

February 1988

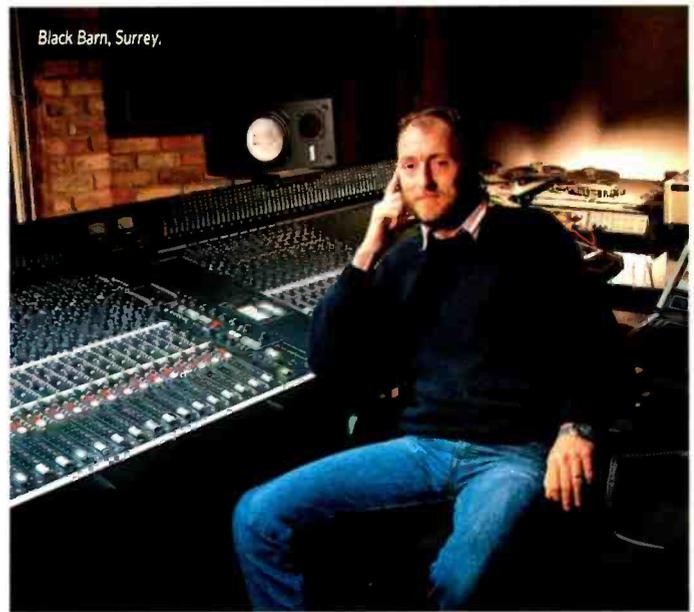
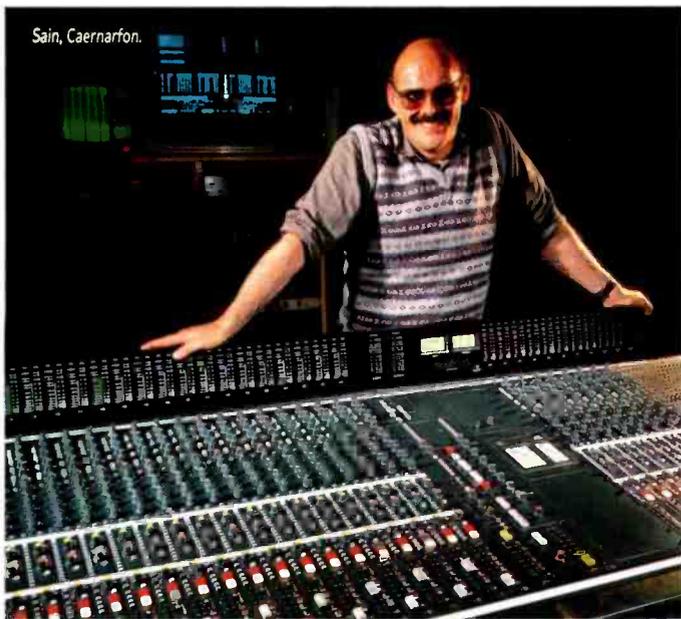
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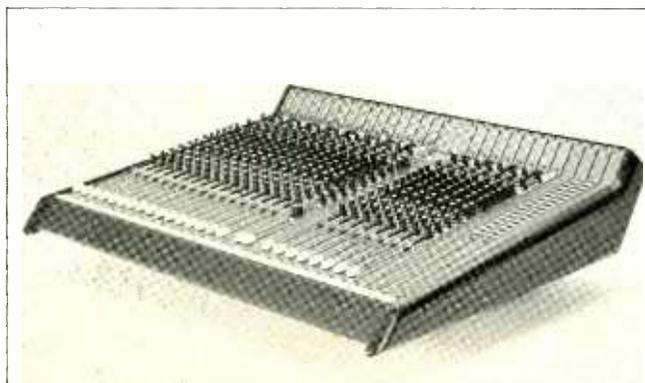
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EDITORIAL

As we have commented before, changes in the area of transducers are subtle. The most subtle changes of all are in the area of microphones. I would not go so far as to say that this is a backward branch of technology but it is fairly true to say that most modern microphones still have a direct line of descent from work done many years ago and have reached their current abilities through a gradual refinement of established physical principles rather than sheer innovation. Today it is possible to call in at almost any pro-audio dealer and purchase—maybe at great cost—a mic that is major steps in specification beyond the microphone that you bought 20 years ago but still looks very similar internally.

Yes, new materials and refinements abound in modern mics but as specifications and performance increase and we get nearer and nearer to the theoretical maximum performance for this style of transducer, what have we to look forward to?

I believe not many people seem to care very much about future mic developments outside the manufacturers. The current top end models are capable of performance that will not let down a fully digital signal chain and they are certainly not the weak point in the signal chain at all. Aside from gradual improvements it seems from discussions that most manufacturers feel that the future has to include some way of getting into digits earlier than is currently possible. At the moment this is rather difficult within the physical constraints that we assign to the practical aspects of these devices. Additionally there is really a case for a completely fresh approach to the mechanical design of the diaphragm capsule arrangement itself: something that will allow faster response to transients and audio impulses; not suffer from a maximum SPL limit; have a linear response at frequencies and level of all types. Much of this tends to suggest that either fairly revolutionary mechanical arrangement is needed or we have to look towards lasers and in that technological direction. At this point most manufacturers tend to shrug their shoulders and say it will come but don't hold your breath.

Meanwhile, back in reality, the average user has very little interest in the distant future of microphones and only little more in the near future. Strangely, most look back towards the time when mics were warm and glowed in the dark but in terms of performance were very modest by current standards. They may have sounded 'good' but they were not 'accurate'. Such mics, therefore, had a role as both a transducer and an element of signal processing far beyond the console or outboard processing available at the time.

OK, so what do we have? Perhaps a very unique opportunity—a breathing space to think about the future of mics without the immediate commercial pressure. If this is the case then I would like to throw an idea into the ring that may even be original.

Firstly, it is very likely that microphones to come will use some form of laser technology but for the foreseeable future there are practicalities that prevent mics being made in a size that would work effectively in a studio environment. So the first problem is size. But this would not be a problem if the bulky components could be housed remotely. So perhaps there could be a central microphone housing with laser heads closer to the instrument in question. Secondly, why do the 'microphone' heads have to be near the instrument at all?

Imagine then a central mic system housing the bulky electronics and the mic heads in the form of laser scanners that could look directly at very precise parts of musical instruments rather than just a more composite sound source. It would be possible to look not just at the instrument but at the room itself and with specially placed resonating panels it would be possible to find exactly the type of room ambience or delay that you should want purely by guiding the mic laser head direction and focus. Think about it—no acoustic spill whatsoever unless there was sympathetic resonance within the scanned surface, and an infinitely variable control aspect—as long as there was line of sight of the instrument.

Perhaps one of the most exciting aspects could be the ability to tie such an arrangement into a central studio system. There have been many attempts to integrate aspects of condenser mics into the studio system such as remote control of the polarisation voltages and automatically sliding input level windows on the mic amps with ref to mic output level, but nothing has really developed out of this so far. If the future direction of the studio is the integration of the recording/processing/mixing processes then an idea such as this may give the opportunity to fully integrate the microphone system under a central processor with the ability to recall and reset mic positions, levels, etc, together with maybe the possibilities to dial in the required sound waveform and then the mic laser head under processor control would go looking for the nearest sound source to the requested type simply by rapidly scanning the instrument and storing a number of samples for comparison. The possibilities are endless.

Now I don't think that such a system is close—it may be a long way off—but it does seem to represent one possible direction of development.

On a more practical level it would also stop the way that mic booms keep finding their way into camera shot. During Woody Allen's *Sleeper*—shown on UK television a few weeks ago—the mic boom crept into top middle screen considerably upsetting those of us of a nervous disposition. But would we feel happier being scanned with a laser?

Cover: Schoeps microphone exploded. Photography by Roger Phillips

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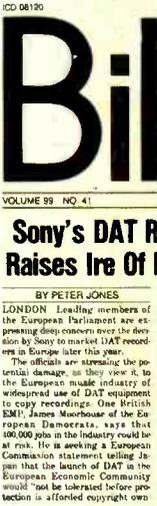
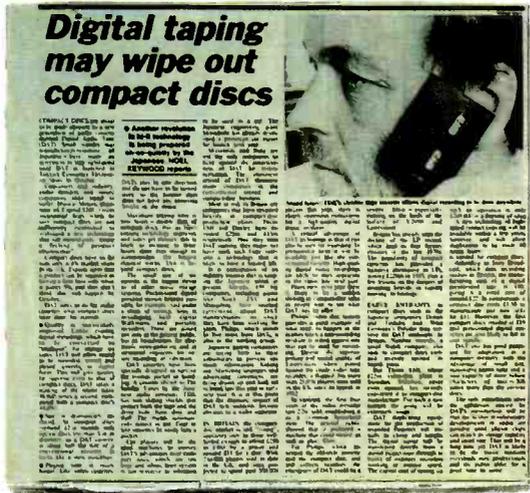
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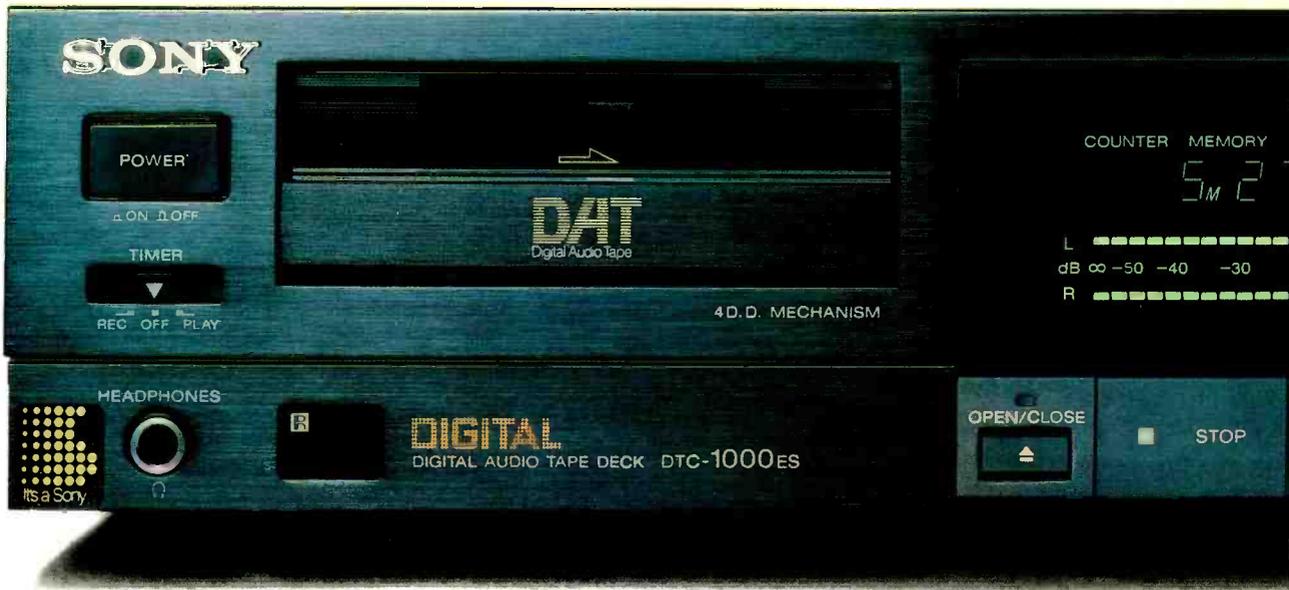
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F a



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.

Hopes rise of accord on digital audio tape

By David Thomas

MP3G has been in Europe and the US since the start of a similar agreement with the Japanese. It is expected that the introduction of digital audio tape, a new music recording format, will sweep the music industry.

The success of music industry buyers, that an early introduction of digital audio tape could double the sales of compact discs and increase the production of high quality personal stereos.

However, the Electronic Industries Association of Japan (EIAJ) has agreed to discuss the problem with the International Federation of Phonogram and Videogram Producers, the international trade association for the music industry.

Leading figures in the Western music industry had accused the EIAJ of violating its obligations to their consumers.

They believe that agreement to the meeting is a first step that EIAJ is now willing to be taken by the Japanese before they arrive at the solution.

They also think that the Commission in the next few weeks will be able to help in the meeting.

Commission officials have been considering those for the introduction of digital audio tape, which is being done with an international format.

The Commission has also studied the possibility of being on digital DAT tapes and might as a reserved DAT products.

Japanese likely to launch digital tape despite outcry

By CARLA RAPPOPORT IN TOKYO AND DAVID THOMAS IN LONDON

JAPAN AND its Western trading partners are heading for a trade dispute after the Japanese Ministry refused to change a new audio system which the music industry thinks threatens its survival.

The Japanese now look certain to launch the digital audio tape system next year, but the Western music industry will press the US Government and the European Commission for laws to force the safeguards it wants.

The system will allow music reproduction on a par with compact discs. The Western music industry fears that compact discs will be copied onto the digital tapes unless they carry a "spoiler" to prevent this.

The industry believes that combined compact disc-DAT players, which the Japanese have already exhibited, will encourage consumers to tape off compact discs with out buying royalties, undermining its copyright earnings.

Senior executives from both sides met in Vancouver, Canada, this week to solve the problem. However, the meeting broke down after the Japanese rejected the demands.

Mr. Sobuchi Saba, chairman of Toshiba, said home taping

was "quite different and should be distinguished from piracy."

The music industry will take up the Japanese offer of a campaign against "copyright piracy" but think that leaves the main issue of home taping unaffected.

DAT machines are expected to be launched in Japan in the next few months. The music industry fears they may be sold overseas as early as next April.

It reacted to the breakdown of the talks by promoting a separate music industry initiative in the US Congress and the EEC to secure implementing legislation.

The Recording Industry Association of America, the US music trade association, will try to get a bill introduced into the next session of Congress imposing a 35 per cent duty on all imported DAT machines with out a spoiler.

The International Federation of Phonogram and Videogram Producers, the international music trade association, will press for speedy European legislation requiring all imported machines to have a spoiler and for tariffs on machines as an interim measure.

The federation, which has a

Continued on Back Page

TECHNOLOGY

Michael Cross

Don't panic over DAT

THE second industry agreement against digital audio tape (DAT) are beginning to emerge, a new book, "The Music Industry's Response to Digital Audio Tape," is being published by the International Federation of Phonogram and Videogram Producers (IFPI) in London.

The book is a collection of essays by leading industry figures. It is a response to the IFPI's recent report that the music industry is in a state of panic over the introduction of DAT.

One of the main reasons for the panic is the fact that DAT machines are expected to be launched in Japan in the next few months.

The book also discusses the fact that DAT machines are expected to be sold overseas as early as next April.

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Japanese companies ready to sell digital audio tape systems

By CARLA RAPPOPORT IN TOKYO

THIS JAPANESE launch of a controversial audio technology, digital audio tape (DAT), is gathering pace as Matsushita Electric and Sony, two heavyweights in the world consumer electronics industry, are set to unveil marketing plans for the product this week.

DAT, which will both record and play back music with almost perfect quality, has been attacked by the international music industry. It claims that the technology would undermine the industry by allowing music pirates to record copyrighted material, such as compact discs, without penalty.

As a result, it is seeking to modify the product or tax its sales heavily in the US and Europe.

Matsushita, which will announce its plans today, is expected to put DAT on sale in Japan on March 2, the same day which Sony, a medium-sized electronics company, has already said it will begin sales.

Matsushita, the world's largest consumer electronics company (under the National, Panasonic and Technics brands), is notorious within the Japanese industry for being late or last into a new market. Its switches on DAT underline the high expectations that Japanese consumers have for the product,

despite the controversy surrounding it overseas.

Sony, which is expected to make its marketing plans known tomorrow, is normally among the first to enter a new market.

Both companies, along with Aiba, are expected to limit sales to the Japanese market for the time being, but industry analysts expect that exports of the product will begin in the second half of this year.

The Sony and Matsushita machines are expected to have a copyguard device which will oblige the user to record compact discs through a conventional amplifier. This will reduce the quality of the finished tape, but industry executives say that the device can be easily removed by an audio shoe clip.

Matsushita yesterday said it would manufacture audio hi-fi tuners and video tape recorders (VTR) in France. VTR production will start at Longwy, Lorraine, in August, costing about 60 jobs. Initial production will be 30,000 units a year.

Production of his users has already begun, and will reach 50,000 units a year. The company stressed yesterday that it aimed to achieve a high rate of local component content.

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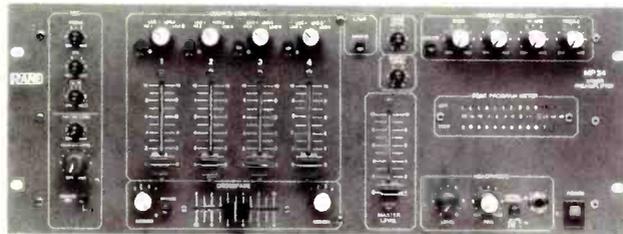
HHB should know. The company created a massive pro-audio role for the EIAJ digital format.



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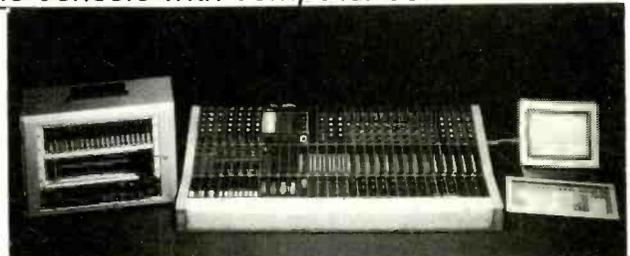
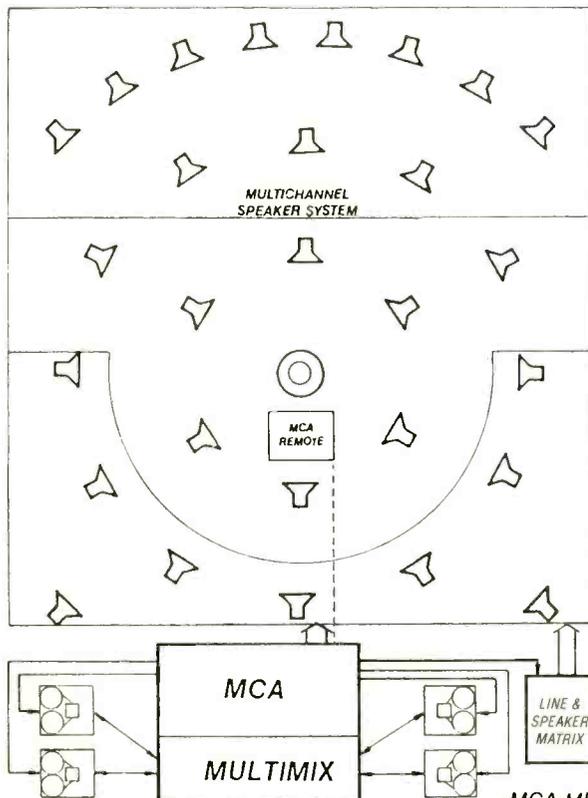
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Contracts

● **SSL** have announced orders for the new *G Series* Master Studio System. In the UK, the Virgin Group have confirmed a £750,000 contract for the delivery of three systems to the refurbished Olympic Studios. In Los Angeles, A&M and Suma Music Group have each ordered a system, while in South East Asia, sales include those to Sound Inn, Vincent and Aoi Studios in Tokyo, and a Korean contract with Jigu Records in Seoul. Elsewhere, Presence Studios of New Haven, Connecticut, have upgraded to the *G Series* from an *SLA000E*, while Power Play in Long Island, NY, have added a 56-input *SLA000E* with *Total Recall* and automation.

● The first **Amek APC1000** to be installed in the States has gone to Greene Street Studios in New York City, an 80-input version with dynamics, recall, reset and GML automation. Sunset Sound Studios in LA have also placed an order for the desk, as have Jive Studios in Tokyo, who've opted for a 64-input version with GML.

● The first UK recording studio to purchase the Otari *MTR20 ½* in 2-track mastering machine from **Stirling ITA** is Sam Therapy. Stirling ITA also announced sales of a *DDA DCM 232* in-line console to Woodbine Street Studios in

Leamington Spa, an *AMS AudioFile* to Phil Wainman's Utopia Studios, and the first dedicated 32-track Otari *MX80* in Britain to Audio FX.

● British pro-audio hire company **Hilton Sound** have announced the sale of their *PDASH* 'format buster' interface and *PDATCH* patchbay to New York's Power Station studio complex. The Power Station have two Sony *3324s* and a pair of Otari *DTR 900s*.

● **Sandy Brown Associates** have announced a number of recent contracts, including the specification of a totally equipped full-range sound system for Croydon's 1700-seat Fairfield Hall, the refurbishment and expansion of the TVam facilities in London's Camden Town (originally designed by SBA), and their appointment as acoustic consultants by Air TV for the new MTV Europe facility, also in Camden.

● Following orders for 10 series *8000* in Sweden, **Soundcraft** have announced six further sales in Norway. Meanwhile, in New Zealand, the Broadcasting Corporation recently commissioned Soundcraft to develop a newsroom editing desk based on the *200B*, as part of a long term re-equipment programme. The order is expected to total more than 30 desks.

NEWS

In brief

● Following the recent inauguration of the Bregman Electronic Music Studio at Dartmouth College (see *Studio Sound* January 1988), **New England Digital**, who supplied the integrated *Synclavier* system, announced that over 50 colleges, universities and music schools around the world have installed *Synclavier* digital audio systems. The original *Synclavier*, according to marketing director Mark Terry, "was a computer-based teaching tool for music theory, ear training and composition, and while it today moves in the worlds of hit records, movies and television production, it has never lost its academic roots".

● The **Distinguished Engineers' Audio Federation** (DEAF) presented

to Mr John Davies, on behalf of the Laycock Partially Hearing Unit, a cheque for £13,000, which will be used to buy a vidi-speech computer, helpful in showing a profoundly deaf child 'sound pictures' to enable him or her to form basic words correctly.

● **Le Studio Andre Perry**, who recorded Juno Award winners Kim Mitchel, Luba and Glass Tiger, were also busy elsewhere. The **Groupe Andre Perry Inc** was formed, to help take into account the company's activities in video, both in Canada and the States. They acquired Positive Video's two post-production facilities in the San Francisco Bay area, as well as building a major Washington DC facility.

Forthcoming events

January 27th to 28th Syn-Aud-Con, Anaheim, California, USA.

February 17th to 18th Syn-Aud-Con, Seattle, Washington, USA.

March 1st to 4th AES 84th Convention. Palais des Congrès, Paris, France.

March 9th to 10th Syn-Aud-Con, Orlando, Florida, USA.

March 9th to 13th Frankfurt Musik Messe '88, Frankfurt, West Germany.

March 17th to 19th Master Loudspeaker Designer's Workshop, Atlanta, Georgia, USA.

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 20th to 22nd Digital Processing of Signals in Communications, Institution of Electronic and Radio Engineers, Loughborough University of Technology, 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.

June 17th to 23rd ITS, Montreux, Switzerland.

1990

March 30th to April 3rd NAB, Atlanta, USA.

Address changes

● **HM Electronics Inc** have moved to a 40,000 ft² facility in the newly developed Sorrento Mesa area of San Diego, which is aimed at increasing their engineering and manufacturing departments. The full address is: 6675 Mesa Ridge Road, San Diego, CA 92121, USA. Tel: (619) 535-6060.

● **Jay Cee Music Ltd** and **Barge Records** of Rainhill, Merseyside,

UK, have a new telephone number: 051-493 1166.

● London-based **Cable Technology**, UK distributors for Klotz cable, are moving to larger premises in Northamptonshire. The full address is: Unit 9, Enterprise Court, Park Farm, Wellingborough, Northants, UK. Tel: 0933 674800.

TC HQ in UK

TC Electronic of Denmark have announced the opening of their UK sales office, which will handle all sales, servicing and dealer support under the direction of Phil Beaumont, UK sales manager. TC UK also offer full back-up, promotions and product training at

the facility, and are able to handle all queries concerning their equipment and applications, plus carrying a full stock of all relevant literature and videos.

TC UK, 24 Church Street, Oswestry SY11 2SP, UK. Tel: 0691 658550.

Sticky fingers

HW International of London issued the following statement in November. "Persons unknown, not prepared to wait until the end of November when stock of the Luxman *KD117* DAT player arrives, broke into our premises last week and stole the prototype along with a considerable quantity of other Luxman units. So,

if you notice the only Luxman DAT player in the country changing hands for a fistful of notes in your local pub or, indeed, any other new Luxman units, get in touch with HW International, 3-5 Eden Grove, London N7 8EQ, UK. Tel: 01-607 2717."

LEXICON AND STIRLING THE EFFECT IS SENSATIONAL

Since Lexicon designed the first ever digital reverb algorithms, they've continued to offer updatable, software-based effects that are the most sophisticated of their kind.

Now, Lexicon's expertise, combined with Stirling support and service, adds up to a powerful combination.

At the peak of digital effects technology, the 480L provides a stunning array of spatial/time domain effects that will change your idea of what digital processing can do.

Voicing is manipulated from the unique LARC controller and the presets include halls, rooms, plates, natural environments, effects and sampling. Dynamic MIDI adds an incredible dimension to the 'static' program effect.

The PCM-70's presets include stereo reverb, chorus, echo, multiband delay, panning and resonant chords. There are 50 user registers, and the exciting performance potential of Dynamic MIDI.

And thanks to 'open architecture' software and Stirling ITA's after-sales service any Lexicon product can be kept ahead of the field in future.

Contact us today for more details.

◀ **480L DIGITAL EFFECTS SYSTEM** True 18 Bit converter, 48/44.1KHz sampling • 20Hz-20KHz bandwidth • Digital output, Sony 1610-1630 compatible • Parallel or Cascade processor operation • Dynamic MIDI control of up to 10 parameters simultaneously • Expandable hardware & software • LARC controller allows real-time velocity changes.

◀ **PCM-70 DIGITAL EFFECTS PROCESSOR** 43 Preset registers including stereo reverb, chorus, echo, multiband delay, panning and resonant chords • User-assignable Dynamic MIDI • Easy to use Program Matrix and Parameter Matrix.

 Stirling **ITA**

1 Canfield Place, London NW6 3BT. Telephone 01-625 4515
Fax: 01-372 6370. Tlx: 946240 CW EASY G Ref No. 19014280

People

• Michael Stickler, deputy head of the BBC TV Planning and Installation Department, has been elected a Fellow of the Society of Motion Picture and Television Engineers (SMPTE) in recognition of his work with remote control and digital video interface standards.

• New York's **Transcom Digital Studios** have appointed Elisabeth Lawrence director of sales and client services. Lawrence has previously worked for Home Box Office, NBC's *Saturday Night Live* and CBS, picking up three Emmy Awards along the way.

• **QSC Audio** of Costa Mesa, California, have announced two appointments. Gregory B McVeigh has been promoted to director of marketing, while Peter T Kalman has been appointed national sales manager.

• **WaveFrame Corp** of Boulder, Colorado, have announced the appointments of Courtney Spencer to vice-president of sales, and Joe Kelly to their board of directors.

• **Sandy Brown Associates** have made a number of appointments. Ian Knowles has joined from Marconi's acoustics laboratories, and Nigel Renwick, a specialist in the technique of sound intensity vector measurement, has joined from GEC.

• The **IFPI** have appointed Patrick

Macartney as the new press and information officer, taking over from Dave Laing who, after three years in the post, has moved to become features editor of *Music Week* magazine.

• **dbx** have appointed John E Stiernberg as national sales manager for dbx professional products.

Stiernberg had been pro division national manager for Bose Corporation since 1981.

• **Panasonic UK Ltd** have announced the appointment of John Dixon as manager of the Electronic Musical Instrument Division of Technics/Panasonic UK.

• **Syco** have appointed Pete Wandless as UK sales manager, with responsibility for studio, post-production and broadcast markets. Wandless was formerly UK and European sales manager for SSL.

• **Pro Audio Recording** of Maryland have appointed Mark Greenhouse as studio manager. Coming from Track Recorders, he will handle bookings, project planning, correspondence and promotions.

• **Mitsubishi** have appointed Martin Wallace to their service and support team, where he will be responsible for servicing and maintaining both digital recorders and consoles. Wallace comes from Neve where he worked as an engineer.

NEWS

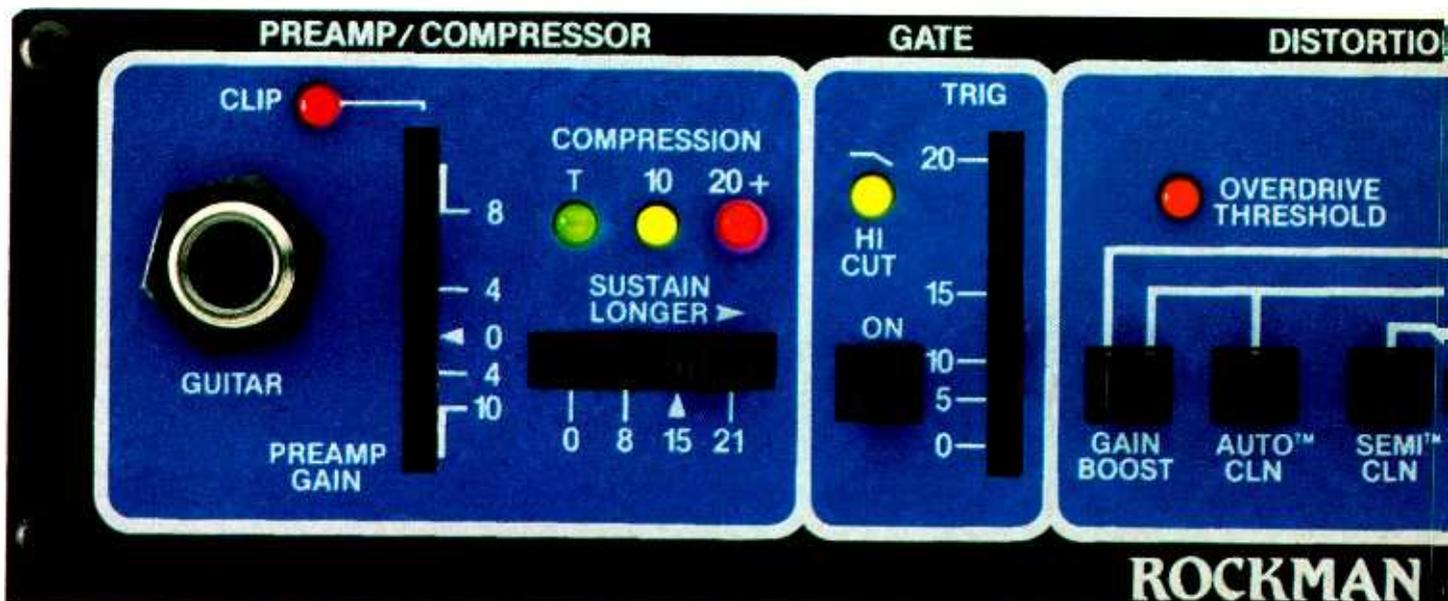
Time for a change at Yamaha

The Nippon Gakki Company Ltd of Hamamatsu City, Japan (Yamaha to most people) officially changed their name to the Yamaha Corporation while celebrating their 100th anniversary in 1987. While the name change itself is purely cosmetic, it signifies the beginning of a major consolidation of corporate identity and effort to push Yamaha 'confidently into the 21st century'.

Yamaha Corporation, worth some US\$2.7 billion and employing more

than 15,000 worldwide in the US, Europe and Pacific Basin, is ranked among the world's largest industrial organisations. Along with the wide range of musical equipment and leisure goods they produce, the company also sponsors several music popularisation activities under the auspices of the Yamaha Music Foundation. In the US, the Yamaha Corporation of American (YCA) is the holding company for six Yamaha subsidiaries.

The Next Stage...



Bigger APRS 88

The APRS have announced that their 1988 exhibition to be held at the Olympia 2 exhibition centre June 22nd to 24th in London will incorporate additional floor space on level two. APRS 87, which used the ground floor and level one, was the first held at Olympia, and by most accounts was a notable success.

