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studio sound

AND BROADCAST ENGINEERING

A LINK HOUSE PUBLICATION

Digital in audio

AES New York preview

When you're used to the best there is...

You would choose Soundcraft too. That's what producer/songwriter Pete Bellotte told us.

And he certainly is used to the best. After recording in Westlake Studios, LA, and other top studios on both sides of the Atlantic, Pete Bellotte chose Soundcraft for his personal studio in Surrey, England.

"I needed the absolute freedom of a studio at home – but I also wanted the same high quality I was used to, so I could produce master tapes without additional overdubbing at a later stage.

"I had use Soundcraft consoles before in the States, and I was told by my engineers how good the 'sound' of Soundcraft desks really was. So the choice was simple.

"My only guidelines in selecting the equipment were space and quality. That's why I spent a fortune getting the accoustics just right, having Westlake monitors fitted by a team flown in from the States, a Lexicon reverb unit – and a Soundcraft 2400 console with the new Series 760 multitrack.

"Once you're used to the best there is, you'll never want to compromise. And that's why I chose Soundcraft."

Soundcraft

The Producer's choice

Soundcraft Electronics Limited, 5-8 Great Sutton Street, London, EC1V 0BX, England. Tel: 01-251 3631. Telex: 21198.

Soundcraft Electronics USA, 1517 20th. Street, Santa Monica, California 90404. Tel: (213) 453 4591. Telex: 664923.

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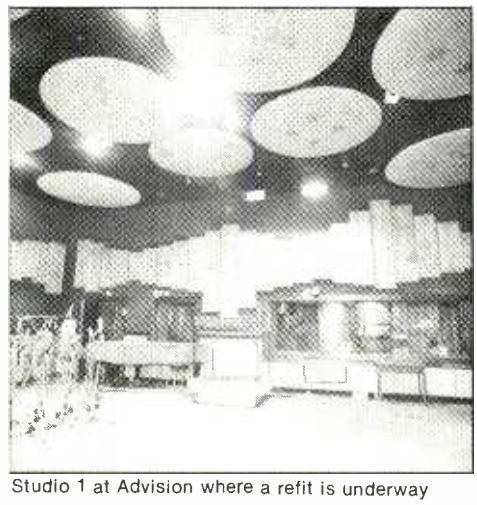


Studio 1 at Advision where a refit is underway

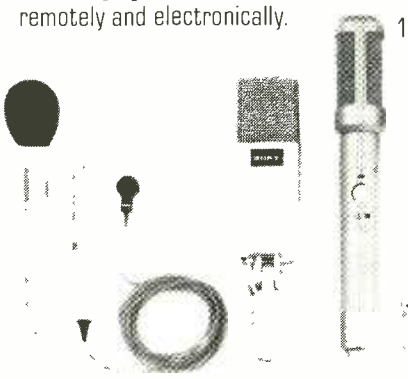
Aphex *The Compellor*

White Instruments *Model 4520*

See New Products

THE SONY® RANGE OF PROFESSIONAL AUDIO EQUIPMENT BY FELDON AUDIO

1·Microphones: From the new C-48 studio condenser to the ECM-50 miniature microphone, Sony's range covers every conceivable application. Included is the new 989 stereo microphone that employs three capsules and incorporates a facility for changing the directional axes both remotely and electronically.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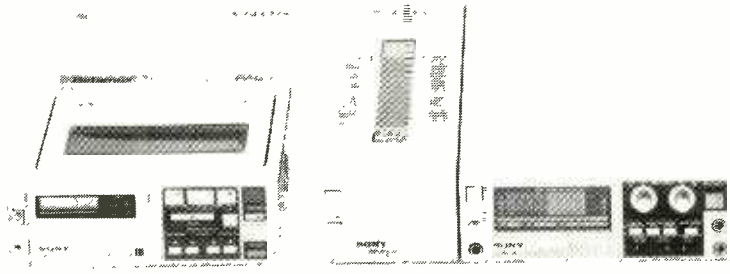
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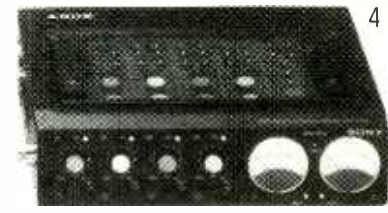
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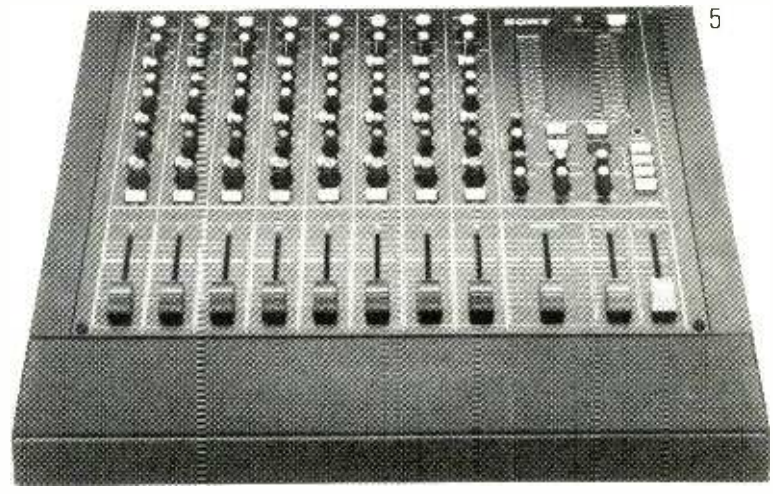
2·Sony P.C.M.F-1 System: The complete 2 track 16 bit digital recording package. Now with the R.T.W. interface, recordings can be transferred digitaly to P.C.M. 1610 in preparation for digital editing and subsequent transfer to either standard or compact disc.

3·TC-D5 PRO Cassette Recorder: Sony's constant commitment to technological excellence is culminated in this extraordinarily compact unit, the TC-D5 PRO, with fully professional quality and long term reliability.

4·MX-P42 Mixer: Sony makes the difficult easy in field production with the ALC (automatic level control) equipped 4 x 2 portable mixer. Direct VTR interface. Ganging facility, Pan Pots, Phantom power facility for condenser mixes.

5·Sony MX-P21 Mixer: A new professional multi-purpose mixer for Audio/Video recording and post production. 8 input channels, 2 output channels, plus 2 AUX outputs. 3 band E/Q, Pan Pots, P.F.L.

6·Sony Audio Duplicators: The new range of high fidelity, high speed, sound cassette duplication system at 8 and 16 times normal speed. Depending on the system adopted, between 1 and 40 cassettes may be made in one run.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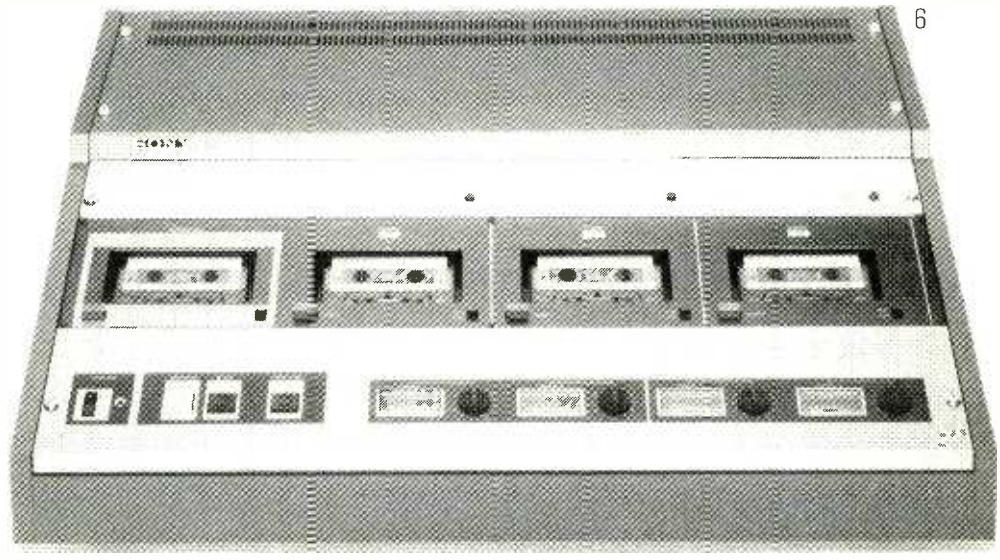
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EDITORIAL

studio sound

AND BROADCAST ENGINEERING

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Which way to go?

This month's issue concentrates on 'Digital In Audio'—an important use of words, because of course analogue is very much alive and well and will be around for ages yet: thus *digital control* of analogue signals is just as important today as digital signal processing and recording. It looks very much as if a division of opinion is developing among console manufacturers particularly: a division between those who feel that digital signal processing is the way to go (as Neve do for example) and those who feel that digital control of analogue is not only equally valid but in some cases (cost, for example) better—Alice are among those who appear to share this view. Both opinions are represented in this issue.

So what are the pros and cons? On the digital processing side, it is no doubt a fact that integrating digital control with digital signal processing (as in the Neve DSP) brings an elegant solution to a number of problems. Everything is a matter of juggling numbers, and the computer aspect of the system can simply ensure that the right numbers get to the right places at the right times. In the long term, the approach has obvious benefits, but today some may feel, rightly or wrongly, that an all-digital approach, with its reliance on currently expensive bit-slice processing technology plus the fact that it is entirely new (as opposed to a digitally-controlled analogue system which may include circuitry not much different to traditional approaches) is just not being offered at the right price. The R&D is expensive and so are the bits for manufacturing. Indeed, the whole process is expensive, from R&D, to tooling up, to parts, the lot. The prices in all these areas will come down as they are exploited, but in the meantime the main problem is going to be one of finance. Where will a studio get enough money for one?

With a digitally-controlled analogue-processing (DCAP) system the problems are different. You are adding a digital control system to what is otherwise a pretty normal analogue mixer, conceptually speaking. Console automation systems have been doing this for years, and the idea is attractive. However, here again, some objections are bound to be raised. Whatever the system, tomorrow's (or even today's) consoles will be living in a digitally-recorded environment. At least some of the recorders will be digital, and it is likely that the replay system at home will be also. A system is only as good as its weakest link; is an analogue signal path in the console up to it? And how about the area where the digital controls the analogue—are D/A converters and VCAs good enough?

The answers to these questions vary depending on who you ask. DSP proponents will say no; DCAP proponents will say yes. The true answer is perhaps a qualified maybe (I used to be indecisive, but now I'm not so sure). The main problem areas are, of course, all the areas where digital claims to be better than analogue: distortion, noise, and dynamic range. Now I wouldn't like to tackle the question of distortion. I am used to amplifiers with minimal distortion driving speakers with lots: I suppose it comes down to whether you can hear *this* particular type through all the other stuff. I leave that debate to others.

As far as noise and dynamics are concerned, let us first leave aside the question of whether or not all that dynamic range is a good idea. A lot of rock music studios (ie those who really need big consoles and many channels, as opposed to the classical environment in which as few mics as possible—one or two, I would suggest—at least *ought* to be the rule) don't go much on dynamic range anyway: we are used to our VU meters sitting around zero, and patching compressors into the mix. And if you gave people dynamic range in such music, what would they do with it? They'd either compress it on a radio station or not be able to listen to it at home (if you hear the quiet bits, will the loud bits send the cones across the room?).

But if you want dynamics, can analogue supply them? The answer is probably yes. The theoretical limits of noise level and clipping are probably such that *more* dynamic range is possible *in theory* than you get on CD. Where the *practical* design constraints leave you is another question, and of course analogue technology is still advancing and the answers will get better with time. Ted Fletcher and Steve Dove address this question: they are designers of consoles, I am not. Enough.

So what of the control devices themselves? The VCAs and the D/A converters? The standard way of controlling analogue parameters with a computer is to use a D/A controlling a VCA, and we have looked at the constraints on the performance of such a setup elsewhere, in discussions on automation. There are other approaches too, and here again there are many developments coming on line.

All this is why I go for a 'maybe' when asked whether DCAP or DSP is the future. 'The future' is obviously both. Literally, you pays yer money and takes yer choice. I expect we will see ordinary analogue consoles in the smaller studios, DCAPs in the bigger ones, and DSPs in the top studios, for some time to come; the DSP region expanding with time and the DCAP region moving more down-market until ultimately there aren't any 'straight' analogue consoles left. This latter is already happening—you find me a new console today in a studio without logic control of some sort—and the trend will continue with more things being controlled and more integration between console and automation. Ultimately, both DCAP and DSP types will involve fully-integrated signal processing/control packages, driven by computer(s), and the only difference will be the way in which the signals pass through the board. Apart from that, you may not be able to tell them apart—this is already happening with music synthesisers. In the final analysis, it doesn't matter which you have: it's what the music sounds like that matters. It can come out of a piece of wet string, as far as I'm concerned, as long as it sounds good. Let's not lose sight of what we're trying to do in our race to get there.

Richard Elen

Turnkey's Summerend Review

First Choice for Soundcraft
In case you dont yet know it, Soundcraft celebrate their tenth anniversary this year. In that time we have grown to be their biggest outlet worldwide.
We are their only distributors for the full range of recorders and mixers in Britain. Our unrivalled experience of these products extends to complete installation, service and comissioning.
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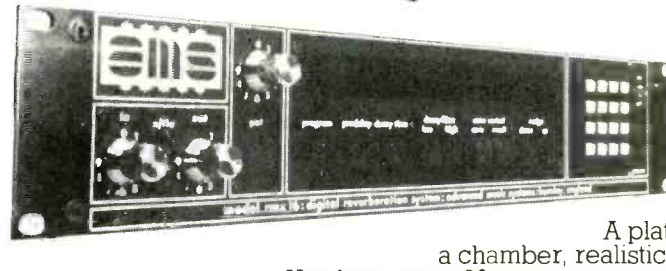
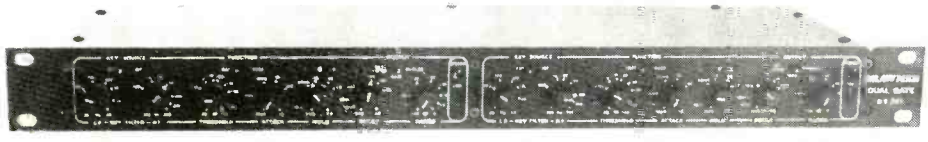
If you are planning to step up to a sixteen, or a twenty-four track system , call us and discover why we are the first and only choice for all your Soundcraft supply, service and installation.
Nobody knows Soundcraft better.

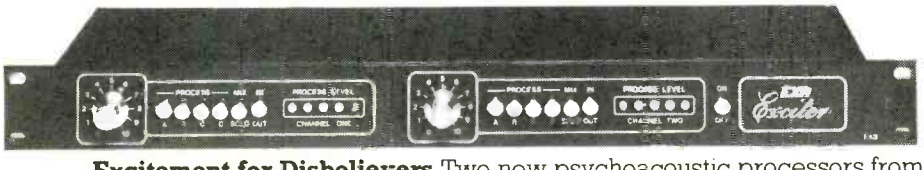
First professional 4-track cassette.
The 234 is Tascam's newest multitrack. It combines the format of the Portastudio with the facilities of open reel. Three motors, mixing, LED counter, pitch and monitor mix. The studio four track for the eighties.



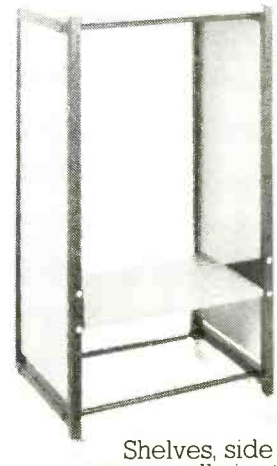
The Newest Reverb
A plate, a spring, slapback, a chamber, realistically created, digitally. You have up to 90 user programmed settings as well as the 9 preset, classic sounds. The AMS reverberator offers full 18kHz bandwidth and 90dB dynamics. We are the new South of England distributors. Arrange for a demonstration.



A new era in Gating. The Drawmer dual gate offers precise, full control over difficult signals. It allows sophisticated sidechain patching and a new range of techniques to be developed. Also ask about the compressor.

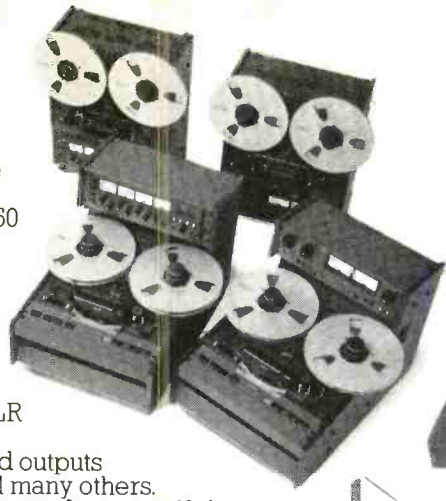


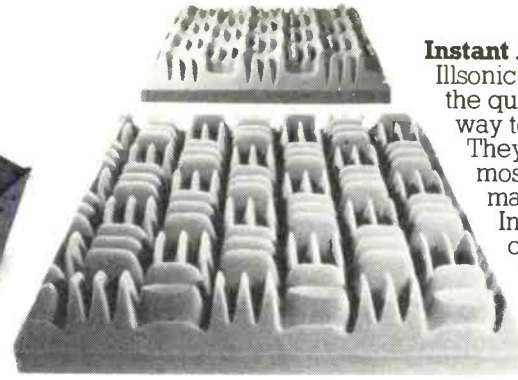
Excitement for Disbelievers Two new psychoacoustic processors from EXR. Success in both broadcast and recording studios, has resulted in development of specialist units to enhance sound using their patented process, yet offering a degree of control.



Stak Rak
It's an ingenious British system of interlocking components to build into your exact racking requirements. It's designed for fixed or mobile use with a full range of parts and accessories so you construct a system of any height, quickly and very economically.
Shelves, side panels and castors are normally in stock. Call with your requirements or for a brochure and specs.

Budget Otari
In a land where performance is the major criteria for success, Otari's 5050 series two track is America's most popular mastering machine for the smaller studio.
Take a closer look and you discover features such as XLR inputs, standard reference balanced outputs direct capstan, and many others.
Call us and find out more for yourself about these new Otari's from Turnkey, the new source.





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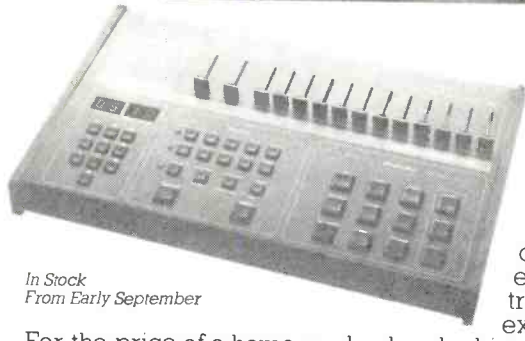
Illsonic panels are acclaimed as the quickest and most effective way to control room response. They are sculpted from the most effective 'absorption' material ever produced. Installing a panel is like opening a window wherever you need to control reflections. Call us for a free copy of the latest Acoustics Cookbook.
It Works!

Two Track 52 shown here. Eight track model 58 in stock and on demo now. Series 50 mixer also available.

Toughest Tascams to Date.
The 50 Series are designed for the most demanding production applications. Built smarter and stronger, a microprocessor to makes SMPTE lock and editing faster. Examine the range and see how serious Tascam is about the recording industry.

Fostex Lab Series Amplifiers. Not for the road.
Specs are impeccable, and you cant blow them up. XLR connectors are used throughout.
Priced per Watt, they're first in value.
But dont let the photo fool you.
The reason they cost less than the established brands, is because they are built for studio racking and not for throwing around on the road.
Available in 300W and 600W versions.



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New Drum Computer beats the rest.
MXR enters the rhythm market with a highly versatile new product offering many of the facilities that are familiar to professional users and players.
Twelve programmable sounds, a storage capacity of up to 100 songs of 100 patterns, each up to 99 beats, conforming to a 1/32 triplet accuracy per beat. Tape dump and external voicing are also possible.
For the price of a home made cha-cha-hiss box, you can now have a precision rhythm computer, offering simple interface and highly authentic sounds.

Webber Webber Webber

Every one a Master US made test tapes have one major drawback. Costly to produce in the first place, by the time they're through the hands of transatlantic dealers, they can be prohibitively expensive. Now an enterprising British engineer is mastering test tapes locally. On the finest tape, on precisely aligned machines. The range covers all speeds and formats. Now the affordable Webber tapes, direct from Turnkey.

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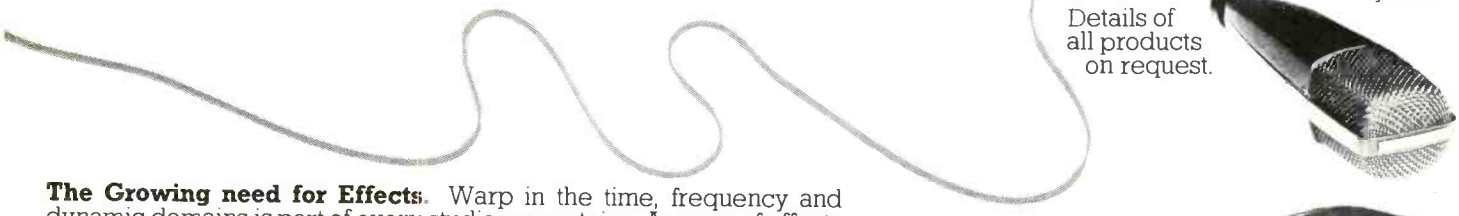
The black rogue of Sennheiser's range, the MD421 breaks all the rules, yet after 20 years produces a sound that's as desirable today
We also stock the low cost Telemike system.
Details of all products on request.



The Growing need for Effects. Warp in the time, frequency and dynamic domains is part of every studios repertoire. A range of effects is as essential as a locker of microphones.
We specialise in demonstration and supply of signal processing from the leading effects manufacturers such as **Rebis, MXR, EXR, Loft, Drawmer, AMS, Ashly, Deltalab, Ecoplate, BEL.** You can evaluate them in our demonstration studio, or ask about the no obligation 'Sale or Return' scheme.

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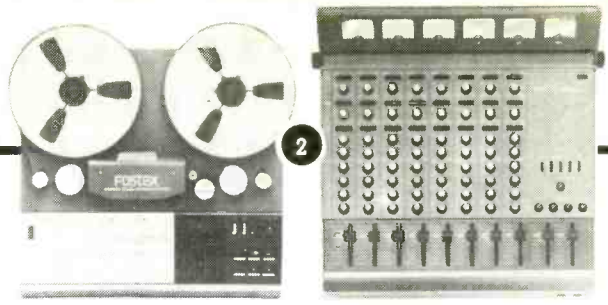
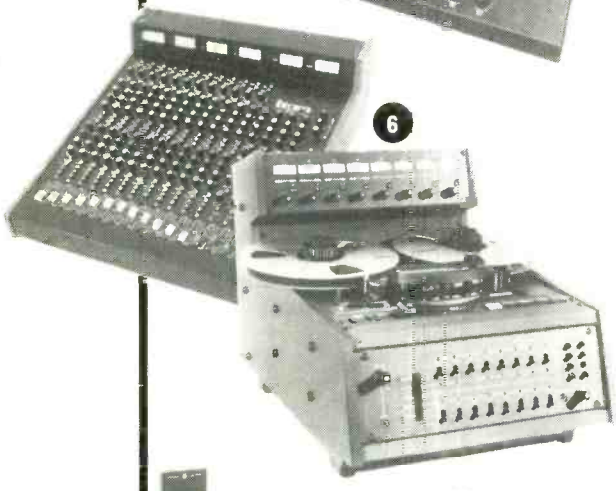


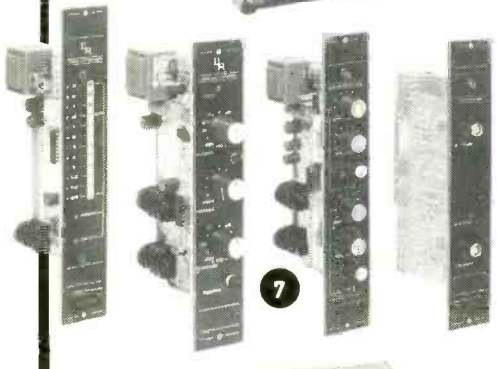
BUDGET PACKAGES

1. Tascam 4 track systems
A variety of small systems for the cost conscious, from the M244 Portastudio, complete on its own; or the latest Tascam 34 4 channel reel-to-reel now available in a package with the new PEP 800 8 × 4 mixer. This mixer has the comprehensive facilities of larger mixers costing twice the price. Total Package Price **Only £985.**



2. The world's smallest 8 track. Available also as a complete system, with the 350 Mixer. NEW LOW PRICES.

3. The New Sensation from Fostex — X-15 Tracker
A portable battery or mains operated 4 channel cassette recorder with built-in mixer. The musical note book you can use anywhere. Dolby noise reduction, treble and bass EQ, punch-in/out, and lots more for **Only £260.**



4. Tascam 8 track systems
38 — the sensational new half inch 8 track has shattered price barriers. Yet performance is better than ever, with digital counter, lower noise electronics, and pitch control.

Special Offer
Only from ITA — the new Tascam 38, 8 track with Itam dB30 noise reduction. 8 channels of simultaneous NR giving 30dB improvement in sig/noise ratio. **£1,750 Complete.**

5. ITAM/TRIDENT 16 track system
This brand new package brings 16 track recording to those with an 8 track budget! The Itam 1610 is a one inch 16 track and features 3 speeds (inc. 30 ips) full function remote with varispeed, optional noise reduction. The Trident VFM is a fully modular 20 × 8 × 16 console with 20 inputs and full 16 track monitoring. Special Offer (subject to stocks): **£6,350 Complete.**

STUDIO SYSTEMS

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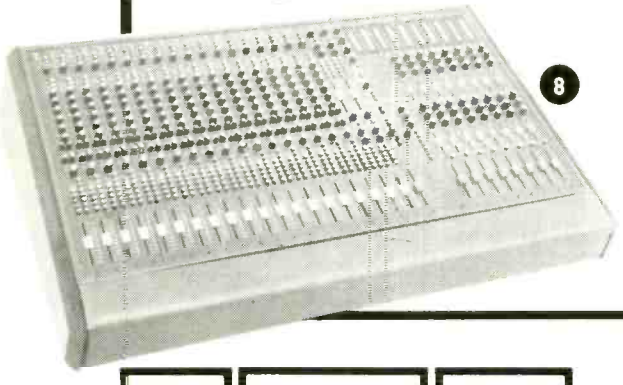
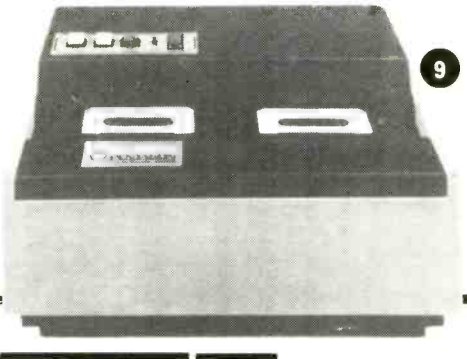
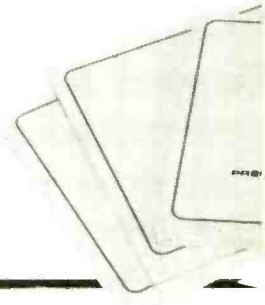
Any 4 of the following modules, complete with power supply and cabinet: parametric EQ, noise gate, compressor/ limiter, stereo limiter, compander, stereo disc amp, high-low pass filter. **Only £295**
Alternatively, buy any 4 D & R modules at our normal professional price, and get a 19 inch rack FREE!







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Our new Premises mean a better service for you. Live demonstration area — all equipment is now **fully functional.** Listen to anything from the new Fostex X-15 tracker to Otari's 24 track MTR-90. Equipment on **live demo** includes: **Otari** recorders and cassette duplicators; full range of **Tascam** and **Fostex**

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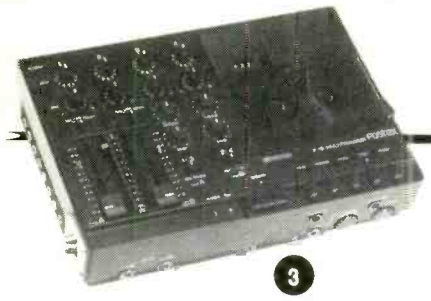
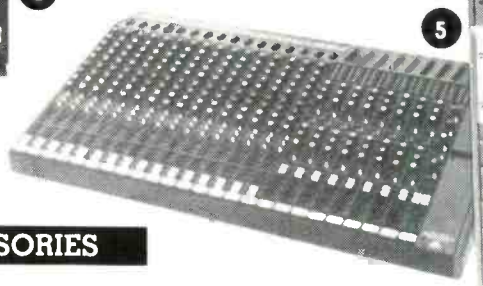
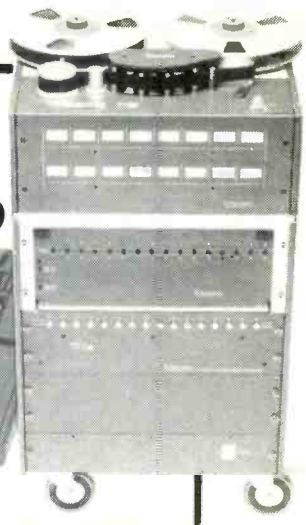






MULTITRACK MIXERS

8. ITAM Sigma
SIGMA — the new multitrack console that outclasses the competition — in price, features and performance
Facilities include: Full modular construction, full 16 track monitoring, 8 busses + stereo buss + 4 aux busses, programmable muting, autosolo, LED bargraph metering with switchable VU/PPM characteristics, PFL on groups and cue sends, comprehensive line-up oscillator, dedicated FX returns, 4-band EQ mid-bands sweepable, hi and lo pass filters, flexible talk-back system, electronically balanced mic. inputs with switchable phantom power, phase reverse and pad.
16-8-16: £3,960
With Audiofad faders: £4,360
Stand: £155.

CASSETTE DUPLICATION

We have been installing and servicing duplicating equipment for 10 years, and have built up considerable expertise for small or large systems. Whether you need to copy 100 cassettes per week, or 50,000, we can give you the back-up you need.

9. PENTAGON
Small in-cassette copiers, mono or stereo. 16 times duplicating speed. Prices from around £500.

TAPE+ACCESSORIES

10. Always available — big stocks of tape and accessories. Your Central London source for: AMPEX tape, Editing accessories, Jackbays and leads, Auratone speakers, Signal processors, etc. etc.
Open an Account & order by phone! Daily deliveries.

LOW PRICES ON AMPEX TAPE

	Single (£)	Carton (£)	Carton qty
406 7 inch	3.95	3.50	10
406 ¼ 10½ HUB Bulk pack	–	5.30	10
406 ¼ 10½ NAB spool	8.40	7.95	10
406 ½ 10½ NAB	15.50	14.50	7
406 1 inch NAB	25.45	24.25	5
406 2 inch 10½	52.90	49.50	2
407 7 inch (LP)	5.25	4.75	10
407 ¼ 10½ NAB	11.95	11.45	10
456 7 inch	5.65	5.25	10
456 ¼ 10½ HUB Bulk pack	–	7.20	10
456 ¼ 10½ NAB spool	10.46	9.90	10
456½ 10½ NAB	18.95	18.00	7
456 1 inch NAB	29.90	27.90	5
456 2 inch 10½ NAB	62.50	59.50	2
456 2 inch 14 NAB	144.00	140.00	2
457 7 inch (LP)	6.95	6.60	10
457¼ 10½ HUB Bulk pack	–	12.25	10

SECOND HAND EQUIPMENT

The following equipment has been taken in part exchange, and has been overhauled in our workshops.

MCI JH114 24TR	£12,000
STUDER A80 MKII 16TR	£9,500
TASCAM 80-8	£1,150
TASCAM 3440	£400
OTARI MX5050B 2TR	£855
OTARI MKIII-8 8TR	£2,400
PENTAGON CASSETTE duplicator STEREO	£625

(Please phone for latest details)

HIRE

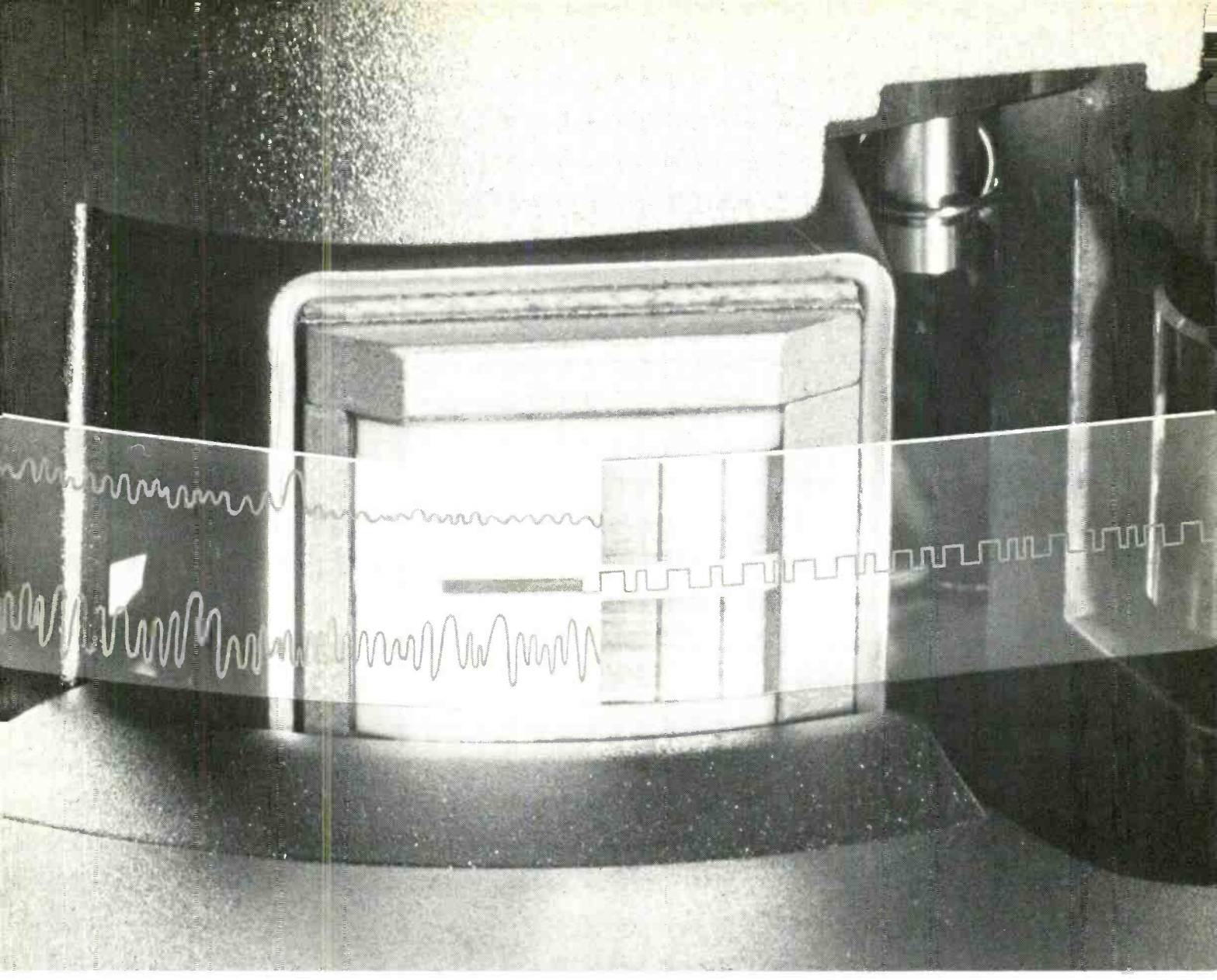
TAPE RECORDERS	Week £	3 days £	Daily £
Fostex A8 8-track ¼"	60	40	20
Fostex Multitracker	35	20	10
Tascam Portastudio 244	35	20	10
Revox B77 Stereo	40	25	15
Otari MX5050B Stereo	60	40	20
Tascam 4-track	50	30	20
Tascam 38 8-track ½"	90	50	30
Otari Mk.III-8 8-track ½"	110	60	40
Itam 8-track 1"	150	80	50
Itam 16-track 1"	200	120	75
Otari MTR90 24-track 2"	600	400	150
MIXERS			
Teac Model 2A 6×4	20	10	–
Tascam Model 30 8×4	40	25	10
Fostex 350 8 × 4	35	20	10
Itam Stereo 8 8 × 2	45	25	15
Seck 10 × 4	25	15	10
Seck 16 × 8	75	40	25
Location 8 × 2 Portable	60	40	20
Itam 14 × 4 8-track monitor	100	60	35
CASETTE DUPLICATORS			
Otari DP4050C2 cassette master	150	80	40
Otari DP4050 OCF reel master	300	200	80
VARIOUS			
GBS Reverb	20	10	–
Quad 405 amp	20	10	–
DBX noise reduction 2-track	20	10	–
Dolby C.N.R. 4-track	20	10	–
Fostex Digital Delay	20	10	–
Fostex Graphic EQ	20	10	–
Stereo compressor (various)	20	10	–
Roland Drumatix	20	10	–
Roland Space Echo	30	20	10
Roland Rhythm Composer TR808	50	30	–

Subject to our standard conditions of hire. Prices exc. VAT
Only a small selection shown here. Please phone for any requirement.

ne Source.

multitrack systems; mixers from **AHB, Itam, Trident** and others. Big range of effects units from under £50 to over £5,000. Interesting essentials for the composer/musician from **Roland.** Plus mics, speakers, amps and everything else. The best Central London demo room.

W6 9JT. Tel: 01-748 9009. Telex: 21879



TOTAL SEPARATION AND PERFECT TIMING.

These are the innovative features that place the microprocessor-controlled Studer A810 way ahead in the science and art of analogue recording.

The A810 incorporates a specially-developed time code system, utilizing a new combination head arrangement to input SMPTE code data on a 0.35mm wide central track between the audio channels on a ¼" tape. Two 'combi-heads' are employed, on either side of the audio record and reproduce heads. One head contains the time code reproduce gap and the audio erase gap; the other has the time code erase gap and time code record gap. Because the heads are totally separate, audio/code crosstalk rejection is better than 90dB.

An integral digital delay automatically compensates for the problem of audio/code time offset – at all speeds. During recording and playback, this delay holds the time signal until it is in exact synchronization with the audio output. Tapes can be spliced in the normal way without fear of removing SMPTE data.

Not only does this novel A810 time code system eliminate the need for a multi-track recorder when synchronizing stereo audio programs with video tape recorders, but it is also ideal for a variety of other applications: film audio editing, TV – simulcast, broadcast automation systems, A/V system control, and slow-speed logging.

And the A810 offers a host of other advanced features including: fully-programmable functions; a revolutionary memory system for electronic alignment parameters and different tape formulations; quartz-referenced capstan speed control with +/– readout; and many other monitoring and control options.

Just write or 'phone for full technical details.

Studer A810. A quantum leap.

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INTERNATIONAL AG
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STUDER REVOX AMERICA INC Nashville Telephone (615) 254-5651
STUDER REVOX S A R L Paris Telephone 533 5858
STUDER REVOX CANADA LTD Toronto Telephone (416) 423-2831

F.W.O. Bauch Limited
49 Theobald Street, Boreham Wood, Hertfordshire WD6 4RZ
Telephone 01-953 0091, Telex 27502

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

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NO FRILLS.
NO FUSS.

The EMT 938 professional broadcast turntable combines traditions of excellence with a highly competitive price. Design has been based on the proven EMT 948, which ensures high reliability, complete practicality and optimum performance.

Essential features include the direct-drive platter and motor-driven tone-arm lift for quick starts, three fixed speeds and a variable speed controller, and exceptional shock absorption. The built-in EQ amplifiers have balanced studio outputs as well as integral muting for run-up.

Almost all international standard 47 k-ohm magnetic cartridges are compatible with the EMT 938. Compact and light in weight, the unit can be surface mounted or recessed in a table-top.

For full details, contact F.W.O. Bauch Limited.

The EMT 938 – no frills, no fuss.

EMT FRANZ GmbH
Postfach 1520, D-7630 Lahr,
Tel. 07825-512, Telex. 754319. Franz D

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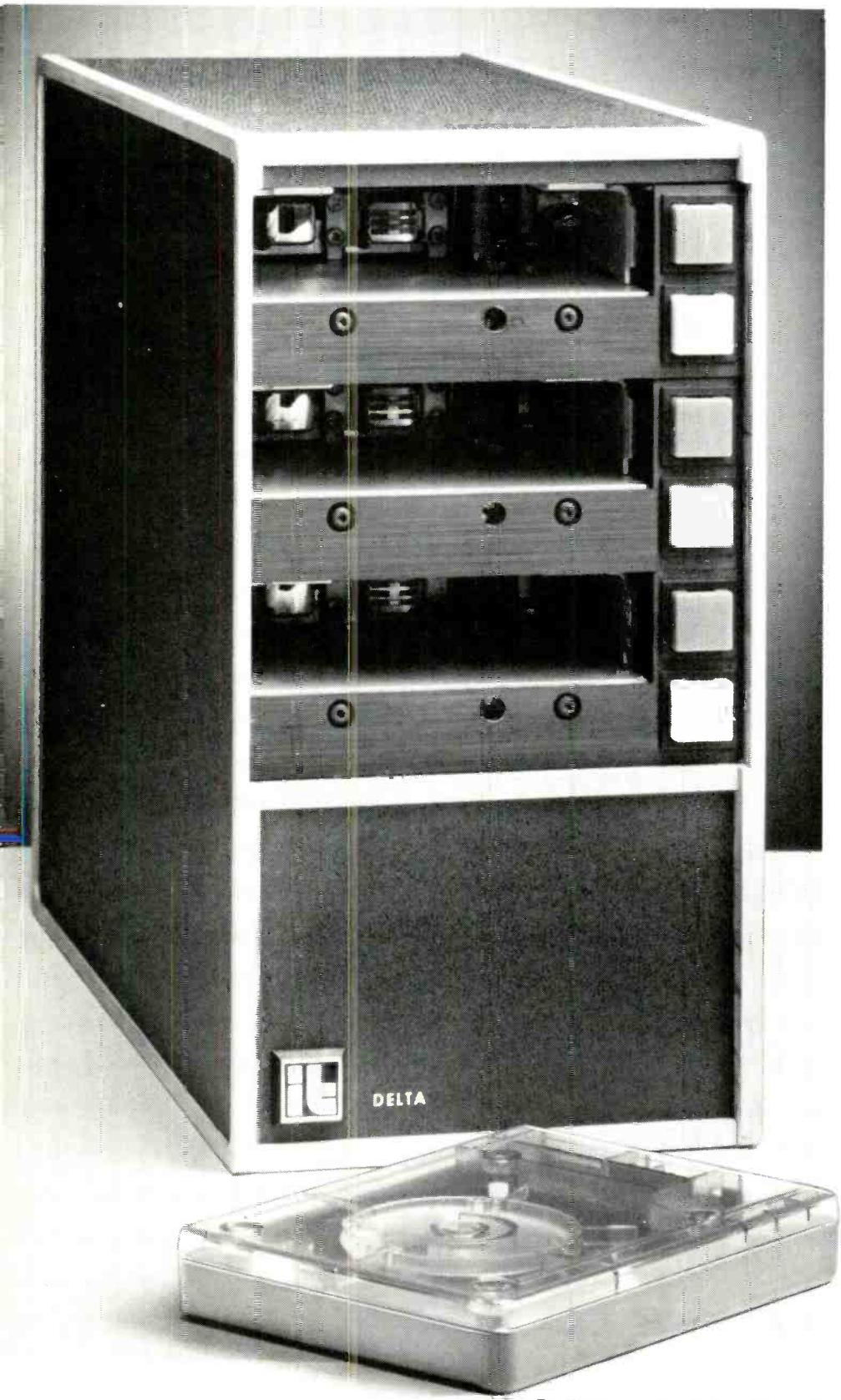
MAJOR BREAKTHROUGHS DON'T HAPPEN OVERNIGHT.



The new Delta three triple-deck cartridge machine from ITC gives you even more rugged reliability than its well-proven predecessors in the Premium Series, it provides improved performance, is more compact and includes a host of new operating features.

All this has been made possible by major technological advances in the ITC research and development lab. Advances which have created an electronically and mechanically superior unit. A machine that will take all the inevitable day-to-day knocks yet keep on functioning at the high standard you – and your listeners – expect.

The Delta Three has three independently-romovable decks and modular construction makes alignment and servicing simple and convenient. It is clean and smooth in operation, with minimal flutter and optimum frequency response, in mono or stereo. Insertion and removal of cartridges is positive, and there's a microprocessor-controlled digital cue tone detector. A newly designed capstan motor with its own integral "gallows" greatly reduces bearing noise and ensures stability of shaft along its entire length. Record facility on lower deck is made possible by the addition of Delta Four.

Rigorously tried-and-tested in the field, the Delta Three represents a significant breakthrough in practical technology for the studio.

ITC. Sound quality.

International Tapetronics Corp.,
2425 South Main Street,
Bloomington,
Illinois 61701, USA

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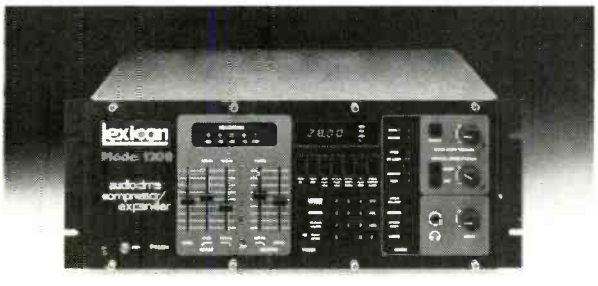
For anyone who knows the cost of running out of time.

Ever wished that you could compress or expand recorded material for a commercial to avoid time consuming and costly retakes and editing?

Now you can. With the Lexicon Model 1200, you can speed up programme material by up to 25% -or expand it by up to 10%. Your best 'take' can be time-adjusted to fit the available time slot precisely.

The pitch remains unchanged, and you get broadcast-quality audio, totally free from distortion.

