

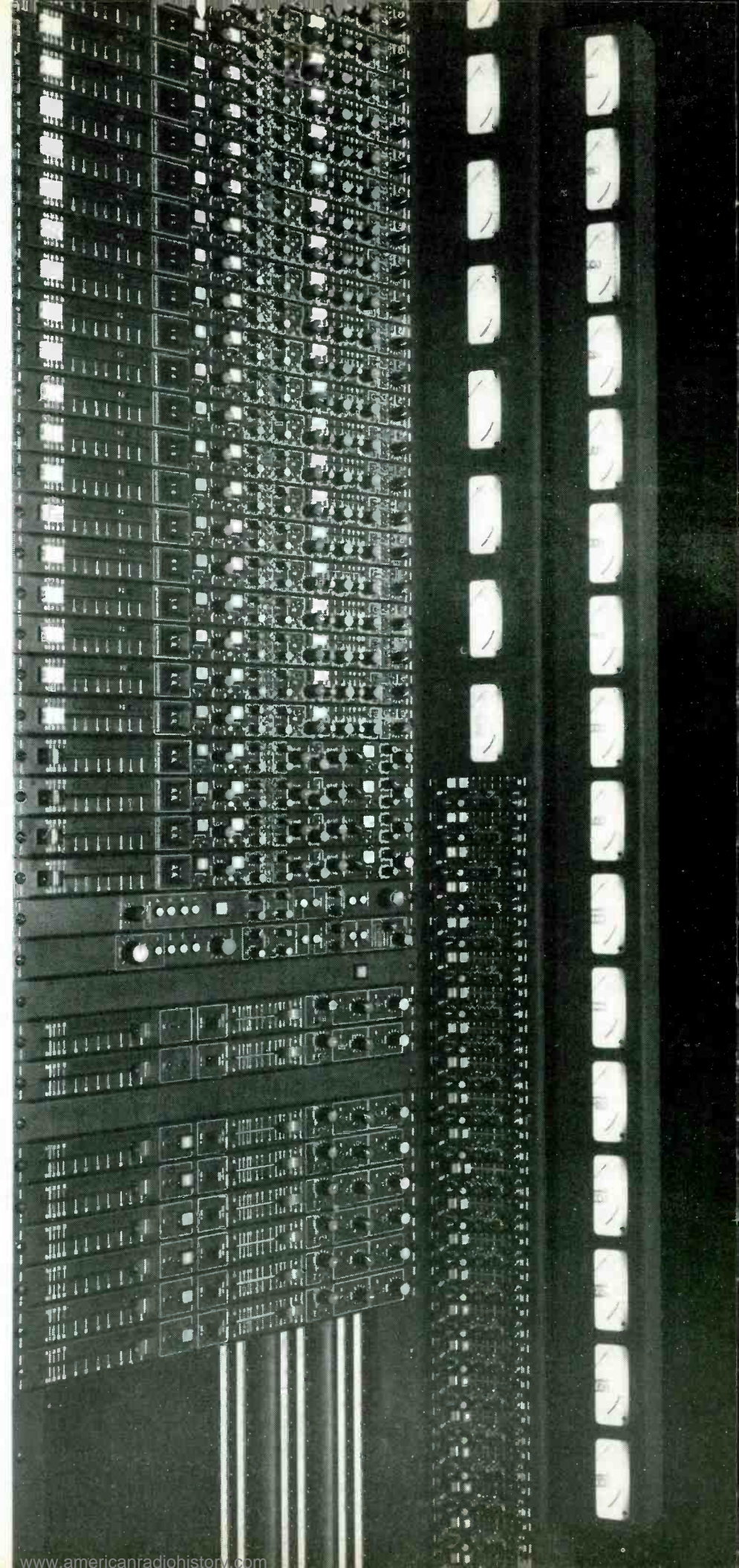
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March 1979 60p

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THE LINK HOUSE GROUP

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In a year when numerous new disc formats (both audio and video) are being launched into the marketplace, it is sad to say the least to be reporting on the official demise of the first commercial disc, the 78. Some 30 years after the long playing record was introduced, the Recording Industry Association of America has finally deleted references to the 78rpm record in its revised *Dimensional Standards, Disk Phonograph Records for Home Use* bulletin. Perhaps we should be organising a sweepstake on the actual year that the 33rpm LP is similarly officially no longer recognised. But then what is to replace it? A new digital dedicated audio disc system (such as developed by Matsushita and Philips) or perhaps a digital format disc that may be replayed on a video disc player. A typical 'serious' 'hi-fi' listener will currently have a dual speed turntable, open reel tape recorder, and Compact cassette recorder with Dolby—it is probable that a video cassette recorder will have already, or will shortly be, joining these three other units in the hi-fi cabinet, and this to be followed by either a digital audio disc player or a video disc recorder. Each of the six different units has a distinctly different purpose within a typical consumer household.

According to this scenario, the old turntable will presumably have disappeared to have been replaced by a digital disc of some form which should then be free from contamination by dust, and damage by scratches. But which record company will be the first to offer digital discs (forget digital PCM video cassettes—duplication costs are astronomic) because the origination, pressing, and distribution costs will be phenomenal while there are only a few thousand digital disc players in the market place, and only the major multinational record companies could possibly justify the venture capital necessary to break into the market. But while there will be resistance to programme suppliers, player sales will similarly be restricted since who will possibly purchase a unit for which there are very few discs available. So no players means few discs, and few discs means few player sales. Naturally this problem doesn't arise with cassette systems, be they audio or video, since these machines can also be used to pirate other people's records and tapes, that is until this supply runs out and it becomes necessary to purchase prerecorded cassettes.

We are all agreed that digital audio discs will prove advantageous over LPs, and many of us will appreciate the cheap feature movie video discs just becoming available in Atlanta with the Philips/MCA/Magnavox video disc player launch in January. It would thus be in the best interest of both record and film companies for the same player to handle both audio and video discs. One 'pressing' plant could handle both audio and video discs thus reducing the pressing costs of each, with also increased penetration of players since consumers will have double the potential programme/records available, even initially. It naturally goes without saying that there is only room for a single digital audio disc format, and that wheeling and dealing between manufacturers is essential to ensure that the market is not saturated with a variety of non-compatible units. While this does not significantly matter with video cassettes which are primarily an off-air recording medium onto blank tape, multiple audio or video disc formats would be disastrous for all parties concerned.

Elsewhere in this issue is an article about the audio aspects of the *Superman* movie. It might be interesting to note that in its first five days on release in the USA it took no less than \$9.5 million (with \$7.5 million over a single weekend) in 500 theatres, while British receipts totalled £475,068 in the first seven days of release. It goes without saying that *Superman II* is already in production at Pinewood.

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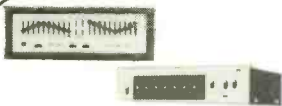
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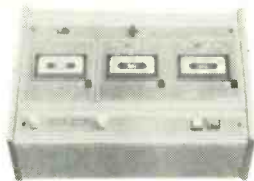
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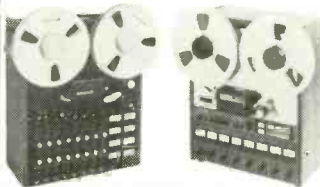
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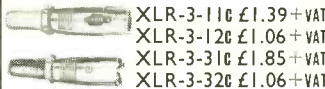
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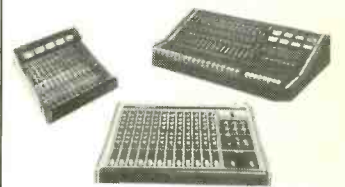
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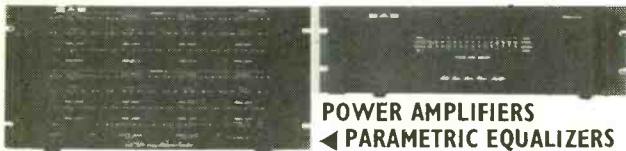
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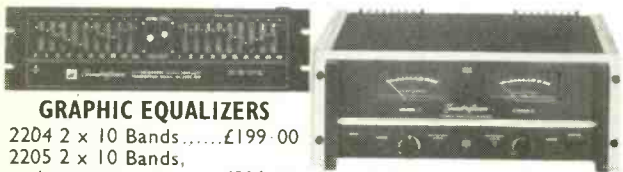
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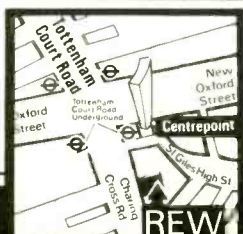
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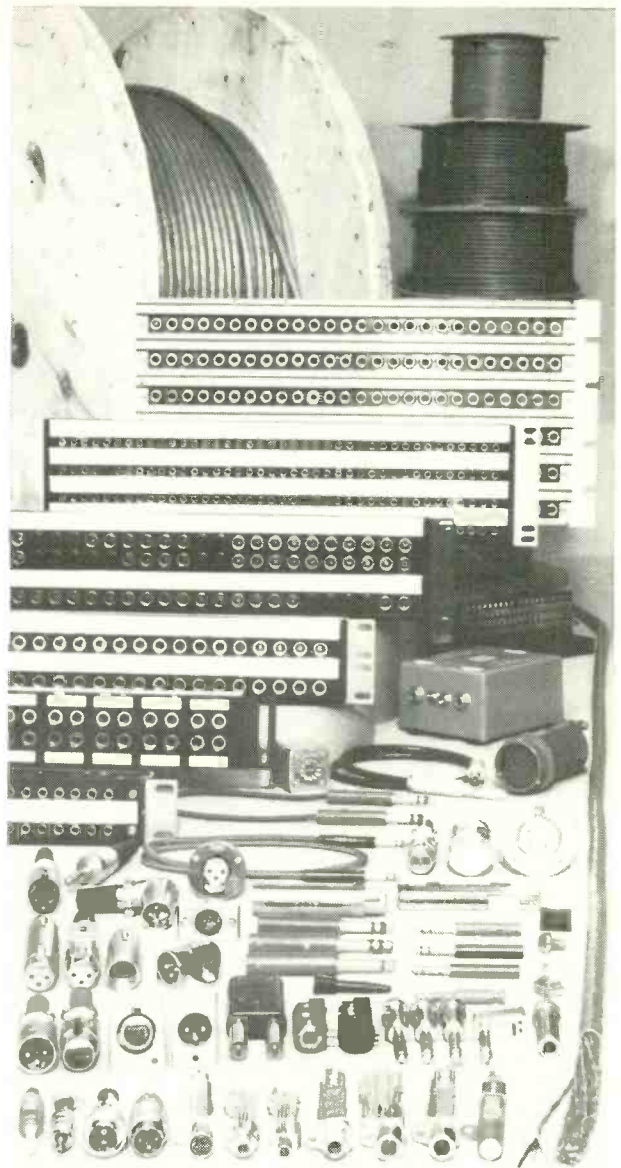
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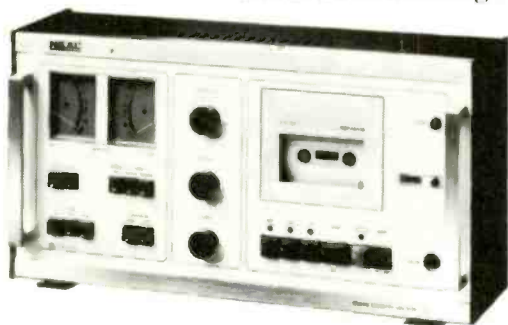
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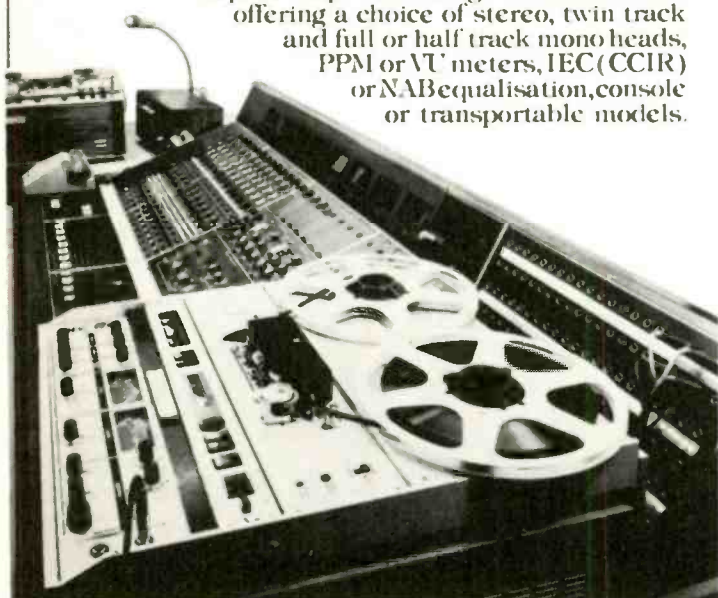
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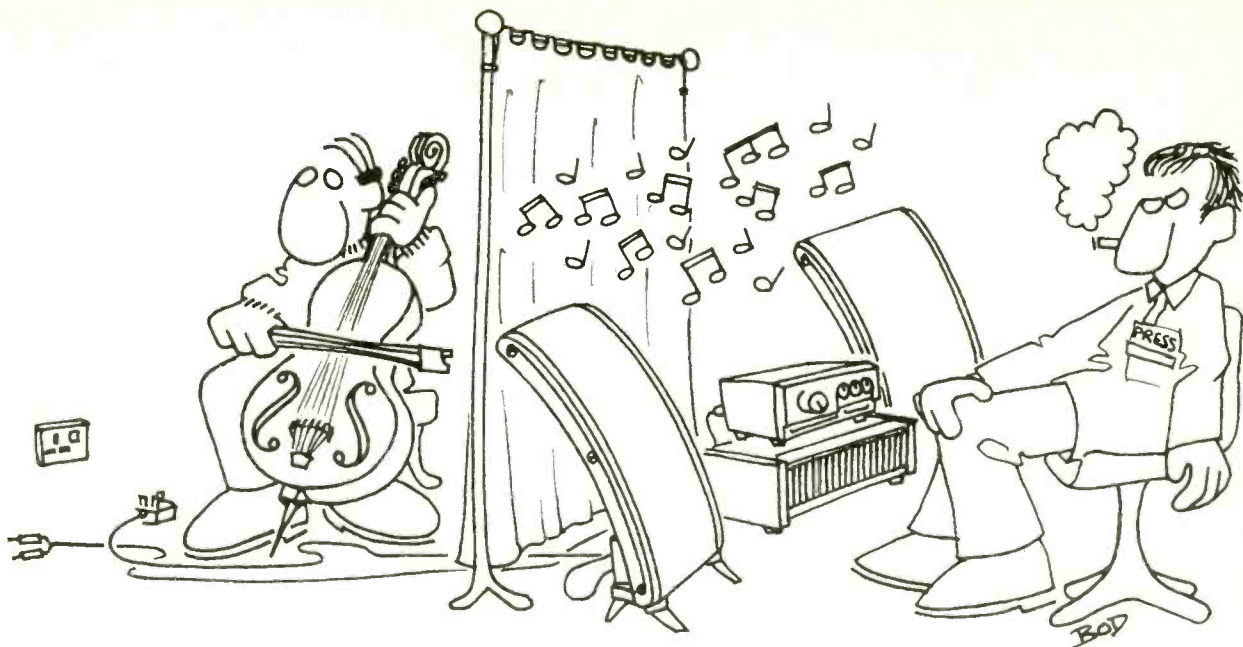
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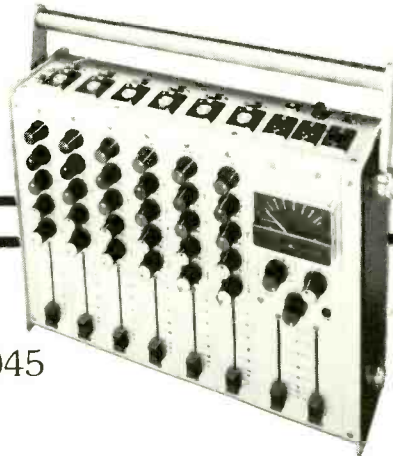
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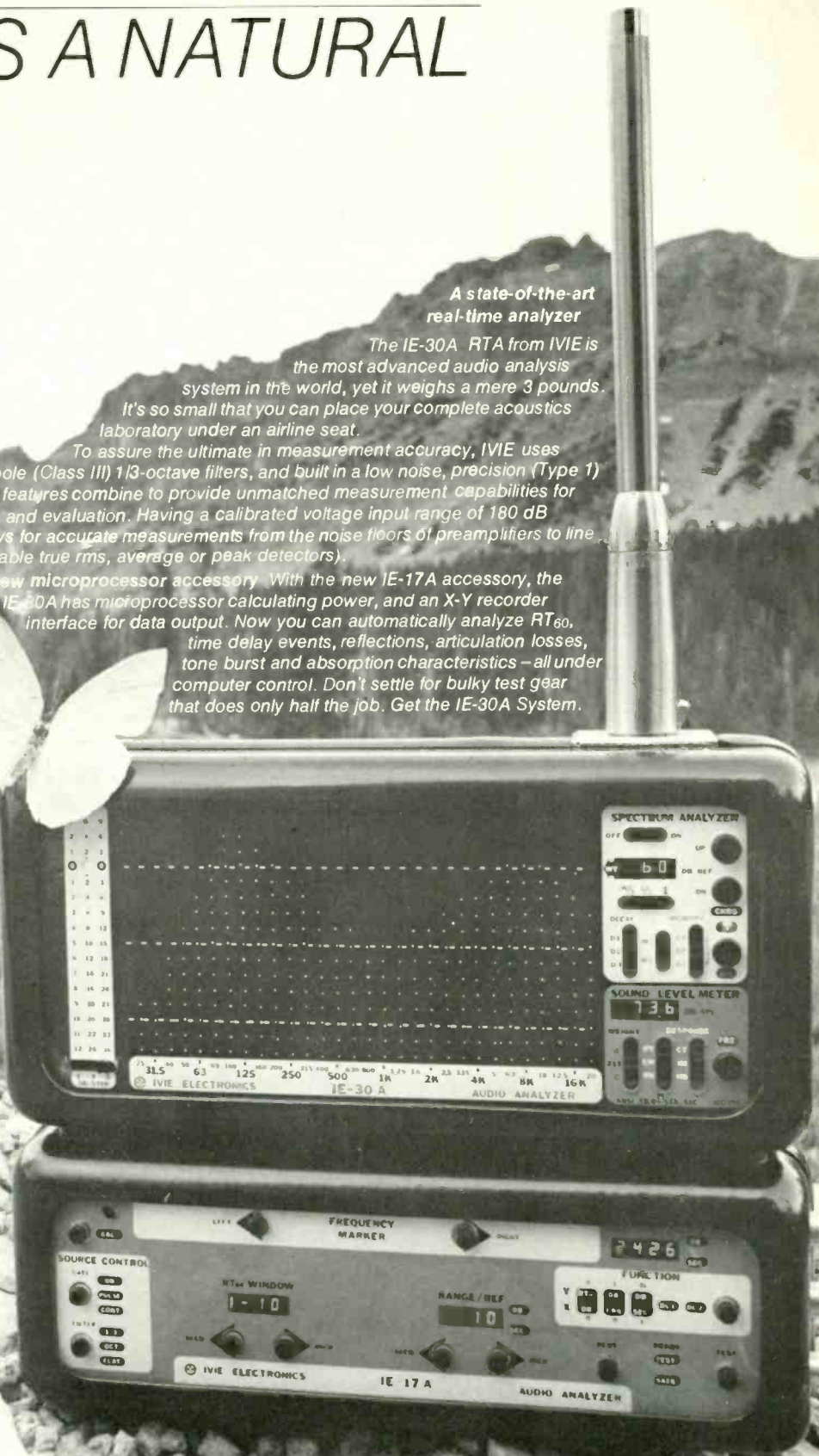


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- * Compact size and grouping of functions.
- * A highly sophisticated computer system with functions of level-memory, drop-in timing, autolocation, editing and record-keeping which are as yet unparalleled.

