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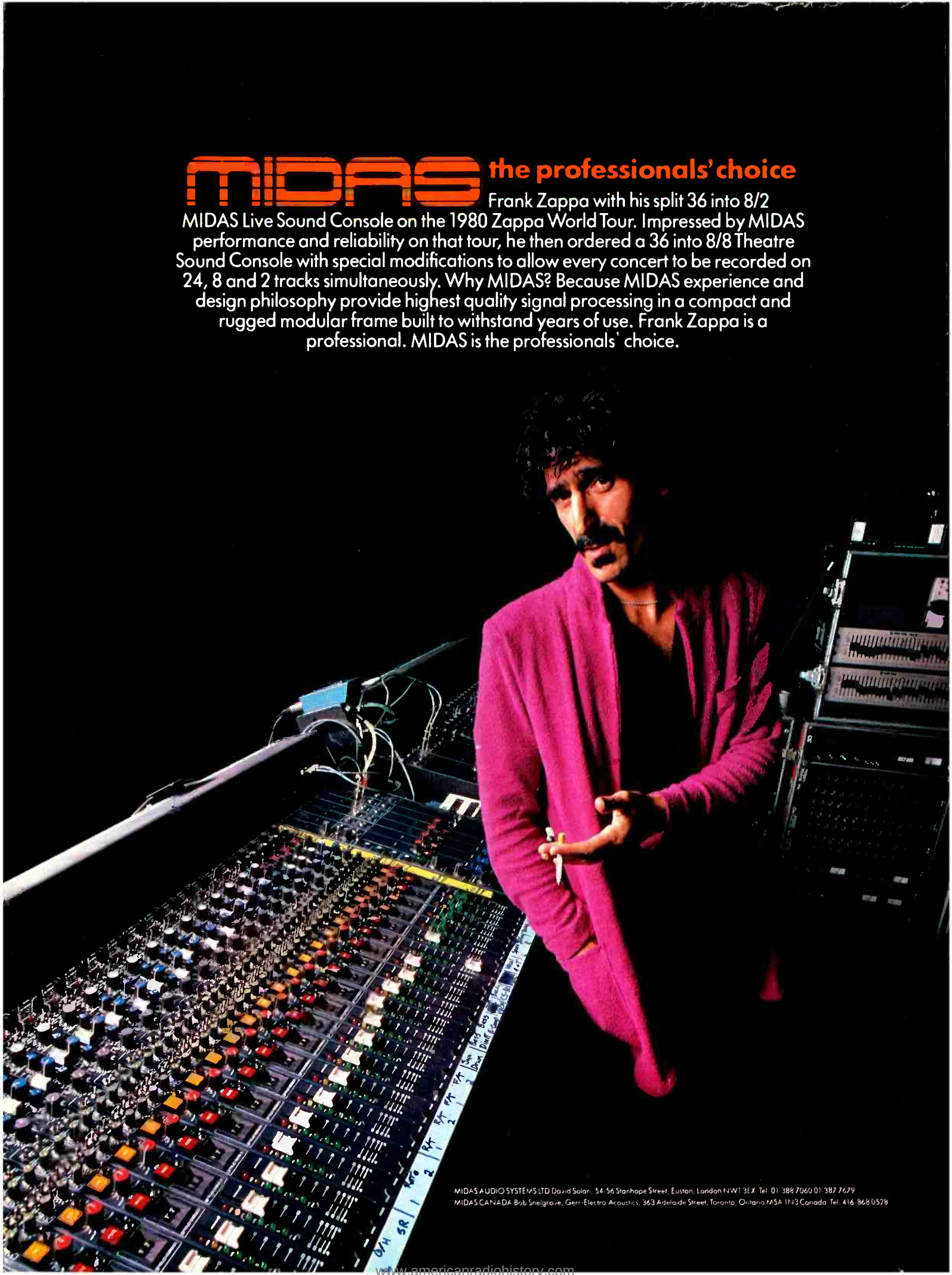

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ABC MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

This month's cover photograph of Allen & Heath's Syncon M24 was taken by Roger Phillips

22 Diary — People, places and events

26 New Neve products — Details of four new console systems

30 New products in general — Recently unveiled equipment

34 Synchronisers and autolocators — NEW items and PRODUCT GUIDE

42 Tape machines—Part Two
NEW recorders and PRODUCT GUIDE covering machines above 16-track

50 Using the Trident Series 80 and TSR
RICHARD ELEN uncovers the practical intricacies of this console and tape machine

56 Studiofile
Including Playground, London; Herne Place, Berks; and Kingdom Sound, New York

62 Martin Rushent tells all — in an interview by HARRY MANGLE

66 Business — BARRY FOX's regular column

68 Designing a mixing console—Part Fourteen
STEVE DOVE concludes

Reviews:

74 Soundcraft SCM 762-24 — 24-track tape machine reviewed by HUGH FORD

82 Fostex 250 Multitracker
RICHARD ELEN studies the last item in the Fostex Range

Welcome to 1982

What is going to happen to the professional audio industry in Britain over the next few years? A good question, that. Almost immediately after the BPI had expressed 'cautious optimism' about the state of this country's record industry, interest rates suffered another hike in an apparently panicking attempt to preserve the value of the pound. The overall result is likely to be that the British recording industry will trundle along for some time to come, neither getting much better nor any worse than during the past year.

There have been some disturbing reports circulating, however, including the fact that one well-known north London studio is up for sale, as is another facility in southern England, and that Trident Studios in central London has gone into liquidation. No doubt the latter case is more a political measure, with the Trident group wishing to concentrate more wholeheartedly on video (and it should be pointed out to those who don't already know that this will have no effect whatsoever on Trident Audio, who are a *totally* separate operation). Further adverse results of Government spending cuts—like the totally absurd and incredibly stupid cuts which threaten the BBC Transcription Service (whoever thought of that one needs their head examined)—are bound to have at least indirect effects on our industry. There is still a good market in local radio, where there are a number of new stations left to come on-line, but for manufacturers to survive (or even, with luck, thrive) the answer probably lies in export, especially to North America.

While the European market is not as bad as the UK, it is still rather flat, and North America probably accounts for about 50% of the world market. Hardly surprising, then, that more British companies are opening up offices in the US, and doing very well at it too. British products are very competitive, not simply in price due to the state of sterling, but also in terms of quality. It is notable that the companies who are doing particularly well at the moment are those who have a strong export market, a good example being Solid State Logic, who were recently awarded the Queen's Award for Export Achievement. But the basic problem was underlined by one commentator at SSL's presentation who pointed out that the one unfortunate aspect of the presentation certificate was that it was signed by a certain Prime Minister, who could be said to be the one person who had contributed most to trying to ensure that SSL *didn't* receive the award!

But certainly the international market is healthy enough to ensure continuing developments from manufacturers all over the world. Obviously, video and digital will have their effect, particularly in the domestic field, and the *Compact-Disc* will hopefully liven up the record companies (and, incidentally, give no excuse for bad pressings—they'll either be fine or not play *at all*) and thus the studio industry. A professional digital standard is needed, and indeed the Sony/MCI/Studer agreement gives every indication of leading to a *de facto* standard in the near future, which may give the users and manufacturers of other systems a nasty cold. More than one company is working on an all-digital console (see the exclusive news feature on Neve's new range in this issue), and other companies are examining the remote-controlled assignable automated console concept, whether utilising digital signal processing or not: a development we have been predicting for some considerable time. There will be a market for these products, and a thriving industry to use them, even in the UK. And no doubt the combined expertise of these many manufacturers will offer equipment which is not merely more sophisticated, flexible and exciting than last year's models, but also even more appropriate for the creative task of making music, film and video productions, and broadcasts.

Richard Elen

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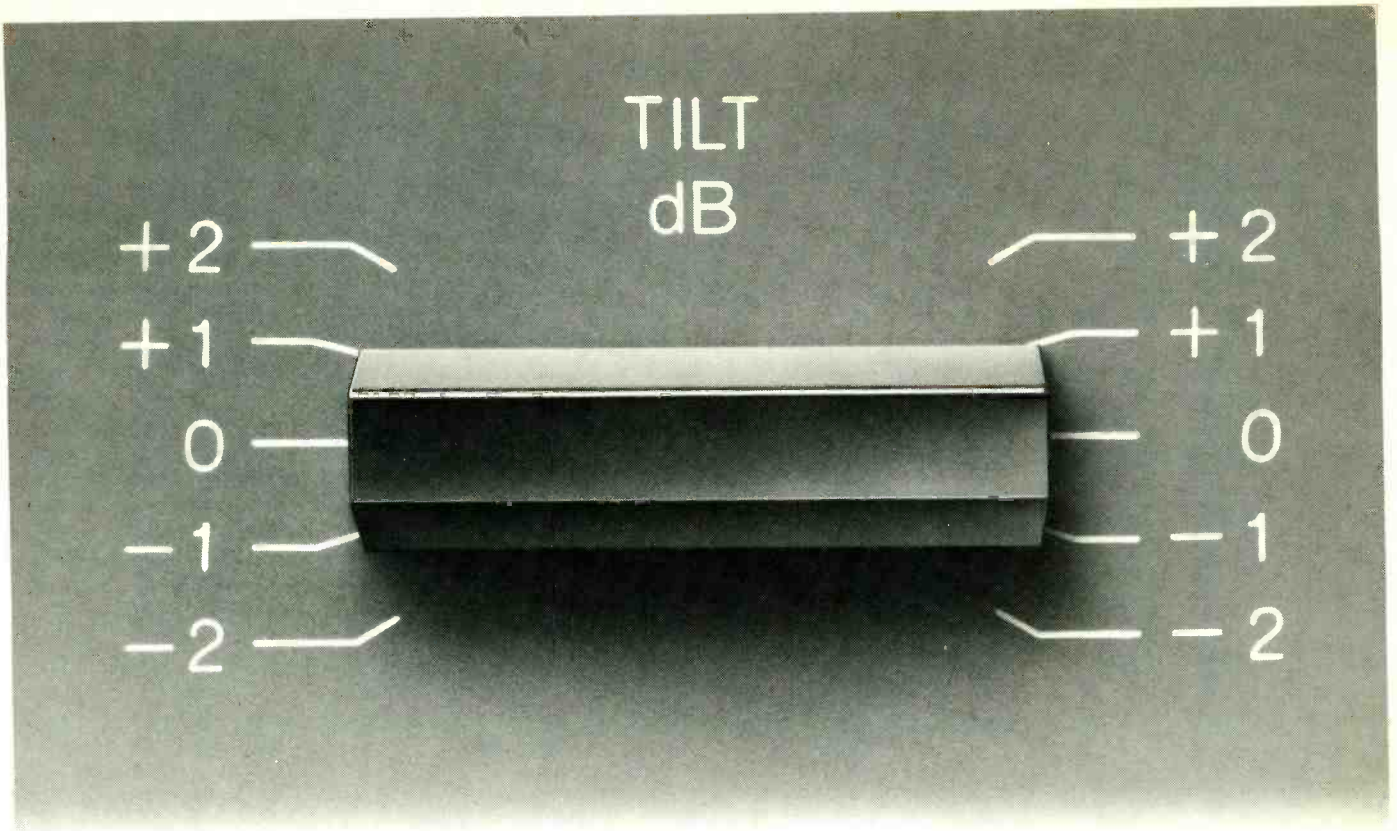

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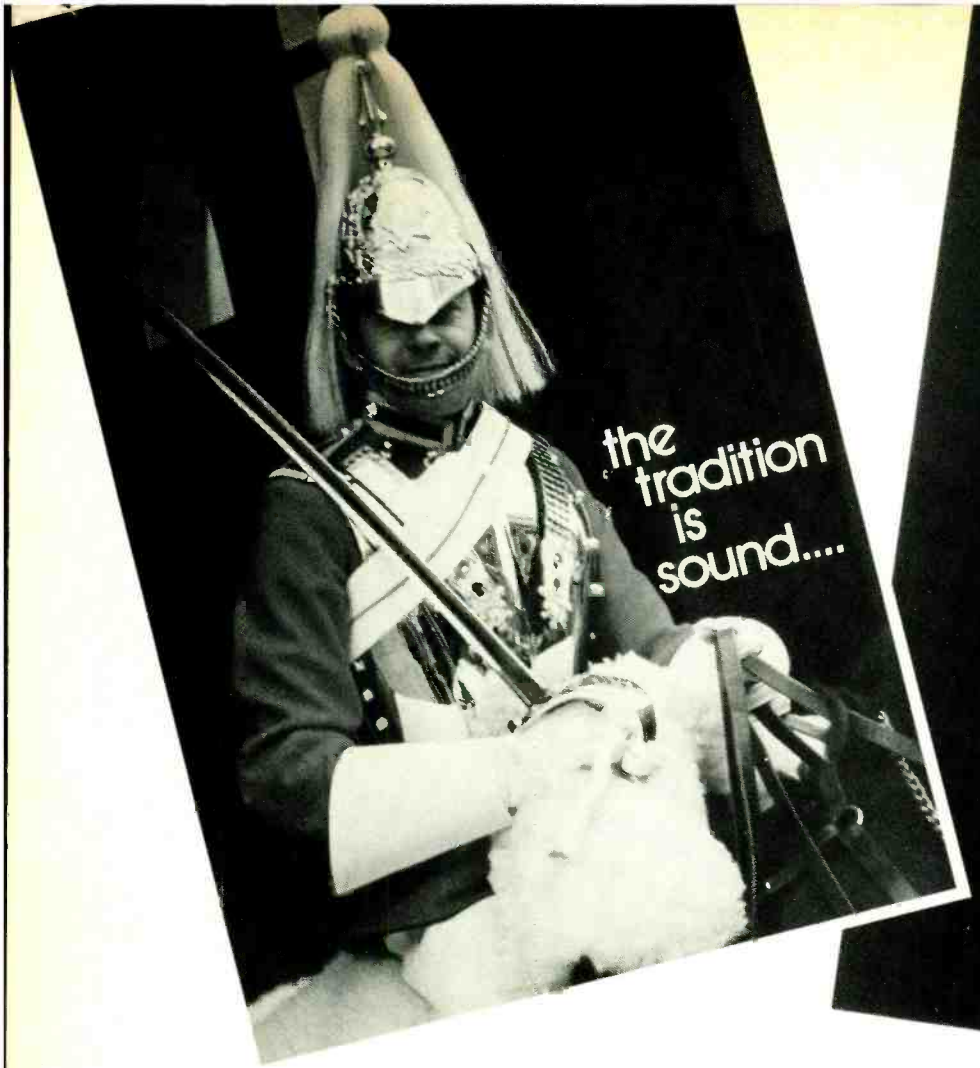

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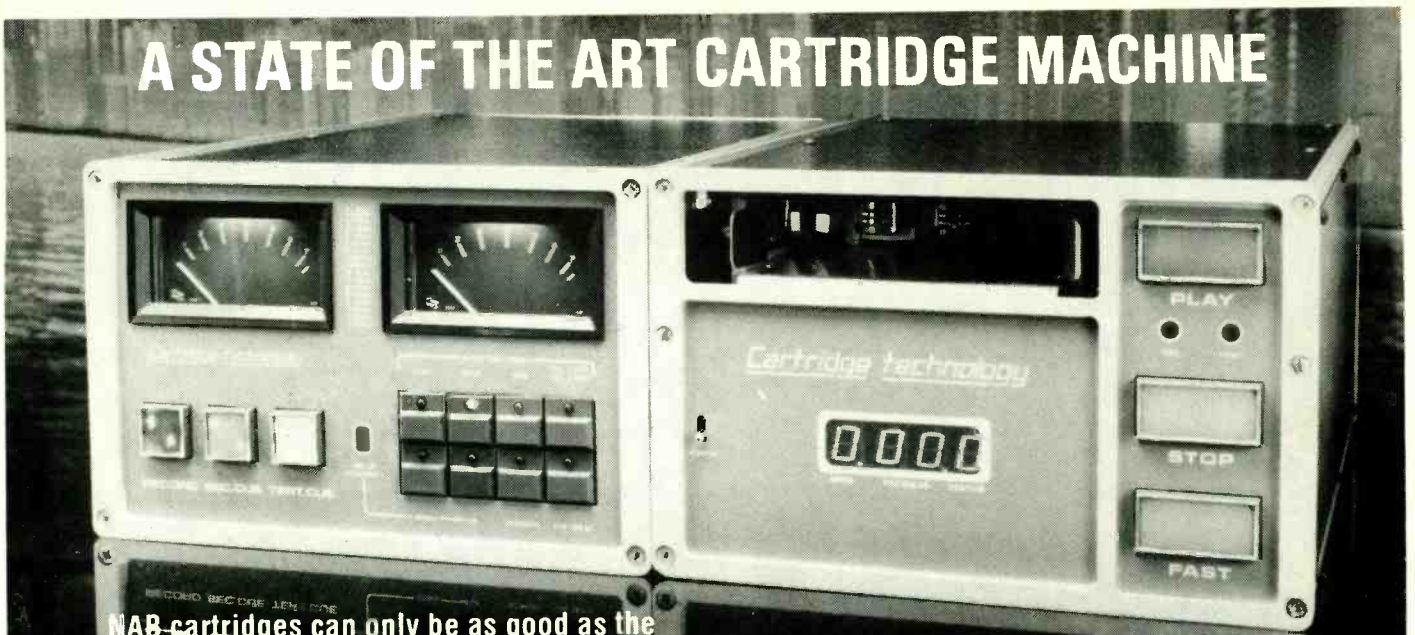

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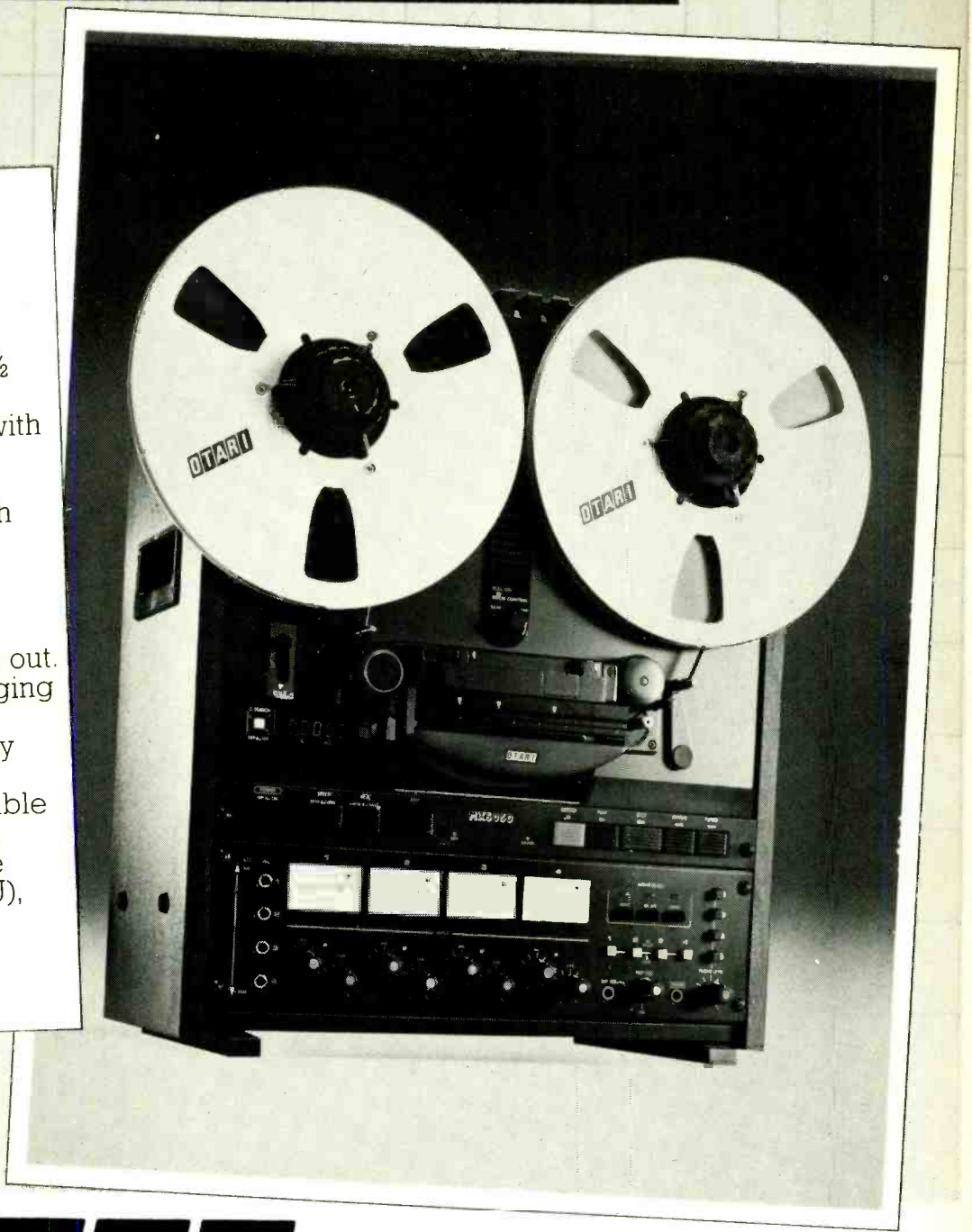

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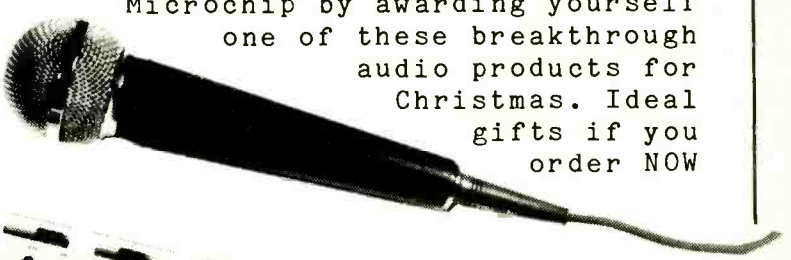

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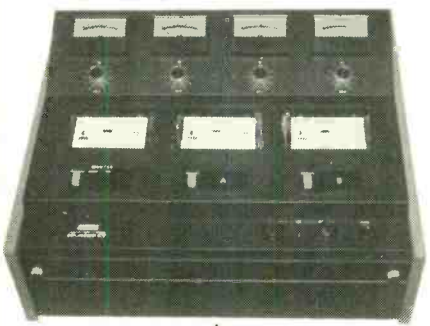

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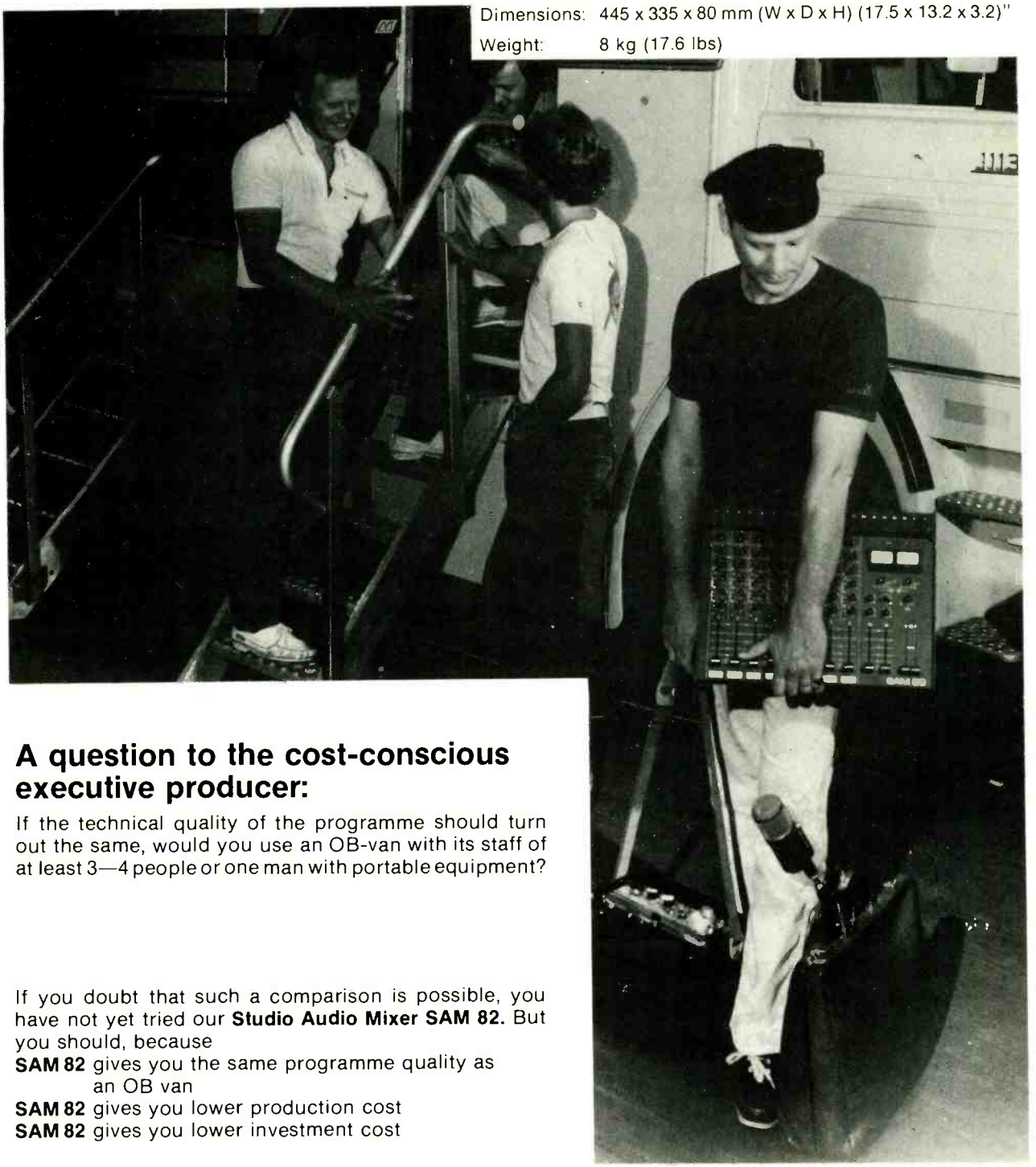

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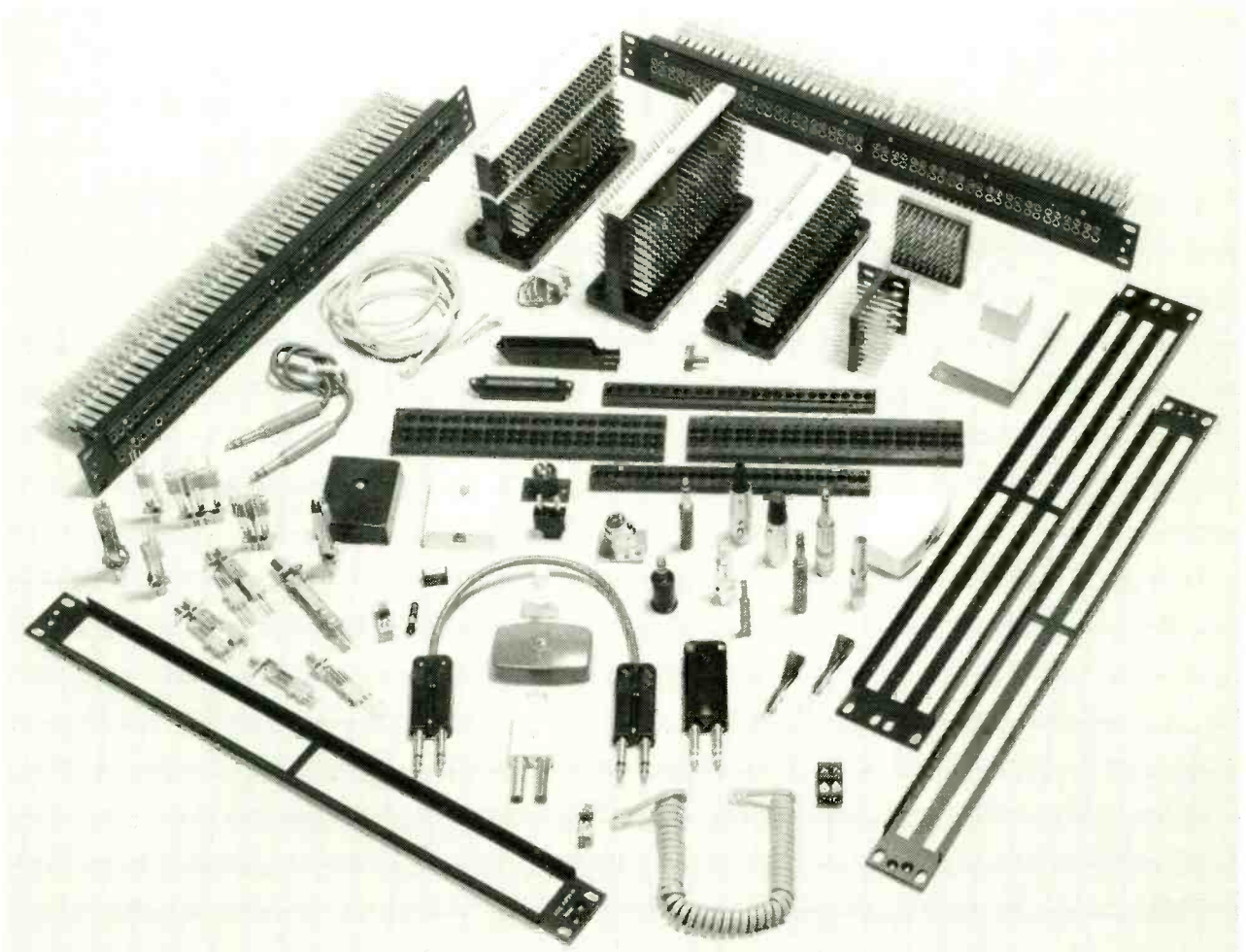

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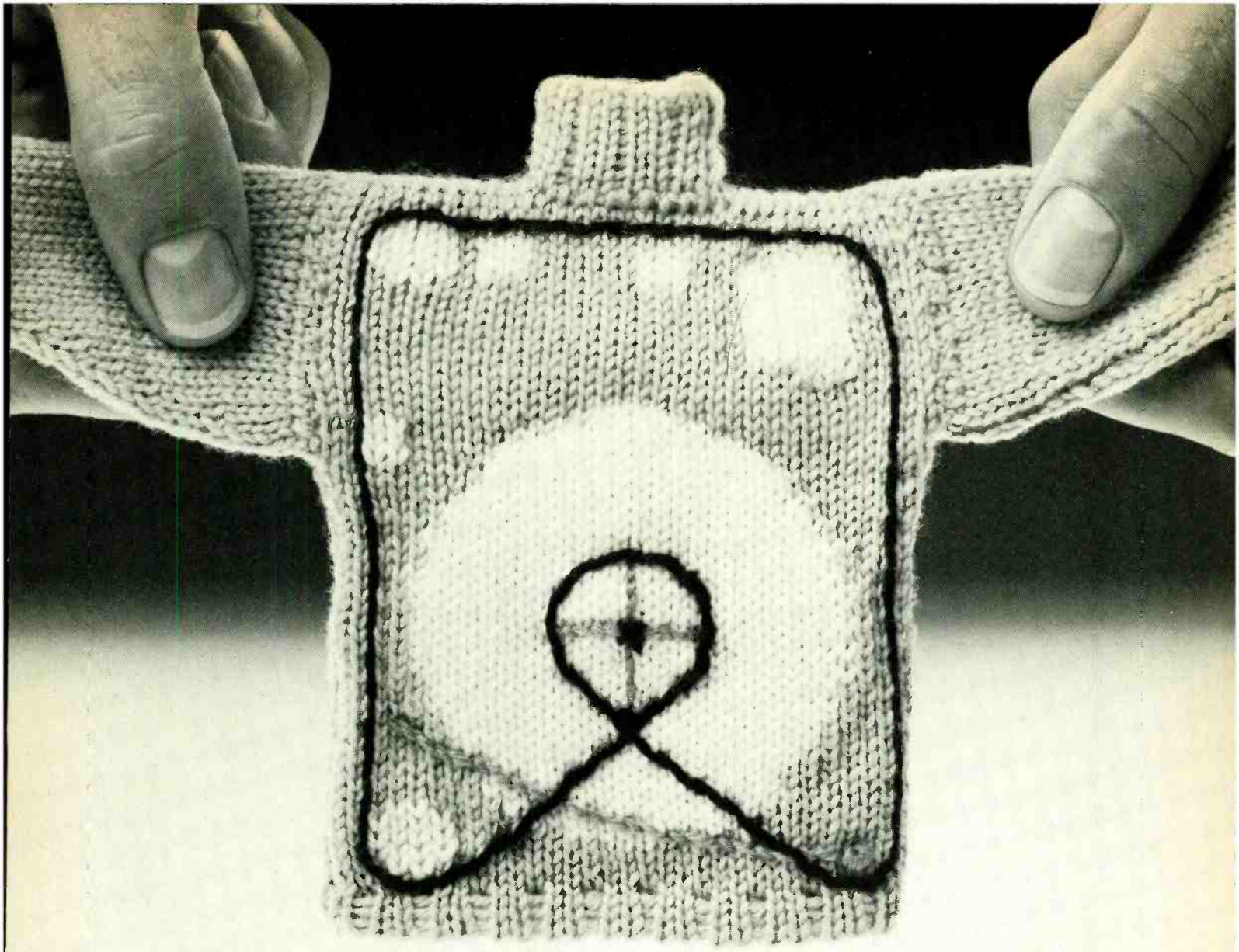

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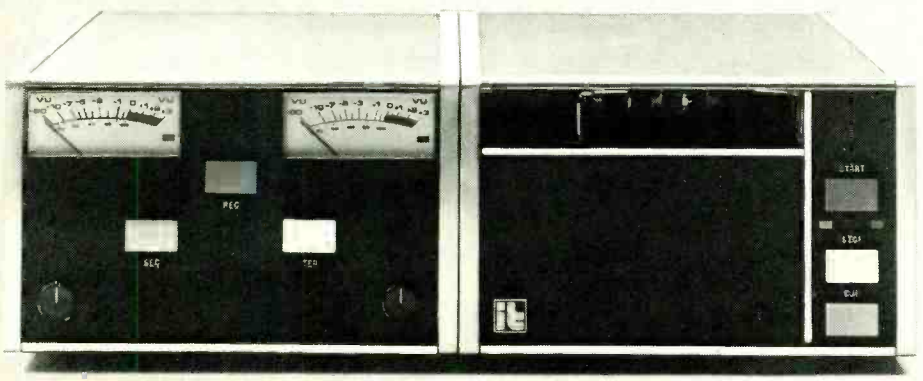

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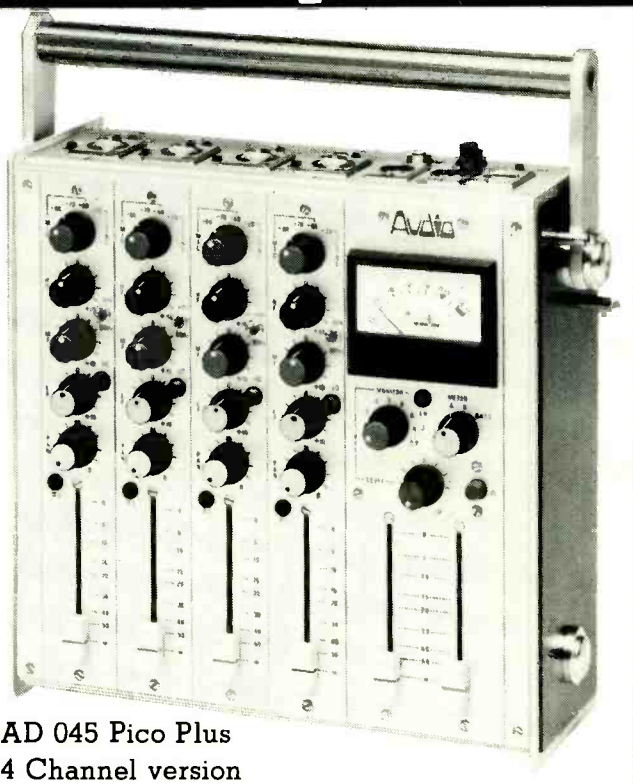

AD 045 Pico Plus
4 Channel version

How many times have you wished you had a 4 Channel Stereo Mixer! You have searched through the manufacturers brochures, visited every exhibition, and found nothing.

Now the AD 045 Pico Plus is available in a 4 input version with all the usual facilities packed into an even smaller case! It measures only $11\frac{1}{2}$" x $10\frac{1}{2}$" x $4\frac{1}{2}$" and weighs only 9 lb. This is the smallest broadcast stereo mixer around having 3 band EQ, Penny and Giles faders, P.P.M. or V.U. meter, Rechargeable Nicad Batteries and many more essential features.

Write or phone today for price and delivery to Antony Levesley — Sales Director.

Audio DEVELOPMENTS

Hall Lane, Walsall Wood,
WALSALL, West Midlands
WS9 9AV.
Telephone: Brownhills 5351/2/3
STD Code 05433
Telex: 338212 Audio.

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The Professional Revox.

The PR99 has been developed from the highly successful B77 in order to meet the stringent demands of the recording and broadcasting industries. The PR99 offers the professional these important features:

1 Raised deck plate for easier editing
2 Improved tape start
3 Tape dump
4 Two way self-sync with automatic sync/input switching
5 Balanced line inputs and outputs
6 Calibrated or uncalibrated level adjustments
7 Manual or remote control operation, with fader start

The Revox PR99 is available in several versions: mono or stereo 3¾/7½ ips NAB or 7½/15 ips NAB or IEC. And being built to Studer precision, the PR99 achieves exceptional performance and reliability but now at an easily affordable price.

For more information on the PR99 phone or write for a catalogue.

STUDER REVOX

F.W.O. Bauch Limited

49 Theobald Street, Boreham Wood, Hertfordshire WD6 4RZ
Telephone 01-953 0091

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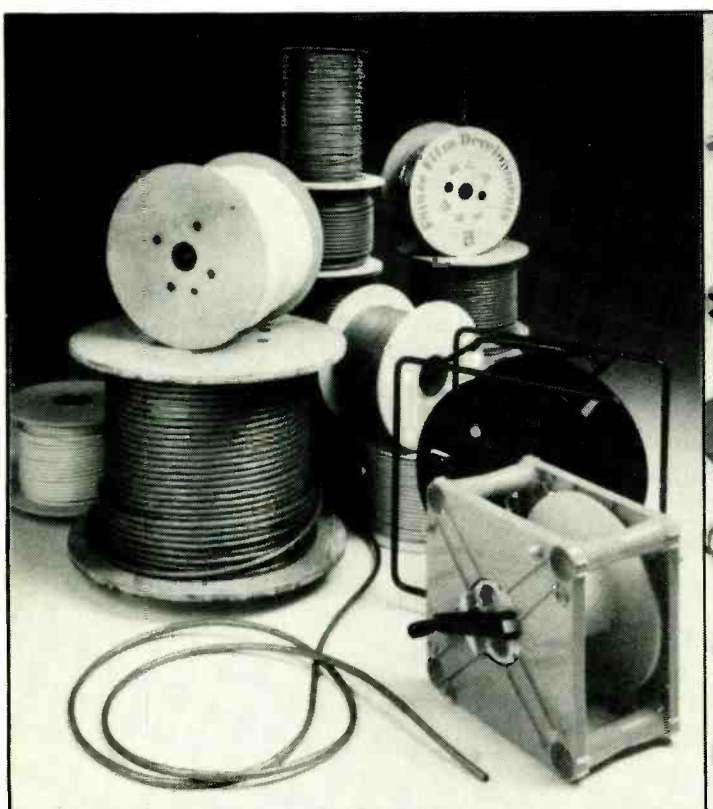
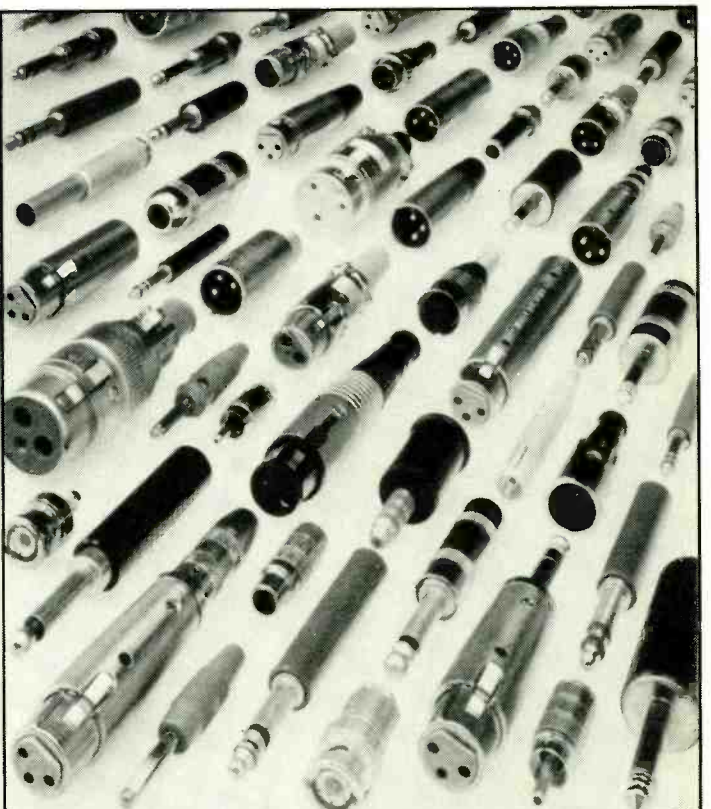
ELECTRO-VOICE RE 20. THE MICROPHONE MOST HIGHLY PRAISED IN RECORDING STUDIOS.

The studio-microphone RE 20 is a cardioid microphone of the variable-D-series, i. e. incorporating the patented system that avoids proximity effect and reproduces the true sound. It was especially developed for broadcasting, recording studios and sound reinforcement applications and therefore features an essentially flat frequency response, a very wide frequency range, an exellent transient response and numerous further sophisticated qualities appreciated in recording studios.
It is, therefore, not surprising that more and more recording studios so highly praise the various Electro-Voice microphones. Why not ask for further particulars from Gulton Europe Ltd., Electro-Voice Division, Maple Works, Old Shoreham Road, HOVE BN3 7EY.

EV Electro-Voice® a gulton company S.A.

Telephone: Brighton (0273) 23329
Telex: 87680 Gulton G





FFD Future Film Developments, 36/38 Lexington Street, London WIR 3HR, England. Telephone: 01-437 1892/3. Telex: 21624 ALOFFD G. Cables: Allotrope-London W1.

-f.f.d.-

Vertriebsges. für Electronic-Componenten m.b.H. Rumfordstraße 10, 8000 München 5, Germany. Telefon: 089/22 53 56. Telex: 05 285 92 gtcff d.

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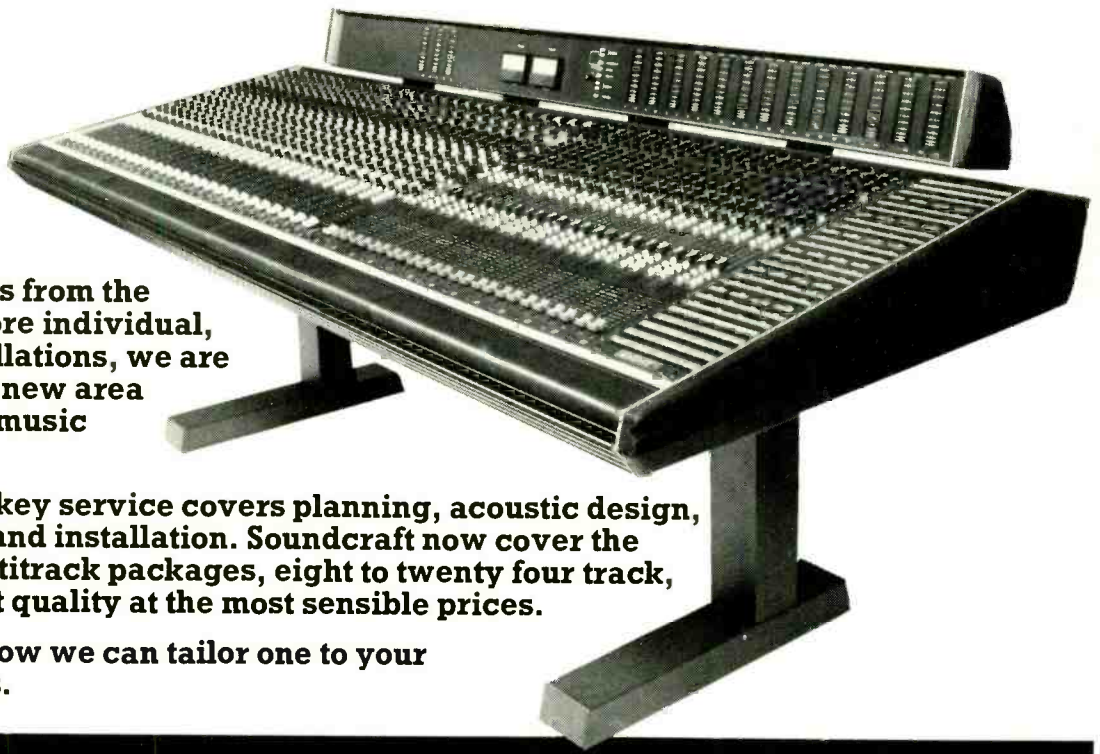
Soundcraft

UPDATE turnkey



The Package Revolution

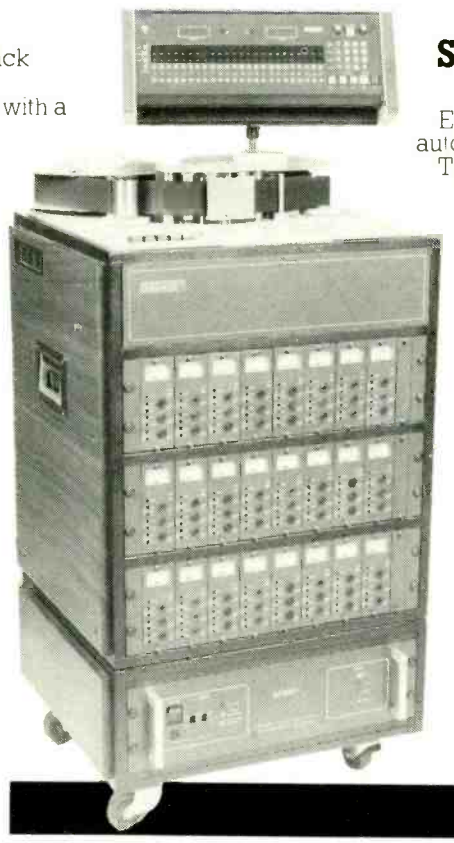
As recording moves from the mega-studios to more individual, cost effective installations, we are specialising in this new area of the professional music industry.