It's been through the hoop on Madison Avenue too: the Lexicon 1200 has been used by 19 of the top 20 US agencies in the production of nationally broadcast commercials.



And the system is equally suited to the time adjustment of special effects and dubbed translations.

Lexicon 1200. Every production house should have one. It could save you a great deal more than the cost of a parking ticket.

Lexicon

International: Gotham Export Corporation
New York, NY 10014 TLX: 129269

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Individually, they're amazing. Together, they're unbeatable.

Recording studios, radio and television production suites, video and A/V facilities and serious musician/composers have discovered that Valley People equipment improves productivity, offers ease of operation, requires little or no maintenance and provides excellent signal quality. Standing alone they offer unrivalled processing power and versatility: used together by the creative engineer/producer, they increase variety and control dramatically.

QHZ Quad Preamp

Provides all the equipment below with instant access to the full range of high impedance sources, such as electronic musical instruments, microphones and even hi-fi kit. The clarity of audio is unsurpassed.

QLZ Quad Mic Preamp

The low impedance unit for transparent, distortion-free recording as well as on-the-air or live performances. Each of the four inputs is adjustable from 20dB to 60dB of gain.

Maxi-Q Equaliser

Provides maximum flexibility: the seven octave range on each of the three frequency bands gives a six octave overlap. Ideally suited to pre-conditioning of signals when used in-line with the Kepex II and Gain Brain II.

Kepex II Expander/Gate

Spectacular performance in noise gating, reduction and elimination is complemented by its creative value in 'loosening' drum effects, removing excess cymbal ring or performing electronic musical effects.

Gain Brain II

Widely adjustable limiter/compressor and ducker, specially designed for production work. Major advantages include 'natural' quality of sound, flatness of VU and improved low frequency performance.

Five superior products. Each amazing. All unbeatable.

Valley People Inc., Nashville, Tenn 37204
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Their newest studio suite fulfills the most creative mixing and overdubbing requirements of today.

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Otari MTR90 Series II is their multitrack choice.

From Turnkey.

A total service of supply, design, installation and backup commitment.

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Incredibly small floor area required

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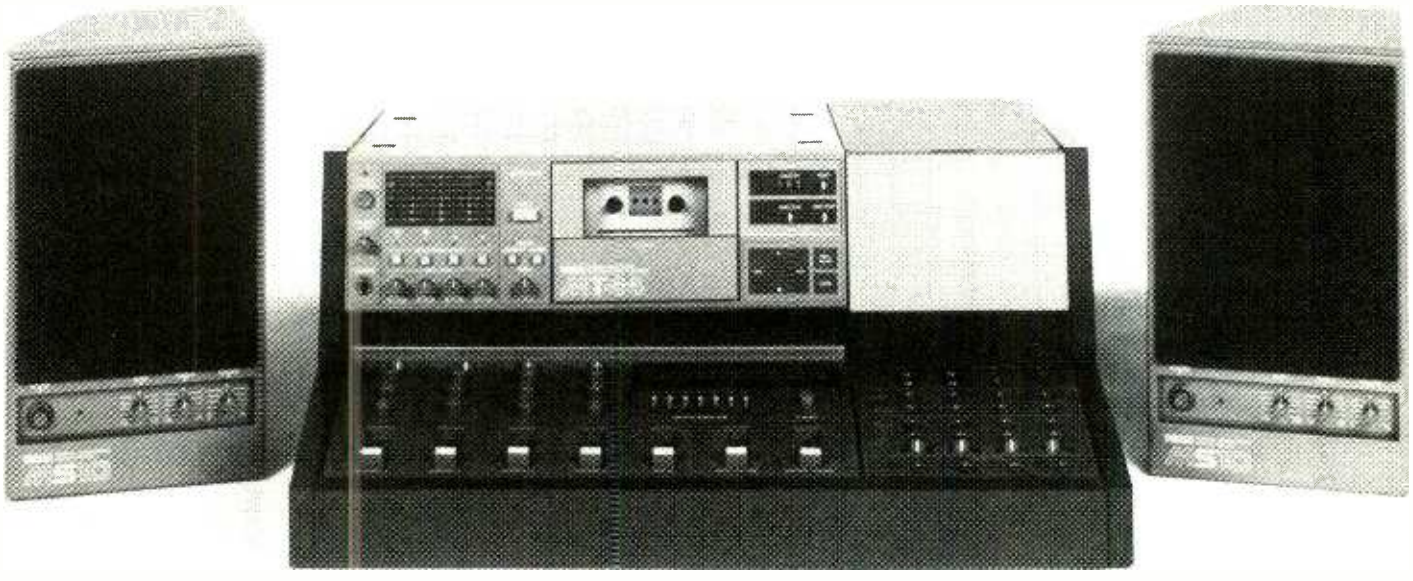
our aim is sound.



Introducing Yamaha's new modular 4-track cassette system consisting of 4 primary products which together make up a very professional Home Recording System.

The heart of the system is the MT44 4-channel cassette deck. Now not everybody is going to have a 4-track system, and so you need compatibility with stereo hi-fi cassette machines to allow you and your co-writers to work separately if necessary on the same piece and to allow direct playback on any standard machine. It's a great idea, but there can be problems:

Problem: The majority of 4-track cassette machines run at 3¾ ips whilst most domestic machines run at 1⅞ ips.

Solved: The MT44 runs at 1⅞ ips and through its Auto-Sensor System can also be used as a hi-fi quality 2-track stereo deck.

Problem: Dolby C noise reduction is superior to Dolby B, but is not commonly found on desks of this type.

Solved: The MT44 is equipped with both systems for multi-use compatability.

Each According To His Needs. As well as being an excellent cassette deck in its own right, the MT44 is ideal for use with our MM30 mixer, the RB30 combined rack and patch bay;* and the Yamaha MS10 20 watt self-powered monitor speakers. However, if you already have a mixer or some monitoring facilities, you aren't forced into paying for superfluous features as you are with 'all-in-one' machines. You buy just what you need.

Results: The MT44 spec is good and the recordings sound excellent; it's simple to use and we reckon it's the best around at the price. Because at Yamaha, when we shoot for a product, we like to think our aim is sound.

*Patch bay (PB44) available separately.

YAMAHA

Leading the world to play.

Yamaha Musical Instruments, Mount Avenue, Bletchley, Milton Keynes, Bucks, MW1 1JE. Tel: (0908) 71771. 24 hour Ansaphone: (0908) 649222.

"I really had to work just to get a tiny bit of hiss out of the thing."

Craig Anderton
Modern Recording and Music
March 1983

"Superb Sonic Accuracy"
"–88dB S/N Ratio with superb sonic accuracy – quiet, good definition, no noticeable glitches or artifacts, and a clean high end"
"The Korg SDD-3000 is the closest I've heard yet to being truly noise-free"

Hearing is believing! The new SDD-3000 programmable digital delay from Korg is a remarkable piece of professional equipment, with excellent features and reasonable cost.

Write for further information and details of the nearest specialist Korg Key Centre where the SDD-3000 is on demonstration.

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- Tough, flexible P.V.C. jacket
- Conductive thermo-plastic shielded
- For: Microphones, Data Transmission, etc.

STUDIFLEX

- Available in 1 and 8 pairs, other configurations to order
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- Conductive Thermo-plastic Shield
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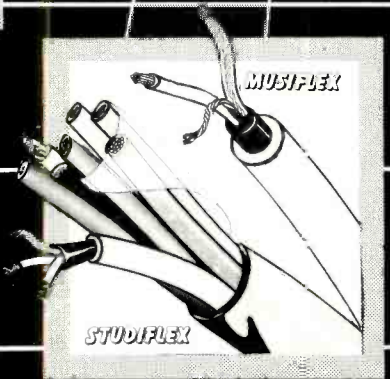
- High-speed preparation
- For: Audio, Hi-Fi, HiZ Mics, effects racks patching etc.



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- Sends and returns separately shielded (36 sends and 7 returns)
- For: P.A. Cable Systems ('Snakes')

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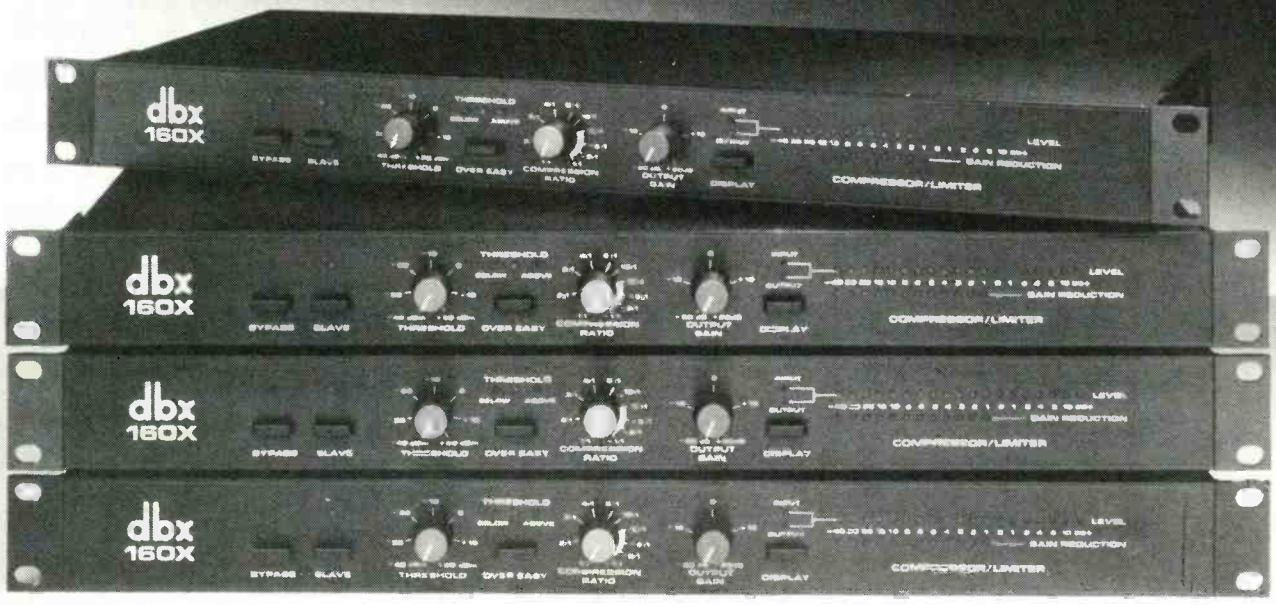
dbx

We listened to you– now we would like you to listen to us.

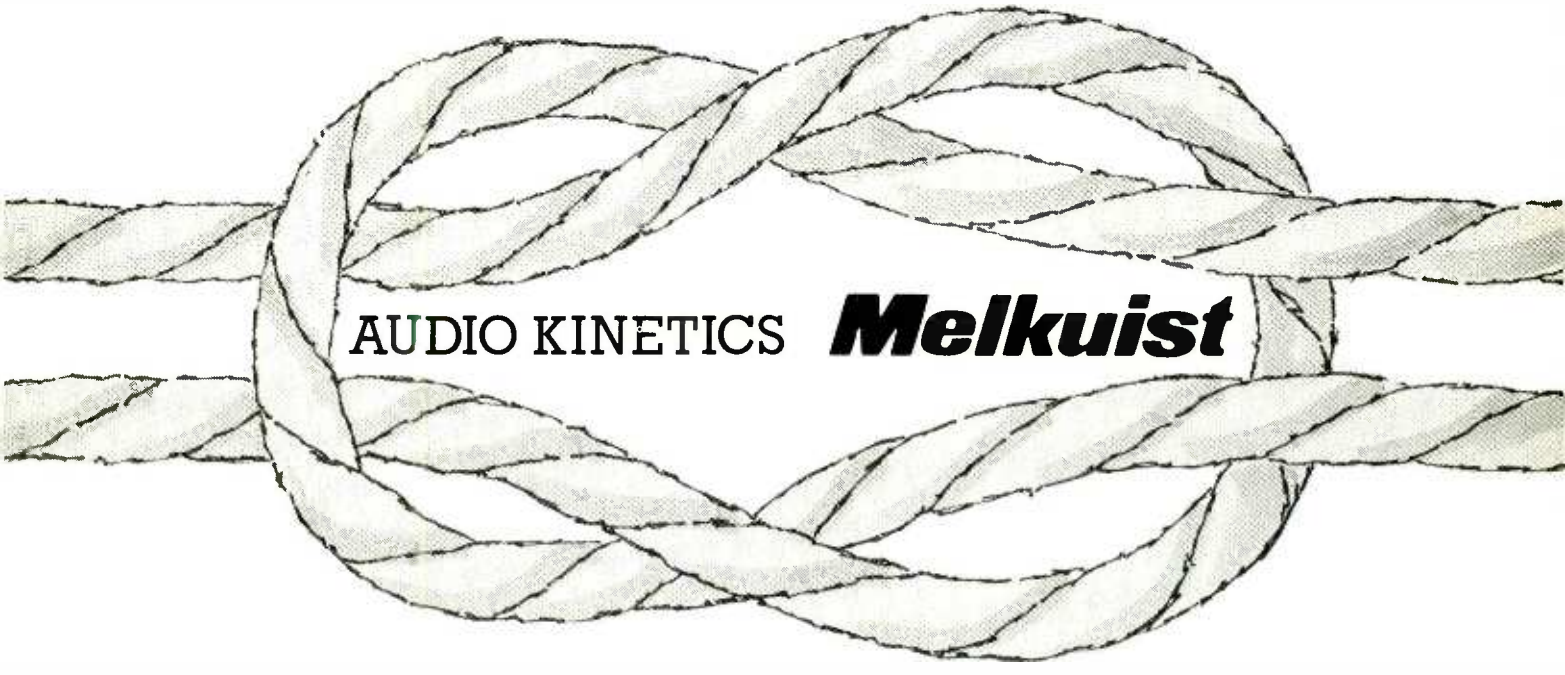
The dbx 160 was one of the world's best selling compressors, but still there were a few areas you wanted improved; stereo linking, mounting, clearer meters, easier rack selectable compression characteristics.

We listened and the result is the 160X.



Austria: Kain Ges. m.b.h. & Co. KG, dba/Stereo Center Kain, Muenchner Bundesstrasse 42, A-5020 Salzburg. **Belgium/Luxembourg:** Trans European Music SA, Koeivyerstradt 105, B-1710 Dilbeek. **Denmark:** SLT, Helgesvej 9-11/DK-2000, Kopenhagen. **England:** Scenic Sound Equipment, 97-99 Dean Street, London W1V 5RA. **Finland:** Studiotec Ky, Eljaksentie 9, 00370 Helsinki 37. **France:** Cineco, 72, des Champs-Elysees, 75008 Paris. **Greece:** Bon Studio Sound Systems, 14 Zaimi Str. Athens 48. **Hong Kong: Phillipines, South Korea, Thailand, People's Republic of China:** Studer Revox (Far East) Ltd, 5th Floor, Parklane Bldg, 233-5 Queens Road, Central, Hong Kong. **Italy:** Scientel Audio SRL, Via Pietri 52 (or) Via Venturi 70, Modena 41100. **Japan:** BSR (Japan) Ltd, Tokyo 101. **Netherlands:** Special Audio Products B.V. Scheldeplein 18, 1078 GR Amsterdam. **New Zealand:** Videx Systems Ltd, Ellice Industrial Estate, P.O. Box 31-029, Auckland 10, 48 Ellice Road, Glenfield. **Norway:** Lydrommet, St Olavsgate 27, Oslo 1. **Spain:** Commercial Lavilla, Legaledad, 64066, Barcelona 24. **Sweden:** Tal & Ton AB, Kungsgatan 5, 411 19 Goeteborg. **Switzerland:** Audio Bauer AG, CH-8064 Zurich, Bernerstrasse-Nord 182. **West Germany:** Audio Vertrieb, Bargweg 45b, 2000 Norderstedt.

The perfect tie-up



Two companies, both respected as market leaders in their individual product fields, have merged to produce one of the most talented design teams seen to date. With both companies working in the area of Audio Post-Production and timecode-based equipment, the combination will enhance both product lines, as well as offering exciting product potential in the future.

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U.S.A.: **AUDIO KINETICS INC.,** 4721 Laurel Canyon Boulevard, Suite 209, North Hollywood, California 91607, U.S.A. Tel. 980 5717 Telex 230 194 781

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Introducing The Compellor,™ the most revolutionary audio processor in the world. It thinks, adapts and delivers three separate functions – simultaneously. ☐ Its control circuits are actually an analog computer which has a single VCA for minimal signal path to give you simultaneous compression, leveling and peak limiting. ☐ You just set The Compellor™ once and its three separate functions work together harmoniously to deliver a loud and clean sound. The kind that audio engineers have always wanted but which wasn't available before. ☐ The Compellor™ provides complete dynamics control, smooth inaudible compression, increased loudness, freedom from constant gain riding and the desired density – all automatically. ☐ This smart, versatile audio processor is extremely cost effective and thoroughly functional for broadcast pre-processing, microphone control, audio production, tape duplicating, live sound and even film dubbing. ☐ What's more, you'll find The Compellor™ works perfectly with the Aphex Aural Exciter.™ ☐ With The Compellor™ working for you, everyone will feel compelled to call you what we call it. Genius. ☐ Experience The Compellor™ today. Contact your nearest Aphex dealer.

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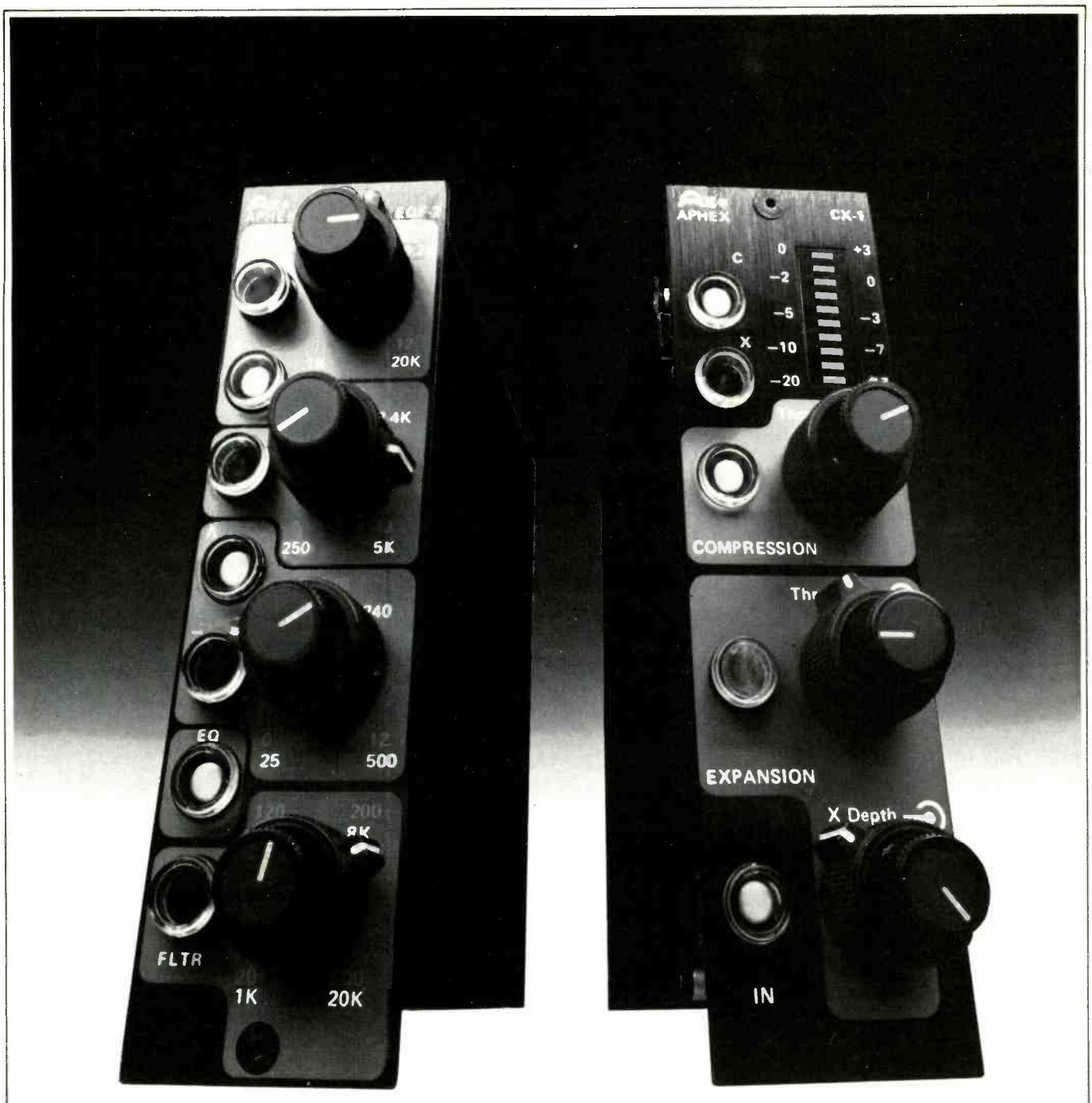
DESIGNED BY SCOTT GRIFFITHS DESIGN ASSOCIATES, INC.



TOOLS...NOT TOYS

Already well known for its musicality and ultra low noise, the EQF-2 Equalizer/Filter packs 3 bands of sweep EQ with peak/shelf and 12 dB of reciprocal boost or cut as well as an independent sweep hi and lo pass filter section in an A.P.I. sized module. With +30dBm output capability, the EQF-2 can fix that impossible part without adding any coloration of its own.

The CX-1 Compressor/Expander offers performance beyond any similar device previously available. Total transparency, headroom to spare, up to 100 dB of expansion/gating without clicks, smooth acting "soft knee" compression and unique multi-function LED metering. It is simple to use, compact, powerful and effective.

APHEX®

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Also available through: AKG Acoustics (U.K., Germany, Austria)

Neve Today Neve Today Neve To

Autumn 1983

Across the Atlantic

Not surprisingly, Neve's largest single market lies across the Atlantic, where the Canadian and U.S. subsidiaries have gained a strong foothold and are an established household name.

The successful penetration of what is probably the world's most sophisticated and competitive audio market, is no doubt due to Neve's individual market approach and philosophy, expressed in a strong concern for "human requirements" in the increasingly complex world of the audio industry. Barry Roche, the new President of Rupert Neve Incorporated, feels very strongly about companies who, by adopting the "bells and whistles" approach, may seem to be moving forwards – at the expense of the basic necessities.

Neve's tradition is simplicity embodied in ergonomic design. With the maxim "LESS IS MORE", the 8128 Series has been simplified by eliminating 1500 buttons, giving today's engineers the famous Neve sound without the tedious chores of resetting.

B. J. Roche – President of Rupert Neve Incorporated

This tradition of simplicity of design and ease of use lies at the heart of Neve's latest development, the DSP Digital Console, and will play an integral part in Neve's approach to the consoles of the future.

Barry Roche adds dependability to the list of Neve qualities. The reliability and durability of the consoles' mainframes and their internal construction have persuaded more and more broadcasters to turn to Neve, even for that type of broadcasting most notoriously unkind to consoles, that of live TV sport.

Neve's position as leader in the audio industry carries strongly across a new North American advertising campaign which stresses those keywords of Neve: QUALITY AND RELIABILITY – sweet music to the ears of broadcasters and recording studios alike.

ATLANTIC RECORDS

With artists such as Paul Simon – Paul Sloman, Studio Manager for Atlantic Recording Studios New York, couldn't take a chance when specifying the new console for his remodelled studio – it had to be Neve.

Many weeks of effort later, the graceful 81 Series console with NECAM Automation takes pride and place as the focal point of studio B. The first Neve ever for Atlantic with the clean musical sound for which Neve are famous, based on the Formant spectrum equaliser.

Atlantic Recording Studios

Electric Lady's Underground Movement

Amid the dust and rubble is the new home for a Neve 8128 56-input console complete with NECAM Automation, making this the fourth Neve console purchased by Electric Lady.

Although the new mixdown room is below street level and down a flight of stairs, the 8128 console comes apart in sections, enabling the console to literally go around corners. This little known fact really makes a difference, especially when replacing an existing console in a room with limited access. Neve plan to install the console directly after the AES show in New York where it will be featured.

NEVE IN ORBIT

High quality, fast turnaround and expertise were the pre-requisites to clinch a $120,000 deal for the supply of distribution amplifiers, providing some 3000 feeds, at the soon to be completed satellite complex at Smithtown, Long Island, for Home Box Office. This latest order from the new HBO Satellite Distribution Centre was again awarded to Neve, who also landed the previous six contracts from the HBO for production and post production audio consoles.

The first edition of Neve Today achieved a circulation of 69,000 copies and we hear that it was well received worldwide.

Welcome to this second edition.

A Stamp of Success . . .

The Republic of the Seychelles, which last year launched its first ever television service, has issued a special set of commemorative stamps in recognition of the World Communications Year.

One of the stamps features the Neve 5432, 8 channel audio console as installed in an Outside Broadcast vehicle now located at Victoria on Mahe Island.

Seychelles stamp

STOP PRESS

World Premiere of First-Ever Digital System

The future is here today! Two years of heavy investment in research and development, human and financial resources and close co-operation with the broadcasting and television industry have resulted in producing a worldwide recognised technological breakthrough: The first all-digital professional audio system, Neve's DSP.

The DSP marks the beginning of a new era in digital sound mixing, as several leading names in the broadcasting industry are going digital with Neve. The forthcoming exhibitions (see "Show Guide" page 4) present an ideal platform for Neve's International Digital Launch and a unique opportunity to discuss the advantages of this system with Neve's digital experts.

BRITISH DIGITAL CONSOLE IS WORLD LEADER

By Richard Elen –
Editor of Studio and Broadcast Sound.

At a time when British music is once again being heard all over the world, it is appropriate that it is British technology that is leading the world in digital console technology, in the form of the Neve DSP (Digital Signal Processing) console. The DSP is unlike any other console currently available in that signals are digitised at the input where necessary and remain in digital format until they are sent to the studio monitoring system; all signal manipulations, including equalization, level control, compression, expansion and even delays are performed in the digital domain. In addition, the console is completely assignable, allowing an almost infinite combination of different configurations to be set up and stored on floppy disk for instant use.

Although complete digital signal processing may seem an expensive approach, Neve firmly believes that it is the only really cost-effective approach to the problems of the "all-digital studio" of the future. The DSP concept allows far greater and more flexible operation by completely integrating the audio and control aspects of the console. This flexibility is easily used too, with the addition of high-resolution video graphic displays and software-controlled legends on the panels.

Of course, the DSP really comes into its own as part of a complete digital studio, utilising stereo and multitrack digital recorders and no doubt recording for Compact Disc or a similar medium. The digital console as a concept is the final – and central – addition to a studio of this type and, apart from other benefits, a DSP-type console will reduce the number of A/D D/A conversions required between microphone and master – one of the main areas of possible degradation in a digital audio system. The DSP handles AES-recommended digital signals and will thus interface happily with modern digital recording equipment. Ultimately, it will also be possible to patch outboard digital effects into the system without conversion.

Digital recording systems are the subject of major development projects all over the world, and the digital studios of tomorrow will incorporate equipment from many different countries. It is heartening to see a British development – the Neve DSP – at the centre of this new world of high-quality audio.

FIBRE OPTICS – THE MISSING LINK

By Dr. Martin Jones

Few people would have thought ten years ago that by 1983 the most effective studio system "wiring" would use glass instead of copper. Thanks to the Neve DSP digital audio system, recording studios, radio, TV and theatres are now recognising that modulating an LED light source with digital audio and transmitting it down optical fibre cable presents powerful advantages over conventional copper cable:

- 20 channels of 20-bit 48kHz sample rate digital audio on one fibre.
- Equally effective for high-speed control signals.
- Total freedom from earth loops, hum, RF and other electrical interference.
- No crosstalk.
- No audio high frequency loss or other signal degradation.

The fibre itself is drawn out of special glass and is only 50 microns in diameter, though its toughness resembles steel. An outer plastic coating provides immediate protection, then an outer PVC tube sheaths the fibre so that it is suitable for studio "wiring". For mobile and OB use, we fit as an even tougher protection a 9mm diameter highly-flexible polyurethane tube reinforced with "Kevlar" strain members. Normally carrying two fibres for a bidirectional (duplex) link, this rugged cable is resistant to most hazards such as crushing by a 25-ton truck or trapping in a well-fitting door.

Running at the frequency of 25 megabits per second, the standard Neve DSP link guarantees performance up to 1 kilometre, suitable for virtually all studio and mobile applications.

Now that the importance and potential of optical fibre transmission is widely recognised by the professional audio industry, Neve is working with its colleagues from other leading manufacturers to agree standards for connectors and transmission hardware and software. We anticipate the day in the not too distant future when those familiar bundles of twin-screened wire will be superceded by slender fibres.

Kenneth Baker examines fibre optics link.

Could we even be approaching the day when there is *always* enough room in the cable duct for the wiring to that extra multitrack machine?

British Minister of Information Technology communicates with the Neve factory in Scotland via Neve's Teleconference system.

During a recent visit to Neve's Melbourn factory, Mr. Kenneth Baker, Britain's Minister for Information Technology was clearly impressed by Neve's technological achievements.

His interest was captured by the digital sound mixing consoles now at advanced stages of production and Mr. Baker was invited to experience first-hand Neve's optical fibre transmission of multi-channel digital audio.

The Minister's busy schedule also included a demonstration of Neve's Teleconference system which enables groups of people in separate locations to participate in one meeting with an audio quality, as though they were in the same room.

Highlight of Mr. Baker's visit was without doubt the presentation of Neve's major technological breakthrough, the world's first professional digital audio mixing console which is now in its final stages of manufacture. Mr. Baker concluded: "It is encouraging to see this British company as leaders in this important international field of digital audio."

In front of Neve's Headquarters and the large Outside Broadcast vehicle which will accommodate Neve's first all digital sound mixer: Left to right: Laci Nester-Smith, Managing Director of Neve, Kenneth Baker MP, Derek Tilsley, Group Marketing Director, and Dr. Martin Jones, Group Techical Director.

Trading on a Reputation

The name GENERAL TRADERS does not automatically associate itself with high technology – yet General Traders is the leading Japanese distributor of high grade professional audio products.

GENERAL TRADERS is renowned for its outstanding technical service. Customer support at all levels is of prime importance to Mr. Ueshima, Chairman and Managing Director and his partner Mr. Shirushi who have built up a highly qualified team under the leadership of Mr. Yamada, Director of the Electronics Department.

Since their association with Neve back in 1970 both companies have grown together forming an ideal partnership.

In fact, one of Neve's largest single contracts ever placed was the direct result of close co-operation between Neve and General Traders: CBS-Sony Studios now have six Neve consoles and two NECAM systems.

GENERAL TRADERS and Neve look forward to welcoming you at INTERBEE.

General Traders' Chairman, Mr. Ueshima.

大鳥居

High Technology with a Human Touch

With the design of their new studios, Seibu has successfully combined an individual style with the environment of high technology audio equipment. The studios are now nearing their completion, and will be equipped with two Neve 8128 audio consoles which recently completed manufacture at the Melbourn factory.

Seibu's Studio A will be equipped with a 8128 48-channel console and a VCA Fader sub group system. Studio B will have a 56-channel Neve 8128 desk fitted with the NECAM Automation system. Clearly committed to high technology and quality sound, Seibu are planning to install a totally digital audio system in Studio C within the next two years.

Seibu's 8128 undergoes final tests at Melbourn

How TV Asahi Saves Production Time

TV Asahi, one of Tokyo's leading commercial television organisations, have equipped their largest studio with two Neve mixing consoles. In addition to on-air news programmes, where the multitrack outputs from the audio console are effectively used for numerous network outputs and other cleanfeeds, the studio is used for audio post production.

Centre piece of the studio is a 48-channel Neve 8128 audio console fitted with VCA fader sub-grouping facilities used in conjunction with a 24-channel 5315 auxiliary sub-mixer.

Asahi's Studio 7.

The unique internal memories of the 8128 console enable the operator to recall assignments to suit the operational mode required, thus saving valuable production time.

NEVE TAKES NHK TO THE FOREFRONT OF POST PRODUCTION

NHK, the Japanese National Broadcasting Organisation in Tokyo, has completed a dedicated post production suite which is a topic of conversation throughout the Japanese Broadcasting industry.

With this totally new approach to television audio post production, NHK has demonstrated its commitment to new technology.

The installation comprises a Neve 5116-48 channel mixing console incorporating NECAM automation interfaced with a Japanese synchronizing system.

NHK's post production suite – much discussed by the Japanese Broadcasting industry.

FALKLANDS' HERO RETURNS TO NEVE

One of the last casualties of the Falklands war has returned to Britain via a Heathrow luggage conveyor belt, receiving a far less ceremonial welcome than that reserved for other Falklands veterans; a "badly damaged" portable Neve 5422 recording console.

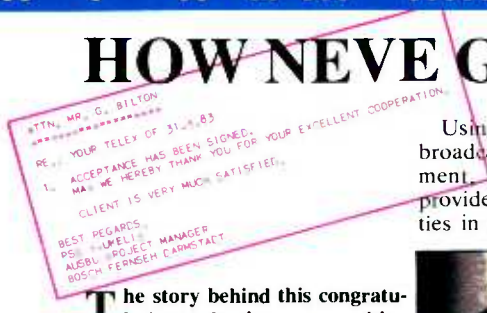
As part of the BBC radio broadcasting team, the mixer was in continuous use throughout the Falklands war, keeping Britain and Europe in touch with the latest events, and frequently operating under extremely difficult and dangerous circumstances.

Sadly therefore, that, after completing this vital service, it should be dropped accidentally some 20 feet out of the departing aircraft on to Port Stanley's runway.

However, it seems to take more than that to make a Neve broadcasting console speechless. Alan Archer, Neve's Customer Service Manager, found the system to be fully operational, the actual damage being purely cosmetic; a dented case.

Plastic surgery has been completed and the Neve 5422 is reporting back for duty.

HOW NEVE GOT THE MESSAGE

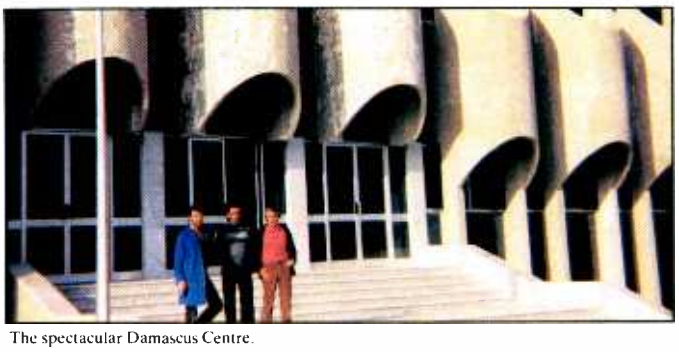


The story behind this congratulations telex is a very exciting project undertaken on behalf of the Arab League ASBU (Arab States Broadcasting Union): the Damascus Centre.

An international body of the Arab League, founded in Cairo 14 years ago as a professional, non-political organisation, the ASBU seeks to promote training and co-operation in TV and Broadcasting throughout the Arab world. Member countries include Syria, Saudi Arabia, Iraq, Jordan, Kuwait, Qatar, UAE, Algeria and North Yemen.

The Damascus Centre, a culmination of ideas developed in the Seventies, came to fruition under Mr. Khudr Shah, and was built on prime land donated by the Syrian Government. Incidentally, Damascus is the oldest inhabited capital city in the world.

Using the most sophisticated broadcasting and recording equipment, the Damascus Centre now provides extensive training facilities in a complex which houses a TV Studio, a Sound Studio, a Central Apparatus Room and two classrooms. In association with the Arabic Centre for Viewers and Listeners based in Baghdad (also part of the ASBU), training courses tailored to Arab requirements now cover all technical aspects of broadcasting as well as programming and journalism.


The spectacular Damascus Centre.

Main contractors for this important project were Neve and Bosch Fernseh. As Mr. Khudr Shah pointed out: "We selected these two companies after an extensive survey of equipment and experience in the Arab world. Our main requirement was for high quality, reliable equipment widely used in the Arab world, to be supplied, installed and managed by companies with a proven Turnkey capability who had worked successfully together in the Middle East."

In the early stages, technical co-operation was provided by the British Broadcasting Corporation and the German Government, assisted by the expertise of Arab member countries.

The first phase of the project involved the equipping of TV and Sound Studios to full professional standards, together with a technical training classroom and workshop.

Neve's installation team, headed by Greaeme Bilton arrived at the beginning of February, experiencing the worst winter for 60 years and braving the elements to complete their part of the project which was ready for customer acceptance in May.

Neve supplied two 5104 consoles, distribution amplifiers, patchfields and an intercom system together with third party equipment to complete the audio system.

Bosch installed the video system. Co-ordination was essential at all stages between all contractors and Mr. A. R. Kassem, a technician from Neve's Syrian Agents was involved throughout the installation.

The Neve team returned to Britain in June presenting the customer's acceptance forms and the congratulations message.

Ladies from the Nile

NEVE's Turnkey Systems Division, headed by Adrian Bailey, provides extensive customer training both on-site and at Neve's own training centre. All training programmes are tailored to the needs of each individual installation and are offered on a world-wide scale.

Several months ago, the Organisation for Broadcasting and TV for Egypt (OBTF) delegated six lady engineers for training at Neve's Melbourn Training Centre. The course, which extended over five weeks, covered virtually all aspects of Neve's mixing consoles and included a vital introduction to English Fish and Chips.

The OBTF recently purchased 15 of Neve's new 51 Series stereo broadcasting consoles as well as a special customised music desk. Again, in the face of heavy international competition, Neve equipment was considered superior not only from the technical point of view, but also in terms of cost-effectiveness. Most of the units are now installed and in operation.


Hands-on experience at Neve's Melbourn Training Centre for Shadia Kamal and Salwa I. Amin from The OBTF, Cairo

INTERNATIONAL RENDEZVOUS WITH NEVE

No important exhibition can be without Neve. Our presence will again be felt at the most important events taking place during the latter part of this year:

CTEAP	Paris, France	21–23 September
SBES 1983	Birmingham, UK	27 September
VIDCOM	Cannes, France	5–7 October
AES	New York, USA	9–12 October
Interbee	Tokyo, Japan	25–27 October

PS: Don't let a crowded stand put you off. Neve's post production demonstration always attracts enormous interest. But despite the crowds, you will always get a welcome.

JOIN THE VETERANS CLUB

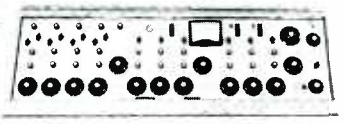
Neve consoles have been around for over 20 years now and there are hundreds in operation throughout the world.

The very first Neve desk holds a prominent position in Neve's Melbourn museum, but who owns the oldest working console?

Gerry Humphreys of Twickenham Films hopes to claim the title and award for his 12-year old, 36-channel dubbing desk which is still in daily use today. Forest Studios are challenging this position with their multi-track recording console, also still in operation, after completing 13-years of service with the BBC, which proves that Neve consoles are built to last!

If you own an even older Neve console, still in use, Neve would like to hear from you. Please send a photo for the Veteran's Club page which will be published in the next Neve Today. Neve are offering the owner of their oldest console a magnum of champagne and a privileged place in the photographic gallery of the Neve museum.

Send your entry to Neve Veterans Club c/o Maureen Pinner Cambridge House Melbourn, Royston Great Britain
CLOSING DATE: November 30, 1983


Neve's piece de resistance – a museum piece – can you beat it?

Neve

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 USA. Tel. (203) 744 6230. Telex 969638
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diary

New Pro-Audio Yearbook

The new edition of the *Pro-Audio Yearbook* is now available. The 1983/84 edition has been revised thoroughly and now contains over 8,000 separate entries, over 750 photographs of products covering the complete spectrum of professional audio. As with previous years, the book is a hard back with over 700 pages and a very useful address index giving phone and telex numbers for 3,000 companies in pro-audio and related industries throughout the world. It is available from specialist bookshops, professional audio dealers in the UK and the USA as well as other countries. Alternatively, is also available by mail order from the Special Publications Group, Link House Magazines PLC, Link House, Dingwall Avenue, Croydon CR9 2TA, UK. The price is £25 ($44) for the book and £2 ($4) should be added for delivery. Also available is the 1983/4 edition of the *Video Yearbook*. This book is a sister volume to the Pro-Audio book and follows a similar format covering the complete range of industrial, professional and broadcast video on an international basis. The price and postage for this book are the same as for the *Pro-Audio Book*.

Pro-Audio Yearbook 1983/84 ISBN 0-86296-017-7.

Video Yearbook 1983/84 ISBN 0-86296-016-9.

APRS DEAF results

At the recent APRS exhibition in London, a number of exhibitors were raising money by various competitions for DEAF, the Distinguished Engineers Audio Federation, which is a British recording industry organisation dedicated to raising money for charities connected with deaf children. Two companies have asked us to publish the results of their activities at the exhibition and since DEAF is an organisation that we as a magazine like to support, we will certainly do so.

Ampex held a draw, entry to which was by answering a few questions. This raised the sum of £250 for DEAF and made winners of Cy Langston (The Who Group Ltd) and Roger Knapp (Eel Pie) both of whom received Konica *FT1* 34mm SLRs, and one Richard Elen (?) who took star prize in the form of a Philips CD player (no fix).

Scenic Sounds were asking contestants to guess the number of footballs suspended in a net over an Orban *424A* de-esser/compressor. The correct number was 228 balls and the nearest correct guess came from Simon Quill of Angel Studios and he became the new owner of the Orban *424A*. This competition managed to raise £66 for DEAF.

Restoration enlarge

Restoration is a company located in Van Nuys, California offering refurbishment and repair facilities to professional tape machines with emphasis on Ampex. They have recently tripled their operational size and this has enabled them to add the complete reconditioning of Ampex Series *350, AG350* and *AG440* to their existing line of head refurbishment and new head sales. Also offered are the Inovonics line of replacement electronics for updating machines.

To assist with these new services, Restoration have appointed Rick Olsen, formerly of Ampex and United Western Studios, as chief of maintenance. Chris Olsen, formerly with Saki Magnetics has been appointed marketing manager.

Restoration, 15904 Stratern Street, Van Nuys, CA 91406. Tel: (213) 994-6602. Telex: 66-2922.

Spencer A Hughes 1924-1983

We are saddened to report the death in June of Spencer Hughes, co-founder and technical mainstay of Spendor Audio Systems, manufacturers of some of the best respected and popular monitor loudspeakers for broadcast applications.

Before founding Spendor some 15 years ago, 'Spen' had worked alongside Dudley Harwood on loudspeaker research in the BBC for 15 years. During this period they conducted much original research on plastics materials, in addition to developing engineering techniques which improved design consistency and stability while reducing distortions.

Spen's unique contribution was to put these lessons into a practical commercial context, a far from easy task given the tight quality control standards imposed by the BBC. As a result Spendor speakers are now used throughout the world with no fewer than 2,000 in use by professional organisations. Cornerstone of the range has remained the 'classic' *BC1* design, which broke fresh ground on its introduction in the late 'sixties. Other popular professional models include the large *BC3* and *SA3* designs and the miniature *SA1*, while the brand new *SP1*, finished just before Spen's death, is the legacy which is conceived as the eventual successor to the *BC1*.

Agencies

● Sifam Ltd have been appointed UK agents for the range of portable test instruments made by Metrix of Annecy, France. Products include hand-held digital, analogue multimeters and a dual trace oscilloscope.

AHB/MBI join together

In a move aimed at strengthening Allen & Heath Brenell's share of the multitrack mixer and tape recorder market, AHB has joined forces with MBI Broadcast Systems in Brighton, UK. The new UK sales and administration address of Allen & Heath Brenell now is 69 Ship Street, Brighton, BN1 1AE. Tel: 0273 24928. Telex: 878235. The factory address remains unchanged as Kernick Industrial Estate, Penryn, Cornwall, TR10 9LU. Tel: 0326 72079. Telex: 45717. AHB's address in the USA remains as Five Connair Road, Orange, CT 06477. Tel: (203) 795-3594. Telex: 643307.

Magnetic Recording Course

A second, four-day course entitled 'Magnetic Recording Engineering' is to be held at the Cranfield Institute of Technology from September 19th-22nd. The lecturer will be Finn Jorgensen MSc, who has had over 25 years experience in magnetic recording covering the spectrum from audio to video and high density digital recording as well as designing equipment within these categories and magnetic tape and heads. He is the author of *Handbook of Magnetic Recording* and is at present a consultant to the US navy and a lecturer at the George Washington University, Washington, DC.

The objective of the course is to provide technical personnel with a fundamental knowledge of magnetic recording and playback and key components in the recording system. It stresses the fundamentals of magnetism, recording equipment and techniques, magnetic heads and tapes, digital read and write functions, AC bias, longitudinal and perpendicular methods, coding techniques, proper control settings, general maintenance etc.

Further details may be obtained from Michael Perry Associates, 22 Coleshill Place, Bradwell Common, Milton Keynes MK13 8DN. Tel: 0908 668118.

People

● Molinaire Holdings PLC have announced the appointment of Gerhard Wick as chief executive. He was formerly general manager of Ampex operations in Europe, Africa and the Middle East and vice president of Ampex International.

● Audio Rents Inc has announced the apointment of C Arthur Bannister as manager of its London branch. Formerly with the Decca Record Co, he has a vast experience of every aspect from studio design to mastering and with Decca he was involved in many innovative developments.

Contracts

● Trident (USA) has announced the installation of a 32/24 *Series 80* console in the mobile unit of Fedco Audio Labs, Providence, Rhode Island.

● Elliott Brothers, London have been appointed to redesign and reinstall the sound system interface for the Barbican Concert Hall. This includes a 900-way jackfield with distribution amplifiers for facilities such as the provision of TV and satellite links as well as links with other Barbican venues. Elliott Brothers are also to supply equipment and installation for a sound post production suite at Complete Video, London.

● Harman UK have announced orders and installations for five complete 70 mm JBL cinema systems from EMI Pathe; 35 mm cinema loudspeaker systems from Westrex and custom installations of 70 mm JBL loudspeaker systems at the National Film Theatre and the Royal Festival Hall.

