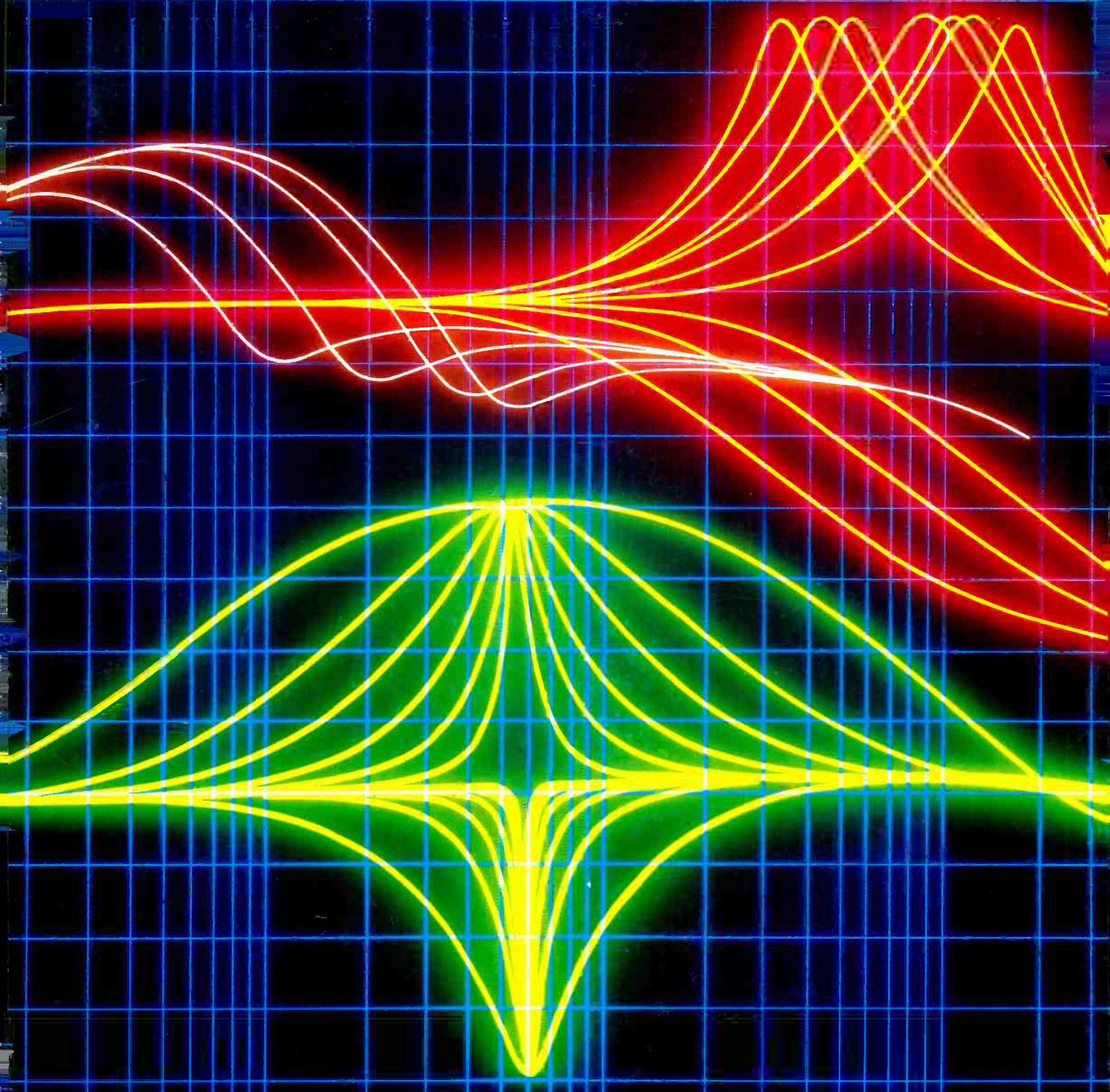
January 1988 $5.00 £2.00

STUDIO SOUND

AND BROADCAST ENGINEERING

A LINK HOUSE PUBLICATION



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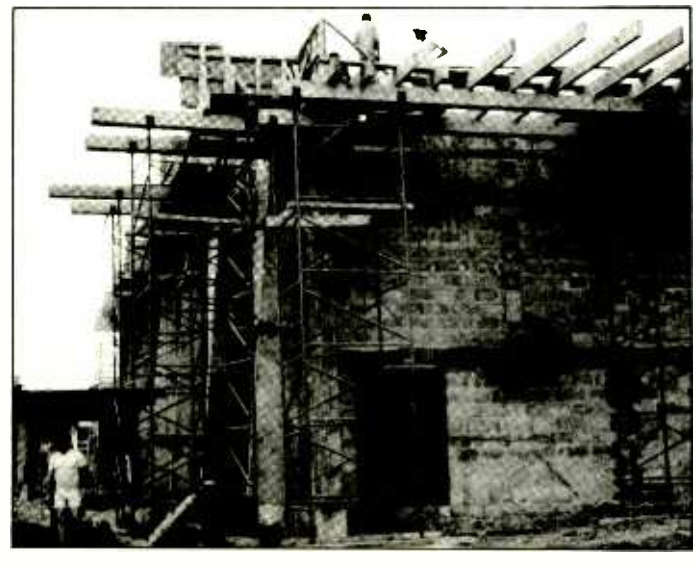

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STUDIO SOUND
AND BROADCAST ENGINEERING

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EDITORIAL

This may be the January issue but, pre-Christmas post permitting, most of you will have received this issue before the end of 1987. So perhaps there's still time to take a retrospective look at some aspects of 1987. I hope that I am not alone in feeling pleased with the progress of the year. There has been a maturing of technology and, perhaps more important, the user's attitude to it—something we mentioned a few months ago when we referred to a period of technological stability.

It has been a very good year for new products and for making many of those seen in previous years actually work. Although I know that contrary opinions have been voiced, I was actually quite surprised how many of the new products shown at the October AES were actually working. Maybe it depends on the degree of cynicism that you exercise in expectation.

To summarise the technology—we have seen a major expansion in disk-based recording systems of all types, from a couple at the start of the year to at least a full half dozen major names (some more working than others) and growing for certain next year. 1987 has also been the year of the optical disc. WORM drives are a reality with delivery of working units from two manufacturers actually possible now and many other companies talking of their uses in the near future.

On the consumer side we have seen CD manufacturing capacities up the point when I have heard it said that there may be an element of overcapacity for the present level of consumer demand. We have also seen CD-V launched—perhaps that will eventually appear in a practical consumer form in '88 with all the demand for closer integration of audio and video to produce the necessary hardware. CD-ROM also keeps raising its head but I have to reserve comment on any progress in that area. The 3 inch CD single is a reality, and unbelievably fiddly it is too, and until dedicated players arrive I think that most will simply pass up the need to battle with adaptors to make the disc work in a standard CD player.

On the console side we have seen new console designs seriously begin to earn their keep; on the analogue audio side we have seen more new analogue tape machines of all sizes than at almost any other time I can remember. Dolby *SR* has undoubtedly changed some minds and *telcom* has also made new friends with some successful major album projects.

Regarding digital, we have seen a practical side—getting down to the business of recording with the realisation that machines of all perspectives are capable of good performance even if they *are* different. Editing and mastering has become easier with more varieties possible. Correct me if I am wrong but has the demand for digital reel-to-reel 2-tracks really happened yet?

There is little doubt that the tail end of '87 is R-DAT time. It hasn't been far out of the news throughout this year, however, in the history of new technology, can there have been a development that has created such hysteria both from the technical press (who ought to know better) and sheer scaremongering irresponsibility from the mainstream press that quite simply did not have a clue what they were writing about. The consequences of this were almost disastrous for us all as pressures built up in the Spring for Copycode and the concept of the redundant slither which hopefully has been seen for what it is (although it is not dead by any means). On the pro side—R-DAT is a reality in London and has been since about July. I can't help but feel it will follow the footsteps of the *PCM-F1* as largely a pro format with only specialist consumer use.

Have we also seen the inevitable on the rights and wrongs of the sampling issue now that writs, etc, are flying about regarding a track released a little earlier this year where the 'creators' have stepped too far beyond a vague line in sampling acceptability? So it would seem that in this particular waiting game we are about to see the inevitable being played out.

As a magazine we look forward to covering the events of 1988 with renewed vigour and we hope that you will join us.

All that remains is for me to wish you, on behalf of all the staff of *Studio Sound*, the compliments of the season and the wish that 1988 may bring you everything that you strive for.

Keith Spencer-Allen

Cover: Equaliser range plots. Photomontage by Roger Phillips

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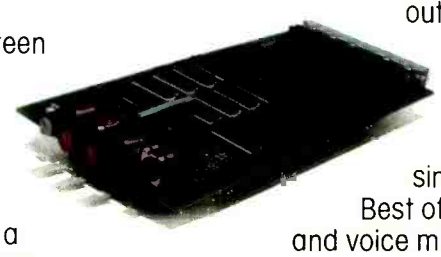
THE F16 DRUM COMPUTER.

F16 Now, through the power of 16 bit digital sampling technology, there is a drum computer capable of reproducing any sound with the clarity and brilliance of a compact disk: sounds so amazingly precise it's shocking.

The F16 provides from one to sixteen modular voices that will alter your percussive perspective forever. Full 16 bit samples with 96 dB of dynamic range. Imagine a crash cymbal sampled at 50 KHz that plays for 6 startling seconds; or a tom that booms for 22 seconds or more.



Each voice has independent tuning, volume and pan controls, and is available through direct outs or the stereo mixer. Mic and line inputs make your sampling easy, and editing commands allow you to trim and move samples at will. Save your sounds on the super fast high capacity floppy disk drive.

Driving the F16 from pads, pre-recorded drum tracks or your drum machine's trigger outs, the response time is a blinding 100 microseconds! It's dynamic sensitive, of course, with MIDI in, out and through.

The F16 is rugged, reliable, and simple to use. And, it sounds incredible. Best of all, prices start at under $2,500 and voice modules are easy to add.

Prepare yourself. Forat Electronics is about to propel you and your music into dimensions of sound that previously existed only in the farthest corners of your imagination.

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Fict

Digital taping may wipe out compact discs

DIGITAL AUDIO TAPES

The tiny challenger

By Chris Rapport in Tokyo and David Thomas in London

Actual size

ICD 06120

Bil

VOLUME 99 NO. 41

Sony's DAT P Raises Ire Of

BY PETER JONES

LONDON Leading members of the European Parliament are expressing deep concern over the decision by Sony to market DAT recorders in Europe later this year.

The officials are stressing the potential damage, as they view it, to the European music industry of widespread use of DAT equipment to copy recordings. Uwe Britti, EMP, James Moorehouse of the European Democrats, says that 400,000 jobs in the industry could be at risk. He is seeking a European Commission statement telling Japan that the launch of DAT in the European Economic Community would "not be tolerated before protection is afforded copyright own-

Fa

From its very conception, Digital Audio Tape has been the subject of hype and controversy.

Much of the hysteria has stemmed from the use in which some consumers may choose to put DAT equipment.

Be that as it may, HHB has always believed that digits point the way forward in both professional and consumer audio.

Quality must always be king.

It is quality that will guarantee a successful future of the music business as well as the studio industry.

Forget the hype. Ignore the controversy. DAT is highly convenient and it works. And it can provide professionals everywhere with the extra quality they seek.

Professional format DAT equipment can record and playback on 48 KHz or 44.1 KHz.

i o n.

Hopes rise of accord on digital audio tape

Japanese likely to launch digital tape despite outcry

BY CARLA RAPOPORT IN TOKYO AND DAVID THOMAS IN LONDON

Don't panic over DAT

Japanese companies ready to sell digital audio tape systems

BY CARLA RAPOPORT IN TOKYO

c t.

It's now available at HHB in the shape of the Sony PCM 2500.

The DTC 1000ES is designed primarily as a domestic device at a domestic price, but we see it as an every-day tool in any professional recording environment.

HHB should know. The company created a massive pro-audio role for the EIAJ digital format.

Of course, both machines are well supported by HHB's legendary expertise and back-up service. That's the special reward for those that choose Europe's leading pro-audio centre for their digital technology.

You've read the fiction and you've got the facts. Now buy the product. There's no turning back.

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TASCAM

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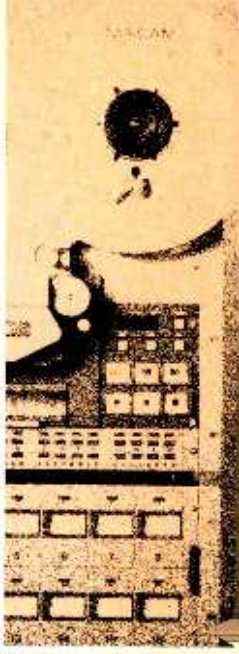

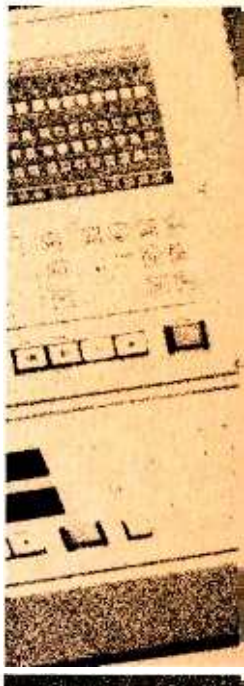

UNIT 2, 12 WILLIAM ROAD, LONDON NW1 3EN. TELEPHONE: 01-387 1262 TELEX: 27939 SCENIC G

NEWS

Ampex renovation

For the past three years, Tony Arnold has committed himself to buying, supplying, repairing and advising on all aspects of Ampex tape machines. Based in Dorset, his company, Arny's Shack, receives orders and phone calls from all over the world. For £15 a call, Tony will listen to descriptions of the symptoms and with mutual reference to certain chapters and pages of the relevant manual will systematically run through the procedures for repair.

Rebuilding and modernising Ampex machines is the core of Tony's work. An updated ATR with new logic boards, says Tony, "outperforms everything, especially with Dolby *SR*. Externally, even the smallest details are modernised. If there is a small scratch in the paintwork, we'll repaint with baked enamel. There is no difference in looks between the original ex-factory machine and one we have modernised."

Arny's Shack employs a resident engineer, with experience in computing and electronic design. Through his efforts, and those of colleague Cyril Selinger of Brambles Enterprises—whose world wide travels and research have resulted in a library of Ampex information—Arny's Shack brings Ampex machines up to 1987 and beyond.

Tony expects to open a showroom in March 1988. Based in a chapel, the whole range of Ampex components will be on show, along with modernised and customised Raindirk mixing desks. But that's not all Arny's Shack deals in. Toolkits—ranging from £100 and supplied in a briefcase to complete workstations with analysers, testing equipment and spares for up to £10,000—are available for absolutely any piece of recording or musical equipment.

Tony debunked a myth surrounding Ampex equipment, "When Ampex sold recorders, they sent letters to all their customers on a regular basis, highlighting all updates and changes to both equipment and manuals. We're trying to continue on that basis, selling equipment and encouraging our customers to keep in touch. Because the Ampex is in fact very reliable."

Arny's Shack, 17 The Cornmarket, Wimborne, Dorset BH21 1JL, UK. Tel: 0202 880749.

Forthcoming events

March 1st to 4th AES 84th Convention. Palais des Congrés, Paris, France.
March 9th to 13th Frankfurt Musik Messe '88, Frankfurt, West Germany.
March 21st to 24th 7th International Conference on Video, Audio and Data Recording, University of York, UK.
March 22nd to 24th Digital Audio Signal Processing, The Institute of Sound and Vibration Research, Southampton University, UK.
March 22nd to 26th 28th USITT (United States Institute for Theatre Technology) Annual Conference and Stage Expo '88, Disneyland Hotel, Anaheim, California, USA.
April 5th to 8th Acoustics '88 University of Cambridge, UK.
April 8th to 12th NAB, Las Vegas, USA.
April 25th to 28th Audio Visual '88 Wembley Exhibition Centre, UK.
May 18th to 20th ShowTech Berlin '88, Berlin Exhibition Grounds/International Congress Centre, Berlin. West Germany.
June 22nd to 24th APRS 88, Olympia 2, London, UK.
September 23rd to 27th International Broadcasting Convention '88, Metropole Conference and Exhibition Centre, Brighton, UK.
September 30th to October 9th BBC Radio Show, Earls Court, London, UK.

1989

April 28th to May 2nd NAB, Las Vegas, USA.

The reviewer reviewed

The first of John Woodgate's reviews for *Studio Sound* appears in this issue. It is planned that this will be one of many technical measurement reports. By way of introduction, John has sent us these few words.

"John Woodgate was educated at Chislehurst and Sidcup Grammar School and Queen Mary College, London, graduating in 1958. He has been interested in electronics from an early age and ran a sound reinforcement business with a friend while still a student. On graduation he joined a company called Kolster-Brandes Ltd and remained with them until 1984, having been in charge of audio products development and subsequently product manager for audio products and video equipment.

"Since 1962 he has taken an active part in work on standards, both nationally in BSI and internationally in IEC. He is currently chairman of BSI committees on audio, video and audiovisual equipment and on radio and television receivers.

"The consultancy J M Woodgate and Associates was set up in 1984, and provides professional advice on electronics design, standards and marketing, together with technical writing and translation services.

"John Woodgate is a chartered engineer, and a member of IEE, AES and ISCE.

"There are many and various ways of reviewing products. It is only fair to readers, and to the manufacturers of the products, for a reviewer to make a statement about his approach to the subject.

"Being deeply involved in IEC standards work, it would be surprising if I did not use those standards for reviewing. Indeed, all measurements will be carried out by IEC standard methods, where they exist, unless there is a good reason to use another method. In this case, full details of the method will be given, so that anyone can check the results, or even criticise the method.

"In many cases I will have the advantage of access to new standards in draft, and will be able to use very up-to-date methods. At the same time, of course, the review tests will act as checks on the practicability of new measurement proposals.

"Many of the measurements will be carried out with aid of a Lindos *LA100* audio analyser. Equipment under test will be operated from a stabilised sinusoidal mains supply. The use of other, specialised test equipment will be noted in the texts.

"Where appropriate, measurements will be supplemented by subjective assessments but not of the golden-eared variety, of course. Rather, the emphasis will be on effects such as hum, for which meaningful measurements are difficult."

McKenzie join Fane

Audio Fidelity, the parent company of Fane Acoustics, have acquired control of McKenzie Acoustics and their product lines. Both companies intend to maintain their separate names, headquarters, product lines and product identities. The main point of the move, according to McKenzie MD Glyn Baxter, is to realise a combination of money and talent with which to spearhead a move into the American market.

People

- Total Audio Concepts have appointed Carl Reavey as product manager, whose responsibilities will include liaising with TAC's dealers worldwide and handling specific product enquiries.
- Elliott Bros have appointed Chris Swift, ex-SSL, as installation engineer. His first project is the Studio T1 installation at BBC Kensington House.
- Interface Technologies Inc of New York, manufacturers of the Stable Cables line of studio cables, snakes and patchbays, have appointed Jim Gillespie as vice-president and national sales manager. Gillespie was formerly with Audiotechniques and Harvey Pro.
- DDA have appointed Joseph Evans to their research and development team.
- HH Electronics have appointed Ashley Mirfin as managing director. Mirfin's background is in telecommunications and he has wide experience in the electronics industry. Additionally, Stuart and Sheila Mercer have become chairman and deputy chairman, respectively.
- AMS Industries have appointed Julie Wood to concentrate on the planning and preparation for trade shows and publicity.

Change of address

- The US operation of Audio Kinetics has moved to Carmel, New York. Headed by John Klett, technical services manager for North America, the full address is: Audio Kinetics, PO Box 1260, Carmel NY 10512. Tel: (914) 225-0380. Fax: (914) 225-0382. Telex: 9102502437.

NEWS

Blank stare from UK Government

The IFPI, BPI and the Music Copyright Reform Group have hit at the British Government on its stance on blank tape levies, following the October publication of the Copyright, Designs and Patents Bill. The Bill makes no change in the present 10% 'tax', after last year's White Paper on Intellectual Property and Innovation suggested having instead a 10% levy that would be distributed directly to copyright owners—in exchange, as it were, for legalised home taping. It was inclusion of this levy proposal that was expected in the Bill.

The harshest words came from the British Phonographic Industry, who called the move: "A stab in the back for the UK record industry, a triumph for short-term political expediency over long-term legal objectives. The decision to leave the law as it stands is an insult to a dynamic British industry." BPI director general John Deacon continued: "The record industry is evidently seen as a public benefactor, a kind of cultural soup kitchen in which everyone may eat irrespective of their needs."

The International Federation of Phonogram and Videogram Producers were not far behind in the anger stakes: "The British Government has made a hasty and unprincipled *volte-face* in deciding to retain the existing law on the home taping of pre-recorded music. The decision of Kenneth Clarke, Minister of Trade and Industry, to scrap the levy shows a total disregard for the interests of copyright owners." The IFPI also used the term 'short-term political expediency', in reference to a general belief among supporters of the levy that Clarke's justification for his decision comes from trying to appease the massive blank tape export industry into the UK. The IFPI's statement went on to describe the tape industry as: "parasitic, without any manufacturing base in Britain, which relies for its profits on the widespread availability of high quality recorded music."

The Music Copyright Reform Group was less harsh but equally dismayed, stating that the reform was regrettably not included in the Bill. After quoting Clarke saying that the Government had come down on the side of the consumer, the group replied: "This ignores the fact that the true interest of the consumers is to ensure fair treatment for those who create the music and other copyright material from which they derive so much pleasure and enjoyment."

Agencies

● DDA have appointed new distributors in Brazil and Italy. In Brazil, Savana Communicacoes Ltd of Rio de Janeiro (tel: 021 274 5009) will handle the equipment, while in Italy, distribution will be split between Professional Equipment of Milan (tel: 02-817-839), who will handle the *AMR24*, and Audio Link of Parma (tel: 0521-598-723), who will handle the *D* and *S* (both PA and Monitor) series.

● API Audio Products of Virginia have announced two new agency appointments. Syco of London will be dealers for the UK and most of Europe, while Milam Audio of Illinois will represent API throughout the middle region of the US, including Nashville.

● The Synthesiser Company (TSC) of London have been appointed an Apple retailer, specialising in the *Macintosh*, and have also become dealers for Akai Digital, E-mu Systems and Roland systems.

● McKenzie Acoustics have appointed Soundside of Sweden to handle Swedish distribution.

Contracts

● Recent orders from DDA. *AMR24*s to INIT Sound Studios in Soumagne, Belgium; Studer Japan for use in the demonstration studio at Akai; Daniel Miller of Mute Records; and Ian Kewley for his private studio in Guernsey. An *S* series PA desk has gone to Central Television, and a confirmed order has come in for the new in-line *DCM232* console from Woodbine Street Studios in Leamington Spa. Group Andre Perry Ltd have also ordered the new console, for use in their Washington DC facility, where work includes mixing audio for film or video, *Synclavier* work, voice-over production, and recording and mixing original scores.

● A Soundcraft *200B* 24-channel desk, supplied by Paul Farrah Sound, was used at the Labour Party's annual Brighton conference at the end of September, with all the on-site reinforcement being handled by MBI of Brighton.

● News from Neve: Decca Records of London, following their 1986 purchase of two custom 16-channel consoles, have ordered two more, based on the Neve *51* series and designed as transportable units for location recording. Central Independent Television in Birmingham have ordered a custom version of the *V* series desk for their new music studio, which will be involved with both multitrack recording and post-production dubbing. Tape One in London have added a *DTC* to their existing inventory of two *DSP*s, to augment their recently purchased AMS *AudioFile* in their digital editing suite. Two *V60* consoles have been installed in the Toshiba/EMI facilities in Japan, and two 96-channel *V* series consoles have been ordered by Sound Sky Studios, also in Japan.

● Allen & Heath Brenell have announced sales figures of 14 *Sigma* consoles since the London APRS. In Britain, session-guitarist Alan Murphy and Impulse Studios in Edinburgh each purchased a *Sigma*, while newly opened Opus Recording Studios in north London have the first in-line version in the UK. A 44/24 in-line version has gone to Bauer Sound in Austria, two *Sigmas* have gone to Amptown in Hamburg and two more to Studio Sound & Music in Frankfurt.

● Harman UK have announced several major purchases of Fostex synchronisers. HTV have purchased four systems since May, with *E2* master/timecode recorders being locked to Betacam. Video post-production specialist Malcolm Bristow has purchased a system of two *E2* stereo/timecode recorders with full events control and a *4010* wide band code reader to lock his *MTR 90* 24-track to video and to stereo master. And the 48-track SSL studio Maison Rouge has installed two synchroniser systems locking two pairs of Studer *A800/A820*s.

● Monster Cable of San Francisco have supplied all the wiring and cabling for Paisley Park Studios, the $10 million audio/video/film production complex developed and owned by Prince. The 65,000 ft^2 facility includes two recording studios, demo/screening rooms, video and film editing suites and a 12,000 ft^2 soundstage for film and video production.

● Albert's Home Studio in El Paso, Texas, have recently purchased a suite of Otaris. These are a *DTR-900* with overbridge controller, an *MTR-90-II* with autolocator and an *MTR-12-I* with interchangeable headstack.

● Industrial Acoustics Company of Middlesex have recently installed two sound studios and two large voice studios for Wild Tracks Audio Studio Ltd. The modular systems include large windows to the outside and between adjoining areas.

● Audio Kinetics, in association with Sony Broadcast, have supplied seven *Q.Locks* to TRT, a major dubbing facility in Turkey. Another *Q.Lock* has gone to Vector Television Ltd, formerly Viewplan Facilities. And a Neve *8232* with 32 channels of *Mastermix* has been delivered to Crosstown Recorders in Memphis, Tennessee.

● Sony Corporation have sold a 36-input *MXP-3000* with the *ADS-3000* automation system to Audio Recording Studios in Cleveland, Ohio.

● Recent contracts from Soundcraft include a 24-channel *200B* console to Exeter University, a 16-channel *200SR* to Colston Hall in Bristol, and a 24-channel *200B* to the Weymouth Pavilion Theatre in Dorset. Additionally, three Saturn multitrack analogue recorders have been sold through dealer Don Larking of Luton, the first of which went to Hot Nights Studio.

● From Mitsubishi, the news is that an *X-400* digital 16-track has been sold to the Music Station, while an *X-850* 32-track has gone to Livingstone Studios. Virgin-owned Olympic Studios has invested in Mitsubishi/Westrex film equipment, including two *ST 1606* 6-track 35/16 mm multi-gauge recorder/reproducers, two *ST 1606* playback machines, and a digital master motion controller with wide-screen footage counter readout.

Two Milan-based companies, TTV and Digitalvideo, have ordered Mitsubishi/Westrex equipment: TTV have placed an order four *ST 12000* dual dubbers and a digital master motion controller and Digital video a single *ST 12000* dual dubber/recorder.

OPUS RECORDING STUDIOS

Sigma 24

High performance orientated design with user comfort and ergonomics as primary design criteria has produced the Sigma series.

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- Fader options including full automation
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mbi/AHB

NEWS

In brief

• DDA have announced that the winning *Gramophone* record of the year, *Missa Pange Lingua/Missa La Sol fa re mi*, was recorded and mixed on one of their first consoles ever made, a *Digital* series, which is a forerunner of the current *S* series.

• The Center for Recording Arts & Sciences of the Middle Tennessee State University opened its new Studio B recording facility in November. It features a 34-input Neotek *Elite* with *DiskMix* moving faders, triamped *Boxer 4*s from Discrete Research, an Otari *MX-80* 24-track and RPG diffusors.

• Audio Research & Technology of Victoria, Australia, have been awarded the Lucasfilm *THX*-type certification for the ART *TSS I* surround loudspeaker. They are the first Australian company to gain the certification.

• Following a Europe-wide meeting of record industry representatives in Prague in October, companies from the USSR, Bulgaria and Poland have announced their intention to apply for IFPI membership. Current members Yugoslavia and Hungary are expected to seek National Group status.

• Cameron Video Systems, exclusive UK distributor for For.A products, have opened a 2500 ft² showroom in West London. Led by sales & marketing manager Charles Kelly, the showroom is located at: Station House, 4-8 High Street, West Drayton, Middlesex UB7 7DJ, UK. Tel: 0895 446661.

• The Music Department of Dartmouth College, New Hampshire, USA, recently opened a multi-million dollar electronic music studio. The Bregman Electronic Music Studio features 16 individual satellite computer/piano keyboard workstations, networked to a *Synclavier* digital audio system and *Direct-to-Disk* digital multitrack recorder. The set-up allows students to interact with the host computer, as well as with the professor and each other, thereby greatly improving the learning process and providing hands-on experience in digital recording, sampling, synthesis, sequencing, microtonality, polyrhythmics and sound design.

• The Gateway School of Music have confirmed their proposed move to the Kingston Polytechnic in Surrey (see *Studio Sound*, September). Gateway courses will form part of the Polytechnic's Bachelor of Music, Bachelor of Education and post-graduate studies.

• Solid State Micro Technology of Santa Clara, California, have named UK representative Hartech Marketing Ltd of Chichester, West Sussex, as their distributor of the year. Since their appointment, Hartech have pushed SSMT's UK export sales to account for a third of all exports.

• The APRS's UK standardised labelling system for audio master tapes is to be supplied by Ampex and BASF. The system is based on self-adhesive colour-coded tape box labels of identical size with specific standard designations seen by the APRS as foolproof against misunderstandings.

• Whitely Electronics Ltd have acquired Tantek Pro Audio and moved manufacture of *M4000* Master *Matrix* equipment to their audio manufacturing division in Norfolk. The *Master Matrix* line will continue under the Tantek name. About 12 months ago, Whitely bought the manufacturing facilities for the Ram and Dynamix systems.

View from the bottom

This is the view of the sound industry, far from the ivory towers of 32-track digital desks. This is the view from the other end of the scale. Come with me, if you will, to that other world where underfloor heating in the control room erupts and water fills the studio; where musicians cannot get the 'feel' of the music without taking some flea-bitten cat with them who succumbs to the call of nature, climbs the walls and howls to render all recording impossible; where a musician, in order to get 'into' the mood, starts sniffing glue, only to have to be taken to the nearest hospital with a pot of the stuff stuck to his nose.

Come with me to the real world...

Anyone attempting to survive in the recording industry must first deal with 'Goofies'—enter, the 'original' Goofy:

His real name was Gary but because of his lolloping walk, his vacant expression and his total inability to do anything right, everybody called him Goofy. Goofy worked for a German PA company. He could be seen locking himself into the back of trucks, painting speakers with oil paint that took a week to dry the day before a concert, and on one memorable occasion, knocking over a baby-grand while he was supposed to be looking for piano strings. But one day he performed the ultimate goof.

Goofy had discovered girls and thus became a cool Goofy. He wore designer jeans, tried to grow a moustache and failed, had his hair blow-waved and, like all cool men, smoked cool cigarettes. He smoked cool cigarettes while painting some speakers in the paint-store and, on finishing his cigarette, flicked the butt across the room into an old oil drum that he thought was a trash can. But it wasn't, it had been used to hold paint thinner. When this mistake was pointed out to him, Goofy toddled over to the drum and stuck his head into it to get the butt back out again.

He told me two weeks later he couldn't remember what happened after that but he looked as if he had shaved his face and hair with a blow-torch.

The horrible truth of the matter is that I too was once a Goofy. I soldered plugs with such expertise and care that each and every joint looked like a tiny model of Mount Vesuvius and I cut out sheets of chipboard with such skill that my employer ran out of saw blades almost daily. But the worst thing I ever did was tell a customer the truth.

A rock band of singular awfulness had spent several days and quite some money recording a song that one of the members of the band had written. The final mix was one of the worst things I had ever heard: nobody in the band could play their instruments and none of them could keep time, least of all the drummer. When the whole thing was in the can and the band were discussing which record company they should allow to distribute this noise and if they should make do with 6% for starters or be firm and hold out for 10, they turned to me and asked what I thought of their song.

I gave their question serious thought for a moment and told them that I had certainly heard worse. But then, like a fool, I added that I just couldn't remember when.

They never came back and I nearly lost my position as resident Goofy.

A few weeks after that incident, came the terrible day of Herrman and the Hawaiian guitar. Even now, as I write this piece, I must stop writing to calm down as I think of Herrman and the Hawaiian guitar.

A country & western band came to the studio and I could tell they probably wouldn't be much good because I had to show the drummer how to tune his kit. He was deeply impressed and didn't know one could do that with a drum kit. He spent the rest of the session pointing me out as the man that showed him how to tune a drum kit. Then Herrman, the star of the show, turned up.

Herrman had two secrets in life: he wore a toupé and he could not play the Hawaiian guitar.

We did take after take of Herrman and his guitar, and the more we did the more it was obvious that he just could not play a note. He struggled manfully with his instrument, leaning over it and sweating heavily, as he slid from one wrong note to another—always flat and always half a beat behind. I was in the control room and was making strange noises in my effort not to laugh. Then it happened. Heat and sweat took their toll.

Herrman's toupé leapt from his head like a live thing and got caught up in the strings of his guitar where it remained twitching in its struggle for freedom.

I collapsed on the floor where I remained for the next half hour, rolling about helpless with wave after wave of laughter. By the time I had recovered and the pain in my sides had abated enough to allow me to stand up again, Herrman and the band had left, never to return.

Shortly after this, my employer told me that the time had come for us to part ways so, nothing daunted, I set out into the big cruel world and started my own studio.

That was my first 'View from the Bottom'. My ex-boss and I are now good friends and he regularly comes round to scrounge beer off me and talk about 'Goofies we have known'. I just have one final thought: it has been said that there are enough relics of the Cross to build Noah's Ark. I have met enough people (Goofies) claiming to have been involved in recording *Sergeant Pepper* to fill the Ark. And fill it very aptly, I might add.

Andrew von Gamm

Simple Intelligence

Let's assume that results are what's important, not which tools you use.

Audio production is at least as much art as science; there will always be those who ascribe a magical aura to certain pieces of equipment. But if your client list is built on quality and consistency rather than techno-voodoo, the DCM 232 in-line console with CAT automation can give you more of both.

You need more console, not more headaches.

You're working for more demanding clients, on bigger projects, with tighter deadlines. You need greater flexibility, expanded features, enhanced performance. What you don't need is a "mega-star" console—or the jumbo mortgage that goes along with it.

DDA's AMR 24 has already set new standards of audio performance and versatility in the "classic" split configuration. Now the in-line DCM 232 combines the accuracy of digital-quality audio, the flexibility of digital control and the capacity to handle a pair of synchronized digital 32 tracks.

CAT Central Automation Terminal: engineered to speed your work flow.

The DCM 232's Central Automation Terminal controls one of the most ingenious automation systems ever to shorten a mixing session. Along with the precise fader and muting control you'd expect, the CAT system includes advanced functions like *Channel Copy* that lets you duplicate a channel's signal flow as many times as you need to. The computer will recall a "snapshot" of most console switch settings manually or via SMPTE code.