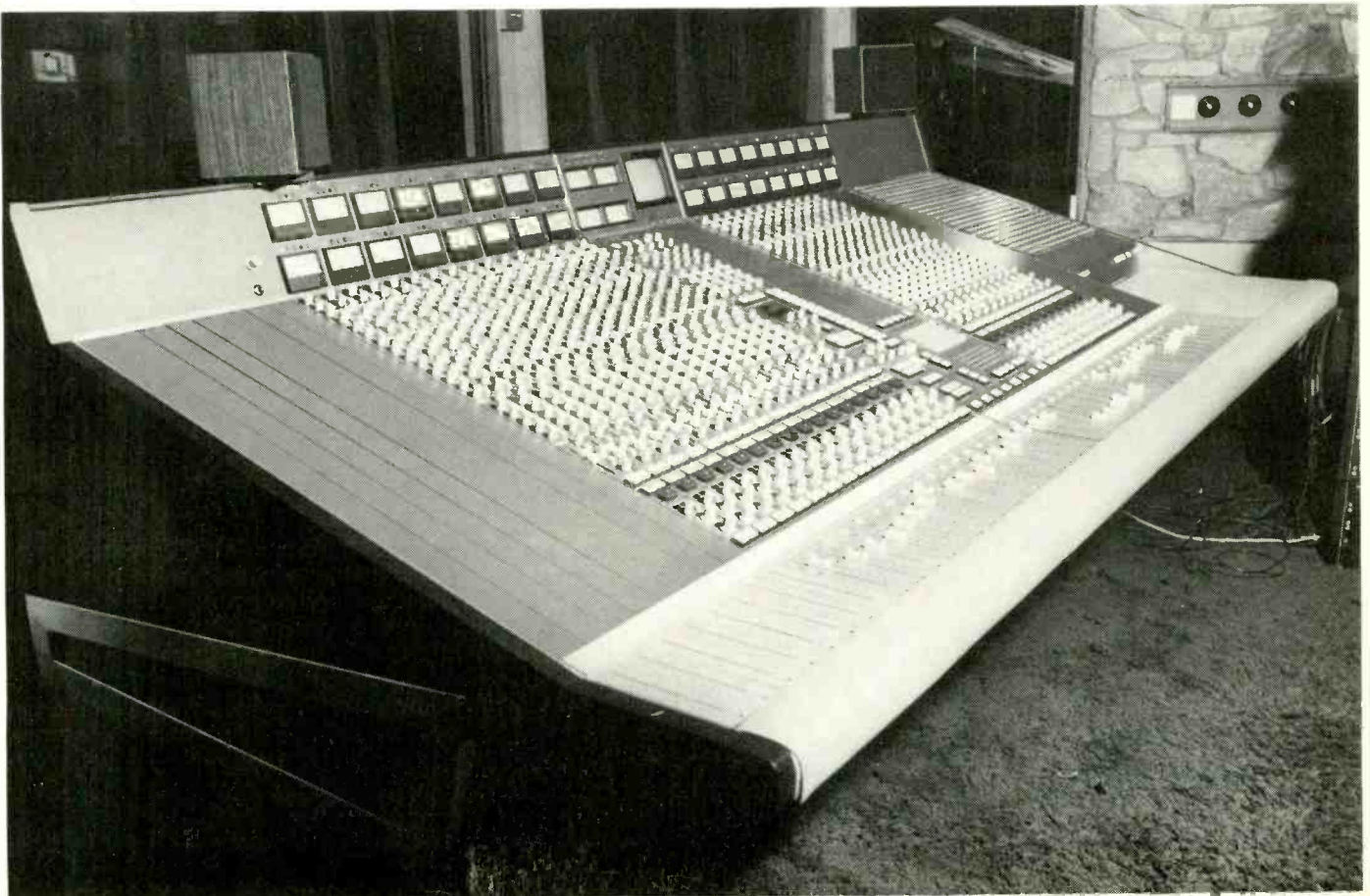
Like no other, the SL4000 Series works while others play.

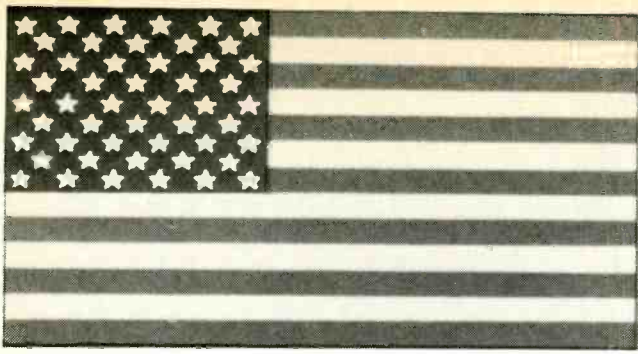
No wonder Virgin chose it for their new complex.

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American Newsletter

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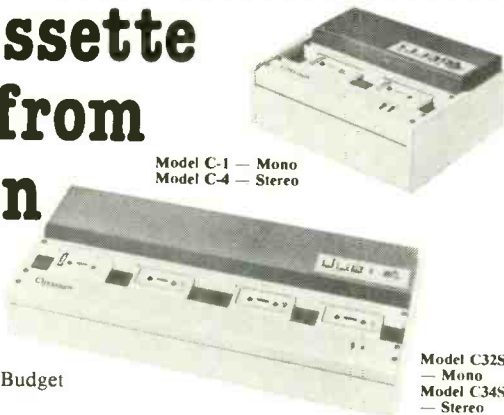
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Model C-4 — Stereo

Model C32S
— Mono
Model C34S
— Stereo

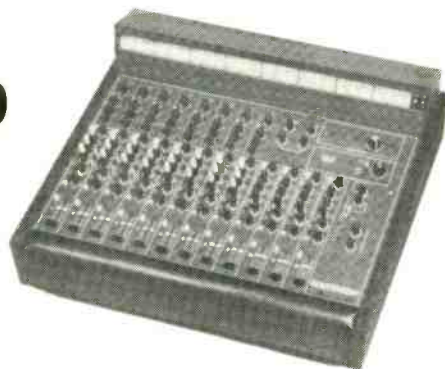
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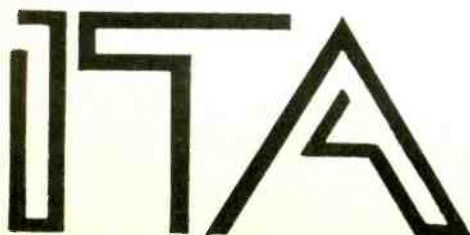
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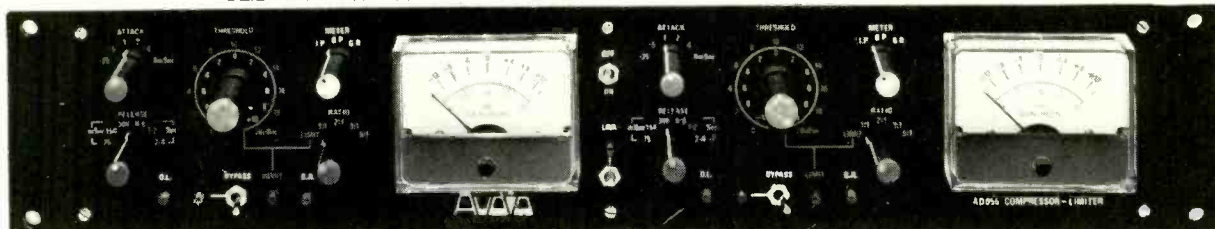
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Studio Compressor-Limiter

AS REVIEWED IN NOVEMBER STUDIO SOUND



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The ADO55 is for rack mounting. The controls on the attractive front panel are clearly laid out and colour-coded for greater simplicity. All the input and output connectors have XLR, DIN and PO Jacks fitted as standard.

The ADO55 Compressor is a dual channel compressor/limiter with a comprehensive range of useful facilities. The two identical systems may be linked for stereo operation.

Specification

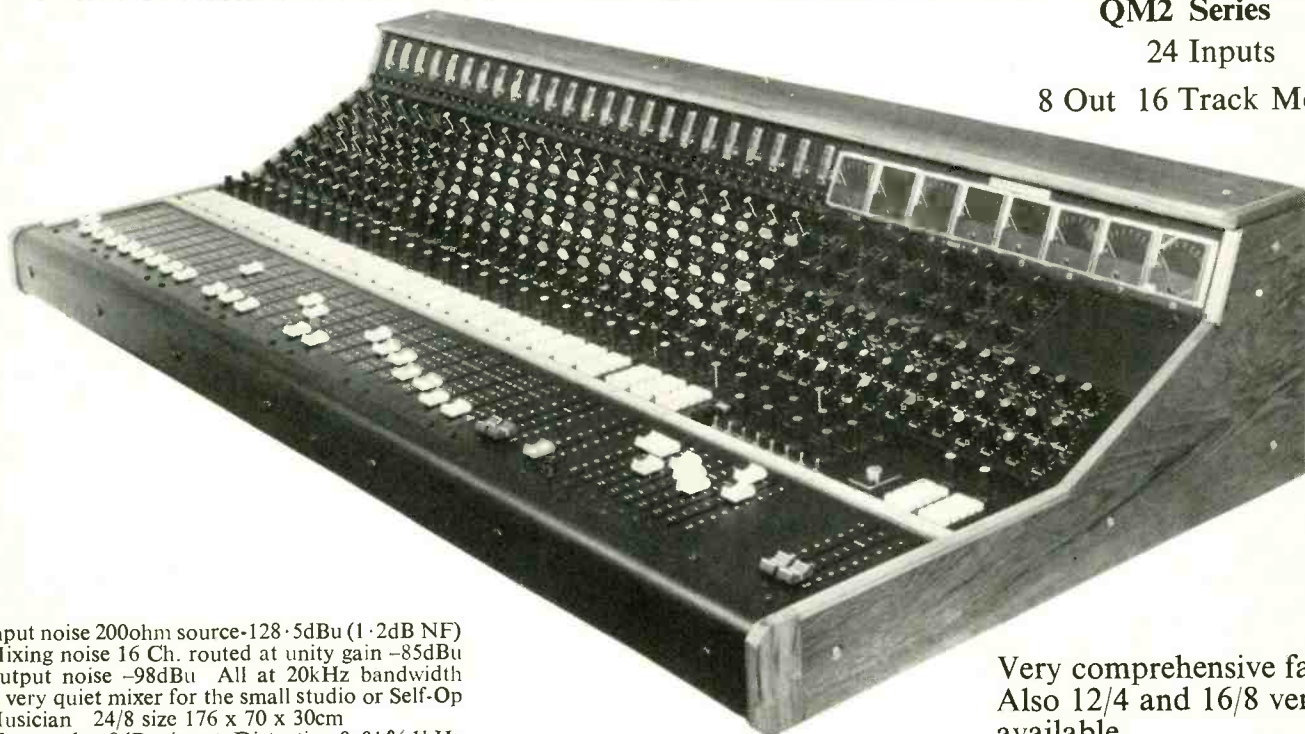
RATIOS 2:1 3:1 5:1 Limit (20:1)
 RELEASE TIME Adjustable – 75mS 150mS 300mS 600mS 1.2 sec 2.4 sec
 ATTACK TIME Adjustable – 0.25mS 0.5mS 1mS 2mS 4mS 8mS
 FREQUENCY RESPONSE 1dB 20 Hz to 30 kHz NO COMPRESSION
 DISTORTION 0.1% at 1kHz to 10kHz NO COMPRESSION +8dB input
 MAX. COMPRESSION 25dB
 MAX. OUTPUT +19dB at 1kHz +12dB at 20Hz
 MAX. INPUT Dependent on the MAX. OUTPUT and MAX. COMPRESSION
 NOISE Wideband –68dB Band Limited –71dB

Audio



Developments

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 WALSALL, W. Midlands, WS9 9AU
 Telephone: Brownhills 5351/2/3 (STD Code 05433)
 Telex: 338212 Audio



QM2 Series

24 Inputs

8 Out 16 Track Monitor

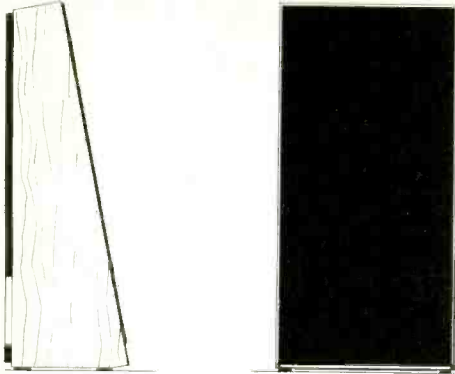
Input noise 200ohm source-128.5dBu (1.2dB NF)
 *Mixing noise 16 Ch. routed at unity gain -85dBu
 Output noise -98dBu All at 20kHz bandwidth
 A very quiet mixer for the small studio or Self-Op
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 *Measured at 0dBm input: Distortion 0.01% 1kHz

Very comprehensive facilities
 Also 12/4 and 16/8 versions
 available

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 Tel: 01-876-7957

Boothroyd Stuart—Meridian Active Loudspeaker M1



An active loudspeaker derives great musical and sonic benefits from the incorporation of electronics specifically matched to the enclosure and drive units. Each of the three drive units is driven directly by its own power amplifier and is individually protected against abuse. The electronic crossover is a constant voltage design which has only a 1.8dB energy ripple. This, combined with electronic time delay and phase compensation, gives a speaker system which is minimum phase ripple and time delay compensated up to 5KHz. The exact action of the crossover and phase compensation is the result of several years' investigation into stereo image formation in multi-way speakers.

Feedforward and feedback correction, and the use of a high order bass system comprising a specially designed driver and auxiliary radiator results in a speaker whose response is smooth and even, from 26Hz to 20KHz.

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 Noise 20dB spl
 Response —3dB 26Hz—25KHz 3/8π steradians
 ±2dB 150—20KHz
 Input for full output 0dBm over 4K or 600Ω
 or —20dBm over 4K or 600Ω

Matching Size

Weight

±1dB wrt reference 30Hz—20KHz
 990mm high (39in), 495mm wide (19.5in), 345mm deep (14in)
 Approx 30 kilos (66lb)

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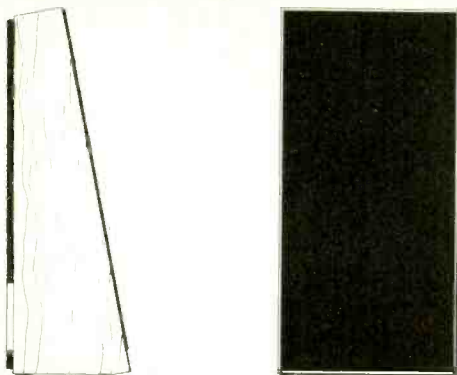


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Boothroyd Stuart—Meridian Active Loudspeaker M1



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Matching Size

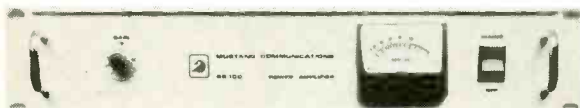
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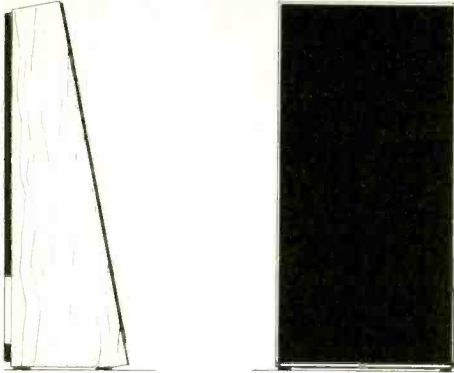
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 Approx 30 kilos (66lb)

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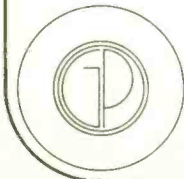
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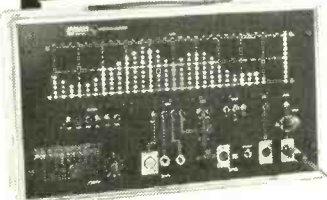
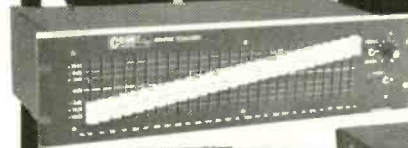
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Sound Workshop 1280 Console

Sound Workshop Professional Audio Products, now distributed in the UK by ITA, has introduced the 1280 8-track recording console. The console is essentially a 12/8 console with an 8 x 2 stereo monitor mix, 8 x 1 musicians cue mix, and an independent 2-track mixdown buss. Each of the 12 inputs features 3-band eq (± 15 dB of shelving at 100Hz and 12kHz, and 15dB of peak or dip at 3.7kHz), 35dB trim control, push-button track assign, full panning, echo send, locking solo and mute switches, 26dB mic pad, mic/line switching, straight line fader, and pre- and post-fader patch points. All 10 output busses feature Sound Workshop's unique Tri-lite LED readouts (a two colour/three LED readout with two green linear LED's operating at -15 VU and -6 VU respectively and a red quasi-peak LED operating at 0VU). In addition an optional VU meter bridge can be fitted to the console. The console also features talkback, slate, and 'talkback into cue' switching and the eight tape/buss switches permit monitor mixes to be fed by the buss outputs or multi-track tape machine. For installations where the 3-band eq is not flexible enough Sound Workshop offer an optional *Super Eq* facility providing three bands of equalisation within a choice of five frequencies per band and the facility for each band to be switched in or out individually. *Super Eq* is available on either the first eight input channels or on all 12 input channels. Another option is the 1280 *Expander* which provides an additional 12 input channels. This unit is available with or without mic input transformers. Specifications of the console are: frequency response $+0.25$ dB -0.75 dB 20Hz-20kHz, distortion 0.04% (maximum 0.15% at 20kHz $+10$ dBm output), crosstalk 60dB (10kHz), output buss noise -80 dBm (10Hz-20kHz unweighted — 12 inputs assigned), and mic input equivalent noise -124 dBm (10Hz-20kHz unweighted). Size of the console is 686mm x 508mm x 140mm and price is approximately £1,600. Sound Workshop Professional Audio Products Inc, 1324 Motor Parkway, Hauppauge, NY 11787, USA. Phone: (516) 582-6210. UK: Industrial Tape Applications, 1-7 Harwood Avenue, Marylebone Road, London NW1 6LE. Phone: 01-724 2497.

Virgin tape moves

The tape duplications department of Virgin Records has moved to 150 Goldhawk Road, Shepherds Bush, London W12, UK.

Contracts

● Alice has secured a contract for four sound control consoles from the Ghana Supply Commission for the Upper Region Agricultural Development Programme.

● Dynair Electronics has received orders in excess of \$1 million for its new *Dynair System 21* distribution switching equipment in its first six months of availability.



Sound Workshop 1280B-8EQ with meter bridge

AES British section

Forthcoming meetings include a lecture on February 13 at 7.00pm by Christopher Daubney and Ian Collins of the IBA entitled *Surround Sound*; March 13—a lecture by Professor Seker on *Static Electricity in Hi-fi Equipment*; April 17—*Amplifier Testing* by John Woodgate (ITT); May 15—*The Soundfield Microphone* by John Wright (IMF); and June 12—*New Developments in Electrostatic Loudspeakers* by Peter Walker of Quad. The venue for the meetings is the Institute of Electrical Engineers, Savoy Place, London WC2. In addition to the above meetings there is a visit to Thames Television at Teddington on February 15 organised by Hugh Ford. Further details of this year's AES activities are available from Brian Atkinson, 32 Knoll Rise, Orpington, Kent BR6 0EL, UK. Phone: 0689 25423.

NARM 21st Annual Convention

The National Association of Recording Merchandisers are to hold their 21st annual convention in Hollywood, Florida from March 23-28. This year's convention includes educational sessions on radio advertising, creative in-store merchandising, and opportunities in home entertainment via the video disc and video tape. The convention will also see the presentation of the 1978 NARM Awards for the best-selling recorded product. Full details are available from NARM Inc, 1060 Kings Highway North, Cherry Hill, New Jersey 08034, USA. Phone: (609) 795-5555.

Studio acoustic analysis and room equalisation service

Sound Research Laboratories Limited has introduced an acoustic analysis service for the small studio owner which can cost as little as £100. The service is a two-tier service offering initially a complete acoustic checkout of a studio or monitor room enabling the studio to be tuned to the type of recording envisaged. This overall measurement and analysis of room response, monitoring acoustics and sound insulation noise transfer performances can be surveyed and a report submitted. Secondly, Sound Research Laboratories can make detailed recommendations as to the most practical and cost effective means of improving the acoustic performance of a room and consultants will, if required, commission the studio after the work has been carried out. Further information on the service is available from Peter Mapp, Sound Research Laboratories Limited, Holbrook Hall, Little Waldingfield, Sudbury, Suffolk CO10 0TH, UK. Phone: 0787 247595.

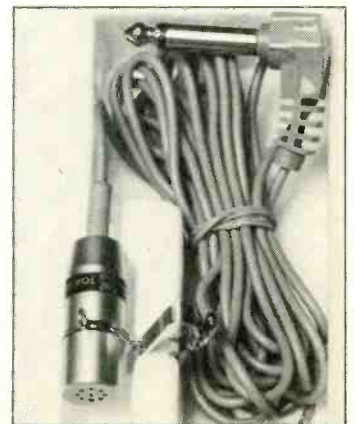
Toa tie-clip mic

Toa Electric has introduced a new tie-clip electret condenser mic, type EML024. The mic has a frequency response of 50Hz to 15kHz, sensitivity in 65dB ± 3 dB at 1kHz, and impedance is 600 Ω . The mic comes with a 10ft lead and retails at £14.43 (ex VAT). Toa Electric Co Ltd, Castle Street, Ongar, Essex CM5 9JY, UK. Phone: 02776 4333. 30 ▶

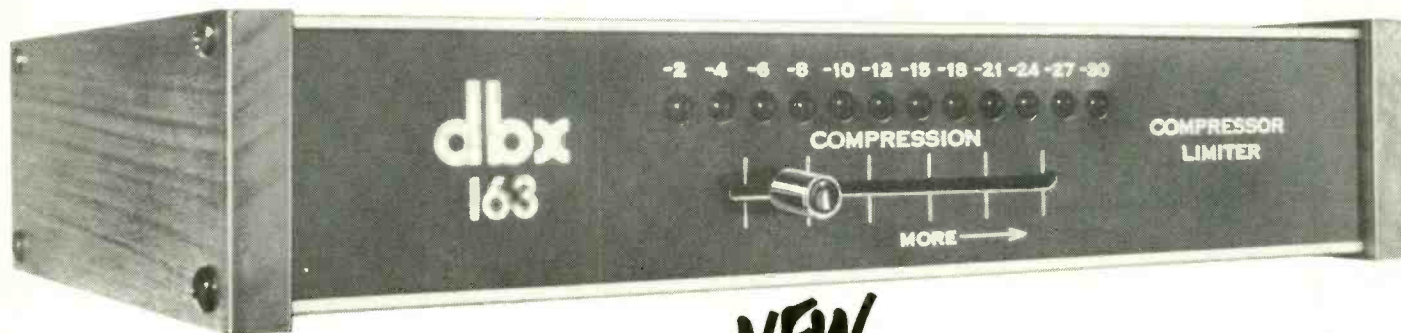
Sound 79 International Exhibition

The Sound 79 International exhibition organised by the Association of Sound and Communications Engineers, is to be held at the Cunard International Hotel, Hammersmith, London W6 from March 20-22 inclusive. On display will be a wide range of sound and communications equipment ranging from up-market mixers and studio equipment to discotheque, intercoms and paging equipment. The exhibition hours are 10.00am to 6.00pm (5.00pm on the final day) and admission is free to anyone having a professional or business interest. Further information is available from Douglas Joyce or Sandra Dreelan at ASCE Limited, 47 Windsor Road, Slough, Berks SL1 2EE, UK. Phone: 0753 39455.