● Klarion Enterprises, Australia have recently supplied the following Otari tape machines: two *MTR10/2*, four *MTR-10/4*, two Otari *MX5050-B/II* and a *DP4050-C2* copier for installation in the Papua New Guinea Parliament; an *MTR-90/II* 16-track to the Australian Broadcasting Commission; an *MTR-90/II* 24-track for the recently constructed Jands mobile; an *MTR-90* 16-track to 5DN in Adelaide for their production studio.

A reader service

We have just received the most recent catalogue from a certain internationally based studio equipment rental company and have noted that only some of their typographical errors had been corrected from the previous edition. We therefore feel bound to point out to any of their potential clients that however excellent EXR signal processors may be, the only kind of excitement that you can truly expect them to generate is aural and not oral. Sorry to disappoint.

Errata

As the task of preparing *Compact Disc* masters seems to be fraught with its fair share of misunderstandings, we would like to correct an error which appeared in Hugh Ford's article *A Technical Introduction to Compact Disc* (August issue). The ¾ in *U-matic* video cassette master should have SMPTE type timecode recorded on analogue track 2, with track 1 being used to record the P and Q sub-code information. This is the direct opposite of the procedure stated in the article.

38▶

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SS-10

diary

New facility at Linguaphone

Linguaphone, the international language publishers have doubled the capacity of their UK tape duplicating plant at Slough by installing a new system manufactured by Lyrec of Denmark in addition to their existing Gauss system.

The new system consists of a 4-track, vertical loop bin, containing the master tape and 12 duplicating slaves running at a speed of 32:1, with a real time master speed of 7½ in/s. This enables Linguaphone to take full advantage of the latest tape formulations such as chrome, without the limitations imposed by 3¾ in/s loop bin masters. (The normal mastering speed for duplicators run at 64:1.)

Air conditioning has also been installed to ensure dust free operation and temperature regulation. This and special duplicating techniques mean that Linguaphone is also able to offer a competitive and reliable service on copying data cassettes for micro computers.

Over the last year Linguaphone has completely re-designed its London editing and mastering facilities by re-building the three production suites and matched the acoustics found in studio control rooms. On the equipment side the company has purchased three new ¼ in Studer *A80* stereo recorders and a 4-track 1 in Studer *A80* recorder to produce the 1 in master tapes for the duplicator loop bins.

As well as producing records and tapes for its own language courses, Linguaphone has built up an excellent reputation by pressing LPs and singles for other record companies; with the extra capacity a similar service can now be offered on pre-recorded cassettes.

For further details contact John King, The Linguaphone Institute Ltd, 252 Argyll Avenue, Trading Estate, Slough, Berks SL1 4AH, UK Tel: (0753) 23200.

Address changes

● Aphex Systems Ltd have changed their address and are now located at 13380 Saticoy Street, North Hollywood, CA 91605, USA.

● Due to changing telephone dialing codes in the Stevenage area, the UK telephone number for consultant Eddie Veale of Edward Veale Associates is now 0438 350023.

● Shuttlesound, the UK importers and distributors of Electro-Voice have moved and they are now located at Unit 15 Osiers Estate, Osiers Road, London SW18 1EJ. Tel: 01-871 0966. Telex: 27670.

● Turner Electronic Industries, manufacturers of power amplifiers, have moved their complete base of operation to East Sussex. Their full address is now Turner Electronic Industries Ltd, PO Box 49, Etchingham, East Sussex, TN19 7NZ. Tel: 0435 882581.

● The telephone number of Canford Audio, Ryton has changed to Tyneside (091) 413 7171.

Contracts

● Frank Zappa has taken delivery of a Sony *PCM-3324* 24-track digital recorder with a complete Sony *PCM-1610* mastering system.

● Rebis Audio have announced the delivery of the first of their Omega range mixing consoles to the Guildhall School of Music and Drama in the Barbican Centre, London.

● Martin Audio in conjunction with Regie Scene has supplied a sound reinforcement system to the Palais de Festival, Cannes. The system includes *RS 1200* compact full range units, plus the new single *S 115* bass bins and a variety of Martin Audio's established units.

● FM Acoustics has an order to supply 7,000 W of amplification to La Scala Di Milano, the renowned Italian opera house.

Agency

● Soundcraft Electronics has announced the formation of Soundcraft Electronics Canada Inc as exclusive importer and distributor of Soundcraft products in Canada with full technical support. Soundcraft Electronics Canada Inc, 1444 Hymus Boulevard, Dorval, Quebec H9P 1J6. Tel: (514) 685-1610. Telex: 05-822582.

People

● Soundcraft Electronics Inc has announced new appointments to their Santa Monica operation. Larry Schara, formerly of AVC Systems has been appointed field sales manager; Erika Lopez formerly of *Recording Engineer/Producer* magazine, to handle all advertising and PR; Mary Gutierrez as sales administrator; and Gary Lynn, formerly of Westlake Audio, as service manager for the full line of consoles and tape machines.

● Harman UK have announced the appointment of Nigel Mann as northern area sales manager for JBL professional and Tascam products.

● Edwin W Engberg has been appointed business manager of audio tape products in the magnetic tape division of the Ampex Corporation, Redwood City, California. He will be responsible for the worldwide marketing of Ampex Professional audio tape products.

● Brittania Row have announced the appointment of Steve Lane, formerly of Rockfield Studios, as head of maintenance for studio equipment hire.

Plug into oblivion

On a rather complex play for BBC Radio more microphones were being used than the control desk could accommodate and a quick replug was made before the next scene was faded up. On fade-up it was found that only the left side was working, therefore recording was stopped and the actors stood by while the fault was traced. The easy things were tried first: the LSU's; the mic/desk connectors and the tie-line positions. These seemed to be fine so the inputs were quickly cross-plugged to see if the right channel was OK—it worked. So the problem probably lies in the studio it was surmised. Next tie-lines 23 and 24 were tried instead of 19 and 20. Also the mic cable ends were changed, but the fault persisted. Another set was robbed of its *SM69* since it was known that this worked. However, imagine the puzzlement when the right channel still didn't work. Someone shouted "phantom power" and suddenly the floor manager leapt over three semi-reclining actors and raced back from the mic cupboard with two dynamic mics.

"Where would you like them?" he asked. "Anywhere you like," was the answer, "you plug them and we'll find them." Well, believe it or not, this time the session was back in business.

Where was the fault? It was a funny in the phantom supply wasn't it? Not a bit of it! Later a spare jack hole was found immediately to the left of tie-line 19, the first in the row. The marker strip was out of alignment by exactly one place to the right.

A comical tale

A European studio had just installed a new monitor system with units from the USA when an amplifier fault put 80 V dc on a speaker with unpleasant results. Following many phone calls around Europe it was found that the only replacement stock was in the form of re-cone kits from the English importer, who confirmed that the re-cone kit was the correct part for the studio's quoted model number. Unfortunately, because export arrangements were not possible, the studio had to collect the kit by hand. Several hundred miles later, the studio's technician arrived at the importer. The salesman (who didn't know the difference between the speaker model number and the Pope's telephone) presented their 'engineer', who, it transpired, was a warehouseman covering the real engineer's holiday period.

"Those are the ones guvnr, the big round ones."

The technician was perplexed that some were black and some were white.

"Don't worry they're the right ones—the factory sometimes runs short of black cardboard."

The technician's continued doubts annoyed the man. Measurement of the voice coil showed the diameter to be 10 mm too small. The technician proffered a brochure with his speaker displayed.

"Oh! You want the professional model—we don't do *that* one." The salesman then chipped in "can't you modify the one's we've got?"

Some heavy buck-passing ensued and the technician departed empty handed leaving some very red faces behind him, as he headed for the nearest telephone to order direct from the States!

Reverberant silence

The new studio was almost ready. The long hours of installation, cable running and wiring were almost over. At last the console and the multitrack machine would talk to each other without a chorus of hums, buzzes and intermittent pops. The ancillary gear sat flashing and occasionally whirring in the racks. Time to open the doors? Not quite. One last and vital piece of equipment was yet to arrive; the spring reverb unit, elegantly encased in teak veneered cabinet.

The following morning, the unit arrives. "£1,500-worth there, lads; don't drop it!" shouts the studio manager. With great care, the box is laid to rest in its place of honour. The eager young engineer quickly patches in the sends and returns. Power is applied. A signal is sent, and all wait for the returning reverberation with expectant ears ... And wait. No reverb emerges. No hum, hiss or other sound, in fact ... nothing at all. Not a sausage.

Our young engineer dashes backwards and forwards with test meter in hand. Signals are injected into the desk (which still works) and then into the mystery cabinet (which still doesn't). Engineering efforts are met with continuing silence. The young engineer arms himself with the appropriate Allen key and prepares to open the box and enter the holy of holies. Silence falls as the bolts are removed and the cover is lifted off.

There is nothing inside. The box is empty! "Expensive drinks cabinet," mumbles the studio manager. Others merely gasp while some look under the console to see if the spring might have tried to leave in disgust (it hadn't).

A new reverberation unit is promised for delivery by first light tomorrow morning. ■

Once in a blue moon.

Only once in a blue moon does a company with an established track record, reject successful design principles and start again from scratch. Harrison have. The new 4 series consoles offer a completely new concept in console design combining creativity with advanced technology and deep understanding of the music business.

The major result of this new concept is a range of mixing consoles which give the studio Harrison quality and features at a price you associate with lesser consoles.

For details of the range of MR4 and TV4 Harrison Mixing consoles contact:
F.W.O. Bauch Limited.

Harrison

F.W.O. Bauch Limited

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

new products

Aphex introduce The Compellor

The Compellor is a versatile two-channel signal processor which combines compression and levelling functions. The compressor section works over a 30 dB range of input levels and has a self adjusting range of ratios from 1.1:1 to 20:1 with programme controlled attack and release. The features of this section allow a natural sound to be maintained even when using heavy compression. The *Leveller* section performs audio levelling in a manner similar to the way that the ear senses loudness over long time intervals. The unit will maintain gain within 1 dB for a 20 dB level change with the action slow enough to have little effect on programme transients and short term dynamics. In addition there is also a peak limiter feature which will hold an absolute ceiling 12 dB above the average level.

Other features include the *Silence Gate,* which will prevent the gain reduction release function from recovering should the input level drop below an adjustable level; and a stereo enhance feature that will widen the stereo image when the side chains are triggered by certain programme information.

Metering is by a dual function, two colour display with the levelling action being shown as a red dot and the compression as a green bar above it. Monitoring of output level is also selectable.

Front panel controls are simple with the mix control adjusting the balance between leveller and compressor with separate input and output levels. The unit is standard 19 in rack mounting and is 1¾ in high.

Aphex Systems Ltd, 7801 Melrose Avenue, Los Angeles, CA 90046, USA. Tel: (213) 655-1411. Telex: 910-321-5762.

UK: AKG Acoustics Ltd, 191 The Vale, London, W3 7QS. Tel: 01-749 2042. Telex: 28938.

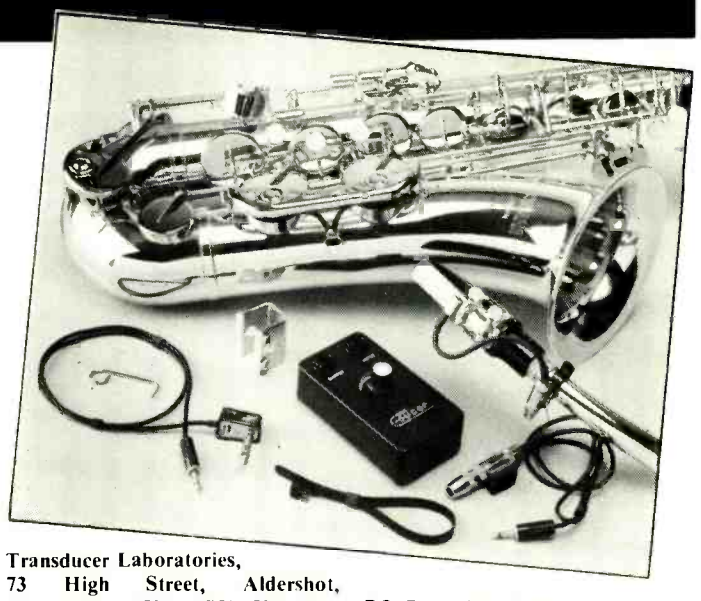
C-ducer for sax and clarinet

C-Tape Developments have added a transducer suitable for sax and clarinet to their range. The C-ducer *Saxman* employs an easily mounted reed transducer requiring no modifications to the instrument or changes in playing technique, together with a battery-powered preamplifier. C-Tape say that this produces the natural sound of the instrument but without the key noise and allows reed players to compete on equal terms with electric musicians.

The *Saxman* system comes in a sturdy carrying case that contains options allowing the preamp to be mounted in differing locations. C-Tape will shortly announce details of an effects unit to be known as the *SAXFX* for use with sax and clarinet especially.

C-Tape Developments Ltd, Transducer Laboratories, 73 High Street, Aldershot, Hampshire, GU11 1BY, UK. Tel: 0252 319171. Telex: 858623.

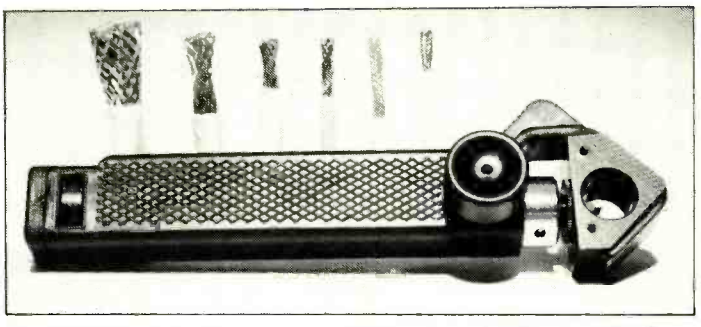
USA: C-Tape Developments Inc, PO Box 1069, Palatine, IL 60078. Tel: 1800 562 5872 (toll free). Telex: 232 80502.



Coax Cable Stripper

A new design of cable stripper for the removal of outer sheathing from twisted pair coaxial cables has been developed by AB Engineering. The *Coax-3* incorporates a spring loaded cutting head which, when revolved, follows contours to provide a precise circumferential cut to a predetermined depth. The operator then twists the cutting blade through 90° and the outer sheathing is separated along the axis of the cable. The device is also suitable for other cables of irregular cross-section, having a cable capacity of 3 mm to 12 mm diameter. The *Coax-3* is supplied in a fitted case with five colour-coded cable guides.

AB Engineering Company, Timber Lane, Woburn, Milton Keynes, MK17 9PL. Tel: 052525 322.



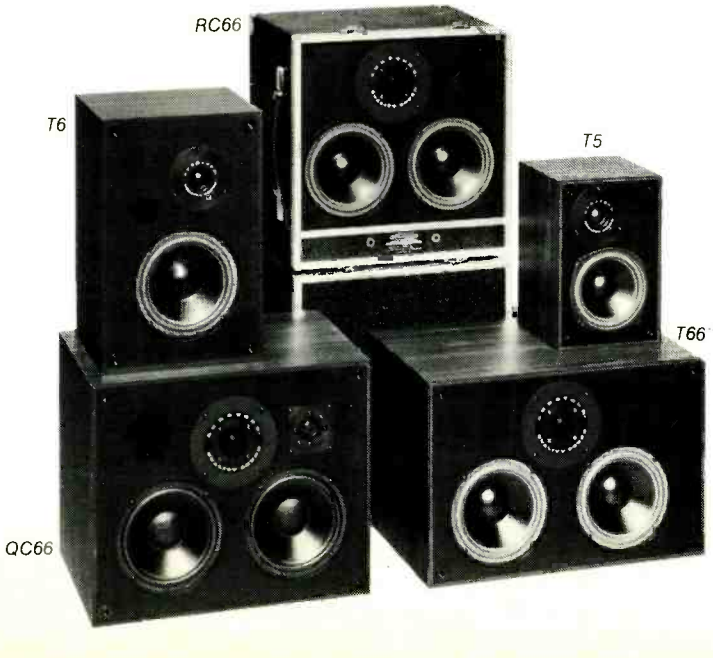
New Auratone monitor range

The Auratone Corporation have introduced a completely new range of multi-way monitors. There are five models in the range, *T5 Ultra-compact* 2-way; *T6 Sub-compact* 2-way; *T66 Compact* 2-way; *QC66 Quality control* 3-way and *RC66 Road-Cube* 2-way. All the models use polypropylene LF drivers with MF and HF units being dome types. The crossover networks all use 12 to 18 dB/octave slopes with the 2-way systems having six elements and the 3-way having 10 elements. The enclosures are all manufactured from a low resonance, high density, wood-based material known as *Super-Acousticwood* and all models are available as mirror-image pairs with the exception of the *RC66 Road-Cube.*

Specifications: power ratings: *T5* 40 W, *T6* 80 W, others 100 W programme; frequency response: *T5* 90 Hz to 20 kHz ±3.5 dB, *T6* 60 Hz to 20 kHz ±3 dB; *T66* 55 Hz to 18 kHz ±2.5 dB; *QC66* 50 Hz to 20 kHz ±2 dB; *RC66* 55 Hz to 18 kHz ±2.5 dB; sensitivity: *T5* 87 dB, *T6* 88 dB, *T66* 90 dB, *QC66* 90 dB and *RC* 90 dB, all at 1 W 1 metre.

Auratone Corporation, PO Box 698, Coronado, CA 92118, USA.

UK: Scenic Sounds Equipment, 97-99 Dean Street, London W1. Tel: 01-734 2812. Telex: 27939.



DeltaLab long delays

DeltaLab have introduced three new units recently, two programmable delay lines and a long-delay line. As the *Time Line* series the *ADM-512* and *ADM-2048* are low cost, 16 kHz bandwidth, programmable digital processors both featuring flanging, doubling, chorusing and echo effects capabilities. Both units are programmable via their front panel or with the accessory remote control. The only difference between the two models is the maximum delay capability which is 512 ms for the *ADM-512* and 2,048 ms for the *ADM-2048.*

The third unit is the *Echotron.* This offers a delay range from 256 ms to 4,096 ms with a full 16 kHz bandwidth. It also has infinite repeat capabilities and can retain use of the feedback control in the infinite repeat mode. There is also provision to sync drum machines to the delay time.

DeltaLab Research Inc, 27 Industrial Avenue, Chelmsford, MA 01824, USA. Tel: (617) 256-9034.

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

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CMI-Extending your compositional creativity...

Consistent with Fairlight's policy of always offering the musician a choice, the CMI offers no less than three compositional programs – a real-time multitrack sequencer (Page 9), a non-real time music composition language (MCL) and the revolutionary Rhythm Sequencer. Each specifically designed to suit different styles and methods of composition. Together they are probably the most complete compositional package available today

The Real Time Multitrack Sequencer records performances from the CMI's six octave dynamic keyboards together with all expressive nuances from either the keys or the six real time controllers. The recorder is organised in such a way that there is no limit to the number of tracks that may be laid down or overdubbed, and total storage capacity is in excess of 50 000 notes. After recording, each track may be easily 'patched' to any of the CMI's voice channels, allowing orchestration and arrangements, even while the music is replaying.

MCL is a non-real time composition language that allows all the parameters of a composition to be specified from the alphanumeric keyboard. Designed primarily to allow non-keyboard players to record music within the CMI, great attention has been paid to the expressive control of each sound. Powerful editing facilities allow any part of the score to be located and changed as necessary. MCL incorporates an error detection program that assists the composer by pinpointing any error he might have made while entering the music.

The Rhythm Sequencer, which has caused more excitement amongst CMI users than any other single development, allows real-time composition of complex rhythmic phrases which may then be combined to form complete songs. After specifying a phrase length eight separate channels of sound may be combined while that phrase is looping. The interactive program displays notes on the screen as they are played. All pitch, timing and dynamic information is recorded and an adjustable time correction facility will correct any playing inaccuracies. The Rhythm Sequencer may also be used in non-real time using a combination of the keyboard and the lightpen.

Each channel in the CMI benefits from a separate audio output allowing it to be independently equalised and echoed: the complete composition may then be recorded onto tape in one take. With the use of the analog interface, a hardware/software peripheral for the CMI, that musical information may be extracted as voltages and used to control up to eight analog synthesisers simultaneously.

If you are a composer you will find the CMI one of the most creative tools you have ever used. If you're not, we have a feeling that very soon you will be.

For further information on the CMI please contact:
Syco Systems Ltd, 20 Conduit Place, London W2.
Telephone: 01-724 2451.
Telex: 22278 Syco G.

new products

Low cost Sifam meters

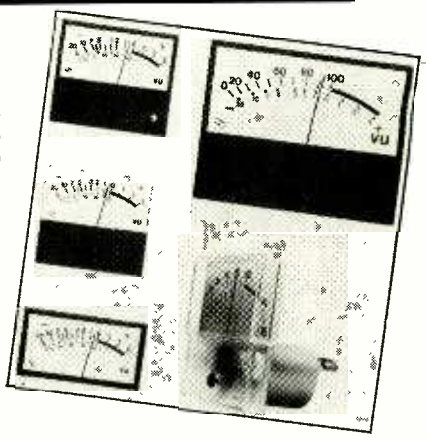
Sifam have introduced a new design of low-cost audio level meter with claimed performance characteristics not significantly different from those of the highest grade true VU meter.

The new design is based on Sifam's *Presentor* core-magnet movement meter which aside from making the unit cheaper than the Sifam economy series meters has ballistics that are better suited to audio level measurement and so is even closer to ANS C16.5-1954. Additionally the core-magnet is inherently self shielding against ferrous panels and stray magnetic fields so that prior specification or special shielding is unnecessary. The bridge circuit components have been incorporated in space available between the meter yoke and case. The meter also has ⅔ fewer moving parts and requires 1/5 of the barrel space of ordinary meters. There is also a choice of design—scale lengths of 34 and 60 mm printed in the standard VU colouring but with a choice of two scales.

The meters may be mounted at any angle and dial illumination can be provided although this requires the use of white translucent dials to allow illumination from the rear.

Sifam Ltd, Woodland Road, Torquay, Devon TQ2 7AY, UK. Tel: 0803 63822. Telex: 42864.

USA: Selco Product Co, 7580 Stage Road, Buenapark, CA 90621. Tel: (213) 921-0681. Telex: 655457.



Rebis Omega

Rebis are well-known for their modular signal processors, the *RA200* series, but what is less well known is the fact that they have 10 years experience in the design and construction of custom built multitrack consoles for clients as diverse as the BBC and Mike Oldfield. The *Omega*, launched at APRS 83, is a 30/24/24 standard production console and represents a new direction for Rebis.

The *Omega* is 1.8 m wide and is a very compact split type console (separate input and group/monitor modules). The input module EQ features two fully parametric sections each with variable Q and split range frequency controls (Q range 6 to 26 dB/octave, frequency range 20 Hz to 2 kHz, 2 kHz to 20 kHz with x10 switch). Both pre and post EQ insert points are provided together with an insert enable switch. Aside from allowing the EQ of effects, sends or returns and switching in or out at the console, this also allows the entire EQ section to be used externally without breaking the through channel signal. Other input module features include three solo modes—mono pre fade, stereo post fade and stereo post fade in place as in mix but without other channels; cut disable buss, channel LED meter and P&G conductive plastic faders.

When recording, fader reverse switches on the group/mix input modules allow the long throw faders to be used to control the monitor mix levels. In mixdown the groups can be used as submixers feeding to the main stereo mix, and monitor sections can be switched to EXT to give an extra 24 line inputs for effects returns, etc. A useful feature of the *Omega* is the foldback cue module which instead of deriving foldback directly from the aux outputs, provides four independent aux sub mixes.

Other facilities include comprehensive monitoring, metering and communications systems and also oscillator and warning lights sections. Options include 32 inputs in the same frame, LED metering, fader automation with VDU and internal or external jackfields.

Rebis Audio Ltd, Kinver Street, Stourbridge, West Midlands, DY8 5AB, UK. Tel: 0384 71865.

SSL dual mic amplifier

Solid State Logic have announced details of a *Dual Microphone Amplifier System* consisting of a powered 19 in rack capable of housing up to 12 SSL dual mic amp modules. Each module contains two mic amps with each having 50 dB continuously variable gain control, a 20 dB pad, switchable phantom power, phase reverse, and a 6-segment 3-colour LED input level indicator. Interface with the console is via 3-way terminal blocks mounted on the rear chassis.

This system is available in two different versions. The first is designed to interface directly with the faders of an in-line console, and thus double (or increase) the number of mic inputs available for live broadcast, etc. The second version houses 10 dual mic amp modules and a mix module allowing the unit to function as an outboard mixer. This system could also be used to upgrade the front end of older consoles to better noise and distortion performance, bypassing the existing front end.

Specification: — input device: Jensen *JE115K-E* transformer; input impedance: nominally 1.2 kΩ nominal output level: +4 dBm; equivalent input noise: −128.5 dBu, 20 Hz to 20 kHz true RMS measured at full gain with 150 Ω source; gain 74 dB maximum, 20 dB headroom above nominal output level of +4 dBm, output clipping at +26 dBm balanced and +22 dBm unbalanced; frequency response: ±0.5 dB 20 Hz to 20 kHz; distortion: SMPTE IM 0.003%, THD typically 0.01% at 1 kHz, −20 dBu 0 dBu output and also at 0 dBu input and +20 dBu output; CMRR: input better than 85 dB at 50 Hz and 1 kHz, 65 dB at 10 kHz, output electronically balanced with 75 Ω source better than 65 dB at 1 kHz and 50 Hz.

Solid State Logic, Churchfields, Stonesfield, Oxford OX7 2PQ, UK. Tel: 099 389 8282. Telex: 837400.

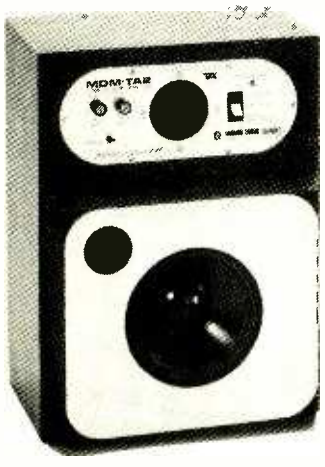
USA: Solid State Logic Inc, 2633 Fifteenth Street NW, Washington, DC 20009. Tel: (202) 333-1500. Telex: 440519. ■

CSI MDM-TA2 monitor

Calibration Standard Instruments are producers of compact monitor speakers with particular emphasis on matching between units of ±0.5 dB. Their latest model is the *MDM-TA2 Time-Align Nearfield Monitor*. The frequency response of the unit is ±3 dB 60 Hz to 20 kHz and is capable of 108 dB SPL at one metre. They are sold in pairs and include protection circuitry to allow power amplifiers up to 300 W/channel to be used safely. Each monitor measures 16 × 11¾ × 9¼ in and weighs 20 lbs.

The *MDM-TA2* has, however, a number of unusual features such as the Position/Program switch on the front panel which adjusts the response on the front panel for listening position (nearfield or distant) and program material (original or final) so that proper equalisation may be applied to the original recording to overcome upper range losses in the recording chain. The monitor is probably the first unit to incorporate a polarity switch on the front panel to allow checking of the absolute polarity of the program material.

Calibration Standard Instruments, PO Box 2727, Oakland, CA 94602, USA. Tel: (415) 531-8725.



Symetrix compressor/limiter

Symetrix have a new low cost compressor/limiter in production known as the *CL-150*. This is a development from their earlier models and is based around a single 19 in 1 U rack mounting format. The signal detection system is claimed to exhibit the advantages of both peak and RMS detection methods and Symetrix refer to the design as *Fast RMS*. On programme material with slow (slower) transients and low frequency components, the RMS side of the detection system will be operative giving the associated type of compression. However, on fast transients, the *CL-150* can respond with attack times as fast as 120 dB/ms using its peak detection abilities. The claimed result is low transient distortion and a 'natural sounding compression'.

Control features include variable threshold, attack, release, compression ratio and output gain. There is also a programme controlled mode for attack and release functions. Gain reduction is indicated on an LED display. Inputs and outputs are electronically balanced as standard and there is provision for stereo operation interconnection.

Symetrix Inc, 109 Bell Street, Seattle, WA 98121, USA. Tel: (206) 624-5012. Telex: 320281.

Advice, instruction, back-up support. These are the key words in HHB's digital service philosophy.

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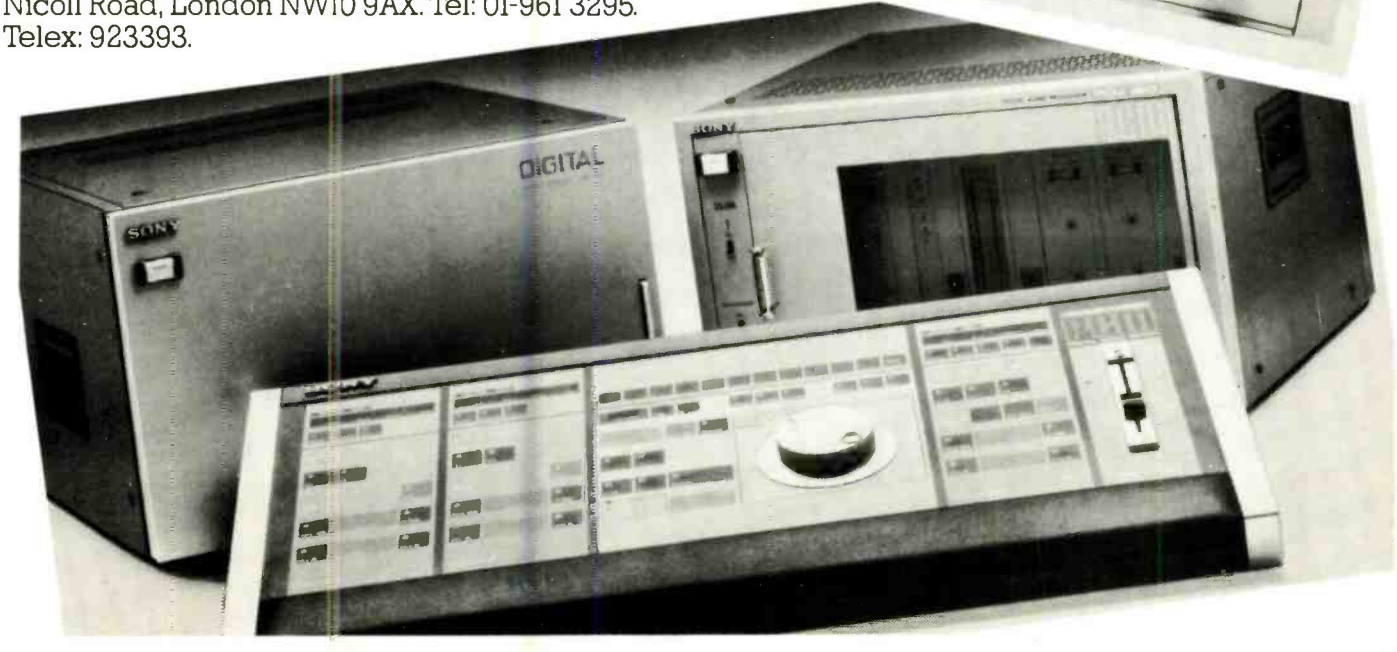
HHB Hire and Sales, Unit F, New Crescent Works, Nicoll Road, London NW10 9AX. Tel: 01-961 3295. Telex: 923393.



Making the Best Even Better

New England Digital Announces Exciting New Synclavier® II Options

Roland GR Guitar

New England Digital Corporation is pleased to announce exciting new options to be available as additions to all Synclavier II's.

Once again, with the release of these options, New England Digital honors its commitment to steadily upgrade the Synclavier II.

This consistency could only be possible from a company whose product incorporates tremendous hardware/software flexibility and power. ***The Synclavier II has them both!***

DIGITAL GUITAR OPTION

Guitar Players - welcome to the world of computer music! The synthesis power, creativity and flexibility of the Synclavier II can now be offered to guitarists using New England Digital's revolutionary new digital conversion process. Complete access to all of Synclavier II's capabilities, such as digital synthesis, automated music printing and Sample-to-Disk™ are now yours. A unique 16-button LED panel attaches simply to all Roland GR* guitars to allow convenient access to important Synclavier II real-time features. (Available August 1983)

Optional Ebony Model Synclavier II Keyboard

* Roland GR is a registered trademark of Roland Corporation, Japan

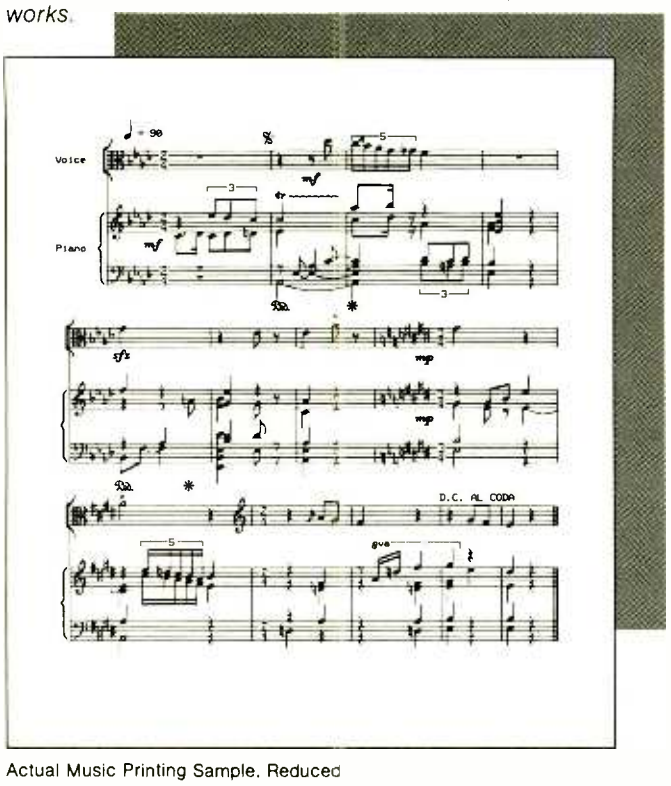
Synclavier® II is a registered trademark of New England Digital Corporation

STEREO OPTION

Now any Synclavier II can be simply upgraded to produce fantastic live stereo results. Many elaborate stereo control modes never before possible from any system or recording environment come standard with Synclavier II's new Stereo Option. Increase your Synclavier II's sonic capabilities, *plus* save valuable production time and expense by going direct from Synclavier II's 16-track digital recorder to 2-track tape!

MUSIC PRINTING "Enhanced"

In March of 1983, New England Digital released a new, enhanced version of software for Synclavier II's Music Printing Option. Now, important aspects of western music notation such as random changes in time signatures and key areas are available, along with tuplets of any kind. Plus, you will have instantly accessible editing capabilities along with dynamic markings to enhance your finished complete score or individual parts (see example below). Yes, there is an automated commercial music printing system which is available today . . . *and works.*



Actual Music Printing Sample. Reduced

SAMPLE-TO-DISK "Polyphony"

The company which offered the only high fidelity sampling system worldwide with a sample rate of *50kHz, 16-bit data conversion,* and extended sampling time to Winchester Disk (pictured below) is planning an exciting new enhancement for the Synclavier II's Sample-to-Disk option . . . POLYPHONY. New England Digital engineers are now working to expand the sampling capability to be completely polyphonic. The same high-fidelity sonic capability and high resolution presently offered will be incorporated. The new polyphony option promises to add one more amazing capability to the Synclavier II.

Z-80/C.P.M. OPTION "Personal Computing"

Available for all Synclavier II systems is the convenient Z-80/C.P.M. option. This simple retrofit option allows all users to purchase computer industry standard C.P.M. software programs to aid their personal or company computing needs. Whether it is accounting, word processing, or computer games, New England Digital's Z-80/C.P.M. adds another dimension to the remarkable Synclavier II.

To New England Digital these additional options are just steps along the path to the ultimate instrument. Some day we believe the Synclavier II will be a complete music production facility. We also know that it takes a series of developments to achieve this goal, especially in this highly technical field. Using New England Digital's advanced hardware and software, along with creative input from customers, will ensure the longevity of the Synclavier II. We invite you to start with the best and grow from there, as hundreds of others have! If you haven't heard a Synclavier II lately, you haven't heard it at all!

Synclavier II Instruction Manual
A complete and descriptive Instruction Manual is available for $85 (USA & Canada) and $100 US (elsewhere).

For more information please call or write

New England Digital Corporation
Box 546 Attn: S1
White River Junction, VT 05001
802/295-5800

or contact one of
New England Digital's only authorized distributors

London: Turnkey
202-4366

Brussels: Trans European Music
569-1823

n.e.d. new england digital

turnkey

An introduction to C~ducers

Although contact microphones and transducers have been around for many years, it is only relatively recently that their performance could be considered good enough for 'serious' applications. The C-ducer is one of the transducers that has helped to bring about this change and it is finding use in a wide range of applications. In part I of this article, Keith Spencer-Allen covers the background and basics of this fairly unique device.

Keith Spencer-Allen

I have to own up to having had a fascination with contact mics and transducers for many years. It probably began when I used to try to make an old acoustic guitar I had play through a table radio by attaching a cheap tape recorder mic to the body. You could certainly hear the guitar through the radio but the sound bore little resemblance to the acoustic sound at all. The purchase of a crystal pick-up a few months later, for a little under 30 shillings, was only a slight improvement, being limited to about 4 ft of lead from the radio; an insensitivity to about a third of the notes on the fretboard; a dislike of any form of dynamics in the playing, giving a good impersonation of 1:∞ compression; a tendency to feedback; and lastly, a habit of just simply falling off the guitar at will. Things only got better when I could afford my first solid electric guitar with magnetic pickups.

In later years, I found an interest in contact transducers and acoustic instruments returning although for rather different reasons. I had grown rather tired of shutting musicians away in boxes to achieve the separation required by certain fashions in music. I felt that the music was beginning to sound a little like the way it was recorded—with 'unconnected' musicians. This coincided with several manufacturers bringing contact systems on to the market that actually worked quite well but were limited in one way or another. The most common problem was that for good results you had to use the guitar transducer on the guitar as it didn't work too well with percussion or the piano and so on. To have all your options covered you needed a whole cupboard of units that were far from cheap. The piano systems were reasonable but very difficult to adjust so that you had an even response across the complete keyboard—no hot or cold notes. It did, however, mean that by using a little of the contact transducer in combination with the standard mic you could improve separation while junking the isolation booths, retain some of the acoustic sound and with musicians in closer proximity, suddenly backing tracks became musical again.

There was also the other application of these devices—signal processing. The output of a contact mic or transducer could be processed the same way that a DI'ed input could. Flanging the output of a mic on an acoustic guitar or piano has never seemed quite as effective as a contact transducer and for these reasons, as well as the separation aspects, I concluded that contact transducers were a very effective addition to an engineers mic technique.

In the late '70s, I found myself involved heavily with recording synthesiser music. When using acoustic instruments with largely synth tracks, the acoustic instrument often sounded rather insignificant against the rich, full tones of the electronic instruments. This had me reaching for the contact transducers once again. It was a great shame that we had to resort to these tricks as some of the instruments we were using sounded really excellent but even carefully miked and in sympathetic acoustics, were often not a match for banks of synths. We actually evolved contact transducer techniques to overcome these problems and gradually got to know exactly where to place the transducers to achieve the effect that we were after. This does, however, quite clearly show that the contact units we were using at that time were very sensitive to positioning—even a few inches making an incredible difference. Although this gave us a greater range of sounds to play with, it did mean that it was very hard to achieve a generally good approximation of the overall sound of the instrument.

I have explained the angle from which I approach contact transducer systems—which should be borne in mind—as this subject does necessitate subjective statements, being made later in this article.

I first came across *C-ducers* about

three and a half years ago when the prospect of a new type of transducer, employing a principle quite different from that of the systems outlined above, was quite intriguing. Since then I have used it fairly regularly but it is not a system that will come totally naturally to someone unfamiliar with contact mic technique. It does appear that *C-ducers* will need the development of a whole new technique and way of looking at instruments—in many ways as varied and quirky as general mic technique. Without understanding some of the basic principles of the system you will not be able to obtain consistent results and almost certainly not know what is possible and what is not. The purpose of this article is to outline the system and its development together with some operating principles and then to relate these to a wide variety of practical applications, the latter to follow in part II.

C-ducer physique

The *C-ducer* system consists of two components: the transducer and the preamplifier. The transducer is the unique aspect of the system, being a flexible strip of plastic approximately ⅝ in wide and either 3 or 8 in in length. The transducer element is sandwiched between the two layers of plastic although not attached to them. The internal element is therefore not quite as wide as the casing. The unit is fully flexible and quite capable of being wound around a pencil should you wish to do so. It is fixed to the sound source using double sided adhesive tape that runs the full length of the underside. At the end where the cable enters the transducer, there is a wedge-shaped plastic block that seals the strip and houses the connections to the element. The *C-ducer* comes equipped with about 8 ft of screened cable terminating in a standard mono ¼ in jack plug. There may soon be options offered for different connectors and this is under consideration.

The current range of tapes is finished in a textured light brown although earlier models were completely black. This change was purely for cosmetic reasons—brown looking better on most stringed instruments—and has no technical significance. All tapes, even early ones, are compatible and interchangeable with recent units, including the 30 in model which is no longer offered as standard.

The control units are available in a number of different versions with two major ranges, the *Gigster* and the *CX series*. The *Gigster* is for general use and is battery powered. The *CX series* is for stage and studio use and phantom powered from a standard 48 V supply, although suitable mains adaptors are also available. Within these two series there are a number of different models including mono, stereo, 6-way units (for drum kits) and two-input/single output with balance control. Although styled differently, there is little difference between the series in terms of performance.

The preamplifier is purely that and contains no equalisation circuitry. Aside from gain, its main functions are to match the very high impedance of the transducer with more normal operating impedances as well as polarising the transducer element.

Development

Prototype *C-ducers* were put into commercial operation in mid 1979 although it was not until early 1980 that they were actually launched. C-Tape Developments, the manufacturers of *C-ducer*, did not actually set out to produce a universal transducer but rather a system for miking cymbals. Two of the directors, John Ribet and Francis Townsend, had developed a magnetic shim system for drum

miking, largely as a result of John Ribet's percussion activities. User feedback gave them a requirement for a cymbal miking method to complete the system. In conjunction with the third director, André Walton, they set out to design it. The development of the *C-ducer* can be traced from the requirements of a cymbal mic—the need for a physically flat transducer, one with minimal damping effect and very lightweight construction so that it has the least effect on the cymbal mass and so least effect on its tone. They came up with a transducer that was not too different from the *C-ducer*. According to John Ribet, they came very close to achieving their aims—but not quite. The problem was that you could achieve good results with a certain type of cymbal with a given EQ in the electronics (and the electronics had to be viciously EQ'd) but if the type of cymbal was changed with all other factors constant, you got a different sound, naturally, but the EQ did not stay fixed for all cymbal types.

To quote André Walton, "The cymbal was the archetype of all the problems that subsequently occurred with the development of *C-ducer* as it has what is probably the most spectacular difference between the sound that you generally hear and the sound that the instrument is actually producing. If you place your ear under the cymbal, there is an incredible distribution of bass notes right down to sub-sonics and these are normally never heard as we usually listen only to the sound from the edge of the cymbal. Realisation of this gives an idea of the problems we had with the cymbal—how to get rid of large quantities of bass energy that would cause vast speaker cone excursions with little audible effect coupled with the incredible attack transients that are caused by actually hitting the cymbal."

At this point the idea of cymbal miking was temporarily shelved but in their experiments they had already placed prototype models on drums, double bass and piano with encouraging results, the very low mass of the tape having little effect on the acoustic vibration of the instrument.

Another area of experimentation that they then examined was the aspect ratios of the *C-ducers* themselves. They felt that currently available transducers were probably limited by the small area in contact with the instrument itself and if they could increase the contact area, a wider range of the sound capabilities of the instrument might be transduced. They were a little limited by the available materials but this was of virtually no practical significance. Wide tapes were found to have weird responses sounding like 'mad graphic equaliser settings'. If a tape of this width was shortened slowly, a hump in the gain was found when the tape was about an inch square but the sound of the device was still not too good. As the tape was shortened beyond this the gain started decreasing. Narrow tapes were found to sound better than wide types and so the width was standardised at the present size. They also found that the overall sensitivity of the tape is not proportional to its length as logic might suggest.

C-Tape have, until quite recently, been understandably reluctant to discuss the *C-ducer* element, although with worldwide patents now granted, they are happier to give details. Basically, it is a co-axial transducer with the central element being a flat foil. Around this is wrapped an earthing element. There are two effects that come in here; one is the change in capacitance between the inner foil and the outer earthing layer and the second is that the inner foil itself is covered in C-Tape's own piezo-electric vinyl—a material like an electret or vinyl plastic with a lot of free electron activity in the outer lattice. The transducer uses these two effects, the pressure sensitivity on the inner foil and the change in capacitance.

"Basically it is not too dissimilar to a co-axial cable that has been run over by a truck," to use André Walton's description.

Some anomalies

As a transducer, the *C-ducer* has some fairly unique properties that underline the fact that it is a new type of transducer rather than an evolution from a previous type. For instance, the unit has a 'usable area of activity' from ⅓ Hz to 5 MHz (yes MHz) and because of this there have been certain areas of industrial usage where this extended range has been made use of. These include the observation of vibration in such applications as detection of wear in bearings and acoustic emissions from materials under stress.

Phase cancellation across the length of the tape does not behave as you might think. At audio frequencies with the 3 and 8 in units there would be little effect anyway—it should have been noticeable with the 30 in model but this was not the case. C-Tape have experimented with *C-ducers* at very high frequencies (MHz) where such phase cancellations would be easier to observe due to shorter wavelengths. Using calibrated ½ mm diameter receivers there has been no sign of phase cancellation across the length at all. You should be able to change the frequency of the on-coming wave and note the changes in amplitude as you go in and out of phase cancellation; multiples of a half-wave should give you successive nodes and anti-nodes in response but there has been no sign of this either.

The *C-ducer* is susceptible to both transverse and longitudinal waveforms. As one travels at twice the speed of the other you would imagine that when looking at airborne wave reception and reception through the body of an instrument, there would have been some double path, resulting again in some form of phase interference at different frequencies. However, there appears to be little sign of this effect either, not that this effect could be easily measured at audio frequencies.