The association also announced a new feature for exhibitors—different rates for each floor—and that the average increase in site cost has been held to 5.6% over 1987, which, claim the APRS, “is still notably cost-effective in comparison with other major international exhibitions”.

Literature

● **Universal Instrument Services** of Leicester have released the 10th edition of their test and measurement catalogue. The 76 pages contain over 400 instruments (over 30 of which are new) plus a wide range of useful accessories from some 40 suppliers. Also included are details of Universal's repair company and calibration labs, along with their ability to supply BSC certificates with new instruments. Free copies

are available on UK tel: 0533 750123.

● **Focal Press**, a division of Butterworth & Co publishers, have announced their most recent list of media and audiovisual titles aimed directly at professionals. The 16 titles range from *The Use of Microphones* to *The Art of Digital Audio*. Further details are available from: Focal Press, Borough Green, Sevenoaks, Kent TN15 8PH, UK. Tel: 0732 884567.

Agencies

● **Otari (UK)** have appointed KGM Studio Specialists of Wakefield to handle sales and service of their tape machines in the north of England. 18-42 Charlotte Street, Wakefield, West Yorkshire WF1 1UH. Tel: 0924 371766.

● **Selfmade Productions of London**

have announced they are now handling ATC's range of *SCM* studio monitors along with **Cadac's RME 100** rackmounted equalisation. Selfmade Productions, 1 Horseshoe Close, Oxgate Lane, Staples Corner, London NW2 7JJ. Tel: 01-208 1712.

Audio Kinetics interfaces

Audio Kinetics have announced a number of new interfaces for the *Q.Lock* synchroniser system including options suitable for the Sony *APR5000*, Digitec/Schlumberger *F500*, Tascam *ATR80*, Otari *BTR5*, Mitsubishi *X-86*, Otari *MX80*, Telefunken *M20* and Fostex *E15*.

Audio Kinetics have also released a number of new master cables and slave interfaces for the *Pacer* chase synchroniser. Cables are suitable for the Akai *MG14D*, Mitsubishi *X-850* and *X-86*, Otari *DTR900* and *BTR5*, Revex *PR99*, Sony *APR5000* and

5850, Tascam *ATR80* and Telefunken *M20*. *Pacer* and timecode only masters include Akai *MG1214D*, Sony *BVU800* and *BVW10/40*.

There are new slave interfaces for Akai *MG14D* and *MG1214*, Mitsubishi *X-850* and *X-86*, Otari *DTR900* and *BTR5*, Revex *PR99*, Tascam *ATR80* and Telefunken *M20*.

Audio Kinetics Ltd, Borehamwood, Herts, UK. Tel: 01-953 8118.

USA: Audio Kinetics Inc, Middletown, NJ. Tel: (201) 671-8668.

Corrections

In the Loudspeaker feature in November, we listed Tannoy's fax number as their telephone number. The phone number should have read 0494 450606.

Under the Cetec entry we gave HHB Hire & Sales' old address. HHB are at 73-75 Scrubs Lane, London NW10 6QU. Tel: 01-960 2144.

Under Power Amplifiers, Elliott Brothers were listed as UK distributor for HH Electronics, when it should have been Michael Stevens & Partners. Elliott Brothers distribute HIT in the UK.

In our December article on Trickey Studios, the phone number should have read: 0392 77205.

or studio you play, take your guitar and the Rockman Sustainer™ 200.

Rockman products from Scholz Research & Development have always meant uncompromising quality and innovation. The Rockman Sustainer™ 200 is no exception. It upgrades all four Rockman sounds with studio quality specs and footswitch capability. The Sustainer™ 200's extensive signal shaping and tone modifying circuitry deliver optimal flexibility for truly customized sound.

Found only on the Rockman Sustainer™ 200, the amazing AUTO CLEAN™ enables you to go from powerful distortion to clean, bright sound without losing output volume or tone as you turn down the guitar volume.

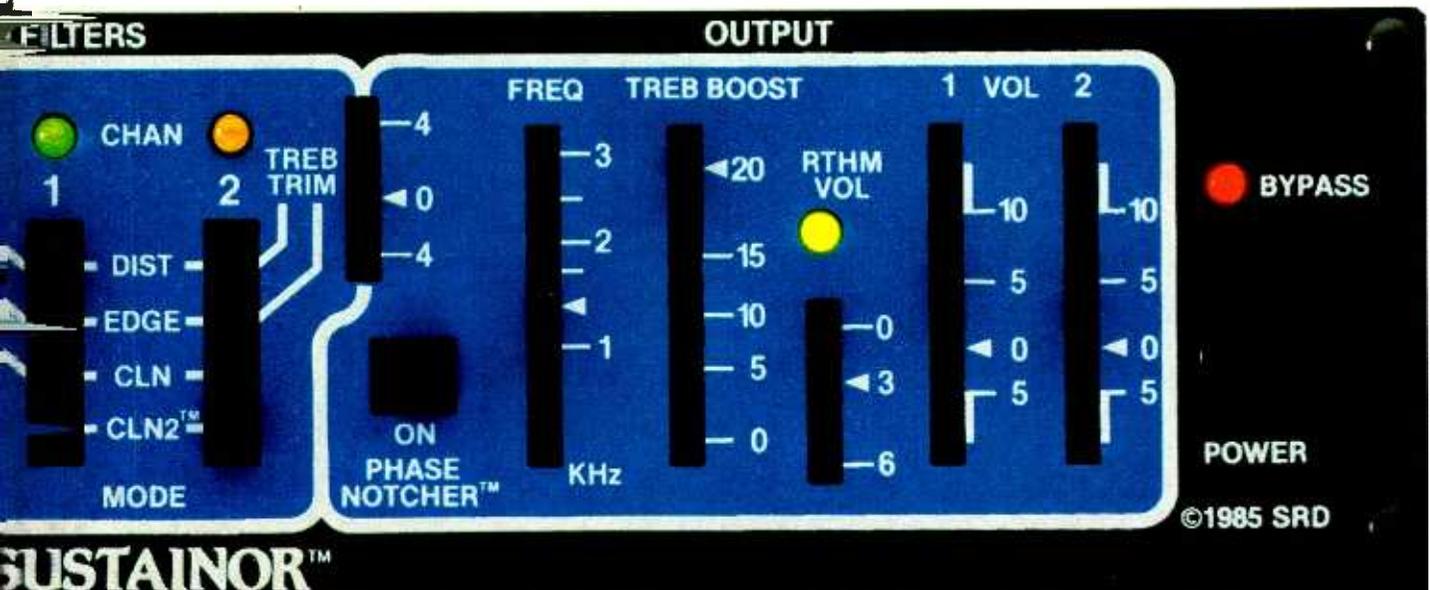
Other Sustainer™ 200 features include: individual channel volumes, two effects loops, adjustable compression, and noise gate.

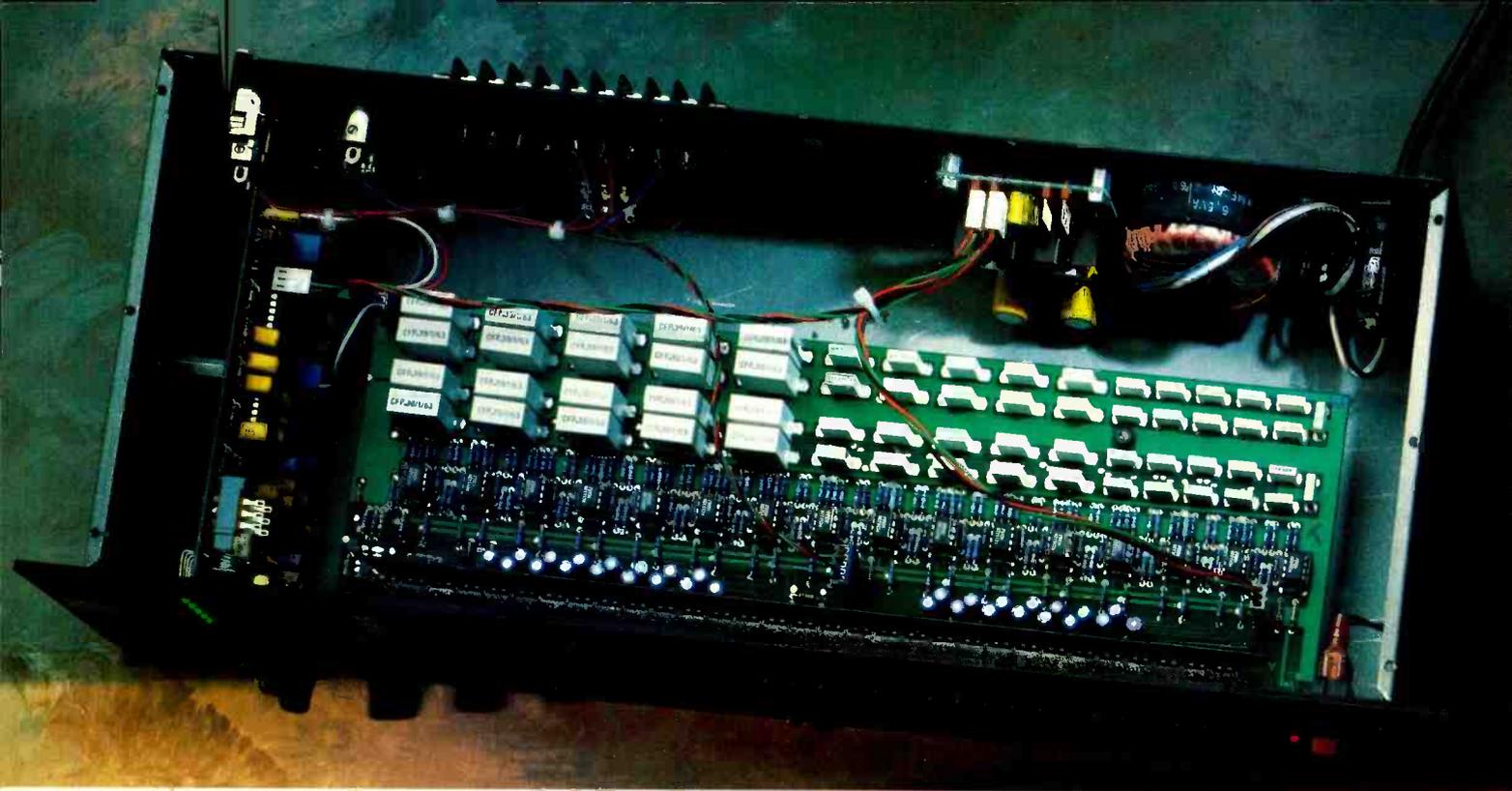
All this adds up to today's most sophisticated guitar processor. One you won't want to be without on stage or in the studio.

For more information write:



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Waltham, MA 02154





THE COMPETITION HATES OUR GUTS.

It takes a lot of guts to compare yourself to some of the biggest names in professional audio.

Of course, when you offer the quality and features found inside the Audio Logic SC31 Graphic Equalizer, it's easy to display more than a little extra intestinal fortitude.

The SC31 is a powerful signal processing tool designed for professional use. It features 31- $\frac{1}{3}$ octave centered bands of equalization with selectable 6 dB or 12 dB of boost and cut. But that's just for starters.

Take a look at the chart.* It shows how the SC31 stacks up against the competition in the specs most important to audio engineers and sound contractors.

Maximum output. Dynamic Range.

*All specifications taken from manufacturer's published literature.

6 Letchworth Business Centre, Avenue One, Letchworth Herts SG6 2HR
Tel: 0462 480000 Fax: 0462 480800 Telex: 826967



	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

Frequency response. Number of bands. Total Harmonic Distortion plus noise. In every category, the SC31 comes out even or on top.

In every category, that is, except price. Because the SC31 gives you all that capability, plus

incomparable sound quality, for considerably less than any other professional graphic equalizer. And that's what galls the competition most of all.

For a hands-on demonstration of the SC31, visit your professional audio dealer.



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NEWS

Circuit Design Technology signal processors

CDT have introduced two different signal processors for gain reduction, the *CGM-2 Champ* and *MC-8 Multicomp*.

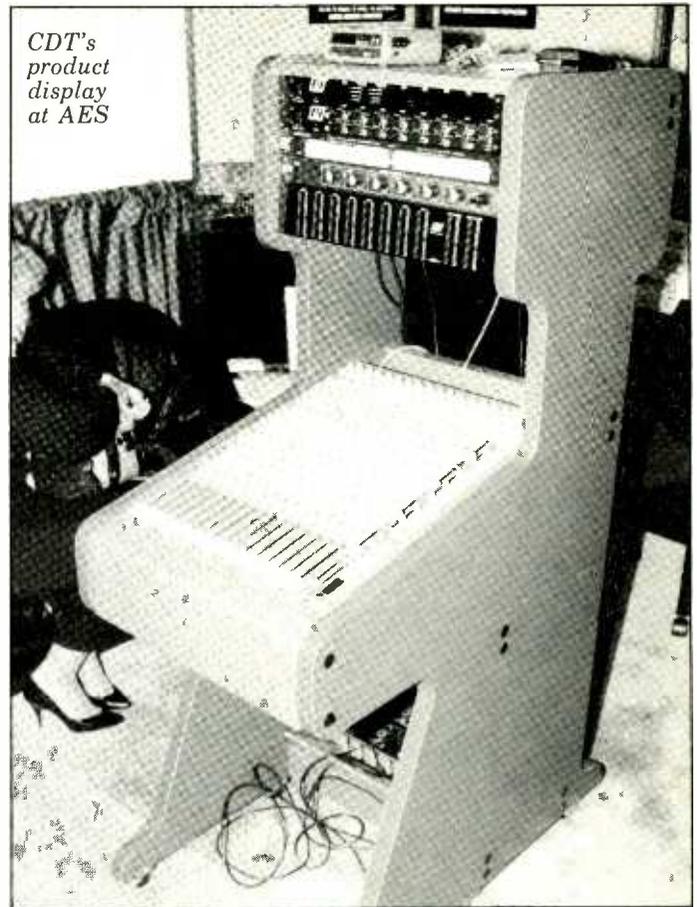
The *CGM-2 Champ* is a stereo unit providing compression, limiting, gating and expansion using *Dynex* circuitry. It can be used as a stereo unit or as two independent processors and features balanced TRS inputs and outputs with side chain access and key inputs to the expander. Other features include true stereo summing and Class A VCAs, and 2-pole RMS to DC conversion throughout.

The *Dynex* circuitry puts the attenuation or accentuation of transients under user control and allows the dynamics of percussive material to be varied, thus modifying the dynamic range for a wide variety of sounds.

Specifications for the *CGM-2 Champ* include a frequency response of 20 Hz to 20 kHz ± 1 dB, THD of 0.02% at 1 kHz, 0 dBm, output noise of -88 dBm over full bandwidth and maximum input/output levels of $+24$ dBm. Threshold range for the compressor is -40 to $+20$ dBm and -20 to infinity for the gate, attack rates are programme-dependent, release rates are programme-dependent for the compressor and 1 ms (fast) or 500 ms (slow) for the gate, gate attenuation is up to 90 dB and the *Dynex* features an expansion ratio of 0.5:1 to 6:1 and a release of 50 ms to 1 s.

The *MC-8 Multicomp* provides eight independent channels of compressor/limiter/noise gates in a 1 U package and features what CDT call a Crest Function and Automute.

The Crest Function control varies



CDT's product display at AES

the attack and release characteristics of the compressor circuit on transients while leaving the RMS content unaffected, in order to create what CDT call 'very punchy, tight and percussive sounds'.

The Automute function is an automatic muting with programme-dependent attack and release rates for up to 100 dB of attenuation.

Specifications overall are as for the *CGM-2* with the Crest Rate quoted as 1.2:1 to 8:1 with the compressor threshold variable from -40 to

$+20$ dBm.

Also new from CDT is a 16/16 rackmount mixing console intended for sound reinforcement, OB trucks, submixing, small studios, etc, and several consoles can be cascaded when more channels are required. The mixer provides most of the facilities found on larger consoles such as four auxiliary sends, 16-track monitoring, sweep equalisation, etc. **Circuit Design Technology, 26801 Richmond Road, Bedford Heights, OH 44146, USA. Tel: (216) 292-0491.**

Akai Professional products

Several new items of interest in 1U rackmount formats have been introduced. First the *PEQ6* is a MIDI programmable equaliser providing 7-band equalisation for each of six channels. The unit has 32 memory banks and bank program change via MIDI is possible. The equaliser section provides ± 12 dB in 1 dB steps at 63 Hz, 160 Hz, 400 Hz, 1 KHz, 2.5 kHz, 6.3 kHz and 16 kHz. Performance quoted is 20 Hz to 20 kHz flat ± 1 dB; 0.015% or less distortion at 0 dBm out; S/N of -95 dB (IHF A) and crosstalk at -70 dB (1 kHz at 0 dBm input). Specifications are: input impedance 47 k Ω with nominal input level of 0 dBm and maximum of $+20$ dBm; output impedance 600 Ω with nominal output level of 0 dBm; optimum load impedance 10 k Ω or greater.

The *MB76* is a MIDI-programmable

combined mixer/patchbay with seven inputs and six outputs. The unit provides 12-step trim-level controls for each input, which can be programmed and stored, together with the routing to each output, into the 32 memory banks. Technical specifications are similar to the *PEQ6*.

The *ME30PII* MIDI-programmable patchbay is a more sophisticated version of the *ME30P* 4-in/8-out MIDI patchbay. As well as providing 32 patch configurations, the *II* version is equipped with a footswitch bank up/down function. LED indicators for the output channels and a MIDI-merge function for combining two MIDI signals into one control signal, eg playing a synthesiser module from a sequencer and keyboard.

Akai has also introduced a number of upgrades and options for its range of samplers.

The *S9V4.0* 3½ in floppy disk upgrade for the *S-900* also expands the memory $\times 3$. Owners of the *S9V2.0* disks may have these upgraded free of charge. There is also an SCSI interface for the *S-900* which allows it to be used in conjunction with Apple *Macintosh* computers and compatible 20 Mbyte hard disk drive. *MD-540* is a new 40 Mbyte hard disk drive.

For the *S-700/X-7000* samplers there is a new *SXM-007* ROM memory option which allows for the expansion of up to 16 samples, 10 of which are held in static RAM (SRAM) on power-off. The unit also enables crossfade looping.

UK: Akai Professional, Musical Instruments Division, Hounslow, Middx. Tel: 01-897 1508.

USA: Akai Professional Products, Fort Worth, TX. Tel: (817) 336-5114.

JBL Control Five

JBL has launched the low cost *Control Five*—big brother to the *Control One*—with power capacity of 175 W with a quoted frequency response which goes flat from 75 Hz to 20 kHz (± 3 dB) with usable output down to 50 Hz, generating 114 dB SPL (1 m) per speaker; 92 dB (2.3 V/1 m) sensitivity, 4 Ω impedance, incorporating a 25 mm titanium HF driver and 165 mm LF driver.

Applications include moderate sound reinforcement setups, audio and video studio use, exhibition and background and information systems.

JBL International, Northridge, CA, USA. Tel: (818) 893-8411.

UK: Harman (Audio) UK Ltd, Slough, Berks, UK. Tel: 0753 76911.

NEWS

Symetrix SX200 series

The SX200 series is a half-rack low cost series of signal processors from Symetrix. All units feature high headroom balanced inputs, low noise, wide dynamic range, low distortion, studio quality circuitry and low impedance high current balanced and unbalanced output line drivers. They may all be used standalone or

rackmounted.

The series initially comprises SX202 dual microphone preamplifier, SX204 headphone amplifier and SX201 parametric EQ/preamp. Symetrix, Seattle, WA, USA. Tel: (206) 282-2555.

UK: Sound Technology plc, Letchworth, Herts. Tel: 0462 480000.



As might be expected, the first software packages for the DMP7 digital mixer are now appearing and these include *Q-Sheet* by DigiDesign and *DMP7 PRO* by Digital Music Services.

Q-Sheet runs on a *Macintosh* computer (512K minimum) and uses the newly agreed MIDI Timecode standard to lock all MIDI-compatible equipment within the system to SMPTE timecode in order to completely automate audio mixdowns or generate video soundtracks.

The program is built around a user-defined cue list of MIDI events—such as a fader movement, processor setting, note on/off command, etc—and a string of MIDI events can be treated to perform as a single function when simultaneous commands are required. A sequence created using *Macintosh* software can also be treated as a single event and fired off in sync to timecode.

Once a cue list has been programmed, *Q-Sheet* makes the computer a complete MIDI automation centre with a graphics display of the cue list or a realtime representation of the *DMP7* control surface.

Q-Sheet is also intended for the creation of soundtracks when locked to a VTR. Cue lists of sound effects etc, can be created using the editing

capabilities of the program and a keyboard mapping function stores the name of sound effects and location on the keyboard for easy identification by *Q-Sheet*. The programme can then trigger sounds, automate external processors and execute a 2-track mix from the final cue list.

Q-Sheet features advanced one-step editing capabilities for easy overall control and controllers can be drawn on the computer screen with a single mouse stroke and assigned any MIDI controller number for visual feedback.

Other features include full printing and offset capabilities, all SMPTE frame rates and 16/35 mm film, internal clock option, multiple cue lists, event backtimer, infinite tracks, multiple event repeat with randomisation and undo capabilities. Requirements for the program in addition to the computer are a SMPTE/MIDI timecode converter and MIDI interface.

DMP7 PRO is designed to bring out the full potential of the *DMP7* and incorporates extensive graphics and tools to make mixing and automation



Kenwood DA-3531 CD encoder

Kenwood's DA-3531 CD encoder is a reference signal generator conforming to CD standards for use in evaluation testing of CD players. Direct connection to CD players gives symmetrically variable functions. The unit will also provide output from the laser pickup as well as pickup simulation for all player signal patterns including DC bias addition, radial and focus error and pickup simulation format.

There are nine test patterns in the range 20 Hz to 20 kHz for audio frequency band characteristics, emphasis functions, crosstalk between left and right channels and intermodulation distortion. Other facilities include 16 subcodes, eight error patterns, internal and external clocks.

UK: Thurlby Electronics Ltd, New Road, St Ives, Huntingdon, Cambs PE17 4BG, UK. Tel: 0480 63570.

Software packages for Yamaha DMP7

easy and efficient as well as adding some important functions not found on the *DMP7* itself.

The computer screen provides a full graphic display of the mixer as it would appear in conventional form, ie no control assignment panel, thus allowing instant access to all parameters with a mouse. It is possible to change several parameters simultaneously by using a 'hand' icon to touch the controls required and then these can be manipulated as a group. This latter function is very important as it allows different control changes to be put under a single group control, eg channels panning while others are changing EQ and auxiliary send levels are being modified simultaneously. Groups once set up can be stored to disk in one of eight memories.

The graphics also allow parameters to be displayed numerically and editing windows allow a 'zoom' facility for detailed editing such as EQ changes.

The *DMP7* stores snapshot settings of console status at any one time called 'scenes' and the *DMP7 PRO*

includes a powerful librarian feature for the renaming, editing and shuffling of scenes, which can then be stored to disk and recalled as required. A special mix-compare mode allows different mixes to be displayed by only showing parameters that have been changed between the two versions.

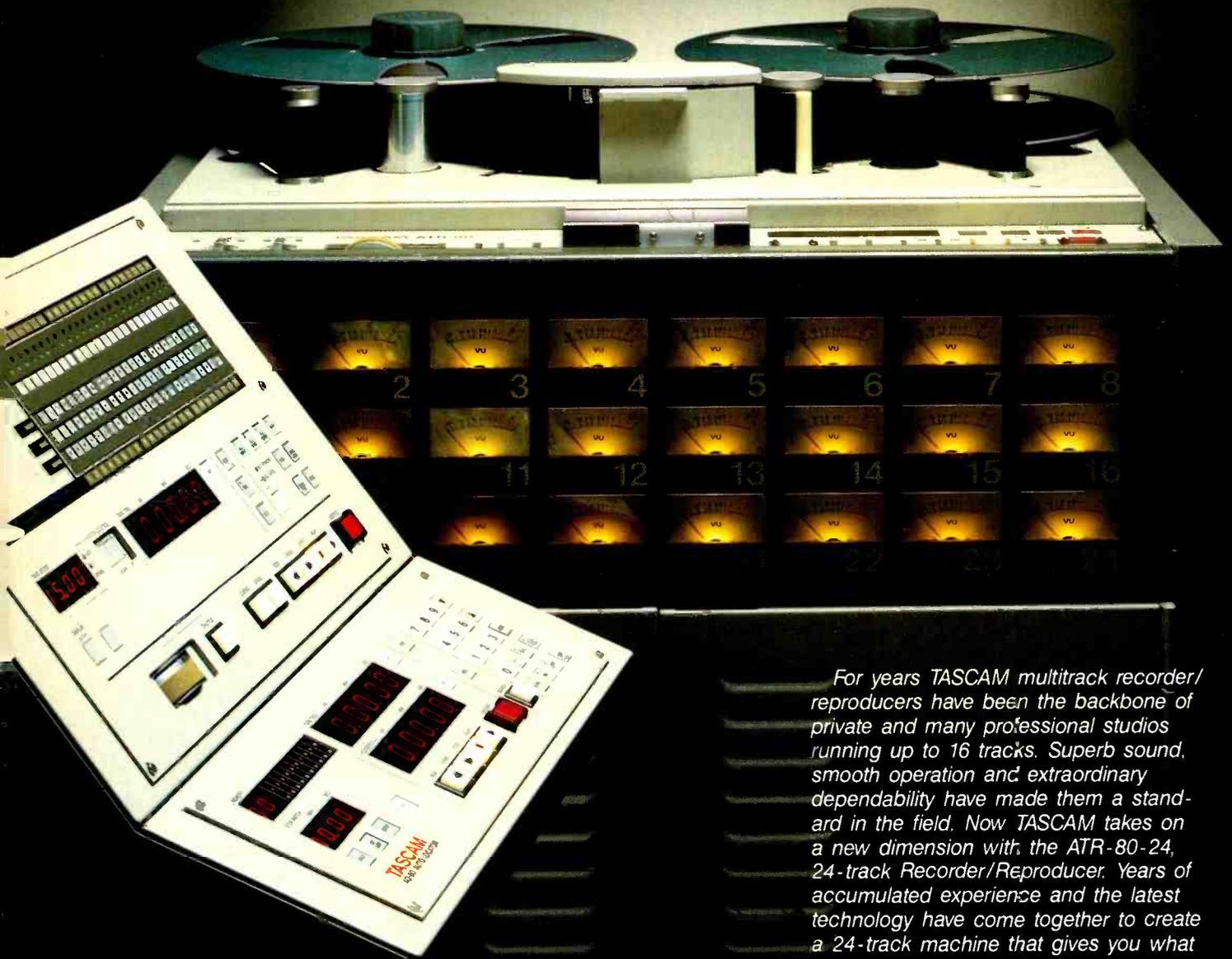
In automation mode *DMP7 PRO* works very closely with MIDI sequencers for final mixdown and the graphics display shows the realtime 'movements' of the console front panel. Should adjustments need to be made, a control can be easily accessed with a mouse and edited accordingly.

Other features of the program include templates for saving screen layouts, cut and paste editing to copy settings from one channel to another, screen printouts, 'smart' ratio-based or linear grouping of all parameters and overall level dimming.

Requirements are a *Macintosh* computer with 1 Mbyte of memory and a MIDI interface. DigiDesign, 1360 Willow Road, Suite 101, Menlo Park, CA 94025, USA. Tel: (415) 327-8811.

Digital Music Services, 23010 Lake Forest Drive, Suite D334, Laguna Hills, CA 92653, USA. Tel: (714) 951-1159.

24 TRACKS - 24 HOURS A DAY TASCAM PROVES THE WAY TO WORK



TASCAM PROFESSIONAL ATR-80-24
2-inch Recorder/Reproducer

For years TASCAM multitrack recorder/reproducers have been the backbone of private and many professional studios running up to 16 tracks. Superb sound, smooth operation and extraordinary dependability have made them a standard in the field. Now TASCAM takes on a new dimension with the ATR-80-24, 24-track Recorder/Reproducer. Years of accumulated experience and the latest technology have come together to create a 24-track machine that gives you what you need to compete.

If you're going 24-track, now is the time to go TASCAM.

TASCAM

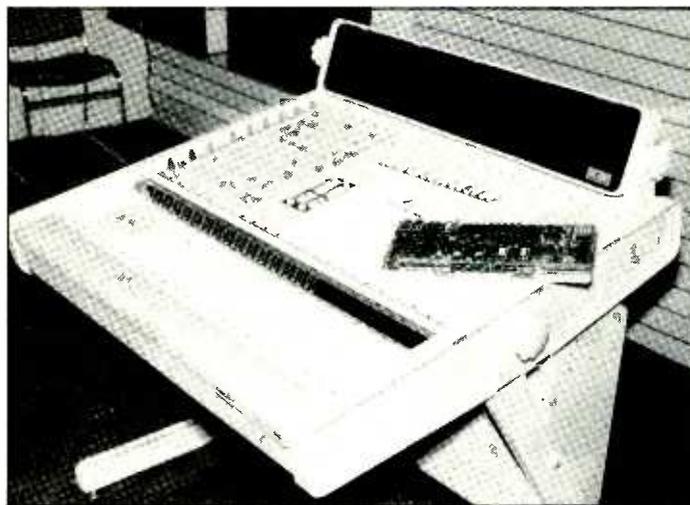
NEWS

Analog Digital Synergy in-line console

Synergy One is a new digital in-line mixing console with the first production unit due for installation in a 'major New York post-production facility early next year'. It has been designed for use as a 4-channel CD mastering console and for recording or broadcast applications requiring up to 64 channels. As yet the console does not have mic preamplifiers and is only suitable for line level use.

To provide instant systems familiarity the console has been designed around the in-line concept, thus bypassing the 'learning curve' of assignable consoles. The ADS uses 40 bit internal processing in order to meet present and future formats and can accept sampling rates from 32 to 50 kHz. Other features include optional electronic grouping, timecode-based function automation with complete data recall and console reset.

Comprising the main frame and a converter rack, all signals in the console are digital with the exception of the monitor section. The overall



appearance of the mixer is uncluttered and provides a clear operating surface with Mylar-covered panels and back-lit status indicators. The console and meter panel can also be adjusted for optimum operating convenience.

Features include: channel strip—high and low pass filters, each switchable to 11 corner frequencies together with in/out switch and selection of 12 or 18 dB/octave slopes; 4-band parametric equaliser with the low and high bands switchable to 10 centre frequencies and with peak or shelf characteristics and 12 or 18 dB/octave slopes, the two mid bands feature 15 switched centre frequencies and slope selection of 6, 12 or 18 dB/octave, all four bands have ± 18 dB boost or cut; the fader module houses a true 16 bit 100 mm channel fader for 65,536 level steps (compared to 256 for an 8 bit digital fader), Mute-Solo-Phase Reverse switches, High-Low-Unity Gain indicators and Group-Group Select switches (consoles with grouping or automation option), the channel

status display has a 10-segment bargraph indicator displaying the last 10 dB of headroom remaining for the channel, an overload indicator for signal overflow, a Group Display indicates group assignments and selected masters; the console features two stereo auxiliary sends, each with level and pan controls together with on/off and pre/post switches, a 16 bit channel pan control and PCL and ACL (pre-channel listen/after-channel listen) switches; a final switch bar selects EQ on/off, 15/50 μ s de-emphasis (independent of the equaliser) and a 1 Hz offset filter to eliminate possible DC-offset 'clicks' occurring during editing due to A/D converter drift.

The Master module contains the master reset controls for the status displays as well as the controls for the meter panel scales and Peak Hold indicators—a status display similar to that of the channel strip (and for group faders) is also included.

The monitor module is the only analogue part of the console and selects signals from the following sources: digital stereo mix out and two stereo sends, four stereo analogue signals (eg tape machines). Speaker control consists of Mono, Left Mute, Right Mute and Dim switches and a 100 mm P&G stereo fader.