With all of its convenience functions, this CAT won't leave footprints all over your tracks. The DCM 232 maintains an overall dynamic range of 100 dB with at least 22 dB headroom at each stage, thanks to exacting calculation of every circuit component.

A console investment that instantly doubles your returns.

Each of the DCM 232's channels, *including the four band EQ section*, can be split during mixdown. So a 56 channel frame can handle as many as 112 inputs from samplers, synths and digital storage media. You'll probably run out of control room space before the DCM 232 runs out of inputs.

The advantages of the DCM 232 in-line console with CAT automation are explained more fully in our brochure. To get a copy, write on your letterhead to the appropriate address below.

DDA DCM 232 SPARS

Unit #1, Inwood Business Pk., Whitton Rd
Hounslow, Middlesex. UK TW3 2EB
01 570 7161

Klark-Teknik Electronics Inc., 30B Banfi Plaza North
Farmingdale, NY 11735 (516) 249-3660

NEWS

People

• The Music Works, the London-based recording studios, have appointed Dennis Muirhead as studio management consultant. Besides his management role, Muirhead will control the studios' new marketing and publicity campaign, focusing mainly on the recently redesigned and refitted main studio.

• Dynamic Technology Ltd (DTL) of London, who've been given the contract to design and build NBC's broadcast centre for the 1988 Seoul Olympics, have appointed David Bower as general sales manager. Bower comes from Sony Broadcast and Philip Drake Electronics.

• Wm Jay Ray & Associates, South East representatives for Otari and Adams-Smith in the States, have appointed Rex Lee as regional sales and technical manager for Florida.

• Electro Sound Inc have appointed Amir Hindie as senior design engineer. Hindie has extensive design experience in the audio and telecoms industries in both the States and Europe.

• The Centro Corporation of Salt Lake City have named John Harris executive vice-president/general manager. Harris comes from Sony Broadcast and Sony Communications Products Company. Another recent migration from Sony to Centro is Curtis J Chan, who has been appointed vice-president, marketing and product development. Chan was product manager at Sony Communications.

• Surrey-based Executive Audio have appointed Nicola Barwell as divisional manager to head their musical instrument software department. Barwell has spent the last three years doing promotional work for Paul Farrah Sound and Simmons.

• Audio Kinetics have announced the appointment of their new sales team, comprising Iain Roche (sales/marketing manager), Ross Caston (technical), Naomi Farrington (sales/marketing administrator) and Gerry Davidge (export administrator).

• New England Digital have retained Shelly Palmer, president of Shelton Leigh Palmer & Co, as a software consultant. Palmer will work with NED in developing and refining advanced software for commercial production and film/video post-production applications.

• Otari Corporation, California, have appointed David Ruttenberg as central regional sales specialist, where he'll work with dealers, representatives, sound contractors, consultants and end-users in the central states region. Ruttenberg comes from Neotek where he was director of marketing.

• Audio Developments have appointed Tony Pitchford marketing manager. Pitchford was previously sales manager, South East Asia and Africa, with Eddystone Radio, a division of Marconi.

Agencies

• Solid State Logic have appointed Finnish Studiotec as exclusive distributor for Finland.

• Qantum Audio Labs Inc of Tustin, California, have been appointed exclusive distributor for the new line of Weircliffe high-energy tape degaussers.

• British loudspeaker enclosure manufacturer Scott Sound Systems have appointed Animation Lumineuse French representative for their full range of enclosures.

SSL G Series

Solid State Logic introduced their new *G Series* consoles at the New York AES. In addition to incorporating the increased power of the *G Series* computer announced several months ago, other areas of improvement have been incorporated with particular emphasis on sonic performance. Physically the end profile has been changed and the colour scheme has been modified.

On the control side the *G Series* computer has brought with it a new full-size keyboard augmented by a numeric keypad and an array of special function keys that can be defined to perform a string of SSL command words with a single keystroke. This data is retained with power off. This keyboard section is also available as a stand alone unit and can act in parallel with a keyboard mounted in the console.

Part of the new series has also apparently involved careful study of many different parts of the audio signal chain and in ways that sonic performance could be maximised. One of the benefits of this research has been a new equaliser for the *G Series* and significant changes in a number of other areas. The computer and the equaliser are available as separate product upgrades for existing *4000 Series* owners. SSL are currently taking orders for the new series.

Solid State Logic Ltd, Begbroke, Oxford, UK, tel: 08675 4353.
USA: Solid State Logic, New York, tel: (212) 315-1111; Los Angeles, tel: (213) 463-4444.

NEWS

WaveFrame AudioFrame

The recent AES and SMPTE Conventions saw the first public showings of the *AudioFrame* digital audio workstation from WaveFrame Corporation. This workstation incorporates synthesis, storage and editing, signal processing, mixing and mastering in a single unit. The system employs a proprietary digital audio bus that allows an array of plug-in modules to communicate digitally. Currently available modules include A/D and D/A modules, sampling synthesis, studio control processing and memory expansion. The control station computer is an IBM *Personal System/2* and all software runs under Microsoft *Windows* software for ease of use and multi-tasking capability.

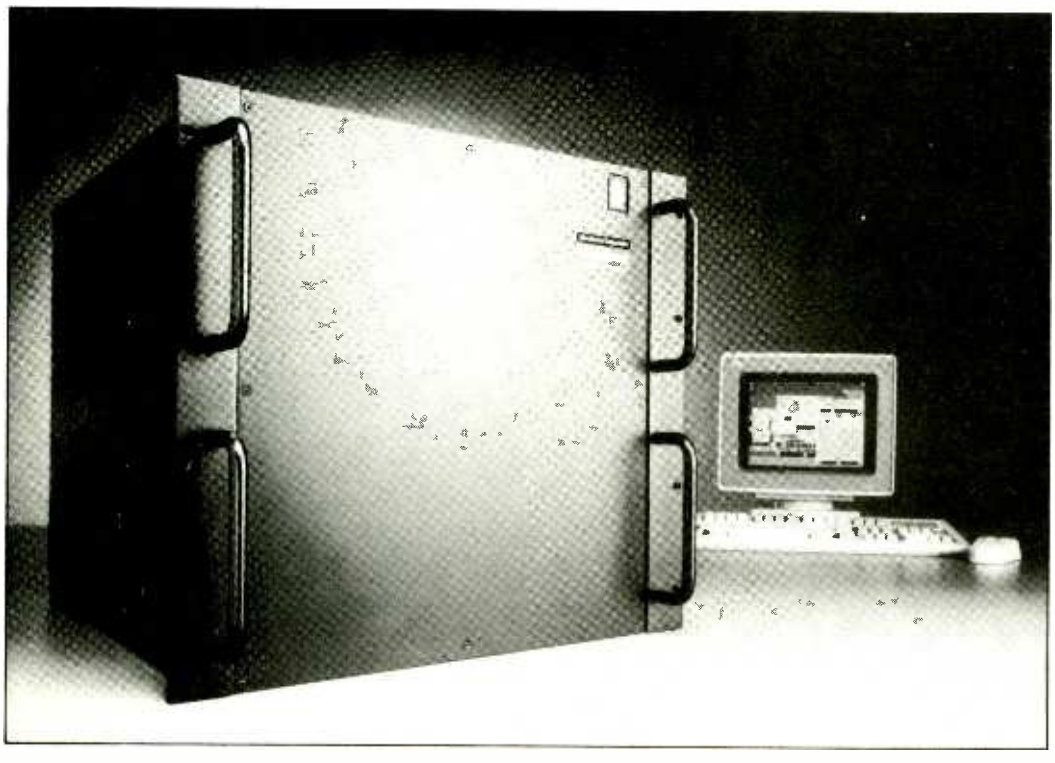
One of the main features of the *AudioFrame* is the use of a fixed sample rate processing that WaveFrame say gives the advantage of avoiding the aliasing and noise problems inherent in variable rate sampling used in some other systems. This allows the sampler to pitch shift four octaves up and eight octaves down and also to provide the feature of realtime scrubbing. The *AudioFrame* modules communicate totally in the digital domain over the digital audio bus, which is a 64-channel switching matrix designed for digital audio. Any module using a suitable multiplexed switching bus can communicate audio information every 350 ns with 24-bit precision. All 64 channels can operate at the same time allowing up to 64 audio signals to be routed through the systems at any one time and the configuration could be changed every 22 ms. The physical dimensions of the system is a 10U, 19 in rack frame with space for 10 modules and power supply, with possibility of adding further frames if necessary.

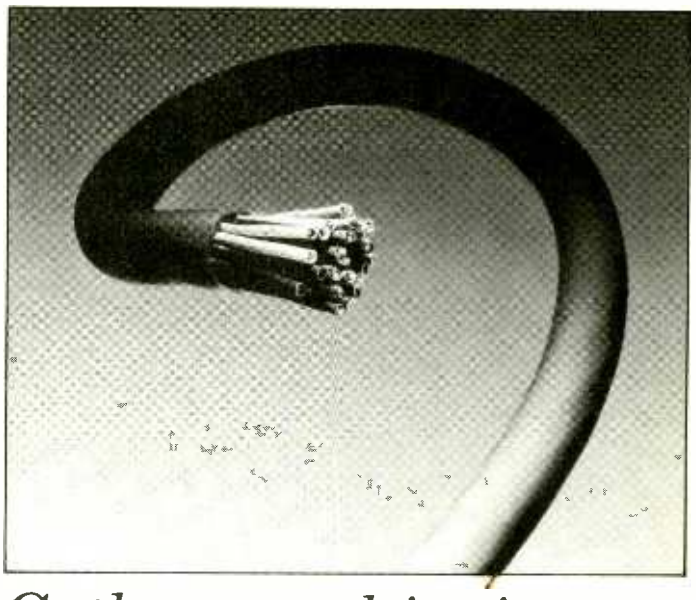
WaveFrame have decided upon an open architecture for the system allowing easier integration of the system into existing studios and they will also provide outside developers with information to design new hardware and software.

Specification for the sampling synthesis module includes 16 voices with 2 Mbytes of RAM for 24 s of audio at 44.1 kHz. The sampler memory can be extended to 30 Mbytes giving 6 min storage including phase coherent stereo sampling operation. The A D module is available in 8-channel or stereo configuration. The D/A module is driven to 18-bit quality at 176.4 kHz sampling rate.

For storage the *AudioFrame* uses floppy and hard disks provided with the control station computer with further storage options including additional hard disk, magnetic tape and WORM drives. On the musical aspects, the user has realtime control of layering, split, mix, detune, chorus and arrangement of the instruments over MIDI channels or the QWERTY keyboard. There is provision for 128 setups and their channel assignments. On the sequencing side, the *EventProcessor* software is a full digital sequencer and edit decision list capable of managing MIDI data, editing passages or individual notes, etc. The system has full capability in displaying musical bars and beats, SMPTE data, feet and frames of film. There is also a large sample library of popular sound effects that are free of copyright restrictions.

WaveFrame Corporation, 4725 Walnut Street, Boulder, CO 80301, USA, tel: (303) 447-1572.



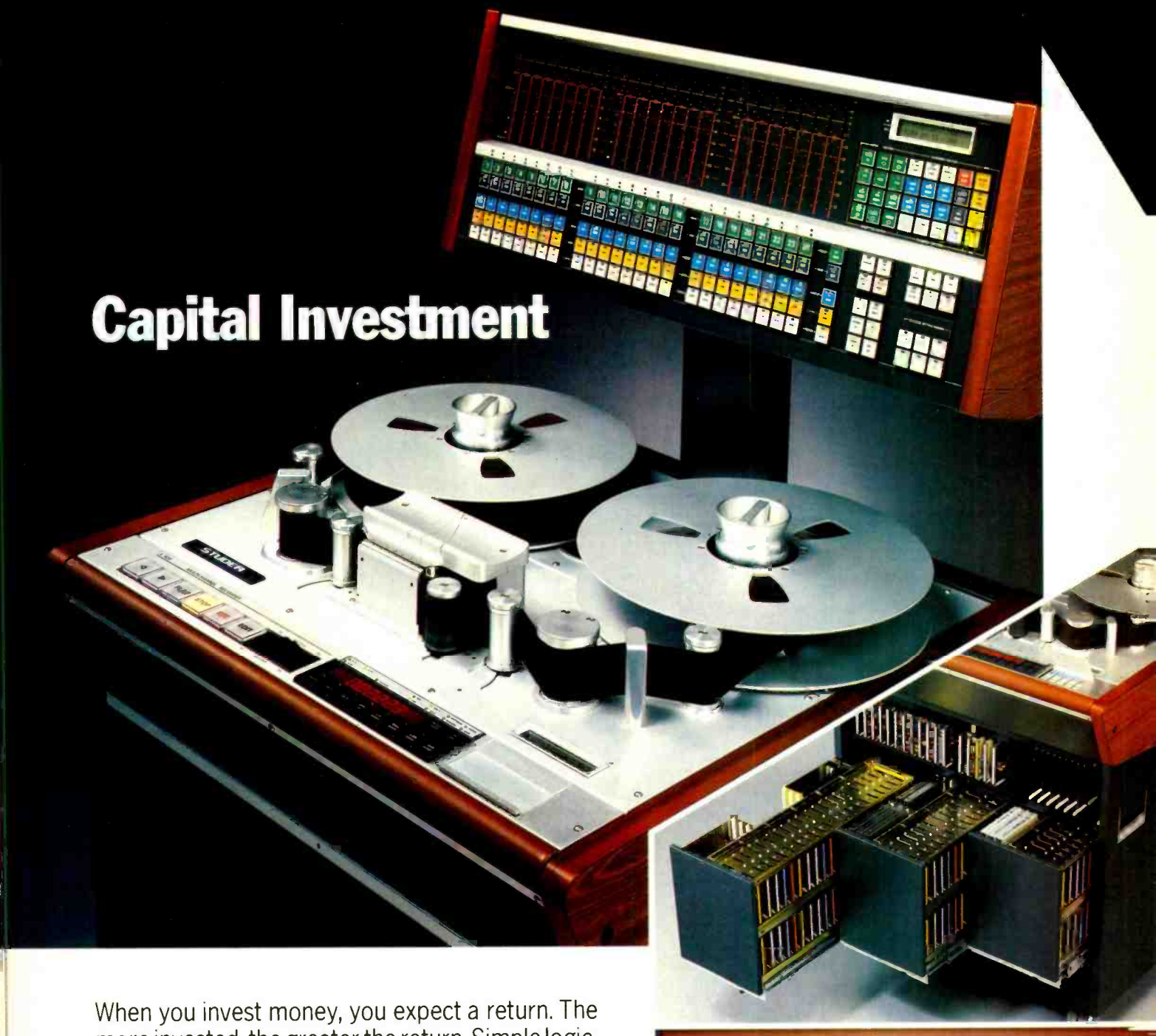


Gotham multipair GAC-34 cable

Gotham have added a new cable to their existing range of multipair cables. *GAC-34* has 34 pairs with each pair having its own double layer shield with the conductors being PE insulated 25 strand copper wires. Due to the individual double shielding the manufacturers say that the cable is highly flexible, easy to handle and with a reasonable outside diameter—27.4 mm. Cross talk attenuation is quoted as 80 dB. Other cables in the series are 10, 19 and 27 pairs in addition to other Gotham cable products.

Gotham AG, Althardstrasse 238, 8105 Regensdorf, Postfach 122, Switzerland. Tel: 01 840.01.44.
UK: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts. WO6 4RZ. Tel: 01-953 0091.
USA: Gotham Audio Corporation, 1790 Broadway, New York, NY 10019-1412.

Capital Investment



When you invest money, you expect a return. The more invested, the greater the return. Simple logic. In the studio business, this boils down to matters like hourly rate limitations and equipment utilization.

That's why, when it comes to profitability, the new A820 multichannel recorder is likely your best choice. This is analog technology thoroughly re-engineered by Studer. Economical. Universally compatible. When teamed with new noise reduction technology, A820 sound will unnerve the digital devotees. All-encompassing microprocessor control provides unprecedented convenience and flexibility. Studer manufacturing ensures precision and reliability.

For the sake of your bottom line, drop us a line for more information.

Studer A820 multichannel recorder.
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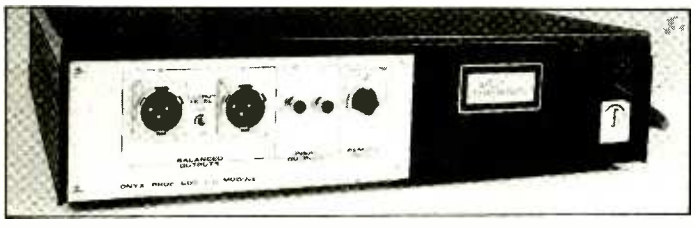
Worldwide: Studer International AG, Regensdorf, Switzerland, +411 840 29 60.

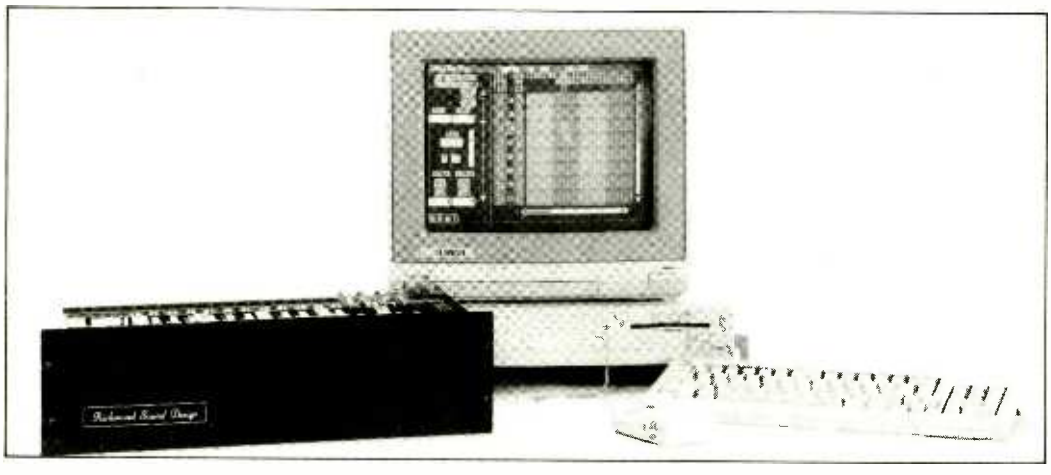
NEWS



Onyx Pro CD Player

Dutch company, Onyx Advanced Audio Technologies, have introduced a low budget professional CD player, the CDP PRO 1. This is a standard Denon *DCD300* that has been modified to include balanced outputs with *XLR* connectors and switchable output levels of −10 dB and +4 dB. There is also a fade start/stop facility. The standard Denon outputs remain and the unit retains the same function and specs as the standard *DCD300*.

Onyx Advanced Audio Technologies, Graanhoeve 52, 3992 NK Houten, The Netherlands. Tel: 03403 73818.



Richmond Sound Design Command/Cue

The *Command/Cue 4096* is a computerised audio console allowing complete control of a theatre sound system level and routing of up to *4096* faders. The system may be configured into many sizes of theatre sound effects matrix systems and may be used in conjunction with live PA mixers running mics, while the console is running taped effects and presetting levels.

The *Command/Cue 4096* is of modular card frame construction design which is under the control of software designed for use on the *Amiga* computer. Because of its modular design, systems may be configured starting with an 8×8 theatre sound effects matrix system. Systems may be expanded by adding more cards.

The *DCA-8* card used for the level matrix has eight digitally controlled attenuators with 60 1.5 dB steps. The *DMF-8* card is used for master input levels and is identical to the *DCA-8* but with 240 0.395 dB steps, each card has a signal-to-noise ratio of over 100 dB and claimed total harmonic distortion of less than 0.03%. The *DAP-8* card has eight digital autopans that will fade up, down or crossfade levels in durations from 0 to 94.5 s in 1.5 s steps.

Richmond Sound Designs Ltd, 1234 W 6th Ave, Vancouver, BC V6H 1A5, Canada. Tel: (604) 734-1217.

USA: Full Compass Systems Ltd, 6729 Seybold Road, Madison, WI 53719. Tel: (608) 271-1100.

Utilux high power audio connectors

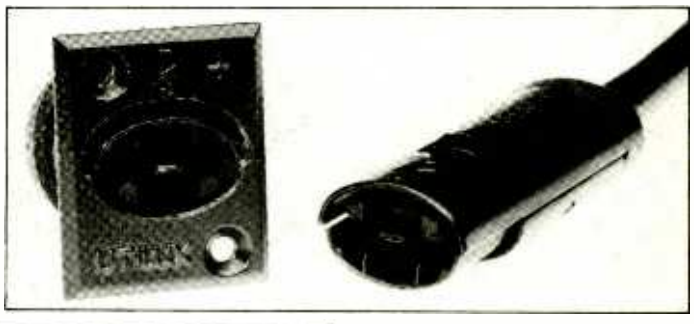
Following the debates of the last few years on the need for a suitable audio connector for handling high level audio such as the outputs from large power amplifiers, Utilux have introduced the *UX* connector system designed to address this problem. This consists of the *UX101* line connector and the *UX501* panel mount socket, both of which are genderless, ie no separate male and female types, with the *UX101* mating with another *UX101*. Utilux claim the connectors are capable of carrying 30 A or power of 3000 W and comply with IEC safety standards. The *UX501* features an acoustic compression seal for mounting into speaker cabinets and panels and when mounted has the same profile as a standard female *XLR* socket.

Connectors have features including large cable capacity of 8×14 mm, terminated to 10 AWG; contacts supplied separately for fixing to cable before fitting into connector, reducing chance of insulator damage; withstands considerable pullout force before it releases; rugged diecast metal casings made from zinc alloy with silver plated contacts (optional gold); distinct oval shape helps differentiate between this and other connector types.

Utilux Pty Ltd, 14 Commercial Road, Kingsgrove, NSW 2208, Australia. Tel: (02) 50 0155.

UK: Utilux (UK) Ltd, Hillside Road East, Bungay, Suffolk NR35 1JX. Tel: 0986 2963.

USA: Connectronics Corp, 652 Glenbrook Road, Stamford, CT 06906. Tel: (203) 324-2889, (800) 322-2537.



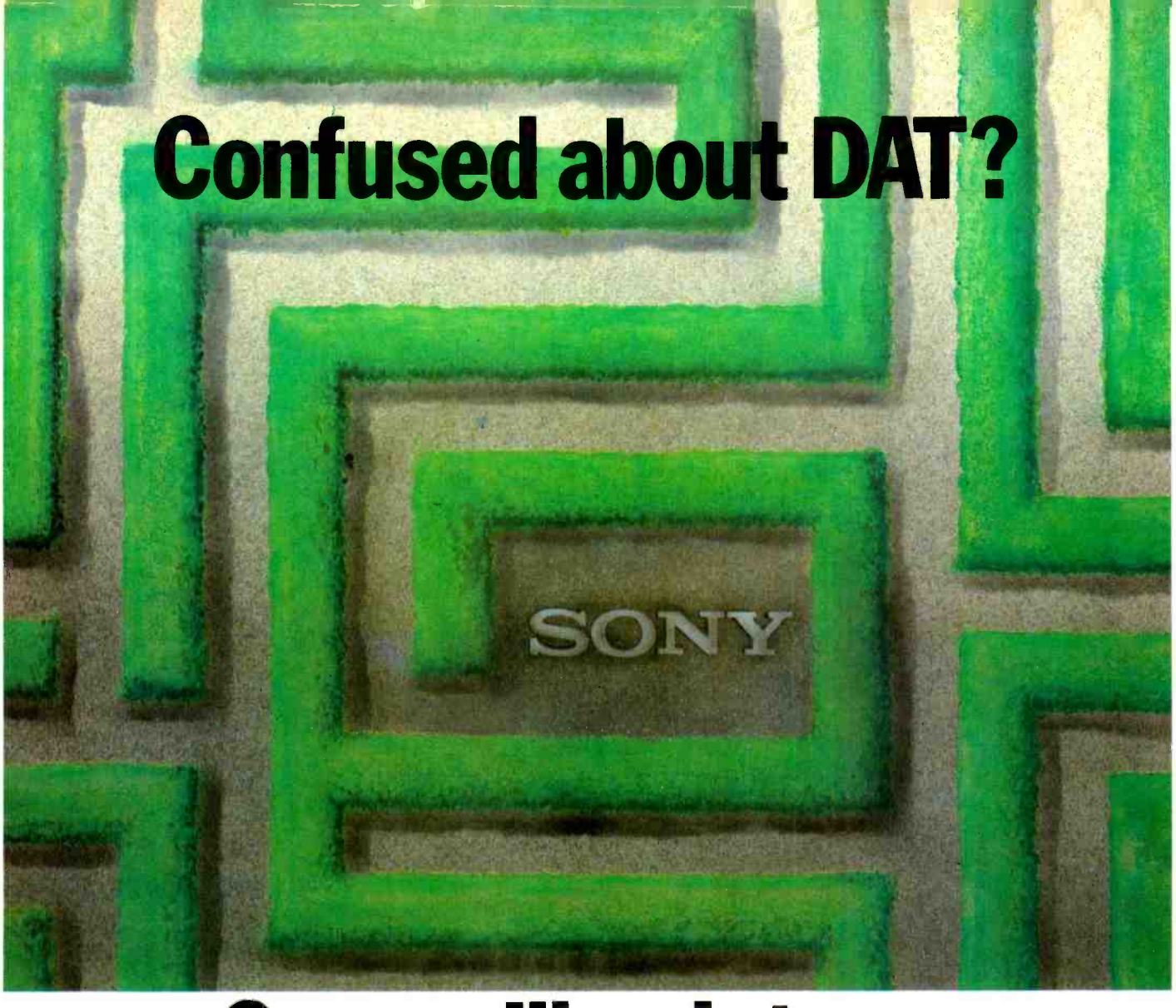
Racey

Guildford-based Anderton's Music Co is selling large numbers of red John Hornby Skewes mic windscreens to the Marlboro MacLaren Racing Team (Formula 1 cars in red and white livery) to place over the ends of the exhaust pipes.

Atlas/ Soundolier MAC-1

Atlas/Soundolier have introduced the *MAC-1* omni purpose adaptor intended to assist in clamping mics, holders and booms in close proximity to musical instruments as well as adding additional mics to existing stands. The *MAC-1* will accept ⅝ in 27-female-threaded mic holders and standard accessories including boom attachments, extension tubes, goosenecks, etc. Manufactured from extruded aluminium and finished in non-reflecting ebony epoxy.

Atlas/Soundolier, Div of American Trading and Production Corporation, 1859 Intertech Drive, Fenton, MO 63026, USA. Tel: (314) 349-3110; or at, 10 Pomeroy Road, Parsippany, NJ 07054, USA. Tel: (201) 887-7800.



Sony will point you in the right direction.

Beware! The digital maze offers many enticing routes.

If you need to record at 44.1 kHz, copy digitally to and from other formats, and take advantage of sub code editing and switchable emphasis, there is only one way to go: the Sony PCM-2500.

Tread carefully. Consumer DAT machines will lure you down the garden path. Only PCM-2500 leads you clear of the confusion.

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Tlx: 923393

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Tel: 01 437 1892
Tlx: 21624 Aloffd G

ASC
4A King Street
Mortimer
Reading. RG7 3RS
Tel: 0734 333100

Return to: Marketing Services Department, Sony Broadcast Ltd. Belgrave House, Basing View, Basingstoke, Hampshire RG21 2LA.

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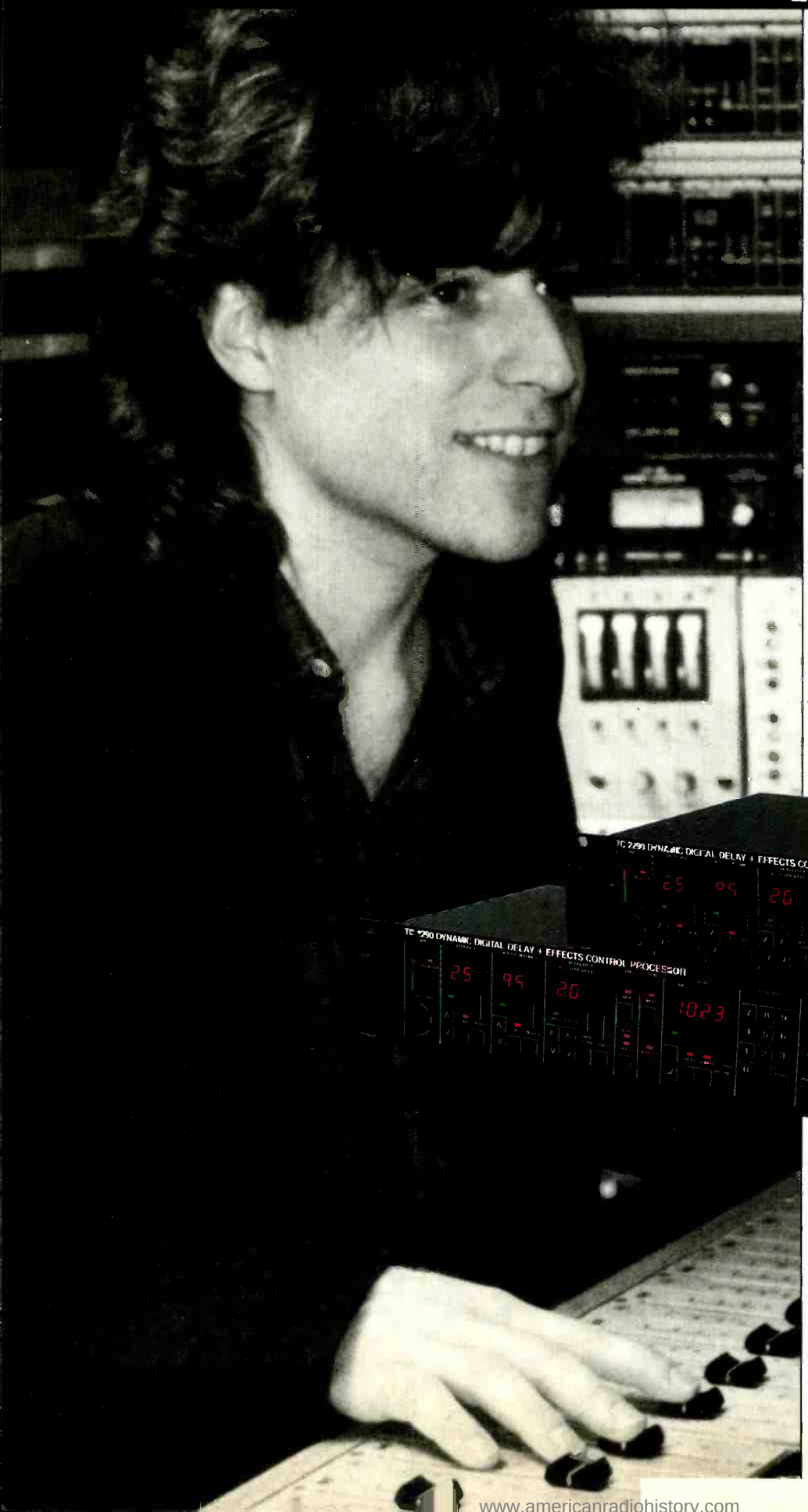
Power Station selects t.c.electronic installs 6 TC-2290 sampler/delays



"I love the sound, the ease of operation, and the complete control over all parameters. With the three modulation parameters, speed, depth and waveform on the front panel, and the special key functions to access software T.C. allows fine tuning of parameters that are predetermined in other units.

The combination of dynamic delay and pan modulation allow quite a variety of effects within a single processing device. T.C. was very smart about this. The 2290 does a lot more, and is more affordable than any other unit we've used."

Engineer Don Rodenbach

A demonstration model of the new TC 2290 was sent to Power Station by Martin Audio. The first engineer to use the 2290 was Don Rodenbach, who was so pleased with the sound, and features of the 2290, as well as "the clarity of the :32 samples," that he bought one for his own rack. His unit then started making the rounds of various sessions at Power Station. Today there are six TC 2290 units at Power Station and no waiting. Each unit has 32 second capability for sampling (and delay), can be locked in perfect synch with a second 2290 for stereo sampling *(The new stereo link update)*, and has Sampling 2 software, along with "Fast Trigger," update.

Sampling 2 Features

1) Multi-layering of samples. Up to 16 samples on top of each other with no degradation of signal, into the same pre-set.
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The TC 2290 offers 2 bits more resolution, at a quarter the price of any truly competitive unit. T.C.'s 18 bit resolution, 1 MegaHz sampling rate, and 20-20KHz bandwidth (rolling off at 33KHz even out to 32 seconds) make the TC 2290 a remarkable unit for sampling, multi-effect delays, and panning programs.

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NEWS

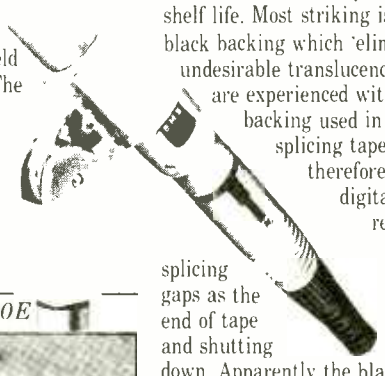
In brief

• AKG have announced a number of changes in the *D300* series microphones. The finish on the *D310* and the *D330* dynamic vocal mics have been switched from nickel to matte black to reduce reflections from stage and TV lighting. This change was made following the successful introduction of the matte finish *D321*. The *D321* is now available in a version with an on/off switch known as the *D321S*. The only remaining nickel finish mic in the range is the *D3210S* which is nickel only. All other specifications remain as before.

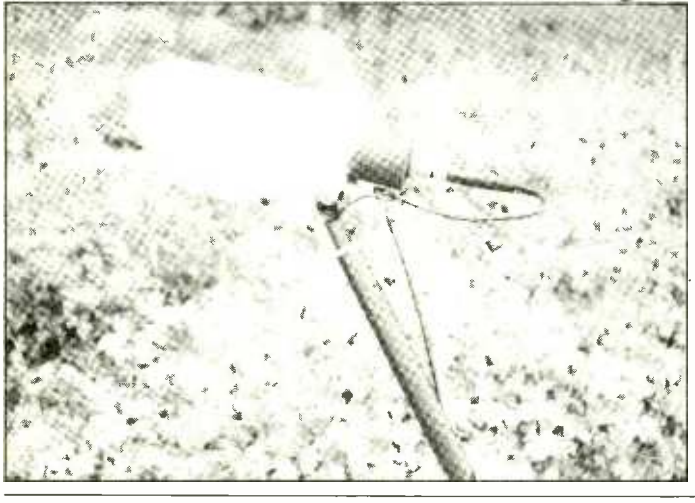
• Rycote have developed a new windshield with a fairly unique approach of combining a windshield and a shock mount. The windshield is known as the *Softie* and is only 70 mm in diameter. The microphone is pushed into the shockmount and on into the windshield with no clips, screws or zips. The manufacturer claims that in tests it performs just as well as the standard windshield. The bracket allows fixing by handle, boom or on to a video camera and offers the soundman a compact unobtrusive lightweight windshield.

Rycote Microphone Windshield Ltd, Unit 6, New Mills, Slad Road, Stroud, Glos GL5 1RN, UK. Tel: 04536 79338.