Perhaps the strangest of all is that of the phase relationship between two *C-ducers* on the same instrument. If you place a pair of *C-ducers* on the soundboard of a grand piano in a position analogous to where you would place a pair of mics to record it in stereo, and then change the polarity of the output from one of the *C-ducers* there will be no difference in the resultant combined sound. A quite different case to the results that would occur from treating a pair of mics in the same way and not something easily explained. ■

(Next month: application areas, basic rules and techniques and practical applications from user interviews)

AES 74th Convention, New York~a preview

The 74th AES Convention will be held from 9th to 12th October at the New York Hilton Hotel, New York. The convention will comprise the presentation of a wide range of technical papers, the details of which are not yet available, and the associated exhibition. We have compiled our usual preview of the exhibition using the lists of exhibitors and information available to us at the time of writing.

A

● **ACO Pacific:** range of ¼, ½ and 1 in mics, preamps and accessories, plus two low cost portable chart recorders. ● **Acoustilog:** range of acoustic test equipment including reverb timer, the *Impulser* option, time delay spectrometry equipment and details of their acoustic consultancy services. ● **ADC Magnetic Controls:** wide range of audio connectors, terminal blocks and patchfields. ● **Advanced Music Systems:** full range of products with featured items *DMX15-80S* stereo digital delay line/pitch changer with new de-glitch module and audio triggerable loop editing software; the *RMX16* digital reverb with optional bar code reader and two new programs; *A/V SYNC* 3-channel digital delay for use with video synchronisers. ● **Agfa-Gevaert:** full range of audio and video tapes. New items will include *PEM 297D* digital ¼ in tape in 4,600 ft lengths on 10½ in reels and a new range of cassette tapes. ● **AKG:** full range of mics, headphones, reverb systems and delays and other audio components. Featured will be *The Tube* valve microphone. ● **Allen & Heath Brenell:** range of consoles including *Syncon B, System 8* and *21 Series,* and details of their range of multitrack tape machines. ● **Alpha Audio:** *Sonex* acoustic foam, plus a variety of studio equipment and accessories. ● **Altec Lansing:** wide range of equipment including monitor speakers, small mixers and power amplifiers. ● **Amek:** full range of consoles for multitrack, post production and broadcast mixers. Featured will be the *Angela* range of consoles. ● **Anvil Cases:** wide range of equipment cases. ● **ATC (Acoustic Engineers):** professional monitor drive units, an electronic crossover and studio monitors. ● **Audio & Design:** full range of Audio & Design products including two new

The Tube from AKG

Scamp modules, the *S30* expander/gate and *S31* compressor limiter; the full range of 'little boxes' including the *ProPak* audio interface, the *AmPak* monitor amp and a new time code reader. They will also be exhibiting microphones from the **Calrec** range of mics including the new *Soundfield Mk IV.* ● **Audio Developments:** full range of products including the *AD049, AD160, AD145* and *AD062* small mixers. ● **Audio Kinetics:** demonstration of the US debut of the *Mastermix* console automation system plus an automated post-production demonstration of the *Q.Lock 3.10C* time code synchroniser. The system will incorporate recent software additions *Q.SOFT ADR* automatic dialogue replacement and *Q.SOFT SFX* sound effects assembly programs, plus a new control software option and the new *Q.SOFT CONFORM* package. ● **Audio Technica:** full range of stage and studio mics, both dynamic and electret types with some models being phantom powered. Also other accessory items. ● **Audiotechniques:** details of the company's sales, rental and service operations. ● **Audio Video Consultants:** no information received.

B

● **BASF:** range of professional tapes, cassettes and magnetic film including calibration and test tape. ● **BGW:** full range of power amplifiers and associated equipment. ● **Bose:** range of speaker systems, equalisers and power amplifiers. ● **Brooke Siren Systems:** full range of crossover systems including the new *FDS 300* series and the accessory range of DI boxes and the handheld range of cable/phase checkers.

C

● **Calzone Cases:** range of flight cases for amplifier racks, mixers, effects units, etc. ● **Cetec Gauss:** tape duplication systems, speaker drive units and complete monitor systems. ● **Community Light & Sound:** range of high level soundreinforcement equipment. ● **Connectronics:** wide range of cable and connectors for audio applications. ● **Countryman:** range of miniature microphones for a wide number of applications. ● **Crown International:** full range of power amplifiers, crossovers, *Badap* programmable audio measurement system and the full range of *PZM* mics including the new corner boundary models. ● **C-Tape Developments:** the full range of *C-Ducer* transducers with the new *CX* range of control units. Featured will be the new reed transducer for saxophone and clarinet use.

D

● **The David Hafler Co:** range of power and preamps. ● **dbx:** the full range of compressors, limiters, the *900* modular series of processors and the *700 Series* digital processor. ● **DOD Electronics:** wide range of graphic equalisers, and other sound processing equipment. ● **Dolby:** full range of noise reduction systems, including the *SP Series.* New items will include the 2-channel portable *M372* Dolby A system and a range of noise reduction cards for video recorder use — including *cat 226* for Ampex *VPR2B* and *cat 234* for Sony *BVH 2000.*

E

● **Electro Sound:** full range of high speed tape duplicating systems including units incorporating Dolby *HX* noise reduction. ● **Emilar Corporation:** wide range of loudspeaker drive units. ● **Eventide:** range of sound processing equipment including the *SP2016* digital reverb/effects processor. *Timesqueeze* time compression/expansion system, *H949 Harmonizer,* etc, and *Specsystem* software package for spectrum analysis with personal computer systems. ● **EXR:** the EXR range of aural enhancers

featuring the new *EXR IV* system with LF and MF control.

F

● **Fender:** range of sound reinforcement equipment including power amplifiers and mixers. ● **Fostex:** full range of Fostex equipment including the *A2, A4, A8* tape machines with accessory units; the *250* and *X15* multitrack cassette systems and the new *B16* 16-track ½ in tape machine.

H

● **Harrison:** full range of consoles for multitrack recording, post production and live use. Featured will be the *MR-4, TV-4* and the new live console, the *SM-5*. ● **Heinl Electronics:** range of PA loudspeakers from Martin Audio, manufactured under licence. ● **Heino Ilsemann:** audio cassette labelling and loading equipment. ● **Hill Audio:** new items will be the *DX2000* 1,000 W/channel stereo power amplifier, the *J Series 3* sound reinforcement and multitrack console available in any format from 16/4/2 to 48/16/2, *Series 3* monitor console, the *DX* range of power amplifiers and the *B Series* range of budget modular mixers. ● **HM Electronics:** wide range of radio mics and receivers including road cases and accessories. ● **Hoshino:** no information received.

I

● **ICM:** wide range of audio cassette materials including C-0, labels, etc. ● **Industrial Tape Applications:** *Itam* range of equipment including the *Sigma* multitrack console. ● **Inovonics:** range of audio processing, recording and instrumentation including audio analyser, average/peak limiter, octave-band compressor and the *MAP II* broadcast audio processor. ● **Interface Electronics:** range of mixers designed for recording, sound systems, theatres, stage monitoring and other applications. Configurations range from 8/2 to 48/16.

J

● **JBL:** full range of JBL speaker components and monitor systems including the *4612* mini live system. Also the full range of **UREI** monitor speakers, equalisers, compressor/limiters, etc.

K

● **King Instruments:** self feed cassette loaders and various video tape loaders. ● **Klark Teknik:** full range of products including graphic equalisers, digital delays and audio measurement equipment. New items include *DN 360* 2-channel 30 band ⅓-octave graphic; *DN 300* single-channel version of *DN 360*; *DN 301* ⅓-octave attenuating graphic; *DN 332* 2-channel ⅔-octave graphic and *DN 700* 3-output digital delay.

L

● **Lexicon:** full range of signal processors including *224X* digital reverb, low cost *200* digital reverb and *LARC* remote for *224X*.

M

● **Martin Audio Video:** film sync generator, and ranges of toroidal power transformers, metal rack cases and other components and hardware.

Lexicon 224X control unit

● **Martin Audio London:** comprehensive range of sound reinforcement systems. New models will include the *RS 1200* horn loaded 'all-in-one' flying system, plus a new ultra-high power handling, modular flying system with separate horn-loaded 3-way dual drive units. Also the new *CX-2* compact co-axial full range system. ● **Meyer Sound Labs:** sound reinforcement speaker systems, stage monitor systems and studio monitor systems. Featured will be the *M3* studio monitor system. ● **MicMix:** range of electro-mechanical reverb systems, *Dynafex* single ended noise reduction, reverb time controller. ● **Midas:** *PR system* consoles for sound reinforcement applications, *TR System* modular theatre consoles and *Auditorium* console system. ● **Milab:** full range of mics from low cost dynamics to studio condenser types. New mics include the *MP-30*

50 ▶

AES preview

Hemispherical mic, the transformerless *LC-25*, the multi pattern *VIP-50* and the live application *BM-73*. ● **Mitsubishi:** *X-80* 2-channel digital recorder, *X-800* 32-channel digital multitrack and *XE-1* electronic editor. ● **Keith Monks:** wide range of mic stands, cable accessories, adaptors, disc cleaning machines, etc. ● **Motorola:** mobile, stationary and hand portable VHF and UHF communications transmitters and receivers. ● **Music Technology:** computer controlled digital synthesisers. ● **MXR:** full range of signal processors including new *Pitch Shifter* and digital delay lines with 320 ms and 1 s max delay.

N

● **Nady Systems:** *Nady Cordless* and *Nasty Cordless* radio transmission systems and various transmitter/receiver units. ● **Neotek:** range of mixing consoles for multitrack applications. ● **Neutrik:** comprehensive range of audio connectors and the *Audiograph 3300* modular audio measuring system. ● **Neve:** wide range of mixing consoles from portable types to large multitrack systems with *Necam* automation. Also details on the Neve digital audio console. ● **New England Digital:** *Synclavier II* digital synthesiser with recent options and software additions.

O

● **Omnimount:** range of mounting systems for speakers, etc. ● **Orban Associates:** range of signal processors including the *424A* and *422A* compressor/limiters, and a new 2-channel de-esser. ● **Otari:** full range of professional tape machines and tape duplication equipment. Includes *MTR-90-II* multitrack machines, *MTR-10* 2- and 4-track machines with ½ in 2-track tape option; *MTR-12* range—similar to *MTR-10* but with 12 in spool capacity.

P

● **Panasonic Ramsa:** wide range of equipment including amplifiers, mixers, loudspeakers, mics, headphones and digital equipment. ● **Passport Design:** synthesiser systems. ● **Penny & Giles:** the full range of conductive plastic faders featuring the *3000 Series* faders as well as other fader ranges and rotary pots.

Q

● **QSC Audio:** range of power amplifiers.

R

● **Red Acoustics:** professional monitor loudspeaker systems. ● **Renkus-Heinz:** range of loudspeaker drivers, horns and passive crossover networks.

S

● **Saki Magnetics:** range of hot pressed glass bonded ferrite heads including heads for in-cassette duplicators, and high speed metal tape duplication. ● **Schoeps/Posthorn Recording:** the full range of **Schoeps** mics for studio applications. New items include the *BLM 3* boundary recording capsule for the *Colette* range of preamps and capsules. ● **Shure Brothers:** the full range of microphones, headsets, live sound systems, *AMS 8000* directional mic/automatic mixer system, and other audio products and accessories. ● **Simmons:** no information received. ● **Sifam:** wide range of VU and PPM meters, control knobs, switches and transformers. ● **Solid State Logic:** the established *4000 Series* with *Total Recall* and the newer *6000 Series* console designed for live teleproduction, outside broadcasts and video post production. ● **Sorco:** no information received. ● **Soundcraft:** the full range of consoles for multitrack, live sound, post production, broadcast applications and multitrack tape machines. New will be the *SCM 2000* 2-track machine with centre timecode option. ● **Sound Technology:** range of test equipment including distortion measurement equipment and microprocessor controlled automatic tape recorder test set. ● **Soundtracs:** full range of compact mixing consoles for recording and live applications. Featured will be a new modular mixing system available 16/4/2 to 32/12/2 with 24-track monitoring using a microprocessor for routing and memory allowing full write, store and recall routing externally via a keyboard on one of the modules. ● **Sound Workshop:** several ranges of multitrack consoles and the *Diskmix* automation sytem. ● **Stanton:** wide range of phono cartridges and phono pre-amps. ● **Studer:** full range of tape machines from Studer and Revox for a wide variety of applications, Studer mixing consoles and details of the Studer range of digital products. ● **Studiomaster:** range of mixers and ancillary equipment for live and recording applications. ● **Studio Technologies:** *Ecoplate* reverb systems. ● **Symetrix:** wide range of rack mount units including headphone amplifiers, compressor limiters, signal processors, etc.

T

● **Tannoy:** range of professional broadcast and studio monitor loudspeakers from small to large models. ● **Telex:** no information received. ● **3M:** full range of the company's magnetic tape products including magnetic tape and cassettes. Also *DMS* digital mastering system. ● **Trident:** the full range of Trident consoles including the *Series 80B;* the *Series 70; TSM; VFM* and *Trimix*. ● **Turbo Sound Sales:** professional range of live sound speaker enclosures with an emphasis on space saving design. Also a range of high power stereo power amplifiers.

U

● **Ursa Major:** the *Space Station* echo/reverb processor and the *8×32* digital reverb.

W

● **Whirlwind:** wide range of cables and connectors assembled into patch cables, stage boxes, multiway systems, etc. ● **White:** wide range of equalisers and equipment for room tuning and monitor system flattening.

X

● **Xedit** drift and flutter meter, and wide range of splicing blocks.

Y

● **Yamaha International:** the Yamaha range of equipment including mixing consoles, speaker systems, power amplifiers, crossover units, graphic equalisers, delay lines, etc.

Studio Sound's Richard Elen, Keith Spencer Allen and Phil Guy will be attending the convention and look forward to meeting you at stand 121 or around the exhibition. Copies of the magazine and sister publication, *Broadcast Sound*, will be available. ■

THE NEW OTARI MTR-90 SERIES II

"...thoroughly recommended,"

Hugh Ford, Studio Sound, November 1982

"The Otari MTR-90 Series II is a very well-built machine with the tape transport having many of the features of the premier recorders of European manufacture..."

"Both the remote control and autolocator are highly practical with excellent layouts. Full and foolproof interlocking is provided for all functions with clear displays of the machine's status."

"This machine is to be thoroughly recommended particularly when comparing its price with the competition."

We have refined the features and extended the performance and capabilities of the new, second generation MTR-90 by working closely with recording and film/video post-production engineers who demand the extra measure of technology and commitment. The Series II Mastering Multichannel machines are the logical result; microprocessor-controlled recorders specifically designed to easily interface with any SMPTE-based video editing system, machine controller or synchronizer.

The complete text of Hugh Ford's review, plus a comprehensive technical brochure and price details are available now. Further, should you desire your own "hands-on" review of the MTR-90, ring us directly at 0753-38261 and ask for Mick Boggis.

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The weak link in any digital set up is when D/A and A/D conversion is necessary. Here Dr Martin Jones of Neve Electronics takes us through the development of the first available all-digital console.

The digital mixing console

Dr Martin Jones

THE future of audio is digital. When digital recording burst upon the scene in the late 1970's, digital audio had already been well established for several years as the top quality medium for music transmission circuits. Digital recording presents challenge and opportunity. We must recognise that much studio work consists of the mixdown and sweetening processes involving transfer from one tape to another tape; with digital recording this involves A/D and D/A conversion at every interface between digital recorder and analogue mixing console. As these conversions are the weakest links in the digital audio system, their proliferation must be avoided to achieve the best quality possible, but this requires all the mixing console functions to be implemented using digital signal processing.

The ideal approach to mixing console design would be to employ remote control of all the processes such as gain control, equalisation, limiting, signal routing, etc. Whilst great strides have been made in improved voltage-controlled amplifiers and solid state switches, there is still no doubt that such devices degrade the performance of analogue circuits to some extent; analogue circuits by their very nature work best when the potentiometers and switches are located next to the relevant electronic circuitry, as exemplified in the serried ranks of channel strips in an analogue mixing console. Multiple stages of remote control are therefore distinctly unhealthy for the quality of an analogue system. Digital signal processing (DSP) on the other hand, is entirely controlled by numbers and is not at all fussy about their origin; it therefore presents the ideal opportunity for distortion-free remote control. Furthermore, DSP provides the answer to the increasing flexibility of signal routing required in today's studio, the digital buss technique of transmitting many signals on one set of wires eliminating the over-complex systems of switches, and crosspoints in analogue systems which inevitably degrade noise and crosstalk and can introduce serious reliability problems.

Neve found such a technical opportunity too good to pass by and our long experience of digital control techniques put us in a good position to explore this new realm of digital signal processing. We found the most relevant and advanced work virtually on our doorstep at the BBC Research Department and a formal collaborative agreement with the BBC enabled us to develop quickly the most up-to-date cost-effective digital signal processing techniques.

By 1981 we had completed our trial DSP mixing console which enabled us to enter an even more in-

DSP under construction

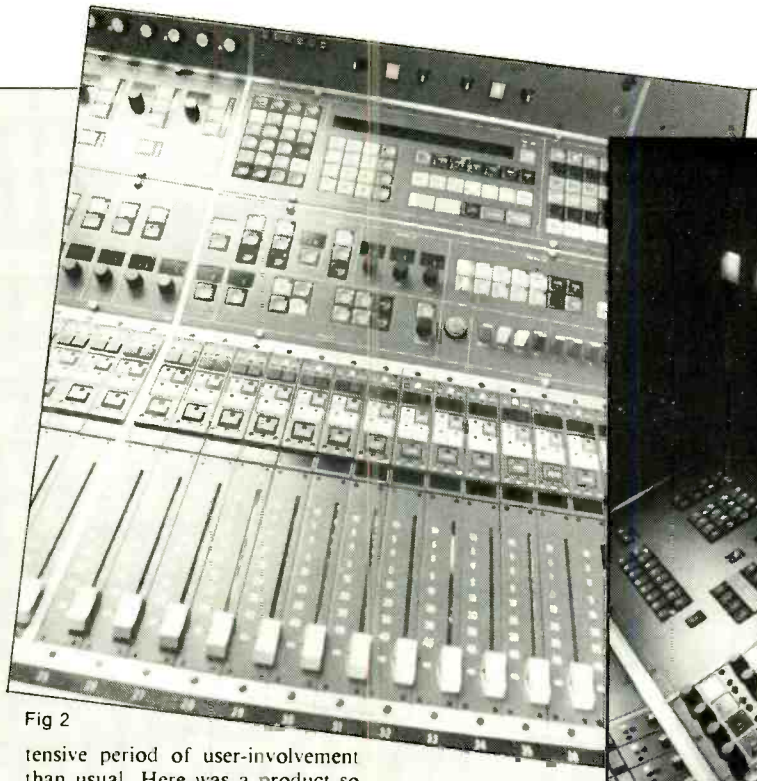

Fig 2

Below: 1981 prototype

tensive period of user-involvement than usual. Here was a product so different and exciting that extended trials were essential before entering the production phase. To date this trial console has been used and evaluated by over 300 professional operators, with their comments and suggestions being carefully logged for inclusion in the production systems.

Digital Signal Processing

Most of the operations required of digital signal processing are relatively straightforward in concept. The digital audio signal consists simply of a sequence of numbers and its processing is a matter of arithmetic. For example, a gain control or fading process operates by multiplying those numbers by a figure derived from the position of the control; multiplying by one gives unity gain, a factor of 0.5 gives 6 dB attenuation whilst of course multiplication by zero mutes the signal. The mixing buss becomes a high speed adder capable of summing 128 inputs.

Filtering and equalisation, whilst a little more difficult in concept, involve translating the frequency-dependent phase shifts and gains of analogue reactive circuits into corresponding time delays, multiplications and additions in a digital filter. High-speed digital filters using bit-slice processors and fast multipliers can synthesise exact replicas of the well-known and loved second order peaking and shelving equalisers so familiar in our industry. The difference is that the digital filter is not limited to such characteristics but can create entirely new effects such as complex comb filters and phase-linear equalisers, most of which are unexplored by the subjective judgement of the balance engineer. Dynamic range control functions such as compression and expansion are also readily implemented by measuring the amplitude of the signal and computing, the appropriate gain control to be applied in accordance with the settings of the front panel controls for the appropriate threshold and compression ratio.

The DSP channel processor, which handles the main functions, is designed with a 24-bit capability providing 144 dB maximum signal to noise ratio, some 30 dB greater than the capability of the best analogue channels. To the user, this means greatly increased headroom in critical areas like equalisers, giving scope for boosting on high level signals without fear of pre-fade overload.

The mixing processor also exploits the advantages of an extended digital word to overcome the well known potential risks of overload on a mixing buss. Here 32 bits are used giving 192 dB maximum signal to noise ratio and an effectively overload-proof mixing buss—something of a balance engineer's dream.

A new and powerful control is also available on the DSP channel: variable signal time delay. Digital signal processing is effectively conceived in the time domain, so it makes sense to provide the capability in every channel for a time delay variable from 0 to 100 ms for control of relative signal arrival times. Thus an important and little-exploited technique for achieving phase coherence in multi-microphone mixes can be employed without importing expensive delay lines and indulging in inconvenient patching.

Digital signal switching and transmission

The miles of copper wire used in an analogue console are not only costly to buy and install, but the resulting interconnections are permanent and inflexible. Many's the time a balance engineer has wanted to attack his console with a soldering iron to change the system specially for a particular session. Once again, digits provide the answer. The computer industry long ago developed the data 'buss' technique whereby one set of wires carries many thousands of signals, to many different destinations.

The secret lies in transmitting the digital words in rapid sequence, with each number having a defined 'time slot' on the wires—20-bit audio words are carried in parallel form on 20 twisted pairs in a ribbon cable using RS422 transmission standards. In the 20.8 μs available between successive audio samples there is in fact plenty of time to slot in corresponding samples of 128 different signals. Thus, for example, input 55 may be routed to output 13 by arranging for output 13 to accept its input from the digital buss at exactly the time that input 55 is present. Each of the 128 inputs has its own time slot on the buss, the whole system running in sync like a video studio. An output connection on this buss is akin to a railway enthusiast train-spotting on an ideal railway network which always runs exactly to time. Standing for example on

54 ▶

The digital mixing console

Doncaster Station armed with a timetable and an accurate watch, our enthusiast knows precisely when to look out for the Flying Scotsman or The Aberdonian. Although all trains travel on the same rails, they may be distinguished by the times of their appearances.

On the digital buss, we can take advantage of the large number of slots to re-route signals and, for example, send sub-groups round again for further equalisation and compression. Inserting a signal in its appropriate slot on the buss is achieved simply by high-speed short-term RAM memory to introduce the appropriate timing adjustments. At the output of the console, all signals are of course readjusted to be in precise time coherence.

A remarkable advantage of this time-division multiplex system is that the whole mixer system can be effectively 'rebuilt' by the operator. For example, the order in which most of the processing occurs can be chosen by the operator during the initial configuration of the console. The number of mix groups is freely selectable; sub-groups can feed further sub-groups, with equalisation, compression, etc, included at any required points. Any fader on the console can be selected to control any input, group or sub-group, giving a system flexibility which would require a major rewiring job in an analogue system. Stereo channels can be instantly configured from any pair of inputs. A choice of four basic configurations is available as a starting point for the operator's creativity so the system does not need building up afresh on every occasion.

The enormous insertion jackfields necessary on analogue consoles are largely eliminated by the flexible signal routing, and there is greater choice than ever in the connection of insertion devices. A dozen or so A/D and D/A converter pairs are generally sufficient to provide for the appropriate number of analogue effects devices likely to be in use at any one time—anything from the latest vocoder to that beloved old valve limiter. These patch points are then routed between any two processing stages as required. The system memories facilitate instant 'repatching' during a session.

The digital studio system —wired with glass

Fig 1 shows the outline configuration of a typical DSP system. Signals are converted to digital form at the earliest possible moment and it is perfectly feasible to convert microphone signals directly in the studio via the remote-controlled microphone amplifier/converter boxes. Long microphone lines, the bane of most quality-conscious engineers because of HF loss, are thus eliminated. The control room itself is uncluttered, the compact control console reducing that vast area of acoustically reflective surface between speakers and engineer. The racks of processing circuits (typically three in number) are out of the way in a separate apparatus room. Interconnections are by optical fibure cable, which is used for both digital audio and control signals. One 50 micron diameter graded index silica fibre can comfortably carry 20 channels of 20-bit digital audio over distances up to 1 km. These modern fibre optic cables are sheathed so as to be protected against all common hazards such as being driven over by trucks and shut in close-fitting doors. Furthermore, field splicing is nowadays straightforward. They have in fact proved ideal for mobile use, replacing expensive and troublesome multi-pair snakes, eliminating HF loss, earth loops, crosstalk, RF interference and hum.

Assignable automated controls

The remote control property of digital signal processing has been combined with a multi-processor control system to produce a revolutionary assignable control console with considerable ergonomic advantages (**Fig 2**). Instead of each input channel carrying its own set of knobs and switches for equalisers, echo sends, etc, the control console in its simplest form is equipped with just one set of 'channel' controls. Access to any control on any channel is obtained by touching the 'access' button on the relevant fader, which automatically and instantly allocates the central control panel to operate the processing functions of that channel. This assignable control principle greatly simplifies the desk and allows more space for the controls and displays. It is rather as if the channel controls on a conventional desk were made to slide along under a 'window' at the operator's hand, the correct channel always being immediately accessible without awkward reaching and groping. Not only does the technique speed up the operation of the desk, it also assists in producing a better sound balance, the operator remaining in his optimum central listening position at all times, thus assisting stereo imaging and avoiding the effects of loudspeaker polar diagram variations.

The rotary control knobs operate highly reliable shaft encoders and have no end stops, the associated display being the indication of control setting. Both analogue bargraph and 4-character digital displays are used. We have found operators to be especially appreciative of the high resolution possible with the latter. Digital signal processing works with laboratory precision and it is perfectly feasible to calibrate controls in fractions of decibels and know that they are totally accurate, with all channels being absolutely identical. **Fig 3** shows the clear

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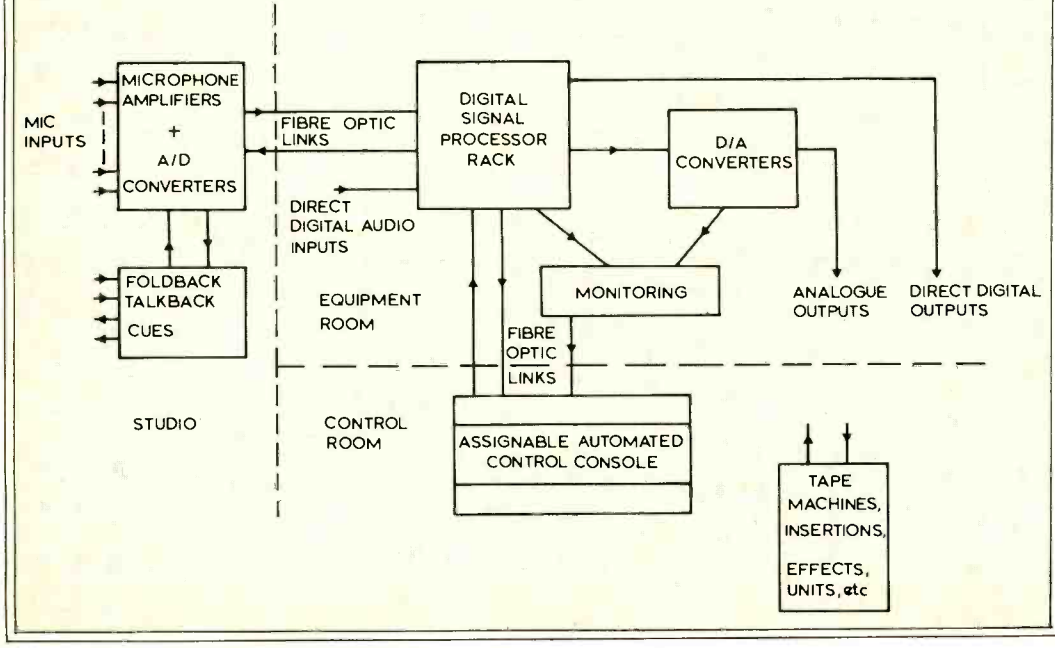
FIG1 TYPICAL DIGITAL STUDIO SYSTEM



Quantec
Room Simulation

see Review Studio Sound Jan. 1983

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G.T.C. Studiotechnik
Nordendstraße 3
D-8000 München 40
Tel. 089-2780404

Holland:
SYNTON
P.O.B. 83
3620 AB Breukelen
Tel. 03462-3499

Belgium/Luxembourg:
HES ELECTRONICS
Vliegwezenlaan 6
1730 Zellik
Tel. (02) 465 2917

United Kingdom:
SYCO SYSTEMS
20, Conduit Place
London W2
Tel. 01-724 2451

Schweiz:
QUANTEC AG
Parkweg 30
CH 4051 Basel
Tel. 061-231331

Australia:
SONTRON
17 Arawatta Street
Carnegie, 3163
Tel. (03) 568 4022

South Africa:
ELTRON Ltd.
112 Polly Street
Johannesburg 2001
Tel. (011) 293066

Norwegen:
P.A. SYSTEM
Normannsgt. 25
Oslo 6
Tel. 02-679313

Sweden:
TAL + TON
Kampegatan 16
41104 Göteborg
Tel. 031-803620

Italia:
MM
Via Savoia 78
00198 Roma
Tel. 06-8450186

Denmark:
Studie- & Lydteknik
Helgesvej 9-11
2000 København F
Tel. 01-341284

Japan:
TALK STUDIO
1-26-3 Zenpukuji
Suginami-Ku Tokyo
Tel. 03-3944368

France:
S.C.V.
B.P. 10314
95705 Roissy Aéroport
C.D.G. Cedex
Tel. 862 43 04

South East Asia:
STUDER REVOX (FAR EAST)
2-12 Queen's Road West
Hong Kong
Tel. 5-412050, 5441310

Quantec GmbH, Sollner Str. 7a, D-8000 München 71, Tel. 089/791404 1, Telex 523793

The digital mixing console

uncluttered control layout achieved.

Inevitably, the most critical controls on any console are the faders. The 'moving knob', operated by a precision servo-system is well-established as an ideal integration of display and control. The knobs are always in the right places, corresponding with the gain setting in use and are always available for instinctive manual updating of settings recalled from memory. An automatic clutch disengages the motor when it is at rest, giving free and smooth manual operation.

A much-praised feature of every fader is a 4-character alphanumeric 'channel name' display next to the access button. A compact typewriter keyboard enables the entry of appropriate names. Similar names in all the assignable control panels and VDU routing displays **(Fig 4)** give a very clear indication of the channel accessed. Association of names means that the operator soon gets to know his signal routing. For example the 'violin' input fader may be routed to the 'string' subgroup which in turn feeds the 'orchestra' main group.

There are 100 'snapshot' memories enabling particular combinations of control settings to be recalled instantly as required. This storage may be relatively long-term, as, for example, when breaking a session overnight the console can be instructed next morning to reset all its controls to exactly the same settings as were used the previous day. In this instance, the operator takes away a floppy disk memory of the control settings for reload the following morning. On the other hand, the multiple memories can be switched in sequence to reproduce in rapid succession the fader, EQ, etc, settings pre-determined for particular points in a 'live' script in broadcast or theatre.

The automation software package synchronises all control settings to SMPTE/EBU timecode providing full mixdown and post-production automation complete with the usual off line data merging and list handling. These are all familiar functions in analogue automation such as NECAM, but they reach their full potential in the DSP, no longer being restricted to just faders but memorising all controls. The operator thus quickly appreciates the time-saving creative advantages of being able instinctively to change passages on a second pass of the tape, whilst leaving the system to look after the parts which he got right first time.

The reality of DSP

After many man-years of research and development, the first two systems, for BBC Radio OBs and CTS Studios, London are nearing completion in our factory. The cost of DSP systems is competitive with the large custom-designed analogue consoles which major studios have previously demanded and the system offers these four major features:

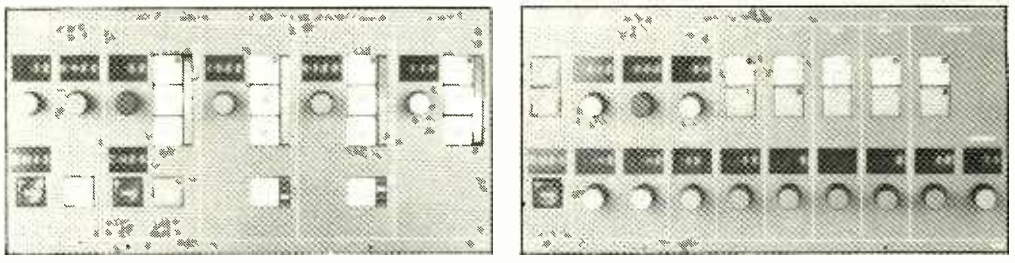
- direct digital interfacing to digital recording and transmission systems via the AES/EBU RS422 digital audio link for the truly all-digital studio;
- fully assignable controls including communications and monitoring providing the sought-after ergonomic solution to the control of complex systems;
- complete system flexibility enabling the operator to customise his own console before every session if required;
- snapshot memory and timecode synchronised total automation available on all controls including faders, equalisers, limiter-compressors, pan-pots and routing.

Major applications in progress are large scale radio and TV productions, theatres, top music recording studios and post-production facilities. On a smaller scale, the production of *Compact Disc* master tapes can now be a totally digital process, using a new digital concept of the 'disc mastering' desk.

Multiple studio complexes can benefit from the economy of shared central processing facilities.

Here is a totally new instrument whose capabilities have only just begun to be exploited. A virtually limitless range of creative opportunities is being explored worldwide with the DSP as we enter the truly digital epoch. ■

Fig 3



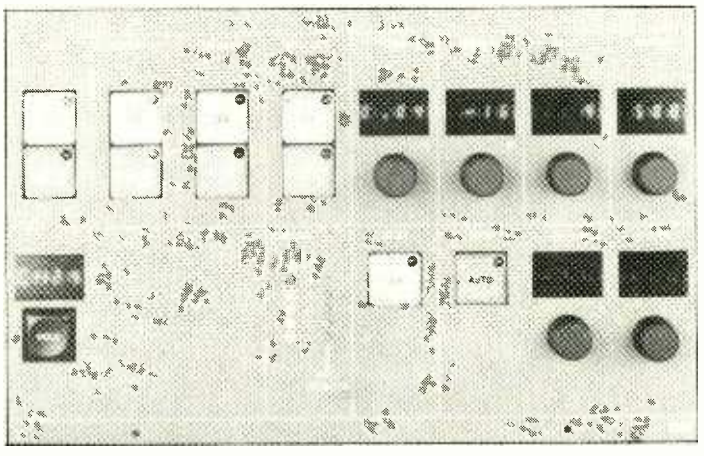
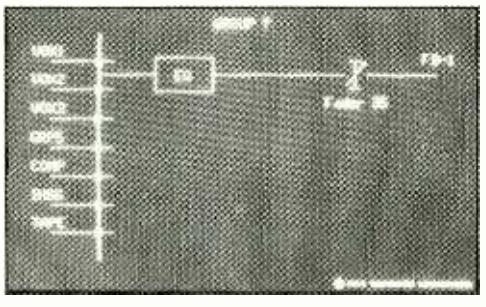
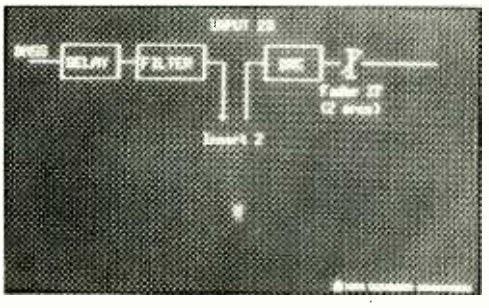
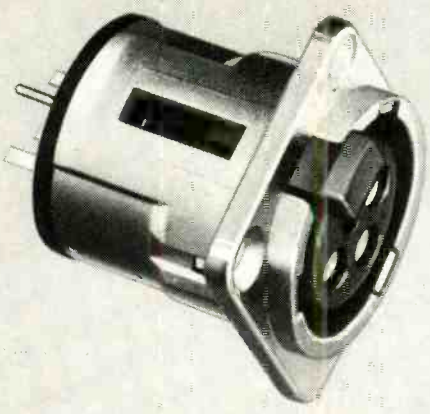


Fig 4







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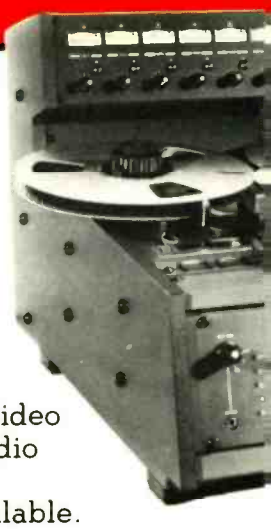
U.K. Distribution-Service and Hire. Hardware House (Sound) Ltd. 1-7 Britannia Row. London N1 8QH. Tel: 01-226 7940. Hardware House

OTARI DP 4050 C2 ▲

Highest quality and reliability from the world's leading manufacturer. Cassette or reel master. DP4050C2 is expandable to max. of 11 slaves.

OTARI MkIII-8 ▶



Otari's advanced MkIII-8 recorder, with microprocessor controlled transport, built-in oscillator, and full function remote. The MkIII-8 can be interfaced to video synchronizers for "audio sweetening" work. Autolocator Now Available.

◀ OTARI DP 2700

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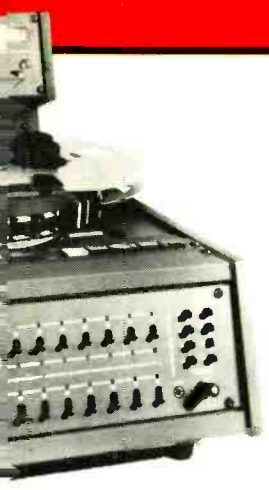
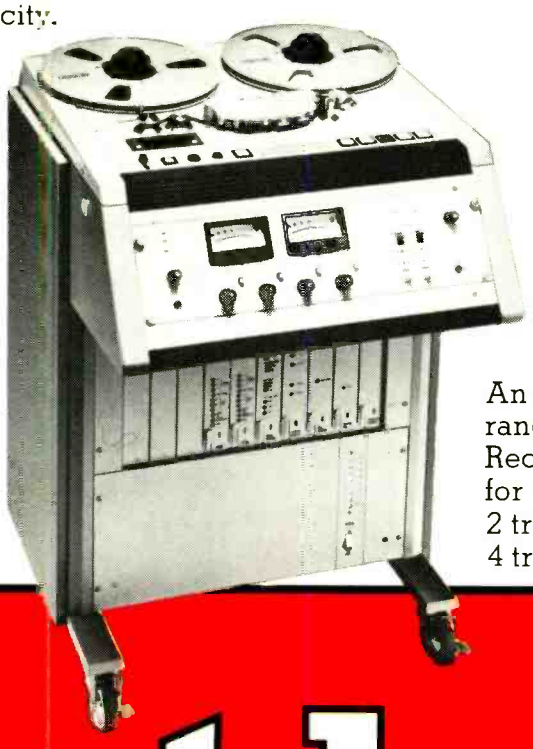


OTARI MTR90-II ▶

The new series MTR90 — the pinnacle of tape recorder technology. Now available in 8 track 1 inch, 16 or 24 track 2 inch versions. Optimal Tape Guidance System, with pinchroller-less PLL capstan, two ½HP DC reel motors, and integral tape guidance headblock assembly governed by Otari's proven microprocessor controlled servo system. Transformerless I/O, adjustable record phase compensation, spot erase, tilting deckplate for easy access, 14 inch reel capacity.

◀ OTARI MX5050 B211 2 TRACK

Otari's latest compact 2 track features — microprocessor controlled transport, LED tape timer, active balanced input/output for better transient response, 3 tape speeds, ref. flux indicator. Now in stock.



◀ OTARI MTR 12-2 2 TRACK

An additional model in the MTR range — MTR12-2 2 track Master Recorder, featuring 12 inch spools for extra playing time. Available in 2 track ¼ inch, 2 track ⅜ inch and 4 track ½ inch formats.

nust be OTARI

and the MTR Series are available for demonstration in your own studio. Early delivery is offered on all models.

From the user's point of view, a supplier's commitment to their product is more important after installation rather than before. Our approach to after-sales maintenance is five-fold. 1) The training and experience of our engineers. 2) Quick response time. 3) Availability of appropriate technical material. 4) Understanding the requirements of each customer. 5) Substantial inventory of spares for all current models. All five factors have to be fulfilled to provide the complete service. We know Otari — so talk to the specialists!

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product reference

Digital Recording Equipment

This product reference differs slightly from our standard reference section in that it includes a wide range of manufacturers connected with digital recording from multitrack to editing. As things are moving very fast in this field we have included some manufacturers who do not at present have a definite model in production but are likely to do so within the near future.

dbx (USA)

dbx Inc, 71 Chapel Street, Newton, MA 02195.
UK: Scenic Sounds Equipment, 97-99 Dean Street, London W1. Tel: 01-734 2812.

Predictive Delta Modulation processor.

DENON (Japan)

Nippon Columbia Co Ltd, No 14-14, Akasaka 4-Chome, Minatoku, Tokyo 107.

Random access PCM editing system with disk storage of music program.

EMT (West Germany)

EMT-Franz GmbH, Postfach 1520, D-7630 Lahr. Tel: 07825 1011. Telex: 754319.
UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Hertfordshire WD6 4RZ. Tel: 01-953 0091. Telex: 27502.
USA: Gotham Audio Corp, 741 Washington Street, New York, NY 10014. Tel: (212) 741-7411. Telex: 129269.

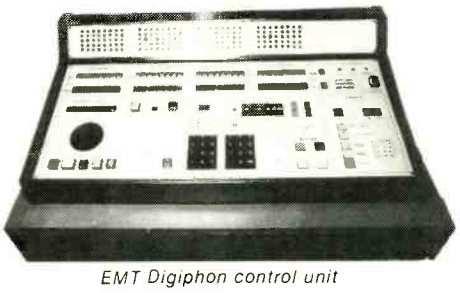
Recording system using hard disk digital storage.

HITACHI (Japan)

Hitachi Denshi Ltd, 1-23-2 Kanda Suda-Cho, Chiyoda-Ku, Tokyo 101. Tel: 03 255-8411. Telex: 24178.
UK: Hitachi Sales (UK) Ltd, Hitachi House, Station Road, Hayes, UB3 4DR. Tel: 01-848 8787. Telex: 933611.
USA: Hitachi Sales Corp of America, 401 West Artesia Boulevard, Compton, CA 90220. Tel: (213) 537-8363.

Combined PCM processor and VHS format video recorder.

dbx 700



EMT Digiphon control unit

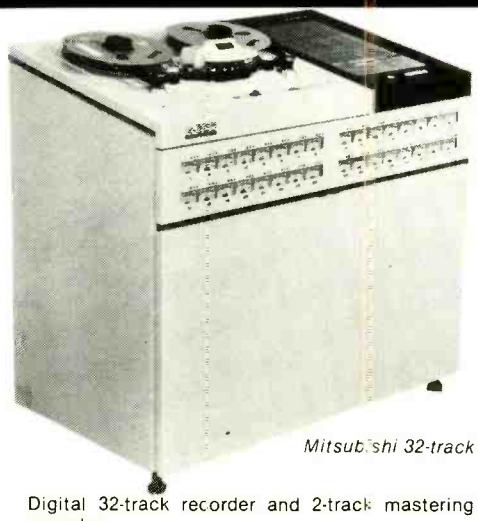
JVC (Japan)

JVC, The Victor Company of Japan Ltd, Tokyo.
UK: JVC (UK) Ltd, Eldonwall Trading Estate, Staples Corner, London NW2. Tel: 01-450 2621. Telex: 923320.
USA: JVC Cutting Centre Inc, RCA Building, Suite 500, 6363 Sunset Boulevard, Hollywood, CA 90028.

Digital mastering system including PCM processor, editing system, U-matic video recorder and digital audio disc mastering preview unit.

MITSUBISHI (Japan)

Mitsubishi Electric Corp, Mitsubishi Denki Building, Marunouchi, Tokyo 100. Telex: 24532.
USA: Mitsubishi Electric Sales America Inc, 7045 N Ridgeway Avenue, Lincolnwood, IL 60645. Tel: (312) 982-9282.



Mitsubishi 32-track

Digital 32-track recorder and 2-track mastering recorder.

SONY (Japan)

UK: Sony Broadcast Ltd, City Wall House, Basing View, Basingstoke, Hants RG21 2LA. Tel: 0256 55011. Telex: 858424.
USA: Sony Corporation of America, 9 W 57th Street, New York NY100019. Tel: (212) 371-5800. Telex: 424595.

Digital 24-track multitrack recorder, 2-channel PCM processors, digital audio editing system and digital delay preview unit.

SOUNDSTREAM (USA)

Soundstream Inc, 2505 East Parley's Way, Salt Lake City, UT 84109. Tel: (801) 486-4701. Telex: 388900.

Digital recording service with location editing facilities. Also digital recorders up to 8-track available for sale.

STUDER (Switzerland)

Studer International AG, Althardstrasse 150, CH-8105 Regensdorf. Tel: 01 480.29.60. Telex: 58489.
UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Hertfordshire WD6 4RZ. Tel: 01-953 0091. Telex: 27502.
USA: Studer Revox America Inc, 1425 Elm Hill Pike, Nashville, TN 37210. Tel: (615) 254-5651. Telex: 554453.

Soon to be launched digital multitrack, digital sampling rate convertor and digital delay preview unit.

TEAC (Japan)

UK: Harman (Audio) UK Ltd, Mill Street, Slough SL2 5DD. Tel: 0753 76911. Telex: 849069.
USA: Teac Corporation of America, 7733 Telegraph Road, Montebello, CA 90640. Tel: (213) 726-0303. Telex: 677014.

2-track reel-to-reel digital recorder.