Each channel and output is equipped with 100-segment bargraphs with two scales and illuminated level and position markers. Peak memory recall is also provided. The standard scale is from infinity to +10 dB (clip point) with the +20 dB extended scale being from infinity to -10 dB. **Analog Digital Synergy Inc, 120 SW 21 Terrace, C 104, Fort Lauderdale, FL 33312, USA. Tel: (305) 791-1501.**

Valley International Leveller and Automute

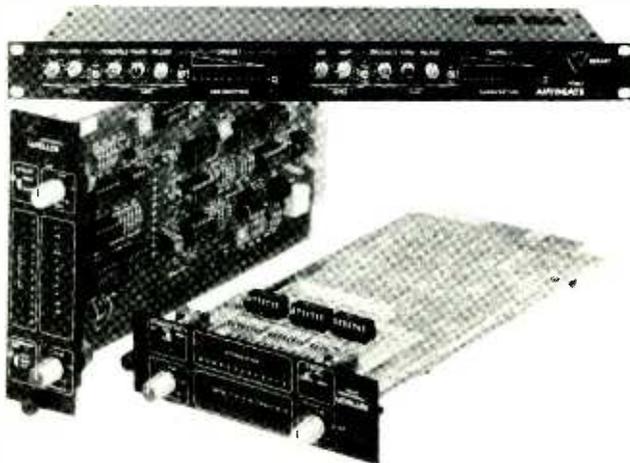
The *Leveller* is an audio level controller. Proprietary linear integration detection enables the unit to comprehend optimum output loudness for each note, syllable or accent. Once input level and output gain are selected 'levelling' action may be increased or decreased as desired. Attack and release times are programme-selected and are optimised by Automated Program Dependency circuitry as the programme content changes. The manufacturers claim that this circuitry also prevents the introduction of dynamic distortion.

The *Leveller* is available in 2-channel 19 in rackmounting or single-channel Valley 800 series rackmounting units.

Autogate is a new 2-channel frequency selective noise

gate/expander. Features include auto slope and program variable release shape circuitries which allow it to be used on acoustic piano, guitars, drums and strings to remove leakage; high and low pass filter; dynamic

filter and trigger generator circuitry. **Valley International Inc, Nashville, TN, USA. Tel: (615) 383-4737.** **UK: Stirling ITA, London, Tel: 01-625 4515.**



JL Cooper Mix Mate

JL Cooper Electronics have announced a low cost 8-track fader/mute automation package, the *Mix Mate*. The package comprises SMPTE or FSK reader/striper, dbx VCAs, fader and mute controls, memory and control smarts (providing sync and MIDI clocks and song position pointer). *Mix Mate* can also run as a slave to software packages such as the DigiDesign *Q-Sheet*. Options include the provision of graphics display, expanded memory and disk storage via Atari ST PC.

JL Cooper Electronics, West Los Angeles, CA, USA. Tel: (213) 473-8771.

UK: Evenlode Soundworks, The Studio, Church Street, Stonesfield, Oxford OX7 2PS. Tel: 099 389 228.

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The Sony APR 5000 series offers a far wider range of capabilities than many people realise.

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London, W1A 3DG
Tel: 01 437 1892
Tlx: 21624 Aloffd. G.

ASC
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Reading, RG7 3RS
Tel: 0734 333100

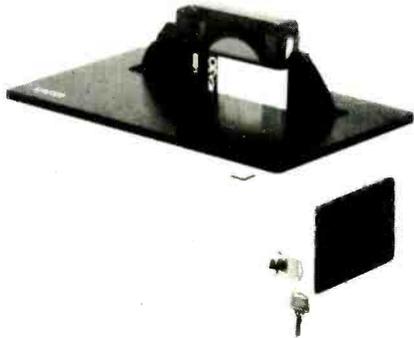
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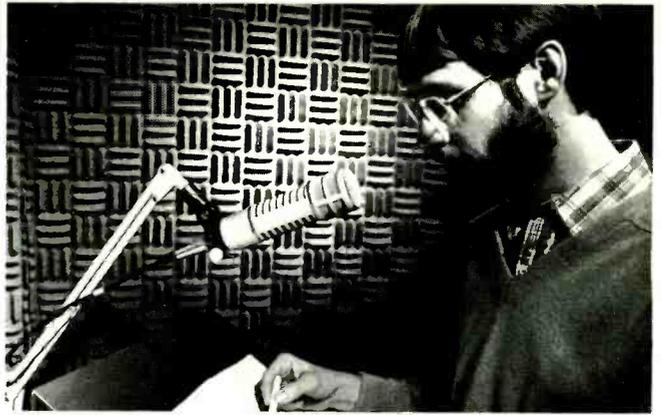
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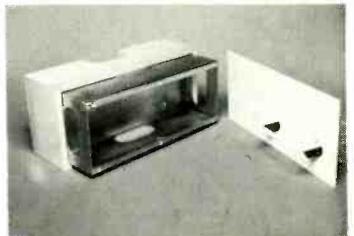


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Some quotes to make you think hard (disc).



"We've just completed our first film for Cannon Films completely on AudioFile without reverting to mag stock in post production. We can't see anybody wanting to work the old way once they've worked on AudioFile."

Vic & Linda Radulich,
Digital Post, Los Angeles.



"On our latest film, 'Lords of Magic', we recorded all of our production sound digitally. The AudioFile is used to handle the dialogue and music editing and will be used as a playback source in the final mix."

David Marsh,
Marsh Films, Los Angeles.



"Commercial production forms the bulk of our business. The AudioFile has proven to be easy to use and now makes it possible for us to realise our goal of digital audio from start to finish."

Jay Scott,
Producers Color Service, Detroit.



"When we took delivery of our AudioFile, we got it out of the box, powered it up, and did a project with it, it really is that simple."

John Wiggins,
HBO Productions, New York City



"Over the years we've built up a very comprehensive digital audio effects library and we're now building two complete new rooms, each equipped with an AudioFile to get the very best results when laying audio to picture."

Wylie Stateman & Lon Bender,
Soundelux, Los Angeles.



"The AudioFile has eliminated the need for our analog 24-track in post work. Recording and editing entirely in the digital domain makes possible first generation audio for our final video mix. This has allowed us to maintain our leading edge as one of the top audio for video facilities in the world."

John Binder,
Editel, Chicago.



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Hank Newberger, & Tim Butler
Chicago Recording Company, Chicago



"We own a lot of AMS equipment, and all of us at the Hit Factory are very excited about the addition of AudioFile to the Studio. Right now, our clients are eagerly awaiting the arrival of our first system."

Eddy Germano
Hit Factory, New York City



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Ken Hahn,
Sync Sound, New York City



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- B Heynen N.V., Bedrijfsstraat 2, 3500 Hasselt, Tel.: 011-21 00 06
- CDN Elnova Ltd., 4190 Rue Seré, St-Laurent, Québec H4T 1A6, Tel.: (514) 341-6933
- DK PSS, 38 Aaboulevarden, 2200 Copenhagen N, Tel.: 451 - 39 00 37
- SF Lounamaa Electronics Oy, Uimarinpokku 27 A, 00330 Helsinki 33, Tel.: 90-488 566
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MUSIC NEWS

New instruments due for worldwide distribution by Yamaha are previewed by Mark Jenkins

TX16W Sampler: Yamaha's long-awaited TX16W rack-mounted sampler offers 16-note multitimbral playback, 12-bit sampling, memory expandable from 1.5 Mbyte to 6 Mbyte and a stereo sampling mode. Its operating system is loaded from disk (this takes about two minutes) and at launch there were 13 disks of instrumental sounds already prepared; six are supplied with the instrument.

DX7 Centennial: Manufactured in a limited edition of 300 to celebrate Yamaha's 1987 Centenary, the DX7 Centennial is basically a modified DX7MKIIIFD, including that model's 3½ in floppy disk drive. The Centennial model has the advantage of a 6½ octave keyboard rather than the usual 5-octave version. The bodywork is finished in chrome with gold patch buttons, sliders and performance wheels.

DX11: The DX11 is a new synthesiser resembling a TX81Z synth module with a 5-octave keyboard. Known as the V2 in Japan, the DX11 is a 4-operator, 8-note multitimbral, budget FM synthesiser with 'quick edit' features to alter overall brightness and envelope speed.

RX120: The RX120 is a preset-pattern budget drum machine using technology established on the RX21 and RX17. The unit has 40 preset rhythms including Rock, ChaCha, Rhumba, Rock 'n' Roll, Shuffle and Bossa Nova; it's possible to combine these patterns into complete songs.

WX7 Wind Controller: The WX7 has a saxophone-like design and gives monophonic MIDI output for the control of any MIDI-equipped synthesiser or sampler. The rear of the controller has octave switch rollers and there are two distinct control modes for different mouth/tongue styles. Power is supplied from a battery pack that also features the MIDI output. Two MIDI channels can be accessed alternately and this makes it possible to hold a note or chord on one instrument and solo over it on another instrument set to a different MIDI channel. A set of sounds for the TX81W synthesiser has been released with the WX7 in mind.

TX1P Piano Module: The TX1P is a 1U 19 in

MICROPHONES

A list of manufacturers who have introduced new microphones during the twelve months since January 1987

AKG

C522: twin-cardioid stereo condenser ENG mic with built-in rechargeable batteries.

C414B-ULS: updated, low-noise version. Also *TL* transformerless available.

C1000: 'Professional' quality condenser for vocals.

D300 range: all now available in matte black, non-reflective finish.

D1200: re-introduction of popular vocal mic.

AKG Akustische u Kino-Geräte GmbH, Brunhildengasse 1, Wien A-1150, Austria.

Tel: (222) 956517.

UK: AKG Acoustics Ltd, Vienna Court, Catteshall Wharf, Catteshall Lane, Godalming GU7 1JG.

Tel: 04868 25702.

USA: AKG

Acoustics Inc, 77

Selleck Street,

Stamford, CT

06902. **Tel: (203)**

348-2121.

Audio Technica

AT40 series:

includes set of three studio condenser

microphones with replaceable capsules:

4049 is omni, **4051** is

cardioid and **4053** is

hypercardioid. Also new is

the **4031** unidirectional cardioid

capacitor mic with fixed charge,

permanently polarised capacitor.

Two shotgun mics in the **40** series

are the **4071** externally polarised

capacitor lobar, and the **4073**

externally polarised capacitor with

a narrow directional polar pattern.

Audio-Technica Corp, 2206 Naruse, Machida, Tokyo 194, Japan. Tel: 0427 295111.

UK: Audilec Distribution Ltd, 6 Hornsby Square, Southfields Industrial Park, Laindon West, Essex SS15 6SD. **Tel: 0268 419198/9.**

USA: Audio-Technica US Inc, 1221 Commerce Drive, Stow, OH 44224. **Tel: (216) 686-2600.**



Beyer Dynamic

M58: long-handled dynamic omni ENG.

MCE 81: hypercardioid condenser for vocals, with multistage pop filter.

MPC 60: cardioid boundary.

MCE 10: electret condenser hypercardioid tie clip, weighing 7 g, battery powered with option for wireless transmitting or phantom power supply.

Beyer Dynamic Electrotechnische Fabrik, Theresienstrasse 8, Postfach 1320, Heilbronn, D-7100, West Germany. Tel: (71) 316170.

UK: Beyer Dynamic (GB) Ltd, Unit 14, Cliffe Industrial Estate, Lewes BN8 6JL. **Tel: 0273 479411.**

USA: Beyer Dynamic (USA) Inc, 5-50 Burns Avenue, Hicksville, NY 11801. **Tel: (516) 935-8000.**

Bruel & Kjaer

4011: Prepolarised cardioid condenser.

UA 0777: microphone nose cone, previously available only on matched stereo pairs.

Bruel & Kjaer A/S, Naerum, DK-2850, Denmark. Tel: (2) 800500.

UK: Bruel & Kjaer (UK) Ltd, Harrow Weald Lodge, 92 Uxbridge Road, Harrow HA3 6BZ. **Tel: 01-954 2366.**

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

C-Tape

MIDI APT: this is the working title of a product expected to be launched at the Frankfurt Musik Messe in March '88, an update on the *Acoustic*

Percussion Trigger.

Features include eight mic channels with *C-ducer* pickup mixed down to stereo output, and

triggering for both analogue and MIDI instruments.

MIDI outputs are controlled from the front panel, enabling the user to access any note

or sound from another MIDI instrument from any of the

eight drums. Ten program

modes can be set to change

triggering patterns. The unit is

19 in rackmountable, with

triggering and audio muting achievable from a footswitch.

UK: Audio Marketing Group, Unit 19, Holder Road, Aldershot, Hants GU12 4RH. **Tel: 0252 319171.**

USA: C-T Audio Marketing Inc, South Tech Industrial Plaza, 3050 SW 14 Place, Suite 3, Boynton Beach, FL 33435. **Tel: (305) 738-0622.**

Crown/Amcron

CM hand-held series: comprising the *CM-300* differential-type electret cardioid condenser ('the world's first Differoid') the *CM-200* cardioid electret condenser, and the *CM-100* electret condenser omni.

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UK: Shuttlesound, Unit 15, Osiers Estate, Osiers
Road, London SW18 1EJ. Tel: 01-871 0966.

UK: HHB Hire & Sales, 73-75 Scrubbs Lane,
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N/D357: supercardioid; *N/D257:* cardioid; *N/D408:*
supercardioid instrument mic with improved pivot

MICROPHONES

yoke; *N/D308:* same as above but cardioid.
**Electro-Voice Inc, 600 Cecil Street, Buchanan,
MI 49107, USA. Tel: (616) 695-6831.**
UK: Shuttlesound Ltd, Unit 15, Osiers Estate,
Osiers Road, London SW18 1EJ. Tel: 01-871 0966.

Fostex

M20RP: M/S stereo with 'printed ribbon'
elements (no need for phantom powering),
including XLR adaptor giving connector for left,
right and mid signal.

UK: Harman (Audio) UK, Mill Street, Slough,
Berks. Tel: 0753 76911.

USA: Fostex Corporation of America, 15431
Blackburn Avenue, Norwalk, CA 90650. Tel: (213)
921-1112.

Ramsa

WM-D55E/WM-D65E/WM-D70E: unidirectional
dynamics, the first two with locking on/off switch.
WM-P40/WM-P50: unidirectional condensers with
facility for battery or phantom power.

UK: Panasonic UK Ltd, 300-318 Bath Road,
Slough, Bucks SL1 6JB. Tel: 0753 34522.

USA: Panasonic Professional Division, Matsushita
Electric Corporation of America, 1 Panasonic
Way, Secaucus, NJ 07094. Tel: (201) 348-7000.

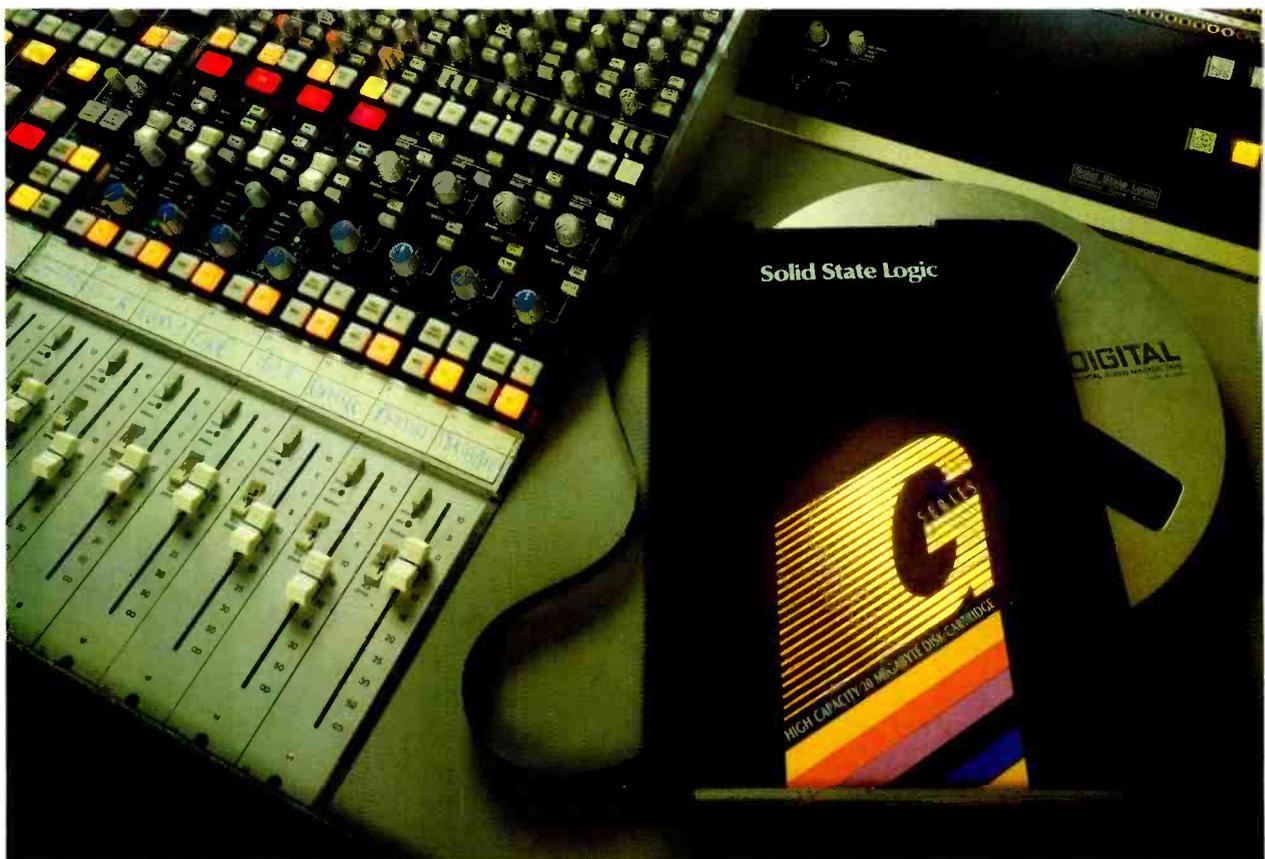
Sennheiser

MKE 4032: cable-bound version of 4032 radio mic.
4032U studio and 4032U-3 stage vocal versions.

Ramsa's WM-P50E



E-V's N/D series



G · SERIES STUDIO COMPUTER

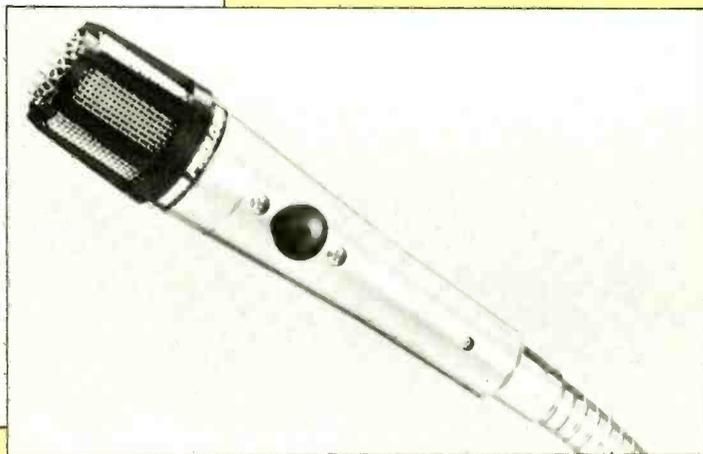


MKE 48: headworn vocal mic.
Sennheiser Electronic AG, Wedemark, D-3002, West Germany. Tel: (5130) 5830.
UK: Hayden Laboratories Ltd, Hayden House, Chiltern Hill, Chalfont St Peter, Gerrards Cross, Bucks SL9 9UG. Tel: 0753 888447.
USA: Sennheiser Electronic Corp, 48 West 38th Street, New York, NY 10018. Tel: (212) 994-9440.

Shure

SM84: electret lavalier condenser with supercardioid pickup.
Prologue 2L: based on 8L and 10L models, it's fitted with a push-to-talk switch, attached cable,

The Prologue 2L from Shure



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Shure Brothers Inc, 222 Hartrey Avenue, Evanston, IL 60202, USA. Tel: (312) 866-2200.
UK: H W International Ltd, 3-5 Eden Grove, London N7 8EQ. Tel: 01-607 2717.

Sony

ECM-672: short rifle electret condenser
ECM-979: hand-held stereo electret condenser.
ECM-23FII: hand-held mono electret condenser.
UK: Sony Broadcast (UK) Ltd, Belgrave House, Basing View, Basingstoke, Hants RG21 2LA. Tel: 0256 55011.
USA: Sony Corporation of America, Professional Audio Division, Sony Drive, Park Ridge, NJ 07656.

Yamaha

MZ106S: switchable dynamic unidirectional for vocals.
MZ203Be: top-of-the-line directional dynamic with beryllium diaphragm.
MZ204: unidirectional dynamic for drums.
MZ205Be: similar to above with beryllium diaphragm.
UK: Yamaha-Kemble Music (UK) Ltd, Mount Avenue, Bletchley, Milton Keynes MK1 1JE. Tel: 0908 71771.
USA: Yamaha International Corp, PO Box 6600, Beuna Park, CA 90620. Tel: (714) 522-9105.

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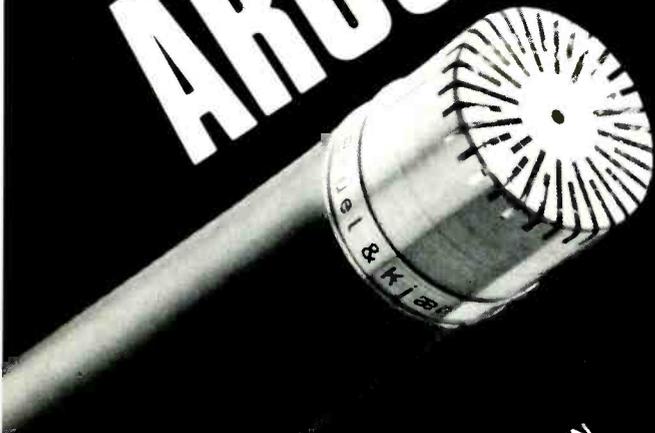
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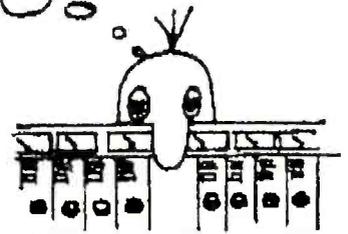
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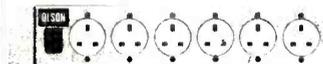
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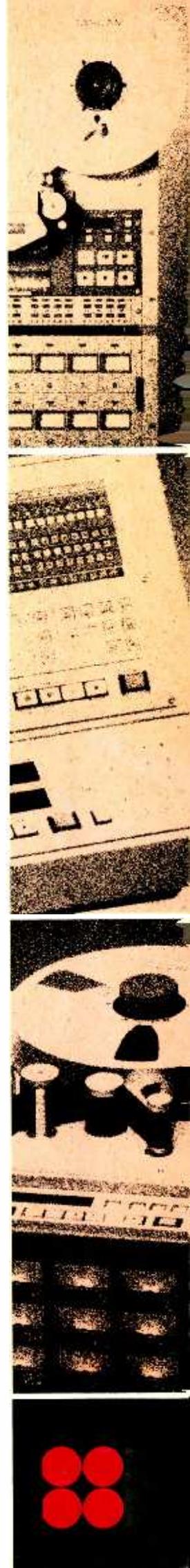
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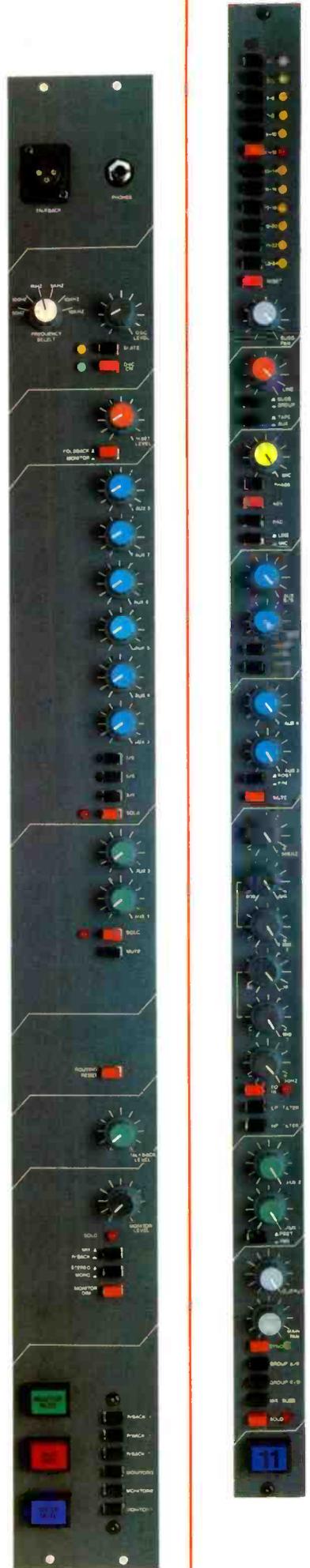
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GML AUTOMATION SYSTEM

The GML automation system at Air London is the first to be installed in a European studio. Patrick Stapley went to try it out

My introduction to GML automation took me to Studio 3 at Air London where the system has been installed in a 48-channel Neve V series console, making it the first Massenburg to be seen in a European studio. I must admit that having heard a lot about the sophistication and cost of the system I was surprised by its appearance. I suppose I expected to see a hi-tech control panel with multicoloured readouts and recessed video monitors. Instead there was a standard IBM 3163 computer terminal and monitor sitting on the

tape operator's desk, plus a small, rather insignificant set of controls in the centre of the console called the Master Panel. However, the faders looked more impressive with well positioned mute and select buttons plus a sensible arrangement of status LEDs.

Although somewhat uninspired by the system's looks, I was pleasantly surprised by its mechanics. The feel of the faders is excellent; one is totally unaware of any motor resistance or stiffness associated with moving faders, and the speed is very impressive with a top to bottom time of $\frac{1}{20}$ s which is so fast that I missed one group of moves by blinking! Each fader has a 10 bit resolution dividing it into 1024 segments producing 0.1 dB accuracy. Because of this large segmentation the fader not only becomes extremely precise but also behaves well at slow speeds giving a smooth, non-jerky response.

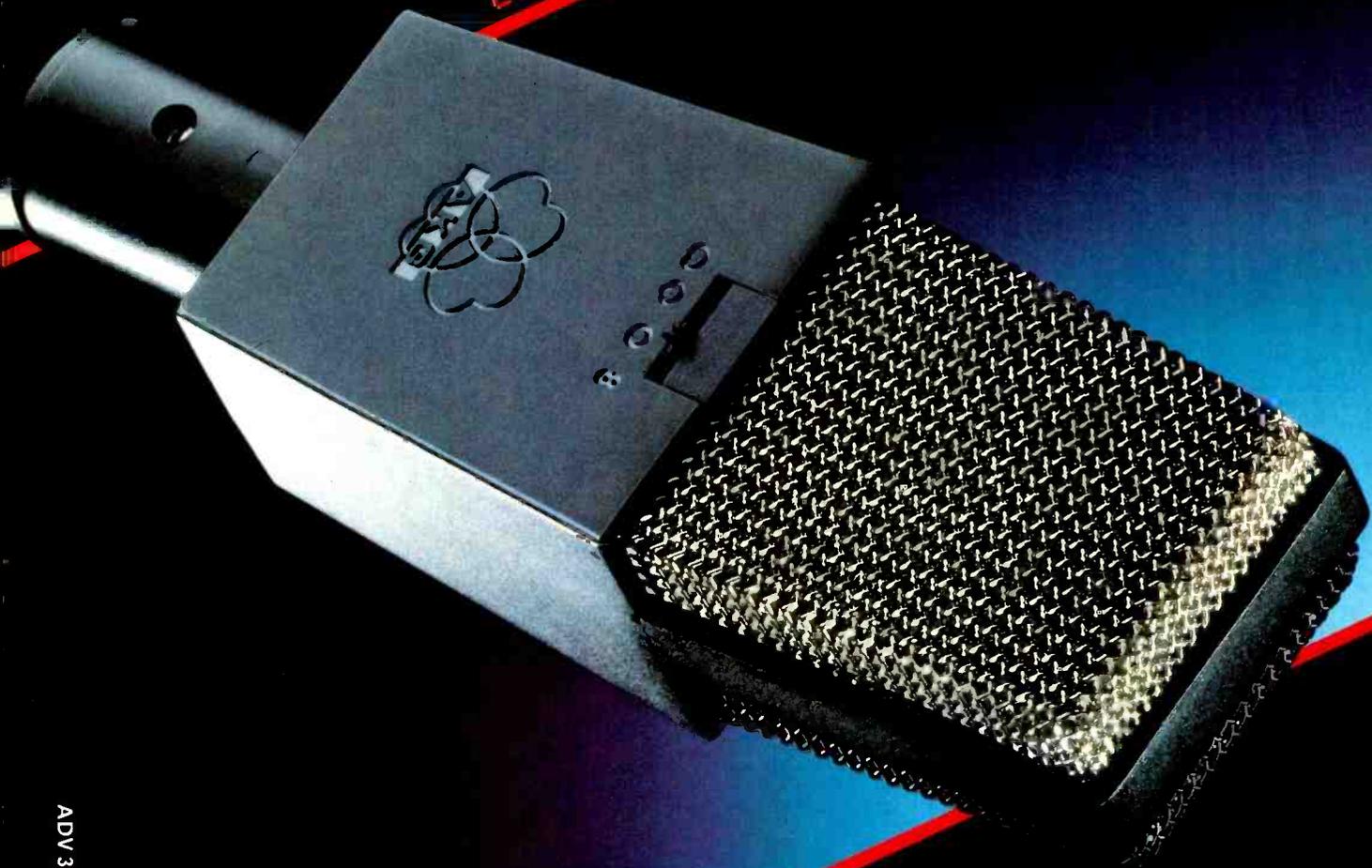
The computer itself is very powerful, being made up of two Motorola MC 68000 processors, a 40 Mbyte hard disk (which is capable of storing approximately six month's work), and 1 Mbyte of RAM. There is also a floppy disk drive which is used for backing up data from the hard disk and for converting SSL and Necam discs into GML format. The computer is in fact so powerful that at present only 20% of its capability is being used, allowing a lot of room for expansion in the future. One area where this would be useful is in transport control. There is no control over tape machines and one relies on whatever remote or autolocator is at hand; consequently, the operation of the system falls into three areas: terminal, master panel and autolocator. This makes for rather fragmented working and I would prefer to have seen all the controls built into one



George Massenburg demonstrates GML automation to George Martin at Air London's Studio Three

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GML AUTOMATION SYSTEM

centralised area.

The first step is to log into the system by entering your name and personal password, if you have been allocated one. The password procedure is a bit like typing in your number at an automatic cash till and is done invisibly. Once logged in correctly, the Wait Tape message will appear informing you that the SMPTE interface requires initialising and this is simply done by running the tape so the computer can learn the frame rate, tape speed and the tape tach relationship constant, which will tell the computer where the tape is in the absence of SMPTE.

The next step is to create client and song directories, where the names of the artist, the song and all the mixes will be listed. The directory structure is very comprehensive keeping all engineers, their clients and associated work separate from one another. There is a strict hierarchical arrangement to the directories with the engineer at the top in his home directory, which is created when logging in. Only from here can the client directory be established and only by being in the client directory can a song directory be made to store mixes. All directories must be named and a maximum of 14 characters may be used with the exception of certain punctuation marks and spaces. When typing into the system all user entries will appear in lower case with the computer responding in upper case; this makes for an easy distinction between man and machine.