Close-up of the Toa EML024 tie clip



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NEW yes! the dbx 163

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Boulevard de l'Oise,
95000 Cergy
Tel: Paris 749 0275

Holland
Pieter Bollen Geluidstechnik,
Hastelweg 6,
Eindhoven
Tel: Eindhoven 512 777

Norway
Kvam Audio,
Tollbugt 7,
Oslo 1
Tel: Oslo 412 996

Sweden
Tal & Ton Musik & Elektronik AB,
Kungsgatan 5,
411-19 Gothenburg
Tel: Gothenburg 130 216

Syntovox 221 Vocoder

Synton Electronics of Holland has introduced the *Syntovox 221* 20-channel electronics effects vocoder. The vocoder is basically a 20-channel audio analyser, synthesiser and control system which can analyse and synthesise speech, impose speech upon various sounds, alternate the timbre of instruments, add harmonic or non-harmonic overtones to instruments, generate speech (with optional computer interface), and control synthesisers and other voltage controlled units. The unit features 18-band pass filters plus low pass and high pass filters operating over 54dB per octave in both the analyser and synthesiser sections; real time analysis LED readout; 20x20 matrix patching; internal pulse generator



Syntovox 221 Vocoder

for speech synthesis; a fill-in and cleanfeed facility; random vlf and step modulation; lfo modulation; and voiced/unvoiced inputs in addition to the speech input. The vocoder is a 19in rack mount unit

which has a 56-way multiconnector for external control and computer applications. Synton Electronics BV, Zandpad 46, Postbus 83, NL-3620, Breukelen, Holland. Phone: 03462 3499. ●

FRAP transducer systems

Stateside Electronics Limited has been appointed sole UK and Ireland distributors for FRAP transducer systems. FRAP's complete range of pick-up transducers for acoustic instrument amplification including their three-dimensional transducer and professional pre-amp systems will now be generally available in this country. Specialised woodwind and special application units will be available to order and a new model, the *IT*, with an integrated pre-amp miniaturised into the head, priced at £31.78, has been introduced. Full details of the FRAP range are available from Stateside Electronics Limited, Unit 8, New Road, Ridgewood, Uckfield, Sussex TN22 5SX, UK. Phone: 0825 5566.

Technicobel mixing consoles

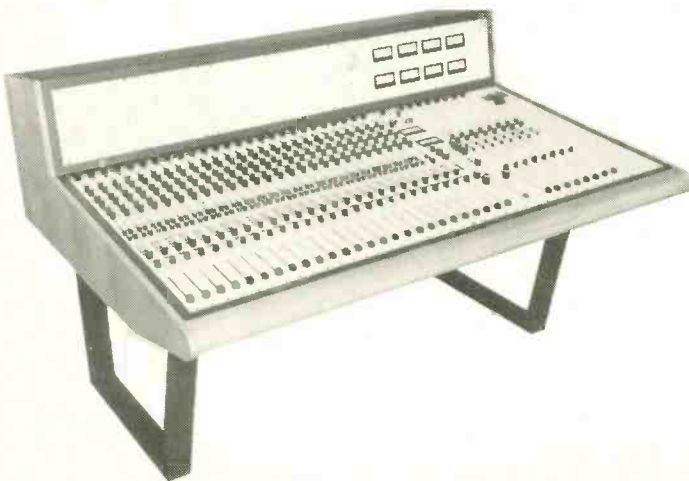
In July 1978, the Belgian holding company Electrobob sold its interest

in the Televic Group to the Belgium company Presisia, except for the French division which specialises in professional audio, and was



Technicobel RS50 console for sound reinforcement and theatres

renamed Technicobel. Technicobel specialises in developing and manufacturing mixing consoles for sound reinforcement, broadcasting and recording studios—the development department employs 12 including four engineers. The *RS50* console is designed for sound reinforcement and theatres and offers 24 inputs, 2 returns, 2 sub-masters, 8 outputs and optional 16-track monitoring. First introduced in October 1978, the *RS50* has been supplied to the 'Maison de la Culture' of Amiens, and ordered by the ones in Aulnay, Bobigny and Le Havre. Similar modules are used for the *RS40* 12/4 sound reinforcement console, the *RB60* 12/4/4 broadcast console and *RST50* 24-track music recording console. Technicobel also manufacture communications systems, including the *Coma 50* 9 input, 80 output triple matrix system supplied to the *FR3* regional station in Bordeaux. Finally Technicobel manufacture the *Carl 50* radio broadcasting console designed for smaller stations, that offers all mixing, communication and monitoring systems necessary for producing simple programmes. Technicobel, 8 rue De La Croix-Matre, BP 26, F-91122 Palaiseau, France. Phone: 920 8039. Telex: 692543. ●



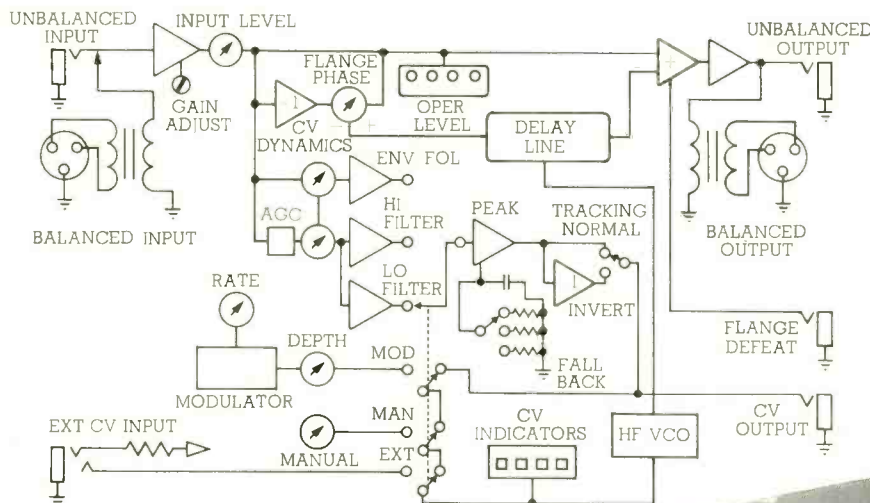
Tandberg to be restructured

December 13th, 1978, saw the announcement by the Norwegian government that Tandbergs Radiofabrikk A/S is to stop its present trading operations in Norway. Following the announcement a receiver was appointed and a group of consultants are presently evaluating the long-term future of the Norwegian company. The consultants we understand are to report their findings on January 8th, 1979. The Norwegian government has pledged to continue its support of the company with a view to restructuring the special product divisions of the company that have a continuing commercial future. Tandberg's data products division and educational equipment division we understand will continue to operate as will the major part of

Video Yearbook 1979

Despite its name, the *Video Yearbook 1979* includes considerable material of interest to sound engineers including sections on mixers, tape recorders, headphones and headsets, magnetic film recorders, talkback and intercoms, and an extremely comprehensive address

3 Modes of Dynamic Flanging from MICMIX



- * Dynamic Doubling
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- * Modulator Flanging
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The MICMIX Dynaflanger has the unique capability to *dynamically* control flanging effects automatically in response to the frequency or amplitude variations of the programme material. Input signals are continuously analysed

for spectral content or peak amplitude envelope and corresponding control voltages are developed. These control voltages vary the time of the delayed signal and thereby establish notch spacings in the flanged output according to programme content and front panel control settings.

Dynamic flanging is possible in three basic modes, with the dynamic tracking reversal capability expanding this to a total of six distinct effects.

For full details on the MICMIX Dynaflanger contact :

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AP Postal 8.178
Madrid
Tel : Madrid 637 0752

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Lake Audio APS,
Artillerivej 40,
DK-2300 Copenhagen S
Tel : Copenhagen 570 600

France
3M France SA, Mincom Div.,
Boulevard de l'Oise,
95000 Cergy
Tel : Paris 749 0275

Holland
Pieter Bollen Geluidstechnik,
Hastelweg 6,
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Tel : Eindhoven 512 777

Norway
Siv Ing Benum,
Skovvn 22
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Tel : Oslo 565 753

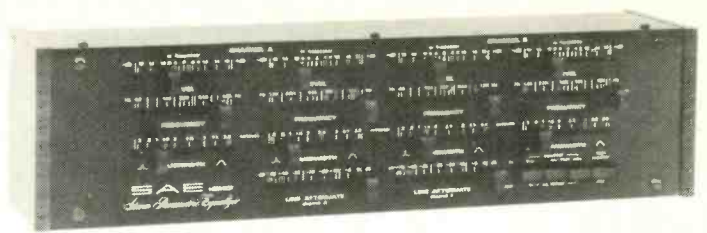
Sweden
Tal & Ton Musik & Elektronik AB,
Kungsgatan 5,
411-19 Gothenburg
Tel : Gothenburg 130 216

the audio and hi-fi division. The future of Tandberg's Norwegian TV set manufacture, loudspeaker manufacture and receiver production is in some doubt; however it is unlikely that tape recorder production including the new Actilinear machines will be affected. With regard to Tandberg's UK operations (Tandberg (UK) Limited and Tandberg (Electronics) Limited), these are likely to be sold to the present UK interests operating them. News of the UK companies futures is expected in early January. Commenting on the present situation John Farnell,

managing director of Tandberg (UK) Limited, said: "We are still a very active and viable company here in Britain, marketing both the consumer range of products and specialist educational equipment. We have every confidence that we shall be able to secure supplies of all our key products from Norway. We do not expect the immediate future to be without its difficulties, but we intend to pursue a vigorous programme for safeguarding our markets and, in close co-operation with our Norwegian colleagues, to create and build from the very best to emerge from their situation."



SAE 4200 speaker switching system



SAE 180 two band per channel parametric equalizer

New SAE models

Scientific Audio Electronics has unveiled two new products, a new parametric equaliser and a loudspeaker switching system. The *Model 180* is a two band per channel stereo parametric equaliser with variable level, frequency, bandwidth and line attenuation controls. Price of the unit is \$250. The *Model 4200* is a loudspeaker switching system designed to

accommodate up to three pairs of loudspeakers or three sets of headphones, or any combination of these. The third headphone output is a direct output capable of handling inefficient headphones or electrostatic headphones. Price of the unit is \$75.

Scientific Audio Electronics Inc, 701 E Macy Street, Los Angeles, Cal 90012, USA. Phone: (213) 489-7600.

Broadcast Equipment Show

The third Broadcast Equipment Show, sponsored by Audio & Design (Recording) Limited, was held at the IBA's Crawley Court Centre near Winchester in early December. This event, which was an informal exhibition open solely to people working directly within the broadcasting industry, was a friendly and highly successful evening for all concerned. Over 20 companies exhibited their products and we understand that orders worth in excess of £1m were taken by the exhibitors.

Whilst the majority of equipment on display had been shown before, two companies products caught the eye. The first was the unveiling of the prototype of a new broadcast *Custom Modular Mixer* from Alice. This is a development of Alice's successful *ACM* system to cover the full range of radio broadcasting requirements, from multitrack and stereo production mixers to on-air master control and self-op consoles. The new mixer system is available with any number of input channels and with variable output configurations—mono, stereo (plus derived mono) or programme plus audition in mono or stereo (plus derived mono in either case). Up to four separate mono sources, with individual talkback to each source, can be accommodated, enabling two or three-way telephone discussions, and additionally external news sources (eg, sports reports) to be incorporated into networked or two-way programming. The mixer

system features very comprehensive voice-over and monitoring systems and in addition to the usual loudspeaker and local headphone outlets, has two independent studio headphone feeds, all with independent level controls. A number of optional configurations are available and the mixers can be supplied with or without a central script area, in table-top or floor standing formats, or in basic metalwork for custom mounting.

The other company which attracted our attention was Philip Drake Electronics who exhibited a dual audio distribution amplifier and a flexible talkback communication system. The talkback system features customised central switching units using combinations of

plug-in pcbs structured to the individual user's needs dependent upon source, destination and distribution. The dual audio distribution amplifier is a high quality, high performance line amplifier with 50k Ω balanced input and 50 Ω or 5 Ω balanced output and an overall gain of unity. Both the input and output are transformer coupled allowing total isolation between signals. The unit is intended for use in the distribution of a balanced line level signal to 10 outputs, through isolating resistors, or for applications which require an input signal to be buffered or isolated. Frequency response of the unit is 50Hz to 50kHz ± 0.1 dB, THD better than 0.1%, and output noise better than -80dB. The distribution

amplifier is based on a BBC design and is manufactured under licence from the BBC. This unit is the first product from a projected comprehensive range of broadcast standard equipment which will include a line sending amplifier, a high gain line amplifier, a Post Office line interface and a power supplier with automatic battery standby. It is anticipated that these and other products will become available during the year.

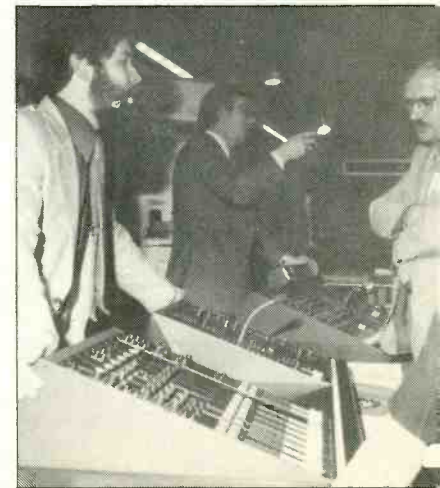
Congratulations must go to Dave 'Scoop' McVittie of Audio & Design for organising this highly successful mini exhibition which was a delightfully informal event without any of the hassles involved in visiting the larger exhibitions.

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Overall a busy scene at the Broadcast Equipment show



Below: New Alice broadcast custom modular mixing system



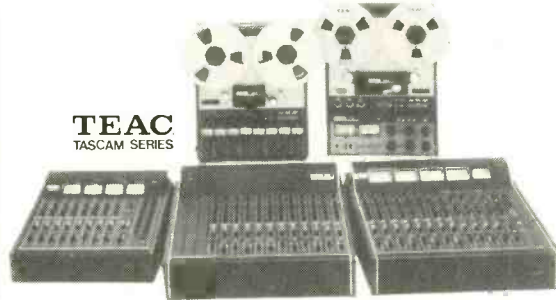
turnkey

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For many years QUAD amplifiers have been a standard in UK Studios for quality monitoring. Their latest model, the 405 current dumping design is now available from TURNKEY.



We supply and install the TEAC TASCAM multitrack system. Mixers Models 2, 3 and 5, and tape recorders 3300S, 3340S and 80-8 are suitable for both multichannel and audio production applications.

VARISPEED

By popular demand we have produced a compact vari-speed unit that can be easily connected to any fixed speed recorder. The power oscillator is housed in a free standing case and connection is via two wires to the capstan motor.

The hand held remote switches between fixed speed operation and a plus or minus 15 percent pitch control.



Custom rolling consoles for all TEAC recorders. A unique design permits tape storage or mounting noise reduction. Sold as a flat-pack kit.



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With every four track that we sell, we supply, free of charge, the remarkable 1478 mixdown mixer. Tone pan and fader on each channel, and no noise, distortion or overload.

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Dual Notch - Twin tunable low frequency notches for programme filtering.

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Teac's 16 page booklet "Are you ready for multitrack?" is also available on request.

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Neumann celebrate 50 years

November 30, 1978, saw the 50th anniversary of Georg Neumann GmbH. Neumann is a name which almost demands no further comment but we feel we ought to briefly add our own accolades to the achievements of the company's 50 years in business. Much of its success is undoubtedly due to the pioneering spirit of its founder Georg Neumann. Georg was a remarkable man who constantly worked to further the audio industry's state of the art. The achievements of the man and the company are almost legion, ranging from the first industrial manufacture of condenser mics (including the Neumann *CMV3*) to the first Neumann disc cutting machines in 1930; the development of the principle of the gastight NiCad rechargeable battery; the introduction of the legendary *U47* condenser mic; the company's work on the technology of mic membrane production; and perhaps of greatest impact on today's audio world the development and production in conjunction with Teldec of the stereo disc cutting system. The



Custom-built Neumann mixing console

work of the company and the man was recognised when Georg Neumann was awarded the Emil Berliner Prize in 1973 and the AES Gold Medal in 1976. It is unfortunate to say the least that the great man's death in 1976 prevented him joining the company in its 50th anniversary celebrations. However, the success of the company's products whether they be condenser mics, mic accessories, artificial heads, disc cutting equip-

ment, recording consoles or computer-controlled switching systems, seems to be assured. As a measure of this success it is interesting to note that the newly introduced *VMS80* disc cutting lathe is already sold out well into 1980 even though deliveries of the new lathe have yet to commence. Although no company's continuing success is sacrosanct, we are sure it would surprise no one if in 2028 we celebrate the company's centenary!

MCI JH-32 developments

Further to our report on MCI's *JH-32* three-inch tape recorder in our AES New York report, news reaches us that Ampex, 3M, BASF and Agfa are currently offering three-inch tape and that MRL are making a three-inch alignment tape available. Scheduled deliveries of the *JH-32* at present are for Air Recording Studios, London (2); CBS Recording Studio, London (3); Compass Point Studios, Nassau; Criteria Studios, Miami (5); and Stare Records, London (4).

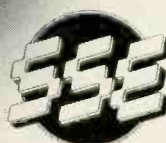
People

● Dennis Wratten has been appointed executive vice-president of KLH Research and Development Corp, with Frank Jones being appointed vice-president of product development. Robert Coppola, formerly executive vice-president of KLH, has become president of parent company Electro Audio Dynamics new European operation.

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EQUIPMENT**



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The Soundcraft 1" 8-track.

Produced after two years of development, it's sophisticated, easy to use, reliable, and its specifications are superb. The deck plate is a rigid aluminium casting of extreme dimensional accuracy, ensuring the absolute stability of the tape path.

Tape tension is servo controlled, as is the capstan (which has +15, -50% varispeed control), and wow and flutter is only 0.03%.

Control and monitoring facilities are comprehensive. A simple push-button matrix permits selection of line-in, sync and replay for any of the tracks and led's indicate the selected status.

The tape counter has a plasma display reading in minutes and seconds. There is also a highly accurate search-to-zero facility.

A special feature of the machine is that the whole of this control panel, and the varispeed control, can be used remotely. So once the machine is prepared, a single engineer can work a recording session without leaving the mixing console.

Replay S/N is 76dB (reference 510nWb IEC curve A); erasure is 70dB and record/replay frequency response is +1, -2dB (30Hz to 20kHz).

All signal levels can be adjusted by presets on each channel. The external power supply is fully protected and 19" rack mounting.

The Soundcraft SCM 381-8 is built to the highest professional standards throughout for the production of master quality recordings.

The UK professional price is £5,250 (excluding VAT). It includes all the above features as standard.

Contact Soundcraft for a brochure giving more details and a full technical specification.

Soundcraft Magnetics Ltd, 9-10 Gt Sutton Street, London EC1V 0BX, England. Telephone 01-251 3631 or 01-253 9878. Telex 21198.



SOUNDCRAFT
MAGNETICS LIMITED

studio diary

Morgan Recording Studios

Morgan Studios have been around for a long time, since 1968 in fact when engineer Harry Davis began building the first studio of what has become one of the best known studio complexes in the UK. From being an 8-track studio in a room which is now the studio's bar, the studios have grown considerably so that now there are four studios, all well equipped and spacious. Growth of the studios under Harry Davis, who oversaw the building of all four studios, has been a steady progression, with the most recent studio, Studio Four, coming into operation in 1973. Since this time, however, considerable updating has been carried out, the most recent changes being the updating of Studio Three in August 1977 and the updating of Studio One in September 1978.

With the latest update just having been completed I felt now was a good time to visit the studios and meet chief engineer Jack Davies. Jack is a member of the 'old school', a man with a wealth of knowledge at his fingertips and a pleasant, friendly approach born of long experience of the recording business. Having started straight from school with EMI back in 1933, Jack has been involved with the development of recorded sound from the advent of stereo recording by Blumlein, and the introduction of magnetic tape recording, right up to the present time. The most interesting period has been the development of recorded sound since 1945. At that time Jack worked at EMI Hayes as a liaison engineer liaising between the design and production teams on the manufacture of EMI's professional and domestic stereo equipment. Jack recalls the introduction of one

of the first domestic stereo replay only decks using the transport of the professional portable *TR50* mono recorder. He also recalls the advent and unfortunately also the demise of EMI's stereo pre-recorded tapes. Other products with which he was involved at EMI were the *TR50*, *TR51*, *RE301* and *TR90* mono and stereo recorders. Jack was also involved with the *BTR4* which was the last professional recorder produced at EMI.

When EMI pulled out of the tape machine production market in the early sixties, Jack moved over to EMI's servicing and installation operation, staying there until 1962 when he moved to Stage Sound in Covent Garden, where he became involved with film dubbing and recording studios. Jack remained at Stage Sound until 1970 when he became chief engineer at the ill-fated Command Studios in Piccadilly. The problems and traumas of Command were reported by John Dwyer in the April 1975 issue of *Studio Sound* and Jack understandably has nothing to add to this. Jack was chief engineer at Command until the studio's final demise in December 1974, moving to Morgan in 1975.