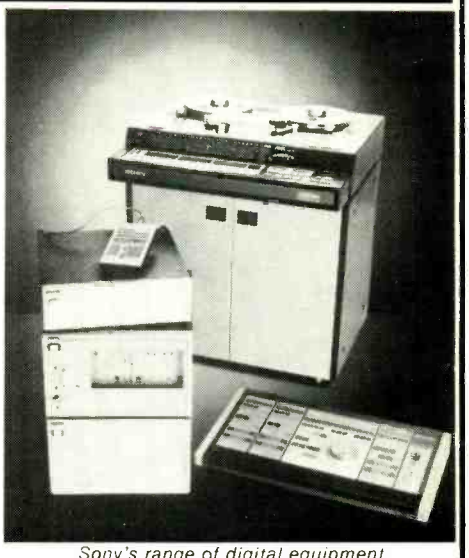
TECHNICS (Japan)

UK: National Panasonic Ltd, 308-318 Bath Road, Slough SL1 6JB. Tel: 0753 34522. Telex: 847652.
USA: Panasonic Co, 1 Panasonic Way, Secaucus, NJ 07094. Tel: (201) 348-7000. Telex: 710-992 8996.

PCM processor and digital cassette deck.

TELEFUNKEN (West Germany)

AEG-Telefunken, Postfach 2154, D-7750 Konstanz. Tel: 07531 862460. Telex: 733233.
UK: Hayden Laboratories Ltd, Hayden House, Chiltern Hill, Chalfont St Peter, Bucks SL9 9UG. Tel: 02813 89221. Telex: 849469.



Sony's range of digital equipment

Telefunken are marketing the Mitsubishi range of digital equipment under their name in Europe and the UK.

3M (USA)

3M Mincom Division, 3M Centre, St Paul, MN 55101. Tel: (612) 736-9567. Telex: 297434.
UK: 3M UK PLC, PO Box 1, Bracknell, Berks. RG12 1JU. Tel: 0344 26726. Telex: 849371.

32-track digital recorder, 4-track digital recorder and editing system. ■

Advision and the digital refit

MENTION the name 'Advision' and you're likely to evoke thoughts of the revolution in sound recording and popular culture associated with the 60s. Memories too perhaps of Jeff Wayne's *War of the Worlds*, the double album that's platinum in most every country and remains CBS Records' most successful LP to date.

Quite simply Advision has been around for 30 years, which is a long time for a sound recording studio. Now, with a change of ownership and the injection of fresh capital, the studio is about to become one of the most advanced and comprehensive in Europe.

"Advision started off as a 1-track mono studio in New Bond Street," says joint managing director Roger Cameron, recalling the old days before the studio moved to its current Gosfield Street premises in 1969. Roger joined the studio five years after its inception from a disc-cutting and film dubbing background, swiftly advancing to balance engineer and studio manager.

"We then became the first 8-track studio and later the first 24-track, adding the first automated mixing console (a Quad/Eight system) about a year before AIR," says Roger. Advision was also one of the first to sync up two machines for 46-track. Now, Advision is the first studio in the UK with a Sony *PCM-3324* fixed-head 24-track digital recorder. According to Sony, two studios are operating the machines in Germany and Holland. There are also three more on order for British studios; but only Advision is up and running with the system in Britain.

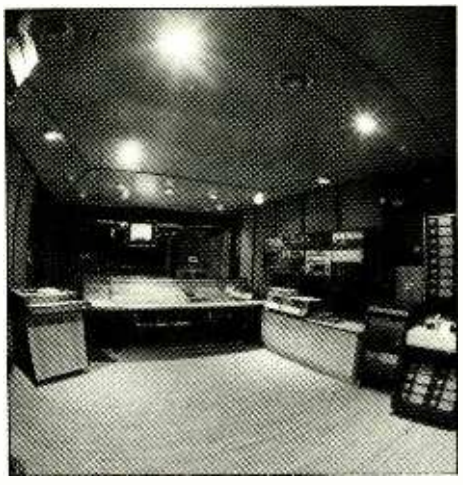
"My partners Doug Hopkins, Jeff Trendell, and myself took over the studio from its founder Kevin Hibberd earlier this year," explains Roger, "and we decided that the studio required heavy technological investment." An investment of some £350,000 in fact. Advision is now a division of a holding company called Addax Film Productions together with Pumacrest Ltd and equipment suppliers Feldon Audio.

Pumacrest, which operates the old Island mobile, was brought into the business by Doug Hopkins. He created the Team mobile years ago before joining RAK and later Island at Basing Street, setting up mobiles in each case.

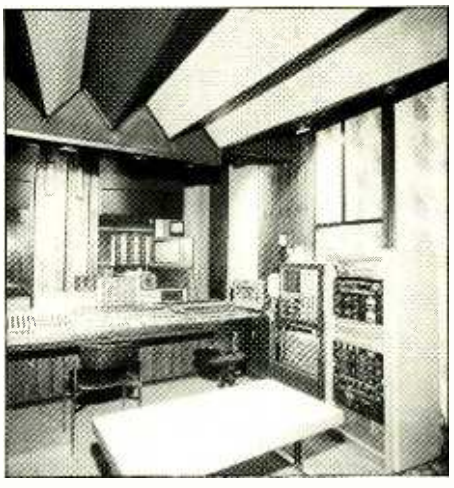
"I'd known Roger socially for years even though we were competing with each other," says Doug. "While I was at Island rumours started to circulate that the studio was up for sale, so I spoke to Jeff Trendell—he's the accountant—and we devised a financial package to buy the studio. As it happened, the studio eventually went to SARM but we thought we could use the same plan for Advision; which we did."

The modernisation programme involves each of Advision's three studios in some way or another. Studio 2, the large mixdown room facing a glazed overdub booth, is almost complete with the digital 24-track in service through an SSL *6000 series* 32 into 24 desk (of which more later).

Studio 3 is a film dubbing theatre totally re-equipped with Magna-Tech high-speed 16-35mm rock-and-roll equipment, including a high-speed Holoscope projector. In addition to this, the dubbing theatre is capable of handling synchronous 24-track analogue or digital mixdown configurations.



Control room to studio 2 with SSL desk



32/24 Quad/Eight console in control room 1 with assorted effects

Downstairs in the orchestra-sized Studio 1, the winds of change are approaching gale force. Extensive refinishing is planned for completion by the end of the year. "We're going to give this area a facelift," says Roger casually gazing at the Albert Hall-style wave breakers on the ceiling (and designed by the same person). "Don't write much about them; they might not be up for much longer. We're also changing all this," he says, pointing to the patterned and stylised absorbers on the walls, which also accommodate a film screen for music scoring, opposite the sideways-on control room.

Briefly the control room has a basic 32/24 Quad/Eight desk ("great for primary recording") and a selection of reverb systems. "We've got three EMT plates plus Lexicon, Ursa Major, and Sony digital units, depending on the recording requirement.

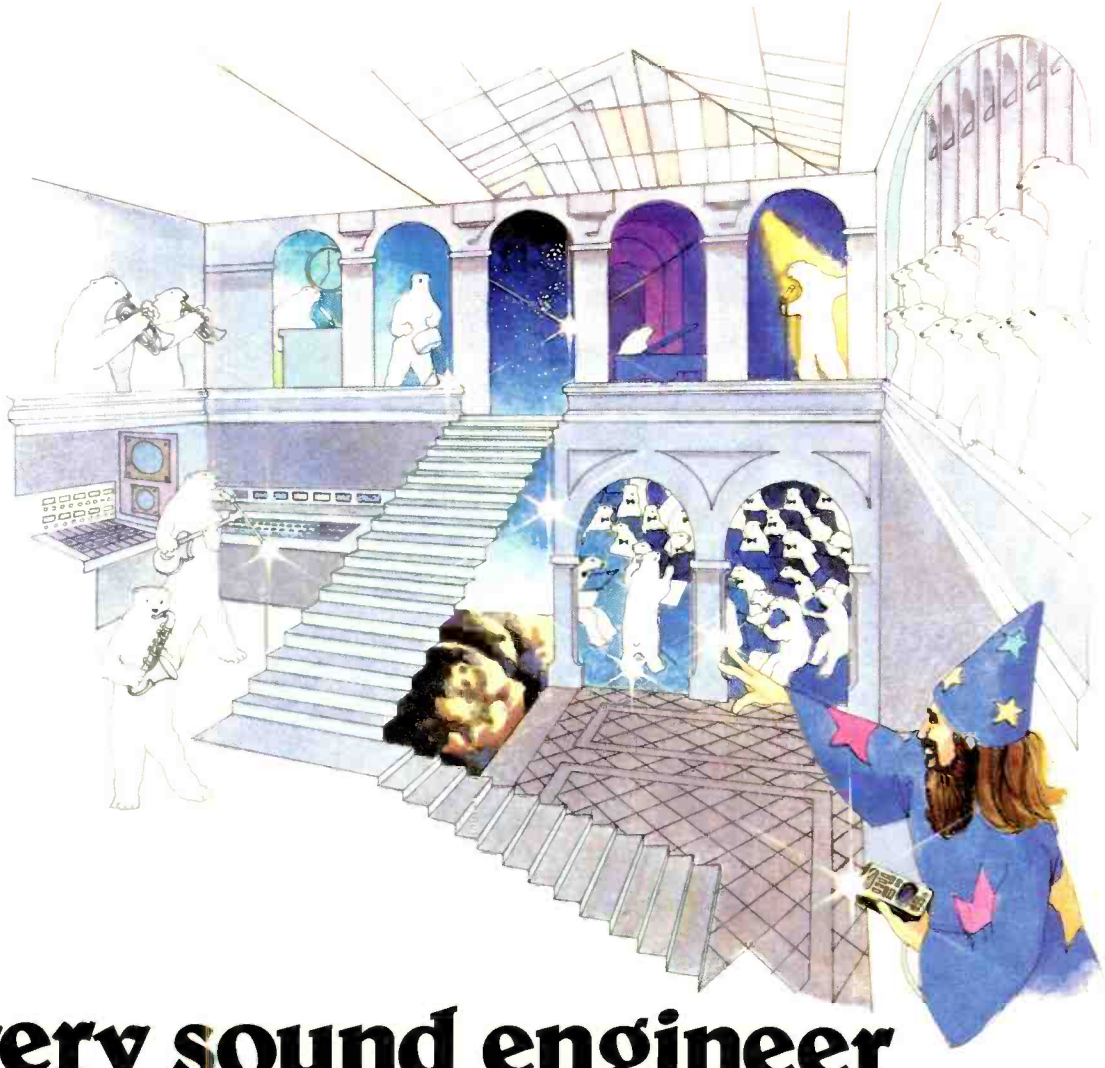
"These days a lot of post-production work is done with video, but one of our strengths is to be able to cope with practically any sound requirement," says Roger. "I also believe that film scoring is an art which needs to be built up over a period of time. We've got a C-format 1 in VTR going into Studio 2 which we will be able to lock to analogue or digital tape machines."

Back to Studio 2 and a closer look at the SSL *6000* console. It's analogue, because Roger wasn't convinced by digital desks on the basis of facilities weighed against the cost. "An analogue desk requires D/A (digital to analogue) conversion followed by A/D back into the recorder," says Roger, "but that's a negligible loss compared to analogue tape generations. I've also tried the across-tape A/B test on the Sony—that is an input to track 1 taken off the replay head to the track 2 input, and so on to track 24. The signals from the clean input and track 24 off-tape are indistinguishable.

"We've also found that digital tapes retain the signal more accurately than normal analogue," claims Roger. "Identical recordings made on digital and analogue systems sound fairly similar in the initial A/B test. But after a while, and with a few playings, the difference in quality between the two media becomes much more noticeable."

The desk has automated mixing on the faders, which remain stationary during playback and assume a relative function during updating. A bargraph fader position mimic diagram is available on a Sony *Profeel* monitor, with a second *Profeel* for video dubbing work. Mixes are

64 ▶



Every sound engineer needs a little magic

The Ursa Major 8X32 digital reverberator puts pure magic at your fingertips. Touch a button and you're transported to a concert hall stage. Touch another and hear sound roll through vast, empty canyons. And another, to conjure up a bright, tight plate that adds body to brass and drums. And then another: a larger plate, warm and beautifully balanced for voices.

In fact, the 8X32 lets you create and explore an almost infinite universe of acoustic environments. Four pre-set programs establish basic spatial qualities; then, the microprocessor-based controls allow you to separately fine tune all seven key reverberation parameters. For more control, there's a full remote console, LEDs that constantly display all the panel settings, and 64 registers of non-volatile memory to preserve and recall useful set-ups.

And the 8X32's acoustic spaces *sound real.* Rich, uncolored and clean—even with difficult material and decay times as long as 20 seconds.

If you'd like to add a little magic to your sound, spend some time with an 8X32. We invite you to write us for detailed system specifications, prices (surprisingly low), and the name of a local Ursa Major dealer. See for yourself what it's like to acquire powers you once thought existed only in your imagination.

The 8X32 DIGITAL REVERBERATOR

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Advision and the digital refit

stored on a floppy disc, the number depending on the number of changes.

But perhaps the main benefit of the SSL *6000* is its *Total Recall* feature. This allows all the primary settings of the channels—each have a noise gate, compander and parametric EQ compared to the 4-band EQ only of Studio 1's Quad/Eight and groups—to be displayed on the *Profeel* to allow exact replication of the original mix session. Does this not sterilise the art of mixing, with ever-increasing decision postponement and mechanical rather than artistic guidance?

"On the contrary," replies Roger. "This feature allows total confidence in the re-creation of original conditions, without the producer and artists being forced to continue a session beyond physical endurance for fear of losing the 'feel'.

Isn't there a tendency for the engineer to become blasé about digital's dynamic range and the real level of channels during automation, and wind up the level during subsequent updates? "It comes down to good recording technique as always—and probably more so with this technology," says Roger.

"The old maxim of emphasising a channel by reducing the level of the others instead of the beginner's mistake of jamming all the faders against the end-stop still holds true, and we use PPMs throughout to provide accurate metering of transients. It's especially important to train and maintain a skilled staff—we're fortunate at Advision I think in having two ex-operational engineers among the directors to understand the complexities involved."

It has been argued that complexity is the name of the game with digital recording. "It's all very simple with the Sony *PCM-3324*," says Doug. "You can cut the tape with a razor in the same way that you would edit an analogue tape. There is no need to edit between two machines video-style, as with the 3M *DMS*."

"For drop-ins, a delay circuit is incorporated which alleviates the normal time gap between the erase and record heads," says Roger. "This produces a better result than a normal analogue drop-in." Two additional analogue tracks are provided for rock-and-roll editing guidance, with ½-in video formulation tape yielding 60 min on a 14 in reel.

Then there's the question of standards," adds Doug. "Sony uses 16-bit encoded to the DASH (Digital Audio Stationary Head) standard, which is being adopted by Studer and Matsushita (Panasonic-Technics) as well as Sony's own MCI company. Also we've got a lot of other Sony digital gear anyway, so the 24-track blended well with our existing servicing arrangements."

The 'other digital gear' at Advision is the *PCM-F1* Betamax and *PCM-1610* U-Matic (rotary-head) stereo master machines. "We can patch either into any of the studios," says Roger. "The *1610* has become the industry standard for *Compact Disc* mastering, though RTW in Germany have a unit which will transfer from *F1* to *1610*." Each use a 16-bit system, but the encoding is different. *PCM-1610* digital masters can be edited in a separate suite accommodating the Sony *DAE-1100* Digital Audio Editor, which allows cross-mix edits with a changeover period of up to 98 ms, and a 6 s solid-state RAM for edit review.

It was suggested to Roger that *CD* puts a new responsibility on the balance engineer—that of the disc mastering engineer, since the *1610* master is transferred straight to CD without the usual intermediate stage: "Engineers should always be aware of the medium they are working for," he says. "We always have Academy monitor EQ available for film dubbing and of course the *Auratones* for tranny-testing pop music," (the normal line-up is JBL *4350s* through Crown amps, though this may change).

Isn't the new realm of dynamic range offered by *CD* wasted on the average listener? "I believe that top quality must be striven for," says Roger, "otherwise, why aren't we still recording on wax cylinders? Compressors may be developed for *CD* players to allow selection between background or in-car and more deliberate listening. But generally, while the consumer may not be able to itemise quality, he is usually aware of the experience."

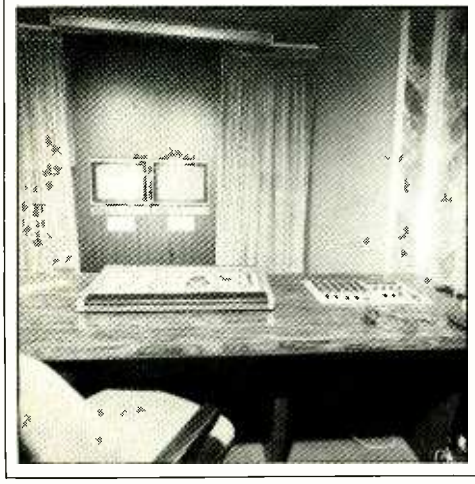
What about *CD* track marking and the initial banding standards conflict? "There is now a common banding standard on the first point and secondly we don't band *CD* tracks here. The masters are sent away for 'PQ editing' which puts a cue at the start of each track for programmed playback. What's more important, is a system of authentication for *CD* product. I've been speaking to SPARS, the US equivalent of the APRS, of which I am a committee member, about their *CD* vetting procedure. They use a sticker system which authenticates all-digital recordings, and I'd like to see us operate a similar system in the UK."

Roger Cameron sees Advision making a significant contribution to *CD*. And besides that, he likes the discs.

There's also the ease of handling," he says, "I had a fault on one of my discs recently caused by a scratch on the surface. A good rub with a bit of Brasso, and the disc was as good as new."

Richard Dean ■

Digital editing suite



A Quad/Eight also graces Advision's film dubbing theatre

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In addition to the purity of sound that an orchestral recording in a studio or concert hall demands from a good professional microphone, the AKG C422 stereo condenser microphone attains those indefinable qualities called ambience, imagery, presence.

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AKG

Since our Studiofile report in October last year, Jacob's have installed a 3M digital mastering system at their studio in Surrey.

3M Digital Mastering at Jacob's Studios

3M's third UK digital mastering system is now up and running at Ridgway House, the Surrey countryside setting for Andy and Fran Fernbach's Jacob's Studio.

Jacob's is a residential studio offering every home comfort in a rambling farmhouse retreat, an architectural splendour dating back to Georgian times. The studio was set up more than three years ago when the Fernbachs outgrew their smaller local premises and saw the need for a residential facility.

Most work comes from albums and already Jacob's has been home and 'workshop' for Rick Wakeman and Haircut 100. Sad Cafe and Kajagoogoo have recorded singles there, while the new 3M digital installation is bringing Barclay James Harvest to record a new album.

Jacob's already competes in a specialised corner of the recording market and the purchase of the 3M digital mastering system is seen by Andy Fernbach as giving him the edge over the half-dozen or so competing residential studios. The digital installation moves Jacob's up league into competition with European residential studios and Fernbach says "Digital has made quite a difference; it has already brought in the big producers."

A lot of producers who have come to Jacob's have not worked with digital before; for them it opens up new possibilities. But Fernbach also hopes now to attract the American producers who already have digital experience. In his words: "the availability of digital injects a new element into Jacob's reputation—it puts us in line for work where we previously might not have been considered".

For the moment Andy and Fran Fernbach manage Jacob's themselves, although as a professional musician himself Andy wants to make more free time to get on the other side of the mixing desk to do his own recording. Two studio engineers and a maintenance engineer comprise the full time technical staff; their reaction to the 3M system has been every bit as positive.

Fernbach stresses that the benefits of digital are not something to be found on a spec sheet but are very real. In his words: "Musicians are really knocked out. It's just been a revelation. Digital is difficult to describe, it has a lot of 'presence', almost like 3D, but everyone's been excited by the general sound and clarity."

Creatively too the 3M offers new approaches. Originally concerned when he'd read and heard about the digital system's editing requirements, Fernbach was enthusiastic once he'd learned a new approach to editing. "When there's a really tight edit there are things you can do digitally that you can't do with a razor blade. You can preview the pre- and post-edit sound from the 3M system without making the edit." The Jacob's engineers were in full agreement that once a new way of working with edits has been accepted then digital editing opens up areas of creative possibility.

Through the summer the second studio is being refitted and then both studio areas, which join end to end, can be used for digital recording, offering even greater flexibility over booking and usage of studio space whether for digital or analogue 24-track recording. Already Andy is discussing the possibility of a special order 16-track digital recorder with 3M to further expand his business. Multitrack master editing would then be simple offering even further possibilities for Jacob's clients. 3M's DMS has so far offered full satisfaction to Andy Fernbach's demands as both businessman and musician—that is high praise indeed. ■

David Prakel

Photo: David Prakel

Klark-Teknik Series 300

GRAPHIC EQUALISERS

Reliable performance – at reasonable cost.

Introducing a whole new family of audio equalisers combining active-circuit design with thick-film engineering .. to reduce the component count and set new standards of reliability and performance.

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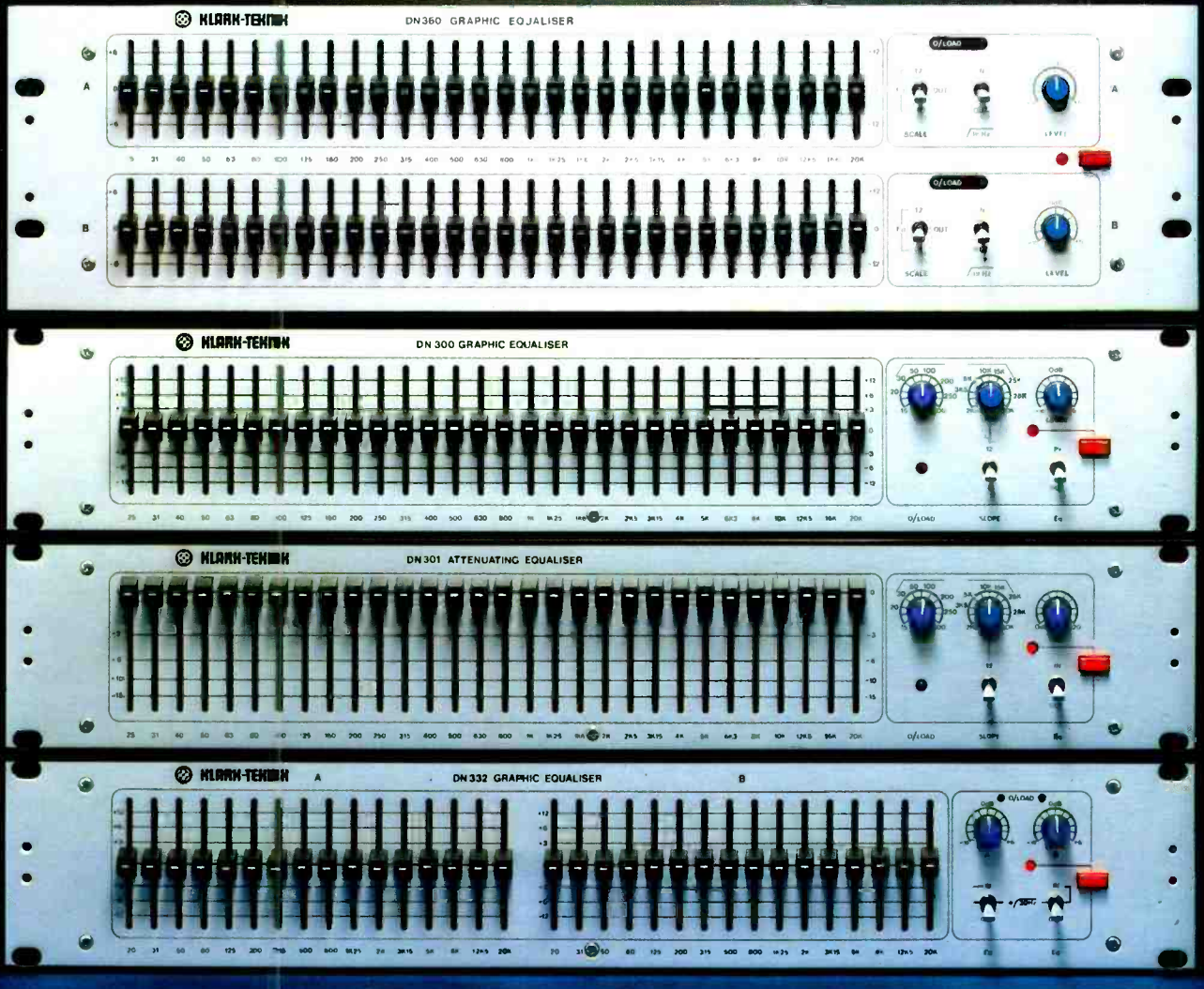


Dedication is the soul of good design. Klark-Teknik are dedicated to making every product a classic. *Terry Clarke*

Cutting the cost of certainty

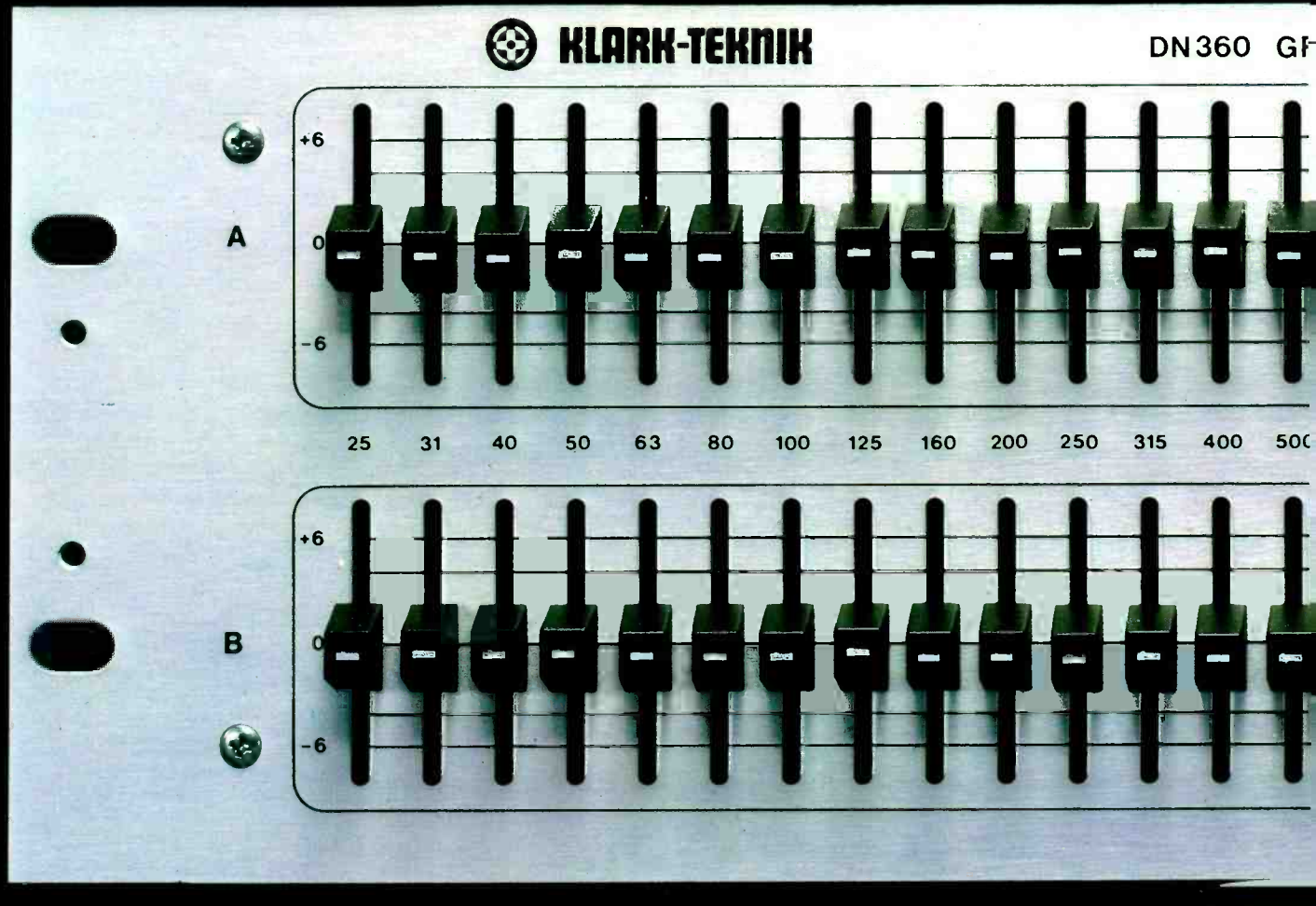
In 1975 Klark-Teknik launched the DN27 – the graphic equaliser that brought the price of high reliability and precision performance down to a new affordable level. Now our policy of constantly watching new advances in technology has led through a series of design breakthroughs to yet another generation of graphic equalisers. Every equaliser in the Series 300 from Klark-Teknik has been given extra heart by innovative use of microelectronic circuitry engineered with thick-film technology.

Result: our Series 300 equalisers don't only equal the performance of the DN27 – they actually improve on both its impressive reliability record and its unrivalled price: performance ratio. The whole family of related instruments show greatly increased capability over a wide variety of applications ranging from monitor and recording equalisation to sound system tuning. But that's not all ... Klark-Teknik have designed the Series 300 around a philosophy of maximum affordability.

FITTING INTO YOUR PLANS

How did we do it? By pursuing a policy of dedicated attention to our design objectives, we were able to fulfil the professional's need for greater control over sound. By giving attention to production engineering detail we have been able to maximise the economic as well as the performance benefits from the new technology, so that this new family of instruments fits in with your needs and your budget better than ever before. As an added benefit, all the instruments in this prolific family now fit into just 2U of rackspace – except the DN360 that fits *two whole channels* of equalisation into 3U of rack.

The photograph of the DN360 below, is ACTUAL SIZE.



RELIABILITY CONTROL!

Even with the advanced technology incorporated, these instruments are given the full backing of Klark-Teknik ***'reliability control'***, which proves each equaliser against a specification consistent with the highest professional standards. Only top quality components are used, and every unit is bench-tested and aligned before a burn-in period and final performance test.

THE INVISIBLE EXTRA

Careful design of microelectronic filter circuits and the application of thick film technology have effectively raised our previously outstanding reliability standards by a measurable amount. This makes it possible for Klark-Teknik to back every equaliser in the series with a unique ***five year warranty.****

*Parts only.

Specification

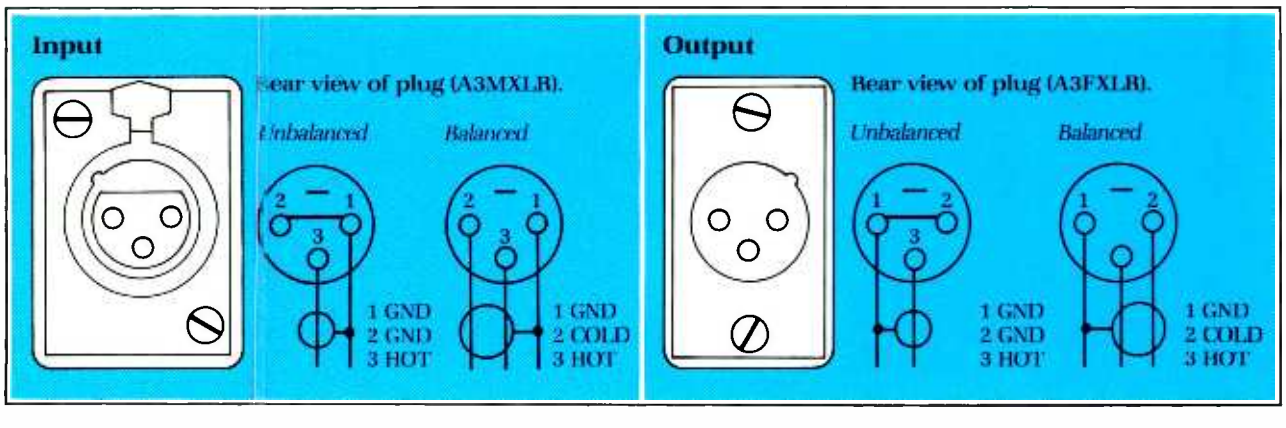
	DN360	DN300	DN301	DN332	DN27A
Input					
Electronic balancing	Balanced	Balanced	Balanced	Balanced	Unbalanced
Impedance (ohm)					
Balanced	20k	20k	20k	20k	10k
Unbalanced	10k	10k	10k	10k	10k
Output					
Type	Unbalanced	Unbalanced	Unbalanced	Unbalanced	Unbalanced
Min. load impedance	600 ohm	600 ohm	600 ohm	600 ohm	600 ohm
Source impedance	<60 ohms	<60 ohms	<60 ohms	<60 ohms	<60 ohms
Max. level	+22dBm	+22dBm	+22dBm	+22dBm	+22dBm
Frequency response (20Hz-20kHz) Eq out	±0.5dB	±0.5dB	±0.5dB	±0.5dB	±0.5dB
Eq in	±0.5dB	User defined	User defined	±0.5dB	±0.5dB
Distortion (@+4dBm)	<0.01%@1kHz	<0.01%@1kHz	<0.01%@1kHz	<0.01%@1kHz	<0.01%@1kHz
Equivalent input noise (20Hz-20kHz unweighted)	<−90dBm	<−90dBm	<−90dBm	<−90dBm	<−90dBm
Channel separation	>75dB@1kHz	N.A.	N.A.	>75dB@1kHz	N.A.
Overload indicator	+19dBu	+19dBu	+19dBu	+19dBu	N.A.
Auto-bypass (failsafe)	YES	YES	YES	NO	YES
Gain	+6dB	+6dB	+20dB	+6dB	+6dB
Filters					
Type	MELT	MELT	MELT	MELT	LCR
Centre frequencies ISO	2×30 25-20kHz ⅓ octave	30 25-20kHz ⅓ octave	30 25-20kHz ⅓ octave	2×16 20-20kHz ⅔ octave	27 40-16kHz ⅓ octave
Tolerance ...	±5%	±5%	±5%	±5%	±2%
Maximum boost/cut	±6/12dB	±12dB	−15dB	±12dB	±12dB
Subsonic filter	18dB/octave −3dB @30Hz	N.A.	N.A.	18dB/octave −3dB @30Hz	N.A.
High pass filter slope	N.A.	15Hz-300Hz 12dB/octave	15Hz-300Hz 12dB/octave	N.A.	N.A.
Low pass filter slope	N.A.	2k5Hz-30kHz 6/12dB/octave	2k5Hz-30kHz 6/12dB/octave	N.A.	N.A.
Power requirements					
Voltage	110/120/220/240V 50/60Hz	110/120/220/240V 50/60Hz	110/120/220/240V 50/60Hz	110/120/220/240V 50/60Hz	110/120/220/240V 50/60Hz
Consumption	<15 VA	<15 VA	<15 VA	<15 VA	<15 VA
Weight					
Nett	4.5kg	3.5kg	3.5kg	3.5kg	6.5kg
Shipping	7kg	6kg	6kg	6kg	8kg
Dimensions					
Width	482mm (19 inch)	482mm (19 inch)	482mm (19 inch)	482mm (19 inch)	482mm (19 inch)
Depth	205mm (8 inch)	205mm (8 inch)	205mm (8 inch)	205mm (8 inch)	205mm (8 inch)
Height	133mm (5¼ inch)	89mm (3½ inch)	89mm (3½ inch)	89mm (3½ inch)	133mm (5¼ inch)
Terminations					
Inputs	3 pin XLR	3 pin XLR	3 pin XLR	3 pin XLR	3 pin XLR
Outputs	3 pin XLR	3 pin XLR	3 pin XLR	3 pin XLR	3 pin XLR
Power	3 pin CEE	3 pin CEE	3 pin CEE	3 pin CEE	3 pin CEE

*MELT – Proprietory Microcircuit.

The whole Series 300 family of graphic equalisers comply with standard 19 inch rack mounting requirements.

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

PIN CONFIGURATIONS



Options

Security covers

An optional perspex security cover is available to prevent unauthorised interference with calibrated equaliser settings in permanent sound installations.

For DN300	Order number SC30
For DN301	Order number SC30
For DN332	Order number SC30
For DN360	Order number SC36
For DN27A	Order number SC27

Transformer balancing

Retrofittable output balancing transformers:
For all Series 300 models — Order number BU37

Transformer input balancing is available on all Series 300 equalisers but must be specified with initial order. — Order number BN37

For DN27A (In/Out) — Order number BA27

THE RIGHT PERFORMANCE LEVEL AT THE RIGHT PRICE

Series 300 equalisers are designed with inbuilt capability for a very wide range of applications – including:

In live performance – sound reinforcement, wide-band equalisation and monitor tuning.

In the recording studio – monitoring, system equalisation and 'second thoughts' track clean up.

In the motion picture industry – dialogue sound equalisation ... and B-chain equalisation in the re-recording studio.

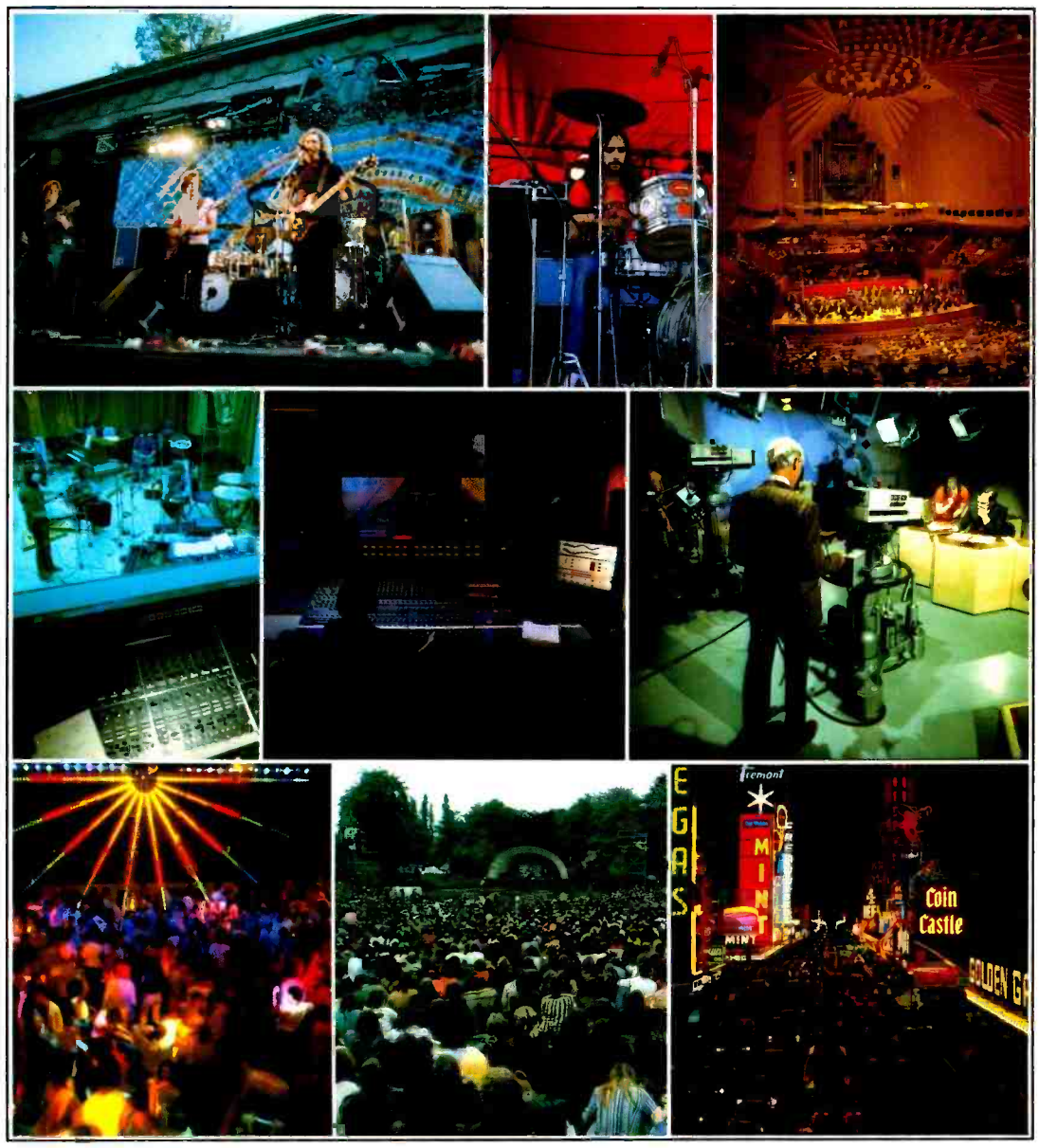
In stereo broadcasting – announcer microphone enhancement and stereo channel equalisation to give maximum on-the-air brightness and punch.

In the discotheque to give bass with substance – and aggressive top for increased accentuation.

For contractors and others who need effective equalisation to achieve spot-on public address system intelligibility.

In the theatre for front-of-house system and grouped microphone equalisation.

Ask around, you'll find that Klark-Teknik equipment is known for its ability to take the roughest conditions with the smoothest performance, in the studio or on the road.



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All photography: Conrad Fletcher

Development of a digitally-controlled console

Ted Fletcher
Steve Dove

WHAT THE WORLD NEEDS NOW IS ANOTHER MULTITRACK CONSOLE?

The story of the Silk started in the summer of 1982. Robbie Weston was planning an expansion to his Berwick Street empire and during a chance meeting discussed the possibility of a 24-track desk for multi-purpose radio and TV commercial production. The stock Alice reply to any suggestion of competing in this field was: "Why not try the manufacturers who are good at multitrack desks—we don't make them." Because of the three successful Alice equipped studios already in Silk House, their advice was sought again in October. "These are the two leading contenders—what do you think." The two consoles were well known, excellent multitrack mixers and Alice commented accordingly—choose the one which will do the job. In November Robbie started an hilarious inverse sales routine, asking advice on digital interface systems, sub-grouping, in-line ergonomics, light column meters and a host of detail design problems. In December at an evening meeting they finally got the message—the available technology was not what Robbie had in mind. The mixing system he wanted combined the ergonomics of some American consoles with the price and excellence of the UK industry with some interesting technical additions vital to his operation. Alice had to admit that they had already developed some complex digitally controlled audio switching systems and were at an advanced stage in the development of total balanced audio as an answer to performance limitations. A few glasses later they had agreed to commit the ultimate crime of our industry—to build yet another multitrack console. Within a few days of late nights Steve Dove had proposed a channel that looked like the diagram of a central heating system and Ted's hair was falling out at the concept of 100 audio connections to the monitor module. The quotation was calculated on innumerable cigarette packets and the deal settled immediately before Christmas.

How could Alice compress development and production of a revolutionary digitally-controlled console into the 4-month period that Robbie had talked them into? Read on—Ted Fletcher and Steve Dove will tell you why mixer manufacturers die early and never become millionaires.

WE remember the days so many years ago when sound mixers were large metal plates sporadically sprinkled with multi-coloured knobs, certain of our friends and latterly competitors used to mix audio signals by throwing audio currents down mixing busses and terminating them with beautiful transformers. The results were adequate at the time—and indeed often excellent by present-day standards. In the 1950's the 'virtual earth' mixing system was (re)discovered and suddenly the ability to mix any number of audio signals to a single output with no 'on/off' loss became a reality and balanced mixing went out of fashion.

Engineers at Alice were always a little diehard and conventional and the idea of 'passive mixing' was retained even up to the present day in the little Alice *828* mixer—but in unbalanced form.

Continuing experimental work at Windsor on low noise input stages and new ways of using these new-fangled op-amps came up with the theoretical concept of balanced mixing using an 'instrumentation' type of circuit in place of the transformer. The test bench proved that this arrangement not only reduced the noise created by the mixing system itself, but gave the added benefit of a 6 dB improvement in overload margin over conventional unbalanced systems. This was all very well, but the system was still a 'dual unbalanced' one and did not have the inherent advantages of the transformer in terms of interference rejection and power transfer.

The real answer came as in all good stories—right out of the blue. A doodle on the design white board showed two op-amps in a somewhat immoral pose—the back-to-front one providing negative feedback to a positive input! The 'Superbal' had been discovered (we would love to know if the Russians discovered this first was well!) The 'Superbal' circuit arrangement was quickly converted to hardware and measured to death; with different op-amp types, changes in resistor values, band limiting and biasing, until we thought that we knew enough about this oddity of physics.

The results of measurement were all encouragement. Noise was as predicted, distortion was not measurable, overload tested the capabilities of some very expensive test equipment. The biggest problem was where to test the beast in the practical, sceptical and cruel world. The answer to that one came in the innocent form of a 'can you build a simple mixer for VT editing' request from Auntie BBC. The design team (he was locked in a room with only bread and water) created some extraordinarily dense PC boards, and a mechanical design that fitted

70 ▶


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Robbie Weston seated at the newly-installed digitally-controlled console at Silk Sound in Berwick Street, London

the requirements. This was converted to workshop schedules and the first superbal mixer was born.

The reaction to the 'special' from the acceptance engineers was initial stunned silence, followed by a considered 'no comment' when it finally dawned that conventional test techniques were totally inadequate for this technology. The mixer might as well have been a piece of well-screened wire! It would be boring to enumerate the figures that were finally measured; suffice it to say that the BBC's *EP 14* test set don't go that low—or high!

The basic superbal circuit is shown in **Fig 1** and anyone with a mathematical bent is welcome to attempt the parameter calculations for the twin balanced ports.

The Silk idea

The digital age was upon us all in the summer of 1982.

The *F1* was a practical reality and clever clogs in flash magazines were telling us how analogue went out with hot pants and no self-respecting audiophile would be seen dead listening to anything but beautiful digital sounds. Arguments raged (and still do) about the fine points of psychoacoustics in the medium war but those antidiluvian engineers at Alice were looking fondly at their catalogue of physical oddities and giggling.

The *Silk* was a development in its time, and a timely development: a bringing together of digital exuberance and analogue innovation. The story of its conception at the head of the text is true and happened precisely at the time when Alice was running out of ideas for bringing the industry's bright young things down to earth and teaching them some homespun physics.