Initial Preset

The computer contains eight time registers which are used to hold useful timecode positions that the engineer will want to recall. A timecode value is entered by typing it in from the terminal, 'Grabbing' it with the tape running or by treating the operation like an edit and rocking the tape to find the exact point. They can be used in command lines instead of typing out timecode and are abbreviated t1 to t8, but it must be remembered that they are not locatable. Where they can be useful is in the Preset function.

A Preset is a static store of all or selected faders and/or mutes which can be set to the mix at a pre-programmed time using a time register. When a Preset is defined, it immediately alters the current mix data without having to run the tape. Before automated mixing can begin, an Initial

Preset must be made. The Initial Preset is the computer's reference point before the start of the mix and it contains a value for all the faders and mutes before any changes have occurred. When a pass has been made, the computer will reset to these original values and all subsequent changes will be proportionate to them. If an Initial Preset was missing the faders and mutes would retain their last configuration (probably the end of the mix) and adjust proportionately to that giving a false playback. The reason an Initial Preset is necessary is that the computer does not record the starting point of a move, only the settling point. The correct positioning of the Initial Preset is very important; the recommended arrangement is that it should be placed 5 s after the start of the timecode with a 20 s gap before the music. The autolocator should then be programmed to start *after* the Preset; if it were to start before there is the danger of erasing some of the Preset information and consequently destroying the balance of the mix. I find this a little worrying in so much as autolocators running from tach can slip and so too can humans. I would have thought some kind of write protect system could have been arranged to guard against accidents.

Read and Write

The computer's memory is divided into two equal halves—readlist and writelist. The system works by playing back all the data on the readlist while at the same time copying it with any additional changes to the writelist. As soon as the tape stops the readlist is erased and replaced by the writelist. However, if one is unhappy with the present pass one can erase it by pressing the Abort button on the master panel, but this must be done *before* the tape stops. This took a little getting used to, and I felt that rather than automatically updating and losing the readlist, it would have been better to see this decision left to the user, or at least some provision made for retrieving the readlist. I believe this is an area that GML are looking at for the future.

Standard Configurations

To aid the user in mixing, seven read/write arrangements for faders and switches have been incorporated into function keys 4 to 10 on the terminal. They are called the Standard Configurations and are divided into Main and Alternate arrangements. (See **Table 1**.)

You will notice that all the Main settings are for read only on both faders and mutes; this is basically a safety feature allowing quick access to a playback only mode. To call up a standard configuration the appropriate function key is pressed which will set the desk into the Main configuration lighting up the two green LEDs on each channel representing switch and fader read status. If the Alternative button on the master panel is then pressed it becomes possible to toggle between Main and Alternate settings either by using the individual select buttons on each channel or by pressing the All button on the master panel. So, for example, if I want to update certain fader moves, but leave the mutes as they are, I would select standard configuration No 4, press Alternative and then decide whether to select only the faders I'll be working on or to put the whole desk into this status. The advantage of selecting individual faders is that it keeps the

Table 1

Main	Alternate
1 Fader Read+Switch Read	Fader Read and Write+Switch Read and Write
2 Fader Read+Switch Read	Fader Read, Switch Read and Write
3 Fader Read+Switch Read	Fader Read, Switch Write
4 Fader Read+Switch Read	Fader Read and Write, Switch Read
5 Fader Read+Switch Read	Fader Write, Switch Read
6 Fader Read+Switch Read	Fader Read and Write, Switch Read and Write, Absolute offset
7 Fader Read+Switch Read	Fader Read and Write, Switch Read and Write, Relative offset

other faders safe from inadvertent moves. While on the other hand if you suddenly have a flash of inspiration on an unselected fader, it won't be remembered. Anyway, whichever method you choose, the red fader Write LEDs will light up on selected faders. There are a total of six status LEDs in three colours and as one becomes more familiar with the system the various combinations fall into recognisable patterns.

A quick word now on the Absolute and Relative Offset modes as all the other configurations are self explanatory. In Absolute Offset the fader will immediately return to its previous setting as soon as one's finger is removed. Normally speaking, this is done at the computer's fastest speed (1 frame). If a smoother transition is required, the speed or Vector Length can be altered to a maximum of 63 frames. With Relative Offset, the fader does not return to the original setting but remains in its new position following existing moves relative to that position.

Whatever configuration is used it must be de-selected when finished with and this is especially important where configurations containing write only commands have been selected. Any of the configurations can be accessed at any time, even with the tape running, and there is also the provision for making personalised configurations which can be stored in place of the standard ones.

Grouping

The group master faders are situated in the centre of the desk and the Air system has six of them. On the master panel is the Group Select button which is used to assign and display groups. With this button lit a group master fader is chosen, set to around 0 dB, and its select button pressed. Keeping this button pressed, the select buttons on the faders that are to be grouped are pressed (if you are working single-handed this can be a bit of a stretch). The faders are now tied to the group master and will follow its moves retaining their internal balance. A point to be aware of is that the computer is only remembering moves on the group master fader and it is the group master that controls the others. If the group is de-selected, the master would play back moves but the other faders would not follow. Groups can be displayed by simply pressing the select button on the group master which will light up all the selected LEDs on the assigned faders. Similarly, if an individual fader in the group is selected, the group master will light up. Group masters also control muting.

Saving mixes

As the mix is tailored it is a good idea to save mixes to the hard disk as reference points and for safety reasons. In addition to the mix name, mixes can be given a 1-line descriptive header to distinguish them from each other, but what I found particularly confusing was that mixes are listed alphabetically rather than chronologically and I ended up numbering mixes rather than naming them.

The actual process of saving and loading mixes is performed extremely quickly by the computer with an average mix taking 2 s to load. Apart from fader, mute and header data the mix also contains information on groups, standard and personalised configurations, the eight time registers and the time and date the mix was saved. At the end of the session it is recommended to 'back up' or copy the day's work

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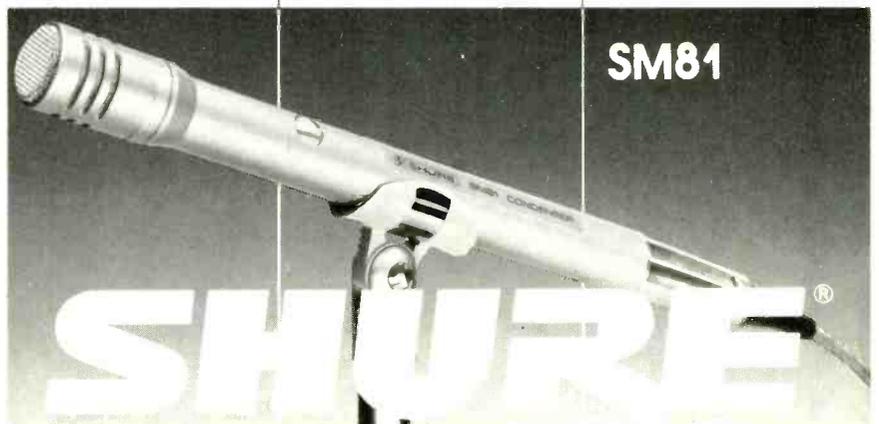
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GML AUTOMATION SYSTEM

across to a floppy disk, which can then be kept safely with the tape.

Mix Editor

The Mix Editor program contains a comprehensive set of processing operations giving overall or selective control of channels and functions. There are nine operations available which are displayed in a main menu.

Merge: A segment from one mix can be joined to another, using all or selected channels and incorporating all or selected functions.

Splice: A segment of the current mix may be moved and copied to another part of the mix; channels and functions are selectable.

Copy: The data on one channel may be copied to another channel either for the entire mix or between two specified points.

Swap: All data is swapped between two selected channels.

Clear: Data between two specified points on selected channels is erased. Functions are selectable.

Trim: Faders can be trimmed up or down between two specified points.

Extract: This is the inverse of the Clear Operation. Data from selected channels is retained while all other channel information is erased. Functions are selectable.

Mix Shift: All data for the entire mix is shifted forwards or backwards.

Chan Shift: Same as above but for selected channels and functions.

All these examples will change the current mix in memory, so it is important to save it for reference. Three of the operations—Merge, Splice and Channel Shift—will automatically save the resultant mix to the hard disk if required.

When the two mixes are joined together the Merge operation works like an edit and any level mismatches between the two sides will bump. Sometimes this is the desired effect, but there is no provision made for a crossfade where the faders would slowly start matching a few seconds prior to the edit and be matched a few seconds after it. It is possible to utilise a slow vector time but this will only happen at the edit point.

Using the Preset and Trim functions, one can create a mix without touching the faders, and I was told of an instance recently where an entire album was mixed, excluding lead vocals, using this technique. Apparently, George Massenburg favours this method of mixing.

Snapshots, Solo & Help

A snapshot is a still picture of the faders and mutes at a given moment in time. Snapshots are

created by using the Snapshot Take button on the master panel. With this, individual channels can be selected with their select buttons or every channel can be taken with the All button. To set a snapshot back to the desk, the Snapshot Recall button is pressed, followed by either individual select buttons or the All button. Whichever method is used, the channels will reset themselves immediately to the snapshot.

Snapshots can be stored in the mix list where they are named and, if required, given headers. They are distinguished from mixes by SN after their name (MX for mixes).

If the Solo button on the master panel is lit, the select buttons on each channel will act as a solo. All unselected channels will mute, producing an in-place solo, and by using the MA (Mask) command, effect returns can be programmed to remain unmuted, giving an in-place solo with effect. All solo activity is ignored by the computer with no mute information being stored.

The Help key is a very useful function. If at any time one is having difficulty executing a command or can't remember the correct syntax, a press on this key will bring the computer to the rescue, producing the relevant instructions for the procedure at hand. This is far more satisfactory than having to reach for the manual, which never inspires great confidence in one's clients!

Conclusion

The speed and resolution of the faders and the speed at which the computer carries out operations are all extremely impressive. The standard configurations are well thought out and the provision to write personalised configurations is useful. I don't like the way the system is split into three operational areas, and it would be much neater and more ergonomic to have one central control panel. I would like to see the computer control transport and offer locatable cue points. I think the system takes longer to become familiar with than others, mainly due to the lack of dedicated keys which consequently results in the operator having to remember a lot of abbreviations and syntax; however, this is made easier by the on-board Help program.

My overall impression of the GML was of an enormously powerful computer that had been programmed to perform the job of automated mixing, rather than a complete system that had been engineered and designed from scratch and evolved into a cohesive working unit. When one remembers that the GML organisation is very small (19 people), and that the system was developed largely to meet George Massenburg's way of working, I think this becomes clearer. However, there is much talk of future developments and that—alleged with the keen interest being shown in the system—should mean exciting times ahead for GML. □

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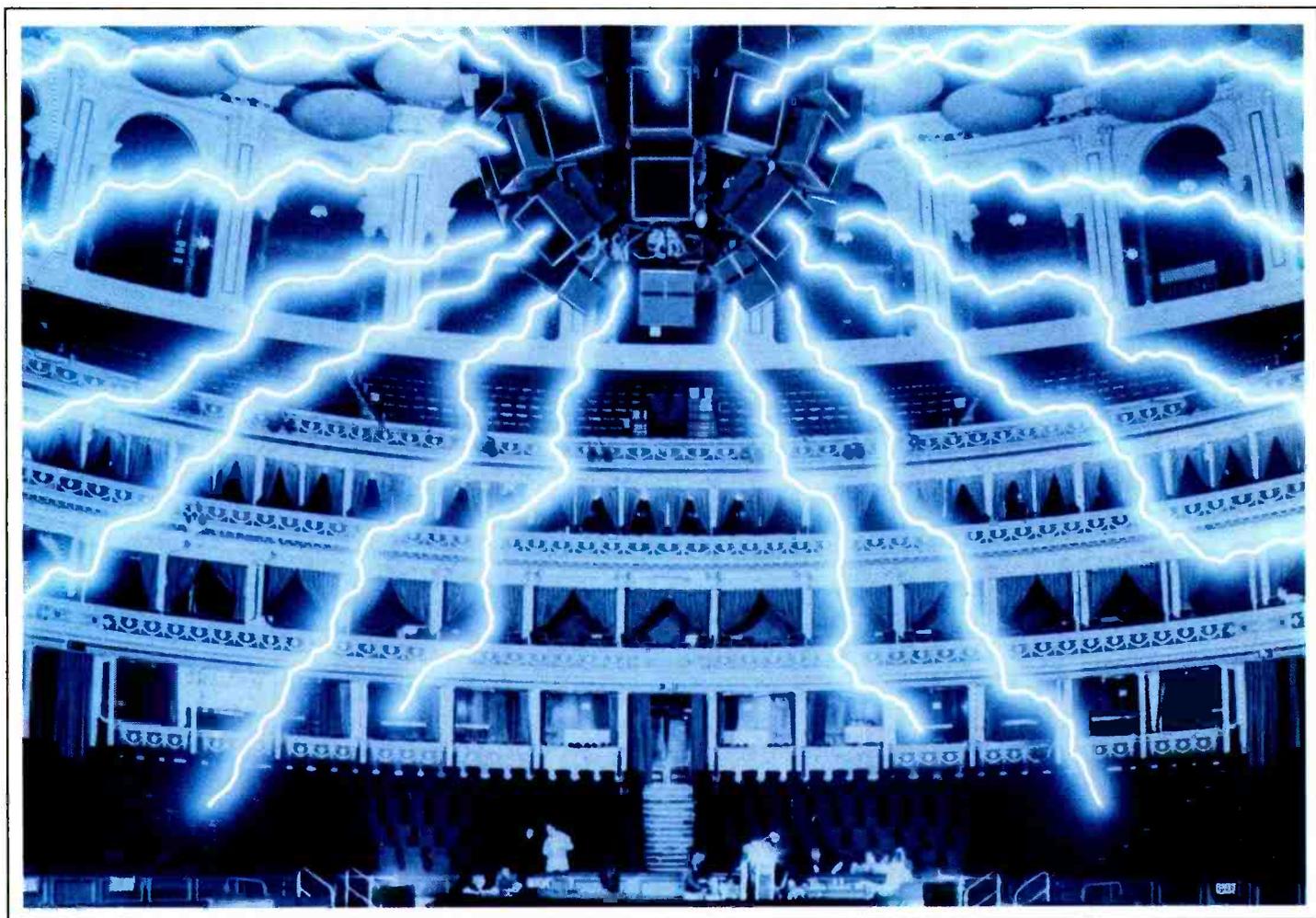
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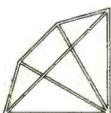
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Sain, pronounced 'sign', means simply sound, says the Sain (Recordiau) Cyf's catalogue. About 90% of the studio's output is in Welsh. "I think it's true to say that we're the only full-time professional record producing company specialising in Welsh records," says managing director Dafydd Iwan.

One of the company's claims to fame is that it discovered boy soprano Aled Jones, issuing his first single and two albums before he was whisked away to a major record company. Sain also records almost every leading Welsh male choir and this attracts worldwide sales. The company operates a couple of 24-track studios and a mobile recording unit.

Sain has its roots in the mid '60s when singers Dafydd Iwan and Huw Jones wanted to improve the quality of their recordings: "Our records at that time were made in a fairly rough-and-ready way with the established companies in Wales. A simple mic, straight down," Iwan recalls. "With the developments in the recording world generally, we were aware of the need for more sophisticated recording. I don't think the other companies appreciated the need for that because pop was very new, especially in Welsh, and we eventually decided that the way to do it was to do it ourselves."

So Sain was founded in the capital, Cardiff, in 1969 and began using studios in London. In 1970 Rockfield studios opened at Monmouth about 30 miles (50 km) from Cardiff and many of Sain's early records were done there, often with session players like Pick Withers and Dave Edmunds.

At first it was mostly solo artists, including Dafydd and Huw, performing folk music and protest songs: pro-Welsh nation and language, anti-nuclear and the establishment in general. "That it is done in Welsh is part of the message." (The English always find it hard to accept that people who can speak English still prefer to speak their own language.) In 1971 Sain moved from the city in the south to the countryside close to the coast in the north-west, with Caernarfon, the nearest town, about 3 miles (5 km) to the north. Many Welsh-speakers live in North Wales so Welsh is an everyday language here.

As Sain grew it made sense for the company to have its own facility so an 8-track studio was set up in a converted cow shed in 1975 with a custom-built desk by Rosser Electronics of

Swansea. Welsh rock and folk-rock bands were flourishing and for the next five years this studio turned out a stream of records, mainly singles and EPs. Gradually the range of material expanded to take in the spoken word and traditional and classical music with instruments such as the Celtic harp. In 1980 came the big step: a 24-track studio, purpose-built with financial help from the Welsh Development Agency on a loan and share deal.

There is no motorway and no direct rail link to the main business centre at Cardiff 120 miles (200 km) away on the other side of the Welsh mountains, yet the studio has managed to keep busy. "I think a lot of people get the impression that we're far from anywhere," says Dafydd Iwan, "But of course it depends where you start from, and being a producer of mainly Welsh records we're really in the centre of what is a very good sales area for us."

The rural setting also has definite advantages for a recording studio: "We've got plenty of room—no problems with parking, no problems with expansion—and plenty of quiet—very little passing traffic, the odd aeroplane is the only problem. And obviously many people who come here appreciate the fact that we're near the sea and near the mountains."

The studio was built alongside the record company offices, which are housed in what was once a military hospital. One room still has four beds so people can grab a bit of sleep on all-night sessions. More long term accommodation can be provided by arrangement with an hotel in Caernarfon or in winter months there are holiday chalets vacant nearby. Naturally the studio has kitchen and canteen facilities as well as vending machines.

An unforeseen advantage of the location appeared in the early 1980s with the development of the fourth television channel in Wales, Sianel Pedwar Cymru (S4C—Channel Four Wales), which carries most Channel 4 programmes plus 22 hours a week of programmes in Welsh produced by BBC Wales, HTV Wales (the regional ITV station) and independent producers. Several production companies also set up in the Caernarfon area.

About 25% of the Sain studio's work is now pre-recording and post-production for television, both for local productions and for BBC and HTV from Cardiff. The rest is record company material covering the full range from poetry reading and traditional folk music through light orchestral to massive male voice choirs and heavy rock bands. At busy times some record company sessions go out to other 24-track studios in Wales.

An increasing workload meant that post-production was keeping other sessions out of the studio. The solution was to equip a second control room to handle mixdowns, overdubs and VAPP, complete with digital editing. Design for this was carried out in-house, supervised by studio manager Bryn Jones who joined Sain as the company's first engineer in its original 8-track studio 13 years ago. He has since added the role of part-time producer and aims to combine a bit of engineering and a bit of production with the full-time job of management. He is also in charge of maintenance, and now studio design.

STUDIO SAIN

Along with much Welsh language recording, Sain's work includes everything from choirs and poetry to folk music and heavy rock. Tim Leigh Smith investigates



Studio One

The studio area is a comfortable size, 30×40 ft (9×12 m), holding up to 40 musicians. Design and construction were by Elliott Brothers. At the far end (live end) is an untreated stone wall built in traditional style by local craftsmen. This wall is convex with the centre almost 2 m thick. For full live acoustic the carpet at this end of the studio can be lifted to reveal a magnificent floor of local slate.

There is the familiar range of microphones from AKG, Beyer, Calrec, Neumann and Schoeps. A collection of instruments is available free of charge: Yamaha grand, Hammond organ, Ovation acoustic guitar, Yamaha bass guitar, Simmons electronic drum kit, Akai S900 sampler, Akai AX73 and Yamaha CE20 synths.

The control room is 25×25 ft (7.6 m) with a 28-channel Cadac fed via a full set of Dolbys to a Sony/MCI 24-track recorder and a couple of Sony/MCI 2-track machines. A Sony FI-format 2-channel digital recorder is also part of the complement. Outboard gear includes UREI limiters, Rebis noise gates, Ibanez delay line, AKG BX20 mechanical reverb, EMT 162 plate, Ursa Major StarGate, Yamaha SPX90 and REV7. Monitoring is on

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 TC allows fine tuning of parameters that are predetermined in other units.

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Engineer Don Rodenbach
Power Station N.Y.C.

“ I mostly use the sampling... flying in vocal chorus and verse. Error-free, no glitches, easier and more accurate editing of samples, and storing of edited samples in pre-sets are great features.”

Engineer Rob Eaton
Power Station N.Y.C.



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 sec. 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 looked 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.

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Tannoy *Buckingham*s bi-amped with HH V500 MOSFET amps. Check monitors are Visonik *Dauids* with Auratones available but currently out of favour.

Studio Two

The second studio has been in operation as a mixdown suite since March 1987 and has subsequently acquired an 8×18 ft (2.4×5.4 m) overdub booth for voice or single instrument. The 20×17 ft (6×5 m) control room has a 36-channel Soundcraft *TS24* desk with full Audio Kinetics *MasterMix* automation ("A very nice facility," says Bryn Jones). Computers and tape machines are tucked away in an adjacent machine room. Recording equipment includes a Sony/MCI 24-track and two Studer *A810* 2-tracks with centre-track timecode, all with Dolbys, and a *PCM-701* with HHB *CLUE* logging and editing system that has proved very useful.

In the outboard section are 10 limiters, six noise gates, and effects including AMS *rmx.16* reverb, Aphex *Aural Exciter*, Ibanez *DMD2000*, Roland *DEP5*, Yamaha *SPX90* and *REV7*. "We're looking forward to trying the new *REV5*, the full bandwidth version of the *REV7*." *Q.Lock 3.10* is available to synchronise pictures from a U-matic VT machine. Video playback can also be provided to control room and overdub booth from VHS or Betamax. Bryn Jones designed and set up the main monitoring, tri-amped with 3-way active crossover, using standard components. Check monitors are Yamaha *NS10M* with Visonik *David* and Auratone available if required.

The design is quite different from the main studio. "Because of the range of work we cover it has to be very flexible," says Bryn Jones. "One minute we're doing a TV job to picture and the next minute we could be doing a mixdown on a symphony orchestra." There are even windows so the outside world is visible. "We all find that it's a great asset to be able to see the light of day, and it does make a difference to the feel of the room—it makes it more like an ordinary living room. I think we've been mixing stuff for too long in rooms which were virtually 'acoustic chambers'. Obviously you have to keep sound out but we went for as natural an environment as possible rather than a heavily treated environment.

"One reason for that was I wanted a monitoring environment that was completely different from the monitoring environment where the stuff was originally recorded. Studio One is an 'Eastlake' environment because that's what we wanted at the time, it's designed for power and not particularly for definition and dynamic range, whereas the other studio we've designed for definition and dynamic range rather than power; it's much more analytical. We master almost everything on *F1* so we're trying to use the limiters less and less, going more for the dynamic range."

Even TV sound is getting the digital benefit now that Barcud, the local video facility, has an AMS *AudioFile* in its dubbing suite. "They just dump our *F1* into the *AudioFile* and then they can work with that." In theory the *F1* and a VT machine should both run at exactly the right speed. In practice there is occasional slippage but this is easily sorted out by editing and slipping sections into sync on *AudioFile*.

Location recording

Most of the leading Welsh male choirs who were formerly with major record companies in London are now recorded by Sain, often in performance at Eisteddfodau and suchlike festivals, going straight to stereo on-site using a portable *PCM-F1* system with a 12-channel Soundcraft *200B*. ("I like Soundcraft desks because they're so quiet," confides Bryn Jones.) Digital recordings of choirs inspired Sain's first CD release featuring the best 20 male choir tracks, including several performed by 1,000 voices at the Royal Albert Hall in London.

CD is the latest stage in a move away from singles and EPs which were popular in the 1970s to albums on disc or, increasingly, cassette which are the big sellers in the 1980s. Records tend to be cut by the likes of Harry Moss at Abbey Road and processed and pressed by PR Records of Wimbledon. Cassettes are handled by Grampian Records of Wick in Scotland ("The only people who send us back a cassette which sounds similar to the master that we sent them," says Bryn Jones). Packaging is completed by locally produced artwork to a high standard.

Like any other record company, Sain is hoping for wider markets for its products, within reason: "I know a few small companies who've had a big seller and it knocks them for six. They have to drop everything and concentrate on that one thing," Iwan recalls. With a potential audience of half a million Welsh-speakers in Wales the company is looking for ways to improve sales to the rest of the world. A growing interest in Celtic music in Britain and America is helping sales of Welsh folk music but for many people the language appears to be a barrier.

Iwan: "I think we've lagged behind Scotland and Ireland in the projection of our folk singing. There are a large number of excellent songs recorded in Welsh over the last 15 years or more, which are not known outside the Welsh audience. One thing we're thinking of doing is trying to get these sung in English because some of them are very good and we haven't really tried to sell them outside. I'm sure we've got a lot of songs that deserve a wider audience and that's something we're working on."

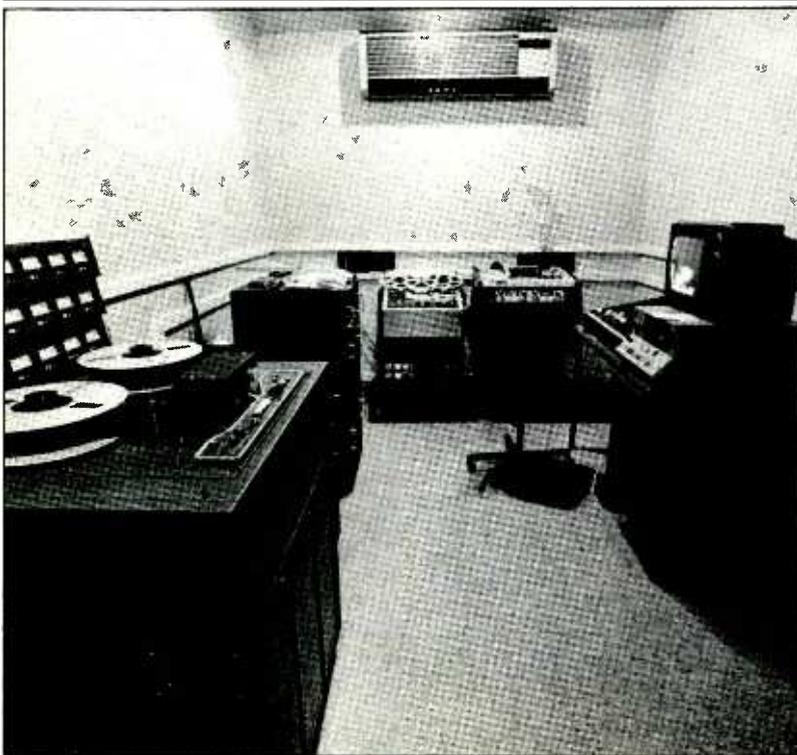
Sain does hire in an orchestra for some recordings, the most dramatic example being *The Gates of Greenham*, a two-hour musical work by Tony Biggin telling the story of the Women's Peace Camp set up outside the Cruise missile base at Greenham Common in 1981, which is still there today. The work was recorded in London at CTS Studios with the London Philharmonic Orchestra, the Quaker Festival Chorus, four soloists and two narrators.

"But primarily we're still the company which specialises in Welsh language material and the music produced in Wales, and that probably gives us a wider range than most other companies."

It is interesting to note that a cassette of songs in traditional style sung by Plethyn, a close harmony trio from Mid-Wales, captivated everyone who heard it. "The voice of Linda Healy, the group's lead singer, is arguably the outstanding voice of contemporary Welsh folk singing," says the Sain catalogue. □

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MY HEART leaps when I behold a headline as promising as that which stared out at me the other day from *The Times*. 'The anti-sound of silence', it read, and went on to give details of a device developed by British scientists to 'stop background noise drowning conversation in telephone boxes'. Apparently this 'active noise cancellation'

operates by means of a small microphone in the telephone, which identifies the background noise, and a micro-circuit produces an exact mirror image of its waveform, thus cancelling the undesirable noise. So the newspaper said, anyway.

In pensive mood, I pondered on the possibilities, while attending glumly to the sounds of passing trains, with their burdens of nuclear waste, bound for uncertain destinations. At the time, I was actually in the control room of a West London studio, waiting for the clatter to subside so we could continue recording a story by D H Lawrence.

But my thoughts were really elsewhere: if only this magical device described in the newspaper could be made to work, and remove all those undesirable intrusions. Why, such a miracle, encountered earlier, could have transformed the whole pattern of my life! But 'where is it now, the glory and the dream?' In this Wordsworthian humour, my mind went back over the years, to the days of the swinging '60s, when I was in charge of the British Council's Recorded Sound Section, located at the top of a London building.

In an earlier time than mine, this same building, Albion House, had housed the infamous Dr Crippen. There, in a cosy little studio, was gathered a collection of what would now be

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Traffic, toilets and underground trains are all things to be avoided when choosing studios to record the spoken word, according to Peter Orr

regarded as veritable antiques: a Vortexion WVB, converted to full-track operation at 15 in/s (a quarter of a century later, I am still using it for occasional editing), two series-4 Ferrographs, and a number of STC microphones, all sturdy objects (remember the 4021, 4033, 4038?).

At the beginning of my career there, I made the startling discovery that the main waterpipes were concealed within a casing in the corner of my 'studio'. Later, workmen brought in bales of glass-wool to serve as insulation but, of course, little improvement was achieved. We even began to consider placing notices throughout the building: 'Please do not flush toilet when recording is in progress'.

There was, it must be admitted, a certain eccentric charm hovering over those far-off days, and many of the poetry recordings which originated there in the '60s and '70s (recordings by Robert Graves, Stevie Smith, Ted Hughes, C Day Lewis, Sylvia Plath and many others), later made their way on to commercially-issued long-playing records, and a substantial number survive in the catalogue today. But we knew we were up against it, even then. It was distinctly disconcerting to receive an apparently serious request from overseas, asking for copies of tapes

'recorded at 7½ miles an hour, please'.

Then, when the time came to move to a new building where we were promised a studio to our specifications, it really did seem that my luck had changed. Eagerly, I examined the plans submitted by the architect: yes, every requirement had been met. But just as I was passing the drawings back

my eye fell on something immediately adjacent to my dream studio. 'Motor Room', ran the legend.

"Er, what is that?" I ventured nervously.

"Oh," said my almost-benefactor breezily, "that's where the lift motor is going to be."

"Does it have to be right there?" I demanded.

"Ah, yes, definitely. Can't go anywhere else."

"Well, could you move the studio somewhere else?"

A stony stare met this question. "Not a chance. Plans are firm now. Can't alter things at this stage. Don't really see you'll have any problems."

Well, the studio was never built, and after a few tedious years during which we attempted unsuccessfully to make spoken word recordings in a supposedly soundproof enclosure, rather like a large telephone box, the time came for the British Council and me to part company. I don't think they ever understood the cause of my dissatisfaction.

Indeed, almost a decade later, I am still surprised to realise how very few people are willing or able to recognise the special problems presented by speech recording, and to acknowledge the fact that it is so appallingly vulnerable to every thud, creak or whistle, to the sound of rain on the roof, nesting starlings in the





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eaves, or underground trains (yes, once and once only I did do a production in Kingsway Hall), to aircraft, and to all the various sounds of this planet of ours.

Following correspondence in

Studio Sound, I have been taken severely to task by the proprietors of several studios, who seem to have formed the impression that I am really expecting too much. One blunt correspondent in Leeds levelled the following accusation at me: "Have you ever stopped to consider," he writes, "that you might exert a malevolent influence on recording equipment?" Perhaps he has a point there, but I must leave that verdict to the mercies of time. For here (as they used to say on *The Goon Show*) is where the story really begins.

It concerns a series of memorably painful sessions which, in line of duty, I was called upon to endure recently. In fact, things were so bad that after the first day's sessions, the man from the studio telephoned me at home, overflowing with desperate apologies, and saying plaintively: "I don't want you writing about this in *Studio Sound*!" Well, sorry old chum, but such disturbing events as those I am about to relate do demand a faithful chronicler, in order that they may serve as a stern warning to others. So here is an honest, unvarnished account of the rigours to which I was submitted earlier this year. The location is 'somewhere in the north of England'.