Our complete Turnkey service covers planning, acoustic design, equipment supply and installation. Soundcraft now cover the whole range of multitrack packages, eight to twenty four track, offering the highest quality at the most sensible prices.

Call us to find out how we can tailor one to your exact requirements.

Did you know?

1624 Series is number one 16/24 multitrack console in Europe.... Soundcraft recorders and mixers connect with a single flat multicore.... Krystof, their Swiss brain, is completing the new audiomation system first scheduled for the Series 3B.... the new autolocator prints 'good day' when you switch on.... extraordinary custom export order for one dozen battery powered Series 1S mixers with power amps now completed.... forty six track recording now possible with new synchroniser system developed jointly with AK.... more Soundcraft on demo in our new showroom.... bigger workshops and more staff means fast turnaround on all Soundcraft service....



SCM382-24

The long awaited 24 track alternative. Excellent specs, inclusive remote autolocator and a highly competitive price. The full range, including the 8 track workhorse and the 16 on one and two inch are in stock.

Specs & Prices

For information and latest prices on all Soundcraft products call Andrew Stirling on 01-440 9221.
As appointed UK main dealer, we offer full before and after sales service on all Soundcraft products.

Series 800 – Immediate release

The up market solution for the serious eight track user. Replacing the 400 Series, this console offers eight busses and two output modes for PA or recording. Full details on request.

turnkey

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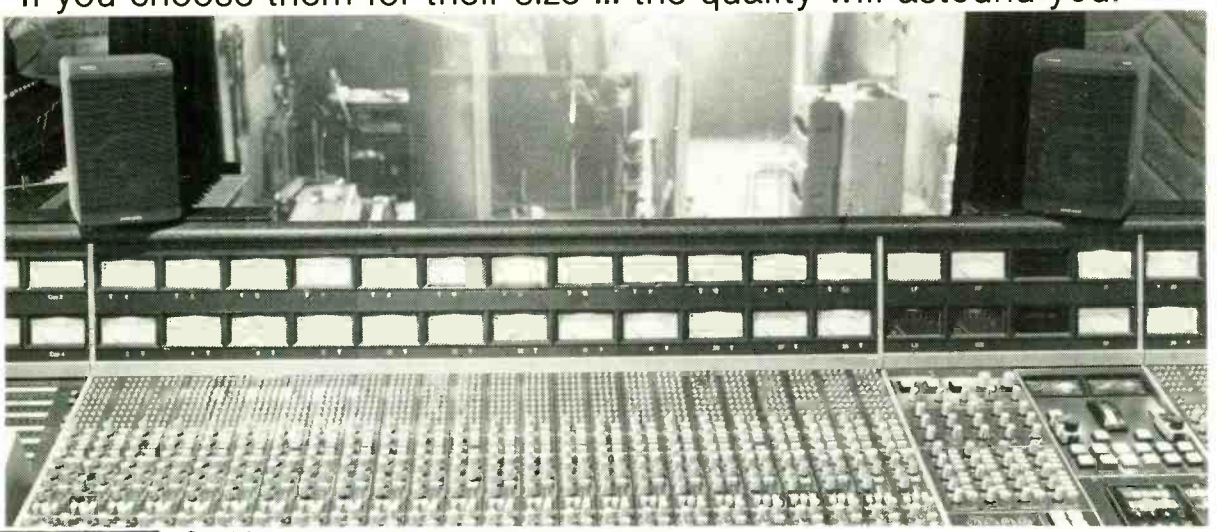
VISONIK® «DAVID»

If you should choose Visonik "DAVID" speakers for their accuracy and power handling ... the diminutive size would amaze you.
If you choose them for their size ... the quality will astound you.

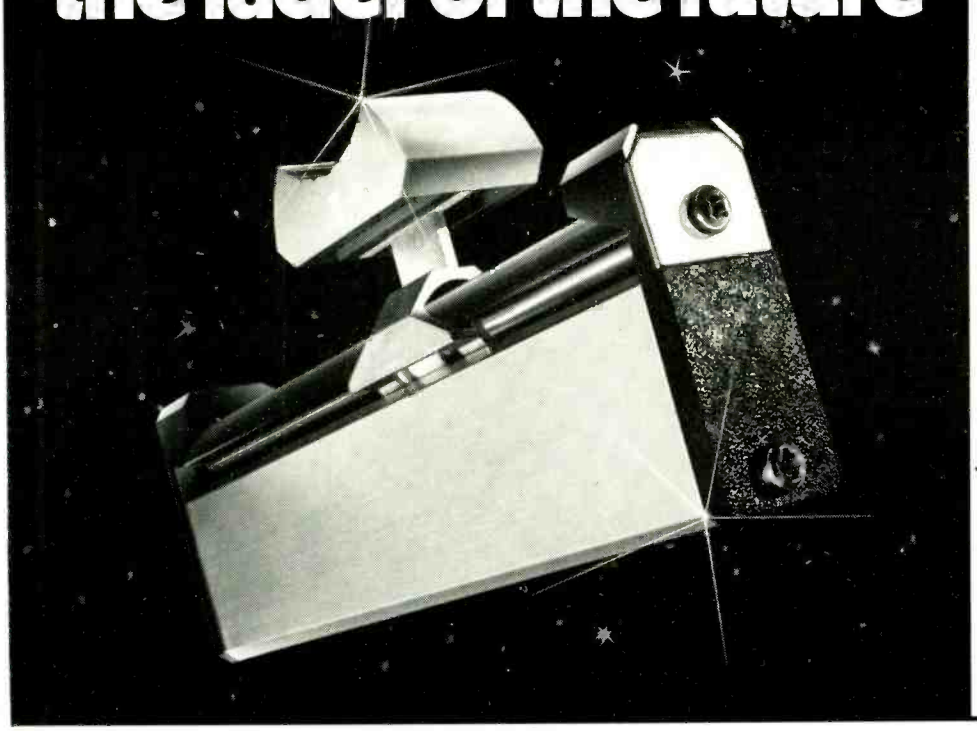


Photograph by courtesy of Ridge Farm Studios, England.

Send for details of the complete Visonik range.

UHER SALES AND SERVICES LTD.
30 - 31 LYME STREET, LONDON NW1 0EE. TELEPHONE: 01-485 0943/4

Penny & Giles launches the fader of the future



a new standard in fader technology

Penny & Giles new 3000 series sets a new standard in fader technology. The 3000 combines the world famous Penny & Giles smooth-as-glass feel and total reliability with a break through in cost effective design.

nothing comes near our faders

Technically, nothing approaches Penny & Giles faders. Our 3000 series have full environmental shielding. They provide stroke lengths from 65mm to 104mm in the smallest body size ever, integral switches, linear, audio taper or VCA outputs, a smoothly positive linear action – all you'd expect from the world's leading fader company.

Penny & Giles

Penny & Giles Conductive Plastics Ltd.
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Newbridge Road Industrial Estate Pontllanfrith Blackwood Gwent South Wales NP2 2YD
Tel: Blackwood (0495) 228000 Telex: 498135
USA
1640 Fifth Street Santa Monica California 90401 USA Tel: (213) 393 0014 Telex: 65 2337
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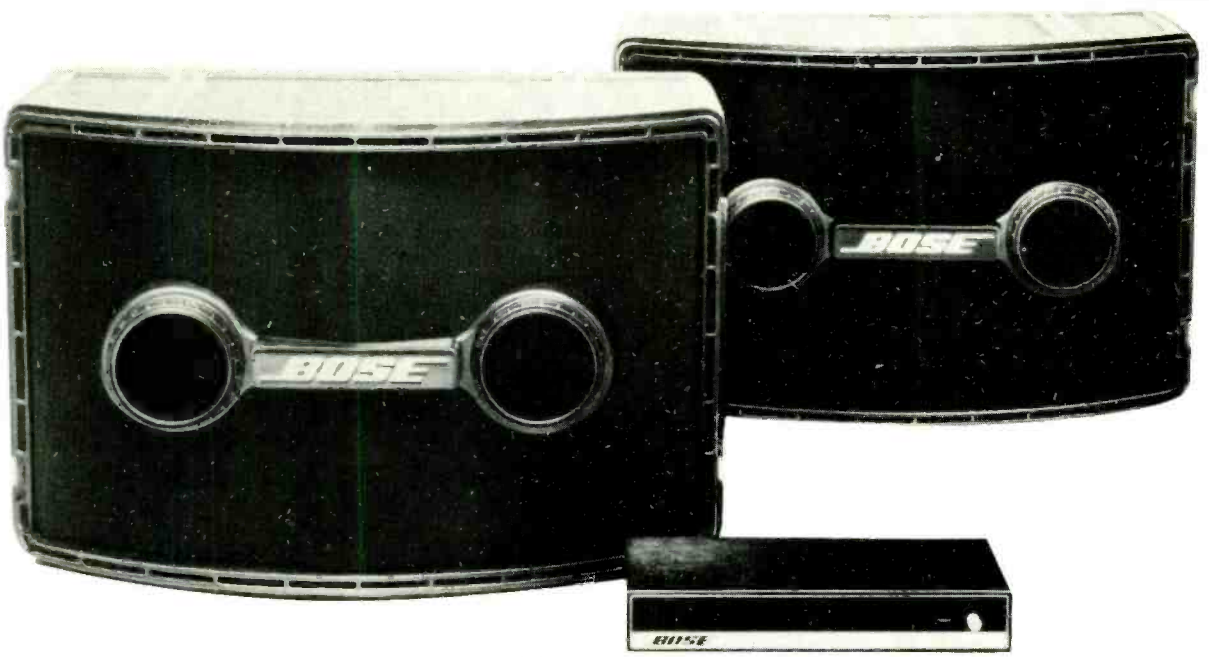
MUSIC LAB

FOR PA SYSTEMS

Let us put you on the road and keep you there!

Music Lab now has a new separate PA section to supply all PA gear for any size of band. We have the right deal and the right equipment for *YOU*. Visit our spacious premises and ask for demonstrations and comparisons (we're a short stone's throw from Euston Station so we're not hard to find). Investigate Music Lab's own cost effective customized PA rigs from 150 watts to 5K. Don't forget, once we've supplied the equipment to put you on the road, we have the service back-up and accessories to keep you there and even a hire department if you need it. In fact once you've tried Music Lab, you may find you never need to visit another Pro-Sound dealer again. Current lines include mixing desks from *Allen & Heath, Soundcraft, Studiomaster* and *Alice*; microphones from *Shure, Beyer Dynamic* and *AKG*; power amps from *H/H, Bose, Quad, RSD* and *Amcron* plus a full range of accessories including stage boxes and cables. We're a main dealer for *Bose* and we now have a complete selection of *Mega* products in stock — ring for details and prices.



music lab

MUSIC LABORATORY 01-388 5392
72-74 Eversholt Street, Euston, London NW1

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diary

Conservation conference

The Manchester Museum, in conjunction with the Extra-Mural Dept, University of Manchester, has invited papers for inclusion in a conference on all aspects of the storage, cleaning, repair and reproduction of sound recordings and their materials. This conference, entitled the Conservation of Sound Recordings, will be held from 21-23 September 1982 (note the year). It is hoped to include such subjects as cylinder recordings; wax, shellac, vinyl and other discs; magnetic recordings (wire, paper, acetate and polyester tapes); reproduction and recording techniques applicable to archive material; and environmental problems and storage.

If you're interested in contributing, your paper should last 30 to 50min including discussion; full details and a form may be obtained from Mr K Howarth, The Manchester Museum, The University, Manchester M13 9PL, UK. Apart from papers, there'll be demonstrations and other events, so if you think you might have something to offer, get in touch.

20 years ago

The cover of the January 1962 issue of *Tape Recorder* (which became *Studio Sound* some nine years later) showed the 'editorial workbench', complete with a number of pieces of equipment which were new then, but are antiques now. Pride of place was a new Brenell deck which took NAB spools. The News section described a new Reslo ribbon mic, the *PR*, which retailed at a mere £7 10s. Also discussed was a demonstration of some new decks, including the Telefunken *95* (59gns) and the Brenell *M* (88gns). A news feature gave details of some German machines for attaching magnetic stripe to film.

As always, the advertisements show how far recording has come in two decades (and also how copywriting and advertisement styles have changed!). One ad, for the Philips Family Tape Recorder ("only 34gns including microphone, 5in reel of tape, and 5in take-up spool") leads off with the headline " 'Pinky wins by a short head' " over a picture of

a pair of mice racing (we imagine) across a table-top, and the words "Young Roy's quite the star sports commentator since we got our Philips Family Tape Recorder. That commentary of his on his White Mice *(sic)* Derby, for instance . . ."

Elsewhere, Garrard featured their magazine-based recorder, which utilised two small spools in a plastic cartridge, each cartridge, with 650ft of Double Play tape, costing a mere £1 13s 4d.

Address changes

● Paul Farrah Sound, hirers and designers of theatre sound systems and associated equipment, has moved to Unit 7B, Worton Hall Estate, Worton Road, Isleworth, Middx TW7 6ER, UK. Phone: 01-568 2313.

● Digital Recording Systems, who provide full digital recording and editing services using Sony equipment have moved from Elkins Park, Pennsylvania to New York. Their new address is: Digital Recording Systems, 424 Greenwich Street, New York, NY, USA. Phone: (212) 431-9184.

Syn-Aud-Con

Synergetic Audio Concepts has announced that a further two companies have become sponsors of its audio engineering seminar series. They are HM Electronics and Community Light & Sound. Current Syn-Aud-Con sponsors are Crown International, Emilar, UREI, Shure, Sunn Musical Equipment, Industrial Research Products and Rauland-Borg. Don Davis on (714) 496-9599.

Synergetic Audio Concepts is also running two workshops at its West Coast Seminar Centre early in 1982. The first covering LEDE control room design techniques is to be held from January 19 to 21, while the second covering the engineering of loudspeaker arrays will run from February 23 to 25. Full details of these workshops are available from

New publications

Two new publications of interest to readers have recently been published. These are the *Professional Audio Buyers Guide* from SIE Publishing and Volume 1 of the *Professional and Home Recording Effects Guide* from Progressive Sound Publications. The first guide as its name implies covers the complete range of professional recording equipment, and contains details of products from over 70 manufacturers within its 240 pages. Priced at $15.95, the Guide is published by SIE Publishing, PO Box 4139, Thousand Oaks, Cal 91359, USA. Phone: (213) 991-3400.

The second guide, devoted purely to effects units, incorporates sections on compression, delay, equalisation, auto-panning, pitch changing, reverberation, guitar synthesisers and vocoders, and rack systems. Each product entry is fully detailed including specifications plus a synopsis of facilities, functions and capabilities. Also included in the guide is a glossary of effects terminology written by Tim Orr, and reprints of three articles by Len Lewis, late of Audio & Design (Recording) Ltd, covering equalisation, time-delay, and noise gates. These articles originally appeared in *Studio Sound*. This guide is an excellent overview of currently available effects units suitable for professional applications and is available from Progressive Sound Publications, Hurnmead Ltd, 6 Alma Court, Frampton Road, Little Heath, Herts EN6 1JT, UK.

Contracts

● Neve has received an order for six *8108* consoles from the Dutch national broadcast organisation, NOS. The order worth approximately £750,000 includes the supply and fitting out of three OB vehicles, each with 48-channel *8108* consoles fitted with VCA sub-grouping; plus a further two 48-channel consoles and a 32-channel desk. Two of these latter consoles will have VCA sub-grouping, while the other is to be fitted with *Necam II* automation. Other Neve contracts include a portable 12-channel four group *5315* console for Hadeko Film studio, West Germany; a custom film production and dubbing console with *Necam II* for Batavia Atelier, West Germany; two *8108* consoles (56-channel with *Necam*, and a 48-channel model with VCA) for the new studios near Frankfurt operated by Frank Farian, producer of Boney M; a *5316* console for the Tokyo Broadcasting System; and a 48-channel *8108* console with *Necam* for Crown Records, Hong Kong.

● The Metropolitan Opera and the New York Philharmonic have taken delivery of an Ursa Major *SST-282 Space Station* digital reverb for use with a sound reinforcement system for outdoor concerts.

● Tweed Audio has supplied Essex Radio with two custom on-air consoles designed to accommodate *Tomcat* cart machines. In addition, Tweed is to supply Capital Radio with two custom master control room consoles with separately racked, remote controlled electronics. Tweed is also to supply Moray Firth, the Inverness ILR station, with two on-air consoles plus the majority of the station's ancillary equipment.

● Turnkey Two has completed the design and construction of a new Soundcraft based 8-track studio for Chappell's Music in central London. In addition, the company is to design and construct a second studio for Playground Studio, London, incorporating time delay spectrometry design.

Forthcoming Exhibitions

January 25 to 29
Midem '82, Cannes, France (505.14.03).

March 2 to 5
AES 71st Convention, Montreaux, Switzerland ((212) 661-2355).

March 14 to 18
International Music Show, London (01-729 2666).

April 4 to 7
NAB Convention, Dallas ((202) 293-3500).

June 23 to 25
APRS Exhibition, London (09237 72907).

September 18 to 21
International Broadcasting Convention, Brighton (01-240 1871).

24 ▶

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Neve in brief

Service, installation and turnkey systems

Our Technical Service and Turnkey Departments maintain a fully equipped base service facility. They also operate an on-site installation and maintenance service anywhere in the world, in conjunction with our network of subsidiary companies and agents.

Training for operational and maintenance staff is normally provided at our central facility, but can be arranged at customers' locations.

Spares policy

All Neve products are designed for high reliability and trouble free operation. To reduce down-time to a minimum a comprehensive spares kit is provided with every console, enabling on-site maintenance to be carried out by the customer. The Neve Long Term Spares Policy ensures that spare parts can be supplied quickly and that products are supported throughout their lives.

Quality in design and manufacture

Expertise in analogue circuits and digital techniques supported by an in-house software capability ensures that today's high performance standards are met in all products.

The Neve standards of quality and reliability which were set in the early 60's are maintained today at every stage of manufacture from incoming material inspection through to final test of equipment.

In keeping with our policy of continuous development, we reserve the right to change the design of any unit forming part of this specification if such a change will, in our opinion, improve the performance or produce any other advantage mutual to the customer and to ourselves.

Neve

Designers and builders of audio mixing, control and distribution systems in use throughout the world by leading radio and television broadcasters, production, film and recording studios.

Neve Electronics International Ltd. Melbourn Royston. Herts SG8 6AU England Tel Royston (0763) 60776 Telex 81381 Cables Neve Cambridge

Rupert Neve Inc. Berkshire Industrial Park Bethel Connecticut 06801 U S A Tel (203) 744 6230 Telex 969638

Rupert Neve Inc. 7533 Sunset Boulevard. Hollywood. California 90046 U S A Tel (213) 874-8124 Telex 194942

Rupert Neve Inc. P O Box 120907 Nashville Tennessee 37212. U S A Tel (615) 385-2090

Rupert Neve of Canada Ltd. 2721 Rena Road Malton Ontario L4T-3K1 Canada Tel 416-677 6611 Telex 06-983502

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5I Series

Exciting production consoles for radio, television, film and video. Versions for post-production. Standard or custom, mono or stereo, ranging from 4 group to 8 group/24 track, these consoles are of unsurpassed versatility in use.

(available with Necam)

8128

A new master recording console with immaculate musical sound.

(available with Necam)

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New technology from

www.americanradiohistory.com

5322

A new, versatile, easy to use and very reliable mixer for 'on air' radio broadcasters.

The revolutionary digital sound processing system. Accepting analogue or digital inputs, this system has full control assignability, CCR (Complete Control Reset) and total automation. Sound is processed digitally to analogue or digital outputs.

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WE SAY SYNCLAVIER II IS UNDETECTABLE FROM REAL INSTRUMENTS.

BUT YOU DECIDE.

Synclavier II's 30 minute stereo demo record will blow you away.

The violins and cellos are so true, you can hear the rosin on their bowstrings. The electric guitar is undiscernible from a real electric guitar. The trumpets bell like real instruments. The xylophone gives you the distinct sound of mallets hitting the wooden bars. The cathedral bells are so resonant, you can feel the overtones. The kick drum and wood blocks have the snap of real life. The human whistling sound even captures subtle changes in breathing.

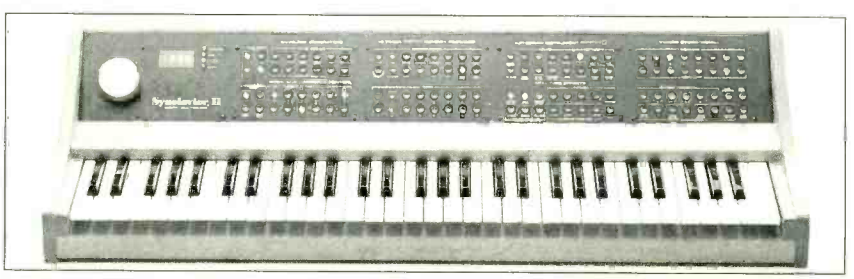
And once you have a sound on Synclavier II, there's no limit to what you can do with it. Synclavier II offers more real time control than any other synthesizer in the world.

You can alter the bow stroke of your violin for each separate note during a live performance. You can adjust the amount of breath blowing across the sound hole of your flute to create double tongueing and overblowing. You can bend your guitar notes and change the vibrato depth during solos. And only Synclavier II gives you an absolutely real snare drum that lets you increase or decrease the amount of snare on the drum.

Synclavier II comes preprogrammed with over three dozen real instruments. In addition, there are over 100 unique sounds, many of which have never before been possible on any synthesizer. Each of these sounds can be instantly recalled with the touch of a button. And this is just the beginning.

You can modify all of these preprogrammed sounds any way you wish and then store them. Or create sounds from scratch and store them as well. The number of sounds you can store is unlimited.

We invite you to listen to a startling sample of the incredible sounds of Synclavier II. Better sit down when you listen.



For a copy of Synclavier II's stereo LP, send your address plus £2.50 to: Keyboard Hire
8 Thornhill Road,
London NW1 1HN.
01-607 8797.

New England Digital
Corp., Main Street,
Norwich, VT 05055,
(802) 649-5183.

Synclavier II is the registered trade mark of New England Digital.

Your order will be despatched within 7 days.

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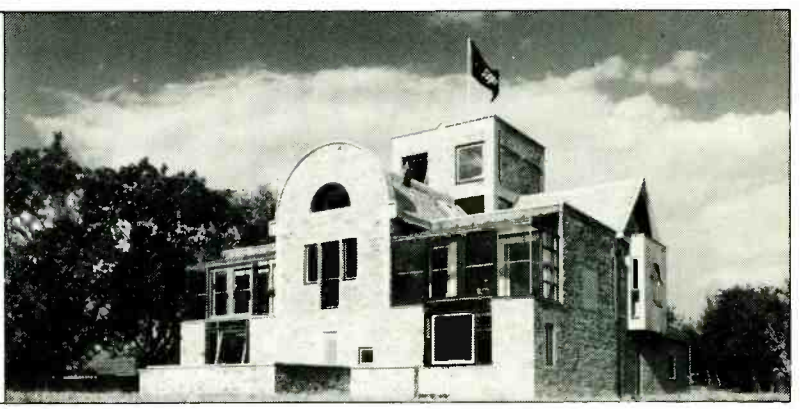
diary

Solid State Logic developments

At an award ceremony held in mid-October, Solid State Logic were the recipients of the Queen's Award for Export Achievement, in recognition of the company's outstanding success in marketing its products throughout the world. This award, which neatly complements the Design Council Award for engineering design awarded to the *4000E Series* console earlier this year, reflects the fact that in a typical year some 80% of sales are exports. Sales of SSL consoles have been particularly successful in the highly competitive markets of the USA and Japan, with a healthy number of orders also having been gained in the other traditional markets of Germany, Scandinavia, and the UK. Recent export orders include consoles for National/Panasonic and Onkio Haus in Japan; a third console for Record Plant, Los Angeles; a console for a state-of-the-art audio/video complex at Bullet Recording Studio, Nashville; a console with *Total Recall* for Tennessee Studios, Hamburg; and a console for the Danmarks Radio Concert Hall in Copenhagen.

It is worth noting that the recognition the company has obtained over recent months for its innovation and sustained export success, has been achieved in a remarkably short period of time. Although SSL has been in existence since 1969 it wasn't until 1978 that console production for the recording industry commenced. Prior to this the company was best known for its range of electronic control systems for pipe organs—over 8,000 of these systems having been installed (including 57 in cathedrals) in 23 countries to date. The move into console production came about because one of the company's commercial ventures was Acorn Studio—a 16-track recording studio. When this studio required re-equipment SSL decided to design its own console and in 1971 produced a console which included a dynamics section as well as an equaliser in each channel—a feature still retained in the company's consoles. This console was further improved in 1974 with the addition of a computerised control system, and in this form it was decided to commercially launch the console system. The first SSL production model, the *4000B Series*, then made its debut at the Paris AES Convention in 1978. Following further development and user feedback the *4000B Series* evolved into the present *4000E Series* which was introduced in 1979. Accordingly, in just over three years the SSL console system has become an established broadcast and recording studio system highly respected for its performance qualities and user-orientated facilities.

The export success of SSL has led to a rapid expansion of the company's operations, and such has been the growth of business that larger company premises were required. Hence, while module production still remains based at the company's factory at Brandon in Suffolk, a new headquarters building has been constructed at the company's existing location of Stonesfield, Oxfordshire. Situated on the outskirts of this Cotswold village, the new headquarters building (which accommodates an expanded design, production and administrative team), is a highly distinctive yet functional building. Purpose built to a design by Eric Parry, the new building successfully blends into the village background and combines many traditional Cotswold features with several novel design elements which are at the forefront of building technology. As an example, it is one of the first buildings to rely solely for its heating and cooling on a heat pump—a device which derives its heating capacity entirely from the outside atmosphere. As the accompanying photographs show, the new building reflects the purposeful and pioneering spirit of SSL, and with the current vogue for the company to be in the habit of collecting well deserved awards, it wouldn't be too surprising if yet another award, this time for architectural design, is in the offing.



Above and right: SSL's purpose-built headquarters at Stonesfield in the Cotswolds blends with existing local village buildings.

Spelling for computers

The arcane differences between American English and English English give a magazine like ours particular problems, being UK-based but with international coverage and circulation (we're an 'international magazine with a British accent' it says here), in view of the large amount of development in our field continuing on both sides of the Atlantic. Nowhere is this more true than in the area of computer technology, now becoming more and more important in audio engineering. And although many of the earliest computers were developed in Britain, many of the American terms used in this area have come into common use on both sides of the Pond. This faces us with a problem of style: do we stick to normal English, or adopt the US spelling? As time has gone by, we have developed our own rules for this, and to avoid confusion, they're worth making a note of, at least mentally. In this standardisation we are, incidentally, following the practice of the majority of UK-based computer publications:

Computers run *programs,* but we refer to a radio or audio *programme* or a peak *programme* meter.

A floppy *disk* is an 8in diameter plastic *disc* coated with magnetic material, used for data and program storage in a computer system. A record player, however, plays vinyl *discs*, 12 or 7in in diameter. (Discs, as in records, have always been spelled this way in the UK, although the only other word in the language of like type appears to be 'Mollusc').

A resistor may have a value of 25*k* (lower-case 'k' = 1000) Ohms, but a computer memory board may have 48*K* of storage (upper-case 'K' = 2^{10} = 1024). 'K' stands for 'Kilobytes' and may be abbreviated to 'Kb' if the sense isn't obvious.

In general, therefore, we have adopted the US spelling where that is generally recognised.

Broadcast products brochure

American manufacturer EECO has produced a new 28-page full colour brochure describing its broadcast product range for audio and video post production purposes. Designed to aid equipment specifiers, the comprehensive brochure contains product photos, specifications, interconnections, interfaces/accessories, features, options and drawings of typical applications. Copies are available from EECO Inc, Broadcast Products Marketing, 1601 East Chestnut Avenue, Santa Ana, Cal 92701, USA. Phone: (714) 835-6000. ■

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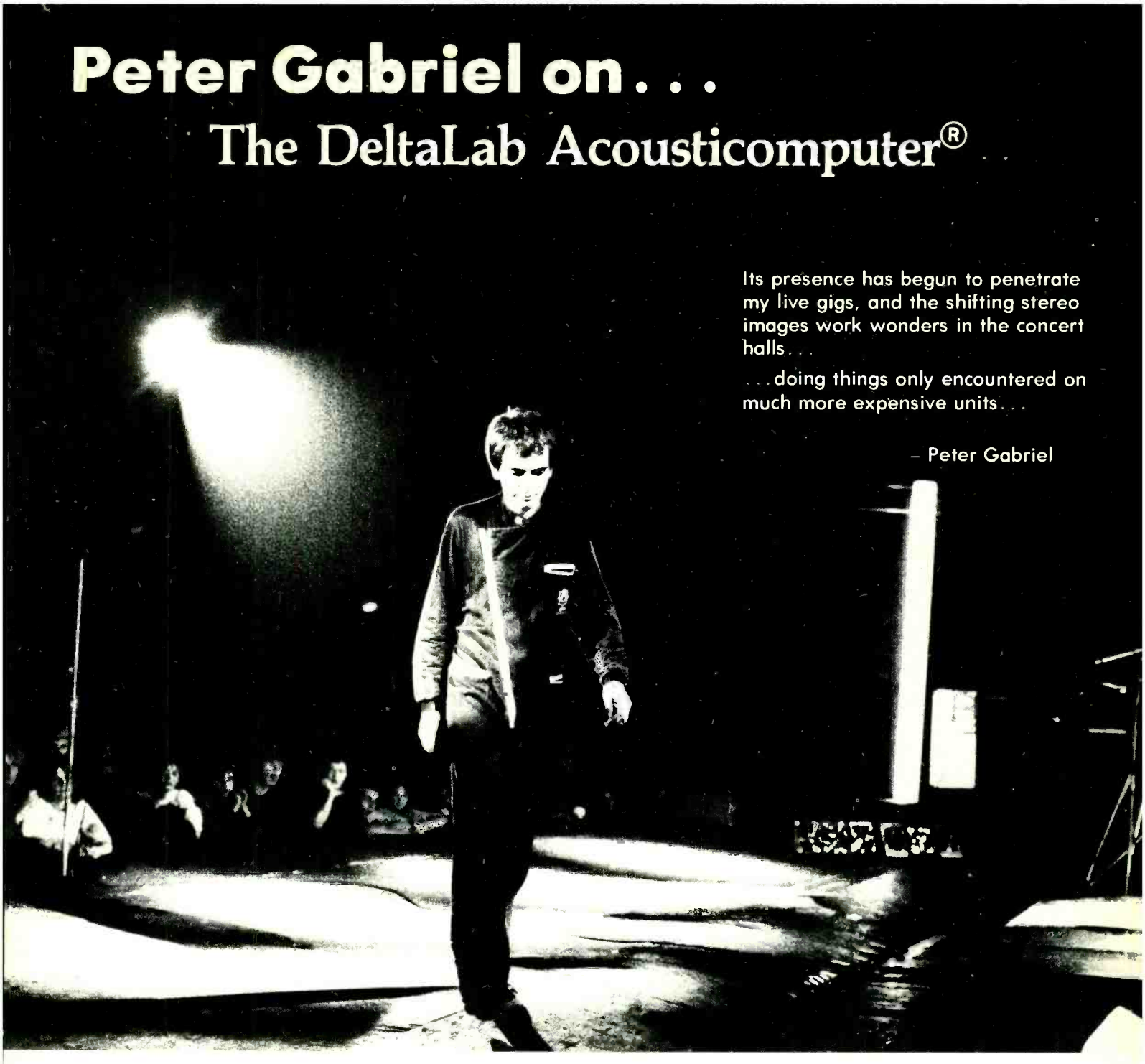
Peter Gabriel on . . .

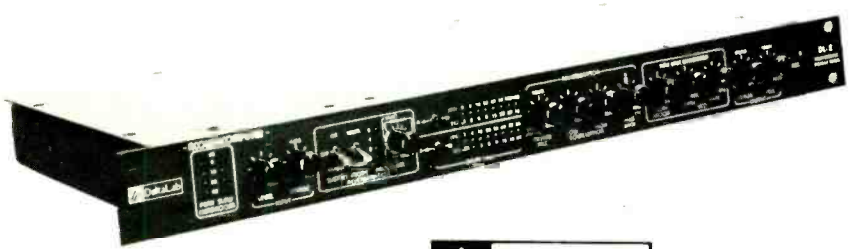
The DeltaLab Acousticomputer®



Its presence has begun to penetrate my live gigs, and the shifting stereo images work wonders in the concert halls . . .

. . . doing things only encountered on much more expensive units . . .

– Peter Gabriel



The effects in Peter Gabriel's last album "Games" were created by the DL-2 Acousticomputer®

DeltaLab **DeltaLab Research, Inc.**

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London W1V 5RA
Telephone : 01-734 2812/3/4/5
Telex : 27 939 SCENIC G

France	**Lazare** Paris Tel: Paris 878 6210
Holland	**SAP** Amsterdam Tel. 797 055
Sweden	**Tal & Ton Musik & Electronic AB** Gothenburg Tel: Gothenburg 130 216
Switzerland	**Audio Bauer** Zurich Tel: Zurich 016 43230
Finland	**Studiotec** Espoo Tel: Espoo 905 20604

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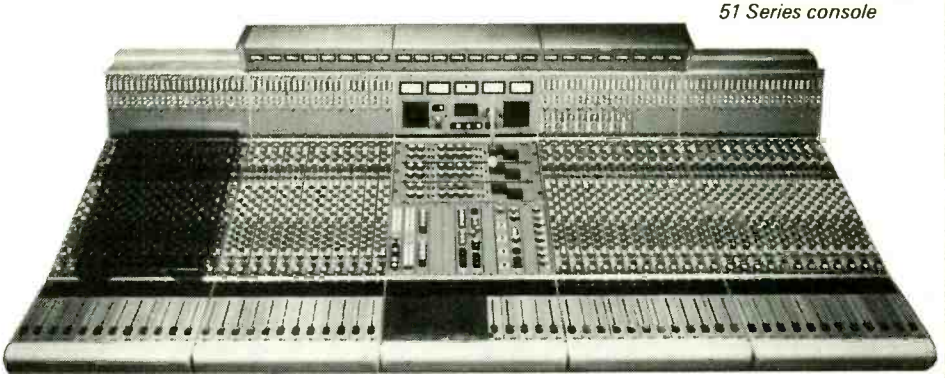
new Neve products

November saw the announcement of a new range of console systems from Neve Electronics. Four new systems were announced, the *51 Series*, a new range of mixers from 16/4 to 48/8/24 for radio, TV, film production and post-production; the *8128*, a new multitrack studio console developed from the distinctive and successful *8108*; the *5322*, a new and versatile mixer for 'on-air' radio applications; and most interesting of all, the *DSP System*, a fully-assignable mixer utilising full automation and signal processing in the digital domain, capable of analogue or digital inputs and outputs.



51 Series console

Special feature

Richard Elen

THE NEW ranges are the result of a decision to upgrade Neve's custom-console capability. The traditional design of Neve consoles was based on a modular system in which all inputs and outputs to each module were balanced, generally via transformers. Until recently, the flexibility that this approach offers (namely the ability to arrange modules in a wide variety of configurations) was not thought to be feasible with op-amp circuitry and transformerless systems, being at that time the domain of discrete transistorised components. In many ways, previously available op-amps were inadequate for the tasks that a fully flexible modular approach demanded. However, today there are an increasing number of suitable ICs available, leading to the practicability of op-amp-based modular designs which do not require compromises between quality and operational flexibility. As a result, Neve are now able to offer ranges of modules which can offer a higher technical performance than before, with more facilities, more cost-effectively, and without quality degradation.

51 Series modules

The *51 Series* of modules is an excellent example of this approach. Designed for broadcast/post-production work, the modules offer a set of 'building blocks' which can be assembled to suit the application, yet still fall well within the stringent technical specifications required in this part of the audio industry. Dr Martin Jones, Group technical director, believes that the *51 Series* offers facilities "fairly near the ultimate in direct analogue controllability". Modern consoles for this aspect of the industry need to be all things to all people, says Dr Jones, yet fully customised consoles of the traditional sort are costly, being exceptionally labour-intensive, needing a large amount of time to construct, and expert labour. The *51 Series* is, therefore, an adjunct to Neve's existing (and continuing) commitment to total customisation, offering a range of standard units which can be combined in a large number of ways, making available the flexibility of custom units while at the same time keeping costs down. The 'building block' approach of the *51 Series* enables easy interconnection and removes the need to design totally new circuitry from the ground up for each custom console. The cost of transformers in each module is avoided, and in addition, computer-style ribbon cable may be used for interconnection within the frame.

On the technical side, the *51 Series* incorporates a number of IC application innovations, particularly with reference to the equalisation section, where it was obviously necessary to retain the characteristic and well-loved 'Neve sound' whilst making use of active, rather than passive equalisation circuitry. The resulting circuits take up a smaller space than previous designs and have an essentially 'musical' character in use. Sweep or switched EQ options are available.

In a transformerless system, particularly for broadcast use, the output amps must remain stable under a wide variety of operating conditions, including driving long lines, short circuits and the like without taking off or misbehaving. This goal is achieved through the use of power MOSFETs in the output amps, and discrete circuitry around them. Indeed, the philosophy of being able to cope with abuse permeates the *51 Series*. As it is necessary, for example, to press mic inputs into service as line inputs from time to time, the input circuitry has been designed with a remarkable degree of headroom to cope with the requirements of real situations where the desk must be relied on to cope with extremes. Overload margins are important—for example on live music shows where the vocalist suddenly blows a trumpet into the mic—as well as noise and distortion considerations. Dr Jones calls the system "a console for real people". Rapid recovery from overload is therefore also important and has been built into the circuit design.

The features of the *51 Series* are large in number, including mic input gain up to 80dB, with a gain trim control on line and mic inputs; an easy-to-use limiter/noise gate on each channel featuring variable attack time, auto recovery and variable threshold; plus a 'soft limiter', the entire 'dynamics section' being designed to be flexible, yet with few controls.

Three standard formats are available, in addition to the ability to construct custom units from the modules. These are the *5104, 5106* and *5116*, and each version differs somewhat in facilities. The *5106* and *5116* feature eight aux sends, pre/post fader selectable, each send having full programme performance so that they may be used as clean feeds as well as ordinary cue/foldback/effects applications. Each channel has a direct prefade output which may be used as a multitrack send (the *5116* being specifically designed for multitrack work). The EQ section features 4-band sweep controls with overlapping ranges, each offering ±18dB of range. Filters are also provided with variable frequency, the HPF being 24dB/octave and the LPF offering 12dB/octave. An 'A/B' programmable cut system is fitted, as on the *8108*. Stereo line input channels with no EQ are available, if required, whilst an optional 2-band EQ is available on the *5104*. The *5104* offers four groups and two main outputs, while the *5106* and *5116* have eight groups and up to 48 inputs. Particularly useful in post-production is the fact that the groups all have full facilities and may be used as channels, and subgrouped as necessary to give group-to-group rerouting. Unused parts of the group are still available as a limited-facility channel.

The *5104* console comes complete with integral jackfield, whilst the *5106* and *5116* have the jackfield unwired as standard, this being suitable for console, 19in rack or furniture mounting—the customer specifying the configuration or housing required. Metering is via standard pointer-style meters, but bar-graphs are an option on main outputs. Interlock circuitry is provided, and the switching logic is accessible for external control, for example for monitor switching, red lights, etc. Solid-state switching is used extensively, plus sealed relays where appropriate.

8128 music recording console

The *8108* was Neve's first fully standard music recording console which incorporated ICs, and the *8128* is a development of it, being the result

28 ▶

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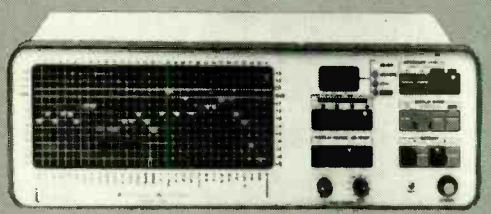

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new Neve products

of a great deal of discussion between the company and clients. Many of the features and facilities which were custom options on the *8108* are standard fittings on the new console, and there are additional features which make it even easier to use than the earlier model. The *8108,* with its 'in-line' approach, was ideally suited to the US market; the *8128* has added refinements which will also appeal to the European user, notably the use of the overdub facility. The *8108* relied in several respects on tape machine switching (for example between line in and sync), thus reducing possible redundancies where the same facilities were present on both machine and console: however, it seems that there is a market requirement for full switching of this type in the console, and this has therefore been incorporated.

One aspect of the *8128* which makes it obviously different from the previous console is the colour scheme: the striking blue of the *8108* has been replaced by a more conservative grey/silver finish. Beyond this, there are certain cosmetic alterations, but the general shape of the console has been retained. As with the *8108,* the new console retains the philosophy of having just as many controls on the front panel as necessary at any one time, but allowing creative use of the patchbay to facilitate other possibilities. The keynotes of the design are very much simplicity and versatility. The centralised microprocessor-controlled routing system is retained, and the EQ circuitry—again a development of the earlier model—maintains the 'musical' operation characteristics developed largely as a result of experience with George Martin and the Air Montserrat console. Indeed, the EQ curves of the *8128* were developed primarily by listening—the curves are not necessarily particularly logical from the technical point of view but have a sympathetic relationship with musical instruments, says Dr Jones. The result is an EQ which is at once subtle at low levels of adjustment, yet 'gutsy' enough when turned up more vigorously or for effect purposes. The result is a sound which caters for modern music and meets the needs of modern tape and monitoring techniques. The equaliser design also allows plenty of headroom.

In essence, the *8128* is an enhanced-performance *8108.* Standard models are 32/24 (28 mic channels plus four dedicated reverb returns), 48/32 and 56/48.

5322 on-air console

The *5322* stereo broadcast p oduction console is designed to meet modern 'on-air' studio requirements, offering compact design, flexibility and ease of operation. Such features may generally be expected to be mutually exclusive: for example, how do you offer flexibility without confusing the operator? On-air consoles need to be exceptionally straightforward for the operator to use almost without thinking about it, yet they must fulfil a wide variety of functions. The solution to this fundamental problem featured in the *5322* is the use of internal pre-set switching to configure the modules, while keeping front-panel controls to the minimum. Three types of input module are available, a total of 16 input modules being able to be accommodated, eight either side of a central script panel: microphone, stereo line and outside source modules being so designed as to fit into the multi-purpose frame in any combination. Connections are available for pre/post fader patching for EQ or compression as required, and all inputs are routed to a mic- or line-level subgroup, these also being fitted with insertion points. The subgroups are combined to give both mono and stereo main outputs, while two clean feeds are also available which may be preselected from pre- or post-fader on all channels. Two aux outputs, also able to pick up any channel pre- or post-fader via level controls. are fitted in addition. The mic subgroup has an echo return. Comprehensive monitoring is provided, including stereo control room and studio outputs plus a separate PFL speaker. Talkback and reverse TB facilities are available, with necessary interlocks. PPM or VU metering may be supplied, and a peak level detector across the main outputs drives two large overload indicators.

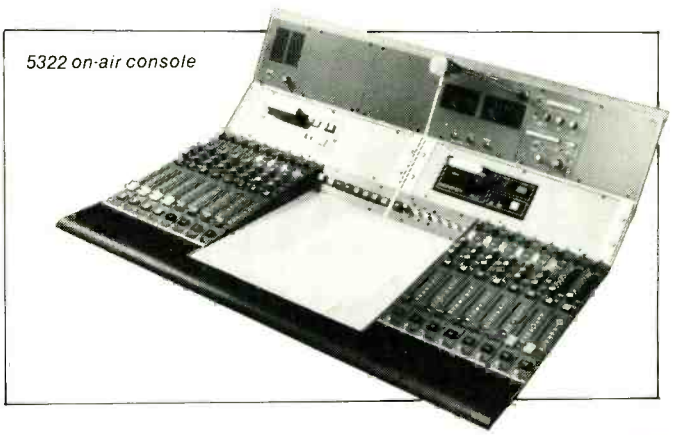
To facilitate the mounting of cart machines, etc, two 19in rack areas, each 3U high, are available above the channels across the width of the console. In addition, switching (eg for phone lines) may be fitted immediately above the script area. Other options include a digital clock with run and reset buttons which may be fader-linked via a timer buss available from all modules. Furniture is also available to house necessary outboard gear, eg turntables and tape recorders.