The analogue Silk

Once the order for a *Silk* had been confirmed, the problems started in earnest. How big can we make the rack, what sort of metering is best, what is the ideal ergonomic layout, and so on and so on. The answers were arrived at in the simplest possible way—by experiment from first principles. All preconceived ideas were ignored and cardboard mock-ups were used to check yet again the reach of any young enthusiastic recording engineer. Mechanical details were prepared in double quick time; rejected, and done again in even quicker time. Colour schemes were tried out and sneered at, knob styles proposed and quailed at (no time for special injection moldings). The complete mechanical concept was finished in the space of three weeks.

The concept of digital control demanded very advanced switching matrix thinking

Meanwhile circuit preparation was grinding to a conclusion. Some long term decisions had to be made in these early(!) stages.

The consensus based on about a century of experience and some extreme opinions (see on these pages) demanded a wholehearted leap into the balanced technology.

The microphone amplifier should be a transformer balanced device. Strange choice? Not really, we know not of a transformerless microphone input that is really proof against all ills; and even if one was available, the testing time to make 110% sure would take too long. The circuit chosen was one which offers extreme overload margin combined with a very wide gain swing.

Line inputs are an entirely different bucket of bits. The superbal technique comes into its own again with supremely accurate static and dynamic balance—with none of the deficiencies or disadvantages of transformers.

The concept of total digital control demanded some very advanced switching matrix thinking . . . No clicks, no crosstalk, no distortion. Someone actually mentioned relays—but he hasn't been seen since. The requirement was for an extremely dense configuration with a performance that would allow say 20 passes through the matrix with no measureable degradation. The answer was once again with us all the time in CMOS broadcast switchers using balanced (well I never) techniques. The matrices in the 'channel' consist of arrays of 16-legged animals whose gates are opened and shut incredibly quickly by the 24 discrete digital command centres. These matrix arrays link the analogue circuitry into forms which resemble a conventional mixer; either 'in-line' or 'production' (channel/group).

It was well after the 'channel' had been laid out, built and tested in prototype form that a drawing office silkworm made an attempt at

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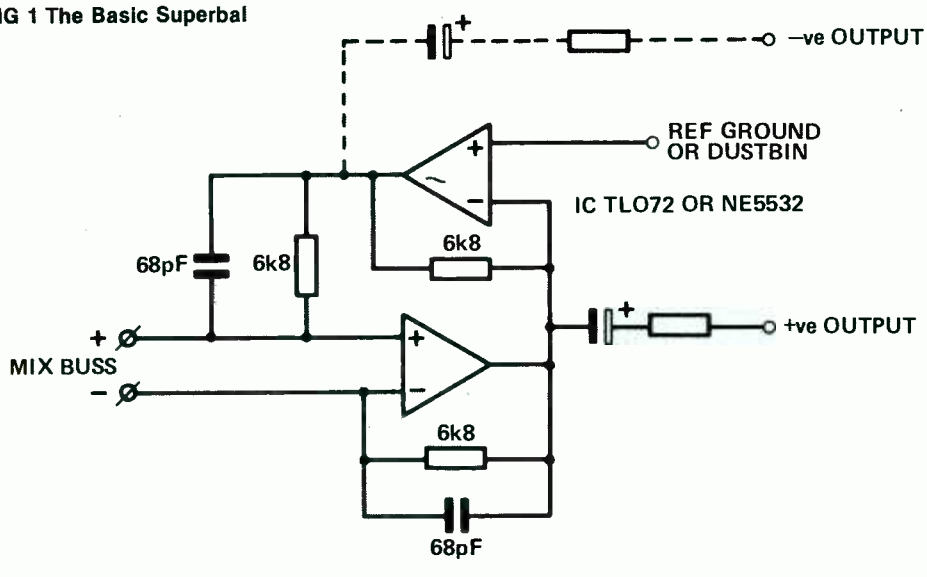
FIG 1 The Basic Superbal



DRUMS HAVE BEEN ROUND FOR AGES

The SDS6 is a fully programmable 8 channel sequencer designed specifically to trigger Simmons electronic drum modules. It has been designed to allow the non-drummer and composer access to the exciting sounds of Simmons electronic drums, as well as widening the horizons of drummers and percussionists who wish to play "live" (using Simmons Drum Pads) over composed passages stored in the sequencer.

Via the unique "matrix display", 99 patterns of drum music can be programmed in any time signature and used to compose up to 99 sequences, each up to 250 patterns long. Chains of these sequences can then be compiled to produce songs.

Every single drum "hit" can be assigned a dynamic level from 1 to 9 and a variable "humanizing" control gives a realistic feel on playback.

A comprehensive range of sync inputs and outputs allow the SDS6 to work with a multitude of other electronic equipment and a tape syncing facility is provided, along with program dumping to an external memory pack in 0.4 of a second, making a vast library of compositions instantly available.

The Simmons electronic drum kit plus the SDS6 sequencer — the worlds most versatile electronic percussion system.

For further details, please contact:-

SIMMONS

Simmons Electronics Ltd., Abbey Mill, Abbey Mill Lane, St. Albans, Herts AL3 4HG. Tel: 0727 54601/2. Telex: 8952387

drawing up a system block diagram for the collection of hardware that we all prayed would turn into a *Silk*. The final (current?) version is shown in **Fig 2**. The arrangement of interconnecting matrix blocks, although extremely difficult to show diagrammatically, works beautifully—all you've got to do is ignore the block and just use the thing, it's only a sound mixer after all!

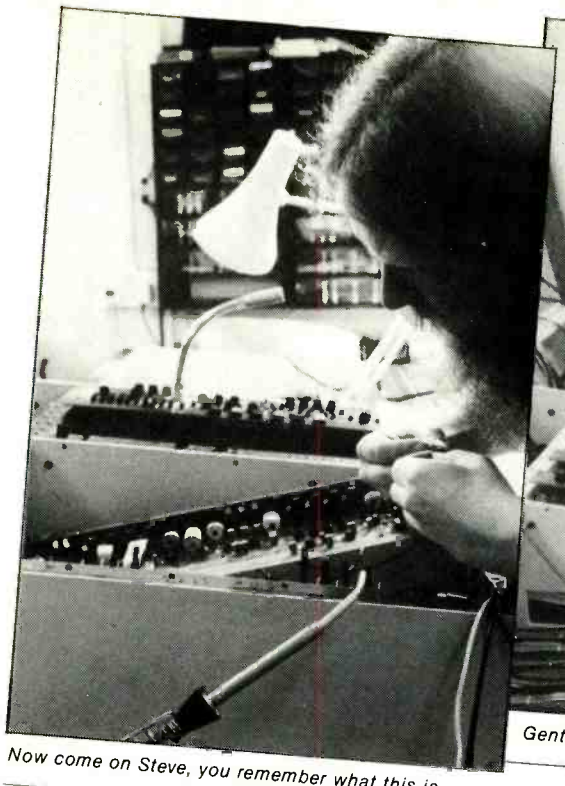
The dustbin concept

All mixers large or small suffer to some extent with ground path problems. The universal problem is that if any current flows along any conductor, a small voltage is produced between the ends of that conductor. The obvious answer, impossible up to now, is to avoid any current whatsoever in ground paths. In a true balanced system the problem ceases to exist as no signals are referred to ground at all—they all refer to themselves in opposing phase. Of course there are unbalanced sections even in the *Silk*, and here are danger areas where ground paths could degrade performance down to that of a conventional mixer. Here yet another esoteric concept was used: the dustbin. This makes use of the 'virtual earth' effect of a high gain op-amp, effectively reducing ground currents by a factor of about 100 dB, in fact, eliminating the problem completely. Already this technique is in use in other mixers and has proved to be more economical and effective than the 'reference earth' system used by some well known continental manufacturers, and certainly more economical than employing a master plumber.

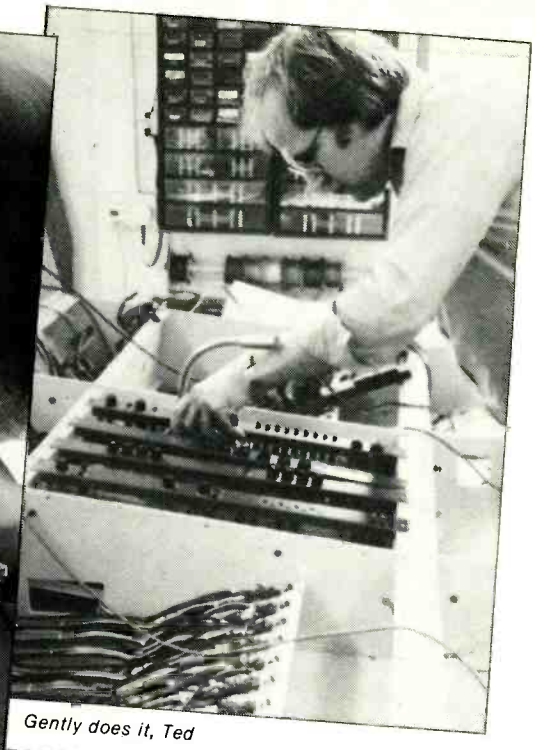
Mixing the mix

The sheer complexity of the mixing paths in a truly multi-purpose console demanded something special in the circuitry. The mathematics of the superbal system promised perfection and the reality aproached it. All the balanced mixing lines were run in unscreened ribbon cable with no special care taken about magnetic fields, high level signals or tone generators. In reality there was no room to do anything else within excess of 100 balanced pairs squashed through 5 cm holes in the main frame. The *Silk* contains some 200 superbal mixing stages within its system.

The output stages (which are numerous) presented a further huge problem to 'Silk City' (as the sign on the door said). How could a totally balanced mixer be produced without output transformers? Yet again the Alice catalogue of dusty relics came up with the answer in the form of a discarded circuit developed to drive telephone lines without a lump of iron. The circuit is self-balancing and repeatable and can be driven from balanced circuitry. The last link in the analogue chain had been found: the superbal output.



Now come on Steve, you remember what this is



Gently does it, Ted

Gee whiz!

In the Silk there are:
8,000 6k8 1% resistors
63 integrated dircuits per channel
450 illuminated pushbuttons
32 1 MHz oscillators
6 km of screened twin cable
10,000 insulation displacement connections

In spite of over 2,000 devices in the mixer, the total power consumption is less than 200 W.

Why not all digital?

Sixteen-bit linear digitally encoded audio makes for an extremely impressive recording and transmission medium, as is evidenced by the many machines and links using the idea. (That it really isn't 16-bit by the time error correction etc overhead is included shan't be dwelt on—it's inherent to any digital system). The idea that it is the 'ultimate' is rather dangerous—people thought that rotating drums of soft wax were pretty neat once—the best attainable performance presently for transmission is along a matched transmission line, which may be approximated by a bit of wire. *That* is the standard of reference, *not* that which is currently commercially viable and fashionable.

On that basis, we come across a rather interesting pecking order of performance capabilities for various parts of the chain:
Recording: digital (except for preference in such cases as drums where the soft-limiting characteristic of analogue tape does wonders by nicely smashing off the transients).
Transmission: Digital for other than short links, except for mass distribution where analogue wins on financial and 'technical inertia' bases. (How many trannies are there in the world? How many *PCM-F1*s?). With suitable error correction digital audio over an RF path is now almost as hardy as FM.
Processing: (a) Simple time manipulation (delays, flangers, fake reverb etc). Either expensive or next to impossible to achieve in analogue but cheap using well-proven bits and technology in digital. (b) Complex (frequency and phase versus amplitude manipulation—that means EQ, sunbeam—and gain).

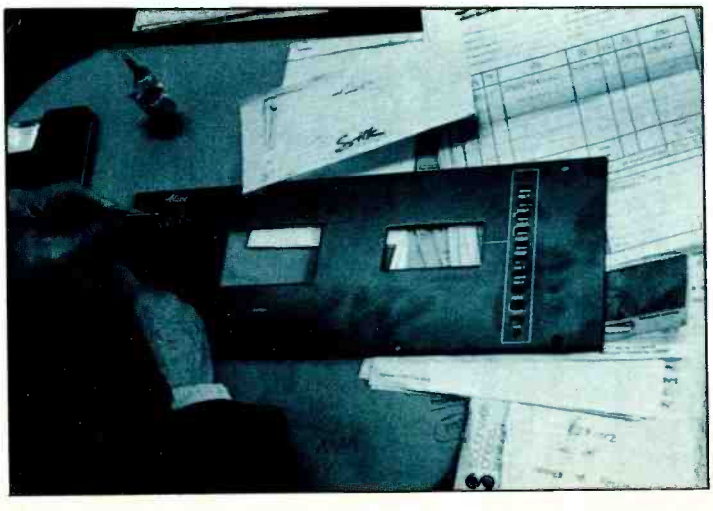
Gotcha! How do you get gain out of a digital system? Answers on the smallest possible postcard please . . . If you have say a small signal using only four bits of a 16-bit word, it doesn't matter how much you multiply it up it's still only going to be 4 significant bits of information, only displaced up the digital word. Gong! No advantage at all.

Implicitly, any signal that needs to be processed has to be presented to the digital processor at a sensible manageable level before it can do its job.

Leaving apart the sci-fi world of laser-interferometry microphones and such, real-world sources have to be manipulated before they even get a sniff of digits. Even allowing for sci-fi, the unique characteristics of *D12*s, *U47*s and *PZM*s will still be in demand. The means of this manipulation? Analogue of course!

This brings us to quite a sobering juncture and the ultimate lie to digital processing. Present day analogue technology allows mixer companies such as Alice to regularly churn out even budget-range consoles with a microphone input noise factor of 1 dB or better—resultant noise being mostly attributable to the thermal noise of

The personal touch is added



the source. Without radically altering the climate or moving quite fast there is no way things will get any quieter, so here we are lumbered with a minimum noise power of some —126 dBm for a typical 200 Ω source. Let's assume our noise source (microphone) is plonked in front of somebody and 70 dB of gain is needed to crank said body's utterances up to a manageable level. The thermal noise is brought up to 70 dB also and no degree in maths is necessary to deduce that it has been brought up to —56 dBm. Even allowing 20 dB headroom that makes a total dynamic range of 76 dB—what price the claimed 96 dB range of a 16-bit digital system here?

The question of what the noise floor of a typical multi-source balance would be only needles the point further.

Admittedly, the same argument of expected programme noise floor versus system dynamic range applies to proponents of analogue signal processing but if the numbers game is to be played—and it does seem to be a fair amount of the gee-whizz-manship of digital marketeering—then analogue can acquit itself very smartly. Walk this way . . .

On the *Silk*, using the vaunted Superbal mixing system, a buss noise figure of some —86 dBu peak (equates to about —93 dBu RMS) is achieved. Allowing for 25 dB headroom above nominal signal level (0 dBu) that sums up to a system dynamic range capability of over 110 dB.

Taking present-day 16-bit signals, summing 24 of the claimed —96 dB signals (always assuming that root-square summation is appropriate for the possibly coherent quantisational noise characteristic) a total dynamic range of some 82 dB results.

There's only about 38 dB in it, not much!

If 'claimed 96 dB' sounds bigotese this is due to the subjectively nastier quantisation noise reducing the useable dynamic range—measurement via a CCIR 468 filter bears this out, both techniques indicating a —90 dB-ish figure.

If a numbers game has to be played, it had better be played very carefully indeed

If a numbers game has to be played, it had better be played very, very carefully indeed . . . analogue audio signal processing for the moment easily exceeds digital simplistically for things like dynamic range, although the bit-slice technique of using an overflow number of bits to increase the post-multiplication or summation of digital signals ameliorates significantly the position.

Cost

A handful of pots, chips and bits—presto a channel with reasonable sounding EQ.

A fast minicomputer, A/D interface, an analogue front-end gain-stage, a few horrific algorithms, an aircon plant and an interactive control surface—presto a channel with a reasonable sounding EQ.

Making the assumption that—given the way our industry makes money enough for us all to survive—equalisation is here to stay, ease of implementation is the important parameter.

An amassed wealth of both design knowledge and user feedback has obtained over the (many, sobs) years in trying to evolve elegant, simple to use and effective analogue EQ arrangements. All manner of weirdnesses and tortured circuit topologies—just to try and make life easy all round.

Experience, like why two circuits with identical frequency and phase characteristics sound entirely different. Like why a Constant-Amplitude Phase-Shift network based mid-section sounds so much smoother than a State-Variable based section. Like why second-order responses work beautifully sometimes and diabolically elsewhere in the spectrum. Like why the 30-year-old Baxandall arrangement makes cute, hip, new filters wither by comparison.

All this often-quantified, sometimes ethereal and occasionally mystical nouse can readily be called and acted upon in analogue design procedures.

Somebody, somewhere has an awful lot of groundwork to make up in establishing the specific EQ characteristic emulatory algorithms for digital audio processing systems.

It sure ain't gonna be us.

It became quite evident over a period of time just how far the market wasn't prepared to go in terms of the radical control and operational changes permitted by the use of digital control.

Single-channel—or 'Assignable'—control surfaces found a few friends, but far fewer than those rightly or wrongly horrified by the prospect. The pure assignable concept is as far removed from

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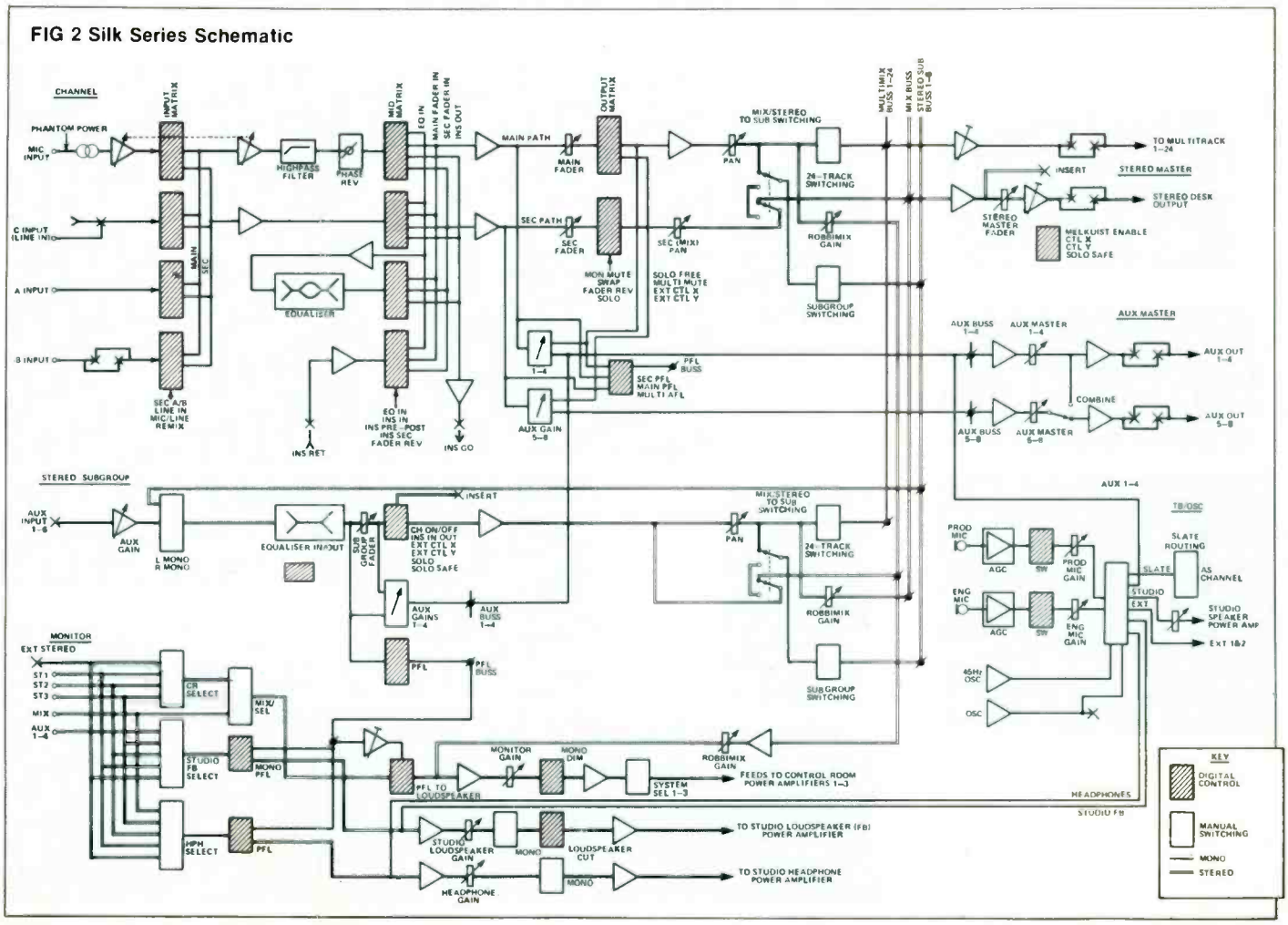
FIG 2 Silk Series Schematic



operational optimum as is the present highly redundant multi-knobbed monster brigade; the optimum lives somewhere between. The 'Silk' approach, of 'automating' every sensibly recallable function of major signal paths within a powerfully unconventional in-line desk format was felt to be a worthwhile step into this conceptual void.

The digital Silk

Given enough funds, time, enthusiasm and opening hours, the depth of digital (and almost implicitly computer) control is virtually unlimited. Complete storage of all switched and variable functions, the time-cue related recall and direct instantaneous usage of that information, the removal of the electronics from the control surface . . . yeah, yeah, yeah.

This was a real mixer to a real job by a real installation deadline using real, at hand technology which lent itself admirably to the active recall requirements of the desk. At a real price.

Note the definition; 'active recall' meaning anything stored that when recalled directly actuates the appropriate control—as opposed to 'informational recall' (with the greatest of respect to the guys near Oxford) which will remember the universe and it's cousin's girlfriend but only *tell* you where everything was and leaves the actual resetting to you.

Concurrent to *Silk* was a massive computer-controlled audio switching matrix development program, in particular for a large Government department and for large broadcasting organisations in general. As the control mechanism for this, some mighty fine software had been contrived—uncommon and astonishing good sense came over all involved in the decision to make the Silk console digital stuff compatible with both the matrix hardware and configure it for ease of software implementation. As an aside, the software takes the form of machine code manipulatory routines running within a high-level-language executive; this possesses the twin virtues of speed with very human interactive characteristics, namely in prompts and informational display. (Anyone who's tried to write prompt literals in code will empathise!) Display characteristics are rapidly modifiable in the executive to suit the bill without causing major upheavals.

With one eye on system automation and the other on stand-alone capability, some embarrassing questions had to be asked;

'Digital noise?'

'What happens if the central processor snuffs it?'

'Is it Admiralty Blue or Honeydew?'

Despite the amount of fast digital circuitry on each module, it was decided to make every channel stand-alone, ie it can be heaved out of the desk, power hung on and tested—digits or no digits. To this end, every module has its own on-board free-running 1 MHz clock oscillator, dividers and timing peripherals. This lot abdicates control to the frame system only if that particular channel is being addressed/interrogated—the rest of the time it sits there Megging around itself merrily.

The reality of what we'd actually done only dawned quite late in the proceedings: the possible consequences of having 32 free-running one-meg oscillators inside a mixer frame with the same number of high-gain input amplifiers and medium-impedance equaliser stages were really too creasingly painful to even think about. We were building it. It *had* to work . . .

It did.

Mercifully, the logic board of the channels being a mere 6 mm away from the high-gain audio section of the adjacent channel, we still don't even know what the digital noise sounds like. It is despite the odds the quietest console to have left the Windsor factory.

This can be attributed to a number of things:

- the 'balanced throughout' philosophy;
- the non-ground-referral 'dustbin' technique;
- the non-synchronous digital electronics;
- the complete floating of all digital circuitry from all analogue, (with the exception of the matrix elements themselves).

It's all in the grounding. Or more to the point, it's not all in the grounding.

A quite compact digital buss (sharing the same indirect card connector as most of the audio, incidentally) carries card decoding and local data/address matrix information to the on-channel switch decode/buss interface cells. It would have been quite nice to have provided totally asynchronous switch debounce, decode, buss drive, buss receive and matrix driver circuits but a seemingly endless cycle of PC board layout 'real-estate' juggling proved this impossible. An old but novel 'transitional logic' cell, which, running at full processor speeds, performs all the debouncing, driving and buss interfacing for 24 controls in a few square inches of board space. Suddenly—and to everyone's relief—this made the automatable channel a reality. ■

Authors' note: our sincere thanks to Robbie Weston at Silk Sound for his ideas, patience, understanding and humour; the best customer in the universe.

THE HUMAN SILK

A side of mixer-making generally not appreciated by customers is the tremendous human interplay involved in the design, proving and construction of a new console series. The *Silk* certainly had a dramatic effect on Alice—a small 28-strong 'family'. The whole spectrum is there; wiremen, card assemblers, test department, buying and credit control, accountancy, documentors, drawing office staff, administration and the odd few liabilities such as managing directors and designers ligging about.

Getting an entirely new design together in the (ludicrously) short time span galvanised an exhilarating single-minded corporate 'vibe'.

Silk was everywhere—the young lady administrative staff were christened 'Silk Stockings', the design office generating the computer correlated wiring schedules became the 'Silk Press', Ted's office transformed into 'Silk City' as the design co-ordination point.

'Silkworms' were weaving about everywhere, emanating mostly from the 'Silk Factory', previously the workshop.

Some interesting personality conflicts arose as they tend to under such intense circumstances—one fairly minor difference of electronic design practice caused a big white line to be drawn down the middle of the building for a while; the pressure of deadline versus design satisfaction similarly caused many dark threats of 'Silk Curtains' and sitting at opposite ends of the pub.

The heat was on. Everyone knew it and loved it.

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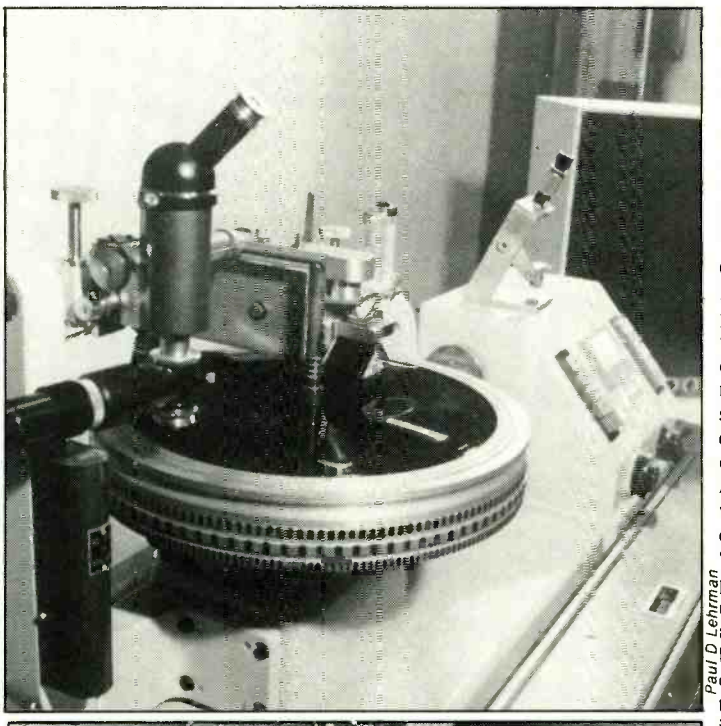
Technisonic Studios St Louis

Where was the first automated mixdown console installed in the United States? Where can you find one of the most complete recording plants in the country – a place that will do everything from recording, to automated mixing, to shooting film, to designing and executing animation, to pressing discs and shipping them out? According to the highly experienced and often very opinionated staff at Technisonic Studios, the answer to these questions happens to be the unlikely midwestern city of St Louis, Missouri.

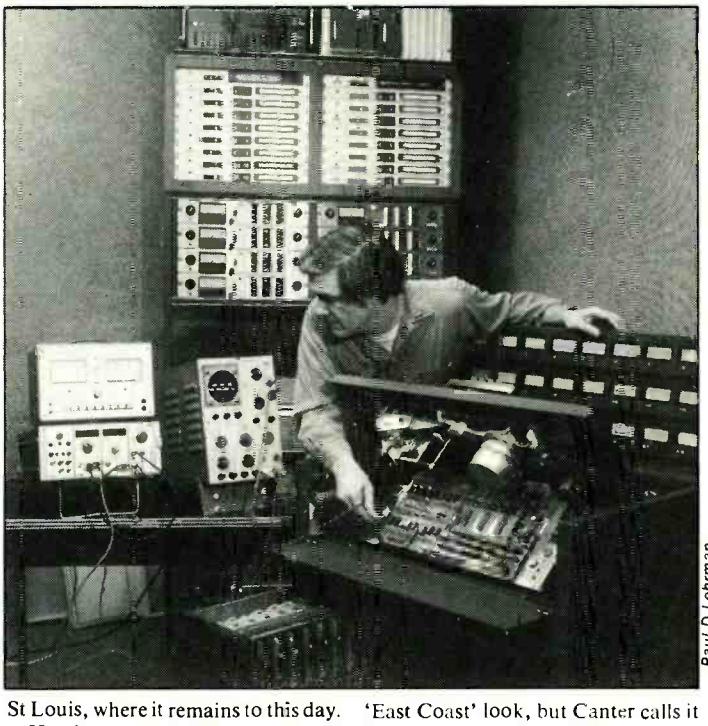
You need a map to get around Technisonic Studios, or better still, a seeing-eye dog. What looks from the outside to be a fairly ordinary, if somewhat underfenestrated, office building, turns out to be a labyrinthine maze of tunnels, passageways, and stairwells that would warm the heart of any writer of Gothic mysteries. What it also turns out to be is a completely up-to-date, although cosmetically strictly utilitarian, soup-to-nuts recording facility. "The only way we can keep local business from going out to the east or west coast," says 'chief talker' and manager without portfolio Ralph Canter, "is to offer everything in one place, right here in town." 'Everything' includes a dual-console automated 40-track recording studio, three 4-track recording and production rooms, high-speed duplicators for reel and cassette tapes, complete film editing, shooting, animation, and transfer facilities, a sound stage, a mobile film truck, a disc-mastering setup, and an automated record press. "We used to do plating here, too," says Canter, "but we moved that over to the chief engineer's house when we expanded our disc pressing equipment."

Technisonic may well be the oldest continuously operating recording studio west of the Mississippi River. It was founded in 1929(!) by Charles 'Bud' Harrison, when he took a job with the Central Institute for the Deaf in St Louis, operating and maintaining the lacquer-on-aluminum disc recording equipment used for research and therapy. In his spare time he made discs for local advertisers and radio stations, and soon he was recording network radio broadcasts from telephone lines fed from the east coast, for delayed broadcast over stations in the Central Time Zone. In 1947, Harrison purchased a Magnecord ¼in tape deck, and shortly thereafter an Ampex, and within three years, all of the studio's original recording work was being done on the new medium.

In 1952, Harrison, by now a charter member of AES, moved the studio operation into its own building in the suburban community of Richmond Heights, a stone's throw from US Highway 40, 15min from downtown St Louis, where it remains to this day.



Paul D Lehrman



Paul D Lehrman

Harrison now holds the post of chairman of the board. Company president is his nephew, Edward Canter, whose son is Ralph. The younger Canter, a gaunt figure who moves and speaks quickly and tersely, yet with a hint of a Southern drawl, conducts the visitors through the architectural jumble that is now Technisonic Studios.

"We've never thrown away a piece of equipment," he says. "Instead, we just build new studios." All of the studios were designed and built by staff. The main music room, Studio A, a rectangle measuring 30 × 40ft with a 20ft ceiling, has wooden panelling on the walls that gives it an 'East Coast' look, but Canter calls it ". . . merely icing. There are no traps behind the wood — nothing's hiding anything."

"It's a live room," he explains, "but it has enough of whatever it is that lets us close-mic too." Two large baffles fold out from one long wall, and a rolling drum booth that measures 10 × 12 × 8ft is in one corner. "The booth is versatile too," says Canter. "It's tight, and it's isolated with lead sandwiching in the walls and floor, but it's big enough for space miking." Bill Schulenburg, whose good-natured joviality complements Canter's austere manner, joins us. Schulenburg is responsible for engineering 90% of the music sessions at the studio, and has been a full-time employee for seven years. "We don't put much time into appearance," he chimes in. "We're a working place."

Off the main room are two smaller rooms that wrap around the control booth, one large enough to be a New York rock studio in its own right, the other a small overdub booth.

Control room

Inside the control room, set back on a platform a couple of feet from the walls is the L-shaped console, which is divided into three independent areas: record, monitor, and mix. The input section is an API 24/32 with four effects sends and stereo cues. At the other end, 90° to it, is a 24-channel API *Automix* desk. "The automation was put in in 1975, the first automated console in the country," says Canter, "and we keep updating it. It's completely voltage-controlled – faders, quad pans, EQ, and echo sends. There are three complete EQ presets, which helps save data. It can't become obsolete. The only limitations are in the programming, not in the board itself. Right now we're using a Valley People *65K* programmer, one of the largest ones they've ever made."

"The monitor section is separated from the input section, so that the producer can set up his own mix without him and the engineer getting in each other's way," says Schulenburg. "The record and mix boards can function completely separately, and either one can take full control of a session. When one goes down, the other doesn't. We've even done two different mixes in here at a time – although we try to avoid that."

Another pioneering piece of equipment, MCI's first *JH-114* 24-track deck, also from 1975, is in use here. There is also an Ampex 16-track, which was installed on New Year's Day, 1972. "We keep it around," Canter says, "because it helps us fight the basement studios." We fix a lot of other people's tapes," says Schulenburg, "and it helps that we're the only studio around with two 2in machines." Close at hand is an MCI *JH-110* 4- and 8-track deck, which Canter is trying to get a ½in 8-track head stack for, which would then allow the studio to work with virtually every format available. Quarter-inch tape is handled by Ampex machines: *ATR-102* and *440* stereo, and *ATR-100* and *440* mono. There are 40 channels of Dolby-A, spanning three generations of design, as well as two channels of Dolby-B and eight channels of dbx.

Schulenburg uses Ampex *456* on 24-track music sessions, and Scotch *206* on commercial and 16-track work, *206* is also used for mixdowns, and a change is being considered to *226*. "The Ampex is fine for music," he says, "but the print-through is too high for voice-only work."

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The LinnDrum Syndrome...

With the emergence of a number of 'alternative' drum machines, Linn Electronics, the inventors of the digital drum machine, feel that you may be slightly confused as to why professional musicians, producers and studios still insist on a LinnDrum as their drum machine.

We don't think that it's only because of the longer, crisper sounds or the flexibility and ease of operation; and it isn't merely the large library of user-changeable plug-in drum sounds or the custom sound chip service that lets you put your favourite kit sounds in the LinnDrum; nor is it the sixteen drum sounds each with its own output, volume fader and pan control or even the 2600 event memory with its 98 patterns and 49 songs and programmable dynamics; and it isn't simply the five trigger inputs with which you can trigger all the drum sounds from drum synthesiser pads, tape tracks or any audio source or the programmable trigger output that allows the rhythmic programming of external synthesiser sounds; nor is it the unique tempo display in beats-per-minute or frames-per-beat or the adjustable hi-hat decay.

But it is the combination of these features and many more that makes professionals choose the LinnDrum. But don't take our word for it – come and hear it. Then decide.

SYCO SYS Linn

20 Conduit Place, London W2 Tel 01-724 2451 for appointment

Now Available from Stock

Reverb at Technisonic is provided by an acoustic chamber designed by Bud Harrison, four EMT plates and an AKG *BX-10*. Compressors and limiters include an Eventide *Omnipressor*, two generations of *Kepexes* and *Gain Brains*, and units from UREI, Allison, dbx, API, and Fairchild. Equalisation is handled by Pultecs, APIs, ITIs, and a UREI *Little Dipper*. There are delay lines from DeltaLab, and two Eventide *Harmonizers*.

As with tape machines, Technisonic cannot bring itself to throw out good speakers, and so old whitewashed Altec *9844*s can be found in every studio. In A control, there are four, along with pairs of *Big Reds* and *Auratones*. In the studio itself, four Altec *A7*s hang from the ceiling. Amplification is all MacIntosh. "We probably have 50 channels of Macs of various sizes around the building," says Schulenburg, "and we've never had any trouble with any of them." "We tried some Crowns a few years ago," says Canter, "but we blew them out inside of a few weeks."

The consoles in the 4-track Studios C, D and E, are Bushnell and API. The disc mastering console is an API as well. "We find it amusing that all of the manufacturers of our consoles are out of business," cracks Canter. There are no fewer than 17 tape decks in the three studios. Except for one MCI, all of them are Ampexes, ranging from mono *300*s to 4-track *ATR-100*s.

One of the production studios is restricted to staff. "It's amazing," notes Canter, "what an engineer can get done in there when the client isn't around."

Technisonic's list of microphones covers two pages, and, as expected, spans the decades. There are RCA *77DX*s and *44BX*s, Neumann *U47*s and *U64*s, and Telefunken *251*s, as well as *RE-18*s and brand-new AKG *D330BT*s.

Past the multiple sound effects libraries and the duplication room, which houses an Electrosound 8:1 ¼in duplicator, an Electrosound 16:1 and a new Gauss 64:1 stereo cassette high-speed machine, as well as King automatic cassette loaders, is the disc mastering suite. Here a stereo Ampex *440* deck feeds the custom API console, which Canter believes was one of that company's last completed pieces of gear. It is connected to a Neumann *VMS-70* lathe outfitted with an *SX-74* cutter head. The current lathe dates back to 1974, and has seen plenty of use. "We do lots of demo work," says Bill Schulenburg, "and I tell bands that if there's more than 15min of music, then rather than run off cassettes they should make a single-face disc. If they plan to make more than 30 or 40 copies, it's cheaper, and the sound quality is superior to what you get with high-speed tape duplicating. It's also more impressive, and there are no compatibility problems."

"Having an in-house record plant allows us to answer any questions about the final product immediately," says Ralph Canter. "I really don't like to press less than 100 copies of anything, but sometimes we get radio orders for 30 or 50 discs. A big part of our operation is the low-volume specialty record."

Down in the basement is the record press. The first unit on the premises was installed in 1952, and it was replaced in 1980 with automatic equipment. The staff don't seem to mind that the place is hot and smelly. Barrels of vinyl flash clutter the floors, and stacks of blanks line the walls. "All of that shouting about virgin vinyl is ridiculous," opines Canter. "We tell clients who demand it that we've found, for the lowest noise and the best stability, that about 10% regrind is optimum."

Paul D Lehrman

Among the pressing plant's bigger clients is the Rolling Stone Rock Revue, a syndicated weekly radio show made up of short bits of music and talk that airs on 600 stations. "The tapes arrive Monday," says Canter, "and we ship the records Thursday. We do 30min of stereo – ten shows – on each side. Because we work so fast, and put so much on, we have to be careful not to overcut, so we pull back on the level about 5dB from normal. But as far as quietness is concerned, I'll compare these shows to anyone else's work any day."

An important adjunct to the pressing plant is a fully-staffed packing and mailing room. "If you're trying to cover the entire country," says Canter, "and using parcel post or United Parcel Service, which charge by the zone, then you can imagine mailing from the centre of the US works out considerably cheaper."

Having so many formats right at hand has allowed Technisonic to experiment with different disc transfer techniques, and Canter has come up with some surprising conclusions. "In the old days, of course, everything was direct-to-disc, but we recently tried it again, both recording live to the lathe, and also feeding the *Automix* console directly to it. What we found was that the most appealing sound came from a regular old Dolbyised 2-track tape transfer. Now we know a little more than we would otherwise."

Elsewhere in the basement, and in the extension to the building that was put on in 1967, are carpentry shops for set construction, props storage, film editing rooms, an Oxberry animation stand, and a small sound and shooting stage on which today is parked the studio's remote film truck. Film is a large part of Technisonic's operation, and the audio and visual media are often combined. In one editing room, for example, a film shot in Studio A, documenting a music recording session, is being worked on.

Workload

"We do no videotape work here," says Canter, "just 16 and 35mm. When videotape came in, it killed most of the film houses in town except us. We jumped into a higher echelon. 35mm is still the best medium for commercials and industrials. Last year all 63 Clio Award-winning spots originated on film.

"The industrials keep us in business. In the past, we would do two or three a year, but now we're shooting 30 or more." Says Schulenburg, "our versatility is finally being noticed and appreciated. We participated in the first non-Los Angeles shoot for a national Michelob Light beer TV commercial."

"We have no writers, directors, or producers on staff," explains Canter, "although we have 30 full-time employees, including six engineers, two film editors, a cinematographer, a cameraman, and a grip. For the other jobs, we contract freelancers that we've had experience with." Meanwhile, Schulenburg is preparing to run a film project himself. "I always boasted that if someone ever asked me to direct a film, I wouldn't say no. Well, someone asked me."

Financially, Technisonic Studios is in an enviable position. "We have no outstanding loans," says Canter. "The only loan we ever took out was for the building, and that has long since been paid off. I myself own an in-house company that acts as a clearinghouse and agency to pay musical talent. It's a natural offshoot of the rest of our work, and it makes things easier for the producers. We can also help finance film projects, by accepting the expenses and billing the client on a 30-day basis. Our accounts receivable is around a $¼ million and we're doing almost $2 million a year."

Technisonic's unusual approach to business has paid off in other ways as well. Awards from advertising, industrial, marketing, and film associations, as well as an Emmy and a Clio, line the walls of the only 'pretty' room in this strictly functional plant, a small waiting area behind the receptionist's desk.

Says Ralph Canter, "we've grown the way we have because we simply have to do everything ourselves. No one can come in the door today and ask us to do anything we haven't already done. We couldn't do this well if our various operations were two blocks away from each other. Unlike New York or Los Angeles, speciality houses just can't survive in St Louis. Musically, the town is slow, but for us, when the sound business is off, the film work is up, so we keep going.

"I would love to specialise – doing business this way can get pretty confusing. But unless we can offer full services, with no frills and at low rates, how can we possibly expect anyone from the advertising agencies to work here, when they could be vacationing in southern California?"

Canter says that Technisonic is now responsible for 90% of St Louis's commercial recording and filming. The studio is also developing a co-production arrangement with KSHE, a local FM rock station, which will result in an album compilation of local music, Bill Schulenburg laughs, "One record reviewer said that we were 'rapidly becoming a favorite of local artists'. That's pretty good, because we've only been here fifty years!" **Paul D Lehrman**

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studiofile

Craighall Studios, Edinburgh

Situated in the very heart of the statuesque 'Beautiful City' Craighall is one of Britain's longest established recording studios. Owner Bryce Laing has been in the business for over 25 years and has seen the industry's progress first hand. His first venture was actually in a soft furnishing business and he still retains a directorship in that company today, although he devotes all his time and energy to his studio.

The studio itself has distinctly visible signs of being steeped in tradition. A long standing link with EMI has kept Craighall at the forefront of the industry and its goings on. Bryce started with a simple 2-track in the back room of the furnishing store, which also sold records. When the building came up for demolition, the record shop had to move elsewhere and the studio went with it for a while before going to the building it occupies today.

The move to Craighall Road took place in 1962, and although they still had 2-track status this was soon to change to 16-track with a Neve and Studer set-up. Bryce has since then been involved in many different aspects of recording including his own label, disc cutting facilities and a mobile unit. The label and its

catalogue were at that time deeply involved with EMI and during the years 1966-81 they were contracted to supply mainly Scottish albums including the Royal Tournament and military bands.

Bryce has very fond memories of his link with EMI and was understandably sad when in 1981 EMI decided to close down their MOR department with the result that relations with Craighall were ended. Nowadays Craighall's label—Waverley Records—is distributed through Ross Records in Aberdeenshire, and the studio has recently started making compilation albums for the MFP label.

The studio occupies a house, the conversion of which did not involve too many drastic measures, although the floor of the recording area was lowered quite considerably. This resulted in a very high ceiling, giving an airy atmosphere and a fairly ambient feel. In this room there is a bay window which, although strangely high up, allows sunlight (yes it does shine in Edinburgh) to flood in. A section of the floor immediately inside the room was left at its original level creating a small platform often used for seating choirs. Another nice touch is the 'musicians balcony'—roughly 18 × 12 ft—which was put in to create more space. This it does very adequately and also provides a good acoustic for up to seven brass players. Beneath this is situated the 6 ft Steinway concert grand piano, and since the area is fairly dead acoustically, it is sometimes preferred to utilise the area by the bay window for drums etc as it is much livelier.

Acoustic treatment generally is minimal consisting of patches of Slotex (a wall covering which absorbs high frequencies), complemented by an equivalent amount of blockboard to liven the room up. None of the walls is parallel, and so it was found that there was little need to do anything more. The floor is carpeted and these coverings may be lifted if the general acoustic is not live enough for any paticular session. A useful feature of the balcony is its more than adequate separation. In fact, if there are rather too many friends and relations hanging around, it seems that putting them in the balcony gets them out of the way and even if they are chatting this doesn't usually interfere with the session.

There is an additional area which, until very recently, served as the control room and which now may be used as a vocal booth. This also doubles as the rest area which is very convenient since it looks directly on to the studio, so you can always see when you are needed.

80 ▶

Contact with the control room itself is via a video monitor and Tannoy Gold speakers in Amesbury cabinets.

The recent upgrade to 24-track coincided with the building of a brand new control room, during the course of which acoustic measurements were taken at regular intervals. Again, acoustic treatment is minimal with the back wall being broken up by two screens set at right angles to it. Between these is a small area for those not directly involved in the session.

The Raindirk *Concord 2000* desk and Soundcraft *Series 760* 24-track machine form the basis of the new set up—the machine also having a 16-track headblock. Other machines include a Studer *A80*, Studer *B67* and various Revoxes, with monitoring on JBL *4315*s. Ancillary equipment includes an AKG *BX15* reverb, MXR digital delay, four MXR phaser flangers, two Tweed Audio compressors, four Drawmer noise gates, four Dolbys, an MXR graphic equaliser, three Bel noise reduction units, a Sony cassette machine and a Technics computerised record deck. The last item is there because amongst other things Craighall compiles tapes for the Scottish Dance Institute exams, and this involves taking excerpts from various LPs.

