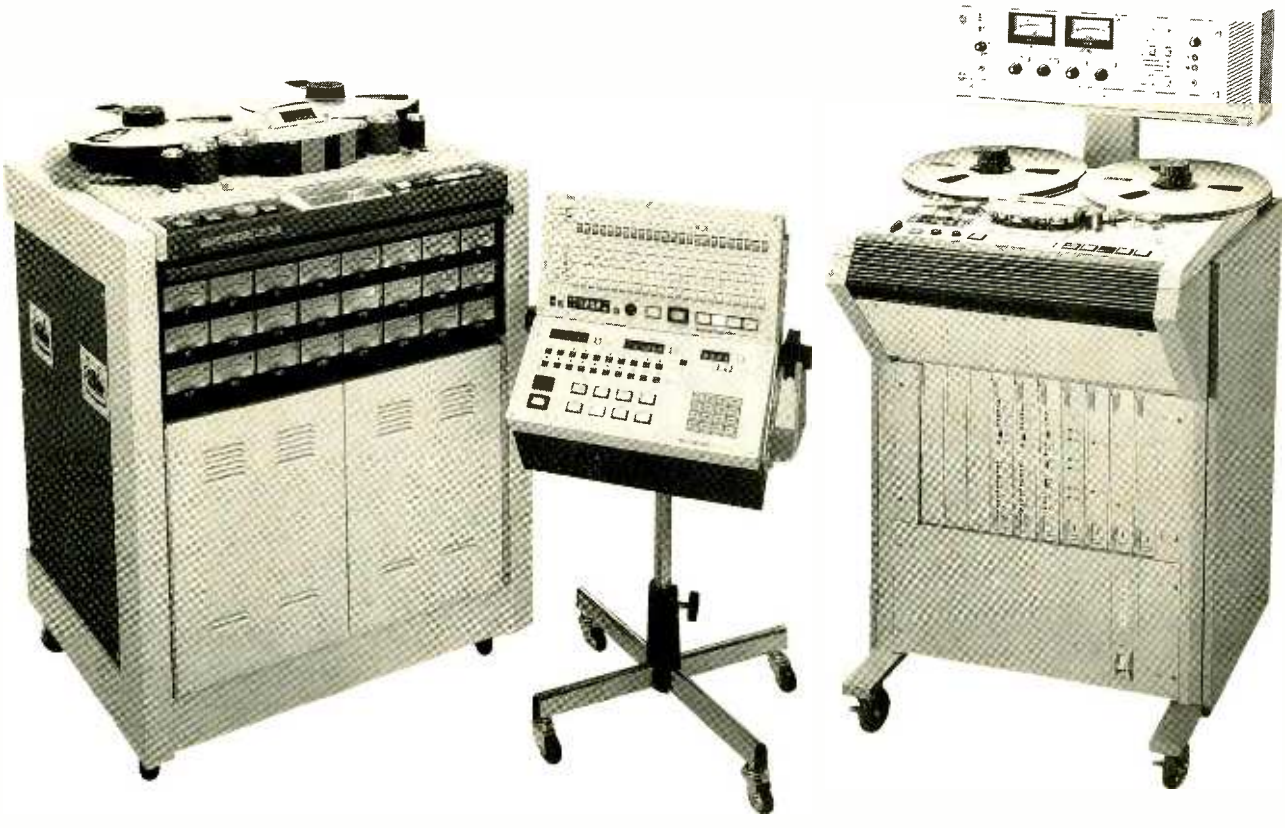
Otari Rentals



THE OTARI MTR 90 24 TRACK AND MTR 12 2 TRACK

The MTR 90's track record for outstanding reliability and performance and more recently the MTR 12 master recorder have proven Otari's long term commitment to producing state of the art analogue tape machines.
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At Music Lab we not only recommend Otari – Otari recommend us.

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EDITORIAL

EDITORIAL

This month's comment from Keith Spencer-Allen

Putting the choice back

Mixing consoles time again. In this issue you will see information on new or developing consoles of a wide variety of types and designs from a wide cross section of individual manufacturers. We have also attempted to obtain some opinions from manufacturers who are looking at the top end of the console market although are not yet ready to commit themselves to specific models. Although there are some quite remarkable low cost consoles available with increasing amounts of automation, it is not in this area of the market that the really important developments are imminent.

This is neither the time nor the place to debate the good or bad market dominance of certain manufacturers. That has already been done in these pages and to excess in other publications. The terms 'flavour-of-the-month', 'backlash' and other such phrases are the indicator signs of a total lack of comprehension of the situation that we find ourselves in. There is no doubt that one top end manufacturer has found itself in an enviable position in certain parts of the world but it is really not as simple as that. If we look a little deeper we see we are witnessing a change in function of the mixing console—a metamorphosis that will eventually reshape the studio as the changes originating on different sides of the studio converge and leave us with a studio that will be visually unfamiliar and with function control far beyond that which we currently have available from any source.

The changes have started, and with the introduction of digital control and signal paths they will continue. The direction we take and the speed with which things change will depend on the reaction of the purchasers of the systems offered but it should be stressed at this time, there are several manufacturers that have prototype designs and are working on ideas for consoles—not too far away from production—far ahead of what we in the studio industry are ready to accept. With technical innovation presently seen as a virtue in its own right, there is considerable pressure—or there will be—for studios to make decisions about your future requirements without having the discussion and background available. May I suggest that at this time our thoughts should be focused on this crucial question: what is our perception of the role of the piece of control room equipment we presently refer to as the mixing console/desk/board?

The first function is obviously the mixing of audio signals from a selection of sources and their redistribution to the required outputs. We then have signal processing functions and the master control room functions. That is where development appeared to remain until the mid '70s. The most important change in approach was the introduction by SSL of a system that has caused the console to change from a simple audio signal path manipulator to a central control system that has tied various elements of the control room under a single system control. There can be little doubt that the *4000* and *6000* series consoles have introduced this master control concept to many users even though they may have chosen the console because of other performance and facility aspects. But whatever their reason it is with this central control system that many studios are operating.

So the first question is 'Do we want the console to become the centre of all control room functions?' If manufacturers can co-operate and supply the necessary control information to allow this development to take place then this is a positive direction. But how far do we go? The first off-console facilities to be swallowed are/will be the tape machine remotes and the synchroniser facilities. With a digital signal path it becomes easy to bring many of the outboard signal processor facilities such as delay lines into the console. One logical end product of such a path is the Lucasfilm *ASP*/Droidworks *Sound Droid* that incorporates the recording facilities and some of the capabilities currently undertaken by outboard gear.

Over the next 12 months there will be many differing approaches on offer as manufacturers' differing design philosophies emerge. We will have to familiarise ourselves with the relative benefits of digital and analogue signal paths; assignable consoles of both types; consoles that contain sophisticated automation of in-console facilities and those that form the heart of larger central systems; resettable or partially resettable consoles, etc, and you the client will be asked to make the choice between some combination of these types of choices. Often, however, these consoles may be sold on their channel facilities and resetting automation alone. I think that now is the time to start looking beyond such functions—commercially important though they may be—towards the demands that we envisage making of studio facilities in five, 10 or 15 years time.

We should try thinking beyond our present restrictions and spend more time thinking in the absolute terms that some console designers are working in.

If you feel that some of these ideas are somewhat remote from your practical experience then it is you that this is aimed at. Remember many studios are already familiar with centralised control systems from a particular manufacturer. The changes that are about to occur will emanate from many directions and the wrong choice will be expensive—as will the right one. Now is the time for thinking.□

STUDIO SOUND
AND BROADCAST ENGINEERING

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■ **BEL BD320** Now with up to 32 seconds digital sampling, full bandwidth, external trigger, loop edit facility, VCA.

■ **DRAWMER T102** Two channel trigger interface provides variable length tone bursts and can create logic pulses for triggering outboard effects. Manual or auto reset allows single or continuous sequencing, selectable delay plus invert control.

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■ **RANE PE15** Five band parametric, 1.5 to 0.03 octave bandwidth, 20db cut for notch filter capability, end bands switchable to shelving mode, individual by-pass, four octave sweep.

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■ **DRAWMER VACUUM TUBE 1960** Dual compressor limiter using vacuum tubes in conjunction with semi conductors. Saft-knee compression characteristics. Classic valve guitar sound, stereo linkable.

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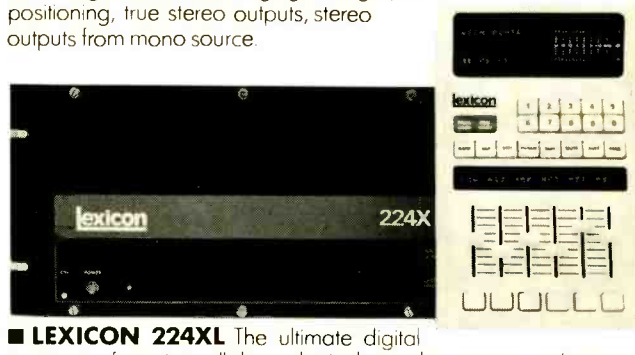

■ **LEXICON 224XL** The ultimate digital processor featuring all hyperthetical reverb programs plus many effects and split programs. LARC Remote/control, 60 stores.

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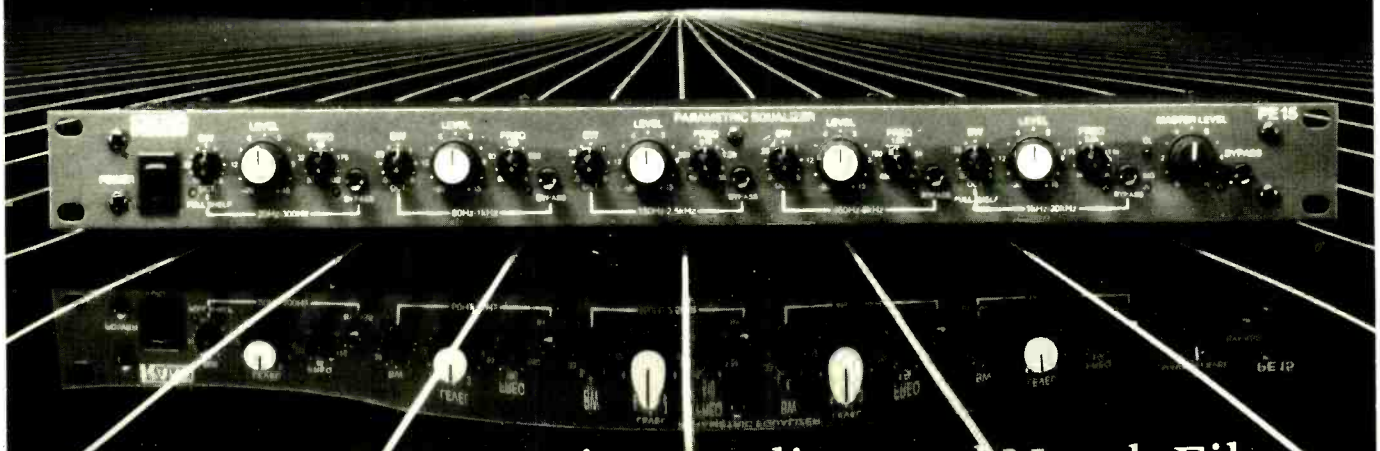

The PE 15 Parametric Equalizer and Notch Filter

We got carried away again, making another single box do all kinds of different things so that you can do your job that much better. We started with a single space steel chassis, tucked an unparalleled FIVE parametric bands into it, then made each of these bands incredibly flexible:

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Rane is literally re-defining the relationship between cost and comprehensive quality. The PE 15 is more proof positive.

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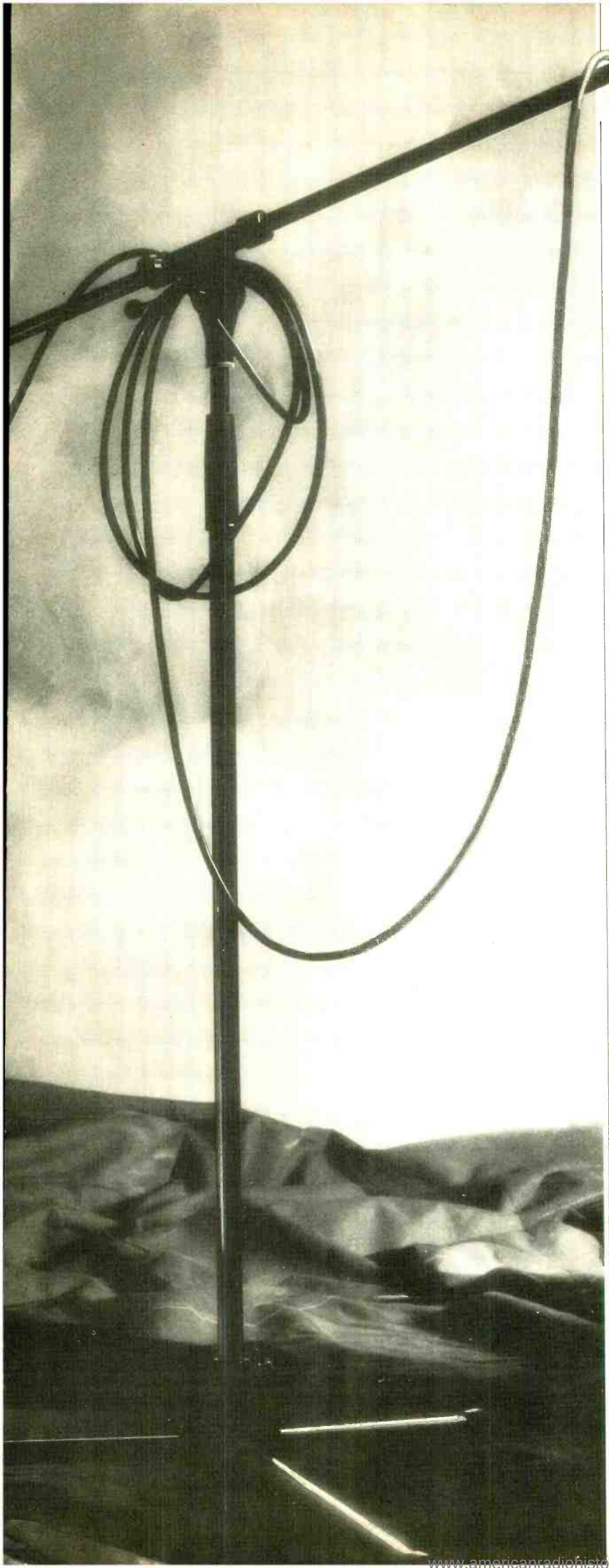

If it's your job to get sound onto tape you'll know there's no one 'right' way to do it, there are just degrees of quality and control.

Between the sound made by an instrument to the final master, there are an infinite number of options.

Choosing what you're going to place between the sound source and the finished product, is a profoundly important part of the production process.

Where do you go from here?

The wrong decision, particularly when you're buying equipment can be an endless source of frustration. There are, after all, any number of experts only too willing to help you part with your money.

At Turnkey we take a slightly different approach. We'd rather not make a sale than have a dissatisfied customer. (The proof of this lies in the fact that the majority of our turnover comes from repeat business.)

Our staff are specialists. They know about equipment inside and out, in some cases they have actually designed and specified it.

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CLUE is a unique computer-based logging, autolocation and editing system, designed for use with VCR's, especially those employed in digital audio mastering.

It provides superior counter/timer displays, stores extensive information concerning each take in a session – title, start location, length etc – and provides intelligent autolocation based on this logged data.

CLUE also allows frame-accurate editing of digital material encoded using Sony's low-cost digital processors PCM-F1 and PCM 701ES, as well as the PCM 1610/1630.

Options available include a printer interface that allows the creation of a hard-copy record of the logged data, and a time-code reader for more accurate location; this will read both SMPTE and EBU code.

CLUE will operate with either Sony Betamax recorders or V series U-matics or a combination of both.

CLUE will also handle both PAL and NTSC video formats.

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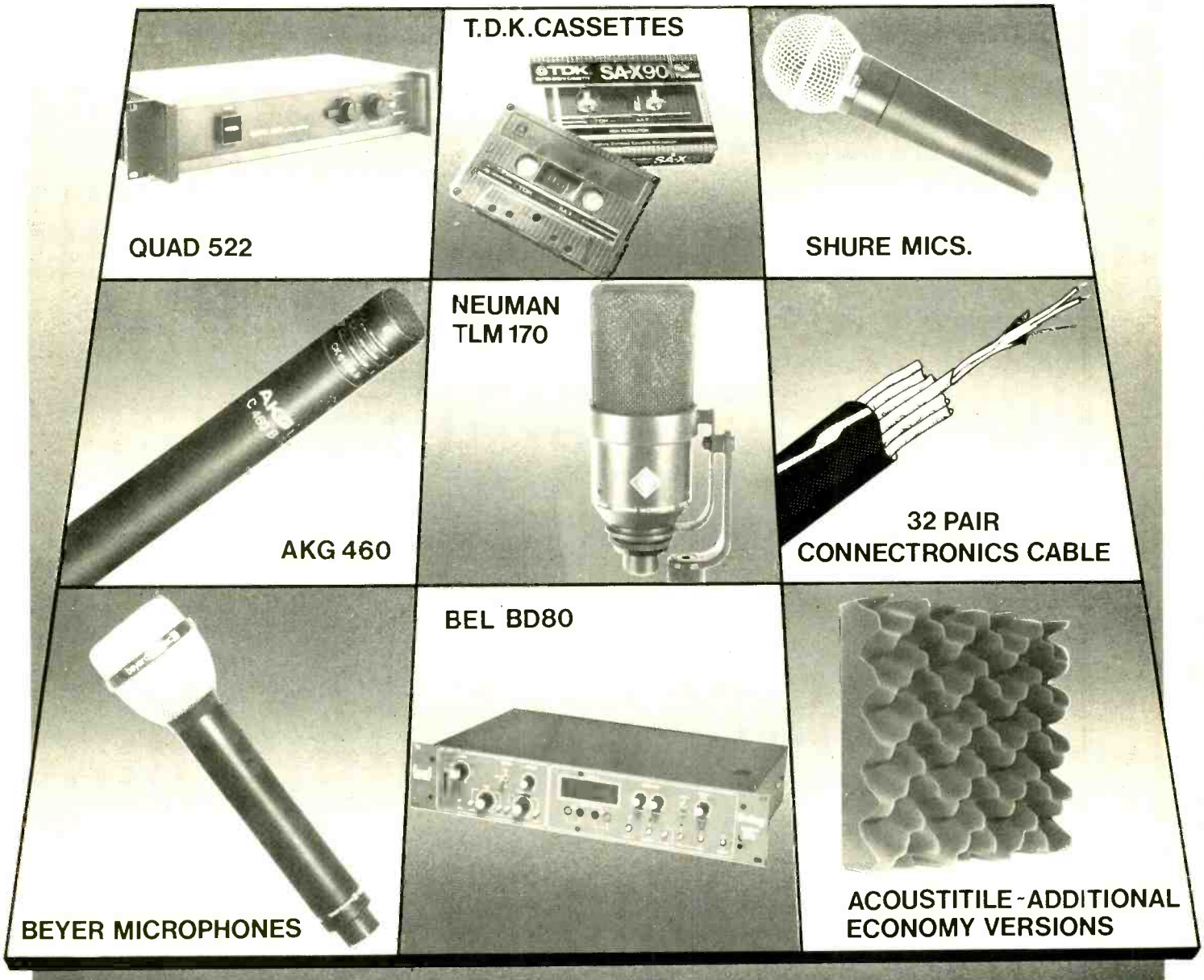
NEW PRODUCT PROFILE



Room Service?

HHB's reputation is founded on quality, value for money and service, as well as its commitment to the new technology of digital recording.

So, as digital multitrack has yet to become an affordable reality for most people, we have sought out a superb range of packages to fill the gap in analogue 24 track choice.

We feel these make sound economic sense in the 2" jungle.

The picture shows the superlative Total Audio Concepts 'Matchless' console – one of the large range from Amek/TAC – and the Sony/MCI JH2424, which has an established reputation for quality and reliability, further enhanced by Sony since their acquisition of MCI. This package of console and recorder, complete with autolocator and audio remote, costs the same as some recorders alone, but makes no compromise on quality yet saves thousands of pounds.

Alternatively, for an even higher mixer specification, we can offer any of the other Amek/TAC consoles, such as the Angela or 2500 series, both of which are available with automation if required.

All these consoles feature the famous Amek EQ, thought by many to be the finest available, as well as the facilities that make Amek consoles world leaders.

In addition to the analogue Sony 24 track recorder, we can also offer their digital PCM 3324, as well as the top-line Studer range.

Of course a multitrack system does not start and finish with the mixer and recorder; we can also supply everything you need from digital mastering systems through signal processors and monitors to microphones and hardware.

We can also put you in touch with the country's top acoustic consultants, and gain access to the amazing Tecron TEF 10 audio analysis computer.

All this is naturally supported by HHB's established advice and back-up service.

So if you're on the horns of the 24 track dilemma, why not try HHB's Room Service, and call Martin Westwood.

HHB

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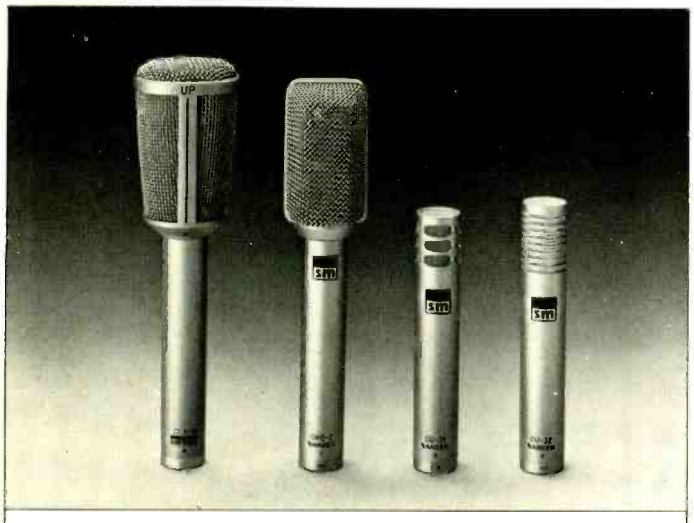

SANKEN INTRODUCES FOUR MORE MICROPHONES

Maker of world-acclaimed CU-41 double-condenser microphone releases new products to international market.

Sanken Microphone Co., maker of the CU-41 two-way condenser microphone, famed among sound engineers throughout the world for the transparency of its recording qualities (which make it perfect for compact disk recording), is pleased to announce the release of four more of its high quality microphones to the international market. The microphones are:

CMS-6 MS Stereo Microphone A small, lightweight, hand-held microphone for high quality outdoor radio, TV and movie recording. Comes with portable battery power supply and switchable matrix box. Freq. response 50Hz to 18kHz, dynamic range 108dB, self noise less than 19dB.

CMS-2 MS Stereo Microphone For quality music, radio, and TV studio recording. Small and lightweight, it has been widely used in Japan for more than eight years. Freq. response 20Hz to 18kHz, dynamic range 129dB, self noise less than 16dB.

CU-31 Axis Uni-Directional Condenser Microphone and CU-32 Right Angle Uni-Directional Microphone For music, radio, TV and movie studio recording. Renowned for their high performance and remarkable reliability. Freq. response 20Hz to 18kHz, dynamic range 129dB, self noise less than 19dB.

For more information on these new microphones, as well as on the famous CU-41, contact your nearest Sanken dealer, as listed below.

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MS-MULTIMIX

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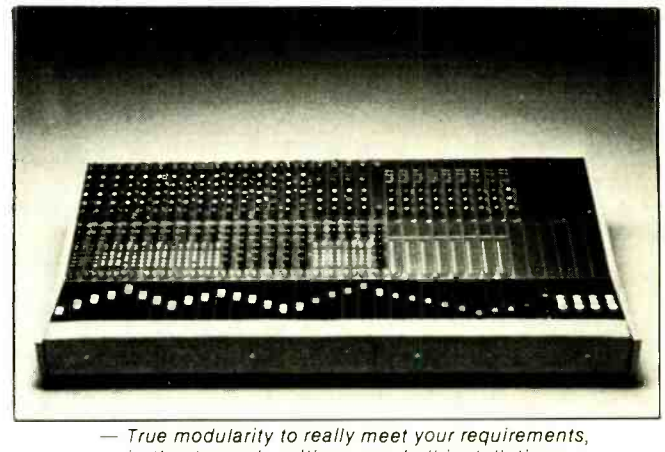

- *True modularity to really meet your requirements, in theater and multipurpose hall installations.*
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- *Stores up to 600 cues (scenes) on floppy disk*
- *Controls up to four tape recorders.*
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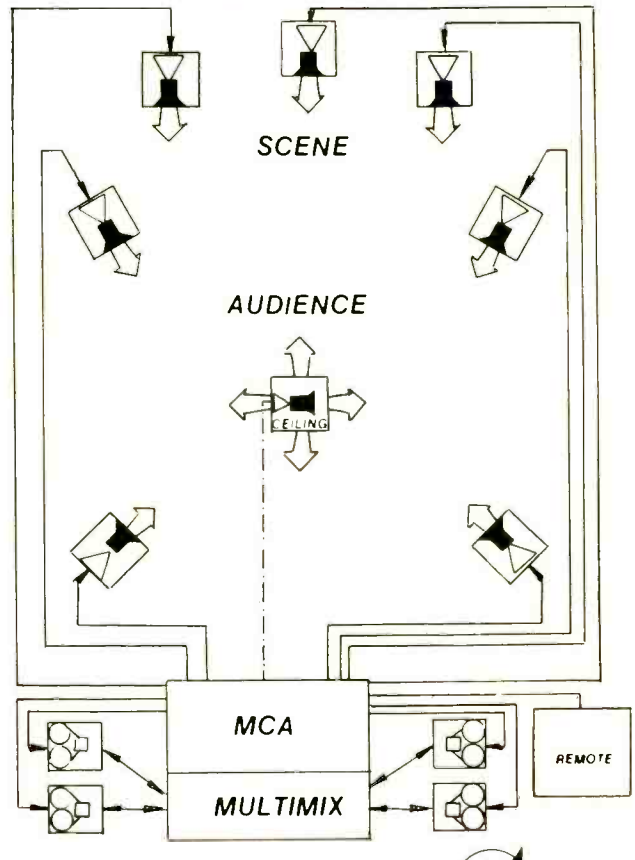
- *System operation by single cue entry push button.*
- *Pocket terminal for remote control and cueing.*
- *Optional speaker switching matrix.*



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More effects from HHB.

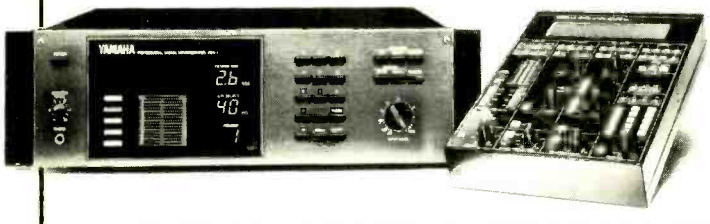
Introducing the amazing Yamaha REV 7 digital reverb + effects processor.

At last, a professional quality, programmable digital reverb, with the sounds and features you want, at a price so low you won't believe it.

Here are a few of the REV 7's features:

- ☐ True or simulated stereo.
- ☐ 30 factory presets and up to 60 user stores.
- ☐ Hall, Plate & Room reverb programs.
- ☐ Reverb available with gating, reverse, flanging...
- ☐ Early reflection programs.
- ☐ L/R delay and stereo echo.
- ☐ Stereo phasing and flanging.
- ☐ MIDI interface.
- ☐ Remote control.
- ☐ 16 bit @ 31.25 kHz sampling giving 20-12kHz response.
- ☐ 3 band parametric EQ.

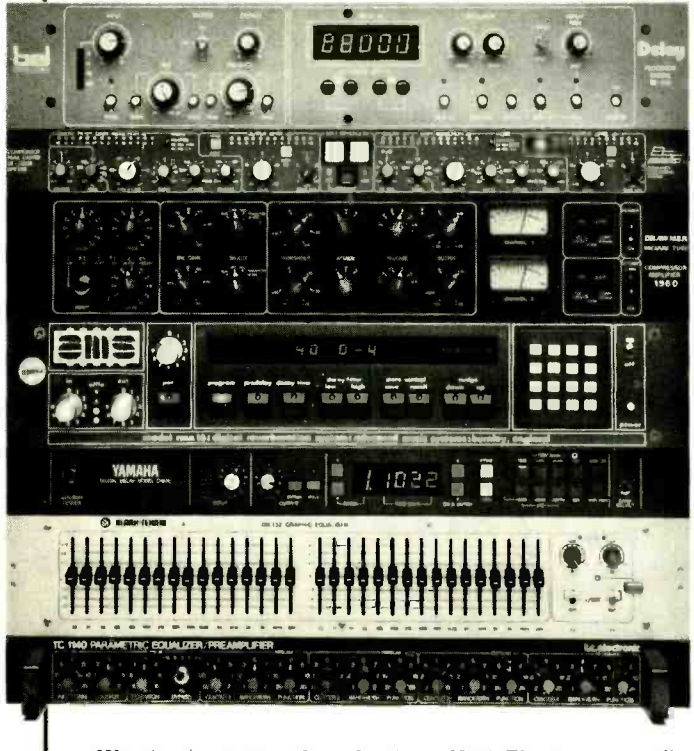
£1040



For the more demanding user, don't forget Yamaha's original REV 1 digital reverb with its full function remote control at £6595.

At £1040 the REV 7 must be the year's best buy; send now for colour brochure.

In addition to the REV 7, here are some more gadgets from HHB's effects collection:



The newest from the BEL stable, the BD320 gives all the functions of the popular BD80, but with up to 32 (yes 32) seconds of delay. BD80 £695 (2 secs) + £200 per extra 2 secs. BD320 £1200 (8 secs) + £500 per extra 8 secs.

The BSS DPR402 is an all in one dynamics processor, providing compression, peak limiting, de-essing and expansion, all with frequency keying all in a 1u package £615.

For that authentic 60's sound, DRAWMER's 1960 valve compressor/pre-amp is a must. "Soft knee" compression, microphone inputs, side chain operation etc £750. (Don't forget the DL221 @ £325, and DS201 @ £275.)

The AMS RMX16 shown here is the state-of-the-art in programmable reverb. We also try to keep the DMX 15-80 DDL/pitch transposer, but demand is high so order now. RMX16 £4680. DMX15-80 £POA.

The YAMAHA D1500 is a low-cost, high-value programmable DDL with MIDI interface; it gives up to 1 sec delay, with 16 user memories. Our price is so low that we don't dare print it! £POA.

KLARK-TEKNIK's range of equalisers should need no introduction: they are simply the industry standard for graphics. We also stock other Klark-Teknik products, such as their excellent digital reverb and the DN60 analyser. DN332 (shown here) £525. DN360 £980. DN60 (analyser) £1650. DN780 reverb £3580.

TC ELECTRONICS TC2240/1140 are stereo/mono 4 band fully parametric equalisers offering 20dB of cut and boost. We think they are the best value and best sounding outboard EQ's around. TC2240 £330. TC1140 £195.

We also keep toys from Lexicon, Urei, Electrospace, dbx, Eventide and many more. Our demo room is ready for you to try before you buy, or take advantage of our mail order service for best prices and free delivery.

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JUNE 1986

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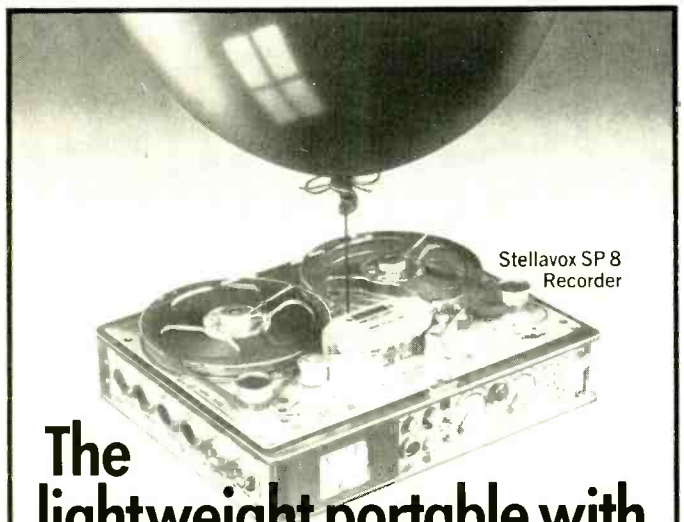

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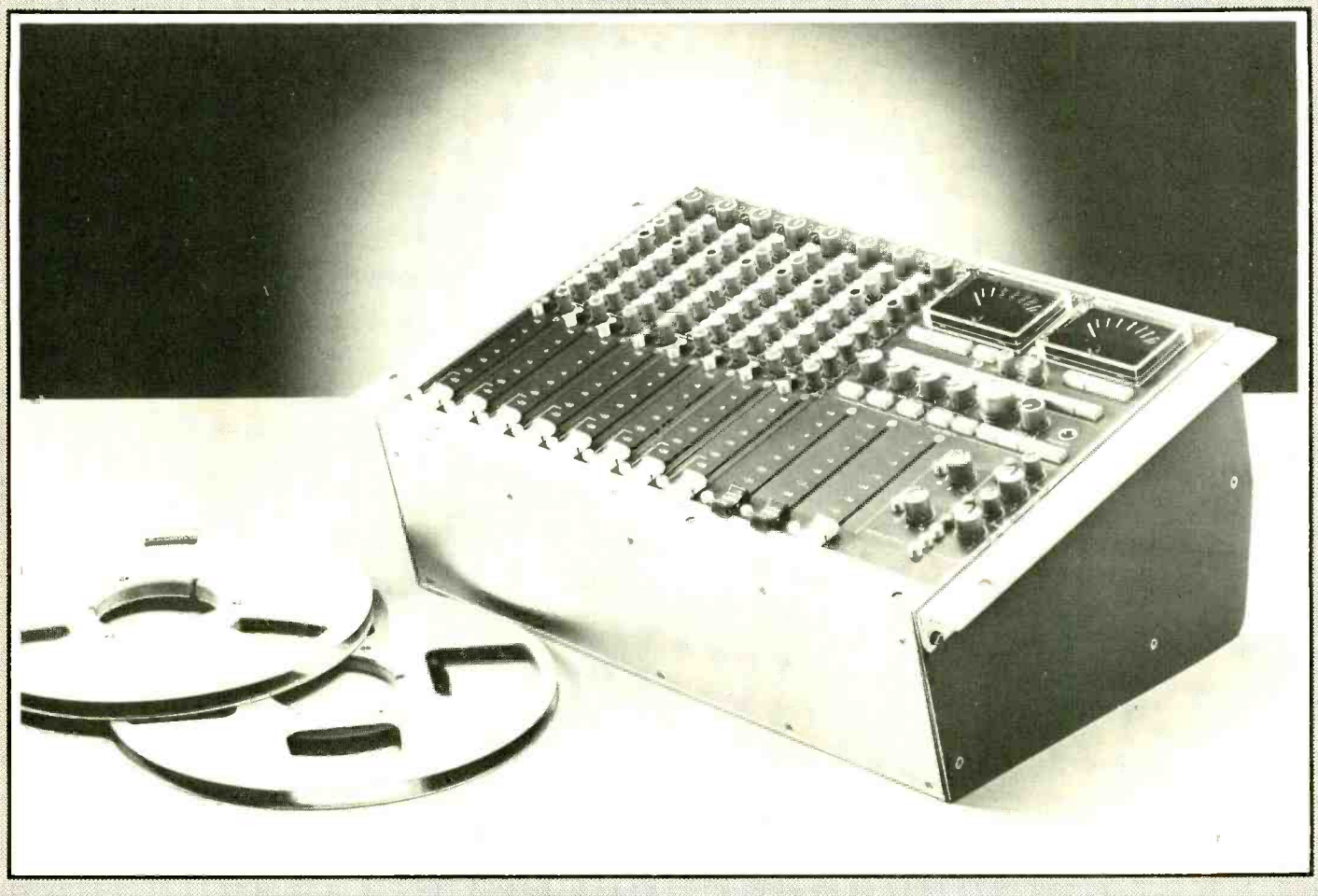

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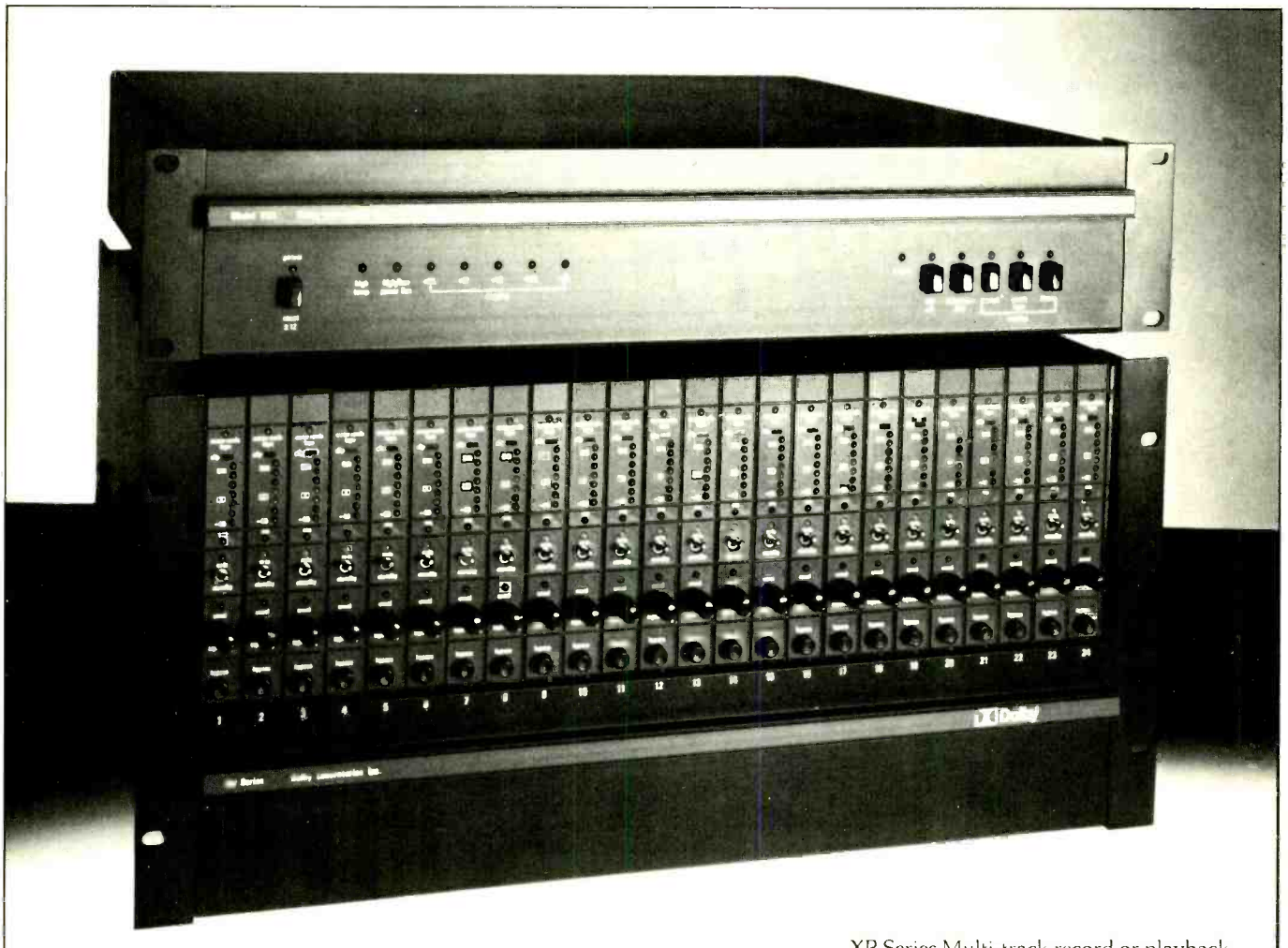
The Dolby XP Series Professional Cost-effective

NEW



XP Series Multi-track record or playback.

The Dolby XP Series contains up to 24 channels of Dolby A-type noise reduction in 12¼" of rack space, including power supply. The XP Series utilizes an on-board, integrated noise reduction circuit instead of the interchangeable Cat. No. 22 modules used in the SP Series, providing the same A-type noise reduction at a price over 20% lower.

Each XP noise reduction channel consists of a plug-in Cat. No. 331 module which contains the Dolby A-type noise reduction circuitry, precision input and output amplifiers with low distortion, controls, and an accurate LED calibration display. The separate, regulated PS3 power supply, designed for rack mounting directly above the noise reduction unit chassis, contains fan cooling and electronically-controlled output protection.

The XP Series includes "uncal" controls, permitting convenient resetting of Dolby level for playback of and punch-in on tapes from studios with different Dolby level standards. The user can select the option of "hard-wired" or electronically-buffered bypass of individual channels or all channels simultaneously. The XP offers discrete FET switching for reliable, noise-free routing of audio signals. For convenience of wiring and for stability, a new detachable multi-channel connector plate is used, with tie bar for the cable form.