USA: agents include Audio Services Corp. 4210 Lankershim Blvd, North Hollywood, CA 91602. Tel: (818) 980-9891 and Audio Services Co, 326 W 48th Street, New York, NY 10036. Tel: (212) 977-5151.



Below: Rycote new windshield; right: AKG D1200E



• 3M announced a number of additions and changes in their tape and accessory products during the New York AES. Firstly a splicing tape for digital audio tape designated *8175*. The adhesive used is a synthetic type that 3M say does not creep or dry out while having a roll-to-roll tack consistency and a long shelf life. Most striking is the special black backing which 'eliminates the undesirable translucences that are experienced with the clear backing used in most splicing tapes and therefore prevents a digital audio recorder from interpreting splicing gaps as the end of tape and shutting down. Apparently the black backing on this tape prevents this from happening.

Other products include a series of three new audio cassettes for professional audio customers. The SX series are chrome bias types available in C-30, C-60 and C-90 lengths and will be available in North America from April '88. 3M also announced that new reels will be introduced from the beginning of 1988 on mastering, digital audio and logging tape products. These have been redesigned with improved winding characteristics and added durability. They also announced the availability of the AUD digital audio cassette range in 30 and 75 min lengths to join the existing 60 min length.

• AKG have reintroduced the *D1200E* vocal microphone that was discontinued on the introduction of the *D300* series. Demand for the mic has continued to be high particularly as it has found other uses including backline and brass/woodwind miking.

• Dolby laboratories have introduced an enhanced version of Dolby *Surround* called Dolby *Surround Pro Logic*. This is a consumer version of the decoding matrix used in professional Dolby cinema equipment and was presented to licensees in the first half of this year.

• Canford Audio have announced a new catalogue for their wide range of distributed products. New products featured within its pages include Universal Connector Panels based on the Neutrik *D* series housing; a wide range of extruded boxes with internal PCB slots; mains filters which are both noise filters and transient suppressors; and most importantly a range of products that Canford say should improve the quality of life within the industry—19 in rack mount fridge, wine rack and microwave. Catalogue available from Canford Audio, Crowther Road, Washington, Tyne & Wear NE38 0BW, UK. Tel: 091-417 0057.

• Revox have launched a plug in expansion module for the *C279* compact audio mixer. This gives the unit four additional features including stereo noise reduction using dbx *II* encode and decode processing; built-in test tone generator with levels at 0 dBu and +6 dBu; fader star logic for all six inputs as well as the master channel; and two phono inputs with fader start logic. Revox have also introduced a carrying case for the mixer.

Studer International AG, Aldhardstrasse 10, CH-8105, Regensdorf, Switzerland. Tel: 01 840.29.60.

UK: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts WD6 4RZ. Tel: 01-953 0091.

USA: Studer Revox America Inc, 1425 Elm Hill Pike, Nashville, TN 37210. Tel: (615) 254-5651.

Fairlight MFX

The *MFX* is a hardware/software upgrade for the *CMI Series III* that comprises a custom control console specifically designed for audio post-production use and a new Cue-List software program. The *MFX* (Music and Effects) allows full use of the *Series III* for film and TV post-production without use of the musical keyboard. The control console includes a conventional QWERTY keyboard and numerics keypad for issuing commands and entering timecode locations; sound triggering keys for shorthand entry of system commands; LCD displays of user-designated function keys; SMPTE LED displays with buttons showing the current position of tape machines; and a jogger wheel for rock-and-roll cue point locating with the *Series III* disk recorder, adjusting timecode values and volume levels, etc, as well as controlling external tape machines via timecode. Use of the *MFX* does not prevent use of the Fairlight musical keyboard should it be desired.

The Cue-List software has been designed as the master controller for all *Series III* functions. Principally it is a timecode-based sequencer capable of initiating any Fairlight function at a specific time from either internal or external code. Up to 30 events can occur simultaneously within a cue list. Other functions possible with the *MFX* system include the ability to record control changes in realtime with subsequent screen editing using a mouse; the execution of sound effects, music sequences and any other *Series III* command at a given timecode location; the replaying of a group of Cue-List events stored in a library file and the control of sound parameters such as volume, attack and pitch. The *MFX* control console can be used with *Rev.7* software and the *Waveform Supervisor* hardware option. It can access up to 80 *Series III* channels and 140 Mbytes of waveform RAM.

Fairlight have also announced a 400 Mbyte removable 5¼ in WORM optical disk for the *Series III*, usable on line together with hard disks.

Fairlight Instrument Pty Ltd, Rushcutters Bay, NSW, Australia, tel: (02) 331 6333.

UK: Syco Systems, London, tel: 01-724 2451; HHB, London, tel: 01-960 2144.

USA: Fairlight Instruments Inc, Los Angeles, tel: (213) 470-6280; New York, tel: (212) 219-2656.

NEWS

DAR Soundstation II

SoundStation II is a disk-based digital recorder/editor developed by Digital Audio Research, a British company based in Surrey, England. It consists of two sections—the control console used to perform all system operations, and the processor and storage unit which contains the system hardware, software and disk drives for storage of digital audio data. Design of the control console allows emulation of conventional tape machine functions such as a locator control that simulates audible reel rocking for edit points. Matching gain across edits can be achieved by digital gain control and variable crossfade adjustment. Varispeed facilities are available, adjustable from zero to twice normal speed. *SoundStation II* also has the ability to adjust the timing of inserted audio segments to fit required length within existing program.

The screen is a touch-sensitive plasma display. It is used both to select sound segments to be edited and relocated and also to display the list of sound segments stored within the system. This makes the unit easy for the user to work with when linked with the other hardware switching on the control surface, the majority of which are dedicated single function controls thereby reducing the amount of learning time needed for the system.

The basic *SoundStation II* configuration includes 4-channel recording and editing with expandability up to eight channels. Analogue and digital balanced inputs and outputs are provided for each channel. The AES/EBU digital interface is a standard feature supported by the 20-bit recording structure. The processor and storage unit includes four front panel slots with the Small Computer Systems Interface (SCSI) for either 5¼ in Winchester or WORM disk drives. Up to four track-hours of audio and edit information may be stored on the Winchester drives and another five is achievable on the optical disk.

Digital Audio Research Ltd, 2 Silverglade Business Park, Leatherhead Road, Chessington, Surrey KT9 2QL, UK, tel: 03727 42848.

USA: Digital Audio Research (USA), PO Box 275, Rheem Valley, CA 94570, tel: (415) 376-2760.

Acoustic Energy AE1

Acoustic Energy are small UK manufacturers of speaker systems and their first product is the *AE1*, a full range compact nearfield monitor. It is a 2-way speaker with 3 kHz 3rd order passive crossover and an enclosure that can easily be converted for active use. Both the 5 in bass and the 1 in HF drive units use metal diaphragms and edge wound ribbon voice coils. AE say that the single most important design aspect of the bass/mid range driver is the rigidity of the triple layer alloy sandwich diaphragm, which allows very low distortion characteristics. This is coupled with the ability of the metal diaphragm to dissipate heat and therefore maintain a more constant impedance load giving a quoted figure of 200 W programme for the *AE1*. The manufacturers come from a practical engineering background and have spent three years on developing the design principles. The *AE1* is the first of a range of products that will soon appear using the same technology.

The *AE1* is being offered in a black utility finish and can be operated with or without the grille and vertically or horizontally. The cabinet is manufactured from MDF which is lined with a high density, non-resonant material that aids LF response. Manufacturers specification includes frequency response 35 Hz to 30 kHz; sensitivity: 2.83 V RMS produces 84 dB at 1 m under anechoic conditions; minimum impedance 8 Ω; harmonic distortion: less than 0.01% at 90 dB at 0.5 m and less than 0.1% at 89 dB at 0.5 m; power handling 200 W programme and a weight of 10 kgs each.

Acoustic Energy Ltd, 3a Alexandria Road, London W13 0NP, UK. Tel: 01-840 6305.

Agfa tape

Agfa have several new tape products. *PEM 291D* is a new formulation suitable for the current generation of DASH and PD recorders. The tape is available in ¼ in, ½ in and 1 in widths, all in lengths of 5,000 ft, 7,500 ft and 10,000 ft.

On the duplication side *PE 619i* cassette duplication pancakes have the same electro-acoustic properties as *PEM 619* but improved handling characteristics. Lastly, Agfa now have 60 min R-DAT duplication cassettes available according to demand.

Agfa-Gevaert AG, Leverkusen, West Germany.

UK: Agfa Gevaert Ltd, Brentford, Middx, tel: 01-560 2131.

USA: Agfa Gevaert Inc, Ridgefield Park, NJ.

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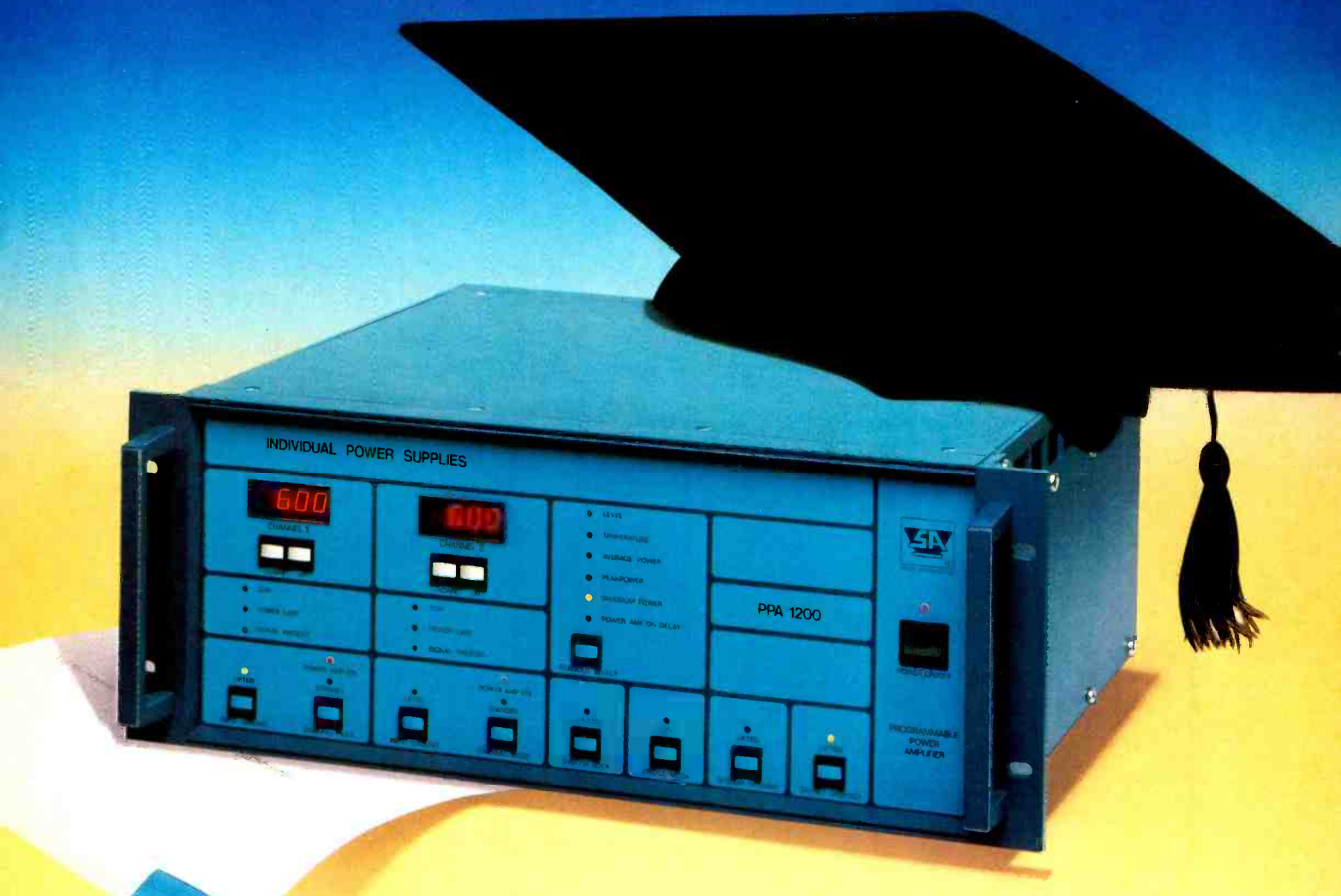

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LETTERS

I thank Ted Nurse (Letters, *Studio Sound* October 1987) for his 'multi mic' approach to MS technique. It is difficult to see how three cardioids, with their general problems, together with the difficulty of getting the ones he mentioned, as close together as an 'obsolete' fig-of-eight and an omni, could produce as coherent a single stereo pair result.

Essentially he describes a 'twin stereo pair' mix, which, although valid in its own right, is unlikely to match in finesse the 'obsolete' methods of the past. I would particularly like to make a comparison of the stereo 'depth perspectives' obtainable by the two techniques.

Mike Skeet, Whitetower Records, 44 Challacombe, Furzton, Milton Keynes MK4 1DP, UK.

As I understand Mr Ted Nurse (*Studio Sound* Letters, October 1987), a flexible, coincident XY mic pattern is to be had, without resort to MS-XY matrixing, by employing a set-up of three coincident mics: a forward-facing (M) cardioid, panned L and R; a right-facing cardioid, same phase and panned R; and a left-facing cardioid, same phase and panned L. This will indeed generate an XY pair but, as can be appreciated by doodling with balloons, dumbells and algebraic signs, the polar sensitivity pattern for the resultant X or Y will always be broader than that of the starting cardioids, and thus yield recordings of inadequate stereo width (fat mono). If, however, X and Y mics of identical recording angle were to be created by MS-XY matrixing of a cardioid and a dipole mic, then one would obtain significantly narrower (hyper) cardioid polar patterns.

For example, an equal combination of a forward-facing ideal cardioid ($1+\cos\theta$) and right-facing cardioid ($1+\cos(\theta-90)$) will produce in effect a mic aimed 45° off-centre, with the following off-axis response characteristics: −0.5, −2.0, −4.6, −8.4 and −12.9 dB, for respective off-axis angles (wrt the new mic) of 30°, 60°, 90°, 120° and 150°. Compared with a cardioid (−0.6, −2.5, −6.0, −12.0 and −35.4 dB), the new mic is clearly fatter, with less back rejection.

It helps to visualise the side-facing cardioid as composed of an omni plus a dipole; his 3-mic set-up is then equivalent to the front-cardioid/side-facing dipole MS technique, plus two extra dollops coincident omni to reduce the stereo width! By all means use the 3-mic set-up if an eight is unavailable, or has a poor sound. Stated specifically, Mr Nurse's arrangement should certainly give the MS virtues of a solid centre-stage but might be better still if the signal panned hard R in the desk is not right-facing cardioid but right-facing–left-facing, with a similar treatment for the L channel. Hold on to your matrix devices!

T McCreadie, Keizersgracht 63-B, 1015 CE Amsterdam, The Netherlands.

PS: I am sure that Mr Nurse will be perfectly aware of these rather ploddingly outlined points—so perhaps I am missing something. Does he trade in his stereo localisation for extra hall ambience (especially with a mid-omni)? I have tried a 3-mic rig (Calrec *2050s*), both his way and mine (with the help of Mike Skeet's MS box).

If Max Headroom had a girlfriend would she be called Unity Gain?

Jim Preen, The Red Shop, 236 St Paul's Road, London N1 2LJ, UK.

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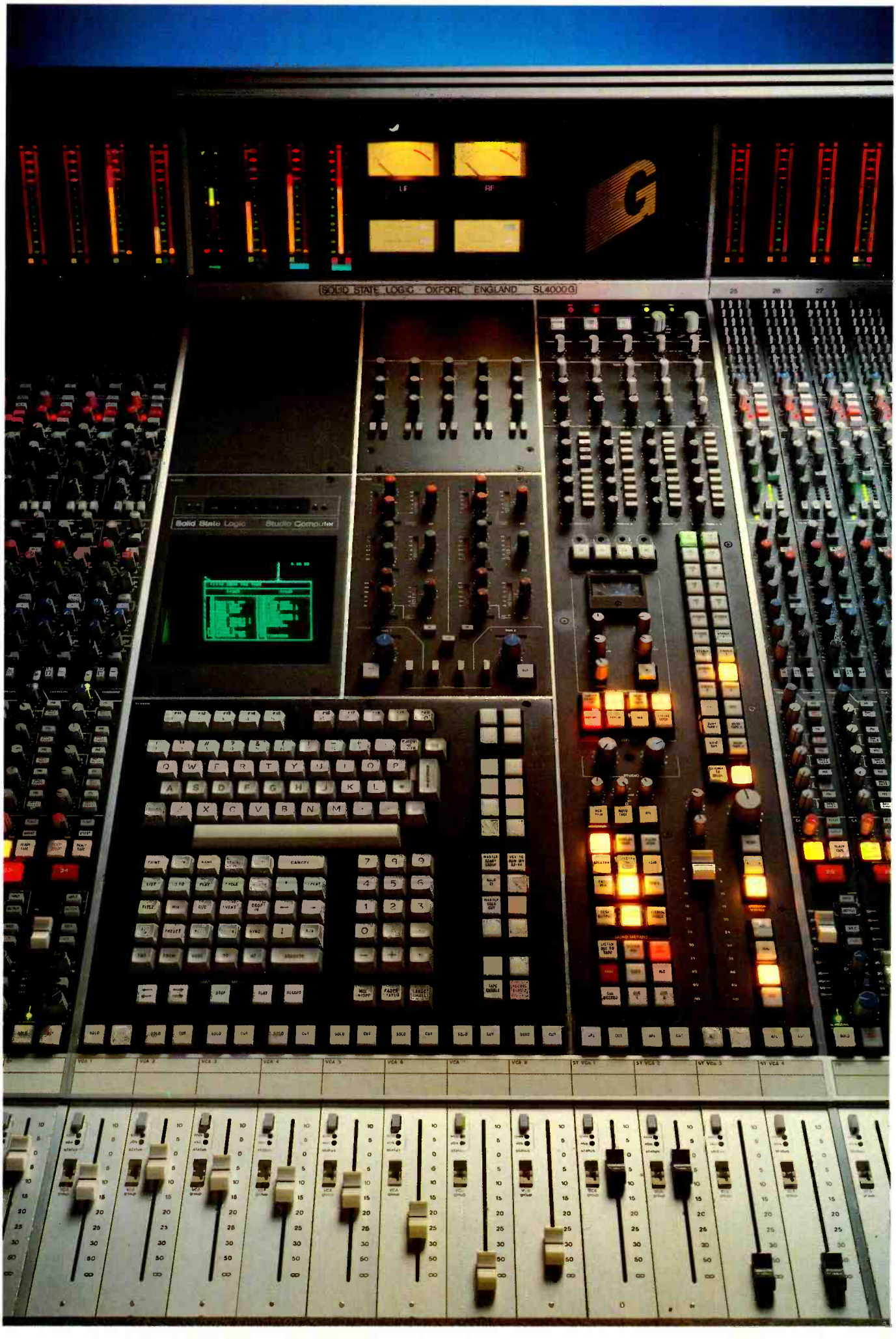

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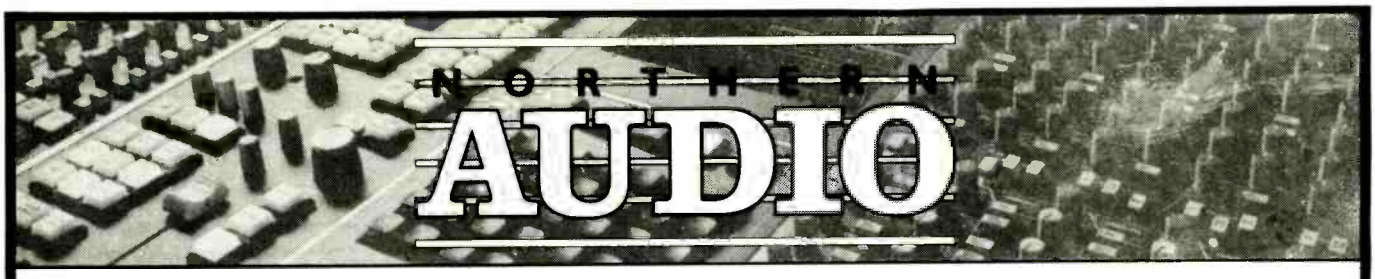

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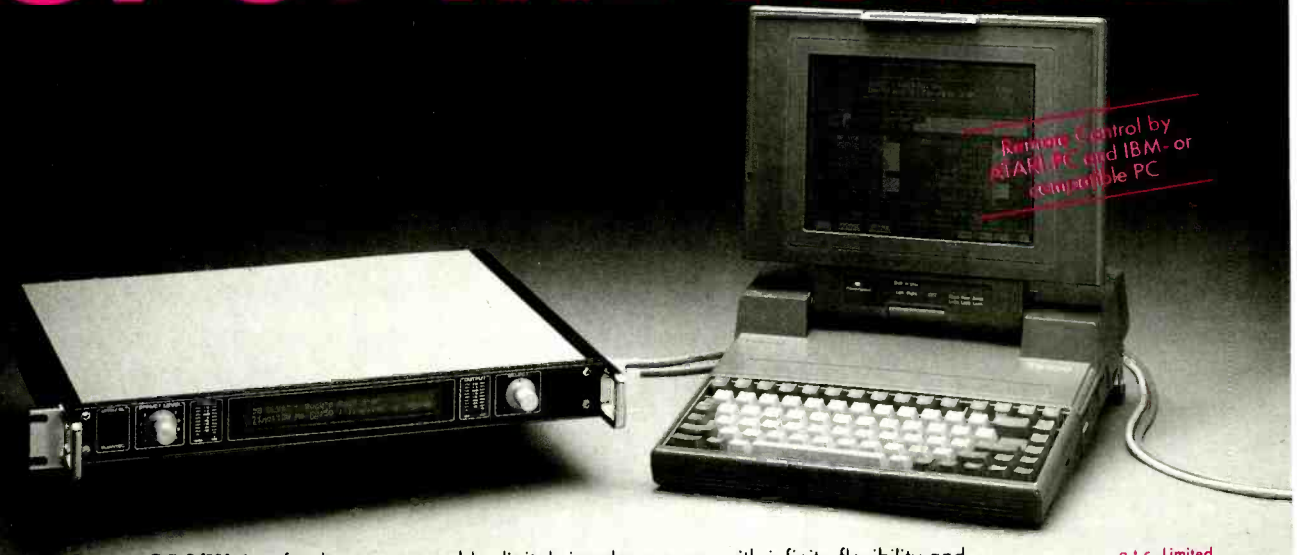

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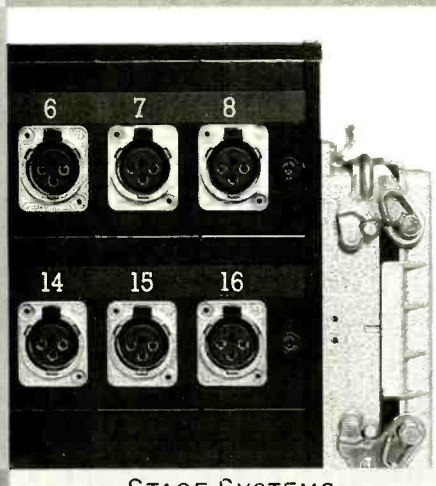

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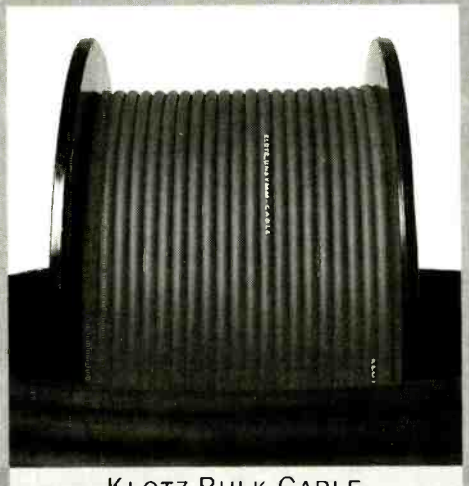

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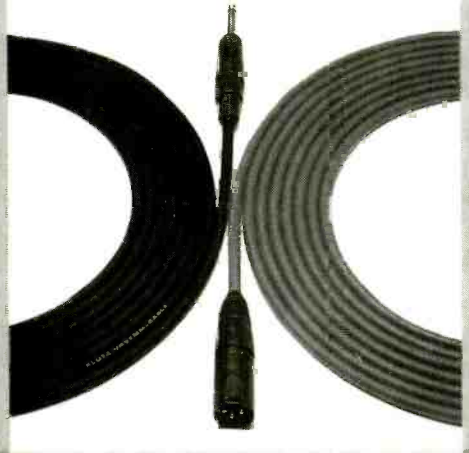

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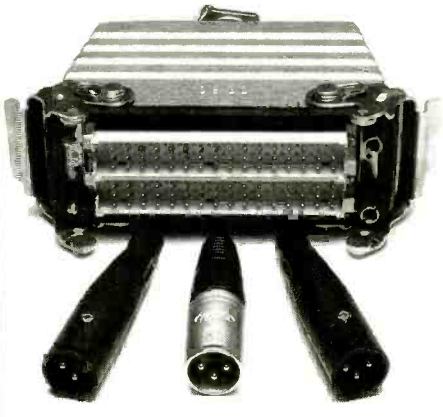

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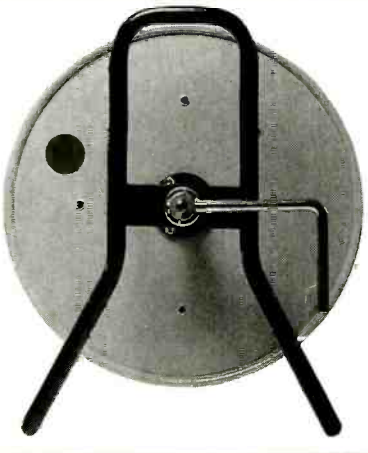

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2 SM85 Condenser

The SM85 is ideal for the most demanding live applications as well as broadcasting and studio requirements. It exhibits remarkably low distortion (right up to overload point) over the entire audio spectrum, considerably less than other more expensive condensers. Controlled low frequency, roll-off, tailored mid-range and clean, scintillating high frequencies set this mic in a class of its own.

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The SM7 is among the finest studio professional dynamic microphones in use today. It features a wide range, very smooth frequency response with graphic response-tailoring switches to allow the choice of four different mic response curves. It has an accurate, symmetrical cardioid pick-up pattern, uniform with frequency and provides maximum rejection of unwanted background noise.

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The SM87 is a studio-quality supercardioid condenser with Shure's legendary road mic ruggedness. New cartridge element and highly directional polar pattern enable the SM87 to reject unwanted sounds and produce high gain before feedback. Its vocal-contoured response provides tremendous flexibility at the mixing board and a warm, smooth, naturally rich sound. High SPL levels are handled effortlessly.

3 SM96 Condenser

This vocalist's microphone has features usually found in much more expensive condenser units. Smooth response has a controlled low-end roll-off to correct for proximity effect, and a slight presence rise to enhance vocals. Efficient 3-leg capsule suspension system minimizes handling noise. Optimized output level to control overloading. Steel-shielded against hum and RF pickup. Operates off phantom power, plus the convenience of automatic battery switchover.

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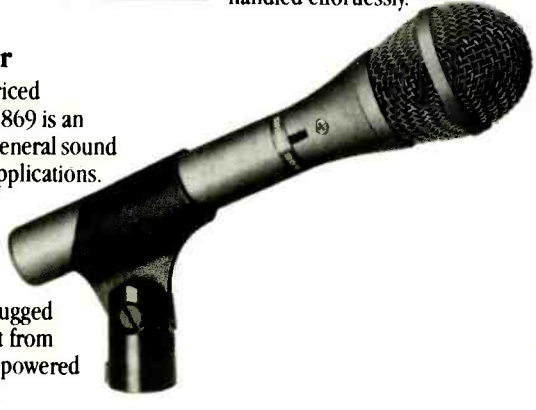

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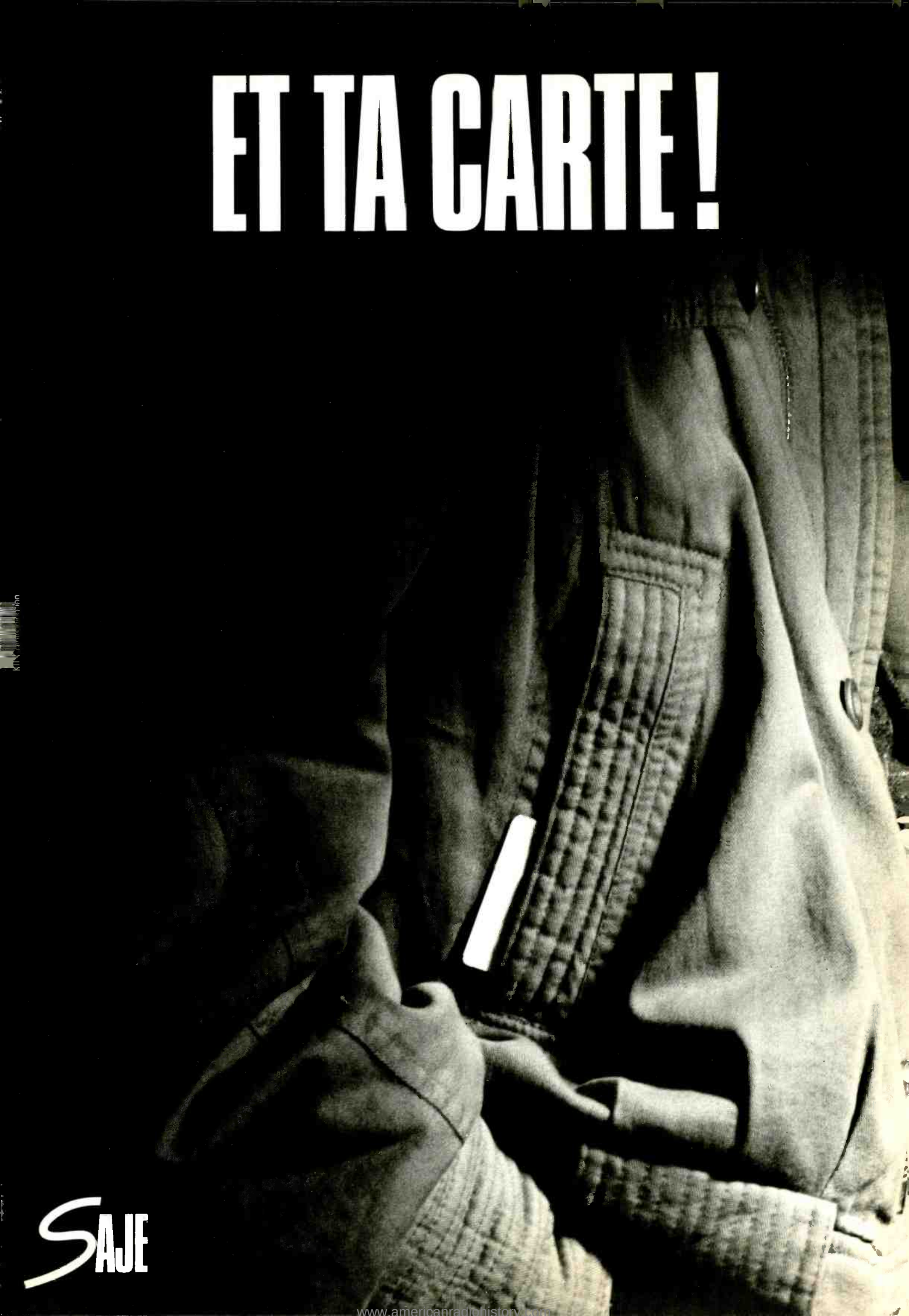


SAJE

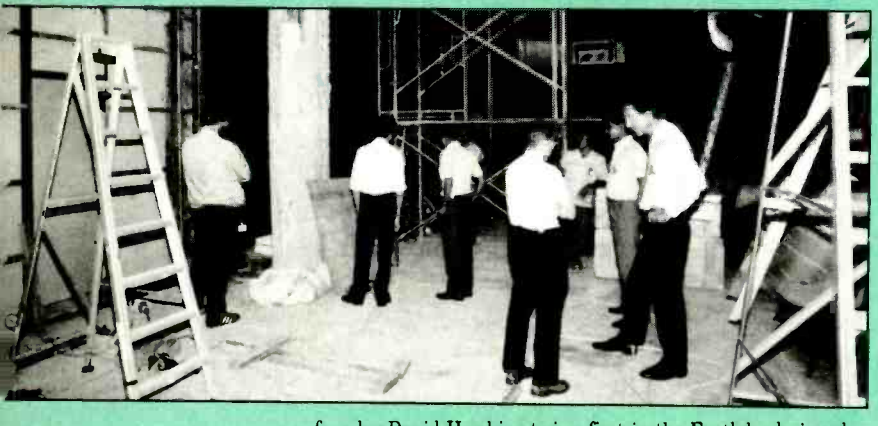
EASTLAKE IN OPERATION

Studio designer Dave Hawkins of Eastlake Audio talks to Jon Kaye about his approach to studio design and construction

In a time when the field of studio design is recovering from being wildly divided in ideology, certain designers have managed to produce successful designs without bending their own approach to acoustic design beyond what they consider to be practical, physical and acoustic principles. There is nothing impractical in this position, but merely a commitment to providing good recording environments given the restrictions of space and budget, without any real hype or marketing exercises.

What sets Eastlake apart from others with this approach is the sheer number of completed projects in their portfolio—over 250 so far. Add to that the number of countries in which Eastlake are represented by their studios—22 at last count—and a picture begins to emerge of an international company based on a solid design approach and willingness to tackle projects from London to Lagos and beyond.

We managed to pin down the globe-trotting Eastlake co-founder David Hawkins twice, first in the Eastlake-designed Yamaha R&D centre in London, and then in their offices near Paddington Station.



After graduating from the Royal Melbourne Institute of Technology with a degree in electronics, Hawkins moved to England and within a year found himself on a ship in the North Sea working for pirate station Radio London and looking after on-air and production studios and transmitters. At least until the Marine Offences Broadcasting Act put an end to it. From there he went to Pye Studios in London, but on considering the hours and holidays he had to work, plus the general situation of his lot, Hawkins concluded that things there were "really wacko. And I thought 'this is not a place to stay at' ".

A brief period as a freelance balance engineer ensued, including the recording of an obscure Bee Gees title at Nova Studios in London. The break came when the Moody Blues, in the early '70s, asked him to handle aspects of a studio project, and in order to get up to date on the latest equipment, he went to an AES Convention in Los Angeles. It was here that he enlisted the services of Westlake Audio to handle the acoustical design. But at the same time, he was astonished at the amount of very good US-manufactured equipment that wasn't represented in the UK, and so went on to set up Scenic Sounds, which within a very short time was turning over £1 million a year. His interest in studio design had by this time grown, although his experience was still limited. "And obviously you can't take people's money if you don't have the experience."