Amongst the collection of Neumann, AKG and Shure microphones are three AKG *C24* valve mics which the studio has owned since 1959—and they are still the best mics they have ever had says Bryce Laing! They have been soaked through time and time again whilst being used for the Edinburgh Tattoo and other outdoor activities, and after a respectable drying out period have worked perfectly.

Craighall also owns a very busy mobile which has been working since 1971. This is fitted out with a Tweed Audio 14/8 desk, Studer 8-track machine and JBL *4311* monitors. Various effects and noise reduction are brought in from the studio when necessary. As well as all the functions it attends in Edinburgh itself, the mobile makes regular trips to Europe, often for military work, and at the time of our visit, they were preparing for a trip to the Sultan of Oman!

A more recent addition to the business is Keith Mitchell who came to Craighall straight from school as tape-op and is now the fully fledged house engineer. Bryce has unusually stringent requirements for his tape-ops whereby he insists that they be able to read music as well as playing an instrument, because the nature of their work often demands the reading of scores.

Although a lot of the work does involve Scottish country music and bands they have also been involved in a large quantity of classical recordings—of special interest being the first ever stereo recording of Elgar's 2nd Symphony with (Sir) Adrian Boult conducting. They also do quite a lot of work with the Scottish National Orchestra.

The 24-track update was partly precipitated by the fairly new fierce competition which has suddenly flared up between the studios in Scotland, with the result that not only have Craighall splashed out on brand new equipment and control room but they have slashed their rates. You can't become much more competitive than that! **Janet Angus**

Craighall Studios, 68 Craighall Road, Edinburgh EH6 4RL, UK. Tel: (031) 552 3685/(031) 229 8389

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BARRY FOX

PRS

A few months ago I recounted the tortuous tale of the Performing Rights Society or PRS, and its long running squabble with Trevor Lyttleton. Without Lyttleton, PRS would be just three little letters to most people. Because the MCPS hasn't been involved in any similar squabbles, it's still just four letters to most people. But the MCPS, or Mechanical Copyright Protection Society, is in fact more important to the industry than the PRS.

When a band or orchestra wants to perform music live, it pays royalties to the composer through the PRS. When it wants to record music, it pays royalties through the MCPS. As with the PRS, the MCPS is intended to save composers and the firms which publish their music the hassle of dealing direct with the musicians who play it. Here's how the system works, with a few side issues you may not have thought about.

Take a song like *Star Dust* by Hoagy Carmichael. Actually there are several songs called *Star Dust* by different composers. You can't copyright the title of a song, so there's nothing to stop anyone writing another 'Star Dust'. In most Western countries the local copyright bodies, like the PRS and MCPS in Britain, won't get confused. But in Latin America, where it's hot and who cares anyway, there's often money to be made for locals from writing a few songs called 'Star Dust', 'Yesterday', 'Yellow Submarine', or 'White Christmas'. Or better still, something with the same title as whatever happens to be top of the pops. The chances are that you'll cream off some royalties by mistake.

The MCPS, now in Streatham, England, has been going since 1912. In 1976 it was bought by the Music Publishers Association. The MCPS employs around 180 people, to keep tabs on around two million published songs, of which around 100,000 are recorded at least once a year. Some of the files are on card index, others on computer. Each year now around £12 million comes in and £10 million a year goes out. The money comes in from anyone who records music and it goes out to the publishers who then pay it to their composers. The MPA wants the MCPS to make as little profit as possible, either ploughing money back into projects like computerisation, or as a rebate. Last year the publishers got a rebate of £150,000.

A hot property composer will now get anything up to 90% of the money paid to his publisher by the MCPS. Around 75% is average. But before the pop music boom it often used to be a 50% split between publisher and composer. Payment is pretty prompt. The MCPS takes around three and a half months, on average, to turn round its money from record companies. If there's a delay the MCPS has to pay the publishers 3% over minimum lending rate as a penalty. Thanks to computerisation and good indexing, turn round is pretty straightforward. BBC Radio, for instance, now sends in its returns as data on magnetic computer tape. A lot of the time the BBC computer is effectively talking direct to the MCPS computer. The £2 million a year that the MCPS creams off is spent mainly on policing other parts of the industry. Too many companies are using music on their video productions without paying for permission. For instance, when a record company makes a video promo to promote sales of a disc, no royalty is paid. But a royalty must be negotiated with MCPS if the promo video is later sold as part of a pop video compilation.

As soon as a work has been recorded once, anyone can record it again without permission. All they have to do is file a statutory notice with the MCPS saying that they are recording the work. Payment is then at the fixed rate of 6¼% of the retail price of the record in the shops. This money is evenly divided between the number of titles on the disc, unless any of them is inordinately long. This of course explains why some record producers are so anxious to get their own songs on an LP, or B side. If the disc sells well, then they get a share of the action, however lousy their songs may be. The MCPS has the right to audit a record company's accounts. Large companies pay their 6¼% royalty on the number of discs leaving the warehouse, because this is classed as sales and they are trusted. But smaller companies will often be asked to pay on the total number of discs pressed. The snag here of course in the old run-on trick. There's money to be made for a record company if it can press more copies of the disc than it admits. The balance is royalty-free, which means a nice little extra profit for the record company.

Although publishers may have different deals with different countries, under EEC law there's no way of stopping the free movement of records throughout Europe once a recording royalty has been paid in one country. Whatever the publisher or composer would like, a record that is legitimately issued in Germany and France can't be blocked from Britain and Holland. This is one reason why many of the record companies are now centralising their pressing operations in one European country. Unfortunately for Britain, a lot of the pressing work that used to be handled here is now being handled from Holland and Germany where standards have on the whole been higher for mass-production.

The way in which MCPS gets revenue from the broadcasters is very complicated. The sooner Britain gets some clearer copyright laws, the better. But to cut a long and confused story short, when the broadcasters play a record over the air (subject to the Musicians' Union 'needle time' agreement) they have to pay a fee to PPL (Phonographic Performance Ltd). When they re-record a disc on to tape, or record a band live in the studio, then they pay MCPS. It's perhaps not generally known that there's a yawning gap between the rates paid by the BBC and the independent broadcasters. BBC TV has been paying the MCPS around £3.30 for every 30 seconds of music recorded, or re-recorded. But the ITV companies are now paying nearly £20 per 30 seconds for the same privilege. The BBC argument has always been that it runs on a licence fee shoe string, and pays its staff far less than the ITV companies. But watch out for some hard bargaining when the BBC starts satellite broadcasting in 1986. At least one of the BBC's two channels will be a subscription service. Will the BBC be able to continue to swing its low payments to the music publishers? Or will the music publishers use the subscription satellite service as a chance to get the BBC over a barrel?

Satellite broadcasting

Satellite broadcasting is coming, faster than some people want. Although the BBC is due to start transmission in 1986, the electronics industry still hasn't got a specification for receiver design. The European Broadcasting Union is still having meetings on a final decision about who will use what system. But even when the broadcasters have made their decision, their governments *still* have to make a final decision. Although the UK is committed to the IBA's MAC system, with packets of digital audio slotted into gaps in the waveform, the French and Germans are still talking about sticking with SECAM and PAL transmission. Dual standard receivers will cope with both systems.

Then there's the problem of encryption, or scrambling to ensure that only those people who have paid for a programme can receive it. The more complicated the system of encryption, the more the decoder costs. But a cheap system is easy to crack. Essentially, the TV picture lines are broken up into irregular halves at the transmitter and reassembled at the receiver, according to key data which the subscriber 'buys'.

Current BBC thinking is in favour of both the BBC satellite channels being available only on a subscription basis. The original Government idea was for one subscription channel and the other channel 'free' in return for a blanket increase on the licence paid by all TV viewers. According to a tiered approach now also favoured by the BBC, a few selected programmes would be available only on a pay-per-view basis. It wouldn't be the old coin-in-the-slot approach as used with the early cable TV experiments both in Britain and America. More likely, satellite subscribers would buy a 'smart card' like those supplied by the banks for their cash dispensers. On its own, the smart card is valueless, but when fed into the decoder, along with an identifying code number, it unblocks a circuit. Obviously, it would be expensive to send every subscriber a new card every month when they paid their subscription. So more likely the card will need a new number every month. The viewer will receive this number in return for each monthly subscription.

To cope with pay-per-view the same card, or another card, would have encoded credit units. Telephone cards are already available from British Telecom to work non-cash 'phones and they are planned for gas meters. During a pay-per-view programme, the receiver just gobbles up an appropriate number of units from the subscriber's card.

All this is feasible, but to be viable the code circuitry has to be integrated with essential components in the domestic receiver. If not, a DIY electronics enthusiast will be easily able to do some judicial circuitry. Less able enthusiasts will very probably electrocute themselves.

The British electronics industry is not, let's face it, noted for its quicksilver speed in design, development and marketing. That's why so many TV factories in Britain are now owned by the Japanese. Although 1986 may sound a long way off, it's uncomfortably close in terms of IC design. So every time there's another delay in settling the satellite transmission standards, the 1986 start date looks even more like a pie in the sky. ■

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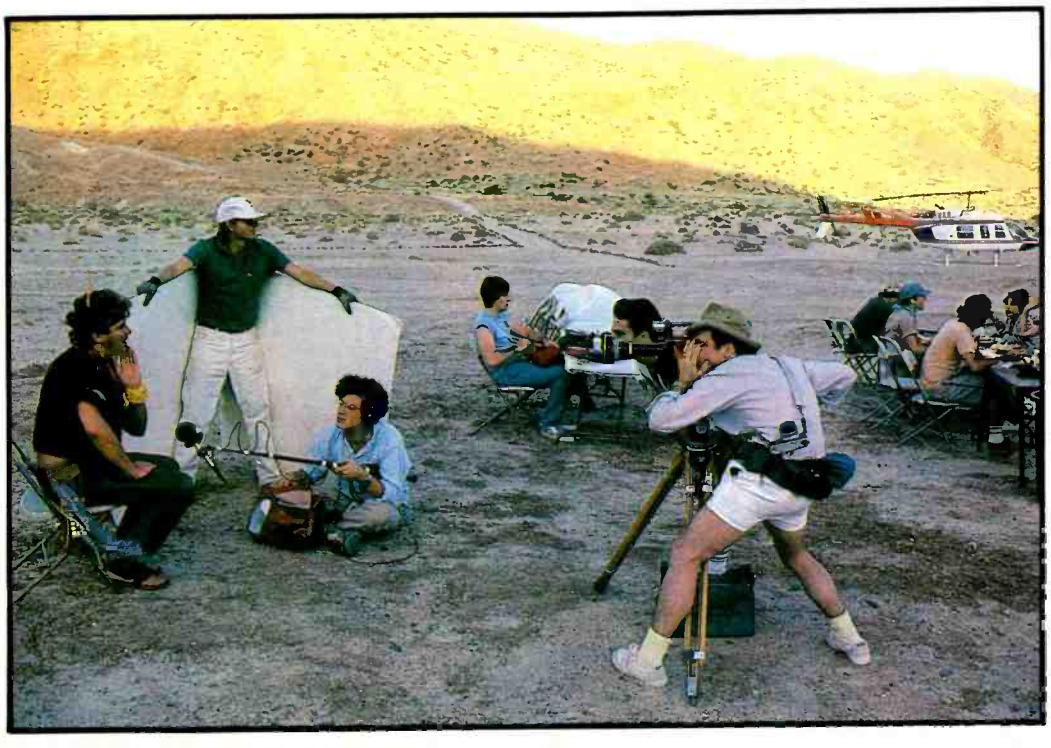
Cable TV is widespread in the United States, but few companies are making money doing anything other than showing movies. Two years ago, Music Television (MTV) set out to change all that: and 17,520 hours of video music later, they are part of the mainstream of US rock culture. Carl Levine, Contributing Editor to the US magazine *VideoPro*, looks at how MTV has created video'n'rock'n'roll.

rock around the clock

Carl Levine

California desert location where CBS artists Lover Boy shoot their newest video, Queen of the Broken Hearts



ALTHOUGH television and rock 'n' roll both emerged in the '50s, experienced adolescent growing pains in the '60s and sought identification in the '70s, it was not until the '80s that the two finally settled down together on American cable TV. Nobody ever questioned the impact of television in promoting rock. The popularity of Elvis and the Beatles, was certainly enhanced by prime time appearances on the *Ed Sullivan Show*. Research studies proved that an appearance on Dick Clark's *Band Stand* or *Don Kirschner's Rock Concert* would result in increased sales the following week. Despite the positive effect television appearances had in promoting record sales and artists, rock on TV was limited to spot appearances by major artists on prime time variety shows or to syndicated afternoon and late night programming. Thanks to MTV, video 'n' rock 'n' roll have emerged as one in the '80s.

MTV, Music Television, is an advertiser-supported, basic cable service, produced and packaged by Warner Amex Satellite Entertainment Company (WASEC). Since August 1st, 1981, MTV has provided

stereo video rock around the clock and revolutionised the music industry in the United States. At a time when the record industry is singing the economic blues, video clips are being supported to the tune of major investments. Music Television is replacing radio as the basic ingredient in promoting records sales in America and video is viewed as being a cost efficient way to break new acts or support established stars and present performers in foreign markets.

Although WASEC has reportedly invested over $20 million in MTV, the station is still operating in the red, however a profit is predicted in the near future. MTV is currently carried by 1,650 affiliates and reaches over 13.5 million subscribers. It has been described as 'video valium', 'the hit parade gone mad' and 'a destructive force on the youth of America', which is probably why it is so successful among its target audience. "MTV is targeted at the psychographic group of rock enthusiasts," explains John Sykes, director of programming for MTV. "Surveys show that 52% of our audience is 18 to 34, 20% is 12 to 17 and 20% is 35 and over. We reflect the new musical trends emerging in the '80s. We feature conventional and modern rock from America and England."

According to Sykes, "MTV has a very positive effect on record sales. Independent studies by *Billboard* and *Variety* have shown that retailers experience a 5% to 35% increase in record sales when MTV is introduced into the market."

Australian band *Men at Work* demonstrated how Music Television play is replacing FM radio play as the prerequisite for record sales in America. The group's 1982 debut album only made it on to the restricted play list of AOR FM radio, after its video clip appeared on MTV. Despite the initial snub by radio, *Men at Work* went platinum and was perched atop the best seller charts.

Producing music television

Although the majority of MTV programming consists of three or four minute video clips (approximately 14 in an hour) supplied free of charge by record companies, a heavy production schedule is required to maintain a daily, 24 hour cable channel. Wrap-around studio segments of 'video jockeys' hold the video clips together. To create the 24 hour daily programme MTV is in production approximately 60 hours every week at Teletronics, in New York, videotaping all VJ and celebrity segments.

MTV's weekly production schedule begins at 10 am on Monday at Teletronics Center Stage, a 65 × 50 ft studio on the west side of Manhattan. A Neve 24-channel audio board, with a Vega wireless microphone system and Dolby noise reduction is used to record the VJs in 2-channel mono. According to John Fisher, production manager for WASEC: "We play with sound effects to enforce stereo. When we first started we experimented with real stereo sound on studio segments, but it was limiting because the jocks could only stand in one place. Now we do so much material in such a short period of time, there is no time to experiment."

MTV is distributed from the WASEC owned and operated Network Operations Center in Smithtown, Long Island, via transponder 11 of RCA's Satcom F-3R. The VJ and interview/walk-on segments, shot at Teletronics, are continually sent by messenger to the Smithtown uplink facility, 50 miles from midtown Manhattan, where it is mixed on air with the video clips and commercials to create the MTV feed. The music clips are rolled into the show from an Ampex automatic carousel that holds up to 24, 6 min, 2 in cartridges, by a technical director, who mixes the video rock, around the clock.

"After looking at our specs, Ampex produced the only three stereo automatic 2 in quadraplex cartridge machines in the country, to meet our needs," explains Andy Setos, vice president engineering and operations for WASEC. "Operationally speaking, MTV is a stereo radio station with pictures. It took a frantic nine months to build the Smithtown uplink facility. Everything in the plant is 2-channel, with Dolby A encoding on all audio. We also have the first two Grass Valley *1500* 1x switchers with audio following video in stereo. In 1978 or earlier, MTV would have been prohibitively expensive. With developments like stereo layback and stereo synchronisation, technology has caught up to the needs of transmitting a stereo television station."

MTV spends up to $1,000 to standardise and perfect the audio and video on each clip. The clips are sent to Image Transform in Los Angeles for colour correction, to check for drop-out and to enhance the quality of the video. The record company's master audio mix is dubbed at Regent Sound in New York to provide the best quality stereo mix for the clip.

Since there is a much greater loss in audio than video quality when transferring to subsequent generations on 1 in Type C video, an attempt is made to match original studio sound on all clips. At Regent Sound, a ½ in tape dub of the studio audio master is matched to a 1 in type C video master using a EECO *MQS* synchroniser to link an Ampex *VPR 2* 1 in VTR with Dolby A to either an Ampex *ATR 104* 4-track or an Ampex *102* 2-track.

"Large record companies are consistently on the ball with good transfers and alternate versions of the studio master audio track. For this reason 60% of the audio matching is straight forward," Regent Sound engineer, Bob Donlan relates. Despite MTV's efforts to maximise the quality of the audio, sometimes record companies or groups cannot provide a dub of the studio master audio track. Another problem in matching audio is producing a clip using a sound track other than the master. "We can generally make 95% of the matching work, but if we can't match sound, we will clean-up the audio from the videotape by transferring it to a 4-track and equalising audio for the entire song," Donlan discloses.

MTV splits the audio and video signal on its feed and offers cable operators a Stereo Transmission Processor which allows for reception and delivery of stereo sound. The processor consists of two components which receive the signal from the satellite and launches it into the cable on the available FM frequency of the affiliates choice. Leaming Industries in Costa Mesa, California and Wegener Communications Inc, Narcross, Georgia, manufacture the Stereo Transmission Processor which was designed by Don Steed. The signal to noise ratio on MTV is actually better than most FM radio stations, proving that television audio need not be bad.

Bob Donlan resyncing MTV audio at Regent Sound, New York

Producing video clips

The major scripting queston facing producers of video rock is whether to create concept pieces or present live performances. Concept clips are probably more in vogue, because a good video clip can help to sell a weak song. A performance piece can only be as good as the performance and the music. Another advantage of concept clips is that they can be made, even if the artist is unavailable for the production.

The London based production company, Millaney, Grant, Mallet and Mulcahey, is one of the leaders in concept video rock. The four British directors, who are the principals of the company, have produced over 500 clips in the last three years. Their credits range from ABC to Ultravox and include: The Rolling Stones, Barry Manilow, Olivia Newton John, Rod Stewart, Fleetwood Mac, Elton John and Squeeze.

Clips are generally shot in 16 mm film or 1 in type C video and post production is generally in video, if the budget permits. An average clip takes 10 to 14 days of production including concept and costs between $20,000 and $100,000.

Does concept video rock sell records? According to Grant: "When a clip is played on the *Top of the Pops*, you can see the rise in record sales the next day." When asked about MTV promoting record sales, Grant's response is, "It must be. The clips are quite expensive and if they weren't working the record companies wouldn't pay for them. We have quite a lot of work lined up in the future, so the clips must be working."

A wide range of producers and directors are creating programming for the relatively new video clip market. Bob Giraldi Productions of television commercial fame (Miller Lite Beer, Dr Pepper, McDonalds) made a smashing debut into the video clip area with Michael Jackson's *Beat It*—it was voted the most popular video ever made, by CBS News. The 'mini musical movie' was shot in 35 mm Panavision on location in the Los Angeles downtown Bario section at night and required two days of rehearsal and two days of production. Two versions were edited, a video version for television on 1 in type C tape and a 35 mm print which is being shown in movie theatres in South East Asia with *Tootsie*. A 4-track audio mix was made at Motown in Los Angeles, combining the studio master with sound effects from the location shoot. When asked about the budget, executive producer Antony Payne of Giraldi Productions replied, "Too much emphasis has been placed on the price, rather than the quality of the video. It did cost between $140,000 and $150,000 which is actually breathtakingly low. A movie scene with the talent and time of this clip would cost twice as much." Bob Giraldi Productions' 30 s commercials are generally substantially more than the *Beat It* budget and considering Giraldi directed the clip himself, Tony Award winner Michael Peters was choreographer, the size of the cast and the clip's production values, it was a bargain. To date no video clip has beat it.

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MTV

Donlan of Regent Sound recommends that the producer or director should use 4-track when making the audio for the clip. Music should be on tracks 1 and 2, with induced timecode on track 4. He adds, "Ideally that tape should be used for production and if you are shooting the group in a studio use the 4-track locked in playback mode." For location clips Donlan suggests, "when making the Nagra dub make a 4-track copy. If you can't, be aware of where the Nagra audio is and send it with the clip."

The MTV production staff and Regent Sound personnel are willing to provide free advice to producers/directors of clips to help ensure high quality audio in sync. "The best situation for us is when the producer contacts us first," says Setos, "that might help us limit our steps in matching master audio. We do not require stereo on 1 in videotape, since we lay back the audio at Regent anyway." Setos finds that clips from concerts are easier to match at this point in time because the live performance on multitrack has fresh sound and picture with original master audio and video tapes.

Many production companies, like San Francisco based One Pass Video, are videotaping live performances at very competitive prices. In recent months, One Pass has recorded Elton John, Mel Tormé, Dave Brubeck, Luciano Pavorotti, the Ramones, Marshall Crenshaw, Willie Nelson and Eddie Money. The Eddie Money concert was taped live at the Kabuki Theatre in San Francisco and has appeared on MTV.

According to Scott Ross, director of production operations for One Pass, "The Eddie Money Concert had six Ikegami *HL 79* cameras and The Record Plant (Los Angeles) did a 24-track audio mix. With production crew and post-production, the total cost was $20,000." Ross feels that the key to keeping costs down is, "When you are doing live performances have an AD who knows every move the artist will make and a director who knows how to cut live TV." Ross also feels, "A facility can give a better break on equipment."

For the Eddie Money concert, Record Plant provided an MCI *JH 636* console and two Studer *A800* 24-track tape machines. The standard microphone complement included Electro-Voice *RE 20*s on kick drum, Sennheiser *421*s on tom tom, AKG *451*s for overheads, Shure *SM 57*s on snare drum, Neumann *U 87*s on saxophone, direct boxes and Shure *SM 57*s on guitars, direct box and Electro-Voice *RE 20*s on bass guitar, Shure *SM 58*s for vocals, and Crown *PZM* and Neumann *U 87*s for the audience.

Live performance audio/video can also be used to enhance the production values and impact of a concept clip. Arnold Levine Productions used the live 24-track audio of Billy Joel's concert in Washington DC and then selected specific footage from the six iso cameras to be matched with dissolving colour slides provided by Vietnam veterans, to create the moving *Good Night Saigon* clip. According to Arnold Levine, "In addition to the expense of the live performance, the clip cost $23,000 for production and a donation of $7,000 to the Vietnam Veteran Agent Orange Organisation." The personal slides, combined with the live performance which includes Vietnam veterans on stage singing the song's chorus with Joel, are the basis for the emotional impact of the clip.

Video clips are not only being produced for promotion of established artists. Sophisticated production techniques are also being employed by artists attempting to break into the music business or trying to obtain record contracts. One Pass recently completed a concept clip for recording veterans Mary and Peter Buffet, who are attempting to establish themselves as feature artists, after years of working as back-up/studio performers. Their clip, a remake of *My Boyfriend's Back* illustrates the technical creativity being employed in the production of video clips, even by artists seeking to obtain a record contract.

One Pass shoot clip for My Boyfriend's Back

Although *My Boyfriend's Back* was shot on 16 mm film, One Pass had a simultaneous recording of the master audio tape made on 1 in and two ¾ in videotapes. Time code was put down on the address track of each videotape in addition to the stereo audio tracks. The 1 in master videotape was locked away and during production, a Sony *BVU 800* was utilised for audio playback, as well as having the timecode readout used as the slate. The audio person had a script, which included precise timecode numbers making it easy to shuttle to the exact cue point. The slate operator was tied by an umbilical cord to the timecode generator. During post production, the 16 mm footage was transferred to 1 in type C video, and the original master 1 in tape with timecode and the studio master audio track were then put together as the master video as well.

According to Ross of One Pass, who directed the production, "The sync was always perfect because the numbers don't lie. During production we saved valuable time because we never had to listen since we could use the timecode as a visual cue." Ross feels, "The Nagra is not a very good field playback unit; however it is excellent for recording natural sound."

For sweetening, the audio was transferred to 8-track. Track 1 had stereo left, track 2 had stereo right and track 8 was used for timecode off the edited master. Natural sound was dropped in on tracks 3, 4, 5 and 6. Since the audio and video tape recorders were locked via a BTX and therefore in perfect sync, the final stereo left, stereo right mix could be adjusted until the desired levels were achieved. Since One Pass utilizes a Rank Cintel with Callaway AVRS for film to tape transfers and colour correction, timecode can be used as the common denominator between all audio, the address track of the VTR and video on the Rank Cintel.

My Boyfriend's Back cost approximately $40,000. The cost and technical sophistication of producing this clip, which will be aired on MTV's *Basement Tapes* competition, indicates the drastic change in budgets and hardware since 1978, when Gerald Casale of Devo, a pioneer in video rock, produced his group's first clip.

"We experienced resistance when we shot *Satisfaction*, on 16 mm film," Casale recalls. "The technology did not permit stereo sound and our budget for the two day shoot in Akron, Ohio, was approximately $5,000. It was basically a segment intercut with imagery of simple insert shots to enhance the song. The audio was ¼ in mono which we could not restrip down," Casale relates.

Casale reveals that Devo generally, "Use a work track off a stereo Nagra. During post production a clean track is then put on 1 in video tape from a studio ¼ in audio tape." Casale adds, "More and more production is using video. Ideally, budget permitting, I'd prefer shooting in 35 mm transferring to 1 in and editing in 1 in." Casale warns creators of clips to beware of the difference between video's 59.94 Hz and film's 60 Hz audio cycle. "On *That's Good* the audio had to be jam synced with new code because the engineer did not make the adjustment for 60 cycle film during video post production. It's like reading the fine print," Casale suggests. "We're still in the dark ages with people offering misinformation."

MTV and the future of video rock

"MTV has legitimised video rock 'n' roll. In the last two years MTV has made rock'n'roll part of our mainstream television culture," Robin Sloane, director of national video promotion for Elektra/Asylum Records states. "Besides MTV there are 95 other ways to use video clips," she enthusiastically adds.

"Video is the silver bullet that knocked the doldrums out of radio music and the recording industries," Randy Hock, director of national promotion and marketing at Arista Records, declares. Despite cutbacks in other areas as a result of slumping sales, record companies are investing substantial sums of money into video. A major reason for the record industry being bullish on video is MTV, which has shown that video is a cost efficient way to break new acts, promote artists and sell records. MTV has lived up to its name and has provided excellent sound, an element overlooked by network and syndicated TV.

MTV has opened the door for other rock related cable programming. Syndicated television programmes as well as cable, government owned and private television stations around the world are broadcasting rock 'n' roll. Stereo VCRs and disc players and other new home items like Sony's 'video albums' and 'video 45s' are just being introduced to the consumer market. Video clubs and video juke boxes are already a reality. Issues like royalties, publisher payments for air play, artist's rights and production budget responsibilities have not been resolved as yet, but thanks to MTV, the new phenomenon of rock 'n' video in stereo has emerged in the '80s. ■

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Electrical safety requirements

Ken Dibble

Does your equipment come up to standard? Ken Dibble runs through the legal requirements for electrical equipment in the UK.

THE pro-sound industry is as international as any in its trading habits, with equipment from every corner of the globe available in most developed countries. The product range available in any particular market depends only upon a manufacturer's resources and energies in servicing that area, and to a lesser degree, on traditional trading ties and political barriers.

In many countries however, before a manufacturer can begin peddling his wares, it is necessary to ensure that his products will comply with any relevant national legislation. As far as member countries of the EEC are concerned, there is a European Communities Council Directive, (No 73/23/EEC (O. J. No L77) dated 19 February 1973) Article 2 of which states

> 'The Member States shall take all appropriate measure to ensure that electrical equipment may be placed on the market only if, having been constructed in accordance with good engineering practice in safety matters in force in the Community, it does not endanger the safety of persons, domestic animals or property when properly installed and maintained and used in applications for which it was made.'

However, the Directive then goes on to stipulate at some length, that in complying with Article 2, '...preventive and repressive measures by means of binding provisions' shall not restrict free trade within the Community, and states in Article 5:

> '...electrical equipment which complies with the safety provisions of harmonized standards shall be regarded...as complying with the provisions of Article 2 for the purposes of placing on the market and free movement (within the Community)'.

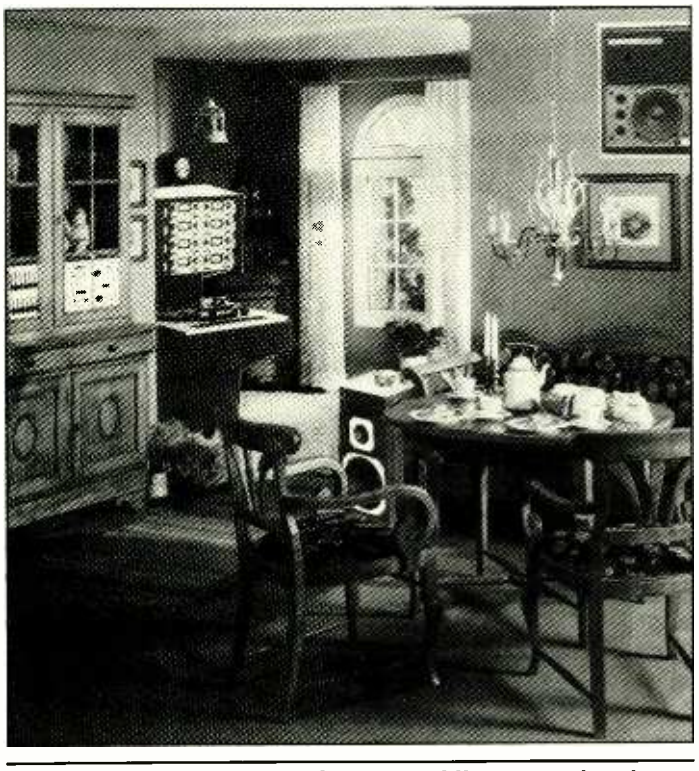
A harmonised standard is one which has been agreed by the national committees of all member states, and in the absence of such a standard, Article 6 provides for an appropriate CEE (International Commission on the Rules for the Approval of Electrical Equipment) or IEC (International Electrotechnical Commission) standard to be substituted.

It is within this framework that the UK electrical safety controls operate.

UK legislation

The primary instrument at law in the UK is encompassed within the Consumer Protection Act, 1961, and comprises the Electrical Equipment (Safety) Regulations, 1975 and the Electrical Equipment (Safety) (Amendment) Regulations, 1976. The Regulations are concerned with:

a) insulation and earthing;
b) accessibility of live parts;
c) the fitting of all-pole switches on appliances with accessible heating elements;
d) the enclosure or guarding of moving parts;
e) the enclosure or guarding of parts which get hot;
f) the generation of excessive heat and the dangerous emission of radiation of any kind and the emission of toxic gases;
g) the provision of information on safe operation.



In the absence of a specific standard, professional audio comes under the heading 'Household Electronic Sound and Vision Equipment'

The regulations are consistent with the requirements of the EEC Directive and with one or two specific exceptions which do not concern us here:

> '...apply to any electrical equipment (including any electrical apparatus or device) designed or suitable for domestic use (whether indoors or out-of-doors) at a voltage (in the case of an alternating current) of not less than 50 volts nor more than 500 volts or (in the case of a direct current) of not less than 75 volts nor more than 750 volts'.

The muscle behind the Regulations is not contained within the document but is to be found in Section 2 of the Consumer Protection Act, 1961, the basic provision of which is to prohibit the sale and possession for sale of goods and component parts which do not comply with the Regulations. Again, there are exceptions—mainly it would seem to cater for the maintenance and/or disposal by trade of old equipment manufactured prior to the introduction of the Regulations, but it should be noted that the term 'sale' in the provisions of the Act would appear also to include hiring, letting and hire-purchase transactions.

In endeavouring to interpret the Regulations, it is essential to have to hand three further documents issued by the Department of Trade. These are the *Administrative Guidance on the Electrical Equipment (Safety) Regulations, 1975* and the *Electrical Equipment (Safety) (Amendment) Regulations, 1976* along with *Amendment No 1* and *Amendment*

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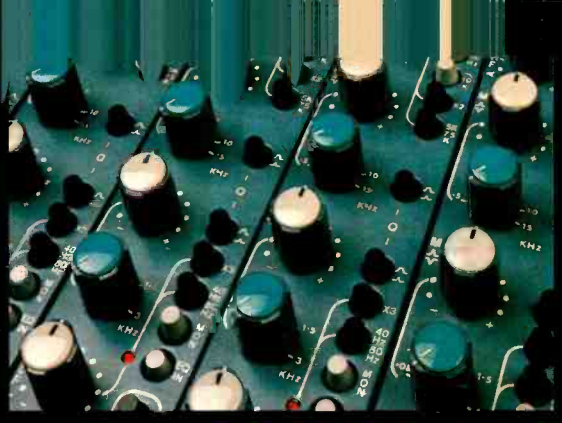
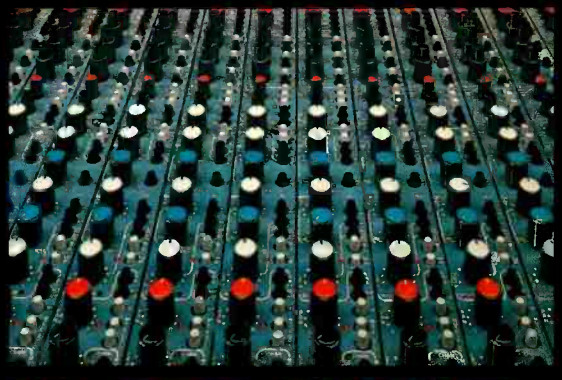
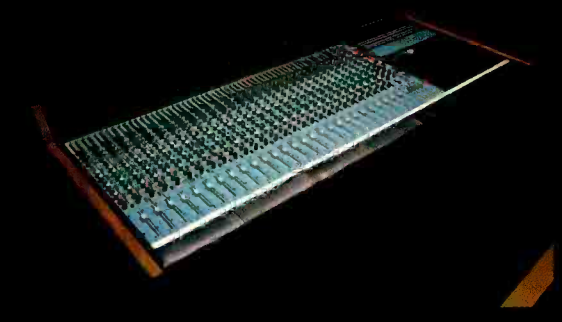
ANGELA 28/24 at Sanwa Video, Osaka, Japan

ANGELA 28/24 at Castle Audio, Dallas, Texas







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Electrical safety

No 2 issued in 1977, 1978 and 1980 respectively. These documents clarify and considerably elaborate upon the requirements of and compliance with the Regulations, and give useful guidance on the way the Regulations are likely to be interpreted and applied by the DOT. They further provide a list of BSI, CEE, and IEC standards which are acceptable under the Regulations, compliance with which will ensure full conformity.

This really is the key to this whole complex subject, for whilst an equipment manufacturer can warrant his own product under the terms of the Regulations, it is much more convenient and straightforward to design within the framework of an established standard and seek type approval by the appropriate recognised certification authority—in this case, the British Electrotechnical Approvals Board for Household Equipment (BEAB).

In the absence of a specific standard, professional audio comes under the heading 'Household Electronic Sound and Vision Equipment' in the Administrative Guidance document and lists only BS415:1979 *Specification for Safety Requirements for Mains Operated Electronic and Related Aparatus for Household and similar General Use* as the 'Acceptable Standard' under the Regulations. We shall therefore consider the requirements and implications of that standard rather than become embroiled in the more general and legalistic requirements of the Regulations themselves.

BS415:1979

The harmonising standard in this area is CEE/1 which is identical to IEC/65. BS415 is in exact agreement with IEC/65 except where it has been amended by declared UK deviations. A note in Appendix B to the Administrative Guidance document, as amended by Amendment No 1 1978 draws attention to the form and effect of the deviations:

> 'It is possible for equipment made to the latest edition of IEC 65/CEE1 to meet the requirements of BS415 or give an equivalent degree of safety and meet the requirements of the Regulations. However, compliance with IEC 65/CEE1 might not ensure full compliance with the Regulations or comformity with BS415...'

The statement goes on to quantify some areas, including the accessibility of live parts in Class 2 appliances, where the IEC/CEE standard may not conform to the Regulations or to BS415. It would therefore seem that conformity to the requirements of BS415 will automatically ensure compliance with the Regulations as well as with the European standard, CEE1 and the International standard, IEC 65.

In essence, the Standard is concerned with personal protection against electric shock, excessive temperature, ionising radiation, implosion and danger due to mechanical instability or from moving parts. It is concerned only with safety aspects and not with other properties for equipment intended for indoor use at altitudes below 2,000 ft which is not subject to dripping or splashing and designed for supply voltages not more than 250 V RMS single phase or 433 V RMS between phases of a three phase supply.

Subsection 1.1 defines the scope of the standard as:

> '...apparatus that is to be connected to the mains, either directly or indirectly, intended for household and similar general indoor use...'

and lists the following types of apparatus:

- radio receiving apparatus for sound and vision;
- amplifiers;
- independent load and source transducers;
- motor driven apparatus which comprises one or more of the above mentioned, or can be used only in combination with one or more of them;
- other apparatus obviously provided to be used in combination with the above;
- battery eliminators.

It will be obvious that the list is providing for most types of domestic electronic equipment including television sets; radios; hi-fi; videos; tape heads and microphones; loudspeakers and headphones; whilst the penultimate listing covers practically anything else and must therefore include such equipment as aerial amplifiers, video games, equalisation equipment, effects units, video cameras, etc. And although not specifically included, BSI are in practice including computers intended for the domestic market, in the absence of a specific applicable standard, although larger computers come within the scope of the office equipment standards.

The key word in all these regulations is the term 'household' and it is the interpretation of this expression that must govern the extent to which the Standard is applicable to equipment intended solely or primarily for professional use. The Standard itself provides some guidance by the inclusion of the following statement in sub-section 1.1:

> 'In the absence of an appropriate standard for professional apparatus likely to be used by laymen, this standard may be used in so far as it is applicable.'

This does shed a glimmer of light on the matter, but goes nowhere near far enough, so the author approached the Technical Officer at BSI who is secretary to BSI Technical Committee EEL/25/2—the committee responsible for the preparation of BS415—to seek clarification on the point of what is, and what is not, household or professional equipment. And in due course, back came a most il-

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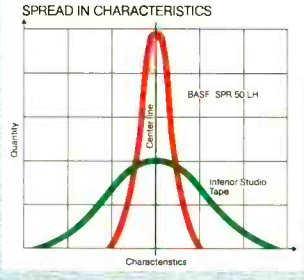

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Electrical safety

luminating response and some encouragingly positive guidance.

Firstly, it would seem that the term 'household' is used by international agreement in preference to 'domestic' to avoid confusion with the use of that term to mean 'of the home country'. Secondly, the Technical Officer would seem to be in agreement that further clarification is needed, for the reply agrees that the 'Scope' section of the Standard is:

> '...somewhat ambiguous as there are no definitions of the terms "household", "professional" and "layman" and the words "and similar general use" add a further uncertainty'.

However, the letter specifically states that the Standard is *not* intended to cover '...professional equipment operated by technically qualified staff...' and would therefore exclude most types of equipment likely to be found in a professional recording studio or in use at a professionally staffed stage show. Nevertheless, it would seem that BS415 *is* increasingly being quoted in tenders and contracts for professional equipment in the absence of any other suitable standard. In interpreting the clause 'professional equipment likely to be operated by laymen', the deciding factor is apparently, the way in which the product is offered for sale. If it is readily available to the general public (presumably by the over-the-counter purchase at a retail establishment), then '...BS415 would be expected to apply'. However, it apparently would not cover '...professional equipment used by non-technical people which is subject to conditions more severe than would be expected in the home, for example, amplifiers used by professional musicians'. Meaning in that particular instance, presumably, that the Standard is insufficiently stringent to cover the more arduous usage.

Vague though the foregoing may be, there are probably sufficient clues, if used in the context of the Regulations, to form the basis of an intelligent assessment of what is and what is not likely to be required to comply. The following may help.

Some guidance

To start with some obvious examples, it will be apparent that almost any type of turntable assembly or the individual component parts thereof, and any type of professional quality cassette tape recorder is just as likely to be sold for 'household' use as it is to a studio or other professional user, so clearly, these items should comply with the Standard. Equally, reel-to-reel tape recorders, up to and including it is suggested, machines like the Revox *B77* range and its commercial counterparts, along with various 4- and 8-track machines currently popular for home studio set-ups, are likely to be sold for 'household' use and therefore would be required to comply, whereas the Revox *PR99* for example, and any console mounted tape recorder would be classed as 'professional' and would probably come outside the scope of the Standard. Possibly, the Uher range of reel-to-reel portables should comply, whilst something like a Stellavox or Nagra probably need not, as these are not generally available for over-the-counter purchase, and in any event, it is highly unlikely that any other than a professional user with a genuine requirement for the particular performance capabilities of the latter machines, would pay those prices for a portable tape recorder.

So as far as these types of equipment are concerned, there should not be too much difficulty in coming to a sensible decision by the application of the spirit as well as the word of the Standard. However, something like a mixing console is not so easily defined. Accepted, it is highly unlikely that a large studio or live sound console would be sold over-the-counter for 'household' use, but a small 6/2 or 8/4 might very well be. But is a non-professional user likely to pay £700/£2,000 for something like an Alice *828* or *2000* series, the Satt *SAM/82* or one of the little Audio Developments mixers to give just a few examples? Probably not, but where, and on what criteria does one draw the line?

Power amplifiers represent another problem area, but one which—it is suggested—can probably be resolved in another way. High power amplifiers intended for professional use are without doubt sold over-the-counter to non-professional users for use in elaborate home hi-fi set-ups and by part-time musicians and DJs, and any product that is so marketed will be required to comply. However, it is suggested that the majority of professional type power amplifiers currently available which are rated at more than 150 W/4 Ω are unlikely to comply with the requirements of

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clause 9.1.1 of the Standard in respect of the existence of a 'live terminal contact' at the loudspeaker output connector, as the male *XLR/3* or insulated binding post terminals fitted to most such amplifiers will not meet the 'standard finger test' and will therefore constitute an 'accessible live part' within the terms of the Standard. (This particular area will be discussed by the same author in a future issue of *Studio Sound*.)

However, it would seem that where poor amplifiers—and/or any other items of equipment for that matter—are housed in equipment racks, and the equipment or system is supplied already racked and interconnected by a turnkey contractor, then it is the entire rack which is required to comply, as in the terms of the Standard and the Regulations, the complete assembled rack will comprise a single item of equipment. The various references in the Standard to equipment covers, specifically give that provided the equipment covers are not removable *by hand* and that the design of the covers is such that the required degree of protection is afforded (in other words, that all the rack accommodation is taken up or blanked off, that rear covers are fitted and that the design of the rack meets the requirements of the Standard) then the complete rack will become subject to the Standard rather than the component equipments. This aspect is further qualified in paragraph 7 of the Regulations which states that:

> 'In the case of equipment which has a mass exceeding 40 kg and which when in use normally stands on the floor, a part shall be treated for the purposes of (the) Regulations . . . as not being capable of being touched by hand, or with a finger, without something first being done which requires the use of tools, if that part can only be so touched from underneath the equipment and by tilting it.'

This regulation is obviously intended to cover washing machines, refrigerators, and similar domestic appliances, but is nevertheless clearly applicable to the situation here being considered. This particular aspect is likely to be an important consideration as regards turnkey sound systems provided in schools, colleges, clubs, theatres, public halls, industrial and commercial premises, etc, where there is every likelihood of the equipment being operated by non-technically qualified users.

Summary

It is unlikely that an action would be taken against any equipment manufacturer or supplier unless or until an accident occurs, even though the Consumer Protection Act 1961 prohibits the sale and possession for sale of goods which do not comply with the requirements of the Regulations. However, should an investigation reveal that an accident could in any way be attributable to an equipment malfunction or design shortcoming, then proceedings could very well be instituted against the supplier and/or manufacturer under the Act. The responsibility will then lie with the supplier and/or manufacturer to show that either the equipment does comply with the requirements of the Regulations or that it is outside the scope of the Regulations and therefore is not required to comply.

Compliance with BS415 is one way an equipment manufacturer or supplier can be sure of meeting the requirements of the Regulations as far as equipment falling within its scope is concerned, and will at least show good intent if not absolute compliance in respect of equipment that may not strictly speaking, fall within its scope as the nearest applicable recognised Standard.

BS415 itself is not an instrument at law and compliance is not mandatory. However, the Electrical Equipment (Safety) Regulations, 1975 and the Electrical Equipment (Safety) (Amendment) Regulations, 1976 are the law of the land and are enforceable as such under the Consumer Protection Act, 1961. Enforcement is the responsibility of the local Trading Standards Office or Consumer Protection Department who can be expected to take advice and guidance from the Electrical Advisor to the Board of Trade. The final decision is a matter for the courts.

In this first part of this article, the aim has been to trace a reasonably definable path through the jungle of legislative controls that seem to surround this subject, and to attempt to provide at least some basic guidance as to the extent and scope of the requirements. However, the author is not qualified in law and the treatment of the subject has in any event, had to be generalised over a very broad base. Should further information be required, it is recommended that copies of the various documents herein referred to be obtained, and further, the Department of Trade maintains an advisory service on the application of the Regulations whilst the British Standards Institute are usually prepared to advise on the application of their standards. The relevant addresses will be given at the end of the second instalment.