Dolby noise reduction is a mainstay of professional multi-track recording in studios throughout the world for music, film, broadcast, television, and videotape production. Over 90,000 channels are now in use world-wide. The benefits of Dolby A-type — improved signal-to-noise ratio, lower distortion, and reduced cross-talk and print-through — are achieved with a minimum of signal processing and with resultant high signal integrity.

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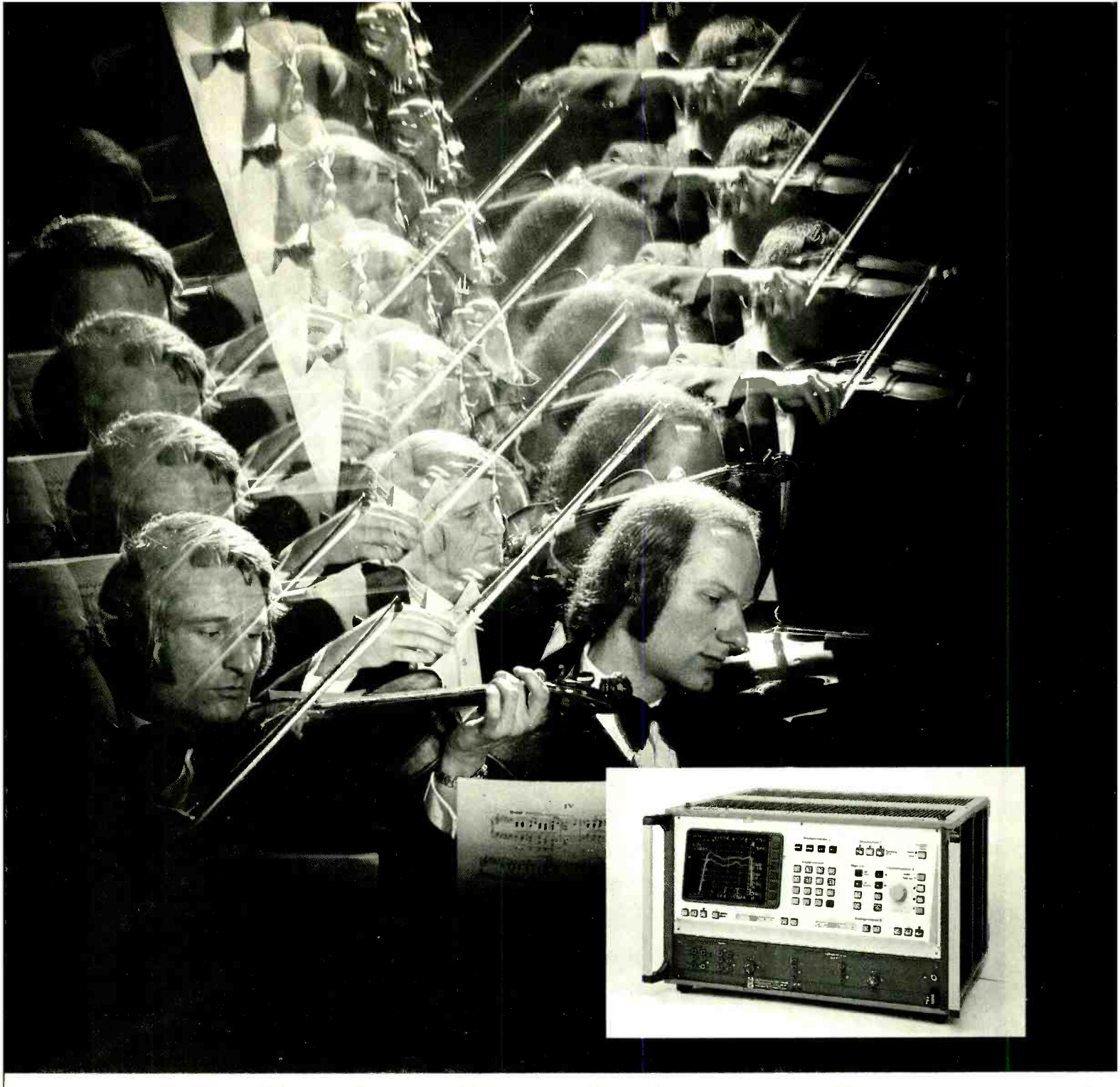
L85/300



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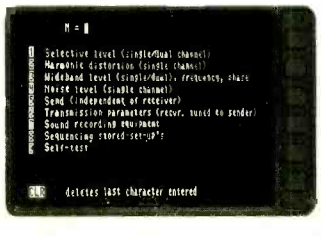

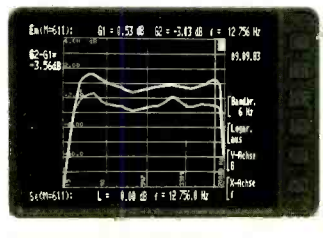

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☐ the NFA-1 colour prospectus
☐ info on AF measuring techniques
☐ a discussion with a sales engineer

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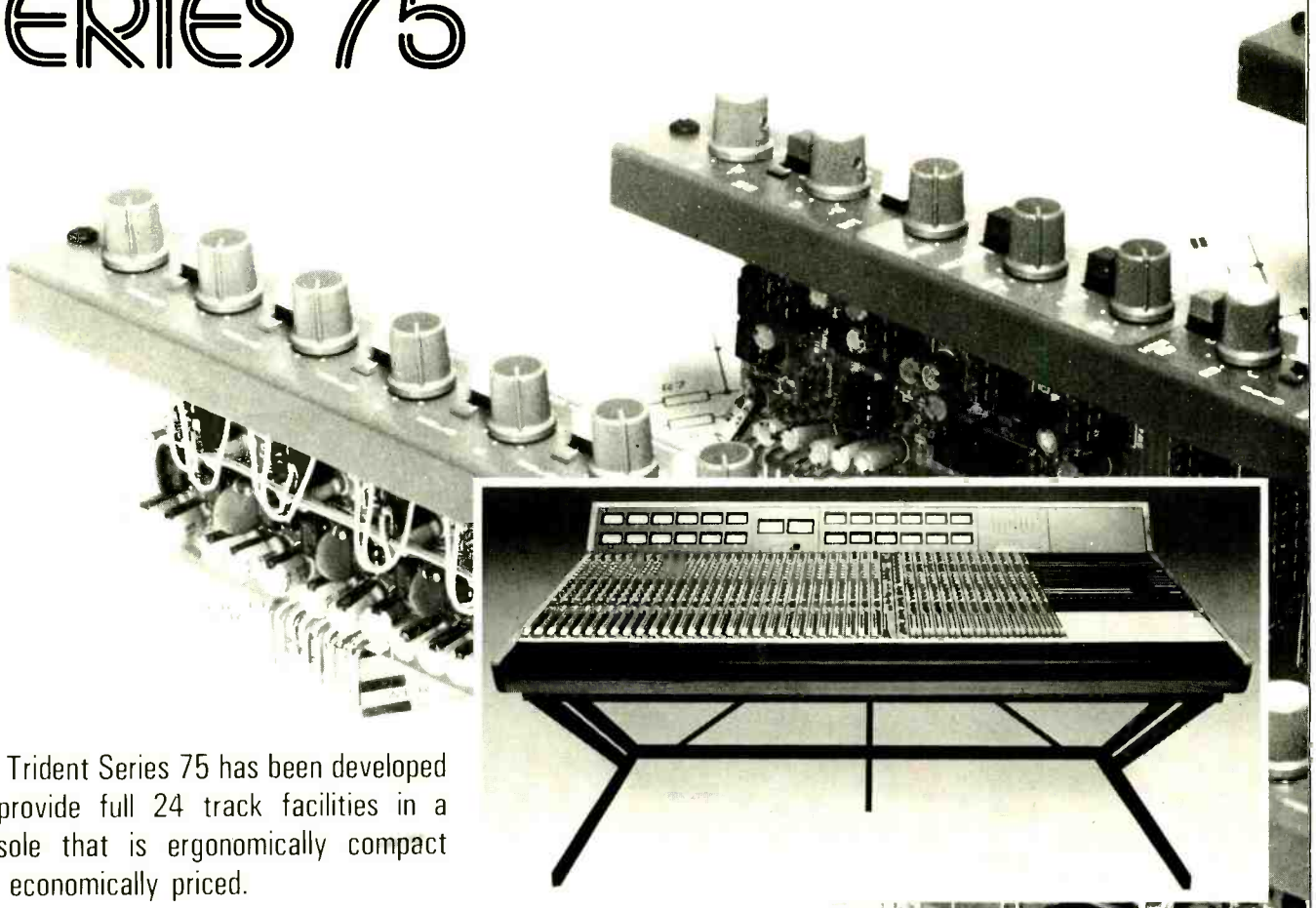
SERIES 75



The Trident Series 75 has been developed to provide full 24 track facilities in a console that is ergonomically compact and economically priced.

Because of this, the Series 75 is equally suitable for use in a musician's home studio or a commercial multi-track facility.

The electronics design of the console allows no compromise. Trident have been manufacturing consoles that are used in world class studios for the past dozen or so years and enjoy a reputation for providing particularly warm and musical sounding equalisation. Series 75 carries on this tradition in characteristic style.

A feature of the console is its comprehensive, separate monitor section that provides monitor equalisation and the availability of up to 56 line inputs during mixdown, complete with equalisation, panning, aux sends and muting. A full 308 point bantam patchbay is also provided as standard.

Take a close look at the Series 75. We'll be surprised if you can find a console with a better reputation and more features at the same price.

TRIDENT

Trident Audio Developments Ltd.
Trident House, Rodd Industrial Estate,
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The above prices do not include VAT

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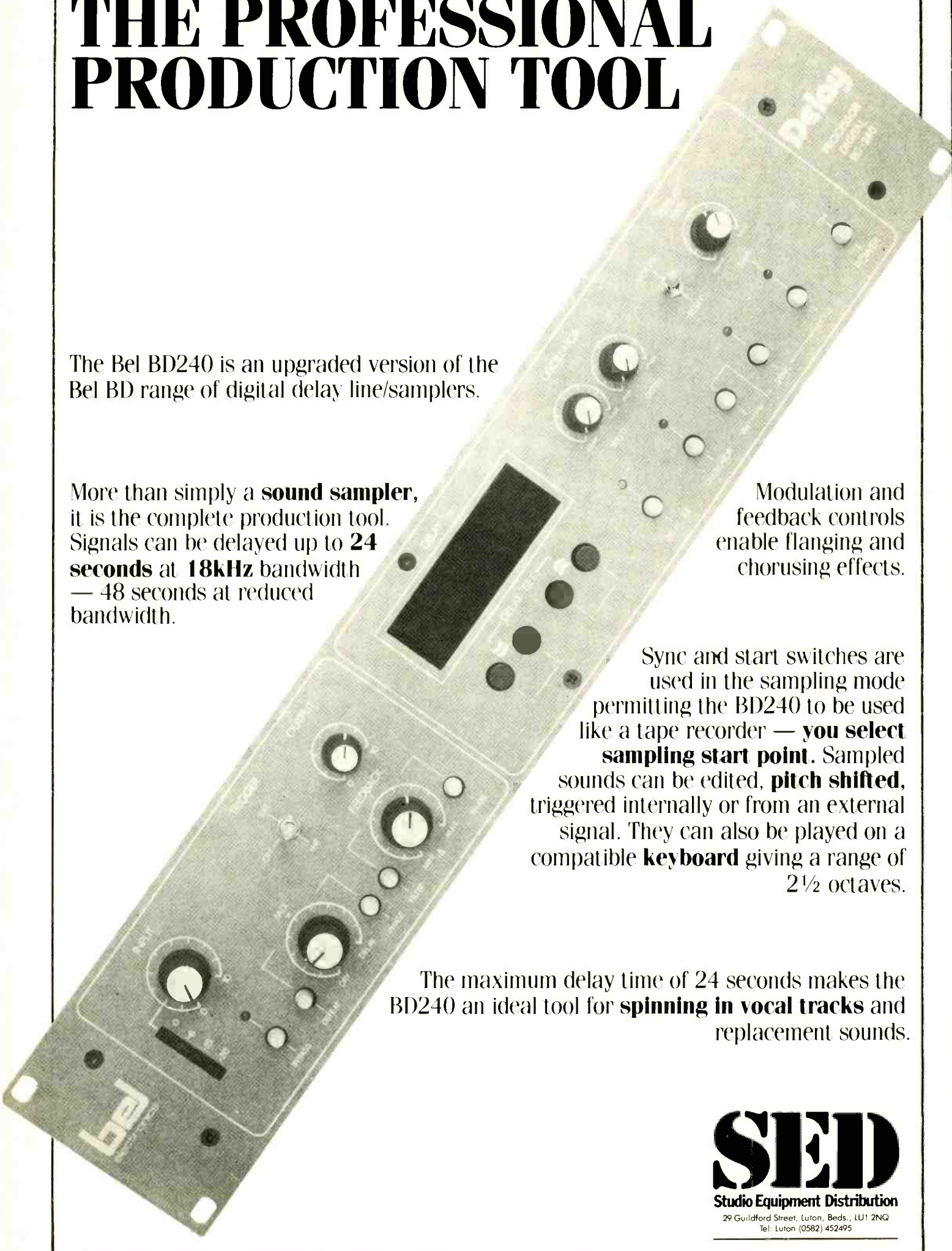

The Bel BD240 is an upgraded version of the Bel BD range of digital delay line/samplers.

More than simply a **sound sampler,** it is the complete production tool. Signals can be delayed up to **24 seconds** at **18kHz** bandwidth — 48 seconds at reduced bandwidth.

Modulation and feedback controls enable flanging and chorusing effects.

Sync and start switches are used in the sampling mode permitting the BD240 to be used like a tape recorder — **you select sampling start point.** Sampled sounds can be edited, **pitch shifted,** triggered internally or from an external signal. They can also be played on a compatible **keyboard** giving a range of 2½ octaves.

The maximum delay time of 24 seconds makes the BD240 an ideal tool for **spinning in vocal tracks** and replacement sounds.

SED

Studio Equipment Distribution

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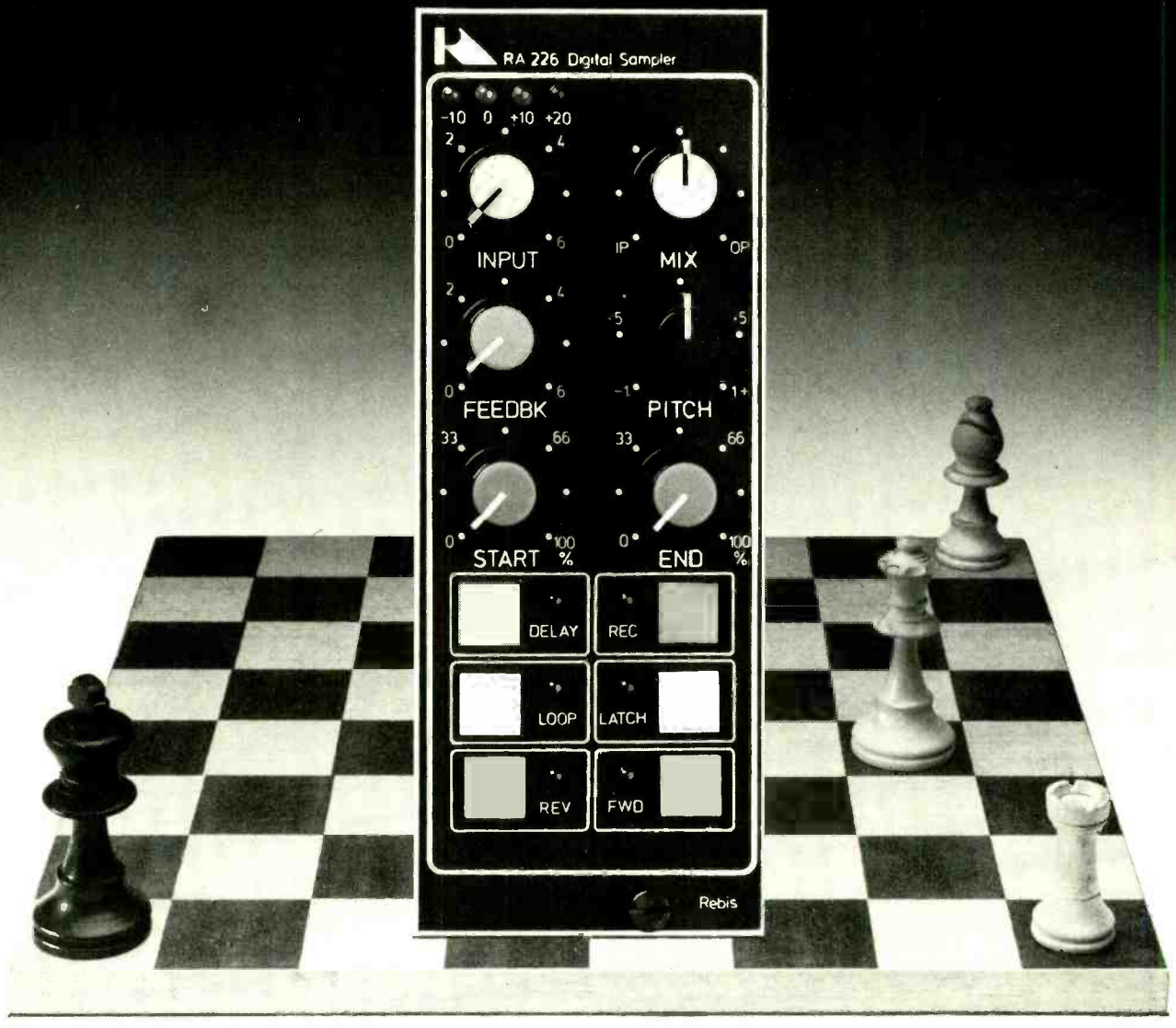
The most intelligent move yet!



The RA226 Sampler represents a price breakthrough in digital audio technology.

Using innovative techniques in software driven processing this new Rebis module gives you 5.25 seconds record/playback expandable to 21 seconds on board, maintaining 16kHz bandwidth.

Variable two octave pitch shift also lets you take advantage of a useful range of time/bandwidth settings through to 84 seconds at 4kHz

Auto trip makes recording simple. Start and end controls define the memory zone for record and playback to enable precise editing and splicing of single or multiple samples.

Forward and reverse playback modes plus loop, one shot and step functions with momentary or latching action ensure full creative control.

External inputs are provided for CV keyboard, DC remote and audio trigger.

Delay mode for ADT and repeat echo can be used without erasing samples from memory.

The RA226 Digital Sampler is one megabyte of pure processing power made so instantly accessible you may never read the manual!

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DIARY

Installations, agencies, addresses

DEAF Awards dinner

The 1985 DEAF Awards dinner will take place at the Hilton Hotel on the evening of December 20th. This year's committee includes Rodger Bain and Gloria Luck of CBS Studios; Derek Witt, corporate PR, CBS Records; Virgin Studio's MD, Barbara Jeffries; and Robin Millar, Power Plant MD. Taking care of finances and accounts for the second year running is Do Bell of AIR, London. Mike Cooper of FWO Bauch has produced the DEAF diary with Phil Graham of *Music Week* selling ads.

There is still time to provide cash donations or prizes for the draw and offers of help for the dinner itself (table novelties, the cost of making an Award, entertainment, etc) will be happily received by Gloria Luck at CBS Studios.

ACO Pacific correction

We would like to correct an error made in the manufacturers/distributors listing in the microphones review in the October issue. Under manufacturer ACO Pacific's address we listed the UK distributor as Audio Video Marketing. Unfortunately a line was transposed and this distributor should have been given as the UK distributor for Milab. At present there is no UK distribution for ACO Pacific.

We apologise for any problems that this mistake may have caused.

Address changes

- Keith Monks (Audio) Ltd and Amdio Ltd have moved their operations to Progress House, Albert Road, Aldershot, Hants GU11 1SZ, UK. Tel: 0252 334121/2 (Amdio) and 0252 334123/4 (Keith Monks).
- SynthAxe Ltd the synthesiser control company has moved to Four Seasons House, 102b Woodstock Road, Witney, Oxfordshire, UK. Tel: 0993 76910.
- Highland Recording Studio, Gollanfield, Scotland has a new telex and telephone number. The new telex number is 265871 MONREF G quote MAG95082. Tel: (studio and bookings) 0667 62304, (bookings only) 0667 62570.
- Trident Audio Developments has moved to Trident House, Rodd Industrial Estate, Govett Avenue, Shepperton, Middx TW17 8AQ, UK. Tel: 0932 224665.
- Drawmer Marketing & Sales have moved and are now located at Unit 4, Brook Lane North, Brentford, Middlesex, UK. Tel: 01-847 2890.

Voiceprints—a new art medium?

An interesting combination of video computer techniques and sound sampling has been developed by artist/designer Les Arnett and Electronic Data Systems' computer expert John McNulty. For a recent EDS sponsored symphony concert Arnett and McNulty set about creating a full colour 'voiceprint' of Mahler's First Symphony as an original souvenir of the concert.

Starting with a complete digital recording of the work they initially mapped the performance using Fourier analysis and a Vax computer. A 'snapshot' of the entire musical work was then taken from a Tektronix colour oscilloscope and enhanced using the Quantel Paint Box. The results are claimed to be quite stunning with a full spectrum of colours, and according to Les Arnett every piece of music has a totally different voiceprint. With the range of colours available in the Quantel system there is enormous scope for artistic interpretation.

Various commissions have already been accepted and if you are interested further details can be obtained from John McNulty, Tel: 0923 28466, or direct from Les Arnett, Van der Graph, 4 Glemsford Drive, Harpenden, Herts, UK. Tel: 05827 4318.

Official BBC/Neve handover

In a brief ceremony on September 16th, at BBC Broadcasting House, London, Neve Electronics officially handed over the fully digital *DSP* console to the BBC. The console has been the result of a collaborative agreement between Neve and the BBC's Engineering Research Department whose COPAS digital audio processor formed the basis of the design.

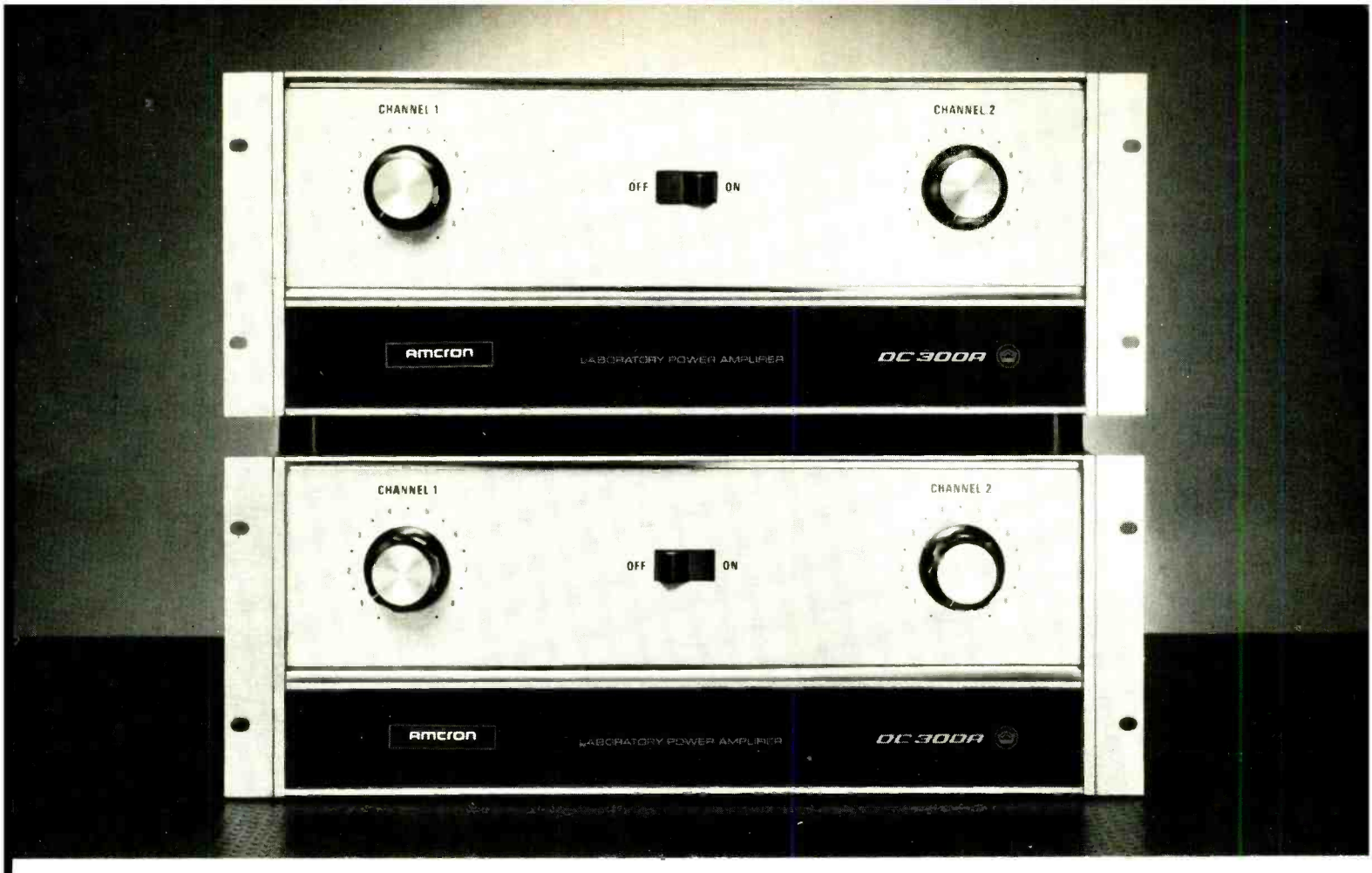
This is the second full *DSP* console in use and although similar to the system installed at CTS Studios, it has several major differences. The system has 48 analogue mic/line inputs and 30 outputs with a variety of other analogue interfaces. Digitally there are full interfaces for a digital multitrack together with four tape machine returns. There is no separate monitor section for multitrack work but the desk can flip its functions to a monitoring mode at a single switch.

The console is installed in an equally unusual mobile truck that the BBC refer to as a DCV (Digital Control Vehicle). This is an articulated truck with three major areas—control, recording and equipment. Most interesting is the control area whose sides can be extended at rest by hydraulic rams to increase the cubic area from 20 to 30 m^3. The recording area has two Mitsubishi *X80* digital 2-tracks with BBC designed interfaces to transcode between AES/EBU and Mitsubishi formats. There is also provision for analogue and digital multitracks.

The BBC have described the vehicle and console as experimental in the context that they will be using it in a wide range of applications so they may learn the maximum amount to help them in future equipment planning. First recording outing for the truck was Choral Evensong, at Kings College, Cambridge University on November 1st.

Agencies

- Solid State Logic has announced the appointment of Audio Intervisual Design of Los Angeles as its special consultant for large-scale film and video industry projects. Audio Intervisual Design, 8456 West Third Street, Los Angeles, CA 90048, USA. Tel: (213) 653-0240.
- Audilec Distribution has been appointed main UK distributor of Audio Technica sound reinforcement microphones, ie *800* and *Unipoint* series. Audilec Distribution Ltd, Unit 16, Laurence Industrial Estate, Eastwoodbury Lane, Southend-on-Sea, Essex SS2 6RH. Tel: 0702 511661.
- Custom Cable Services, the sole UK importer of Monster Cable products has appointed Wilmex to distribute the Monster *Prolink* range. Wilmex Ltd, 35 High Street, New Malden, Surrey KT3 4DE. Tel: 01-949 2545.
- Harrison Systems Inc and Westlake Audio Professional Sales have announced the re-establishment of their dealer relationship. Westlake Audio Professional Sales will represent Harrison's full range of 16, application specific, audio console systems. ▷



This much power in this much amp.

The Amcron tradition of peerless performance was established with the introduction of the legendary DC300 series in 1967. Now, in 1985, on the back of modern technology and two decades of experience, Amcron bring you the Micro-Tech 1000 amplifier.

The Micro-Tech 1000 is the amp we've all been waiting for – lightweight, compact, and with more than enough punch to suit the increased power requirements of the digital age. These are the facts:

- ☐ 400 watts RMS per channel into 4 ohms.
- ☐ 500 watts RMS per channel into 2 ohms.
- ☐ 1000 watts RMS into 4 ohms – bridged mono.
- ☐ Safe operation at high power to 1 ohm.
- ☐ Reversible forced-air cooling.
- ☐ Amcron performance in 3½"rack space.

We believe that these facts, coupled with Amcron's reputation speak for themselves. But if you wish to know more about the Micro-Tech 1000 and how it can solve your headroom problems, call HHB Hire & Sales at: Unit F, New Crescent Works, Nicoll Rd, London NW10 9AX. Tel: 01-961 3295. Telex: 923393.

Amcron

HHB

DENMARK, AVIDAN 02-179591. FRANCE, SCV AUDIO 01-8632211. ITALY, AUDIUM 02-2537853. HOLLAND, IEMKE ROOS 020-972121. SPAIN, AUPROSA 03-3517011. SWITZERLAND, MUSICA 01-2524952. WEST GERMANY, MUSIK PRODUCTIV 05451-140612.

DIARY
DIARY

Events, management, licensees

Mixing consoles

We had hoped to bring you an appraisal of the latest developments in this area but due to the number of manufacturers who will be launching new models and innovations at the New York AES we have been unable to gather enough information to make this worthwhile: our report would have been out of date by the time of publication.

It is anticipated that full details will be available in the January issue.

Forthcoming events

- **November 27-29,** ITAME '85 (International Test & Measurement Exhibition), Olympia 2, London.

1986

- **January 17-19,** NAMM Winter Market, Convention Center, Anaheim, California.

March 4 to 7, 80th AES Convention, Congress Center, Montreux.

March 10 to 14, Fiarex Electronics Trade Fair, RAI, Amsterdam.

November 12 (papers) 13 to 16, AES, Los Angeles.

Studio Management Services

Studio Management Services is a new Australian agency formed to exclusively represent a number of leading producers and engineers including Tony Buetell, Chris Corr, John French, Ross Fraser, Karen Hewitt, Trevor Lucas, Ian 'Mack' McKenzie, Martin Pullan and Eddie Raynor.

Although Studio Management Services operates from Platinum Australia's studios the people it represents are available for work anywhere in the world and while SMS aims to secure more production work for Australian talent it recognises that there will always be a demand for overseas producers. It also represents a number of English and American producers in Australia. The agency does not get directly involved in negotiations for international producers but provides information on previous credits, availability, cost, etc, and general co-ordination.

Studio Management Services, 643 Chapel Street, South Yarra, Victoria 3141, Australia. Tel: (03) 241-7485.

ADA becomes DeltaLab licensee

ADS Signal Processors has been granted a non-exclusive licence for the use of delta modulation technology under four patents of DeltaLab Research Inc.

Simultaneously, a lawsuit which was initiated by DeltaLab has been settled by consent judgment. Analog & Digital Systems Inc (ADS), which bought certain assets of DeltaLab Research including the patents, will receive a one-time licence fee and a per-unit royalty based on the sales of ADA. Specific terms were not disclosed.

Richard E DeFreitas, founder of DeltaLab Research and now pro audio vice president of ADS, said, "I have long been convinced of the superiority of Adaptive Delta Modulation technology over PCM-type digital sound processors. The Patent Office's reconfirmation of our patents and the consent judgment in this case mean that other competitors who use delta modulation should be very willing to become licensees of ADS rather than face litigation."

NEW!

The Aphex Aural Exciter® Type C

The Best Way to Improve Your Sound System Just Got Better.

And more affordable!
Like the famous Type B, the new Type C restores natural brightness, presence and detail to live and recorded sound... and does it more quietly and musically! Lyrics will have more intelligibility... guitars more bite... drums more kick. The overall mix will be cleaner, more natural and exciting.

The Type C is the best way to improve any sound system. It adds that *extra edge* that is impossible to add with any other processor. Live sounds fill the room without all the problems of high frequency EQ. Multitrack tapes made on narrow format machines will sound like they were made on expensive studio recorders. Even cassette dupes will have an unmuffled, professional sound.

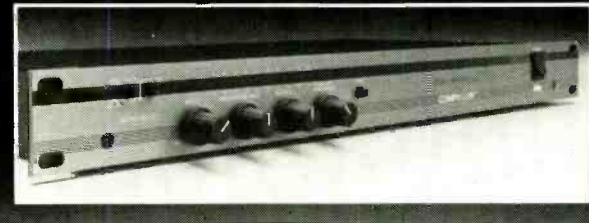
Hear the difference *only* a genuine Aural Exciter can make at your dealer today. Or write us for more information and the name of your nearest dealer.

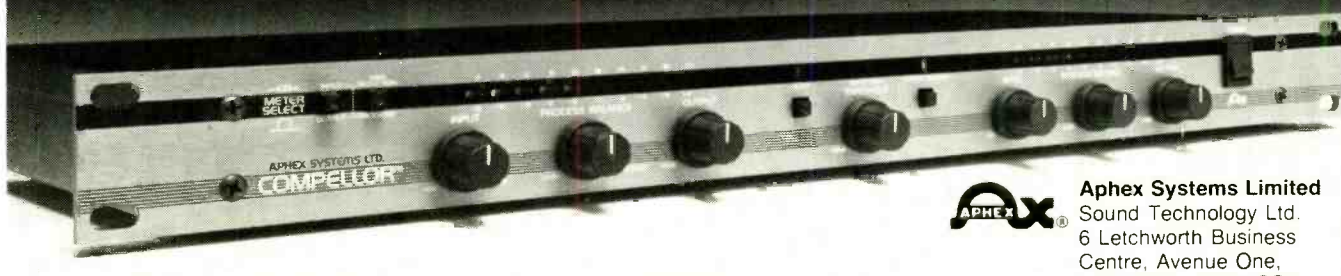
The Aphex Compellor.™

Invisible Compression in Stereo or Mono.

The Aphex Compellor is the most acclaimed compressor/leveler/peak limiter ever made. With good reason... you simply can't hear it work. It doesn't add *any* color or other sonic effects. Best of all, the Compellor is easy to use. Set it once and it goes to work automatically... inaudibly controlling your dynamics.

Ask your professional sound dealer for a demonstration of the remarkable Aphex Compellor. Available in monaural and stereo versions. Or write us for the name of your nearest dealer and more information on the full line of innovative Aphex products.





Aphex Systems Limited
Sound Technology Ltd.
6 Letchworth Business Centre, Avenue One, Letchworth, Herts SG6 2HR

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East Coast Audio Sales, Melbourne

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Wynberg, Sandton

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DIARY

DIARY

Companies, awards

Chrysalis/Air/MAM merger

The summer reverse takeover of Management Agency and Music by the Chrysalis/Air Group and the public flotation of the subsequent amalgam Chrysalis Group PLC, brings a number of important London recording facilities together within the same corporate structure.

The Air/Chrysalis facilities are Air's 4-studio complex, the Wessex Sound 2-studio complex and the Air-Edel 8-track facility. The latter is used mainly for Air-Edel's own demo work and in-house projects.

The two companies previously operating within the MAM congolomerate are Audio International Recording Studios and Research Recordings. Audio International have two studios, one 24-track and the other a smaller 2-, 4-, and 8-track studio. Research Recordings is primarily a broadcast post-production video facility with a satellite up-leg operating on 1 in C-format, encompassing computer graphics and all aspects of video.

John Burgess, managing director of the Air Group, states that no immediate changes are planned and the studios will continue to operate as individual facilities at present. **Ralph Denyer**

Syn-Aud-Con Awards

Synergetic Audio Concepts (Syn-Aud-Con) of San Juan Capistrano, California has announced the introduction of the Syn-Aud-Con annual award for Excellence in Audio and Acoustics. $1000 will be awarded to the individual who has been associated with Syn-Aud-Con either as an instructor or a 'graduate' and has made a significant contribution to the understanding or advancement of audio and acoustics.

The first recipient of the award is Richard C Heyser for his development of the Heyser *Transform*. He was presented with it at the Syn-Aud-Con Advanced TEF Workshop in Anaheim on August 3rd, 1985

In brief

Playback Studio: are now able to supply Maxell *UD11* C46 length cassette tapes in the UK and throughout the rest of Europe. Previously these tapes were only available in Japan. Further details from Playback Studio, 15 Percy Street, London W1P 1FD. Tel: 01-637 8392. . . **Monster Cable Products:** has a growing range of audio cables which includes the *Interlink Reference* with dual inner conductors and three multiple gauge 'wire networks' within the cable for bass, midrange and high frequencies. The *Reference* is available in a variety of lengths terminated in gold plated RCA phono connectors. Other *Interlink* signal leads include the *Special*, *Interlink* and *Interlink Video*. . . **Audio Kinetics:** has introduced several new features to the *MasterMix* automation system. Among these is the Splice option which enables the user to 'splice' two versions of a mix together without timecode manipulation. Another feature allows the Solo function to be automated and recorded on disk as part of the mix data . . . **Doepke & Co:** the *ED* range of earth leakage circuit breakers manufactured by this West German company is now available in the UK through Richdale Engineering Co Ltd, 22 Updown Hill, Windlesham, Surrey GU20 6DX. Tel: 0276 73708. They are suitable for use in both single and 3-phase installations with leakage trigger rates of 10, 30, 100, 300 and 500 mA. The tripping mechanism actuates within 30 ms. . . **Solo Sound,** an 8-track professional computer music studio, opened on October 1st, 1985, offering MIDI sequencing, 16 s sampling, MIDI keyboards and electric grand piano, digital drums, digital effects and timecode synchronisation, Solo Sound, 47 Draycott Avenue, Harrow, Middlesex, UK. Tel: 01-907 3889.□

Low-cost digital audio comes of age.

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

Sony has acknowledged that this acceptance by professional users necessitates a change of policy towards these products. Accordingly they have upgraded them from the domestic catalogue, and, realising the need for professional support and all that that entails, have appointed HHB as specialist dealers to represent them in the pro-audio market.

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

SONY® FROM HHB

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

THE SONY PCMF1 AND PCM701ES DIGITAL AUDIO PROCESSORS.

NEW PRODUCTS

NEW PRODUCTS

Equipment, modifications, options, software

Amek APC1000

Amek Systems & Controls has announced preliminary details of the *APC1000* Assignable Production Console that is featured in preproduction form on this month's cover. Originally conceived as a broadcast type console, it has applications in a wide range of studio and theatre uses. A major part of the design philosophy was to reduce overall console size and to this end a 30 mm channel width was adopted. This has been achieved without reducing channel facilities or lengthening the module by the use of a separate assignment panel. The on-board memory allows all assignment panel switch settings to be stored and reset and several further levels of automation are shortly to be added as basic or optional features.

The version shown on the cover is the basis of the working prototype that will be completed by the end of the year and contains 32 modules in two banks of 16 with the assignment panel between them. This panel also contains monitoring and aux send masters although it is possible that the finished panel may be configured quite differently. The desk also has eight subgroup and four stereo output buses expandable to a maximum of 64.

The faders section contains the channel interrogation switch, AFL/PFL monitoring switch, remote start, mute button, automation select and the faders. *MasterMix* is the standard automation used although the faders have been reconfigured to remove the controls down the fader and replace them with the single automation select button. The channel strip facilities contain three inputs—either mic or line plus an additional input that would normally be used as monitor or bus inputs to the channel although the inputs can be configured to give a choice of more than one mic input; high and low 12 dB/octave swept filters; 4-band parametric-type EQ with switchable peak/shelving on high and low bands; eight aux send buses; panpot, of which there will be a number of options; and a peak LED or gate from each of the EQ bands. There is no dedicated monitor section but as each channel has the choice of three inputs and full routing capability to up to six stereo buses monitoring, including subgrouping functions can be handled fairly easily by selection of channel functions.

The penthouse area is in two sections. The upper layer can contain metering or extra modules such as dynamics sections or even both depending upon your metering requirements. Under the console there are three 9 U racks for computer functions, distribution amps, etc.

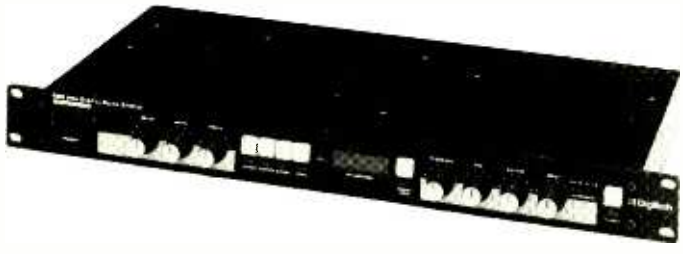
The assignment panel keyboard functions include channel input selection with phantom power and phase, etc; EQ in/out with HF and LF filters separately; aux bus selection with pre/post; up to 48 routing buses, six stereo buses and optional controls for the dynamics. This keyboard is accessed from the channel button marked Interrogate. If there are selections from the keyboard already operative they will illuminate. The keyboard can then be used to update the channel functions and the information stored in RAM. The keyboard will also operate from the alternative way—should you wish to know which channels have a particular function selected, pushing the function button in question will cause all channels it is operative upon to illuminate a large rectangular LED above the modules but just below the penthouse. The basic console will have just one page of memory that will reset the desk to its last set of keyboard functions. There are possibilities of expanding this upwards to 16 pages and beyond although cost will be a factor. Provision for downloading of keyboard data will also be provided.