Morgan is a rare bird among studio complexes exhibiting a level of standardisation of equipment which to say the least is unusually comprehensive. Throughout all four studios, with one major exception which I will come to later, all equipment is standardised. This naturally aids ease of maintenance and also means that Jack Davies does not need to stock as wide (and divergent) a range of spare parts as could have been the case. Jack sees standardisation of equipment as being of great importance to the studios as this allows inter-

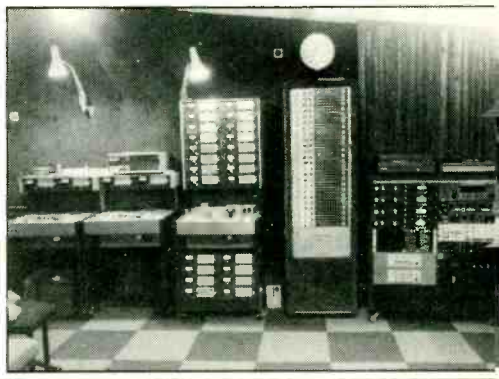
changeability of equipment from studio to studio should some small (or great!) catastrophe befall any one of the studios. A further advantage of such standardisation and one which has been taken full advantage of, is that Studio One and Studio Two can be linked for 46-track operation using Studer synchronisation.

As to the equipment utilised by the studios this is mainly based on Cadac, Studer, Amcron and Tannoy models. However, as previously mentioned there is one major exception to the studio's standard equipment. This exception concerns Studio One, the most recent studio to be updated. Here Morgan have just installed a Harrison 36/24 console with Allison Research *65k* auto-programmer. The reason for the change to Harrison, Jack explained, was simply a question of availability and delivery times. Cadac, the studio's normal supplier, could not provide a console at the right time and of the other possible choices Harrison could meet the required delivery date and offered the necessary facilities. Jack was extremely pleased with the Harrison, stating that not only was it more compact than their Cadac's but also that

they found it "ergonomically excellent".

With regard to the other studios, Studio Two has a 24/24 Cadac console; Studio Three has a 32/32 (wired for 40) Cadac desk with Studer auto; whilst Studio Four has a Cadac 28/24 again with Studer auto. Studio Four additionally is fully quadraphonic being equipped with EMT quad plates. Regarding standardised equipment, this consists of Studer *A80* tape recorders in 24-track, 4-track and stereo formats, Amcron *DC300A* power amps, Tannoy *Buckingham* loudspeakers (JBL *4311* loudspeakers are also available), UREI limiters, Deltalab digital delays, Eventide digital delays *Harmonizers*, flangers and phasers, Syntron *Model 903* phasers, Pye and EMT compressors Astronic and UREI graphic equalisers, Allison *Keplex* and *Gainbrains*, Meyer noise gates, EMT reverbs and Dolby A *Model 361* noise reduction. In addition, the studios use Beyer *DT100* headphones and a wide range of microphones including Neumann, Calrec, AKG, Beyer Schoeps, Sennheiser and Sony models. The tape which Morgan use is Scotch 256 tape recorded at +4dB above Ampex 185nWb/m.

Below left:
The new console
in Studio 1.
Centre:
Close-up
of Studio 1.
Below right:
The Cadac desk
in Studio 3.
Right:
Studio 3 equipment
line up.



The use of Tannoy *Buckingham*s provides a good example of co-operation between a studio and manufacturer. Having used Tannoy HPD's and Gold's for a long time, Morgan wished to update their Tannoys. Accordingly, in conjunction with Tannoy, studio engineer Martin Levan gave assistance with the development of the new *Buckingham* loudspeakers which involved modifications to crossovers and cones which has resulted in more punch and a cleaner bass. Morgan are very pleased with the results from the loudspeakers and all four studios are now fitted with *Buckingham*s.

Morgan is an extremely well laid out set of studios exhibiting an attention to detail in decor and equipment placing which utilises the available space to good effect. Nothing can be more annoying in a control room or studio than to feel hemmed in, therefore it was pleasing to see that all the studios at Morgan have spacious control rooms and studios which allow simple use of the facilities. An indication of the thinking which has gone into the control rooms is the mounting of all optionally used ancillary equipment in custom-built enclosures which are on castors, hence allowing them to be pushed out of the way when not required. Other examples of the amount of careful planning which has gone into the building of the studios include the provision of a bar/coffee room, a self-contained

restaurant, and the provision of three standby generators in case of mains power failure (two diesel generators and one gas). As to studio sizes, three of the four studios are larger than 3,200 square feet the largest being Studio Four, whilst the smallest studio (Studio Two) is over 1,600 square feet. This variety of studio sizes allows Morgan to accommodate groups of musicians ranging from solo artists to groups of over 40 musicians depending on the studio being used. Jack Davies informed me that recent users of the studios included Child, The Dooleys, Brotherhood of Man, Japan and Jethro Tull. Also interestingly Jack said that one of the most frequent users of the studios were Hansa Records, a German record company.

Morgan appears to be in very good health. With as experienced and likeable a chief engineer as Jack Davies in charge everything seems to operate like a well oiled machine, and whilst it is always pleasing to visit a studio complex which has obviously been well thought out, when it is also as friendly and businesslike as Morgan the pleasure is increased. It only remains to wish all at Morgan well for the future and, yes, next time they update I'd love to pay another visit.

Morgan Recording Studios, 169-171 High Road, London NW10. Phone: 01-459 7244/7. Noel Bell

Westlake Studios

Westlake Audio, as many readers will already be aware, is one of the elite distributors of professional audio equipment in North America. Situated on Wilshire Boulevard in central Los Angeles, Westlake has built itself a reputation for handling the best in the industry, designing studios and recording environments of renown, and being innovators in an intensely competitive industry.

1971 saw the evolution from straight pro-audio dealer to the addition of a mixdown room in the same premises as the showroom, followed by an overdub room which rapidly became known throughout the industry in 1973 for its first class mixes and masters—these include several Stevie Wonder albums. These new additions offered a convenient showcase for the products handled by Westlake as well as being an ideal testing ground for new and untried products.

In its present state, the mix room is permanently equipped with an automated API 32/24 console with Allison 65K *Programmer*—the mix room was one of the first fully automated facilities and was undoubtedly instrumental in getting the industry into automation.

Glenn Phoenix (president of Westlake Studios): "API was certainly the console of its day and still commands respect. It is still the preferred console by many even though there are now many offering auto facilities." The facility also boasts 3M 79 24-track tape machines, 3M 2- and 4-track machines plus Studer A80 and Ampex ATR-100 2-track machines. Outboard gear includes pretty well everything the industry has to offer at the top end of the market. Monitoring in all rooms is of course the Westlake monitor system.

Turning to the new Westlake Studios which are a continued evolution from the mixdown facility, Glenn Phoenix: "The decision to build came through the repeated requests by customers of the mix facility for a recording facility of the same high standards and quality; plus the need by Westlake Audio for a showcase studio—clients hitherto being taken to other Westlake designed/built studios for product appraisal which wasn't always convenient for the studio or client. Plus the necessary quality was not always maintained."

Completed in January 1978, Studio A is unmistakably Westlake



Westlake Studio showing the Harrison desk

dressed virtually entirely with Redwood strip panelling. Geometric in shape, it measures roughly 1,200 square feet and is capable of holding up to 30 musicians with ease. The studio utilises the Active Trap system which Westlake has used for years. The 700 square feet control room has been built very much as a working environment for the musician—being biased towards the user and group actually working in the control room—mic lines being brought up in the control room as well as the studio and all tape machines being recessed into the walls. This allows the control room to hold a dozen working musicians with ease. The console this time is a Harrison 40/32 with Allison automation once again. Monitoring, with the facility for quad, is supplied by a still experimental version of the new Westlake monitor. Glenn Phoenix: "The key points of the existing Westlake monitor system are its excellent dispersion characteristics, power handling and broad bandwidth. The system can be worked and worked at a known high level, while many other systems on the market can't handle this heavy use, be they good or bad in other respects. While most people are more than happy with the system, some have criticised the honky (for want of a better word) character of the horn while others say it lacks a good solid bottom end. Our response has been: 'OK, yes—due partly to the design of the original system . . . there are always trade-offs in the design of speaker systems. The trade-offs at the time of the design were quite proper and resulted in a successful system.'

"The new monitor will be as good as the existing system from the point of view of power handling, but will offer some additional acoustic properties which will answer these criticisms and give the industry the 'state of the art', high powered, high resolution,

phase aligned, broad band system in keeping with other such systems. How we are achieving this is not yet for public consumption—the system being somewhat proprietary.

"Units employed within the monitor have varied over the years—when they were first built there was no Gauss, just the JBL 2215 woofer, the 2240 mid-range driver, and the 2420 tweeter. With the introduction of Gauss, 5831 woofer, several versions have followed. There is now a divided opinion as to the preferred 15in woofer—half go with the Gauss 5831 and half with the JBL 2215 or 2231. The Gauss HF4000 midrange driver is still the recommended unit but some choose the JBL 2440. The tweeter has generally remained the same with the JBL 2420 although a few systems employ the JBL 2405 allowing extended bandwidth, though some say this has a harshness characteristic which the 2420 does not." A year's research and development has gone into the new monitor in Studio A and Glenn Phoenix stressed that this is not yet its final saleable version—no orders will be taken until the system is perfected.

To the left of the control room (entry to both studio and control room being from the right) is a variable decay isolation booth ("one of the best Westlake has ever done for its physical size of 300 square feet") with excellent and even decay times from $\frac{1}{8}$ s to a maximum of 1.2s. A wrap around window offers a virtually complete view of the studio from the control room. It is a three glass system and isolation between control room and studio is a respectable broadband 56dB from 50Hz on up. Glenn Phoenix: "People often think certain aspects of a window system will determine the isolation between control room and studio—this is often not altogether the case. The leakage between rooms is the sum of the leakage through the glass

and the rest of the isolation system. A lot of leakage is due to the diaphragmatic action between the control room ceiling and studio ceiling working together. In some designs, there will be a good deal of coupling between the two, and in some there won't. The natural setting of the facility will affect this. For instance, if you have the luxury of a high ceiling, you can allow air space between the control room 'cap' (ceiling) and the studio 'cap'. The air coupling between the two will obviously be very loose and springy because of the large amount of air.

"In Studio A, we were limited to a 14ft ceiling with a very flat 'cap' by the building itself, and it was not easy to obtain good coupling in that area. Another source of isolation problems which causes a great deal of debate is the floor coupling. In A, the floor is fully floating which eliminates any street rumble or interconnection between the studio and control room floor slabs."

Another feature of the new Westlake studios is its 'drapery' system—all motorised and remote controlled from the control room allowing the engineer to tune the room without moving from his seat and listen to the change in character of the room. There are a number of studios which have this feature but this is a particularly fine example achieving a 2:1

variance in decay time.

Apart from the Harrison console and the tape machines previously mentioned (the selection of 3M multitrack and Ampex and Studer 2-tracks are a standard feature of all the rooms at Westlake) certain outboard gear has been adopted as standard apart from that on appraisal. UREI limiters have become "the accepted necessities of life" the Inovonics 201 limiter together with *Kepex* and *Gainbrains* and the new ADR *Scamp* system. Dolby noise reduction is required in all rooms while dbx is available as a plug-in item. Westlake also offers the Telefunken *C40* noise reduction system "which we have found to be excellent. However, hitherto there has been a lack of interest due probably to the old standardisation thing. We do recommend it as an excellent system and it is there to be used." Three EECO SMPTE dual cue synchronisers can be used to link multitrack machines and also for use with VTR machines. Westlake is fully equipped to handle simultaneous video production in both studios. Digital delay lines are now an accepted necessity. Westlake uses an Eventide *1745A* in most rooms, while the Lexicon unit is beginning to feature more and more.

In the last year, Westlake A has been busy—a sample of the work done includes the Brothers Johnson *Blam* album, the latest album from

Michael Murphy, a new CBS release by Dave Donaghue, George Duke has just finished his latest album project and is returning next month to work on the new Dee Dee Bridgewater album. The Jacksons are scheduled to use the studio in the near future having just completed mixing their new album at the Wilshire room. Eddie Money is currently in the studio with Bruce Botnick producing. So what about Studio B? This is still under construction—trapping going in at the time of writing—but is scheduled to start work in January 1979—exactly a year after A opened. Studio B will evidently be very similar to A in design and equipment—Harrison Console, the usual array of tape machines and whatever's new in outboard equipment. The big difference will be size; 700 square feet compared to 1,200 square feet of Studio A.

To conclude the visit to Westlake Studios, Glenn Phoenix gave his thoughts on Westlake and the future of digital recording: "Like most people, we're keenly watching 3M and the others for the moment when the state of the art of digital recording makes it practical for it to enter the main stream of studio recording. How long is a political question—but on past experience it's not going to swoop into studios within 12 or 18 months even ignoring the growing pains it will have to go through. A good two

years is probably realistic before any considerable amount of music masters will be digital. One problem, apart from the technology, is the sheer physical problem in getting large numbers of the product onto the market place considering the number of studios making music masters."

And on Westlake's future: "The Company has recently embarked on a programme of research and development involving a commitment in terms of cash investment in personnel who will be solely dedicated to the development of new products—plus of course the necessary equipment to do this. Apart from the new monitor system already described which will probably be a 4-way system, a physically smaller monitor system is on its way—still high power, broad band, but with some reduction in power—for the smaller studio which does not have the room for the larger system. Along with these monitor systems and the necessary proprietary active cross-over systems, Westlake is moving more towards research, design and manufacturing."

That's Westlake then, from Pro-Audio dealer to mixdown and overdubs to a fully fledged recording facility to manufacturer. Westlake Audio, 6311 Wilshire Boulevard, Los Angeles, California 90048, USA. Phone: (213) 655-0303. **Enbee**

Why Colorado?

As an American who has found the pleasures and preference of life in London, I feel that I must bring my American home, Colorado, into proper perspective. Certainly, with respect to our industry.

Recording enjoys a large proportion of its growth and development from the popular music industry. With a climate and geography rivaling any paradise on earth, Colorado has drawn many musicians who may have desired an escape from the pace and style of Los Angeles, New York or London. Examples range from Supertramp and Elton John, to John Denver and Stephen Stills. Barry Fey of Feyline, Inc has done much for Colorado to add a fantastic range of concert appearances, thus creating and preserving a demand within all parts of the industry.

We have nearly 100 recording studios, over 30 radio stations devoted to a variety of music programming, and enough record retailers to have fostered the beginnings of a boom in the industry in these humble mountains.

Since music and its recording is an art, and with man being a product of his environment . . . it is only natural that Colorado has enjoyed such growth and maturity. With barely 2,000,000 people living here and the ski industry still holding a certain dominance in the life of the average Coloradan, recording is still growing slowly. The services are here and certainly the local talent is at a per capita level with any music centre, it is the faith of people like Northstar, Applewood, James Guercio, Barry Fey, Chuck Morris and many others that will make Denver another of the world's music cities.

We speak with great reverence of the new generation of studios appearing in dreamy locations like Montserrat, the Virgin Islands, Essex and the Cote d'Azur. Why? It is the location and the style of life that the scenery breeds. When you live in a city regardless of its merits (London), or lack of (Los Angeles), you adapt to that situation. In a natural setting your music becomes a more natural form of communication, with facilities

that are available you would certainly not be stifled by the lack of equipment. For those artists having trouble finding the energy they may have lost over the years, I offer full logistic services necessary to bring them to the Rockies and am nearly able to guarantee to them the rejuvenation only found in this setting. If John Denver would change his name to Akron I would feel comfortable using the phrase 'Rocky Mountain High'!

David Clamage

TAM Studio

As London's most recent disc cutting room, we have already been associated with a notable first—the recording at Watford Town Hall of the London Philharmonic Orchestra by Crystal Clear as the first direct-cut to take place on location in the UK. Being one of the few completely independent cutting rooms in the UK, we were able to handle the normally difficult problem of shifting a complete cutting lathe, and within three

hours of leaving our own premises had the lathe in place in the Green Room, high up behind the concert platform, and mechanically set up.

As owners of a cutting business we have, in less than one year, become very adept at moving lathes! Originally we had arranged to buy a complete system in the UK, but for various reasons this deal fell through and we were left in January this year with a newly-built facility, brochures and advertising but no equipment. To try and find at least a basic lathe, we perused the advertising columns in several magazines and the third person that we telephoned was John Southard of Trad Electronic Sales in Watford. His immediate reaction was: "Well I don't have one, but give me a while and I can probably find someone who has one to sell". Within two hours he called back to ask if we would like to go over to Paris to look at a complete suite! Two days later we were on the night ferry to Paris heading for the Pathé-Marconi (EMI) Studios where we were

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Tam Studio

shown not one, but two, complete systems available for sale. The one that we preferred had been in use up to September, cutting their classical LPs.

So we not only had a lathe but a system complete with monitors, eq, limiters, spares, all the latest auto facilities—and all within a few days of ringing John. On the ferry back to London we thought all our problems were solved but, no, they were just beginning. The main problem was that everybody that we spoke to was quite happy to carry out whatever job we wanted done (packing, transport, freight agents, insurance, customs) until they discovered what it really was that they had to deal with then, one by one, they decided they did not want to know. You would think that with so much electronic equipment being transported around Europe, getting from Paris to London would be a cinch—just try it sometime for yourselves when you only have a one-off to arrange and it's outside the usual run of equipment.

So, after three abortive attempts (arrangements made and prices quoted until the agents actually saw the cutting suite) we left Lydd airport (where the latest agent's transport had failed to arrive) in our hired van, drove to Dover, and just caught the ferry in time to arrive in France as it got dark. Our only preparation being a few sandwiches, an RAC tourist map, an address in Paris and advice on how to drive on the right.

If you want an interesting experience, try wandering the streets of Paris at 5am, accosting passing strangers (in English, of course) and attempting to get directions. Eventually we were parked in Pathé's car park waiting for the doors to open at 8am. By dint of laboured conversation consisting mainly of technical French and English, we had the system

stripped down and loaded by noon, the lathe itself being lifted straight into the van by what seemed to be the entire French engineering staff—they couldn't have been more helpful and Anglo-French relations must have been jacked up quite a few notches that day. Until, that is, we arrived at Charles De Gaulle airport to get 'just a minor EEC form' to allow us to clear French customs back at Calais. Three hours of infuriating delay and £40 later we eventually got back on the motorway.

Steaming up the motorway in a long line of artics, obviously making for the same ferry as we were hoping to catch, is quite an experience in a hired van governed down to a maximum of 50mph, particularly when you're loaded with some very valuable equipment which all the regular transport agents have refused to touch—every bump and overtaking juggernaut is a potential threat. And so to Calais—co-operative Customs and port authorities—we had the magical bits of paper which rapidly disappeared into various file cabinets, and on to another late night ferry. As we ate and drank to make up for lost meals over two days, we were looking forward to Dover at 11pm and home by 2am for a quick sleep before unloading. But no, we had passports, but the equipment had none. Not only that, but the Customs lists lacked 'disc-cutting suite' as a classification, and with no classification the form could not be completed; and with no form it could not be stamped; and with no form the van could not leave the compound; despite the fact that it was an EEC transaction, so no duty involved and no immigrants under the floorboards. That stupid official muddle held us up for over five hours and cost John another £25 to a freight agent who did nothing except spend a few minutes filling up a form

that, if incorrectly done, could have left us sitting there for five days or more.

Eventually, we did arrive home and unload with no damage whatever. Within one month of that phone call to Trad, we were completely set up, overhauled, tested and cutting. Not quite yet the end of the story, however. John Southard found another buyer for the second lathe and cutter, and, faced with the same transport problems, asked us to undertake the shifting of the second lathe from Paris to London. Experience does not count for much when dealing with officials, but we managed to get into the country in two hours instead of five. John still got taken by the agents though, for the same exorbitant sum.

You can imagine our reaction when Bert Whyte, the recording engineer for Crystal Clear, telephoned a few months later and asked if we would like to rent our lathe out on location to Watford. Once the idea of participating in the excitement of the first direct-cut on location in this country caught on, we changed our minds, tracked him down in his hotel and finalised arrangements.

In the event, the recording was every bit as interesting as we had hoped. Ed Wodenjak arranged for Ortofon cutting heads and amplifiers to suit his technique, together with an adaptor to fit our lathe and also arranged for a lathe to come from Denmark to achieve as many good lacquers as possible. The longest side cut was over 19 minutes, which is a record for a direct-cut of this type and the only disappointment was that Pyral were unable to get lacquers to us in time, so the lacquers used had to be American instead of European.

In only eight months, we have achieved far more than we ever dreamt of in October last year when we originally conceived the idea of setting up our own cutting room. We look forward to many more exciting projects, but hopefully without the involvement of officialdom!

Tam Studio, 13a Hamilton Way, London N3 1AN. Phone: 01-346 0033.

Tony and Myrtle Batchelor

Roundhouse postscript

Further to our report in *Studio Sound* June 1978 at which time Roundhouse Studios were still in the process of completing their rebuilding we can now bring readers up to date with news from the environs of Chalk Farm. Rebuilding is now completed so that the

reception area studio control room and mixing room are fully operational. The studio has taken delivery of the Harrison Autaset automation system to accompany the Harrison 32/32 desk and are very pleased with the unit. Parent company Bronze Records we learn have just installed a computer which it is intended Roundhouse will have access to through a VDU for studio booking and inventory purposes. In addition to which in the future there is the possibility of using the computer as a synthesiser interface. The mind boggles! A quick visit to Chalk Farm confirmed that all was well and very relaxing and luxurious it is too. Artists who have used the studio recently include The Real Thing Sally Oldfield Andy Mackay Osibisa and Patti Boulaye. Roundhouse Recording Studios, 100 Chalk Farm Road, London NW1 8EH. Phone: 01-485 0131.