Part two, which will follow shortly will consider some of the particular requirements of BS415 in relation to the types of equipment likely to be used in professional audio and the extent to which a random selection of such equipment imported into the UK is likely to comply—irrespective of whether or not the samples selected come strictly within the scope of the Standard. ■

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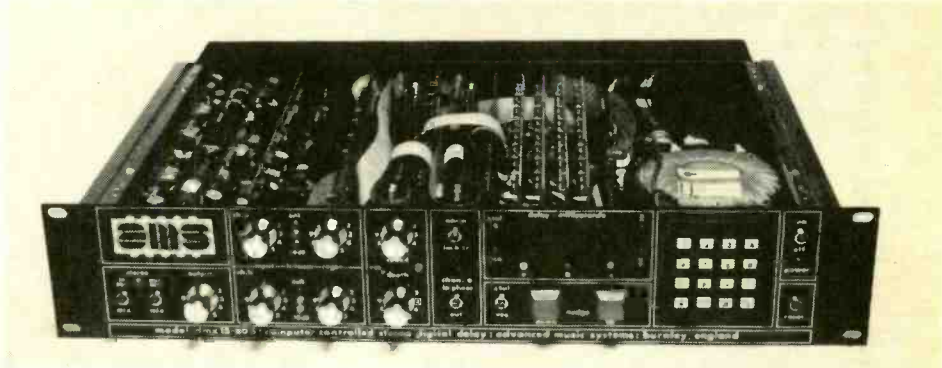
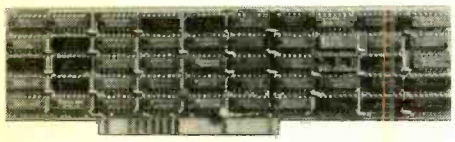
October, 1983, Number 2

ECHO TIMES

THE NEW A.M.S. DE-GLITCH MODULE



Since its introduction, the Advanced Music Systems pitch changer has been considered by many as the quietest and highest quality system available. Even when others described systems as "glitch free" or introduced circuit cards to de-glitch existing pitch changing systems, it seemed that people still preferred the A.M.S. system. Although no pitch changer can be totally glitch free, efforts have been continuing over the past 2 years at A.M.S. to provide a significant improvement to the quality of pitch changed material whether it be a couple of percent either side of unity or a full octave above or below.



The result of these efforts is now commercially available in the form of the A.M.S. de-glitch card as pictured above. The card itself can be installed in any DMX 15-80 or DMX 15-80S system which contains or has been updated to two pitch change modules. It employs a new, even more advanced pitch changing algorithm capable of analysing the incoming audio waveform and automatically adjusting itself to optimise performance according to pitch ratio selected.

The algorithms are implemented by a 10MHz, 16 bit microprocessor coupled with discrete specialised circuitry. The 8.8" by 2.2" de-glitch card is made up of 50 integrated circuits offering a remarkable packing density of almost 2.6 IC's per square inch. The new de-glitch card also now allows a host of new features on the very popular Loop Editing System (LES) employed in DMX 15-80 and 15-80S units. Firstly, when forming a loop, automatic optimising of selected start and finish points is available. This depends on whether "one-shot" triggering by key depression/audio input or looping is selected and it reduces trigger-to-output delay to virtually zero whilst maintaining best loop splice performance.

The new card also makes it possible for "electronic reel rocking" using the DDL's nudge controls – speeding up and increasing the accuracy of finding desired points in the loop.

Previously, DMX 15-80S systems when placed in "LOCK-IN" to generate loops only offered LES on channel A of the stereo unit and because of the internal structure of the system, channel B was rendered inoperative. With the new card, an exciting new facility is now available which frees channel B but automatically adjusts the pitch ratio on that channel such that any information given "electronic vari-speed" on channel A can be automatically pitch corrected on channel B. Hence, if a loop on channel A is speeded up to twice the sampled speed, then channel B pitch changer will automatically have dropped a full octave to maintain pitch of the sampled loop from channel A.

The processing power of the DMX range of units is staggering and as over the past 4 or 5 years these new developments by no means represent an end to the work that continues on these systems. In fact, further updates to these very new improvements are under way at present and may well be available at the New York AES this October.

For the technical minded amongst you, a typical DMX 15-80S system contains:

2 10MHz 16 bit microcomputers.
1 8085 supervising micro with non-volatile storage.
1 Discrete high speed arithmetic processor.
Up to 1.5 Megabytes of optional directly addressable storage. ■

NEW PROGRAMS AND MEMORY EXTENSION AVAILABLE FOR RMX 16

Existing users of the RMX 16 will know that the DELAY program allows a delay of up to 810ms. at 18kHz bandwidth and 90dB dynamic range programmable in lms. steps. This program was released as a mono in single channel out program. A memory extension is now available for the RMX 16 increasing the maximum delay to 1620ms. again at full bandwidth.

New software for the RMX 16 is now available and the DELAY program has been altered and is now known as the ECHO program. With the new Echo program it is possible to program different amounts of delay for each output of the RMX 16 as well as programming different amounts of low or high frequency boost or cut to any regenerated signal.

This new software version is REV.2.1 and as well as the echo program A.M.S. have introduced a CHORUS program and provided different versions of the NONLIN and REVERSE programs. ■

A/V SYNC REMOTE NOW AVAILABLE

A remote terminal corresponding exactly to the A/V SYNC front panel is now available and interfaces to all systems already in the field. The remote has been introduced to ease the dilemma as to whether the A/V SYNC should be in a video or an audio bay. Now the chassis can be located in one bay and the remote in another. ■

A.P.R.S. EXHIBITION JUNE 83

A.M.S. were very pleased to be visited during the exhibition by several very distinguished members of the industry. Pictured below is Mr. Stuart Nevison of A.M.S. with Rupert Hine producer/musician. Mr. Hine's thoughts on A.M.S. are made

quite clear under the "People in the know" section below. Also pictured *(right)* is John Entwistle of The Who with colleagues Cy Langston and Keith Smith. John Entwistle owns a DMX 15-80S with 3.2 seconds of delay and two pitch changers and he dropped in to order a de-glitch module for it. Finally caught on film at the A.M.S. booth were Hugh Padgem, Alan Parsons and colleague. Hugh's work includes albums for The Police, Genesis, Phil Collins and Split Enz.

In fact Hugh had just popped in to say goodbye before disappearing off to Australia where he would doubtless be overworking various pieces of A.M.S. gear on the new Split Enz Album. Alan Parsons work at Abbey Road is well known whether it be for others or for his own "Projects". Abbey Road already own a DMX 15-80S with 6.8 seconds of delay and pitch change capability and just after the exhibition A.M.S. received an order for two further DMX 15-80S units with 3.2 seconds of delay, dual pitch changers and de-glitch cards for each.

A great deal of interest was generated by the A.M.S. stand at this year's APRS. Manufacturers of audio processing systems usually have no difficulty in drawing attendees to their stands to witness first hand the weird and wonderful effects that can be generated on their latest "toys". Earlier in the year A.M.S. acquired on of the J37 Studer multitrack machines that had been used on the 1960's Beatles sessions. The machine came from EMI Abbey Road and also with the machine came copies of the original Beatles master tapes for both the Revolver and Sergeant Pepper albums. The idea of getting hold of this machine and the early Beatle material was to provide certain tracks at an exhibition and allow anyone who wished the possibility to add A.M.S. processing to what on whole were very dry tracks by today's standards. This meant that stereo pitch changing as well as reverberation could be added by means of the DMX 15-80S and the RMX 16. The result was a total success,

the most popular track being the Paul McCartney vocal from "Here, there and everywhere" from the Revolver album.

The demonstration was made even more interesting by using a cue track to provide automatic selection and adjustment of the RMX 16 programs and user selectable parameters. So, should the visitor not feel the desire to mix in the effects himself the demonstration would automatically continue, inserting the settings A.M.S. felt would please. This element of the demonstration alone generated many interesting comments with the obvious advantages this could have during computer mixing and work is already underway to make this facility generally available

Also of interest on the stand was the DMX 16E digital editer/sampling system which captured the imagination of both musician/producers as well as broadcasters. With a full bandwidth memory in excess of two and a half hours, the interest generated at the APRS has meant that we will be hearing a lot more of this system in these pages in the future.

PEOPLE IN THE KNOW

Chas de Whalley interviewing Rupert Hine in 'International Musician & Recording Word".

R.H.: Everything is part of one long chain. It's auxiliary gear readily available in a studio which makes the place for me. And it can make or break the finished record too.

C.d.W.: *Once on the subject of outboard equipment Rupert Hine begins to sound like an A.M.S. salesman because he almost dotes on the stuff. Their Tape Phase Simulator, their Digital Reverberation Unit and their Digital Delay Line all come in for resounding praise, not just for their sound and their versatility but for their compact size and the high quality of workmanship. Farmyard Studios is apparently completely up-to-date on the A.M.S. line. Even down to the latest software cards which offer up to a one and a half second delay in the DDL. And without which Rupert Hine will simply refuse to work.*

R.H.: It's so useful – I suppose it's become almost second nature to me. The DDL offers you so much variety and flexibility. It only takes a little thought and you can find thousands of ways to use it – quite apart from the usual echoes and chorus effects. I use it for drums all the time. It has the facility to store up real sound in its memory which you can then recall at will, either by pressing a button or else using a signal voltage as a trigger. That's the ideal way to convert Linn drum patterns back into a real drum sound you've recorded yourself. Or else you can record yourself slapping out a rhythm on your knees and use that to trigger the real drum sounds in the A.M.S. It's wonderful.

David Hewitt talking about Glyn Johns mixing of The Who's farewell concert at Toronto's Maple Leaf Stadium. (Recording Engineer/Producer).

"Johns used very little processing equipment in his mix, it was all in the miking. The only piece of outboard gear called in being an A.M.S. stereo digital delay line . . ."

Bruce Swedien on engineering Michael Jackson's Thriller album. (Pro Sound News).

"I use a lot of special effects, one of the primary amongst them is the A.M.S. digital delay . . ."

Robert Palmer talking about the audio trigger on the DMX 15-80S Loop Editing System. (The Guardian)

"I listen to music by the sea and I had this fantasy of using a wave sound as percussion, so I found a device for trapping the sound and playing it back. To get the perfect wave sound I got one from a sound effects record, slowed it down and mixed it with a firework. To trigger it off I made a device with a contact mike on a ping-pong bat that went off whenever I hit it with a dart. It was a way of getting the right result and also having a lot of fun . . ." ■

INTERVIEWS

As in the first edition of E.T. we include here short chats with a couple of owners of A.M.S. systems. In this edition we spoke to Dave Harries and Malcolm Atkin of Air Studios and Andy Hilton of Hilton Sound.

AIR CUTS Air Studios London/Montserrat

Air studios is one of those places where hundreds of classic records have been made and hundreds more seem likely to be made. Even from the early days of A.M.S. the bookings board in the studio lobby boasted such names as Roxy Music, Elkie Brooks, Frank Zappa, Blondie, Adam Ant, Japan, Paul McCartney, Kate Bush, Duran Duran, Human League and many many more that we didn't see. Even more impressive for A.M.S. was that Air were one of the first London studios to purchase A.M.S. units.

Dave Harries worked at EMI Studios Abbey Road before joining George Martin at Air in 1970. He followed Keith Slaughter as manager of Air in 1973 and in 1978 he built the Montserrat Studios with George Martin. Malcolm Atkin is chief engineer at Air. He previously worked for the Pye mobile whose last gig before being sold to the Manor was in fact for Air.

D.H. I remember our first meeting at Air – we were in studio 3 at the time and you had just come down to London for a couple of days. I think you had sold the first DM 2-20 flanger to Strawberry Studios up in Stockport and this was your first visit to a London studio. We liked it and decided to buy one. After we had used it for a couple of months we found engineers fighting over it and so decided to buy three more – one for each studio.
A.M.S.: I certainly remember that and I also remember the comments from certain members of the Air staff which were along the lines of – "you'll be able to work full time now. . .!" – which I suppose was justified as our full time employer was still with Lucas Aerospace at that time!

D.H.: When was that? 1973?
A.M.S.: Late 1977
D.H.: No! Was it only so long ago?
M.A: I tell you what I remember as being a breath of fresh air – when you came into Air with the first prototype A.M.S. DDL. It didn't hiss nor did it have the horrible metallic sound of the other earlier units that engineers were being forced to use. We really jumped on that one and no one was surprised when we ended up having to buy one for each studio.
D.H.: We did better than that because we ended up with three units out at Montserrat as well.
M.A.: I think the thing that has always impressed me about A.M.S. is the forethought that went into those early units that has allowed them over the years to have new bits of hardware and software added to them. The newest and most exciting addition is the Loop Editing System. People don't ask for an A.M.S. now – they ask for an A.M.S. Loop Editor. What we have seen a lot of people do now is to use a noise gate in conjunction with the loop editor so that if the unit is being triggered by a real sound, the level of the output from the A.M.S. is controlled by the level of the real sound input. This gives any triggered sounds an added realism and certain producers love that. We even had to send out extra delay cards to Montserrat for Duran Duran who wanted to expand the Loop for some special effects.
D.H.: Yes and everyone does ask for them – There are an increasing number of engineer/producers in London who carry their own A.M.S. equipment around with them. Chris Hughes has worked here on all sorts of things from Adam Ant to Tears for Fears and he supplements our units with his own. Paul McCartney has just finished his latest album here and I have a photo of the control room and there are 6 A.M.S. DMX DDL's piled on top of one another. George Martin used them for just about everything.
M.A.: Greg Walsh is another of those producers who knows his A.M.S. units inside out – I noticed that when he was working on the Heaven 17 material.
D.H.: A.M.S. is the only standard outboard equipment we have in Air apart from an Eventide Harmonizer in each studio.
M.A.: That is true, but that was only because the A.M.S. pitch changer was not available at the time. We did hold out as long as we could but we were spending so much on renting Harmonizers in that we couldn't afford not to buy the Eventides. The A.M.S. units are very reliable, we have had the odd problem but certainly nothing to speak of. Considering the number of units we have and the length of time we have owned most of them it is very fair to say we are delighted with the reliability they have shown.
A.M.S.: Have either of you got a most memorable day at the studios?
D.H.: The funniest was when we learnt the Sex Pistols were coming in to record for about a month. We had letters from the building manager who was concerned about their reputation and obviously keen to establish that we'd be responsible for them.
They were as good as gold! The only slight concern I had was one day when Johnny Rotten and Sid Vicious managed to climb out through one of the windows in Studio Two on to a 12" ledge that is about 80 feet above Oxford Circus. They then disappeared off round the building and the next thing I knew about it was complaints from Studio Four where they were banging on the control room window and pulling faces at the Ozark Mountain Dare Devils preventing them from getting on with their recording. We had a feud on our hands from then on!
M.A.: I think the funny things I like relate to filming that has been going on recently for the new McCartney movie. Filming is a completely different game and the amount of money involved just gets into telephone numbers. Shooting was going on at Elstree and Geoff Emerick had been using an RE 20 mike on a McCartney vocal – the next time they got round to the scene it was decided that the RE 20 was not the sound they wanted. So now there was a problem with continuity and what should they do? Simple, the RE 20 is a massive dynamic mic and so they ripped the guts out of it and stuck a Shure mic inside.
Of course that means at the end of the week I get a bag of bits back.
To be fair though I sent it back to Shuttle Sound and it came back completely as new – they didn't charge us and they even phoned up and apologised for having it too long. You wouldn't have believed it possible if you had seen this bag of bits! Another nice "continuity" story is when the McCartney filming was going on at Air. One of our engineers went into the studio where filming had just finished to continue the job of removing an A.M.S. unit from the rack for use in another studio. He must have tried to do it earlier in the day and been told he couldn't for continuity reasons. But, he did forget his screwdriver which he left on the top of the console! So that day when shooting had finished he went back into the control room – couldn't find his screwdriver – but then took the A.M.S. out of the rack. When the filming eventually returned to Air the A.M.S. was still being used in some other studio so the film crew had to rent a unit for about a week to maintain continuity! What was also nice was that when they finally pulled out with all the footage they needed at Air – our engineer's screwdriver miraculously reappeared on top of the console where it had

originally disappeared from!
D.H.: Well, now we have the new Solid State Logic console installed and that room was used this week for the first time. That unbolting of the A.M.S. reverb from the rack Malcolm was just on about reminds me it is probably about time we had 2 more RMX 16's – so you'd better tell me what delivery time is on them!

THE HILTON DIARIES

It almost seems as if every month now sees the introduction of a "new" piece of digital audio processing equipment. Prices can range from a couple of hundred pounds to in excess of 10,000.00 pounds. Whatever the price, investment in such devices often makes it difficult to get a true reflection from owners as to whether or not, after a unit has been in service for a couple of months, the purchaser still feels he has made the correct choice. One group of people make their living by ensuring they do make the correct choice when purchasing effects units – the rental companies. A.M.S. have long used this yardstick as an unbiased reflection of what the end user wants and needs. The following interview is with one of the U.K.'s leading rental companies, Andy Hilton's 'Hilton Sound'.

Andy Hilton was a computer programmer for his father before starting a maths and computing course at Manchester University. He left mid-course to roady for Supertramp before getting involved in engineering for Gallagher and Lyle. When the band wasn't touring Andy worked with the P.A. when it was rented out to other bands. When life on the road got to be too much, Andy ended up being the first house engineer at Virgin's "The Venue".

A.M.S.: So how did Hilton Sound start?
A.H.: A loan of three hundred pounds from my father! Whilst working as the house engineer at the Venue I was amazed at how often, usually at the last minute, I was asked to get my hands on a Roland Chorus Echo – so I bought one myself and rented it to whoever needed it. With the advent of the Lexicon reverb system, Barbara Jeffries (at that time the manager of the Manor, Town House and The Venue) suggested I buy one and make that available in a similar way to the Chorus Echo.
A.M.S.: And was your company's growth pretty rapid from then?
A.H.: It certainly was. People went mad for the Lexicon 224 – I really just could not get enough of them. I ended up with 7 of them and they were all permanently out on rental! Renting is a strange business – whenever something surfaces that is new, everybody wants to rent it immediately to be the first with a record out with new "never heard before" effects on. It was very good for me that interest in the 224 was sustained – the 224X hasn't followed in those footsteps, I have 3 of them – they rent well but they haven't generated as much interest as the 224 did. The 224X does a lot of "fun sounds" but I feel sure people find that it is much more difficult to use than the 224.

There are always new and fashionable units coming along, interest usually being generated by a good demonstration at an industry exhibition or convention. For instance the German Quantec digital reverb or the French Publison pitch changer. They are good units but it is an indefinable thing as to what makes a system a lasting success. Take the Quantec, I had the first rental unit in the U.K. When I got it I saw almost from the beginning that it would be a specialist unit with a healthy but limited amount of users. How you put your finger on the things that people want to use for a long time is a very difficult formula.
A.M.S.: So what about A.M.S. equipment?
A.H: I now have more A.M.S units than anything else, 6 DMX 15-80S digital delay pitch changers and 6 RMX-16 reverbs and I still need more! People have been as mad on A.M.S. units now for the past twelve months as they ever were in the early days of Lexicon. What also amazes me about A.M.S. is your pitch changers and reverbs are everywhere – from a rental point of view I kept expecting business to fall off, but it seems the more units there are around the more people realise how good they are and the more they seem to want to rent. What's really keeping A.M.S. the leader in the field is the continual increase in new pieces of hardware and software for existing units. That and of course the inherent quality of the basic functions of the units – just using small amounts of delay on the 15-80S gives the best stereo chorusing effect I've ever achieved. Add to that the possibility of dual pitch changers, lock-in and the audio trigger and it is easy to see why people are so enthusiastic.
A.M.S.: So A.M.S. rentals are a significant part of your business?
A.H.: Oh absolutely! Not only with me but also with all the other major U.K. rental companies where they can represent like myself almost half the business. When I look at the figures it shocks me to see how much business I do with A.M.S. When I buy something I expect to rent the system for a certain number of days per month – with A.M.S. we exceed that by about 60% which is wonderful! The business is very much a supply and demand situation, but sometimes I try and influence clients choices if I feel it's to their advantage. Particularly bands on the road, experience shows they'll be far happier with reliable A.M.S. gear than something that's broken at the end of a taxi ride from me to their rehearsal studio. I do rent to lots of tours and you do have quite a list of satisfied customers. The last Hall and Oates tour took A.M.S. equipment right round the world and used it very effectively throughout the set. Icehouse, Joni Mitchell, Culture Club, Duran Duran, Kajagoogoo and Joan Armatrading have all just done tours with A.M.S. In fact the RMX 16 was the only piece of back line effects equipment that went out with Joan Armatrading. My most recent disappointment was to learn that Showco are knocked out with the RMX 16 and that I won't be able to rent my units to the forthcoming David Bowie tour as he is going to be using theirs!
A.M.S.: So where is it all going to end, Andy?
A.H.: I really don't know – I seem to continuously need more and more A.M.S. units. I find more and more that when I haven't got any A.M.S. units left, neither have Audio Rents, Britannia Row, M.L. Executive or in fact any of the other rental companies. That is probably why I still have systems on order from you!!!

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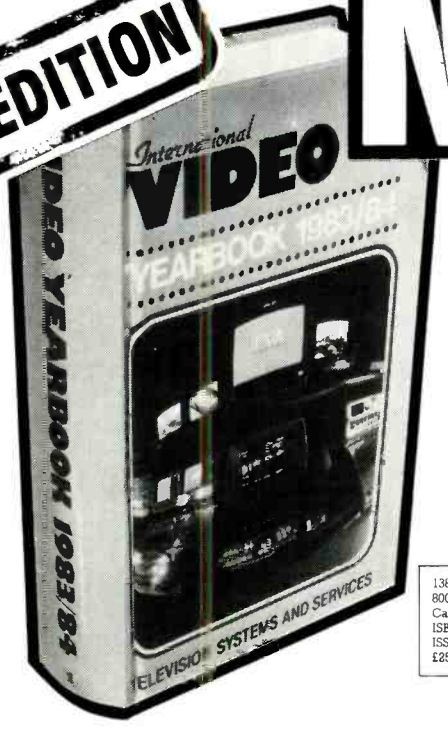

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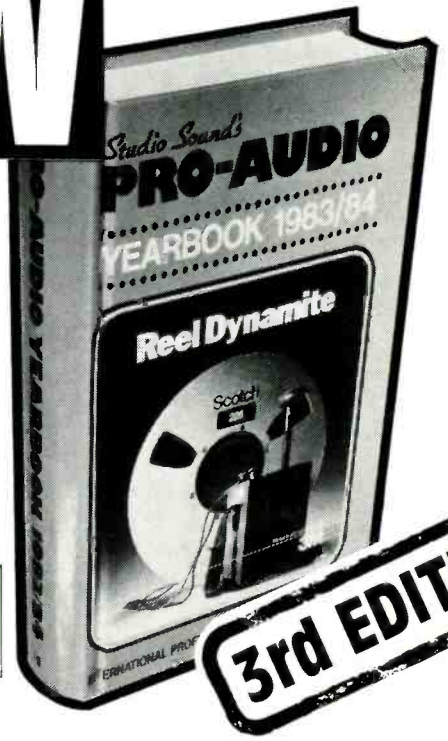

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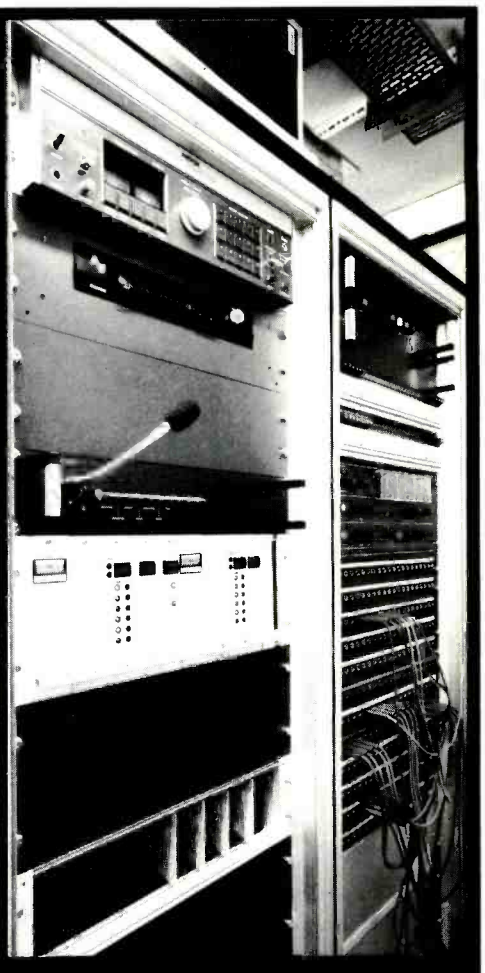

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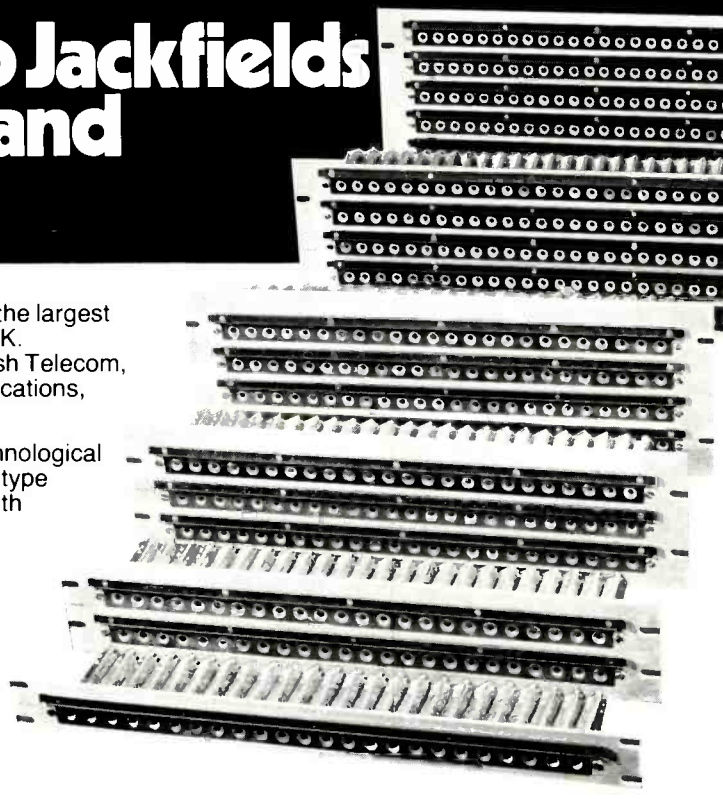

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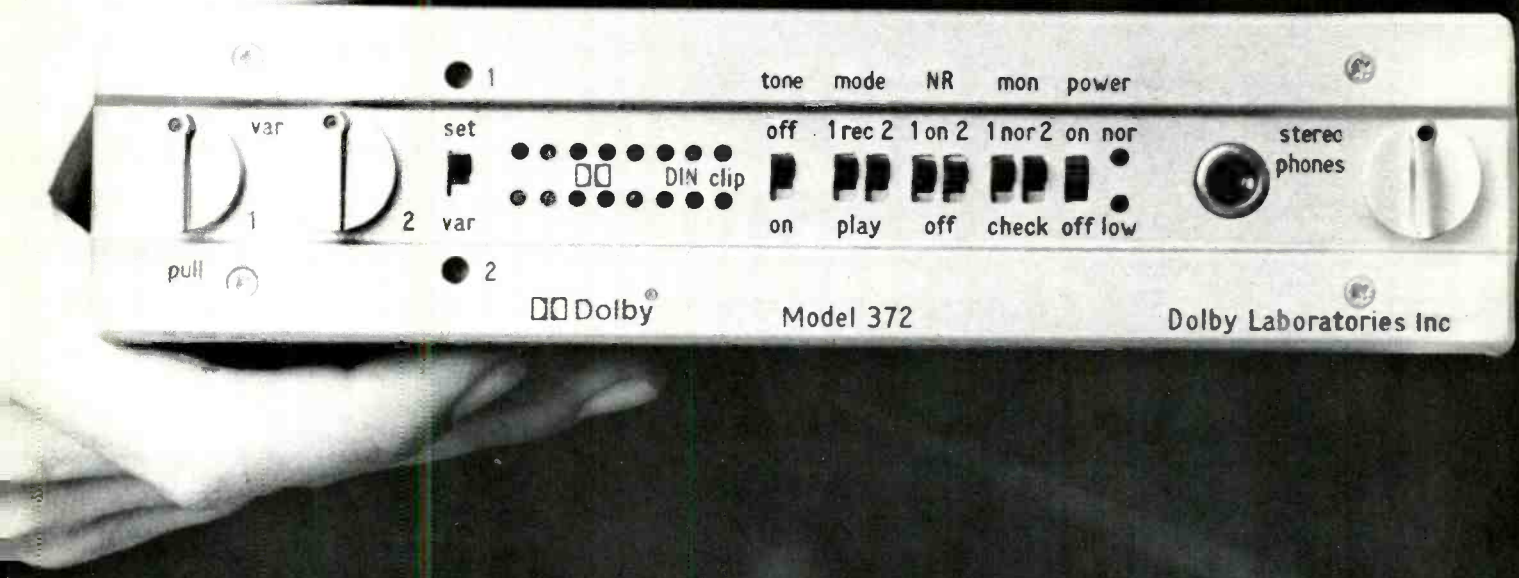

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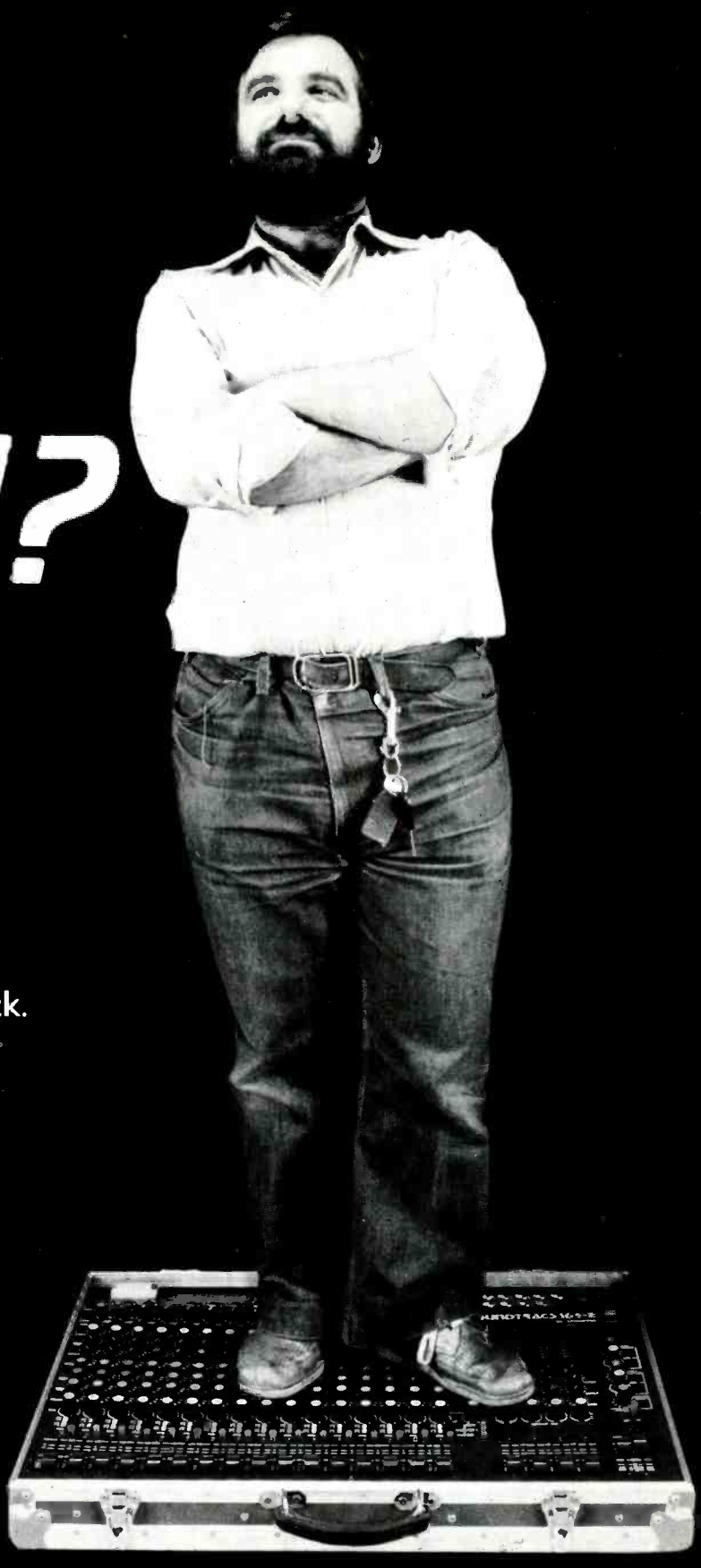

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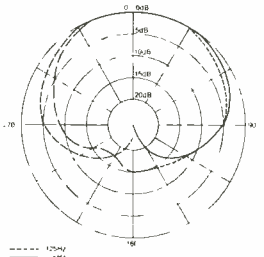

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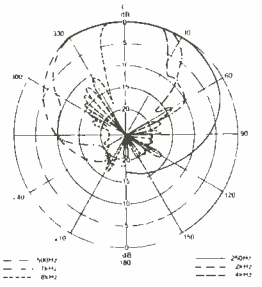

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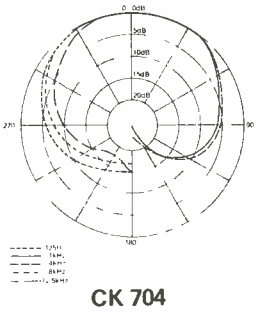

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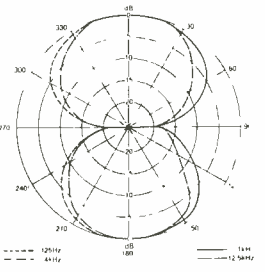

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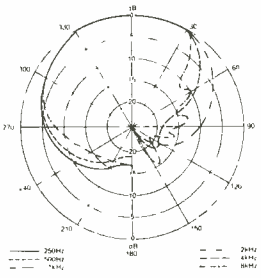

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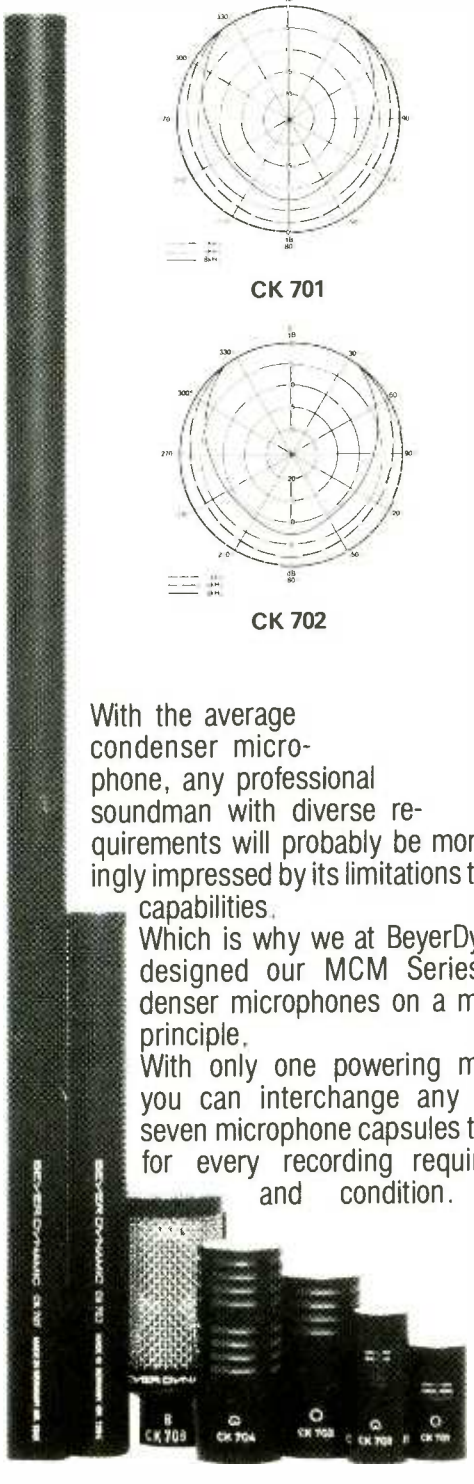

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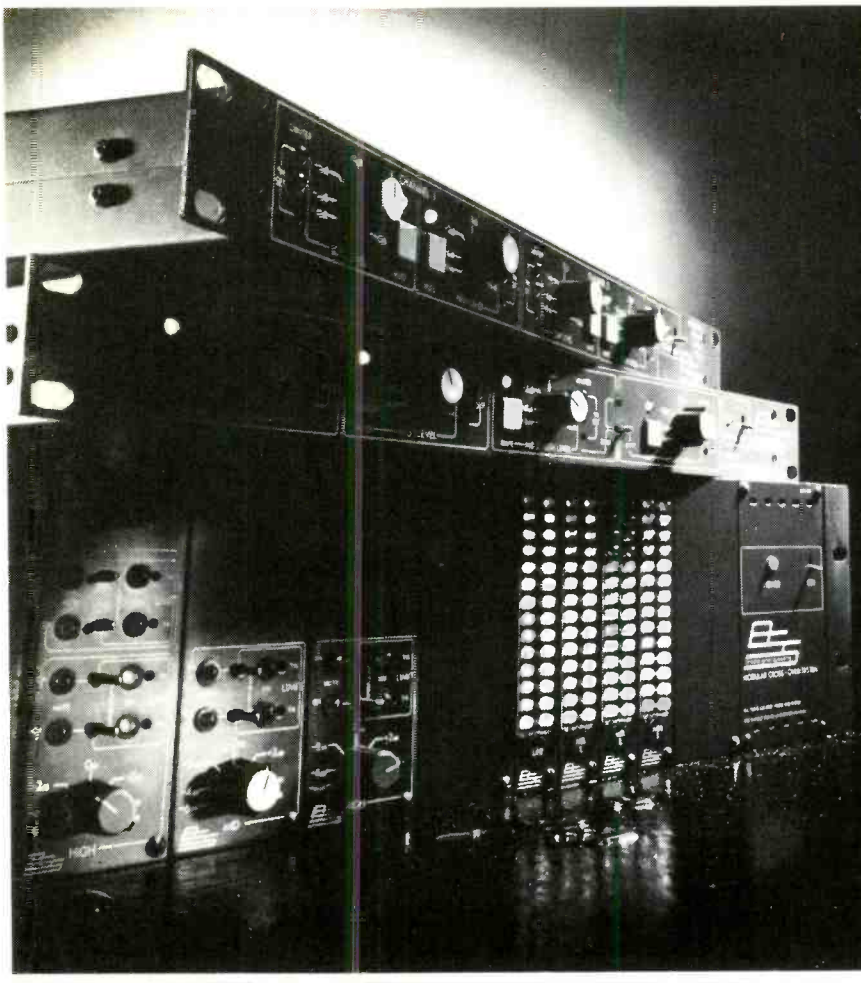

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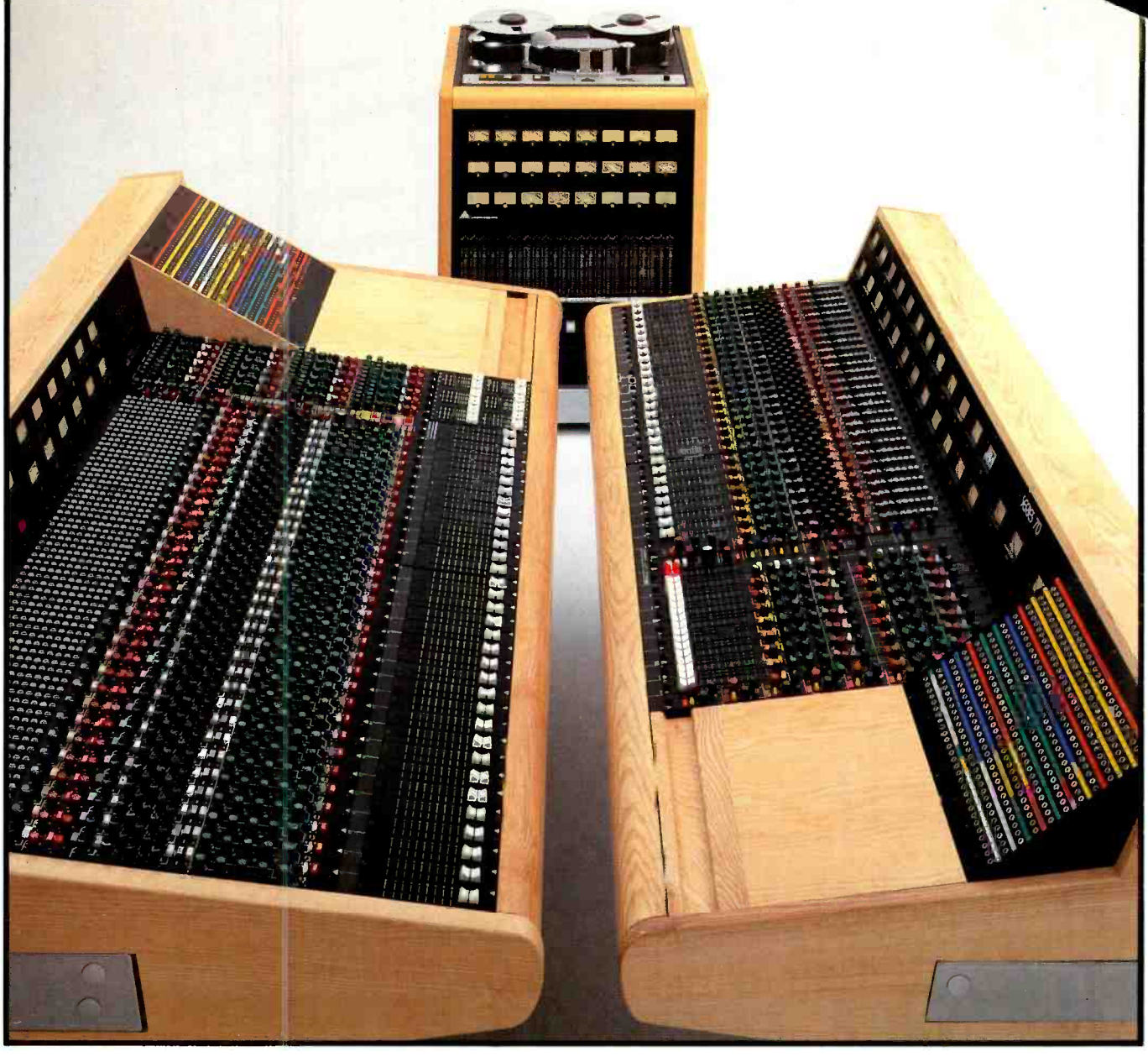
In a word, Trident



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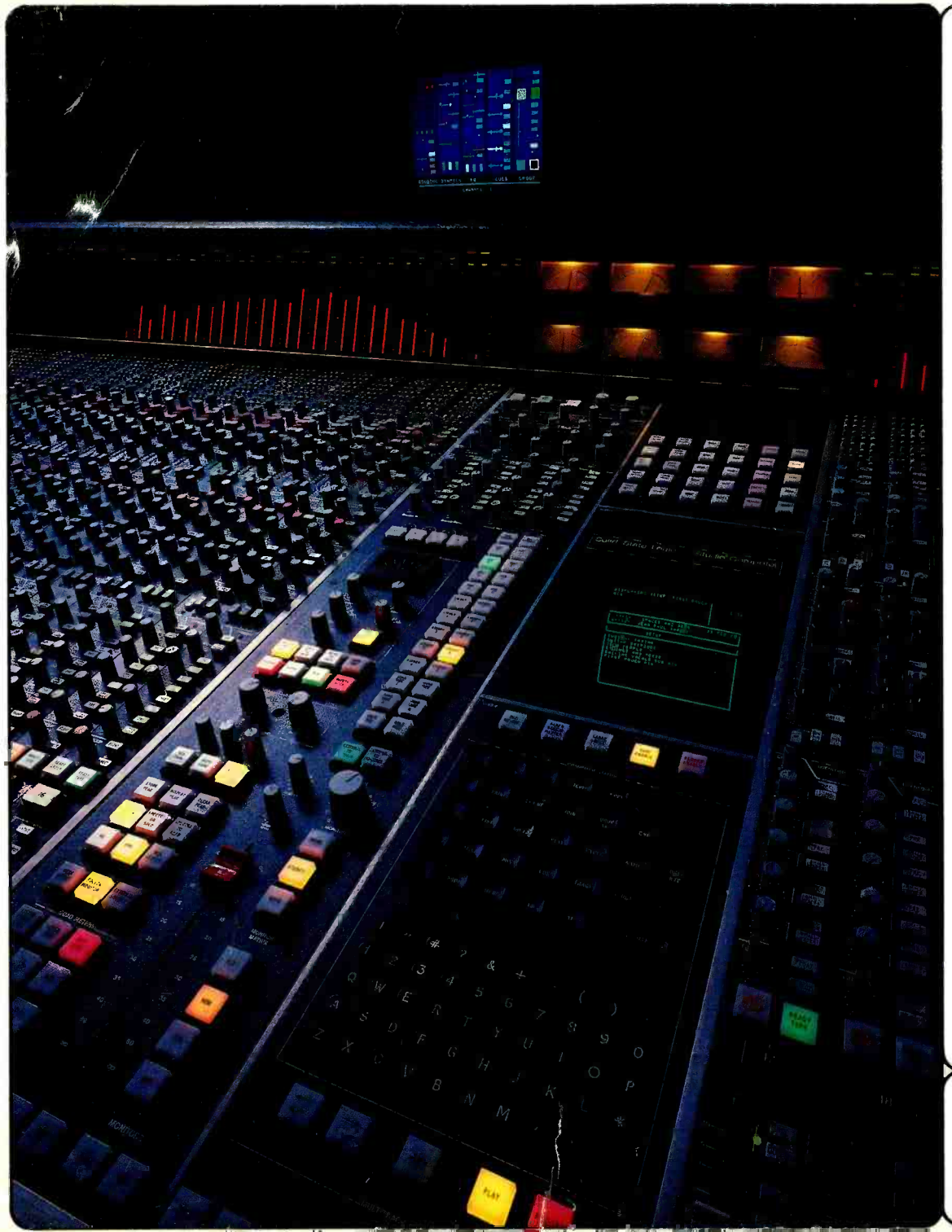

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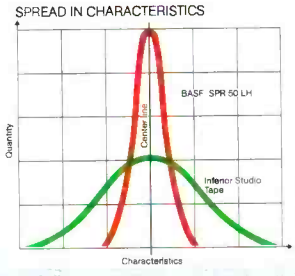

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