Not shown on the cover prototype is a system for resetting channel module levels described as 'total retrieval', and consisting of a keyboard with a switch for every rotary control found on a channel (26). Pressing that switch will illuminate two bar levels on each channel in the lower penthouse area—one for the actual pot position and the other for the memorised position. These can be matched by turning the pot in question. It is apparently possible that this system may be standard with the data stored along with the switch data.

There is also the option of fitting a Massenburg Laboratories automation fader system. This will then allow a number of channel functions such as aux sends cut, filters in/out, remote start and channel mutes to be controlled in real-time against the automation timecode system.

Amek Systems & Controls Ltd, Islington Mill, James Street, Salford M3 5HW, UK. Tel: 061 8341351. Telex: 668127.

USA: Amek Consoles Inc, 10815 Burbank Boulevard, North Hollywood, CA 91601. Tel: (818) 508-9788. Telex: 662526.



Dod RDS 3600 digital delay

New from Dod Electronics is the *RDS 3600* digital delay which offers up to 7 s of delay in a rack-mounted package. Four pushbuttons provide various effects—Flange (1.5 to 14 ms); Chorus (6 to 14 ms); Double (50 to 450 ms) and Echo (200 ms to 1.8 s, 400 ms to 3.6 s, 800 ms to 7.2 s).

LEDs are provided for Delay Kill and Headroom. Repeat Hold can be activated either at the front or rear of the *RDS 3600* with a feedback option available either in or out of phase. The unit can be triggered via a drum machine or footswitch.

Dod Electronics Corporation, 5639 South Riley Lane, Salt Lake City, UT 84107, USA. Tel: (801) 268-8400.

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

Roland SRV 2000 digital reverb

The Roland *SRV 2000* is a MIDI compatible digital reverb incorporating a 16-bit A/D/A converter. The *SRV 2000* can store up to 32 individual front panel settings (excluding input level) all of which are automatically recallable via MIDI. All the program data—attack gain and time; gate time; reverb density and time; early reflection density; HF damping; room size (1 to 37 m^3) and output level can be confirmed on the unit's digital display. Additionally all the parameters can be modified in real-time.

Memory capacity is 48 kbytes and the unit has a frequency response 30 Hz to 10 kHz (+1/−2.5 dB), a S/N ratio of 80 dB and a dynamic range of 90 dB. The *SRV 2000* includes two digital equalisers—a low frequency control and a 2-band parametric the settings of which can be stored in the memory.

The *SRV 2000* includes eight basic room settings, five Hall and two Plate settings. Pre-delay can be adjusted up to 160 ms in 1 ms steps, and reverberation time between −0.9 and 99 s. Gated reverb using a single *SRV 2000* is possible.

UK: Roland (UK) Ltd, Great West Trading Estate, 983 Great West Road, Brentford, Middx TW8 9DN. Tel: 01-568 4578.

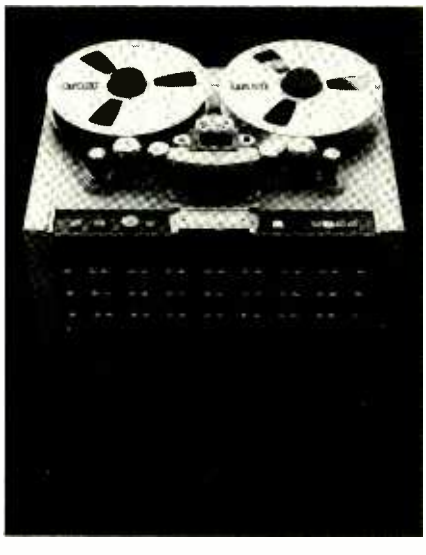
USA: RolandCorp US, 7200 Dominion Circle, Los Angeles, CA 90040-3647. Tel: (213) 685-5141.

MTR90 SYNC CARD IS HERE! NEW PRODUCT.

Deliveries have started of Otari's eagerly-awaited EC-101 retrofit chase syncroniser module for the MTR90-II. This small card assembly simply plugs into two of the spare slots in the front of the machine. Recent MTR90's have been completely prewired for the EC-101, earlier MTR90's require simple alterations internally. Adding the EC-101 turns the MTR90 into a self-syncronising machine, which will follow any other audio or video machine designated as a master. One cable feeding SMPTE/EBU timecode is all that is required between the two recorders.

The EC-101 comes complete with a small, elegant remote control unit, allowing offsets to be captured and stored, display of master & slave timecodes, etc.

As the foremost Otari dealer in the UK, ITA will be pleased to demonstrate the EC-101 to existing or future MTR90 users.



16 TRACKS ON 1 INCH FROM OTARI.

Engineered to the same high standards as the MTR90 – the world's best-selling 2" multitrack – the MX70 brings Otari design and performance to the increasingly popular one-inch 16-track format.

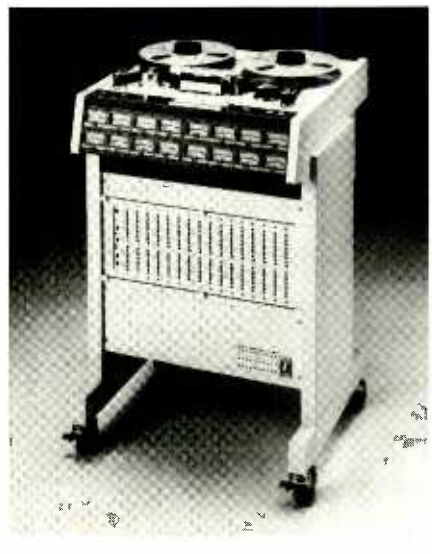
The MX70 offers most of the operational facilities of the MTR90, including an extremely fast lock-up time under synchroniser control. A full-function remote control comes as standard, with two-memory location; an optional autolocator is also available.

The MX70 comes in 8-track and 8-prewired-16-track formats as well as 16-track. An unusual option is a ½" 8-track conversion kit to enable tapes to be interchanged with machines such as the Otari 5050 MkIII-8.

MX70 deliveries have already started, and ITA will be very happy to arrange on-site demonstrations to show just what 1" 16-track can do.

For more information on ITA products and services, call us on 01-748 9009.

OTARI UPDATE FROM ITA.



STOP PRESS

OTARI MTR90 TECHNICAL SEMINAR

DEC 11th-13th

For further details and an application form, contact Jaquie at ITA.

INDUSTRIAL TAPE APPLICATIONS
PROFESSIONAL PRODUCTS DIVISION

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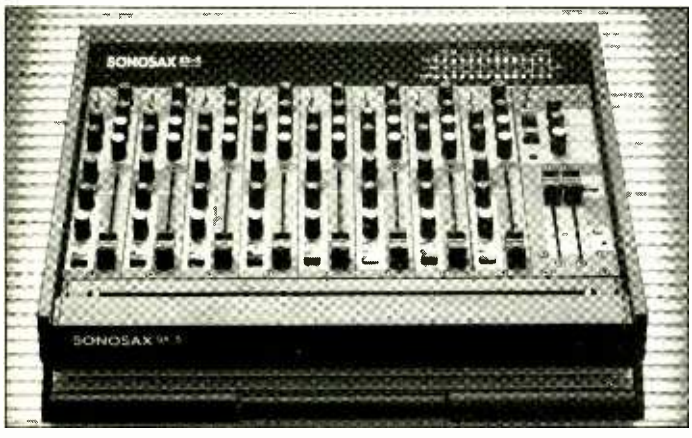
NEW PRODUCTS

NEW PRODUCTS

Equipment, modifications, options, software

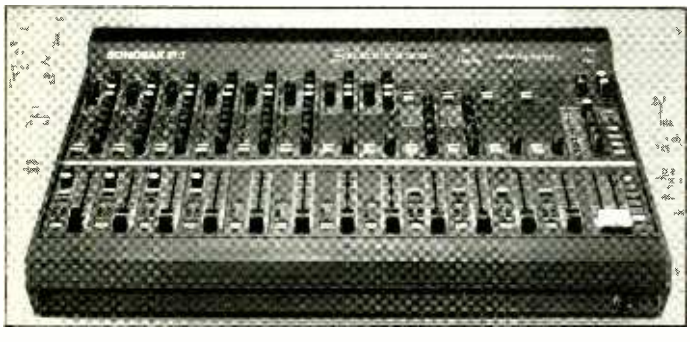


Sonosax SX-S and SX-T mixing desks

The Sonosax *SX-T* is a new professional mixing console designed for studio and broadcast use. In the standard form there are 10 inputs but 12, 16 or 24 can be specified with VCA or conventional amplifiers and with up to three VCA groups as an option. Mic/line input modules feature 3-way EQ and low frequency filter, four aux sends, pre/post select and two stereo mix bus assigns. Penny and Giles 102 mm faders are standard.

The *SX-S* series are high quality portable mixing desks available with six channels (*SX-S6*), eight (*SX-S8*) or 10 (*SX-S10*). The self-contained consoles are designed for professional mobile and studio applications and are built in rugged anodised aluminium cases. P&G 83 mm faders are standard and the desks include gold connectors, military spec components and sealed conductive plastic rotary switches. The *SX-S* series is battery powered and will typically run for 20 hours with eight D cells (*SX-S6*) or 10 D cells (*SX-S8* and *SX-10*).

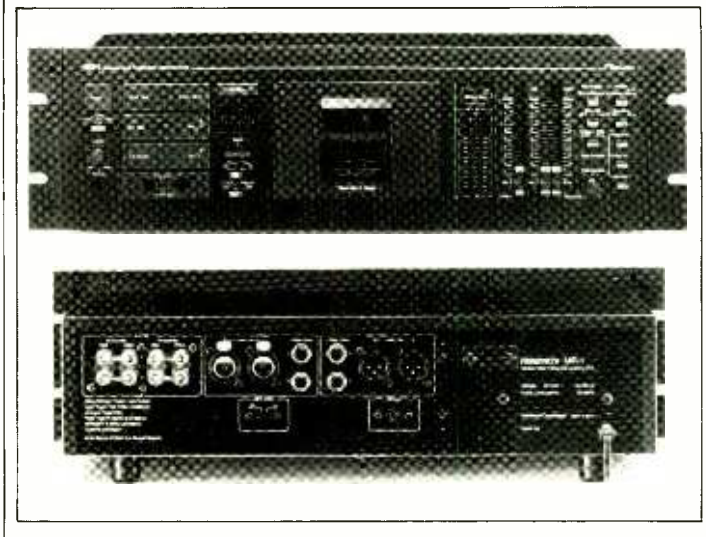
Sonosax SA, Rte Cantonale 116, CH-1025, St Sulpice, Switzerland. Tel: (021) 35 35 01/02.



Circuit Research SEP 800 compressor

Circuit Research Labs Inc who have recently purchased certain assets of MicMix Audio Products Inc, has introduced a new stereo 4-band compressor. The *SEP 800* features a patented CRL circuit that automatically corrects for drifting as the circuits age. Front panel EQ provides precise shaping of the signal at the output of the four compressor bands. A front panel switch provides wideband/multiband switching thus allowing the *SEP 800* to be used as an AGC amplifier or a multiband processor.

Circuit Research Labs Inc, 2522 W Geneva Drive, Temple, AZ 85282, USA. Tel: (800) 535-7648.



Nakamichi MR-1 cassette deck

Nakamichi has announced the first in a new range of professional cassette decks specifically designed for studio applications. The *MR-1* is a 3-head, dual direct-drive capstan machine with front panel ¼ in balanced inputs and ¼ in (unbalanced), *XLR* (balanced) inputs and outputs at the rear. Dolby *B* and *C* are included and a NR loop is available for external noise reduction systems.

Additional features include optional *RM-200* remote control, 4-digit LED counter, accurate memory stop, Record Mute and one touch Record/Pause. Each *MR-1* includes an EIA standard rack mount adaptor (with handles).

Nakamichi Corporation, Shinjuku Daiichi Seimei Bldg, 2-7-1 Nishishinjuku, Shinjuku-ku, Tokyo, Japan. Tel: (03) 342-4461.

UK: Quested Monitoring Systems Ltd, 59 Maltings Close, Bagleys Lane, London SW6. Tel: 0836 204995 (temporary).

USA: Nakamichi USA Corporation, 19701 South Vermont Avenue, Torrance, CA 90502. Tel: (213) 358-8150.

AMIX audio products

French audio manufacturer Societe Nouvelle Etelac has a range of audio products being marketed under the *Amix* name. In the range are two professional stereo amplifiers—the *H2200* and the *H2400S*. The latter provides 270 W/channel into 8 Ω (700 W bridged) with 0.007% THD. The *H2200*, although physically similar, provides less power at 120 W/channel into 8 Ω, 380 W bridged.

Also in the range are two rack-mounted equalisers: the *EMH 127* a 27-band mono unit and the *ESH 211*, stereo 11-band graphic. The units use gyrator circuits with the *EMH 127* having ⅓-octave spacing and the *ESH 211* octave spaced at mid/high frequencies and ½-octave spaced at the lower end. Both models include an EQ bypass switch.

For AV applications the *CSL AV* series stereo mixers can be fitted with either 8, 12, 16, 20 or 24 input channels. There are seven different frame sizes, five of which include an external power supply. The *CSL 2086* modular mixer is an 8, 16 or 24 into 8 desk, each input module including two inserts, six aux sends, stereo monitor, solo, direct out and P&G fader.

Other items in the *Amix* range include disco mixers, turntables and a variety of small sound reinforcement/disco loudspeakers.

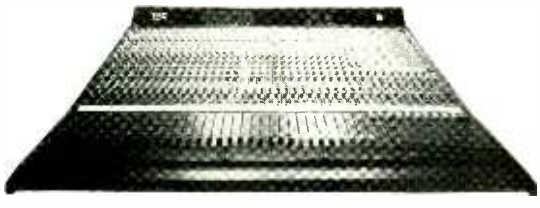
Societe Nouvelle Etelac, Zone Industrielle des Chanoux, 62-66 rue Louis Ampère, 93330 Neuilly Sur Marne, France. Tel: 300 96 30. Telex: 240779.

AMS DMX 15/80S (DUAL DELAY SYSTEM).

Another industry standard incorporating the following features:

★ Keyboard interface ready: allowing stored sample to be transposed via a keyboard. (NEW FEATURE)
★ Looping facility: now available simultaneously or independently on both channels. This allows the unit to be used as two separate mono units.

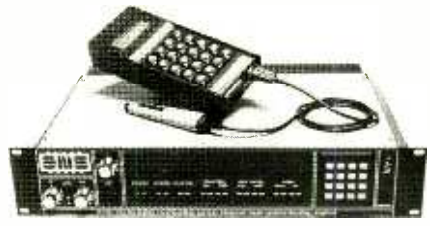
This astounding unit is in stock at ITA. Call for a demonstration.



TAC SCORPION – NEW VERSIONS.

★ Expandable for 24 track recording (NEW FEATURE)
★ Up to 32 input modules
★ 4 AUX sends
★ Comprehensive EQ with 2 × MID frequencies
★ EQ on TAPE/FX returns (NEW FEATURE)

Call ITA, the UK's main AMEK/ TAC dealer for your free brochure.



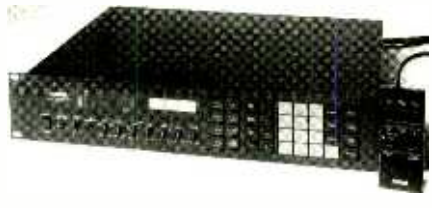
AMS RMX 16, FROM STOCK AT ITA, WITH NEW FEATURES.

The RMX 16 is now regarded as a studio standard and needs little introduction, but to say ITA can supply this fabulous unit ex stock.

LATEST STARGATE, THE 626.

The successful Ursa Major StarGate reverb is now available in an enhanced version; the 626. In addition to the 8 reverb programs found on the 323 (still available), the 626 gives you a further 8, including "outer space" very-long decay times and a variety of useful delay effects.

NEW PRODUCTS, NEW FEATURES, NOW AT ITA.



YAMAHA REV-7, HIGH-TECH, LOW-COST REVERB.

The reverb that's taking the industry by storm is now available for loan or sale from ITA. Call ITA now for a demonstration or brochure.

The Ursa Major range of reverb units, available exclusively from ITA, are not to be confused with other low-cost digital reverbs. The algorithms used in the Ursa's software give a much more convincing simulation of "real" rooms, and the units are manufactured to unusually high engineering standards.

For more information on ITA products and services, call us on 01-748 9009.

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PROFESSIONAL PRODUCTS DIVISION

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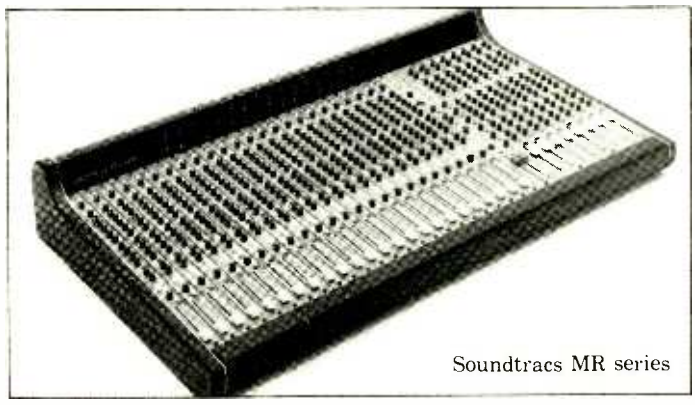
NEW PRODUCTS

NEW PRODUCTS

Equipment, modifications, options, software

In brief

Lexicon Inc: has recently introduced expanded software packages for the *224XL* and the *200* digital reverberators. Retrofit kits are available and both models benefit from additional programs and enhancements... **Fane Acoustics**: after a successful trial period is now using a new edgewound glassfibre high temperature voice coil on many drive units and it is now standard fitment in many of their 1985 *Studio* and *Crescendo* series models... **Vecteur**: the French based company has released a new cable consisting of four solid wires of linear crystal, oxygen free, very high purity copper encased in special insulation and shielding. The cable is suitable for both low level signals and loudspeaker connections. Ready made stereo pairs are available with high quality connectors and come complete with carrying case... **FM Acoustics** has introduced *Forceline 5*, an AWG 5 (16.5 mm) gauge single conductor cable capable of carrying 200 A RMS continuously or 1200 A on peaks. Also new is the *Forceplug 200*, a 220 A ultra low loss load connector which accepts wire up to AWG 5 gauge. A special 200 A spade terminal—*Forcelug 25*—is also available... **ICE Equipment**: has introduced the *Panamic* microphone suspension. Rubber O rings support the microphone in the suspension cradles so a wide variety of microphones can be used. The support brackets are adjustable on the mounting bar. A multi-position thumb lock is used to fix the tilt movement... **NSR**: has announced a major improvement for the AVL Genesis AV computer with the introduction of 25 frames/s EBU timecode, enabling AV users to sync their shows to other audio tapes or video.



Soundtracs MR series

Soundtracs consoles

Latest additions to the *Soundtracs* range include the *MR* series and the *T* series. The former is designed for 16-track recording and is available with either 24 or 32 inputs. Facilities include four individually swept frequency EQ, six aux buses, 3-band EQ and fader reverse on eight of 16 tape returns. The *T* series is an expandable console for sound reinforcement: the basic 16/4/2 configuration being easily expanded to 32/8/2.

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

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

NEW PRODUCTS

NEW PRODUCTS

Equipment, modifications, options, software

Eventide SP2016 reverberation and effects software

Eventide has announced new software for the *SP2016* reverb unit which provides four new reverberation effects, a vocoder program and an automatic panner facility.

The *RMX Simulation Plus* program provides accurate simulations of the AMS *RMX-16* 'Reverse Reverb' and 'Non-Linear Reverb' effects. Two independent channels are available and these can be used simultaneously. In addition 'Natural Reverb' with natural decay ambience and 'Gated Reverb' have also been included. All these new reverb programs have been included at no extra cost in the standard *Generation II* software package and are also available as free software enhancements to present *SP2016* owners.

The *Automatic Panner* program provides delay panning as well as amplitude panning functions. User adjustable parameters make a wide variety of crossfade and panning effects possible. The program is available as an option on new *SP2016*s and can be retrofitted to existing units.

The new *Channel Vocoder ROM* is also available as an option and enables the *SP2016* to function as a full 18-band professional vocoder.

Eventide Inc, One Alsan Way, Little Ferry, NJ 07643, USA. Tel: (201) 991-8715.

UK: Marquee Electronics, 90 Wardour Street, London W1V 3LE. Tel: 01-439 8421.

Sound Technology audio test equipment

New from Sound Technology is the *3000* series audio and transmission test equipment. Available separately as the *3100A* audio generator and the *3200A* audio analyser or together in a single mainframe unit (*3000A*) the 2-channel, electronically balanced and floating *3100A* generator provides sinewaves, squarewaves, IMD, toneburst and sine-step waveforms. The 2-channel *3200A* analyser measures level, noise, frequency, harmonic distortion, intermodulation distortion, phase error, channel separation and quantising noise (digital data).

Using Frequency Shift Keying (FSK) the new equipment allows unmanned automated remote transmission line testing without the need for external computers and modems. Extensive front panel programmability allows the storage in non-volatile memory of complete audio test sequences. By entering a two digit code a complete audio test can be performed over an audio path thousands of miles long in a matter of seconds. Results can be stored in the analyser or printed out on a standard printer or plotter. If the user requires immediate feedback results can be conveyed back to the generator site via a modem.

Sound Technology Inc, 1400 Dell Avenue, Campbell, CA 95008, USA. Tel: (408) 378-6540.

UK: Precision Audio Marketing, 131 Mini House, Christchurch Road, Virginia Water GU25, Surrey. Tel: 09904 4416. □

MUSIC PAGE

MUSIC PAGE

Mark Jenkins synthesis for the studio

Simmons SDS 9 electronic drums

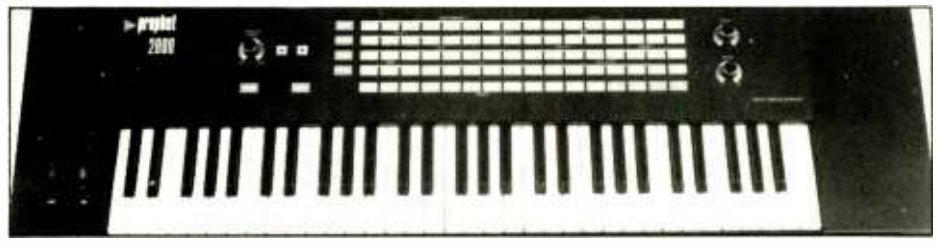
The *SDS 9* electronic drum kit from Simmons features three toms, bass and snare with newly developed injection moulded pads. There are 20 factory programmed drum kit memories with a further 20 user programmable options.

New for the snare drum are three independent yet related samples of snare hit, cross stick and rim shot. The rim sample being triggered by a second pick-up located on the rim of the snare pad. Spare snare eproms are available or can be user sampled with the SDS EPB.

Other features of the *SDS 9* include auto trigger, wide dynamic range, tape dumping of programs, remote footswitch switching, fully assignable MIDI interface and fully programmable on board digital delay.

Simmons Electronics Ltd, Alban Park, Hatfield Road, St Albans, Herts AL4 0JH, UK. Tel: 0727 36191.
USA: Simmons Group Center Inc, 23917 Crastsman Road, Calabasas, CA 91302. Tel: (818) 884-2653.

SDS 9 electronic drum kit



Prophet 2000

Sequential Prophet 2000

Sequential has launched the *Prophet 2000*, an 8-voice sampling device with weighted velocity-sensitive keyboard, full MIDI implementation and 64 variable sampling and synthesiser parameters.

Sounds are saved on 3.5 in diskettes, and functions include 8-way keyboard split plus layering, sample reverse, mix, truncate, auto loop finding, arpeggiator, programmable pitch bend and modulation amounts, and velocity-controlled sample start point and mix level.

MIDI, Mono, Poly and Omni modes are supported; sampling times are 16 s (8 kHz), 8 s (15 kHz), 6 s (20 kHz). A library of sounds is available and the *Prophet 2000* has 12 on-board analogue sounds as emergency backups.

Assessment

The *Prophet 2000*'s obvious competitor is the *Mirage* from Ensoniq. The *2000* is slightly more expensive but it has longer sampling time and higher frequency response. Its control layout and operational logic make it easier and faster to use (particularly in user sampling) but its synthesiser section is less powerful than that of the *Mirage*.

The *2000* offers more velocity control from the keyboard than the *Mirage* and it can format its own diskettes for economy. Its MIDI implementation is comprehensive and will allow computer editing but its arpeggiator contrasts with the polyphonic sequencer of the *Mirage*. Although initial impressions are very favourable, both units are likely to suffer by comparison with new releases at the Frankfurt Musik Messe in February.

Sequential Circuits Inc, 3051 North 1st St, San Jose, CA 95134-2093. Tel: (408) 946-5240. Telex: 364412.
Europe: Sequential Circuits, PO Box 16 3640AA Mijdrecht, Netherlands. Tel: 31 2979 6211.

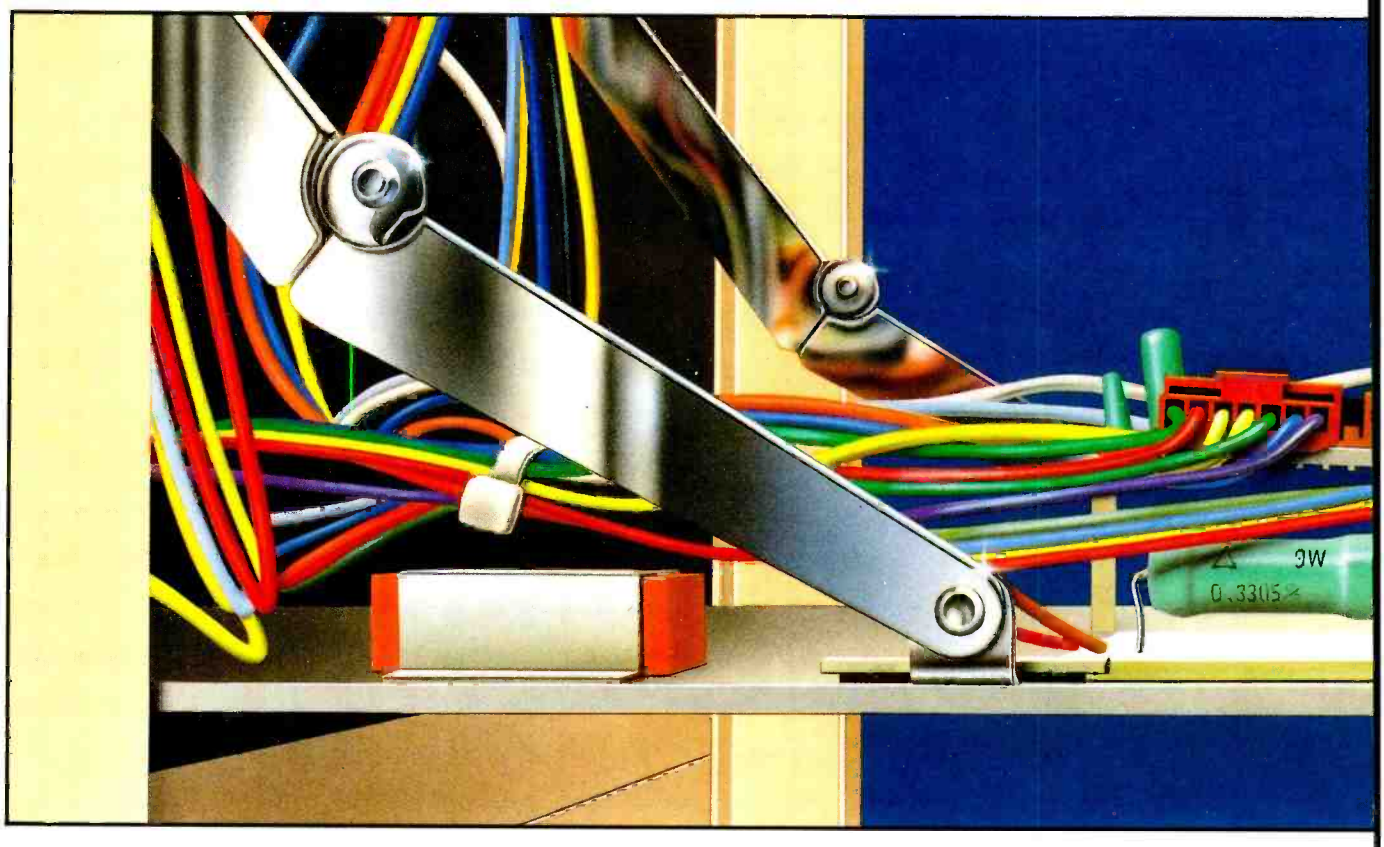
Roland's Music Processing System (MPS)

Roland Music Processing System

The Roland Corp has announced the *Music Processing System (MPS)* for IBM personal computer and compatible systems. *MPS* records, transcribes and prints music using MIDI-equipped instruments.

Program options are selected using the PC's functions keys and function labels are displayed on the monitor screen. Music can be entered from the computer keyboard or from a synthesiser keyboard in real-time or step-time, and real-time performances can be edited and re-arranged. Tracks can be merged, muted or transposed and MIDI channels can be re-assigned. A Score mode displays the tracks in musical notation and allows a score to be prepared for printing.

Hardware required is a 256K RAM IBM PC or compatible (320K RAM for printing), an IBM Color Graphics Display Board, a Roland *MPU-401* MIDI interface, a Roland *MIF-IPC* interface card, and any MIDI instruments.
UK: Roland UK, 983 Great West Rd, Brentford, Middx. TW8 9DN. Tel: 01-568 4578.
USA: RolandCorp, 7200 Dominion Circle, Los Angeles, CA 90040-3647. Tel: (213) 685-5141.□



IT MAY SEEM JUST A DETAIL TO YOU, BUT OUR REPUTATION HINGES ON IT.

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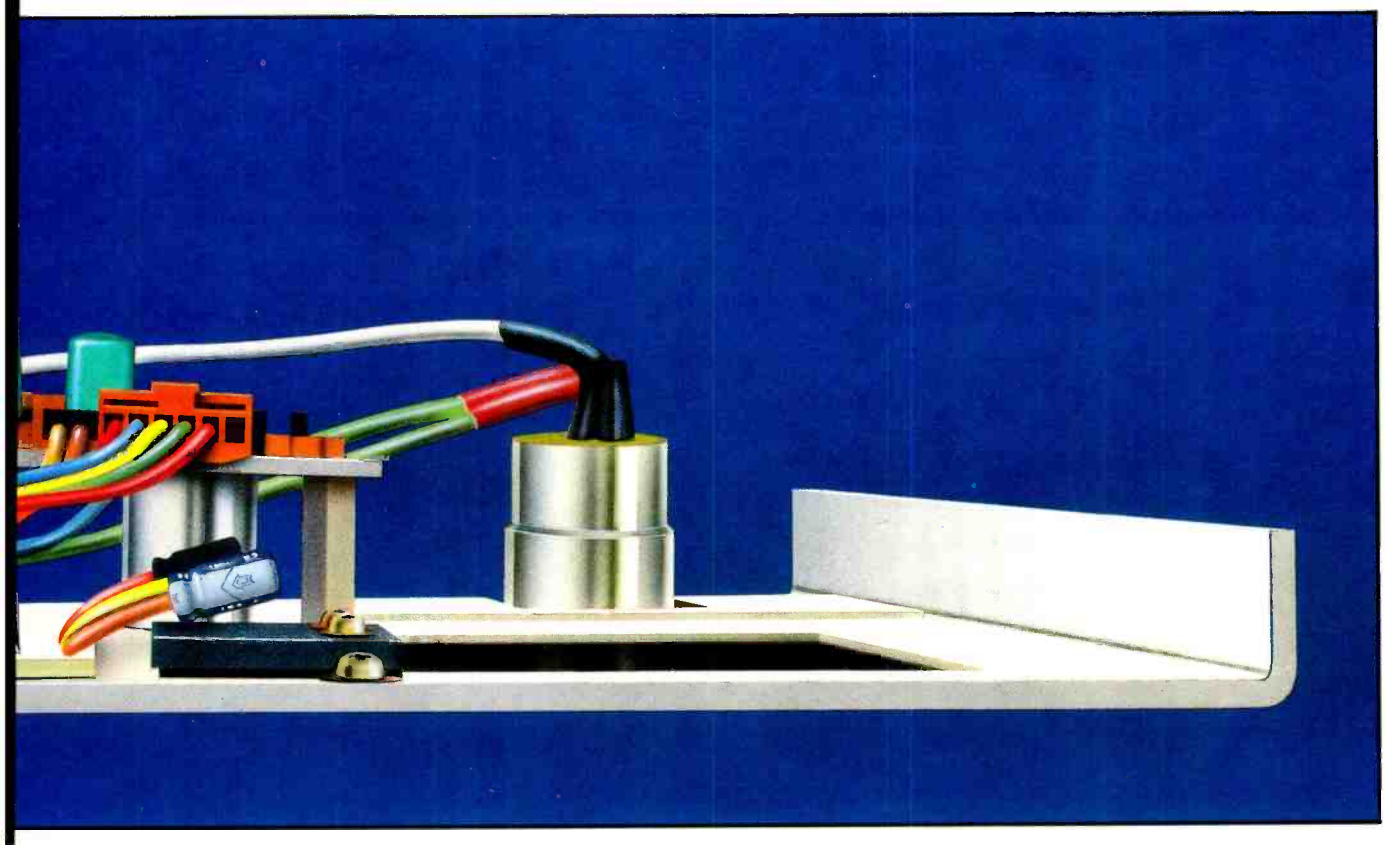


This panel protects the mother board at the heart of the Otari MTR 12. And it's hinged to allow easier access.

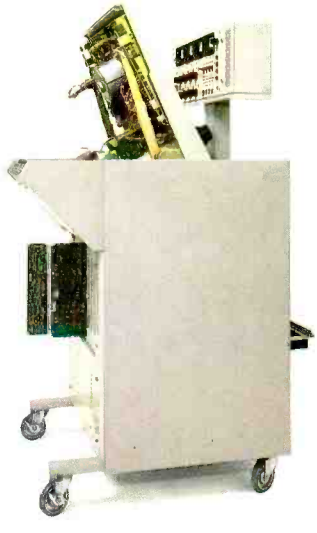
The MTR 12's power supply is fully modular, too, for fast diagnosis and repair.

Even the transport assembly is hinged, for total accessibility.

In fact, every area of the MTR 12 shows that Otari did more than design a recorder with superlative performance. They also made it easier for you to keep it that way.

All of which goes some way towards explaining what makes the MTR 12 the most professional of ¼" or ½" two-track mastering and production recorders.

Otari's advantage can be summed up in one word.



Detail.

A passionate attention to those things that make a professional's life that little bit easier.

Naturally, because it's Otari, the technology is true state-of-the-art. It's the only recorder of its type to offer 7.5, 15 and 30 i.p.s. And the only design that lets you incorporate IEC format centre-track timecode, with the capacity to resolve mono and stereo pilotones, all in the same machine.

Other than these features, you'll find very few options on the MTR 12. For the very simple reason that the MTR 12's standard specification makes it one of the most complete professional recorders you can buy.

But Otari's attitude can best be shown by the way they build a 24-hour a day mastering recorder to the utmost standards of reliability. And then make it as accessible as they can, for maintenance.

After all, Otari reason, just because they have bent over backwards to make the MTR 12 more reliable, there's no reason why you should have to do the same to keep it that way.

OTARI®

For more information on the MTR 12 or other Otari products, contact
Industrial Tape Applications. 1 Felgate Mews, Studland Street, London W6 9JT. Telephone: 01-748 9009.
Stirling Audio Systems Ltd. 1 Canfield Place, London NW6 3BT. Telephone: 01-625 4515.

Drop-in, drop-out, trigger effects, remote control...

QuPlay does it all for under £300, automatically!

Drop everything and listen. Whether you're a recordist who plays a bit, or a player who records alone, you'll know you can't do both jobs at once. QuPlay changes all that.

Free to play...and free to think

This brilliant new device will memorise drop-in points, trigger external devices and functions as a remote control. Leaving your hands, and head free to get on with more creative things.

Save time, stop mistakes

Just program QuPlay to carry out your instructions then you can concentrate on getting the performance right. The operation is quick and efficient and you won't run the risk of wiping or clipping a perfect take.

QuPlay...as versatile as you.

Works without using up valuable tracks or the risk of stretching your valuable master tape.

Does *not* need batteries or mains power.

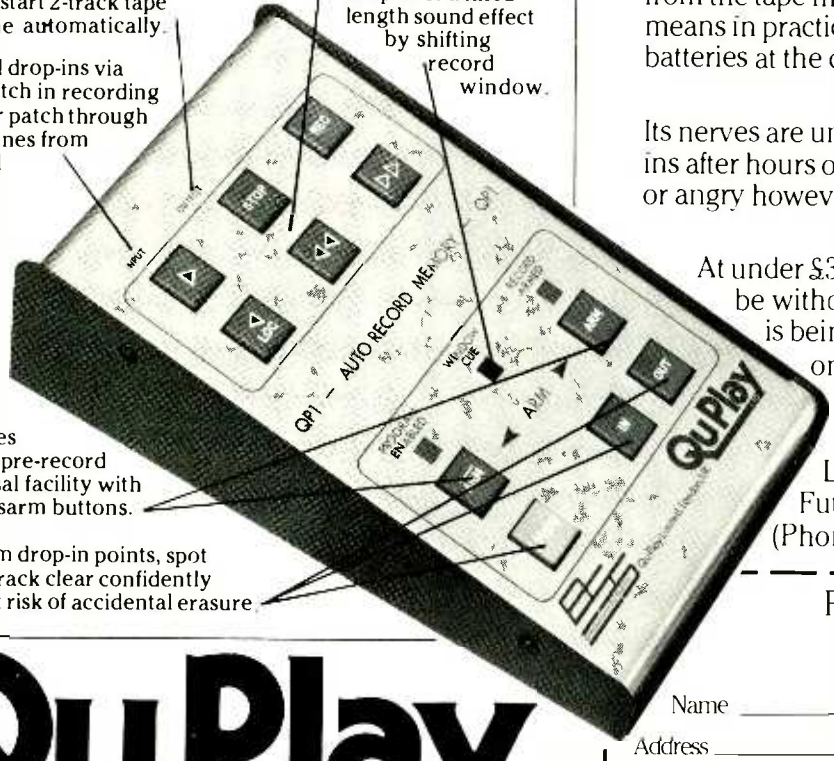
Acts as conventional remote control.

Accepts programming by time-code driven devices.

Trigger external effects, bounce tracks, start 2-track tape machine automatically.

Allows multiple drop-in of a fixed length sound effect by shifting record window.

Control drop-ins via footswitch in recording area, or patch through on tie-lines from control room.



Provides unique pre-record rehearsal facility with arm/disarm buttons.

Program drop-in points, spot erase, track clear confidently without risk of accidental erasure.

Only a minute to master

We designed the QuPlay to help you. In operation, it's simplicity itself; after one demonstration you'll wonder why you tried to manage without it.

Rugged and reliable

Housed in a tough steel box measuring just 17 × 11 × 15cms, QuPlay is still light enough to permit one-hand use. And with its long remote cable, it'll give you mobility between instruments and tape machine, control room and studio.

Accurate even after 20 passes

If you DO need twenty takes at a drop-in (maybe you should be thinking of a new career) QuPlay will stay locked on cue.

From MTR90 to Model A80

QuPlay is designed to interface with all the latest multi-tracks from state-of-the-art 24-track to the more compact personal recorders.

Self-powered

Actually, strictly speaking. QuPlay draws its power from the tape machine it's plugged into. But what this means in practice is that it's never going to run out of batteries at the crucial moment.

A silent partner

Its nerves are unshakeable, performing precise drop-ins after hours of operation. It doesn't get tired, irritable or angry however long you work.

Affordable

At under £300, how much longer can you afford to be without a QuPlay? In fact, when studio time is being paid for by the hour, if it saves just one mistake it could well pay for itself.

Want one?

Post the coupon or, phone Don Larking, Turnkey. Audio Services Ltd., Future Music or Music Labs today. (Phone QuPlay for a list of foreign stockists.)

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Tel: 01-482 4288 or (0707) 44616, 24 hour answering service.
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U.K. distribution exclusively by QuPlay. Credit facilities available. Contact us for details.

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Address _____

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Private Studio ☐ Commercial Studio ☐ (Please tick)

Tape Model No. _____ Your Daytime Phone _____

QuPlay Ltd., Unit 5, 43 Carol Street, London NW1

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Austria	Peertronic Tel: 43 222 832224 Telex: 134072 Contact: Gunther Friedrich
Balkan States	Constantin Stavrinids Tel: 4121 39 5015 Telex: 26297 Contact: C. Stavrinidis
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DIGITAL NEWS

This year has seen an increase in activity on the digital front. Keith Spencer-Allen appraises the situation

The digital year: a ball gathers speed. The last year has seen much happening in the field of digital audio. The purpose of this short update piece is to draw attention to the breadth of change and the way that digital audio is becoming a part of most audio signal chains.