The Music Factory, Miami

After months of major renovations and conversion from 24-track to 32-track, Miami's Music Factory recording studios are now back in full operation. Bob Archibald, president of The Music Factory, has incorporated an extra large new console into the conversion which boasts some, to say the least, rather unusual features. The new console features remote control of 3M recorders; a special custom-designed console with 24 inputs and 32-channel outputs with parametric and conventional equalisation; and a separate 32-channel mixdown section allowing simultaneous mixdown whilst recording is taking place. In addition the studio has four separate monitor loudspeaker systems. $\frac{1}{3}$ -octave equalisation, real time analyser, digital delays, a time axis manipulation system, and a wide selection of limiters and compressors. Other features include a specially designed drum booth fully equipped with a 14-piece drum set and a computerised Yamaha theatre organ.

Located only 10 minutes from Miami International Airport, The Music Factory is housed in a large complex of some 5,000 square feet, with 3,500 square feet being devoted to studio use including rehearsal studios. Although initially the studio was intended exclusively for Bob Archibald's own productions, the studio is now available for outside use.

The Music Factory Inc, 567 NW 27th Street, Miami, Florida 33127. USA. Phone: (305) 576-2600.

Northstar, Boulder

One short hour outside of Denver is a most dynamic college town . . . Boulder, Colorado. Playboy magazine (a technical publication dealing with different specifications), has seen fit to name Boulder and its School, The University of Colorado, "the most party oriented" in America thus giving the town, its people and its businesses a rather dubious distinction. Finding Northstar having matured from the homespun SoundSynergy, and now credited with work for Spirit, Michael Murphy and Earth, Wind & Fire, I determined that a visit would be in order.

Bob Burnham is resident engineer and manager, and a man of substantial knowledge and style . . . he alone makes the studio well worth the \$100 per hour price tag. He has cultivated much in the way of equipment, as is common in America, featuring a full MCI package in 24-track, Dolby and/or dbx, Marshall *Time Modulator*, full Eventide ancillaries, and a Steinway that has to be heard (it is autographed no less than by Mr S himself). But I was most pleased to find that Bob is more conscientious than most with such an array of equipment: tapes that he has engineered and produced himself show a clarity and definition of the highest standard, and an example of 24-track 'cleaning' he performed was most impressive.

The room was somewhat of an 'in-house' design and proved to be most functional. I noticed a certain lack in the high end, but he assures me that they are prepared to suit any taste, being a studio of the flexible design. The room itself is a bit on the cosy side, but that affords a certain intimacy and liveliness, and the control room utilises the overhead approach to supplemental gear. Talk with his maintenance engineer, Bill Shepp, proved that all is not infallible—much rewiring was done bringing the system 'on-line', out of phase modules, and a 2-track writing motor noise while in 'safe' were some of the problems ironed out. Manufacturers take note . . . he also moaned a bit on the somewhat sloppy wiring and front panels of a few popular pieces of gear.

For those of you with an interest in electronic music and some of the 'fusion' styles, this facility is ideal—though not limited to those areas. Viewing is quite good, as the room is succinct and the drum booth is crisp and unmuffled in its overall response. Much in the way of humidification has been included for control of the less dense air found at higher altitudes (nearly

6,000ft above sea level).

These people are professionals and are aware of that, though it does not cause any ego problems—they are educational in their approach and most patient. And with the emergence of their own Northstar Records, this is a facility to be reckoned with in the coming years. Northstar Studios, P.O. Box D, Boulder, Colorado 80306, USA. Phone: (303) 442-2001.

David Clamage

Metronome Studios, Copenhagen

Metronome Studios is the longest established of Denmark's studios, dating from 1960. Not content on lying on its laurels, Metronome has always tried to be at the forefront of technical development in Denmark. It is not surprising therefore to find that at its present stage of development it is the only studio facility in Denmark with computer mixing. Metronome consists of two studios, Studio A and Studio B, plus a relaxing room equipped with stereo amp, disc and tape playback, and studio mixer output allowing studio recordings to be listened to under domestic conditions. A useful and perhaps underestimated facility which other studios might care to investigate.

Metronome's Studio A is able to accommodate up to 45 musicians, is fully airconditioned and has two acoustically isolated booths. Its control room boasts an MCI *JH-500* 32-channel console with computer mixdown and spectrum analyser, a 24-track Lyrec tape recorder with Dolby, plus Dolby'd Lyrec stereo machines and a Revox stereo recorder and MCI *JH-110A* recorder. Loudspeakers are Electro-Voice *Sentry 3* in the control room and Altec Lansings in the studio. In addition the studio has available AKG *BX20* and *EMT-140TS* reverberation units.

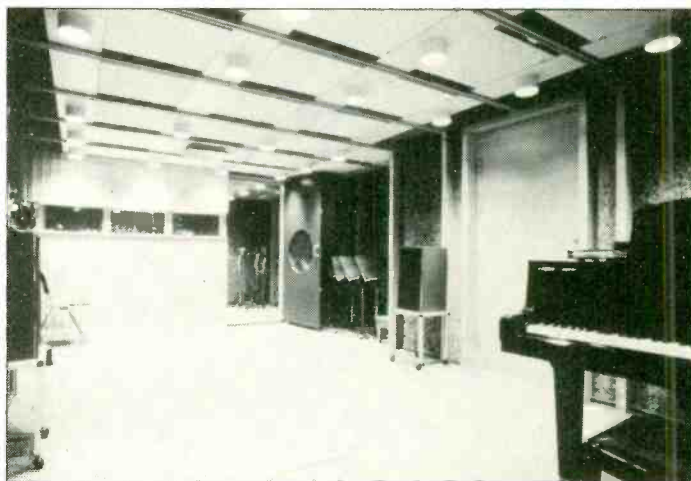
Metronome's Studio B is smaller than Studio A, being able to accommodate only up to eight musicians. As with Studio A, the studio is airconditioned and it has an acoustically isolated booth. Its control room has a Petersen 24-channel console with spectrum analyser, a 16-track Lyrec recorder, plus Lyrec and Revox stereo recorders. Loudspeakers are again Electro-Voice *Sentry 3* for the control room and Altec Lansings for the studio. Studio B also has an AKG *BX20* reverberation unit.

Ancillary equipment used by Metronome includes UREI and Audio & Design equalisers, EMT,



Above: Metronome Studio A

Below: Metronome Studio B



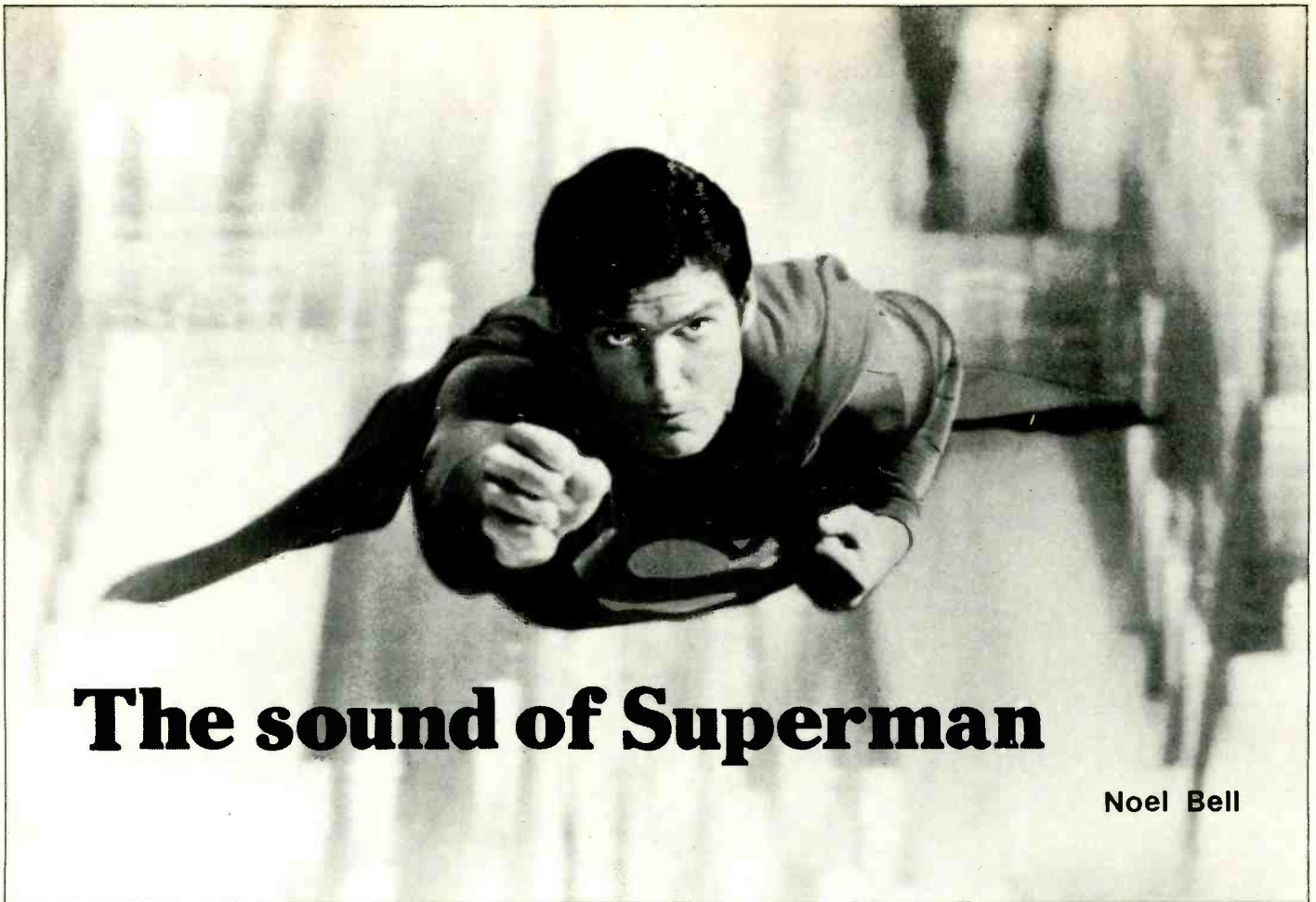
UREI, Barth and *Kepex* limiters, compressors and expanders, AKG and Marshall digital delays, Marshall phaser and flanger, Eventide *Harmonizer*, and AKG, Schoeps, Neumann and Electro-Voice mics. A wide range of musical instruments are available to studio users and artists who have recorded

at Metronome include Marlene Dietrich, Petula Clark, Eartha Kitt and Josephine Baker. Full details of Metronome's facilities and hire rates are available from Birger Svan, Studio Manager, Metronome Studios A/S, Vibevej 31, DK-2400 Copenhagen NV, Denmark. Phone: 01-19 01 12.

Recording Associates, Portland, Oregon

Recording Associates has announced the opening of the first 24-track recording studio in the Portland area of Oregon. Previously established as a 16-track studio, Recording Associates has enlarged and completely redesigned its Studio A control room to facilitate the changeover to 24-track operation. Logical Systems of Vancouver, Washington, acted as consultants for the redesign. Equipment now in use in Studio A includes an MCI console, Ampex 24/16-track recorder, Ampex *ATR-100* 2-track,

Eventide *Harmonizer*, LSI noise gates, LSI limiters and three monitoring systems. Recording Associates offers demo and radio production services, a complete record service and a custom tape duplication service in addition to its 24/16-track facilities. Recording Associates also periodically run a 30-hour recording seminar. Further information on Recording Associates facilities can be obtained from Bob Stoutenburg, Recording Associates, 5821 SE Powell Boulevard, Portland, Oregon 97206, USA. Phone: (503) 777-4621.



The sound of Superman

Noel Bell

December 10, 1978 saw the world premiere of the film *Superman* in Washington followed three days later by the London premiere. Noel Bell traces the sound recording aspects of the making of the film and examines the process of recording film soundtracks.

SUPERMAN has been in the making since 1976 and is one of those films which has had unusually great care taken over its production. With over two years hard work behind it since the start of shooting, this might seem self evident. However I decided to delve in depth into the sound recording aspects of the film in order to discover how the finished soundtrack was produced. This involved talking to those people responsible for production of the soundtrack, examining the recording of the dialogue, sound effects and film score, and finally looking at the theatre dubbing of the premixes and final mix, which is the concluding creative process before the release of prints of the film in its various formats.

The first stage in the production of the soundtrack was dialogue recording. This, as you would expect, was recorded largely on location either outdoors or on the open set. Whilst some of the dialogue was recorded later by 'looping' (voice dubbing in a

theatre by the actor or actress concerned), the majority of dialogue sound used in *Superman* was original location sound.

To discover how the location dialogue was recorded and what problems were involved, I spoke to Roy Charman and George Rice who were the location sound engineers. Firstly I asked them what equipment they used. Roy informed me that on *Superman* they used two Nagra 4.2 tape recorders, a Stellavox mixer, *Micron* radio mics, Sennheiser 815 and 415 mics outdoors and Electro-Voice 668 mics for interior shots, usually mounted on a boom in the studio. I then asked Roy how early on in the film they became involved in *Superman*. Roy explained that the normal practice is to be taken on usually about a week before shooting is due to commence. During this time you check your equipment, get hold of any special equipment you might need, and immediately move on to start shooting. On *Superman* this was slightly different in that they were

involved in doing test recording in January 1977 prior to the start of actual shooting in March 1977. *Superman* used a sound crew of three people—Roy, George and Mike Tucker, the mic boom operator.

Regarding preproduction work on the film, Roy explained that the sound crew doesn't get involved with this. They are employed to do a job and are largely left to get on with it. If any problems come up during shooting, then it is up to them to sort them out in their own time: usually after the day's work is completed to avoid holding up the camera crew and director. However, one point which Roy and George did mention was the difference between working with American and British production managers. They found that American production managers wanted to know why they needed piece x, y or z of sound equipment and if they could prove they needed it, would say get it, and why didn't you obtain it before. By comparison they felt the British counterpart's attitude was do you really need x, y or z? From a sound technician's viewpoint this attitude they felt questioned their judgement.

When they are employed to work on a film they look at the script, do a breakdown of it and decide

what equipment is required. If they take say two Sennheiser 815 mics, one is used as a backup mic. Although they will probably only use one throughout a film, if that one goes down (especially out in the middle of nowhere) it might take two or three days to get a replacement. Since production time on location costs a great deal of money with perhaps 50 people present, plus a mobile canteen and so on, you can't afford to hold anyone up for the sake of a faulty mic. As Roy put it: "equipment cost on productions really is peanuts in comparison to the overall cost"; therefore it is important that your production manager allows you to cater for problems of this sort.

I next asked Roy and George how they set about recording on location. Roy explained that primarily their task was to obtain dialogue sound. As part of the location team they had to be aware of everyone else's problems. As Roy put it: "I'm aware of the cameraman's problems, the director's problems and the actor's problems, and if I'm working with a very good crew, they are aware of mine and we try to co-operate. Of course the main thing we are trying to catch on location is the cinematic value of the setting, but

naturally the sound and camera crews try to help each other. For example, if there's a mic shadow or any problem with a mic in the visual shot, then we've got to get it out of the shot and get our sound another way—at other times if I've got a problem then they will try to help. We've got to work as a team even though it's not like TV where the crews are much more integrated. In feature films as specialists we go for the best results we can get whilst keeping to the general needs of the crew."

"Wherever we go on location, we are shooting for cinematic value and of prime importance is the camera—sound has to fit in with this. Often when shooting we have to cope with background noise which is inherent to the setting and causes us problems. Occasionally a director will shoot elsewhere, but usually they will tell me to get the best sound I can and they will later 'loop' the dialogue. They don't like 'looping', and prefer us to get the original sound and normally we do get it. We know what we can and can't get away with and we know what in the dubbing process Gordon McCallum or other dubbing mixers can filter out."

George elaborated on this by explaining the means by which they evaluated the quality and usefulness of the sound they needed. "When recording on the track you monitor the sound on headphones and think in terms of the relationship between wanted and unwanted sound. You have to know your script and know that the dubbing mixer will have to put a certain type of background noise in under here and that will mask the noises we've got. It's always a fight to get direct sound and to get rid of unwanted background noise and until we find a small highly directional mic which is easily hidden, we will have to work this way. If you record in England or Europe, you're always going to get problems from aeroplanes, cars, and so on. On *Superman*, we went to Canada for a lot of the location work and that was a soundman's dream; you're up in the mountains or on the plains and there's nothing there. You can point a Sennheiser 815 at someone 15 feet away and get excellent sound. But then we were lucky with *Superman*; the director Dick Donner took the view that if the setting required a car going along a road on the plains, then we went to the plains to shoot it. As soundmen we thought it could have been done anywhere but we were wrong—other people were thinking a lot wider than we were and the sequences were right—the director had got the money and effort on the screen so to speak, so it really was worthwhile."

Turning to the question of difficulties in location sound recording George pointed out that their biggest problems were usually practical rather than technical. In fact on *Superman* they didn't have to use any special equipment at all. The only difference from their normal practice being the fact that they used radio mics more often. George gave an instance of this with Marlon Brando. "Marlon was only available for a short time for *Superman* and in one sequence on the planet Krypton was wearing a very reflective plastic costume. The problem we had was where to put the mic. We couldn't use a general purpose mic since any movement of the costume would have ruined the sound even using gun mics. As we don't have any very small directional mics, we decided to go for an omnidirectional 'personal' mic and get it as close as possible to the wanted sound source. The next problem was where to put it. Fortunately Marlon had a big badge on this costume so with a little co-operation from Marlon and the wardrobe department, we were able to have a small gusset put in the costume, lined with velvet into which we put a small Sony ECM50 mic. We used two radio mics for this—one in the rehearsal costume and one in the shooting costume. We had the mics hidden in gussets behind

to put him on air and leave him that way and just make sure that none of the batteries were duds."

George's view was that he always preferred cable mics for their reliability but that where this was impossible they would use radio mics even though there was rather more to go wrong with them. Roy agreed with this and also pointed out that many actors and actresses (some of them famous) would not wear radio mics. There are two main reasons for this. "Radio mics are called 'personal mics' and they are personal. If an actor blows a scene or gets annoyed with the director or producer, he can't swear or mumble to himself because he never knows who's listening. Ethically, I shouldn't even be listening until the director says rehearse and shoot, but I get a bit twitchy with radio mics and always want to check they're working. Another reason is that if an actor and everyone else is ready for a take, the actor is so engrossed in the character that he doesn't want someone rushing up to him and moving the mic because there's some clothes noise. After all, if I were an actor and someone said your shirt's sticking out or your shoelaces are undone it would completely throw me; I wouldn't be able to concentrate on what I was doing, especially if I had five

camera, because as sophisticated as they are, if the actor goes even a couple of inches over his floor mark, the focus will be soft—and the cameraman has to re-shoot. The focus puller is one of the few people who can say to the director and cameraman it's no good. So the actor has an awful lot to remember and sound is not of paramount importance as far as he's concerned. Sound frankly isn't given an awful lot of time by many actors and directors. Often on a film like *Superman* someone will shout 'loop', don't let's stop, everything's going right on the visuals. Every artist has set aside in his contract a period of time for 'looping' but wherever possible we try to avoid this by obtaining original sound. However there are occasions where it is impossible to do this, no matter what equipment you use." George instanced a sequence from the film *Marseilles Contract*. "We had to shoot a sequence in Marseilles under the overhead railway. Anthony Quinn was doing a fairly long dialogue sequence but we had trains going through every minute. You can be the best soundman in the business but there's no way you can do it with a train only a few feet above your head. All we could do was get the best possible cue track for 'looping'."

Roy added another aspect to this with relation to actors. Most actors he felt would go out of their way to help you but some such as Anthony Perkins actually liked 'looping'. Where Roy did find problems was with lesser or inexperienced actors when they had to 'loop'. As Roy put it: "If the director isn't available to supervise the 'looping' then they are tempted to change the performance and so ruin the continuity of a sequence. So often a few extra minutes on the set would avoid difficulties at a much later date."

Turning to the question of recording for any particular sequence of shots Roy explained how he works. "One problem we have when shooting is to figure out how the director and film editor are going to finally cut the film. This is largely a matter of experience. For example, if I'm half-way through say a two minute long dialogue sequence and I hear a noise which I know there's no way the theatre dubbing mixer can filter out, I will go over to the director at the end of the shot and tell him that we had a very bad noise. He'll invariably say that's okay, I'm not going to use that anyway, I'll be using another angle at that point. If he does want the shot, and if the director is sound oriented and wants the location sound and doesn't want to 'loop' an actor,



Marlon Brando and Susannah York in the destruction of Krypton scene

the badges and the transmitters built into the back of the costumes powered by twin Mallory PP3 batteries. The batteries give up to 40 hours power. We put the mics on air and Roy checked the levels all the time. This was a typical situation where practicality is important because we couldn't suddenly run on, say excuse me to Marlon, and plug him up. We had

pages of dialogue to remember."

George added that "actors haven't just got to remember the dialogue. An actor perhaps has to remember to walk to marks on the floor, to watch his key lines; the camera may be moving, it can be very distracting and difficult even for top-class actors just to get through a scene. Technically an actor's got to be inhibited by the

The sound of Superman

then we'll go again until we get a sound take which is satisfactory to me and the director. With a director like Dick Donner on *Superman* who likes to be wired up to the sound, we have few problems, but some directors have to be educated that sound is important and told for example that they mustn't talk and give floor directions when you're shooting."

to the visual picture. "If we're doing a sequence with both distant and close visuals, on say a long shot mic, we don't necessarily put the mic in the optimum position. In this sort of situation you'd be better using radio mics or planting a mic in the middle of the set. If we do have to use radio mics then we have to put them in the best pickup position, but if for example

studio, Roy and George both felt they had more problems when it came to recording on location. Roy commented: "We invariably have to compromise when we record on location. The trend often nowadays is for a hotel or restaurant scene to be filmed actually in the real thing rather than build a set. Accordingly when there's a wall, it's a real wall and we can't float a boom mic over the top of it. You have sound reflection problems, noise problems, even space problems. Sometimes we can be shooting in quite small rooms and by the time we've got our

doesn't interfere with what the camera has to do. Even outdoors this applies because often the position of the sun is important. Actors have to move with it and therefore the sound must follow. A director doesn't worry about sound when he moves his camera—that's our worry."