To begin with, I had misgivings. True, I had recorded in that part of the world before, sometimes with a Uher in somebody's living-room, and the results had not been utterly discouraging. But then I remembered a studio in the centre of town, located directly under a works canteen, which situation rendered recording quite impossible at the morning coffee hour, at lunchtime and afternoon tea-break. At least they

WE INTERRUPT THIS PROGRAMME...

name which was something similar to *The Coach and Horses*; in the course of these adventures, I was to investigate the qualities of both establishments. But first, for my peace of mind, I needed to take a

look at the studio. It seemed much the same as I had remembered it, the dust almost undisturbed, in fact, by the intervening years. Assurances were given that all the equipment was in working order, and so I ambled contentedly across the road for a Madras meat and rice. That was to be my happiest hour for some days.

The distinguished artist arrived promptly, and without unnecessary preliminaries we launched ourselves on the first of four scheduled sessions, in the course of which the intention was to produce a final master of around three hours' playing time. He was very familiar with the work, having appeared in a film version of the same, and proved, in any case, to be a naturally fluent reader. On this occasion, we were running an analogue master at 7½ in/s, which meant fewer breaks for reloading. Everything seemed set fair, though I did begin to wonder nervously about the roadworks outside.

Readers of *Studio Sound* may recall from previous issues, accounts of disasters which have overtaken me in the past. All of them combined pale into nothingness beside what transpired on this occasion. In the first place, the siting of temporary traffic lights hard by the front door meant that the traffic, which seemed to consist largely of heavy lorries, buses and high-powered motorcycles, was at its noisiest just as it passed the studio. And then the taxis... well, affluence must have come to that part of the world since last I was there, because on the evidence of the transmissions which broke through on the monitors with such alarming frequency, the carriage trade seems to have multiplied tenfold. I

had the good grace not to submit a bill after a series of very frustrating sessions! But this time, I was bound for a proper studio, where I had worked eight years previously with no greater problem than very occasional breakthrough of taxi transmissions. I set out, quite confident that all would go smoothly.

Men were digging up the road outside when I arrived hours ahead of the start of my sessions with one of Britain's most famous stars of film, television and theatre, the road-menders had beaten me to the site by some weeks, perhaps even months, and were firmly established in those little temporary habitations (comfort stations, perhaps?) which have become so familiar a part of our urban landscape. There was no sign that they were going to move on in a hurry; indeed, they had set up one of those ingenious arrangements of traffic lights designed to ensure that there is no movement at all from any direction for long periods. Already, I noted, a line of heavy trucks was forming. When they all start off in first gear, I thought to myself, there's going to be quite a din.

Although beset by a few minor misgivings, I entertained no serious doubts at this juncture that the soundproofing of the studio would be more than adequate to deal with this unexpected activity on the doorstep. And it was good to be working in the north again. I am not prepared to be more precise than that about the location, though curious readers will find one or two clues in the course of the narrative that follows. There was an Indian restaurant over the road, and a solid-looking pub a little further away, with a



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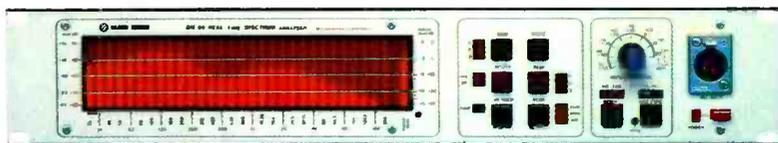
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came to form a positive dislike for the lady despatcher, whose high-pitched, metallic voice persistently invaded our recording.

It is hard to believe that one could continue to work under such

distractions, but carry on we did, with an interruption compelling a retake roughly every 20 seconds. The studio engineer, an agreeable young man with wife and family, was openly embarrassed, and spent most of the first session apologising. The artist, after an initial outburst of

WE INTERRUPT THIS PROGRAMME...

dismay and disbelief that anyone could even contemplate recording the spoken word in such a place, heroically settled down to what was clearly going to be a very uncomfortable task. Inwardly, I suspect, he gave vent to doubts about the sanity of the producer who had lured him there.

After the first session, the studio owner suggested I move 30 miles away, where a friend of his had a much quieter place. I pointed out that this would not be possible as we were well into recording, and matching the acoustic would be a problem. In any case, my distinguished artist had good reasons for not wanting to stray far from the town centre, since he was appearing each evening at a theatre there. So we soldiered on in the stop-start-stop-start mode, hour after hour, with no respite from taxis, buses and lorries. It still amazes me that we were able to keep going.

Sunday morning came round at last, the final day of the gruelling ordeal. Taking no chances, I arrived very early, just as rain was beginning to fall. Someone at the studio who claimed to have eaten there recommended a pub just down the road for Sunday lunch. "Very good value for money," he insisted. But my prudence meant that there was time to kill, and meanwhile the rain was coming down more heavily. Everywhere looked grey—I was beginning to feel grey myself. In the immediate vicinity, the choice lay between a Pentecostal and a Roman Catholic Church; I escaped from the rain into the arms of the Catholics. When I turned from spiritual to more mundane refreshment, lunch turned out to be rather what I had feared. Roast and two veg, but the beef (I *think* it was beef) had been cooked beyond recognition until it resembled pieces of leather, which were then covered with a brown glutinous substance intended to represent gravy; and what had been done to the cabbage, boiled into total submission, should, in my opinion, be classified as an indictable offence.

Another thing I discovered that day: despite what one hears to the contrary, there are some parts of Britain that enjoy a very frequent bus service on Sundays. This was one of those places. And so the dreary routine was renewed, and the hours went by. The afternoon wore on, and the light outside began to fade fast. We were very close to the finishing line now. One more paragraph, and it would all be over. "The river of life..." began the reader, only to be answered by a roar from outside. "And the street of buses," he added sardonically, departing from the prepared script.

Undoubtedly, he was the real hero of the whole business, and it is with genuine gratitude and admiration that I salute his sheer professionalism and indefatigable determination. Had he walked out of the very first session (a producer's recurring nightmare), no vestige of blame would have attached itself to him. But together we saw it through, and although the laboriously handcrafted master contains over a thousand joins (a veritable nightmare of editing), the result is a remarkably polished and impressive reading which gives not the slightest hint of the difficulties encountered in its making.

There is a cruel twist in the tail of this story; one final irony. Very shortly after the duplicate masters were received in the USA, the company who had commissioned the recording went out of business! Perhaps some day, somewhere, someone will be able to hear the results of our efforts. I hope so. Meanwhile, my search for the ideal studio continues. All advice gratefully received. □

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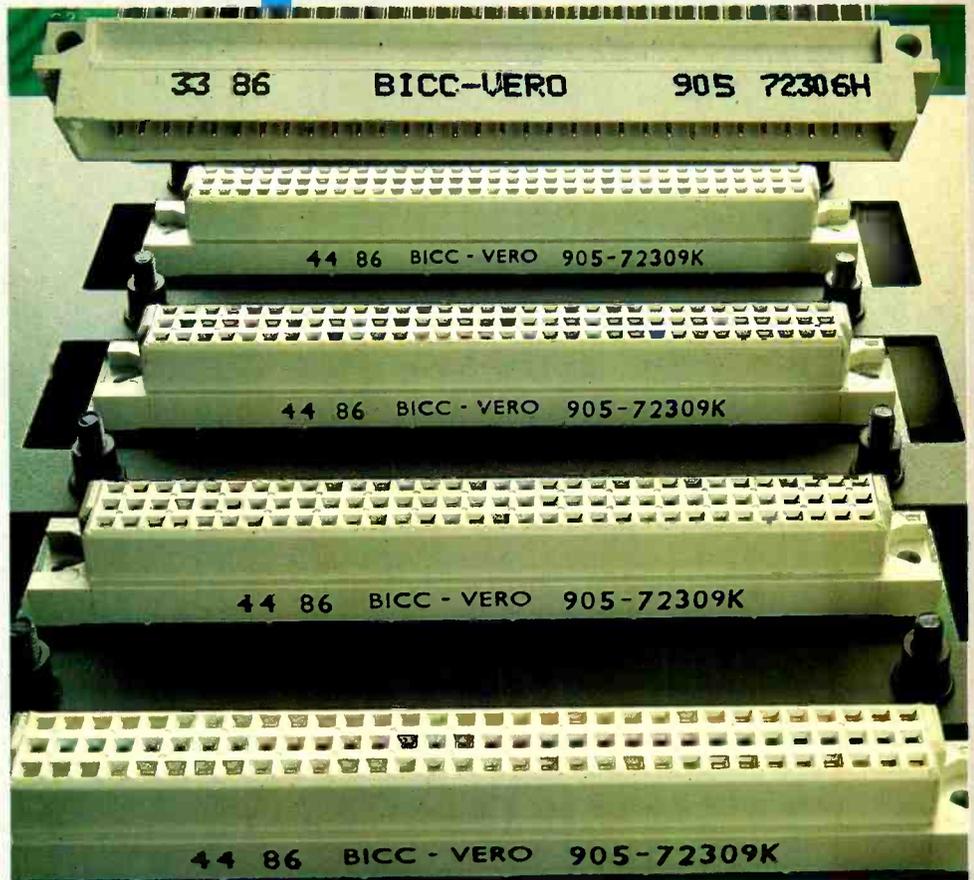
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THE SCORPION – IN A CLASS OF ITS OWN



ARTHEA STUDIOS

Terry Nelson visits a studio nestling in the foothills of the French Alps

Arthea studio is situated in a large country house on the outskirts of Grasse, in the south of France. Grasse is internationally known as one of the perfume capitals of the world and overlooks Cannes from the foothills of the Maritime Alps.

The Arthea story began in 1967 when a group of French musicians joined forces to open up new areas of musical exploration. Calling the exercise 'Sound Gestation', their aim was to experiment with musical influences from all over the world. The group was originally called the *Horde Catalytique pour la Fin* and embarked on a series of concerts, broadcasts and records combined with musical instrument research until 1973. Two members, Goa Alloro and Franky Bourlier, decided to continue with the Sound Gestation concept and the design and manufacture of new instruments. Arthea (Association for the Representation of Technical and Artistic Expressions) was formed in 1975.

In 1979 Grasse's town council put an old country house, Le Prado, at the group's disposal. Further grants from the cultural department of the French government and the regional committee of Marseilles enabled the purchase and installation of specialised machinery for the construction of instruments and accessories.

In 1983 sound engineer/technician Patrick Jauneaud joined Arthea, paving the way for the building of a professional recording facility. Jauneaud's varied background encompasses studio and maintenance engineering both in France and abroad (USA, England, Africa, Jamaica) doing everything from radio commercials to classical music. He also has experience as a live sound engineer which stands him in good stead for Arthea's stage performances when, as sound engineer, he becomes a member of the group.

While being an experimental unit is very interesting from an artistic and technical point of view, it inevitably tends to suffer from lack of funds. Patrick explains: "When I joined the

association one of my immediate concerns was to build the studio to professional standards and this was going to need a certain amount of financing. We could get the basic shell of the studio ready ourselves but the actual treatment still posed a problem until Superbear Studios came to the rescue."

Patrick was formerly maintenance house engineer of Superbear. "The owner was in the process of winding up the studio and all the audio equipment had already been sold. However, the Eastlake acoustics were still in place and I was asked if I knew anybody who would be prepared to demolish them so that the house could be restored to its former occupation of a restaurant. The long and the short of the story was that we were up there almost the next day with a lorry taking the acoustics to pieces as carefully as possible in order to rebuild them here in Grasse! It was just as well we moved fast, too, as the house was burned down the day after the last load, during in the forest fires that always ravage the south of France in the summer."

The studio is installed on the top floor of the house at Grasse. By sheer coincidence the control room dimensions matched almost inch for inch those of Superbear.

"This was a real stroke of luck as it meant minimal adjustment was required in order to rebuild the control room. The main difference was in height but this proved to be no real problem. However, I can tell you that those Hidley rooms were really built to last! We thought taking it to pieces would be easy but we did lose some material when we had to resort to saws and sledgehammers—and the volcanic rock is not exactly what you would call light!"

Though the acoustic treatment was coming in virtually free of charge, it entailed a lot of work. Could Arthea have done anything simpler?

"First of all, the opportunity was too good to miss—it would have been a terrible waste. Secondly, the acoustics at Superbear were very good and provided a good reference so it would mean having that same reference here in Grasse.

"I must say that I am very pleased with the results. The monitoring is different, we have UREI 815s which are mounted in such a way as to be isolated away from the monitor bridge, but I feel we have maintained the basic character of the room."

The acoustics feature a hardwood front area with trapping in the rear half of the room together with some wooden panelling. The monitor bridge features some very fancy marquetry work that blends in very well in addition to almost hiding the monitors! An added advantage is that there is lots of sunlight due to the room having windows and the outside world is suitably isolated when these are closed. The view goes straight down to the Baie des Anges and the surrounding coastline.

The equipment is mounted together in a central frame. "Everything has been made to be transportable. We use the same equipment for the concerts and the studio in order to keep continuity. It also enables us to do location recording."

The console is a DDA *D* series with 28 input channels and eight groups. "The quality is very good and using the direct channel outputs for multitrack is perfectly satisfactory." There are supplementary modules for 24-track monitoring and the studio plans to expand the number of channels "as soon as requirements and finances permit!" The DDA has also been made 'more studio' by having had an Eela 809 phase correlation meter fitted.

Recording centres around a 'highly modified' MCI *JH24* with transformerless electronics complete with a *JH45* Autolock for audio and A/V sync.

"We got the *JH24* secondhand at a good price and as I know the machine well I have been able to tune it up to quite a high level performance. The MCI is really a good basic machine and if you look after it, it gives very good results. The modification to transformerless operation has turned out very well and running the machine at high speed without noise reduction makes for a very good sound."

Digital mastering is the order of the day at Arthea with two Sony *F1/U*-Matic systems, a Betamax *SLF1* and a Technics *SV-P100* PCM recorder using VHS cassettes. "The latter is a good machine though the one we have is NTSC so it is only good for in-house use. A lot of our work is straight to stereo and that means that we have a top quality master recorder. We worked out that it would be virtually the same to buy *F1* PCM as to get a top-of-the-line analogue recorder so digital seemed

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the obvious choice. We are certainly very pleased with the results." There is also a Revox A77 recorder.

Effects consist of two Bel BD80 digital delay/samplers with 16 s of memory each, Lexicon PCM50 and Roland SRV2000 digital reverbs, Drawmer 221 and 201 dual compressors and gates, and various equalisers, including Ashly SC-66A 4-band parametrics.

Monitoring (as previously mentioned) is on UREI 815s driven by a Bose 1800 series amplifier with NS-10s and Auratones for nearfield listening.

Electronic instruments in the control room include a Yamaha DX-7, a Linn Drum and Atari 1040 computer with Hybrid Arts MIDI software. The latter provides up to 60 tracks and 60,000 notes together with synchronisation to SMPTE, MIDI and non-MIDI. A Genpatch function is also included which acts as a MIDI patching system.

The studio is accessed from a corridor (which also serves the control room) and looks out towards the sea. The drum booth from Superbear has been installed in a corner near the control room and the rest of the room is finished with carpet and traps for wall and ceiling. The windows have been angled out into the room in order to reflect the sound up into the ceiling trapping and cut down on resonances. The overall sound is best described as being precise with a very short reverberation time. The hardwood of the drum booth provides a live area for recording when required.

In addition to the upstairs studio one of the ground floor rooms is also used as a recording room tie-lined to the control room. The second room provides more space as well as a 'non-studio' atmosphere, conducive to creativity.

"This way the musicians can just get on with playing without having people peering through at them from the control room or

ARTHEA STUDIOS

feeling the pressure of being in the studio. As soon as things sound as if they are starting to get interesting I can start recording without them being aware of it."

To facilitate their research, Arthea have the rare luxury of a large anechoic chamber which has been built on the top floor near the control room and studio area. The chamber is reached by a short entrance tunnel and the size would keep many a loudspeaker manufacturer happy.

"The room gets used for all sorts of things, from testing pickup systems for acoustic instruments to speakers, etc. We found that it was necessary to install an emergency signal system in case anyone got accidentally locked in—half an hour in here and you're likely to be carried out screaming or in a coma! However, we have had some people doing what I can only describe as 'controlled experiments' by coming in here with an instrument and being recorded when they are in a state of total isolation. For these cases we always install a video camera in order to keep an eye on things."

Arthea is far more than just a recording studio and it is in the other aspects of Le Prado that much of the real interest lies.

"It is clear that compared with many of today's studios we are fairly basic as regards equipment—though we can do a very good

job! What we do have that is different is a vast library of sounds that has been accumulated over the years since the original group in 1967. The thing that is different is that all the sounds have been generated acoustically (ie: no synthesisers) and offer a unique palette of sounds to work with.

The library is now all stored on digital cassettes for easy retrieval and offers a formidable workbase for those who are looking for something completely different.

While many musicians and studios are producing sounds by pushing buttons Arthea are taking a different approach, building acoustic sources of different sounds (without turning their backs on electronics, of course) and it is this that makes them unique.

The instruments they manufacture are the result of close studies of existing instruments from around the world, traditional and non-traditional building materials and research into the resonant and vibratory characteristics of different methods of construction, strings and bridges. The range of instruments evolved includes wind, strings and a whole family of percussion instruments.

For instance there is an Iranian-style bass flute made from brass. Its length of 3 m makes its lowest note A/53 Hz. The scale is non-tempered with 16 notes/octave. The Bass Tar is a metallic instrument that bears some resemblance to the early 'pogo stick' electric basses. It has a range of over seven octaves and employs six melodic strings played either pizzicato or with a bow and a series of sympathetic strings.

In the percussion range two interesting examples are the tamera, an outside 'flute of pan' which provides tuned percussion with a variety of sounds and a new development of the drum, consisting of a flat soundboard with different shapes cut out and covered with drum skins. Though the 'drum' does provide some interesting sounds acoustically, it is fitted with special transducers for use with amplification.

"A special part of our research here into instruments is the design and manufacture of transducers, pickups and systems for the proper amplification of acoustic instruments, be they our own or standard instruments such as the guitar, saxophone, drums, etc. The difficulty is building units that are unobtrusive and do not mar the instrument, can provide true reproduction of the vibrations without colouration and can be used with high-power amplification without feedback problems; we are making very real progress in this area."

The influence of rack-oriented electric instruments has resulted in an ongoing series of electric stringed instruments using a combination of pickups and transducers, melodic and sympathetic strings, pedal-actuated string tension changing, etc. Latest in the series is the altar which uses a bamboo body and is fretted in a similar manner to the sitar, thus allowing changes in scaling.

Their aim is to offer the international musical community a different approach with a unique library of sounds, played either by members of Arthea or visiting musicians and leaded into sampling machines. With the modern appetite for 'new sounds' Arthea should be successful. However, the unusual atmosphere combined with the sunshine and scenery of la France Provencale mean there is more to Arthea than just sounds. □

Arthea, Le Prado, 55 route Napoleon, 06130 Grasse, France. Tel: 93 36 51 04.



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MARTIN
POLON'S

PERSPECTIVE

A number of engineering school seniors clustered about me as I finished my talk on the future of the audio industry at a major university. Well-dressed and articulate, these budding engineering graduates represent an encouraging mix of men and women from many different backgrounds. The thought that motivated many of these students to talk to me was their candid effort to obtain an accurate assessment of the audio career market.

I have never in my life been faced with a more vexing dilemma. I wanted to say, 'What a wonderful way to earn a living.' On the other hand, I have been conducting research into the business side of the industry for many years. I really wanted to provide these fine young people with an honest and positive assessment. I finally settled for a more realistic appraisal similar to the one I deliver regularly to my senior-level university classes in the business of audio. I told them that there was going to be an awful lot of hard work involved but if they loved it, they should reach out for their future in audio.

We certainly need to keep young people moving into the audio profession. Yet, in a human sense we must level with them as to the dimensions of an audio career: positive and negative.

Many of these talented individuals possessed significant computer skills in both hardware design and software creation. I had to let them know that they would be experiencing a considerable pay differential between the audio and computer industries. In fact, the level of pay in the audio field is the lowest pay level found for technical employment in the US or UK.

The ultimate question is whether the audio job marketplace in 1987 really provides opportunity for entry by new practitioners. One problem in seeking and holding employment in audio is that of identity for those who work in the field worldwide. I use the phrase audio practitioner because it best describes the role of all those so employed. It implies a high level of skill and job confidence and most of all a well established aura of professionalism.

The term engineer is frequently applied to those who mix the sound. In England, some mixers are called exactly that and the repair and technical staff are called engineers. Sound reinforcement staff at many convention and meeting centres are known as sound engineers or staff engineers. Technical employees in the television industry in the United States are known as engineers and an audio mixer at a television station would be called an audio engineer. Other individuals serve in audio as sound men (sound ladies?), media technicians, audio people, or as operators. Legitimate engineering graduates frequently work in audio as designers, design staff, technical support, or as acoustical specialists. It really is important that we have a standard term that implies skill without confusion and practitioner may well be it.

The size and shape of the job marketplace in audio is changing dramatically as the end of this decade nears. Whatever the job title, the number of audio-related jobs has shrunk but many of the remaining jobs are increasing in stature and compensation. Much of the loss, which totals about 14% of the job total measured at the beginning of the 1980s, is a result of expanding technology in audio. The use of microprocessors has been especially telling in automating audio systems.

The total number of professional level jobs available in audio has been estimated in a recent study as about 100,000 jobs in North America and about 70,000 jobs in Western Europe and the UK. There are, in addition, another 80,000 jobs that involve audio but which could not be defined as professional or as requiring significant skill levels in all cases. Most of these 'second tier' positions are in mass market consumer audio sales and service.

Opportunities

The areas of opportunity for professional employment in audio cover the following major categories.

Recording studios: The figure of 20,000 jobs is used here to measure the positions available. This statistic is difficult to quantify since the base used is for 10,000 studios with two positions per studio. In fact, many conventional studios have been replaced or augmented in the marketplace by 'home' studios with owner-operators taking the place of paid employees.

Record preparation, production and distribution: These 2,000 employees of the world's record industries are involved in pre-mastering and mastering, pressing, duplicating, engineering and development, quality control, etc.

Motion picture production, distribution and exhibition: The majority of the workers in these 7,000 jobs are either union members or belong to a trade organisation. They are amongst the best paid workers in the audio industry. This category also covers the production of TV programming if it is on film and shot at a film studio.

Television production, network operations and station operations: This total of 12,000 people involved in audio covers chief engineers at individual stations, audio mixers/console operators, news sound mixers, and maintenance staff. All audio production personnel are part of this total, whether they are involved in original production pickup and mixing or just brought in like 'hired guns' to handle the post-production mixing. Also covered in this category is the production of television commercials: a sizeable consideration in its own right.

AM, FM, SW radio broadcasting, programme production and syndication: There are about 15,000 jobs in this category in the so-called Western World. This includes operations.

production and maintenance. Also covered here are radio jingle and commercial production. *Audio for the theatrical stage:* Although it does not seem possible to justify this number, reliable estimates place 2,000 people in this employment category. There is a great deal of legitimate theatre that goes on beyond the West End and Times Square.

Audio/visual media for industry, government and education: This is the primary category of professional-level employment in the audio industry with 34,000 individuals gainfully employed. This category covers all levels of industrial media planning, production and presentation. It also has begun to include radio and/or television commercial production has some companies bring these activities in-house. Industrial television is also included.

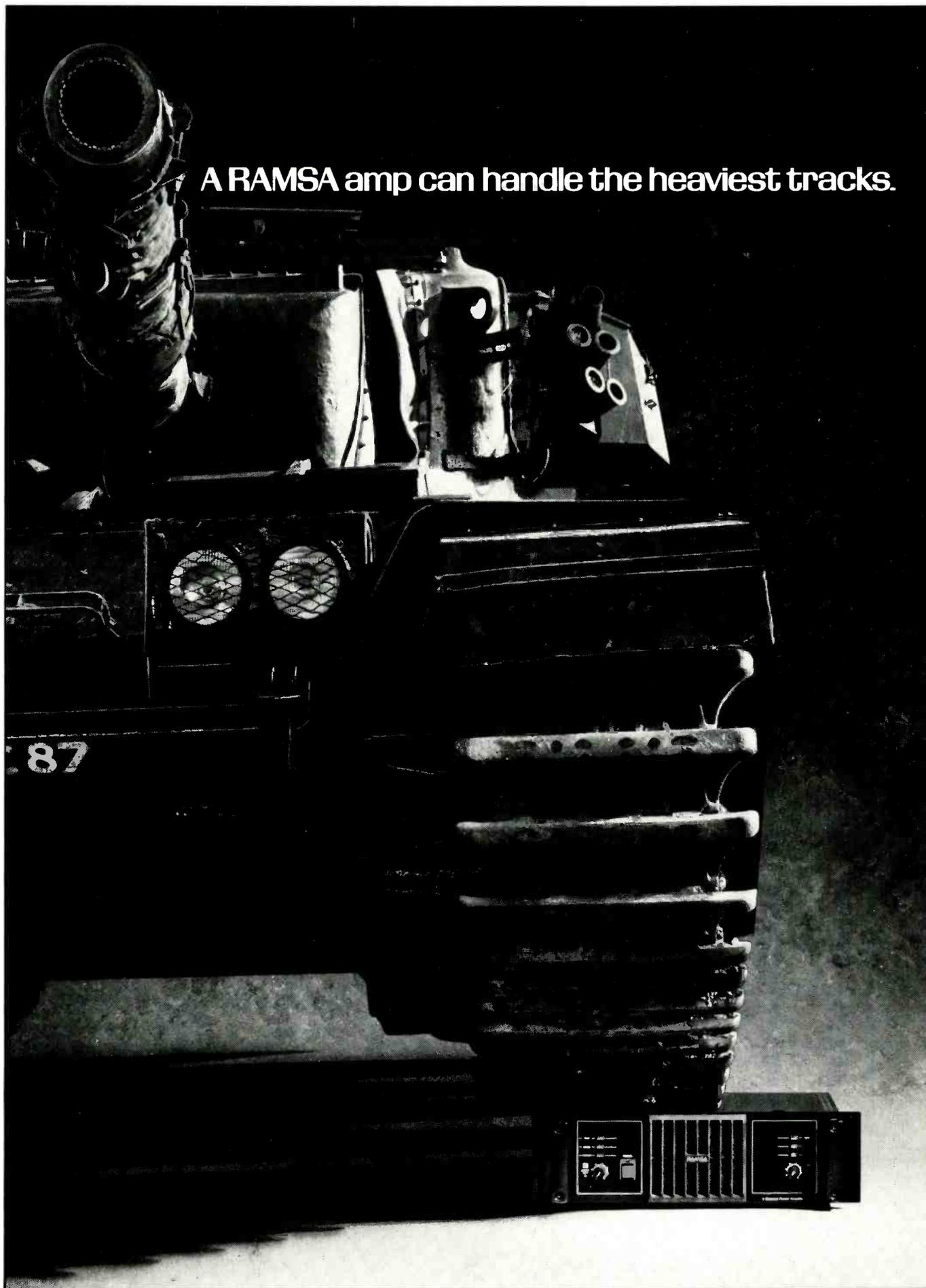
Sound reinforcement operation, installation and maintenance: This category is the second largest employment area in professional audio. The 25,000 practitioners here are frequently union members. Compensation ranges from the lowest level for sound operators at hotels to the highest level for union operators at large arenas. Much of the contracting activity transcends this category and includes turnkey installations for broadcasters and studio operators. It also includes the operation of national, regional and municipal government auditoriums, convention facilities, arenas and meeting complexes.

Communications systems including telephone, satellite and cable TV: The 12,000 workers in this category are generally involved with the transmission of audio from point A to point B or C or Z or all of the above. The cable industry does frequently originate some kind of local programming and the audio requirements of thousands of local cable systems are reflected in the jobs indicated here.

Aerospace, industrial and military development and applications: One of the lesser known categories but generally well compensated. The 6,000 people employed in this area perform a broad range of duties ranging from the design of 'on-board' audio entertainment systems to computer voice recognition and voice synthesis for the 'office of the future.' Military work can range from reinforcement and mixing of military bands to design and implementation of extremely large transportable sound systems for area notification. *Audio equipment design, manufacturing and distribution:* The 6,000 individuals employed here are responsible for creating the equipment that is used by all of the other categories here. Although the basic emphasis is on hardware creation, the emerging usage of microprocessor-based control of audio systems and equipment has made software creation a corollary goal in this category. Whether the equipment is consumer or professional, it provides jobs across the board. One curious aside is that there are now more research and development (R&D) jobs in consumer than in professional audio due to size, scope and funding of the world's consumer audio industry.

Professional audio equipment sales and service: Generally, it is the ability to sell refrigerators to Eskimos that characterises the 4,000-odd workers in this category. Frequently selling against commission, this category can be labelled amongst the most affluent in audio. Not only do these people have to be knowledgeable about technology, but they must have the gift of interesting conversation necessary to close a sale. In another vein, service personnel are frequently the reason for the success of a particular company. Numerous studies confirm that equipment purchased outside of the home is

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MARTIN POLON'S PERSPECTIVE

frequently brand identified by potential users because of service-related issues.

Consumer audio equipment sales and service: The 11,000 workers in this category are sometimes subject to derision from other audio professionals but most often have the same kind of credentials as their so-called professional counterparts. The vast majority of these jobs are with high-end audio retailers whose affluent customers demand the highest quality of assistance. The number used here represents a very limited number of employees in a very limited number of shops in each city considered within the geography of this accounting.

Audio in medicine: A limited category responsible for breakthroughs in ultrasound and acoustic imaging. A large percentage of the approximately 1,000 practitioners here are involved in audio-related research.

Security and law enforcement applications: Another limited category whose 1,000 practitioners are found amongst such organisations as the FBI, New York City Police Department, Special Branch (Scotland Yard), Metropolitan Police (London), and in practice as specialists working with solicitors and other clients.

Sound equipment/sound system rentals and temporary installations: Generally, these 2,000 workers have plenty of physical exercise and frequent exposures to the outdoor life in putting audio reinforcement 'on the road again.'

Electronic music sales and service: Slightly over 4,000 toil at the task of selling musical electronics for synthesis, emulation, sampling, MIDI-based control and creation and related components such as reverberation systems. The so-called 'home studio' category has been most usually serviced by those in this category.

Audio education: The category responsible for the training of those who will fill many of the jobs that open in all of the other categories. The 1,000 or so academic employees come from a diverse range of institutions. Schools of furniture and of funerals, colleges of music and of mass communications, of engineering and of physics, of broadcasting and of business, vocational training and of creative production. This category also includes support and service personnel.

Miscellaneous positions in audio: Everything that does not fit into another category fits here. The 5,000-odd audio practitioners in this all-embracing department include psychologists, physicists, forecasters and analysts (present company included), plus hundreds of other categories too diverse to fit here.

Goals

Even with this snapshot view of the job market in audio, the question still remains to be answered. Are jobs in audio really good jobs? One way to answer that is to use standardised employment

goals developed by management consultants to fit a broad range of industries. By using these goals, we can try to take the measure of the audio employment marketplace.

Variety of responsibilities: Does a job provide for a variety of responsible tasks? The answer here is that it depends upon the job in audio that is being examined. In this category, it does not appear that audio employment is any different to employment in any other industry. Some jobs will have a variety of responsibility and some will not. Certainly, many audio jobs in TV and film will have a variety of creative responsibility as one project is finished and another totally different one is started. The same could be said for A/V media production.

Salary: does a job provide comparable worth when compared with other technology-based employment? In this category, the audio job will almost always lose a comparison with other kinds of similar employment. However, union members (especially those in film and TV production plus TV station operation), will post impressive salaries comparable to work in other disciplines. The lower general rate of pay in audio is usually compensated for most by the love of what they are doing and by the greater flexibility frequently found when employment is in the electronic entertainment sector.

Opportunity for advancement: does a job provide for steps up the management ladder? Several studies have indicated that the audio professional finds satisfaction somewhere between his or her second and third job. The satisfactory situation usually encompasses enjoyment in task fulfillment and the opportunity for salary increase over time, but most often does not allow for management advancement within the job. In fact, it might not be out of line to state that in the audio business, professional and/or management advancement is frequently achieved by moving from job to job rather than within a given employment situation.