This piece has been written before the NY AES and therefore may be out of date by the time you read it—or again maybe not.

The beginning of this year saw the announcement that the first of the Neve *DSP* digital consoles was fully installed and operational at CTS studios in Wembley, London. This was fully covered in the March issue. Since then, the BBC have completed acceptance tests on their *DSP* which was destined for installation in their expandable mobile truck (see Diary this issue). Awaiting full operational use are desks for Tape One (for CD mastering use) and a smaller processing desk for the British National Sound Archive. An order has been announced for another large desk for the WDR concert hall in Cologne, West Germany.

Neve is not the only manufacturer in the area of digital consoles which also has operational units. Sony has been showing a compact fixed format 8-channel unit, the *K-1105*, which consists of a small control panel about the size that would be required for a similar facility analogue console with an additional processor rack. Nippon Columbia, Denon, has been using an in-house designed digital console for classical CD production activities. This unit is part of a complete range of digital equipment that the company has developed which includes a disk based editing system and PCM processing units capable of four discrete audio channel recording on standard U-matic VTRs. We understand there is a possibility that this equipment may be made commercially available in a modified form at some point in the near future.

These are of course far from being the sole manufacturers active in the area of consoles. Possibly the most far reaching is the *Sound Droid* which is a practical development of the Lucasfilm *ASP* in association with the Convergence Corp under the name of The Droid Works. The limits of the capabilities of such a system are not yet clear but they are raising a great deal of interest. We understand that designs from other manufacturers such as Enertec are progressing. The Hamburg AES saw a prototype design from French company VCL Audio, based around a control surface with no moving parts and a nice line in dark perspex.

The Hamburg AES was also the time for a major announcement from the DASH manufacturers regarding the mastering formats. Prior to this both Studer and Sony had been showing 2-track DASH format machines running at 7½ in/s. Changes in proposed formats were the result of external industry feedback and practical experience which suggested a need for a modified additional 2-track standard with a tape speed of 15 in/s and the adoption of a 'double DASH' track arrangement that had largely taken the DASH proposed 4-track format and matrixed the signals so that each track was recorded twice but not at the same point on the tape allowing greater robustness of recording

and improved editing capability. This announcement was greeted slightly sceptically by a European industry which was somewhat taken by surprise. The APRS held a special meeting shortly afterwards to try to assess how to standardise so that one or the other of the DASH formats should be accepted as UK standard. Due to a lack of practical information, however, they found themselves unable to reach a positive recommendation other than to encourage the manufacturers to concentrate on a machine that will handle both variations of the DASH 2-track formats. This we understand is now in hand. Sony was also able to announce that worldwide sales of the *PCM-3324* digital multitrack had exceeded 100 units.

At the lower cost end of digital audio, we have seen the reintroduction of the Sony *F1*, *701* and the *501* PCM processors whose production had been discontinued. Credit for pressure to restart production is due to British company HHB who were able to demonstrate the sheer width of recording applications for the *F1*, particularly, and the way in which it is an ideal low cost introduction to PCM recording. HHB has also continued development of their *CLUE* logging and editing system allowing use with an increased range of machine types.

The APRS saw the introduction of some other new Sony products—the *Digital Tape Analyser*, the *DMR4000* digital audio orientated U-matic with confidence head and the new *1630* PCM processor.

West German company Harmonia Mundi continued development of its *BW102* interface system that currently allows connection between AES/EBU digital standard and EIAJ standard but will shortly allow connection to Mitsubishi and most other formats as well as level control, etc. in the digital domain.

Mitsubishi continued to increase their international availability. In the US, the Digital Entertainments Corporation acquired the Quad-Eight company who had previously acquired the Westrex company who had a long established UK base. In mid summer, DEC launched Mitsubishi into the UK with the first two *X800* machines going to Hilton Sound hire company with another machine going to Jacob's Studios in the UK. These were the first UK multitracks although there are several in Europe. The APRS also saw the first public showing of the new *X850* multitrack which differs from the *X800* in that it has a greater tape editing robustness and a physical redesign together with a number of other improvements. Although not shown, the *X86*, a new 2-track machine, was announced for launch sometime in 1986.

Hard disk based systems for recording are becoming more numerous. One such system was the *AudioFile* introduced by AMS. This is a flexible system that can be used not only for editing, synchronising to outside timecode sources or as a multitrack recording medium in its own right but further facilities include the ability to advance or retard tracks relative to each other. It can also be used as a medium for recording, editing and playback of sound samples. We will be carrying a more in depth look at the *AudioFile* in the near future.

This has also been the year when the compact disc has made itself a viable commercial medium and to this end is acting as an increased impetus to professional interest in digital audio.□

LETTERS

LETTERS

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

Automated testing

Dear Sir, The article entitled 'Automated Audio Testing' in your August issue understated the current technology of front panel programmability in audio test equipment. Specifically, the Sound Technology 3000 Series front panel programmability allows the user to access the full flexibility and speed of the test instrument without an external controller.

The user can define and store 50 front panel set ups. Each generator panel set up defines the type of signal (sinewave, squarewave, IMD, toneburst or sine/step waveforms), the sweep limits, points per decade, time duration of sweep, and sine/step and toneburst frequency and intervals. Each analyser panel set up defines measurement type (distortion, flat and filtered amplitude, IMD, noise, quantisation noise, channel separation and phasing) and units of measurement to be displayed. An additional 10 memory locations are used to chain series of the 50-panel set ups in any sequence the user desires. This chain of tests can be recalled by pressing a two-digit entry. Step-time of measurements is a function of settling time allowing speed of measurement under front panel programming to equal or exceed measurement speed of any audio test equipment available.

The ability to initiate a complex series of tests by pressing a two-digit entry, eliminates sorting through software menus and the need for external controllers and monitors. The resulting speed, portability, ease of use and reduction in audio equipment cost should not be overlooked.

Yours faithfully, John E Williamson, President, Sound Technology Inc, 1400 Dell Avenue, Campbell, CA 95008, USA.

Designs on your studio

Dear Sir, I want to thank you for your clean and fair comments on the importance of the visual design of the music room. It is an art unto its own.

Of recent times (1983-present), I have found that working with creative and 'in tune' decorators can introduce nice visual innovations that work within a controlled acoustic environment.

However, there are only a few clients that seem to accept the need for this art to be introduced into their project. Perhaps this will change in the near future.

I agree with you, the artistic and individual design elements need to advance to keep in step with the ever-improving acoustic performance.

Keep pushing this subject.

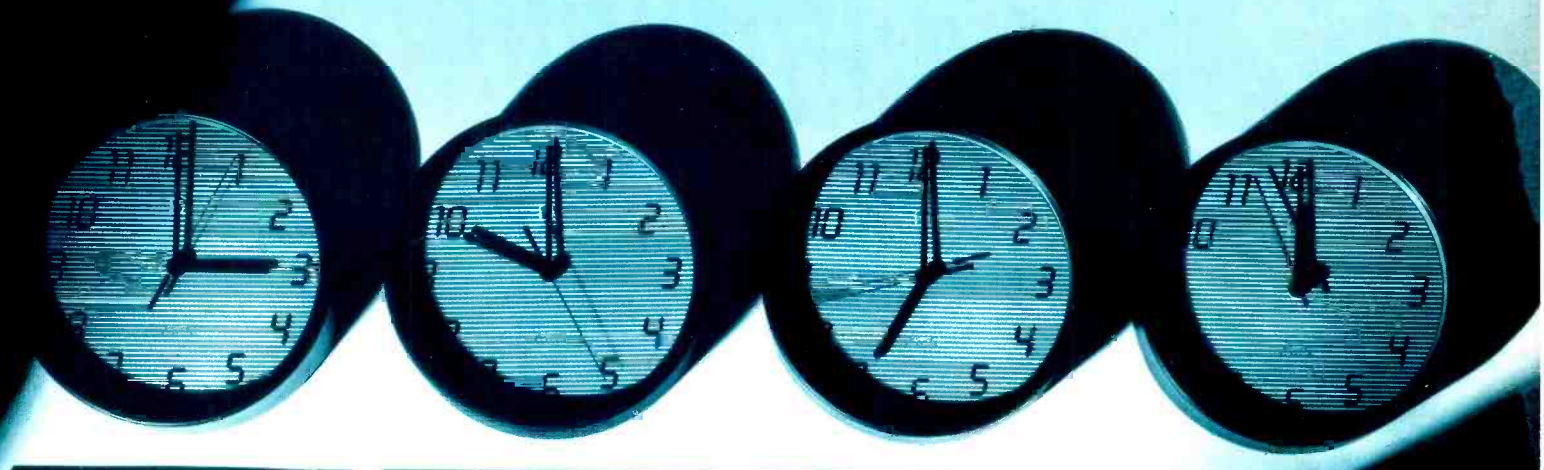
Yours faithfully, Tom Hidley.

Strong design

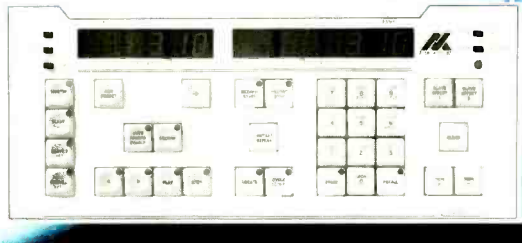
Dear Sir, Your editorial on Studio Design (March 1984) was a breath of fresh air which mirrored precisely the sentiments that inspired us in building the recently-completed StrongRoom studio. Our aim was to combine the latest recording technology with the optimum acoustic environment and good interior design where brick and pine are replaced by space, colour and natural light. Working in close collaboration with Assorted Images on interior design, we developed a calm environment capable of inspiring our clients rather than making them feel it's just another day in just another studio.

Yours faithfully, Richard Boote, StrongRoom Ltd, The Bank, 120 Curtain Road, London EC2A 3PJ, UK.

LOCK AROUND THE CLOCK.



LONDON NEW YORK LOS ANGELES TOKYO



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.

It's the same all over the world. The simple, uncluttered controls. The custom interfaces that suit your machines. The remarkable software capability. The integrated system with built-in expansion possibilities. It all adds up to accuracy and ease of use, and that means speed and creative flexibility. It means Q-Lock. If you're looking for an international standard, you've found it.

Now, more than ever, you need to keep in sync with the times. Lock around the clock – with Q-Lock.

Audio Kinetics Limited,
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Boreham Wood, Hertfordshire,
WD6 4PJ England,
Tel: 01-953 8118 Telex: 299951 AUDIO KINETICS
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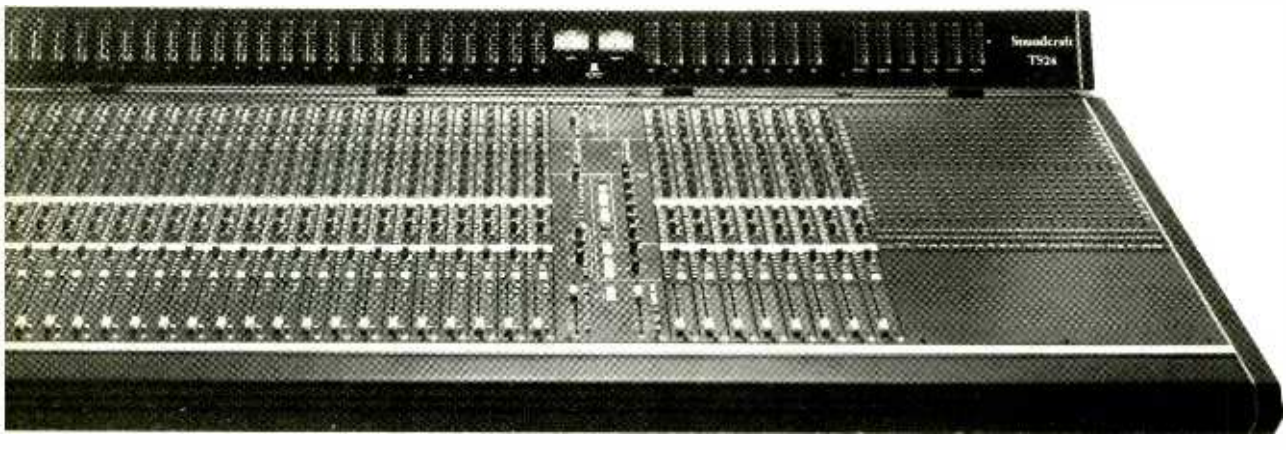

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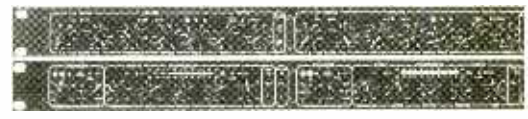

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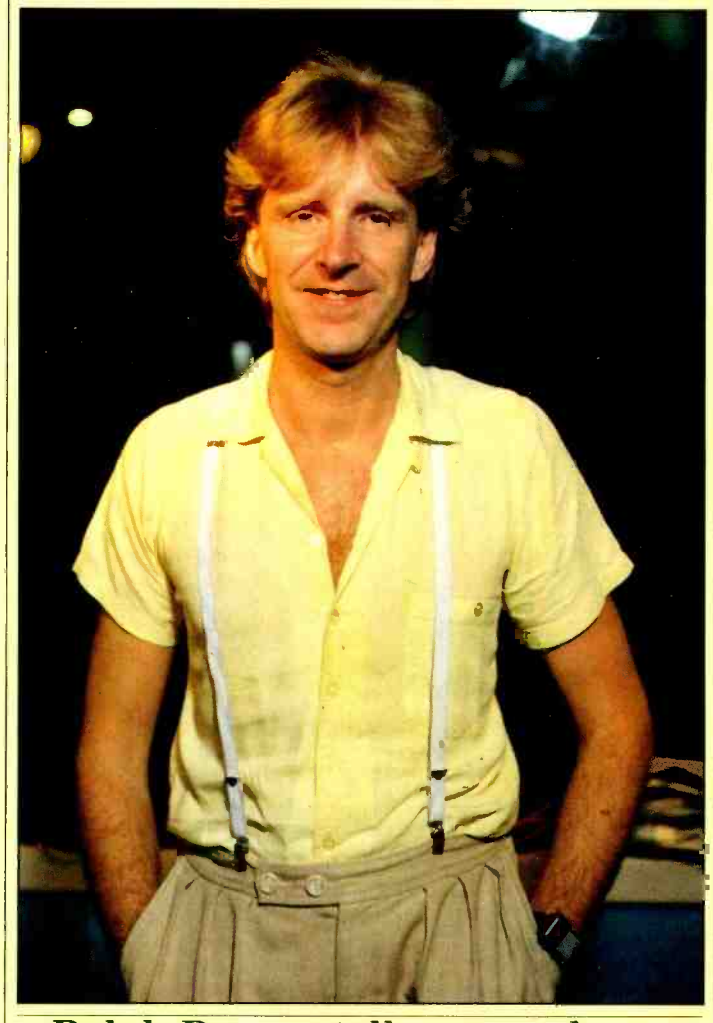

Ralph Denyer talks to producer Robin Millar who has been successful by working independently of fashion

Robin Millar's UK production career started in 1982 with Weekend's *Le Variete* album, followed by the Pale Fountains *Thank You* single, the Bluebells *Forever Yours* single, the Big Sound Authority *This House* single, the Fruits of Passion *All I Ever Wanted* single, seven tracks on Tom Robinson *Hope And Glory* RCA album, both the *Eden* and *Love Not Money* Everything But The Girl albums, the Working Week *Working Nights* album, the Kane Gang's *Gun Law* and *Take This Train* from *The Lowdown World Of The Kane Gang* album, and the Sade *Diamond Life* album which of course includes the tracks *Your Love Is King* and *Smooth Operator*.

He's made considerable progress since somewhat suddenly appearing on the UK studio scene when he took over part of the Morgan studios complex at the beginning of the '80s. He says he never imagined that his success as a producer in the UK would happen as quickly as it did although he adds, "I was confident in my approach at starting as a producer in this country."

Robin has been working in studios for some time, mostly on projects with French artists. This dates back to the early '70s when he was a regular commuter between France and the UK. He worked both as a producer and as a jobbing session guitarist. The last 3½ years that he spent primarily working in France coincided with the Punk and New Wave tidal wash reaching that country and he became something of a figurehead in the movement there as a record producer.

"I was working very solidly. Before that I'd been playing guitar and doing a bit of production in all sorts of styles of music and was of course completely unknown in the UK—I made a positive decision to return. You get to a point where you are frustrated by not getting the respect of your peer group. You can't show people your gold and silver discs with names of groups they've never heard and feel totally vindicated in why you dropped out of conventional jobs and why you struggled away for so many years."

So part of the motivation to return to the UK came simply from a desire to acquire some "hard evidence" of success in his chosen field of work. At the same time, years in the studio had given him a broad base of experience on which to draw.

"I came to the UK feeling that I had an enormous amount of experience in making records of all sorts and an enormous number of good, fresh ideas, perhaps coming from a different angle and perhaps not being bound up with what A&R men would have asked me to do in the UK for years and years. I had no track record and therefore had to find a way to persuade people to give me the initial chance to produce."

At the same time Robin had another train of thought. His experience of working in studios and making records left him feeling that there was a mismatch between the facilities that many recording studios offered musicians and producers and the facilities that would actually be most suited to their requirements. Though he had taken on the role of producer in France, he firmly maintained an appreciation of the musician's outlook as the keystone of his approach to record production. In his book the music came first, and still does.

"It occurred to me that if I was able to take over a London studio that was already known to the British record industry, the very fact that the person had taken it over might be sufficient to stimulate a few key contacts to give me the *chance* to produce, and from there on it would be up to me to prove I could do it. But when I stepped off the boat from France, nobody would have any reason to employ me—however cheap—to do anything. I would have found it almost impossible to have a meeting with an A&R man, to play him a load of French punk records and tell him how wonderful I was."

Robin agrees that the musical and production standards are so high and the competition so fierce in the UK that many people who have been unable to achieve a breakthrough here, frequently find success in other countries where both the market and the industry itself are less complex and demanding. On his return to the UK he had to show he was made of the Right Stuff. I had a point to prove inasmuch as my arrogance, or self-confidence, depending on whether you like me or hate me, told me I was at the stage in my career where I could—in certain ways—knock the spots off the average record producer working in this country. And I could be radical in certain ways and I had ideas and approaches to recording which were well worth a few people taking a chance on."

He came back to the UK at a time when certain aspects of new technology were very much to the fore. "I felt that the actual perceptions of the qualities required to make fantastic productions were getting a little blurred by an over-indulgence in the possibilities of the new technology. People were being dominated by, rather than dominating the equipment. Things were becoming rather shallow, standardised and rather dull."

Robin also sensed the music that bands all around the UK were playing and wanted to play, was often at odds with the type of music the record companies were willing to spend their money on. As far as Robin could judge, the only record companies who seemed to be aware and sympathetic were the small independents.

"So I figured I had the chance via independent record companies—if I put myself out at a low enough price—to get some jobs and produce records that flew in the face of current obsessions and make my mark. What I wasn't intending to do was to fly in the face of new technology *per se* and become

regarded as an old fashioned anti-technology, anti-digital, anti-sequencer type person, which is strangely enough what I've been labelled by an awful lot of people. So I'm now in the curious position where I have been hoisted by my own petard."

By 1982 the Power Plant was well and truly up-and-running and during July and August of that year Robin produced his first UK sessions that were to result in the Weekend album, *Le Variete*. Robin aptly describes the group as, "loosely, a quiet jazz and African influenced group" formed from splits in Young Marble Giants and Scritti Politti. The album was very successful for Rough Trade and according to Robin, was an important album for the independent label, taking their records into Woolworth stores for the first time. Not surprisingly, Rough Trade were somewhat endeared towards Robin, offering him, "the pick of the crop" of their new acts to produce. He chose to work with the Pale Fountains. At the Power Plant they recorded a "totally live, totally orchestral, back to the '60s sort of big bashy single".

The track came off the stereo mastering machine on a Sunday evening and by the following Tuesday the band had what seemed like every major record company in the country trying to steal them off Rough Trade. Virgin won the band over and the single *Thank You*, though not a big hit, made an impression on the charts in half-a-dozen or so countries including the UK. The fact that the record was different made an impact on A&R people. Thus, Robin feels that *Thank You* was the record that opened the door to work with the majors.

"As a result I did the first single for the Bluebells which was on London. Cherry Red Records were losing Everything But The Girl to a label licensed to WEA, so they were basically a major group on a major label and I was given the opportunity to ask Everything But The Girl—who were very suspicious of producers, full stop—whether I could work with them."

Six months later Robin had persuaded the group that producers were not necessarily all as bad as they were sometimes made out to be. This was the time at which the producer backlash was at its peak. The cry from many bands was: 'We don't want to be manipulated by producers.'

"I honestly think that was fair comment from the groups because of the obsession with *LinnDrums*, digital reverbs, sequencers and things."

Robin invested considerable time in convincing the group that he was primarily concerned with identifying the qualities of their music that should remain intact and not lost in a welter of over-emphasis on meeting marketing requirements. "And we produced the first album *Eden* which became very successful commercially and with the critics, which at that time in my life was very important to me."

As if to vindicate Robin's against the trend approach, the record became popular with record company and A&R people. "And in fact the album had no drums on seven out of the 12 tracks, some acoustic guitars, flugal horn, trombone and things like that. And from there, I came across Sade."

Robin had met Sade Adu and the band long before they were pronounced to be the next big thing by the industry and the waving of cheque books started. "I'd already met and established a relationship with the band and had long talks and even gone into arrangements and styles of production. In fact Sade still says, to this day, that they'd decided to work with me as a producer before they'd heard a single note of anything I'd produced."

Again, Robin feels that a major factor in the band wanting to work with him was musical empathy combined with the fact that here was a producer who was not the, "big evil one, brought in from the record company. I felt, well, just very lucky that I'd caught up with her at the right time and been very excited by the demos. I had *no* idea the record was going to make the kind of global impact it did. You know, if someone had told me it was going to sell five million albums I would have said: 'You must be mad!' "

If you had thought the fact that the Sade album *Diamond Life* had also picked up the BPI (British Phonographic Institute) Best Album 1984 award would allay any negative connotations for him you'd be wrong.

Whereas he observes some producers at the Power Plant on the telephone seeking A&R approval for "the colour of tambourine they are going to use on the chorus of a record" Robin has a slightly different approach when producing. "I have this habit of throwing record company people out of the studios and things like that and I really think one of the most interesting climaxes to all that—this is about as much as we need to say about my background—was the BPI (Awards). The Sade album was nominated album of the year and *Smooth Operator* was nominated for single of the year, which are both categories where you might say that people on the production side might have more claim to share the limelight than some of the other categories. And I wasn't invited to the BPI dinner. I wasn't given a ticket and I wasn't nominated anywhere in the Producer's category. You have to bear in mind that these nominations are made by record companies.

"I watched the awards on TV at a friend's house, in front of a gas fire with a cup of tea and a glass of wine or something. And the group's name came up and they were awarded Album Of The Year. Sade—bless her cotton socks—stood up and actually said: 'I would like to thank Robin Millar—who's not here tonight—for his contribution.'

"The group came in to the studio the next day and gave me the award. But that says a lot about what that group is like. There you have it and there I will continue to go. I will continue to not be on the short list of all these groups record companies are signing up, trying to follow in the footsteps of a Duran Duran, or be *another* Howard Jones, or *another* Tears For Fears or whatever the reason is that they've signed them up, because they think I'll mess it all up or get it all wrong. I've been involved now in the production of six LPs in the last two years and all six of them have gone Top 20. So I figure so far, so good."

To summarise he feels popular music is based on change. For him music—not commerciality—is the fundamental. Because of this attitude he feels he has flown in the face of prevailing production styles and he's challenged many record industry people's concept of the record producer's job, ie to follow trends, to look at the Top 40 and try to copy it. Robin says his job is not to copy pop records.

"I think it's a strange irony that in periods of time during last year—according to *Music Week* statistics and anyone else's you care to name—I was outselling every other producer in the country including Trevor Horn but people weren't adding up 2 and 2 and making 4. They were still saying that the producers who brought out the cannon fodder of contemporary pop were the one's who should be smiled upon and that Robin Millar's a renegade evil influence."

It should be clarified that there is no question of sour grapes because Trevor Horn in fact won the BPI Producer award. In fact Robin is flattered by descriptions in print calling him 'The acoustic Trevor Horn'.

What I wasn't intending to do was fly in the face of new technology *per se* and become regarded as an old fashioned anti-technology, anti-digital, anti-sequencer type person

In a previous article in this series Martin Rushent used the word 'transparent' in a positive way when talking about his own work and certainly believes that the listener, unless it's someone in the trade, shouldn't really *hear* the production. "John Williams once quoted something someone once said about the music he had

written for a movie. The person said: 'The movie was fantastic—I didn't really notice the music.' John Williams said that was one of the finest compliments anyone had ever paid him. I'd say you could draw a certain parallel to that in record production. I would like people to say: 'The record was fantastic—I didn't really notice the production.' I would take it as a compliment as it's very difficult to do that."

On his return to the UK and with obvious determination, Robin mortgaged himself to the hilt and started to look at recording studios that were for sale. He was also determined not to borrow. From the financial situation of most of the studios he looked at, he could see: "It didn't seem to be very easy to pay back all the loans on setting up a studio, you're really better off trying to persuade people to invest in you." To this end, Robin painstakingly put together a "solid business package" which he describes as "very coherently worked out with lots of financial details and well analysed—not cowboy stuff." The overall presentation aggressively set out in detail why he thought his ideas for studios were the right ideas. Robin worked on the proposal until he thought it strong enough to go to financial institutions for help. "And apart from the fact that I felt a tremendous amount of prejudice against me because I couldn't see, I did eventually find people who were able to ignore that and put their money where my mouth was."

Before attracting the investment he spent the best part of a year doing the rounds. "I was turned down by pretty well everybody. Most people are suspicious of anything that has got anything to do with the music business, doubly so if you've got any sort of handicap—both suspicions are very ill-founded. The handicap wasn't a handicap for what I was trying to do and the music business has its risk and its non-risk elements."

The decision not to borrow appears to have been a good and necessary one. Robin is certain that paying back loans *and interest* would have been financially crippling. "If I think back to the first year or 18 months of the Power Plant's life, if we'd had to borrow all or even half the money to set up, we'd have been in dead lumber. We'd have had to stop and sell up because the investments in re-designing and re-equipping were essential to keep the work coming."

So both tenacity and belief in himself have been important factors.

Robin has had to deal with the gradual deterioration of his eyesight since childhood. He fools quite a lot of people because to a degree his studios are tailored around his requirements and he knows the environment well, enabling him to move around confidently. He refuses to wear dark glasses or to utilise any paraphernalia that identifies him as handicapped because that may set up barriers in communication.

"Historically all you need to say is that it has made me a very determined person and that determination follows through in the work I do. It also meant that making music was a very appropriate thing for me to do because it's all about listening.

"The only barrier I have to get over is that I have to make it clear to people that it shouldn't alarm them in any way. The odd little thing becomes clear all of a sudden, as a matter of chance. At times I can kind of make the choice of whether to see or not to see. If I decide not to look, then I just don't see. If I decide I have to look at something I just concentrate all my energies on it, which is rather tiring." Robin doesn't seem to dwell on the point, making it clear that for him "life is good" and adding with a laugh "at least God gave me brains and good looks."

He finds that his reliance on some help from the acts he works with—just to avoid things like bumping into people and other moveable objects—actually tends to break down barriers, removing preconceptions of the producer as the all-powerful dictatorial ogre. Another advantage is increased aural concentration as a result of the lack of visual distractions. From this experience he developed a theory. Because he just has "this enormous void" in front of him "that should be full of beautiful music" he is not distracted by the sight of dominating monitor speakers pumping away at the air. He feels the result is a better perception of sound and consequently, better recordings and mixes.

This theory was put into practice when the mixing room at the Power Plant was upgraded: "We deliberately blacked the whole front wall of the mixing room and put the speakers somewhere behind it. So no matter how well you can see, when you're sitting at the console, you cannot tell where the music is coming from. And I've had an awful lot of positive feedback from people who have said: 'It's marvellous not being able to see the speakers. You suddenly start to concentrate on the music and on the person and all sorts of other things.'"

> It just wouldn't be the case that if a group came in on their first day of recording I would be sitting there with a whole armoury of equipment

Robin says they have found that it matters not how someone conceptualises the sound they're after—the arrangement still seems broadly popular.

Talking about his general production approach, Robin says, "I hope there is something people can identify about what I do to the point that they might choose to use me." He would hope to be known as someone who nurtures talent and aids the development of musical individuality. If a record company tells him that they liked a group before they went into the studio but they like them more after they've worked with Robin and the music's basic essence has remained intact, he's a happy man. "It just wouldn't be the case that if a group came in on their first day of recording, I would be sitting there with a whole armoury of equipment that is part and parcel of my production and they would have to fit into that sort of scene. What I had already set up would be entirely dependent on talking through their demos, working with the group and understanding what we wanted at the other end. I might have nothing at all set up except for one microphone or one acoustic guitar, or whatever I considered to be the right starting point for that particular group.

"I think you have your ground rules but those ground rules are more to do with professional approach and attitude. You've got to be systematic and use your time correctly and cleverly. And you've got to have an end in sight and that's something a lot of people don't do. That end can change as you go along. You have to allow yourself the freedom to mutate in the studio but in the back of your mind you have to have a clear vision of what you want the ultimate result to be before you embark on recording. Beyond that, I wouldn't go. I would never, for instance, say that I have my favourite piano sound, that I've got the EQ written down in a little black book, and where I put the microphone in Studio One on that particular piano because it will always depend on what I am trying to achieve on that particular track. A lot of record production is about people, relationships between people and understanding what people want."

Robin refers to recording technique as technical backup and talks about a minimum responsibility for the producer to develop his knowledge of the medium. "I think that goes almost without saying. I think any jerk shouldn't set himself up as a producer unless he has a great deal of hard knowledge and is prepared to do a lot of hard work to gain and maintain that knowledge of the nitty-gritty of the technical side of his work. But once you've got beyond that point, an awful lot of it is about talking, relating to people, personality and things like that."

One of Robin's regrets is that nowadays, demands on his time as a producer and studio owner are such that he rarely has a chance to play guitar on sessions and be directed by a producer. Subject to commitments he says, "I'm available at MU rates because ▷

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I feel I've benefited a lot from playing. I feel that I've always go to make more and more effort to remember what it's like to be there on the other side of the glass."

When asked if it was just coincidence that many of the acts he has produced are jazz influenced in some way, his response was a quick, "Yes." Then was it also a coincidence that these jazz influenced acts also have female singers? This time a laugh is followed by a pause for consideration. "I have to be careful what I say here, as a happily married man. I have always got on well with women. I relate to them well—I think they're good to work with and have a good attitude. So it's not an accident. I tend to be drawn towards projects that have girls involved in them based on the fact that I think: I'm good at that, so I'll do it.

"I happened to have a good jazz record collection and I happened to play some jazz guitar when I first met the people from Weekend. They'd met two or three other producers who happened to know nothing about jazz."

His knowledge of jazz meant that Robin was able to record a brass section and say if the voicing was right, or to judge a jazz solo on its merits or demerits. After Weekend, one project led to another. "I'm neither running away from nor towards it at the moment. There was a great flurry about 18 months ago when every dodgy jazz group in the country wanted me to work with them but that seems to have died down a bit at the moment.

"It was getting to a point where it was starting to bother me because people started to imagine me as someone who was an antidote to loud records, which of course—from all those years of rock and punk before that—was absolutely not the case. But at the time I was very happy. I liked the people and the type of music. At the same time I would say that some of the tracks I did with Tom Robinson as well as The Kane Gang were some of the most enjoyable things I've worked on in the last few years because I was able to make a racket. In the middle of making all these soft late-night records I was able to come out of the closet and make a lot of noise. It is certainly true that in this country I will never be established in people's minds as someone who can do his job properly until I do something that people identify as having nothing to do with the jazz thing which they regard as competent and successful."

Relating some of the important features in the recording of *Diamond Life*, he feels that the Power Plant's ambience is conducive to creativity, adding, "I always feel with any project that if we've got the environment right and the right people, we're halfway home. The demos were good and had that sparkle and magic. It was perfectly obvious what we had to keep and what we had to make sure we didn't lose."

Robin remembers hearing the demos and then simply hearing the founder members of the band in someone's living room. "I just thought: This is the way I like this group best, I think it really works. I like Sade's voice best when I just hear her standing next to me in a room." Robin decided that he would get the band to set up to play in the studio together, get everything sounding good and then work towards replicating that sound in the control room and on tape.

This approach also seemed a good idea from the point of view that they were working to budget and recording time limitations so Robin wanted the tracks to be "coherent and easy to mix".

A major part of his recording philosophy is to get and keep everyone in the band involved in the recording from day one. He also found that it was generally "a good approach to get the band sounding good in the room" and then to get it sounding like that on the other side of the glass.

"It was something that I'd never done before, it was an experiment. I didn't tell them because the last thing you want to tell a group is that you're conducting an experiment and using them as guinea pigs. Everything we recorded, if I couldn't close my eyes and imagine that the person was there playing in front of me, we stopped."

Robin recalls constantly trying to ". . . retain that audio image in my mind when I went back into the control room. Then we changed a microphone, or moved a microphone, or changed the EQ or reverb, to the point where—in my mind or imagination—there was not a pair of monitor speakers there, or a console or three panes of glass. We spent a lot more time moving microphones around than working on the EQ."

Robin tried to maintain this philosophy all through the sessions but felt that he could relax the policy slightly for certain final overdubs.

"I think the two tracks that the approach worked best on are *Hang On To Your Love* and *Smooth Operator* maybe because they were the sort of mid-tempo natural groove with the very fundamental bass, drums, *Rhodes* congas and sax."

Most importantly, he feels the 'experiment' was successful in that the results suited Sade's music and performance: "Particularly the concept of selecting ambient mics that seem right for the room and seem right for the general sound of the band. Selecting and maintaining their positions throughout the recording, feeding them in to a greater or lesser extent with close mic signals to give continuity. And it does seem to make the business of mixing a little bit easier. I'm talking about sound rather than balance."

Of course, budget considerations can severely limit the time available for experimentation with microphone technique. But Robin feels that although basic reference points and techniques are useful, far too often they limit creativity. "I'm always mystified by producers who come to the studio and say: 'Haven't you got a such-and-such microphone? I can't record a vocal without one.' Of course, what I do is immediately get them a such-and-such microphone but sometimes I scratch my head and think: 'But the singer hasn't even arrived he hasn't even heard him sing. He hasn't even recorded the backing track yet.' To me that's still bizarre. At some point, I think I must have used every microphone in this building for a lead vocal."

Robin moved on to point out that the microphone a producer or engineer thinks to be technically ideal may not "inspire the person to sing well". In such cases Robin may set up the microphone the singer likes, sending the signal from it to his headphones while taking the signal from another microphone to the tape. "I do that a lot. Some people like the sound and action they get from spitting into a *57*, it gets their performance going. But the way they sing and where they are in relation to the mic, it's unrecordable. So you poise a valve *47* up in the air pointing down towards them at a diagonal, out of line of the spit. Let them gobble away at their *57* and you get the performance you want on tape with the valve *47*. Whereas if you confront some singers with a valve mic, nothing happens. People who do a lot of stage work find studio mics aesthetically unpleasant things to sing at. You have to be conscious of the fact that studios are very difficult and alien places for performers to work in. You've got so many barriers: all this sound-proofing, triple-glazing and recording desks. You've always got to be trying to minimise the effect that has on them. You've always got to be trying to make things convenient for them and not for you. Somebody might say they hate singing with headphones on. The minute you put a speaker up, their singing improves enormously. Maybe they have to have the speaker quite loud so you may get spill problems. Then you've got to do conjuring tricks. If necessary, you've got to record that speaker—after they've finished—out-of-phase and then make a bounce to minimise the spill. Or you do your backing vocals through speakers as well with the speakers out-of-phase leaving them on while they're not singing. Then bounce the whole thing across with really tight gating between the singing and put roll-offs where the bass drum is rumbling away. Do your conjuring tricks. You do the bloody work."

Robin could of course play the role of the all powerful successful record producer and studio owner and operate on an intimidatory basis. "As a guitarist I remember being on the receiving end of that time and time again. It mustn't be a them-and-us antagonistic situation. If you're going to ▷

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work for 12 or 13 hours a day six days a week almost all the year round, you've got to enjoy it. Otherwise you must be mad. The amount of people I see wandering around the studio with long faces surprises me. They look as if they're dreading the next experience in making a record. I think that's terribly sad."

The Kane Gang's *Gun Law*, complete with some machine generated music is a very adventurous track. Unfortunately it was to a certain extent buried on the album *The Bad And Lowdown World Of The Kane Gang*.

"Yeah, I loved making *Gun Law*. That was a Roland *TR909* with about half the original drum sounds maintained, half of them sampled and replaced by my favourite drum sounds. It was a sort of synth bass line, sampled kettle drums, pianos, all sorts of things. It was great fun to do. I wanted to do that song partly because I thought the demo and the band were very good and partly because I wanted to establish to myself—and anyone else who was interested—that it's all a part and parcel of music and *Gun Law* was just something I liked that shows I'm not hamstrung or stuck in narrow musical ideas of what I want to do and that I can do a good job on a record like that. I regarded it as a really exciting track to work on and in a way it was a bit of light relief because I find making loud records a lot easier."

And *Gun Law* was totally different from *Take This Train* the other track Robin cut with the Kane Gang. "Yes, that was a track on which I used the basic philosophy I used on *Diamond Life*, of trying to get that sort of 'being there' type of atmosphere on the drums, *Hammond* and piano parts and the basic blues guitar and vocal backings. If you listen to *Take This Train* and then listen to Sade's *Hang On To Your Love* with your eyes closed, I think you'll see what I mean. I think that's a good way of identifying what I'm saying about this question of a band being in a room. It'll identify it in terms of the production style. I think you'd be able to play *Take This Train* and *Hang On To Your Love* and say they were done by the same producer. So all the things I said about *Smooth Operator* and *Hang On To Your Love* applied absolutely to *Take This Train*.

The amount of people I see wandering around the studio with long faces surprises me. They look as if they're dreading the next experience in making a record. I think that's terribly sad

"I wanted to give the impression of a large choir of people and we built up 20 tracks of backing vocals with two girls. We just ran the track again and again and I told them, very specifically, not to sing like session singers singing exactly the same each time, just to sort of sing any old how, doing their ad libs and any variations of the tune that came up. We just built it up and suddenly when we'd done about 20 tracks of vocals, it sounded like this huge group of happy people."

Sade's *Diamond Life* has a lot of delicate musical shading thus creating different subtle musical flavours. Also the old adage comes into play: what you leave off a track is just as important as what you put on.

"I think that suits Sade's music. Overloaded production is rather commonplace at the moment and I find that you have to be very careful. There are various stages of saturating records with musical ideas which lead you on to another plateau and you then have to complete the picture to that degree of complication. You can put one little idea in one little part of a song and that becomes top heavy and you find that you want to put the idea at the beginning and the end as well. Then you find the gaps you've left sound rather empty and weak, so you tend to put something else in there. You find you reach a point at which if you put one more musical idea on a track, you've got to put six more on to make the song sound coherent within that new framework."

During virtually every interview Robin has given, by his own volition he's referred to Trevor Horn's production at some point. "I regard Trevor Horn as one of the major musical finds of recent years. A major talent. I regard him as a record maker on the artistic side of the fence. It's very difficult to say that without seeming to diminish the abilities of the groups and people he works with but I think it has to be said that he dominates the musical side of the records he produces as well as the approach to the overall sound and style. I don't think you can put him in a category of a producer whose job it is to bring out what there is about a group that is already magic and guard it, keep it, expand on it, nurture it, be true to it and give the group a platform on which they themselves can build and grow. I would try to identify the essential difference between us there.

"I take great pleasure in the thought that I might work with a group again on a second project because generally speaking, for me it is much easier if I've taught them how to work in the studio properly and how to express themselves; how to get and keep their confidence, and get the maximum creativity and bring out the best in them. If they're good, they'll have learnt those lessons well.

Robin was most enthusiastic about the APRS Producers' Guild, as he explained. "It's really had some very tangible results already inasmuch as we've had two main people from Sony sit down in front of us and talk for about four hours about what they are doing with digital recording and what we think they should be doing. We've done the same thing with Studer who actually flew in a team from Germany to talk to the people who are actually going to use their equipment and make records. We're going to do the same thing with Mitsubishi and the AMS people who are working on digital systems."

Robin says the Guild intends to try to improve communication with other sectors of the industry—such as record company A&R people and recording studios—with whom they feel a more meaningful dialogue should be established, as well as between producers themselves.