I wondered if Roy and George ever recorded in stereo to facilitate the theatre dubbing. Roy explained: "We can use twin-track machines but we don't shoot stereo dialogue. We tried it in 1966 on *Grand Prix* using equipment especially built by Samuelson's. The director scotched it very quickly though. If you've got an actor on the left and one on the right, the director isn't going to like it if he can't move them. Even with radio mics and twin channels, if they move about and the director keeps cutting, it becomes a nightmare trying to match everything up. It's very difficult to do stereo divisions, you don't know when the camera is going to be close up or where it's going to move, so the left and right channels could be moving all over the place. It would be a nightmare, even though it can be done. Unless directors change their whole style of shooting, it just isn't practical. The time to do stereo sound is in the dubbing theatre when you're doing it to a cut visual. The dubbing theatre is



Left:
Anvil control room,
Eric Tomlinson controls

Below:
Christopher Reeve as Clark Kent and Margot Kidder as Lois Lane in the office of the *Daily Planet*

Regarding recording levels, Roy explained how he matches the sound between distant and close visual shots. "As the sound balancer, if we do both wide angle and close shots, then it's down to me and my colleagues to try to get sound that matches. For example, if I'm in a long mic position, I might have to sacrifice an extremely good sound for the long shot so that it will match better to the close shot. If the director says he is not going to cut into this sequence but it's going to run for two minutes and there'll be no intercuts, then I go for the very best sound I can get from the situation. Some directors, Eddy Dmytryk, for example, will tell me at the beginning of each day exactly what is pertinent dialogue and he will tell me what he wants. He will demand that I get what he wants, even if it means umpteen retakes and even if it means sacrificing his scenic beauty."

George amplified Roy's comments by stressing the practical nature of recording sound relative

we're shooting a sequence with actors sitting round a table with glasses clinking, then we have to find a position where the sound is kept in perspective—you can't ask an actor not to put a glass of whisky and ice down too hard.

"If we are in the studio, we don't have too many problems because studio sound is much more controlled. If a wall is in the way then we just float the mic boom over the top, but even there we can have problems. For example, in *Superman* we had one problem shot, a sequence which is set in the newspaper offices of the *Daily Planet*. The office was full of glass partitions which were very reflective for both sound and light which of course caused problems both for us and the camera crew. We had to hide cable mics all over the place on desks and so on, and we had to cover the mics and cables in black to minimise light reflection. We even had our boom operator dressed in black for the same reason."

By contrast to recording in the



lighting and cameras in, there's not much space left. We can hang sound damping material on walls, etc which are out of view of the camera but we have to make compromises and sacrifices to record in such situations. Sophisticated equipment helps but you're mainly there for the camera, and so sound tends to be a necessary evil in such situations. Sound crews are only given facilities and aid when it

where everything is put together. They do the real work from what is basically one track coming from the floor. The floor technician is concerned to get sound which is audible and good up to 6kHz for an optical soundtrack, even though magnetic soundtracks and Dolby stereo are available."

As location sound recording was therefore biased towards the needs



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The sound of Superman

of the dubbing theatre, I asked Roy how he facilitated this. "On *Superman* as with most films, our job was basically recording dialogue, which was later split into small segments. Thus we preferably don't want two people to overlap on dialogue. If for example there are three people speaking in a scene, then their voices may well be laid for dubbing on three different tracks. If we have a twin-track recorder then we may use two mics, say one on the set and a radio mic on an actor, and when he goes out of the room we fade the first down and the other up, recording them on different tracks so as to keep them separate for later balancing in the dubbing theatre. The film industry view is to keep dialogue in small bits so that it's easier to match with the visual shots. For a 2-minute sequence in the cinema, we might have taken 20 minutes of film including closeups, and we have to have sound for all of it because we don't know which angles the director is going to use. When it comes to the dubbing stage, dubbing mixers will often run both the location tracks and the 'loop' tracks and it is only then that the director, producer or dubbing mixer will decide which tracks to use. Sometimes they will use the location sound because the 'looped' sound is too perfect and doesn't match the rest when the picture has been cut."

Whilst the location sound recording for *Superman* was still under-

way, work had already started on the composition of the film score and preparations had begun to organise the recording at Anvil Recording Studios at Denham. There I spoke to engineers Eric Tomlinson and Ken Somerville about the way the film score was composed and recorded. I asked Ken how the composer, John Williams (of *Star Wars* and *Close Encounters* fame), set about writing the score.

"First the composer is shown an incomplete, rough cut of the film in order to judge the broad requirements of mood and interpretation. The composer, director and music editor then decide where they will put the music in the film. This is known as 'spotting'. 'Spotting' may be carried out on a rough cut and then the composer has to change the score when an improved and more complete 'fine cut' becomes available. After spotting the sections which are to be scored they are timed and music cue sheets prepared. At this point the composer starts detailed scoring of the film score. For *Superman*, John Williams was given a video transfer of the 'rough cut' to take to America which he used along with the timings and music cue sheets. Once composition of the score has begun, one of the first things is to nominate which musicians will be used. John Williams nominated the London Symphony Orchestra with whom he's worked before. They had tremendous success with



Above and right: Pinewood's dubbing theatre 2. The Neve console was made to measure and the theatre was recently converted to rock and roll stereo dubbing and the whole interior redesigned. Maximum screen size is over 34ft wide, larger than most cinemas



Star Wars with John so he decided to use them again, this time arranging for 85 musicians.

Each session at Anvil comprised a general rehearsal to check the music parts, followed by rehearsals with the final cut picture which is full of 'punch holes', 'streamers' and music cues. These are really to make sure the orchestra comes in on cue and that the orchestra and conductor get the timings right. Once this is done, then we record. On *Superman* we started recording sessions in July 1978 and finished in October, the total hours of recording involved being about 60."

Recording was carried out in Anvil's large studio which measures some 37 feet high, 60 feet wide and 70 feet deep. The studio was originally a film shooting stage and is now the only stage at Denham still used for film work. Details of the origins of Anvil, including a plan of the studio layout, appeared in the November 1973 issue of *Studio Sound*. The control room is 24 by 16 feet and features a 24/24 Neve console with an MCI 24-track tape recorder with Auto locate together with 6-track, 35mm sprocketed recorders. Loudspeakers are Tannoys and all the recorded tracks are Dolbied. An unusual piece of equipment which was available, although not used on *Superman* by John Williams, is a digital variable speed click track metronome used to give the musical

beat in click form over headphones and earpieces to musicians and conductor.

Eric Tomlinson described the recording procedure. "The orchestra have their backs to the huge projection screen, whilst the conductor faces it and conducts to the music cues as they come up before him. The music is recorded on three tracks and simultaneously as 24-track although we use mainly only the basic three for the film soundtrack. However, in this case we also needed to record ambient music for the 70mm 6-track Dolby magnetic formats of the film, so these and any remixing of tracks are from the 24-track. In fact we treat the first three tracks of the 24 tracks as the basic left, centre and right with the remainder available for ambient sound and remix purposes. From these tracks we then mix down to 6-track on 1in tape and then transfer to 6-track 35mm sprocketed magnetic film which we send to the dubbing theatre. The 6-track and indeed all the tracks are Dolbied throughout. The music mixing and editing

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John Williams conducts the LSO at Anvil



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sessions for *Superman* took about 30 hours to complete. All the tapes are maintained in sync by using a 50cps pulse and are only transferred to 35mm sprocketed magnetic film at the final 6-track stage. The ambient tracks are usually taken from three Schoeps mics which we position above the orchestra.

"For the album of the film score, we generally used the material recorded for the film although some of the recording sessions were laid on specially. The album was a fairly straightforward job of mixing down from the 24-track to 2-track stereo and this took about a week."

One point I asked Eric and Ken about was whether they ever felt their efforts were sometimes wasted when the soundtrack was replayed in cinemas with facilities only for mono optical sound. Their viewpoint was that if they accepted that they only recorded for this level of capability, why should they or the Dolby Labs be going to such great lengths to improve the quality of film sound. It was only by providing better sound that cinemas would make the effort to install better systems. As Ken put it: "The quality of sound is excellent in most West End cinemas and we record soundtracks to the highest standards we can; if it's replayed on poor quality equipment then that is unfortunate, but at least we have done our best."

To complete my survey of *Superman's* sound I visited Pinewood Film Studios and talked to chief dubbing mixer Gordon McCallum and his assistants in Theatre Two, Graham Hartstone and Nic Le Messurier. Gordon mentioned that *Superman* was for him the revival of a very happy association with John Williams and Eric Tomlinson on the film version of *Fiddler On The Roof*. (Gordon's Oscar for that job stands proudly in Pinewood's entrance hall.) He explained something to me of the complexities of feature film post-production and dubbing.

All dialogue and sound effects recordings are supplied to the cutting rooms in the form of 35mm magnetic film. These are patiently edited and pieced together into roughly 10-minute reels, and in the case of a mammoth picture like *Superman* there may be as many as a hundred such reels for each 10 minutes of edited picture. There will be many dialogue tracks; for example keeping separate the various characters and allowing a choice between original sound and possibly a 'looped' version recorded in a post-synchronisation theatre at

a later date. "Although much of the *Superman* dialogue was 'looped'," said Gordon, "the director Dick Donner preferred the original wherever possible, and we were able to use it about 90% of the time. Every word, every line has to be controlled, filtered and equalised to produce a clean, intelligible, consistent quality with dramatic value to enhance the content and perspective of the picture. Even actors' performances are not constant from shot to shot, so we have to take the material in short segments and even it out as smoothly as we can. At this stage we kept the dialogue monaural, so that last-minute changes were easier to insert."

Graham, assisted by Nic, was in charge of handling the sound effects. These came from many sources: from original recordings made on location, from effects libraries, from synthesiser studios, and from Pinewood Studio's effects theatre, where spot effects and footsteps are created to fit repeating loops of the picture in a similar manner to dialogue post-sync. The requirement of *Superman* for effects was so prodigious that an exceptionally large staff of sound editors were occupied for months producing and editing hundreds of thousands of feet of material in preparation for dubbing. "Our main problem," explained Graham, "was to organise the management of so many tracks. For example we had as many as 28 parallel footstep tracks alone to go with one reel of picture. So we were faced with perhaps 10 or 12 pre-mixes for each reel in order to bring such a volume of material down to something which we could



handle in the final mix. These pre-mixes were themselves in 5-track stereo, so that in making them we were levelling, equalising and panning, as well as adding reverberation where necessary. On this production we used a further extension of the Dolby 6-track idea, in which our 70mm release print carries not only stereo on the screen, with special bass enhancement tracks to add excitement in the noisier sequences, but also the separate tracks required to produce left and right ambient sound in the auditorium in those theatres which equipped themselves to reproduce it."

Gordon McCallum took up the story: "Dolby Laboratories were toying with this idea at the time we were preparing for the *Superman* dub. We saw at once how appropriate it would be for this project, and the production people agreed. In association with Dolby, and in particular their film systems engineer Max Bell, we produced a workable format. Our engineers installed additional loudspeakers and invented a radically new type of opto-electronic panpot giving us total freedom over five channels of stereo. Meanwhile the Dolby boys were kept busy producing the necessary filters and meeting our orders for more 360's—we ended

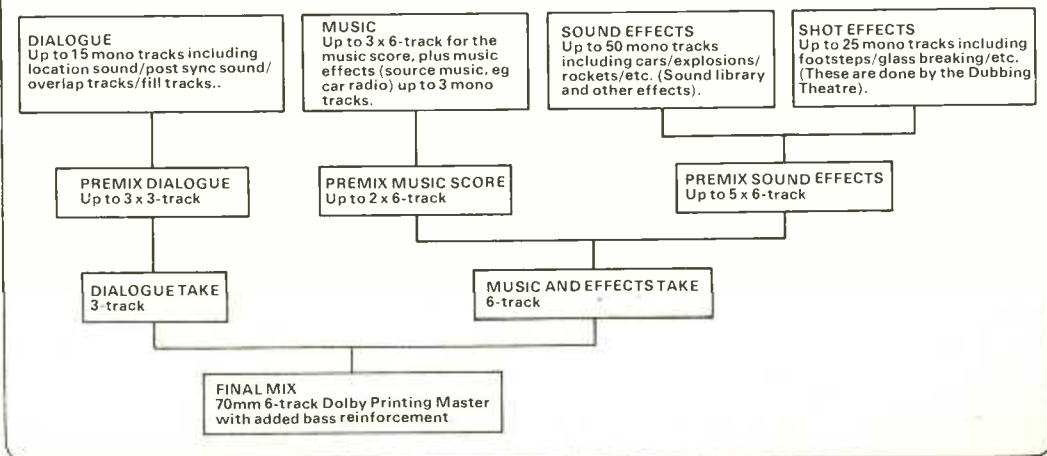
up with about 70 on the picture. When the day came that we could try the divided-surround system on an actual sequence from the film, our hearts were in our mouths. Had we wasted our time and money on a failure? We should have had more faith—the result was a knockout. The sound took the visuals right out of the screen and round behind you. We knew we had a winner."

Gordon went on to say that the music recordings from Anvil brought no problems. Eric Tomlinson's mixes were excellent, and the joy of working with John Williams was that he took the trouble to understand how the music was going to be integrated into the total dub, including the potential of the new surround effect.

I asked Gordon how he went about achieving the final mix. His reply, which is summarised in fig 1, was: "The final mix is made onto 6-track 35mm magnetic, just like the stereo pre-mixes, but still using only five channels and now with the addition of a separate multi-track recorder carrying just the dialogue. This way we keep the dialogue separate from the combined music and effects, and that makes it far easier to produce stereo

50 ▶

FIG.1 DUBBING THEATRE MIXDOWN TO 70mm 6-TRACK DOLBY MAGNETIC STRIPE



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The sound of Superman

versions in other languages.

"The music is of course in stereo when it reaches us, and many of the effects have been panned or placed in making premixes. But we still have to position the dialogue, and this must be done with subtlety and care in order to keep the attention of the audience riveted to the screen image but without violent swings or picture cuts. All the time we have to use our experience and artistic judgement to tell the story the way the director wants it, as a perfectly-integrated complement to the edited picture. Using the 'rock-and-roll' method we go over each little piece of the mix countless times, rehearsing, matching and rerecording until we are satisfied and move on to the next. Wide-range sound is very demanding and shows up the slightest flaw, so our engineers have evolved new techniques for keeping all our equipment in top notch adjustment. The real-time analyser has now become our standard backroom tool for frequency response alignment: Cyril Jones, who is our chief transmission engineer tells me that it speeds

things up at least 20 fold."

Graham described the method used for giving cues to picture cuts and similar critical timings. "We put wipes on the picture film, or streamers as the Americans call them. These are sloping coloured ink lines which, when projected, appear to travel across the screen to the left or right. The cue point is when they hit the far side. Our trouble here was that we ended up with so many on the film that it became something of a nightmare sorting them out!" I gathered also that such were the problems experienced with some of the special-effects shots that picture shooting was still in progress during final mixing, and this led to the need to make frequent amendments to the dubbed track even after it was completed.

The 'final mix' was not the end of the story, however. A mixdown was carried out ready for transfer to Dolby stereo optical (SVA). For this processing equipment was inserted in the stereo monitoring circuits of the dubbing theatre to simulate the effect of the matrixing networks used in Dolby SVA

cinema installations. From the 5-track master, the two-track was mixed down and sent for transfer on Dolby's optical camera at Elstree. Next an English language monaural mix was made and used to transfer a number of optical soundtracks for making prints to be shown in cinemas without Dolby equipment. The third job was to make the magnetic master for the production of 70mm 6-track prints, and then at last the theatre shook as the full potential of the recordings was realised. Never before had Theatre Two experienced such a wide range of levels and frequencies, giving an extra couple of dimensions to the stunning picture effects. It seemed like a comedown when, completing months of continuous, painstaking work without even a day off, the crew spent a few days mixing a version with separated monaural dialogue, effects and music for the benefit of other countries wishing to enjoy *Superman* in their local languages.

My contacts at Pinewood paid high tribute to the practical help which they had received from Dolby Laboratories, led by Max Bell at the London end—a real team effort by both companies. The names I have mentioned at Pinewood are of course those of the people to whom I spoke. But in fact almost everyone in the

sound and projection staff of over 40 worked on the film at some stage, and they all feel that they contributed something. In spite of its European origins and American interests, it is very much a Pinewood film. No mixer can produce magnificent results from poor material, and the theatre staff acknowledged that tremendous effort had been put into *Superman* by the sound editing crew under the supervision of Chris Greenham, and the fruits of their labours are there for everyone to hear in the soundtrack of the picture.

The soundtrack recording for *Superman* and the problems involved in recording a film soundtrack, whether they be of a practical or technical nature, were quite an eye-opener for me. As someone who takes film sound rather for granted unless it is obviously poorly recorded, badly dubbed or out of sync with the visual image, it was very interesting to discover just how much work and effort goes into a film soundtrack. With people like Roy Sharman, Eric Tomlinson and Gordon McCallum, who take great care over their work, involved in *Superman* this should augur well for the success of the film, especially when combined with some of the spectacular visual effects which *Superman* contains. ■

Alice



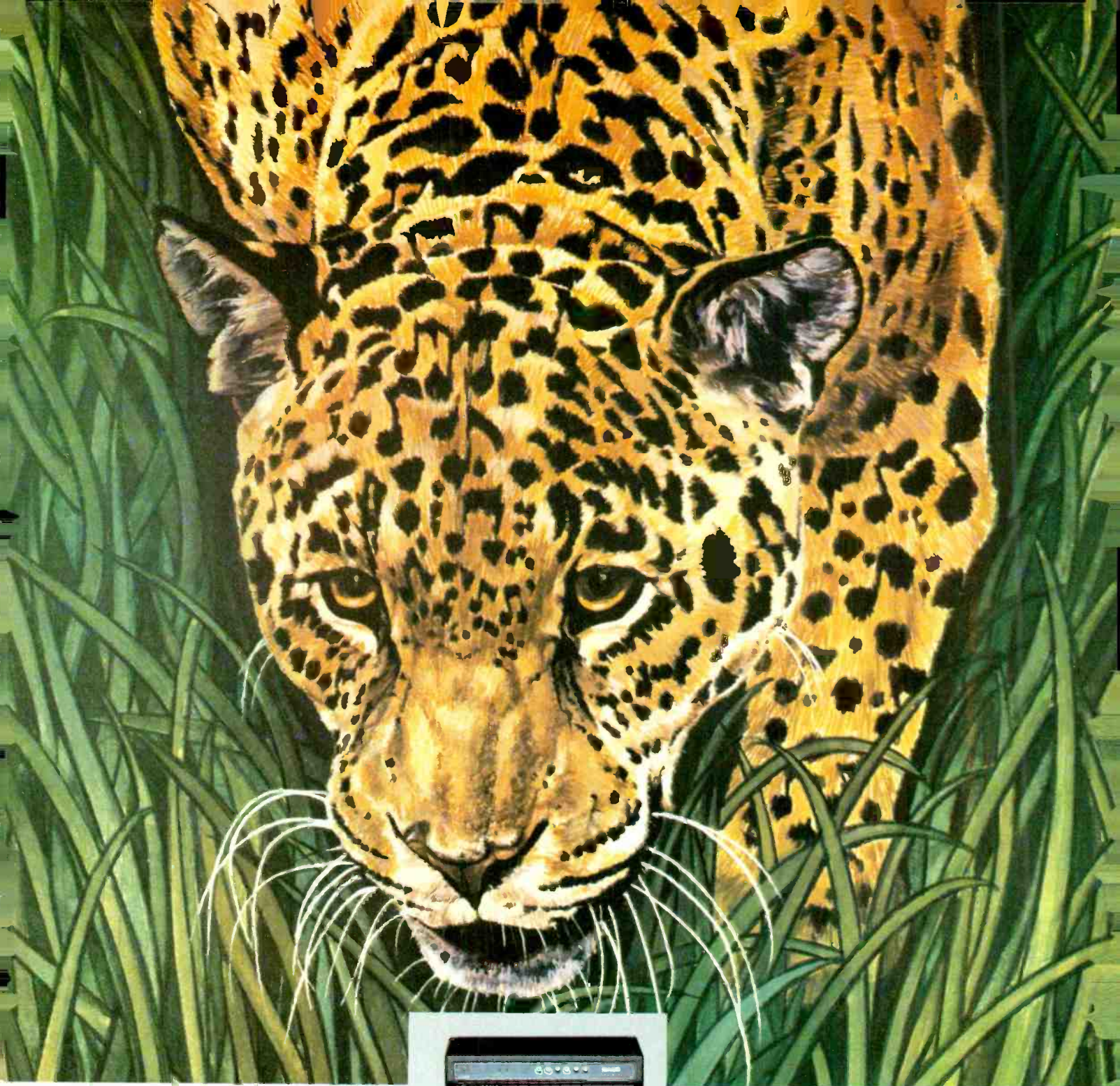
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IF THE record companies think they have problems over audio disc and tape piracy, they ain't heard nothing yet. I recently came across a foretaste of what's to come in video piracy. One enterprising chap has bought and rented a total of five VHS video cassette recorders which he switches on to tape any good feature film shown on BBC or ITV. So with the minimum fuss and virtually no legal risk, he ends up with five pirate copies of the film. A few contacts working on airlines that fly to the Middle East enable him to flog off the feature film cassettes at a bargain price for those buying them and a handsome profit for the pirate. Another entrepreneur runs a similar racket with Match of the Day and similar sports video tape recordings. It's an odds-on certainty that this is already just the tip of an iceberg. And that iceberg is going to grow and grow and grow. Many of the newer video cassette recorders have a pause control that operates on both record and playback, so that a film can be pirated off ITV with the exclusion of all commercials. Philips-Magnavox has now launched a video disc player in the USA with an impressive catalogue of MCA feature film and musical short titles at what must be loss leader prices. I'll bet that already pirates have rigged up a system to dub from video disc onto video tape. As the price of video recorders and tapes drops so the problems will proliferate. The sad fact of life is that you can't have something for nothing and someone has to pay the film and sound studios, production crews and performers. The pirates won't pay and piracy is unstoppable. I'll bet that within a decade, we'll be paying an entertainments tax along with income tax to reimburse the entertainments industry for losses from piracy which will by then have become so rampant as to be accepted as a way of life.