Workload: do similar jobs have similar workloads? For unionised personnel the question of workload is controlled by the high rate of pay and the automatic ascension into overtime when the contractually established workweek is exceeded. For non-union staff in audio, the usual option is to receive some kind of compensation for time worked, whether it be compensatory time off, continued straight time or overtime. This blue collar attitude has been a part of the audio business since its beginning and most usually involves operational and production staff. Sales personnel and engineering personnel are much less likely to adhere to these kinds of strict rules. Those on commission will work to their capacity in the quest for that commission.

Non-monetary recognition: does a job provide for peer or social or superior recognition of excellence? It would appear that in the areas of record, film or television production a kind of camaraderie develops and rewards all concerned when a successful project is completed. That point

could also be made for most of the categories of employment in audio listed above. It is the nature of the electronic entertainment business.

However, there is frequently the historical bugbear of 'visual over aural' or 'audio after video' that can plague a dedicated professional in theatre, film or television. Sound reinforcement has its own curse of there being no kind words if it sounds good—if there is feedback, better pack your bags.

Performance review process: does a job have a built-in system for review and salary advancement and how does this relate to performance? This is as much a mixed bag in audio as it is in other related fields such as video, photography, etc. Too much of the bag of tricks used by audio management today is out of the 'by gosh and by golly' school of management left over from the adolescent days of the industry. Most manufacturing positions depend upon personnel departments to implement such systems. For those in sales, a kind of quota system rules. You sell—you win. Union staff have set procedures with little or no variance possible. Some people will resent the picture I am drawing here, but the audio industry could never compare itself to the handling of human resources issues at IBM. This is not to say that what is being done in audio is necessarily bad. Big companies in audio more closely resemble big companies anywhere, and small companies in audio still frequently fly by the seat of their pants.

Professional status: does a job convey a sense of status of the chosen profession to its holder? This is in the vernacular a tough call to sort out. The issue pretty much follows colour of collar lines. Audio white collar types in sales, engineering, management and administration/financial most usually do indicate a sense of status. Blue collar operational and production types find themselves frequently regretting the status issue, however high their pay rate.

Reputation of employer: does the reputation of the employer enhance the employment? For a majority of those working in audio, the answer is yes. Being in film, records, television, radio, theatre, concerts, etc, is just plain sexy in our society. So is mingling with top name artists and stars as though everybody is part of the same team. Working for a three-letter TV network or four-letter TV station has a great deal of status, even if you spend your days in a sub-basement repairing ailing control circuits on analogue audio tape recorders.

Job security: does a job promise some level of employment security? The toughest and most difficult question to answer today. You are as secure as your skill level will make you. It is not that the audio industry is any more cut-throat than any other in the corporate Western World. What we are seeing is a mirroring of the outside world of takeovers, union-bashing and mergers with all of the associated personnel cutbacks. The best that can be said is that an audio job is likely to have the same conditions as any other job in today's marketplace.

So what is the bottom line? What does one tell young people who are looking for a job in the audio field? One says that it is at once the best of all possible worlds and a fascinating way to earn a living. It can be one of the most difficult professions in the world to enter but if hard work and perseverance are applied liberally with enthusiasm, then fortuitous results will be the outcome. As long as audio job seekers know the pluses and minuses of the industry at the outset they will not be disappointed when they land their first job in audio. □



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BARRY FOX'S BUSINESS

As 1987 drew to a close and the full-scale launch of CD Video receded into the distance, everyone got down to the serious business of busily blaming everyone else. By the mooted launch month (December) it looked increasingly unlikely that players and discs in volume would be available before March 1988, a full year after the system was first unveiled to the world's press at Amsterdam.

Favourite whipping boy was the software industry, for not making enough films and pop video clips available. In turn the software wallahs blamed technical problems and mastering bottlenecks. It's as if no-one remembers going through all this before, first for Laservision videodisc, and then for compact disc audio. There's such a turnover in the software industry, that often no-one has been around long enough to remember past mistakes.

As usual non-technical spokesmen were giving technical opinions. Len Eband, senior vice-president of music and video at Polygram Records in America, told *Billboard* why there were holdups on CD-V mastering.

"What makes it complicated is that the sampling rate varies between digital for CD-V and digital for normal CD, and you need a special computer to translate the time numbers."

He's got it wrong, said Philips in Europe. He was misquoted, said Polygram—what he meant to say was that there was a difference between CD sampling rate (44.1 kHz) and the sampling rate for digital audio with video (44.056 kHz).

Whether Eband did or did not understand what he was talking about, the mastering bottleneck is all too real. Virtually everything in the West goes through Philips in Eindhoven; and there are indeed terrible problems over making a CD master with 44.1 kHz soundtrack, from an NTSC 1 in video recorder synced to separate digital audio tapes that have been recorded on an NTSC video cassette recorder at 44.056 kHz. Many tapes received by Philips are wrongly prepared.

With commendable foresight the organisers of the recent Digital Information Exchange Seminar asked Philips Du Pont for someone to speak about the problems and how they can be solved. Gert-Jan Vogellar, of PDO, gave a full description of the awful confusion that exists. But I was very soon mentally adrift in a sea of almost-but-not-quite-the-same sync tracks running at 30 Hz or 29.97 Hz.

And, wait a minute. The talk that Vogellar delivered was virtually the same as the one he had given the month before at the AES Convention in New York. So a roomful of engineers, living and working in a PAL Continent, heard all about the problems of mastering NTSC videodiscs from NTSC masters. Digital audio recorded on a PAL VTR will have a 44.1 kHz sampling rate. Problems in Europe arise when NTSC video tapes are sent over from America for transfer to PAL format for release.

But surely the problems of PAL-to-PAL and NTSC-to-PAL mastering are enough, without getting PAL engineers bogged down in NTSC-to-NTSC syncing?

At one point, Vogellar referred to the need for backwards compatibility, so that new CD-V discs will play on old Laservision players. This is true in NTSC countries, but *not* in PAL countries. It's seriously worrying when a spokesman for Philips lecturing in a PAL country forgets that the PAL CD-V format has only a digital soundtrack and thus new discs will not play on old Laservision players—which, of course, had only analogue sound decoding circuits. It is only in NTSC format that there is room in the waveform for both analogue and digital soundtracks to give backwards compatibility.

I have every sympathy for Gert-Jan Vogellar, who appears to be a one-man fire brigade trying to be in two continents at once, explaining the situation to software companies all across America and all across Europe. But when PDO lectures PAL engineers about NTSC mastering and NTSC compatibility, the net result must surely be that software companies simply say: 'blow this for a lark, let somebody else sort out the mess'. And that is no way to launch a new format.

It becomes clearer every day that the launch strategy for CD-V was planned by marketing enthusiasts from the hardware industry, the software companies and the mastering facilities, who either never talked to each other or, if they tried to talk, couldn't understand what they were being told. What CD-V needed—and clearly lacked—was a stage manager inside Philips who really understood what was required of all the players in the game. Instead there was a cast of middle managers who either dared not admit their narrow understanding, or did not dare sound warning bells when they saw their superiors making promises that could not be kept.

Most airports round the world now have modern low dose X-ray machines that shoot only a short pulse of weak radiation into a passenger's hand baggage, then freeze the image on screen. So all but the very fastest film (above 1000 ASA) is safe. Only a very few airports, like Hong Kong, still have primitive high dose machines that saturate hand baggage with intense radiation for as long as it takes to inspect the image. These you can rely on to ruin film.

I've carried out controlled tests, sending identical films through different machines, and I'm pretty confident that when you see a 'film safe' reassurance at a major airport it can be relied on—unless you carry the same film through numerous airports.

Every so often, someone comes up with a scare story about analogue or digital tapes, or computer floppy disks, being erased or corrupted by X-ray inspection. I have never found anyone with first

hand documented proof of this. And an X-ray dose low enough to be film safe should not alter a modern high coercivity magnetic pattern.

But there is one loose end. Baggage runs through the X-ray machine on a conveyor belt. The conveyor belt is driven by a motor and the motor stops and starts. It is conceivable that if, by bad luck, magnetic material passes close to the motor, it might be affected by the fields created by stop-start surges. The same thing could happen in aircraft holds, if baggage is stored near heavy duty servo equipment.

Does anyone have any first hand evidence of damaged tape? If so I'll put it to the X-ray machine manufacturers and ask to run a controlled test.

The old ideas are still often the best. JBL has now sold 0.1 million *Control One* speakers round the world. Japanese audio shops are ankle deep in them. Although never intended as a hi-fi studio monitor, they are ideal for surround sound reinforcement and spoiling people's meals in restaurants.

Also, unlike a lot of other small speakers, the ferrite magnets are shielded. Shielding cobalt Alnico magnets was relatively easy because they are small and easily potted. Shielding ferrites is much more difficult because they are much larger. There are two reasons why Alnico is now prohibitively expensive: it's used by the military, eg for turbine blades, and comes mainly out of politically unstable parts of Africa.

At first, speaker makers said it was impossible to shield large lumps of ferrite. But where there's a will, there's a technology. JBL does it by putting a second magnet in anti-phase with the first to cancel stray flux. This means that the speaker can be sat near a video monitor, without pulling the electron beams and souring the colour. It can also sit on top of a studio desk without affecting the meters.

The *Control Five*, like the *Control One*, is said to be 'almost indestructible'. Instead of fancy protection circuits, JBL went back to the oldest idea of all. A low voltage lamp, like a car bulb, is connected in series with the speaker voice coil. At low power levels, the lamp stays cold and offers virtually no resistance. As the power is cranked up, the lamp filament gets hot and its resistance increases to act as a compressor/limiter. (Putting a lamp in a parallel, as a non-linear shunt, expands dynamic range.)

Because the filament has thermal inertia, all this happens smoothly, without sharp overload cut-offs. Some Altec monitors have a similar lamp limiter. Hence the folklore theory that sessions really only get groovy when the Altecs are glowing.

JBL describe the *Control Fives* as 'deliberately not giving a neutral voice' but giving a 'forward voice' instead.

But how exactly do you quantify these industry stock phrases? Who better to ask than Garry Margolis of JBL?

"The difference between the so-called British and US sounds can be as little as 1 dB in the mid band," says Margolis. "People say that the minimum sensitivity of the ear is 1 dB. That's nonsense, unless you are talking about broad band sound. The ear can hear differences of as little as 0.2 dB."

The *Control Five* sounds 'forward' because the band between around 1 kHz and 4 kHz is elevated by 1 or 2 dB, and the bass bumped by around 1 dB at 70 or 80 Hz.

London Weekend Television (LWT) is one of the UK's 'big five' commercial companies that produce a large amount of material for the ITV network and Channel 4 as well as serving their local regions. LWT has three main production studios next to the National Theatre on the South Bank of the Thames.

Studio One, the largest, was taken out of service for four weeks in the summer of 1986 for the installation of a Neve 48-channel stereo sound desk, replacing a 10-year-old 30-channel Neve. A similar operation was carried out in Studio Two during the summer of 1987 and Studio Three is due to acquire a stereo desk to complete the set.

With this latest generation of desks, multitrack recording and playback are available in the LWT studios for the first time. The company have no sound recording studios, apart from a small voiceover booth associated with the dubbing suites, so sound supervisors (balance engineers) have gained considerable experience over the years laying tracks and mixing down in other major London recording studios. This has kept them up to date with the latest techniques and outboard equipment in music studios.

Graham Hix is one of the sound supervisors who handles large

scale light entertainment and music shows such as Cilla Black's live audience participation show *Surprise! Surprise!* for ITV and *Saturday Live*, the 'alternative' comedy show with live music for Channel 4. Graham says he cut his teeth as a balancer on *Supersonic* some 10 years ago. This frenetic pop music show, directed and presented simultaneously by Mike Mansfield, featured as many as eight groups in the studio each week. Rather than miming to the sound of their hit singles, the Musicians' Union agreement with LWT is that musical items are performed live or recorded specially for a particular show.

"One reason why we like to record them ourselves anyway is that television sound definitely needs a slight change from the record. You need to push the bass end slightly more to come over the grotty three-inch speaker in a TV set, and you need to compress the dynamics a bit. I tend to squash the voice right up into the backing, obviously still keeping it intelligible wordwise. It makes for a more exciting sound. That would be unacceptable on a record because records are generally listened to on better equipment. You listen to them louder, possibly, and therefore the voice can be more prominent.

"We always get artists who wonder why we can't use their master tape saying they took a fortnight to make the single. Now I maintain that most of that fortnight is putting things down on multitrack, playing them back and then trying something else. Once they've decided on what's in the arrangement it's just a question of re-creating that sound. So we listen to the single and analyse it. The artists usually know what they did anyway."

Even with multitrack facilities in the studios most programmes will still be mixed straight to mono or stereo. This is partly because the sound supervisors are used to doing that anyway but mainly because avoiding a mixdown saves valuable time in the dubbing suites. Multitrack is sometimes used as back-up in case of disaster on the direct mix but more often it is used to prepare tracks for playing into programmes. In the past $\frac{1}{4}$ in twin track mono was the only option.

Pre-laid tracks

If backing tracks and vocals are pre-recorded it is necessary to keep the vocals separate and dry so they can be balanced with

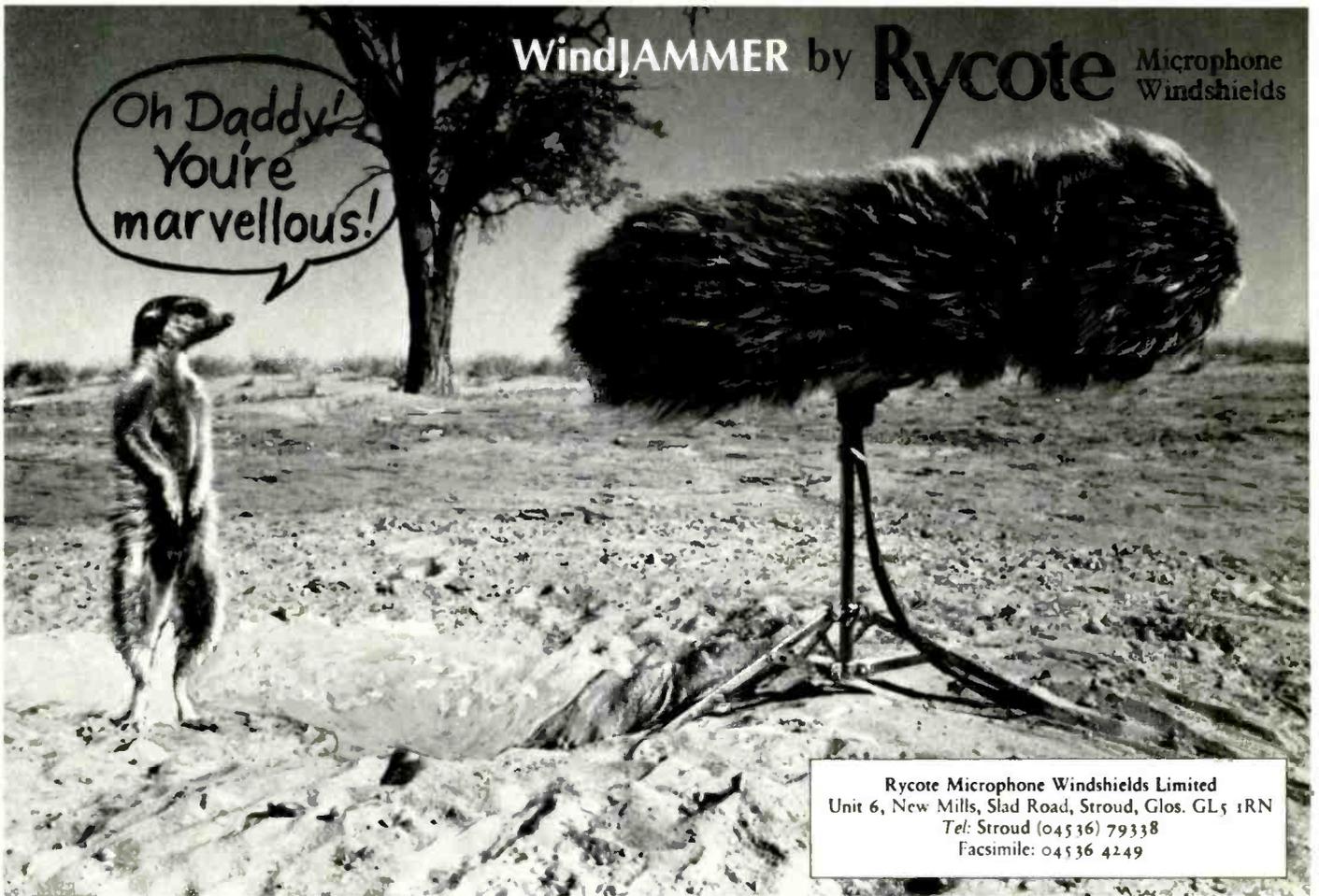
LONDON WEEKEND TELEVISION

The studios at LWT, one of the major UK TV companies, have been the subject of major refits recently. Tim Leigh Smith visited



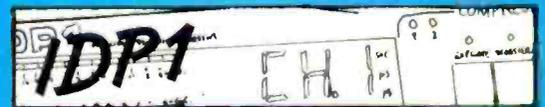
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the live lead vocal and placed in the proper acoustic setting to suit the visuals. An alternative arrangement allows a live orchestra to accompany a pre-recorded singer. This may be used in the studio if the singers will be leaping about a lot, and it is frequently used on spectaculars such as *The Royal Variety Performance* and *Live From Her Majesty's* done as OBs from theatres. (LWT sound supervisors cover the shows out on the road as well as in the studios. Many other companies have separate studio and OB sound departments.)

At pre-recording sessions in a London music studio the singers perform in the main studio with basic accompaniment in an isolation booth. Only three signals are taken on a 2-track ¼ in recording: vocals are laid clean and dry on the top track and the bottom track carries the music director's count-in plus a hi-hat 'click' from the drums. On the night vocals go to PA and programme chain while the cue track goes to the orchestra pit foldback for MD and band.

The pre-recorded vocal ensures that on the night of 100 nervous breakdowns the singers give a good account of themselves while the orchestra maintains the ambience of a live performance in the theatre. Graham Hix remarks that it can be rather frightening for the sound supervisor: "There are so many things that could go wrong. What happens if the MD's cans

fader. It's for safety, it stops you going over the limit. In a recording environment if you go over the top the first time, you go back and do it again. In a broadcast environment you can't because you're going live or to videotape so you need the safety of that compressor holding your levels down post-fader. Having said that, we still use pre-fader compressors on bass drum and bass in the usual way."

Refits

The pressure for studio time made it essential that each studio remained in service until the last possible moment before any installation of new equipment. Philip Ballabon, one of the project engineers specialising in studio sound, began planning the operation about 18 months prior to the Studio One installation.

User departments requested certain constraints. There were to be no changes in room acoustics, no programme disruption while the studio was still in service and just four weeks was available for installation and handover. Some new facilities were to be added and some would no longer be required so, to avoid confusion, all existing facilities were to be maintained until the new desk was in service.

As many LWT productions are recorded during the week, only weekends and odd days were available for changeover preparation. This began in September 1985—10 months before the desk was due to be installed. The first move was to replace the video monitor stack with a new assembly carrying more monitors in a smaller space to allow for a new cable trunking route to the studio.

Two of the four bays were emptied by transferring equipment to a temporary bay or to some other accessible point in the room. Over the course of three months, all the cables were gradually laid under the computer flooring. Audio cables for connection to the new desk from studio wall boxes and new jackfields in the two cleared bays were terminated on Verelco 56-way plugs, and DC cables on Verelco 38-way or Cannon D-type plugs.

Cables in the studio were led to new wall box panels and, wrapped in polythene bags, were secured out of the way until it was time for the changeover. With about three months to go Philip Ballabon's team began testing all the new cables using temporary terminating boxes to simulate the desk inputs and outputs.

When that part was completed the desk arrived from Neve, already tested and accepted. It was set up with some old jackfields and a multitrack machine in a temporary room for training purposes. Neve provided a course for the maintenance staff and the balancers began to get familiar with the desk.

Out with the old

The last programme to be recorded was Cilla Black's matchmaking programme *Blind Date*. She said, "Goodnight," the show ended, and the wiremen cut the cables so the old equipment could be cleared out. During the next week all the old cables were removed unless they were marked for re-use, then the room was given a thorough clean out.

Once the room was ready, the desk was brought in by Bullens with Neve people in attendance but it took a couple of days to get the desk precisely positioned. There is an air duct under the floor to provide a touch of cool air below the desk to aid heat dissipation. Also, the multipair cables used to speed up the installation are not very flexible so everything had to be aligned within an inch or two—a bit like trying to get granny, the kids and the dog all in the car at the same time without the hamster or the rabbit.

With the desk in place it took four days to get all the other equipment in and plugged to the multipair cables. There were 10 days left for fault-finding and alignment. Philip Ballabon checked the system and did the basic alignment. Then the LWT alignment test department carried out fine adjustments and saw that everything was within the spec laid down in the Independent Broadcasting Authority's *Code of Practice* for studios.

Finally the balancers checked that everything worked as they expected and Graham Hix tried the desk on a pilot programme.

LONDON WEEKEND TELEVISION

break down? Suddenly you're going to get a voice with no orchestra because they haven't heard the count-in. Or if the vocal chain breaks down the artist starts miming and no voice comes out. Fraught with peril but, touching the proverbial wood, it's worked up to now."

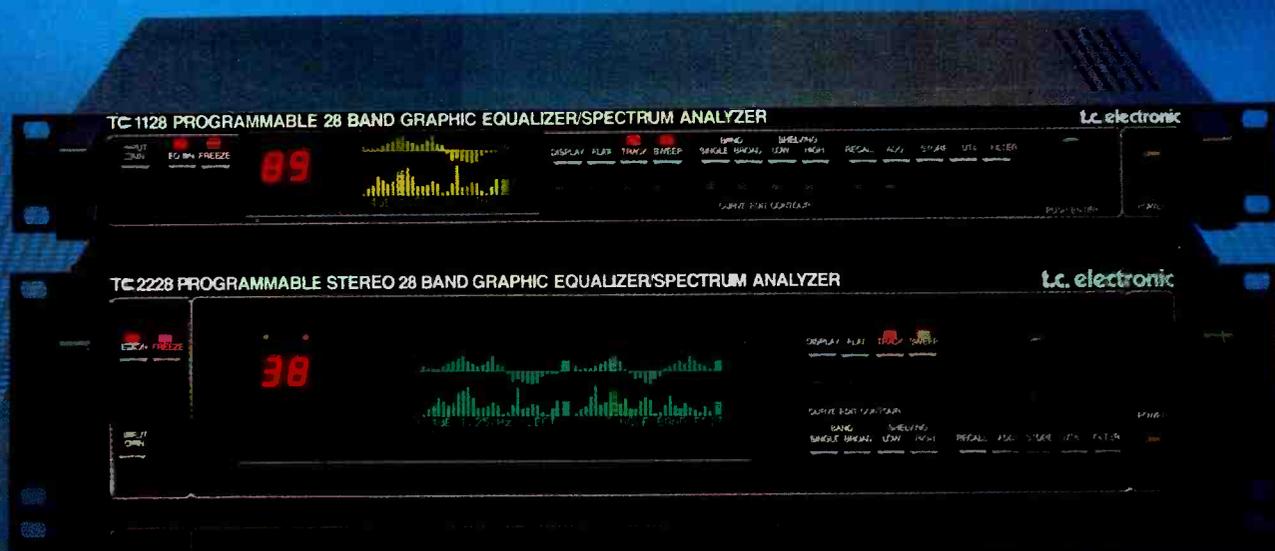
Another alarming aspect of the major spectaculars is the amount of rehearsal time available: "On things like *Royal Variety* the rehearsal time is severely limited. They'll stagger through a thing once, then go back and do it again and that's the last time you'll hear it until you do it. You have to be very quick up with your basic mix and then start taking notes of fader settings immediately. That could be the Saturday afternoon and you don't hear it again until the performance on the Monday night. It's amazing we get the results we do, really."

The need to get things right first time and quickly is one reason for the use of compressors on group outputs in broadcast studios: "We use compressors post-fader more often than pre-



Studio One looking to right

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SAJE

The desk was officially handed over in mid-August: the studio had been out of service just four weeks.

When Philip Ballabon was planning the operation he devised a safeguard in case the desk was not ready in time. As part of the project, numerous sound, and a couple of vision, tie lines were run to a wall box outside the building so an audio mobile could be hired in to cover sound. This facility has proved useful for pop extravaganzas when the desk runs out of faders and a mobile can provide a premix. Also a potential problem with stereo broadcasting is that high level sources like grams, ¼ in tapes, VT, telecine, OBs and echo returns each require two channels.

The 48-channel desk in Studio One is based on the Neve V series. Channels include highpass filter, parametric EQ and basic dynamics section with compressor/limiter and gate. Insert points abound and the outboard goodies feature Yamaha *REV1* digital reverb plus *REV7* used for drum reverb and the like; AMS *RMX-16* mainly used for vocal reverb; AMS 'all singing, all dancing' *DMX 15-80* with 3.2 s A-leg, 1.6 s B-leg and double pitch shifter; Drawmer noise gate mainly for such things as bass drum; four Neve compressors and four Audio Design compressors.

Free grouping provides eight groups which can be taken as a separate output or routed via any fader as required. Eight auxiliary outputs can be paired up to work as four stereo auxiliaries. 24-track routing is provided for two machines with options of pre-fader, pre-EQ or post-fader send plus individual level adjustment. The 48 channels include in-line monitoring which can be routed to the main output for replay. In effect the monitor mixer adds another 48 high level input channels.

Additional inputs are catered for by a simple 12-channel sub-mixer which is typically used for about 10 audience reaction mics. A second sub-mixer with eight mono and four stereo channels is fitted in one corner of the room where the gram/tape op sits surrounded by an Otari *MTR-90 MkII* 24-track machine with Dolby *XP24*, Studer twin-track ¼ in machines, ITC cart machines, cassette machines—all the paraphernalia for sound recording and for playing in recorded music and effects.

Monitoring is on a pair of Tannoy *SRM 15B Super Red* Monitors and Auratones for nearfield. There are numerous PPMs including separate mono, left and right output meters, eight aux output meters and an NTP 24-track PPM on a 20 in Brabury colour monitor alongside the main transmission monitor.

Memories, memories

A customised *Necam 96* automation system was added a couple of months after the first desk went into operation. This delay was mainly to avoid the confusion that would have arisen had both been installed at once and either desk or automation had given problems in the live situation.

When the transmission red light comes on the desk must be ready for action and stay that way. About 25% of the time the studio works live although Philip Ballabon points out that light entertainment recordings are done 'as live'. The aim must be to get it right first take since a second take will not capture the spontaneous audience reaction.

Because the greatest threat to studio output is a power supply failure, each of four sections of the desk has its own power supply. Even a dead short in one section would not affect the other three. The *Necam* has only one power supply and can affect every channel; a bypass facility was therefore fitted.

Necam will not normally be used for multitrack mixdown but rather as a store for snapshot set-ups. Much of the time the desk is operated manually; continuous drive volts are required to maintain a normal light feel on the motorised faders. If *Necam* has to be taken out for servicing a stand-by power supply is used to put volts on the faders and keep them light.

Graham Hix first used *Necam* on *Surprise! Surprise!* "In that show you have six radio mics, a couple of booms, a couple of stand mics and a 12-piece band. The actual title music is live to a click track on ¼ in. The first part is rhythm and brass (accompanying VT opening titles) and then a tympan roll with a voiceover from the ¼ in, 'Ladies and gentlemen: Miss Cilla Black!' (applause) and she comes in singing with backing vocals. Cilla's voice for the opening is again on the ¼ in.

"The *Necam* really comes into its own on that. I've put the opening on two snapshot memories and programmed one of the soft keys, the biggest so it's easiest to hit, to update the mix by one. I put in a 1 s crossfade so it doesn't snatch the levels. As we come to Cilla's vocal I just tap the key and the brass sits back to make room for the vocal, the rhythm guitars drop back a bit and the backing vocals fade up. It would be even better if we could get that soft key remoted to a footswitch so I wouldn't have to take a hand off the faders. On any light entertainment show one hand is permanently glued to the audience fader because you *must not* miss a laugh."

For maximum effect audience reaction at LWT must be picked up and thrown hard into a post-fader 10:1 limiter backed up by a 5:1 group limiter which tends to duck the audience chain if the artist speaks over a laugh. Go for a laugh that doesn't happen and you get PA colouration all over the next line.

"You just hope your sense of humour matches the audience's."

Even during film or VT inserts while everyone else gets a chance to relax the sound supervisor must remain vigilant. In the past it was not unusual for the gram/tape op to come over and move faders to their settings for the next sequence so the panel operator could concentrate on the audience.

Now fader settings can be stored at the rehearsal and recalled

LONDON WEEKEND TELEVISION

at the touch of a button. *Necam* text pages can be used to keep notes on mic routing, from studio mic point to desk channel. What the system cannot manage is the full set-up which is much the same each week with EQ, echo sends, foldback, PA, clean feeds (mix minus) for telephone calls and an OB, etc.

This sounds like a logical application for the total reset of a *DSP* desk. LWT seriously considered *DSP* but at the time the decision had to be taken, both BBC Radio OBs and CTS were up to their gums in teething troubles with the new technology. As Graham Hix says.

"If it did go down you'd get nothing out of it and 10 million viewers at home are waiting for you to do something."

When the 30-channel Neve in Studio Two was replaced by another 48-channel stereo desk in the summer of 1987 various improvements to the facilities arising from experience in Studio One were incorporated and these are being retro-fitted in Studio One to conform. Studio Three will have its stereo desk installed in good time for the start of stereophonic TV sound in the UK. □



Studio One in use

REVIEW

Although the C414 has been popular for some years, AKG have upgraded it. Dave Foister assesses the C414B-ULS



Some might call upgrading the *C414* gilding the lily; after all, it was pronounced the most popular vocal mic in the US and runner-up in Europe in a recent *Studio Sound* survey, and has been established as an industry classic for years. Even amongst all the panic about digital quality exposing all our gear's defects and noise which hitherto had been masked, one would have thought a microphone of this calibre would still be on safe ground. Nevertheless, digital advances are the rationale offered by AKG for the Ultra-Linear version of the *414*, although I would suggest many desks' mic amps generate enough

noise to render the old *414*'s contribution insignificant.

There is no doubt that the *414B-ULS* is an extremely pleasant microphone to work with in an enormous variety of applications. It is indeed, as expected, a beautiful vocal mic, clear, smooth, transparent and natural, and much more tolerant of varying position and singer movement than some. It has a remarkable resistance to popping, but for cautious belt-and-braces types an all-enveloping windshield is provided; unfortunately with this sock pulled right down into position the three switches on the mic body are completely covered. These switches of course comprise a 4-position polar pattern selector on the front,

giving cardioid, hypercardioid, fig-of-eight and omni settings, plus a 2-position high-pass filter and a 10 or 20 dB pad on the back. The off-axis frequency response is excellent in all configurations, such that using it on hypercardioid on a quiet singer working live in the room with rhythm section gave good spill rejection with no noticeable colouration.

On the classical voice *414* also gave very good results. Techniques and placements are obviously different for this kind of work, but the sound was just as transparent and accurate, and the microphone coped comfortably with the sustained high levels which trained voices can often produce. On other classical sessions I used it on violin, cello and piano among others, and the results were all to the same high standard. I take the view (up to a point) that using certain microphones on certain instruments because their deficiencies somehow enhance that particular sound is a bit of a cop-out; a genuinely good microphone should simply reproduce accurately—nothing added, nothing taken away—the sound of whatever it is placed in front of. The *414* appears to pass the test.