"It has taken away the competitive corridors in which we producers were all running side-by-side but with walls between us all, looking furtively over our shoulders to see what's so-and-so doing? Has he taken over a project I was doing and should I hate him because he did?

"We've all met around the table and got to know each other and suddenly there's this league of friends who all do the same job and are not in competition with one another, they're just trying to do their best. And we have a fantastic exchange of ideas."

Robin explained a pooling of information. If someone has bad experiences with a piece of software, he tells the other producers. On the other hand, if someone has found some new equipment that performs a particular function well, the information is passed on.

"The most interesting thing about the meetings stemmed from one person saying: 'I don't know what it is but every time I hear one of my tracks on the radio, it sounds quiet and all you boys' records sound really loud.'

"Then the person to his left said: 'It's funny you should say that because I always think my records always sound dull and your records always sound really bright.'

"Then I said: 'It's funny you should say that...'

"We're hoping to bring in a lot of other producers—young, old, experienced and inexperienced—to get the benefit of the information, strength and muscle that we've got—to make manufacturers toe the line and not just ram things down our throats; level the score a bit between the producers and the record companies and perhaps stop some of the enmity and aggression that exists between record companies and producers by sitting them all round the same table."□

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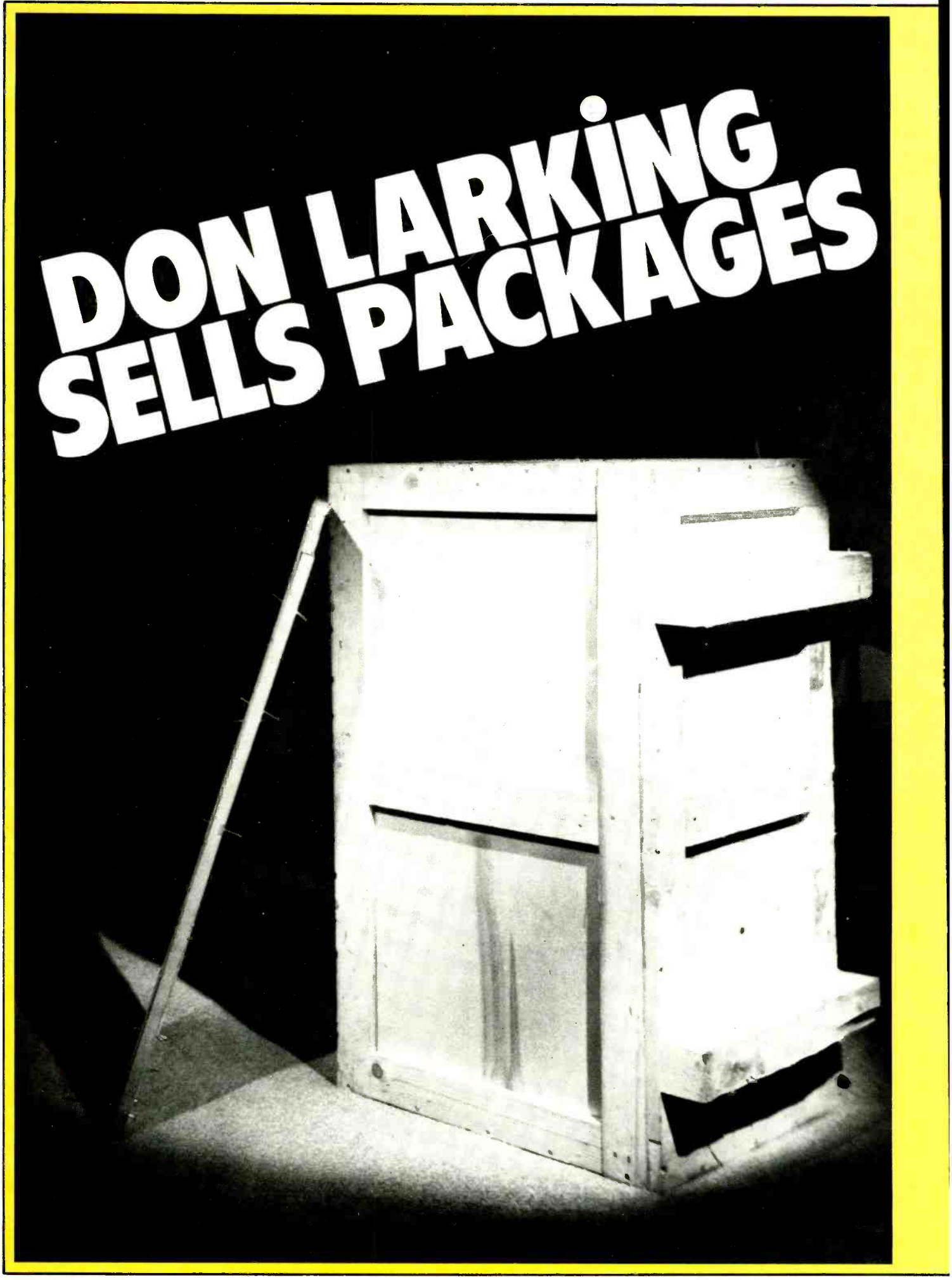

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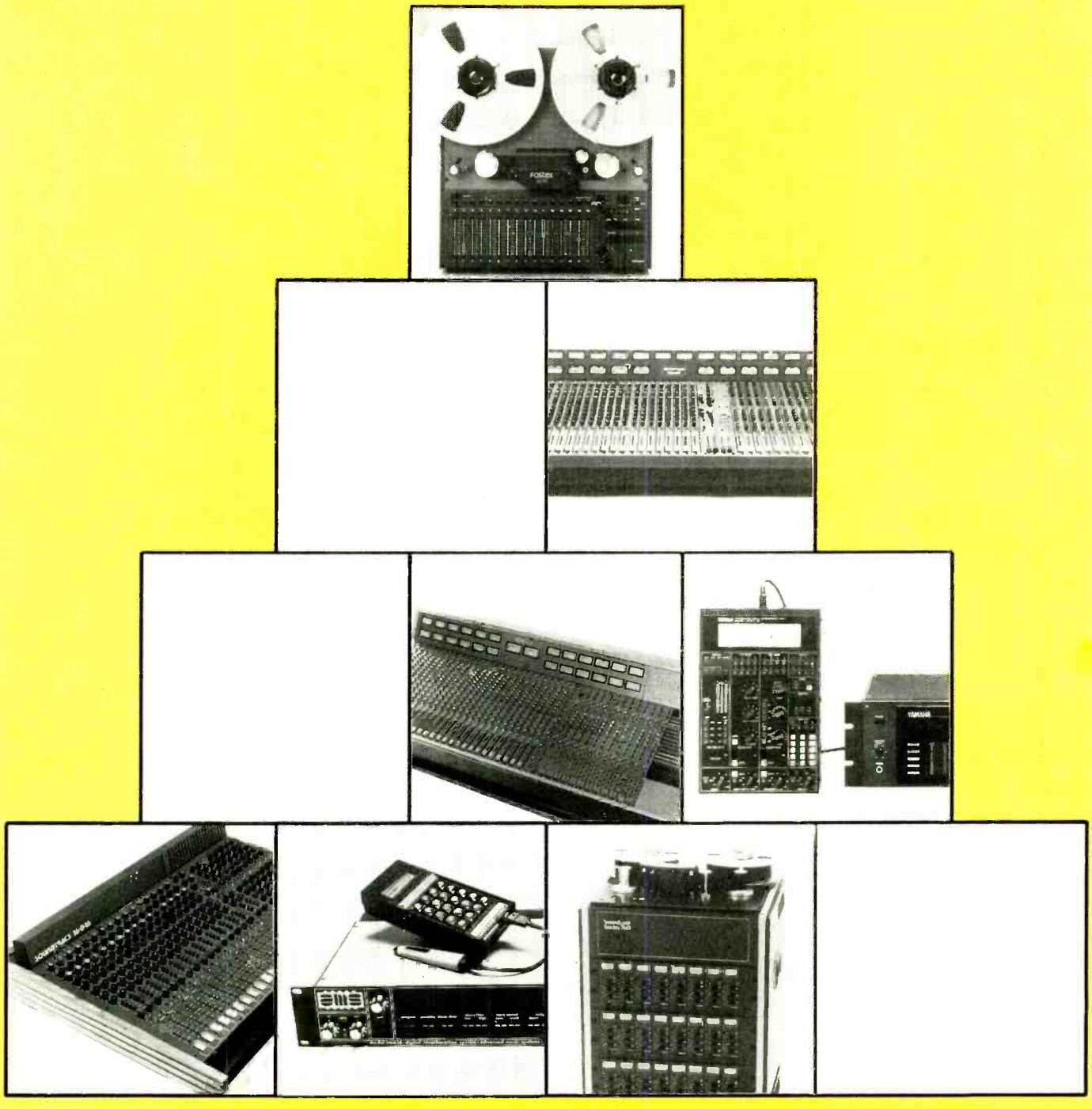

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DEVELOPMENT OF A DIGITALLY CONTROLLED MIXING CONSOLE

Ted Fletcher and Steve Dove of Alice described the thinking behind the development of a digitally controlled mixing console in a previous article. Throughout the building of the original console it became clear that it had a wider application than was first envisaged. Ted now outlines the modifications which enabled two more Silks to thread their way into recording studios

The traumas involved in the creation of the first *Silk* mixing console were well documented in *Studio Sound* October 1983. The mixer was developed from first principles and incorporated a wealth of new technology. Completed early in 1983 it was installed in Studio Four of Silk Sound in Berwick Street, London, where it has been busily producing the sounds for massive quantities of TV commercials every since.

In spite of its enormous success as a working tool, the process of creating the monster was so traumatic to all concerned that Alice decided not to go for a sales drive; in fact the many enquiries that were received were dealt with more along the lines of polite suggestions that there were other manufacturers of multitrack consoles whose products were jolly good!

Steve Dove flew off to warmer climes to perpetuate the rumour that he is the highest paid 'roadie' in the world, Ted played at commuting to the Far East, and quietly, Alice got on with producing mixers and gradually developing computer control of complex switching systems. It was all too quiet and well ordered to last: around Christmas 1984, in quick succession, Alice was talked into manufacturing two more *Silk*s with the probability of orders for several more. The cries of anguish from the silkworms could be heard from Slough to Staines. The stalwart Alice wiremen finally relented under the pressure of bribery with promises of crates of beer for a frame free of faults and the process began again—but this time the computers were ready.

Silk revisited

The original *Silk* was conceived out of frustration with an industry that could not, or would not, supply equipment to the requirements of a major customer (Robbie Weston at Silk Sound). It was created to perform the function of a highly flexible 24-track in-line mixer, with the ability to emulate a conventional mixer with stereo channels, subgroups and groups; the format that is a requirement in the modern commercial studio specialising in TV and radio commercials. To achieve this, neither the in-line nor the conventional approach was suitable; the method adopted was to create a collection of the finest individual circuits known and to interconnect them with an array of switching matrices. Alice already had an established track record in the field of audio switching, stemming from earlier days in commercial radio and latterly in large computer controlled systems for theatres as well as radio and television.

The format requirement for the *Silk* was for 24 input channels working to 24 outputs but with six stereo subgroups operable as stereo line level channels as well, and with access to both audio paths of each channel at any time (under some conditions making it a 60-channel mixer).

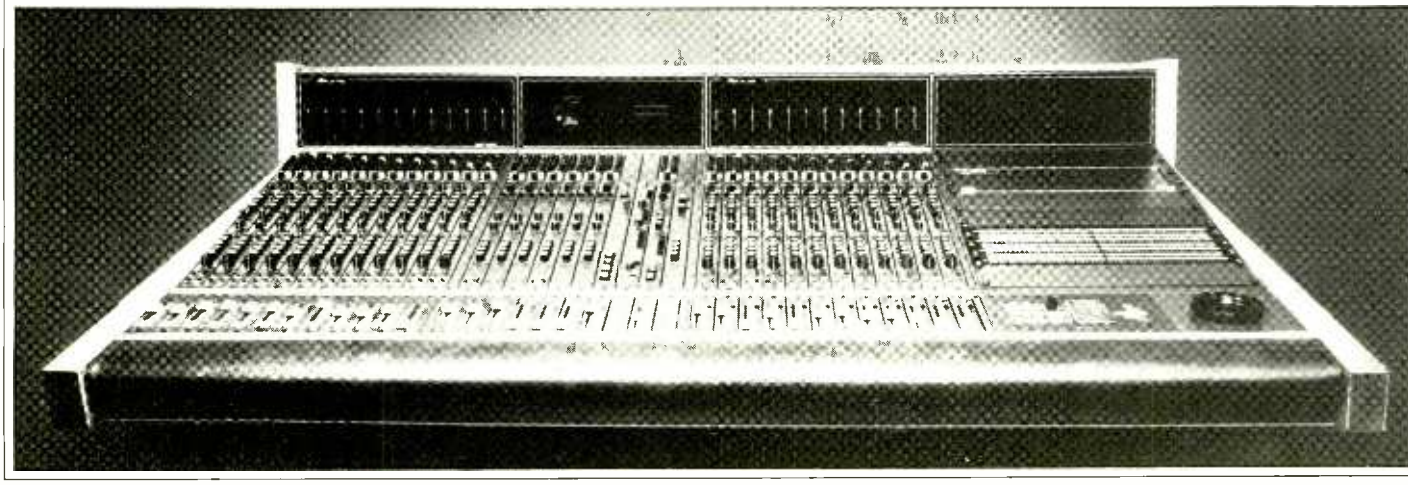
As soon as the first mixer was completed and installed, it became obvious to all the engineers who saw it that its scope of use is very much greater than first envisaged; the mixer is ideal as a full blown music recording console, its stereo subgrouping facilities being a valued bonus.

Analogue

Big radio stations are just complicated collections of fairly simple audio 'circuits' interconnected by a massive switching system. As the audio signals have to travel long distances through some horrid environments, signals have to be kept at a high level and *must* be balanced. That philosophy is as old as radio and as true in 1985 as it was in 1930.

The *Silk* mixer is a large collection of audio circuits interconnected...etc. What other way is there to go? Isn't it obvious that any mixer of this magnitude must have a balanced audio path? The industry generally (and universally) has been struggling for years with the limitations imposed by 'one wire' tunnel vision. The *Silk* was the first multitrack mixer to apply the obvious in every audio path. Doesn't the console strain the floor with the weight of transformers? No! In 1981 a seemingly simple little circuit was developed in Windsor, it looks like an op-amp eating its own tail but in reality, it's a truly symmetrical summing amplifier that can be used for inputs or balanced 'virtual earth' mixing. We tried it in anger for the first time in a ▷

The completed console is currently used for TV commercials sound mixing and music recording



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DEVELOPMENT OF A DIGITALLY CONTROLLED MIXING CONSOLE

little video editing mixer for the BBC in 1982, the test performance was so startling and vice free; the circuit was nicknamed the 'Superbal' and the name has stuck. The *Silk* is stuffed full of superbals and its output equivalent—a circuit that thinks it's an output transformer.

So the *Silk* has no transformers? Wrong again. The very best microphone input stage we have seen and tested has one of those little lumps of iron and copper sitting on the front. It's hardly reactionary to use the best available circuit even if opposition insists that we are senile. Using a mic transformer is more expensive than fitting the latest marvel of physics that receives Radio 1 quite badly and doesn't sound too good anyway but it's a small price to pay for excellence.

The other departure from normality in the system came from those big switchers that Alice quietly make; a neat little trick for avoiding audio current in the ground paths (there is some unbalanced circuitry tucked away inside the building blocks!).

This is the 'dustbin' technique of using op-amps to gobble up unwanted signals like little pacmen. This in combination with the superbals makes the detail circuit diagrams look distinctly Daliesque but what's a few extra op-amps sprinkled among the thousands?

A seemingly major problem in the development of the first *Silk* was the integrity of the analogue switches—there had to be literally thousands of stages and audio signals could have to pass through up to 20 switching stages with *no* degradation whatsoever. Once again the existing technology came to the rescue with current-mode CMOS switching; a technique where stages can be simply cascaded with no measurable (or audible) degradation, no clicks, no crosstalk, no distortion.

In hindsight, we shouldn't wonder at the performance of the *Silk*; the absence of perceived noise and the massive overload margins are all predictable in a proper balanced system. The thing to wonder about is how the industry managed for so long with such inferior 'conventional' equipment.

Digital

The press and the media must be to blame for the picture that is conjured up by the word 'computer'. Inevitably it is the idea of a keyboard with some 'chips' behind it, surmounted by a grinning VDU. By this definition, the original *Silk* had little to do with computers; it didn't even have a microprocessor in it! But the digital manipulation that goes on in the 'channel' is certainly as digital as your watch or washing machine. For ease (!) of initial testing, each channel module has its own on-board free running clock (1 MHz originally) complete with dividers and timing peripherals but capable of being interrogated and responding to commands from 'somewhere outside'. The clock and its associated circuitry scans the matrix controls and switches (three banks of eight per channel) sitting there quietly Megging away to itself right next to all that sensitive audio stuff! Not to worry, this is just the sort of horrific environment that balanced audio ignores completely.

Provision was made in the first mixer for the later addition of overall processor control but once the mixer was installed at Silk Sound, the studio became so successful that Robbie threatened to shoot any Alice engineer who touched the mixer. So all the channels are still Megging away doing their own things at their own rates.

1985

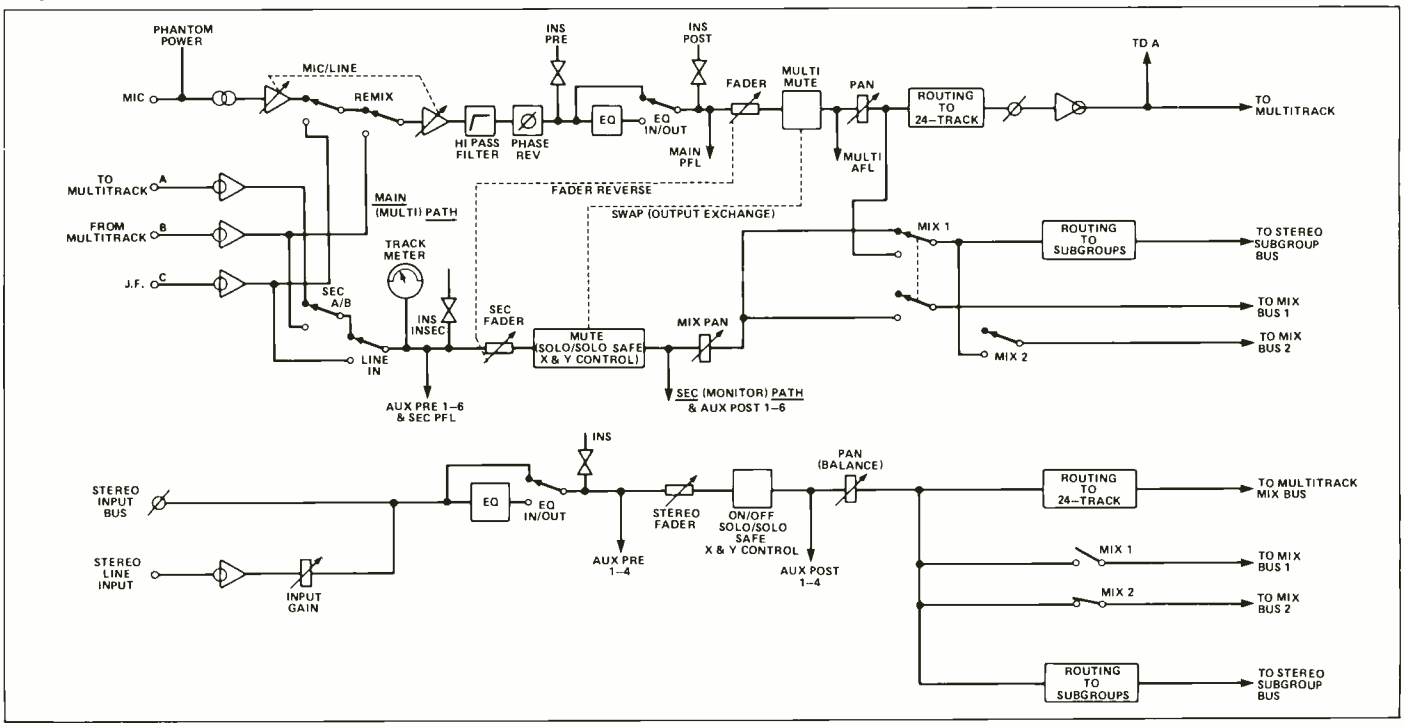
The specification for the new *Silk*s for Greenwood and Blackwood Studios in Switzerland, included such minor items as 16 presettable mixer configurations, running real-time status change under SMPTE code control and fader automation. The design team now consisted of Steve Dove, Ted Fletcher, and a 6 ft digitally controlled weirdo—Mike Law—who after gaining work experience at Alice during his last two years at Birmingham University, graduated with an excellent degree, then claimed that we had mentally ruined him for gainful employment anywhere else—so he might as well stay in Windsor. We divided up the responsibilities with Steve as the architect of the channel blocks, Ted watching over the routing systems and the peripheral audio (monitoring, aux systems, comms and metering) and Mike shouldering the impressive burden of computer systems.

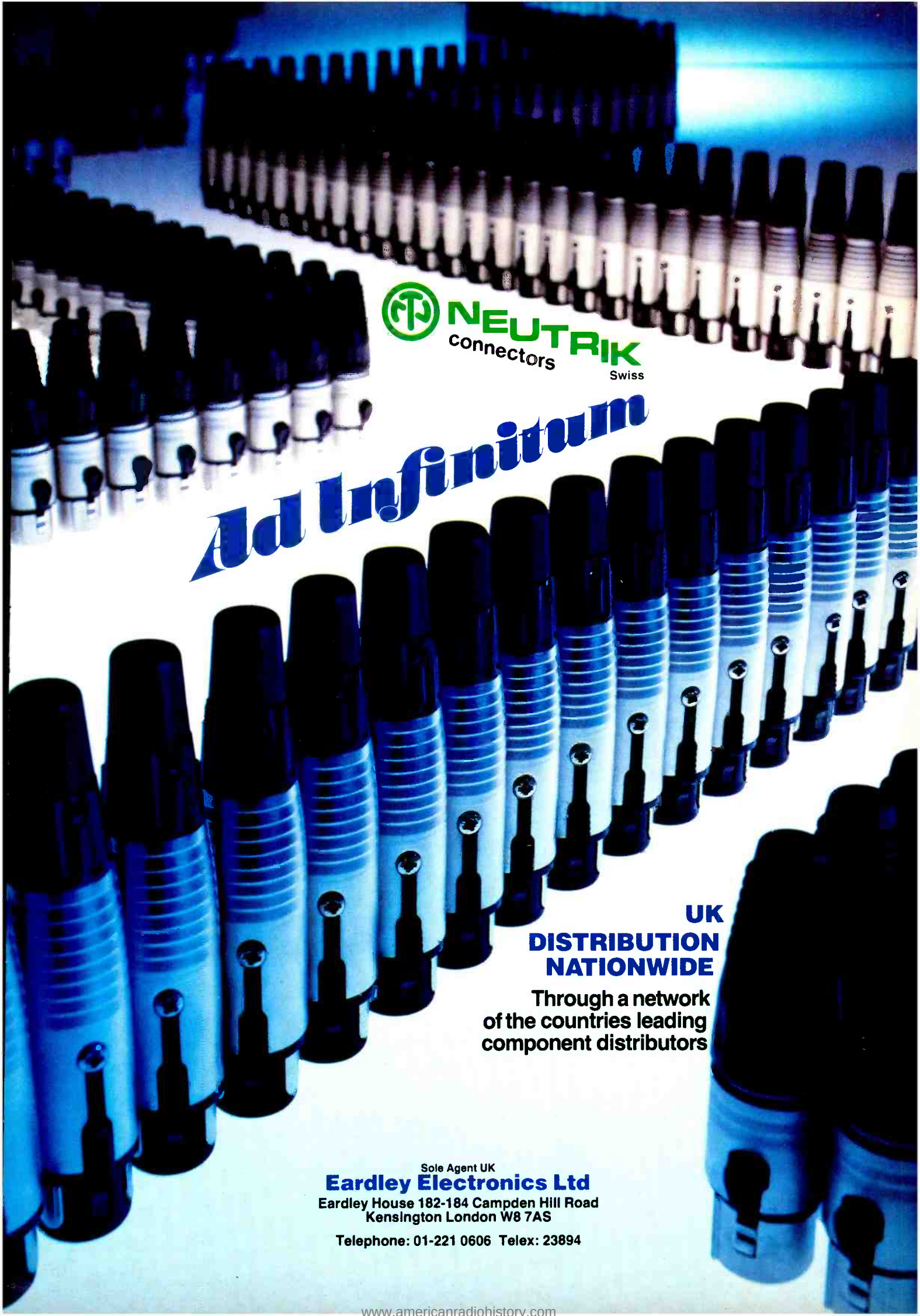
We spent a week or so studying the old *Silk* with the valuable benefit of hindsight and user comments and came to the surprising decision that in spite of the deadly timescale that was required on the original design, the system still 'stood up' and remained ahead of its time. A minor change to the automatic routing of aux outputs 5 to 8 which had caused some user confusion (too automatic) and that was it.

Time had not stood still, a detail improvement in matrix technology had been made late in 1984—a simple way of rationalising power supplies between audio systems and the controlling computers, eliminating much level shifting circuitry and actually improving distortion performance in very large systems. It was our first stroke of luck that our old prototype *Silk* channel took to the supply changes as if they had been designed in originally! The channel was hastily (well, a couple of days) hooked in to the lab matrix development computer (a BBC with bells and whistles on) where it was coaxed into thinking that it was a section of a theatre matrix in Helsinki, and started to show distinct signs of intelligence.

After much testing and patting each other on the back, it had become obvious ▷

Simplified block diagram—Silk channels





DEVELOPMENT OF A DIGITALLY CONTROLLED MIXING CONSOLE

that although the 'channel' was behaving itself under all conditions, the changes to the power supplies made it impossible to see the illumination inside the tiny logic switches that are sprinkled all over the channel. A tripartite meeting decided that the only sensible course of action was to control the LED drive current to each switch separately with a transistor—this involved the adding of 800 transistors to the mixer. Miniaturised PC design has been a feature of the *Silk* from the beginning, so there were not too many groans from the drawing office when they were presented with the pencil sketches of a 4 cm square PCB containing an IC, a resistor pack and eight transistors. Prototypes were manufactured 'in house' and the module promptly lit up like a Christmas tree.

Meanwhile, having decided that operators actually like looking at TV screens and our friends in Oxford can't be wrong, John Andrews set about the task of shoehorning a VDU into the centre section—a success but only at the expense of a 'power bulge' at the back.

The pace of work slowly and inexorably increased. The old computer generated wiring schedules were dusted off and passed down to the *Silk* farm in readiness for the arrival of the mainframe. The huge double-sided PCBs started to arrive—for the *Silk* stockings to work on under magnifying glasses (too dense for flow soldering), and a massive area of testbench was crammed with equipment for channel testing, the required test equipment being: two audio oscillators and a sweep generator/plotter; two oscilloscopes; 12 audio meters; an extended scale true RMS meter; a precision noise meter; a ⅓-octave analyser; four power supplies; two digital voltmeters; a logic probe and a 40-way jackfield—all necessary to test a single channel.

The production prototype channel was lovingly prepared by the *Silk* stockings, inspected for obvious faults by Eric, the production director, and passed on to Steve for the harrowing task of testing to destruction on the 'big rig'. This process meandered on for days and days; Steve surfacing from his manic mumblings every few hours to apply red pencil marks on the component layouts to indicate the modifications, then

Steve Dove and wireman Chris assemble the Silk while production director Eric works on a module

rushing away to avoid the wrath of the stockings who were well into production by this time and dreaded the word 'mod'.

The prototype 'channel' was judged to be fit for use under local control (with its own 'computer' working as a 'stand alone' system) and handed on to Mike Law to be taught to behave correctly under central processor control. The rest of the *Silk* team only had to suffer muttered 'nrds and nwds' for a day, before the educated module was returned to the stockings with the instruction 'make 'em all like that one'.

Monitor magic

The monitor module on the first *Silk* followed conventional lines with the audio being switched and routed mechanically. The final module ended up as four layers of unbelievably dense wiring and PC work terminating on a 120-way connector; the process is not repeatable outside a mental hospital. TF's first job after the order confirmations was to completely redesign the monitor arrangement with the eventual aim of being able to reproduce it with a semblance of reliability using existing technology if at all possible. As the central computer system was due to be contained in a 3U Eurocard rack with plenty of room to spare, after a little cross-technology horse trading, the spare space was allocated for the monitor switcher (as it was to become). A bank of 8/1 switch cards originally designed for a television company joined some VCA amplifiers (original research) and a complex interface card first used for the British Forces Broadcasting tape duplication system in Paddington. The whole system when plumbed together is controlled via a 26-way ribbon cable from the 'monitor' position in the mainframe, the module having almost nothing on it! The most significant advantage of working the long way round with a remote logic controlled switcher is the ease of interface with the dreaded computer systems; such mundane functions as 'mute', 'dim' and 'PFL' become instantly more controllable.

Computer nuts and bolts

For historic reasons (big switchers and even bigger software) the central processor of the *Silk* computer is a *6502* running under an operating system close to the BBC/Acorn system—a specially written version designed for 'stand alone' cards. Its basic function is to scan the control cells in the mixer (three cells per channel with eight switches per cell) and to be able to store the switch combinations, respond to modifications to the status, and take control of any combination of switches when required. To do this, the computer needs memory references for set switch patterns and modifications. To achieve this, the main EPROM operating system chip contains not only the operating system and such 'language' as is required but also a set of four 'preset' switch combinations covering the main desk functions together with the command systems required to operate the mixer interface, with video driver system and a large block of RAM (not to mention a comprehensive set of diagnostic programs which can be accessed by plugging in an intelligent terminal or even by telephone).

The 8K EPROM used is substantially full of machine code; the print-out runs to many feet of paper! The battery backed-up RAM adds a further 8K of memory and the video card makes use of yet another 16K. But should a stupid ex-operator (just been fired) pour Coke down the computer rack, the whole system still works—just acting a little more stupidly! (Remember Hal?)

Fader automation

A second processor controls the fader automation system—the two computers talking to each other in interrupt mode. (Action by the automation computer flags the main computer which asks what has been done—the information is then displayed on the screen for mere mortals to look at or ignore.) The system stores the fader information in yet another block of memory—dynamic RAM, where the 48K of capacity is sufficient to store more than 20 minutes of fader action by even the most phrenetic of engineers.

To keep the system in time with the real world, SMPTE code is used. This was an early decision in the development of the automation as it is the most used timecode making the system compatible from studio to studio.

Final storage of the fader movement information at the end of a session is a 'download' on to the single SMPTE track where each minute of track running time is compressed into about ½ s.

Fader movement information appears on the VDU, courtesy of the main computer, as a series of vertical bars. Reading and writing to the fader automation computer can be done overall or using separate faders. Special functions such as fader grouping and the setting of SMPTE time positions, are controlled from a small panel conveniently placed for coffee cups (a drain hole is supplied so that hot coffee pours straight on to the ▷

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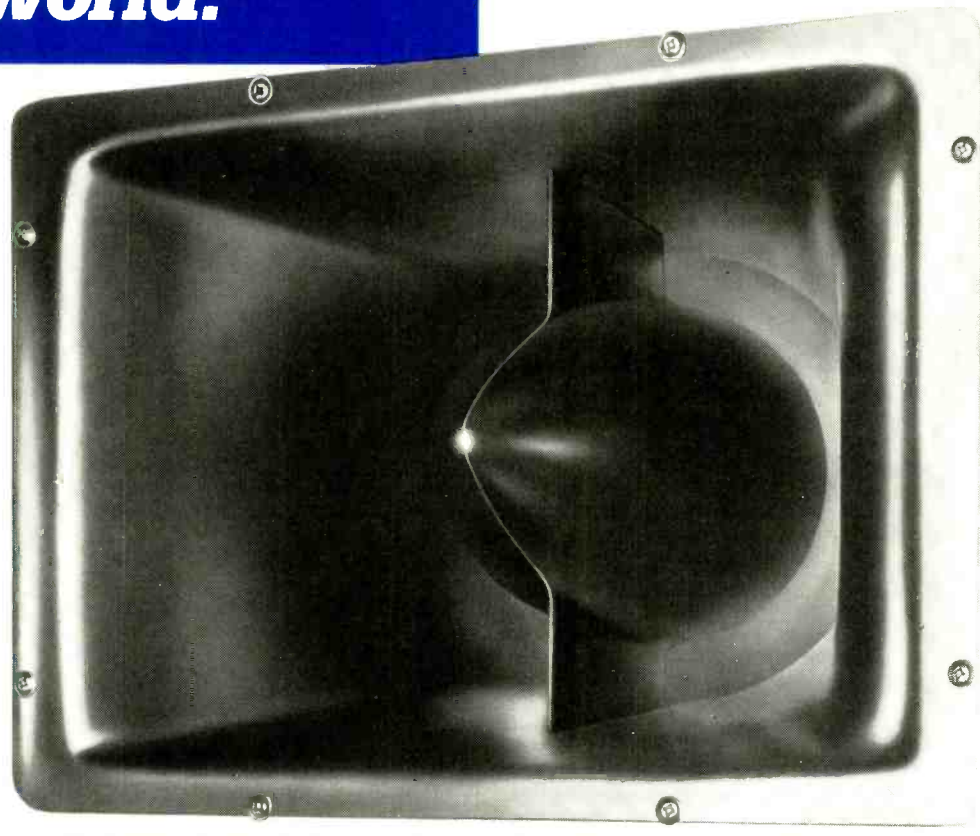

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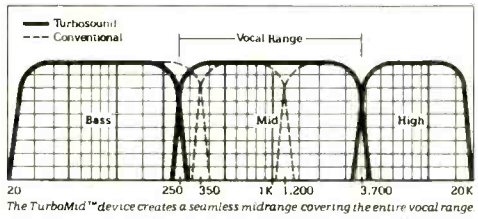

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knee of the operator).

Velocity

So basically the *Silk* has 30 'channels' which are semi-intelligent and think that they are individual computers, two real computers that talk to each other (and incidentally, simulate a third 'processor simulation' for channel interrogation) and a whole heap of high speed software to hold it all together. So isn't there a time lag when you try to operate the beast?

The answer is a resounding *no*! The main programme loop which interrogates the channels is designed for a mixer size of 96 channels, and it gets round that in a mere 60 ms. This means that a total desk re-configuration happens within ¼ s of hitting a preset button. Alteration of individual routing happens faster than that. As a delay of even 0.1 s could be an annoyance in a complex music mix, the software has been arranged so that main functions like X/Y muting are scanned first making the operating appear to be instantaneous.

Operationally, it works like this: you throw the main power switch and the mixer lights up like fairyland—in the operational state that it was in the last time it was switched off (control presets and modifications retained in battery backed-up RAM). The screen comes alive and you see a display at the top like '9 PRESET'. This indicates that the last preset condition to be used was number 9. You press a small button in the middle of the control surface which says 'SET ZERO'. This is one of the pre-programmed desk states and turns everything off. You then hit 'RECORD' and the channels adopt a conventional 'in-line' mode ready to take signals from mic inputs and route through to multitrack, with monitoring automatically routed from the multitrack through the 'sec' or monitor path and down to the main mix bus. You press PFL or SOLO and the words appear on the VDU, similarly with master functions like MASTER A/B, SOLO and others.

You start your session setting the start time of the SMPTE code and changing routes and paths (little + signs appear on the screen) and hit on a switch combination that you want to repeat later. You press a large red button marked 'STORE' and at the same time touch one of the PRESET buttons. The word 'STORE' flashes, within the time that you blinked, the complete desk status is stored in the selected preset and is permanent until changed.

At the end of the session, you run the tape a little longer with the SMPTE track in 'record' mode and store the fader information for a few seconds. Then choosing an unused preset, you 'store' again so that the next day, the desk will return to the mess you left it in.

Back to reality

A mixer is only a collection of microphone amplifiers, line amplifiers and routing switches laid out to enable the poor recording engineer to put down on tape the wonders of the music of the time.

The *Silk* is only a mixer—a handful of circuitry that 20 years ago would have been inter-connected by some sort of patchfield or a few thousand relays. Now we interleave the analogue with digital control—why not digitise the lot?

The answer to this basic question is in two parts; one abstruse and the other economic.

What is an equaliser for?

Deciding whether a sound is real or not to the ears of a listener is a combination of so many factors that, in the classic description, it is an art form—a science with more than seven variables! One tiny section of that art is the type and use of the equaliser.

In the real world, positional information (near or far as well as direction) is acknowledged to be a complex combination of relative levels with frequency (amplitude frequency response) and phase relationships across the audio spectrum. Every environment modifies the sound we hear, from the open air—which attenuates high frequencies relatively with distance, to a highly reverberant concert hall—which embellishes the sound with multi-path reflections, phase shifts and cancellations. From this it is obvious that large sudden changes of amplitude at specific frequencies rarely occur naturally—the ear is unused to them therefore they sound unnatural.

The most common use of the equaliser whether engineers realise it or not, is to change the perspective or perceived distance of the signal that is being equalised—a brighter sound apparently pulls the signal forward. This works well if the electronics correctly emulate the natural effect, however, an equaliser which introduces phase and amplitude distortion of orders that do not occur in the real world will sound unpleasant—the effect being rejected by the ear, thus requiring greater distortion to even begin to produce the desired sound. In the recent past, experiments have been carried out along these lines—applying different circuit designs in the attempt to emulate audio reality. The results were unremarkable in that the facts and results confirmed the theory. Simplistically, it is a proven fact that, particularly at middle and high frequencies, modification of the spectrum should be restricted to first order (6 dB/octave) with attendant phase shift (lead for lift, lag for cut) proportional to it, and this rule of thumb must apply for both steady state signals and transients.

The design of circuitry to achieve this is well understood and applied by some console manufacturers (including Alice), others ignore the psychophysics and produce equipment which in specifications promises superior frequency control but in practice sounds disgusting giving the equipment a sound of its own that is only wanted (and deserved) by cloth-eared producers and engineers who are affected by hype.

DCA-DSP

On the question of the relative merits of digital signal processing (DSP) versus digitally controlled analogue (DCA), when considering the finer points of perceived sound, digital systems must be considered—being an important part of our working environment.

The digital equaliser is a mathematical construction of what is believed to happen in the real world—the shapes, orders and phase shifts can be neatly accommodated into the channel processing and now they exist. Yet there are a remarkable number of quality aficionados who complain of astringency, apparent distortion, unreal effects and general uneasiness when listening to pure digital recordings. Technical buzz words like 'quantisation and aliasing' are bandied, and blame is laid time and time again at the door of the poor old A/D and D/A converters. We have a theory.

Given that some difficult to define problem does exist—and all our ears are not completely past it—the spurious effects are the result of the totally different manner that digital processing treats complex waveforms: those with transient content. The mathematics are adequate for the steady state but once transients appear the phase components become unrelated to their frequencies and a perceived unreality is introduced.

We must not be dogmatic—it is only an unproven theory based on some listening tests but there is some writing on the wall (albeit partisan graffiti) and presently, it supports our case for real-time electronics that react in a manner very close to the world we continue to live in.

At Alice experience of the maligned digital converters has shown no serious problem in the transient domain—only a huge step forward in allowing the use of digital recording of analogue signals with complete fidelity. The problem seems to manifest itself in the CD mastering process—is it where a digital equaliser was used?

To maintain equality and prove our attempts at fairness, it must be stated that where dynamic control is required for whatever reason, then the digital domain with its inherent time delays reigns supreme. This is one good reason for omitting dynamic processing in the *Silk*; the future will provide a new breed of digital goodies which will become hooked into the real-time *Silk* to achieve another step towards the perfect mixer.

The economic answer

Since the completion of the first *Silk*, fully digital mixers have been installed. Their price is approaching 10 times that of the *Silk* and their audio performance is no improvement on properly used balanced analogue (is any improvement possible or even necessary?) their adaptability is restricted and reliability has yet to be established. As forward looking engineers, the *Silk* design team have an accumulated 100 man years of experience and 20 man years of design behind them. The decision to stick with analogue for the foreseeable future is not a light one. Digital audio design is happening and perhaps our grandchildren will operate totally in the digital domain but for the present and the next 10 years, analogue *will* rule the industry; economics and technology demand it. □

The essence of great musicianship is to make the difficult look easy.

The essence of good technology is to make the sophisticated simple.

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STUDIOFILE

STUDIOFILE

The Fleetwood Mobile Studio, Warlingham, Surrey

The Fleetwood Mobile Studio has, until very recently, kept a fairly low profile. This was mainly due to the fact that they were not geared up for live work and were therefore operating only on location. Location work as such has not been the 'fashionable' way of doing things for a few years now and it is surprising that Fleetwood only decided to install a second 24-track machine and 'go live' in January of this year. If there was any doubt about the decision, there are certainly no regrets now as the work comes pouring in. They didn't exactly get off to a bad start either—their first live assignment was Frankie Goes to Hollywood's *Europe A Go Go*, satellites and all.