Multitrack for the masses

CONGRATULATIONS to the IPC magazine *Practical Hi-Fi* and their contributor Carl Anthony, for doing what the recording industry should have done years ago.

They gathered together around a hundred grand's worth of studio equipment for an Audio Show at the Cunard Hotel in London and used it to explain the mysteries of modern multitrack recording and mix down to the public. Remember them? They're the people who actually buy the end products that studios are in business to produce.

Anthony used a Telefunken *M15A* 24-track and 2-track, a Soundcraft *Series II* 24-in mixer, AKG stereo reverb, a pair of JBL *4350s* bi-amped by a JBL *6233* and Citation *16A*, with all the toys including Aphex. The material used was a 24-track master, from the then new Brand X album *Masques* bounced down from the 46-track Trident original. To wall-to-wall audiences over several days, Anthony explained the gear and did a rough remix of one track at around 100dB.

I find it increasingly astonishing that the record companies have not yet woken up to, and exploited, an increasingly obvious trend. This is that the public no longer buys electronic equipment just to reproduce music. They enjoy setting up and using the equipment at least as much as listening to the results. Sooner or later it has to dawn on the recording industry that there is a market for raw multitrack material for the home user to play with. For years now Teac have been selling simulsync 4-track, quarter-inch tape recorders for the domestic and semipro user. Almost everyone who has bought one of these machines has the four channel line output hooked up to a 2-track stereo machine, through some kind of mixer or switch panel. In their vaults the record companies must have countless old master tapes in 4-track format, for instance Beatles material up to and including *Sergeant Pepper*. It would be the easiest job in the world to dub and duplicate this material on quarter track open reel tape. Eight and 16-track material could be rough mixed down to 4-track for release. The enthusiast with a simulsync machine could then mix and remix, with a touch of echo and simple eq, to try and better the original mix and in the process learn a heck of a lot about modern recording techniques.

Equipment is soon to come onto the market from Japan which will enable the owner of an ordinary record or tape reproduction system to 'lose' all the centre front, in phase, content of a stereo recording (usually the featured voice or solo instrument) and overdub a fresh voice or instrument onto the remaining backing track spread. Kenny Everett, on London's Capital radio station, has played numerous backing tracks and raw mixes and there is a commercially issued rerelease of some Beach Boys backing tracks minus vocals. But so far there's been nothing especially intended for remix on quarter-inch simulsync gear. And when, as sure as night follows day, an enterprising hardware firm like Teac comes out with a simulsync 4-track cassette recorder, the market will really be hungry.

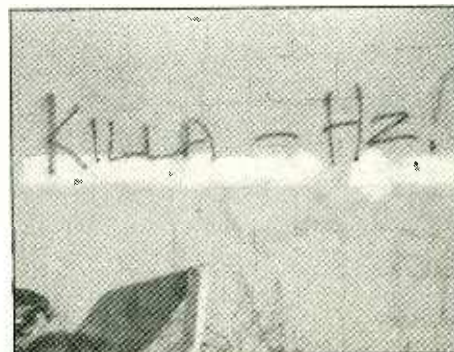
Acousonics

A RECENT album by Quincy Jones *Stuff Like That* is especially interesting on two counts (apart from being a great album). The sleeve note includes a few paragraphs by engineer Bruce Swedien explaining that the album was recorded using the so-called 'Acousonic Recording Process'. It turns out that ARP is multi-multi track recording, achieved by locking 24-track machines together to provide 46 or even 69-track recording capability (one track of each 24-track machine being sacrificed for the locking timecode pulses). This is by no means new. Trident have for some time been locking two machines together and Jeff Wayne's quarter of a million dollar bash at the *War of the Worlds* was made in this way.

It is unclear from the sleeve note just exactly what Swedien is doing that is different. But the album does have such a clean fresh sound that I contacted Swedien to fill in the gaps. Two 24-track machines are used linked either with an SMPTE or Maglink timecode lock, to give a 46-track format. So far pretty normal but it is the way Swedien designates the tracks that is unusual. The original rhythm tracks are recorded on one tape and this then regarded as the 'master'. Using timecode, the master tape is rough mixed onto four or five tracks on the second tape. This is designated the 'work' tape and is used as a cue mix for all subsequent overdubbing. This way there is no risk of degrading the rhythm section tracks as can be caused by repeated passes over the playback heads for overdubbing. The work tape is copied and used to store parts and whole sections. The number of tracks available enables the engineer to record some instruments or sections in true stereo rather than mono. Whether the fresh sound of the Quincy Jones album comes from overdubbing in stereo rather than mono, or from leaving the rhythm section tracks virgin on the master tape without the physical wear and tear of overdubbing is anybody's guess. Probably it's a bit of both.

The sleeve is also notable for its delightful frankness, unrivalled I would say since a long since deleted big band recording was sleeved with a note written by the bass player criticising the featured arrangements as not up to the writer's usual standard. On the *Stuff Like That* album Quincy Jones, in a rather garbled stream of consciousness note, verbally chastises featured vocalist and concert mistress Patti Austin along with New York Super Singer director Tom Bahler as "both . . . artistically adept but mentally ain't gon' git it". Later, buried in the note, there's special thanks to Gordon and Edna Austin "who can not be held responsible for their daughter's actions". Assuming the sleeve note is the tip of the iceberg I'd just love to have been a fly on the wall at those sessions. ■

agony



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Simplified audio measurements using digital storage

Derek Bond (Wayne Kerr)

Most studio engineers have at least memories of laboriously squeaking tape recorders using conventional oscillators and millivoltmeters. Digital storage techniques now enable such response curves to be directly displayed on a CRT and also provide comparison facilities. Derek Bond here describes the techniques used in the Wayne Kerr frequency response analyser *RA200*.

CONSIDERING that most of us make audio measurements daily with our ears, the characterisation and standardisation of audio systems should be easy, and agreement on sound quality might appear trivial to the layman. In practice it has been unusually difficult for learned people to agree, and when they do (as in CCITT and IEC regulations for example) the applications are specific and often anomalous. It is worthwhile taking a look at why this is so.

A mechanical engineer has a standard of length (the metre) which is easily compared by expert and laymen alike. Two rules one metre in length can be compared to 0.1mm by eye, very easily, an accuracy of 1 part in 10^4 , and thus precision measurements are easy. But this is only so because the wavelength of the light used for viewing is very small compared to the required precision. How far would the mechanic get if he had no light and no hands, and could only measure the rule by listening to the reflected sound waves? How useful would his rule be if it were very heavy or delicate, expensive to produce, and needed a controlled environment for guaranteed accuracy. This is the situation for the audio engineer. What does the audio engineer do? He joins the ranks of lawyers and politicians and uses his subjective experience to form judgments. These judgments are based on comparison and recollection rather than standards. He has replaced the standard by his memory.

Memory is a far more powerful tool than any standard and can transform the way in which measurements are made. Electronic techniques have dominated the audio industry for over 50 years, and it is therefore sensible that audio measurements should be quantified and

compared in terms of electronic parameters. However, the best or easiest way to measure a signal in electrical terms may not be the best way to present it, and if the result is not presented in a clear understandable manner its meaning will be lost. The electronic measuring instrument must therefore be capable of displaying its results in useful form, and this may require calculations and transformations of the results by building in these facilities. The power of logical thought and calculation may be transferred from the user to the machine, requiring little skill by the user, and enabling complex decisions to be easily made. The electronic pocket calculator is an example of this technique.

The design philosophy for accurate audio measurements is therefore becoming clear. Accurate electronic measurements should be made in a

universal manner by the user and the results should be stored. They may be subsequently recalled, transformed into useful information, and displayed. This approach, which at first sight appears indirect, enables the instrument to simulate in many ways the working of the human mind, and gives unusual flexibility and adaptability to the instrument.

This article describes the *RA200* Audio Response Analyser manufactured by Wayne Kerr. This instrument (fig. 1) can stimulate a circuit with sine waves, record and display the response from below 20Hz to above 200kHz. For many applications it may be used as a complete measurement and data recording system. Although the *RA200* has manual front panel controls and may be used as a conventional instrument, most of the controls may be easily over-ridden and remotely

set by an ATE system or through a digital to analogue converter from a computer.

The *RA200* measurement system is shown in fig. 2 and contains four independent blocks:

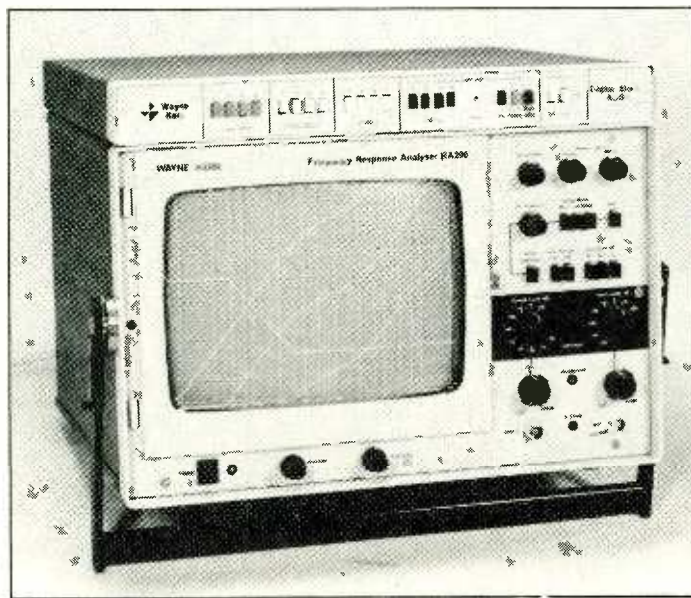
1. A sine wave oscillator for stimulating the system on test.
2. A detector which measures the frequency and amplitude of the signal from the system.
3. A store which records the analogue voltages from the detector, and may replay them to the display.
4. A CRT display which accepts these analogue voltages and displays them as an amplitude/frequency plot of the system on test.

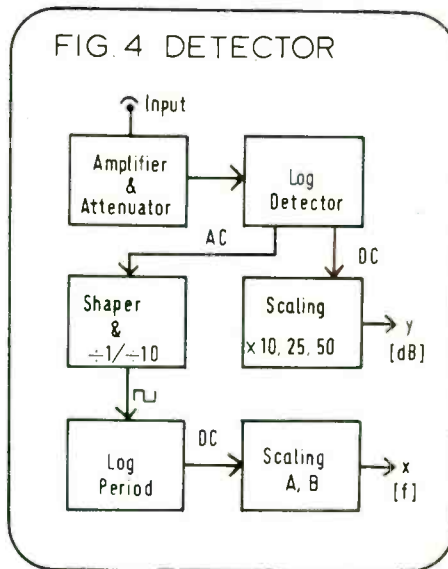
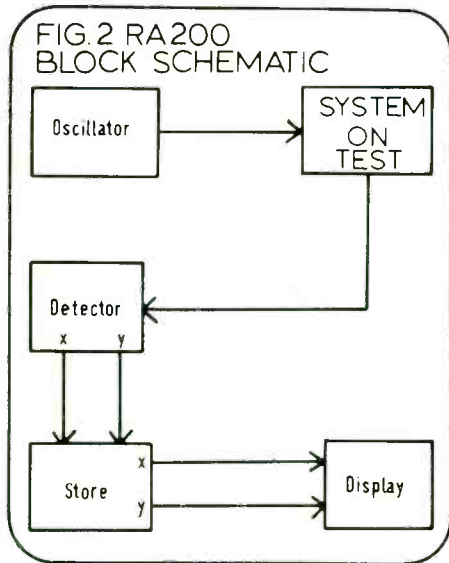
Oscillator

The oscillator must have excellent amplitude stability when being rapidly swept over a frequency range from below 20Hz to above 200kHz. A voltage controlled oscillator (VCO) is designed to produce an accurate triangular wave, which is then shaped into a sinusoid using a precision nonlinear amplifier. The shaped output is then amplified and fed through a precision attenuator having a constant 50Ω output impedance to give any level from $80\mu\text{V}$ to 12V rms (-80dB to -24dB relative to 775mV).

A time-base generator drives the VCO with an exponential sweep (giving constant rate across log display) and by varying the time-base amplitude, dc level, and frequency the oscillator will sweep between any sweep limits at the required rate. The oscillator is completely isolated and an opto-coupled square wave output enables frequency monitoring without earth loops.

Fig. 1. Wayne Kerr RA200 audio frequency response analyser





Detector

The high impedance detector input ($1M\Omega - 30pf$) enables scope probes to be used and will not load the system under test, fig. 4. An input attenuator/amplifier feeds a log amplifier/detector which generates a DC voltage proportional to the log of the input signal amplitude. This DC voltage is amplified to give the required display scaling factor and becomes the Y input to the store or display.

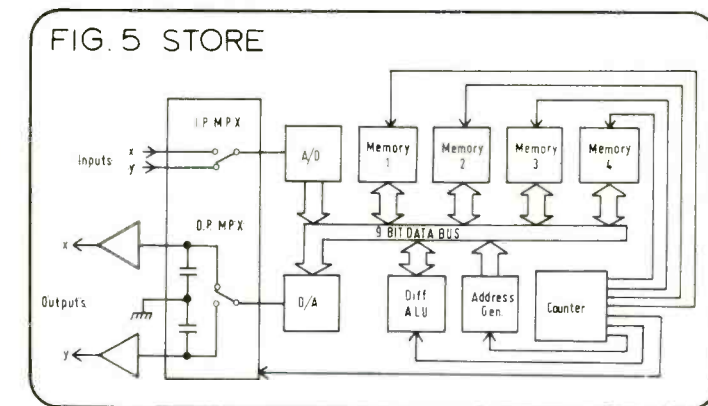
The input frequency must be measured every cycle, and displayed on a log scale. This is achieved by sampling a linear ramp after each zero crossing of the input, and feeding this through a log amplifier. The resulting DC voltage is scaled to give the X input to the store or display.

Digital store

The store (fig 5) accepts analogue voltages directly related to the input frequency and amplitude from the detectors. These voltages are sampled and quantified by an A-D converter into 512 (9 bits) levels. The X input becomes the address and the Y input the data for an array of CMOS memories in four independent blocks. According to the front panel instructions (fig 1) these memories may accept new data (load) or output stored data (display).

The output data goes via a D-A converter through a multiplexer onto the output terminals, and thus reproduces the original input conditions to within 0.22% (comparable with the display resolution).

The address generator comprises a counter which sequentially gen-



erates all addresses (X values) at high speed, and thus enables stored traces to be repeated at a rate of 50Hz approximately giving a flicker free continuous trace. The difference ALU computes the difference between any two selected memories, and outputs this as a new trace, which may be stored, amplified or displayed.

The store is driven via rechargeable batteries from the RA200 power supplies, and memory contents will be retained for several weeks with no external power. The store is therefore a general purpose unit and could be adapted to store any analogue variables and display them on the CRT, or plot them out on a chart recorder.

The CRT display

The RA200 display system comprises a 28cm CRT with long persistence phosphor, magnetic deflection and DC coupled amplifiers. The

display should operate at constant brightness with a stationary spot through to high speed scanning. A brightness modulator circuit therefore controls the CRT cathode current in proportion to the spot velocity, and also protects the tube against damage.

The display scaling is engraved on moulded graticules, which are very quickly interchanged. Blank graticules may be marked with tolerance limits and so on.

Simple applications and measurements using stored audio responses

The following applications have been chosen because:

1. They are practical methods which are normally very tedious and time consuming, involving recording of large amounts of data.
2. They can be performed with speed and precision very easily using a display storage

system.

3. The methods used, whilst accurate, do not rely heavily on subjective judgments or expensive standards. They are repeatable and use the memory and logic of the machine rather than the man.

Acoustic responses

The routine testing of loudspeakers and microphones for production, or quality monitoring is normally incredibly tedious without anechoic chambers, standard rooms and standard transducers since it involves multiple plotting of amplitude responses at different frequencies with either sine wave or weighted pink noise sources.

In practice most people merely wish to know if the unit under test is better or worse than a known good unit and fig 6 shows how this may be done.

It can be seen that whilst measuring the performance of the good unit the errors in the measurement system are also recorded and stored. The unit under test may then be placed in the same jig, subjected to the same sweep tones at identical levels, and the results automatically stored. If the display is set to show the difference between the two traces then the normalised frequency response is displayed. This trace is very accurate provided the differences are small, and gives an indication of both amplitude and phase nonlinearities.

Audio recording

Modern tape recorders are capable of a high standard of repro-

Simplified audio measurements using digital storage

duction when correctly biased on a good tape at the correct levels with the proper equalisation. In practice often they are used until they sound bad and then an engineer spends the best part of a day bringing them back up to spec.

They are electro-mechanical devices and as such gradually wear and accumulate dirt and oxide. It is commonly known that routine maintenance is essential, but this is not always done because the job is tedious.

Fig 7 shows the variety of measurements which can be made using an RA200. A test tape can be loaded, the frequency and amplitudes of the tones may be read directly on the screen, and any necessary replay equalisations made. The recorder can then be loaded with the required

tape, driven with sweep tones from the RA200 signal source, and a real time record-replay response made. Note the time lag between record and replay heads does not matter since the replay frequency is tracked and recorded. As shown, the effect of bias changes, record equalisation and distortion may be immediately viewed, and stored if required.

Note that even if the replay response cannot be equalised flat, then by minimising the difference between test tape replay and record-replay response, the machine can record flat tapes which will replay perfectly on another machine. This is a tremendous advantage on multitrack machines, and enables multiple track matchings to fractions of a dB.

Inter channel crosstalk may be monitored down into the signal

noise by tracking the source oscillator.

Future trends in audio instruments

The applications described above are ones which in the past will have needed several separate instruments either wired or connected together. The results would have to be manually or chart recorded, and the comparisons made either by eye or calculator. Measuring instruments of the future will become more universal, with auto-ranging, auto-trim, self-testing and remote control facilities. The IEC interface bus is specifically intended for interconnecting such instruments.

The application of microprocessors and LSI memories will enable results to be recorded, manipulated and either displayed or used as controls for other measurements, and thus highly intelligent instruments will result with very simple operating controls. The advances in display

technology and drive electronics will enable the user to read his results in the most useful form such as a graph, table of results, or plain language descriptions on the machine or a CRT screen.

As the instruments become more adaptable and programmable, they become more universal and whereas today the user sets the instrument controls manually, we will see him programming the machine functionally either by push-button, cassette, or via the telephone depending on the task complexity.

The RA200 store is only able to make comparisons between frequency response traces and this is a small step towards storing complete equipment characteristics and test routines, thus closing the present gap between the large computer driven ATE systems of electronics manufacturers and the scope and multimeter approach of the average audio test engineer.