DSP digital console

The *DSP system* is a radical new console concept from Neve. While it has been recognised for some time that the way forward in console design was to head for centralised, assignable control functions and consoles in which the audio signals were separate from the control aspects, nobody with the exception of the EMI digital console (see *Studio Sound,* December 1980) had previously managed to do it, although many have talked about it (see, for example, *Studio Sound,* October 1981 and Dick Swettenham's article in *Recording Engineer/Producer,* August 1981). Systems like the *Param* equaliser point to centralised, assignable controls, while the new Capital Radio consoles (designed and started by Helios and completed by Tweed) go some distance towards using only DC control voltages in the console, the actual audio electronics being VCA-driven in a separate rack. Yet it is difficult to handle every function of a console via VCA control—the Helios/Tweed consoles, for example, still have to bring audio to the console for the equalisers—and there may be quality degradation problems if all aspects of an analogue console are VCA-controlled. When Neve tackled the idea of a fully assignable console with separate control and audio paths, they discovered that a VCA-based approach was neither cost-effective nor technically satisfactory: the answer was to use digital signal processing, throughout the console. The result is a fully-custom digital console system which can be built up to customer requirements. Obviously, the *DSP* is tailor-made for digital recording—the I/O interfacing with the console is 16-bit linear—but it also makes economic sense to use the *DSP* as part of an analogue system, with A/D on one end and D/A on the other. While the *DSP* uses a 16-bit format 'at each end', the internal signal processing system uses up to 28 bits, utilising bit-slice processing amongst other techniques.

As many of the operational parameters are software-determined, the appearance of the console is very much up to the customer, as are its functions. For example, faders could be based on P & G-style Gray code 'conventional' faders; motorised varieties; EMI-style rotating bands (or the Paul Buff variety); or other compact linear optical encoders. And there need not be as many faders as audio paths (unless you want them). Equalisation is assignable, typically from two EQ units; metering is more or less what you fancy, from ordinary meters to VDU displays; and virtually everything else is assignable, too, including comp/limiting, mic gain, channels/tracks, and so on. Filter coefficients, faders and aux controls, and total automation are under software control, with various methods of access. Particular operating configurations may be stored on floppy disk, allowing engineers to 'personalise' the console for their own work, or for specific types of project. Automation is available at all stages of the recording process, enabling not only the taking of 'snapshots' of complete console settings, facilitating cues, sections, etc, during mixing, but in addition, the entire console may be zeroed rapidly, and previously used settings may be recalled, not simply to enable you to set the controls to previous positions, but actually configuring the entire console for you ('Complete Control Reset').

The *DSP system* is, in essence, so flexible in design that it is difficult to discuss many specific aspects, as they all appear to be mutable or subject to customer requirements. However, the essence of the system seems to be that through digital signal processing it is possible for Neve to offer a console system for the digital age (and the latter part of the analogue era) in which the definition of 'customisation' is limited only by the imagination. Yet while the *DSP* is no doubt the most exciting of the new releases from Neve, the company is also committed to state-of-the-art analogue consoles which will be around for many years to come. ■



5322 on-air console

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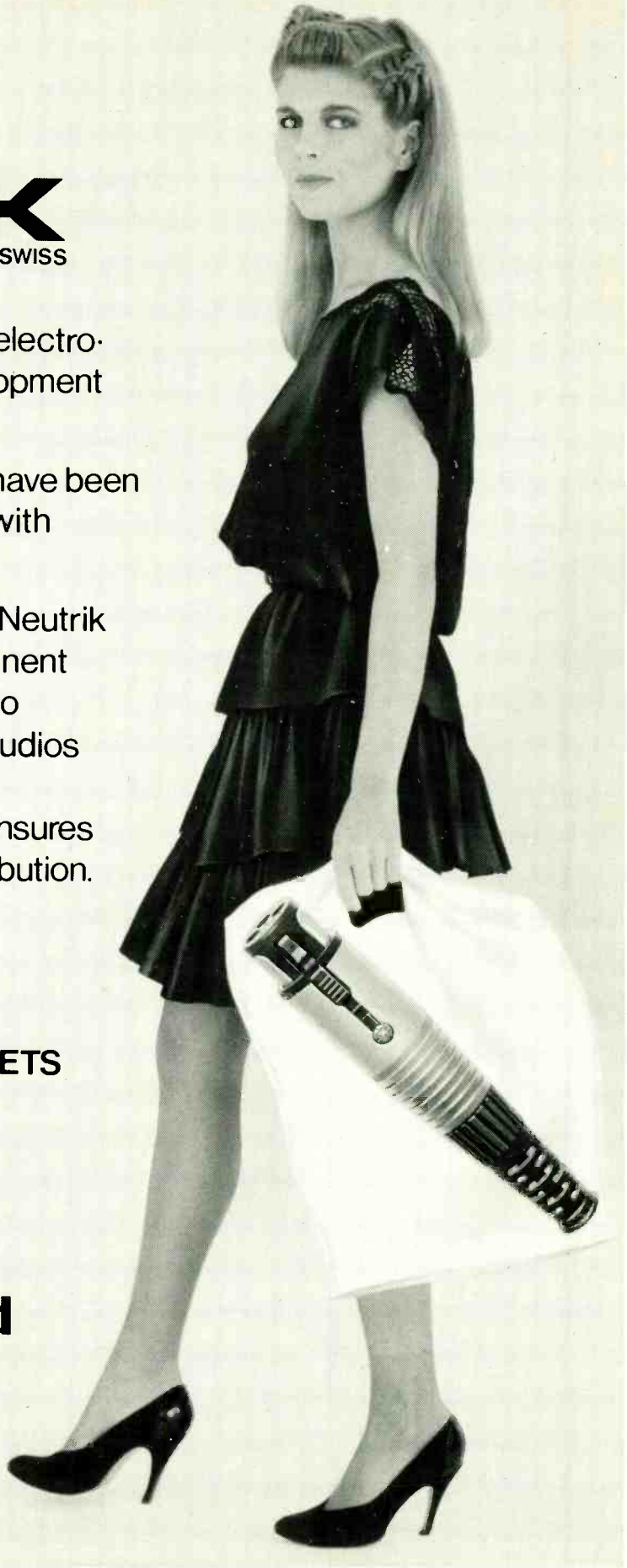

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new products

New electronic crossover

Dearden Davies Associates has announced the introduction of its *DD1000* electronic crossover. This unit which is a 19in rack mount active frequency dividing network is suitable for 4, 3 or 2-way stereo operation. Selection of operating mode is via pushbutton switching, and both the left and right channels feature independent output level controls on each of the four bands, each band also having a front panel accessible phase reverse switch.

A feature of the unit is the use of plug in system programming modules allowing the unit to be highly flexible in operation. This system allows users to tailor crossover parameters such as frequency, slope and filter function precisely to their needs. Standard programme modules are available for 18 or 24dB/octave Bessel or Butterworth filters in a wide range of frequencies. Other features of the *DD1000* include tamper proof cover; electronically balanced inputs and outputs; sub sonic input filter; delayed turn on, instant turn off loudspeaker protection; detented level controls for stability and repeatability; input overload indicator; and optionally mid and high band output limiters. Price of the *DD1000* is £375.

Specifications: input impedance >10kΩ electronically balanced; input level +4dBV nominal, +20dBV maximum; output impedance <75Ω electronically balanced; output level +4dBV nominal, +26dBV max balanced, +20dBV max unbalanced; noise < −90dBV at any output; crosstalk < −70dBV; distortion <0.02% at any output (+4dBV).

Dearden Davies Associates, 40 Stillness Road, London SE23, UK. Phone: 01-690 1847.

UK: Scenic Sounds Equipment Ltd, 97-99 Dean Street, London W1V 5RA, UK. Phone: 01-734 2812. Telex: 27939.

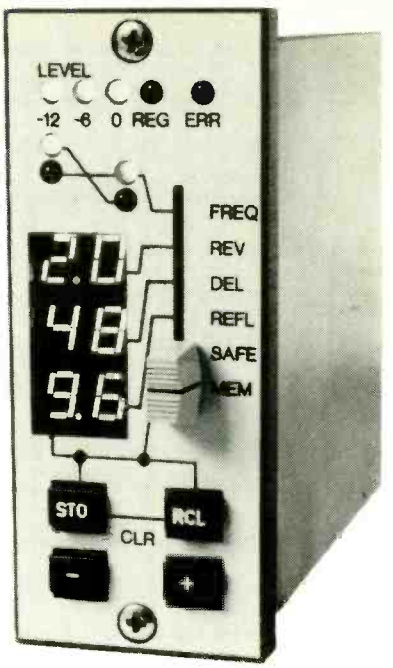
EMT 245 S remote

EMT has produced the *245 S* remote control unit to accompany its *245* digital reverb unit with memory bank and microprocessor control. The remote unit which is extremely compact, being identically sized to the German Broadcast Standard B1 (half fader) size, has a front panel area of only 40×95mm yet offers the facility to control all the functions of the *245* through a single balanced audio line. Designed to be easily installed in mixing consoles and taking up only the minimum of space, the remote has controls for selecting 'linear' or 'roll-off' reverb time frequency response; selection of reverb time; selection of delay time; and selection of amplitude of the first reflections. All these functions are indicated on the remote with the addition of an input level LED display.

As a further facility the remote contains a buffered storage unit in which 10 separate combinations of all parameters may be stored and recalled. In order to use the remote with the *245* a special interface board is required. A particularly useful feature of the unit is that because the link to the reverb uses serial data, the remote may be used at up to distances of around 300m from the reverb.

Specifications: program storage via CMOS RAM storage sections with a lithium battery capable of storing information for approximately 10 years; storage functions—store, recall and reset with indication of storage unit assignment; guaranteed line distance 300m; max connection resistance 200Ω; dominant control signal frequency 8kHz; control signal level −20dB (0dB=0.775V); remote control unit impedance approx 200Ω; impedance of interface at the reverb approx 200Ω; connector 23-pin Tuchel multiple connector; power requirements 24V DC, max 300mA.

EMT-Franz GmbH, Postfach 1520, D-7630 Lahr, West Germany. Phone: 07825 512. Telex: 754319.



UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ. Phone: 01-953 0091. Telex: 27502.

USA: Gotham Audio Corp, 741 Washington Street, New York, NY 10014. Phone: (212) 741-7411. Telex: 129269.

Voltage stabiliser

Galatrek International has introduced a new, all British designed and manufactured range of electronic voltage stabilisers. Three models suitable for audio usage are available with input voltage ranges of 155V to 275V, 176V to 316V, and 202V to 361V. All the models are solid state units, have a power consumption of 250W, and have stabilised outputs within the range ±8%. The unit's feature high voltage protection with instant cut out at over voltage. Also available is an optional low voltage cut out which may be fitted internally.

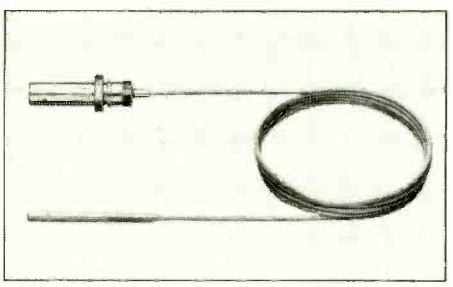
Galatrek International, Scotland Street, Llanrwst, Gwynedd LL26 0AL, North Wales, UK. Phone: 0492 640311. Telex: 617114.

Eagle boom headset

Eagle has produced a new lightweight boom headset, *Model HMA 701*, with a single earpiece and mic. Allowing both live and transmitted sounds to be heard simultaneously, the *HMA 701* is fully adjustable, with the mic boom arm capable of being adjusted to a maximum length of 90mm and with 180° vertical and horizontal rotation on the boom axis. Designed to reduce background noise the boom mic has a frequency range tailored to the speech band (500Hz to 4kHz) while the headset frequency range is 30Hz to 18kHz. The headset is fitted with a jack plug on the headset lead, the mic lead being open ended, and is priced at £17.95.

Eagle International, Precision Centre, Heather Park Drive, Wembley HA0 1SU, UK. Phone: 01-902 8832. Telex: 922131.

32 ▶



B & K mic preamp

Bruel & Kjaer has produced a new high specification mic preamp for use with its *4135* and *4136* ¼in mics, both of which can be directly mounted to the preamp, or alternatively for use with the *4138* ⅛in mic, which accepts the preamp via an adaptor. The preamp, type *2633* is supplied in a robust mahogany case, is ¼in diameter, and derives its power from the input sockets of the various B & K instruments to which it can be connected. These include the company's measuring amplifiers, frequency analysers, etc. The *2633* presents virtually no load to the mic and this together with a low inherent noise level ensures a wide dynamic range. B & K claim that because the preamp has a high input impedance and low output impedance, it can be connected to the company's measuring equipment via long cables without significant loss.

Bruel & Kjaer, DK-2850 Naerum, Denmark. Phone: 02 80.05.00. Telex: 37316.

UK: Bruel & Kjaer (UK) Ltd, Cross Lances Road, Hounslow, Middx TW3 2AE. Phone: 01-570 7774. Telex: 934150.

USA: Bruel & Kjaer Instruments Inc, 185 Forest Street, Marlborough, Mass 01752. Phone: (617) 481-7000.

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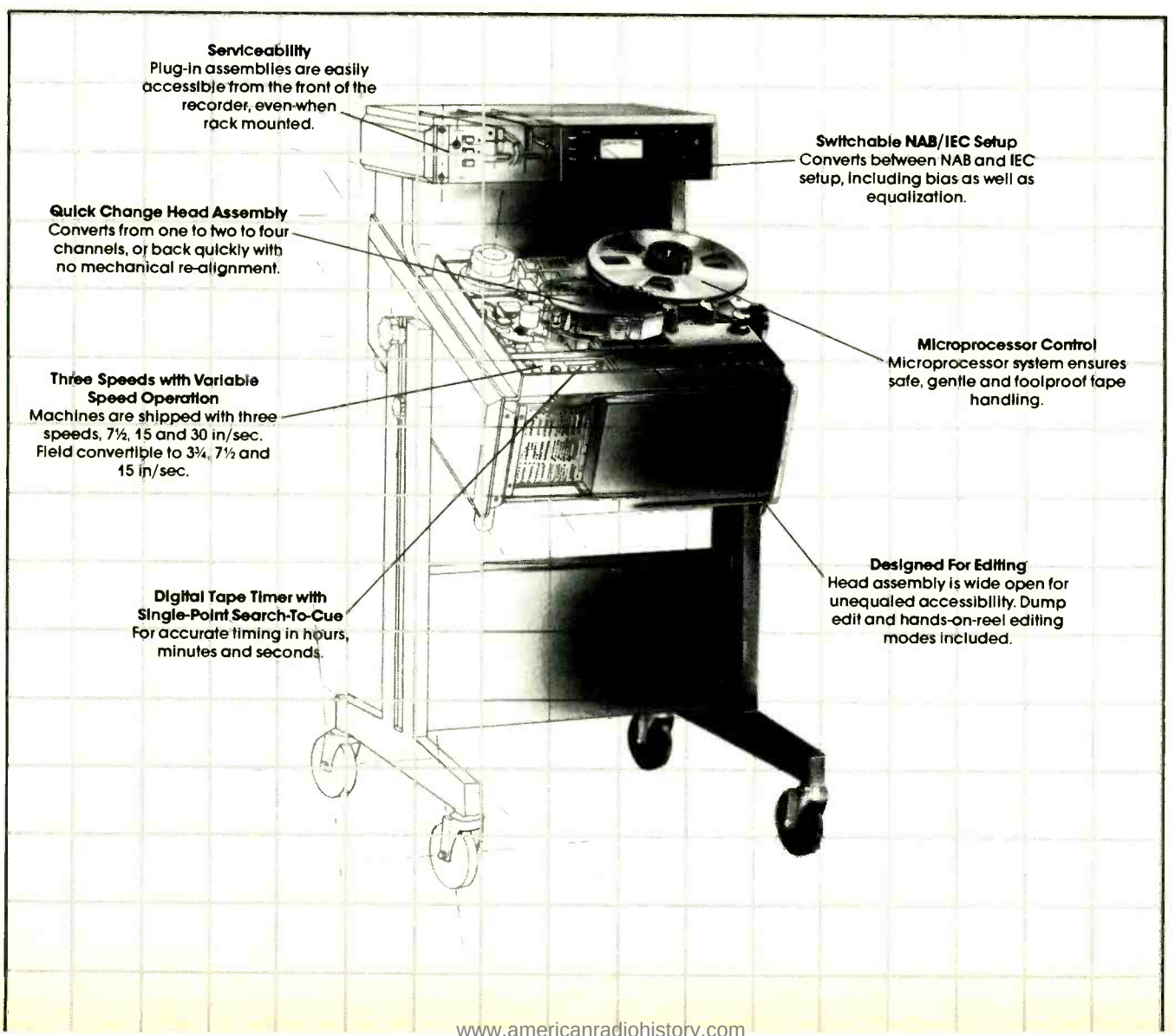

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new products

Sphere digital fader

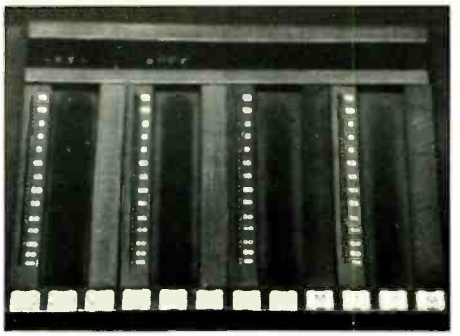
Sphere Electronics has announced the availability of its digital fader which was first shown at the AES Los Angeles Convention. This unit which comprises the *Travis* fader and the Sphere digital attenuator, and forms the basis of the company's *Datalog* automation system, places analogue signals totally under digital control. Sphere claim that this arrangement accomplishes the best of both worlds with the actual audio signal never becoming digitised, thereby retaining the warmth and harmonics of analogue audio, but with digital control.

The *Travis* fader is basically a digital encoding device and uses no moving parts. Infra-red light bridge technology is used to feed a *6500* microcomputer which receives and processes information from four fader units, with level changes being accomplished by placing a finger tip anywhere in the shallow fader trough and moving it up or down. Adjacent to the trough is a row of LEDs which track the level, this facility being analogous to conventional fader knob position. Located along the bottom of the fader are three switches, preset 1, preset 2 and fader solo/mute, such that two level memories are available plus solo/muting of that channel. Fader output is an 8-bit digital word which is routed to the digital attenuator and to the automation computer.

The Sphere digital attenuator is a resistive ladder, CMOS switching device controlling the analogue signal in 224 discrete digital steps. The circuitry is essentially passive hence not introducing noise or distortion. The attenuator is designed to either replace conventional VCAs or plug directly into the audio signal and has the advantage of making SMPTE timecode automation available for consoles immediately or on a field-installed retrofit basis.

The Sphere *Datalog* automation system using the above units eliminates the problem of manipulation and interface of analogue VCAs as the fader microcomputer simplifies the number of automation tasks the main communications computer has to undertake. This makes for an eminently simple automation system using readily available computer hardware, while the automation software is designed to facilitate user programming.

Sphere Electronics Inc, 20201A Prairie Street, Chatsworth, Cal 91311, USA. Phone: (213) 349-4747.



Travis fader

Interface Electronics 400B

Debuting at the New York AES Convention was a new compact 10/4/2 mixer from Interface Electronics, the *Model 400B*. Designed on the modular concept, the mixer's primary application is for use with sound systems, where it can provide four mono submixes each of which can be panned into the two main stereo outputs. Slider masters are provided for submixes and the main outputs, while four cue/effects sends are provided for special effects, cueing, or stage monitoring. Monitor can also be used to listen to the outputs or any input or any cue mix using the solo function.

In addition to its modular assembly the mixer is also sectional, such that whilst the basic unit has 10 inputs, each added section holds 15 more inputs. Modules have four cue/effects sends each with pre/post fader switch; three equalisers with ±15dB control range, including a tunable MF equaliser covering the range 200Hz to 20kHz; plus LF and HF highpass filters. Balanced low-Z transformerless mic and bridging line inputs are provided (via panel mounted connectors), and a mic/line switch with two pads, variable preamp gain, phantom power, phase reverse, solo, and module on/off switching are also included.

The output module includes cue masters each with solo to monitor, echo returns, panpots to pan submixes to outputs, and a monitor level control. In addition four VU meters are provided, these being switchable to indicate either submixes, cues, or output and monitor. The *Model 400B* is also available in 16/4/2 and 24/4/2 formats and as an option Penny & Giles faders may be fitted.

Interface Electronics, 6710 Alder, Houston, Texas 77081, USA. Phone: (713) 660-0100.

MBI TXS System

MBI Broadcast Systems has produced a studio-to-transmitter, profanity delay, network/opt-out microprocessor based broadcast system with remote control to accompany the company's *Series 24A* broadcast console. The system, termed the *TXS System*, comprises two units, a 6U high 19in rack containing the central control unit, and remote control panels which are housed in the *Series 24A* console's meterhood. The system is modular and enables different functions to be operated and programme sources to be routed remotely from the studio or centrally from the rack unit. The system is fully expandable and provides the following functions. Selection of which studio is routed to which transmitter; the ability to send a mono signal to a stereo transmitter in the event of studio equipment, phone line, or transmitter failure; the ability to institute delay and 'profanity dump' systems remotely; the ability to split different commercials to different transmitters in a normally networked programme; and the ability to send any number of programmes to different transmitters in a network (eg twin or satellite) radio operation. Features of the system include microprocessor control; all push-button functions are illuminated; remote units are provided with a positive feedback system (ie when a function is engaged remotely, the relevant button will only illuminate when the function has been activated at the central unit); comprehensive fail-safe logic is incorporated to avoid operator error; and the remote system may be overridden for security and engineering purposes at the central rack.

The remote meterhood modules comprise a studio-to-transmitter module with 'to air', 'release' and stereo/mono buttons; a profanity delay module with delay on, programme delay and dump buttons; and a network/opt-out module with network and commercials opt-out buttons. The central control unit houses four plug-in modules for the logic, lamp and relay control, main audio relay, and profanity audio relay; a hinged panel, below which are three psu cards for +5V, +24V and +24V; and a central control panel. This latter being split into three sections; stereo programme source with six source buttons, plus stereo/mono, local control, network and commercials opt-out buttons; mono programme source with internal and external buttons; and a profanity delay control section with safe, programme delay and dump buttons.

MBI Broadcasting Systems Ltd, 69 Ship Street, Brighton BN1 1AE, UK. Phone: 0273 24928.

Computer control for radio stations

An innovative system for handling the mechanical aspects of radio station programming control has been introduced by Fitch Tape Mechanisms Ltd. of London. The *TA-2000* computer control system is designed for two main areas of operation: equipment control and what they term 'Utilities'.

For the primary, control aspect of the system, the computer is either interfaced with the station master clock, or utilises its own system. It can then take care of all the machine-handling tasks involved in on-air production, such as the control of signals within the station; timing of events; operation of tape recorders; automatic programme logging; etc. A supervisory program in the machine, written to customer requirements, determines the number of such tasks to be handled, the order in which they operate, and their priorities: thus there is no question of trying to fit a 'standard' program into a typically non-standard situation. The system can, for example, take control of the station, using cart machines for music and advertising material, plus open reel machines for specific sections of programming, and allowing the interleaving of 'automated' and 'live' programme segments as required, by handing over to a live presenter at the predetermined time. The presenter can then return control to the system after the live segment is over, as necessary. A presenter may also use the system to control output from other studios, calling them in where needed. The system incorporates a high-quality printer for use where 'hard copy' records are required (logging, for example), and is also useful for the 'utility' functions of the system.

The 'utilities' comprise programs which may be run on the system when it is not needed for programme control, and include a full package of office software, the range at present offering accounting, mailing, stock control and word-processing packages, with more being added as time goes by.

The system was demonstrated recently at the Sixth Sound Broadcasting Show in Birmingham and consists of a compact microcomputer system, incorporating built-in video monitor (48 characters/line, 32 lines), twin 5¼in double-sided, double-density disk drives, *6502* processor running at 2MHz and an exceptionally fast Microsoft BASIC interpreter. Interfacing for the control of external equipment is also incorporated in the main unit, which is little larger than a typewriter. Also demonstrated was the printer, which is based on the successful Epson *MX-81* design offering high-quality impact matrix hard copy. The computer system is operationally compatible with the Ohio Scientific range of machines, allowing access to a number of well-tested utility packages.

Fitch Tape Mechanisms Ltd, 7a Balham Grove, London SW12, UK. Phone: 01-673 1362.

34 ▶

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TRIMIX

Trident Audio are proud to announce their new range of expandable consoles: Trimix.

Trimix offers all the previous features of the well established Fleximix system, plus more facilities at a similar price

Trimix features

- Compact size: Each mainframe housing up to 24 modules measures only 40'' wide.
- Any module can be placed anywhere in the mainframe allowing 'ergonomic tailoring' to customer's requirements.
- 4 band equalisation on each input plus 60 Hz filter and EQ bypass.
- 4 auxiliary sends, each switchable pre or post fader.
- Separate mic and line gain controls.
- Precision five L.E.D. level indicator on each input module.
- Eight group outputs plus separate stereo master outputs.
- Long throw conductive plastic faders on both inputs and outputs.
- Comprehensive monitoring facilities including monitor pan, monitor level and mute for each group output/machine return.
- Full sub-grouping facilities.
- V.U. metering as standard, L.E.D. column P.P.M.'s available as an option.
- Can be 'Fadex' automated at any time.
- Frames can be joined together both electrically and mechanically to make larger systems.
- Eight way monitor module available to provide sixteen track monitoring.
- Integral patchbay available.

Trident Worldwide Representation:

U.S.A. Studio Maintenance Services, Los Angeles. Tel: 213-877-3311
Wilson Audio Sales, Nashville. Tel: 615-794-0155
Trident (U.S.A.) Inc., 652 Glenbrook Road, Stamford, Connecticut 06906 U.S.A. Tel: 203-348-4969

Australia	John Barry Group, Sydney. Tel: 2-439-6955
Belgium	A.S.C. Professional Audio Consultants, Brussels. Tel: 2-520-0827
Canada	Heinl Electronics Inc., Markham, Ontario. Tel: 416-495-0688
France	Lozore Electronics, Paris. Tel: 1-878-62-10
Holland	Dick Swaneveld, Hilversum. Tel: 35-17722
India	Kapco Sound Studio, New Delhi. Tel: 43718
New Zealand	Mandrill Recording Studios, Auckland. Tel: 9-793222
Norway	Protechnic A.S., Oslo. Tel: 2-46-05-54
S.E. Asia/ China	M.B.L. Audio Ltd., Hong Kong. Tel: 5-931006
S Africa	Leephy (Pty) Ltd., Blairgowrie 2194, Johonnesburg. Tel: 11-789 2424
Sweden	Stage & Studio, Gothenburg. Tel: 31-22-40-90
Taiwan	Linfair Engineering & Trading Ltd., Taipei. Tel: 3214454-7

Trident Audio Developments Ltd.
Shepperton Studio Centre,
Post No. 38, Studios Road,
Shepperton, Middx. TW17 0QD, U.K.
Tel: Chertsey (09328) 60241.
Tlx: 8813982 (TRIMIX G).
Contact: Steve Gunn.

TRIDENT

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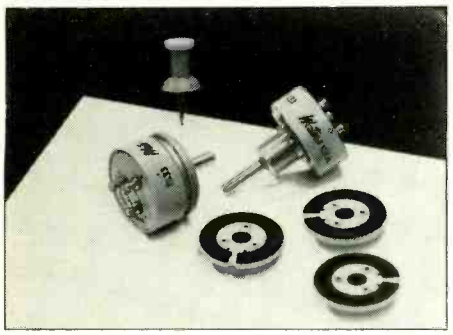
new products



Waters pots

American manufacturer, Waters has announced a new series of moderately priced miniature high performance conductive plastic potentiometers. Available in either servo or bush mounting versions, the units are ⅞in diameter units corresponding to the international dimensions for servo size 9.

The pots are designed for use with servo feedback applications such as recorders, position sensors and other instrumentation applications. The servo mount version, termed the *CP22*, features a precision metal mounting flange with a lubrication free Polymide bearing, while the bushing mount version, designated *ECP22*, uses a metal shaft running in a moulded plastic bearing. The rotational life of the *CP22* is specified as five million cycles (one million for the *ECP22*), with power dissipation being 2W for both versions. Standard resistance values are 1, 2, 5 and 10K ±20%. Linearity of the servo mount version is 1% as standard, with 0.5% or 0.25% options, while the function angle is 340°. On the bush mounting version the electrical angle is 310° and the linearity either 1% or 0.5%. Typical prices for 100-off orders are less than £9.50 for the servo mount and under £6.50 for the bush mount version.

Waters Manufacturing Inc, Longfellow Center, Wayland, Mass 01778, USA. Phone: (617) 358-2777.

UK: Variohm Components, The Barn, Wood Burcote, Towcester, Northants NN12 7JR. Phone: 0327 51004. Telex: 311754.

World's first PCM cassette deck

Although it has been known that a number of research teams (particularly those of the large Japanese electronics companies) have been actively pursuing the task of developing a PCM recording cassette deck, the announcement by JVC that it has successfully developed such a deck is still somewhat staggering news. Coupled with the advent of the *Compact Disc* and other consumer orientated PCM systems (including those using video cassette tape formats) this announcement makes it likely that in the immediate future there will be increasing consumer pressure for digital recording technology to be adopted by professional recording and broadcast organisations.

The JVC PCM cassette deck is capable of 60min (30min each side) stereo PCM digital recording and playback on both sides of a standard compact cassette tape, and the JVC system has been made possible through the development of a high density (46.3K Bytes/in) recording technique. Designed for digital recording and playback, and replay of digital pre-recorded cassettes, the PCM cassette deck combines the advantages of digital audio with the convenience of operation, portability, and low cost advantages of the compact cassette and cassette decks. The JVC PCM deck uses metal tape with a high coercivity, while the tape transport system uses a direct drive capstan motor combined with a newly developed tape tension servo system. The recording system utilised is a 2-way 4-track-per-channel system with service tracks for random access, programme indication and other functions also being provided. Despite the high linear recording density of 46.3K Bytes/in JVC claim to have ensured extremely high stability through a bi-parity error correction system. Although only preliminary specifications of the PCM cassette system have been released, and production of cassette decks will not commence until a worldwide standard for PCM cassette systems has been established (JVC naturally are actively working towards acceptance of their system as a worldwide standard), this development is an important breakthrough in digital technology.

Specifications: recording system, 2-way stereo recording/playback; tracks, 4-tracks/channel, plus service tracks for random access, programme indication, etc; tape speed 7.1cm/s (2.8in/s); playing time 60min (30min each side, C-90 cassette); tape heads, recording/playback and erase; tape type, metal cassette tape; sampling frequency 33.6kHz; quantisation, equivalent to 14-bit; error correction, bi-parity system. ■

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Shadow Control

Shadow

btx Shadow

The btx Corp announced the introduction of a new microprocessor, software-based machine interface system at the Los Angeles AES Convention last year. Known as the btx *Shadow System* and comprising the btx *Shadow* and btx *Shadow Control*, the latter being a keypad control unit, the system is compatible with all existing video/audio editing systems and was specifically designed for direct computer interfacing whether it be audio/video tape machines, mixdown consoles, or commercial mini-computers. A major feature of the system is the facility of

36 ▶

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December 1981

X05B * 6 Sennheiser MK816T shotgun microphones, can also be used for audio, each, £170.

E15B * EMT Gold Foil Echo Unit. Two years old but gilt condition. £3200
E16 * Large Ecoplate, on special offer to free stock space, £1999

M10 * 16 x 4 x 2, slightly secondhand, road case version of this rockproof quality mixer, £664
M15 * MM eight into four, two only in orginal packing. A never to be repeated offer, £150
M16 * A Hill original, 32 in by 24, with P&G, VU's etc. Must be seen. Offers around £4000

N07 * TEAC DX8, used dBx professional system, can be made to work with any recorder, £600

P04B * TEAC 3340 plus sound on sound unit and 4 by 2 passive mixer. A few years old, but in good condition, £500

S15B * pair Bose 800 PA speakers. High Power in small cabinets. Sound Condition, £275

T27 * TEAC Industrial 3340, wood case, new record head, clean and portable, £495
T31 * Portastudio, musicians upgrading, so always available, little used, from £420
T33B * REVOX A77 quarter track, eight years old and needs loving care. Excellent for an engineer on a budget, £225
T34B * TEAC 3440 plus RX9 noise reduction. Exceptional condition so only £800
T35B * REVOX A700 converted to IBA line standard by Alice, in admirable condition, £575
T36 * TEAC 80-8, great heads and very reliable, £1650
T37 * Soundcraft 1 inch, 16 track, 18 months, pristine, British and compact, £6000
T38 * Stellavox SP7 headblock, stereo for SP7, new and unused, £100

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Editing with our new PCM recorders requires this sophisticated hardware...

The AEG-Telefunken MX80 and MX80a are a completely new breed of PCM tape recorders. Now, for the first time, you can use cut-and-splice editing procedures on a PCM machine. Smooth, silent splices are ensured by a sophisticated automatic cross-fade technique which joins the signals before and after the splice.

But AEG-Telefunken didn't stop with just one innovation. They designed these machines to be so simple that anyone familiar with analogue master-tape machines can operate them. For example, they use standard analogue controls; they aren't unduly sensitive to dust and dirt; they're rugged, reliable and simple to maintain and service.

Another important feature is that the head assembly is finished to a tolerance of 10 microns, which results in complete compatibility between machines.

And you'll be pleased to hear that all these innovations have resulted in a system which is about half the price of our competitors.

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TELEFUNKEN

AEG-TELEFUNKEN

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Chalfont St. Peter,
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HAYDEN

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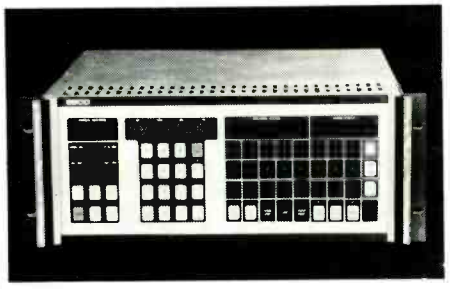
chase interlocking machines in the wind modes, plus the ability to achieve precise play sync down, not only to the sub-frame, but to the sub-bit! In addition, in fast forward, rewind and stop the system provides synchronisation that is the equivalent of sprocket-lock.

Compatible with all previously manufactured btx timecode equipment, the *Shadow System* accommodates one master and one slave, and may be expanded to include additional transports. The basic *Shadow* is a chasing synchroniser with a standardised RS232C interface for remote computer control, however, as an alternative btx offer the *Shadow Control* command console which provides full autolocate and control facilities with an LED data display and nine memory registers. The *Shadow Control* provides 34 dedicated keys to initiate all GO TO and FOLLOW commands; will store and retrieve destination data for machine shuttles; will perform as a master or slave timecode reader; and allows subframe locking in both sync and frame modes. The *Shadow System* operates with SMPTE/EBU timecode, 24-frame film timecode, or auxiliary 60Hz tachometer pulses. In play modes the *Shadow* has a 24-hour offset capability in $\frac{1}{100}$-frame increments, whilst in its other modes the chase-lock facility is within 10 frames at all times. As the system is microprocessor, software-based, the system learns and remembers the dynamic characteristics of machine transports thus optimising machine control, this self-calibration capability additionally precluding the need to recalibrate the system when switching from one application to another.



EECO MQS-100A

American synchroniser manufacturer EECO has announced the introduction of the *MQS-100A Series* multi-cue synchroniser, an enhanced version of the established *MQS-100* microprocessor based SMPTE/EBU timecode unit. The new model has several new features including transfer of timecode from any machine to any cue or event register, variable pre-roll, event offset capability, three 'scratchpad' memories accessible from the keyboard, and the ability to make mode changes 'on-the-run'. In addition to its use in marking cue points, the *MQS-100A*s store direct command can now be used for on-the-fly capture of selected tape times, the keyboard display then being transferred into scratchpad memory or one of several cue points or event registers. Cue search is available with a pre-roll option allowing machines to cue to a time equal to the entered cue point minus a user-specified interval. With the unit three events can be programmed, each with its own time designation, and time offsets can be specified for events 1 and 2. In addition, a third special event has been added which automatically enables, rolls and synchronises machine 3 when the master timecode reaches the stored event time.

Elector MkII Time Code Series

Canadian manufacturer Electro & Optical Systems Ltd produces a variety of SMPTE/EBU synchronising units under the general title of the *Elector MkII Time Code Series*. This series comprises the timecode reader *TCR/VCG/D-2*, the *TCG/D-2* timecode generator, a range of timecode distribution amplifiers, and a wideband amplifier for use with videotape machines not already equipped with these amps. The timecode reader/video character generator may be used with quadruplex or helical video recorders and audio tape machines and features counter hold, indicator hold, and video cancel controls, plus an LED drop frame indicator facility. While the unit allows timecode readout to be via NTSC, PAL or monochrome video display, the reader also features an LED display of timecode on the front of the unit.

Standard speed range of the reader/generator is 0.1 to x60, however an extended speed range option is available covering the range 0.033 to x80. The *TCG/D-2* timecode generator generates either SMPTE or EBU timecodes, and has rear entry provision for parallel user bit data at TTL levels.

Features of the unit include a 'jam sync' mode in which the generator can be automatically or manually locked to an Elector timecode reader; a coincidence output which can be used for editing, pre-cueing or machine control; thumbwheel entry of timecode values; automatic sensing in the 'jam sync' mode of when incoming data is at play speed; and in automatic, continuous updating of the unit by the incoming timecode both in forward and reverse, high or low speed, in a 'sample' mode condition.

TL1

TL2

Omni Q TL Series

A system of synchroniser/effects modules by Commercial Electronics Ltd, Canada, comprising *TL1* synchroniser which will slave virtually any tape transport, *TL2* expansion module adding a number of functions to the *TL1*, and *TL3* providing remote control for the *TL2*.

For fuller details on these modules please see *Studio Sound*, December 1981, page 28.

product Synchronisers & autolocators guide

ADAMS-SMITH (USA)

Adams-Smith Inc, P O Box 130, 34 Tower Street, Hudson, Mass 01749. Phone: (617) 562-3801. Telex: 710-347-6698.
UK: Pye TVT Ltd, PO Box 41, Coldhams Lane, Cambridge CB1 3JU. Phone: 0223 45115. Telex: 81103.
USA: Philips Broadcast Equipment Inc, 91 McKee Drive, Mahwah, New Jersey 07430. Phone: (201) 529-3800.

Model 605: synchroniser for master transport with two slaves (video or audio using SMPTE/EBU timecode. Operates over 1,000:1 speed range with an accuracy to 1/100th of a TV frame (333μs USA, 100μs Europe); operates with inconsistent and mixed timecodes; provides programmable stop and automatic roll-back; independent rapid cueing of transports. Slaves follow master wind and stop functions; 15 stores available for timecode comparisons. Servo outputs available as either bipolar DC signals with adjustable offset, or as 9.6kHz FM signals. Interfaces are available for Ampex *MM1100/1200, ATR100, VPR1, VPR2, VR2000*, Ferrograph *Studio 8*, Bosch *BCN50*, JVC *CR8300*, Sony *VO2850* (modified), Studer *A80*, 3M *M79* and Philips *PVR2*. Does not include timecode generator.
Model TS-1605: system controller with extended editing memory for television audio post-production; utilises VTR for master; accepts up to two audio slave transports; and includes facility to control auxiliary equipment such as cartridge transports. Also has facility to sync telecine sound follower equipment with a film chain and facility to sync audio tapes to film projection equipment interlocked to a magnetic film transport. Unit uses SMPTE/EBU timecode; can accept 50/60Hz sine-wave pilot tone signals; operates over ¼ to 100x speed range with an accuracy of 1/100 of a TV frame (333μs NTSC, 400μs PAL); operates with inconsistent and mixed timecodes; provides fast or slow dynamic phase adjustment; provides programmable stop and automatic cycling; independent rapid cueing of transports. Slaves follow master wind and stop functions; scratch pad memory with 100 10-digit registers for storing edit and cue points and offsets. Servo outputs available as either bipolar DC signals with adjustable offset, or as 9.6kHz FM signals. No external interface boxes nor specific transport-related internal interface modules required. Does not include timecode generator.
Series 2600: modular SMPTE/EBU synchronising system for video tape editing utilising VITC (vertical interval timecode) thus freeing an audio track by eliminating the need for longtitudinal timecode on helical scan VTRs. System accepts PAL/SECAM, NTSC and 24-frame film standards.

AUDIO KINETICS (UK)

Audio Kinetics (UK) Ltd, Verulam Road, St Albans, Herts AL3 4DH. Phone: 0727 32191. Telex: 299951.
USA: Quintek Distributors Ltd, 4721 Laurel Canyon Blvd, Suite 209, North Hollywood. Cal 91607. Phone (213) 980-5717. Telex: 194781.

QLOCK 210: multi-microprocessor SMPTE/EBU generator/synchroniser able to locate and lock two audio/video tape transports; SMPTE single frame accuracy; two additional event operations for auto-record drop in/out memories or additional machines start/stop; built-in SMPTE/EBU skip/SMPTE non-skip generator with jam sync; offset memory with calculation facility, 10 memory locate points; record/offset/locate memory frame trim facility; user definable preroll and instant replay; full transport remote controls; high speed tachometer processing eliminates need for tape-to-head contact in wind; cascade feature allows linkage of two more *QLOCK* systems for control of three machines or control by external computer command source; many interfaces available.
QLOCK 310: similar to above but synchronises and locks three tape transports; also provides up to five external events rather than two.
Q-Soft: range of specialist software packages for the *Q-Lock* synchronisers including an automated record entry and exit package with five timecode programmable events for multitrack studio audio

38 ▶

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More time on your hands from MXR.

Providing extended delay times at an affordable price, the new MXR Model 151 Delay System II gives you over three full seconds of delay (three times that of similarly-priced digital devices). Specifically, the Delay System II can offer you up to 800 milliseconds of clean, quiet delay at a full 16 kHz bandwidth (over 200 milliseconds more than the closest competitor). As a digital recorder, the Delay System II's exceptional memory capability lets you capture entire musical phrases or obtain a wide variety of dynamic and *musical* studio-quality effects from flanging and chorus to echo and doubling in one rugged package.

And it's easy to use in real time. The large front panel and simple control format make it a snap to quickly select from a vast range of time delay effects. The Delay System II's high-resolution four digit readout displays the precise amount of delay and the bandwidth is indicated by LED's, so there's no "squinting & thinking" to find out exactly where you are. Level-indicating LED's let you set up the optimum level in seconds.

The Delay System II fits right into your rack, looks great and provides clean, noise-free performance. A level switch is provided to optimize signal-to-noise for professional/home recording and onstage applications. The Delay System II also features easy access with both XLR and phone jack connectors (inputs *and* outputs) on the rear panel for instant interfacing with your patch bay.

MXR Delay System II — More time on your hands and more ways to use it as a creative tool on stage and in the studio. Hand-assembled in the U.S.A. with the finest components available in a compact, easy-to-use rack-mountable package.

MXR Professional Products Group

MXR Innovations (Europe),
1 Wallace Way,
Hitchin, Herts. SG40SE, Eng.
Phone 0462 31513 Tlx 826967

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sweetening; an automatic dialogue replacement package for film and video post-production; a telecine mastering package where automated assemble editing with separate audio is required; a sound effects package for specialised film and video post-production; and on request special software to user requirements.

XT-24 Intelocator: Intelligent autolocator that has the capacity to 'learn' a particular tape plus transport behaviour pattern and subsequently optimise the locate sequence. Uses two separate counters for master and intelocate; four memories; in/s readout for varispeed; full transport remotes; leverwheel numerics for fast entry of locations; ±2s accuracy over 30min of tape at 15in/s; auto compensations for high and low speed. Various interfaces are available for many machines.

btx (USA)

The btx Corporation, 12 Huron Drive, Natick, Mass 01760. Phone: (617) 653-6811.
UK: Scenic Sounds Equipment Ltd, 97-99 Dean Street, London W1V 5RA. Phone: 01-734 2812. Telex: 27939.

Model 4500: synchroniser designed to slave a single magnetic transport to a VTR or another audio transport using SMPTE/EBU timecode. Contains integral timecode readers and offers three modes: 'Frame' mode provides frame-by-frame comparison of actual timecode, 'Sync' mode maintains synchronisation by comparing frame rates of timecode but ignoring actual numbers, 'Auto' mode provides direct synchronisation by comparing timecode numbers then maintains its using rate. Master timecode input operates at only normal speed, slave between ¼x and 4x; accuracy ±50μs. provides both a DC control voltage for servo capstan machines and a squarewave frequency which may be used with an external amp to drive non-capstan servo transports. Thumbwheel switches set frame offset, but no timecode generator or code display. May be slaved to synchronise more than one slave.
4600: SMPTE/EBU tape remote controller designed to offer timecode automation to standard audio or video recorders. Provides full remote control of fast forward, rewind, play, stop, record in, record out, record enable. Pre-programmable with up to 30 sequential instructions; multiple instant previews or replays; 'learns' conventional manual production sequences; calculator adds or subtracts codes; two LED displays of code; basic unit interfaces to two recorders but may be expanded to handle three or four. Built-in timecode generator.
5000 Series: comprises seven SMPTE/EBU timecode units: *5100* timecode generator with LED display; *5100V* similar to above but with video display facility added; *5200* timecode reader with LED display; *5200V* as above but with added video display facility; *5300* timecode video display with user adjustable character size and position; *5400* timecode jam sync generator/reader with LED display; and *5400V* as above but with added video display facility. Units generate or read SMPTE/EBU and 24-frame timecode including time data, user data, status bits, and drop frame or colour frame; readers operate over 0.1 to 60x play speed; jam sync accuracy ¼-frame.
Shadow System: microprocessor, software-based, synchroniser and tape controller with intelligent interface to audio and video tape machines. Comprises two units, the *Shadow* and *Shadow Control* command console. Basic *Shadow* is a chase synchroniser with a standardised RS232C interface for remote computer control. Optional *Shadow Control* command console provides full autolocate and control facilities with 34 dedicated key commands, LED data display and nine memory registers. System operates with SMPTE/EBU timecode, 24-frame film timecode, or 60Hz tachometer pulses. System will sync to 1/100-frame in play mode; has 24-hour offset capability; will sync three or more transports. Does not include timecode generator.