Which is not to say that it's a delicate, classical microphone for purists and elitists alone. I've been using it regularly on snare drums, and it gives the most usable, full, uncoloured sound I've had in the studio. Although its output is higher than, say, a *KM84* in the same position, the 20 dB pad enables it to handle the transients of close drum work better, and the drum needs far less EQ than usual.

Perhaps the best test of a microphone of this kind is to use a crossed pair on a live classical concert. AKG kindly provided two of the new *414s* for this very purpose, and I recorded three such concerts, one involving a large brass ensemble, one a chamber orchestra accompanying Benjamin Luxon in some Schubert songs, and one a string ensemble. In the first two cases I used a 90° pair on fig-of-eight with the fronts facing out, placed closer than perhaps is usual because the acoustics of the hall leave something to be desired. In the third I used a wide (about 110°) cardioid pair, again quite close to the group.

The results in all three concerts were excellent. The stereo imaging was natural, precisely pinpointed and stable, noise virtually non-existent (I was recording through a small Neve desk onto Sony *PCM-F1* 16-bit), and the smooth frequency response reproduced everything faithfully. The large diaphragm provides an extended bottom end, which was noticeable on the big orchestral bass drum, the tubas and basses in the brass band, and the celli and basses in a string group, with no apparent trade-off at the top—all the bite and sparkle of the brass was there. The orchestral concert in its softer moments showed how quiet the new *414* is, and the singer required no extra help from obtrusive spot miking, which is partly attributable to Mr Luxon and the band's balance but also due to the exceptional clarity and imaging of the microphones.

There seems to be little or nothing the *414B-ULS* can't do superbly, whatever area of recording it is used in. The *414* needs little recommendation; the *ULS* model strengthens its position as one of the world's finest, most versatile microphones. □

AKG GmbH, Brunhildengasse 1, A-1150 Wien, Austria.

UK: AKG Acoustics Ltd, Vienna Court, Catteshall Wharf, Catteshall Lane, Godalming, Surrey GU7 1JG.

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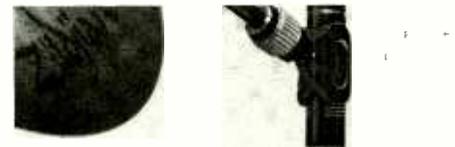
Percussive attacks test the entire system's transient response. Like several Beyer Percussion Mics, the M 422 has a small diaphragm for the



instantaneous response that produces a crisp, well-defined sound.

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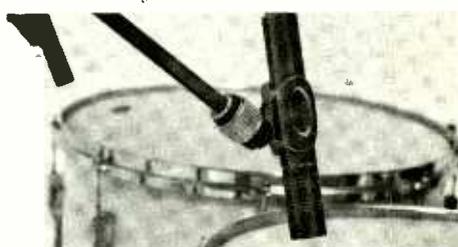
Isolation of individual drums and cymbals is critical when a variety of microphones are used on the drum set. Beyer Percussion Mics such



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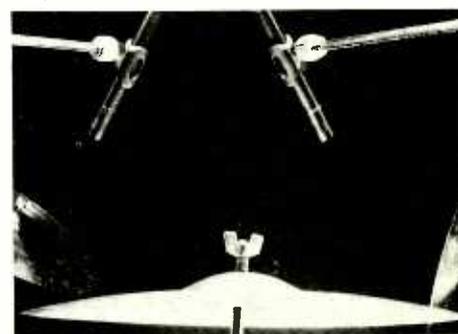
More than any other factor, it's what sets acoustic drums (and drummers) apart from the crowd. Beyer Percussion Mics like the



M 201 combine carefully regulated proximity effects with precisely controlled polar patterns. By varying placement and distance, you can capture each drum's character and personalize the player's sound.

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ACCURACY IN AUDIO

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REVIEW

Electro-Voice's N/D 308 and N/D 408 dynamic mics are assessed by Keith Spencer-Allen



These dynamic microphones are just two from a range introduced by Electro-Voice within the last year under the label of the *N/Dym* series. They take their name from the use of a Neodymium alloy used within the magnet structure of the mics which Electro-Voice claim gives the mics' magnets four times the power of conventional microphone magnets. Further, the design offers increased sensitivity and a more uniform magnetic field, which E-V say lowers distortion during peak sound pressure levels.

Another design aspect is the large diaphragm—E-V say 50% more surface area than conventional designs—and the fact that this is reinforced to increase rigidity and so reduce 'breakup'.

These two mics are intended for use with musical instruments. They are very close in specified performance and design parameters and though the *N/D 408* has a marginally better specification than the *308* their main difference lies in their polar patterns: the *308* is cardioid and the *408* supercardioid. Also, there are slight differences in the mesh covering the shape with the *308* being slightly flattened.

As can be seen, the capsule is totally enclosed within a mesh housing, which is in turn attached within a 'yoke' arrangement that allows the capsule assembly to be angled to choice over almost 270°. The mic stayed in the angle it was adjusted to simply by friction. Should it become loose through wear it would be possible to tighten the hex nuts that pivot this assembly; although this appears to be a rather primitive approach, they will probably work quite well. The yoke then meets the base which houses the *XLR* connector. The cable from the capsule leaves the mesh assembly at the lowest point and enters the base just below it but there is enough cable to allow the maximum adjustment of the capsule angle.

This would appear to be the only vulnerable aspect of the microphone—particularly on one of them where the cable seemed to catch against itself every time the adjustment went through the vertical position.

Within the grille the capsule is well packed with foam and in general the design seems robust—as one tends to expect from E-V—and, in terms of construction, fully at home in studio or live use. Both mics are finished in non-reflective matt black.

I have had problems in the past with E-V mics and the fact that the milling of the base was too little so some *XLR*-type connectors did not necessarily fit correctly, which could lead to jamming. I am, however, pleased to relate that these mics handled all my different problem examples with no difficulties.

There can be very little doubt that these mics are for live sound or the multitrack studio. While voice response is quite acceptable their use is largely unwarranted for this application so I made

Manufacturer's specification

N/D 408

Frequency response: close—30 Hz to 22 kHz; far—60 Hz to 18 kHz
Polar pattern: supercardioid
Open circuit voltage: 3.1 mV/Pa @ 1 kHz
Sensitivity: -50 dB (0 dB=1 mW/10 dynes/cm²)
Dynamic range: 144 dB
Equivalent output noise: 14 dB (0 dB=0.0002 dyne/cm²)
Impedance: 150 Ω balanced (Lo-Z)

Weight: 6.7 oz/190 g
Dimensions: 2.85×4.55×2.75 in/72×115×70 mm (whl)

N/D 308

Frequency response: close—40 Hz to 20 kHz; far—50 Hz to 16 kHz

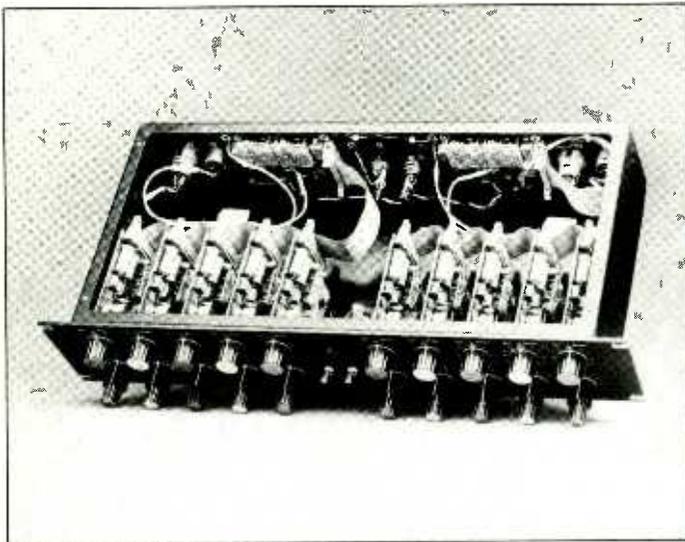
Polar pattern: cardioid
Open circuit voltage: 2.2 mV/Pa @ 1 kHz
Sensitivity: -53 dB (0 dB=1 mW/10 dynes/cm²)
Dynamic range: 141 dB
Equivalent output noise: 17 dB (0 dB=0.0002 dyne/cm²)
Impedance: 150 Ω balanced (Lo-Z)
Weight: 6.7 oz/190 g
Dimensions: 2.85×4.55×2.75 in/72×115×70 mm (whl)
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GML 8200 Parametric Equaliser

B & K

Bruel and Kjaer's range of 4000 microphones now comprises four omni's and the new 4011 cardioid. The careful attention paid to optimising both on-and off-axis response results in a sound which is clean, transparent and well-balanced.

API

Renowned during previous decades for their "proportional Q" equalisers and mixing consoles, API has launched a new range of products built to the same specifications as the originals. Amongst the range is the 3124 mic/line pre-amp, 3124M mic/line mixer and 5502 two channel, 4 band equaliser as well as the famous 550A parametric and 560A 10 band graphic.

EAR

Esoteric Audio Research manufacture a range of valve products which includes the 822Q program and 822MQ mid equalisers, based on Pultec's EQP1A and EQP3, and the 660 Limiting Amplifier based on the Fairchild 660. EAR's models benefit from transformer enhancements and improved signal-to-noise ratios without altering the character of the sound.

GML

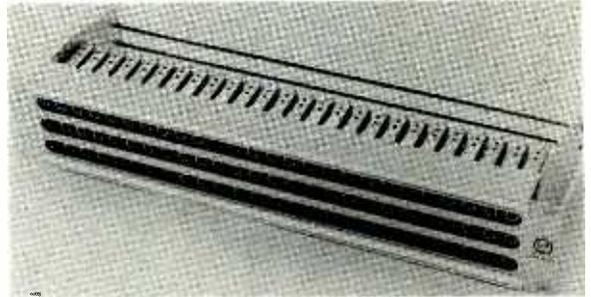
George Massenburg Labs 8200 Parametric Equaliser is a dual channel, five band parametric whose quality and versatility has made it an industry standard. The 8300 microphone pre-amplifier, available in either 2 or 4 channel versions, uses the same design philosophy and provides a similar throughput quality.

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ACOustics Begins with ACO

REVIEW

no attempt to look at these units as anything other than multitrack rock recording mics.

The first thing that strikes you is their functionality. They somehow look quite old fashioned but I could not define precisely why. For sheer miking practicality, however, it is very hard to equal their mechanical abilities. The swivel arrangement allows mics to poke up between drums or angle down over a whole kit without restricting the drummer's playing—something not possible using the pencil type mics where the complete mic would have to be above the skin height. Also these mics stay where you put them—provided your mic boom does. In a way they remind me of an '80s version of the AKG D12 in its earlier versions where it was regarded as a general purpose mic.

Both mics have a marked proximity effect—which was designed into the mics. They are meant for close-up work. I might even venture to say that they *need* to be used close up to really get much out of them but this may be unfair. The effect from these mics can be likened to tweaking the HF on an EQ and then suddenly turning it off, which can leave you feeling flat (an old exhibition demo trick). When used around 6 in from the sound source they sound bright and with a well-emphasised bass response but this rapidly tails off by 12 to 18 in away. This is what they are designed to do. There may be uses for the mics further away but the temptation to make them 'come alive' by pushing them closer will always be there.

Output is higher than one expects from mics such as this and that from the 408 is slightly greater than the 308 as well as being slightly more bassy. The sound of the mics is in the E-V tradition and anyone who has used the RE20, PL10, etc, will feel quite at home with their abilities. In terms of mechanical pick-up even when used very close to the sound source this was quite low. The capsule is seemingly quite well isolated from external vibration, which is obviously very important when in use close to loud sources.

The cardioid patterns are quite tight and careful positioning is required as off-axis pick-up is not subjectively totally smooth—it would be surprising if it was! Response from the rear of the 308 was very low, as the manufacturer's spec suggests it should be, and in every way the 308 performed well. It was used on percussive and amplified sources even in close proximity and the results were very good. The sound was well-controlled even when almost touching the sound source and this mic deserves a full recommendation.

I found the 408 rather more difficult to get on with. Its supercardioid response means that the forward facing pattern should be rather tighter than the 308 and there should then be a small rear-facing lobe. Subjectively, however, the mic does not appear to tail off quite so quickly in the lower mid region as does the 308 and as such has a far more coloured off-axis response than the 308. Whether this was the effect of the rear lobe or not I would suggest care with this mic, since although it performs well there is a little uncertainty about what you are going to get from the off-axis response. I hope that we can have these mics back soon and give them a thorough measuring.

I found these mics to be extremely useful in the multitrack recording environment and they would possibly have sampling applications. Their mechanical design allows use in otherwise difficult situations and they are not let down by their acoustic properties. Within their intended application these mics can be recommended. □

the 'mix' consoles

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SOUNDMIX RAKMIX

24:4:2:1 and 16:4:2:1

19" rack mount 8:4:2:1

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REVIEW

Keith Spencer-Allen takes a look at a Bruel & Kjaer 4011 cardioid mic

Bruel & Kjaer's launch of their 4000 series of mics several years ago represented a number of firsts both for themselves and in an industry sense. Certainly, in the UK the series appeared with minimum announcement and as a product line they were very unexpected. Bruel & Kjaer has a reputation for the manufacture of high quality test and measurement equipment and not as a manufacturer of products for the 'entertainment industry'. So although B&K had long been manufacturing mics for measuring, the new range was a first for B&K. (For more information see 'Bruel & Kjaer', *Studio Sound*, July 1987.)

Further, the 4000 series was a range of four mics all with an omnidirectional polar response—something else quite unusual as most other manufacturers would have included a directional type of some description among them or at least one with a switchable pattern but this was not B&K's way. Their argument (again, as detailed in the aforementioned article) was quite simple. Their company philosophy was to make products to the best of their abilities. A microphone capsule is naturally omnidirectional so a more directional sound capability can only be achieved by compromising the response of the mic. The concept of producing a microphone that was not optimised for performance was simply not part of the B&K philosophy and so was never considered.

Unfortunately, the role of the omni pattern mic in the recording industry had declined to a very low ebb in almost all applications except for those who were using them in certain stereo recording techniques or those studio people who had rediscovered their use as a vocal mic with the benefits of no proximity effect and much reduced noise problems from vocalists, not forgetting the possibility of getting a little 'open air' around the vocal sound. B&K then had to set out on a

campaign to educate us as to the benefits of the omni pattern. They have succeeded, to a far greater extent than I would have thought possible, in reawakening interest, and usage of the omni pattern seems to have increased quite dramatically. There has even been interest from the live sound sector for PA use—something I still find hard to understand.

There was, however, a certain section of the recording fraternity that refused to be swayed and asked right from the start when B&K was going to produce directional mics that sounded the same as the omnis. B&K started looking at this several years ago and apparently carried out a great deal of research trying to optimise a cardioid-type mic. And this is it—the 4011. Shown first at the London APRS 87 and then in near production form at the New York AES, the mic was scheduled for availability from January 1988.

Bruel & Kjaer allowed me to play with a pre-production version of the mic as well as a full set of the other 4000 series mics and these findings are based upon my in-studio experience with the mic. Among other things, I would have liked to have tried coincident stereo recording but the mics were in too short supply to allow anything like that, so I was restricted purely to single instrument miking.

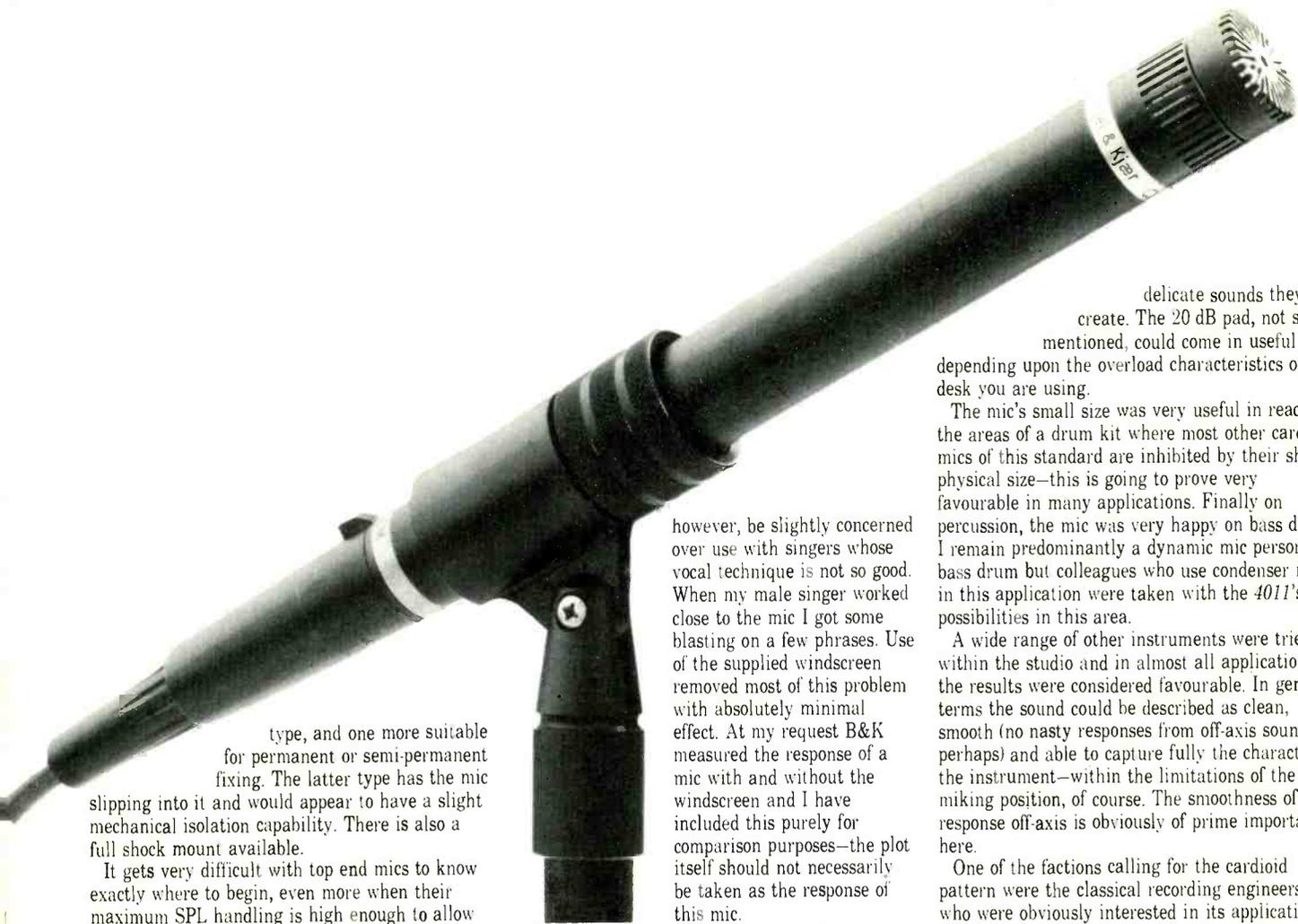
In appearance the 4011 is rather different from the other 4000 series mics as it is what I would call a true pencil type: of constant diameter from grid to XLR connector. Aside from the two silver ident rings, the finish is a non-reflective matt black. Unlike some mics in the series the grid is fixed and around the sides below this are the cardioid ports. Consistent with other mics in the series, the 4011 is a pre-polarised condenser and is only available in a 48 V phantom powered version.

The mic is supplied in the B&K 'standard' mahogany box with calibration chart, windscreen, mic cable and two mic holders: a quick release

Manufacturer's specifications

Directional characteristic: First-order cardioid.
Frequency response (+1/-2 dB): 40 Hz to 20 kHz (measured at 30 cm distance).
Maximum SPL before clipping (peak): ≥158 dB (0 dB or 20 dB attenuation).
Total self-noise: ≤20 dBA
Sensitivity: 10 mV/Pa (individually calibrated).
Total harmonic distortion at 110 dB SPL: 0.5% (worst case).
Difference frequency distortion at 110 dB:

0.5% (worst case)
Cable drive capability: >100 m (325 ft).
Powering: 48 V phantom (transformerless).
Bruel & Kjaer A/S, DK-2850 Naerum, Denmark.
UK: Bruel & Kjaer (UK) Laboratories Ltd, Harrow Weald Lodge, 92 Uxbridge Road, Harrow, Middx HA3 6BZ.
USA: Bruel & Kjaer Instruments Inc, 185 Forest Street, Marlborough, MA 01752.



type, and one more suitable for permanent or semi-permanent fixing. The latter type has the mic slipping into it and would appear to have a slight mechanical isolation capability. There is also a full shock mount available.

It gets very difficult with top end mics to know exactly where to begin, even more when their maximum SPL handling is high enough to allow their use in almost any high level musical application. My starting place is on voice, first with one that I am most familiar with, such as my own, then with a male and a female singer. In general the sound was clean, crisp but not over-bright, and pleasant. In many cases I could not see the need for any form of equalisation to be added prior to recording. The usable vocal area in front of the mic was good and because the off-axis is very well controlled, even extreme deviations from the axis were easily handled by a little gain riding and little change in sound. I would,

however, be slightly concerned over use with singers whose vocal technique is not so good. When my male singer worked close to the mic I got some blasting on a few phrases. Use of the supplied windscreen removed most of this problem with absolutely minimal effect. At my request B&K measured the response of a mic with and without the windscreen and I have included this purely for comparison purposes—the plot itself should not necessarily be taken as the response of this mic.

Handling noise is difficult to quantify. Although it would be possible to hand hold with care, this is not something to be considered lightly for recording use—if at all. On stage it is likely to be acceptable.

On percussion the mic was quite at home. On all areas of the kit it performed well. Perhaps a useful application would have been to try the mic as a pair of overheads but this was not possible. I particularly liked its capabilities when handling cymbals in a way that showed it had a high SPL capability but still was at home with the more

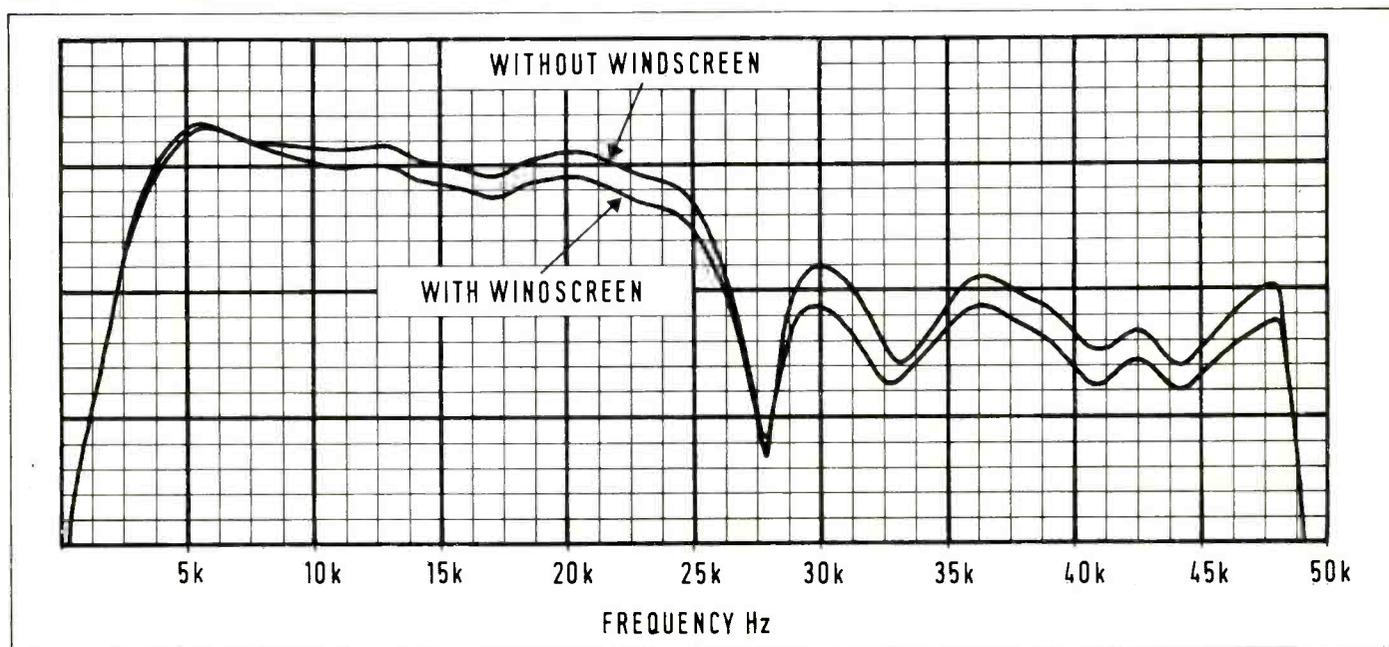
delicate sounds they can create. The 20 dB pad, not so far mentioned, could come in useful here depending upon the overload characteristics of the desk you are using.

The mic's small size was very useful in reaching the areas of a drum kit where most other cardioid mics of this standard are inhibited by their sheer physical size—this is going to prove very favourable in many applications. Finally on percussion, the mic was very happy on bass drum. I remain predominantly a dynamic mic person on bass drum but colleagues who use condenser mics in this application were taken with the 4011's possibilities in this area.

A wide range of other instruments were tried within the studio and in almost all applications the results were considered favourable. In general terms the sound could be described as clean, smooth (no nasty responses from off-axis sound perhaps) and able to capture fully the character of the instrument—within the limitations of the miking position, of course. The smoothness of the response off-axis is obviously of prime importance here.

One of the factions calling for the cardioid pattern were the classical recording engineers who were obviously interested in its application within the coincident pair style of recording. Unfortunately, as I only had one mic I cannot comment on this at all although I might venture that the possibilities seem promising.

To summarise, this mic has been anticipated for some years and now it is here I don't think many people will be disappointed. Its three major assets have to be—in no particular order—its high SPL handling, its very even off-axis response and its small physical size. It also sounds very good to my ears and it goes without saying that a trial of the mic is recommended to you all.



Example of a 4011's response with and without windscreen for comparison

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REVIEW

New from AKG is the C562 BL boundary microphone. Dave Foister tried it out

AKG's new entry into the boundary microphone field, the C562 BL, consists of a substantial and quite heavy metal disc and very little else. Unlike some similar microphones, nothing protrudes from the plane surface—the capsule is buried in the thickness of the plate, covered by a tiny metal gauze. Three small rubber 'feet' provide a certain amount of mechanical shock isolation, but more importantly help to prevent the microphone slipping from its position; generally boundary mics are good at rejecting, for

example, foot noise when mounted on the floor, but make as much noise as any other types when physically moved.

Mounting the 562 anywhere other than on a horizontal surface could present more problems than other similar microphones because of its weight. The ubiquitous gaffer tape is unlikely to hold it for long either on a vertical screen or window or stuck to the underside of a piano lid for example, and the microphone could inflict a substantial amount of damage on whatever it fell on should it come unstuck. With this in mind a stand adaptor is provided; this screws into



locating holes near the rim of the disc such that the plane of the disc extends along the line of the mic stand. Using this in conjunction with a particularly rigid boom stand I found it fairly easy to place inside a grand piano with the plate in firm contact with the lid.

The one thing that lets the 562 down mechanically is its integral cable. This is several metres long and permanently attached to the microphone, terminated in a peculiar extended XLR, the legend on whose barrel informs us that it contains the phantom power adaptor (9-52V). Unfortunately this cable is not only very thin but also relatively inflexible, making it very vulnerable to damage. Presumably this cable was chosen in order to make the microphone easier to conceal (this type of mic is often used in circumstances where a discrete low-profile appearance is desirable, such as float mics on the front edge of a stage, and indeed on a black stage the black version of the 562 virtually disappears). However, for general studio use this cable surely must be too light to be reliable in the long term. I ran into trouble when a cassette deck fell on to the lead from a height of less than three feet—it almost sheared through the cable.

The sonic performance of the 562 is good, as one would expect from AKG. Somehow it manages to avoid the slight colouration apparent in many boundary-type mics and sounds clean, flat and transparent, and the noise performance is excellent. Inside a piano the feeling of boxiness was less pronounced than with other microphones, and yet all the advantages of this technique were still there: the relatively unlocalised pick-up of the whole range of the piano, the rich bass, and the rejection of spill from outside sources.

Of course the microphone works well—possibly best—when placed on the floor, provided the surface is reasonably reflective. I used it in the studio about 1 ft in front of a guitar amp, placed on a large wooden board since the floor is carpeted. The amp was also on the board, yet there were no detectable resonances via the board, and the sound was clean and natural, less selective than a cardioid near the cone, and surprisingly free of spill from a nearby drum kit. A similar set-up worked well on stage for a live jazz concert recording, where space was tight and the 562 could be placed almost underneath the chair on which the amp was standing. Using it on bass drum proved interesting; placed on the floor immediately in front of the drum it produced an unusual, full sound, somehow more real than what comes out of a conventionally-placed mic. All the drum was there, depth, click and everything; it sounded the same in the control room as it did live in the studio with no fiddling about. In fact virtually everything I tried the mic on it worked well, and offered new areas for experimenting with technique.

Boundary microphones and their relations have become reasonably well established for a restricted number of specific tasks, possibly because their advantages in those situations outweigh the peculiarities inherent in some mics of this type. Microphones with the possibilities of the AKG C562 should encourage us to reappraise their usefulness and versatility in a wider variety of applications. □

AKG GmbH, Brunhildengasse 1, A-1150 Wien, Austria.

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REVIEW

Operational and technical evaluations of Tube-Tech's PE-1A equaliser from Dave Foister, Patrick Stapley and Rod Duggan

It always used to amuse me to hear engineers proudly talking about the integrity of their studios' signal paths—originally going solid state (with a small s) then eliminating transformers and so on—apparently failing to realise that the results of their efforts were very likely to end up passing through a pair of old but carefully nursed Fairchild valve (tube) compressors at the cutting room.

When, in the rush to upgrade, refine and modernise the studio equipment, all the old junk had been chucked on a skip, people began to realise that some of the old junk might have had one or two advantages over their replacements; they behaved differently and were able to produce results in some situations which now couldn't be achieved. The upshot was that any of the better old gear which had survived the purge suddenly became highly sought-after, and very possibly re-

introduced in replica form. One example is valve microphones such as the old *U47*; another is the Pultec equaliser. The Tube-Tech *PE-1A* from Lydkraft in Denmark is a replica of the Pultec.

It certainly looks the part. For a single-channel 2-band equaliser it's huge; its big blue front panel is adorned with enormous black bakelite knobs and switches, and a large red filament power indicator—not an LED or a push-button in sight. It is an interesting reminder of how reassuring large controls can be, and of the days when you could operate an equaliser without first getting a manicure or using tweezers.

Stuck on the back are the large transformers—specially wound by Lydkraft as Pultec used to do—some big electrolytics, and a gently glowing pair of valves: an *ECC82* and an *ECC83*. Amongst that lot the *XLRs* for in and out and the IEC mains connector look strange and incongruous.