Westlake to Eastlake

Through his work with Westlake founder Tom Hidley, Hawkins registered Eastlake in the UK simultaneously with Hidley's registering in Switzerland. After three years of massive production at both ends, Hidley went his own way and sold Hawkins the entire operation.

At first he saw Westlake/Eastlake as a product in the same way as hardware. So the two sides, equipment and design, were fairly complementary. But ultimately, the work of Eastlake became a full-time job. "Indeed, it's a different discipline and I found that it wasn't possible to be objective and talk to people about equipment on the one hand and about design and construction on the other. So I totally separated the two companies and I in fact sold my interest in Scenic Sounds to Nick (Martin) and Dave Rivett, who I worked with. I'm totally out of it now."

Hawkins is proud of the fact that they still enjoy a very good relationship, and that things are still amicable. "And when you think about it, there haven't been all that many dissolutions of partnerships that are. I'm now able to suggest impartially to clients who ask about equipment, what they should look at."

Following a boom in oil and mineral prices, Eastlake had a spate of building in areas that were expanding rapidly—world-class studios were made in places like Ecuador, Venezuela, Nigeria, and the Congo and Togo. "But sadly, because of the pressure of commodity prices we've seen over the past five years, those countries have more urgent priorities now than to develop their recording infrastructure.

"It was a particularly interesting period because it offered Western European locations the opportunity, which they simply didn't have before, of putting up a recording studio or a recording complex on a greenfield site in the developing world—where, of course, there aren't surplus buildings around to turn into studios."

More recently, Southeast Asia has become a prime area, with projects completed for the Singapore Broadcast Corporation, and commissioned in both Singapore and Malaysia.

Containing the problems

Just the thought of the myriad problems that could arise with the construction of a studio in an unfamiliar environment, especially in a developing nation, would put many people off the idea completely. If you run out of, say, a certain kind of bracket in Europe or North America, it's simply a matter of popping down the street to the local hardware store. But in a small town or village in a developing area, you might be looking at a day or even longer before supplies can be brought in. Contingencies must be made to some extent, by shipping over some of the material.

In fact, as Hawkins says, in the case of the Congo or Togo, or Nigeria for that matter, it's really better to containerise everything and send the fixings as well as the materials. Eastlake have a fairly general rule where they take over what they think is an accurate list of quantities and then add 10%. And an accurate list of materials can only come about from analysing in fine detail what goes into building a room—how many nails, how many screws, how many feet of timber and so on.

"That's one of the beauties of having a filing system that gives you access to records of more than 250 projects. And similarly, it's easy for us to compare predicted acoustical performance with measured, completed acoustical performance and work out then how large or small that gap is going to be on a future project similar to one of the past projects."

There must be so many unknowns, though, when you go into a country which has probably never had a recording studio outside the local radio station. Local regulations on their own must present quite a problem.

"We pretty much always work with a local architect. I'd say, in fact, that Britain, France and Germany have amongst the highest public health and safety regulations and I think if

you work to the most stringent European regulations, you'll not get into trouble anywhere else. The only other interesting area is if you're doing a studio in an earthquake zone, such as the west coast of the States, the north of Greece or Japan."

Another major problem to keep you up at nights are the effects of insects and fungus on wood. And if the studio is intended to incorporate a lot of wood in its structure, there's obviously a lot of preparation that has to be done.

"In somewhere like Singapore you're talking about every piece of wood needing to be impregnated with insecticide and fungicide. But again, this can all be done here, in enormous high-pressure chambers that they feed the stuff through on a continuous basis, and indeed, that's what we've done in cases where we've had to ship materials to Africa."

At the other end of the climate spectrum, in the freezing cold, there are surprisingly few, if any, exceptional problems. Eastlake built Power Play Studios out in Switzerland in the middle of the winter, and the only place for storing materials was actually outside covered with polythene. Since the humidity level in European winters is very low, the wood was not affected in any way.

"Generally, if all of the materials arrive on site, and if they're inadequately kiln-dried and so forth, it shows up fairly soon and a certain amount has to be rejected. And things like plasterboard are about as inert as anything can be."

Different strokes

The concept of building a recording studio in the Western world is by now a comfortable one. Criteria are laid down by the prospective owners, which can be physical or much less tangible, such as a certain 'feel' to the control room being needed. Studios being used for recording pop music tend to have varying degrees of difference to those used solely for classical music, or for voice reproduction. But in a country where the knowledge of studios is scant to say the least, the studio designer can get only a minimum amount of feedback as to what's actually required. Often the only piece of information resembling a starting point is the fact that money has been made available to build, and there is a location that seems appropriate. After that, it's entirely up to the designer.

"It doesn't take long, though, to work out the local recording requirements. In the case of Africa, you might consider that four or five percussionists playing simultaneously would be a rare sight in Europe, yet 16 percussionists playing simultaneously in Africa is by no means uncommon. And they want to play together, at the same time as the rhythm section. The whole concept of them dubbing tracks is completely alien.

"So you've got to see what they want to do, find out which instruments there are, and how many of them like to play, and the conjunction of instruments, and find out the instruments they never use. Stringed instruments like violins are almost unknown in Africa."

The area in which the musicians play is again totally different, depending on whether the studio is being built on a greenfield site or existing site. Hawkins takes into account an average size group of musicians that perform together in that country and deals with the clients on that basis.

The acoustic treatment is an aspect of design that must be understood completely if the studio is going to capture the kinds of sounds that are going to played in it. Simply juxtaposing Western values on to, say, an African studio shows a lack of understanding and a certain amount of irresponsibility. Different cultures, besides having obvious differences in music, also exhibit different listening characteristics, and that too has to be reflected in the studio design. Once these differences are catered for, there remain common requirements to all studios.

"Any musician playing in a live situation is more excited if he is in a reverberant environment. You can take musicians into a live room and a dead room without recording them. Afterwards, when they choose what to record in, there's no question at all. And one of the reasons—and it's terribly obvious—is that you don't have to use as much energy to get the same level of excitement. You don't have to knacker yourself playing an acoustic instrument."

Eastlake design approach

Behind the glamour and romance of working in all corners of the world, Eastlake's design approach is almost unnervingly simple. Time and again Hawkins stresses the straightforward, logical approach to producing a good studio, and in so doing implies a healthy distrust of labelled approaches, and of the idea that a studio can be imposed rather than built from within.

"Generally speaking, our design approach starts with analysing the proportions of the room, as any design approach should, making sure that we have a mixture, a diffuse distribution of room loads, of designed wall systems which are sufficiently rigid to not dissipate the energy that should be being promulgated into the room. We design angles so that we can have the amounts of reflection in the room without that reflection consisting to any small part of fluttering or any undesirable effects like that. And we obviously incorporate low frequency treatment which compensates for things like carpets and high frequency absorption. There's no magic in it. It's straight up-and-down physics.

"We specify, obviously, air conditioning such that tolerable levels of noise are achieved. The only way that you can make an air conditioning system perform on the threshold of audibility is to make sure that you deliver air at very, very low speeds with absolutely no turbulence by having it delivered through a fairly large cross-section of ducts. Or, if you like, having it delivered at high velocity through a small duct into a plenum chamber where it can be transported into the room without having audible whistles and so forth. Electrical systems and interface systems are both integral parts of our planning, but they're both kept separate and integrated at the electronics boxes end."

Once the basic principles have been established, and adhered to, the requirements of the situation come to the fore, and modifications to the original plan might be made.

"We do make evolutionary changes, but—and I probably sound like a dreadful old reactionary—I don't think that we have any right to put anyone else's money to make revolutionary changes. If we're building a place on our own account, there are probably some ideas that we'd try out, but it's not really fair to do on somebody else's."

In terms of the choice of monitoring, Hawkins expressed a need for some information in the planning stages about what's likely to be used. The dispersion characteristics, for instance, because that's fundamental to the geometry of the room. Equally, he'll try to design a room so that people's options aren't totally closed down, looking at perhaps two or three monitors of the same physical size, any one of which being a candidate for use. And the monitor soffits will be made large enough to handle the largest dimension in each direction of those two or three monitors.

"Your monitors are a very fundamental part of your business—more so, really, than perhaps the desk, in terms of sonic performance—and I'm all for people saying 'let's try two or three types of monitor'. You can borrow microphones, an equally subjective choice, from distributors, so why not borrow monitor speakers? The only difference in that respect between a monitor and a microphone is the amount of effort it takes to carry it in and put it in place."

If anyone asks his opinion about what gear should go in the studio, Dave Hawkins will give it, but he's adamant about offering any unsolicited advice. He might, however, raise an eyebrow and say 'are you really sure about that?' if it was suggested that an unsuitable piece of equipment was going to be installed.

"I don't have very strong prejudices against any particular

type of equipment. For instance, about half the studios we've done have had Studer multitrack tape machines and the other half have had Otari. There aren't all that many possibilities for really eccentric choices. As far as consoles are concerned, I'd say the lower the profile of the desk the better, without question."

Control rooms and machine rooms

For Hawkins, the most predictable thing in the studio business is that over the last five years, the amount of space required in the control room has doubled. Five years ago, Eastlake were typically building 45 m^2 control rooms, whereas now that figure is around 90 m^2. A large proportion of that extra space is taken up by monster consoles, 64 inputs and upwards, when five years ago 36 inputs seemed all anyone would need. But there are cases where building won't allow it, and it's another compromise

EASTLAKE IN OPERATION

that's got to be explained to a client. On a personal level, Hawkins has his doubts.

"I feel very strongly that this doubling of control room size has taken away the ability of a control room to excite the listener, because in small, linear rooms, you actually achieve a sensation of excitement that stems from having your internal organs agitated. It's impossible in a large room unless you had immense amounts of power being delivered into the room moving immense wavefronts of air, and God knows what would happen to your ears in those circumstances. You can fake or simulate that sort of thing by having wooden platforms that actually do move and transmit some of that up your feet and chair stems and so forth. We're actually doing that on a job right now. I think too that larger control rooms are somehow more impersonal, but that's only a personal point of view."

One way to combat the urgent need for space in control rooms is the incorporation of machine rooms, which have been used by the television industry for years.

"And not before time. We've actually in the past made machine rooms within control rooms separated by sliding glass doors. In fact even with the play of wall geometry, it's terribly necessary now, for a number or reasons. One is the noise that the tape machines make. The whisper fans, or manufacturers of whisper fans, should be taken to pieces on the Trades Descriptions Act.

"Secondly, you've got the sheer bulk of machinery now, when you've got two 24-track machines and perhaps three 2-tracks. And thirdly, the heat load of the machines; there's no earthly reason why the heat load of the tape machinery in a room should be on the same circuit as the personnel load of the room because the personnel load is a constantly changing one every time the doors open and close, and when more people come in or go out.

"But the tape machines, provided they're behind glass or whatever, can operate on a completely closed circuit, and in fact the type of air conditioning system can be the type that doesn't introduce fresh air every time because that's not doing any favours to the dust content of the room. It can be the refrigerant analogy of a fan heater where there is 12 to 15% fresh air coming in each time. It's a difficult thing to get right, since obviously someone who's not getting enough oxygen is going to become fatigued earlier."

Closer to home

Naturally enough, Hawkins relishes the thought of being involved in a project from the beginning—when an abstract idea of putting together a recording studio is presented to him but without the restrictions of having an existing building to convert. In Europe, however, that's rarely the case, so the next best thing is being in on the choice of property.

"I can often see merits and demerits in a building that the prospective studio owner is oblivious to because he likes the colour of it or something like that, or the location. The location might be terrific for transport and so forth, but it also might be above a tube line and there may be significant savings in going to a location a little further down the road. Quite often, I'll go out to meet with somebody and look at four or five buildings and then leave the client to do the deal for the most appropriate building."

With an existing building, there are inevitable compromises in the design of a studio. An excellent example of making the best use of available space is seen in the London basement that became the Yamaha R&D centre (see *Studio Sound*, October 1987), where the structural elements had to be built around it, and there was the problem of overcoming the effects of three underground lines. But the largest compromise, as seen by Hawkins, is "the huge area of glass usually between the monitors".

Setting your sights

It is perhaps not surprising to learn that Eastlake are taken to look at buildings that should never, ever, be made into recording environments. Hawkins reckons that some 50% fall into this category, with 25% in the 'possible' category given some structural modification, and the final 25% needing no structural changes at all.

For many clients, location is number one on their list of priorities. When Covent Garden was going through its renaissance, Eastlake looked at dozens of buildings for people who thought it would be great having a studio there. But most were totally unsuited because of the low ceiling height and numerous cast iron columns. "The floors would stand the weight because they'd been built as warehouse buildings. But they were cheap to build at the time, with fairly low ceilings, because it was a store. Things were loaded by hand, there were no forklifts to think about so it didn't matter about the columns every two or three metres. So we had to advise people not to go for them."

There are cases, though, when advice just isn't needed. When all else fails, and the client insists on building on a site that is completely unsuitable, Hawkins suggests quoting an impossibly high figure. The very worst that can happen, then, is that you'll be overpaid.

A balance of experience

Whatever a designer's academic training, believes Hawkins, "unless you actually have your head inside a studio and control rooms, and unless you're talking to mixers and engineers, you miss a lot. So you've got to have experience in both sides.

"As a general rule, people who've done post graduate work, particularly in acoustics, never seem to end up in the nuts and bolts area of applied acoustics. They tend to end up in more esoteric things like designing high bypass turbofan engines that don't make a lot of noise and things like that. In our business, people at the nitty-gritty end tend to be people with some experience of the studio business.

"We sometimes get involved with clients for whom an

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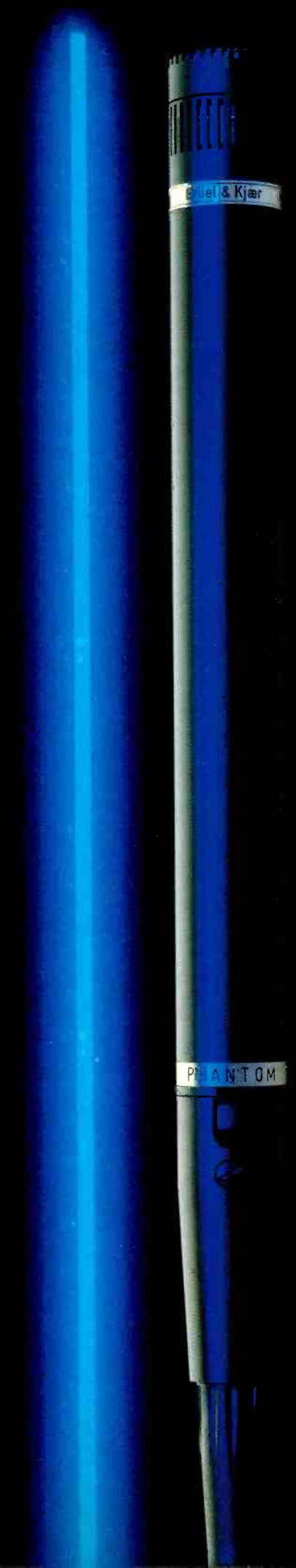
The type 4011 Cardioid Professional Microphone joins the Series 4000 range of Professional Microphones — the product of ten years of research and development by a team of dedicated specialists. The 4011 is a prepolarized condenser-microphone, with a first-order cardioid directional characteristic which combines a flat on-axis frequency response with a uniformly smooth off-axis phase and frequency response. The type 4011 can handle 158dB SPL before clipping. Coupled with extremely low distortion, this gives the type 4011 a sonic performance unequalled by any other cardioid. These design features open up a wide range of application possibilities.

The work Brüel & Kjaer's engineers have put into the design of this microphone ensures that it will not become readily obsolete due to rapid advances in technology. The craftsmanship and materials involved in its construction are what make the difference between a good microphone and a superb microphone, and allow the 4011 to be called, justifiably, a work of art. Its technical specifications paint an impressive picture, but there's more to it than that. Put the 4011 to use and you'll find that, for once, what you read translates into what you hear.



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architect has designed the outside of a building and wants to have a crack at designing the inside of the building. And you can imagine, there are some pretty naïve assumptions. There are people out there, professional people who are highly competent in their own disciplines, who honestly believe that everyone stands around one microphone all at the same time."

But there's no doubting that an academic background does have its uses. One consultant Eastlake have called on has his PhD in behavioural and acoustical properties of very large enclosures, obviously very relevant to studios. "So when we came to do the new model of CTS One we called on him to run simulations using the software he'd developed on the behaviour of the room. Making an error in RT time realisation against projection is really bad news at the best of times, but if it's a studio that holds a hundred people the cost of modifying that is absolutely awful."

While Eastlake themselves have access to computer-aided design systems, most of their constructions are simple enough to

EASTLAKE IN OPERATION

obviate the need for them. They have their own software in spreadsheet form for checking resonances in various room dimensions and so on. "It saves a lot of legwork but it's not really heavy-duty design. We really only use the computer for number-crunching."

Because their process involves turning out two, three or four conceptual drawings and because most people who work in management of studios don't have engineering backgrounds, they're not really used to seeing two-dimensional drawings. So Eastlake tend to keep conceptual drawings simple, and done in a lot less time than computer-aided conceptuals. "Luckily, no one asks for 3-D models. You can get them, but the cost is pretty high."

Darwin and catalogues

Almost without fail, clients get new ideas during construction. While there's not much to be done if the space is smaller than someone imagined, good ideas can be incorporated as the job goes along. "I think it's fairly general that as things start to be realised, people say 'Crumbs, why didn't we do this?' So we obviously keep it in mind and make provisions for it in our contracts."

In order to know precisely what equipment is available for any given project, Eastlake keep up-to-date manufacturers lists on a wide variety of off-site manufactured items, like sliding doors, hinges and the like. And just keeping your eyes open can be very useful.

"In fact, one thing we incorporated into a couple of designs recently is something I saw in Paris. I was sitting down with my wife in a café on the pavement section and it became cloudy and all of a sudden started to rain. A really small, slightly built garçon just pulled a glass door and the whole thing just tracked all the way around; it was almost effortless. It was just beautifully executed, and within no time at all he had the area sealed off to the elements.

"So I went and had a look at the fabrication and saw the size of glass it could carry and it was in fact carrying 12 mm safety glass and so it made an ideal thing to incorporate into studio design for separating off isolation areas. We were able to modify the top and bottom seal so we in fact got down to the limitation performance of the glass, which is probably about 24-25 dB 100 to 3150 Hz."

Eastlake make their own acoustically designed doors. Ready-made ones that could give 45 dB tended to be clunky metal industrial doors, and it was decided to make something a bit more elegant and a bit easier to handle. The very first one they made was also an experiment to find out just how much mass was needed to meet the performance of the wall system. So they made an oversized door with a 100 mm space, mahogany spacer bars separating two sheets of incredibly heavy plywood with a frame around it. They left plug holes in the top, took it to site and filled it with dry sand after it had been installed.

"The performance of the door was then way in excess of the wall system. And there was really no point in that, but I wanted to quantify it. So what we did was make the wall system, put in a dummy door of the same construction as the wall, took measurements, removed the dummy door and put in the real door. We've in fact scaled it down and that's how we arrived at our standard door now. So the door we use is slightly superior to the wall system we use."

As Hawkins points out, doors are very critical things, particularly now in the age of digital recording, since the intrusion of the most innocent of extraneous noises—somebody laughing in a corridor, or walking along outside the door—"is very bad news".

Lofty ideals

When the question came up as to the ideal building in which to create a studio, Hawkins replied: "Something like an aircraft hangar—something with clear spans, a high ceiling—a simple building. A very complicated building makes any structural changes very complex and expensive, so a simple industrial building is perfect. But you only get the chance to work in those types of buildings on the periphery of major cities, or in the new world where they are the only types of buildings that have been put up."

So once again we get back to the real world. This is the world in which only a handful of people can spend millions on the studio equivalent of Disney World, a world in which savings of hundreds of pounds mean a lot to most clients. So when Hawkins speaks about the ideal studio, he does so in this context.

"More than anything now it would have height, which fulfils a cubic volume ambition. But if you've got it in height rather than in width and length, you don't have to pay as much. It's more cost-effective to develop up than horizontally. So get a floor area able to accommodate 30 or 40 musicians—say 10 m by 18 or 20—but have ceiling heights that will make it sound, if you wish, like a very big room. And it won't cost you nearly as much to do than to create a 10 m by 30 m space with half the ceiling height.

"People now really expect the room to give a lot more than it did 10 years ago when too much amplified equipment was being brought into the studio and separation would suffer unless the studio had a very short reverb time. Now people are tending to work in a very much more acoustic way which benefits the players and benefits the sweetness, if you like, of the recording. So that's what I would say given a rationalisation between having unlimited space and a limited cheque book.

"As far as control rooms go, if people continue to insist on very large areas, it's going to imply a lot more power and power handling from monitoring systems and what that's going to do for people's hearing sensitivity is another story."

Hawkins admits to being a very practical person, being very interested in getting and giving cost-effective solutions to problems. "In fact I think in a way it's easier to design terrifically esoteric studios that look spectacular and turn in good results. I think it's possibly more difficult to turn in construction that's cost-effective giving equally the same results, but I'm more comfortable doing that.

"So you could say I'm no opponent of attractive and durable and slightly luxurious finishes—things like solid hardwoods—because I know that studios are really busy places that take a lot of abuse, and if you don't put high-quality materials in, it's going to look a wreck in six months, and really depressing."

Looking back on his career so far, Hawkins has no regrets. "I've been lucky enough to work in loads of different countries, it's let me see more of the world in terms of attitudes, and how the world works, than would have been the case had I gone as a tourist or in some other capacity. It's made me feel quite humble being in places right in the middle of nowhere and being the only white face for miles around and not being hassled or pointed at and all that stuff which has plagued so many people in recent times."

A sobering voice indeed from the ever intensifying jungle.□

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STRONGROOM

Janet Angus visits an expanding middle-sized London studio

When Richard Boote and Dave Formula set up Strongroom Studios at the beginning of 1985 they were up against a dominant SSL hold on the London studio market. Apart from the investment required to set up an SSL studio, Strongroom felt that end of the market was already more than adequately catered for. Instead of going to the opposite end of the market though they settled somewhere in the middle.

Exploring new avenues, Strongroom have recently become deeply involved in the computer side of music-making and control of equipment/instruments. The result is a MIDI room with a difference officially opened in August '87. Although the room was finished in April, the interim period was used to train operators and ensure there were no inherent problems in the system.

The studio owes its existence to a chance meeting between Boote and Formula at a South London bus stop. Boote was managing bands (including Yachts and OK Jive) and Formula had been a member of Magazine and Visage; both wanted to set up a recording facility and their ideas coincided. As Boote was already established in premises it was decided to build their studio there.

Neil Grant was appointed to design the acoustics and supply a monitoring system; architectural design was delegated to Michael Shepherd, building to Tom Brodie.

Boote: "The finishes, shape, size, etc, were all dictated by us. When we first approached studio designers they all came up with pine and brown fabric, brickwork and fish tanks—real post-Westlake stuff. So Dave and I with Malcolm Garrett of Assorted Images (our in-house design company) decided to look after the interior design.

"We were not going for the lower end of the market (which isn't a pleasant area to work in) and we didn't have the resources to go to the top, which was flooded anyway. We thought we would go for a market which would possibly record here and go elsewhere to mix. So we wanted a live room and a largish control room.

"When it was finished we had to spend nine months convincing A&R people that you could actually record on something other than an SSL console. We instigated what was then a radical way of recording. It was better for everyone: the record companies saved money and the records sounded better for having been recorded here."

Richard Boote, Mick Shiner, Steve Taylor and Adam Moseley

The Strongroom team realistically acknowledged the fact that they could simply not afford to get involved in the price cutting so many of the London facilities have.

"We wanted to be a studio that charged what it was worth—and by charging that, be able to supply the standard of service demanded of this type of facility. We spotted a market which lay between a cheap studio and the really expensive £1000+/day studios. Quite a few of the SSL studios are now thinking of opening up a mid-priced studio to complement their other rooms."

Boote already had a strong relationship with console manufacturer Amek having bought his first Amek 16/8 on-stage foldback mixer from them as far back as 1976. "Amek and Neve in my opinion make the two best sounding consoles," explained Boote. "We chose an Amek *Angela* for the sound and because of our good relationship with the company."

March 1987 saw a refit of the control room. A more contemporary interior design was implemented and the console was replaced with the new Amek *G2520* with *MasterMix* automation. The Tom Brodie/Neil Grant team returned to retune the room. An LEDE-type design, the room is finished in various shades of blue fabric. The Discrete Research soft dome monitors are masked by acoustically transparent blue fabric to avoid breaking the line of the room. It is large enough for keyboards to be set up between the console and the control room window.

In the initial design proposal three reflectors on the back wall and one in each rear corner were to be wood. Strongroom requested Perspex. Pirelli floor covering underneath the console completes the look. The control room window looks into the studio, which benefits from natural daylight and a wooden floor, so the overall effect is quite bright and comfortable.

Tape machines are recessed along one wall out of the way. There are an Otari *MTR90 MkII* 24-track multitrack, an *MTR12* ½ in and *MTR12* ¼ in with centre timecode track. There is also a Sony *PCM701* with *C9* Betamax. Outboard effects are housed in racks on the back wall and in a mobile effects pod.

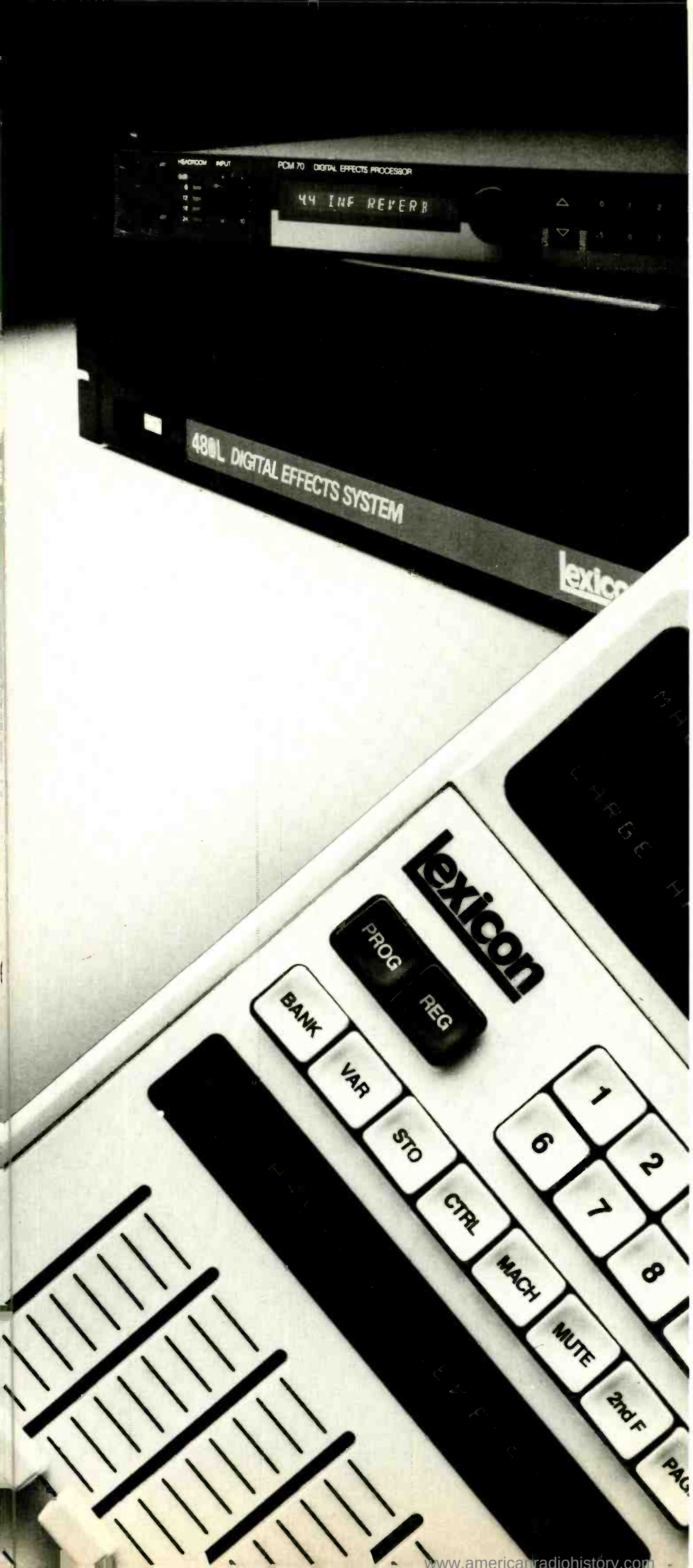
The studio does a lot of film and television work including the *Spitting Image* television series, hence the need for centre timecode track facility. Outboard comprises AMS *RMX16*, *15-80*, keyboard interface and flanger; Yamaha *REV7* and *SPX90*; Ursa Major *Stargate*; Roland *SDE2500* digital delay; Korg *SDD3000* digital delay; Bel *BF20* Flanger; Drawmer *DS201* and *DL221* noise gates and compressors; Klark-Teknik *DN71* 31-band graphic equalisers; a *Scamp* rack and Electro-Voice stereo graphic EQs.

Studio monitoring is a triamped soft dome system by Discrete Research. Nearfield monitors are Acoustic Research *AR18*s, Yamaha *NS10*s and Philips *Motional Feedback*. At the time of this interview producer Adam Seiff was working in the studio. Having launched into an extensive speech about the studio's virtues he decided to backtrack with: "Be less glowing can you? Then perhaps we'll be able to get in here when we want to." He was working with freelance engineer Alan Jakoby who has more or less taken up residence there with various projects including the Spitting Image marathon. "Alan's the best dressed engineer I've worked with," concluded Seiff.

The studio itself has built up a reputation for a good live drum sound and many a project has come in solely to take advantage of that, including recently Killing Joke. The room has also proved a valuable source of sampled sounds for the MIDI room upstairs. Now designated the Storeroom, this was formerly the 'bridge' playroom, so called because it is above the control room looking down into the studio. It is not only a self-sufficient MIDI programming/production room, it is tie-lined to the other rooms and may quite happily record things going on in the studio. The seed of the idea was sown when a band tried to hire the 'bridge' to do their pre-programming in.

Studio manager Mick Shiner arrived in June with a background in both music and personal computers. "There is a lot of new technology in that room and we had to make sure it would run smoothly with no breakdowns, as well as train the operators."

There are both an Atari *ST1040* and *Macintosh Plus* with *Imagewriter* printer and Opcode *Studio Plus* MIDI interface/jam box. Strongroom are thus able to take full advantage of software



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developments both in the US and the UK. "We decided that because the Americans are much more used to Apple than Atari that we should get both. The software is very competitive between the companies and as soon as one brings something out the other is not far behind. The use of the Opcode cueing system enables film soundtrack work."

As Shiner explains, there is a traditional fear of computers but, he says, he knows nothing about them although he loves using them and it is this type of approach that the studio hopes to encourage.

The actual room has not undergone extensive acoustic treatment as it is not being used for mixing, but has been designed loosely on an *LEDE*-type principle. Once again the in-house interior design team has been at work with greys, blues and yellow stripes, creating a bright contemporary look.

Richard Boote explained that the construction of the MIDI wiring was almost more important than the sound.

"You can bring anything into this room and plug it in anywhere and with the full MIDI patchbay be integrated into the complete system—the desk, everything. We have utilised Star system wiring which means there is no MIDI delay."

STRONGROOM

The mixing console is a TAC *Scorpion PB* 28/24/12/2. With mic lines and MIDI inputs all round the room it is possible to plug in absolutely anything you want and work with it straight away. The list of resident equipment illustrates Strongroom's commitment to this technology. Synchronisers include Bokse *SM9* timecode events controller, *U58* Universal Synchroniser and *MHZ* MIDI *Humanizer* plus Sycologic *M16R* MIDI matrix system. Effects: three Alesis *Microverbs*, a Roland *DEP5* multi-effects unit, Drawmer gates and compressors, Rebis MIDI gates and Roland digital delay.

Keyboards include Roland Super *JX10*, Yamaha *DX7* and *TX816Z* expander, Casio *FZ1* and *CZ3000*, *MiniMoog* and Sequential Circuits Six Tracks. The sequencer/drum machine complement includes Sequential Circuits *ST440*, Roland *727*, *TR808* and *Octapads*; sampling is by Akai *S900*, Casio *FZ1* and Oberheim *DPX1* multi sample player.

Monitoring is on Acoustic Research *AR18BXs* and JBL *Control Ones*. Software includes Steinberg *Pro 24*, Mark of the Unicorn *Performer* and *Composer*; Akai *S900* sample editor; Music Mouse; Opcode *DX7 Librarian* and *DX7* patch editor; *JX10* MIDI dump; Southworth *Total Music/MIDI Paint* and *CZ Android ST* editor/librarian.

Live room

Shiner: "Although MIDI technology is in its infancy, the advantages are numerous. Most writers go through the same motions of the initial sketch of an idea, the demo, the edited demo, the master, the edited master, etc, so the facility to be able to quickly change the notes and character of the sound greatly increases productivity and opens up immense opportunities for experimentation."

Formula: "We didn't want to have a Fairlight room because there are already about six people who have them in London and they have their established clientele so there wasn't much point in investing in one of those. Also, this type of room ties in with the Strongroom philosophy of not going for the absolute top of the market. There is a massive market for the sort of set up we have here. We see more and more producers and engineers doing their pre-production on home PCs. We can do 90% of what a *Synclavier* can do—apart from the *Direct-to-Disk* facility obviously. And yet we have more flexibility and variety. The software sequencer programmes we have are much more flexible than a Fairlight.

"You can do lots with an SSL console but you don't necessarily have to use one to get the best results; the same thing applies in the MIDI room."

Strongroom has established a strong connection with Casio who are preparing to launch themselves into the professional audio market. Casio product finds its way into this studio in search of professional feedback in terms of user requirements. Casio MIDI drumkit pads were in the pipeline and expected for experimentation. The studio feels strongly that MIDI has been kept too much to the keyboard playing fraternity and it is time for guitarists and drummers to have a crack of the whip. To this end they have a Roland *GM70* MIDI guitar converter.

"We didn't want to only appeal to computer fanatics. You can come in here as a musician and possibly even not understand any of the equipment but still use it. We didn't want computer fanatics or just keyboard players who are more computer literate anyway. Guitarists have been a bit neglected as far as MIDI has been concerned. A guitarist can come in here and play any of this equipment. It is also better for some sounds because you get the benefit of the touch on the strings. We set the guitar up for each individual client's feel and touch."

In-house operators Steve Taylor and Paul Townrow have been building up a drum sound library recording drummer Pat Ahearn on a Tama kit and on a harder sounding Yamaha kit. The library will obviously be expanded as time goes on.

The rest of the Strongroom building is taken up with various studio facilities: kitchen, rest room, Pool, TV, etc, as well as various other companies including Strongman and Strongword management and publishing.

In spite of the studios' success, partners Boote and Formula are frustrated by it all.

"We wanted to use the studio as a tool rather than run it as just a business but we got so involved in it and spent so much money on it that it had to be run as a profitable business," explained Boote. "So now we have a studio manager we should be able to get on with what we originally intended, ie Dave with publishing, writing and playing and me in management. We really haven't been able to get much time for ourselves. We sold nearly every day in the first 18 months."