EECO (USA)

EECO Inc, 1601 East Chestnut Avenue, Santa Ana, Cal 92701. Phone: (714) 835-6000. Telex: 678420.
USA: Ampex Corp, 401 Broadway, Redwood City, Cal 94063. Phone: (415) 367-2011. Telex: 348464.

Audio Kinetics QLOCK 310

UK: Ampex International, Acre Road, Reading RG2 1QR. Phone: 0734 85200. Telex: 847611.

MQS-100: provides synchronisation for three machines, video or audio, using SMPTE/EBU timecode. Features include roll back, cue, store direct, chase, offset adjustments, machine status, mixed transports, mixed timecodes (unrestricted offsets, drop or non-drop frame), remote operation. Timecode may be transferred from any machine readout to any cue or register storage; machines enabled or disabled during system operation to reduce mode changing; three internal event commands for staggered starting; six scratch pad memories; freeze store of running code. Resync time is slow or fast, accuracy is ±100μs. Various interfaces available.
MQS-100A: similar to *MQS-100* with extra features. See *New Products* for full details.

ELECTOR (Canada)

Electro & Optical Systems Ltd, 31 Progress Court, Scarborough, Ontario M1G 3V5. Phone: (416) 439-9333. Telex: 065-25431.
UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ. Phone: 01-953 0091. Telex: 27502.
USA: E & O Systems Ltd, 2998 Scott Blvd, Santa Clara, Cal 95050. Phone: (408) 727-1506. Telex: 171200.

MkII Time Code Series: variety of synchronising units comprising *TCR/VCG/D-2* reader, *TCG/D-2* generator, a range of timecode distribution amps and a wideband amp. Readout via NTSC, PAL or monochrome video; LED timecode display; speed x0.1 to x60 with extended speed option; SMPTE or EBU timecodes.

MAGLINK (UK)

Maglink Audio Products Ltd, 17 Erncroft Way Twickenham TW1 1DA. Phone: 01-891 2770/0895. Telex: 8954029.

Maglink Multi-Machine System: expandable synchronising system using Maglink timecode; basic system operates with one master and one slave, but additional slave cards may be added, up to a maximum of four; interfaces to audio, video and film machines. Features include: location display, switchable display format for various video or film formats, display hold, system status display, machine select and keyboard for entries, offset, searching, programme cue, advance or retard to speed up or slow down machines, repeat function, and cue recall. Various interfaces available; built-in timecode generator.
Maglink II Synchronising System: basically similar to the Maglink *Multi-Machine Synchroniser* but simplified to only operate with one slave.
Maglink Code Generator: generates Maglink timecode, the start time being set by thumbwheel switches to any time within 24 hours; LEDs show code output; frame rate is switchable 25/30 frames/s.
Maglink Code Reader: reads and provides digital display of Maglink timecode; operates in play mode with range of 0.02 to 2.5x play speed, and spooling mode (externally or manually selected) from 2.5 to 100x play speed.
EBU Timecode Reader: accepts EBU (25 frame) timecode over a speed range of ¼ to 80x play speed; display via front panel LED display; also

40 ▶

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Spring Reverbs are notorious for the odd sounds they tend to produce. Manufacturers have tried to remedy this with limiters, equalisers and the like. The design of the "Great British Spring" takes a different approach. It uses a custom spring unit that sounds good without fancy electronics. The multiple spring paths produce a natural sound that is full at the low end and sparkling in the highs. But don't just take our word for it, send for a free demo cassette, or arrange for a demo and hear it live.

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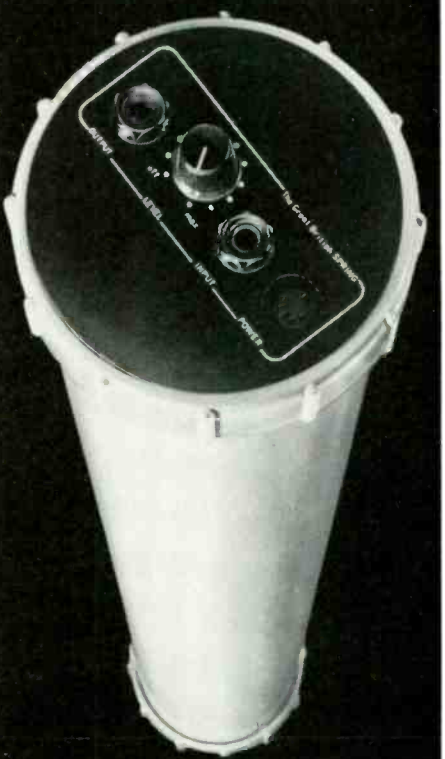

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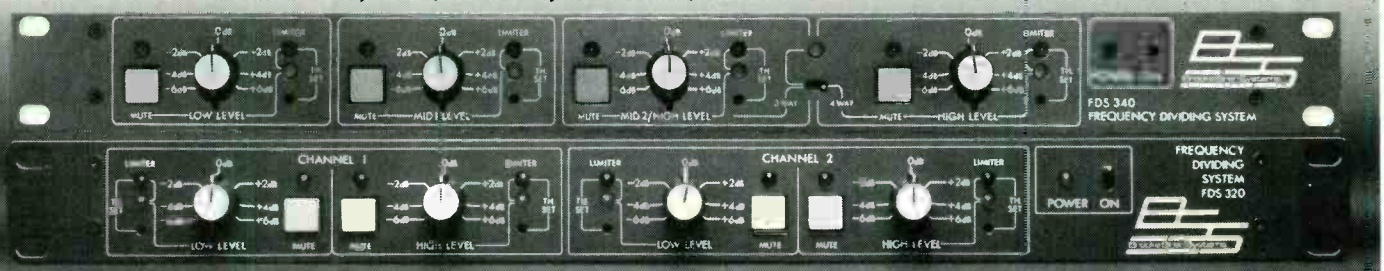
Brooke Siren Systems, 92 Colney Hatch Lane, London N10. Tel: 01-444 7892. Telex: 912881 BSSAudio.



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SRT

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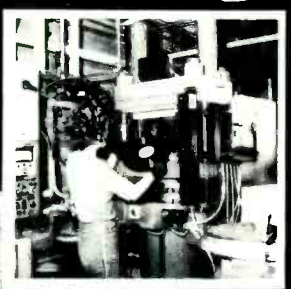

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product Synchronisers & autolocators guide

video character insertion facility; regeneration capability when running at play speed. Features controls for local/remote control; timecode/user bits; run/hold; plus controls governing video insertion, size, format and position. Unit built under licence from the BBC.

Minimag Reader: for use with *Minimag* (an API product), in conjunction with a *Minimag Synchroniser*, provides display of master and slave positions.

Sprocket Code Generator: enables a Maglink synchroniser to be easily interfaced with any machine having a shaft encoded output related to the transport; generates Maglink timecode from a bi-phase input clock frequency normally available on most sprocketed film and sepmag machines, thus eliminating the need to record a timecode track; thumbwheel switches allow timecode to be started at a specific time.

SMPTE/EBU Sprocket Code Generator: enables SMPTE/EBU timecode equipment to be easily interfaced to any machine having a shaft encoded output related to the transport; generates standard SMPTE/EBU or optionally 24 frame timecode from a bi-phase input clock frequency normally available on most sprocketed film and sepmag machines, thus eliminating the need to record a timecode track; thumbwheel switches allow timecode to be started at a specific time.

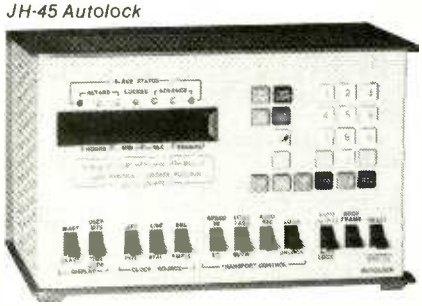
SMPTE/EBU to Maglink Interface: provides interface between tapes recorded with SMPTE/EBU timecode and Maglink equipment; reads EBU timecode at ⅛ to 50x play speed; displays timecode on front panel then generates Maglink timecode which may be either recorded or used to lock Maglink equipment directly.

Portable Code Generator: generates both SMPTE/EBU and Maglink timecodes; start time set on thumbwheel switches; portable battery operated.

MCI (USA)

MCI Inc, 1400 W Commercial Blvd, Fort Lauderdale, Florida 33309. Phone: (305) 491-0825. Telex: 514362.
UK: MCI (Professional Studio Equipment) Ltd, MCI House, 54-56 Stanhope Street, London NW1 3EX. Phone: 01-388 7867. Telex: 261116.

JH-45 Autolock



JH-45 Autolock: self-contained synchroniser with built-in SMPTE/EBU timecode generator, readers, synchronisers and autolocator; slaves any MCI transport to an audio/video/film transport replaying timecode, with a typical accuracy of ±50μs; generates timecode synchronised to external power frequency; permits use of user bits in timecode; reads either tacho pulses or high speed timecode in spooling mode; advance/retard at rate of three frames/s; code display shows absolute difference between master and slave; adjusted timecode display subtracts the offset to absolute timecode difference; park slave allows machine to stop within a frame of timecode display; punch in/out record at selected programmable sequence; 10 scratch pad memories; autolocator mode with realtime display; auto read/write of tape position counter on to tape itself with 10 memory positions; shuttle function.

Autolocator III: microprocessor-based autolocator for MCI transports; 10 memories; repeat function; tape velocity indicator showing both in/s and pitch shift; 35ft connection cable; fast windback time for 30in/s of about 15s per 100ft of tape by measuring inertia of tape spools.

RTZ III: microprocessor based autolocator for the *JH-110 Series* tape machines; return-to-zero function; four memory locations; presettable up/down real-time counter; tape speed indicator; capable of locating from the positive or negative domain. A special version, the *RTZ III/M* is standard on the *JH-110M* mastering machine, and features 20 memory locations, plus four addressable tape position memories, return-to-zero function, and tape velocity indicator.

OMNI Q (Canada)

Commercial Electronics Ltd, 1335 Burrard Street, Vancouver, British Columbia, V6Z 1Z7. Phone: (604) 669-5525. Telex: 0454470.
USA: Omni Q Inc, 8-12th Street, Blaine, Washington 98230.

Omni Q TL Series: synchroniser/effects module system comprising the *TL1* synchroniser/effects unit, *TL2* expansion module, and *TL3* remote control. *TL1* generates a 40 bit timecode (incorporating parity check) modulated on a 21kHz carrier allowing limited audio use of timecode channels. Other features include external sync from pulses within a 20 to 80Hz range; video sync mode from a 12kHz timecode carrier; fast and slow slewing modes; servo control of slave machine ±50μs; and phase control facility allowing manual offsetting of ±30ms for phasing and flanging effects. *TL2* adds the following features; LCD time display; phase meter; master/slave remote transport controls; and dual master/slave autolocate. The *TL3* remote control unit for the *TL2* features a remote display; remote transport controls; and keypad entry of autolocate times with 10 memory locations and automated punch-in/punch-out facility.

SELTECH (UK)

Seltech Equipment Ltd, Rose Industrial Estate, Cores End Road, Bourne End, Bucks SL8 5AT. Phone: 06285 29131. Telex: 848960.

Model 3000: SMPTE/EBU timecode generator/reader suitable for EBU or EIA operation; timecode speed range 0.2 to 30x play speed; key selection of user bits; drop frame, frame blank, jam sync, and freeze facilities; external battery input for ENG or mobile applications; video character generator module available; remote control of most functions available.

Model 3700: EBU (8-field) timecode generator/reader suitable for PAL operation (NTSC version available); includes video character generator; timecode speed range 0.2 to 60x play speed. Facilities include separate generator/reader displays; facility to display generator and reader timecode on video monitor; reader user bits transferable to generator; reader time transferable to generator user bits; continuous or momentary jam sync capability.

Model 3100: EBU/SMPTE timecode reader and video character generator capable of reading EBU or EIA timecode; character generator accepts composite PAL/NTSC or monochrome inputs; timecode speed range 0.2 to 30x play speed; facilities to control video display size and position; user bit, freeze and frame blank facilities; can accept balanced or unbalanced timecode input; remote control optional.

Model 3272: compact mains powered timecode reader accepting EIA or EBU timecode in serial form at play speed only; blanks frame automatically when in play speed mode; hold function to freeze timecode and display frame count.

Model 3500: compact portable EBU/SMPTE timecode generator with battery power supply; timecode and user bits entry via calculator style keypad; facilities include user bit register display, play speed reader and user bits display, and jam sync. Synchronises to NTSC/PAL video signals; optional remote control and start/stop with switched video.

SONDOR (Switzerland)

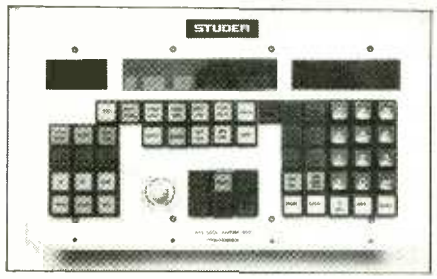
Sondor Export AG, Dachlerenstrasse 11, CH-8702 Zollikon-Zurich. Phone: 01-65.80.90. Telex: 55670.
UK: Hayden Laboratories Ltd, Hayden House, Chiltern Hill, Chalfont St Peter, Bucks SL9 9UG. Phone: 02813 88447. Telex: 849469.

EPS8000: system allowing synchronising of any number of Sondor magnetic film transports from timecode supplied by an audio/video/film master transport. The system will operate by: using timecode on slave, as a timing reference for synchronous operation with actual synchronism achieved by using start marks, or timecode; using timecode on slave to achieve precise synchronism comparing frame numbers but with possible offset; and finally, not using slave timecode but taking timing information from transport itself with synchronism manually achieved on start mark. Allows electronic looping (rock 'n' roll) within the Sondor system; provides reading at ¼ to 50x play speed and display of SMPTE/EBU timecode but no built-in generator; synchronising input from slave is either timecode or 2-phase signal, output to slave is 2-phase signal.

STUDER (Switzerland)

Studer International AG, Althardstrasse 150, CH-8105 Regensdorf. Phone: 01 840.29.60. Telex: 58489.
UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ. Phone: 01-953 0091. Telex: 27502.
USA: Studer Revox America Inc, 1819 Broadway, Nashville, Tennessee 27203. Phone: (615) 329-9576. Telex: 554453.

Tapelock System 2000 Mk II



Tapelock System 2000 Mk II: system to operate with *A80/VU* or *A800* as slave, accepts most machines as masters. Synchronisation accuracy 30μs. Principal features are lock where the slave searches for the master address and synchronises immediately; offset up to 24 hours with display of actual offset; pilot which uses pilot tone as reference after synchronising achieved for transfers back to film; edit mode for programmable drop-in and drop-out to 1ms accuracy and with 8s pre-roll facility, and with rehearse facility (*A800* only); address start and stop for up to four playback machines (cart machines); SMPTE/EBU timecode generator built-in with any address start; hold to capture a time in the memories; store offset which allows discontinuous timecode to be read back, offset being changed when necessary; wow and flutter compensation; operates at 24/25/29.97 or 30 frames/s; lock-up time 3s; auto muting of all playback amps during lock-up; ±5ms (±1ms with repark command) accurate parking allows manual editing; built-in calculator for address manipulation; built-in varispeed control ±15/8 tones; presettable address limits to stop tape winding out. Parallel/serial converter rack allows the programmer to locate several hundred metres away from the synchroniser. Main programmer is available for *A800*, *A80* master control or *A80* locator. Various interfaces available.

Autolocator: available to operate with *A800* and *A80* models, no interfacing required. Microprocessor controlled; separate displays for actual tape position and locate position; 20 memories to store addresses; cue store for auto storage of cue points on the fly (10 memories); roll back to defined time; loop operation; two additional working memories; offsetting of tape position using keyboard; optimisation of search and park for fastest response.

TELEFUNKEN (West Germany)

AEG-Telefunken, Postfach 2154, D-7750 Konstanz, West Germany. Phone: 07531 862460. Telex: 733233.
UK: Hayden Laboratories Ltd, Hayden House, Chiltern Hill, Chalfont St Peter, Bucks SL9 9UG. Phone: 02813 88447. Telex: 849469.
USA: Gotham Audio Corp, 741 Washington Street, New York, NY 10014. Phone: (212) 741-7411. Telex: 129269.

MTS15A-1 Synchronising System: multimachine synchronising system using one or two Telefunken *M15A* transports and slaves, and most video/audio transports as master. Operates using EBU timecode; three built-in readers but no generator; fast synchronising time; timecode offset for record/replay head preparation; timecode display for each transport; operation with non-continuous timecode; external indication of parking and synchronisation; accuracy to one frame (40ms); stability 0.5ms.; slave *M15A* transports require timecode amplifier and synchroniser adaptor; interfaces for Bosch *BCN*, Sony *2850*, JVC *8300*. ■

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MR-2

MR-2 delivers more usable console for the money. Efficient design has reduced the labor and material content, while improving features, signal handling, and reliability.

MR-2 offers a full range of options and features, allowing you to specialize your console to your functional and budgeting needs.

MR-2 expansion frames and module update kits continue to keep your console matched to your future needs.

Resale prices of Harrison-designed-and-built consoles demonstrate that MR-2 will continue to protect you even at trade-in.

More Usable Console for the Money?

Somehow that sounds like cheating—as though you could get something for nothing. NOT SO!!

The secret is to eliminate things that cost money but do not add any function or "quality" to the console.

The console designers at Harrison Systems have identified many traditional inefficiencies and have eliminated these in the design of MR-2.

Printed-circuit boards have been made smaller (thus, less expensive) through the use of double-sided artwork and a more meticulous, time-consuming design process.

Almost all hand-wiring in the frame has been eliminated. Mother-board-mounted multi-pin connectors are used for inputs and outputs.

Seldom-used features (like Quad) have been eliminated and replaced with more desirable and useful features.

Module width has been reduced to 40.6 mm (1.6"), thus reducing metal-work cost for a given console size.

In other words, every small detail of the MR-2 design has been critically optimized for efficiency. This efficiency does not mean, however, a reduction in signal-handling quality or reliability. In fact, just the opposite is true.

A radical new multiple-ground system is at work to even further reduce induced noise.

Modern "dielectrically isolated" switches are used for all logically controlled switch functions.

Patch points now operate full line level (+4 dBu or +6 dBu) and are isolated and balanced.

These are only a few of the reasons that allow us to confidently say that MR-2 is the most efficient, cost-effective console ever offered by anyone to the industry.

We think you will agree and make it your choice as well.

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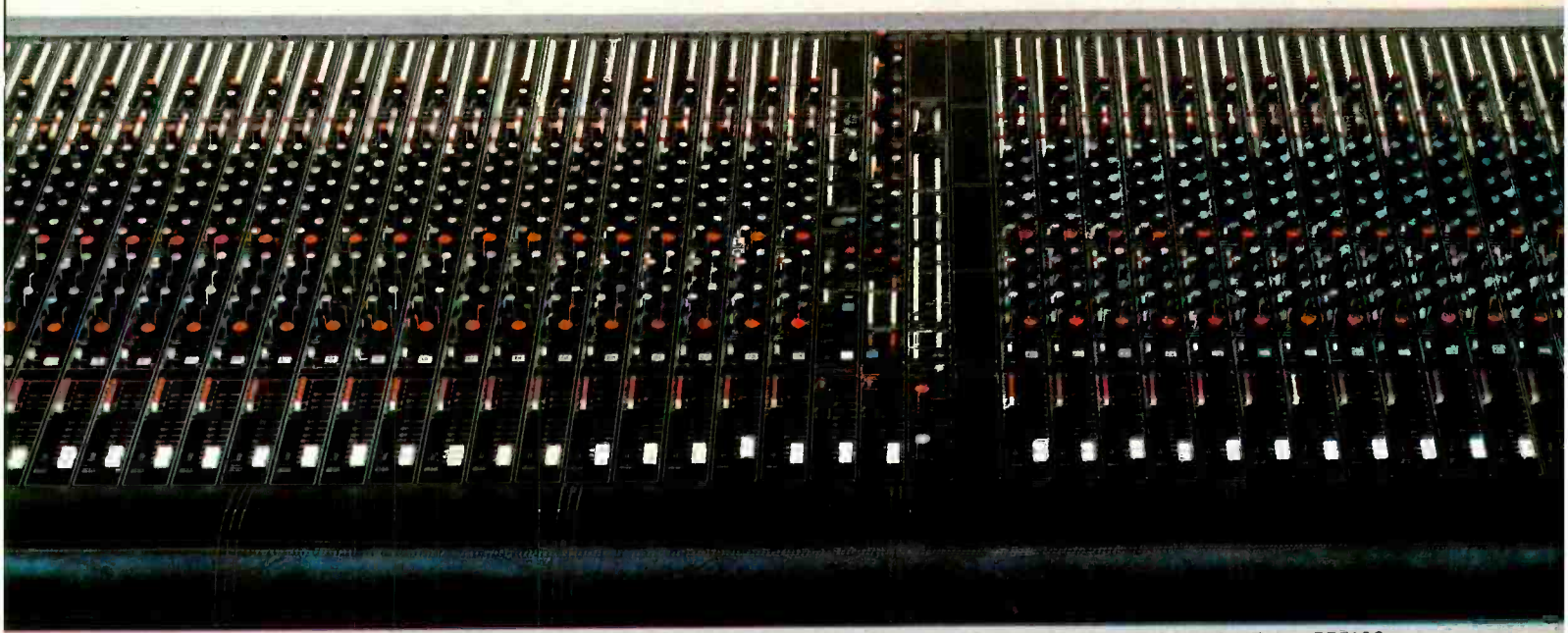

HARRISON SYSTEMS, INCORPORATED P.O. Box 22964, Nashville, Tennessee 37202/(615) 834-1184, Telex 555133

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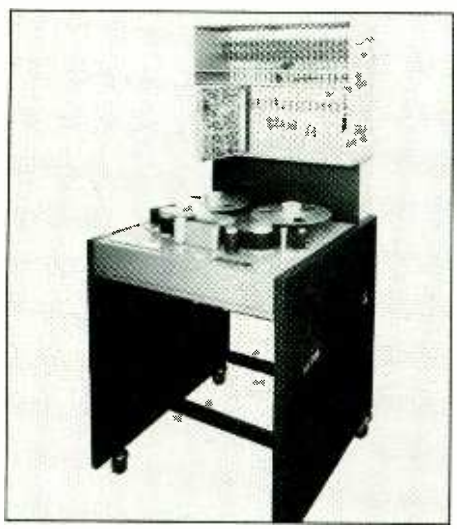
new 16-track + Tape machines products

For address details see product guide

AC Electronic Services 16-track

Introduced at this year's APRS Exhibition was a new 16-track tape machine, the *ACTR16*, from AC Electronic Services. While the new machine is chiefly intended to match the company's range of studio and PA consoles, at its reasonable price of £4,500 it should find a healthy niche in the tape machine market. The new recorder operates on 2in tape, is a single speed (15in/s) machine, and accepts 12in NAB reels. Features include Hall effect motion sensing elements, electronic braking, NAB EQ, and a remote control unit. This latter features record in/out switching, playback/sync switching, an LED tape timer, and tape motion controls.

Specifications: 16-track on 2in; tape speed 15in/s; frequency response ±3dB 30Hz to 25kHz (playback), ±3dB 50Hz to 20kHz (sync); NAB EQ; wow and flutter 0.14%; S/N ratio >65dB; bias frequency 100kHz; record sensitivity −20dB to +20dB at 1kHz (variable); input impedance 47kΩ unbalanced; play and sync output −20dB to +20dB at 1kHz (variable); output impedance 600Ω unbalanced; erasure 85dB at 1kHz; audio connections standard ¼in jacks.



CB Multitracks

Earlier this year CB Electronics announced that it had come to an agreement with Studer whereby it could supply complete multitrack recorders consisting of a Studer *A80* transport combined with the company's own *400 Series* tape electronics. Both 16-track and 24-track tape machines are available in this configuration and the company is offering machines including remote control units from £13,250 for the 16-track, and from £15,000 for the 24-track. In addition the company has also produced an autolocator with eight memories and capable of searching to four positions to accompany these machines, or alternatively the Studer autolocator may be used. The CB multitracks feature facilities to accommodate AES/NAB/DIN equalisation with separate EQ level and high frequency presets for record replay and sync. Other features include phase correction function; Dolby, dbx, Telcom noise reduction mounting facility; full monitoring facilities with both individual channel and master control; master bias adjustment; solo on each channel; noise gate on each channel; silent gapless drop-in; slate input; and a fast line-up system for each channel. The remote control unit includes a tape position indicator and search to cue facility capable of searching to four positions.

Soundcraft SCM 762 Series

Soundcraft has introduced new low cost versions of its established 16- and 24-track 2in tape machines, available with a number of optional features enabling users to tailor machines to their needs. Termed the *SCM 762 Series* the new machines replace the previous *SCM 382 Series*. The basic version of the machines feature base mounted power supplies, modular plug-in front panel mounted audio electronics, hinged tape transport with DC servo controlled direct drive capstan motor and AC reel motors, and a full function remote control unit. The remote features complete control of safe/ready/record modes on all tracks, master selection of monitor status, auto-muting control facilities, real time minutes and seconds counter with cycle and search to zero facility, and a varispeed facility. Optional features which may be added to the basic machine include dedicated sync line output, noise reduction control outputs, interchangeable headblock, autolocator, and Varelco multiway connectors. The optional autolocator features individual channel monitor status selection and nine position autolocate. Soundcraft inform us that in addition to the basic machine and the various options, it is also producing a version which includes all the options bar the Varelco multiway connectors as standard. Prices of the *SCM 762 Series* are 16-track, basic £7,850; 16-track with standard options £9,750; 24-track, basic £8,750; and 24-track with standard options £11,250.

Specifications: 16- or 24-track on 2in; 15/30in/s; varispeed +15, −50%; speed stability 0.1%; wow and flutter 0.04%; wind time 100s for 700m; frequency response +1, −2dB 30Hz to 20kHz (record/replay at 15in/s), +1, −2dB 100Hz to 20kHz (record/sync at 15in/s); record/replay crosstalk at 1kHz −55dB; record/sync crosstalk at 1kHz −18dB; bias frequency 100kHz crystal controlled; input sensitivity adjustable −10dBm to +20dBm, 10kΩ input impedance; output level adjustable −10dBm to +10dBm at 0VU, +22dBm max into 600Ω; line output bandwidth 22kHz including sync mode; sync output bandwidth 16kHz; NAB equalisation as standard others to order or may be set by user.

The Soundcraft SCM 762-24X *24-track tape machine with standard options is reviewed on page 74 of this issue.*

Syncon M Series

Also introduced at this year's APRS exhibition was a new 24-track tape machine, the *Syncon M24*, from Allen and Heath. As its name implies this recorder is designed to accompany the *Syncon* multitrack console range, and the recorder's styling reflects this aim. Although the new machine is not yet in full production, the *M24* is an elegantly packaged unit with several interesting design features. These include a pinch-roller-free tape transport, comprehensive remote/autolocate as standard, and LED column VU metering. The audio electronics are housed behind the LED meters in the tape machine's sloped meter penthouse, while the tape transport electronics and power supply unit are mounted below the tape transport deck. The machine which uses 2in tape with a spool capacity of 14in; has selectable NAB/IEC/AES equalisation; three preset tape biasing circuits; separate EQ for 30 and 15in/s; varispeed facility covering the range +100% to −50%; and a varispool feature. The *M24* also features a power failure correction circuit; balanced *XLR*-type inputs/outputs (optional multiway); a noise reduction interface; close proximity tape heads; and easily interchangeable headblocks to accommodate a 16-track headblock. (Allen and Heath also intend producing a 16-track version of this recorder to be termed the *Syncon M16*). The *M24* remote/autolocate has nine separate memories to control drop-in/out, line/sync, etc plus full logic control, a tape timer with readout in hours/minutes/seconds, and displays for master/local time, transfer time between memories, and tape speed in the varispeed mode in either % or realtime. Price of the *Syncon M24* including remote/autolocate is approximately £17,000.

Specifications: 16- and 24-track on 2in; max reel size 14in NAB; tape speeds (fixed) 15/30in/s ±0.1%; varispeed −50 to +100%; wind time 100s for 2,400 ft; track formats 16- and 24-track, interchangeable headblock; wow and flutter 0.05% at 15in/s, 0.04% at 30in/s, DIN 45507 peak weighted; frequency response (record/replay) 50Hz to 20kHz ±2dB at 30in/s, 30Hz to 20kHz ±2dB at 15in/s, response from sync head limited to 15kHz; S/N ratio, replay −65dB (16-track) −63dB (24-track), sync −62dB (16-track) −60dB (24-track) including bias erase and reproduce amp noise ref 510nWb/m using Ampex *456* unweighted 20Hz to 20kHz; crosstalk at 1kHz ref 510nWb/m, >−50dB (16-track) >−45dB (24-track); distortion <1% (record/replay, using Ampex *456* at 320 nWb/m, at 1kHz); inputs 10kΩ electronically balanced, accepts levels down to −10dB to produce reference level; line outputs 600Ω transformer balanced, switchable line/sync/replay; max line output level +10dB, clipping level +22dB; sync outputs 600Ω transformer balanced, dedicated sync/line; max sync output level +10dB, clipping level +22dB. ■

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product guide
16-track + Tape machines

This month's Product Guide covers tape machines above 8-track. For smaller format machines please refer to last months Product Guide.

All frequency response measurements are given at 15in/s unless otherwise specified.

ABE (West Germany)
ABE Becker GmbH & Co, Mainaustrasse 5, D-7750 Konstanz. Phone: 07531 21536.

MTR Series: 16 – ,24 – or 32-track on 2in; 7½/15in/s; frequency response ±1.5dB 30Hz to 18kHz; + 30 to – 50% varispeed; CCIR or NAB EQ; optional Dolby-A.

ACES (UK)
AC Electronic Services, Broad Oak, Albrighton, Near Shrewsbury, Shropshire SY4 3AG. Phone: 0939 290574.
Worldwide marketing: Intersound Ltd, 103 Layston Park, Royston, Herts SG8 9DY, UK. Phone: 0763 44470.

ACTR16: 16-track on 2in; 15in/s; frequency response ±3dB 30Hz to 25kHz (Playback), ±3dB 50Hz to 20kHz (Sync); NAB EQ; remote control standard.

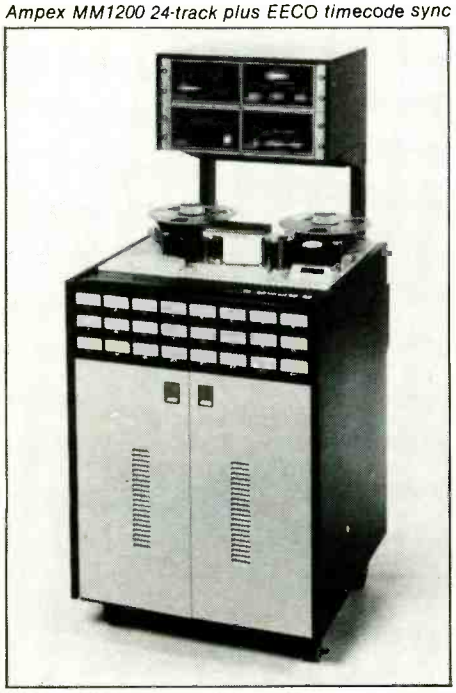
ACCURATE SOUND (USA)
Accurate Sound Corp, 114 5th Avenue, Redwood City, Cal 94063. Phone: (415) 365-2843. Telex: 348327.

Model 2600 Transport: 24- or 16-track on 2in, 16-track on 1in; 3¾ to 30in/s; remote control and DC servo option; Inovonics or ASCO electronics.

AMPEX (USA)
Ampex Corporation, 401 Broadway, Redwood City, Cal 94063. Phone: (415) 367-2011. Telex: 348464.
UK: Ampex Great Britain Ltd, Acre Road, Reading RG2 0QR. Phone: 0734 85200. Telex: 848346.

MM1200: 16- or 24-track on 2in; 7½/15in/s or 15/30in/s; frequency response ±2dB 50Hz to 18kHz 'overall' in sync and record modes; DC (phase lock) servo direct-drive capstan; search-to-cue facility; plug-in headblock with automatic tape tension correction. Optional extras include PURC (pick-up recording capability accessory) for 'clean, precise insert edits'; – 50 to + 15% varispeed; plus EECO timecode synchroniser and other video-orientated accessories.
ATR-124/116: 24- and 16-track on 2in; 7½/15/30in/s; varispeed – 50 to + 200%; accepts up to 16in reels; frequency response ±2dB 25Hz to 20kHz; NAB/IEC/AES assignable EQ; memory stores of channel and monitor modes; variable shuttle control; optional remote.

Ampex MM1200 24-track plus EECO timecode sync



ALLEN AND HEATH (UK)
Allen and Heath/Brenell Ltd, Pembroke House, Campsbourne Road, London N8. Phone: 01-340 3291. Telex: 267727.
USA: Audio Marketing Ltd, 652 Glenbrook Road, Stamford, Connecticut 06906. Phone: (203) 359-2312.

Syncon M16/M24: 16- or 24-track on 2in; 15/30in/s; varispeed – 50 to + 100%; NAB/IEC/AES assignable EQ; pinch-roller-free tape transport; comprehensive remote/autolocate with memory stores of channel and monitor modes.

CADEY (UK)
Cadey Tape Recorders Ltd, 59 Yantlet Road, Strood, Rochester, Kent. Phone: 0634 76117.

Cadey Multitrack: 16-track on 1in, or 16- or 24-track on 2in; 15in/s; frequency response ±2dB 30Hz to 17kHz; full logic interlock but no motion sensing; 2-head configuration (erase plus record/replay/sync); comprehensive remote.

CB ELECTRONICS (UK)
CB Electronics Ltd, 10 Fitzroy Crescent, Woodley, Berks RG5 4EU. Phone: 0734 694512.

400 Series: 16-, 24- or 32-track on 1 or 2in; 15/20/30in/s; frequency response ±2dB 20Hz to 20kHz; NAB/DIN/AES EQ; separate sync amp; phase correction master bias; silent gapless drop-in; noise gate on every channel; servo capstan; bi-directional servo on spool motors; 4-cue position autolocate with search and repeat; remote control unit; and Dolby A. Utilises Studer *A80* transport.

IEM (USA)
International Electro-Magnetics Inc, Eric Drive and Cornell Avenue, Palatine, Illinois 60067. Phone: (312) 358-4622.

1000 Series: 16- or 24-track on 2in; 7½/15/30in/s; varispeed 7½ to 30in/s; frequency response ±2dB 30Hz to 15kHz overall; crystal controlled servo capstan; servo-controlled spool motors; plug-in headblocks; accepts 14in reels.

ITAM (UK)
Industrial Tape Application Ltd, 1-7 Harewood Avenue, Marylebone Road, London NW1. Phone: 01-724 2497/7368. Telex: 21879.

1610: 16-track on 1in; 7½/15/30in/s; ±50% varispeed; frequency response ±2dB 30Hz to 22kHz; plug-in headblock with rotating tape guides; modular plug-in electronics; remote control; optional dbx.

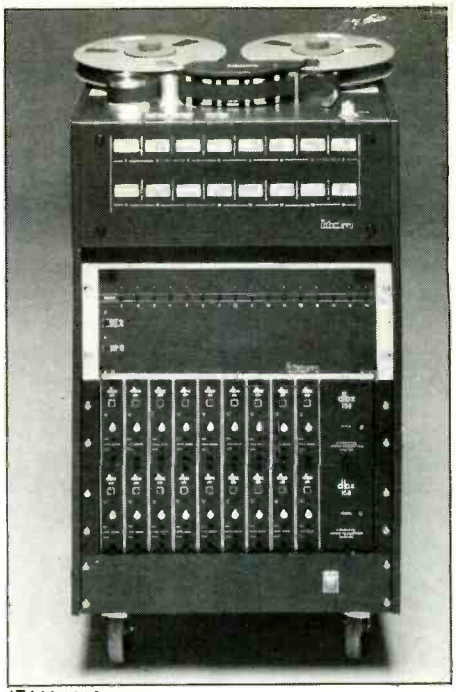
LYREC (Denmark)
Lyrec Manufacturing A/S, Hollandsvej 12, DK-2800 Lyngby. Phone: 02 87.63.22. Telex: 37568.
UK: Lyrec (UK) Ltd, 19 Erncroft Way, Twickenham, Middx TW 1 1DA. Phone: 01-891 2022.
USA: Rupert Neve Inc, Berkshire Industrial Park, Bethel, Connecticut 06801. Phone: (203) 744-6230. Telex: 969638.

TR532: 16- or 24-track on 2in; 15/30in/s; frequency response ±1dB 60Hz to 18kHz at 30in/s (record/repro); DC servo direct-drive capstan; search-to-cue and 7½ to 60in/s varispeed; full selsync plus 'aux sync' on all tracks; servo-controlled winding tape tension with adjustable winding speed limit; swivel-mounted transport; interchangeable headblocks; optional audio and tape controller; positive/negative tape timer; varispeed with speed read out; shuttle mode between two positions; playtime computing for shuttle distance.

MARK LEVINSON (USA)
Mark Levinson Audio Systems, 55 Circular Avenue, Hamden, Connecticut 06514. Phone: (203) 281-6333. Telex: 966405.
UK: Harman (Audio) UK Ltd, Mill Street, Slough SL2 5DD. Phone: 0753 76911. Telex: 849069.

ML5 Recording System: comprises *ML5* recorder, *LNP2* preamp, Bruel & Kjaer mic system. *ML5* available in various configurations including 24-track; 15/30in/s; frequency response ±0.5dB 125Hz to 20kHz; NAB or IEC EQ; uses Studer transport.

MCI (USA)
MCI Inc, 1400 W Commercial Blvd, Fort Lauderdale, Florida 33309. Phone: (305) 491-0825. Telex: 514362.



ITAM 1610

UK: MCI (Professional Studio Equipment) Ltd, MCI House, 54-56 Stanhope Street, London NW1 3EX. Phone: 01-388 7867. Telex: 261116.

JH-24: 16- or 24-track on 2in; 15/30in/s; frequency response + 1.5, – 2dB 30Hz to 26kHz; DC servo-controlled *JH-114* type transport; accepts 14in reels; QUIOR circuitry; NAB/CCIR/AES selectable EQ; remote controls as standard; transformerless electronics; spot erase; accessories include autolocater with 10 memories and tape velocity indicator.

3M (USA)
3M Company, 3M Centre, St Paul, Minnesota 55101. Phone: (612) 736-9567. Telex: 297434.
UK: 3M (UK) Ltd, PO Box 1, Bracknell, Berks RG12 1JU. Phone: 0344 26726. Telex: 849371.

M79: 16- or 24-track on 2in; 7½/15in/s or 15/30in/s; frequency response + 1, – 2dB 50Hz to 15kHz; DC servo capstan and spool motors; Isoloop drive system; 3.9 to 49in/s varispeed; sync facility; Sonoplan autolocator.

OTARI (Japan)
Otari Electric Co, Otari Building, 4-29-18 Minami, Ogikubo, Suginamiku, Tokyo. Phone: 03 333-9631. Telex: 26604.
USA: Otari Corp, 2 Davis Drive, Belmont, Cal 94002. Phone: (415) 592-8311.
UK: Industrial Tape Applications Ltd, 1-7 Harewood Avenue, Marylebone Road, London NW1. Phone: 01-724 2497/7368. Telex: 21879.

MTR-90: 16- or 24-track on 2in; 15/30in/s; frequency response ±2dB 30Hz to 18kHz; ±20% varispeed; NAB/IEC/AES EQ: pinch-roller-free transport; servo-controlled motors; full remote control; motor driven head shield; electronic editing.

SOUNDCRAFT (UK)
Soundcraft Magnetics Ltd, 5-8 Great Sutton Street, London EC1V 0BX. Phone: 01-253 9878. Telex: 21198.
USA: Soundcraft USA, 20610 Manhattan Place, Suite 120, Torrance, Cal 90501. Phone: (213) 328-2595.

SCM 381-16: 16-track on 1in; 15in/s; varispeed + 15 to – 50%; frequency response + 1, – 2dB 30Hz to 20kHz; NAB EQ; removable front panel for remote control; capstan drives outside of tape; jack or multipin connectors; sync output.
SCM 762-16/SCM 762-24: 16- or 24-track on 2in; 15/30in/s; varispeed + 15 to – 50%; frequency response + 1, – 2dB 30Hz to 20kHz; NAB EQ others to order. These models are available as basic machines with a full function remote control unit, or with a variety of options including dedicated sync line output; noise reduction control outputs; interchangeable headblock; 9-position autolocator; and Varelco multiway connectors.

46 ▶

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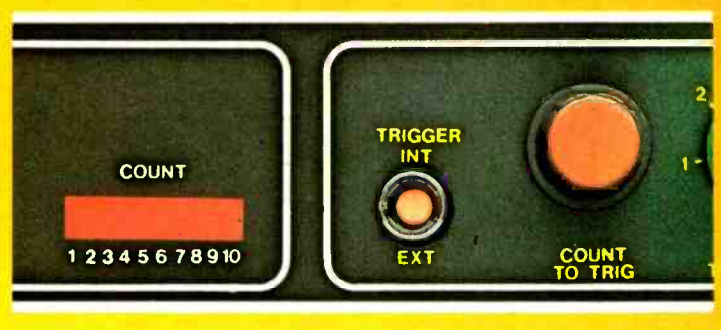

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product guide
16-track + Tape machines

STEPHENS (USA)
Stephens Electronics Inc, 3513 Pacific Avenue, Burbank, Cal 91505. Phone: (213) 842-5116.

Capstanless Multitrack: 16-, 24-, 32- or 40-track on 2in; 15/30in/s, plus 60in/s scan; capstanless tape transport system utilising servo-operated supply and take-up motors coupled with motion sensing; integral VSO system provides 10 to 80in/s varispeed; reels may be of differing sizes (and may be interchanged) as self-adjusting electronics 'guarantee proper tape tension'; optional self-contained 12V battery pack providing over four hours of recording time; sync lock for vertical sync pulse or 60Hz on tape; various remote control units and *Q-II* autolocator with 10 memory locations available as extras. Standard deck mounted in custom cabinet; portable cases available. *Model 811D* electronics (16-track) feature separate rotary channel-select switches for record/ready/sync selection. *Model 821B* (24-, 32- and 40-track) is a multiplex system with one rotary switch and separate channel LED indicators.

Stephens Electronics Model 821B-104A 40-track

STUDER (Switzerland)
Studer International AG, Althardstrasse 150, CH-8105 Regensdorf. Phone: 01 840.29.60. Telex: 58489.
UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ. Phone: 01-953 0091. Telex: 27502.
USA: Studer Revox America Inc, 1819 Broadway, Nashville, Tennessee 37203. Phone: (615) 329-9576. Telex: 554453.

A80/VU MkIII: 16- or 24-track on 2in; 7½/15in/s or 15/30in/s; frequency response ±2dB 30Hz to 18kHz; CCIR or NAB EQ: close proximity headblock; prewired for autolocator; comprehensive remote control and varispeed; full selsync on all channels; variable spooling in 'edit' mode; amp functions may be remote controlled; pivoting transport; available in standard or compact console versions. *TLS2000* tape lock system may be used to synchronise two machines.

A800: 16- or 24-track on 2in; 7½/15in/s or 15/30in/s; frequency response ±2dB 30Hz to 20kHz; microprocessor controlled; electronic or manual editing; master NAB/CCIR EQ switching; master bias setting; digital timer in realtime; zero locator; address locator; optional *Tapelock* synchroniser; varispeed; complex metering and monitoring electronically switched.

Studer A800 24-track

TEAC (Japan)
Teac Corp, 3-7-3 Naka-cho, Musashino, Tokyo. Phone: 0422 53-1111. Telex: 2822551.
UK: Harman (Audio) UK Ltd, Mill Street, Slough SL2 5DD. Phone: 0753 76911. Telex: 849069.
USA: Teac Corp of America, 7733 Telegraph Road, Montebello, Cal 90640. Phone: (213) 726-0303. Telex: 677014.

Tascam Series 85-16: 16-track on 1in; 15in/s; ±10% varispeed; frequency response ±3dB 40Hz to 18kHz; IEC EQ; servo-controlled DC motors; optional dbx noise reduction and remote control.

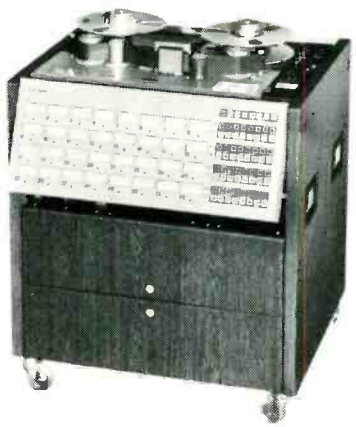
TELEFUNKEN (West Germany)
AEG-Telefunken, Postfach 2154, D-7750 Konstanz. Phone: 07531 862460. Telex: 733233.
UK: Hayden Laboratories Ltd, Hayden House, Chiltern Hill, Chalfont St Peter, Bucks SL9 9UG. Phone: 02813 88447. Telex: 849469.
USA: Gotham Audio Corp, 741 Washington Street, New York, NY 10014. Phone: (212) 741-7411.

M15A: 16-, 24- or 32-track on 2in; 7½/15in/s or 15/30in/s; frequency response ±1dB 60Hz to 15kHz; NAB/CCIR/AES switchable EQ; autolocator with nine locations; ±50% varispeed; tuned record and bias switching for gapless click-free drop-in; interchangeable headblocks and modular electronics.

TRIDENT (UK)
Trident Audio Developments Ltd, PO Box 38, Studios Road, Shepperton, Middx TW17 0QD. Phone: 09328 60241. Telex: 8813982.
USA: Trident (USA) Inc, 652 Glenbrook Road, Stamford, Connecticut 06906. Phone: (203) 357-8337.