The truck itself was born nearly five years ago out of the profits of Fleetwood Publishing which, of course, published Fleetwood Mac, hence the name. The three partners are Nick and Michelle (Mitch) Reynolds and Andy Rose. Andy came from the recently demised Mobile One which he was with from its inception to its end. The dedicated trio run the mobile almost entirely alone with the aid of Eve Bruckner who runs the publishing companies, takes care of bookings and moves into the office when the truck is away to man the phones 24-hours a day. Andy takes care of the inside of the truck, Nick the outside, travel arrangements, ferries and costs, and Mitch is tape/op, cook and PR lady. Driving is split between Nick and Andy, and when they arrive at the gig it's all hands to the deck.

When it is resting, the mobile lives in a haulier's yard in a small Sussex village; "Well, we can't park it outside the house can we?" explained Nick. The haulier's yard is actually perfect because mechanical truck maintenance is instantly on hand and it is also relatively secure. The facility is unusually large and spacious, built in a Ford *D Series* 38 ft lorry. When the cab and chassis were first bought, the chassis had an 8 ft extension fitted and the interior acoustic design and equipping took place over a period of nearly 12 months. Freelance engineer Lou Austin was commandeered to supervise the operation and the equipment choice was his. SHE Audio supplied most of the gear and carried out the installation and very little has changed since then.

The size is really what strikes you first. The van itself does not look enormous but as soon as you set foot inside you can't help but comment. Towards the front the custom-built Raindirk *Quantum* console is the centre piece, and the whole van is lit by day from the three (triple glazed) windows along either side wall, and by night, by spotlights. The Hessian/fibreboard/Rockwool insulated walls are pretty straightforward; the ceiling, more complex, incorporates ¼-wavelength bass trapping above the mixing position; it then slopes away up to the JBL *4343* monitors with a solid oak top surface. From the mix position right to the back of the truck the ceiling is covered in a solid foam tile finish. With the floor covered entirely with thick carpet, every surface is treated. "In a truck like this there has to be very careful control of the bass. In the mixing position the sound is very good, but if you sit on the seat at the back you would tend to hear too much bass," explained Andy.

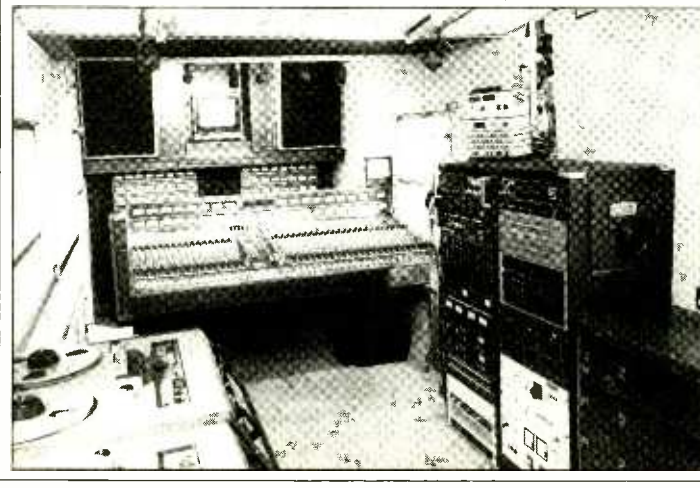
The fact that space is not a problem meant that Fleetwood were able to incorporate a kitchen (albeit small) at the back where not only can you (or Mitch) prepare snacks but there is a small fold-down table if you want to keep out of the way and there is also room for storing the test tapes and the headphones. Heating is installed, in addition to the air conditioning systems which pushes cold air in, in front of the console and it is then drawn out at the back of the room so that cold air is constantly passing over the equipment.

The Raindirk console design was based loosely on the company's *500* series and facilities include VCA sub-grouping, MCI automation, 32-track routing, 50-inputs, programmable muting system (the mutes may also be programmed from the computer), four auxiliary sends, two echos, 3-band EQ with high pass filter and more unusual features such as the Track Jump switch which allows you to bounce tracks without any patching.

Andy finds the console very versatile and believes it to be one of the most advanced consoles installed in a UK mobile recording facility. A new power supply was recently designed for it by Clive Green of Cadac as the previous one's regulators were introducing noise and hum. "Clive Green's power supply is like a tank. The noise figures now are very good—the board is much quieter and it also runs a lot cooler now."

Tape machines are two MCI 24-track multitracks with MCI *JH45* synchroniser, and two MCI 2-tracks all with Dolby noise reduction.

The automated custom Raindirk console is loosely based on the *500*



The JBL *4343*s are driven by HH MOSFET *V800* amps, and equalised by White ⅓-octave EQs; reference speakers are either Yamaha *NS10M*s or Auratones driven by Quad *303*s.

Fleetwood are rather proud of the outboard equipment complement which they, again, believe is probably one of the largest to be installed in such a facility. It includes Eventide *H949 Harmonizer*, AMS *DMX15.80S* digital delay processor, Marshall *5002 Time Modulator*, Drawmer dual compressor/limiter, Audio+Design *F760* limiter/compressor, two dbx *160* compressor/limiters, two UREI *1176* peak limiters and an AMS *RMX16* digital reverb. There is also a *Scamp* rack which contains three Drawmer noise gates, four Roger Mayer gates, two Audio+Design *501* compressor/limiters, two *506* gates and two *504* parametric equalisers. All this, together with facilities to read timecode off tape, lock up to a U-Matic recorder and mix down to picture on the colour video monitor, enables Fleetwood to tackle most things.

Microphones, mic stands and DI boxes and plenty of them are particularly important for live work and they include Neumann *U87, KM84, U47*, AKG *414, D12, 451*, Shure *SM58, 51*, Beyer *M88, M201, PZM*s and Sennheisers, 14 DI boxes and something in the region of 40 microphone stands. They need an abundance of equipment in this area, they all explained at once, because you might be called on to record things like the Heroes and Villains live concert in aid of a music therapy charity which involved 22 different bands, twice in one day, including such memories of our youth as the Troggs and the Tremeloes.

Fleetwood also carry 20 pairs of Beyer *DT100* headphones which are used in conjunction with the four foldback channels in the truck.

Andy: "We always have a couple of spare mics plugged in so that if there is a breakdown for some reason we can just throw another microphone in." Nick, Andy and Mitch work very closely. All three rig and de-rig. As soon as the equipment is all into the venue Nick stations ▷

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STUDIOFILE

himself on the stage, Andy in the mobile and Mitch runs around in between wherever she is needed.

It is all down to organisation, the attitude of the PA crew towards the mobile crew being all important. If the two teams cannot work together they might just as well go home. Andy: "They must be professional. Ten years ago, or even five years ago people's attitudes were very negative if a mobile suddenly turned up at a gig. It's much better these days. Everybody must pull together, and the PA shouldn't fight us, they should be thinking—album, if we do this well for the album then we'll get another gig with the band next year.

"The band themselves are going to be nervous because of the recording so we have to try to be as inconspicuous as possible. We always split from the PA mics, and if at the soundcheck those mics sound good, then we don't do anything else. We do try to go along with the PA soundcheck —we certainly don't go in and insist on having our own. After all, all we're doing is just tagging a few bits of wire on the end of a chain. The mobile shouldn't try to take over. You should just try as much as possible not to interfere and not to add anything not essential—keep a low profile and do everything quickly.

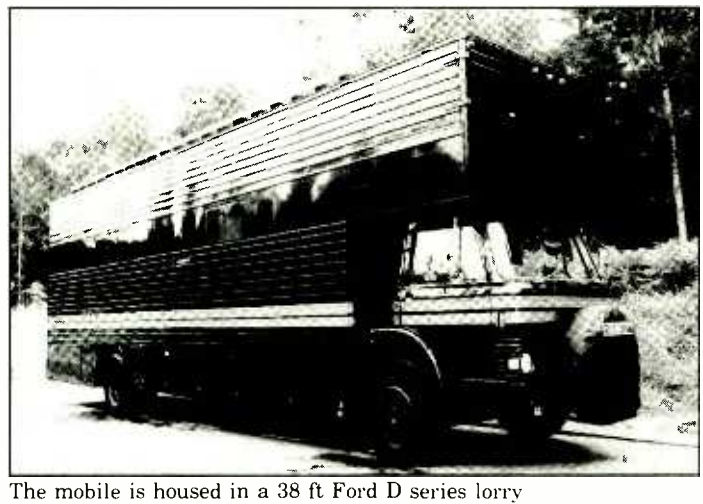
"If you do need to change any of the mics the out front engineers and the stage monitor engineers will usually go with your changes without any problem. The main thing is just to keep it simple, that way then you have less things to go wrong."

Nick gets hold of the PA microphone chart of everything that is going into and out of the stage boxes and during the concert he remains on stage the whole time, ready to throw in the spare mic, pick up the fallen stand, and just generally make sure everything goes smoothly. Throughout the day all three are constantly in communication over the talkback.

Apart from unfailingly turning up very early for every gig that's about it. Apart from the maintenance of course. Maintenance work and mobile recording vehicles are inseparable. The equipment demands constant checking and rechecking—much more than in a fixed location studio. Nick: "You can't have a mobile and part time maintenance—it is definitely a 7 days a week job. We get so much last minute work that we just could not afford to have anything not working, so it is all checked and double checked all the time. The tape machines are lined up before every session or gig. We also have to be constantly updating our equipment to make sure we keep ahead."

On the face of it, it is not immediately obvious that a mobile studio actually incurs more overheads than a fixed location. Although you can charge the client for mileage and your time, you cannot charge as much as it would be earning were it recording, you have to spend far longer carrying out routine maintenance because all the travelling has shaken the equipment around. Andy: "People are also loath to pay vast sums of money for a mobile too. They just don't realise how much cost is involved. American trucks cost something like £2,000 a day. In the UK, however, the people who are running mobiles, and have been for years, find it very difficult to implement price increases and they therefore cannot afford to re-equip or update existing equipment, and a lot of them are still working with the same console they had ten years ago because they are still charging almost the same prices as they were then. It really is a problem. Fixed studios could work round the clock 24-hours a day if they wanted to but we can't. You might spend four days travelling each way to a gig—and a lot of that time could be doing silly things like waiting around for one of two ferries a week or something. People just do not realise what is involved."

Fleetwood continued



The mobile is housed in a 38 ft Ford D series lorry

In addition to constant maintenance, the mobile carries numerous spares, and spare spares in some cases since once you leave the country there is no saying how easy it is going to be to acquire parts, so the answer is take your own—espcially for the console and the machines.

Travelling abroad, all the equipment goes on an ATA Carnet which lists 422 items. This used to be a fairly simple way of showing customs officers what you are taking out of the country and then that you are bringing the same things back. The issue however has recently been complicated by the fact that it suddenly dawned on somebody that blank tape when it leaves England is something that we can value because you know what blank tape costs. However, once it has been used to record, say, Paul McCartney you can look at it two ways: either it is now an extremely valuable commodity, possibly worth millions of pounds, or alternatively you could take the view that since it is no longer virgin, it is as good as worthless. A paradox indeed.

This new customs approach means that you may not export blank tape—you are therefore forced to try and buy it wherever your destination may be, because the same problem applies as you go from country to country. It's a real headache and has led many a desperate engineer to some lateral thinking!

You may export test tapes—you have to use a different form—they still can't go on your carnet, but any pre-recorded tape can go out. Theoretically you could simply record timecode on to your blank tapes. No? Then, in France comes the problem, what do you do with the tape? You can't take money out of the country so how can you sell your client his tape? It is all almost as crazy as the rule that forbids the entry of master tapes in Greece. If you want to get your record re-mastered in Greece, you have to send over a record and have it lifted from the vinyl.

As far as they know, Fleetwood is the only commercial mobile studio that is totally privately owned and run, and they are also the only mobile APRS members. They are totally dedicated to their business and love every minute of it. As Mitch said: "We love being on the road and it all works very well."

Slightly apprehensive at the beginning of 1985, mentally prepared for a hard struggle to success, they are all three genuinely thrilled that things have been going so much better than they could ever have hoped. At the time of this interview they were involved in recording the new ELP album (Emmerson, Lake and Powell (Cozy Powell)) which they were very proud to have got. Past clients are as diverse as they are numerous: Meatloaf to Blow Monkeys, Whitesnake to Mama's Boys, Manfred Mann to Nazareth.

With a pedigree such as theirs, and keenness to succeed, the low profile is lifting steadily and bound to continue to do so.□

Janet Angus

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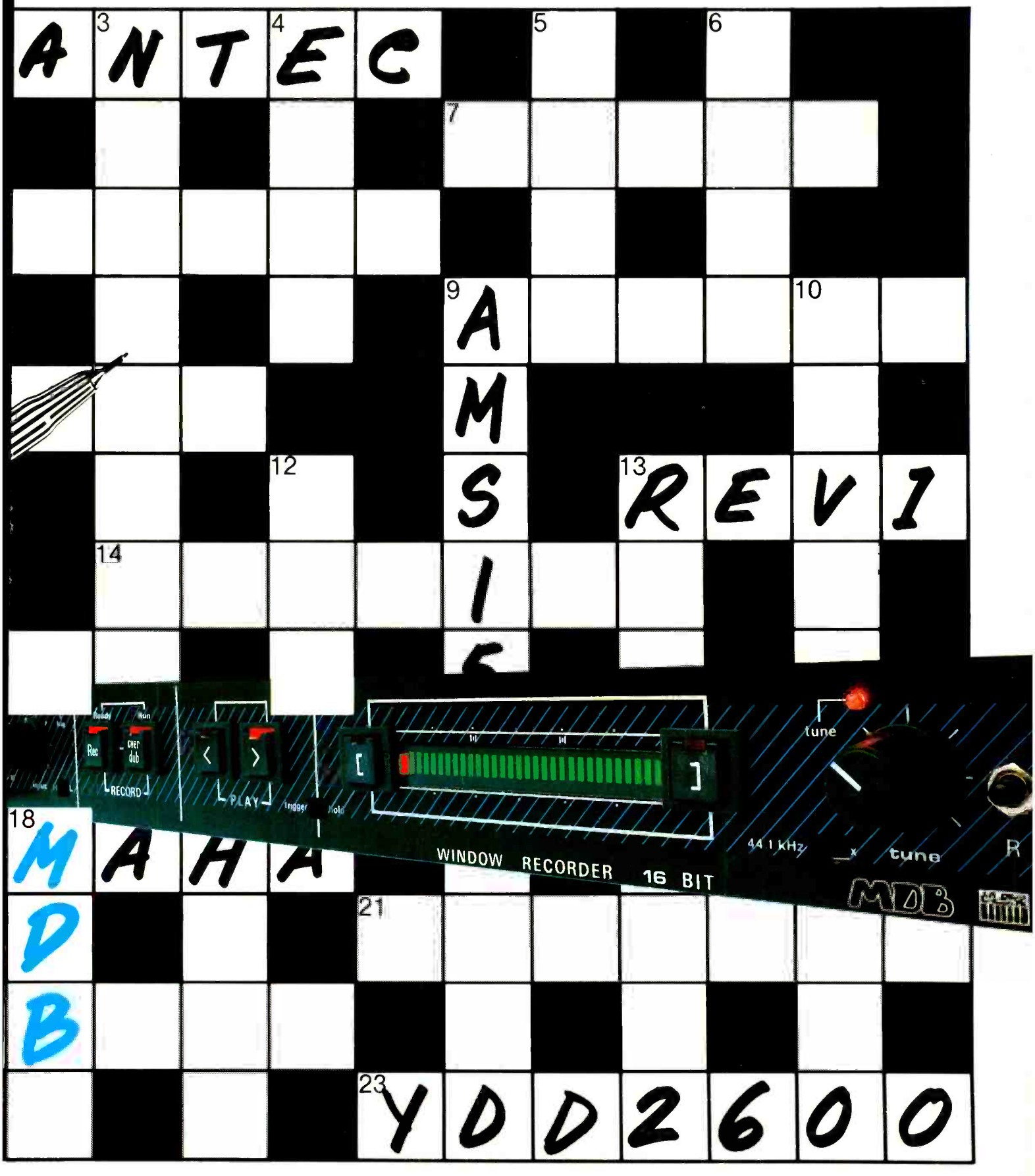

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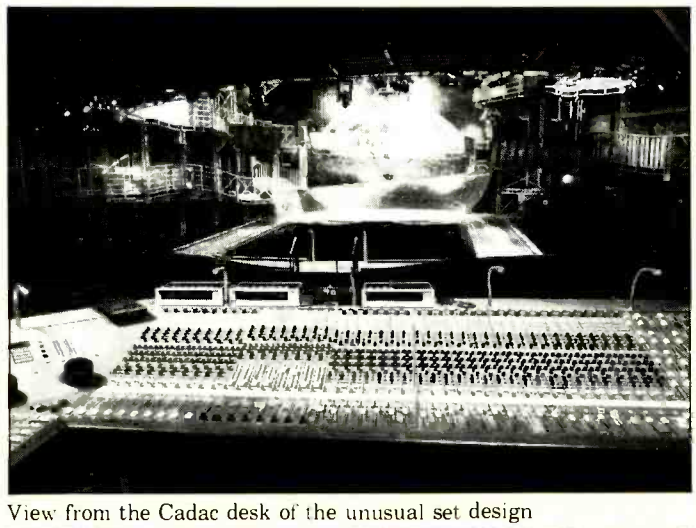
STARLIGHT EXPRESS

Tim Leigh Smith investigates the special requirements for a quality sound system at a major London musical when the cast performs on roller skates

The London stage production of *Starlight Express* became something of a landmark in theatre sound in terms of the scale of the operation, the quality achieved, and its implications for the future of sound in the theatre. Over the last 15 years there have been major improvements in the quality of theatre sound but in the last five years it has distinctly come of age. Permanent installations such as those operated by Britain's National Theatre, the Royal Opera House and the Royal Shakespeare Company usually achieved very acceptable results but in the early 1970s many theatres seemed to hire in gear that was better suited to the raw sound of a pop concert or the dull drone of a political rally. There were even occasions when the audience applauded a break down in the sound system because its failure actually improved the clarity.

Autograph Sound Recording has been part of a movement to get studio quality equipment accepted in the theatre environment. These efforts were greatly encouraged by the pioneering work of early theatre sound designers such as Abe Jacob and David Collison. Sound designers are, more or less, the audio equivalent of lighting designers. They specify the overall effect of the sound system and have considerable influence over the sort of equipment used.

Starlight Express is a musical fantasy by Andrew Lloyd-Webber and Richard Stilgoe depicting the relationships and rivalry between the locomotives and rolling stock on a child's model railway. As for many children this train set includes elements of stamp collecting and motor racing. A wide selection of locos from around the world almost outnumbers the odd assortment of passenger and freight cars, and there are frequent races to determine which is the top train. Each of the 26 performers is on roller-skates and has a name and costume which clearly indicates which of the locomotives, freight or passenger cars they represent. For example, Dinah the diner is dressed as a waitress, and three identical box cars—Rocky I, Rocky II and Rocky III—look like contenders.



View from the Cadac desk of the unusual set design

The show is staged at the Apollo Victoria—just across the road from London's Victoria station. With the entire cast on castors the set design is a little unusual. The stage has been extended out over the orchestra pit to provide a large circular area which could represent the original loop of track that is the basis of every train set. Further extensions form a loop of track round the central section of the front stalls and a massive loop along the sides and across the back of the stalls. An incline across the back of the stage leads up to a high level loop which comes out from the wings to run along the front of the balcony and back into the wings. Suspended above the stage is a swinging bridge which rotates and tilts, rises and descends, moves upstage and downstage to provide a variety of links between the loops of track.

The ambitious staging by director Trevor Nunn and choreography by Arlene Philips—of Hot Gossip fame—posed some interesting challenges for sound designer Martin Levan and the technical team from Autograph led by Andrew Bruce. Autograph covers many of the major musical productions in London. The company has its own sound designers and provides a complete sound package when required. If a production company hires Autograph to supply the equipment for a freelance sound designer, as in this case, then Autograph offers their services as technical consultants, much as an in-house balance engineer provides support for a freelance engineer.

Sound designer Martin Levan was a freelance studio engineer/producer before becoming a sound designer in 1982. He started as a tape op some 15 years ago and was a balance engineer at Morgan Studios when Andrew Lloyd-Webber went there in 1977 with his brother Julian to record *Variations* on a theme by Paganini. This was followed by other sessions with Andrew Lloyd-Webber at Morgan including the album of the London stage production of *Evita*. This was also a show equipped by Autograph and is still running at the Prince Edward theatre.

Late in 1981 Andrew Lloyd-Webber was planning the stage presentation *Song and Dance* which featured songs from *Tell Me on a Sunday* with lyrics by Don Black and a ballet based on *Variations*. He suggested that as Martin Levan had recorded the *Variations* album he should work with Autograph on the sound for the theatre production. It is obviously quite a transition from the multitracking, overdubbing, remixing recording studio to the live theatre where hardware must be unobtrusive and not impede the action. Martin Levan regards it as a very rewarding experience.

"Having never worked in the theatre before I confronted many new problems. It is a very different environment from the studio. You're dealing with the same sort of equipment but the application is totally different. I mixed the show for the opening and the first few weeks. Andrew Lloyd-Webber was very pleased and the show met with some good reactions as far as the sound was concerned.

"It was great fun. I really did enjoy it. A studio engineer might imagine that mixing a show is rather like spending two hours in the studio doing a rough mix of the same thing every day. It's nothing like that at all. The show feels totally different each night and with the audience there's an instant reaction to everything you're doing. You're part of the performance, responding to the shape of the show and moving with it."

After the successful launch of *Song and Dance* in April 1982, Andrew Lloyd-Webber asked Martin Levan to check out the sound on his 1981 hit *Cats*, based on poems by T S Eliot, which had then been running for about a year, and is still running at the New London theatre. Martin decided that some changes should be made and discovered another aspect of theatre sound.

"I quickly learned that performers are very aware of the sound on the stage, even though they're moving around and they're not getting the full force of the PA because they're usually behind it. They are totally tuned in, and they feel very unsettled if it differs night to night. When you're doing eight shows a week with only one day off at the weekend it's very difficult to make any changes because you've got to have the show working well each night. So you may have to make a subtle change every day over a period of four or five weeks. It's a very slow process and some of the changes are unsettling for the performers but it really doesn't take very long for them to settle again." ▷

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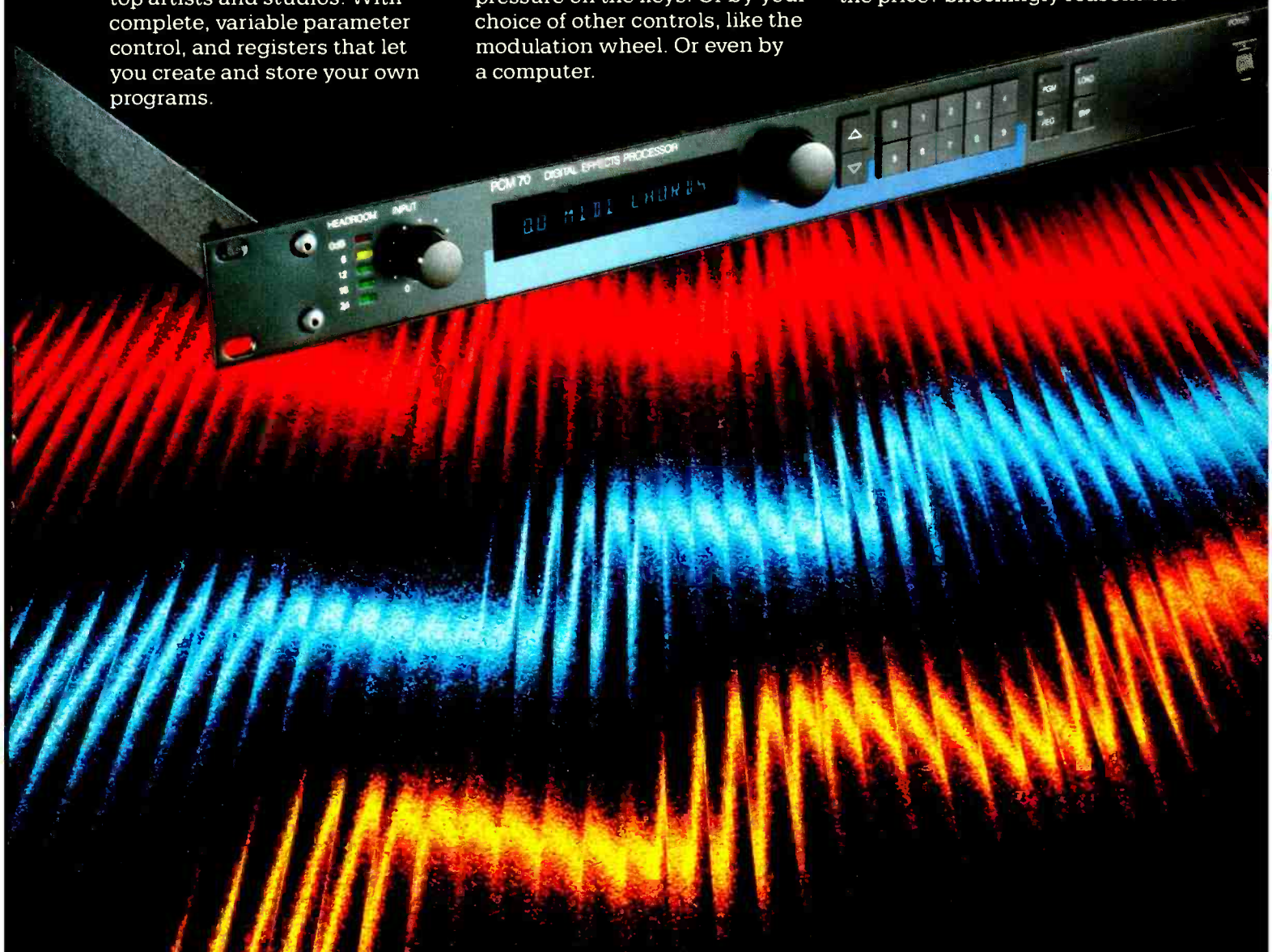

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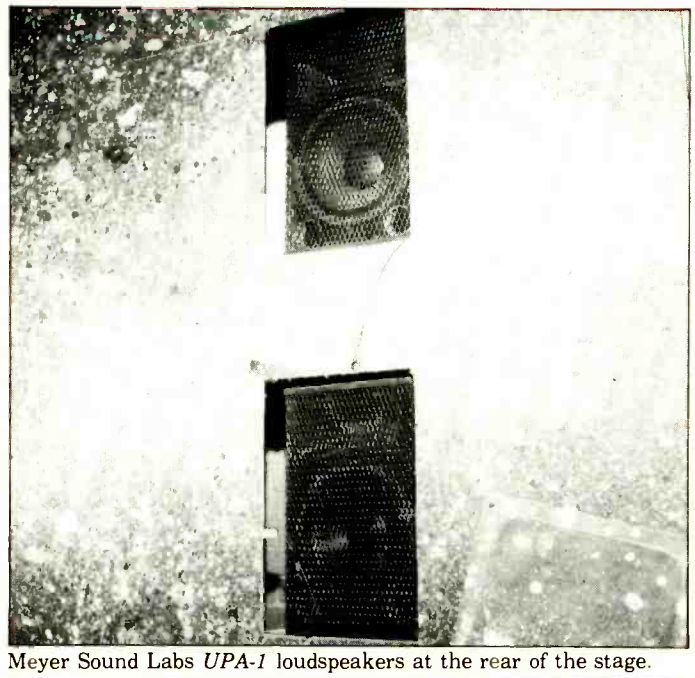
STARLIGHT EXPRESS

When the changes were completed and *Cats* was purring along smoothly once again Andrew Lloyd-Webber was happy with the result so Martin Levan went on to design the sound for the New York opening. *Starlight Express* was already beginning to get up steam for its London opening in March 1984.

A major decision was that the sound for the new show should be totally amplified—very loud with almost no direct sound audible to the audience—rather than the usual reinforcement. The stage extension over the orchestra pit created a near sound proof room for the band which is therefore relayed through a set of monitor speakers behind the stage area. A high level of sound from the band coming across the stage into a rather lively auditorium required a close mic technique for adequate separation on the vocal chain. With up to 20 singing performers on stage at one time, many having solo lines and all on roller-skates, sometimes dancing or racing, the only possible answer was individual radio mics.



Meyer Sound Labs *UPA-1* loudspeakers at the rear of the stage.

The scale of the operation and the extra facilities Martin Levan wanted meant that the sound desk had to be designed and built specially for *Starlight Express*, although it is owned by Autograph and hired to the production company. Andrew Bruce points out that it is not in the best interests of a production company to buy this sort of equipment. The need for service cover, to ensure that the show does go on every night, would add a considerable annual fee on top of the purchase price. And when the show does close, sooner or later, the production company is left with a load of sound gear of uncertain value which will probably be put into storage where it will get damp and end up useless. On the other hand Autograph's hire charges include free replacement of faulty equipment and emergency service cover until 9.30 at night by which time most shows will be safely into their second half.

Clive Green was chosen to build the desk. At the time his company was producing custom-designed desks and subsequently took over the trade name Cadac when the original company ceased trading. Martin Levan was familiar with Cadac desks, Autograph had already taken delivery of Clive Green's first console designed specifically for use in the theatre, and Andrew Bruce was very impressed by the rapid delivery and high standard of the equipment. So the three of them spent several weeks working out the precise requirements for *Starlight Express* along with the types of back-up facilities, long term reliability and ease of servicing needed for live presentation.

The resultant desk is a sizeable beast which would grace any self-respecting multitrack studio. This was not one of your portable PA jobs. In fact much of the equipment was installed at the Apollo Victoria on a permanent basis with an expected life of about 10 years. This implies a confidence which is probably justified in the light of Lloyd-Webber's track record.

"It's partly because they thought it was going to run," says Andrew Bruce, "but quite a lot of the installation is permanent because of the Greater London Council safety regulations. You're not allowed to just run cables under wooden tracks—it's got to be run in trunking. Also this show's a lot more complicated than any other I know of in this country. You're not only dealing with a mega-sound system, you're dealing with two video systems and all the mechanical stuff like the bridge which is the centre piece. They felt it was worth making it neat and tidy because the consequences of being unable to track down a failure amongst a great pile of temporary cables would be horrendous. You'd have to send 2,000 people home, and that wouldn't be good publicity. So there's a greater degree of permanence built into this installation."

The desk has 56 input channels, 32 main and six aux outputs, eight VCA group faders, and a very flexible routing system to accommodate any changes in the production. The inputs are arranged as 22 vocal channels on the L-shaped left hand section of the desk and 26 band channels on the right with eight auxiliary inputs in the middle above the VCA sub groups.

Two of the band channels are used to route delayed band sound to speaker systems further forward into the auditorium than the main band speakers. This leaves 24 channels to handle the 15-piece band which comprises: three keyboard players, one with electric piano and Yamaha *DX7* synth, one with *DX7* and Prophet, one with Prophet and *Emulator* (all keyboards are DI); one of the keyboard players also plays harmonica on one number (SM77); two woodwind players, one with flute (KM84) and sax (U47), one with clarinet and sax on one mic (C460); six brass players, three trumpets (U89 each), two trombones (U47/U89), one French Horn (C414); two guitarists, one bass (DI), one with acoustic guitar (ECM50) and electric guitar (SM77); a drummer with all-electronic kit including bass, snare, hi-hat, toms and cymbals by Simmons and a *LinnDrum* (all DI); a percussionist with two tympani, tubular bells, snare (2×KM84), congas (MD421), glockenspiel and xylophone (KM86).

You may have counted 16 instrument mics and 13 DI links making a total of 29 sources. This demonstrates a sub-clause of Parkinson's Law: pit bands expand to fill the space available. A Studer 8/4 mixer was installed on top of the outboard rack alongside the main mixer to handle the overflow. This pre-mixes two trumpets, two trombones and the four percussion mics on to three channels of the main desk.

Alongside each input fader on the Cadac desk is a row of LEDs indicating input level from −20 dB (green) to +20 dB (red). This shows up very quickly if a channel has gone down or is being overdriven. The main input channels have all the usual facilities such as 3-band parametric EQ, aux sends and access to the outboard rack. Each channel can be assigned to one of the VCA groups (1 to 8) for level control or direct (group 0); the selection being indicated by an alphanumeric LED display above the fader. Three VCA groups are allocated to the band: DI keyboards on group 6, all the mics on group 7, DI drums and bass on group 8.

The output of the 26 band channels can be directly routed to any or all 16 main outputs via a set of 16 pushbuttons and 16 miniature conductive plastic preset level controls at the top of each channel. Ten of these group outputs exclusively feed the main band loudspeakers which are actually sunk into the back wall of the theatre to maximise the usable stage area. This was quite a major operation involving several pneumatic road drills as there are 10 large speaker systems here, some of them 30 in (762 mm) deep. By selecting the appropriate output routing and adjusting the channel output presets, it is possible to position each of the band sources at any point in the wall of sound across the back of the stage.

All the main loudspeakers are from Meyer Sound Laboratories by way of Autograph Sales, British agents for Meyer. The band speakers are four massive *MSL-3* and six smaller *UPA-1* systems. Each system is biamped and includes a controller with active crossover, delay circuitry to align the phase of the HF and LF drivers, and driver ▷

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The *MSL-3* and *UPA-1* are not designed to handle very low bass so an 11th output from the desk feeds all the bass instruments to six Meyer USW-1 subwoofers which are arranged round the proscenium arch and are delayed to match in with the main band speakers. The resultant sound is very loud but clean and impressive.

Foldback for the band is provided on headphones fed via individual Formula Sound *Que-4* mixers so each player can set the desired levels. Three auxiliary outputs from the main desk carry sections of the band and a fourth feed provides audience reaction which is essential for the conductor. The keyboard players and guitarists each have a feed of their own local output on their fourth channel.

With the conductor concealed beneath the stage a video system is used to make his gestures visible to cast and crew. He stands on a well lit podium facing a small b/w camera which relays his image to three large video monitors slung below the balcony for the benefit of the cast on stage, and several smaller monitors located at control points where cues are required such as sound, lighting, and video control. The conductor has two video monitors himself. One shows his own image to ensure that his more enthusiastic efforts do not take him out of shot. The other carries an output from video control following the action on, and beyond, the stage.

When the various races take place the roller-skating racers speed round the back of the stalls, off on to loops out in the wings and across the front of the balcony. Thus they tend to vanish from the sight of all or part of the audience at some of the most dramatic moments in the show. A vision mixer co-ordinates seven remote controlled colour cameras to provide full coverage of the races. As each contest prepares to start, three large screens appear, one above the proscenium arch for the balcony while two more unfold from what look like girder bridges on either side of the stalls, to carry pictures from three video projectors. The conductor has a video feed throughout the show so that the band can vamp 'til ready in the event of a problem or delay.

Since the vocal mics would be right in the line of fire of the powerful reproductive system of the orchestra, as the

STARLIGHT EXPRESS

array of speakers on the back wall has been called, there was no question of using space mics. Andrew Bruce, having arranged for Audio Engineering to supply 20 *Micron* radio mic systems, helped Martin Levan carry out tests to determine the best position for the actual mics. The traditional 'tie-clip' position would not provide enough clean signal and would pick up undesirable chest resonances from the singers.

At first they considered the headset type of mic position, at the corner of the mouth, which is sometimes used in pop concerts. "It's a very ambient theatre. When you're on the stage there are so many hard surfaces that it rings a lot. If you don't get a microphone close to the performer you start re-amplifying the ambience and start getting into trouble."

The very sensitive Micron transmitters, intended for speech from a distance, objected to the much higher levels of singing close to the mic, and their compact design does not leave much room for pads. Pending possible modifications by the manufacturer, a compromise solution had to be found. They tried concealing the mic on the singer's forehead, just at the hair line. "The forehead seemed to be an obvious choice—but it wasn't obvious to anyone else. Everyone else just laughed but it works very well in that position."

Sennheiser supplied the tiny *MKE2* omnidirectional microphones in a convincing pink flesh tint as well as black. The precise location of the mic depends on any headgear or wig that a character may wear but generally the mic is almost completely undetectable even face to face with the performer. Each mic and transmitter is allocated to a particular person on a permanent basis to ensure consistent quality.

Andrew Bruce is very pleased with these microphones. "They're very reliable because the cable that Sennheiser use is steel reinforced and it can put up with a great deal more bending and flexing, without parting company with the connector—much more so than all the other small lavalier microphones that we've ever used. They also sound good. They seem to be able to accept higher sound pressure levels than most of the other types without the distortion, and without bottoming out

"The only problem we have is one that any microphone would have in that situation. They suffer from the ingress of sweat on the forehead, and they're throwaway jobs after about six months. We had one major change-over in the first year and quite a few singles have been changed—in the summer we get through microphones fairly quickly. There was a suggestion which sounded good, using very fine gauze sprayed with 3M *Scotchgard*. The theory was that it repels water and it wouldn't allow sweat through the very fine mesh but it didn't seem to work.

"For a while the deterioration is difficult to spot unless you do an A/B comparison with a brand new mic. It's a gradual process. Then it comes to the point where it cracks up the moment you give it any sort of level. I assume that what happens is that the charge on the electret gradually gets less and less, because sweat is a saline solution so it would tend to conduct electricity. But I would have thought that there were far worse things about dumping a large blob of salt solution on the front plate of an electret than just gradually discharging it." Any suggestions?

There are 21 Micron diversity receivers, each with LED indication of transmitter battery strength, frequency drift, and RF level at each of the dual receivers. As there has to be a member of the sound crew behind the scenes at one corner of the stage to look after all the radio mics throughout the show, it was decided to install the receivers in that corner so that she can monitor the status of all the transmitters both visually and on headphones. This has enabled her to spot problems and take action before the fault becomes noticeable to the audience, or indeed anyone else. It also leaves the sound operator on the desk free to concentrate on his job as balance engineer. Audio Engineering provided a special remote display which is mounted on the mixer so that if the sound balancer hears a fault he can check whether it is a radio mic or something nearer home.

When Trevor Nunn the director was planning the staging of the show he wanted performers to be audible at any time from any point in the theatre. This posed a considerable problem in terms of radio mic reception from the far corners of an auditorium full of metalwork supporting the tracks. However, Autograph has quite a reputation for setting up comprehensive radio mic coverage and it is possible to pick up performers from almost anywhere in the theatre. There are other considerations, like risk of feedback and the problems of musical timing over a distance, but the facility is used on a couple of songs.

In addition to the 21 radio mics there are three other vocal mics. One of these is mounted inside a tunnel entrance in one corner of the theatre. Rusty, the freight yard steam engine and leading character, makes his first entrance from here, and his voice is heard approaching the tunnel entrance, via a loudspeaker in that corner, as he assures us that, "Nobody can do it like a steam train!" This mic shares a channel with the hand-held spare radio mic.

The other two mics are in a dressing room next to the stage which has been equipped with video monitors, foldback facilities, some acoustic treatment, and two AKG *C414*s to form a chorus booth. The chorus singers thicken out the choruses on big numbers and provide backing vox for some solos. Their two mics are transformer combined onto one channel of the desk.

One of Martin Levan's special requirements for the *Starlight Express* desk was computer control of the VCA group assignment for the vocal channels. The idea is a bit like programmable lighting control. Each of the 22 vocal channels can be assigned to any one of the eight VCA group faders or direct (group 0). Although there can be up to 20 singers on the stage at one time, they may not all be singing and those who are can be designated as lead singers or chorus, depending on the particular song. When characters go off stage their mics have to be muted, of course. The changes from chorus to lead or mute always take place at predetermined cue points, so the computer is loaded with the 86 consecutive sets of vocal mic group assignments which are required to cover the whole show. At each cue point the sound balancer pushes a button on the desk, the computer silently steps to the next set of assignments, and the appropriate group number ▷

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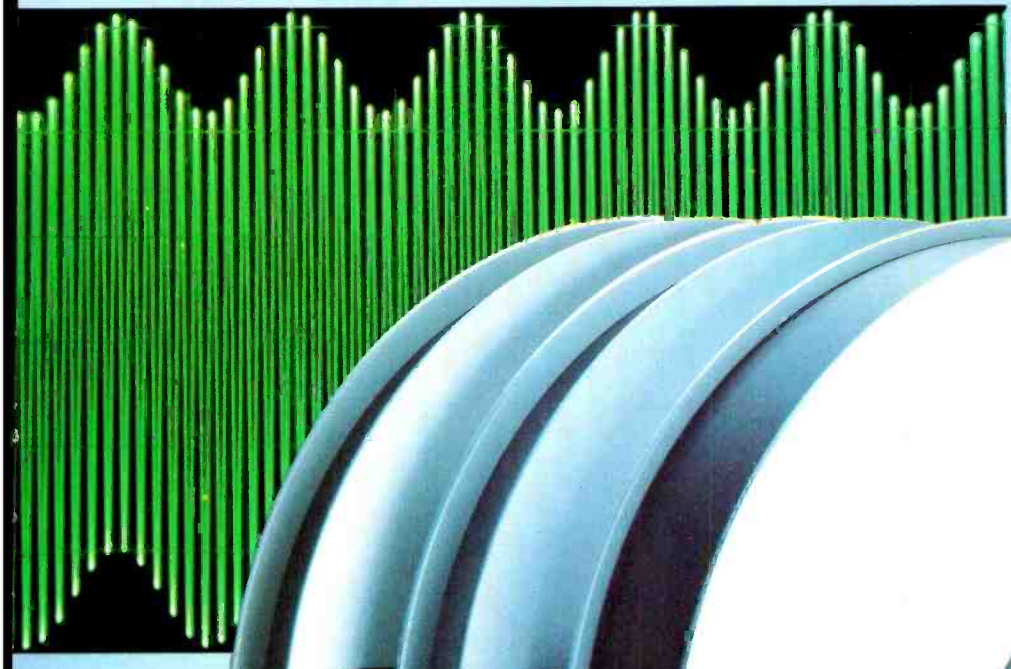

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is displayed at the top of each vocal channel fader.