Even though land in the City area of London is at a premium Strongroom has a remarkable abundance of it. Plans are still vague as they wait to see the results of their latest project, but confident that MIDI/PC programming/production is the way of things to come they hope to venture more and more into that market.

Formula: "We need more facilities than just one studio programming room. If we build three or four studios then it will start to make more sense. The backup, maintenance, management, secretarial staff and catering costs will all be the same as they are now; bookings will be easier because we won't lose a three-week booking just because they can't have the first two days. We will keep aware of what's happening in the recording studio market but intend to move more and more into MIDI; that's where it is going to get very interesting."□

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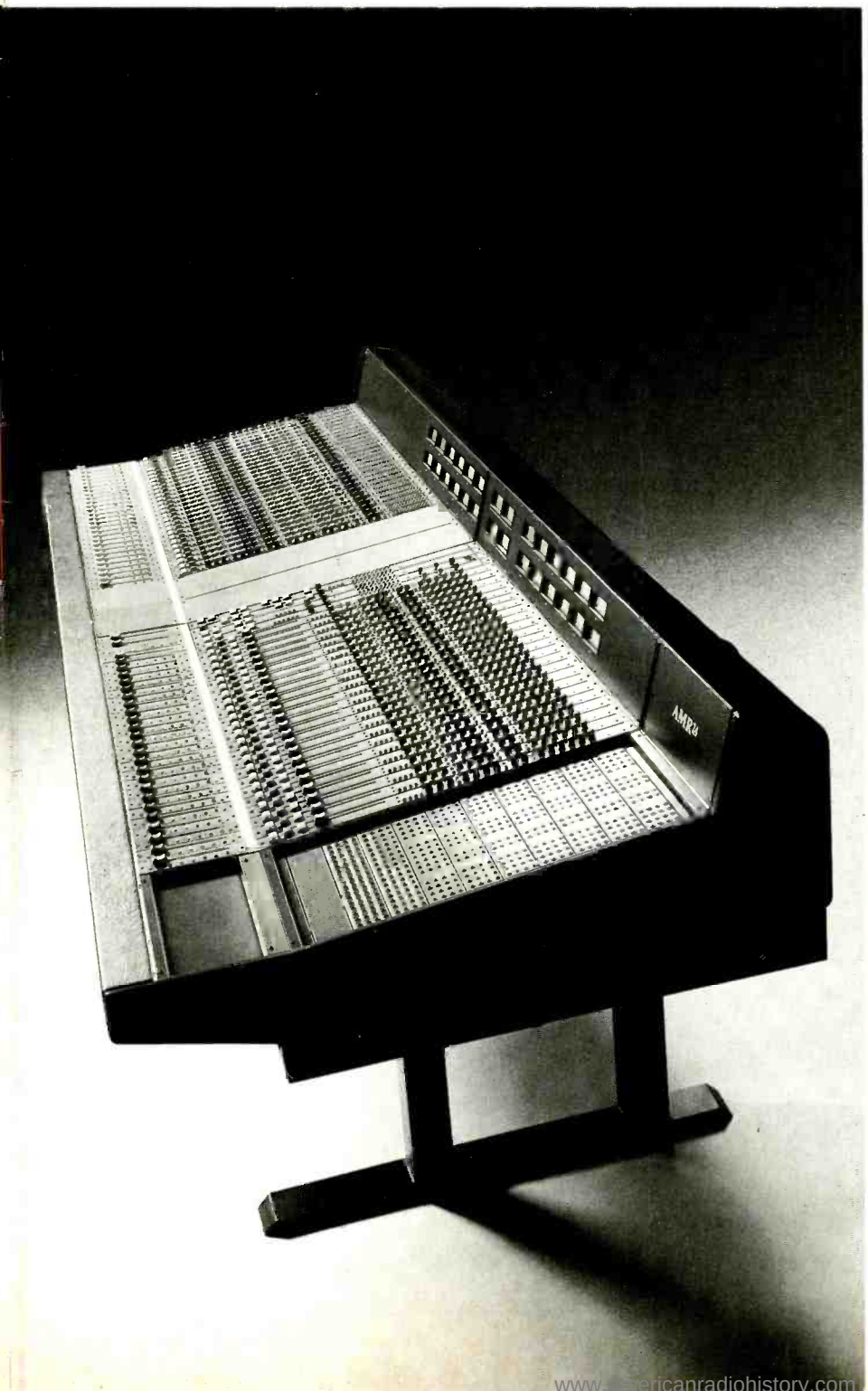

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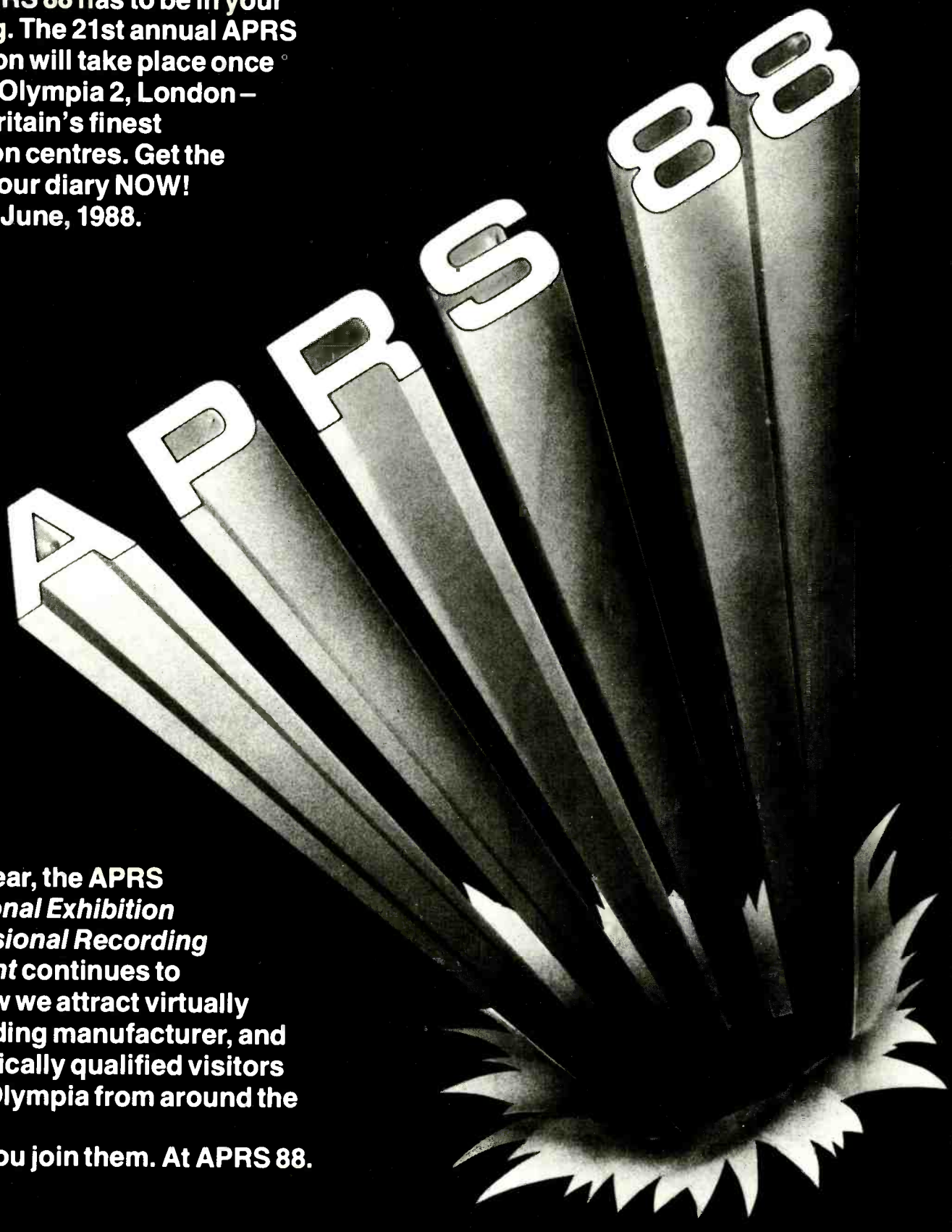

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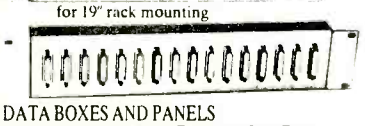

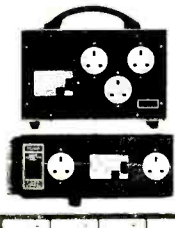

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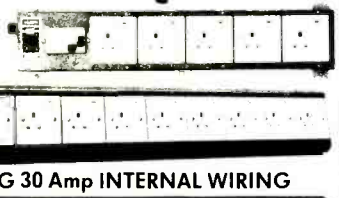

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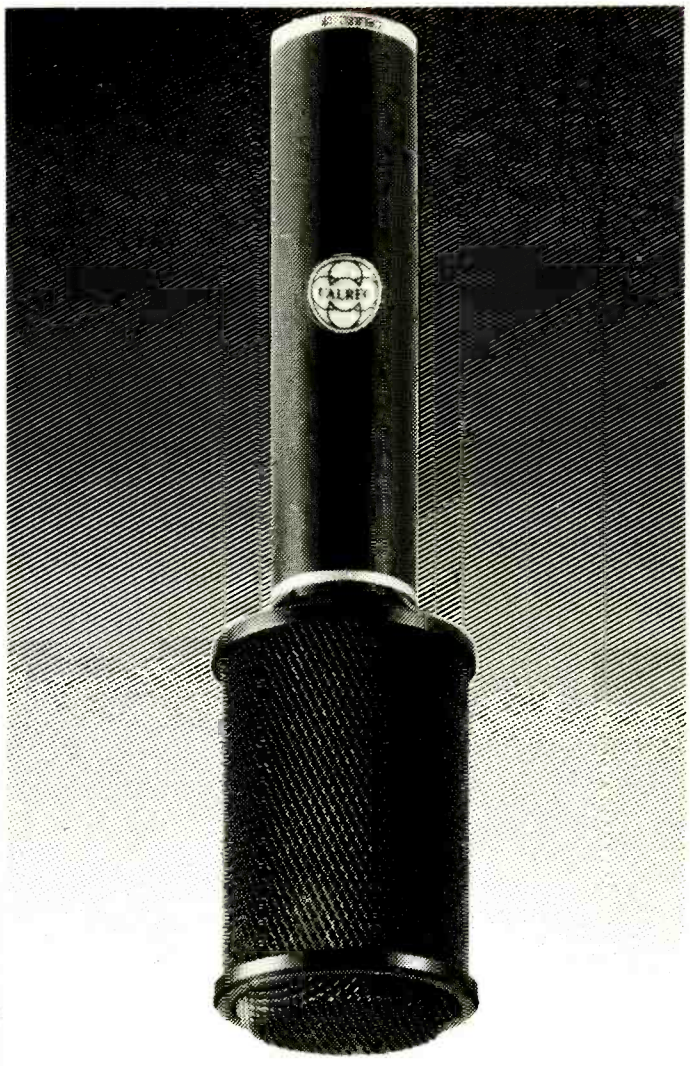

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MARTIN POLON'S PERSPECTIVE

The time is somewhere in the not-too-distant future. The place is the plaza at the base of the New York World Trade Center. Two well-dressed men are wandering about—each with a dazed look on his face. Their well-turned-out suit of clothing bespeaks Brooks Brothers at the very least. In the distance, a man in relatively new blue jeans and a tweed sportscoat, is finishing his breakfast. The two well-dressed gentlemen are put off by the strong aroma of the third man's sausage, egg and pepper submarine sandwich.

From a small kiosk, a blue-uniformed attendant steps towards the three men. "You must be jumpers. The tourists don't show up until 10am at the earliest. After we've cleaned up." All three men nod their assent. The attendant rambles on, "Let me see, you all have your city permits?" The three men nod again.

One of the men nods again nervously and asks, "Why do they allow this?"

The attendant responds, "To control the amount of this that goes on. The mayor says that the city has got to control the time, place and manner of these things. Before, starting with the great Market Fall of 1987, people were leaping just anywhere. They were landing all over the city. And the mess was the least of it. They would hit other innocent people on the sidewalk, fall into the roof of a city bus, hit taxi cabs, why one even fell through a grating and landed on a subway platform. Delayed the rush hour traffic on the Lexington Avenue line for two hours. In the '29-'30 depression it was much more orderly. People knew their place, then. Brokers jumped only in the Wall Street district. Buildings were much smaller. None of this 70-storey stuff you have today. So the city had to regulate it. Move all of it down here. Get it done after most people have gone to work but before the lunch hour. We have city crews ready to deal with the...well, you know. That's the New York way. A place for everything and everything in its place."

The attendant points the way to an elevator marked 'Roof Top. Tourists and jumpers with permits only. Jumpers without permits please form a line here to standby'. The large elevator virtually flies up the 100 storeys with its small load. Once on the top, the three men are led to a small ramp with a diving board out over the edge. "Helps to keep to the drop zone," the attendant mumbles as he takes the official looking permits from each man. The three men stare at each other.

The first says, "I have to do this because I bought Calls when I should have bought Puts. I lost $150,000."

The second man says, "I had IBM when it was at 174. Now it's at 102. I lost $200,000."

The man in jeans turned and said to the others. "You're worrying about money? I bought state-of-the-art digital recording equipment to please my studio clients. I have just acquired multitrack tape machines and hard disk recording systems and computer editing systems and digital audio consoles. All of this has cost me over a million dollars this year. I still can't raise my rates beyond $100 per hour."

Suddenly, three foreign businessmen whiz past and leap off the roof. One is British, one is German and one is Japanese. The two stockmarket types turn to the studio owner. "Who was that?" they asked.

The studio owner replies, "I don't have to go with you, now. They were the men who sold me all that expensive equipment. But they gave me two years to pay and all that equipment is worth double what they charged me since the dollar went on free fall."

As to the immediate impact of the crash on the world audio industry...on the surface there is precious little impact...

Well, I have good news and I have bad news for you, gentle readers. The good news is that there has been a severe downwards 'adjustment' on the world's monetary markets and it is has not hurt the world's audio industry. The bad news is that the audio industry has not been affected yet. That rather outrageous statement is based on the fact that during every major economic adjustment during the last 60 years, electronic entertainment hardware and software sales and development have boomed. The only question here is whether we are truly in perilous economic straits and whether that downturn entertainment phenomenon will repeat itself yet again.

The 'Crash of 1987' has signalled a pause and perhaps more for our technology-driven world economy, which has rushed to ever greater heights since the beginning of the 1980s. It may well be that the 'Crash' signals a needed pause and reassessment for the business of technology and more specifically for the business of audio. The most important point to remember about this drop (and any other stockmarket fall) is that the event signals the dramatic (or catastrophic) recognition by the market of external factors in the economy that the market has been 'discounting' (or ignoring) all along. If the world economy should slide into a severe 'economic adjustment' (or if you prefer recession, depression, etc), it will be because of factors that were in existence before the market's fall.

Surely, the close linkage of the world's financial markets was confirmed by the rounds of linked reaction between the New York, London, Paris, Tokyo and Hong Kong exchanges to name just a few. All eyes are turned to Washington where the sense of a lack of co-operation between the Administration and Congress reinforces the overall theme of a 'lame-duck administration' waiting out its last year in office. And waiting...and waiting...

Despite the presence of significant positive economic indicators in countries such as Great Britain, Japan and even in the United States the continued ideological management of the American economy by Washington has created a scenario with the possibility for a global recession. The seven-year 'experiment' in 'supply side' economics has the left the dollar at historical low points in free fall against the currencies of many major trading partners and created a debtor nation status for the US that stands in stark contrast to the positive status of the US in world trade before 1980. While it is clear that an economic adjustment is a possibility, there is a certain fascination in the fact that the outcome may well be out of the control of the economists and in the hands of the consumers. These are the very same consumers whose past confidence has been buoying up the tail end of the bull market.

The fall in stock value has not damaged the various economies of the world as much as it has dramatically outlined the real uncertainties to the public. So where this all goes is very much a function of business attitudes and consumer psychology rather than the direction of the stockmarket. The stockmarket moved up at a sprightly pace after the initial crash in 1929 before its ultimate nosedive 'into the toilet' at the onset of the great depression in the '30s.

As to the immediate impact of the crash on the world audio industry, several issues stand out. On the surface there is precious little impact at this time. In the first place, the over $1,000 billion in losses worldwide were primarily 'on paper'. That is not to say that many individuals did not lose a substantial percentage of their net worth but that reforms of the world's financial systems have kept banks and the majority of businesses from being drawn into the financial maelstrom. Within the electronic entertainment community, the value of nearly all stocks of hardware and software providers were buffeted downwards during the first month of the drop, some significantly. It is not unusual to find major Japanese electronics manufacturers whose stock lost as much as 25% of its previous value during the fall. In fact, companies positioned in consumer or professional audio/visual products lost a greater percentage of per share value (35%) than the overall loss for the Dow (28%). Foreign exchange losses for the dollar pose the greatest immediate threat to the world audio industry. It is just possible that we will find the dollar trading at half an English pound, with par value to the German mark and the Swiss franc during 1988. The Japanese yen could well be convertible at a cent to a yen. Current rates are close enough to that point and the lack of resources available to the US Treasury to defend the dollar seem to rule out any strengthening for the beleaguered greenback until after the US elections, if then. The thought of a dollar trading at $2.00 to the English pound, $1.00 to the German mark and Swiss franc with the yen pegged at 100 to the dollar is enough to make any audio manufacturer outside the United States ready to join our fictitious gang of jumpers at the top of the New York World Trade Center.

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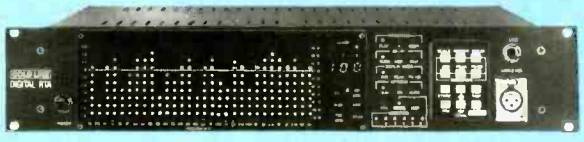

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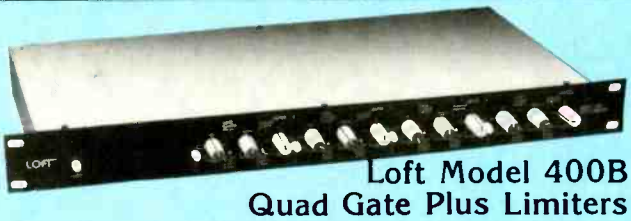

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MARTIN POLON'S PERSPECTIVE

The US audio industry is variously estimated at a value of $8 billion per year in gross industrial product (GIP). This includes software in the form of record sales and hardware in the form of professional and consumer audio equipment sales plus industrial categories and military contracts. Well over half that total is generated outside of the United States. One English manufacturer summed up his concerns for the current uncertainties. "Most manufacturers I know in the EEC share my sense of the United States being a bloody pain in the ass. The customs people are rude and so rule-conscious, that they make the French look like the Italians. Banking between the two countries is awkward because US banks look upon foreign currency as just that: something foreign to be handled gingerly. There is this attitude that the dollar is king. But if the US is a bloody pain in the ass, it is a BIG one. It is the one market that you cannot afford to avoid, with it's 10,000-odd facilities for music recording, transferring, post-production, film production, television production, advertising commercial production, television stations, radio stations, auditoriums, industrial audio-visual facilities, etc. With the dollar sinking as low as it is going, it is getting nigh on to impossible to avoid raising equipment prices substantially. The pound was $1.09 three years ago. Now it is in excess of $1.80. How do we cope with that?"

One way of stabilising exports to the US being used by many companies is the operation of a US subsidiary that handles much of the management and marketing for a product line and may even do final assembly.

The unit volume is too low in professional audio products for manufacturers to take a page out of Sony's or Matsushita's 'book' and manufacture in the United States. Nevertheless, several professional audio manufacturers are beginning to look at free-trade zones in the US for final assembly of their products. Major companies like Matsushita and Philips have just completed significant restructuring of their export operations to allow their US subsidiaries to operate almost as complete corporate entities of their own.

One unexpected outcome of the 'fall fiscal follies' has been the significant retreat of options for passage of the controversial copycode legislation by the US Congress. The most obvious manifestation of that was the roughly 25% drop that affected the stock of CBS Incorporated. That drop was not anticipated and ended early October 1987 planning to spin the record company operations off 'in-house'. It also caused negotiations to be re-opened for the sale of all or part of the record operations to Sony at the beginning of November of 1987. Whatever the outcome, it was clear that the business world had changed forever and that world class problems of software copying would require world class solutions and not a parochial system of filtering that generated only contempt in world markets.

The expectation also remains strong that whatever the outcome of the tests of the filtering scheme by consultants to the National Bureau of Standards, the attitudes of Congress towards any kind of trade legislation 'punishing' Japan had changed. The scare afforded by the market's fall has left the Congress with a much stronger sense of caution in dealing with a country that has investment in the United States considerably exceeding the figure of $100 billion.

The psychological impact of the fiscal fall is much harder to gauge and remains the unpredictable pothole on the road to the potentially banner years of the 1990s. The decision to slow down with capital purchases is not an uncommon response to these times. If the various studios and production centres decide to wait and see what happens before purchasing major items of audio equipment, then the slow down in sales for professional audio would become a major problem. But at this time, it appears that the risk of not having the necessary and competitive technology seems greater than the gains of trying to wait out a downturn. Besides, everybody in the industry knows of and believes in the concept of 'boom times for entertainment during down times for everybody else'.

For the studio owner, the financial moves necessary to operate through this period depend a great deal on his current fiscal condition

Whatever the direction that is taken by world economics, the sophistication of various production organisations is such that the appalling need for software at all levels of the electronic entertainment industry is not being ignored. The motion picture industry is running out of time as the catalogue of some 10,000 old films has reached saturation by the film viewer. It requires some 4,000 films just to fill one television channel, or pay channel, on satellite or cable, etc, for a year of service providing 24 hours per day. Despite impressive industry statistics of 409 films released in 1986 by 11 major film studio organisations and 80 independent film production companies, with $1.32 billion earned by majors and $83 million earned by independents, the sense is still of an industry so starved for successful product that they have settled on the making of sequel after sequel from previous film titles. Examples of this in the planning or production stages are Alien III, Attack Of The Killer Tomatoes II, Back To The Future II, Beverly Hills Cop III, Blind Date II, Caddyshack II, Chinatown II, Cocoon II, Commando II, Critters II, Crocodile Dundee II, Deathwish IV, Dragnet II, Fletch II, The Fly II, Friday The Thirteenth VII, F/X II, Ghostbusters II, Godfather III, Gremlins II, Indiana Jones III, Karate Kid III, Last Picture Show II, Lethal Weapon II, Nightmare On Elm Street IV, Platoon II, Police Academy V, Poltergeist III, Predator II, Rambo III, Remo Williams II, Romancing The Stone III, Running Scared II, Salvador II, Short Circuit II, Splash II, Star Trek V, Star Wars IV, Teenwolf Too (sic II), Terminator II, and Top Gun II. Similarly, the boom in CDs is being met by a massive effort by the world's record companies to supply CDs in the form of back catalogue. That too will run into the 'wall' as consumers begin to demand new product. So it seems clear that the demand for production facilities and audio-visual product will spur sales of studio hardware.

As to the reality of electronic entertainment being 'immune' to economic downturns, past experience has given this 'fact' a kind of legendary status. The fundamental concept behind this is the inability of consumers to make major purchases during economic downturns. Expenditures for housing, remodelling, major appliances and automobile purchases all suffer when times are bad. Consumers apply pent up demand to the relatively less expensive area of electronic entertainment; investing in films and records and the hardware to reproduce them. Whether that will happen during the next economic downturn is unclear as to whether this is the time of the next downturn. It is impossible to predict. The only thing that continues to cause concern is the current trend for films and records to be pointed at the under 25 year old audience. The affluence that will sustain the electronic entertainment industry exists with the older audience of the maturing 'baby boomers' worldwide.

For the individual studio owner, the financial moves necessary to operate through this 'transition' period depend a great deal on each operation's current fiscal condition. For the studio with little or no current debt, well planned major equipment purchase still makes sense. This is especially true if the current reversal of the upwards movement of interest rates allows financing of new purchases at more favourable percentages. The problem that could hit a studio planning significant expansion and carrying a large amount of current debt is the psychological factor of tight money restricting business activity during hard times. The fact that electronic entertainment production has generally prospered during difficult times is not an issue universally held by most bankers, especially when the rest of the industrial community is on the skids. It is not clear that we are going to slide into a recession but if prudence is recommended it would be in the area of facilities and real estate. It might not be the most appropriate time to assume large debt service for new buildings and/or land. However, a sound business plan remains a sound business plan if it factors in the possible changes in the economy.

As for me, please ignore the fact that I have invested heavily in pencils, apples and tin cups. It is just one of my idiosyncracies. If you should spot me on a street corner, just pretend to ignore me—that is unless you want a pencil or an apple or both.□

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BARRY FOX'S BUSINESS

Twice recently, once from a musician and once from an engineer, I've heard moans about DASH cut-and-splice editing, with tales of how you can slice slivers from a Mitsubishi PD tape and lose nothing.

Cut to Japan, where last year Sony made history. The company hired Swiss engineer Dr Roger Lagadec from Studer, to head up the professional audio division at the company's Atsugi plant. No other Japanese company has ever done anything like that before. You can see why they did it, because just talking with Lagadec is an education. You can also see why the other Japanese electronics companies view Sony with suspicion, as a young upstart maverick which imports roundeye *gaijin*.

Visiting Atsugi recently, an hour outside Tokyo, I talked through several subjects with Lagadec. Although now a Sony man he doesn't duck issues.

The new DASH machines have thin film recording heads. Produced like an integrated circuit, a flat coil winds in a spiral round the tiny gaps needed to lay down 12 tracks across ¼ in tape. The playback heads are conventional ferrite.

"What you are getting off tape is a *very* weak signal," says Lagadec, adding in his unique way: "you have to *persuade* the flux to be so kind as to enter the head. You have to make it easy for the flux and then make the most of what you get.

"People say new is better. But physics is old and you don't make physics obsolete. Teaching mother nature to record isn't easy."

The new DASH machines play clever tricks with time. As well as matching audio and video tapes with different time codes (EBU, drop frame, non-drop etc) you can change priority to programme length, giving the machine a start point and a finish point and letting it compress the programme time to match. There is a 12.5% time range.

The signal that comes out will have variable pitch and variable sampling. So you must either use an analogue link or sampling frequency converter before dumping into the next link of the digital chain.

So, what about cut-and-splice tape editing with DASH? Is it really as easy as with analogue tape, as some people say, or do you need a dust-free room and white gloves, as others argue?

"If I told you it was as easy as splicing I'd be lying through my teeth," says Lagadec. "The tape is very thin—it feels awkward. You need to be careful but it's fairly robust. You can corrupt an inch of tape and lose nothing. The data is spread 3.9 cms, whether the tape is running at 7½ or 15 ips. It's the parallel spread that changes with speed."

What about stories of lateral shift when you cut the tape? "Most of the problems come from the discrepancy between hearing the edit point and stopping the tape. There is 2.5 millisecond accuracy after compensation for the data reshuffling that goes on at the splice. When data shifts from one stream to another it's a war zone.

"One fine day there will be a quick swing away from tape cut editing. The industry is already learning to cope with cassette tapes which won't support cut edits. But tape cut editing can be immensely efficient. To add a short pause you can quickly cut in a short piece of blank tape. To do that with transfer editing can take half an hour. But of course that will reduce. That's when there will be that quick swing to electronic editing."

To DAT. Is it the ideal mastering medium for CD? Lagadec has reservations?

"The *1630* has become standard. It's reliable, trusted, robust. You can take that master anywhere in the world. If we change that standard it had better be to something long lived. The head drum scanner of the U-matic is big and tough (110 mm diameter). It can be used as a murder weapon if you want. There is room for both record and playback heads. There is not much room on the small DAT scanner (30 mm, or 15 mm for half size decks) for extra heads. DAT and U-matic are different animals. DAT is a consumer product. It has editing potential but not yet capability. It is designed for the entertainment of millions of people. U-matic is designed as a working tool for merely hundreds of people.

"Of course the *1630* CD mastering system will not last for ever. There will be attempts to introduce DAT as a mastering format. But DAT cannot deny its consumer origin. There will eventually be a new system. But we don't know what that system will be. It could be DAT. But if you were asked to specify a CD mastering system you wouldn't come up with DAT."

Lagadec is deferential to his team of engineers. He tries wherever possible to bring them into the conversation, and not just as a gesture.

We talk of digital microphones. "Very difficult," say the Japanese, "what we need is a real breakthrough. There is no practical technology yet. It's better to convert at the microphone into digital code and then run it by optical cable. You need at least 130 dB, and 24- or even 28-bit coding."

Sony estimates that there are now around 100 24-track DASH machines working in Japanese studios, compared to around half a dozen Mitsubishi units. (*Note the wording—Ed*)

A mental flash reminded me of what happened when, a few years ago, I wrote a piece about how Mitsubishi's PD was carving a solid niche in Hollywood and Los Angeles—and how, for better or worse, the world was dividing down into little islands of DASH and PD. I was immediately blitzed by a 'meganag' from the DASH people in LA. How dare I sell them short. Tell me what's happening then. I pleaded.

I've not heard a thing since. Presumably the rude complaints were written simply to copy to someone else. You get a lot of that in this game. Memories are short. Hit and run.

Talking about rival formats, I recalled the original 3M digital audio system editor. It was never marketed, because it required a studio engineer to isolate edit points by studying a waveform displayed on a TV screen. Wisely, 3M recognised that there was no chance of educating the industry.

So how to educate engineers about today's new technology?

"I'm allergic to that phrase," adds Lagadec. "It means you have a poor product, your design is a failure and you have not thought about what your customers want."

Only Sony could employ someone who talks like that. And God bless 'em for doing so.

For 15 years the BPI has lobbied for a levy on blank tape. For 15 years I've written about the squabbling. It all got pretty boring in the end. Now the issue is a 'dead duck'. I quote Kenneth Clarke, Minister of Trade and Industry, when explaining why the new Copyright Bill, which should become law next summer, contains no mention of a tape levy. In fact Clarke even called it a *tax*.

The pros and cons of a levy have been endlessly debated. At first it seemed like a good idea. Then the BPI ran a disastrous campaign that featured stars whining. At the same time as asking for a tax on tape to legitimise home taping and reward the rich, the BPI said it was looking for a magic spoiler to stop home taping. So the government said no to a levy.

Then the hi-fi and audio companies started selling double cassette decks that could dub at twice, four times and even six times normal speed. The BPI switched to skilful lobbying of the media and MPs, often behind the scenes, and the government said yes to a levy.

Then the tape and electronics industry started equally skilful lobbying. They kept the issue simple: a levy is an unfair extra tax on Joe Public.

And they had a remarkable stroke of luck. The IFPI started out on its disastrous campaign for Copycode and against DAT. The once clear levy issue got pushed aside into confusion and muddle. I wrote a lengthy analysis of the situation in the September issue of our sister publication *One to One*, laying blame for the muddle on the IFPI and naming Director General Ian Thomas as the man who held the buck. The substance of the piece was that the IFPI had been unable to name the "leading figures in the recording studio world" or "technical experts from Polygram and Philips" on whose recommendations the IFPI had supposedly endorsed Copycode.

Quite rightly the editor of *One to One* showed the piece to the IFPI ahead of publication and offered the right of reply. The reply, written not by Ian Thomas but his press officer, makes interesting reading alongside the piece it answers.

I would not like to be in the IFPI's shoes when the record industry starts recriminating about loss of the levy.

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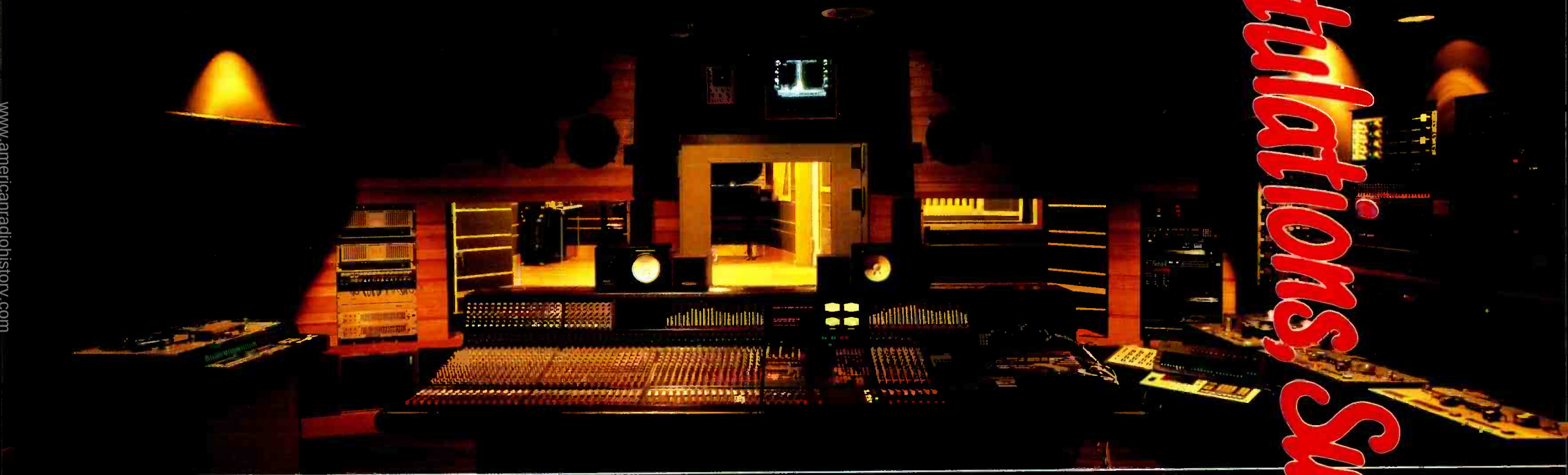

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BARRY FOX'S BUSINESS

Soon after I started in this business I made an appointment to visit Morgan Studios in North London and write an article about them. When I arrived the big chief I was supposed to see wasn't there. He was off in his Rolls somewhere and never did turn up. I ended up talking with an accountant who hadn't heard of *Studio Sound* and thought I was trying to sell him ad space.

Despite a couple of letters I never heard another word from Morgan and wasn't too surprised to learn of their subsequent upheavals and sale.

I was reminded of all this when I recently caught a glimpse of a composer's contract with British music publisher Zomba, who seem to operate out of the building where I once sat trying to explain to Morgan's accountant what journalists do in life.

There, at the end of all the usual legal jargon, was a clause specifying the territory for which all performance rights were being assigned. Zomba, not far from Willesden Junction railway station, has now taken to claiming rights for "the world and its solar system".

Today Willesden, tomorrow the world, next year the moon and Uranus.

If you phone Natural Sound Systems in Watford to ask about hi-fi equipment you will get a horrid 'low-fi' musical ditty in your ear while waiting for an extension to answer. It's the some loathsome sound that more and more firms are pumping down the line to callers as 'music on hold'.