TSR Series: 16- or 24-track on 2in; 15/30in/s; varispeed 6 to 38in/s; frequency response ±2dB 40Hz to 18kHz; accepts 14in reels; differential balanced inputs; DC servo motors; compact versatile remote control included as standard; Audio Kinetics *XT-24 Intelocator* also as standard; optional *Q-Lock;* standard 9.6kHz capstan frequency for machine synchronisation; single card electronics; interchangeable headblocks. ■

Telefunken M15A 32-track



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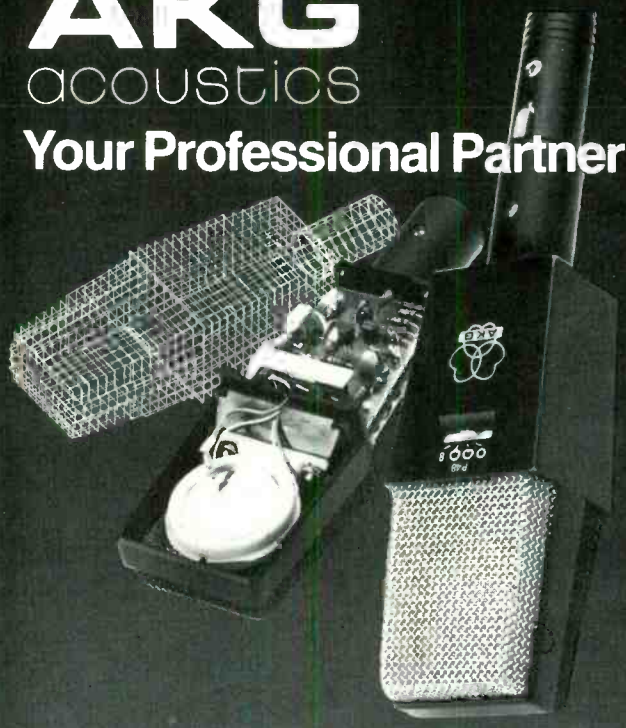

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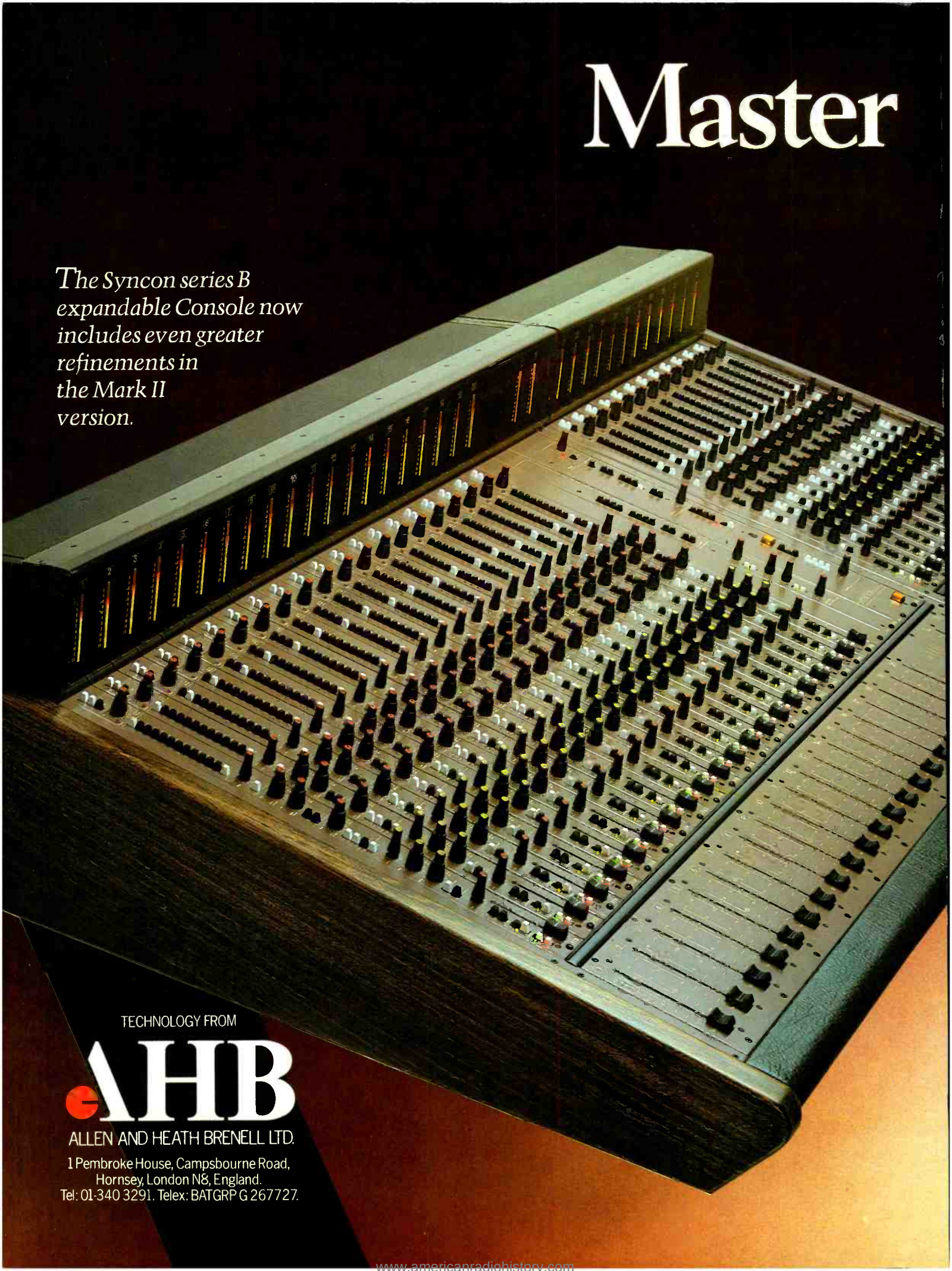

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using the Trident Series 80 and TSR

Richard Elen

Series 80 console and TSR tape machine at Herne Place

The Trident *Series 80* console and *TSR* 24-track tape recorder have generated a great deal of interest since their introduction. This article gives a brief operational assessment of their practical performance.

When I was asked recently to record an instrumental Christmas single at Herne Place Studios, near Ascot in Berkshire, one facet of the studio that interested me was the main equipment: a Trident installation comprising a *Series 80* console and a *TSR* 24-track recorder. Having seen Trident consoles at exhibitions, but not having used one later than the *Series A*, and having been interested in the design of the *TSR*, I felt that the session would provide some useful experience to pass on to readers who may be considering a medium-priced setup on this sort of scale. I make no claims to objectivity in this article; I present merely my own experiences and opinions. It should also be pointed out that the *TSR* at Herne Place at that time was an early model: since I was there a modified transport has been introduced and installed, and as a result, some of my comments on the deck are now out of date. I have included them, however, for completeness.

The Console

THE *Series 80* console was designed by Trident Audio Developments to fulfil a market need for a lower-budget console, yet one which maintained the high technical standards and flexibility associated with the *TSM*. One of the features of the console is a PCB-based jackfield, supplying full access to inputs and outputs via bantam jacks, the jackfield wiring being accomplished by wire links on the PCBs. The console is, of course, fully modular in design, there being four main types of module: a channel module, echo return/communication module, master module and monitor module. The console is distinctively finished in ash, while the panel colour is black brushed aluminium. The jackfield is to the right of the console, and in front of this is a blank panel which at Herne Place is used to mount the *TSR* remotes and autolocator.

Unlike many 'European' (*ie* non in-line) consoles, the *Series 80* is not too long for comfortable operation, even when a large number of channels are fitted. This is due primarily to the compactness of the monitor panel, and the fact that the output groups are in the form of short-throw faders mounted in two banks to the right of the main faders, beneath the monitor panel. Group faders this size are quite sufficient for normal operation.

Channels

Throughout the console, attention has been paid to ways of making the design cost-effective, notably in the choice of switches. Self-indicating press-switches of the 'Shadow' type, with brightly coloured discs obscured by shutters until the button is depressed, are very much in evidence, notably in the track routing section of the main channel module, where 24 of them, plus one for remix, are used. They also figure prominently in the master module, for selecting sources for example. I have no objection to this type of switch, although some may feel that they are a little 'cheap', but it must be remembered that 30 or 40-odd channels-worth of 24 conventional switches, LEDs and all, can add up to a remarkable amount of money. Needless to say, they all performed correctly, and the bright colours were visible even in normal (low) studio control room lighting. Beneath the pushbutton routing is a panpot, which enables panning between odd and even destinations.

While cost-effectiveness has been borne in mind, it has not been at the expense of facilities. The input selection section of the channel is as

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flexible as any I have seen, a notable useful control being a ± 10dB line input gain trim control, in addition to phase reverse pushbutton, mic/line pushbutton and 0 to 60dB calibrated mic gain control.

Next in line is the equaliser section. Trident have made quite a name for themselves, particularly in the US, and a good deal of this is a result of their equaliser design. While most of the system's effectiveness is a matter for the ears, the facilities provided show some good design work. A high frequency section offers ±15dB at 8 or 12kHz: a rather unusual facility, but one which can be very useful. The two frequencies are selected by a large white push-button labelled 'HI', the 8kHz range being selected when the button is depressed. Although 10kHz alone is more usually found, a slightly higher frequency is very useful, particularly for brightening up vocals (and to give the cutting room's top limiter something to do?). This is followed by two overlapping sweep midrange sections, offering ±15dB at 1 to 15kHz and 100 to 1,500Hz. The two frequency ranges and knob calibrations are such that the positions on both knobs are identically marked for a given frequency on the lower mid, and ten times that on the high mid. This type of consistency makes one feel comfortable.

The bass end again has two push-button-selected frequencies, 120Hz and 60Hz. On a normal, old-fashioned switched equaliser I would find this is a little sparse in terms of frequency options; however, the fact that the low mid goes down to 100Hz means that there is quite enough flexibility, although some schools of thought suggest that a sweep bass end is something nice to have, and that only one sweep midrange is necessary. However, equalisers more than almost anything in the studio apart from monitoring amps and speakers are subjective. One of the consoles I was brought up on had such horrible EQ (in about three horrible bands) that it taught me more about creative microphone technique and 'Why Nobody Really Needs EQ Anyway' than anything else. The result is that I jump up and down with glee when confronted with an EQ which actually sounds like you could use it for something (and then leave it switched out throughout the session!) . . . at which point it is worth noting that the *Series 80* has an EQ in/out switch with one of the few LED indicators on the console. Not only that, it does *not* go pop or bang when you push it. Above the in/out button is a bass rolloff which gives a respectable 12dB/octave from 50Hz. Two gold stars go to Trident for *not* labelling it 'HPF' to confuse everyone but communications engineers: instead they have engraved the button with a graphic which explains it far better and would be understood by Japanese engineers as well as English ones.

Next we come to a comprehensive aux send section, featuring three mono sends and one stereo (labelled 4/5) with panpot, all selectable pre/post. The channel module is completed by a large red mute button and LED, plus solo-in-place (which brings up all the other mute LEDs when pressed) and a programmable mute button ('auto mute') which enables all selected channels to be cut by pressing a single button in the master module: useful. In addition to the solo facility we also have a centre-biased 3-way toggle switch which offers PFL in one direction and AFL in the other. These, of course, do not interrupt the signal through the console as the solo button does.

Echo returns

In the echo return/communications module, we find four identical echo returns, each compactly laid out, with 50Hz and 10kHz EQ (both controls ± 15dB), panpot, AFL/PFL and mute buttons. The returns normally route to the mixdown buss but may be sent instead to the monitors with a 'mon' button. The return may also be sent to the stereo foldback (4/5) via the 'aux' button. Level control for the return is by means of a rather small red knob (we will see these again later). The aux sends on the channels are green knobs of the same size, and I am afraid that I find these a bit of a nuisance. Unfortunately, I am quite sure that there is no solution to this. There is a great deal here to get into a small space, and if one of the aux sends on each channel was made a small fader and the echo returns were also faders, there would not really be the room for them, and the price would be too much. There is a possible partial solution to this, which we'll come back to later. It is simply that I find small-ish knobs of this type a little too coarse for fine work. I would much rather have a fader, if only a small one. Such is life. Beneath the echo returns is a pretty conventional talkback section with mic; slate, aux and studio levels; and appropriate buttons, again of the 'Shadow' type.

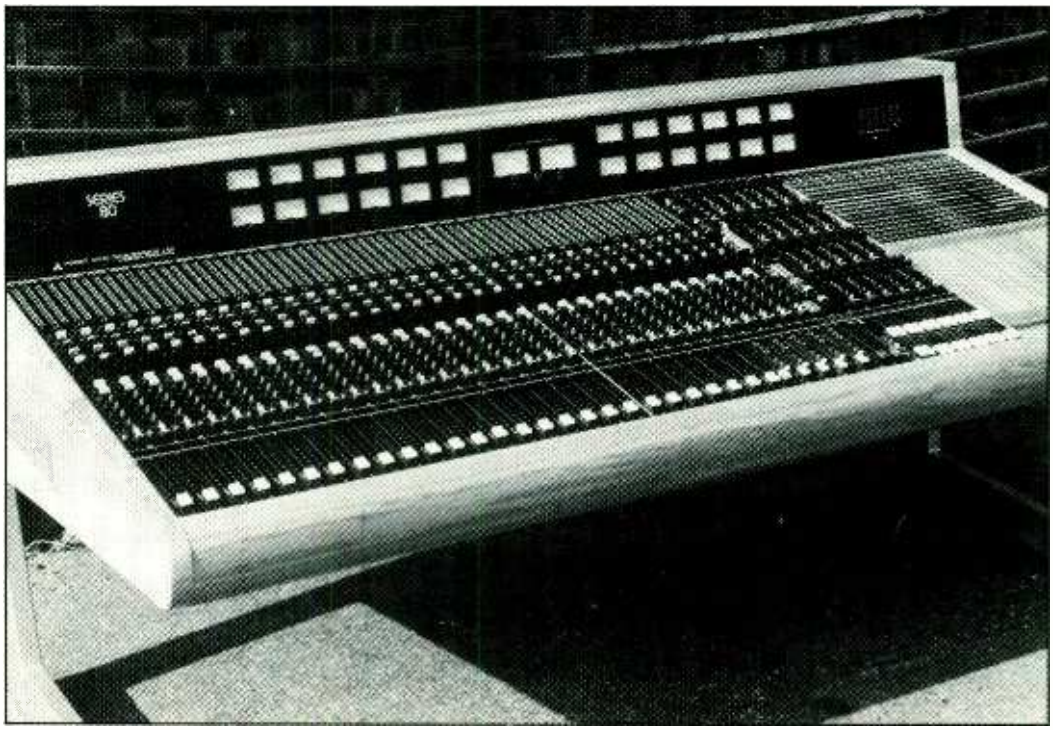
Master module

The master module contains the five aux send masters, with their own solo buttons (they also have LED-bar meters to the right of the meter penthouse). Beneath these is the oscillator, giving 20, 50, 70, 100, 150 and 200Hz settings on a rotary switch, plus x1, x10 and x100 push-buttons. On/off and slate push-buttons are also fitted, along with a level knob. A full range of studio playback options are fitted on the next panel, with level control and mute button. Then there is the PFL master level control and the auto-mute master button. Finally, the module contains control room source selection buttons and mono compatibility check buttons, and the main console select pushbuttons. These latter are illuminated and have a number of primary functions. 'Remix' overrides any other monitor selection to monitor the output of the stereo mix buss, while 'Mute' mutes the monitors. 'O/Dub', 'Tape' and 'Mixer' buttons operate in conjunction with the monitor channels' overdub button to provide a number of monitoring options. When the 'Mixer' button is pressed, all the monitor sections pick up their respective console groups; depressing 'Tape' sets the monitor sections to pick up the multitrack outputs. When 'O/Dub' is pressed, however, the monitor sections pick up the tape outputs unless their individual overdub buttons are depressed, when they will pick up line in. The 'meter couple' button on the main module enables the metering to follow the overdub mode selection made on the monitor panel. Each monitor module is supplied with pre and post aux sends (all five), a panpot, a 'meter' button, to enable the metering to read mixer or tape, mute button and the overdub button with associated LED. There is also the level control, in the form of a small red knob whose size has already been described. Again, I found this rather too small and a little coarse in action, but you can get used to the degree of care required with all these level control knobs with time, if you are prepared to think a little about how far to twiddle them.

Knobs and faders

Beneath the modules are the main channel faders, the positions under the auxiliary and master modules being taken by stereo buss and monitor level main faders. Under the monitor panel are two banks of 12 short-throw group faders. The whole system works very well, and the design manages to pack a great deal of sophistication into a small space. The highest 'knob density'

Series 80



52 ▶

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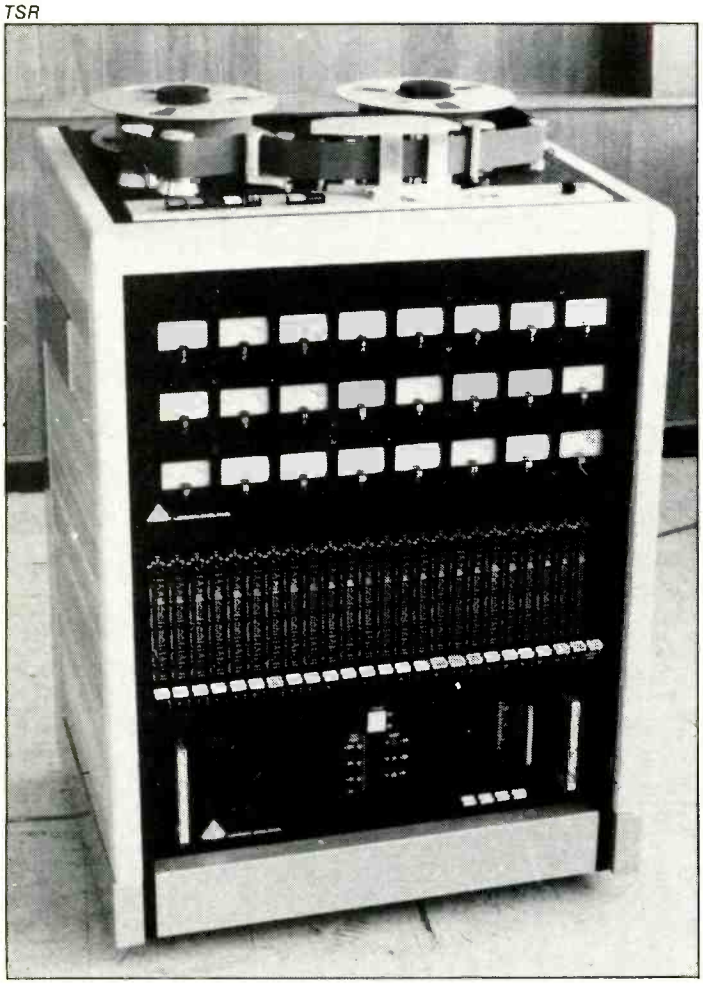
probably occurs among the aux send controls on the monitor modules, where five knobs are packed into a very tight space, yet the distance between each knob is enough for a normal finger not to get trapped when operating them, unlike some consoles.

My only niggle with the console is with respect to the method of level setting in a number of places. Again, this is very much a matter of opinion, but I do feel that at least one aux send per channel should have a short-throw fader (although, as already noted, there isn't the room for it). I am also not a fan of a main monitor level fader. I have always tended to prefer the rotary switch type, where there is a definite level 'notch' you can set and return to without a shadow of a doubt. A fader, especially one next to the main ones, is a little too variable for me. You do not have the positive switch selection that a rotary attenuator (or even multiple-detent pot!) offers: the feeling of security and knowing exactly where your monitor levels are. Again, I like faders on an echo return, rather than a coarse little knob. Indeed, I would rather have that monitor master level fader turn into a stereo echo return fader, with large click-stop knob handling the monitor level. In a similar vein, I find little need for precision setting of group levels beyond a handful (perhaps, say, groups 1-8 should be reasonably-sized faders), the rest of them tending to be left permanently at zero. Why not, then, use those small group faders as level controllers for the monitor modules, instead of the little red knobs, leaving the group faders as knobs instead? Unfortunately, in saying this, I have in fact specified another console, one which would be measurably larger in size than the *Series 80*, and considerably more expensive, no doubt. And besides, other engineers would no doubt feel differently. Console ergonomic design is almost certainly more difficult in many ways than the electronic design, and it is easy to suggest modifications off the top of one's head, oblivious to the fact that many people have thought long and hard about the subject before committing themselves to producing a console for a given market. It is almost certainly true that Trident's ergonomics in the *Series 80* offer the best compromise between features/flexibility and cost. All the features are here, a top-quality performance is also present, and the console is compact. There are bound to be ergonomic problems when so many functions are vying for so little room, and Trident have solved them here as well as anyone and better than many.

Using the console

In use, the console is very easy to understand, very few functions (if any) operating in an unexpected way or being difficult to access, the possible sole exception being the tedious exercise of having to push 30-odd remix buttons, one per channel, having expected the big, illuminated 'Remix' button on the master module to do it for you. Once again, that tedium is the price you pay (or rather *don't* pay) for a relay per channel and a remix control buss to drive them. The console sounds very clean and technically excellent. The EQ deserves the reputation it has gained, being very versatile, useful and capable of getting the best out of a sound. It is relatively easy to come to terms with, and has a difficult-to-classify character. Such things are almost impossible to describe, but if I say that I think it has a very 'English' sound, not quite as warm but cleaner than some American console EQs, I hope you'll know roughly what I mean. This sound is a characteristic of the console in general: I would expect it to excel on crisp, tight commercial rock or pop, yet there is still the capability of subtlety and musicality (this is beginning to sound like a domestic audio review: that's what happens when you try to describe something as subjective as the sound of a console or EQ!) when it's needed. For our track, an instrumental pop record featuring Linn drum machine and a large number of synthesisers, it performed impeccably—what more can one say?

TSR



The Tape Machine

THE *TSR* tape machine takes up to 14in NAB reels and is an impressive piece of equipment, once again finished in black with ash side-cheeks and trimmings. It is not the smallest 24-track machine, its dimensions being 30 × 44½ × 25in (whd) but it is a good deal more compact than many state-of-the-art recorders. The front of the machine is divided into three sections, the top section containing the VU meters, the middle section containing the channel cards—in which all the lineup controls are easily accessible—and the remaining third of the cabinet containing the power supply unit which is designed to pull out as a complete module and contains a number of LED indicators which confirm the presence of correct voltages.

The accessibility of the lineup presets on this machine is one of the best I have seen, all controls being accessible without even having to open a panel, and being situated just below the meters.

Tape transport

The tape transport has recently been updated, and the Herne Place machine at this time had one of the earliest *TSR* production models. I have not yet seen the new transport, which has been introduced over the past couple of months, but the original tape transport appears to bear a certain conceptual resemblance to machines by an earlier British manufacturer (Amity Schroeder?). The tape path is somewhat curious, tape passing from the left-hand spool via a rotating guide some distance away to the *left* of the spool centre (the distance being due to the 14in reel capability), then round another rotating guide of similar construction about 3in from and forward of the first guide. The tape passes round the outside of both of these, and then passes between two small-diameter tensioning guides, whose diameter is similar to the size of the Studer *A-80* guides which serve the same purpose. In the case of the *TSR*, these guides are fitted such that the second guide is above the pivoting shaft, the first guide being to its left. The tape then passes across a sturdy headblock with a fixed guide at each end, tape lifting pins being fitted between the heads. These are engaged by a spring-loaded solenoid, but they may be pushed back against the spring momentarily during fast wind by

54 ▶

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means of a push-in lever in front of the headblock. To the right of the headblock the tape passes between a respectably-sized capstan and floating pinch-roller, the latter bearing on the oxide surface of the tape, and then on to a small-diameter rotating guide on the right of the capstan. The total tape-path is thus quite long, primarily because of the two large left-hand guide rollers, one of which is used for tape motion sensing and counter driving.

Transport controls on the deck are in the form of coloured rectangular pushbuttons in two groups, one offering rewind/fast forward/play/stop/record and the other offering edit mode and head-shield lowering. When this latter button is used during threading (the transport senses tape presence via the tensioning guides and immediately lifts the shields, one in front of each audio head) the headshields do indeed stay down and do not attempt to chop your fingers off as you thread the tape across the heads. Certain other manufacturers could learn from this! Two speeds are featured, 15 and 30in/s, and a varispeed is also standard, coarse and fine controls being fitted to the remote unit, linked to a 7-segment LED display of tape speed in in/s. The varispeed has a remarkable range from below 7½ to a good deal above 30in/s, and is very stable.

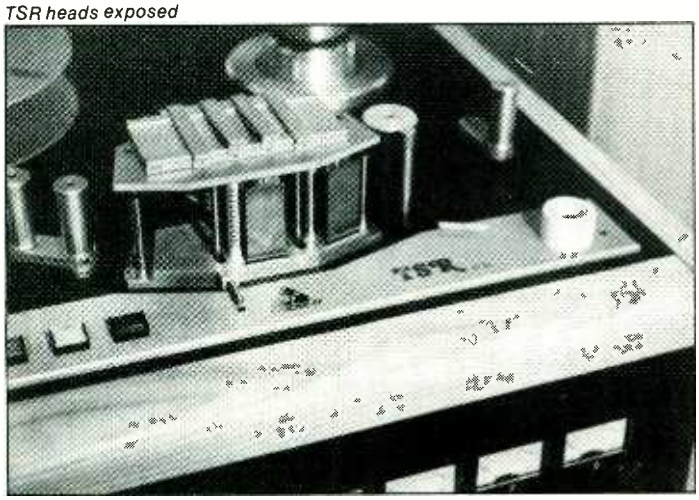
Remote unit

The machine is supplied with a comprehensive remote control unit *and* the renowned Audio Kinetics *XT-24 Intelocator* as standard, a valuable feature. On this machine there appeared to be a certain degree of tape slippage relative to the tacho tape guide resulting in a drifting of the position counter during a session. This rather tedious problem has been cleared up on the new transport. During winding, the high-speed rotation of the small-diameter tensioning guides makes a most satisfying whizzing noise, misleading you into thinking that the *TSR* is rewinding at a good few hundred miles/hour whereas in fact the wind speed, while very respectable (about 1½mins for a normal 10½in reel) is not quite as fast as it sounds, especially if you're working at 30in/s as I was. In fact, one of the slight drawbacks of this particular machine (now corrected) was that in general it was a little noisy mechanically while the tape was moving. One minor problem, again almost certainly a peculiarity of this early transport version, was that from time to time the machine would throw a small loop, when going into stop mode. This may have been misadjustment, but the result was that a loop too small to see from a distance was created, one which was sufficient, however, to take tension off the tensioning guides, thus fooling the recorder into thinking that no tape was present. When this occurred, the LED indicators next to the transport buttons on the *Intelocator* would all illuminate, and the machine would not respond to commands, necessitating physical retensioning of the tape at the machine to resume work. This problem has now been cleared up.

TSR Remote

The remote control unit is compact yet very easy to use, consisting of 24 momentary buttons with red, yellow and green LEDs above each indicating ready (flashing)/record (steady), sync and safe respectively. Four master buttons (to the bottom left of the remote) place the whole machine in safe or sync, a third button with two associated LEDs determining the function of the yellow track buttons, such that two modes are available. In one mode the yellow buttons cycle the track between sync and safe, and in the other they cycle between sync and ready. The two LEDs next to this master button indicate the cycling which will occur on successive depressions of the track select buttons. One disadvantage with this otherwise clever feature is that the yellow track buttons are very light in action and do not appear to be as 'debounced' as one would like: it was sometimes possible to press a track button and have it flip from, say, sync into ready and back again with a single depression of the button. This was worse on some tracks than others and needed a bit of getting used to. I could have done with a little more positive action here. A fourth and final status master button is labelled 'inhibit'. To the right of these buttons are four further momentary buttons labelled 'monitor status'. These are most useful, and indicate that a good deal of thought has been done on their operation. Three of the buttons lock the monitor function into input, mute or repro, while the fourth button, 'clear', causes the monitoring to follow the track selection and transport function such that sync is output during play, while any track in ready or record is set to input in any other transport mode. This effectively obviates the use of the 'overdub' button on the *Series 80,* as monitor switching is performed automatically by the machine. This is an excellent function and makes rapid overdubbing very simple and easy. The remote is completed by a duplicate set of main transport controls.

TSR heads exposed



Operating the TSR

In operation, the first thing I noticed was that on power-up, the machine rather disconcertingly places all channels in ready: this doesn't really matter, as you are hardly likely to go straight into record after power-up, but I would have thought that it would be possible for the machine to default to a rather safer condition on power-up! It appeared to be a little difficult on this machine to get the lineup to look totally satisfactory at 30in/s (I didn't try 15in/s) but this appears to be a quirk of this particular, rather early unit. That being said, I was pleased to note that the sound of the machine was excellent and one of the best I have encountered, despite rather odd meter readings on tone; I don't know why this should be! Crosstalk and distortion were both excellent, and although the noise level appeared a little higher than I would normally expect from 30in/s with no noise reduction, this was almost certainly due to other factors. One annoying factor apart from the touchiness of the track select buttons was the fact that the machine objected to being switched from 30in/s to 15in/s without powering down: unless this was done, a number of tracks appeared to go unstable, issuing high-pitched tones at about −20dB. I imagine that this was due to some kind of break-before-make circuitry in the speed switching and I understand from Trident that this has now been corrected. Switching up from 15 to 30in/s did not reveal this problem. I am always wary of excessive power cycling on expensive lumps of logic, knowing how easy it is to damage logic circuitry through switching transients on the power rails, so I did not test this effect very frequently.

Summary

Overall, I was most pleased with the performance of this Trident package, both console and tape machine having an excellent, clean and undistorted sound. I would recommend this package to the studio which is considering upgrading without excessive expenditure, or to a new studio where limited space and budget are a consideration. From my experiences at Herne Place with this equipment, I can confidently say that Eddie Hardin will be seeing me again for some further sessions in the not too distant future. ■

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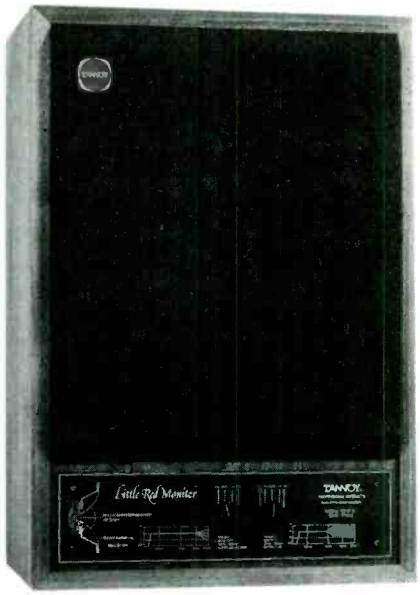

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Studiofile:1

Playground Studio, London

The success of Playground Studio in London's Camden Town proves the old maxim that there is always an exception to every rule, especially in the music industry. At a time when many studios have had to put all thoughts of expansion on the shelf and are offering studio time at rates that would hardly seem to cover running costs, along come Mike Hedges and Mike Jay who open a studio which is booked and operating 23 hours a day within weeks of opening.

Mike Hedges has built up a considerable reputation over the past two or three years as a producer and engineer working with new and new wave bands. Previously working out of Morgan Studios, Mike has picked up substantial credits as a result of his work with the Cure, the Passions, the Associates and others. Together with his business partner, Playground's managing director Mike Jay, Mike has opened a studio intended to attract new young bands similar to those he has been working with over the past three years. The combination of the individuality of the studio and Mike Hedges' prestigious talents at the recording console has attracted the Associates, the Cure, the Skids, Siouxsie and the Banshees, Exotic Panders, Graham Bonnet, Bauhaus and others to Playground.

Studio

The main studio room features a striking maple floor throughout its 84 square metres. The dominant colour of the suedette-faced walls and acoustic panels is blue, while the ceiling is relatively low and is covered with pine slatting. With so much reflective surface the room is obviously very live and bright. Mike (Hedges) explained "That was the idea, to make the studio as live as possible. It's not particularly ambient so much as live. There's no boom or extraneous noise. The room is actually flat all the way up to 7kHz. From 7kHz upwards it's got quite a boost because of the slats in the ceiling resonating, it is actually hollow behind them and that boosts the high frequencies."

And how successful is the acoustical environment in practical terms on a session? "It's the easiest thing in the world to get a drum or guitar sound, anything that has a naturally bright sound anyway. You put a drum kit up in the room, put two mics up and suddenly you've got this hard clean drum sound."

Mike had a pretty good idea of how he wanted the studio to turn out both acoustically and visually and is full of praise for Andy Munro of Turnkey Two who accepted the challenge of meeting the somewhat different requirements. There is nothing random about the acoustics of the studio at all. Skilful use of sound traps, acoustic panels, resonating panels and surfaces has meant that Mike Hedges' specific requirements have been met exactly. When a section of the studio is all that is required for a particular instrument or when separation is needed, custom built screens are brought into use. They are constructed to such a height as to butt up against the existing ceiling load bearing beams and finish close to the ground. One corner of the studio has a trap lined up to 80Hz and another lined up to 100Hz to tighten up the bottom end and provide an area for drums.

A 7 square metre area which lies between the studio and control room can be used as an isolation area, this being even brighter than the main studio as two of its sides are formed by sliding glass doors.

The control room is a slightly irregular nine-sided shape with a floor space of 20 square metres. It is more live than normal control rooms with a delay time of 0.35 to 0.4s. The live ceiling and floor are compensated for by acoustic treatment of the walls.

Equipment

Mike's choice of equipment was as a result of his own experience in different studios as an engineer and producer. He went for a Harrison *24-Series* 24/24 master recording/remix console mainly because he finds it to have a very clean sound, but also because he can comfortably mix single-handed on it. The Studer *A80* 24-track tape machine, which is fitted with the new close proximity heads and the *B67* mixdown tape machine were chosen because of Studer's reputation for high specifications and reliability.

The monitors are UREI *813s* powered by 100W Studer power amps per side, though the control room does boost the volume somewhat. Sound processing equipment includes an Eventide *949 Harmonizer*, a Valley People rack with *Kepex* and *Gain Brain* modules, an EMT *250* digital reverb, a Delta-Lab *DL4*, a reconditioned EMT *2245* valve plate (acquired for its warm sound), Klark Teknik graphic equalisers and a pair of UREI *LA4* comp/limiters.

Microphones are 90% Neumann including *U47, KM84* and *U87* models. A number of AKG *D222* mics are used for close-miking drum kits. As with the sound processing equipment, the range of mics is still being increased as needs arise. Although the studio does not have a noise reduction system for the Studer 24-track at the moment, they do have 2-track Dolby for mastering.

Most of the studio equipment was supplied by FWO Bauch Ltd, while installation and interfacing was by Turnkey Two. **Ralph Denyer**

Playground Studio, 115-123 Bayham Street, London NW1. Phone: 01-267 7200.

58 ▶

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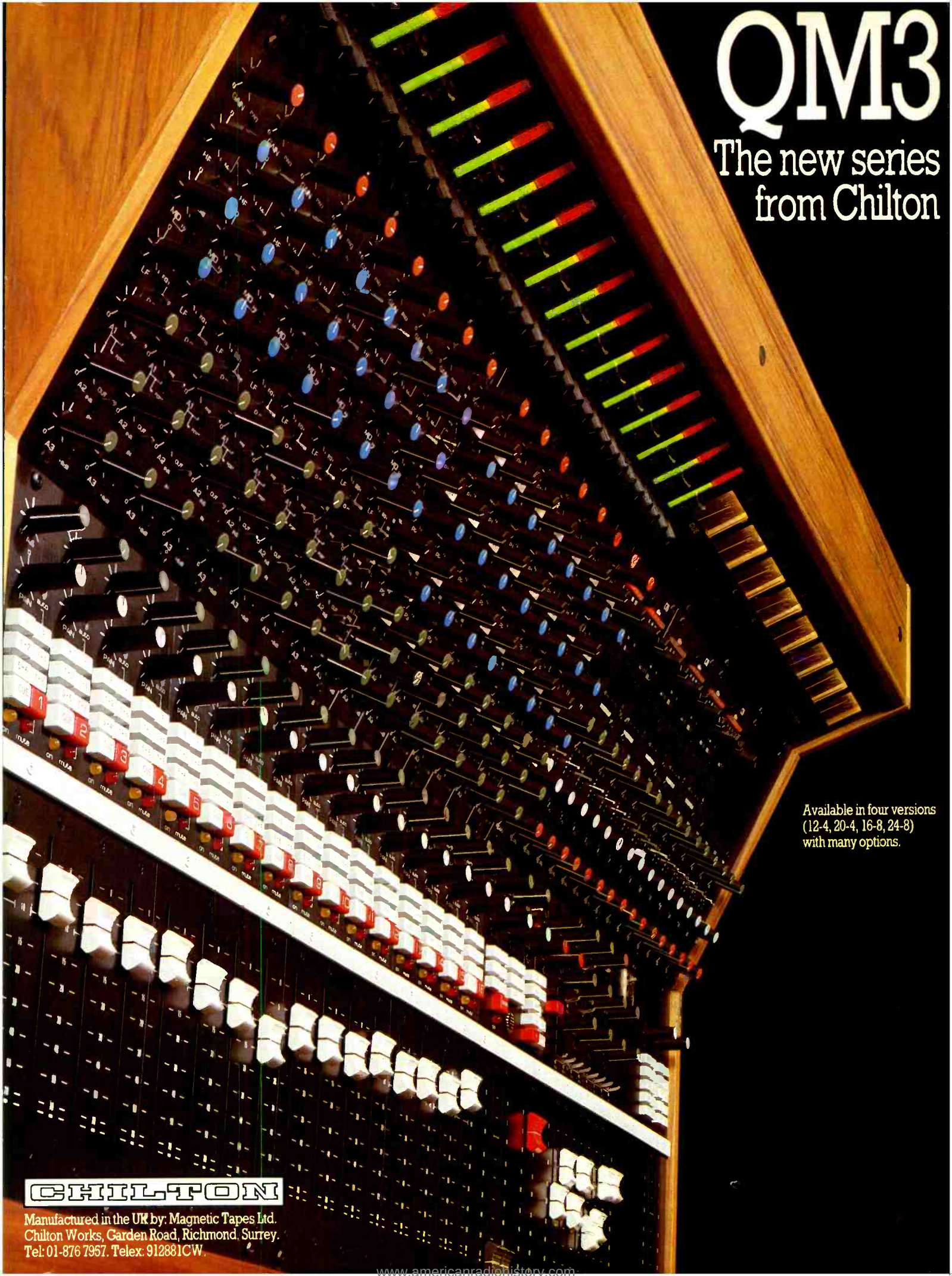

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Studiofile:2

Herne Place, Berks

Eddie Hardin is the guy who took over the keyboards seat when Stevie Winwood left the Spencer Davis Group in the mid-Sixties. He played with the band thereafter, as well as teaming up with drummer Pete York to form Hardin & York who played all over the continent.

A few years ago Eddie decided to 'settle down' in the country and bought Herne Place from Sir Anthony Meyer MP. The place is situated in Sunningdale adjacent to the old London-Southampton road (A30) and runs to about ten acres.

"When we bought the place", recalls Eddie, "it was in a really bad state, in fact we spent almost twice as much as we paid for the place to do it up—and that doesn't include the studio!"

Elegant

Herne Place is elegant, and was built in 1752 for John Norton (whose portrait still hangs in the hall). It boasts 28 rooms, masses of car park and its own basement pool room and bar. The studio is on the ground floor and is accessed from a wide drive through a large, custom built door that should accommodate anything.

The control room is air conditioned, designed by Eddie and built by local labour. It nevertheless works well and has a fairly live sound. Electrical installation was all done by Ralph Cornforth, who also did some of the work at the Marquee.

Acoustically treated walls (Rockwool) are timber framed and fronted with wood or hessian panels, the whole stretching to about 30 x 15ft.

Monitoring is via Tannoy *Buckinghams* (". . .because they were the only ones that fitted. . . "—Eddie) driven by Amcron *DC300s* and using their own crossover network. Also wall-mounted are some *Auratones* for the rough approach!

Mixing desk is courtesy of Trident and is one of the first *Series 80s* to be installed. Based on the familiar Trident layout of channels and subgroups the desk has 32 inputs selectable to 24 subgroups and the usual remix/aux/echo and foldback facilities. Autolocate (Audio Kinetics' *XT24*) for the Trident *TSR* 24-track and remotes for same and the Ampex *ATR100* 2-track are also built into the desk.

Echo is with the latest version Lexicon *224*, much liked by Eddie on vocals. Other tape-moving machinery lying around was an old Revox *A77* (Echo) and Technics cassette deck (demos).

In the auxiliary department, Eddie had a full *Scamp* system (". . .cheap and doesn't take up much room"—Eddie), dbx *165* compressors, a DeltaLab *DL4*, two Eventide *Harmonizers* and two Trident parametric EQs. The studio is adjacent to the control room, at 90° to the desk, and sports only essential acoustic treatment due to the elegance of the architecture, most separation depending on an abundance of acoustic screens which Eddie pulled out of a folded Northern studio. Roughly 30 x 20ft, the studio is equipped with Tannoys for foldback, Beyer cans and stands and an assortment of Neumann, Beyer, Shure, AKG and Sennheiser mics.

"I had always intended to build a studio as soon as I had the space/money," recounts Eddie, "and the catalyst was the Hardin & York album for Germany. Most of my ideas have been gleaned here and there since I must have worked just about everywhere. Studios that I can particularly call to mind as having influence are Kingsway, CTS/Delane Lea, Advision and Morgan but I also worked a fair amount in Los Angeles and Musicland in Munich besides regular 'biggies' like Olympic, Air, Ramport, Konk and Startling (2min up the road). When I decided to build the studio I did consider buying the Island mobile which I got to hear was for sale through Lee Packham, my ex-secretary (now at Basing Street) but having seen the truck and had a think I decided it would be better to have a fixed base."

'House' engineers at Herne Place are freelancers John Acock, who Eddie met at CTS and Lucie Austin from Kingsway.

Clients

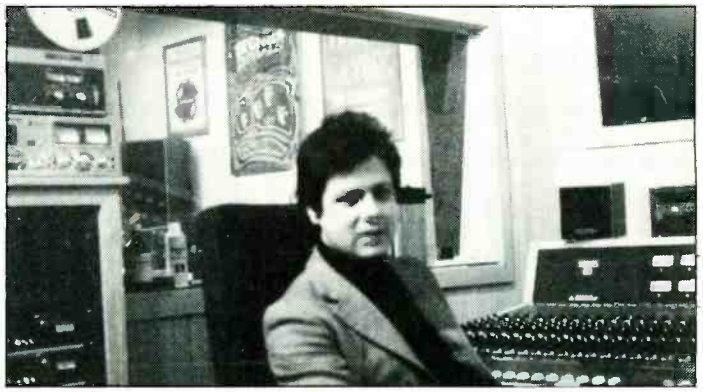
People in, have been Renaissance on their latest album, Mike Hurst, Iris Williams, Mary Hopkin, John Perry and Tony Rivers, and of course Hardin & York. Eddie is also right in the middle of putting together a solo album for Bellaphon in Germany which is on offer to UK record companies (A & R men take note). The Spencer Davis band are also prepared to reform for an album at Eddie's place if interested parties can be found.

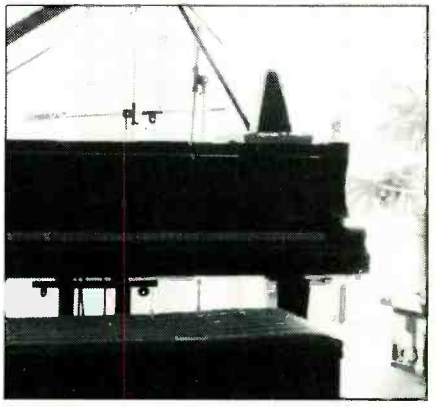
Equipment available on sessions includes ARP *2600*, Blüthner Grand, Hammond *C3* and Fender *Rhodes*. The business angle, bookings, etc, is handled by Eddie's wife Judy.

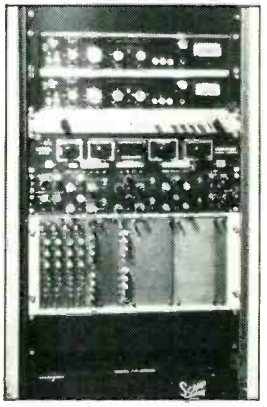
Herne Place Studios, Sunningdale, Nr Ascot, Berks, UK. Phone: Ascot 22439.