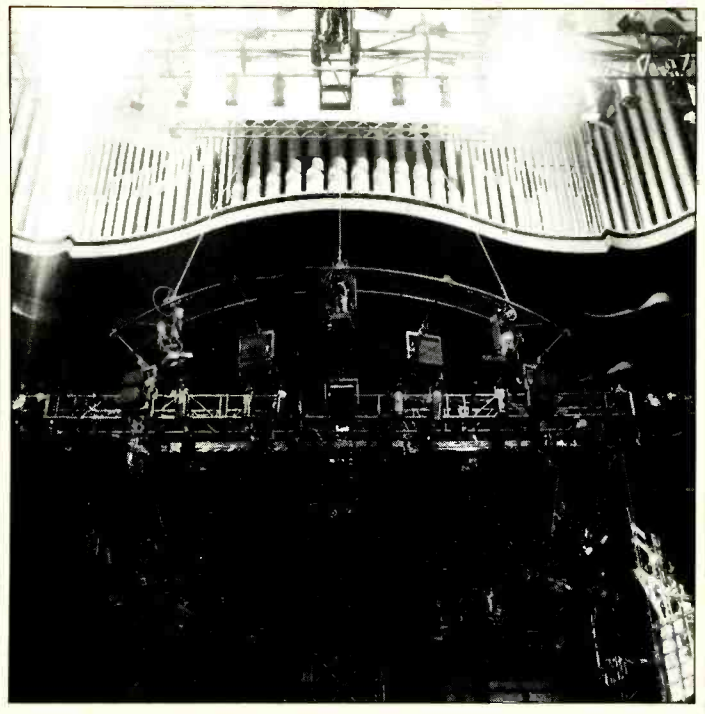
Basically lead boys are assigned to group 1, lead girls to group 2, chorus boys to group 3, and chorus girls to group 4. For complex reasons group 5 is spare and is kept shut, so mics to be muted are assigned to group 5. Groups 6, 7 and 8 are used for sections of the band. In effect the vocal channels can be set to suit the individual performers while the balance is controlled on just four VCA group faders. To assist this operation the sound balancers have added a tactile zero mark in the form of a small strip of gaffer tape alongside each group fader. A LED beside each channel fader indicates when both the channel fader and the assigned group are open.

The programmed assignment system is very important to the smooth running of the show so a simple back-up computer is provided with all the cues stored on an EPROM. If there are major changes to the show a new EPROM has to be blown, but the back-up system has proved to be comparatively inexpensive and very reliable.

The output of each vocal channel can be routed to two audio sub-groups, one main and one spare, which allow for the insertion of outboard equipment on the entire vocal chain. In fact very little EQ is used on the vocal mics, just slight trimming on the channel EQ to suit the combination of performer and personal mic. The two vocal sub-groups have the same 16-way output routing as the band channels. Naturally the vocals are not routed to any of the band speakers behind the stage.

The main vocal speaker systems are two Meyer Sound *UPA-1* mounted one each side of the proscenium arch to cover most of the stalls. Further forward on either side of the stalls is a Meyer *UM-1 UltraMonitor* which is designed as a concert stage monitor. These speakers project sound over a narrow angle to reach the far corners of the stalls without washing over the tracks, thus reducing the risk of feedback if anyone is skating round with a live mic. At the start of one number all the freight cars are collected from a tunnel half way along the left side of the stalls and they then pass close behind the left hand vocal speakers singing as they go without any feedback. Andrew Bruce admits that this is a tense moment for the sound balancer.

STARLIGHT EXPRESS



Meyer Sound Labs *UM-1*s provide vocal coverage for the balcony

Additional vocal coverage for the stalls is provided by a set of miniature Bose *101* speakers slung under the balcony. There is also a line of Bose *101*s on the front edge of the stage, aimed at the people in the front row of the stalls. Andrew Bruce: "The main vocal system goes over their heads. They would hear the vocals going on but it would be 'up there'. They need a signal from in front to push the vocals back onto the stage. It's at fairly low level so that, hopefully, it doesn't drill a hole in their foreheads."

A semi-circle of five *UM-1 UltraMonitors* suspended over the stage provides the main vocal coverage for the balcony. This is reinforced by two rows of Bose *101* speakers hanging from the ceiling above the balcony which carry mainly vocals with some band sound. All the various speakers that are mounted any distance in front of the main speaker systems are on delayed feeds to match the timing of the main signal.

One item of equipment that is notable by its absence is any form of feedback suppression. Andrew Bruce: "Sometimes we use it and sometimes we don't, because no device is wholly acceptable. One device that we've steered well clear of is the frequency shifter. I've heard the effects of a frequency shifter when it finally was nudged further than it could cope and it went into beautiful feedback that rose in pitch as it frequency shifted its own feedback. It sounds ridiculous.

"We have very very steep notch filters which are made as feedback suppressors by UREI. We often stick them in but sometimes you can get just as good a result without them, or just using an ordinary graphic EQ. The big problem with those steep notch filters is that you can lose sight of what you're trying to do, and that is to make the voice as intelligible as possible at as high a level as possible without it sounding awful at the same time. Unless you remember that you end up notching out so many frequencies, in such an important part of the band, that all you're left with is a lot of low and a lot of high with a few spikes here and there in the middle.

"Sometimes after you've used a feedback suppressor for a couple of days, and you're thinking there's just something not right with the sound, you switch it out completely and just reduce level slightly: and suddenly everything comes to life again. It's got to be used intelligently."

One voice in *Starlight Express* is not really part of the vocal chain. This is the Control Voice—the voice of the little boy who is running his model railway, frequently making precocious announcements which interrupt the private lives and affairs of the locos and rolling stock—'This is Control! Tonight is Race Night!' His many portentous pronouncements are pre-recorded on numerous broadcast cartridges which are played in by a tape op tucked away behind the video control desk at the back of the stalls and armed with a triple stack ITC cart machine.

Andrew Bruce advocates the use of carts in theatre shows because they have instant start, and they do it very quietly. More than one cue can be put on each cart as the machine stops automatically, ready for the next cue. The Control Voice cart machine comes up on one of the eight auxiliary inputs and is routed to the main speakers direct and via a digital delay which adds a sort of main line terminus PA effect.

The tape op takes her own cues from the score—she happens to be studying music—and there are several dramatic moments when the orchestra and the Control Voice suddenly burst forth together most effectively. She is also responsible for operating a voltage controlled siren which wails above the stage to heighten the excitement just before each race. Then during the races there is commentary to ensure that no one misses the dastardly deeds done to deter the hero. This is also pre-recorded and times in with the action very well. Finally there is, inevitably, a train crash in the tunnel at one corner of the stage. This effect is routed via another auxiliary input to the speaker in that corner.

At one point the Control Voice announces the arrival of a brand new electric locomotive—Electra. He and his train sing of the joys of *AC/DC*, their voices enhanced by an AMS *DMX 15-80S* stereo delay line with the pitch change card using two different settings, one high and one low. The harmoniser outputs come up on two auxiliary inputs, the remaining four aux inputs take stereo reverb from two Ursa Major *8X32* digital reverbs, one for the band and one for vocals.

There are four effects sends from each of the main desk channels. Two of these go to a pair of quadpots, one main and one spare, which can route signals to the loudspeakers in each corner of the theatre, such as the one used for the train crash effects. The other two go to a pair of 12-way panpots built specially by Phil Leaver at Autograph. These complex ▷

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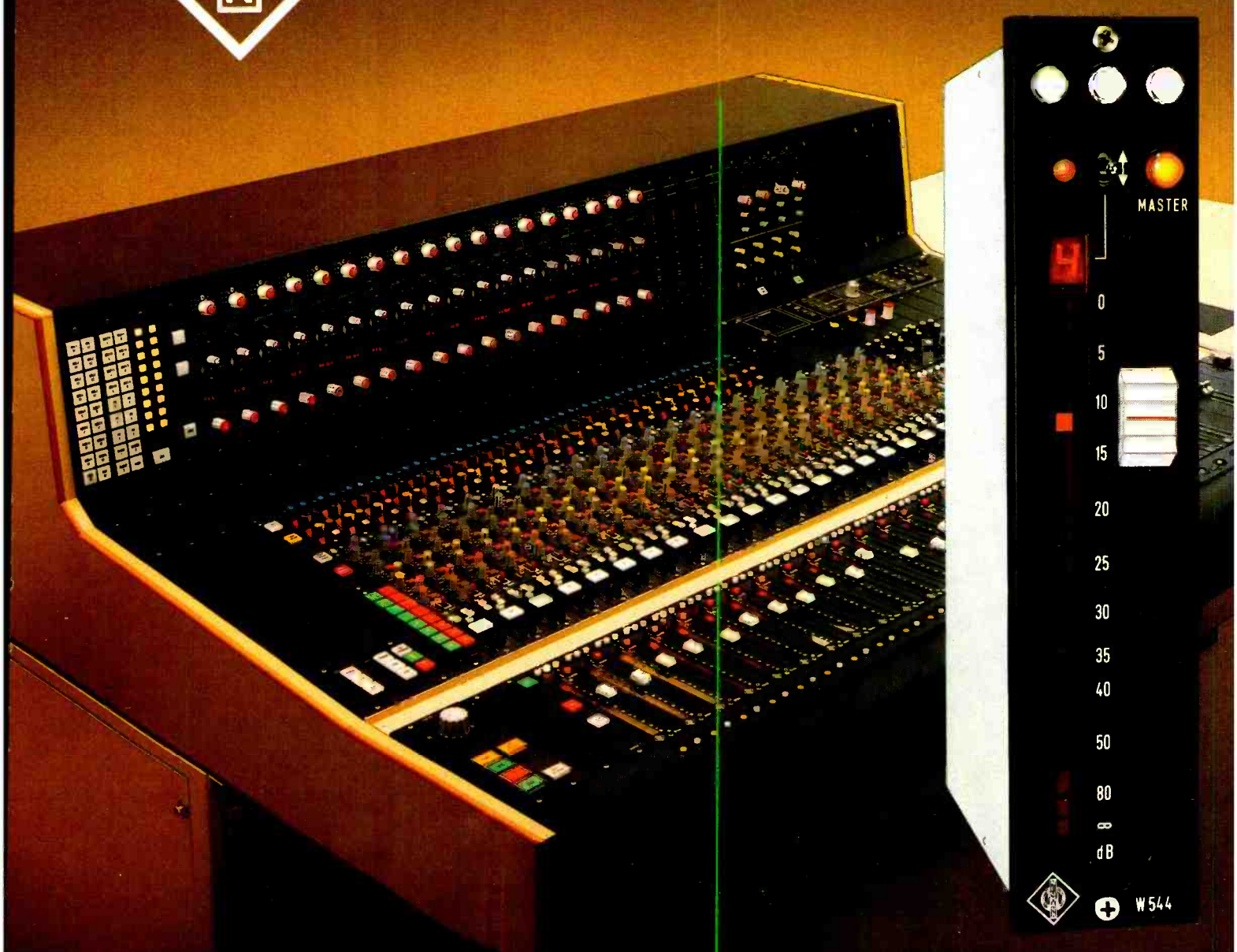

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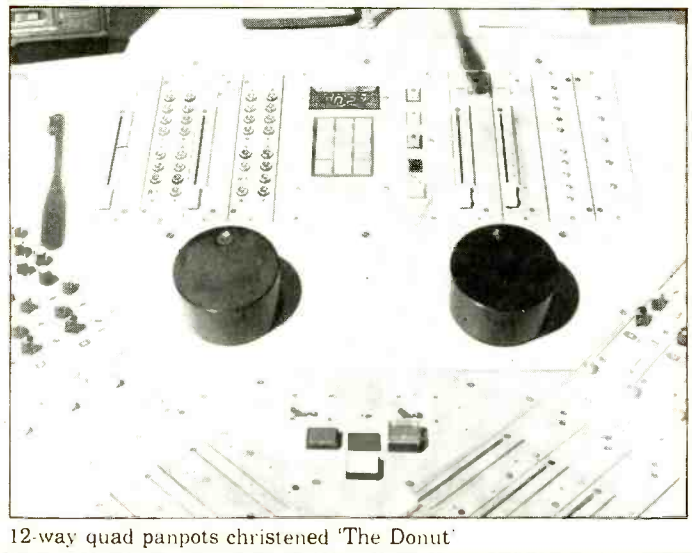

12-way quad panpots christened 'The Donut'

contraptions turn quite easily with the aid of a large black knob known affectionately as 'The Donut'. There are 12 Bose speakers arranged round the big loop of track along the sides and across the back of the stalls. One of the 12-way pots is used during the races to route some of the energetic sounds from the band to these speakers, following the action round the track. A very effective effect.

With the 4-way effects outputs, 12-way effects outputs and 16 main outputs there are 32 output faders with LED level displays on the right hand end of the desk. These feed five groups of amplifier racks in various parts of the theatre, as close as possible to the speakers they serve, their location being subject to safety regulations. Seven 15-pair multicore cables carry all the programme feeds to and from the desk via a patchbay.

For the individual mic leads in the orchestra pit Andrew Bruce used quad cable for the first time and achieved a major reduction in the noise from thyristor-controlled lighting. "Instead of being a balanced twisted screened pair, it's two balanced twisted screened pairs which are twisted round each other. Any noise induced in quad cable is about one tenth of its normal level in an ordinary balanced twisted pair. It's something the broadcasters have been using for a long time and we've had a great need of it in the theatre for years because the thyristors are the bane of our life. Completely quiet sound systems are now quite possible."

Autograph also set up a complex multichannel communications system linking the stage management with the conductor and all the control points. Four of the stage management staff carry 2-way radios which are patched into this wired system, and six others have receive-only sets. The Cadac desk includes four communications input channels which can feed certain intercom mics to the auditorium speakers for rehearsals. This avoids tying up regular mic channels. One of the communications inputs is available to the stage management during the show so that if there is any danger to skaters or audience when a race is on, a track marshal can order 'Stop racing' over the sound of the band.

The outboard rack houses four *MaxiQ* 3-band parametrics and four *Gain Brain* compressors from Valley People. "I love that equipment," says Andrew Bruce, "it works beautifully." Most of these units are used on the band. There are also two UREI *1176LN* mono compressor/limiters and two Ursa Major *8X32* reverb units.

An AKG *TDU 7000* 4-channel digital delay is used for some of the delayed speaker feeds. Andrew Bruce finds this unit very satisfactory too: "It's a rack with eight slots and you can make it into four by one-in/one-out or a single one-in/seven-out (with different delay times) depending on the modules you buy. It's very flexible, and it's the quietest delay that I've ever come across. It's very reliable and it's got one thing that always attracts me to manufacturers: that is a relay bypass so that if you switch the power off the relays relax and there is still an audio path. We have our graphics modified so that, in a live situation, if a unit starts misbehaving you can just kill the power. Although you may suddenly get a funny EQ or no delay time, you still have a show. It's fail safe and it comes as standard with the AKG delay." Three more delay lines are provided by Klark-Teknik *DN700* (one for the Control Voice), and the graphics are Klark-Teknik *DN332* dual 16-band for equalising speaker systems.

There is a noticeable tendency to have spare capacity in case of failure. "We have two complete sets of power supplies, they're combined through diodes so one could go short circuit in the middle of the show and, hopefully, nobody would notice. Details like that come from years of biting our nails, wondering whether power supplies are going to die on the first night."

A couple of years ago there was a story in the British press about a pair of birds which had built their nest between the tracks of a busy railway line. Despite frequent trains the hen laid her eggs and determinedly sat on them. Track maintenance staff took care not to disturb these ornithological train spotters. Then someone thought the brave birds deserved publicity, and the media descended on the nest site. An eager newshound trod on the nest and killed the story.

Something similar happened to the first night of *Starlight Express* when a TV unit turned up to cover audience reaction to the event and, perfectly legally, obliterated one third of the radio mic channels with its transmission link to base. This disaster attracted the attention of a Department of Trade and Industry (DTI) committee which was considering the reallocation of frequencies in Band I and Band III.

Andrew Bruce: "Because of the fuss we were asked to comment and submit an application to be viewed as a specialised user. Broadcasters are 'Recognised Users' (along with radio taxis and the like) but we never have been. We came under the heading of General User with four assigned channels. It appears that the theatre industry may now be regarded as a separate body with specific requirements. I was quite heartened by their very friendly attitude at DTI. We even had the chairman of the sub-committee who was looking into this problem sitting at the desk for a whole show, loving every minute of it. He was completely bowled over by the complexity, he had no idea. He saw the extent of the problem and realised there was a serious requirement for more channels in theatre. You can't have 26 people roller-skating around with mic cables on the floor, it's obvious. And there's no way that you can stick mics up in front of the stage if you've got rock and roll at PA levels. He needed to see these things for himself; you can only describe them up to a certain point."

In the early days of talking pictures and television it was assumed that the loudspeaker must be as close to the screen as possible. The coming of simultaneous television and stereo radio coverage has begun to educate audiences to accept some separation between image and sound. The totally amplified sound of *Starlight Express* without a single microphone visible does create a curious detachment. The effect is similar to the scenes in BBC TV's *Last of the Summer Wine* where minute figures in a distant landscape are heard conversing in 'close up', or the pantomime on ice with the skaters way down there on the rink while actors and singers provide the voices over PA. There are already plans to stage the show in large arenas in the States—that'll be interesting. At the end of each show in the theatre several members of the audience ask the sound operator if the music was live or recorded. On being told that it is all live they are always incredulous but delighted and most impressed—a typical comment being, "What a fabulous job!"

Starlight Express is brilliantly staged. The musicians, cast, make-up, costumes, set, lighting, sound...the whole presentation is superb. Yet somehow the magnificent setting does not seem to support a true gem. The story loses its way. The message of *Starlight Express* might be that each one of us, tea boy, tape op, balance engineer, or producer, has a part to play. The seeds of greatness are in all of us, and the race is not always to the swift. Rusty wins the final race because his competitors cheat themselves off the track—he wins from behind. The story ends with the suggestion that the defeated diesel locomotive should be converted to steam.

●Finally a note of thanks to sound balancer Graham Carmichael for allowing me to see the show from the sound desk and for his help with the backstage photography.□

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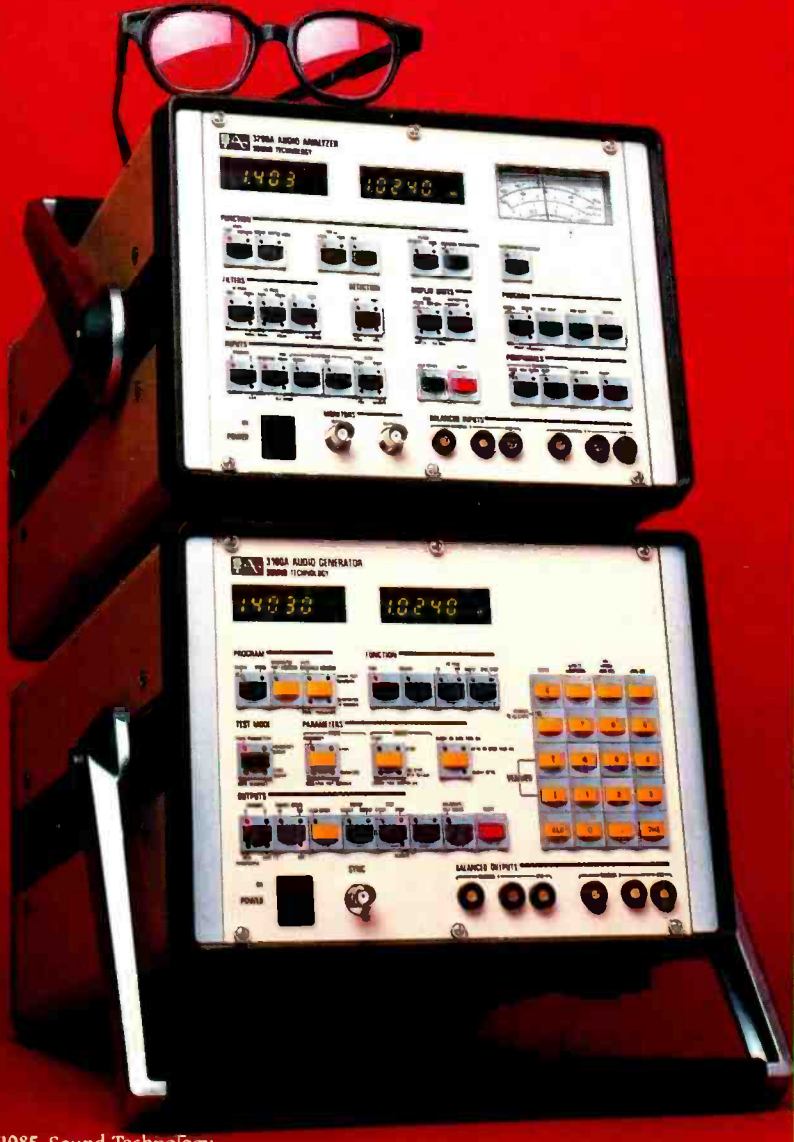

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THE HILL SYSTEM

Following his article on the Live Aid PA last month, Richard Vickers talks to Malcolm Hill and Mike Scarfe of Hill Audio about the development of the sound system

The PA system used at the Wembley Live Aid concert earlier this year was based on an existing Hill Audio sound system which has been in use for a number of years.

RV: Can you outline for me how your system developed?

MH: All the cabinets are identical, four-way, full-range enclosures, run from three-way active crossovers. The bass section uses special ATC long coil 12 in speakers and the mid is the cone element of two Tannoy ferro-cooled 10 in speakers.

The top has a passive crossover, splitting the treble band to high and low The low treble is an Emilar 2 in compression driver and the high treble uses the dual concentric (DC) tweeters which are part of the DC Tannoy package.

The crossover points are not cliff-edge type (ie 24 dB/octave), but quite slow slopes (12 dB/octave), so that bass gently rolls out as the mid gently rolls in. In general these points are around 300 Hz bass to mid, 1.5 kHz mid to top and 6 kHz top to HF.

So the 10 in is running from around 340 Hz to 1.5 kHz, but these are not very specific. We have total control over them and their slopes; we set the electronic crossover up with gaps between the settings, so in fact we set the midrange to control the set at 1.7 kHz with the treble control set at 3 kHz. So the acoustic energy transfer happens gently—somewhere between the two which is just what we wanted to get it flat.

The long coil 12 in dates back to when we were involved with Dave Martin. I walked into his place one day, when we were using his folded horn bass bins with Gauss 15 in speakers, and he said 'listen to this'.

He had this single 15 in bass bin alongside another that looked like a scaled down model of it, and on A/B'ing the two, the smaller one was at a similar level but the bass transient response was phenomenal—this turned out to be the ATC.

It has the same coil strength, diameter and energy as the Gauss but it's coupled to a 12 in cone instead of a 15 in and with a long coil, it's capable of moving under control over an extremely wide excursion, so you get your energy back but being a stiff 12 in cone, the transient response and bass integrity are so much more than the 15 in and it was half the price of the Gauss. So I thought, 'this is the one for me'.

We bought some and got the woodwork shop to make all kinds of cabinets. We were concerned about the Martin cabinet because it was impractical to put in the back of a Transit van—we used them for transporting our rigs at the time and there was the classic Martin situation: you've sold somebody a nice new system, they're totally happy and six months later they can't understand why there's no bottom end.

What happened was the removable bottom panel gradually worked loose, screws fell out and the air seal went—all the energy from the 15 in was rattling the back panel instead of going out of the front of the cab.

I felt this ATC was really happening as a speaker, it gave the kind of bass that I was looking for and came into the price bracket that we needed. I wanted a cleaner sound, a more compact, practical package.

It had occurred to me that in most designs a lot of loudspeaker energy was used trying to break the cabinet apart because of the high compressions in folded horn enclosures. I messed around with designs and I was impressed with the quality and efficiency of a *4560* from 100 Hz upwards, and the very low frequency power potential of the Martin bin.

The end result was a 4 ft folded horn à la Martin bin, but driven from the rear of the cones of the 12 in speakers, the front of the cones being direct radiators.

RV: What happens on the back of the 12 in monitoring—are the speakers completely open at the back?

MH: The three speakers face forward, looking like an infinite-baffle cabinet, and from around 150 Hz upwards it's a direct radiator, and then we have a folded-horn, just like a Martin except it's driven from the rear of the cone. We had to reduce the obvious potential for phase cancellation. We ended up with phase cancellation at 250 Hz. The cab is at its least efficiency at 250 Hz, at its most efficient at 125 Hz, and just right around 60 Hz.

By this time we'd fallen in love with 60 Hz as a bass frequency, we felt that anything that was happening at 60 Hz gave good, strong kick drums—and that's where we wanted the system to be most powerful. We tuned it at 60 Hz, it gave a peak at 125 Hz which we didn't want and a phase cancellation point at 250 Hz; it sounded great.

We played around with it and realised that 250 Hz in general rock and roll terms was the kind of frequency you end up killing on the EQ—well in normal theatres anyway.

So the lack of it didn't seem to concern the sound because it wasn't a frequency that was really wanted, and the 125 Hz we didn't want, so we knocked it back on the EQ. This was still a separate bass bin at this time. That's where our famous *B212* bass bin came from. You could put a 3 k rig in a Transit—it's where I got my dimensions. When we came to do our full range cabinet in 1980, we used this bass bin that had been so successful since 1975, and all we did was to make it three 12s instead of two so it balanced the sound up. It's the one product design that we haven't changed since it was first designed—our systems have never lacked bass power. The only thing you have to watch is that the folded horn completely decouples the speaker below about 20 Hz, so it's usually a pretty good idea to put a 30 Hz roll-off.

RV: Most people seem to knock out 40 Hz down these days.

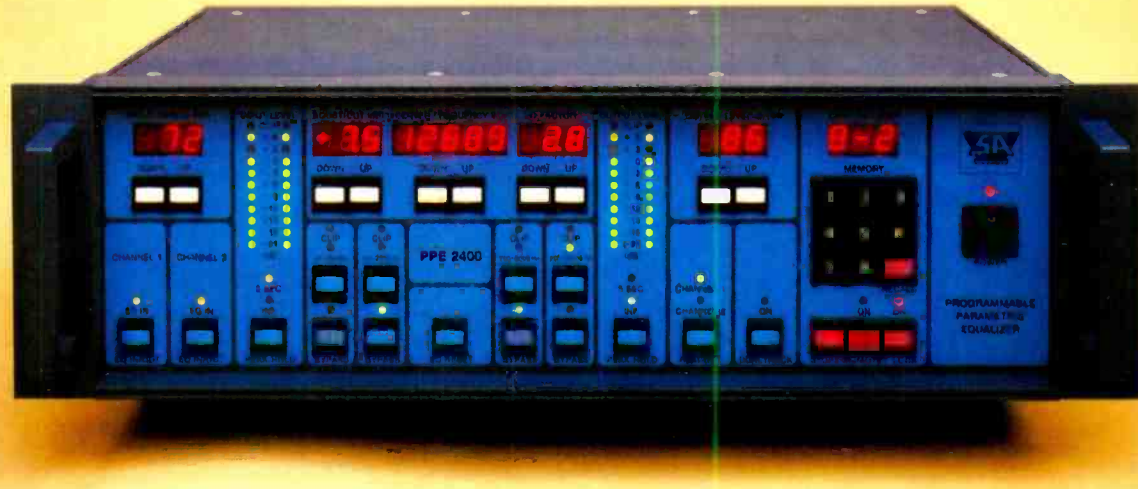
MH: In a high compression folded horn cab, the speaker can't move; in ours you pump 15 Hz through it and the speaker just (Malcolm blows raspberry) and moves about 10 ft in either direction, and falls apart.

Our cabinet presents the ATC and the amp driving it with a horrendous job; all the damping and cone control relies on the coil of the speaker; the amplifier and the cabinet have nothing to do with the control of the cone excursion loading which moves as though it was in free air.

Its natural response is inverse to a Martin bin, or the Clair *S4*. We stuck to a 3-way crossover because we felt that intermodulation etc, over the treble band was not a major consideration, keeping it simple.

We then spent a year messing around with systems. ATC 10 in speakers, a block of *CS5* speakers which were great for quiet bands—on loud bands the bass ▷

64 different EQs....



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energy was moving the midrange cones whatever you put into them which meant the vocals disappeared during any peak.

I bought a pair of Tannoy *Buckinghams* for a studio installation and then bought some *SRM10X* speakers for my home hi-fi. We discovered that the speaker was 150 W and up till then I'd always thought Tannoys had low power handling.

So I rang them and the guy said 'yes, it's a ferro-fluid cooled diaphragm and can take easily 150 W'. So we stuck the speaker on a baffle and put an 800 W amp on it—midrange signal only—and turned it up. The mechanics of the coil coupling were so good it just got louder and louder and ended up receiving about 600 W, creating an incredible SPL, totally clean until the lightweight suspension just collapsed. We did a deal with Tannoy for some slight modifications to make it suitable for PA; it's bolted together so it requires Locktites or it wouldn't travel as it stands, and various things like a higher powered coil.

This gave us a tremendous bonus because we were also trying to find a driver for the top end. The classic format was a 2 in driver and bullet, which I'd never been happy with.

RV: Always too much hiss and not enough of the sound?

MH: All they do is act like a 15 kHz noise generator, whatever signal you put in. Having gone with dual-concentric Tannoys we get free of charge a very clean, high frequency compression driver, two per cabinet for nothing. By putting them at an angle to each other to produce smooth coupling with the midrange we very neatly set it up so as you moved off-axis of the 2 in driver you came into the path of the Tannoy tweeters, giving you a cabinet of around 10-15 kHz range with 60° dispersion.

RV: I wondered if you encountered phase problems with the cab?

MH: The critical thing to look at is using a lot of them together. A lot of designers have made an error by looking at the cab on its own and not paying enough attention to what happens when you use a lot together. Four cabs a side may sound great but 40 a side and you've all types of problems.

Obviously it's the coupling between the cabs that's of primary importance—it took a lot of experimenting to get the angle of the 10s to each other and in fact the end result is that finished cabs couple correctly with adjacent cabinets, as long as they're 7½° from each other. Hence the 7½° that the cabs were stacked with at Wembley.

LA7: System development

MH: Since August 1981, apart from minor details, we haven't changed it.

MS: Apart from changing the 2 in compression driver.

MH: Yes. We started off using the JBL *2441* and it was OK. We were however unhappy with two things—one was that there was always more 2.5-3 kHz than we wanted, and just EQ'ing it out of the system didn't seem to have the right effect.

THE HILL SYSTEM

RV: Isn't that like most compression drivers? Most of them have a hump at the start of the midband area—or around that area—and it's just that the majority of manufacturers don't bother to tell you.

MH: Yes. That's right. We were also having another major problem in that the *2441* diaphragm had proved to be very unreliable.

RV: And expensive.

MH: Well, that's by the by. We tried all sorts of 2 in drivers—the TAD etc, and then we discovered Renkus-Heinz. Although the R-H is limited it does actually do what we wanted very well. It covers the 1.5-5 kHz band very smoothly, more so than the *2441*, so for our cabinet it was great.

It is incredibly tough—I can't ever recall losing a diaphragm, although I'm sure we must have; it's very clean and the bonus is it's lightweight, which for our flying cabinets is important. The main thing at the time was that it didn't collapse.

I'd rather do AC/DC with 60 working Renkus-Heinz than 60 *2441*s in various states.

MS: That was a problem at the time, as the *2441*s weren't just going out, they were gradually deteriorating.

MH: You could start a show and you had no idea what state your horns were in. If they had just blown then you'd have known that they needed fixing—a very expensive problem. We totally lost faith in the JBLs as you'd get this strange sounding top end as the suspension around the diaphragm was cracking up.

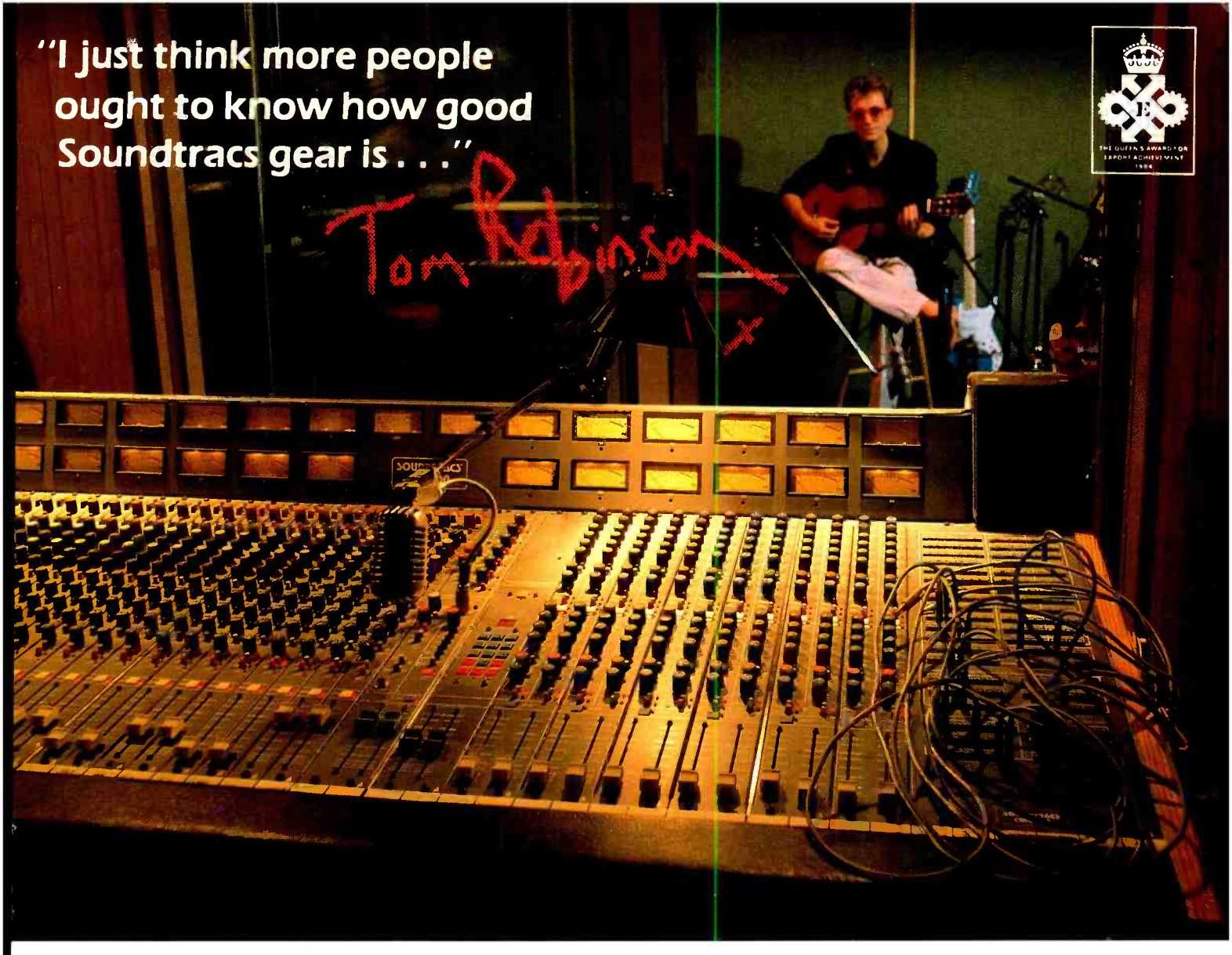
Then the *2445* appeared, but you looked at the size and weight of it and said: 'well, forget it'.

The R-H design team then went back to Emilar and we followed them and so we're now using the Emilars. It's similar to the R-H, but has been improved with a cleaner top end and a little more efficiency—and we're happy with it. In fact the latest Emilar over the frequency band that we use is more efficient than the *2445*.

In my opinion, of all the 2 in drivers I've seen, the TAD is the best if you want a driver to cover a very wide frequency range. Obviously the other negative thing about it is that having a beryllium diaphragm you are a little bit worried about your engineers developing cancer in 20 years' time or whatever—I'd rather avoid it if I can. So that's where the cabinet came from, and it wasn't an overnight thing. It was the result of very long-term work.

For the mechanics of it, we wanted to have all the cabinets identical, so we made it a complete full range enclosure with a multiconnector on the back. From the flying point of view, we built it in to a steel cradle, so each cabinet carries its own flying hardware. All you have to do ▷

Hill Audio's M3 speaker cabinet



"I did a lot of research before buying a mixing console for Turbot studios. Ideally I'd have liked an SSL or a Harrison I suppose, but frankly, they were out of my price range.

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to fly the system, is clip one cabinet to another. You don't need extra chunks of hardware which make the cabinets heavier, but on balance we think it's a better thing to do.

RV: Or as at Wembley, you were able to use the clipping between the cabinets as a method of allowing you to go six high, and still get good stability between the cabinets?

MH: Well that's effectively the result. You can go one, two or even sixteen cabinets in a vertical column by clipping them to each other, which gives extreme versatility and you're left with a rigid structure which is one thing against, say, the Clair or Turbosound flying systems. We felt the Clair system left unnecessary and unwarranted air gaps between the cabinets and the cabinets were independently suspended so there was a lot of kinetic energy being wasted as the cabinets vibrated. Obviously, in designing the systems we looked at everybody else's.

RV: There are theories against this, where people say if you have everything in one block it's angled straight forward, then it's very easy, especially at festivals, for the sound to just go over people's heads. A lot of people in a small area produce a lot of heat—this tends to produce a heat layer over the top of them, and if the sound is projected in a straight wall it tends to bounce off the top of this layer. When it's beamed downwards, though, it's more likely to break through that barrier.

MH: That's a very good theory and I think it has some validity. You could say that the top two rows create a downward pressure front on the cabinets below them, in other words the top two rows divert the sound down; if they weren't there the sound would go up.

MS: This was the main complaint that we had the first time we did Donnington.

MH: I'm sure what you're saying is exactly what happened. That was when we got complaints from villages miles away. It's the conclusion I came to, when the people are in there, there is that layer of hot air and if the sound is coming parallel it gets reflected up.

The easiest thing is just to hit it with more power, so I'm using the acoustic wavefront of the top two rows to deflect the acoustic wavefront of the first four rows downwards.

RV: Allowing you to carry on using the same cabinet, and not have to change anything for your flying rig?

MH: All I can say is that at Donnington last year it was incredibly successful. Although it was the loudest Donnington ever, it didn't travel beyond the festival site.

RV: It seems that it's only over the last four or five years that people have put the correct degree of importance on how much headroom is available. The result is that the sound is that much cleaner, transient response improves no end and you have the capacity to take very high power levels for short periods of time, helping to improve the dynamic range for the audience's appreciation.

MH: It's very important for there to be no natural limit in the system. There are an awful lot of systems around that seem to have a certain, specific limit and when they reach it, they suddenly just crack up. I tried very hard with our system—

THE HILL SYSTEM

there is no specific point; you just keep pushing and pushing it and gradually the amplifiers will start distorting more, and so will the cabinets—but there is no specific point that you have to work below. If it suddenly goes from great to horrible, you've got a big problem.

I first came across this with power amplifiers in the early days with the Crown *DC300*. If you had a *DC300* driving two *4560*s a side on kick drum you went up to a certain point where it just made this horrible noise at you, which meant you had a very quiet bass end because the engineers were desperately trying to avoid that point.

If you put our amplifier in there, and on paper it's exactly the same power, suddenly the whole thing was much more powerful; when you reached the clipping or protection point on mine, it just got slightly more distorted. A progressive distortion, so you could drive it flat out and you had sonic headroom to deal with the peaks beyond it. With the *DC300* your maximum had to be within the rated power.

RV: I'll probably get shot for saying this, but *DC300*s were designed for industrial use and it wasn't until the *300A* that true audio applications were possible.

MH: It was actually for home hi-fi—then for professional use, but this was when I first came across the phenomenon that if it had a specific distortion point, you had a problem. Similarly, on Martin rigs, especially the Philishave—if you had a version that had an RCF speaker in it, rather than ATCs—you came to a point where it actually makes a dreadful noise at you (Malcolm blows another raspberry).

RV: I was quite interested by some of the amplifiers; you had three channel amps driving the side stacks with the *3000*s driving the centre. Were these specifically designed for the flying rig?