The people at NSS hate it as much as their customers who keep complaining. When NSS moved into its new premises BT installed a *Merlin* switchboard.

"BT never warned us about the noise it pokes out," moans NSS. "We would like to use a tape of decent music but BT won't remove the wretched chip—and if we try to do it ourselves we invalidate the switchboard guarantee."

Folklore says that copyright law condemns the world to BT's vile non-copyright music-on-hold. *Not so.*

Record company CBS has now connected a tape deck to its phone system so that callers get an earful of the latest pop album down the line. In the autumn it was Michael Jackson's *Bad* but even that sound is better than *Colonel Bogey* or *Greensleeves* from a chip.

To pre-empt any rubbish from BT, here is the legal situation for anyone who wants to use a tape of real music.

Phonographic Performance Ltd collects money from radio stations and discos for records played in public, and distributes the cash to record companies. PPL has now worked out a fee system for switchboards playing copyright music on hold: it's on a sliding scale but as a guide a 5-line board has to pay £49.50 a year, a 15-line board pays £66 a year and larger boards pay an extra £16.50 per 15 lines.

No-one has to fill in any forms saying what records are played. PPL works on the "mildly inaccurate—but workable" system of using radio play as a yardstick. Records at the top of the radio pop charts get the biggest share of the total PPL pot.

Record companies like CBS can play their own records free because they would otherwise be sending money round in circles. Unofficially PPL also turns a blind eye to anyone with a home telephone answering machine who uses a short tape of music to comfort callers.

Let's join hands and fight the chip-music-on-hold plague before it spreads as far as the background muzak disease. Complain to someone who matters whenever you have to suffer on hold.

Better still do as Spike Milligan does. As soon as he is put through after suffering something nasty on hold he says: "Thank you very much for your music, now I will give you some in return," and sings the National Anthem, very loudly down the line.□

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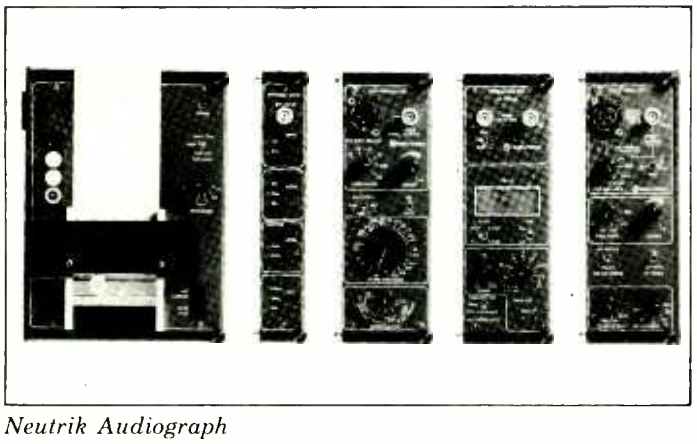
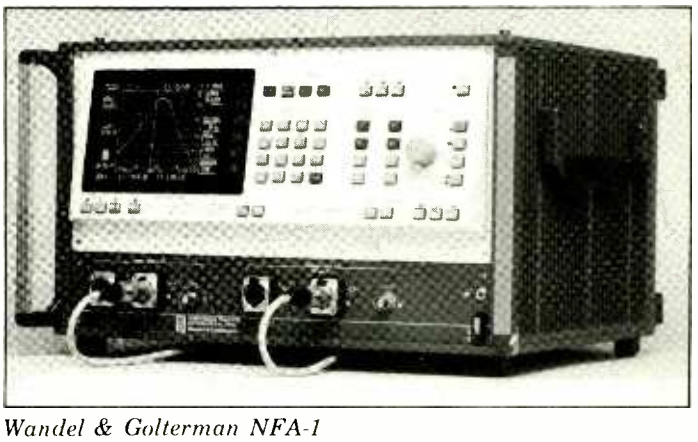
TEST EQUIPMENT

In this brief update we look at new products and updates in audio test equipment in the last 12 months



Neutrik Audiograph



Wandel & Golterman NFA-1

Audio Precision: two new audio testing modules for the *System One*. The *DCX127* measures DC voltage and resistance, provides variable DC output voltages and has digital input and output. The other module (*BURG-EN*) generates variable tone bursts, square waves, pink noise, and narrow band noise. Also new is the 'A-version' that allows amplitude measurements on both stereo channels at the same time.

Other hardware additions bring the number of weighting filters to nearly 20. There have also been three software releases—*1.4*, *1.5* and *1.6*—each offering further facilities while remaining compatible. Further possible facilities include full split site operation and compatibility with a wide range of modems. There is also an optional software program available for use with Studer *A820/812/807* tape machines for auto measurement.

Audio Precision, PO Box 2209, Beaverton, OR 97075, USA, tel: (503) 627-0832. UK: Scenic Sounds Equipment Ltd, Unit 2, 12 William Road, London NW1 3EN, tel: 01-387 1262.

Audioscope: the model *9000* modular audio measuring system which consists of a 3U rack mount box and an external colour monitor. Organised in modules, there is provision for cards to do any of the following: frequency response curve plotter, reverberation time analyser, automation level indicator, pink/white noise generator or oscillator, as well as spectrum analysis and audio level indication. RS232 interface to external computer for control and off-line disk storage.

Audioscope, Elettroacustica Professionale, Via Arrigo Davila n 16, 00179 Rome, Italy. UK: Michael Stevens & Partners, Invicta Works, Elliott Road, Bromley, Kent, tel: 01-460 7299. US: Apogee Electronics Corporation, 1517 20th Street, Santa Monica, CA 90404, tel: (213) 828-1930.

Lindos: software update V4.1 for the *LA100* Audio Analyser, including tolerance testing with completely automated sequences to IBA, EPS 81/84 etc, standards, user-defined tolerance limits that can accommodate five different user-defined sets that can be put into non-volatile memory, two new EPROMs that have been increased in size from 16 to 32 kbytes, and repeating frequency sweeps to check variable factors such as tape heads and other adjustable mechanics. Software upgrades are free to existing Lindos users.

Lindos Electronics, Saddlemakers Lane, Melton,

Woodbridge, Suffolk IP12 1PP, UK, tel: 0394 380307.

Neutrik: new is the *3337* distortion analyser for the *Audiograph 3300* module measuring system. It is fully automatic and includes measuring level, frequency, distortion, level ratio and gain between 20 Hz and 40 kHz; oscillator provides sine and square waves plus IMD and DFD test signals; sweeps, test sequences, keyboard settings, tolerance modes and repetitive measurements can be stored and reproduced as required; results are shown on LCD display. Following the acquisition of Technical Projects by Neutrik, they were manufacturing and marketing the *TP401 Audio Measuring System*, now the *TP402* test set, an enhancement of the *TP401* including phase and level difference measurement, autoranging, and inclusion of a digital meter.

Neutrik AG, Obergass 16, FL-9494 Schaan, Liechtenstein, tel: (075) 2 63 83. UK: Eardley Electronics Ltd, Eardley House, 182-184 Campden Hill Road, Kensington, London W8 7AS, tel: 01-221 0606.

Radford: the *ANM5*, a new unit to combine the facilities of the *ANM3* and the *ANM4*. An audio noise meter (psophometer) and high sensitivity voltmeter with noisemeter weightings to international recommendations. Facilities include wide band, CCIR unweighted (audio band), CCIR weighted 1 kHz and 2 kHz, IEC curve 'A' and external weighting. Above available in true RMS, average and quasi peak responding.

Radford Audio Ltd, 47a Clifton Road, Weston-super-Mare, Avon BS23 1BW, tel: 0934 416033.

Sound Technology: have launched the *3000* series programmable audio test system consisting of a generator and analyser system. Both are microprocessor-controlled and allow front panel programming for automated test sequences. Two-channel system with own software not requiring external computer. Full provision for IEEE-488 and RS232C interfaces and printer port. Digital readout display. Possibility of chaining measurement operations, storing readings and also remote operation. Can be separate sections or a single unit. Generator outputs waveforms including sine, square, IMD, toneburst and sine-step. Analyser measures level, noise, frequency, harmonic distortion, IMD, phase error, channel separation and quantising noise.

Sound Technology, 1400 Dell Avenue, Campbell, CA 95008, USA, tel: (408) 378-6540. UK: PRECO, 21 Summerstown, London SW17 0BQ, tel: 01-946 8774.

Techron: have three new software packages for the TEF *System 12*. *Workbench* software incorporates four basic instruments into the system—sound level meter, digital voltmeter, oscilloscope and function generator with full storage of set-ups and user-defined defaults. *Polar* provides response plots for loudspeakers and microphones measured with TEF at any of 400 different functions. *AutoTEF* includes an aid to conducting TEF analysis and allows automatic recording and playback of keyboard command sequences.

Techron Division, Crown International Inc, 1718 W Mishawaka Road, Elkhart, IN 46517, USA, tel: (219) 294-8300. UK: HHB Hire & Sales, 73-75 Scrubbs Lane, London NW10 6QU, tel: 01-960 2144. UK: Shuttlesound, Unit 15, Osiers Estate, Osiers Road, London SW18 1EJ, tel: 01-871 0966.

Wandel & Goltermann: several hardware and software updates.

Wandel & Goltermann GmbH & Co. Postfach 45, D-7412 Eningen, West Germany. UK: Wandel & Golterman Ltd, Progress House, 412 Greenford Road, Greenford, Middx UK6 9AH.□

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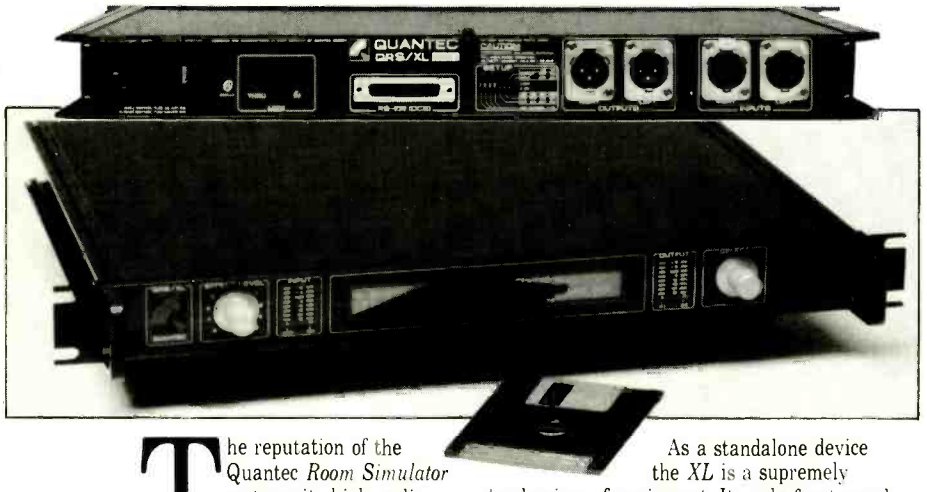
REVIEW

Dave Foister takes a look at the Quantec QRS/XL Digital Audio Processor



The reputation of the Quantec *Room Simulator* rests on its high audio quality and the realism of its reverberation programs. It is one of the few devices many classical purists will use when forced to resort to artificial reverberation. The *QRS/XL* goes one better by adding a high degree of programmability via RS-232 or MIDI, and specifically by means of a dedicated software editing package available for Atari, IBM and *Macintosh* PCs among others.

As a standalone device the *XL* is a supremely simple piece of equipment. Its only front panel controls are a dry/effect mix pot (which can be internally bypassed if required to eliminate any possibility of crosstalk) and a click-stop rotary preset selector used in conjunction with the large, backlit, highly informative display. Even the rear panel controls only stretch to in/out level switching and display angle. All the user can do is select the presets; its value as a self-contained unit therefore stands or falls on those presets.

In all there are 80 factory presets. About 40 of these use the Room Simulation algorithm, then there are various Plate simulations: a Chapel, a Church and a Cathedral, general-purpose reverb programs with a variety of RT settings, and a few specific real buildings such as St Peter's Cathedral, Rome, and Mueller's Volksbad in Munich, neither of whose authenticity I can vouch for personally. There are also several rooms with no musical connection—living rooms, a backyard, a railway station, a cave and so on—and their common feature, as expected, is their convincing realism. It is easy to forget you're listening to a digital simulation, something which cannot be said of many reverb units.

Personally, I would have liked to see the *XL* simulate a few more real, musical rooms. By the time the impressive but limited-application effects have been discarded—including an Oil Barrel, a Wardrobe, a Cotton Tent, a Yellow Submarine, and an outrageous Taj Mahal with a 45 s reverb time—there are comparatively few generally useful effects left (unless you're working in radio drama). This seems to me analagous to selling synthesisers with useless noises like helicopters and submarines in the factory presets: they show off the machine's versatility but nobody ever uses them. The difference with the *XL* is that the factory presets are in ROM, and can't be overwritten. As it is, there are, for instance, only two straight Concert Halls, one with audience and one without, and while these are eminently useful and extremely convincing, more variety would be nice.

Since Quantec's stock-in-trade is this authentic simulation, it may come as a surprise to find so many other effects available in the *XL*. Other algorithms include straightforward stereo delay, gated reverb, flanging, and a dual-channel Finite Impulse Response digital filter, and each is represented by a good selection of effects in the factory presets. There are also some miscellaneous special effects including three effective stereo enhancers, reverse effects and some 'soft attack' presets, which seem to remove percussive transients. Further effects are planned for the future, including dynamics processing, and as an example a program is available on disk to use the Filter function as a Copycode encoder. Such updates will be available free.

Bandwidth on all effects is a respectable but unspectacular 15 kHz, while the subjective audio performance is excellent, with a very low noise

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REVIEW

floor and clean highs. To cater for all tastes, Quantec provide a user-adjustable dither noise control internally.

Any set of unalterable presets, however good (and the *XL* presets, despite their pecularities, are undoubtedly, extremely good), will eventually reveal gaps in its selection, the WIBNIs ('Wouldn't It Be Nice If's') of the computer world. The Quantec, despite its wide range, is no exception but for anyone with a computer capable of communicating via RS-232 or MIDI the unit becomes almost completely programmable. Even a simple RS-232 terminal gives the user considerable power over the device; by typing in simple sequences of Escape codes many parameters can be varied. For example, all the Flange and Chorus presets have various parameters, obscurely known as Runtime Flags, which can be altered in realtime directly from the terminal keyboard; these include all the obvious variables such as flange speed and feedback level. Presets can be remotely selected, the entire *XL* display can be echoed back to the terminal screen, and so on; with full coding details of all these functions given in the manual, plus protocol tables for data file transfers, the user has an unusual degree of low-level, nuts-and-bolts access to the system. Many of these functions can also be performed via MIDI but since several require System Exclusive codes a computer is still needed.

For day-to-day studio use this is a rather laborious way of going about programming effects, and needs either a good memory for Escape codes or a quick hand with a manual. The obvious solution is to write a software routine to provide more user-friendly control, and indeed such dedicated software is available, running on the Atari *ST* (in colour or monochrome), the IBM *PC*, the *Macintosh* and a few others. The version I tested was for the Atari running on a *1040ST*.

On any software package of this kind, one of the most important considerations is how clear, informative and 'goof-proof' the screen display is, and the *XL* program scores very highly in this respect. The screen is divided into four main areas. At the top is a panel mimicking the *XL*'s own front panel display; the current status of the *XL*, whether selected from its own selector switch or via the computer, is echoed here, so the *XL* itself need not even be visible to the user.

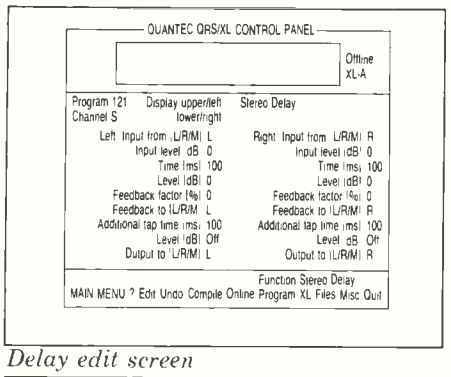
At the very bottom of the screen is the function keys description field. The Atari's 10 F-keys perform different tasks depending on the *XL*'s mode—for instance, in Room Simulation presets F1 mutes the input while F2 activates a Freeze function, muting the input and holding the reverb indefinitely. Similarly in Flange mode different F-keys (in conjunction with the Shift, Control and Alternate keys) change the various Runtime Flags, such as sweep speed, up or down with coarse or fine control, as they do with the other special effect algorithms. As each *XL* preset is called up, the F-key controlled parameters for that preset appear in this field. This gives quick editing control in realtime over all the effects presets, and although the changes made to factory presets are not stored, the current state can be copied to one of the *XL*'s 40 non-volatile RAM user-preset slots for later use.

Above the F-keys is the Menu panel. From here sub-menus covering MIDI utilities, disk operations, Help screens and so on are accessed, either using the mouse or from the keyboard. Moving around the system in this way is extremely fast, simple and for the most part obvious, and at any point hitting Escape aborts the current procedure and returns to the parent menu.

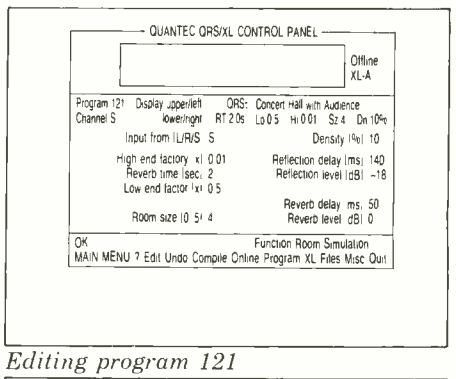
The central and largest portion of the screen is the editing panel, giving the most powerful access to the *XL* operating system. Three of the main function types—room simulation (QRS) and the delay and filter modes—are fully programmable from this editor, although the procedure for doing some of it is not, on the present software version, as fast and simple as it might be.

When the editor is called, a set of default parameters for Room Simulation is available on the screen. These give probably the most comprehensive user control over a reverberation system currently available; adjustable parameters cover not only reverb time, pre-delay, diffusion (or density), room size algorithm (five available), and HF damping but also an independent first reflection—a single repeat whose delay and relative level are adjustable—and a low frequency factor, which like the HF factor is a multiplier giving the possibility of exaggerating the reverb at the extremes of the spectrum as well as damping it. A field is also provided for the *XL*'s large screen display window; a detailed name and description of any new programs created can be entered here.

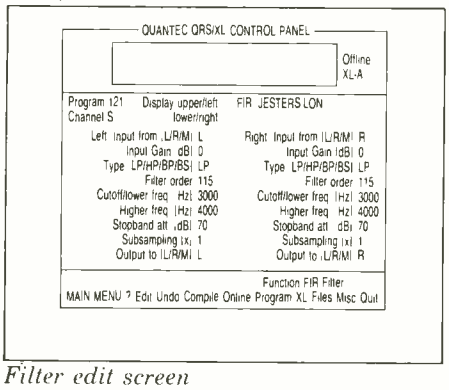
Movement around the fields in the display can be performed using the mouse or the arrow keys, and the first character of the selected field is highlighted. Entry of a new value is made



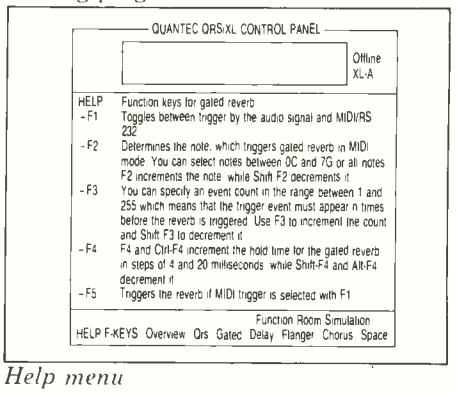
Delay edit screen



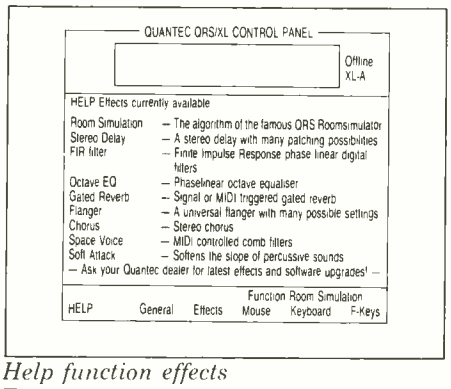
Editing program 121



Filter edit screen



Help menu



Help function effects

REVIEW

directly from the keyboard and the effect of any changes made depends on whether the *XL* is on-line or off-line. If it is on-line, then calling the editor also calls preset 121, a RAM slot, which is used by the computer as workspace, and any changes made in the window are transmitted directly to the *XL* as soon as each value entry is completed by hitting Return, so that the effect of the change is heard immediately. With the *XL* off-line, the values can all be adjusted on-screen before sending the complete end result to the *XL* using the Compile command. One small quibble concerning value entry is that any decimal numbers (eg an RT of 1.5 s) are padded with zeros to the end of the field; if an integer is then entered instead the trailing zeros remain, giving an 'out of range' error if not deleted.

If, instead of the QRS function, Stereo Delay or FIR is selected, an equally comprehensive set of default parameters appears on the editor screen, to be adjusted as for the QRS function. It should be noted that these are the only three fully editable functions; all the other main function types can only be altered as previously described, using control of the Runtime Flags of an existing preset and copying the end result into a RAM slot.

This adjustment of an existing preset is obviously the way most people would want to work with all the *XL*'s functions—it's bound to be easier to find a room simulation close to what you want and edit it than to set up a new room from scratch, just as on, say, a *DX7*. The procedure for doing this to the various QRS, Delay and FIR presets is the one minor flaw in the preset software; unusually it is not obvious from the screen menus how it is done, and it takes a comparatively long time to do it. Puzzlingly, the parameters for each preset are not read from the *XL*'s ROM but from the floppy disk. This takes several operations to execute, involving listing the disk directories on the screen—one of the few times, alongside the Help screens and the big MIDI lookup table assigning patch numbers to *XL* presets, when the main display is replaced by a new screen—and typing in file numbers to be loaded off the disk. This seems a long-winded way of doing things when the required information is already resident in the *XL*'s on-board ROM but apparently forthcoming software improvements will simplify the procedure.

As might be expected, user presets in RAM can be saved to disk, so a library of effects can be assembled for quick loading into the machine, and apparently an *XL* user group already exists for exchanging new programs. In fact, Quantec have a database on a VAX computer in Munich, and their own software updates are available for downloading via a modem for the price of a long-distance call, or much less via various networks and gateways.

The MIDI implementation is comprehensive; the patch assignment lookup table and System Exclusive control capabilities have already been mentioned, and several effects have Runtime Flags that will respond in realtime to control change and note number information. For those who wince at the idea of tying up yet another computer in the control room there will shortly be a 1U rackmount dedicated programmer featuring a touch-sensitive remote control and the novel facility of inserting its display on to an existing monitor when required. Most studios, however, already own a computer capable of running the *XL* software, which by the way is supplied free to your PC format with the *QRS* itself, and of course the computer is only required for programming, not for everyday use of the unit.

The combination of excellent audio performance, realism and an extremely high degree of programmability must make the Quantec *XL* one of the most powerful and versatile reverberation and effects units on the market. Quantec emphasise that all the currently available effects are entirely in software, and the *XL* as a universal digital signal processor will continue to expand its already impressive capabilities. □

Quantec Tonstudiotechnik GmbH, Postfach 440253, D-8000 Munich 44, West Germany.
UK: gtc Ltd, Malby House, 5 Fulmer Drive, Gerrards Cross, Bucks SL9 7HH.
USA: Marshall Electronic, PO Box 438, Brooklandville, MD 21022.

New software

Since this review was prepared, a software/firmware update for the *XL* has arrived from Quantec. The update consists of a new EPROM and a disk containing the *Version 2.00* software. The main feature of the update is a completely new function providing a programmable dual-channel 9-band (octave) graphic equaliser. This gives ±20 dB control over each band, and since the filtering is done digitally the unit remains phase-linear at all settings, however, a 90 ms group delay is introduced overall. This function is fully programmable in the main edit window, with independent control of the two channels, although there are no Runtime Flags adjustable from the F-keys.

There are also other improvements. The *QRS* function now has a lowpass filter with four selectable turnover frequencies for its reverberation output; this is to give a closer approximation to the sound of the original Quantec *Room Simulator*. On the previous version, compiling digital filter (FIR) settings and changes was very slow compared with the other functions; the new software doubles the speed at which this function can be modified. On a deeper level, data files can now be dumped in binary format, a significantly faster process than the original Intel Hex format but slightly more restrictive in terms of the operating systems capable of communicating with it.

This update should be available free to existing *XL* owners, and further developments are eagerly awaited on what will soon, at this rate, be one of the most versatile signal processors on the market, with virtually no trade-ins on audio performance.

(We would like to thank Syndromic Music (Vince Hill Associates) for the loan of an Atari *1040ST* for the purposes of this review.) **DF**

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REVIEW

A user report on the Casio FZ-1 sampling keyboard by Jim Betteridge

Casio's *CZ* range of synthesisers firmly established them as far more than producers of 'fun' instruments, and their new sampling keyboard, the *FZ-1* is a further move into the professional market. It offers more in terms of operational facilities than any other sampling instrument at its price:

- 5-octave sprung plastic keyboard with velocity and aftertouch sensitivity
- 8-note polyphony
- 14.5 s full bandwidth sampling time expandable to 29 s through the simple addition of an *MB10* 1 Mbyte RAM board
- max 36 kHz sampling rate
- up to 64 different sounds within each keyboard set-up (splits or layers)
- eight assignable outputs, plus mono mix out
- onboard LCD screen offering on-screen graphic editing
- comprehensive MIDI specification including multitimbral Mono Mode

Operational simplicity

One of the most appealing aspects of the *FZ-1* is its simple operation. Via a hierarchical menu system—rather like a progressively more detailed multiple choice questionnaire—it takes you step-by-step to the specific set of parameters you wish to alter. Having powered up, you have a choice of two main modes, Play or Modify. Modes divide into Submodes, then into Functions, then Parameters or Operations and finally into Settings. Play and Modify modes are selected via individual buttons but for each successive stage a set of cursor keys and an enter key select from a menu of up to seven options offered on the LCD display. For example, in order to sample a sound you would enter Modify mode, select Source Select from the resulting submode menu, and then the Sampling function, which would give you the following list of parameter/operation options.

- Define Voice—define number and name of voice
- Keyboard Set—define original, highest and lowest notes
- Level Set—set recording levels using bargraph meter on display
- Length Set—set approximate intended length of sample and select 9 kHz, 18 kHz or 36 kHz sampling rate
- Auto Sampling—start of recording triggered by incoming signal
- Manual Sampling—start of recording triggered manually

Alphanumeric data can be altered by the central value slider, the alphanumeric, calculator-style keypad or a pair of nudge buttons. In each case depressing the Escape key returns you to the previous menu. The process is generally simple and effective.

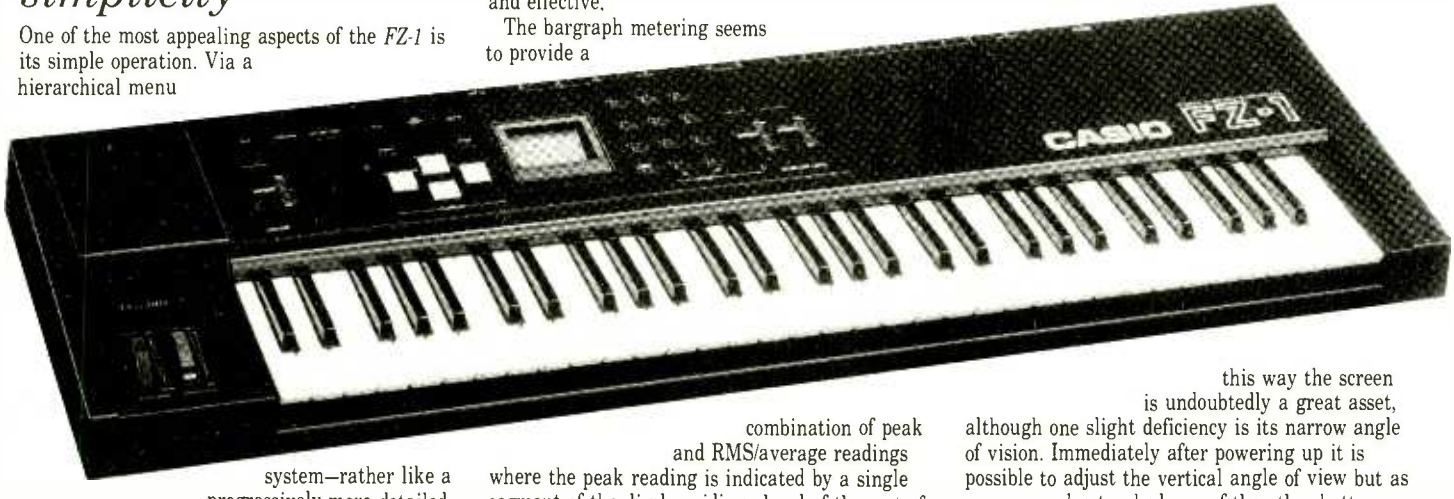
The bargraph metering seems to provide a combination of peak and RMS/average readings where the peak reading is indicated by a single segment of the display riding ahead of the rest of the bar, which is showing the RMS/average signal level. One slight limitation here is that there's no way of monitoring the sound 'post-fade' while it is being recorded and great care has to be taken over the setting of the level to avoid going into audible distortion. Some form of definite input overload indication, eg a red LED, would be a very useful addition. Its performance in terms of noise and distortion makes it suitable for most musical applications, although it doesn't quite achieve the level of sonic quality offered by other significantly more expensive professional instruments. How important this absolute level of sound quality is will differ from user to user but the level and ease of control offered over the signal is unusually high.

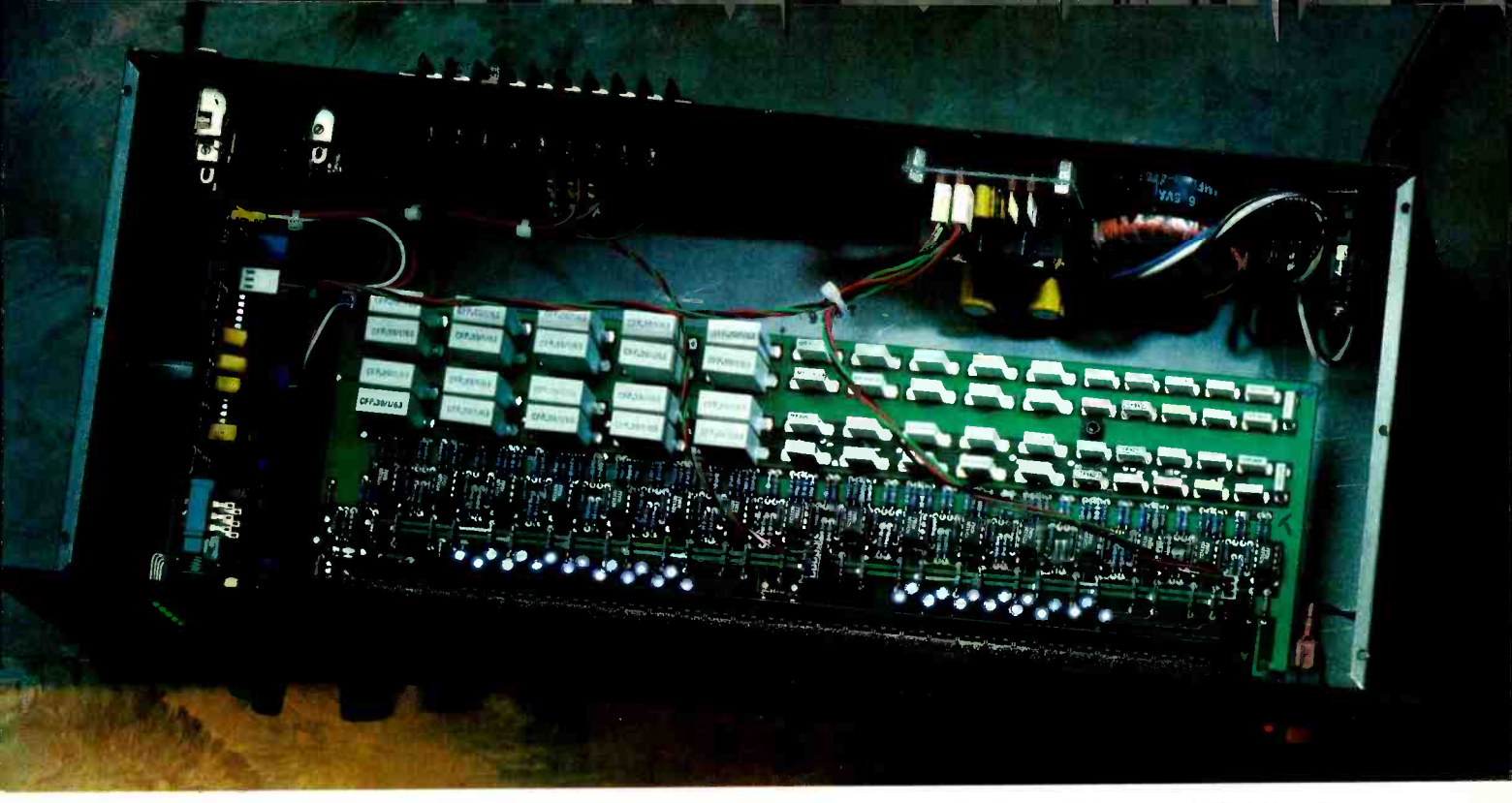
Editing

Having sampled your sound you can go through the Voice Edit submode into the Create Voice function in which the sample can be topped and tailed (any memory space taken up by unwanted sample can then be wiped and made free for other sounds), looped, processed via DCA and DCF envelopes and modulated by a fully variable LFO. Key velocity can be applied individually, positively or negatively, to the rate and level of the DCA and DCF EGs, and also to the filter resonance. Via a different set of menus, key aftertouch, as well as pitch wheel, mod wheel and the variable foot pedal controller data, can be applied to the levels and LFO modulation depth of the DCA and DCF. Surprisingly, these performance control settings are not stored individually with each voice but are global settings affecting any sound on the keyboard. This seems a rather anomalous limitation on an otherwise sophisticated instrument.

The looping facility is unusually comprehensive offering no less than eight loop points within a single voice making it possible to approximate the continuously changing timbres of naturally decaying sounds, rather than being stuck with the constant cyclic repetition of a single loop. For example, you might have the attack of the sound, followed by the next 200 ms looped three times, followed by the middle 300 ms looped five times, finishing with the natural decay of the note. There's no autolooping but an adjustable crossfade time allows manual adjustment by ear to achieve the best glitch-free results.