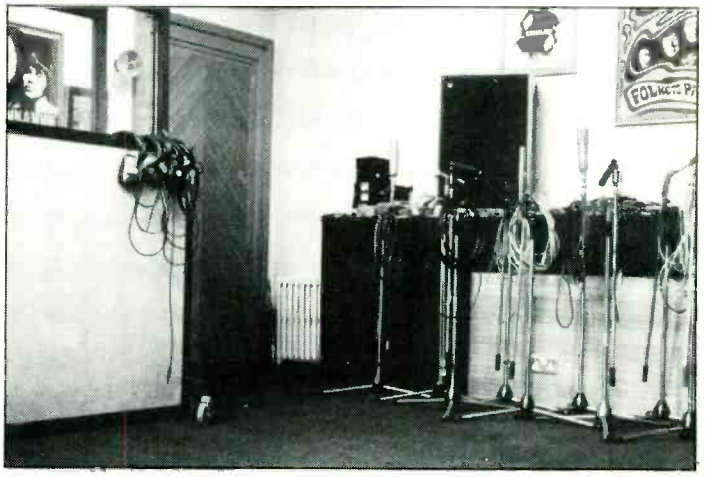
Harry Mangle

60 ▶









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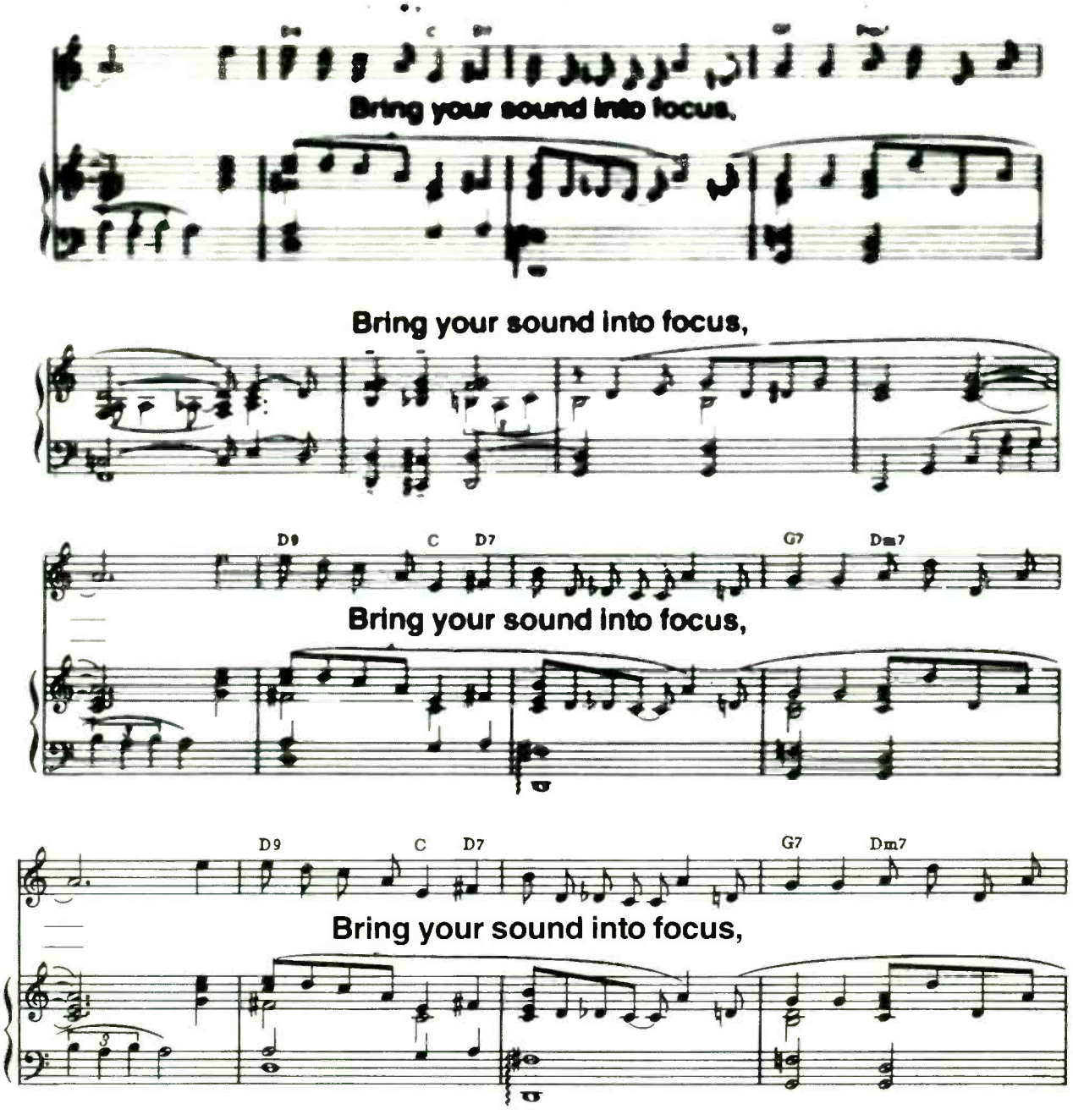

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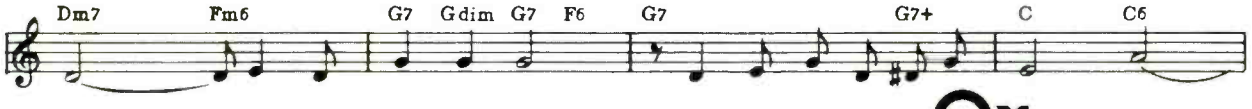

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Studiofile:3

Kingdom Sound, New York

"The North Shore of Long Island reminds a lot of the British groups of the English countryside," says Clay Hutchinson, chief engineer and co-owner of Kingdom Sound Studios. Maybe that's the reason why such transplanted rock stars as Ritchie Blackmore, Robin Gibb, and the late John Lennon have purchased homes among the rolling hills and sheltered harbours of the area. But it's not the only reason why a studio here should do as well as Kingdom has over the last five years.

The name Kingdom Sound Studios is something of a misnomer (although it is soon to be otherwise—more on that anon) in that there is but one studio, albeit a very well-equipped one. Its location, 25 miles due east of midtown Manhattan, is no doubt an attraction for those artists, both native and imported, who live in the area and don't want to put up with the rigours of commuting to the 'Big Apple'.

Kingdom is situated on the ground floor of a large industrial park. "The place gets very quiet after 5pm," says Hutchinson. "I usually don't even start working until three in the afternoon, so we may as well be out in the middle of nowhere." Of course, being in the middle of the business district of what was, not so long ago, strictly a bedroom community, does help when it comes to finding food and lodging for clients. "During the blizzard of '78," Hutchinson recalls, "we were stranded here for five days. There was 6ft of snow in the parking lot, and we had to keep shovelling the door out so it wouldn't freeze shut. We were working on an album for a Boston band called DMZ (Turtles and Frank Zappa alumni) with Flo and Eddie producing. We'd just go to sleep anywhere, any time, and get up and record when we felt like it. Come to think of it, it wasn't much different from a lot of sessions we do here. We lived on food and beer from the sandwich shop across the street. It was like a picnic, except it was kind of cold."

The makeshift sleeping accommodations notwithstanding (transient clients usually stay at places like Burt Bacharach's East Norwich Inn nearby), the studio boasts an impressive array of equipment. The console is a Harrison *4032C* with Allison *65K* automation, hooked into a 3M *M79* 24-track tape machine. There are Ampex, Studer, and 3M 2-track decks, and Dolby throughout. The entire studio is wired for quad, which can easily be accommodated by hanging a second pair of Altec *Big Reds*. Reverb devices abound: there are AKG *BX-10* and *BX-20*, EMT *140* plate and *240 Gold Foil*, and a Lexicon *224* digital.

Clay Hutchinson at the Harrison console . . .

. . . with effects racks

The outboard rack has three Eventide *Harmonizers*, all of different vintages, a Marshall *Time Modulator*, two Lexicon *Prime Times*, UREI *LA-3A* and *LA-4* comp/limiters, two stereo *Compexes*, *Kepexes*, dbx processing, and a host of other toys too numerous to mention. There are no less than 24 API *560* 10-band equalisers, and four Orban parametrics. The control room was designed with the help of Bob Halsall and Bob Valicente of New York's Media Sound.

There is the usual complement of guitars, percussion instruments and amps, as well as a full set of Rogers drums. Keyboards include a custom-modified Rhodes *88*, a Hammond *B3*, a rebuilt 1915 Steinway 6ft grand piano, a *Clavinet*, and a Baldwin electric harpsichord. Kingdom boasts over 100 mics in its collection. "Nothing that no other place has," admits Hutchinson, but a fine array of Neumanns, Electro-Voices, Shures, etc.

There is also a well-equipped video game and cassette machine lounge with plenty of vending machines for refreshments, and a bathroom complete with shower. "When we first started to set the place up in 1975," Hutchinson recalls, "we were working around the clock. For 18 months, I'd only get home on weekends, so we foresaw the need for a shower. It came in handy during the blizzard."

The studio opened on July 4, 1976, while the rest of metropolitan New York was watching the sailing ships creep up the Hudson River to celebrate the United States' 200th anniversary of independence. "We didn't really plan it to turn out that way," says Hutchinson. "It's just that we started construction on April Fools' Day, and finished the night of July 3rd." The room was originally set up for 16-track, with an Ampex *MM-1100* deck and an old RCA console bought from a studio in Nashville to handle the chores. Hutchinson and his partner, Bill Civitella, had been playing in Gloria Gaynor's band, and decided it was time to open their own place. The first projects were all self-produced disco sides. Says Hutchinson, "We were doing disco like it was going out of style, and sure enough it did!

"When we first started, we knew most of the working musicians on Long Island, and so it wasn't hard to get them to come in just by word of mouth. Meanwhile, we were putting every penny we made back into the studio." In November 1977, the 24-track equipment was installed, and not long thereafter, Ritchie Blackmore and his band Rainbow, came in for a look. They stayed to produce two albums, one of which went gold. Meanwhile, Blue Oyster Cult, from nearby Oyster Bay, produced their *Cultosaurus Erectus* album at Kingdom, and then mixed the soundtrack for their *Black and Blue* concert film, in quad.

"Foghat did some albums here as well," says Hutchinson, "when we were 16-track. Then they built their own studio farther out on the island, but they still come here when their place is booked out.

"One of the strangest days of my life was when Robin Gibb came in," he laughs. "I got a call from Bob Koske, who I was to find out later was Gibb's personal manager, who said he wanted to look at the place with his client, but he wouldn't tell me who that was. He showed up the next day in this Jeep Cherokee, with the big wheels, and steps out and introduces himself, then says 'this is Robin.' I said to him, 'you look very familiar. Have you ever done anything here before?' it wasn't until I got back into the office and saw his picture on the cover of the *Billboard* talent directory lying on my desk that I realised who I was talking to!"

Gibb produced the *Sunrise* album for Jimmy Ruffin, which went to number ten on the *Billboard* charts. "The Bee Gees have their own studio in Florida," Hutchinson says, "but when Robin is around here, he'll come in and do little projects with us."

Other projects recorded at Kingdom have included several albums by veteran producer Roy Halee, who also lives nearby, and a series of records by Meco Monardo, creator of the (in)famous *"Star Wars* Disco". Monardo, Hutchinson, and Civitella are the three partners in a production company known as the North Shore Music Group, and Hutchinson expects to have three or four albums, by groups that they are producing, out by the end of the year.

Kingdom Sound has managed to thrive without relying on the bread-and-butter of advertising work. "90% of what we do here is music for records," says Hutchinson, "and the advertising stuff that we do take on, we produce ourselves."

Clay Hutchinson cited the continued influx of international recording stars to the area as one reason that business is good. "We've even had a couple of calls from bands who want us to help them look for real estate," he claims.

Bookings have, in fact, been so steady, that Kingdom is now planning to start building another room, possibly in the same building, before the year's end. "We're thinking of getting a Solid State Logic system," he says, "but it is a lot of money. We have to decide whether it's worthwhile to spend that much on a calling card to bring in those types of clients that would want it. We might go with Neve, or we may just do the second room exactly like the first."

Paul D Lehrman

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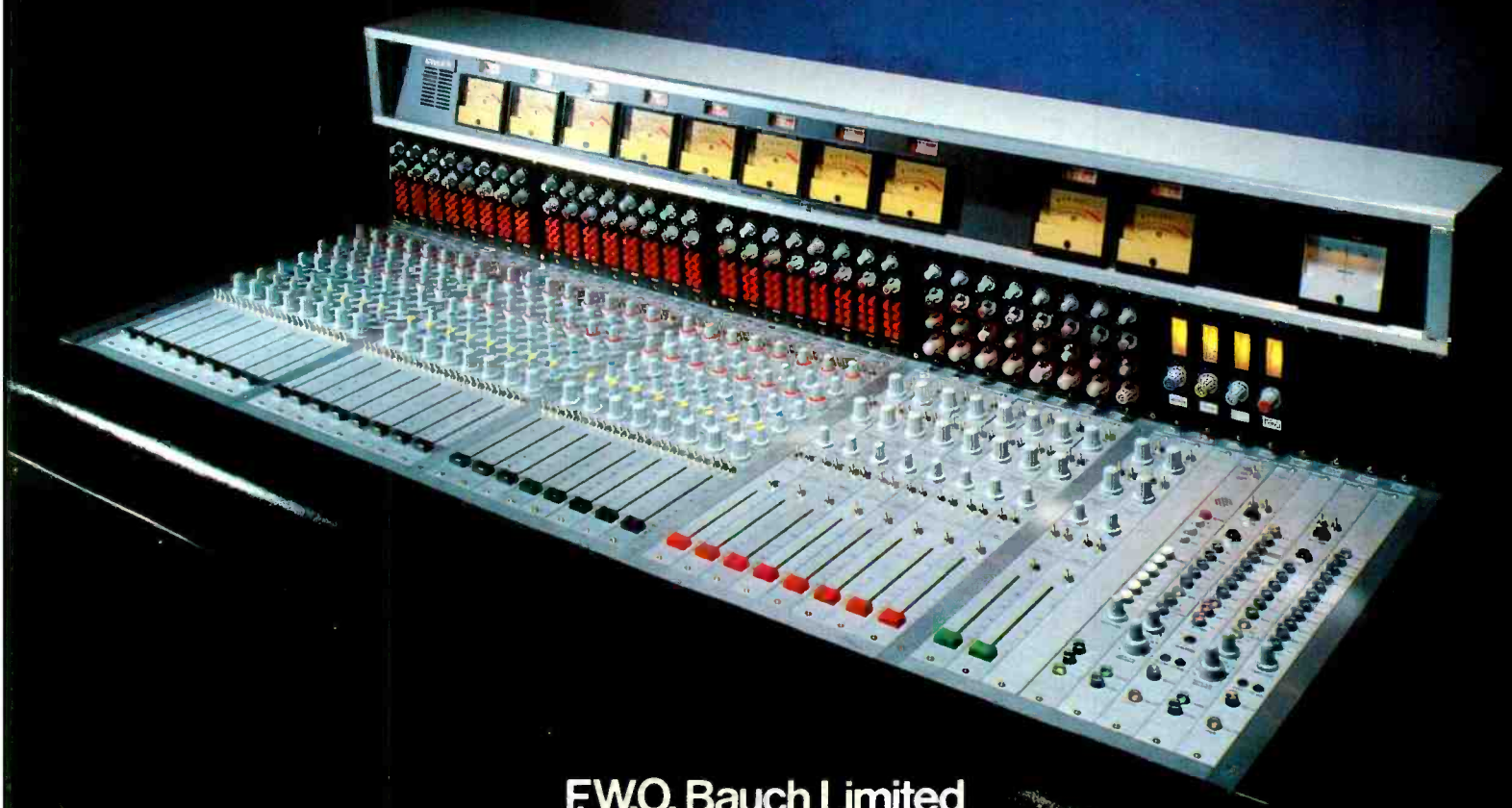

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Martin Rushent tells all

About 13 years ago I started in the recording business. From '66 I was in a band that didn't get anywhere. Through this I came into contact with the recording scene. The band had made a few demos and I found I really enjoyed making records. When I realised that I was the only guy in the band that had the desire to do it seriously, I had to either dump the rest of them or start a new band. I just enjoyed recording more than anything else. Besides I always read 'Producer' on records and had the idea in my head that he was a guy that did very little work for loads of money, which really appealed to me, so I decided I would become a record producer.

I ANNOUNCED to the world that I was a 'record producer' and no one was interested so I thought I had better start somewhere else. So I wrote around for jobs to all the studios. Olympic and Advision were the only people who actually replied to me. I went for an interview with Roger Cameron, who's still the boss there, and the next week I heard I'd got the job. Then I got there and found I was the wrong bloke but they said we'll give you a week's trial anyway. Apparently they meant to give it to somebody else! It's a well-known story. You could say it was a case of the wrong place at the right time. I was a tape op there for about a year, and then I started to engineer all the old rubbish that none of the other engineers would touch.

Equipment-wise, they had a Scully, I think it was a 4-track when I joined. This was about 1968. It was down in Bond Street and they'd just got their 4-track. Before that it had been stereo and tape to tape. They got a Scully 8-track pretty rapidly after that which was the first one in the country and then after that we moved to the current place in Gosfield Street, and were the first 16-track. The desk was a Dag Felner special.

Dag had come over from Mayfair Studios in South Moulton Street (where he built the desk too, I think) and joined Advision roughly when they were starting up the Feldon Audio scene. His 'special' was really advanced for its time, it was an incredible desk. Anyway, I did quite well once I started engineering proper; I was lucky, I did alright and there were a few fortuitous circumstances. I was working with Eddie Offord primarily as his assistant doing Brian Auger and Julie Driscoll and all the Marmalade records. Then I moved on and had Yes, ELP and Gentle Giant. I did a lot of T-Rex stuff there with Tony Visconti producing too. He's a great producer and I learned a lot from him because I used to engineer a lot for him in those early days. He's also been fortunate in as much as he's had one or two artists who really have been enormous, like Bowie.

The job at Advision lasted about six years and then I became a freelance engineer. The decision to freelance was taken when I realised I was never going to be a millionaire working for Advision. They paid me well, but that's where it stopped, plus the fact that there were people who wanted me to work for them but not at Advision, because they wanted a different sound. Some studios are very open to their engineers moving around the place—they consider that to be good for them. If they can build up their engineers' names that reflects on the studio as a whole, but Advision didn't really have that policy and it was always a big fight to be able to work for a few days outside. Even then they looked on it very badly and I felt that that was restricting me. I thought it would be better if I was my own boss and could accept or reject whatever I wanted. Also I found that doing TV jingles and stuff like that, which is part of an engineer's routine work in a studio such as Advision, was soul destroying. I couldn't cope with it. I was making a bad job of it because I didn't like it. I felt I'd rather not do something than do it badly.

So I built a small studio in partnership with another guy—an 8-track studio which was very successful. It was ever so small—the whole place including the control room was no bigger than 25ft square, but we had a hit out of there—got to number 8 by a band called Stretch (*Why did you do it*). The business partnership didn't work out too well though—it just fell apart for a variety of reasons and following it I was left pretty well broke. I did some more freelancing and then a guy called Martin Davis (who at the time was the boss of UA records) asked me to come into UA and work in the A & R dept with special responsibility for production. I thought that would be a good idea because I needed some security so I took a job there and within a couple of weeks Andrew Lauder (who was the head of A & R) asked if I would see a band called The Stranglers for whom he had high hopes. So we went and saw them a couple of times and I agreed that they were great so we signed them and started to look for a producer to do them but couldn't think of anybody. We wanted to get a single out quickly because the market was ripe for it, so I offered to take them in to do the single making more time to look for the right guy to do them permanently. Anyway, we did the single and that crept into the top 50 and everyone said there's no point looking for a producer—you do it. Everyone's really pleased with the single—you do the album.

So I went and did the album and that was an enormous success. That was my first really serious success as a producer—I had done loads of other things that had been failures before while I was cutting my teeth. It was through The Stranglers that I met Alan Wynstanley at TW Studios in Fulham. We got along quite well and did another three albums as well as the Buzzcocks, Generation X and loads more.

The Genetic Sound idea came together during that period really; Al and I were talking and I said one day it would be great if we built our own studio and had a little record company. So we just sort of started—I didn't know how long it was going to take. At first I was really optimistic and thought to have it finished in six months (that was about two years ago) but as time went by so our ideas got more grandiose—at first it was going to be

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a little lash-up place and then we thought we'd build something better, so it got bigger and bigger and cost more and more money.

I did a deal for our Genetic Records with Radar Records which didn't really work out. We have started that up again in conjunction with Island Records and our first signing is Pete Shelley. Now we can do the things that we want to do, in our own way. I don't know yet whether that's the right way or not but I want to try it. Most of the industry is controlled by big record companies so you never get an opportunity to do it your way, the way you believe. You never get the opportunity to make a record and sell it the way you feel it should be done. I'd like to try it a few times even if it's just to learn that I'm wrong and they're right.

We feel a bit responsible in a way for the turn around to small studios. A lot of big albums were made in very small places following the success of The Stranglers. It was suddenly the fashion. Go to a cheap tatty studio to record your album (not that TW's cheap and tatty, Garry) but it became very fashionable and everybody was doing it and everybody's still doing it; that's why we've built a nice big place now.

Own place

There were loads of motives for building our own place—one was ego and convenience; both of us live very close to here, but we found a lot of shortcomings in a lot of studios. No studio was ideal for us and it was always "this studio's all right but the f . . . ing monitoring's not right", or "they haven't got the mics I like"—always something that wasn't quite right. Alan and I have very similar tastes in equipment so we built this studio specifically to suit our requirements. It turns out since we've built it and other people have come up and used it that it seems to suit a lot of people—they're very impressed with the layout and the equipment that we've got here. It suits us down to the ground—it's been purpose-designed for us.

Most of the bands that I had success with in the past I have stopped working with for combined reasons of boredom (doing the same bands) and also that over a period of time working relationships stagnate and it's better to move on to fresh things. I'm looking at a few new things that are being offered and also keeping myself fairly clear to do things for ourselves, to produce albums in future for ourselves as much as for other people.

One recent project was a French band called Telephone, an enormous band in France. We started off with two days in Berlin at Audioton Studio, then moved on to Pathe Marconi Studios in Paris. The sound's pretty good really and a lot of people now are using it. The equipment was all Neve and Studer and very well maintained; their maintenance department is really of the first order and it's the second album that I've made there: they're attracting some quite big people now. It's typical EMI big studio conglomerate sort of thing. The people there are really nice. They've had the Stones out there and I hear Chrissie Hind did her last album there. It's all right if you can stand the food. It's really good to taste but it's hard on the stomach.

Overdubbing was in New York at the Hit Factory and some mixing, then back here to finish it off. I think the Hit Factory is all right, it depends what you're doing really. It's all MCI gear which is one of the reasons that I chose it, because having MCI gear here we're really familiar with it. They've got one mixer in where the sound is particularly accurate. They're nice people and there's a pool table.

There are several reasons why we chose MCI. We like the board: well-made, we've had virtually no trouble with it at all, and the same with the machines. Also Dag Felner at MCI has been really helpful to us all the way down the line both with advice, financially and everything. When you buy a desk it ain't just the desk itself, it's all the backup and everything that goes with it. Overall we've been very pleased with it. Dag's really keen on helping small studios get somewhere. An MCI console in your room gives you all the facilities that you need and more space for chairs. I've worked at Pathe Marconi, on a Neve board which was 27ft long. In terms of what you could do with it, it was smaller than this. The ergonomics of it were just absurd— I even suggested that they ran a bus service on the hour from one end of the board to the other, whereas with an MCI ergonomically it's the best designed board of all. I've seen the Solid State ones and I've seen a Harrison. I've worked on all of them. I have a problem with Harrison desks because I've got normal-sized fingers which does make it a bit difficult at times. If you've got knitting needles for fingers then you're in business and it's no smaller than an MCI, but with an MCI you can get your fingers round all the knobs without touching half a dozen others. The Solid State one is very impressive but there is a point where a board starts to become a little too

"It's all right if you can stand the food . . . good to taste . . .hard on the stomach."

complicated for its own good and at times I find some of the current boards a bit over-complicated (not just Solid State).

Getting back to the mechanics of a production, I never have any set ideas about what to do with somebody before they go into the studio. I can't really get on with pre-production. I like to do it in the studio, so essentially the band comes in with a number which is more or less the way they like it and I get them to run it through and then start. I have an idea of what I want a band to sound like in my head, but in terms of pre-production rehearsals and routing all that sort of stuff I'm similar to Alan, I don't get along at rehearsals because you can't hear properly. You hear the song, the band, you've probably been to see them a couple of times in concert and you've got a good idea of what is required in your mind. The actual mechanics—taking it from what it is to what you think it should be—you usually do in the studio.

Record companies are usually quite specific in their brief—it's usually 'make us an album that's going to be a hit' and that's about as far as they go. It appears that the more confident an A & R man is in his decision to sign a band, the more he will leave you alone. The more paranoid an A & R man is about his decision the more he'll interfere and the more he fidgets the worse it gets. You can usually tell when you're on a winner because nobody interferes. When you're on a loser you know because the A & R man phones up every day to see how it's going. Sometimes it's embarrassing because a lot of them don't really understand the details of record-making—they're more into other things like tours, and album sleeve design, posters, lunches etc.

In terms of band/producer relationships with me it's very much a co-operative effort. The idea of the producer being a dictator, like the old 50s producer, is very much out of the window these days and certainly if you try to adopt that style of production with most of today's artists they won't stand for it. When you need to be dictatorial—and there *are* times—it has to be done much more subtly. Of course, once a band is successful they tend to want to dispense with your services! It happens all the time—it's standard procedure, and from my point of view I can no longer tolerate working with really successful bands.

"There are several reasons why we chose MCI . . . not just the desk it's all the backup . . . "

Attitudes

It's one reason I resigned from things that I was producing before—I couldn't take some of the attitudes any longer and I much prefer now working with bands on their first albums. It's more fun because there's less pressure on the band. If a band makes a first album and it's a failure, then the last thing they try to do is copy that album because it was a failure. If it's a big success that's the first thing they try to do and everybody wants them to. But nobody can copy themselves and make it sound genuine—the first album was them being themselves, and the second album was them trying *too hard* to be themselves—they actually become a caricature of themselves. All the things that made them individual on their first album are stretched to breaking point and it no longer sounds real. Everyone feels the pressure on them to deliver and everyone expects them to deliver—what it means is that it's straining the studio, you have no more or less control. The truth of the matter is that primarily we make records for fun—we get paid a lot of money for doing it as well and that's great. Music is what you do it for and if you don't enjoy music then it's best not to do it. Producers and artists, when they go in to make an album, they're making it for themselves, they're not making it for the public; it is hoped that because they like it the public will.

You've got to work hard, that's the key; really go at it. You've got to give it 100%. I wouldn't like to add up the number of hours that I've spent making records and I'm sure Alan wouldn't, but it's the bulk of our life today. You've got to learn to exist on four hours sleep a night and it doesn't change when you get a big success, it's still very much a high pressure lifestyle. Flying to America becomes a pain after a while. We're like every other human being in this day and age: we're not easily satisfied and sometimes you yearn for the simple life. The 9-5 suddenly starts to appeal a little bit. Producers are

64 ▶

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Martin Rushent

pretty well at the rough end of it—I love doing production but it's one of the most pressurised jobs in the industry. You're the connecting funnel between the acts and the software side of it, the link between the recording studio side of it and the record company. The biggest problem when big success comes along in production is to keep convincing people that you are actually human and not a machine. It can become a problem at times. That you have interests that are outside of music that need to be satisfied for you to remain a whole human being, like going on holiday now and again and doing things that keep body and soul together, but the pressures do become quite heavy. It's more than you can stand sometimes, all the hours that you have to put in.

Money, even these days, is rarely a problem. When times are really good for record companies it's the same thing because it's not so much the cost of an album that concerns them, because the cost of an album compared with the overall cost of the merchandising and the packaging and the advertising is fairly small—that's the actual recording cost compared with overall expenditure.

Pressure

Selling a record in this day and age is a bit of a military operation and all the logistics of it have got to be co-ordinated all to arrive with the maximum impact. So if your tour's geared up to start on such and such a date, there's poster campaigns round the country, there's shop window displays, there's advertising space booked, radio ads taken—101 different facets of the marketing of a record—and of course if the album is three weeks late arriving the whole master plan gets thrown into disarray. Albums that seem to arrive with maximum impact, if you look at it closely, you'll find have been well co-ordinated in terms of their sale to the public, which means that all those elements have been co-ordinated correctly. That is as important as *making* a good album in terms of selling it. That is the pressure that you get from the record company. Very rarely is it 'Jesus, man, you've gotta finish next week cause this is costing a fortune', it's 'We gotta have it next week because it's got to get to the factory to meet the release date because if it doesn't the album won't be out for the first week of the tour which is a tragedy and all the advertising space is going to have to be changed'.

Certainly I would think that the financial pressure has increased slightly in the last 12 months; I think record companies are keen to keep all their costs down in whatever area they can but I think that most of them were sensible enough to be aware of the fact that the studio's really the creative nub of it, and at times things don't go right because you're dealing with personalities. You never know from one minute to the next whether you're actually going to be able to deliver the goods. So patience is very important in the studio and most record companies recognise that. Remember too, that our production is totally on a freelance basis. So we're only as good as our last record.

I read an article by Derek Green, who's managing director of A & M Records, who really predicted an end to the music industry. Obviously that's nonsense, but the music industry's certainly going to change: it is changing now and thats what we're suffering at the moment. I think three major forces are hitting the music industry simultaneously—one is a lull in creative output which comes every six or seven years in the music business—at the moment we're going through a very bland period musically, specifically in this country, I think, but generally worldwide. We are going through a phase where nobody's real creative talents are being tested, therefore you don't feel the sense of challenge and when you don't feel challenge you don't come up with the really good ideas. The second factor is that the *record* industry is going through a change. Video is much more important, sport is much more important—the amount of money people have to spend on entertainment is being spread around a lot more rather than being channelled into two or three specific areas. Then the third factor is the recession. All those three things have come together at the same period of time and that's the prime reason why the business is suffering so badly at the moment. The points about tape copying and imports of records from overseas are valid (*Are they? Ed*), but that's not the whole reason at all—it's far wider than that. The music industry will survive because music is going to survive and people will always want music but it's going to change and is going to have to become a much more realistic industry. It's going to have to realise that it has to make a profit on sales of 100,000 rather than 200,000; that there aren't going to be so many huge selling records; that TV advertising really doesn't warrant the return.

Dealers in this country are going to have to be much more aggressive in their sales techniques. Stores are going to have to be staffed by people who know about music: that the young girl straight from school who's not really interested in music and gets herself a job in a record store is just not good enough—people are going to want to go into a record store and be told and informed about the music so people in record stores are going to have to know what they're selling. The whole approach is going to have to become much more businesslike in the way that it's done and less happy-go-lucky, which was the attitude adopted in the Sixties and Seventies when records were selling in such huge quantities and profits were so enormous that you could afford to waste thousands and still make a very comfortable living.

"I don't predict an end to the music industry: for a business that's basically been going for the last half million years it seems a bit odd that people should suddenly not want music any more."

I also think that organisations such as ourselves, the small record production outlet with its own facility and its own expertise, is going to play a much more important role in future. We don't know yet how many records we're going to release in 1982 or anything, but our staffing levels are very low. We do a lot of it ourselves rather than having a vast army of people to do it for us. We could make records and sell them for substantially less than what they are currently available at. The record companies are to blame in a way for the stagnation in taste of the general buyer—they see an area of a market and they flog it to death, like disco, like punk—those things were pushed to the absolute limit and I saw it with the mod revival stuff—there was so much mod material available it just saturated the market because they have to produce the million seller records to survive which means they have to go for a market, whereas we and companies like us will be able to make records which sell 50,000 and make a comfortable profit out of it. That means that we can make records of many different types, because if you make a really good jazz album for example there are probably 50,000 people out there who'll buy it. That's no good for a major record company, but for us to sell 50,000 of any of our own productions made here would be great—we'd make a profit out of that. Selling at a low cost: I'd be well into giving the studio to a modern jazz outfit for a couple of days to cut a record—and any sort of music because those people are not being serviced properly, people who want to buy music which the major record companies are just not interested in doing because there isn't sufficient volume.

Digital

Finally, a personal opinion about digital recording. It's too expensive and commercially doesn't make sense—I'm really excited by the prospect of my noise levels being dropped from –85dB to 90! When the consumer end of the market is cleaned up then it's worth thinking about. There's no way I'm going to pay like 60 or 70 thousand pounds for a 32-track digital, because I can't justify it to my clients or to myself. I doubt the sense, at a time when the record industry is looking to cut its costs in all areas, of pressing on into an area in which the advantages are dubious at best. You record a record digitally and out it comes from the press with clicks, thumps and rumbles all over it—your noise levels are way below that. The cost has to be passed on to the client which is eventually the record companies. There's problems with editing—I just cannot see the point of it at this time. I can certainly see it with 2-track where you're having to distribute a lot of copy tapes around the world to a lot of licencees where you can copy up many times with no degeneration, there's no editing problems there because you're just copying. That seems to be a useful addition to the tools we've got, but with multitrack I don't see the advantages. It's like having a Rolls and then saying: 'Well do you realise, for the same money that the whole car has cost you, you can have an exhaust which will silence the car from very very very quiet to very very very very quiet'. Seems to me it's got nothing to do with it.

Mind you, I'm not saying 'digital out', I'm just saying 'wait a minute'. I appreciate they need our support to get digital technology saleable where the price does make commercial sense but this is going too far at the moment. Plus the fact from my experience that I remember the first 8-tracks were dodgy, the first 16-tracks were distinctly dodgy and the first 24-tracks were definitely dodgy —I suspect the first digitals are dodgy. I don't really want, for £60,000 or whatever it is, to be somebody's guineapig. I'll wait for a few years until you can buy one that's going to be reliable at a sensible price. ■

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business

BARRY FOX

Stereovision—for some

A sign of the times. The once-every-two-years Berlin Radio Show, or Internationale Funkausstellung, is now sub-dubbed The International Audio and Video Fair. The big deal this year was the launch of TV with stereo sound. There is an interesting background to this. Remember first, however, that stereo sound for TV isn't just about creating a stereo image for music. Equally important, it's about bilingual sound, or the transmission of two different language soundtracks for film, news or sports broadcasts. Even more important, it's about getting people who already have one colour TV set, to buy another. In Japan there is already stereo sound with TV, and over there they use a multiplex system similar (but not identical) to that in use for FM stereo radio around the world. It's actually a double FM system. Stereo TV sound has now started in Japan with programmes transmitted by the TV station ZDF. Although programmes are few and far between, over 60% of the country is covered by stereo-capable transmitters. The German station ARD plans to start in a couple of years.

Germany has adopted a quite different approach from Japan. Instead of multiplexing the extra sound channel, it is transmitted on a quite separate carrier, 0.24MHz above the normal sound carrier. Any stereo system must of course be mono-compatible, so that owners of existing sets hear a mono sum of left and right music and one channel only for a bi-lingual broadcast. This means that the decoding matrix in a stereo TV has to be switched in dependence on whether the broadcast is music or speech. The Germans frequency modulate the upper carrier with a 55kHz tone which is itself amplitude-modulated with either of two low frequency pilot tones. These switch the matrix. For music, the main sound carrier transmits left-plus-right and the extra carrier transmits right information only. So existing sets reproduce the mono sum (L + R) and the matrix of a stereo set is switched by the pilot to decode left and right separately. As an optional extra some manufacturers, for instance Salora, an enterprising TV firm based in Finland, derive a third, centre sum channel and spread the image artificially wide by sending left-minus-right to one loudspeaker and right-minus-left to the other.

For bi-lingual sound, one language is transmitted on the main carrier and the other language on the extra carrier. The matrix of a stereo set is switched by the pilot to send one language to one loudspeaker and the other language to another. The listener then chooses by manual adjustment of the stereo balance control.

The really clever part isn't the technology, but the politics. Although the Germans say they have adopted their two carrier system because there is less crosstalk for bilingual broadcasts than from the multiplex system, this is eyewash. The Japanese multiplex system shows no audible signs of crosstalk. The real reason is that the system, which was developed by the IRT research labs in Munich and sold for 100,000DM to IGR (the German television trade organisation), is protected by patents in Germany. So just as the PAL colour TV patents have enabled Europe to control the import of colour TV sets into Europe from Japan, so the IRT/IGR stereo sound patents could help Germany, and the rest of Europe, to control the import of stereo TV sets and stereo video recorders from abroad. It may not be cricket, but it's a clever move of the type that helped both Germany and Japan win the last war; or at least the peace after the war.

Germany 'hopes' that Britain will have the same system. Unfortunately it's unlikely that we'll have *any* stereo sound for a few years yet. The BBC carries all its TV sound between transmitters using the sound-in-sync method. This involves encoding the TV sound into digital words which are packed into sync-spaces in the video waveform. Unfortunately there's only room for one 14kHz channel. So unless the sound-in-sync can be drastically modified, or abandoned altogether, the BBC can't offer stereo sound for TV. The pros and cons of multiplex or double carrier transmission thus remain purely academic in the UK.

Consumer digital audio

Philips is trying to pull a commercial master stroke over the compact digital audio disc. The Dutch company is claiming a royalty of 3 US cents per disc sold. Think for a moment about what this would mean in hard cash terms. There are now 22 Japanese companies (in addition to Sony, joint developer of the *Compact Disc* system) and seven European companies (in addition to Philips) backing the system with hardware. Already these companies are committed to paying Philips and Sony a royalty on every player sold. So if the software companies now have to pay Philips a 3 cent royalty on every disc sold the rewards could be astronomical. They could even pay for failure of the *Laservision* videodisc system due, as now seems likely, to commercial bungling by Philips in Europe giving the rival VHD system a leg-up to success!

A recent visit to Sony in Japan brought this and other interesting facts on domestic digital audio to the surface. The *Compact Disc* system is of course based on 16-bit linear coding, but domestic and semi-professional PCM adaptors (intended for use with a videocassette recorder) use 14-bit linear coding according to the EIAJ standard. There is also a slight difference in sampling frequency (44.1kHz for *Compact Disc* and 44.056kHz for the EIAJ 14-bit tape format) but this is of no consequence. The servo system of a tape player has sufficient latitude to lock into either frequency, with a change of pitch which is, in practice, inaudible to most human ears. The real difference between *Compact Disc* and the EIAJ PCM tape format is in the coding; 16-bit for disc and 14-bit for tape. (Although, incidentally, a 16-bit disc will replay on a 14-bit linear, or even 12-bit non-linear, system.)

It came as a surprise to learn from Sony that the company's new *F1* PCM adaptor, intended for use with the new *F1* portable *Beta* video recorder, contains 16-bit chips 'geared down' to 14-bit operation. The PCM *F1*, which sells in Japan for around £500 is remarkably small, because its essential bulk circuitry has been integrated into just five chips; an A/D converter, a D/A converter and three peripherals for encoding, decoding, and sync separation. It was cheaper for Sony to produce everything in 16-bit format, and use the same chips in both 16-bit and 14-bit equipment. But why downgrade to 14 bits to conform to the EIAJ standard for European players? The EIAJ standard is based on the NTSC video recording format. So when Sony sell a PAL version of the PCM *F1* adaptor in Europe (some time in 1982 probably) it won't conform with the EIAJ standard anyway. Why not therefore use it with 16 bits? (Perish the thought that it's to safeguard sales of the much more expensive *1600 Series*.) There is as yet no formal answer to this question, but it would be a crying shame if Sony markets a PCM *1* adaptor in 14-bit form even though it is 16-bit capable. Perhaps the PCM *F1* will appear in Europe switchable between 14- and 16-bit capability. If this happens, it should in theory be possible to record direct from *Compact Disc* on to digital tape, without returning the signal to analogue form.

But it may not be possible in practice. It turns out that there is what is tactfully described as a 'gentlemen's agreement' amongst some of the *Compact Disc* licensees not to put a raw digital output on their *Compact Disc* players. This is intended to keep the record companies happy. They don't want to see users of *Compact Disc* players dubbing digital discs direct on to digital tape. But in practice this gentlemen's agreement won't stick. A straight wire connection between the analogue output of a *Compact Disc* player and the analogue input of a PCM adaptor will still produce a dubbed copy of extremely high quality. Witness for instance the fact that the BBC has had to use a straight wire analogue connection between its Sony PCM *1600* recording system and the digital transmission system used for routing signals between transmitters. There's very little loss of quality. So realistically, failure of the hardware manufacturers to put a raw digital output on their *Compact Disc* players will do little or nothing to deter piracy. And once any one of the 30 manufacturers licensed to sell *Compact Disc* players decides to offer a raw digital output, then all the others will be under commercial pressure to follow. Some of the manufacturers licensed to produce *Compact Disc* hardware are also software producers, for instance Philips-Polygram, CBS-Sony and Toshiba-EMI. But plenty more of the hardware manufacturers, for instance Sansui, Mitsubishi, Matsushita, Hitachi and Nakamichi have no direct links with the software industry. So it's an odds-on certainty that one of these companies will very soon open the flood gates and put a raw digital output on their player. In fact that gentelmen's agreement looks more like a cosmetic political gesture than a serious attempt at curbing the copying of commercial recordings from disc to tape.

VL-Tonality

It had to happen. The Casio *VL-Tone* has now made its presence very obviously felt on a pop single. If you can face it, try listening to Hazel O'Connor's *Hanging Around*. Hers is not a pretty sound, but there, unmistakably in the rhythm intro, is the sound of the Casio *VL-Tone* pumping out one of its ten pre-programmed rhythm tracks. ■

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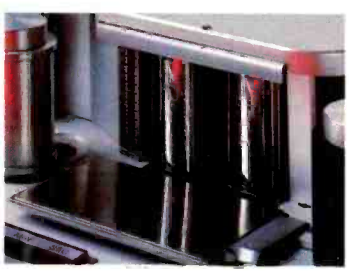
SPOILT FOR CHOICE.



When you come to choose your new multitrack, deciding on a Studer will probably be easy. What will be a little more difficult will be *which* Studer to take - the new A80/VU Mk III or the new A800.

Both machines are superb examples of Studer precision. Both come with the new narrow head block that cuts the travel distance between the erase and record heads to 88 millisecs at 30 ips (now available as a conversion for existing A80/VU models). And both are available in several tape width/channel number configurations.

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Designing a professional mixing console

Steve Dove

Part Fourteen~The Back~end 2

This more-or-less final part of the series (some notes and addenda will follow in the next issue) discusses alterations to the circuitry for non-standard operating levels, suitable ICs for use in the design, what will happen when components fail, and where console design is likely to go from here. Computer design techniques are also discussed.

HAVING completed the major aspects of this design study, it really only remains to consider a few areas which might otherwise have got lost in a confusing welter of circuitry. Nothing particularly complicated, but a few important items like what happens when components decide to give up the ghost (and what it will sound like), metering and questions of headroom, component selection and so on. But first we should look at something rather basic: namely, what happens when you switch the beast on in the morning, and how the master function circuitry operates.

Function masters

Fig 70 shows the devastatingly simple console master function circuitry. All the clever stuff is done in the channels, allowing this bit to be little more than switch contacts. No debouncing is necessary since the master busses directly actuate the set and reset 'latch' functions of the channel function registers.

Lockouts are arranged on the fader main/reverse selection and master monitor 'A'/'B' switching to prevent both the relevant control busses being heaved at the same time: this could otherwise lead to some very odd things happening inside the channel signal routing. Similarly a ground follow-through lockout arrangement is used on the master function mode selection—otherwise the consequences of more than one button being pushed simultaneously would be only to select a virtually random mode, rather than get the channel electronics really upset.

Note that all the switching is to ground from the logic −5V supply rail. This interfaces with the majority of the channel logic as described in **Fig 57b** (September 1981). An important feature is the Master Reset Buss and its control. Ordinarily, a heap of random logic circuitry dependent on flip-flops and latches (of which this console is an ace example) would, on power-up, tend to settle into whatever state these registers 'felt like' at the time. This all depends on device symmetry, temperature, humidity, phase of the moon and colour of hessian you've got on the walls, and worse still is not usually repeatable. An intriguing exception to this is the knack of CMOS flip-flops to come back up in their previous state after a short power disablement—probably a function of small charge storage—but it wouldn't be wise to rest the defence of the nation on it.

Wisdom, common sense and sore ears dictate that on power-up the desk should come on neutral, all channels muted and with monitoring functions such as PFL and solo disabled. As well as providing a frame of reference from which to start re-using the console, it saves all the aggro of finding the one stupid function that's killing the monitoring. Console mode and basic monitoring conditions can be set up just by hitting the relevant master controls.

TR1 of **Fig 70** grounds the Master Reset Buss for as long as the 22μF capacitor takes to charge up—around a quarter of a second. This charging takes place when the −5V logic rail appears. Should the supply collapse, the capacitor is rapidly discharged via D1 ready to re-initialise the MRB signal as soon as power reappears.

Although it would be extremely simple to do, no top-panel master reset control is made available. Why? Because sooner or later someone's going to hit that button at exactly the wrong moment, that's why.

Device idiosyncracies

ICs come and ICs go, and some just lie around on the floor waiting to be trodden on by bare feet. Not a long time ago, the Signetics *5534* was a rare and expensive beastie that took board meetings and ransoms to possess. During the course of this series the production-quantity cost has plummeted by the good offices of basic economics to pocket-change value—today, it's rare to find a piece of gear in our industry that's not bristling with them.

Despite this, there is no real justification for using these devices anywhere in this design other than where they have already been specified (principally the mic preamp). Their main advantage, low input noise, is of little if any value elsewhere, the noise floor being dependent rather on design criteria, the system mechanical construction and grounding than the choice of amplifiers.

The *5534* is also now multiple-sourced from different manufacturers and, it now being proved that a sizable market exists for such devices, a rash of competitive and upgraded op-amps has been provoked. Most promising, to the extent that it is worthwhile using them in these circuits instead of the specified *5534*s, are recent devices from Analog Systems (distributed by Pascall Electronics Ltd in the UK). Apart from a *5534* look-alike, called the *MA 342*, their *MA 322* measures quieter for thermal ('white') noise in the mic amp circuit (Part 12, October 1981) and has a quite significantly lower turnover frequency for its If noise. Being relatively new, it's pricey, but then so was the *5534*.

On the level of more journeyman type op-amps, most major manufacturers are doing Bi-FET devices similar to the Texas *TLO* series.

Many of the circuits described rely a little on the extremely high input impedances of the Bi-FET devices and hence the very low bias currents required. Gaily stuffing in bipolars may result in generated output offset voltages which could manifest themselves in extreme instances as switch clunks and 'scrapy' pots. Also the feedback phase-leading compensation may or may not be adequate for devices other than the Bi-FETs, especially some bipolars with less than tasty internal poles. Should you be tempted to use more conventional bipolar devices, particularly in quad packages, it is also worthwhile examining their characteristics when inputs or outputs are taken above or below the supply rail potentials. If the device structure under such circumstances is unprotected and turns into a silicon controlled-rectifier which deftly shorts the supply rails together—as a certain well-known make or two tend to—you are better off without them. Unless of course you like short, sharp bangs and bits of flying molten plastic.