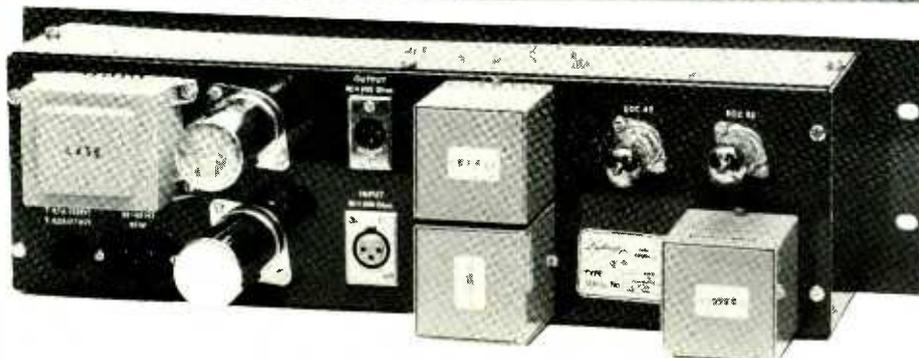
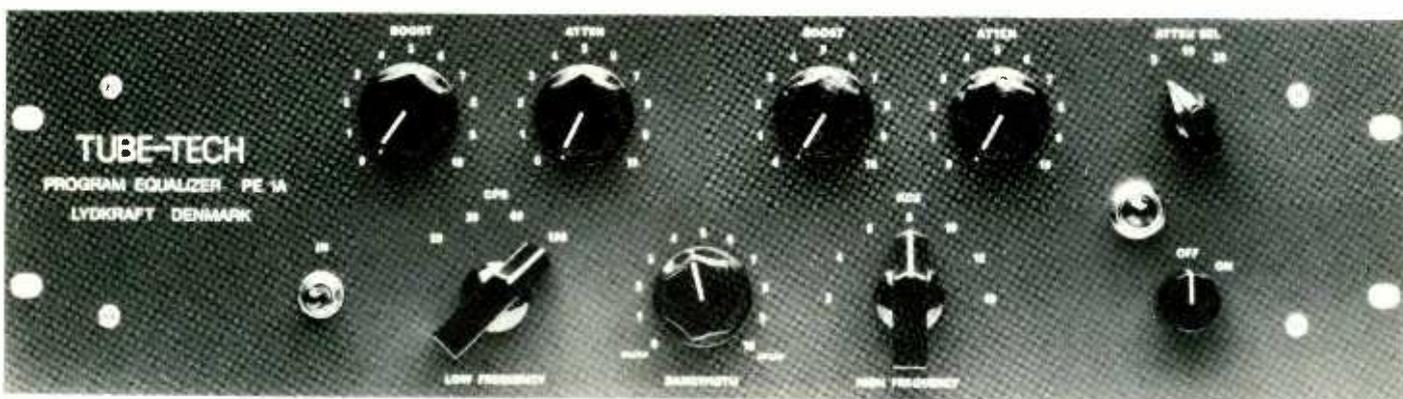
The rather odd collection of front-panel controls may be familiar to old hands who remember the

Pultec original, but for newcomers they need some explaining. The unit is a 2-band equaliser with controls for boost and attenuation on both bands together with various frequency selector switches and a bandwidth control. The puzzling concept of separate knobs for boost and cut on each band is explained by the fact the boost controls introduce a gentle peak at the selected frequency rather as a parametric would while the attenuation controls provide a smooth roll-off. The HF attenuation in fact has its own frequency selector switch, although it's not clear what exactly the marked frequencies represent. The highest position is 20 kHz, and from listening to it I can't believe that's the 3 dB down point.

The treble boost control has seven selectable centre frequencies from 3 kHz to 16 kHz, giving control over a substantial part of the mid band as well as HF, while the bass section has four centre frequencies from 20 to 100 Hz, all quaintly labelled in cps and kcs. The interaction between these boost circuits and the rolling-off of the attenuation controls gives an unusual, interesting and useful variety of treatments, such as upper-mid boost with HF roll-off, or a thickened-up bass with extreme low-end boom attenuated.

The bandwidth control only appears to affect the treble boost, and is extremely subtle in its effect. Its idea of 'sharp' comes nowhere near the resonant peaks of some equalisers. In fact the lack of audible peaks, resonances, phase shift effects and other nasties is what makes the Tube-Tech so unusual. It may well be introducing evil valve distortion (although the soft onset of valve clipping is famous) but there's no trace of anything unpleasant in the unit despite its having no level indication whatsoever, and the noise is also extremely low. On the other hand it doesn't seem to introduce anything else either, other than smooth clean tonal adjustment without side-effects. It's almost as if the equaliser isn't there; the processed sound is different but still real. Even at extreme settings it never sounds 'equalised'.

Of course its excellence on vocals goes almost without saying. A touch of boost at 3 or 4 kHz lifts a voice to the front of a mix without making it sound peaky or phasey, and the warmth of the



bottom end brings out the depth of the voice without unpleasant booms and rumbles. The result doesn't sound like a vocal with EQ; it sounds like a voice, only more so.

I tried it on DI'd, bugged jazz double bass; when the bass player (notoriously hard to please) heard the playback he commented, quite unprompted, on how good his bass sounded, as if it were somehow thanks to him, and indeed the Tube-Tech had got rid of most of the rubbish which comes out of the average bass bug, transforming it into a smooth, warm, believable double bass. On saxophones it provided bite and penetration without shrillness, and warmth without mud, as

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REVIEW

it did on electric guitar tracks.

Not being old enough to have used the Pultec in its heyday, I was tempted to assume that the aura grown up around it had more to do with the rose-tinted spectacles of nostalgia and selective memory than any real benefits. It didn't take long for the Tube-Tech PE-1A to convince me that there

really is something special about the sound. Aurally it is smooth, clean, powerful and surprisingly versatile yet unobtrusive; it does not offer the extremes of control provided by modern graphics and parametrics, but these extremes are seldom needed, and for most uses the Tube-Tech is an enjoyable alternative.

Dave Foister

This unit couldn't be easier to operate with its huge 1960-style knobs and bold graphics being clearly visible across most control rooms. It looks the facsimile of the original Pultec. The only slight drawback is in its size, especially being mono as it makes a stereo requirement very space consuming, but then this was also true with the original Pultec.

Anyone who has ever used a Pultec will know there is something very reliable in its archaic character; it's as though the solid, sturdy appearance of the unit finds its way into the sound, and this is also true of the Tube-Tech. It gave excellent results on vocals making them sound big and natural with lots of clarity, not screwed up like some EQ units. It also worked well on snare drums, producing body and crispness again with a good natural sound, all with the least amount of fuss. Tube-Tech have successfully recreated what was intrinsically a simple but very effective piece of equipment, and in these days of digital everything, it's refreshing to see some glowing tubes and to hear the sound that goes with it.

Patrick Stapley

Technical measurement

The PE-1A is a single-channel valve equaliser, with low frequency boost and cut shelving characteristics at four nominal frequencies. High frequency shelving cut is at three nominal

frequencies, with peaking boost at seven nominal frequencies, and a variable bandwidth control.

A switch disables the equalisation though the electronics remain in circuit.

Maximum output before clipping was measured at +29.5 dBm into 600 Ω. With an input of +8 dBm, no clipping occurred at any frequency due to maximum boost.

The nominal frequencies of the HF boost and LF sections were measured as shown in Table 1.

These values do not match; perhaps some other criterion has been used to arrive at the nominal frequencies. As this is a low-Q shelving filter, this is not too important.

Fig 1 shows the range and characteristics of the HF section and Fig 2 the range and characteristics of the LF section.

The Q of the peaking curves is altered by a rotary control marked sharp and broad at either end of its travel. The curves have different Q values at different frequencies, and the 8 kHz and 3 kHz curves were chosen to indicate the spread of values calculated from $Q = f_0 / (f_2 - f_1)$, where f_2 and f_1 are -3 dB points from f_0 , the centre frequency (see Table 2).

Noise was measured at -86 dBm (10 Hz to 20 kHz, RMS).

Distortion is shown in Table 3.

Frequency response with controls turned down, ie 'flat', was measured at 15 Hz to 30 kHz (+0, -1 dB), and is shown in Fig 3.

Squarewave performance at 1 kHz was fine, with no ringing and good LF response.

The separate boost and attenuate controls can be used simultaneously to modify each other's response, and there is also overlap between HF and LF sections. Measurements and curves have been taken with only one section at a time in use to clarify specific aspects of performance.

To show an example of the interaction possible, Fig 4 shows maximum boost and cut used at all frequencies of the LF section. The HF section has so many variables, one representative curve was not attempted.

Termination in different impedances can cause frequency response aberrations in transformer-coupled equipment and for this reason a 10 kΩ load was substituted for the 600 Ω load with no change in response, as can be seen by Fig 3.

The bandwidth at different boost settings at 3 kHz can be seen in Fig 5.

Rod Duggan

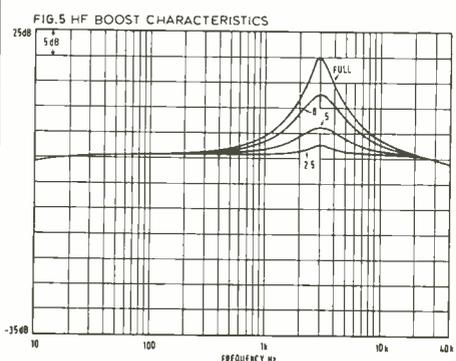
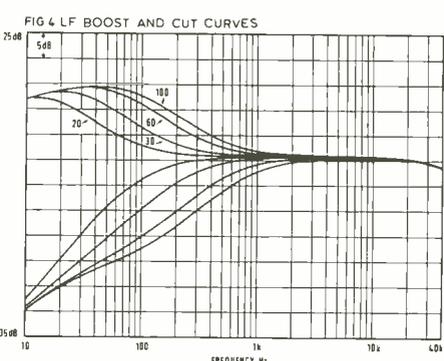
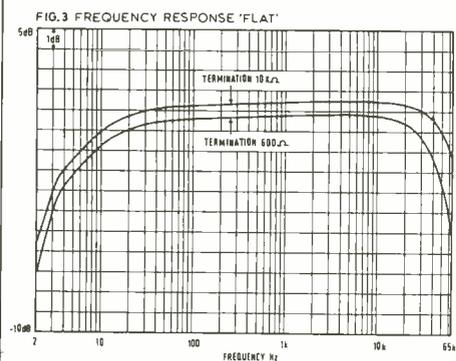
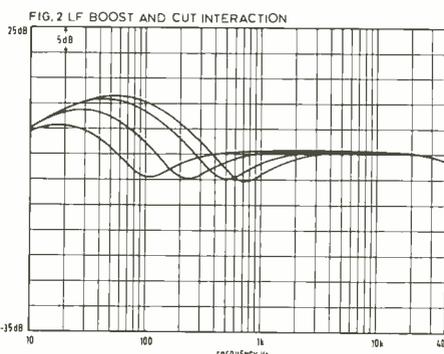
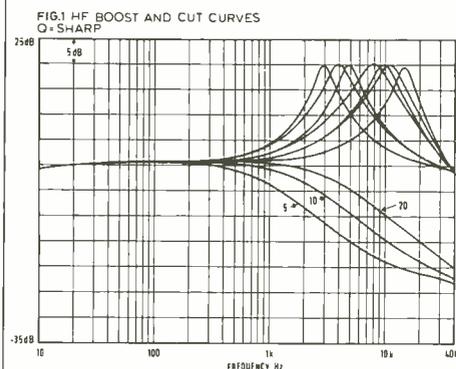


TABLE 1a High frequency

Nominal	3	4	5	8	10	12	16	kHz
Measured	3.07	4.09	5.04	8.2	10.05	11.4	15.1	kHz

TABLE 1b Low frequency

Nominal	20	30	60	100	Hz
+3 dB Measured	82	172	369	512	Hz

TABLE 2

	Sharp Q	Broad Q
3 kHz	2.69	0.74
8 kHz	1.55	0.51

TABLE 3

	100 Hz	1 kHz	10 kHz
0 dBm	0.05%	0.024%	0.04%
+10 dBm	0.03%	0.01%	0.023%
+20 dBm	0.05%	0.06%	0.13%



1 SM48 Dynamic

Perfect for vocalists on the way up. Many of the outstanding performance features, similar appearance, and ruggedness of the world-standard SM58, at a most affordable price. Delivers the famous Shure sound, and features the uniform cardioid polar pattern and distinctively enhanced upper mid-range of the SM58. Rugged, reliable and dependable.



4 SM7 Dynamic

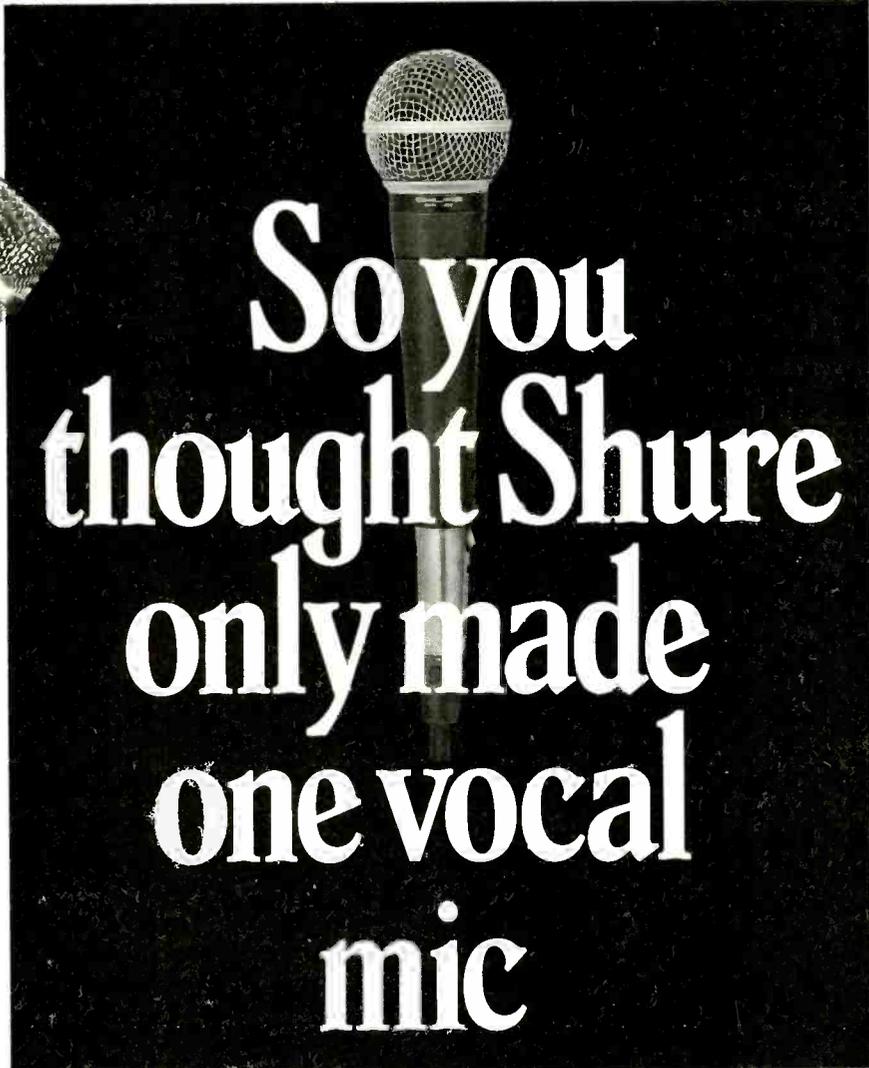
The SM7 is among the finest studio professional dynamic microphones in use today. It features a wide range, very smooth frequency response with graphic response-tailoring switches to allow the choice of four different mic response curves. It has an accurate, symmetrical cardioid pick-up pattern, uniform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



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.



5 SM87 Condenser

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.

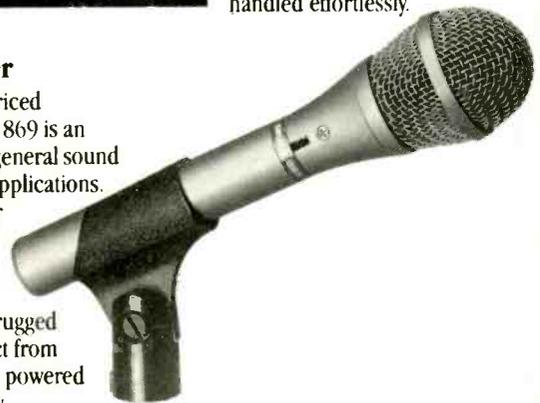
3 SM96 Condenser

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.



6 869 Condenser

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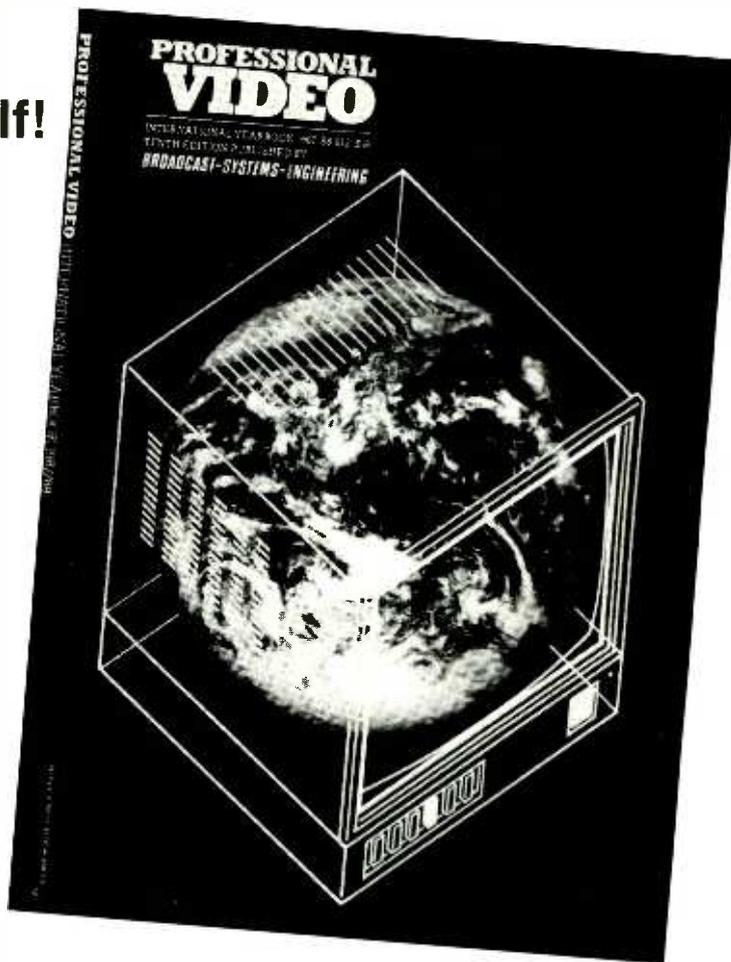
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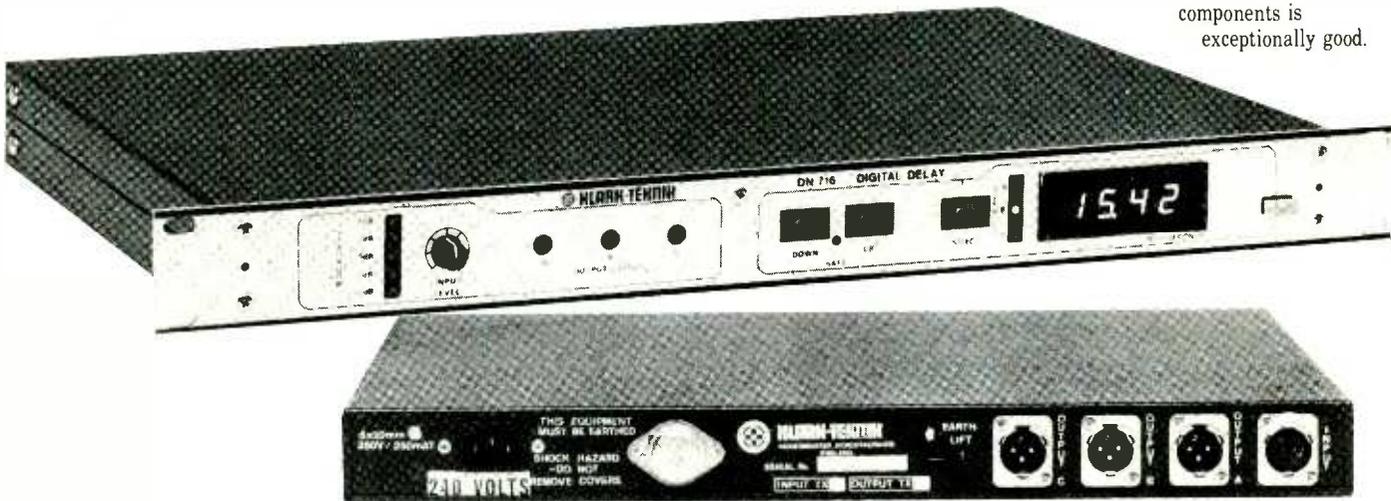
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REVIEW

Technical and operational reports on the Klark-Teknik DN716 digital delay line from Rod Duggan and Dave Mellor



delay line. In other words, it could be used to delay three separately located speakers fed from the same source. Two units are required for stereo. Each of the three outputs can have its delay time independently set between zero and 1311 ms, which should prove adequate for most venues. Sampling resolution is 16-bit linear via a successive approximation A/D converter, the sampling rate being 50 kHz. A/D and D/A conversion is accomplished by one chip bearing the Texas Instruments brand.

The manufacturer's published frequency response is ± 1 dB from 20 Hz to 20 kHz, with a dynamic range of greater than 90 dB at any delay setting.

Construction

The DN 716 is housed in a 1U, 19 in mounting steel case, internal access being via eight sensibly-large crosshead screws for the top and bottom cover. Both covers can be removed as the internal PCBs and other components are all mounted on the vertical members of the chassis.

Maintenance access to all components is exceptionally good.

The Klark-Teknik DN 716 digital delay line has been designed as a high quality unit for use in a live performance for setting correct time delays between separated groups of speakers. It could also be used in a studio setting, although its lack of modulation facilities and other 'tricks' could limit the scope of its application.

It is by now well-known that although improving coverage, using a number of speakers

throughout an auditorium or open air arena can lead to intelligibility problems. As sound travels through air at around 340 m/s depending on temperature and humidity, two otherwise identical sound sources would have a time difference of nearly 30 ms between them if spaced just 10 m apart. This is generally perceived as being a distinctly audible repeat.

Here we shall investigate the usefulness of Klark-Teknik's DN 716 in this context.

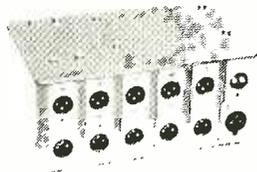
The DN 716 is a single-input, 3-output digital

There are one large and two small PCBs. The small PCBs are fixed vertically to the front panel and carry the display and the controls, together with a small amount of circuitry. As only the numerical display bezel is fixed to the front panel, removal of either PCB would be straightforward. Connection to the main PCB is by one ribbon cable and several neatly bundled conventional insulated wires.

The main PCB is some 42x26 cm and carries all the remaining digital and analogue circuitry. Only one component is not mounted on a PCB; this is a voltage regulator fixed to the rear panel. The TO3-type case of the regulator is insulated from the chassis but not from the outside world. No significant standing voltage was found on the case but I would have been happier to have seen it covered: it became warm in use although not too hot to touch.

All the PCBs are glassfibre, double-sided with plated-through holes. In many cases, the copper track is carried from one side of the board to the other by the plated-through holes, though in only one case does the solder flow look anything less than perfectly adequate. All the boards are printed with component identification. Diodes and electrolytic capacitors are marked for polarity on the PCB. IC positioning is similarly marked. Many of the digital ICs are mounted via sockets, which is understandable. All the audio ICs are

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REVIEW

also similarly mounted. Several audio connections are made by insulation displacement connectors and there are also Molex-type push-on connectors in the audio path. No audio connections are gold-plated.

Several digital ICs and the lithium data-retention battery appear at first sight to be glued to their sockets but a closer inspection reveals the 'glue' to be a low-tack compound which should keep them in place yet, will be easily removable



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for replacement.

Mains power is via an IEC-type socket and the voltage is adjustable internally from 110 V to 240 V. There is one external and three internal fuses. A groundlift switch is provided on the rear of the unit.

Moving to the rear of the PCB, there was none of the 'afterthought' components often found in digital equipment. As this side of the board is close to the chassis, mains voltages are isolated by two pieces of a thin hardboard-like material. Separation between the board and chassis is maintained by one stick-on rubber instrument case foot. Although the board is stiff, perhaps more of these should have been provided. On the rear panel there are also the four Neutrik audio connectors, one female and three male.

There was one piece of debris found inside the case; a short length of PVC insulation.

Audio circuitry

The standard input circuitry is electronically balanced, employing a single TL 072 twin operational amplifier IC. There is a preset potentiometer to adjust common mode rejection ratio. A transformer balanced input option is available but must be specified at the time of ordering.

The pre-A/D conversion is accomplished by a hybrid, thick film, 7-pole, elliptical, low pass filter bearing the Klark-Teknik mark. One would expect them to have some expertise in this field! Post D/A filtering is similar. Prior to output filtering is a CMOS FET mute stage on each of the three outputs. Rather than the more conventional series/parallel system of FET muting, the signal is only shorted to earth. There is no series FET.

The level of each output is adjustable from the front panel by a screwdriver (or sharp fingernail) control. NE 5534 ICs give an unbalanced output, although transformer balancing is possible as a retrofit.

There are aluminium electrolytic capacitors in both input and output stages. In each situation, two are connected in reverse polarity.

It is probably common knowledge that Klark-Teknik employ non-conventional *XLR* wiring: pin 1 earth; pin 2 cold; pin 3 hot. Internationally accepted convention is that pin 2=hot, pin 3=cold. In a unit with balanced inputs and outputs this should cause no difficulty but as the *DN 716* is normally supplied with an unbalanced output, most of us will have to follow the procedure given in the manual to convert to our standard. This involves changing two links on an internal Molex-type connector for each output. This would have been made simpler if suitable links had been provided to make up the required new connections. Changing the connections to the *XLRs* would be inadvisable as they are all PCB mounting types. It would alternatively be possible to resolder some wire links.

The input, with a rotary control knob on the front, is suitable for levels between 0 dBu and +22 dBu. The output is claimed to supply a minimum load impedance of 600 Ω and is adjustable for maximum levels of up to +18 dBm.

Operation

The front panel is graphically divided into analogue and digital sections, corresponding to the PCBs behind. The analogue section contains

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REVIEW

the input level knob and the three screwdriver-operated output level controls already described. The input control has a printed graduation, the output controls do not. In addition to these is an LED headroom indicator. Four green LEDs show amounts of 3 dB, 5 dB, 11 dB and 16 dB headroom. One red LED shows that there is 0 dB headroom, although the manual suggests that even when this is lit there is still another 2 dB before clipping. The decay characteristics were such that the display was easy to read.

The digital section of the front panel contains the numerical display, a Select button with three associated LEDs, a Down and an Up button. There is also a Safe switch, accessible through a hole in the front panel by a fine screwdriver.

The numerical display is used for each of the three outputs. Resolution is to 0.02 ms from 0 to 99.98 ms; to 0.1 ms from 100 to 999.9 ms; and to 1 ms from 1,000 ms to the maximum delay. The output to which the display refers is chosen using the select button. A red LED indicates whether the delay for output A, B or C is displayed. When the recessed safety switch is activated, the display cycles between each of the outputs. This facility can be cancelled by means of an internal switch.

The up and down buttons are fairly self-explanatory. They respond to the length of time they are held down rather than to individual pushes. The rate of change can be made greater if, after the button corresponding to the direction of the change you want to make is pressed, the other one is held down also. Using this method, it takes just under 25 s to go from minimum to maximum delay. As might be obvious, the

recessed safety switch locks out the two shift buttons. A safety cover is available as an extra.

In use

The sound quality was subjectively good. The small amount of noise introduced had a smooth character, in contrast to similar units from other manufacturers.

On power-up, from each output there was a coarse 'digital' noise mixed with a distorted version of any input signal present, lasting just over a second. While this was at a low level from outputs B and C, from output A it was unpleasantly high. One might expect the internal muting to eliminate noises of this nature but perhaps the omission of series FET muting makes this impossible to achieve. This could be a design consideration towards the attainment of good sound quality. I trust that the level of digital noise from the two better outputs is the norm.

There was also a switch off pulse from each output of between 3 and 4 V, which I would have preferred to be absent. Possibly the relay by-pass option will help with these spurious noises. Another, perhaps more personal, preference would be for an internally set dimming/muting option while the delay time is being changed. Obviously, when this is being carried out, data is being read from the digital store at a greater or lesser rate than it is going in, resulting in a pitch change of the output signal. I have in the past found this to be worrying to non-technical personnel who imagine that it is a fault condition of the

equipment or the person operating it. Either way, I believe that it is not necessary for a delay line ever to put out digital noise, or any other imperfect audio signal. Perhaps this could be taken into consideration.

(I would beg to differ. My personal opinion is that muting during delay changing would be far more disturbing. Sound quality or pitch changing during delay time alterations has little significance as programme is non-critical although may be a concern to the non-technical operator. This, however, can surely be removed as a worry by a few explanatory words—Ed.)

The manual

Congratulations on a very clear and informative manual. Installation and operational guidance is given in simple and precise terms, together with a reasonably simple explanation of the internal functions of the DN 716. Circuit diagrams are provided giving component numbers, although there is no corresponding list of component values. These could of course be traced by looking at the PCB, although the failure mode of some components might prevent the subsequent deciphering of their value!

There is also a useful section on the possible applications of a digital delay line such as this, which is taken from their publication *Audio System Design and Engineering* which delves into the topic more thoroughly.

In conclusion, the construction of the unit gives the impression of being very carefully thought out, particularly from the point of view of maintenance, and capably put together. Although I am inclined to question the number of non-soldered audio connections inside the unit, there appears to be little strain placed on any of these connections, which is sometimes not the case when using a mother/daughter board PCB system in a transportable unit.

The unit is operationally straightforward and the only problems found were those already mentioned. The manual is informative and, in my experience, the people at Klark-Teknik are very helpful over any queries.

Dave Mellor

Klark-Teknik Research Ltd, Walter Nash
Road West, Coppice Trading Estate,
Kidderminster, Worcs DY11 7HS, UK.
USA: Klark-Teknik Electronics Inc, 30B Banfi
Plaza North, Farmingdale, NY 11735.

Technical measurement

The DN716 is a single-input, 3-output device for introducing delays into a signal path.

The maximum input before clipping was tested to +22 dBm and was not clipped at this level. Output clipping was not observed at +19.5 dBm output, which is greater than the specified value of +18 dBm. Maximum undistorted output (ie with input adjusted to be just below clipping and output adjusted to maximum) was +16.5 dBm. The clip indicators work just before clipping occurs.

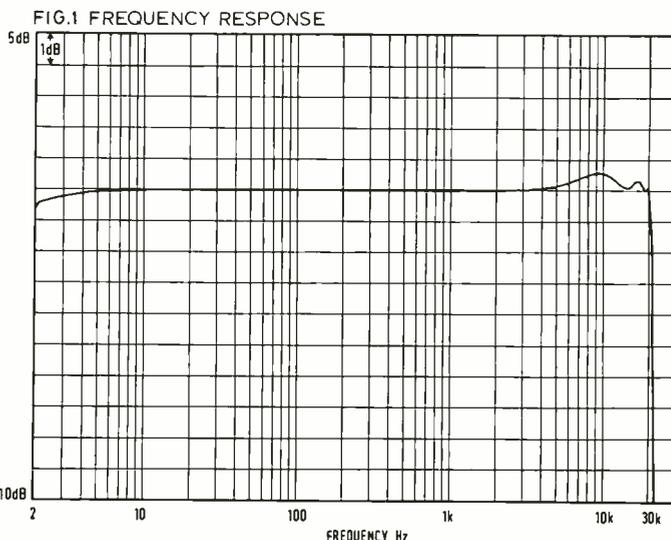
Fig 1 shows the frequency response 2 Hz to 20 kHz ($\pm\frac{1}{2}$ dB) and slight filter ripple can be seen.

Distortion is within specifications: 100 Hz 0.015%; 1 kHz 0.008%; 10 kHz 0.015%; all at +4 dBm.

Noise levels are -91 dBm from all outputs. This is with no signal applied and is not a signal-to-noise ratio.

Up/down adjustments are tricky and there is a tendency to overshoot many times where a specific value is sought. Also, despite a 'fast' mode, it takes some time to adjust over longer delays.

Rod Duggan



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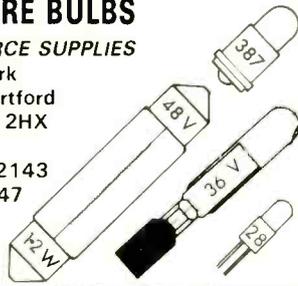
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