Where appropriate, the LCD display gives a written and graphical picture of the process in hand. For instance, truncate, loop and EG settings can all be viewed and executed graphically. In this way the screen is undoubtedly a great asset, although one slight deficiency is its narrow angle of vision. Immediately after powering up it is possible to adjust the vertical angle of view but as soon as you've touched any of the other buttons the angle is locked. Any subsequent change of operating position, ie standing up, sitting down or moving to one side, will then result in virtual disappearance of the picture, which cannot be adjusted for. This is irritating but not greatly





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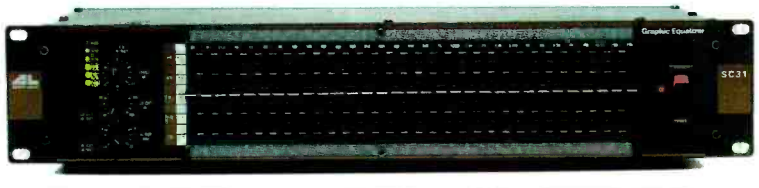

	Audio Logic SC 31	RANE GE 30	JBL/Urei 5547A	Klark-Teknik DN 300
Noise	Less than -90 dBm	Less than -90 dBm	Less than -90 dBm	Less than -90 dBm
Maximum Output	+27 dBm	+24 dBm	+22 dBm	+22 dBm
Dynamic Range	+117 dBm	+114 dBm	+112 dBm	+112 dBm
Frequency Response	18 Hz to 30 kHz +/-0.5 dB	10 Hz to 40 kHz +0/-3 dB	20 Hz to 20 kHz +1/-2 dB	20 Hz to 20 kHz +/-0.5 dB
Number of Bands	31	30	30	30
THD plus noise	Less than .005% @ +22 dBm @ 1 kHz	Less than .01% @ +4 dBm	Less than .5% @ +22 dBm	Less than .01% @ +4 @ 1 kHz
Suggested Retail Price Excluding VAT	£390.00	£498.00	£705.00	£595.00

The SC31 is a powerful signal processing tool designed for professional use. It features 31-⅓ octave centered bands of equalization with selectable 6 dB or 12 dB of boost and cut. But that's just for starters.

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*All specifications taken from manufacturer's published literature.

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REVIEW

inhibiting, unless rapid on-stage editing is anticipated.

There are times when it is necessary to momentarily leave an edit process and return to the play mode in order to listen to the whole sound. Thoughtfully, Casio have included a Call/Set key that allows you to do this and immediately return to whatever stage of the edit menus you were at, saving a journey through all the previous menu stages.

Digital wave synthesis

The *FZ-1* also contains a single oscillator, 8-note polyphonic digital wave synthesiser offering four types of synthesis, any of which can be subjected to the aforementioned editing facilities, eg DCA, DCF, LFO and all the performance controls:

- Additive Synthesis—up to 48 sinewave components can be combined to create a complex waveform. This can be done numerically (enter the number of the harmonic and its amplitude) or graphically where the display produces a series of 48 vertical lines each showing the amplitude of a harmonic. The lines can then be selected and altered in amplitude using the cursor and value controls
- Preset Wave Forms—any one of six standard wave shapes including random, sawpulse, double sine, pulse, square- and sawtooth can be selected
- Cut Sample—allows you to cut out part of a sample to be used as a separate sound source
- Hand Drawing—draw your own wave shape on the screen using the left/right cursor buttons plus the Value slider, where each touch of the cursor button moves the cursor across one of the 96 horizontal divisions of the display. This can be done 'dot by dot' or you can leave your finger on the cursor button and draw a shape continuously with the Value slider

Once you've created a voice, whether through sampling or synthesis, you can reassign it to any area of the keyboard called, sensibly enough, an 'area'. This is done by entering new original, highest and lowest key settings. A complete keyboard set-up is called a 'bank', and it can be transposed to any desired key—an unusual and very useful facility to find on a sampling keyboard at this price. A bank can be divided up into as many as 64 areas and these need not only be across the keyboard but can also be 'velocity divisions', so that as you hit a key harder one voice cuts out and another cuts in—up to 64 times in theory! With this method the voices jump in and out rather than fading in and out and so it is very easy to have two distinct sounds available at one time. Another way of using the velocity information is to apply it to the DCA levels of each voice individually so that one gradually fades out and the other gradually fades in as you play harder. As well as any number of unique effects, this technique allows you to take separate soft and loud samples of an instrument and use the key velocity information to crossfade between the two thereby simulating something like a natural dynamic response.

MIDI and multiple outputs

The *FZ-1* has a very comprehensive MIDI specification including a multitimbral mode in which each of the eight voices can be addressed individually via a separate MIDI channel. For recording applications this might be particularly useful in conjunction with the *FZ-1*'s eight separate assignable audio outputs. Any area can be adjusted in volume and assigned to any combination of the outputs; alternatively there is a mono mix output but no stereo mix output capability.

Cleverly, MIDI data dump and data merge allow new data to be written into any available free memory space on another *FZ-1* without erasing existing data.

Two sampled sounds can be layered together within a single voice using the Mix Write facility, with which you can adjust their relative volumes and tunings and also delay the start of the second sample. It isn't possible to mix a sampled and a synthesised sound, and the two samples are mixed in their original raw forms, without any of the EG or key velocity information applied to them.

Only two sound disks are supplied with the *FZ-1*, the first contains three versions of a grand piano, the second offers Classical Guitar, Acoustic Guitar, Vibraphone, Wood Bass, Vibraphone/Wood Bass split. There is, however, an ever-expanding library of sounds available from Casio in sets of five disks, TSC*, a major UK Casio agent, is also engaged in creating its own sound library, which is to be commercially available. Depending on how much information is contained, a disk can take up to around 80 s to load. This is not particularly quick for live work, although it seems to be fairly standard for similar machines using the 3.5 in floppy disk format.

Conclusion

Considering its price, the *FZ-1* offers an extraordinary range of facilities, with good sound quality and a very high level of control and signal manipulation, while maintaining operational simplicity. For studio applications the expander version, due to be released around spring '88, might be even more interesting. Though nothing has been finalised, the new model is likely to be around the same price but include autolooping, stereo in and out, *XLR* connectors, plus SMPTE and personal computer compatibility. There is currently no mention of a hard disk facility. In its current form the *FZ-1* stands alone within its price range, and there is already something of a waiting list to acquire one.

UK: Casio Electronics Co Ltd, Unit 6, 1000 North Circular Road, Staples Corner, London NW2 7JD.
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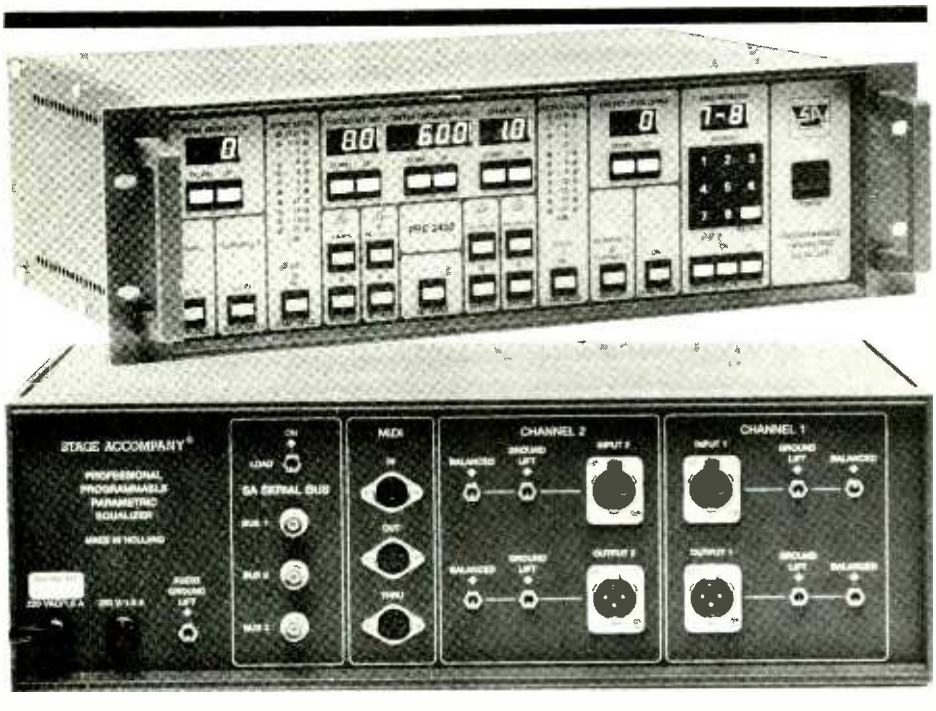
REVIEW

User reports on Stage Accompany's PPE-2400 programmable equaliser from Dave Foister and Patrick Stapley together with a technical evaluation by Rod Duggan



The Stage Accompany *PPE-2400* is one of those products that, like the laser when it was first invented, appears to be a solution looking for a problem. It is certainly an impressive, sophisticated piece of kit—it looks good, sounds good and performs well—but one is left wondering just who could find it useful.

Behind the unorthodox exterior, the *PPE-2400* is a straightforward 4-band parametric and, as such, stands up very well. It has a good frequency overlap between bands, sensible and useful metering, and niceties like clipping indicators and bypass switches on each section. The range of adjustment is not great; the gain range of each band, for instance is ±19.5 dB, which is less than the parametrics fitted to each channel of the desk I use. It would also have been useful to have the option of using the top and bottom bands as shelving controls. The sound of the unit is clean and quiet and the plethora of clip LEDs makes it easy to keep it that way. It may or may not be a good thing for a signal processor to have an identifiable sound but the fact remains that the most successful ones have, and this one hasn't.

Unfortunately what gets in the way is the clever bit, the digital control. Every parameter on the *PPE-2400* is programmable, and every adjustment is made using nudge buttons. While these may be acceptable for some purposes, control of a parametric equaliser is not one of them. They are no substitute for the directness of a rotary control, however user-friendly they may be designed to be, and the control on the *PPE-2400* is stranger than some. Most of its controls have built-in acceleration, which is one way round the problem, but it can make fine adjustment difficult. The exception is the equaliser centre frequency; this can run at one of eight fixed speeds, which can only be changed by direct entry on the numerical keypad. Personally, I prefer a 2-speed system where the higher speed is activated by pressing both buttons at once. The set-up on the *PPE-2400* makes adjustment extremely cumbersome and time-consuming, and the displays, although very impressive, are not much help since equalisation is an effect you adjust with your ears, not by knowing what the device is doing.

All this might be worth persevering with if the end result, 64 instantly recallable MIDI-controlled EQ settings, were somehow incredibly useful but I couldn't think of an application where it would be worth the bother. For all its nice details, such as the user-programmable locking code that renders all the controls inoperative and the individual groundlift switches on every input and output, this strikes me as a classic example of building something very clever simply because it can be done, not because anybody actually wants it.

Dave Foister

At first glance this unit appears somewhat daunting, with its array of controls and displays, but after a little practice one soon becomes quite familiar with its operation. However, it is certainly slower to work with than a conventional 'pot' or graphic EQ unit. The problems here are twofold: first, to actually set up a sound takes longer due to the amount of operational moves and the time it takes to implement them; second, because there is one display shared between the four bands one loses the overall visual relationship between settings, and I found myself continually referring back to previous selections before I ended up with a cohesive result. The stereo working of the unit is also a little confusing with each channel sharing the same controls and displays.

I couldn't find fault with the sound of the EQ, but I didn't feel comfortable or at all spontaneous using it. It's possible with longer use that one may become more accustomed to the 'feel' of the unit, but I would personally stick with something that gave me quick and inspired results. One feature I did like was the ability to store EQ settings in its non-volatile memory. The unit is MIDI compatible and this opens up some interesting possibilities.

Patrick Stapley

Technical measurement

The Stage Accompany *PE-2400* equaliser is a dual-channel, programmable equaliser with four overlapping bands, each being a peaking boost or cut. Input/output levels are metered and input/output gains are programmable. Digital readouts give values of input/output gain (0 to 100), equaliser gain (±19.5 dB), frequency (20 Hz to 20 kHz), Q-factor (0.3 to 15) and programme memory.

The equaliser performance was measured, the memory being left for user reviews.

Maximum input and output were measured at +20 dBm. Output measurement was limited by the equaliser section clipping before the output stage. The output gain can be reduced by the output gain control, and lower levels are indicated by the output meter. The 'clip' LED still operates independently of the meter level. So if input signals are over-boosted to clip the equaliser section and gain reduced to produce a reasonable output level, the indicator still shows clipping.

REVIEW

TABLE 1

Band	I		II		III		IV	
	20 Hz	600 Hz	60 Hz	2 kHz	200 Hz	8 kHz	600 Hz	20 kHz
−19.5 dB	−18	−19.1	−19.3	−20.5	−18	−19	−16	−19.2

TABLE 2

	Boost		Cut	
Nominal Q	1	15	1	15
Measured Q	0.89	5.47	8.2	74

The range and overlap of sections is shown in **Fig 1**. Nominal frequencies agree with measured values to a maximum error of 1.5% at the 600 Hz end of band IV (591 Hz).

The graph shows cuts not reaching the indicated −19.5 dB. This is not entirely chart pen error as measurements in **Table 1** show.

The band IV 600 Hz reading was similar on channel 2 at −15.5 dB, however, at lower Q values the measured values agreed closely with those indicated.

As can be seen from **Fig 1**, the boost curves are quite different from the cut curves in terms of shape and hence Q, despite the display showing the same value of Q. Measurements were taken with band IV at 600 Hz and the results are shown in **Table 2**.

Such wide variations must be taken into consideration when noting the value indicated on the unit. The complete range of Q values is shown in **Fig 2**, for band IV centred at 600 Hz.

FIG.1 BANDRANGES

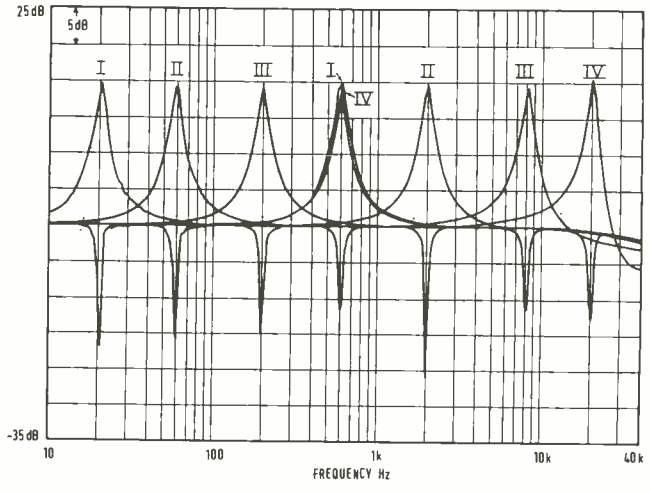


FIG.2 Q-CURVES

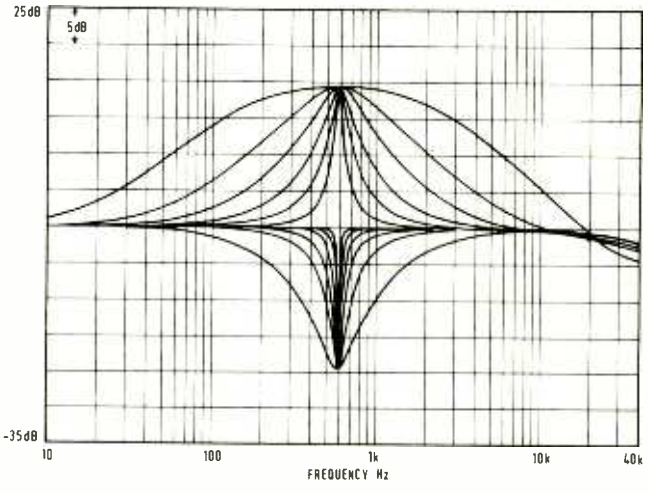


FIG.3 BOOST AND CUT CURVES

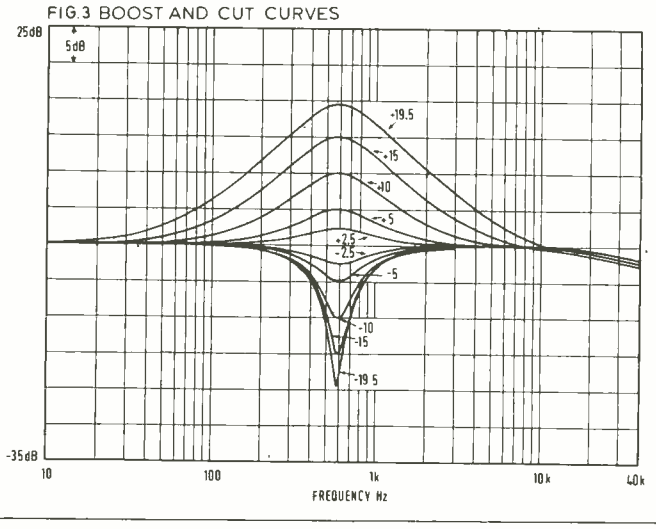


FIG.4 FREQUENCY RESPONSE "FLAT"

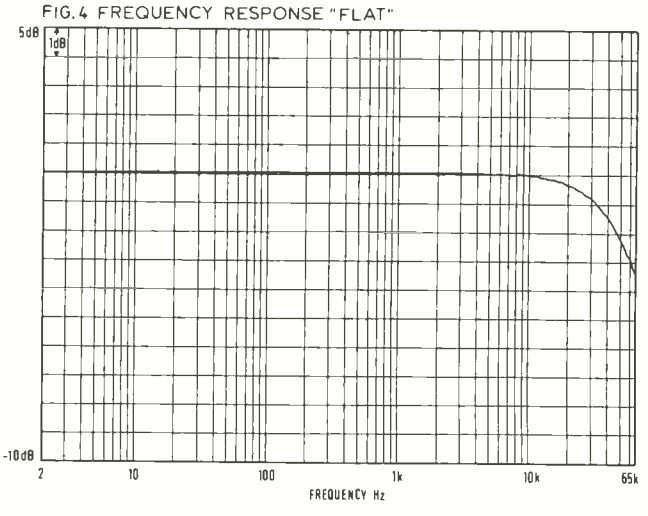


Fig 3 shows the amounts of boost and cut agree with the display readout (at Q=1), and the shapes of the curves may be seen.

Noise was measured at −76 dBm (10 Hz to 20 kHz RMS).

Squarewave respone was fine.

Fig 4 shows the response of the system with all bands in and set flat. Response is 2 Hz to 33 kHz (+0, −1 dB).

One fault was encountered while testing channel 1—channel 2 meter indicated a signal although none was present at channel 2 output. The gain of channel 1 increased by 10 dB, and clipping occurred at +14 dBm. The fault was traced to a vertical PCB that needed a firm push into its connectors. Incidentally, this was the only PCB with a 'QC' label attached. **Rod Duggan**

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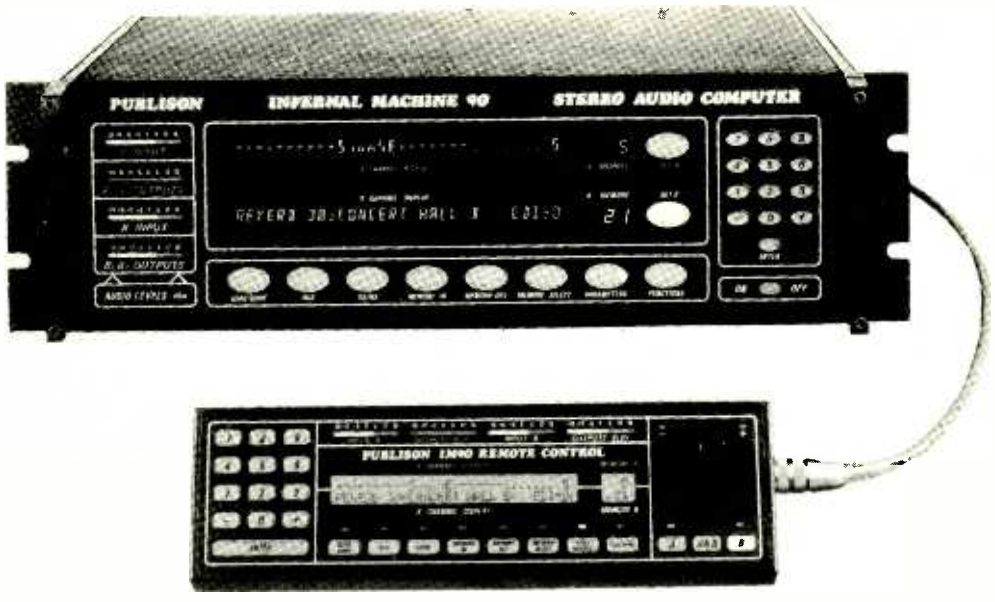

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REVIEW

A technical report by John Woodgate on the QMAX 600 amplifier from McKenzie Acoustics

There is rather a large number of big power amplifiers on the market at present, so any new offering has to have some special distinguishing features (not gimmicks) to establish its product identity. The British-made *QMAX 600* has a number of such features but unfortunately not all of them can be considered positive factors.

External construction

The amplifier is constructed for 384 mm rackmounting, and is housed in a black anodised metal case, 3U high. The front panel is fitted with two strong handles and, although the amplifier weighs only 15 kg, these appear rather thin, at 2.9 mm, to support the weight, particularly if the mounting screws ever became loose. The sides of the case are massive cast heatsinks, which should aid reliability in arduous service but the supporting side-rails in a rack would seriously obstruct ventilation. Thermal cut-outs mounted internally on the heatsinks operate at 100°C so the panel and handles would be very hot indeed when the cut-out operated. Perhaps surprisingly, IEC65 (and BS415) allows a temperature rise for handles and enclosures of 65°C under fault conditions.

On the front panel are mounted the two channel gain controls with suitably massive control knobs and position reference dots on the panel, a rocker-type double-pole mains switch and a very clear LED indicator assembly, which shows power on, channel output level in 10 steps calibrated in dB, bridge-mode operation and protection circuits active. The mains switch is of the 'click-in'-type, and is designed for panels up to 2 mm thick. It does not click-in to the 2.9 mm panel properly and can be prised out with the fingers. Since this exposes live mains terminals, it has to be considered unsafe in terms of IEC65 and should be corrected at once.

On the rear panel all the connectors are mounted and they are a very comprehensive set. The manufacturer claims compliance with BS5428 Section 5.3 and the identical IEC268-12 First Edition. By and large this claim is valid, although the quoted standards are just on the point of being superseded by IEC268-12 Second Edition and the identical BS6840 Part 12: these are in fact complied with to about the same extent. Inputs are on *XLR-3*s and, for paralleling, *XLR* fixed plugs are also provided, together with 6.4 mm 2-contact jack inputs. The jacks have closed ends, and therefore meet the safety requirements in respect of preventing wires being pushed into the interior of the amplifier. Outputs are on *XLR-3* fixed plugs. Although common, this practice is not officially standardised, and is not all that safe because the output voltage exceeds 34 V peak. There is a move to standardise internationally the ITT-Cannon *AXR-PDN* connector for amplifier outputs and loudspeaker inputs, which will resolve this long-standing problem, however, the output connectors on this amplifier should have the IEC65 'flash' mark, at least. The *XLR* connectors are pop-riveted to the panel, which looks amateurish. Even sheet-metal screws would be preferable but I would suggest pan-headed Taptite or similar screws to avoid fiddling with nuts and shakeproof washers. Countersunk versions of these could also save the cost of tapping the heatsinks for the cover fixing screws.

Useful diagrams of the connector pin designations are provided on the rear panel, which also carries the mains input connector and fuseholder, and four DC supply fuseholders. These are marked with their current ratings but not with their fusing characteristics: since they are all 'fast' types, they should be marked 'F6.3A'. A 2 m 3-core mains lead is supplied, with a moulded-on IEC mains connector. The regulation warning notice regarding earthing the amplifier is provided but it is a long way from the mains connector and should be nearer. More serious is the omission of any mention of mains voltage, frequency and current or power consumption, especially as there is an internal adjustment for mains voltages of 240, 220 and 200 V, the latter not being mentioned in the manual because it is not functional, although it appears that rewiring might restore it, if required.

Manufacturer's specification

Output power:
4 Ω both channels driven: 325 W
4 Ω one channel driven: 380 W
8 Ω both channels driven: 200 W
8 Ω one channel driven: 220 W
8 Ω bridged mono: 650 W
Frequency response ref 1 kHz: 20 Hz −0.3 dB, 20 kHz −0.1 dB
Upper 3 dB point: 60 kHz
Lower 3 dB point: 5 kHz
Harmonic distortion: less than 0.005%
Damping factor: better than 100
Input sensitivity: 0 dB 0.775 V
Input impedance: 10 kΩ balanced
Signal-to-noise: 96 dB measured, peak, wideband unweighted
Output rise time: 10% to 90% 7 μs
Slew rate: 10 V/μs
50 Hz squarewave slope (10 ms): 20%
1 kHz squarewave overshoot: 1%
Mains input power: 240/220 VAC 50/60 Hz
Power consumption: 1 kW
Dimensions: (whd) 19×5¼×14 in
Weight: 17.0 kg
McKenzie Acoustics Ltd, Albion Drive, Thurnscoe, South Yorks S63 0AB, UK.

The inside

The top panel of the case comes off easily, and inside we find the usual massive toroidal mains

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REVIEW

transformer. This is fixed in such a way that it could move if the amplifier were dropped, and perhaps damage other parts. In the review sample, the transformer was noisy, producing a 'clattery' hum with much harmonic content up to 750 Hz. A sound pressure level of 34 dBA was measured close to the unit but A-weighting does not give a good indication of the subjective loudness of this type of noise, and the C-weighted figure of 40 dB is perhaps more meaningful.

The power supply has two 15 mF capacitors and the amplifier cards, attached firmly to the heatsinks, carry normal good quality industrial-grade components. The output stages use three pairs of complementary TO-3 case devices, and there is considerable protection circuitry, responsive to excessive current and DC offset at the output. There is also a 5 s switch-on delay. There are two fuses in the protection circuit, whose values and fusing characteristics should be marked next to their holders. Bridge mode operation is allowed, into a minimum load impedance of 8 Ω but the bridge mode is selected by means of an unmarked internal slide-switch, which looks rather like an afterthought. It is mounted on the back of the PCB that also carries the electronically-balanced input stages and the driver devices for the LED arrays. The protection PCB is the only one with component designations.

Measurements and specifications

Performance was assessed using the methods given in the Second Edition of IEC Publication 268-3 *Sound system equipment: Amplifiers*, which is not yet published but will be implemented as British Standard BS6840 Part 3 in due course. Generally, the performance was good, which makes the necessity of the relatively few criticisms of the product all the more regrettable.

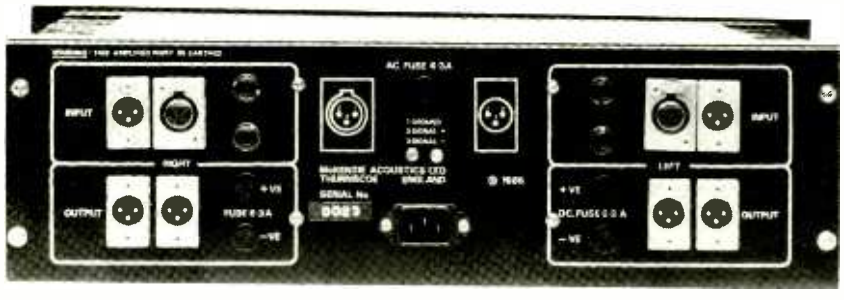
The manufacturer's specification is very brief, and omits such basics as the rated total harmonic distortion, although the manual as a whole is better than some. When testing any piece of equipment, it has to be operated under the proper conditions, and the manufacturer has to say what these are; they are called 'rated conditions', and include the power supply voltage and frequency, the rated source impedance and climatic conditions (which also are not stated). For a meaningful distortion-limited power (or preferably voltage) output specification, the manufacturer also has to give a rated value for total harmonic distortion. In the absence of this information, the realistic value of −43 dB (0.7%) was used, following IEC581-6. For most of the tests a 10 Ω source impedance was used: being electronically balanced the input stage response should not be sensitive to source impedance.

Power supply

Beginning with the power supply characteristics, the no-signal mains input current was 230 mA. The current was also measured under rated conditions and under IEC 'standard measuring conditions' (formerly 'normal working conditions'), where the input EMF is reduced by 10 dB with respect to the rated value. The values are given in **Table 1** and show no problems.

Inputs and outputs

Next, we look at the input characteristics. The manual does not give a rated source impedance



but mentions a 'special electronic circuit to eliminate hum loops', and includes a block diagram of the circuitry and good advice on connecting balanced and unbalanced interfaces. The rated input impedance is 10 kΩ, and measurement confirmed this. The rated source EMF is 0 dBu, and this corresponded, at a gain control setting slightly below maximum to '0 dB', shown on yellow LEDs in the indicator arrays, which also show −20, −10, −7, −5, −3 and −1 dB in green, with +1, +2, and +3 dB in red. These levels were adequately accurate, and at this gain control setting 0.7% distortion was reached at about +1.25 dBu input level with 4 Ω loads, ie the first flash of red correctly indicates the 'end-stop'. With 8 Ω loads the limiting distortion was reached at an input level of about +2.2 dBu. The channels were satisfactorily similar in performance.

When we look at the output characteristics, we need the rated value(s) of load impedance from the manufacturer, and for this amplifier values of 4 Ω and 8 Ω are given, with 8 Ω the minimum in bridge operation. No value is given for the output source impedance. The measured values at 1 kHz are so low that cable and connector contact resistance must form a significant part. No evidence could be found that the 'electronic' part of the output impedance was negative, which would not be good unless intentional and carefully controlled. The amplifier is DC coupled at the output and no rise in output source impedance at low frequencies would be expected. There are also no series inductors at the outputs, so there would be no rise at high frequencies for this reason. The measured values are give in **Table 2**.

The reason for the rise in impedance on the right channel appears to be that the main amplifier runs out of open-loop gain at rather too low a frequency. The same effect can be seen in the frequency response and distortion results. Even so, for many purposes this will not matter, although one would have expected a unit with this degree of difference between channels to have been a doubtful pass at final test.

Distortion-limited output voltage levels and powers, at 0.7% THD at 1 kHz, are given in **Table 3**. The specification is met with 8 Ω loads but there is a discrepancy with 4 Ω loads. This was carefully checked, including digital metering of the mains stabiliser output voltage. Acoustically, this 0.35 dB difference is, of course, negligible.

Regulation is measured by the rise in outuput voltage when the load impedance is disconnected. Using stabilised mains, both channels showed a very small change of 0.1 dB (1.2%). With unstabilised mains the effects would be larger but this is not completely under the control of the amplifier manufacturer: the gain is always slightly affected by the load current demand.

The IEC standard does not include a measurement of rise time, which is quoted at 7 μs but with no measuring conditions specified. At −1 dB ref +33 dBu (but 477 W, of course!) both channels met this specification when measured with a fast rise 1 kHz squarewave, although the right channel waveform was not beyond reproach. At a level 10 dB lower, the right channel rise time was about 10 μs, while the left channel was still below 7 μs.

TABLE 1

	8 Ω load	4 Ω load
Current under rated conditions	2.8 A	5.5 A
Current under standard measuring conditions	1.12 A	1.88 A

TABLE 2

Frequency (Hz)	Output source imp (mΩ) Left ch	Output source imp (mΩ) Right ch
40	45.8	44.6
1 k	46.0	44.0
10 k	49.8	90.2
20 k	68.2	165.0

TABLE 3

	Measured values	Rated values
8 Ω load	34.6 dBu/217 W	34.3 dBu/200 W
4 Ω load	33.0 dBu/300 W	33.35 dBu/325 W

Both channels gave identical measured values

Limiting characteristics

We next come to what the IEC groups together as 'limiting characteristics'. Since in this design there is electronics before the gain controls, we are interested in overload source EMF because inadequate performance in this respect, particularly in microphone amplifiers, is responsible for more sound degradation than almost anything except acoustic feedback. What we do to increase the input signal level and turn down the gain controls until we reach rated THD with the output voltage low enough for the output stage distortion to be negligible; −10 dB ref rated output is usually suitable. No

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specification is quoted but the measured values are satisfactory at +19.8 dBu.

The new IEC standard includes measurements of 'short term' (1 s) and 'long-term' (60 s) maximum output voltage, the former measured with a 1 kHz sine signal and the latter with a weighted noise signal (simulated programme signal) whose characteristics match reasonably well the long-term average characteristics of programme signals. These new characteristics are very significant in determining the reliability of a particular combination of amplifier and loudspeaker, since they correlate with significant failure mechanisms in loudspeakers. Naturally, manufacturers are not yet giving values for these characteristics but the manual does warn 'up to double the rated power may be available for short periods' although it then goes on to make a remark about the LED indicators. This, though, is not quite accurate because indicated '0 dB' does not represent distortion-limited output level at any realistic THD.

Gain

Gain is not usually specified for power amplifiers: for this product the gain is 33.7 dB with the gain controls at maximum, and 32.5 dB with them set so that 0 dBu input gives 0 dBu indication on the LEDs. This is voltage gain from a 10 Ω source into an 8 Ω load. The attenuation law of the gain controls was checked and was found to be good, with −6 dB at 3 o'clock, −20 dB at 12 o'clock and −30 dB at 9 o'clock. Care is needed, of course, to ensure that the input stage is not overloaded if gain control settings below 12 o'clock are required.

Frequency response

We now come to frequency response, and this is one of the characteristics that is measured automatically with the Lindos analyser. At least, it normally measures between 20 Hz and 20 kHz; it can measure between 5 Hz and 35 kHz but the results cannot be computer-processed easily. So the extremes of the frequency range, which are interesting and important for assessing the quality of the design rather than for their acoustic effects, are investigated with traditional manual methods.

The claimed frequency range is 5 Hz to 60 kHz but no indication is given whether these are the −3 dB frequencies. Measurements show that the response of both channels is −3 dB at about 4 Hz, with a very small peak around 10 Hz. At the other end of the spectrum, we find the first significant difference between channels, and a big difference (but not very significant, perhaps) from the specification. According to the IEC standard, frequency response is measured under standard test conditions, ie with an input level of −10 dBu. The −3 dB frequencies are given in **Table 4**, and it will be seen that the load impedance affects the frequency response, and that the right channel is not as wide as the left.

Within the pass-band, the response is given in detail in **Tables 5** and **6** and **Figs 1** and **2**. The interchannel phase difference is also given in these tables: note that this is not the phase response of the amplifier, which is unlikely to be non-minimum phase and therefore has a phase response deducible from the amplitude response.