A similar SCR failure mode exists within the CMOS logic family potentially exhibiting itself in transmission gates. Logic itself is ordinarily working within defined supply rails but with transmission gates such as the *4016*, *4066*, etc, there is the

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possibility that the audio they are switching can exceed the rails. The thing which saves them in the virtual-earth/potentiometric switching system employed here is that they are (a) fed from a reasonably high source impedance so that not much current can flow and (b) the audio level architecture is such that excessive 'breakover' levels are unlikely if not impossible.

A slightly more obscure potential 'failure' mechanism exists with the PROM used in the channel routing logic (**Fig 57b**). 'Failure' is in quotes because it would really only do what it's supposed to. The programming path for the PROM is via the output ports where once an address is selected, the required data is blasted in in short spikes which weaken or blow the approprate bits of the internal diode matrix. Any potential at the open-collector outputs in excess of about 12V opens this programming path and even short accidental over-voltages can 'soften' or even wreck the stored pattern. With only ±5V for the logic rails in **Fig 57b** the PROM is quite safe given good regulated supplies.

It would be quite unfortunate if a little amusing for the desk to reprogram itself should you be tempted to be adventurous or less than thorough with the logic power supplies.

Meters and headroom

Metering is a subject that has been well avoided. There are plenty of proprietary meters of the popular standards and types, plus quite a few strange ones too. It's all down to personal preference and the information one hopes to glean from the assorted needles, twinkly lights and cathode rays dancing before your eyes.

Without jumping into the snake pit argument of average versus peak-reading instruments it is relevant to state that the choice will directly affect the operational levels, the level architecture, machine line-ups and various tweaks, notably the input stage limiter threshold. Out of habit, this console was designed with standard PPMs in mind, where the peak operational level throughout the system is expected to be PPM 6, or +8dBu. Line-up level, ie the system and output level for which the front-end gain stage is calibrated, is 0dBu, PPM 4. This will suit any current or expected PPMs whether to *BS 4297: 1968* specification or the new-fangled bureaucratically-doctored EBU spec.

'Proper' American broadcasters have taken quite a fancy to a mutant PPM which is similar in dynamic characteristics to *BS 4297* only with the level for the various marks elevated by 8dB, the marks being given actual level values (up to a 'max' of +16dB whereupon it's painted red) instead of the familiar 1-7. This is, it is given to be believed, so that the signal levels generated from control areas using these meters are similar to those from older areas using (curiously non-standard) +8dBm-referred VU meters. Such are the levels they are used to sending down inter-studio and telephone lines. Buzby would clutch his little feathered heart and fall off his pole, claws smouldering.

The elevated-level PPM is an idea with some merit where most material dealt with is pre-recorded and fairly predictable in level, thus not requiring an awful lot of headroom.

Users of PPMs and VUs tend to fall into the respective category types of "We'll only peak up to the 3% tape distortion point," and "Let's wind it up 'til just before it comes back sounding bent." VUs are very good for giving an idea of subjective loudness and not worrying you about transients which can often be anything up to 20dB above the indicated value.

Given standard +4dBm referred VU meters that means that under normal operational circumstances, headroom in any console is perilously skinny. Various ways of dealing with potentially inadequate headroom are in use (see **Fig 71**). A favourite is to run the entire console system at a depressed level, usually −4dB, the necessary 4dB make-up at the end being done passively by an output transformer ratio step-up. It's a bit cheesy for a couple of reasons—there is a transformer there that otherwise needn't be and as with any transformer step-up arrangement it is overly critical to termination impedance. The frequency response could suffer awfully with a heavily reactive load such as a long line.

Headroom is mostly a problem in input channels, before the channel

70 ▶

FIG. 70 DESK MASTER FUNCTION CONTROL CIRCUITRY

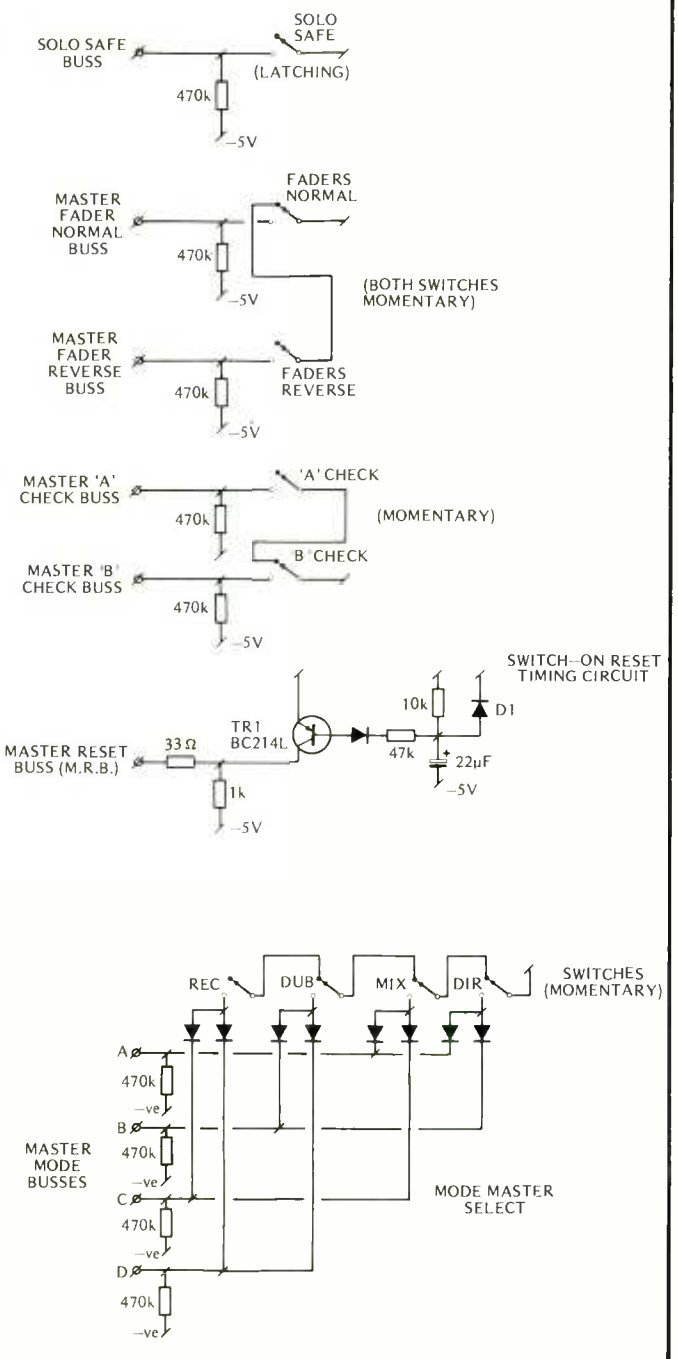
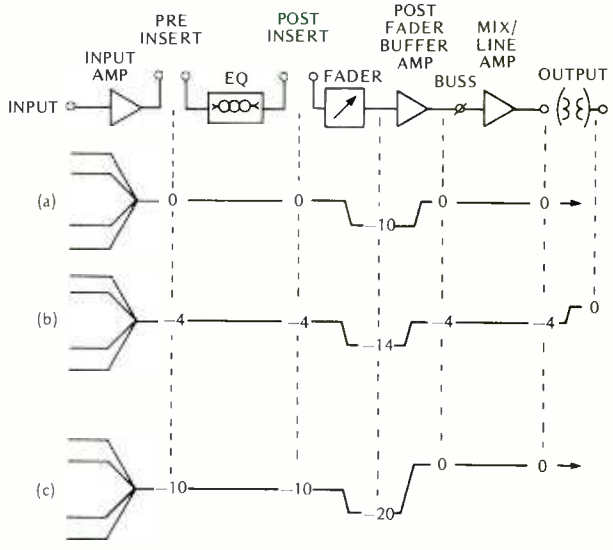


FIG. 71 SYSTEM LEVEL ARCHITECTURES



(a) FLAT – 0dBu referred throughout
(b) DEPRESSED – – 4dBu throughout, level made up passively by output transformer
(c) CHANNEL DEPRESSED –10dBu in channel, 0dBu output

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gain controlling element—the fader. Both ragged unpredictable input sources and equaliser gain gobble up the non-margin—hopefully beyond that point the levels and hence the mix are easily and well regulated by the faders. Dropping channel operating level by 6dB or 10dB helps matters tremendously, the gain make-up being either in the mix-amps or the post-fader buffer amps, the latter being normal. This does compromise buss-noise (quiescent desk output noise) but seeing that the main justification for doing it is the high level of signals thundering around, it's roundabout and swings time. This depressed channel system is worthwhile in any circumstance, regardless of metering type, where there is likely to be a Great Unknown lurking on the end of an input line.

Cons to the pros are that all the channel insert points operate at the depressed (say −10dBu) level which may or may not give pain with some less than versatile outboard toys, but more immediately of concern is that other internal channel circuits will need adjusting.

Machine line-in feeds from the 'A' and 'B' input differential amps will need to be dropped by 10dB—this is easily accomplished by altering the values of the resistors around electronic switches to scale down a factor of 3.16 (10dB's worth) **(Fig 72a)**. The PFL buss mix-amp gains will need to go up 10dB (the extra buss noise here is no great crime) and an extra 10dB of gain put into the pre-fader auxiliary feed buffer amps. Re-establishing main path gain to unity is simply achieved by upping the gain of the post-fader buffer amps **(Fig 72b)** by changing the feedback bottom leg resistors from 1k8 to 430Ω. This provides for 10dB of fader back-off and the necessary 10dB reinstatement.

If all that sounds complicated, just bear in mind that it's all achieved with resistor changes—no surgery.

No, it doesn't matter that the machine monitor differential input amps are still operating at normal undepressed level. The 'A' check is directly monitoring a desk output which is at normal level anyway, so no headroom problem. As for the 'B' check: if you've got more level coming back from the machine than you're putting in ('A' check) then it's time for realignment and a rap on the back of the knuckles.

It is entirely possible to recalculate the values around the diff amps to drop 10dB and still maintain input balance but that would greatly increase the number of component changes necessary to alter channel system level. Which is no mean consideration should you choose to do so on a desk full of 32 channels.

Design by computer?

There is a whole breed of design engineers, who were nurtured and blossomed before the great pocket calculator revolution, for whom active-filter and equaliser design became an intuitive art, not totally unrelated to the master gardener's 'green thumb'. The innovations of calculators and subsequently micro-based computers somehow took the fun out of it all, to be replaced only by the zealous determination that your filter is point nothing, nothing, nought Hz inaccurate, gleaned from a neatly tabulated column of figures or a graph on a computer VDU. That is, until you try to actually *make* it with standard value 5% resistors and 10% capacitors . . . you end up reasonably close anyway, but no closer than a few years ago when a cautious squint and head-scratch were the customary design aids.

Sure, the mathematics of the networks were as well known then as they are now—they were just as unwieldy too.

Pencil and papering the 3dB-down frequency of a multiorder (the most basic formula) is thoroughly tedious arithmetic and doesn't *really* tell you what you want to know anyway, which is when the response departs from flat (say ±½dB). Far simpler to throw it together and juggle bits 'til it works as hoped. Euphemistically described as 'empirically determining values' . . .

Computers have turned the heavyweight and ponderous sums of filter design, previously at all pains avoided, into an intellectual game. Once the filter maths has been written in a digitally digestible form, the machine's great strength—iterative calculation—takes over, either plotting on a screen graph or tabulating a given filter's input/output amplitude transfer characteristic, output phase and input admittance for each of the standard ISO ⅓-octave frequencies in the audio band extrapolated also from 10Hz to 100kHz. The programs written cover variously in one form or another, single and double order filters, gyrators and loop filters.

Originally intended as an exercise in small-computer-programming, the ragged trail of sleepless, tireless nights, cups of coffee and exasperated domestic companions suffered for these programs was all worth it for a design tool that has since proved useful to the extreme of indispensability.

Again, as an indication of the weight of number-trundling involved in a second order filter calculation, the humble micro takes about half-a-second (running in BASIC) to do a single frequency plot. (A simple machine language addition by comparison takes about 2μs.) All the Sallen & Key compound filters (eg front-end, highpass filter as discussed in Part 12, and the blanket bandpass line amp in Part 2) had their values determined using these programs as did much of the eq circuitry.

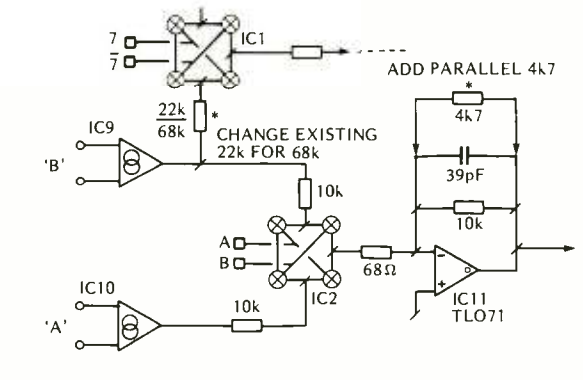
Understanding the impracticality of finding a 34.162kΩ resistor, all the values are rounded out to their nearest standard value (*E24 Series* in the case of resistors). A basic premise is that the capacitors used in the filters are correct at their standard values and that resistors are changed to suit the filter shape. Weird resistors are far easier to find than weird capacitor values.

Raw components

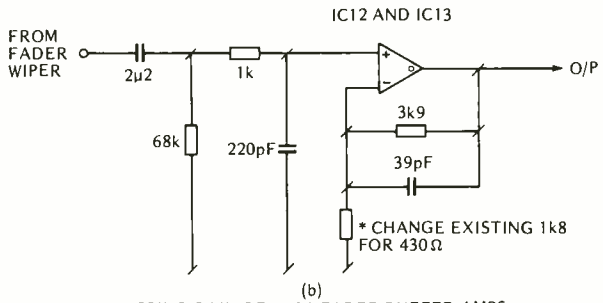
In case the idea of rounding off values to the nearest standard value sticks in your throat somewhat, a quick rationalisation is in order. In hard, solid practical terms borne out over years of measurement, component tolerances of 5% on carbon film resistors and 10% on *good quality* polyester and mylar capacitors are usually reliable and quite pessimistic. A good rule of thumb is that networks created from these can usually be relied upon to be ±0.2dB (for resistors in a purely gain-determining context) and ±5% or within 0.1 octave in frequency. Since most of the frequency determination circuitry is continuously variable anyway these tolerances end up being drowned in

72 ▶

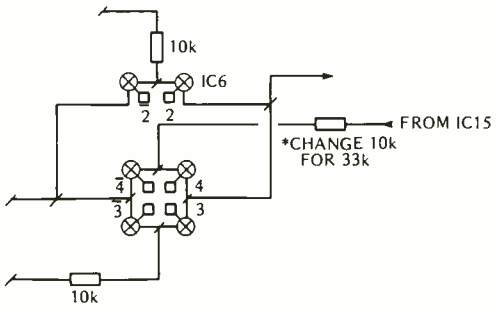
FIG. 72 COMPONENT CHANGES TO OPERATE CHANNEL AT A DEPRESSED (-10dBu) LEVEL
(Refer to Fig 57(a) September 1981)



(a)
CORRECTING LINE IN LEVELS



(b)
UPPING GAIN OF POST FADER BUFFER AMPS



(c)
MAINTAINING CORRECT CROSSFEED LEVEL

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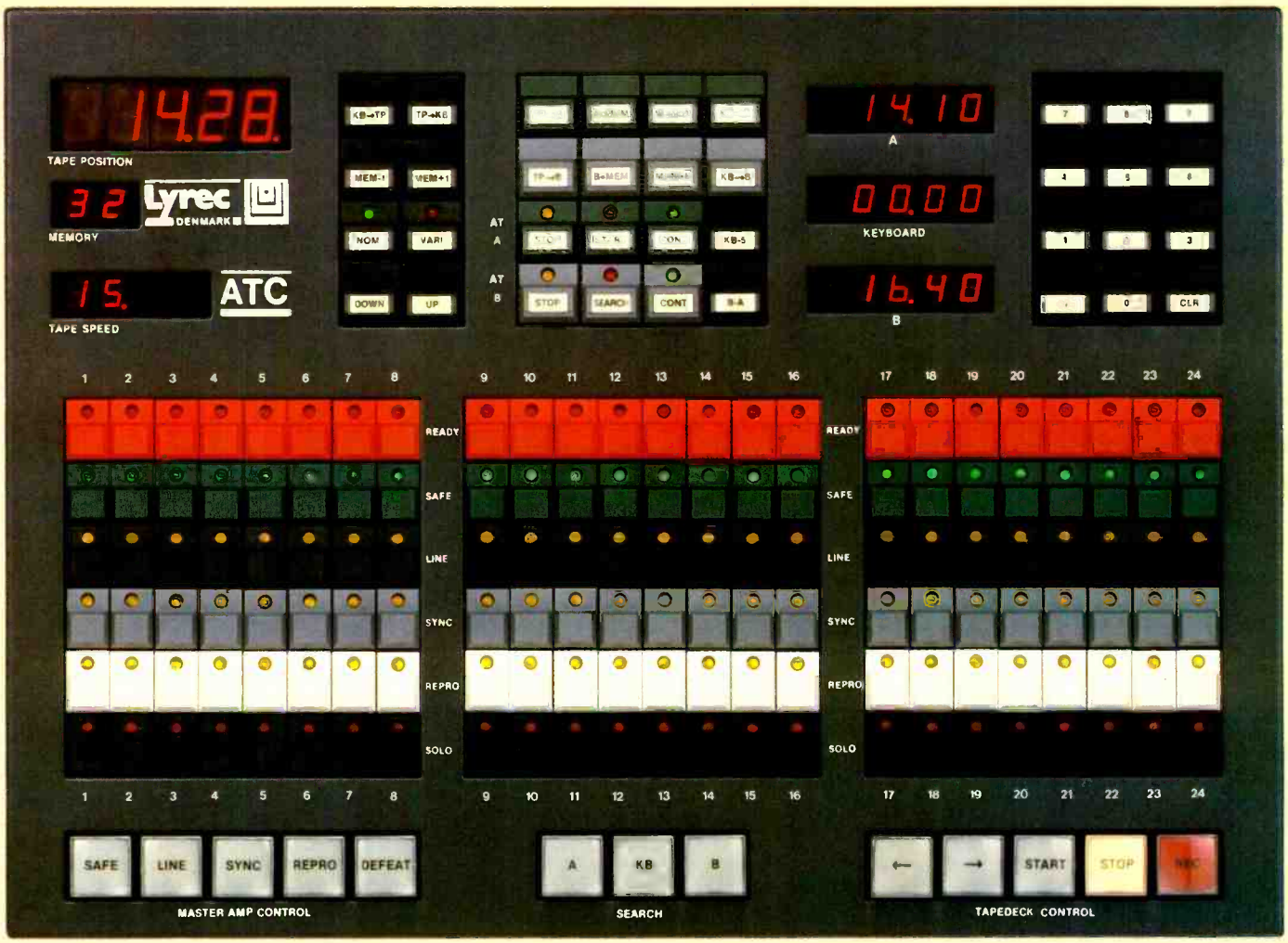
Lyrec TR532 with ATC

The complete 'NO EXTRAS' multi-track recorder



Lyrec's Audio and Tape Controller (shown here half full-size) together with the TR532 provides the most flexible yet compact multitrack tape machine available on the professional market.

Lyrec is the only manufacturer of professional audio equipment able to provide 24 track, stereo (TR55) and complete high-speed cassette duplication systems.

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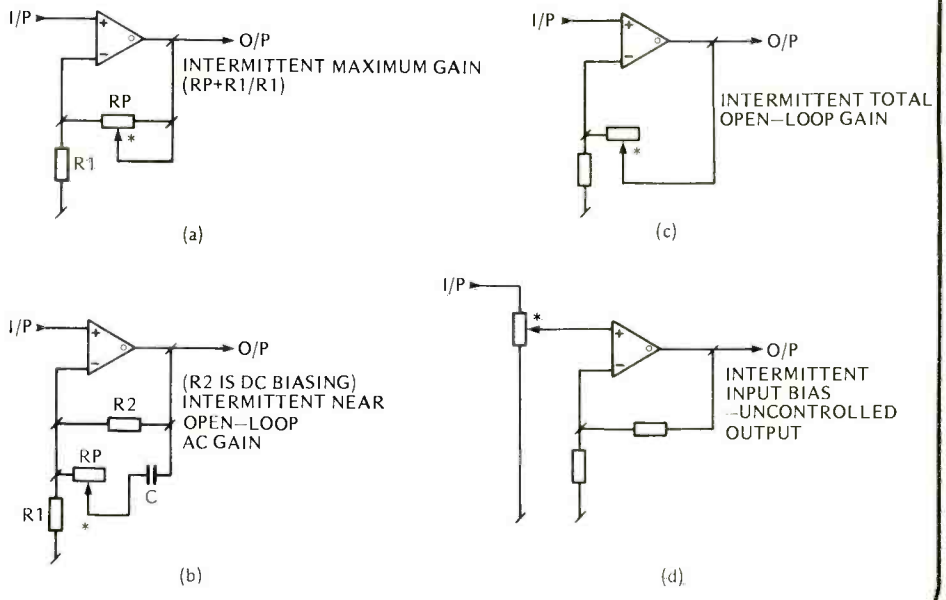
potentiometer, knob and graticule line-up inadequacies.

For any given manufacturer's batch of components, particularly capacitors, the values all tend to 'lean' one way within the tolerance, hence making consistency between modules quite reasonable.

Those who want to 'know' everything is consistent beyond the technically and operationally very acceptable gain and frequency tolerances quoted above can run to the cost of 1% resistors and capacitors or maybe even tighter . . . in the case of fixed-step switched networks whose primary virtue is consistency and repeatability close tolerances would be necessary, since they would then be forming part of not so much an equaliser but more a calibrated frequency/amplitude selective amplifier. A distinction.

Even so, long 'daisy-chain' resistor networks used as switched elements in such animals can quite happily be constructed from our old friend 5% resistors with astonishingly accurate intervals leaving only the capacitors to be highly spec-ed or selected.

FIG. 73 SKELETON CIRCUITS SHOWING EFFECTS OF POTENTIOMETER WIPER FAILURES



Dodgy pots

Potentiometers (pun totally intended) tend to be laws unto themselves with several vices, the principal nasties including:

- wildly varying total track resistance;
- law inconsistency between supposedly identical pots;
- non-zero end stop resistance—disastrous in a panpot particularly;
- non-monotonicity—meaning the resistance versus rotation does not change smoothly up or down, but lurches in rapid up and down steps whilst in transition either way. Caused by a rough carbon surface (which gets worse with age), this one wrecks any notions of resetability!
- intermittent wiper lifting off track.

Any one of these, of course, makes a complete nonsense of careful, if not neurotically precise, fixed component value calculations for gain-sets and equalisation—even few of the best potentiometers affordable for console use really warrant surrounding with better than 5% resistors and 10% capacitors.

Generalisations are odious and some of the newer series of conductive plastic pots as exemplified by the Bourns *80* and *90 Series* are a delight to design with and use, displaying none of the above vices to an extent that could be irritating.

A particularly horrid wrinkle with many cheap and not-so-cheap pots is a predisposition with age for the wiper to break free of the track, over a chunk of debris. Dependent on the circuit context, a variety of loud effects can result. In any arrangement where the pot is included in a feedback loop, or worse still is also part of the dc biasing loop of the amplifier it is controlling, a wiper break will cause:

- the amplifier to operate at a much greater gain (defined by track resistance in conjunction with R1 in **Fig 73a**);
- go open loop at audio frequencies (nearly infinite gain)—**Fig 73b**;
- grandaddy of the lot, go open loop at dc as well, causing the amplifier output to fly to one or other of the supply rails—**Fig 73c**.

None of these are particularly quiet!

In the context of many complex active filters, a lifting wiper can not only create any of the above effects, but also the reactances forming the filter turn miraculously into timing elements creating one hefty great relaxation oscillator, sending plus elephant dB of something usually nastily ultrasonic screaming through the desk, steaming power amplifiers, gently smouldering monitor speakers and your ears. For a short while.

It suddenly becomes a very expensive pot.

Where to from here?

Life is a continual story of change, he waxed lyrical. Despite a faltering last few years, recession and excruciating-to-the-point-of-admirable mismanagement of the media that like it or not support us, our industry is still alive and changing. Bearing in mind that this mixer and series were mooted and first development undertaken two years ago, it is gratifying to see that it is all still current and relevant.

The writing, or rather the digits, are on the wall and it is quite certain that signal processing technology will end up inextricably intertwined with high-speed mainframe computer systems, via an intervening period, downing now, of digital control of analogue electronics. The emphasis is rightly shifting to the control console being *just that* rather than a box full of electronics—which will find its more natural home in a rack elsewhere.

What you see on the market around us now, this mixer design being part of that family, are the *Last of the Great Analogue Mixers* which will be as fondly remembered in years to come as *AXBT* microphones, valves, Michael Miles and round fader knobs.

A tear will drop from your eye as you take your grandkids to the Science Museum.

It's a little worrying to think that those responsible for mixer design in the mid-future will not be electronics engineers with a pair of ears and a knack of translating the languages of sound and electrons, but will be those mathematicians and programmers sparkling enough to translate frequency domain and temporal characteristics into seemingly alien and brain-freezing digital algorithms. OK, maybe it isn't worrying—except for electronics engineers—it is merely exchanging one set of technologists for another. A less obvious danger is that no longer will a console signal path be intuitively simple to grasp and even follow in tangible bits of circuit—digital signal processing is and will remain arcane and very much a 'black box' activity.

Assuming the music industry as we know it still exists, engineer and producer mentality will have to become more 'lady-driverish' and totally user polarised, those who will be most successful being those who possess or can afford the best or most elegant or best sounding mainframe operating system software. Hardware—the equipment—will become almost incidental. Chastening! ■

Subject to demand, it is our intention to produce a booklet containing reprints of all the parts of Steve Dove's series. We expect such a booklet to cost around £1.50 to £2.00, depending on the number of copies we need to produce. This booklet will be offered prior to publication by means of a form in the magazine, but we need to know in advance how many copies will be required, so that it can be produced in the most economical way. Would readers who are interested therefore let us know *in writing* as soon as possible if they will require copies. *Do not send any money at this time.* The booklet will be produced if and when there is sufficient interest to make publication of a reprint substantially less expensive than a bunch of photocopies.

Acknowledgements
The author would like to thank all those whose peace he disturbed during this series for extending encouragement, facilities and time: Ted Fletcher, John Andrews and the staff of Alice (Stancoil Ltd); New Affirmative, Schaffer Satellite of New York, Canyon Country, Brian Kelly, the Village, Deane Jensen and John Roberts.

Especial thanks to Angus, Richard, Noel, Ann, Phil and Wendy at *Studio Sound* for their long suffering assistance; and to AGNES the computer (Awfully Good at Numbers but Extremely Stupid) without which it would have been entirely possible but not until 1992.

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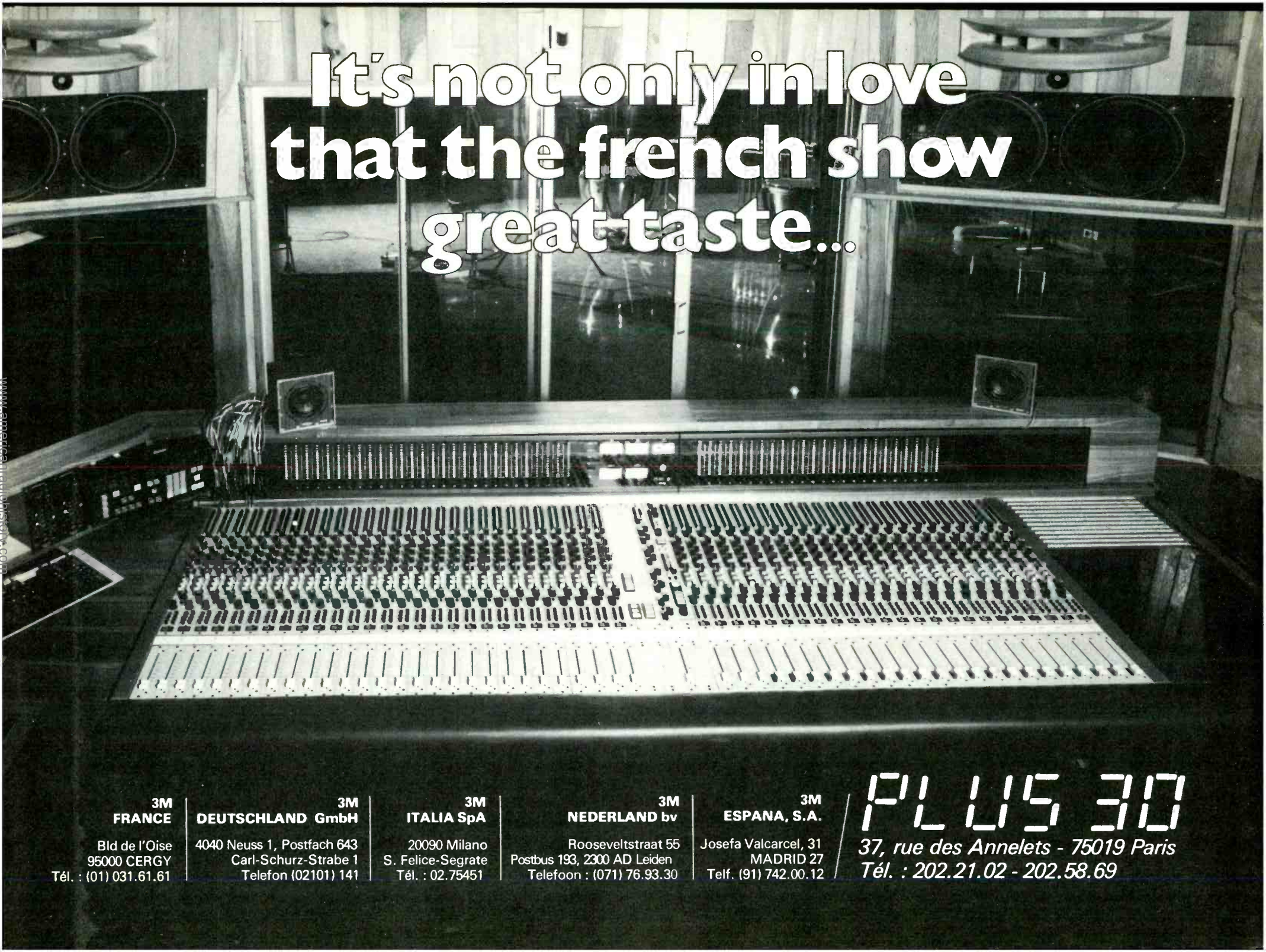

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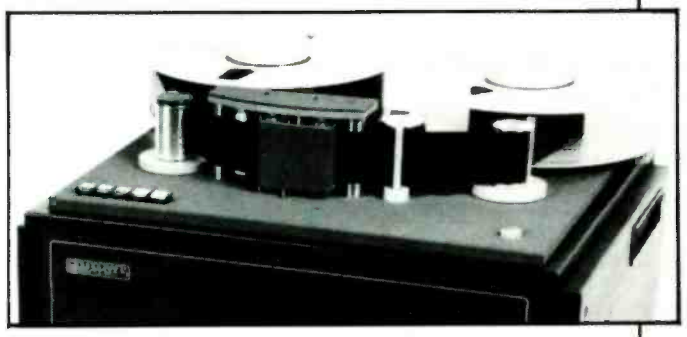
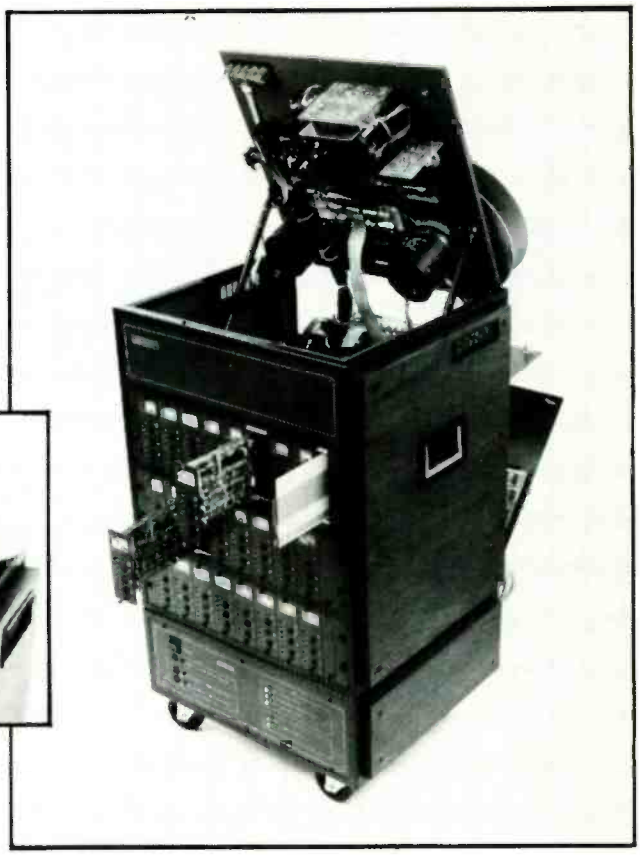
Soundcraft SCM 762-24





THE Soundcraft *762 Series* of multitrack recorders includes 24-track and 16-track 2in machines in addition to 16- track and 8-track 1in machines all of which effectively use the same tape transport and electronics. The review machine was a 24-track 2in machine equipped with several of the options which include dedicated sync line outputs, a noise reduction control interface, interchangeable headblocks, two different remote control units and the availability of Varelco audio connectors.

In concept the machine is designed as a basic and inexpensive unit with the opportunity to purchase options at time of order or updating after purchase.

Being a small machine it is readily portable and will fit through even the narrowest doorways. The base of the machine is fitted with four casters, the two front casters being hinged. The power supplies are part of the base and the audio electronics and the tape transport a separate unit which fits on top of the base and power supplies.

At the top, the tape transport may be hinged up with twin stays to hold the transport for excellent access to all parts. The basis of the tape transport is a ½in thick flat alloy casting on to which the major tape transport components are bolted, the two reel motors being Papst outer rotor AC motors with solenoid operated band brakes. The direct driven spools are secured on to the hubs with screw caps with the spool being located by a rubber O ring and the complete holdown being adjustable in height.

From the feed spool the tape passes to a damping roller equipped with a spring loaded tension sensing arm which drives a potentiometer and a tape detecting microswitch. From here the headblock, comprising a ferrite erase head and metal record and replay heads, is entered via a fixed guide post. Further fixed guides are fitted between the record and replay head and at the exit from the headblock.

The block is in the form of a plate secured to the top of the outer guides with the heads being suspended from the plate with spring loaded azimuth adjustment, each head connecting into sockets on the tape transport. Solenoid operated tape lifters are positioned either side of the record head, a head shield being operated by the same solenoid with access for editing being achieved by removing the shield which has a spigot which passes through the tape transport plate into a hole in the solenoid mechanism.

From the headblock the tape passes to the 7.794mm diameter capstan directly driven from a tachometer-equipped DC servo motor. The pinch roller is operated by a solenoid with conventional spring adjustment of the pinch roller tension. From here the tape passes over a further lightweight roller fitted with spring loaded damping arm and an optical tachometer disc, which drives the tape time and the transport control logic, and thence to the take-up spool.

Servicing of the tape transport is simplified by the fact that all components are fitted with connectors facilitating the replacement of all parts, there being three PCBs on the transport, one just securing screw connectors for the motors and solenoids, the second being the capstan motor tachometer amplifier and the third the tape speed and direction sensor for the optical tachometer.

The mechanical finish of the transport and its components was to a good standard with the only controls being the normal fast wind buttons, play, stop and edit. The latter removes the reel brakes and the tape lifters in the stop mode: however, the reels tended to creep in the edit mode, maybe the

76 ▶

MANUFACTURER'S SPECIFICATION
Format: 24-track 2in.
Speed (others to order): 15/30in/s.
Varispeed: + 15, – 50%.
Speed stability: 0.1%.
Wow and flutter to IEC recommendation: 0.04%.
Wind time (700m): 100s.
Power requirement: 600VA.
Record/replay frequency response: + 1dB, – 2dB (30Hz to 20kHz, 15in/s).
Record/sync frequency response: + 1dB, – 2dB (100Hz to 20kHz, 15in/s).
Record/replay S/N (20Hz to 20kHz ref 510nWb/m): 60dB.
Record/replay crosstalk at 1kHz: – 55dB.
Record/sync crosstalk at 1kHz: – 18dB.
Bias frequency: 100kHz crystal controlled.
Input sensitivity: adjustable – 10dBm to + 20dBm, 10kΩ input impedance.
Output level: adjustable – 10dBm to + 10dBm at 0VU, + 22dBm max into 600 Ω.
Line output bandwidth: 22kHz (including sync mode).
Sync output bandwidth: 16kHz.
Audio connections: ¼in jack/D-type multicore.
Weight: approximately 45kg.
Dimensions: (whd) 21⅝ × 40⅛ × 20½in (550 × 1,020 × 520mm).
Price: Basic machine £8,750: with all options £11,325.
Manufacturer: Soundcraft Magnetics Ltd, 9-10 Great Sutton Street, London EC1V 0BX, UK.
USA: Soundcraft USA, 20610 Manhattan Place, Suite 120, Torrance, Cal 90501.

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It will discourse most eloquent music.

(William Shakespeare 1564-1616)

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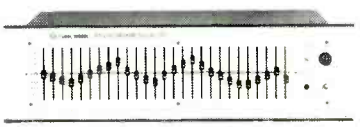
The latest Klark-Teknik equalisers incorporate scale switching which facilitates a fine resolution for small adjustments and yet retains full boost and cut when required. Construction is to the highest standard using selected components and all units are rigorously bench-tested and aligned before a burn-in period and final music test.

DN22 GRAPHIC EQUALISER

The DN22 is a dual-channel Graphic Equaliser, each channel having 11 filters providing up to 12dB boost or cut at 11 centre frequencies, covering the entire audio spectrum. Separate low and high pass filters are provided on each channel giving 12dB per octave attenuation above and below their respective turnover frequencies.

The DN22 offers an extremely wide dynamic range and negligible channel-to-channel crosstalk.

DN27A GRAPHIC EQUALISER



The DN27A is the successor to the widely acclaimed DN27. It is a ⅓rd Octave Graphic Equaliser, providing boost or cut of up to 12dB at 27 I.S.O. centre frequencies covering the entire audio spectrum.

The equaliser filters are of computer-aided design and consist of actively-coupled L.C. networks of the 'minimum phase' type. The inductors have precision-ground ferrite cores and coils wound to extremely tight tolerances.

DN30/30 GRAPHIC EQUALISER

The DN30/30 Stereo Graphic Equaliser represents a breakthrough in equaliser design, giving two channels of full ⅓rd octave equalisation in one compact unit. In addition to saving on rack space the DN30/30 also means a considerable financial saving for anyone requiring stereo system equalisation.

All-new circuitry developed specifically for the DN30/30 uses ultra-stable N.I.C. minimum phase, combining filter networks to give unequalled performance.

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tape tensions required adjustment? These were only identified by colour but their function and the tape loading path are fairly obvious.

Transport of the tape was found to be smooth at a tension of 250g at both spools in the play mode and also the fast modes once full speed had been achieved. A full 2,400ft of tape could be rewound in 90s with the braking at the end of the reel being rather weak: however, in the event of power failure the machine came to a gentle halt.

The tape transport control logic is located at the back of the machine behind a panel below the tape transport. The panel is secured with six self-tapping screws to discourage knob twiddlers from attacking the eight tension setting pots. This PCB, which is almost the width of the machine, was found to be secured by only two screws which hardly provide a secure mounting.

A further PCB at the back of the unit interfaces the noise reduction switching and the remote control unit, these being connected by D connectors which are unfortunately not equipped with locks.

All the audio electronics are housed in three chassis at the front of the unit, each containing eight channels with one plug-in board per channel. At the front of each board, screwdriver-operated pots control level for line in, sync out and line out. Further recessed screwdriver-operated pots control level and HF equalisation for record, sync and replay with the final control being the bias control.

The final features of the front panels are a small level meter and a red 'record ready' LED indicator. As with other printed circuits the layout was tidy but there were a number of hand-wired modifications and no component identifications. However Soundcraft normally provide well illustrated instruction books and the book for the review model is in preparation.

At the base of the front the power supply unit has indicators for each of the five power supply rails and also for the feed and takeup motors. The latter have front panel fuses as does the mains power supply with its indicator light, all the features being properly identified.

At the rear of the unit three multipole connectors each provide the signal connections for eight tracks with two locking connectors feeding the power from the power unit's fixed leads.

The rear of the power unit has recessed voltage change switches near the IEC input connector and also two pairs of banana sockets for checking the reel motor voltages. Finally there are cooling fans for the power unit and for the transport, both these fans being excessively noisy.

Turning now to the remote control unit/autolocator this has 24 columns of red, orange and green LED indicators, one for each channel to indicate line, sync or replay status. Below each column there is a channel select button, a record ready button and a record ready red LED indicator which flashes in the ready state and becomes steady in the record state.

Individual channels can be set up by first pressing the line, replay or sync button to the left of the display and then pressing individual channel buttons. Alternatively pressing a 'master' button sets all channels simultaneously to the same state.

The fast wind, stop, and replay buttons are duplicated on the remote control unit with the normal record button added and interlocked, requiring the simultaneous pressing of the record and replay buttons to enter the record mode.

A 'mute defeat' button allows monitoring in the fast wind modes which normally automatically mutes the replay output when in fast wind.

Finally, before proceeding to the autolocate facilities, there is an illuminated varispeed button with two adjacent pots, one for fine adjustment and the other for coarse adjustment of tape speed.

Turning now to the time and locate facilities there are two displays of time in minutes and seconds up to 99m 59s, one display representing tape time and the other the desired locate time. Buttons allow the contents of the displays to be entered into each other.

To the right of the panel, which may be mounted onto a microphone type stand, there are 16 push-buttons, six red function buttons and ten white decimal buttons. The latter are used either to enter times into the locate display or to access nine tape time stores. If store zero is addressed the locate display shows tape speed in inches per second.

Of the red buttons, the 'clear' button clears the locate display to zero, pressing the sequence 'recall' followed by a store number one to nine entering the appropriate store's contents into the locate display. Similarly the sequence 'store' followed by a number one to nine stores the contents of the locate display into the appropriate store.

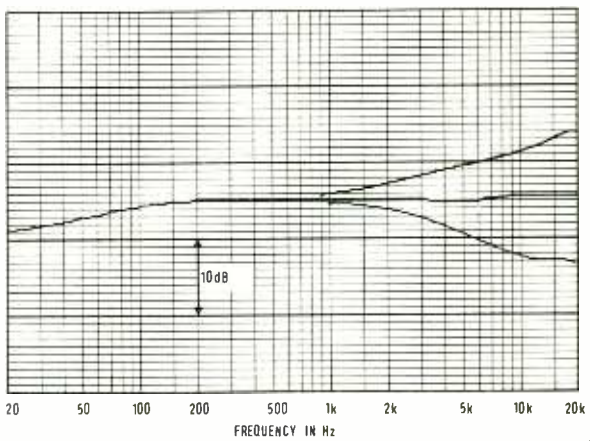
Pressing the 'locate' button locates the tape time entered in the locate display, however the position located may be offset from the tape time zero with the aid of a 'local zero' button. One can, for instance, wind to the start of a recording and then press the local zero: tape times will then operate with reference to this tape position whilst the local zero is switched in, but pressing the button again reverts to actual tape time.

Finally there is a 'cycle' button which permits continuous cycling between two tape positions. Attempts at fooling the locator did not find any shortcomings, for instance the unit would not search for store zero (the tape speed) and rejected silly times. With some sillies the time display indicated 'bOO' with the display saying 'GOOd dAY' upon switch on and 'OUCH' if the autolocator reset button was pressed — this button being a recessed button for use only if the autolocator went crazy due to power line interference.

Overall the autolocate functions were practical and very simple to use compared with some of the more sophisticated devices, this unit providing all the basic functions that are most time saving. Also

78 ▶

FIG.1
SOUNDCRAFT SCM 762-24
REPLAY FREQUENCY
RESPONSE



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- Efficiency (output at 1 meter with 1 watt input) . . . . . 94 dB SPL
- Maximum operating level . . . . . 117 dB SPL

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the channel switching functions were very well laid out with the status of each channel being absolutely clear. However I did not like the record interlock which required the record and replay buttons being simultaneously pressed and the record button released before the replay button.

Inputs and outputs

The three multiway input/output connectors on the rear panel each provide for the unbalanced line input, replay output and sync output for eight tracks. The constant output impedance of the replay and the sync outputs was found to be adequately low at 16Ω with the maximum output level being +20dBm.

Input impedance varied slightly with the input gain setting from a minimum of 7,140Ω to a maximum of 10,500Ω with the input sensitivity range being from −10dBm to infinity for 0VU indication.

As supplied, 0VU corresponded to a recorded fluxivity of 320nWb/m with the machine being aligned for Ampex *456* tape. Under these conditions the record level control had a range of +6.5dB to −16dB which is quite adequate for any current tape types. Similarly the replay level control had a +10dB/−15dB range, the line out control giving +6.5dB to minus infinity for a replayed fluxivity of 320nWb/m.

Examination of the 'VU' meters on the channel modules showed that they were unusual in their ballistics with a rise time of 800ms and a fall time of 1,100ms with the rectifier having an average characteristic. Whilst the meters are useful for machine alignment they should be used with great caution on programme material!

The replay performance

The replay frequency response was examined using a flux loop with 50μs and 3,180μs equalisation to the 15in/s NAB standard. The results, shown in **Fig 1**, show that the equalisation was correct as received with the available range of the equaliser being shown.