MH: Yes the triple channel amp was designed for the flying system to make it very neat and simple—one cabinet, one cable, one amplifier, one input cable.

RV: Are you driving each of the 12s individually, because I noticed six cables running up out of the back of the 10-core speaker cable?

MH: This is one of the things which other people don't do, and I keep telling them they're making an enormous mistake. We have a 10-core cable, six cores powering the 12 inch-ers individually, two cores drive the midrange in parallel and the other two cores drive the top end.

People like Turbosound use the same diameter cores, but only six-way; it's great, because you have a smaller, cheaper, more flexible cable, but you lose so much power and so much damping factor when you're driving a flying cabinet over a long lead. I demonstrated a power amp to Turbo once and they wanted to see how it would drive two cabinets in parallel; the second cabinet they had was in the building next door and they linked the two together. That is something we never do, always one cable per cabinet. The first went half as quiet and there wasn't anything coming out of the second at all on the bottom end, because they were losing so much power.

You end up saying 'look, you add that together and you've got about 1 Ω of resistance in the cable and you're loading it down to 2 Ω so you're only getting ⅔rds of the available power by bouncing 2 Ω off 3 Ω and the damping factor has gone totally out of the window'.

But I can't get through to anyone, so I've given up trying to tell them now. We spend a lot of money carrying a lot of heavy cables around.

RV: Do you think that 1.5 mm cable is sufficient for the job?

MH: Up to 45 ft, I'm happy with it. To me, the loss of damping and power is just noticeable at 45 ft. Not many people would notice the difference, using the cables we do.

RV: You were using CPC connectors—I haven't seen them used as speaker connectors before.

MH: The reason we're using them is because you can load them with as many or as few pins as you want. Because we have this big chunky cable—only needing ten pins—Cannon *EP*s are out. We had to find something with a big, chunky clamp and capable of 10-pin connection. We like the fact that it's plastic: although it's not as strong, in one way, as metal, it can't short out. If a fork lift does go over it it bounces back rather than bending; plus the connector at the cable end is actually of less mass than the cable, so you don't get this weight at the end of the cable.

The only problems that we had with it—if it's plugged into the cabinet and someone drives a fork lift across the cable and rips it out, it also rips the retaining ring of the socket out of the cabinet. What I'd like to do (and I'm very happy with the cable end), is have a metal end in the cabinet which is what we're working on.

Going back to the amplifier front, that's what we did with the triple-channel amplifier, and it was extremely neat, very easy to work, set up and it gives individual control over each cabinet; and we were working on individual control of cabinets such as monitors, side fills, small PA systems and things like that. However, having run a system for several years, we felt that we could benefit from having more power—the headroom thing.

We also felt that when we were pushing the system really hard, the weakness of our triple amp was its common power supply. If you drove the bass band heavily into overload the available power in the midrange was reduced and there was cross-modulation. The midrange got harder under those conditions, so we wanted more headroom and we wanted to have separate power supplies for the mid and top amplifiers. That meant that the tri-amp was getting so much more complex, and bigger, that we thought in that application we are just as well off using a conventional ▷

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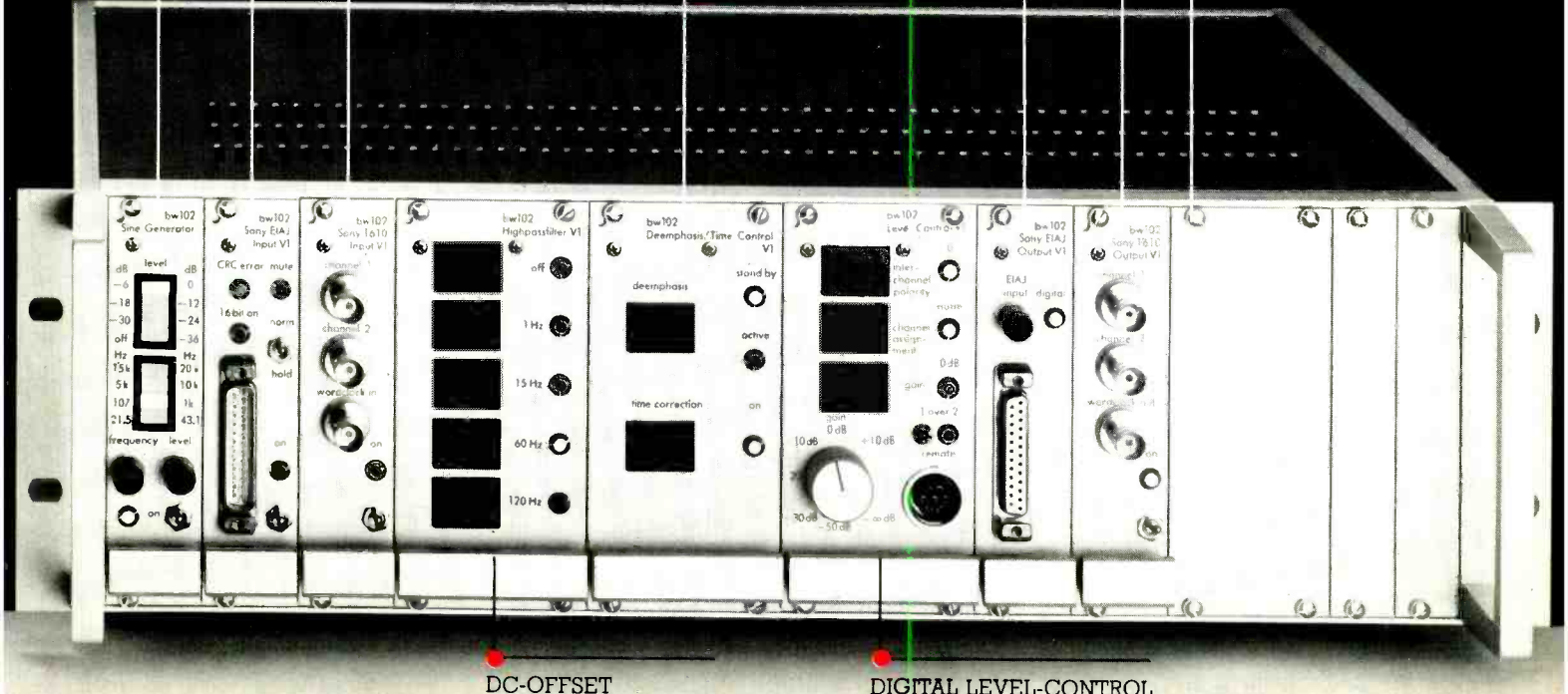

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amplifier, which is why we're using our new *3000*s.

RV: How do you set up the *3000*s to power the stacks?

MH: We put two *3000*s in a rack, both channels of one driving two bass sections each, one side of the second 3000 driving all four mid sections and the other side driving all four treble sections. The available power to each band is double the theoretical RMS handling of the units, so since we developed these amps we've never run out of power—clean amplifier power—at all. As soon as we did that, when pushing the system, we completely lost any tendency towards midrange hardness and the top end cleaned up just like that, so the sonic improvement is quite strong.

Selling a *3000* series stereo amp with a conventional connector etc is a lot easier than selling a tri-amplifier. We use *1000*s for the tri-amped wedges, side fills and anywhere local control is necessary.

Multicores

RV: I believe you run all your multis at line level?

MH: The motivation for having a virtual earth active stage box on stage to bring everything up to line level is that, even using a high quality Belden multicore of say 100 m in length with a 200 Ω microphone driving a 1.2 kΩ terminating impedance on the mixer, you could easily have 70 or 80 Ω in the multicore plus a fair degree of capacitance. If you take a mic direct into the mixer and A/B it there is a tremendous difference in noise, buzzes, crackles, a lower signal to noise ratio because of signal loss and general quality especially at low frequencies, and of course, the damping goes out of the window.

Through an active system, by virtue of having a virtual earth line level output, it's totally immune to lighting buzzes, hums, crackles, RF and the rest of it. You can put miles of cable on it—any kind of cable, and you don't get any noticeable degradation.

By doing it this way the connection between stage and out front is totally immune to all nasties and you only need one core per way so straightaway you can get double the number of channels down the same multicore.

Because it's all at line level, you can also quite cheerfully send the outputs of the mixer and crossover back down the same cable that has the inputs; there's no chance of it oscillating, because there is no gain within the cable.

The disadvantages are that you have to watch the headroom of the gain stage on the stage box, which means that sometimes you have to introduce a pad on the stage box but we've given the input a lot of headroom so this is only necessary in extreme cases. A thing for the future is to multiplex a logic down there for it to drop in pads automatically.

It totally freaks out American stage hands. They've just done Showco or someone, and they turn up with six stage hands to run out six multis, and you just give them one and they can't understand where the rest are. They can't handle the idea of running 50 channels and all the outputs down one small cable.

THE HILL SYSTEM

We use Belden because we find it's mechanically very strong, but electrically you could use anything—we've used all sorts of stuff. It doesn't even have to be screened, and it works very well.

RV: And saves you money as well.

MH: Well the saving on the cable more than pays for the active stage box.

RV: Presumably, the front end that's in your stage box is lifted essentially from your desks?

MH: We keep it in the desks as well, just in case. But it is the same design. The Helpinstall on the piano was the only thing padded at Live Aid.
as that hadn't been sound checked at all. The first time we brought it up, we put the pad on as they were sending us the line output instead of the mic.

RV: My only twitch about the stage box system at Live Aid was that all your splits came off after everything had been through your front end, boosted up to line level and then dropped down again through dropping transformers for the splits (**MH**: 'for the BBC?') Right. Would that not have been more ethically correct if your splits had been in front of your stage box?

MH: This is one of the things which could well have been different if the scale of the event had been anticipated prior to planning.

The BBC wanted to avoid parallel splits because of the voltage change that you get when other departments pull in and out. If I was to do it again, I'd still do an active buffered split, but I'd have had all the mics going into a special box just for the occasion, and that box would have produced the monitor split, the out front split, and the BBC split, rather than them tapping off after our active stage box.

The splitting of the sources was not ideal for that event; in particular, we should have thought: 'What do we do if the lead vocal goes down?' and consulted with the BBC—and that we never did.

We never mentioned it, the BBC never mentioned it, and the worst happened—but I guarantee we didn't lose a snare drum the whole way through.

RV: Why have you stuck with 8-band fixed frequency EQ on your desks, when most manufacturers use sweep EQ?

MH: The Series 3S mixers we use have 8-band fixed frequency, though each band is switchable up or down half an octave. This, we feel is the most practically effective EQ there is. The reason we avoid sweep EQs is that as they stand, the classical sweep EQ is with a gyrator circuit which adds so much distortion and colouration that I'd rather not have an EQ in the first place.

Soundcraft, Studiomaster, Midas, etc, all exhibit it.

To my way of thinking all the EQ does is even out the frequency response, it doesn't alter phase response or anything like that. This is something my ears always tell me. . .

Mike (Scarfe) for instance went along with this in broad terms until one day we were at Tasco demonstrating our new cabinets, and we'd used a pre-recorded tape through our system and they did the same thing using a Midas.

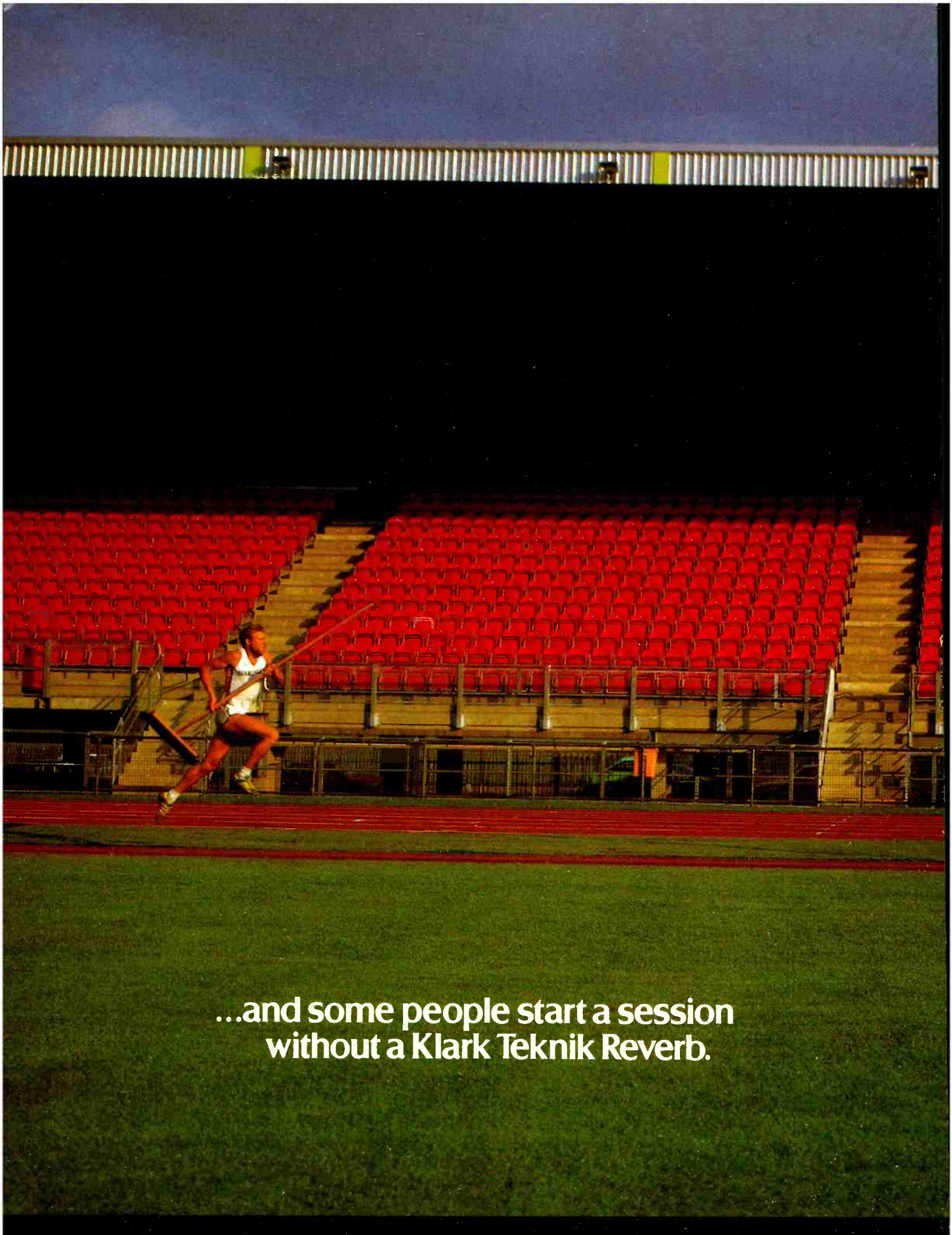
You could A/B the tape through our mixer with the EQ flat or run the tape directly to the crossover and it would sound just the same. Mike couldn't believe it when it went through the Midas with the EQ defeat in and the Midas completely changed the character of the sound coming out.

Nothing wrong with the sound coming out—it wasn't a bad sound, but it wasn't the same as putting the tape straight into the cabinet, because of all the phase colouration in it.

If you'd measured the Midas frequency response it would have been totally flat but the phase response was completely out of the window.

A friend of ours Mike Shea in the States used a Neutrik phase-response recorder and when he checked our mixer against others he thought the machine had gone wrong, because the phase response through our EQ stage was totally flat. When he put it on a Soundcraft and even an Orban parametric, he found it was all over the place. Hence discovering something that no one had really looked at until this point.

This was, for us, a technical conformation of my philosophy—I don't like the colouration that sweep EQs add.□



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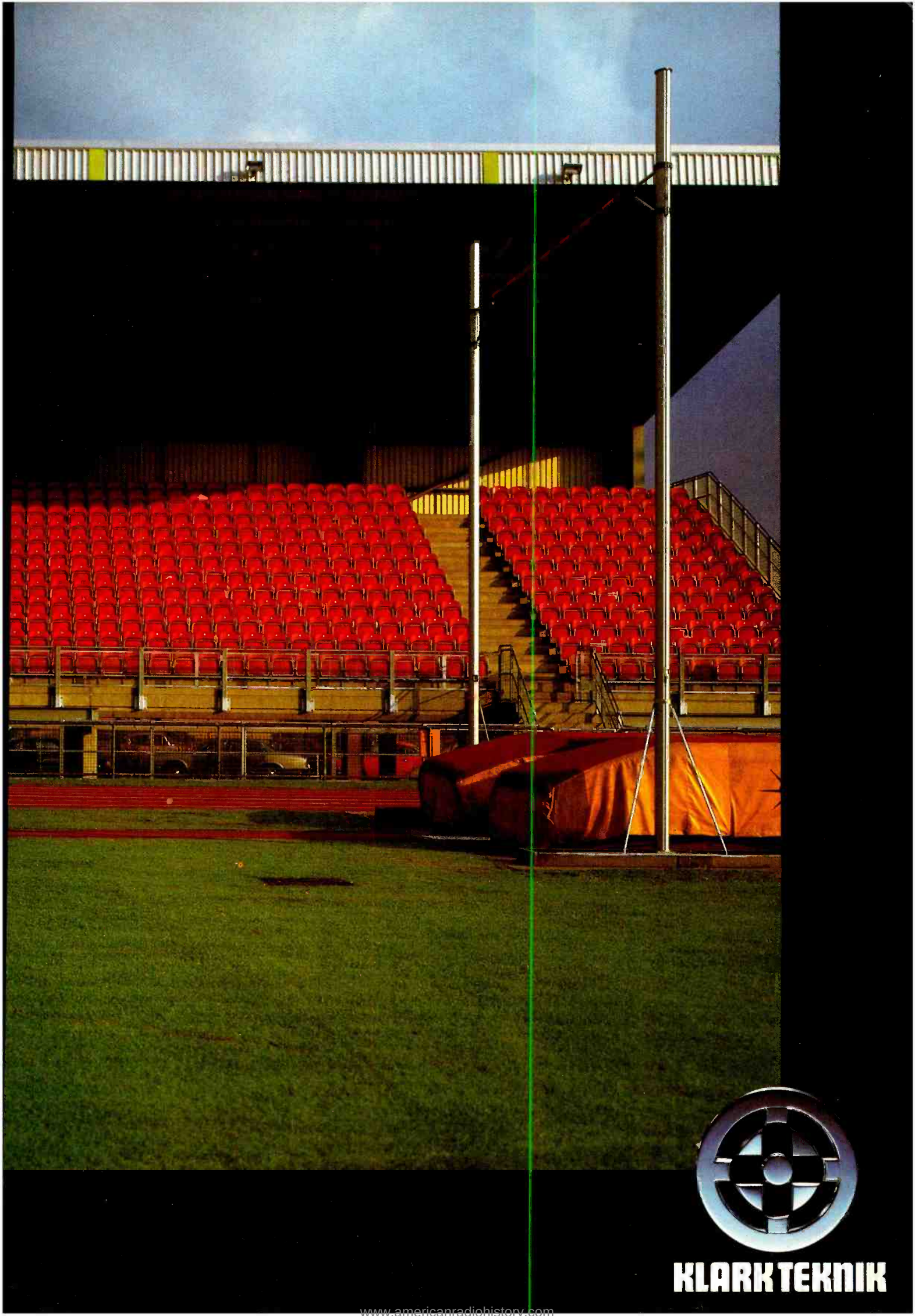


KLARK TEKNIK

BUSINESS BUSINESS

Barry Fox investigates the facts behind the industry news

BBC cutbacks

Let it not be forgotten that if the BBC governors have their way the Neve *DSP* will be the last true innovation ever to come out of the BBC.

BBC engineers joke privately about the recently delivered OB truck now needing its MOT because it was ordered over three years ago. Neve managing director Laci Nester-Smith admits that the project proved far more ambitious than anyone imagined.

"It represents 100 man years of development, in addition to the original BBC work at Kingswood Warren," says Nester-Smith.

The BBC's Guy McNally began work on COPAS (Computer Operated Processing of Audio Signals) in 1978. Neve joined in after two years and by 1981 there was a working prototype. In March 1982 the BBC ordered a working desk in a mobile for outside broadcasts. A team of engineers and studio operators were locked in a room and told to work out a final spec sheet. It still took another three years; the van was finally handed over in September.

The delay is due to one thing. Gross underestimation by all concerned of the yawning gap between prototype design and production engineering. But, says Nester-Smith, "It must be 100% right."

The *DSP* design had to be frozen two years ago, otherwise it would still be at the design stage. That's why the circuit boards use bit slice technology, with strings of power-hungry 4-bit TTL chips wired in parallel to build up the 32-bit main mixing bus. More modern architecture could reduce the number of chips from 250 per board down to 15. The designers of the original ENIAC computer built in the USA at the end of the war had the same problem. They kept on finding better ways of wiring the valves. Someone finally had to say 'now we stop designing, and start building'.

The BBC governors are currently planning to cut back on research and development so up to 1,000 engineering jobs may go. Along with the IBA labs at Winchester, Kingswood Warren is one of the few places left in Britain where there is any original research and development being done into basic broadcasting technology.

As well as the Neve digital mixing desk, the BBC has contributed invaluable work on loudspeakers, digital sound, glass fibre technology, teletext, telecine, standards conversion. . . Over the last five years the BBC has licensed 20 companies to manufacture equipment and pay the Corporation a royalty. The official BBC line is that the royalty revenue from these is 'insignificant'. So presumably are the three Queen's Awards for technological achievement and the prestige that projects like the Neve *DSP* bring to Britain. No one counts the money saved on standards conversion. How much extra would it have cost if the BBC had been forced to produce separate programmes for 405 line TV instead of sourcing them from the 625 line service?

The OB's control room expands from 20 to 30 m when the van is parked—a pushbutton control on the outside works the hydraulics. So what happens if the OB van is covering a carnival and a reveller pushes the button?

Neve and the BBC have thought of that. The button has to be primed, like a bomb.

Engineers up for the chop have a fantasy: "In here Governors. Just make yourselves at home in this nice new 30 m control room. It's a tight fit but you can all just squeeze in. Now the nice boffin from Kingswood Warren will pop outside and press a button."

Ambisonics turn of events

Two recent events suggest that Ambisonics surround sound might finally lift off, after all.

After years of behind-the-scenes negotiations, often fraught with considerable ill-will, some of the rights to the invention have been bought back by some of the team who sold them to the NRDC 12 years ago. Canadian firm Maple Technology will now try to exploit the invention and succeed where NRDC, and the British Technology Group which took over from NRDC, have failed.

The licence with Maple was signed in July. As predictably as clockwork, BTG had just failed to make any effort to publicise the seminar on Ambisonics technology and recording techniques which it was jointly sponsoring with the APRS. "We decided against press releasing it and to play it in low key," I was told. That is, I suppose, one way to sell a surround sound system.

Just before Maple signed on the dotted line, British professional video company AVS also signed on a line with BTG. The AVS subsidiary company, Troy, will now make Ambisonic decoders for use in cars. This, and whatever push Maple can muster, could be the turning point. Before it gets lost in the mists of time, it's as well to have the background to this signing on record.

Around a year and a half ago AVS was dealing with BTG on other matters. Richard Murray and Alan Sexton of AVS (Murray is ex-REW and Sexton ex-Philips and Pioneer) were offered a BTG demonstration of Ambisonics. It was an exotic six speaker dem which they immediately wrote off as far too esoteric for commercial success. But a week later they had an idea. Why not use it in a car? Ambisonics widens the listening area, making the speakers unobtrusive. Back seat passengers usually find the rear speakers obtrusive. Ambisonics could throw the image forward.

Murray and Sexton put engineers on the job of making a car decoder. At the same time they negotiated with BTG for a licence. The decoder worked (I've heard it) and after going through the bureaucratic mill of dealing with BTG, AVS certainly didn't fancy starting again from square one with Maple. AVS created the subsidiary, Troy, and signed the day before BTG's deal with Maple was finalised.

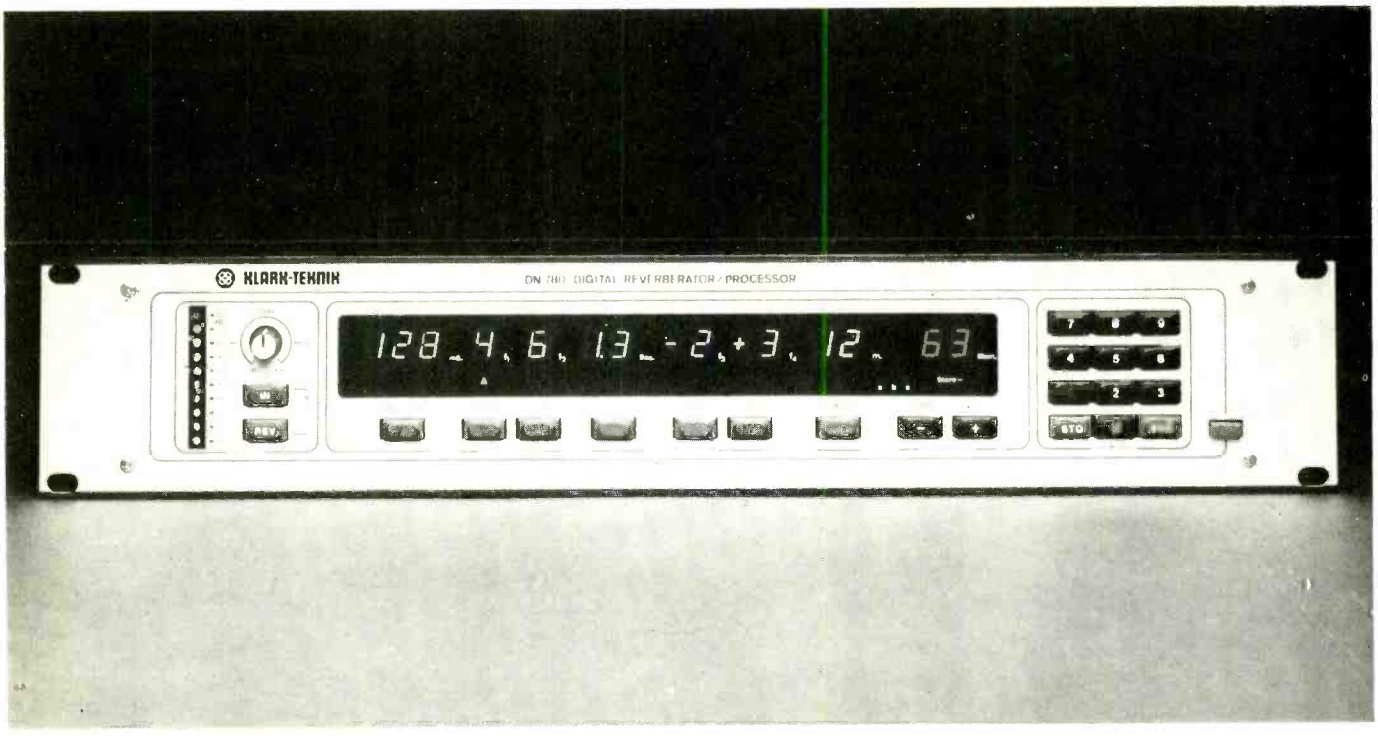
Bearing in mind that it was Troy's idea to use Ambisonics in a car, BTG does pretty well. Troy pays £2,000 up front, and then a 5% (or £2, if larger) royalty on every unit made. Troy spent £50,000 on developing the system. Even before launching the product Troy had committed £0.4 m on tools and advance orders to the Welsh AB group which is making the units for them. So Troy is gambling a similar sum to that which the NRDC and BTG have spent over the last 12, unsuccessful, years. Richard Murray leaves no doubt that he did not exactly regard BTG as a bundle of fire. He knows he has a big education job on his hands and wants to play down the 12 year history when talking to the consumer and popular press. The British public still equates surround sound with quadraphonics and yawns at the thought of something that has been on the shelf for so long. "It needs a commercial kick that BTG hasn't been giving it," says Murray. The dedicated band of Brits, who have kept the faith with Ambisonics, despite all the squabbling and fumbling that has dead handed it, can only hope that Troy will be able to give it that kick.

Miles

Miles Davis played the last concert of this year's JVC and Capital Jazz Festival at the Royal Festival Hall in London. Not only did Miles play an encore (unheard of) but while roaming the stage like a caged lion (normal), he posed to photographers (definitely abnormal). His roaming was courtesy of a Countryman diversity radio mic system, running on US frequencies at US power transmission levels. By the time the DTI has woken up to the fact that a visiting performer is not on 175 MHz with a maximum of 5 mW, they have long gone.

Several times Miles went to the front of the RFH stage, bent over the edge and blew his horn direct into the lens of a crouching snapshotter. He did exactly the same thing at the Nice Jazz Festival. Is this a new Miles? Has the Prince of Darkness suddenly turned soft and friendly to photographers? Not a bit of it.

As Miles leaned over the edge of the stage and dipped his trumpet at a photographer, he would open the spit valve and let the contents fall on whoever was below.□



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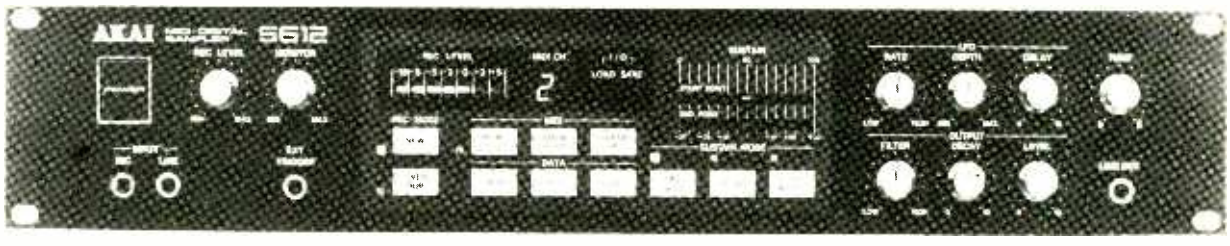
REVIEW

REVIEW

A user report by Mark Jenkins

AKAI S612 5612 MIDI DIGITAL SAMPLER



Akai's *S612* is the first dedicated polyphonic sound sampler to appear in a standard 19 in rack-mounting format. Unlike the AMS *DMX 15-80S* the Akai has no digital delay functions and unlike that unit and the Powertran *MCS-1* it has the ability to play six voices simultaneously.

This factor alone takes the Akai out of the realms of simply triggering sampled sounds and makes it worth controlling the unit from a music keyboard. This can be achieved via a rear-panel MIDI socket, and the Akai in fact responds dynamically to MIDI inputs so the volume of individual chords can be controlled by playing technique on, for instance, a Yamaha *DX7* FM synthesiser.

The Akai has two front panel audio inputs on ¼ in jack sockets at mic and line levels. The record level control has an associated LED VU level meter, and there is a monitor level control to feed the sound input to the line out at a comfortable listening level.

There is also an external trigger input jack on the front panel—this is an alternative to the automatic triggering of the sampling function which can be set to operate when the input level exceeds approximately −5 dB. There are two touch-membrane switches under the record level meter; these are Record New and Record Overdub, which allow you to make a new sample or add another layer of sound to an existing one. Overdubbing can be carried out indefinitely but the quality of each element of the sound will suffer to such an extent that no more than three overdubs would normally be advisable.

Next to the Record Mode controls are three switches for MIDI operation mode—Mono/Poly, Channel Up and Channel Down. On the pre-production model we examined the first of these would more accurately have been labelled Omni/Poly, since there was no indication that the unit could respond to several MIDI channels and play six different monophonic voices simultaneously (Mono mode). The Poly mode did make it possible, however, to select any one of MIDI channels 1 to 9 using Channel Up and Channel Down, the channel in use being shown on a numeric LED display. System Exclusive information can be transmitted to other Akai units.

Under the MIDI controls are the save/load/verify switches which operate the Akai's disk storage system, of which more later. The main sampling control section has three functions, One Shot, Looping and Alternative, together with two Sustain sliding controls to set the start and end points of the sample during playback. I understand that another option, Manual Splice, has been added to production models.

After a sample has been taken from a live source or loaded from disk, a MIDI input from a keyboard, sequencer or computer will cause the Akai to sound the appropriate pitch (notes responded to are keys 36-96 from the total range recognised by MIDI of 0-127).

Unless the sound to be sampled has already been edited on tape, it's likely that you would want to edit it in some way before playing. The Start Point slider allows selection of a new start point on an arbitrary scale of 0 to 100, while the End Point slider has a scale of −30 to +30 with 0 at the centre of its travel.

This arrangement gives you several options. You can cut any initial click off a sample, shorten it, or, by setting the End Point slider to a negative figure, play all or part of the sound backwards. In the One Shot mode the sound will play once when you strike a key; in the Looping Mode the sound will repeat between the start and end points chosen as long as you hold a key down.

The Looping option obviously gives the possibility of sustained (organ or string-like) effects but it's difficult to set up a loop without a noticeable glitch. This is just a matter of practice though and careful experimentation usually allows you to find acceptable start and end points. The Alternative (perhaps more correctly 'Alternating') mode helps in this task; it makes the sample repeat between the start and end points forwards and then backwards, and so at least any glitch which may be audible is only heard half as frequently.

On the right hand side of the front panel are seven rotary controls, of which three refer to a modulation LFO and four to various aspects of the final output. One of the output controls is Decay, which allows a sample to continue playing for a variable time (up to its full length) although a key is no longer held; in synthesiser terminology, this is more properly known as release.

On the *S612* the sampling time is automatically controlled by the approximate pitch of the sample—from 1 s for high pitches to 8 s for lower pitches. More user control in this area would have been welcome but at least the system assures maximum bandwidth when playing back at altered pitches.

Also in the Output section is a filter

SPECIFICATION

Mounting: EIA 2U (Disc Drive EIA 2U)
Depth: 379 mm
Weight: 6.0 kg
Sampling: Up to 8 s
Voices: Six
MIDI: In/Thru; Key Down; Pitch Bend; Modulation; Velocity; Damper; System exc
Inputs: Mic, line
Outputs: Line
Akai Electric Co Ltd, 12-14, 2-Chome, Higashi-Kojiya, Ohta-ku, Tokyo, Japan.
UK: Akai (UK) Ltd, Haslemere Heathrow Estate, Silver Jubilee Way, Parkway, Hounslow, Middx TW4 6NF.
USA: Akai America Ltd, 800 West Artesia Boulevard, PO Box 6010, Compton, CA 90220.

control, which operates a powerful lowpass filter which can remove any unwanted quantisation noise or hiss. The option of controlling this filter from the decay level would have added some interesting analogue synthesiser-type possibilities.

Also on the right of the panel are a level control and a jack line out socket, and above these is the Tune control which gives a range of approximately plus or minus one semitone. On the review model there were two microswitches on the rear panel, one of which produced octave switching in a rather sporadic manner; these switches will probably appear on the front panel in production models.

The LFO controls show that a good deal of thought has gone into the Akai's design. Altering the pitch of a sample which has any kind of cyclic modulation (vibrato, tremolo or filter effects) will change the modulation rate, possibly to a very unmusical degree; if you can sample without modulation, the Akai can offer you some of its own. The controls are Rate, Depth and Delay, and the modulation waveshape is a smoothish triangle.

To return to the save/verify/load functions; the rear panel of the *S612* has a multiway edge connector for a dedicated disk drive unit using the *Quick Disc* system. This is also 19 in rack-mounting and consists simply of a drive unit plus a disk storage rack. It uses 3½ in disks offering one sound on each side of a disk with an access time of around 2 s with LED's next to the MIDI channel display showing when the unit is saving or loading. The *S612* has no method for selecting which of several sounds should be loaded from a disk, although the potential capacity of the disks themselves must be much greater than one sound per side.

This is unfortunate, since it could mean dealing with very large numbers of disks, the price of which would mount up rapidly. It's not clear whether the *S612*'s editing controls actually modify the form in which a sample is stored to disk or whether they still have to be set up correctly after disk loading to reproduce the desired effect.

On the rear panel of the *S612* there's a MIDI-thru socket as well as a MIDI-in, and an enigmatic multiway socket which may turn out to provide individual voice outputs when (and if) the unit is able to function in MIDI mono mode.

I used the *S612* for a couple of weeks, controlling it from a Yamaha *DX7* synthesiser and a Roland *MSQ700* sequencer. The *S612*'s main advantage is extreme speed—it's possible to take a sample, edit it to size, and find yourself playing or recording with it in a matter of seconds.

Sound sources included bass and electric guitars, LPs, compact discs, voice and various synthesisers. The Akai coped extremely well with inputs both to the mic and line sockets, and showed no particular tendency to distort inputs.

Since sample length is chosen automatically, frequency response of the sample was generally very good. Some very high pitches or harmonics generated an unacceptable amount of quantisation noise or harmonic distortion but such incidences were few and far between and the built-in filter often helped out.

Response to MIDI key information, pitch bend, modulation and key velocity was perfect, and the Akai had no difficulty in reproducing very fast playing or sequencer passages. Pitch tracking and stability is quite phenomenal over a very wide range; frequency response varies with sample time but can reach 14 kHz and generally seems good to the ear.

Akai are new to the professional market but have some excellent ideas and very high standards. The *S612*, although it has no digital delay or other functions, wins through its relative inexpensiveness combined with very acceptable quality and performance. It could well set the standard for others in its field to follow.□

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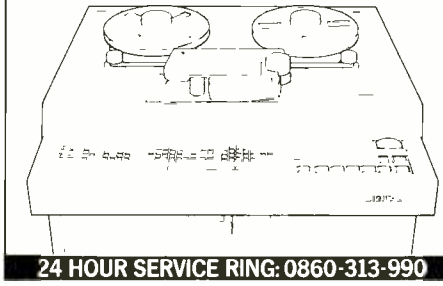

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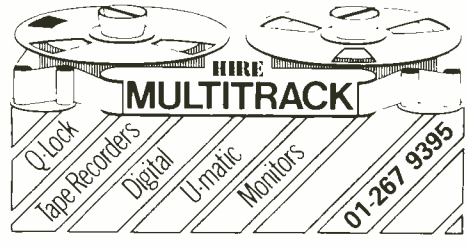

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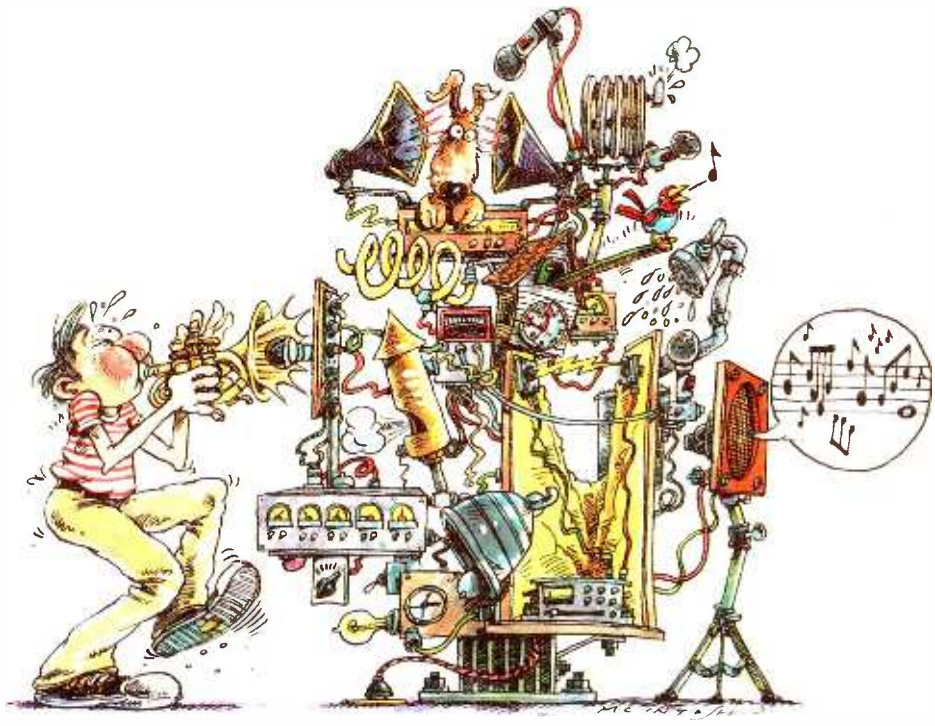

HARRY, THERE *HAS* TO BE AN EASIER WAY.

MEMO:

Listen, Harry, I *know* you keep saying we need "creative sound processing" to stay competitive. I *loved* the way you hung the mikes inside a 24-gallon aquarium for the Fred's Fish Food jingle (too bad Fred's singing goldfish dropped dead, though). And your reverse hyperspatial time-delay effects for the "H.G. Wells Concerto" were *incredibly brilliant*. Real award-winning stuff.

But I gotta tell you: these complicated setups of yours are driving me crazy. First I spend *all day* rigging equipment. Then I go *all night* de-bugging the effects so they sound right.

Harry, there just *has* to be an easier way to produce interesting acoustic environments.

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Anyway, Harry, I want you to cancel everything on your calendar tomorrow morning. I'm taking you to hear a *live demo* of the 626. Don't forget the checkbook, either. We *need* this thing—and the sooner the better.

Regards,

ozzie

THE STARGATE 626

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