TABLE 4

Load imp (Ω)	Channel	Low −3 dB freq (Hz)	High −3 dB freq (Hz)
8	Left	4	34.5 k
4	Left	4	55.0 k
8	Right	4	22.6 k
4	Right	4	46.0 k

Linearity

There are so many ways of measuring distortion that one could fill an issue of *Studio Sound* with

FIG 1 FREQUENCY RESPONSES WITH −10 dBu INPUT LEVEL AND 8 Ω LOADS

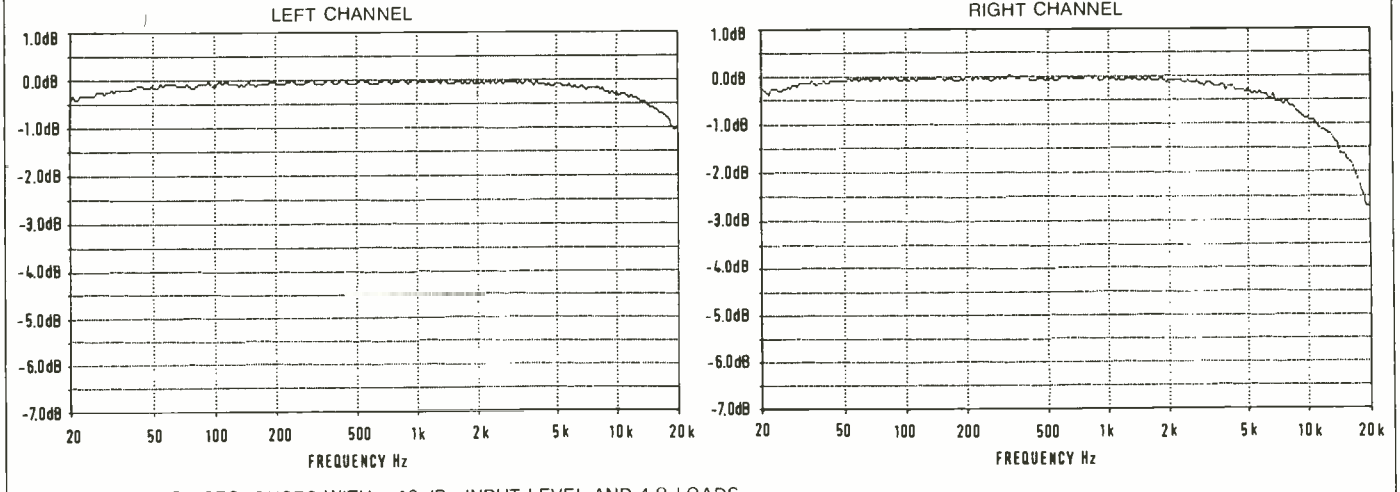
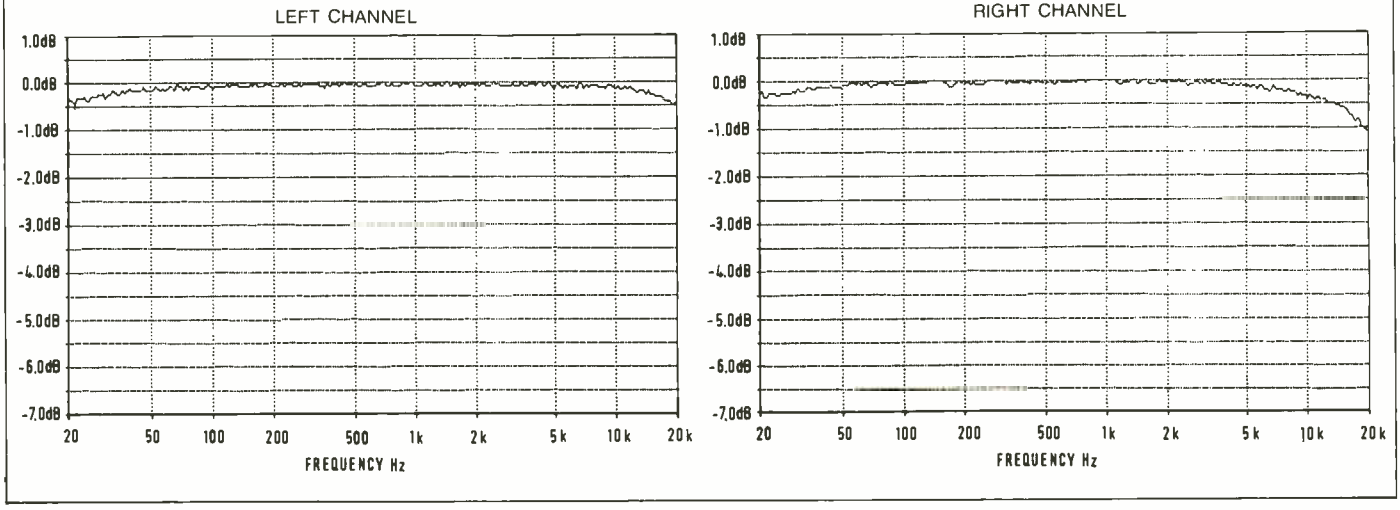


FIG 2 FREQUENCY RESPONSES WITH −10 dBu INPUT LEVEL AND 4 Ω LOADS



results from one amplifier. It is more sensible to make basic THD measurements and to investigate further if it seems necessary, which in this case it did not. Harmonic distortion measurements are shown in **Tables 5** and **6**. It should be noted that these are measurements of THD plus noise in a bandwidth from twice the signal frequency up to 22.4 kHz, except for 315 Hz, where a narrow band third harmonic measurement is made. The results are quite satisfactory. Measurements of distortion at low input levels are important, as the 'cleanness' of the reproduced signal is considerably, but somewhat subtly, affected by small amounts of low level distortion, and ruined if there is a large rise in distortion at low levels, eg crossover distortion. For this amplifier the performance was good (between −50 dB and −60 dB) down to −40 dBu input below which, noise affected the measurements too much.

Noise

Signal-to-noise ratio measurements are included in **Tables 5** and **6**. Since the CCIR 468 measurement is now accepted by the IEC in Publication 268-1, Second Edition (BS6840 Part 1), it is not intended to quote figures measured in other ways unless there is a specific reason. The rated value is quoted as 96 dB, with no weighting stated. This sample probably meets that specification if it is an A-weighted figure. The Lindos was operated from its batteries to avoid any hum being injected during the noise measurements.

Balance

Since the inputs are balanced, we should look at the common-mode rejection ratio (CMRR), which is a measure of the rejection of unbalanced interfering signals. Measured at −10 dBu input to both legs of the input connected together, the values in **Table 7** were obtained.

These values are quite good but do not entirely prevent some risk of audible interference. 40 dB below 300 W is 30 mW—the typical output of a *Walkman*.

TABLE 7

Frequency (Hz)	CMRR left ch (dB)	CMRR right ch (dB)
100	44.9	39.5
1 k	44.9	39.5
10 k	43.9	39.6

Crosstalk

Crosstalk measurements are given in **Tables 5** and **6**. There are no values in the specification and the measured values for the left channel are good. The right channel performance is not so good and could probably be improved by attention to PCB layout. Even with the present performance there will be little subjective effect.

Listening

Listening tests indicated that the amplifier sounds clean, even at very low levels relative to full output.

Conclusions

Overall, this is a good amplifier, marred a little by some rather surprising, niggly defects. Hopefully, some of these will receive attention, particularly the mains switch fixing. The right channel seems to be below par; perhaps this is an accumulation of tolerances and it suggests that there is only a modest amount of overall negative feedback.□

TABLE 5: Measurements with 8 Ω loads

Freq resp 20 Hz to 20 kHz −10 dB	Left ch	Right ch
30 Hz	−0.18 dB	−0.16 dB
40 Hz	−0.11 dB	−0.08 dB
50 Hz	−0.11 dB	−0.08 dB
63 Hz	−0.03 dB	−0.06 dB
100 Hz	−0.04 dB	−0.05 dB
125 Hz	−0.04 dB	−0.04 dB
250 Hz	−0.07 dB	−0.05 dB
500 Hz	−0.02 dB	+0.03 dB
1 kHz	0.00 dB	0.00 dB
2 kHz	0.00 dB	−0.02 dB
4 kHz	−0.03 dB	−0.18 dB
6.3 kHz	−0.08 dB	−0.41 dB
8 kHz	−0.18 dB	0.63 dB
10 kHz	−0.28 dB	−0.86 dB
12.5 kHz	−0.44 dB	−1.29 dB
14 kHz	−0.51 dB	−1.43 dB
15 kHz	−0.51 dB	−1.66 dB
16 kHz	−0.68 dB	−1.81 dB
18 kHz	−0.78 dB	−2.19 dB
20 kHz	−1.01 dB	−2.67 dB
Test level out 1 kHz	+21.86 dB	+21.93 dB
Noise CCIR 468-3 Q-pk (REL)		
Pk wtd	−81.9 dB	−87.4 dB
Pk unwtd	−85.0 dB	−90.1 dB
Mn wtd	−82.1 dB	−87.7 dB
Crosstalk −10 dB (REL)		
40 Hz	−90.4 dB	−77.6 dB
100 Hz	−84.9 dB	−68.7 dB
315 Hz	−78.5 dB	−59.7 dB
1 kHz	−73.1 dB	−50.5 dB
6.3 kHz	−58.6 dB	−36.0 dB
10 kHz	−55.2 dB	−32.6 dB
Distortion −10 dB (2f-22k)		
40 Hz	−77.0 dB	−81.3 dB
100 Hz	−75.6 dB	−78.0 dB
315 Hz	−83.3 dB	83.2 dB
1 kHz	−69.4 dB	67.6 dB
6.3 kHz	−56.5 dB	−53.8 dB
10 kHz	−55.3 dB	−51.9 dB

Freq resp 20 Hz to 20 kHz 0 dB	Left ch	Right ch
30 Hz	−0.24 dB	−0.18 dB
40 Hz	−0.15 dB	−0.09 dB
50 Hz	−0.12 dB	−0.05 dB
63 Hz	−0.10 dB	−0.04 dB
100 Hz	−0.05 dB	−0.01 dB
125 Hz	−0.04 dB	−0.01 dB
250 Hz	−0.01 dB	+0.02 dB
500 Hz	−0.01 dB	−0.01 dB
1 kHz	0.00 dB	0.00 dB
2 kHz	−0.01 dB	−0.04 dB
4 kHz	−0.05 dB	−0.17 dB
6.3 kHz	−0.11 dB	−0.36 dB
8 kHz	−0.15 dB	−0.55 dB
10 kHz	−0.22 dB	−0.81 dB
12.5 kHz	−0.39 dB	−1.20 dB
14 kHz	−0.48 dB	−1.43 dB
15 kHz	−0.52 dB	−1.56 dB
16 kHz	−0.62 dB	−1.81 dB
18 kHz	−0.76 dB	−2.11 dB
20 kHz	−1.02 dB	−2.62 dB
Test level out 1 kHz	+31.86 dB	+31.93 dB
Noise CCIR 468-3 Q-pk (REL)		
Pk wtd	−81.4 dB	−87.2 dB
Pk unwtd	−84.7 dB	−90.0 dB
Mn wtd	−81.6 dB	−87.5 dB
Crosstalk 0 dB (REL)		
40 Hz	−89.9 dB	−78.1 dB
100 Hz	−87.4 dB	−69.2 dB
315 Hz	−78.9 dB	−60.1 dB
1 kHz	70.9 dB	−50.7 dB
6.3 kHz	−56.5 dB	−36.2 dB
10 kHz	−52.9 dB	32.3 dB
Distortion 0 dB (2f-22k)		
40 Hz	−80.7 dB	−83.4 dB
100 Hz	−79.7 dB	−80.4 dB
315 Hz	−85.1 dB	−83.2 dB
1 Hz	−70.8 dB	−68.2 dB
6.3 kHz	−57.3 dB	−54.0 dB
10 kHz	−55.1 dB	−51.8 dB
Phase (Mean, 0°)		
40 Hz	0	
100 Hz	0°	
1 kHz	−2°	
6.3 kHz	−7°	
10 kHz	10°	
15 kHz	−15°	

TABLE 6: Measurements with 4 Ω loads

Freq resp 20 Hz to 20 kHz −10 dB	Left ch	Right ch
30 Hz	−0.29 dB	−0.14 dB
40 Hz	−0.11 dB	−0.12 dB
50 Hz	−0.15 dB	−0.05 dB
63 Hz	−0.08 dB	−0.05 dB
100 Hz	−0.11 dB	−0.05 dB
125 Hz	−0.03 dB	−0.02 dB
250 Hz	0.00 dB	−0.05 dB
500 Hz	0.00 dB	0.00 dB
1 kHz	0.00 dB	0.00 dB
2 kHz	0.03 dB	−0.02 dB
4 kHz	−0.07 dB	−0.09 dB
6.3 kHz	−0.08 dB	−0.19 dB
8 kHz	−0.07 dB	−0.20 dB
10 kHz	−0.10 dB	−0.33 dB
12.5 kHz	−0.23 dB	−0.48 dB
14 kHz	−0.28 dB	−0.53 dB
15 kHz	−0.28 dB	−0.57 dB
16 kHz	−0.29 dB	−0.72 dB
18 kHz	−0.39 dB	−0.82 dB
20 kHz	−0.44 dB	−1.05 dB
Test level out 1 kHz	+21.74 dB	+21.82 dB
Noise CCIR 468-3 Q-pk (REL)		
Pk wtd	−84.4 dB	−86.0 dB
Pk unwtd	−88.3 dB	−88.0 dB
Mn wtd	−84.6 dB	−86.2 dB
Crosstalk −10 dB (REL)		
40 Hz	−88.6 dB	−77.0 dB
100 Hz	−83.2 dB	−68.3 dB
315 Hz	−81.1 dB	−58.2 dB
1 kHz	−86.3 dB	−48.9 dB
6.3 kHz	−77.1 dB	−34.2 dB
10 kHz	−69.5 dB	−30.5 dB
Distortion −10 dB (2f-22k)		
40 Hz	−75.4 dB	−77.4 dB
100 Hz	−74.3 dB	−75.1 dB
315 Hz	−80.7 dB	−79.2 dB
1 kHz	−64.4 dB	−62.6 dB
6.3 kHz	−50.5 dB	−48.3 dB
10 kHz	−48.1 dB	−45.7 dB

Freq resp 20 Hz to 20 kHz 0 dB	Left ch	Right ch
30 Hz	−0.22 dB	−0.20 dB
40 Hz	−0.13 dB	−0.12 dB
50 Hz	−0.10 dB	−0.09 dB
63 Hz	−0.07 dB	−0.05 dB
100 Hz	−0.03 dB	−0.02 dB
125 Hz	−0.02 dB	−0.03 dB
250 Hz	0.00 dB	0.00 dB
500 Hz	0.00 dB	0.00 dB
1 kHz	0.00 dB	0.00 dB
2 kHz	+0.02 dB	−0.03 dB
4 kHz	0.00 dB	−0.08 dB
6.3 kHz	−0.03 dB	−0.15 dB
8 kHz	−0.04 dB	−0.21 dB
10 kHz	−0.06 dB	−0.30 dB
12.5 kHz	−0.13 dB	−0.47 dB
14 kHz	−0.19 dB	−0.57 dB
15 kHz	−0.21 dB	−0.62 dB
16 kHz	−0.26 dB	−0.72 dB
18 kHz	−0.31 dB	−0.84 dB
20 kHz	−0.45 dB	−1.05 dB
Test level out 1 kHz	+31.74 dB	+31.81 dB
Noise CCIR 468-3 Q-pk (REL)		
Pk wtd	−83.6 dB	−85.9 dB
Pk unwtd	−87.9 dB	−88.0 dB
Mn wtd	−84.0 dB	−86.3 dB
Crosstalk 0 dB (REL)		
40 Hz	−88.5 dB	−77.5 dB
100 Hz	−87.8 dB	−67.7 dB
315 Hz	−85.6 dB	−58.5 dB
1 kHz	−89.2 dB	−49.1 dB
6.3 kHz	−77.4 dB	−34.3 dB
10 kHz	−69.5 dB	30.6 dB
Distortion 0 dB (2f-22k)		
40 Hz	−78.4 dB	−79.4 dB
100 Hz	−78.4 dB	−78.2 dB
315 Hz	−82.1 dB	−80.3 dB
1 kHz	−65.2 dB	−63.0 dB
6.3 kHz	−50.8 dB	−48.4 dB
10 kHz	−48.0 dB	−45.6 dB
Phase (Mean, 0°)		
40 Hz	0°	
100 Hz	0°	
1 kHz	−1°	
6.3 kHz	−3°	
10 kHz	−4°	
15 kHz	−4°	

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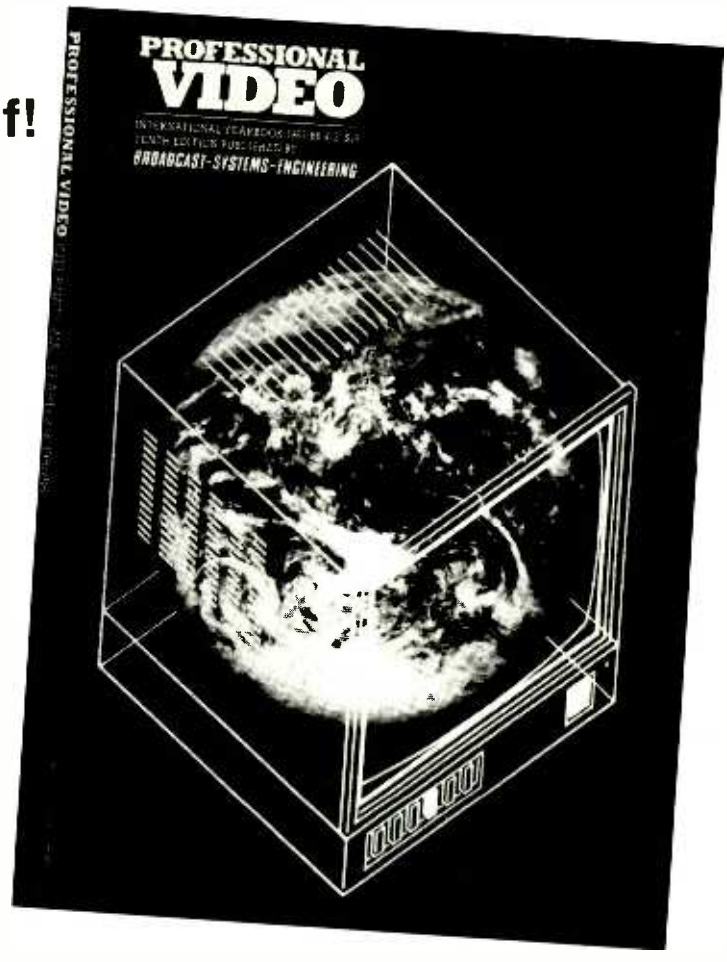

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Replies to Box Nos. should be addressed to the Advertisement Manager, Studio Sound, Link House, Dingwall Avenue, Croydon CR9 2TA, and the Box No. quoted on the outside of the envelope. The district after Box No. indicates its locality. **SEX DISCRIMINATION ACT 1975:** No job advertisement which indicates or can reasonably be understood as indicating an intention to discriminate on grounds of sex (e.g. by inviting applications only from males or only from females) may be accepted, unless (1) the job is for the purpose of a private householder or (2) it is in a business employing less than six persons or (3) it is otherwise excepted from the requirements of the Sex Discrimination Act. A statement must be made at the time the advertisement is placed saying which of the exceptions in the Act is considered to apply.

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SERVICES

Check It Out...

DIRECT FROM OUR MODERN U.K. PRESSING PLANT

- CUTTING · PRESSING
- TEST PRESSING
- LABELS · SLEEVES
- CASSETTES
- ARTWORK
- COMPETITIVE PRICES

MARKET LEADERS

SRT

01-446 3218

REAL RECORDINGS

THE CASSETTE DUPLICATING SPECIALISTS

Real time & high speed loop bin duplication, printing & packaging. Blanks wound to length

TEL: 061-973 1884

THE COMPLETE SERVICE. Disc cutting, pressings, duplicated cassettes and blanks. Bin Masters. Location Recording. Free Brochure. Tam Studio, 13a Hamilton Way, London N3 1AN. Tel: 01-346 0033. (X)

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100 C 60 cassettes beautifully copied in stereo from **£59.50** (plus VAT)

We can copy from 100 to 5,000 high quality cassettes on our high speed loop-bin system, load them precisely into top-class shells. Price includes library case and all production work from your ¼ in edited master. Any length C-5 to C 90. Ring for price check.

STUDIO REPUBLIC VISA

47 High Street, Pinner 01-868 5555 01-866 5555

RAINHILL TAPE SPECIALISTS

High Speed and real time high quality duplication
Printed inlays and side labels
AMPEX Distributors
Studio Accessories
Full mastering suite

Music House
369 Warrington Road
Rainhill, Prescot
Merseyside L35 8LD
051-430 9001

APRS

QUALITY CASSETTE COPYING & PROCESSING, any quantity. Video duplication PAL/NTSC/SECAM systems transfer. While you wait service. Open 24 hours, 7 days a week. GWBB Audiovision. Tel: 01-723 5190 (X).

CASSETTES TO LENGTH!

Exact length cassettes supplied FAST!
Also library boxes and dot matrix shell labels.
Inlays produced from your artwork, as well as 1 to 1 cassette copying.

Write or phone for further details

STEWART ORR SOUND SERVICES
CHURCH LANE, METFIELD
HARLESTON, NORFOLK IP20 0LH
037986 370

CASSETTE DUPLICATING north of Watford. Analogue/Digital, exact length blanks, labels, inlays, shrinks wrapping. Audicord, 59 Mayfield Way, Barwell, Leicester LE9 8BL. Tel: 0455-47298

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jbs records
MUSIC-SPEECH-DATA
REAL-TIME/HIGHER-SPEED Quality Cassette Duplication and Blanks from 1-1000+. Computer printed Labels. Solo, ¼" reel, Sony, Betamax recording. Fast security Delivery service.
FILTERBOND LTD. jbs records div. FREEPOST 19 SADLERS WAY, HERTFORD SG14 2BR. 0992 500101

AA Tape Winders
0268 765010
For rapid supply of exact length Audio Cassette + Tape Duplicating

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HIGH SPEED COPIERS SALES AND SERVICES. Real time cassette copying. Blank cassettes. Audio visual supplies and servicing. Contact Sound Marketing on 0603 667725. (J)

TAPELINE
REAL TIME CASSETTE DUPLICATION
BLANK CASSETTES & ACCESSORIES
061-336 5438

CASSETTE DUPLICATORS LIMITED
Offer the latest technology in Cassette Duplication
High Speed Loop Bin System. Specialists for custom wound blank cassettes to exact length.
For Service and Prices write or phone:
Unit 2, Southern Avenue, Leominster, Herefordshire HR6 0QF
Tel: 0568 3777 or 0789 765507

CASSETTE DUPLICATORS

Specialists in the supply and service of cassette duplicators, bulk custom wound cassettes, and accessories

GRAFF SONY TELEX WOLLENSAK

Main Dealers UK and Export

SOUND CASSETTE SERVICES LIMITED
BODEN STREET, CHARD, SOMERSET

0460 67237

NATIONWIDE

CASSETTE DUPLICATING:
GAUSS Loop-Bin / TELEX In-Cassette
High Quality Blanks / Label Printing
OPEN REEL DUPLICATING
(ANY SPEED - ALSO TO BROADCAST SPEC.)
SPEECH RECORDING
(VOICE-OVERS; LANGUAGES; AUDIO-VISUALS)
SPEECH-PLUS RECORDINGS LTD.
UNIT 32, NO. 19, PAGES WALK, LONDON SE1 4SB. TEL: 01-231 0961

AMPEX Spares, Service and Sales. AMPEX audio tape recorders are of the finest available, some say time has past them by. "Rubbish" we have serviced and updated 440s, MM1100s and 1200s + ATRs with recommended AMPEX mods and spares + we have in our own research, made them extremely reliable with today's standards. We do not refurbish these machines to a price, we only refurbish to a high standard. It is impossible to purchase a poor machine from us. Our own personal love for these tape recorders is likened to an enthusiast when refurbishing a Ferrari. FOR SALE (in showroom condition) AMPEX MM1200s complete with PURCS, ATR LOGIC, SMPTE replay, TUT kit, REMOTES, AUTO-LOCATE, 16 track or 24 track, 15/30 ips, from stock, P.O.A. AMPEX MM1100 16 track all UPDATES, £5,500. AMPEX 440Cs 4 speed up to 30 ips, padnets, NAB or IEC, mono to 4 track, VARISPEED, ½" STEREO. AMPEX 440Bs 2 speed or 4 speed, all mods as 440Cs. ALL MACHINES CARRY A 3 MONTH WARRANTY. We also carry out Service and Sales on RAINDIRK SERIES 3 CONSOLES. WANTED AMPEX tape recorders and RAINDIRK CONSOLES. ARNY'S SHACK LTD, 178 THE CORNMARKET, WIMBORNE, DORSET BH21 1JL. Tel: 0202 880749.

ORBAN PARAMETRIC EQUALIZER Model 622B £520, JBL 4315 Studio Monitors £550, Hammond C3 Organ plus Leslie 122 £800. All good condition. All plus vat. Phone: 0366-382308.

NEVE mixer 24/8/24 with 10 FX sends 64 channels on remix 1057 EQ, £6,500.
STUDER A80 16 track, 2" + 8 track, 1" repro only, for multi-track, lock-up and mixing, hardly used £3,990. Studio racks, new boxed, top quality, from £35.
NEUMANN VG66 cutting rack—transistor, all amps—immaculate £1,500. Telephone: 01-521 2040.
3M M56 2" 16T with Remote Control and Varispeed. Good condition, well maintained complete documentation. £3,000 (+ VAT) BRISTOL (0272) 662932.

TASCAM/SENN/BEYER, trade counter. Erricks VCD, Brighouse 722121. (X)

LOCKWOOD, TANNOY, etc., new and used equipment always available and wanted. Lockwood Audio Sales 01-866 0671. (X)

TAC 24/8/2 £2,000 hardly used 01-740 1268.

CLASSIFIEDS

FOR SALE—TRADE

LYREC TR55 ¼INCH 2 TRACK TAPE RECORDER 7½/15 C.C.I.R. Well maintained machine in excellent condition. £2,000 o.n.o Call Leigh at WMRS 01-437 3935.

FOR SALE—PRIVATE

API SSOA 3-BAND PARAMETRIC MODULES £650 pair, UREI LA3A £450, UREI 565 filter £400, Eventide Phaser £325, AKG BX20 £350, Masteroom reverb £225. 647 1127.

TASCAM 38 EIGHT TRACK, twin dbx units, boxed unused with new tapes. Model One and 35B with talkback, studio mixers. Nearest offer £3,500. 041-638 5695.

AMPEX 456 2" TAPE ONCE USED £40 PER REEL. Schoeps hyper-cardiod microphone 48V Phantom £190. Avo universal meter £40. Altec 15" speaker £50. 01-789 1750.

WANTED

WANTED old audio equipment by Westrex and Western Electric. Amps, preamps, speakers, drivers horns, valves etc. EMT turntables, WAGRA and Studer decks, Tannoy speakers etc. Shipping no problem. Contact Charlie Dripps, 4331 Maxson Road, Elmonte CA, NSA FAX (818) 444 6863 (N).

STUDIOS FOR SALE

FREEHOLD HOUSE WITH ATTRACTIVE purpose-built detached recording studio (fully equipped 16 track), South London/Surrey for details. Send SAE to Box No. 957.

CLASSIFIEDS

FOR HIRE

35 BRITANNIA ROW LONDON N1 8QH

BRITANNIA ROW 01 226 3377

Multitrack, 4-Track, Dolby SR + Telcom

WORKING IN THE USA?

a/t scharff rentals

"THE BEST THAT MONEY CAN RENT"
Complete selection of pro audio equipment for hire.
Outboard Equip ★ Digital Recorders ★ Walkie Talkies
599 Eleventh Avenue, New York, NY 10036
Phone (212) 582-4400

WANTED TRANSMITTER ENGINEER with knowledge of AM and FM stereo transmitters, for offshore Voice of Peace Radio Station, off the coast of Israel. Write to Voice of Peace, P.O. Box 4399, Tel-Aviv, or call Tel-Aviv 245560 or 0536-514437 (U.K).

PART-TIME SALES

A new British company needs extra U.K. sales effort for ultra sophisticated digital audio equipment — via a retainer and commission.
We are looking more for real understanding of digits and their problems than sales experience, though both would be nice. The opportunity is pretty open-ended — send details of your experience, to:

BOX 961

EDEN STUDIOS REQUIRE A MAINTENANCE ENGINEER

Previous studio experience preferred call MIKE GARDNER on 01-995 5432
or write with full C.V. to:
EDEN STUDIOS, 20-24 BEAUMONT RD, LONDON N4 5AP.

AUDIO AMPLIFIERS

TURNER ELECTRONICS IND (Est 1966)

POWER AMPLIFIERS 100-700 Watts. 2u, 3u, 4u rackmount. High stability, ultra low noise and distortion, flat response. Linear class AB1. 70% efficient triples complementary circuitry design by our engineers from Plessey, Fluke, Dolby and Mullard. No noisy fans, thermal limiting of Mosfets, mechanical relays, fuse blowing or overload trips, one million watts in use by artists and sound establishments. Sales, service, export engineering advice and sales of most UK electronic audio products.
PO Box 49, Etchingham, East Sussex TN19 7NZ (STD) 0435-882581.

FOR DETAILS OF HOW TO ADVERTISE IN THIS SUCCESSFUL SECTION PLEASE CONTACT ANDREW KNOX 01-686 2599

SITUATIONS VACANT

POWER PLANT STUDIOS

seek

A TECHNICAL & MAINTENANCE ENGINEER

with major studio experience, to work with Nick Clarke in running current three studio complex (SSL and Harrison desks) and to assist in future expansion.

Thorough knowledge of all latest technology essential

Please contact

Jackie Decosta on 01-451 3727
or write with full CV to Power Plant Studios
169-171 High Road, Willesden, London NW10

KLOTZ IS SEEKING A

UK Sales and Marketing Representative

To be responsible for the following areas:

1. Expansion of UK Sales

To deal with manufacturers, hire services, broadcasting and A/V production companies and all other clients requiring quality cable in bulk. To develop new ideas for distribution and to establish new accounts.

2. Running of UK office

To service and administer account customers and provide a technical back-up service.

Applicants should have a proven record in dealing with senior buyers in pro-audio, PA, broadcasting and A/V markets. Self-motivation, reliability and enthusiasm are essential, and some technical background would be an advantage.
Working hours will be flexible and travel is involved.
In return we offer an excellent remuneration package and an opportunity to act on independent initiative with very good growth prospects. We can provide specific product training if necessary.

Please send your C.V. and any other relevant information to our PR Consultant:

MICHAEL KOMMER ASSOCIATES

66 Chaldon Way, Coulsdon, Surrey CR3 1DD
Attention Michael Kommer
All applications will be treated in the strictest confidence

TAPE HEADS

REPLACEMENT of all types of magnetic recording heads.

REFURBISHMENT of worn heads to as good as new standard.

BRANCH & APPLEBY Ltd.
Stonefield Way, Ruislip,
Middx HA4 0YL 01 864 1577

SITUATIONS WANTED

A HARD WORKING successful English recording engineer with SSL and digital experience seeks position in a well equipped 24/48 track studio. Telephone 0202 624884 or 01049 221 4301237. (J)

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Reporting directly to the managing director you will be responsible for the worldwide sales of Penny & Giles studio faders, video controllers and other studio equipment components. You should be qualified to degree level or equivalent in an engineering related discipline and be able to demonstrate the ability to successfully manage a technical sales team. You will be required to travel overseas and knowlege of German or another major language would be advantageous. The successful applicant will be supported by an established market base, sales offices in USA and Germany and a worldwide network of authorised distributors.

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The Company offers an attractive remuneration package including competitive salaries and other benefits.

Penny+Giles

Please apply with CV to
David McLain
Managing Director

Penny & Giles Studio Equipment Ltd
Blackwood Gwent NP2 2YD

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Our greatest hits

There's only one way to build a great reputation. And that's to do it consistently, hit after hit.

We set the analog standard with Ampex Grand Master® 456. We pioneered a new digital standard with Ampex 467 digital mastering tape. And we developed Ampex 406 for outstanding performance in a wide range of analog mastering applications.

When it comes to analog and digital mastering tapes, nobody offers a wider selection.

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AMPEX

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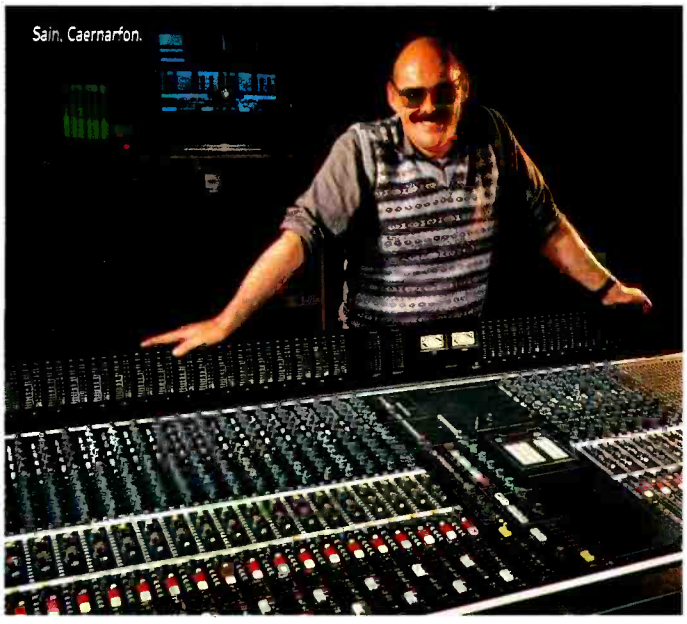

Listen to the business end of a TS24.

Four successful studios.

And one choice of console.

As you can see, they speak for themselves.

Robin Black, Black Barn: 'Since we opened we've handled everything from instrumental work to Motorhead and they've all loved the desk. I wanted a console that was extremely versatile and easy to use without complications; and the TS24 with a Saturn made a great package. The EQ is first class, and the reputation combined with Mastermix means it sells itself.'

Brian Masterson, Windmill Lane: 'We've had our TS24 three years now. I really do like the sound – it's so neutral. But it's the operational design that's best; it never gets in the way, the EQ's very comprehensive, it's easy to get your sounds, and it's the simplest board to bounce tracks down on. The signal flow concept and global switching is the way I like to work. We've had the Waterboys and U2 in recently and the TS24's a great asset when you're handling a wide variety of music.'

Bryn Jones, Sain (Recordiau) CYF: 'We needed a desk to keep up with the needs of independent TV post production and the TS24 is excellent for this. The main feature for us is its flexibility; essential for our work which includes rock, male voice choirs, folk and TV. We've only had two free days since we opened in March 1987 and with Mastermix, it's a very well thought-out combination.'

Tony Millier, TVi: 'We had to go to 24-track to keep up, and everything's there on the TS24 for very fast work. You can re-configure very quickly indeed because there's virtually no need for re-patching. I'd say it was an informed choice – but after a couple of months with it I realised there was even more to it than I first expected. A great package.' For more details and a brochure on the TS24 In Line console, call Steve Gunn at Soundcraft.

Soundcraft
TS24

SOUNDCRAFT ELECTRONICS LTD., UNIT 2, BOREHAMWOOD INDUSTRIAL PARK, ROWLEY LANE, BOREHAMWOOD, HERTS WD6 5PZ, ENGLAND. TEL: 01-207 5050 TLX: 21198 SCRAFT G. FAX: 01-207 0194 SOUNDCRAFT USA TEL: (818) 893 4351 SOUNDCRAFT CANADA TEL: (514) 685 1610 SOUNDCRAFT JAPAN TEL: (03) 341 6201