As the equalisation is not switched for speed changes the equaliser needs a wider range than usual to cope with the 17.5μs AES equalisation at 30in/s or the IEC 35μs characteristic at 15in/s. Clearly such a range is available and the setting of the control is not too coarse.

So far as the LF equalisation is concerned this is fixed and any alterations to change from 3,180μs to flat are a soldering iron job.

The same remarks apply to sync playback with the overall record/sync frequency response being good as shown in **Fig 2**, where the response is absolutely flat up to 15kHz.

At the normal gain setting with a fluxivity of 320nWb/m corresponding to 0VU and +4dBm output the maximum level that can be replayed is limited to 16dB above 320nWb/m by the line output amplifiers, this being quite adequate for any available tape types.

Noise was measured in the replay and sync outputs with the machine alone and with Ampex *456* tape which had been recorded with bias only on the machine with the tolerance between channels being insignificant. **Table 1** shows the results which indicate a good machine performance in both the replay and the sync modes.

No trouble was found with power line hum or other tones in the outputs except when monitoring in the fast wind mode when there was a small breakthrough from the reel motors during acceleration.

TABLE 1

Measurement method	Noise reference 320nWb/m Machine only Play	Machine only Sync	With tape Play	With tape Sync
22Hz to 22kHz RMS	−60.5dB	−57.5dB	−54.0dB	−54.0dB
A-weighted RMS	−68.5dB	−62.5dB	−58.0dB	−57.0dB
CCIR-weighted RMS ref 1kHz	−63.5dB	−56.5dB	−50.5dB	−49.0dB
CCIR-weighted quasi peak	−59.5dB	−52.5dB	−47.5dB	−45.0dB
CCIR/ARM ref 2kHz	−70.5dB	−63.0dB	−58.0dB	−55.5dB

Record/replay performance

Fig 3 shows the optimised record/replay frequency response using Ampex *456* tape at 2.5dB over bias at 10kHz, all measurements being taken at 15in/s tape speed using the 50μs and 3,180μs NAB equalisation. From **Fig 3** it is to be seen that the record equalisers have a more than adequate range of about ±5dB at 10kHz. It also will be noted that the LF response is relatively smooth.

Adjustment of the record and replay levels was found to be very coarse due to their wide range and the use of ordinary pots — here multiturn pots would be a distinct advantage. The same remark applies particularly to the bias adjustment which

80 ▶

FIG.2
SOUNDCRAFT SCM 762-24
OVERALL FREQUENCY
RESPONSE

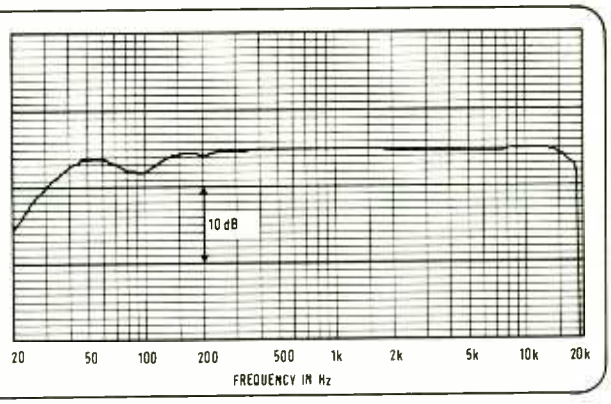


FIG.3
SOUNDCRAFT SCM762-24
RECORD/REPLAY
FREQUENCY RESPONSE

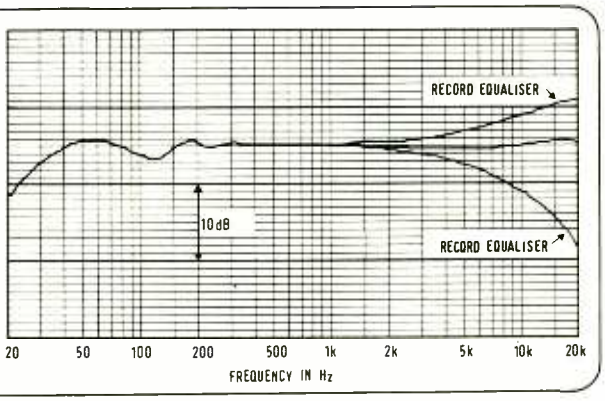
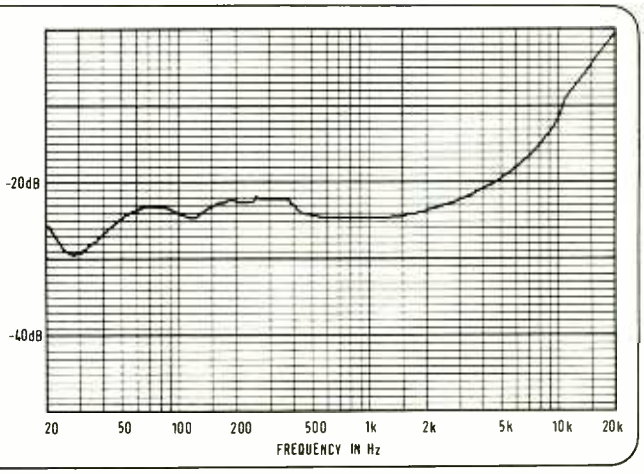


FIG.4
SOUNDCRAFT SCM 762-24
SYNC. CROSSTALK



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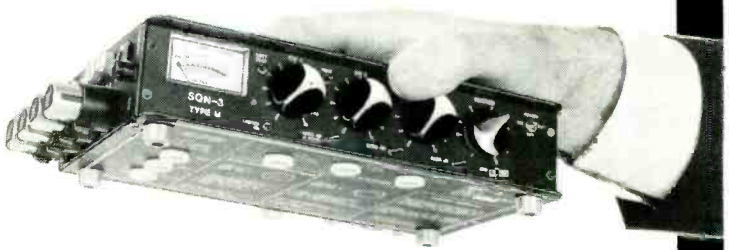

FEATURES

- ★ 3 balanced microphone inputs (XLR-3) EACH with 12V T (DIN A-B) and 12V/48V phantom powering, attenuator –10/–20dB and bass cut –4/–10dB at 100Hz.
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had an adequately wide range but was a critical adjustment.

The maximum output level for 3% third harmonic distortion at 1kHz was found to be +11.5dB reference 320nWb/m with the record amplifier being able to drive well above this level before the onset of serious distortion. Third harmonic distortion when recording 320nWb/m was only 0.22% at 1kHz — a credit to the Ampex *456* tape and the machine.

Erasure of a 1kHz tone was greater than 80dB: it was, however, found that there was a little 'spillage' from the erase head onto adjacent tracks. For instance if a recording of 10kHz tone was on track 8, recording tracks 7 and 9 resulted in a 0.5dB loss in the 10kHz level.

Crosstalk when recording one track and replaying the adjacent track in sync (a worst case condition) is shown in **Fig 4** which, in view of the bandwidth of the sync chain, is a respectable result.

In the replay mode the crosstalk when recording an adjacent track to the replayed track is shown in **Fig 5**, which represents a satisfactory result.

Recording and replaying a 1kHz squarewave produced **Fig 6**, which demonstrates a respectable phase performance with little ringing.

Wow, flutter and speed

Measurement of the peak-weighted wow and flutter to the IEC recommendations at the beginning, middle and end of a full reel of tape at both tape speeds gave consistent results of 0.035% at the beginning and middle of the reel. Initially the results at the end were rather poor, but readjustment of the pinch roller pressure as per the instruction book resolved this problem.

Drift in speed from the beginning to the end of a reel was found to be −0.1% with the relation between 15in/s and 30in/s being within 0.055%.

Using the varispeed controls the available tape speed range was found to be from 11.88in/s to 32.68in/s with the tape speed indication being within 0.1% at all speeds. The fine speed control was adequately fine in action with its full range being approximately ±3%.

A spectrum analysis of a 10kHz recorded and replayed tone as shown in **Fig 7** showed no significant sidebands and a clean performance in terms of analogue recorders.

Other matters

The phase jitter when recording and replaying tracks 1 and 24 is shown in **Fig 8**, it being found that the record and replay heads were securely mounted with positive locking of the azimuth.

Whilst the accuracy of the autolocator was good over short lengths of tape there was some tape slip over longer lengths leading to errors of up to 5s in 10min of tape.

Manufacturer's comment: Soundcraft inform us that the review machine appears to be out of typical performance specifications in two areas. Firstly, typical autolocate tape slip is ±1s over a full reel of tape, while secondly, wow and flutter performance is usually under 0.03%.

Variations in the incoming line voltage over a wide range had no effect on the unit which consumed a maximum of 1kVA at 240V in the fast wind modes and about 700VA in the replay mode.

Summary

Generally, the performance of this machine was both electrically and mechanically to a good standard. Soundcraft's manuals are normally good and maintenance should be easy in view of the ready access to all components.

Whilst the method of mechanical construction is inferior to the major European manufacturers such standards reflect very much in the price tag. Overall this is a good machine which is portable and offers a respectable performance at a reasonable price. **Hugh Ford**

FIG. 5
SOUNDCRAFT SCM 762-24
REPLAY CROSSTALK

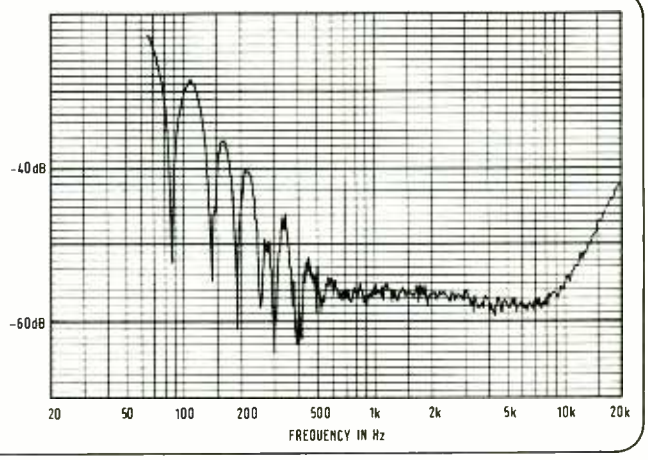


FIG. 6

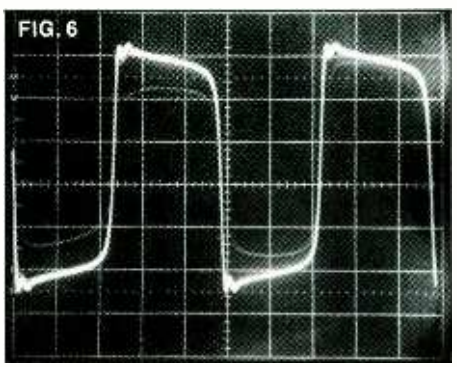


FIG. 8

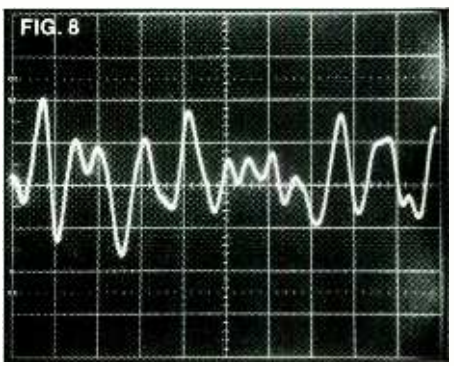
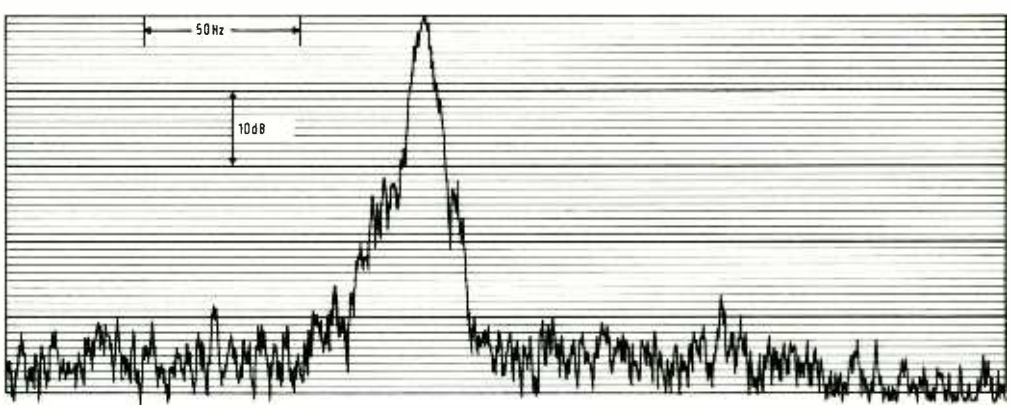


FIG. 7
SOUNDCRAFT SCM 762-24
SPECTRUM ANALYSIS



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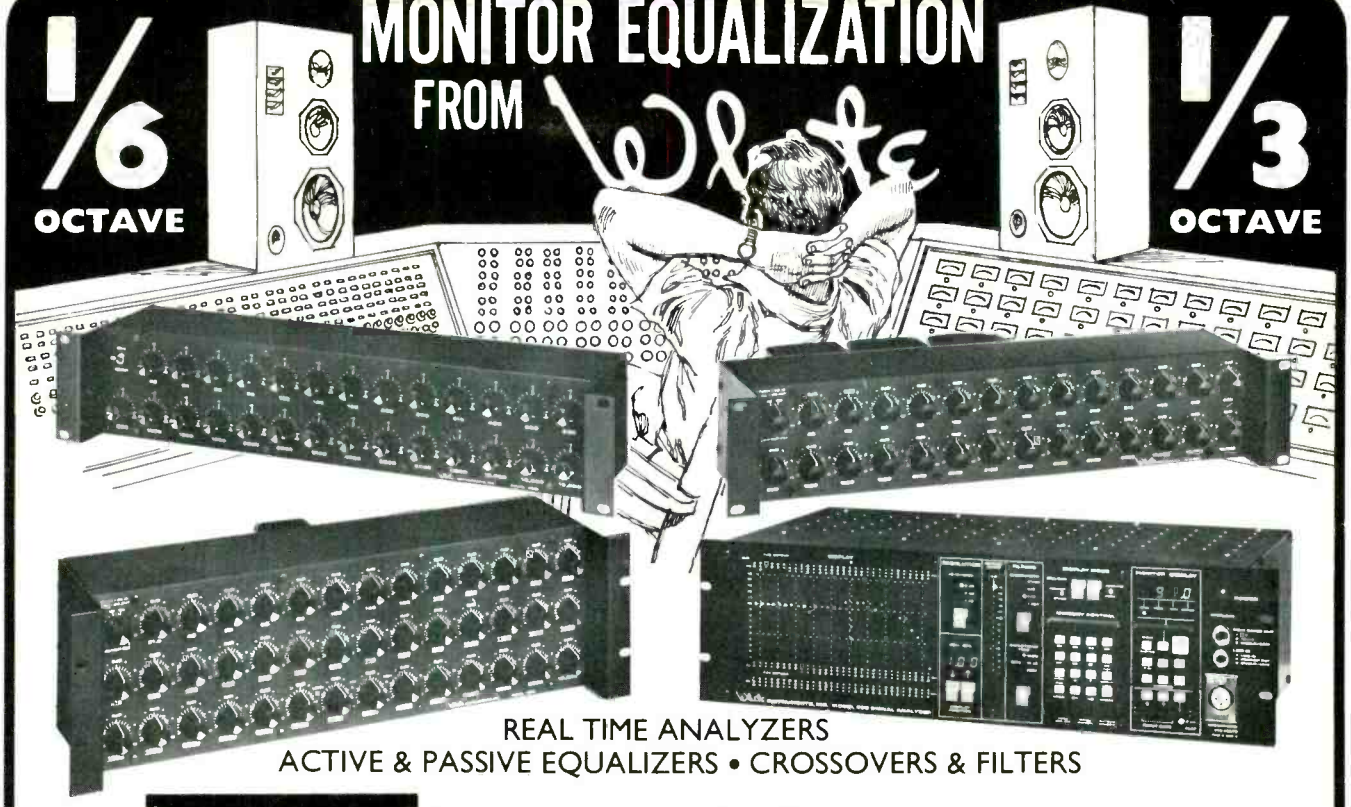

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Fostex 250 Multitracker

THE Fostex *Model 250* completes the range of tape machines produced by this Japanese manufacturer, the reel-to-reel machines having been examined last month.

The Fostex *250* is a 4-track, compact-cassette-based recorder and mixer designed with the performing artist in mind. It features a cassette transport running at 3¾in/s, Dolby-C noise reduction and a 4-channel mixer plus stereo group fader. The unit is extremely compact, in line with the rest of the range, measuring 17 × 3⅛ × 14in (whd) and weighing a mere 19lb. Although comparisons with the Teac *144* are unavoidable, this unit has a number of features which represent a fundamental re-appraisal of the design of this type of equipment.

Transport controls

Apart from the fact that this machine uses a cassette transport, taking conventional compact cassettes, the transport functions and control layout are basically identical to those on the reel-to-reel recorders reviewed last month. The cassette well is fitted to the right of the machine, the cassette itself being inserted and removed manually via conventional front-loading. There is no eject button, and the cassette is removed by grasping either side of the cassette by use of the depressions provided at either side of the well. The cassette well is covered when in use by a hinged smoky plastic lid which is not sprung, laying flat against the front panel when opened and resting in the open position on two rubber pads to prevent scratching. The lid itself may be completely removed by depressing a small plastic retaining notch next to the left-hand hinge and sliding the lid to the right. The transport well contains the usual 'write-protect' sensing notch at the rear left, no automatic tape-type sensing prong being present as the machine is designed to take Type II tapes (high bias, 70μs EQ) only, gamma-ferric oxide formulations such as TDK *SA* or Maxell *UDXL-II* being recommended. The transport is a two-motor single-capstan design, featuring a belt-drive FG servo DC motor for the capstan and another DC motor for spooling and takeup drive. All transport controls are solenoid operated, a small pin next to the left hand cassette locating notch being used to enable the transport only when a cassette is present. Spring-loaded catches secure the cassette when it is

84 ▶

MANUFACTURER'S SPECIFICATION

Inputs: impedance 50kΩ; levels – 60dBV (1mV) mic, – 10dBV (0.3V) line.
4-channel rec in (x4): impedance 20kΩ; nominal input level – 10dBV (0.3V).
Aux in (x2): impedance 20kΩ; nominal input level – 10dBV (0.3V).
Aux send/monmix out: load impedance 10kΩ or higher at – 10dBV (0.3V) nominal.
Direct out (x4): load impedance 10kΩ or higher at – 10dBV (0.3V) nominal.
Tape cue out (x4): load impedance 10kΩ or higher at – 10dBV (0.3V) nominal.
Stereo headphone output: 4Ω minimum, 8Ω or higher typical load impedance, 100mW into 8Ω.
Equaliser sections: 4kHz peaking, 100Hz shelving both variable ± 12dB.
Tape: standard cassette C-60 or C-90, high bias type.
Format: 4-track simultaneous, one direction.
Channels (x4): record/reproduce with Dolby-C, encode/decode switchable.
Tape speed: 3¾in/s ± 1%.
Varispeed: ± 10%.
Recording time: 22min C-90, 15min C-60.
Heads: two.
Motors: FG servo-controlled DC capstan motor, DC reel motor.
Fast wind time: 80s typical for C-60.
Frequency response: mixer 20Hz to 20kHz ± 1dB; recorder 20Hz to 18kHz (40Hz to 14kHz + 2dB, – 3dB at 0VU).
THD: mixer better than 0.05% at 1kHz nominal level; recorder 1.5% at 315Hz, 0VU level (overall).
S/N ratio: mixer overall 75dB weighted; recorder 71dB weighted.
Crosstalk: mixer 65dB at 1kHz; recorder 50dB at 1kHz.
Erasure: 70dB at 1kHz.
Power requirements: 120/220/240V AC, 35W.
Dimensions: 17 × 3⅛ × 14in, 430 × 80 × 355mm (whd).
Weight: net 19lb (8½kg).
Manufacturer: Fostex Corp, 512 Miyazawacho, Akishima, Tokyo, Japan.
UK: Bandive Ltd, 8 East Barnet Road, New Barnet, Herts EN4 8RW.
USA: Fostex Corporation of America, 15431 Blackburn Avenue, Norwalk, Cal 90650.

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inserted, ensuring that the tape path is stable — a useful feature for this type of machine.

In front of the cassette well are the transport controls, two banks of three momentary switches being fitted at the right front of the machine for this purpose, above them being a ±10% varispeed control with centre detent. The upper bank of switches offers zero return, rewind, and fast forward, while the lower bank actuates record, stop and play. Next to the record button is a small red LED which flashes when the record button is depressed, the LED remaining on when the play button is also pressed, if a track has been selected as ready to record. To the left of these buttons is a bank of four push-on/push-off switches which enable record on the selected tracks. When these are pressed in, an LED above the appropriate switch flashes until record is entered, when they and the main record LED remain illuminated. Above the track select switches is the 4-digit tape position indicator and reset button.

Mixer controls

The remainder of the front panel is occupied by the mixer section and by four large (2½ × 1½in) VU-style meters, each of which has a peak LED. The meters are arranged in a row along the top of the machine. Beneath these, four channels are provided, plus a simple section giving meter switching, control of headphone level and aux return to the stereo buss. Each of the four channels has the same functions; starting from the top of the channel these are:

- **Mon mix:** calibrated 0 to 10, this sends a signal from the channel to the headphone amp plus a rear mono 'mon mix' output. These, and the headphone level control, are coloured blue for identification.
- **Aux buss:** again calibrated 0 to 10, this enables a mono mix for effects purposes to be generated, the signal being sent post-fader, and the output emerging from a rear socket. Colour-coded green.
- **4-chan buss:** This switch is used with a panpot to route the signal to the appropriate track. The switch has three positions: 1-2, off, and 3-4, denoting the busses to which the signal may be routed.
- **Pan:** this knob is coloured orange, which is fine: for some reason the aux return control is the same colour.
- **Equal:** these two grey knobs offer ±12dB at 4kHz and 300Hz. No central detent is fitted.
- **Input:** a second three-way lever switch determines the source for the channel, being selectable between line/mic, off, and tape. In the first position, the gain is adjustable with the red knob beneath the switch. This has a 50dB range between 0 (also marked 'line') where it offers unity gain, and 10 (also marked 'mic') where full gain is present. Thus the inputs at the front of the unit (which are ¼in mono jacks) may be used for mic or −10dBV line inputs. (Also fitted on the front of the unit are two headphone sockets.)

A 2-position lever switch is fitted to the right of the channels, with the headphone and aux return controls. This selects metering between the recorder and the mixer.

Rear panel

The rear panel of the *250* offers an array of sockets, mainly RCA phono types. From left to right, we find a power on/off rocker switch, the cable entry for the captive twin-core mains lead (correctly colour-coded) above which is a small sticker on the review machine indicating 240V. Next to these is a socket panel with a ¼in mono socket for the foot-switch punch in/out facility which is one of the excellent innovations of Fostex gear, followed by RCA phono sockets for aux send, monitor mix, line out (stereo), and stereo aux input. A second socket panel to the right of this is divided into four groups of three, corresponding to each mixer channel and offering tape out, recorder input, and direct channel output. The tape out sockets carry the output from the tape recorder section, giving line in during record and sync during replay; the recorder input is self-explanatory; and the direct outputs are derived post-EQ but before the 4-channel buss selector switch and the pan and fader controls.

On the underside of the machine is a slider switch to switch the Dolby-C noise reduction in or out of circuit.

Labelling for the rear and front sockets, plus the warning notices in French and English on the underside about the inadvisability of opening the unit, are embossed in the plastic moulding of the case, and are thus unlikely to fade away. All other markings are firmly silk-screened.

Inside the machine

As one might expect, the innards of the machine — which are exposed after the removal of no less than 10 screws — are absolutely full of compact circuitry. However, everything has been well-placed so as to minimise problems. The main power transformer is mounted as far away as possible from the audio electronics, as are the transport logic and tape counter electronics. The only negative points on the power side are the apparent lack of a mains fuse, the lack of shrouding on the power switch and the rather close proximity of the power switch to the case of the transformer. In addition, although a double-pole mains switch is fitted, the neutral line is commoned to one of the transformer primary leads at the switch, the second contact being unused. It was impossible to determine the voltage capability of the mains switch. Next to the transformer is the PSU board which has three fuse-holders mounted on it with the fuse values clearly marked. The tape transport has a suitably large, well-balanced flywheel.

All the boards in the machine are of the standard Japanese type, looking as if they are mass-produced and snapped off a large SRBP sheet during production. It is doubtful that the use of epoxy-glass PCBs is necessary or cost-effective in this type of equipment.

The machine manages to be compact and crammed-full of circuitry, yet is still designed with maintenance in mind, as all boards are silk-screened with component reference numbers; the majority of the connections are made with plugs and board-mounted sockets; the main mixer PCB is designed to hinge back; and plenty of spare lead is provided on the connectors for operation in the hinged-up position. Assuming a good workshop manual, maintenance would be straightforward, if a little cramped. The circuitry is mainly discrete but several ICs are used, particularly in certain aspects of the mixer and, of course, the logic board. A useful extra is the fitting of what appears to be a

86 ▶

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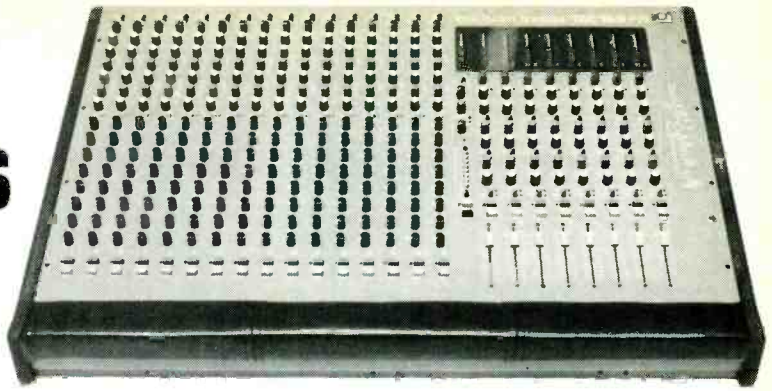

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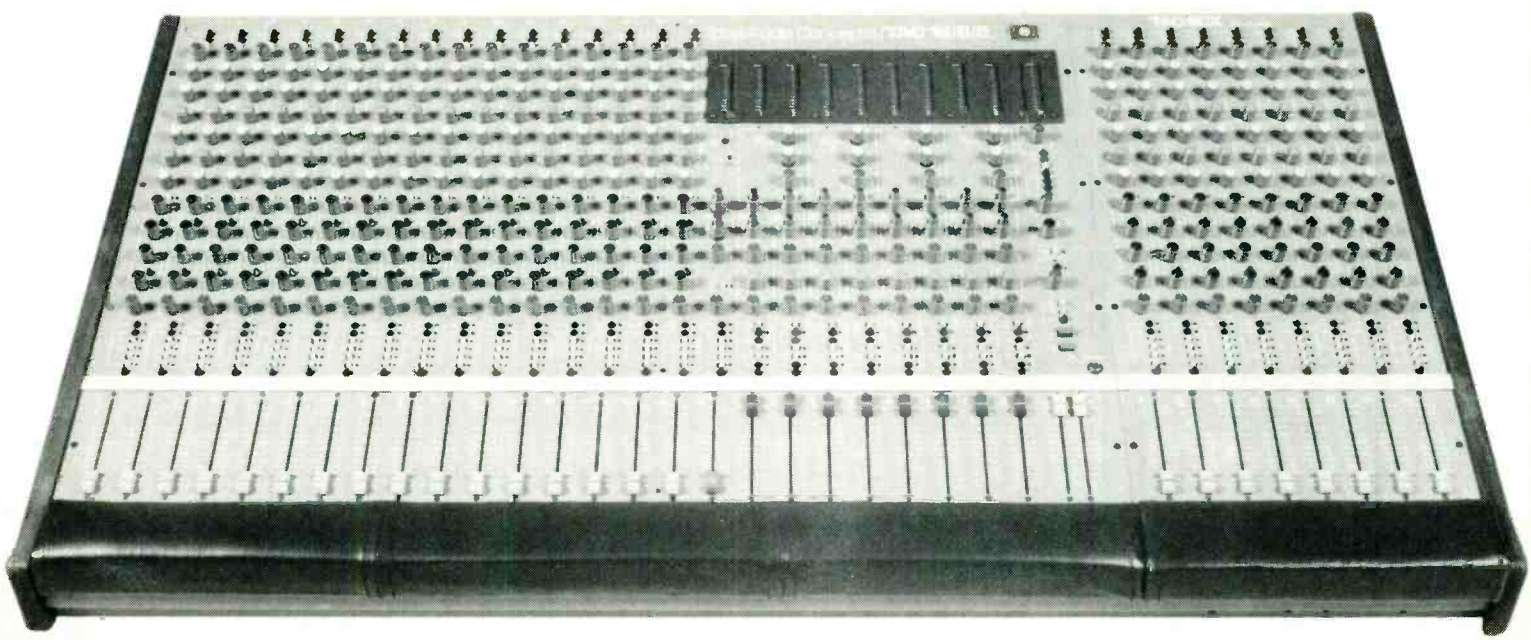

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master speed preset next to the board carrying the varispeed control: this has a sensible-sized screwdriver slot. The high-gain parts of the mixer board are screened with a removable metallised sheet for hum reduction. All in all, a very clever bit of production design, with the exception of slight concern about the handling of the mains input: however, this would doubtless be more than enough for the rather lax North American safety specs.

In use

Using the Fostex *250* is quite straightforward, and the manual supplied with the unit will be of great assistance to the inexperienced user, as it takes him or her through simple record and playback functions after indicating the purpose of each control. A useful feature of the manual is the provision of a fold-out inside front cover which enables you to examine diagrams of the machine controls while reading their functions in the main body of the manual. An introductory section fully describes the track format, and gives a basic overview of the system, pointing out the differences and similarities of the *250* as compared with conventional cassette recorders. The tape is, of course, recorded in one direction only, with the track 1 and 2 positions corresponding to the position of a stereo pair on a conventional machine. Of course, *250* tapes, even if only recorded on tracks 1 and 2, could only be played back on a regular cassette machine if it was able to run at 3¾in/s (as some machines are now able to do).

The manual also covers the normal facilities required for 4-track recording, including initial recording, overdubbing, mixdown, bouncing tracks, stereo recording, drop-ins, and so on, and an extensive rear section covers cleaning, demagnetisation, interfacing, and also provides a blank tracksheet for copying.

With the exception of the fader, the signal flow in the mixer is from bottom to top; considering the routing in this order makes recording largely self-explanatory. A front-panel input is fed into the appropriate socket via the ¼in jack, the gain is set with the input gain trim, and the input switch is set to line/mic. The signal is then routed to the appropriate buss by means of the pan and 4-channel buss selector controls, monitoring being achieved by turning up the appropriate *track* mon mix knob (not necessarily the mixer *channel* that is in use) and setting the headphone monitor knob anticlockwise from the centre detent (or using the mon mix output). The headphone monitor pot could be confusing at first, as it has a centre detent (off), being rotated to the left for mon mix level and to the right to listen to the 4-channel buss. After this, all that is done is to select 'ready' on the appropriate track and record — when you've set the appropriate fader level and EQ. The faders, which have a 2½in throw, are smooth in action and adequate for the job. All channels may be routed in any combination to any track, and all tracks may be recorded at once if desired — an advance over previous machines of this type.

The equalisation controls are best described as 'curious'. The 300Hz control is of the shelving variety, while the 4kHz control is peaking: you have ±12dB on each control and that's it. This arrangement is a little limiting at first, but, as with the *350* mixer, you get used to 'thinking backwards' after a time, the only real drawback being the impossibility of boosting 'real' top end if needed (or reducing it!). It is difficult to see how a more comprehensive EQ could have been fitted into the space, but I do feel that a 3-band EQ (say 200Hz, 3.5kHz and 10kHz) would have offered more possibilities as this arrangement would have handled normal low, mid and high ranges satisfactorily (presumably there will be an outboard EQ unit added to the range at some point to remedy this). Certainly, the 2-band EQ here is fine for 'normal' applications, but home recording isn't always that normal. You also learn rather odd EQ-ing techniques on the *250* which may take a little adjustment when confronted with a more sophisticated console later on!

Recording on cassette tape, albeit at 3¾in/s, with this track format certainly demonstrates the benefit of Dolby-C noise reduction. It appears to offer everything you always wanted with Dolby but never quite got, namely about 20dB of noise reduction with no discernible sound change. Dolby-B always did seem to offer less in the way of sound alteration than the 'A' variety, but you were lucky if your home cassette machine was correctly lined up for Dolby level. Although modern machines are usually satisfactory in this respect, many semi-pro users may have been put off in the past. Although level is still an important consideration, the Fostex Dolby-C appears to function perfectly, although on a 'non-standard' machine like this, there is probably little to choose between Dolby-C and dbx as there is little chance of the tapes needing to be played back on a different recorder.

Overdubbing is simply a matter of using the monitor mix controls and routing the new input to the appropriate destination, while bouncing tracks is equally easy. For this application the recorder and monitor mixer can be considered as a separate unit from the mixer: all four main channels may be used to combine new and existing tracks, deriving signals from tape or from mic/line as necessary by suitable use of the input selector switch and gain trim. Bouncing adjacent tracks appeared to be quite feasible with no problems: indeed you can hardly avoid it with only four tracks! There is a certain degree of crosstalk in the headphone/monitor mixer but this is not at all serious. With noise reduction, several bounces are practical without too much noise getting in the way.

For mixdown, the input selectors are simply set to 'tape', and the channels are routed to busses 1 and 2 via the buss selector and panpot. The output is derived from the line-out sockets via the master fader, and both the aux and mon mix busses may be used for effects purposes, as well as the direct outputs, although there is only one stereo return, which is fed back into the 1 and 2 busses before the master fader. The meter switch enables the buss output levels to be monitored instead of the recorder channels.

Summary

Overall, this machine is a very worthwhile investment for the singer-songwriter, home recordist or demo musician, and offers better facilities as far as recording flexibility is concerned than other machines of this type. The performance compares favourably with open-reel 4-track recorders and is certainly the equal of modern cassette machines such as might be used for 'mastering' with the Fostex. While the EQ is limiting to someone who has experienced more sophisticated gear, it is fine for the purpose for which the *250* is designed. As is all too often the case with imported gear, mains safety — whilst more than sufficient for UL approval — is not up to British Standard and IEC specifications, although at least here we have a correctly-coded mains lead. As this machine may be defined as a domestic piece of equipment rather than a professional one, it may well be that more concern should be placed on conformity to safety standards than is usual for pro-audio gear, although in this respect the Fostex is better than many. This is an area in which both Japanese and North American manufacturers should place a concerted effort when producing gear for export. It may well be that European standards are overspecified, but US standards are generally rather the opposite. Small safety modifications are inexpensive in a production run, yet serve not only to make the equipment more safe to use, but also lead to fewer problems when selling abroad, particularly in Europe. Fostex have comparatively little to worry about here, but other manufacturers should be far more concerned than they appear to be.

Richard Elen

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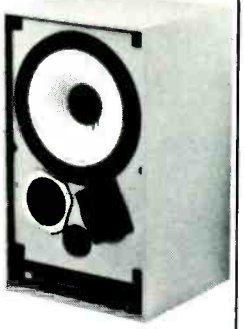

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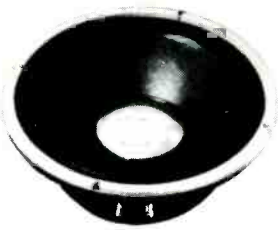

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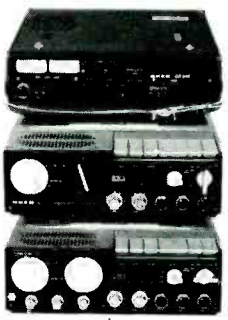

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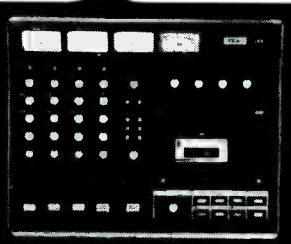

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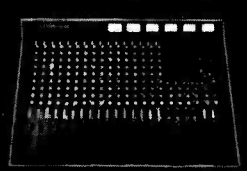

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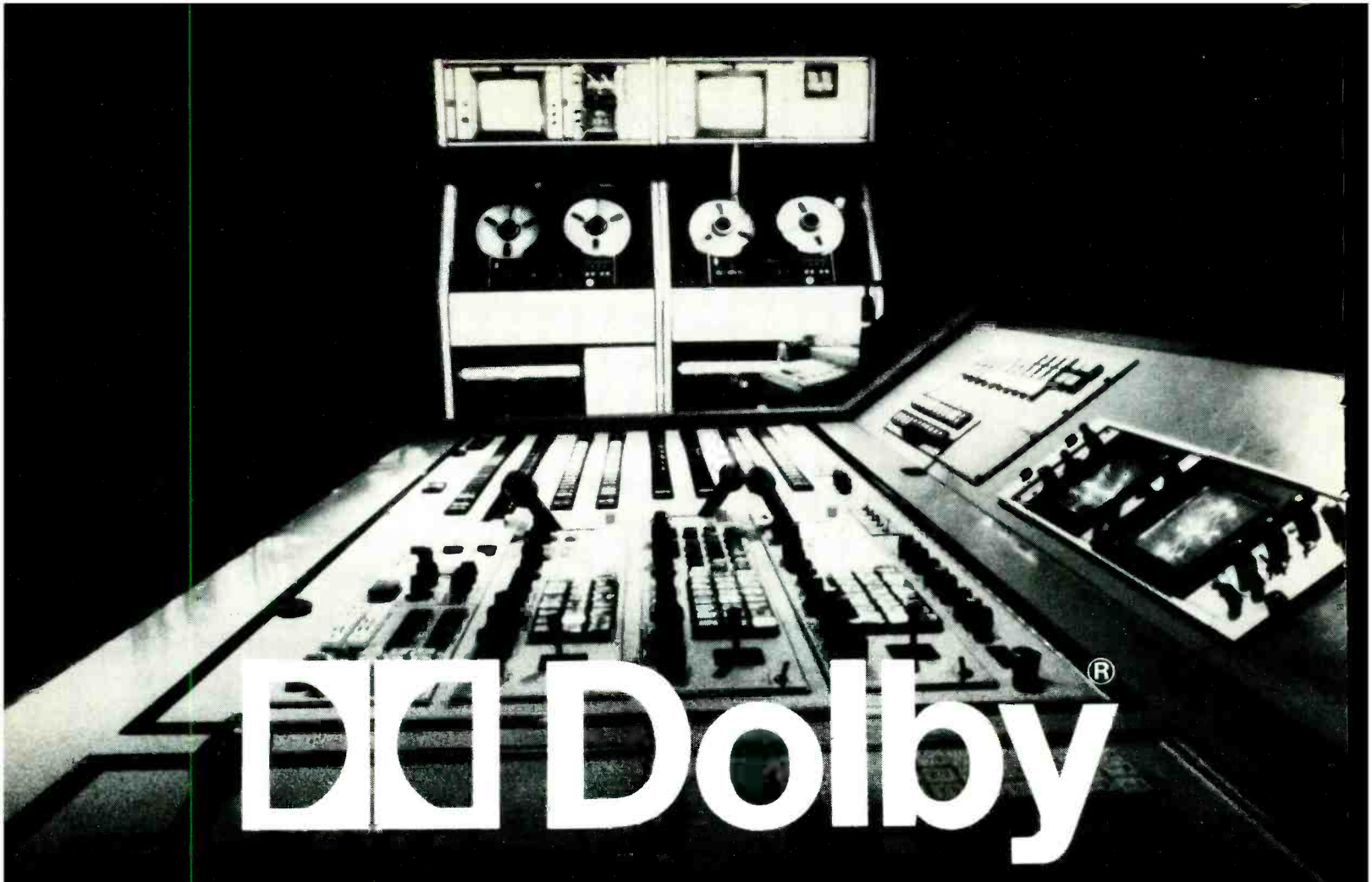

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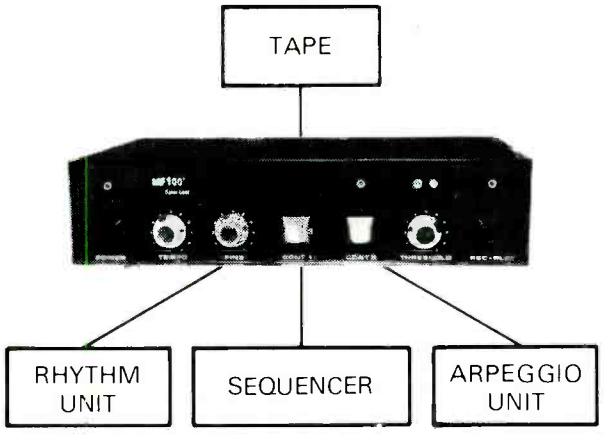

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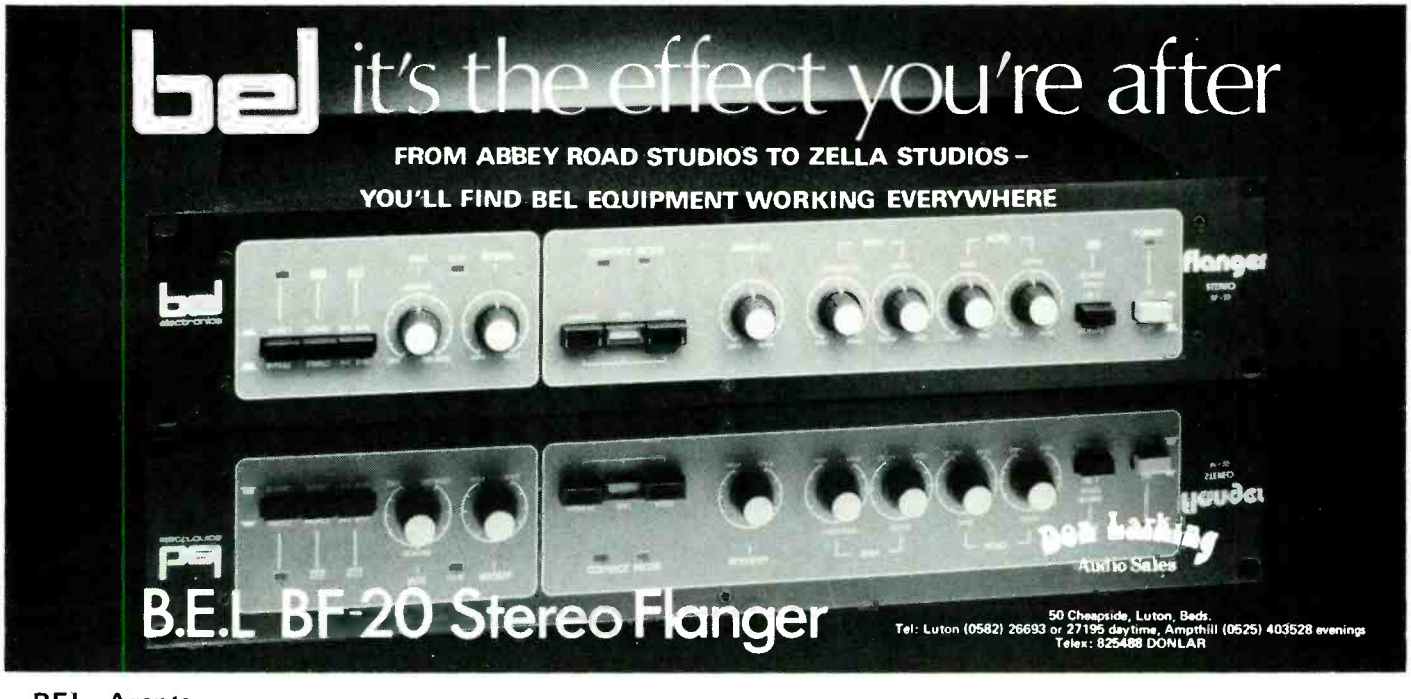

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INDEX TO ADVERTISERS

A.C. Electronic Services 6
Acoustical Manufacturing Co. 4
Advanced Music Systems 83
AKG 47
Allen & Heath/Brenell 48, 49
Ampex 31
Aphex 59
A.S.C.E. 11
Association Professional Recording Studios 94
Audio & Design Recording 45
Audio Developments 16
Audio Kinetics 79
Audio Systems International 90
Audix 10

Bauch, F. W. O., Ltd. 13, 15, 17, 41, 53, 61, 67
Brooke Siren Systems 39

C.A.E. 14
Cetec 46

Dolby Laboratories 88
Dominus 76

Eardley Electronics 29
Electrovoice 18

Feldon 27
Formula Sound 47
Future Film Developments 18

Harrison 41
Harris Audio 77
Haydon Labs 35

ITA 7, 9, 11, 16
ITC 15

Klark Teknik Research Ltd. 75
Keyboard Hire 23

Larking, Don, Audio 90
Lexicon 13
Lyrec UK Ltd. 71

MacFison Electronic Engineers 90
MCI Inc. ..... *IBC*
MCI Ltd. 5
M.E.W. 90
Magnetic Tapes Ltd. 57
Midas Audio Systems Ltd. ..... *IFC*
Music Labs 21
Mustang Communications 11
MXR Innovations 37

New England Digital 23

Otari Electric Co. Ltd. 65

Penny & Giles 20
Plus 30 73

Revox 17
REW 87

Satt Elektronik AB 12
Scenic Sounds 25, 43, 85
Shure Electronics 8
Soundcraft Magnetics Ltd. ..... *OBC*
SQN Sales 79
SRT 39
Stantron 47
Steven, John A. 6
Studer 61, 67
Studio Equipment Services 81
Surrey Electronics 86
Swintex 83

Tannoy Products Ltd. 55
Trident Audio Developments Ltd. 33
Turnkey 10, 19, 34, 38, 84

UHER 20
UREI 53

Westrex Co. Ltd. 89
White Instruments 81

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