FIG. 6 LOUDSPEAKER AND MICROPHONE PRODUCTION TESTING

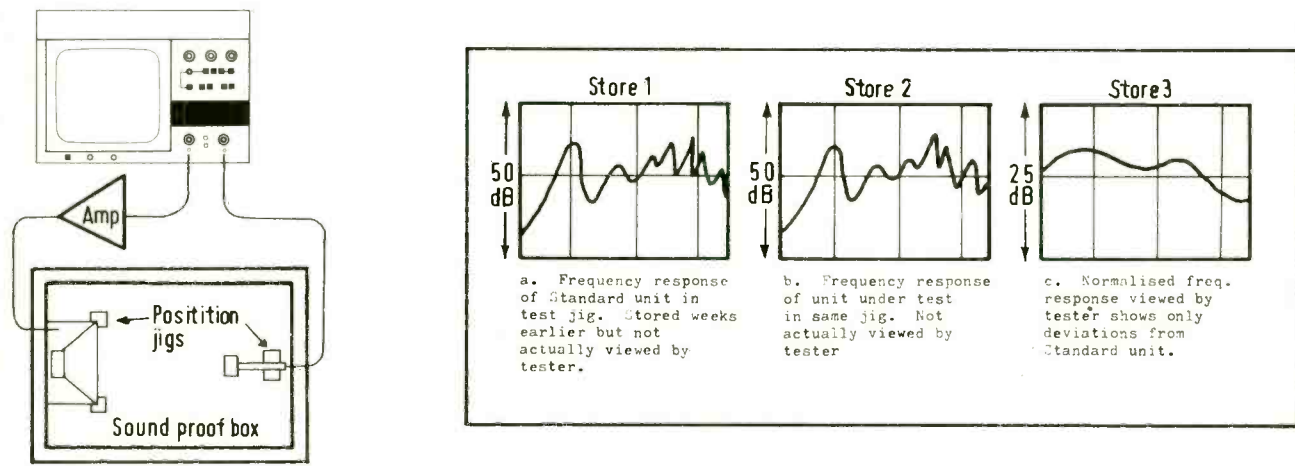
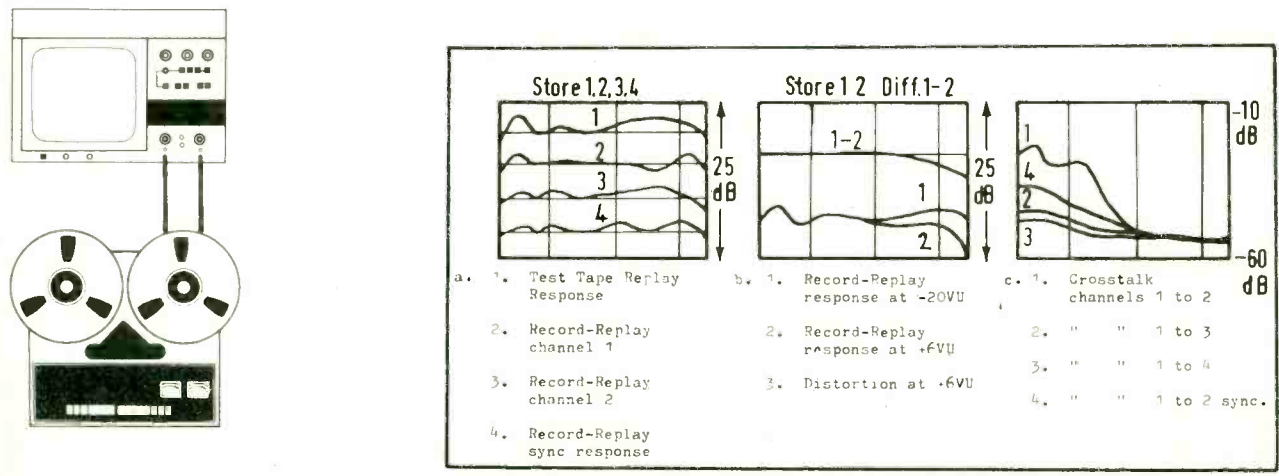


FIG. 7 TAPE RECORDER LINE-UP

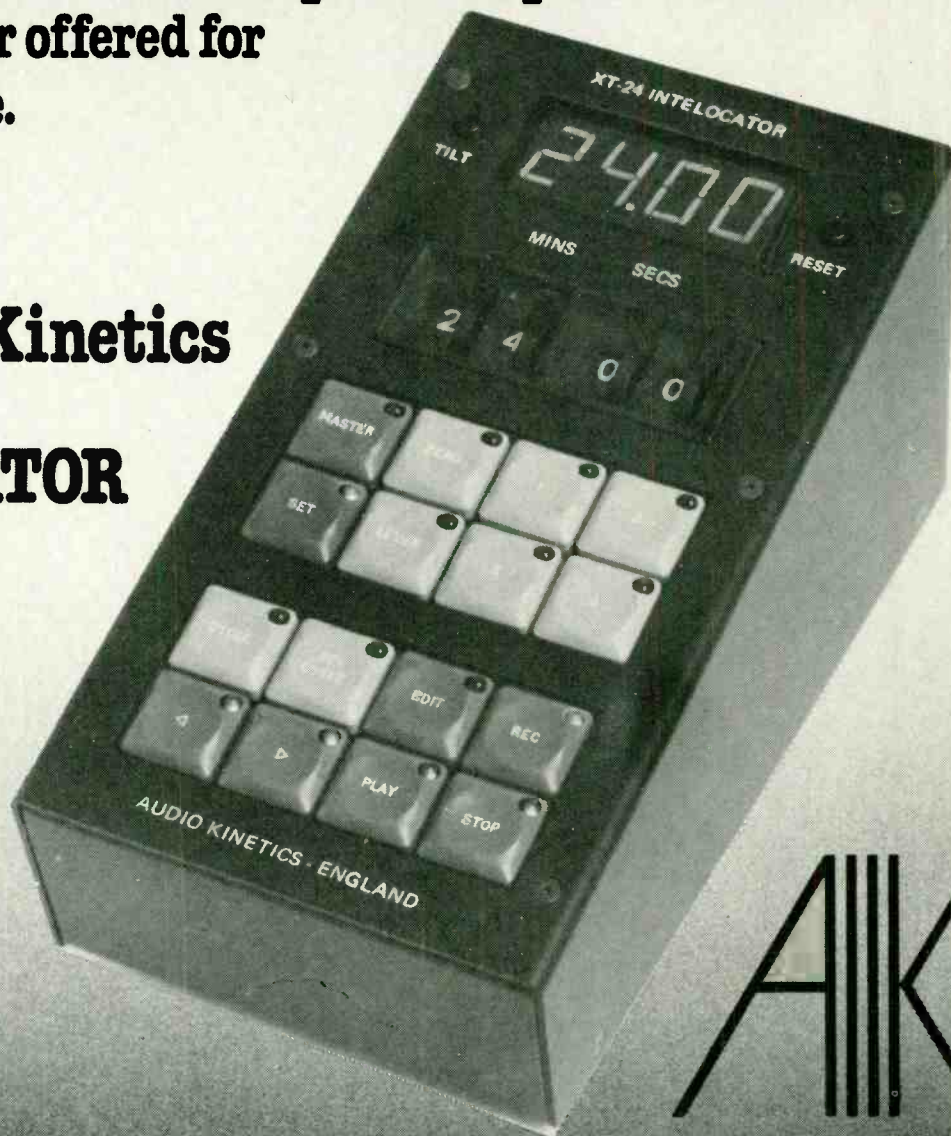


Dear Frustrated & Bored,

How many times do you depress Start/Stop/Rewind on your multitrack in a day? Tedious isn't it.

The answer: the most powerful piece of control equipment ever offered for a tape machine.

The Audio Kinetics XT-24 INTELOCATOR



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- Two counters — Master and Local.
- Operates in minutes and seconds
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- 3M M79
- Ampex MM1200
- Ampex ATR100
- MCI JH-16
- Studer A80

Eliminate yawning producers and frustrated engineers. Dominate your multitrack. Phone for literature now on St. Albans 32191

Survey: compressors and limiters

Forthcoming surveys include turntables, arms and cartridges (May), microphones (June) and radio mics, stands and booms (July). Manufacturers and agents are invited to submit product details for inclusion to reach the editorial office (address page 3) by the end of the third month before issue cover date.

ALICE (UK)

Alice (Stancoil Ltd), 38 Alexandra Road, Windsor, Berks, UK.
Phone: 07535 51056. Telex: 849323.

9904 module

Contains two comp/limiters with switched stereo ganging built into Alice desks, and not available separately.

Noise: 86dB 20Hz to 20kHz.

Distortion: 0.1% THD.

Attack time: 1 to 10ms, limiter 100µs.

Release time: auto 600ms to 5s, manual 400ms to 1.2s.

Ratio: 1.3 to 5:1.

Price: £330.

ALLEN & HEATH (UK)

Allen and Heath Brenell Ltd, Pembroke House, Campsbourne Road, Hornsey, London N8, UK.
Phone: 01-340 3291. Telex: 267727.

US: Audiotechniques Inc, 142 Hamilton Avenue, Stamford, Conn 06902.

Phone: (203) 359-2312. Telex: 996519.

Agents in Canada, Belgium, France, Germany, Austria, Greece, Italy and Portugal.

FEED FORWARD DELAY LIMITER

The unit employs an analogue delay circuit in the main signal path that activates a side-chain limiter circuit in advance of an incoming transient peak. This is claimed to eliminate normal limiting-related problems such as transient distortion and overshoot. Variable threshold, release time and output level are featured, plus an overload indicator, stereo linkage and a 3-position LED PPM.

Pro limiter

Portable limiter designed for use with small studios and PA systems. Features 7:1 compression ratio, balanced mic input, line input, low level hi z input for guitar, switchable attack and decay times, overload indicator, variable input gain.

Price: £85.50.

ALLISON (USA)

Allison Research Inc, 2817 Erica Place, Nashville, Tenn 37204, USA.

Phone: (615) 385-1760.

Export: Gotham Audio Corporation, 741 Washington Street, New York, NY 10014, USA.

Phone: (212) 741-7411.

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

GAIN BRAIN Model 700

A unit containing the 'unique' combination of peak and rms limiters plus high-speed LED readout. Several units can be connected for tandem limiting.

Noise: 83dB below threshold of peak limiting.

Total harmonic distortion: 0.3%, 40-15kHz.

Gain: 0-30dB reduction.

Attack time: peak section 1.5dB overshoot 1µs after application of 50kHz tone burst exceeding the threshold of limiting by 15dB; rms section 7-40ms for 90% ultimate gain reduction, dependent on complexity of waveform, amount of limiting and control positions.

Release time: peak section 1µs for transients of 50µs duration, variable between 50ms and 5s for other peak signals; rms section 0.25-5s.

Limiting ratio: peak section approx 50:1; rms section approx 40:1.

Threshold: -20 to +30dBm in peak mode; rms mode raises peak threshold by 6dB while lowering rms threshold 6dB. This allows a separation of thresholds that is continuously variable from 0dB (peak mode) to 12dB (rms mode).

Power: 24-28V DC, 70mA.

Price: £190.95, 8-channel in powered rack £1,627, 16-channel £2,969.

ALTEC (USA)

Altec Sound Products, 1515 South Manchester, PO Box 3113, Anaheim, Ca 92803, USA.

Phone: (714) 774-2900. Telex: 655415.

Europe: Altec Sound Products Ltd, 17 Park Place, Stevenage, Herts SG1 1DU, UK.

Phone: 0438 3241.

1612A LIMITER

A 2-input device that functions either as a line amp

or a limiter amp.

Equivalent input noise: -130dBm with 1588C mic preamp; maximum output noise -55dBm, 20kHz bandwidth.

Total harmonic distortion: as a limiter amp: 1%, typical, 50-20kHz at -8dBm output, threshold to 25dB compression.

Attack time: typically 10µs in 'fast' mode; 33µs in 'slow'.

Release time: typically 800ms in 'fast' mode; 2.8s in 'slow'.

Threshold: variable from -74dBm input with 1588C mic preamp; from -40dBm direct input.

Slope: nominally 20:1 from threshold to 25dB compression.

Limit/line balance: 0-20dB of compression.

ASHLEY (USA)

Ashley Audio Inc, 1099 Jay Street, Rochester NY14611, USA.

Phone: (716) 328-9560.

Canada: Gerr Electro-Acoustics, 365 Adelaide Street East, Toronto, Ontario, Canada M5B 4R9.
Phone: (416) 868-0528.

SC-50

19in rack mounting peak limiter/compressor which 'combines positive control with sonic excellence'.

Hum and noise: -90dBm, unity gain.

Distortion: less than 0.05% THD, 0dBm 20Hz to 20kHz, no limiting, less than 0.2% -10dBm worst case.

Gain: : 30dB.

Ratio: 2, 3, 5, 7, 10, 20, 30 and ∞:1.

Attack time: 200µs to 20ms.

Release time: 100ms to 2s.

Price: \$299.

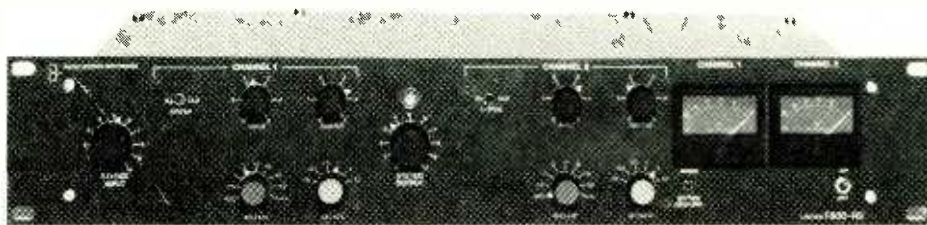
SC-55

Similar to SC-50, but stereo unit with limiting determined by the louder channel.

Price: \$499.

60 ▶

Audio & Design F600-RS limiter



It all adds up to the world's most versatile sound system.

Millbank produce well engineered, well styled sound equipment backed by a 2-year guarantee. At Millbank, we are proud of our flexibility.

With PAC-SYSTEM, we offer you the widest available range of plug-in system variables. Millbank is the only company in the world with plug-in ambient noise sensor, graphic equaliser, monitor amplifier, AM and FM tuners – and total system status monitoring. In fact, you can get from us any-

thing you need for a reliable installation – simply and economically – because everything plugs in: no costly specials.

When you start with a Millbank system, expansion is virtually limitless. Our sound systems are used in every type of public building from airports to supermarkets, cafes to concert halls. Every major product is researched, designed and manufactured in the United Kingdom.

“Mind the doors, please...”

(Public address system, Metro Underground, Brussels.)



“Mr. Lee to the Personnel Office, please...”

(Factory call system, Seiko Watch Service Centre, Kuala Lumpur.)

“Half-time score at Anfield is one-all...”

(Public address system, Arsenal Football Ground, Highbury.)

“Stand by to receive helicopter...”

(Operational instructions, Frigg oil rig, North Sea.)

“The round-London coach tour leaves in 5 minutes...”

(Public announcements, Hilton Hotel, London)

THE NAME THAT SAYS IT ALL

ME
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Millbank Electronics Group Limited, Uckfield, Sussex TN22 1PS. Telephone: Uckfield (0825)4166

International: 825 4166 Telex: 95505 MILBANK G. Cables: Euraudio Uckfield Sussex

www.millbankradiohistory.com

SURVEY: COMPRESSORS AND LIMITERS

AUDIO & DESIGN RECORDING (UK)

Audio & Design (Recording) Ltd, 84 Oxford Road, Reading RG1 7LJ.
Phone: 0734 53411. Telex: 847605.
USA: Audio & Design Recording Inc, 652 Glenbrook Road, Stamford, Conn 06906.
Phone: (203) 356-1391.
Agents worldwide.

F600 BROADCAST LIMITER

A 'straight forward' 2-channel limiter for use in systems that have critical overload conditions, such as optical film recording, disc cutting, and broadcast transmitters.

Noise: 80dB ref limiter threshold.
Distortion: 0.2% at 1kHz.
Gain: 34dB max, unity in bypass mode.
Attack time: 10, 25, 500µs, 1, 2.5 and 25ms.
Release time: 25, 50, 100, 200, 400, 800ms, 1.6 and 3.2s, plus 'automatic'.
Threshold: input: -19dBm max for limiting; output: up to +15dBm.
Price: \$956.

F690 MUSIC-VOICE RATIO LIMITER

Consists of a standard F600 stereo broadcast limiter fitted with a voice-operated threshold switching circuit. Spec virtually identical.
Price: \$1021.

F760X COMPEX LIMITER

A unit that combines a variable ratio compressor with an overall peak limiter and a low-level, noise-reducing expander/gate. Available as a mono or stereo rack-mounting system, and as a mono module. Three limit pre-emphasis values—50, 75 or 100µs—can be supplied.

Noise: better than -80dB ref threshold level as set by output attenuator; better than -87dB with expander operational.
Distortion: compressor 0.1% at +10dBm threshold (typically 0.04%); limiter 0.3% at +14dBm.
Attack time: limiter 250µs for 100% control of overshoot without over-limiting; compressor 250µs, 2.5 and 25ms; expander 20µs, 2 and 40ms.
Release time: limiter 250ms; compressor 25, 50, 100, 200, 400, 800ms, 1.6 and 3.2s, plus 'automatic'; expander/gate variable between 25ms and 5s.
Threshold: limiter +14dBm max ref unattenuated output; compressor calibrated wrt peak limiter threshold and marked 0-20dBm in 2dB steps; expander/gate -40 to +14dBm wrt input.
Price: \$1470 (stereo system).

F769X VOCAL STRESSOR

Basically, comprises a F760X Complex Limiter and an E900 sweep equaliser. A routing switch changes the relationship between the two units: the equaliser can be positioned before or after the limiter, or inserted into the limiter's control side chain, thus modifying its response to frequency content. Not only de-essing, but 'de-rumbling' and 'de-bass end modulating' are among the useful applications said to be possible.
Price: \$1305.

E500/E560 BAND PROCESSOR/LIMITER

Specifically designed for band-split limiting, the E500 features the following: high and lowpass sweep filters for dynamic and static shelf-type eq; parametric notch filter of variable 'Q' for dynamic or static peaking/limiting; monitoring of selected area for adjustment and use as effect; switched threshold control that converts variable input/output limiters or expanders to unity gain; electronic crossover with zero phase-shift; simulated 'stereo' from mono tracks; and phasing effects by altering sweep notch control. The model E560 combines the selective notch section of the E500 with an F600 limiter.
Price: E500: \$1250; E560: \$1350 (stereo models).

SO1 COMPRESSOR-LIMITER MODULE

A member of the SCAMP family of 1in modules.

Noise: less than -80dB (no conditions).
Total harmonic distortion: 0.1% (no conditions).
Attack time: limiter 500µs; compressor 500µs, 2 and 25ms.
Release time: limiter 250ms; compressor variable between 25ms and 3s, with an 'automatic multiple network' position that gives a fast recovery time over 5dB gain reduction range on a slowly changing release platform.
Threshold: limiter -4 to +16dBm max output level; compressor linked to ratio selection so that for 10dB compression on any slope the output level remains constant, and above that level of compression the slope tightens to 30:1 as the peak level limiter becomes operational.
Compression ratio: 1, 1.5, 2, 3, 5 and 10:1.
Price: \$325.

GEMINI COMPACT

Available as *Gemini Compact* or *ITAM Compliment*.
Noise: 78dB ref limit threshold at -3dB and 25kHz.
Distortion: 0.2% at 1kHz for 10dB compression.
Attack time: 500µs and 5ms.
Release time: variable between 25ms and 3s, plus 'automatic'.
Threshold: -10 to -10dBm at output (-20dBm at input).
Ratio: limiter 20:1, compressor 1.5 and 3:1.
Stereo matching: ±1dB on control voltage tracking over 10dB range.

AUDIO DESIGNS (USA)

Audio Designs and Manufacturing Inc, 16005 Sturgeon Roseville, Michigan 48066, USA.
Phone: (313) 778-8400.
Other countries: Ampex International Operations, including:
UK: Ampex GB Ltd, Acre Road, Reading, Berks. Phone: 0734 85200. Telex: 848345.

302 LIMITER MODULE

Noise: -73dBm max below threshold; -85dBm max at 20dB limiting.
Distortion: 0.15%, typical.
Gain: 0dB below threshold; up to 30dB of gain reduction.
Attack time: 1ms.
Release time: 50ms to 2.5s.
Threshold: -16 to +24dBm.
Power: ±20V 50mA.

AUDIO DEVELOPMENTS (UK)

Audio Developments, Hall Lane, Walsall Wood, Brownhills, West Midlands WS9 9AU, UK.
Phone: 05433 5351. Telex: 338212.
Agents in Australia, Austria, Canada, Denmark, France, Germany, Holland, India, Italy, Japan, Norway, South Africa, USA and Venezuela.

ADO55

A rack-mounting unit, the two channels of which are completely independent but can be linked for stereo operation. DIN, XLR and audio jack connectors are fitted for ease of connection.
Attack time: 250, 500µs, 1, 2, 4 and 8ms, switchable.

dbx model 165 professional compressor/limiter

Release time: 75, 150, 300, 600ms, 1.2 and 2.4s, switchable.
Threshold: two ranges; 'low ratios' adjustable from -10 to +10dBm in 2dB steps; 'limit' adjustable from 0-20dB in 2dB steps.
Ratio: 1, 2, 3 and 5:1, plus 'limit' (20:1).
Price: £450.

AUDIX (UK)

Audix Ltd, Station Road, Wenden, Saffron Waldon, Essex CB11 4LG.
Phone: 0799 40888. Telex: 817444.
Canada: MSC Electronics, 254 Wildcat Road, Downsview, Ontario M3J 2N5.
Phone: (416) 661-4180. Telex: 0623494.

4B02 MODULE

A compressor-limiter in a 178 x 40 x 255mm module also equipped with a noise gate.
Noise: less than -94dBm.
Distortion: 0.1%, typically 0.03% at 1kHz for 10dB limiting.
Attack time: 1, 2, 5, 10, 20 and 50ms.
Release time: 100, 200, 500ms, 1 and 2s, plus 'auto' which gives a time related to depth of compression.
Threshold: -10 to +12dBm in 2dB steps.
Ratio: 1.5, 2, 3, 4 and 6:1, plus 'limit'.
Noise gate: sets gate to cut off input signal below -50, -40, -30, -20 and -10dBm, and 'off'.

SP704 LIMITER AMPLIFIER

Designed for insertion into programme lines operating at 0dBm. Facilities for slave (tandem) and voice-over applications are incorporated.
Noise: -80dBm (no conditions).
Distortion: 0.03% residual; 0.1% operating (at 500Hz).
Attack time: 'auto' (nominally 5ms for 12dB of control).
Release time: 100, 200, 500ms, 1 and 2s, plus 'auto'.
Threshold: -12 to +4dBm in 2dB steps, and 'off'.
Ratio: 8:1 internal drive and 2:1 external drive.

CATHEDRAL (UK)

Cathedral Sounds Ltd, Fourways, Morris Lane, Halsall, Ormskirk, Lancs L39 8SX.
Phone: 0704 840328.

CL4

Quad comp/limiter, self powered.
Gain: nominal +8dBm.
Ratio: continuously variable from 1:1 to 20:1.
Threshold: operating from -24dB upwards.
Release time: 100ms to 5s approx.

dbx (UK)

dbx Inc, 71 Chapel Street, Newton, Mass 02195, USA.
Phone: (617) 964-3210. Telex: 922522.
UK: Scenic Sounds Equipment, 97-99 Dean Street, London W1V 5RA.
Phone: 01-734 2812. Telex: 27938.

62 ▶



turnkey by mail

Many items from our catalogue and some new products are now available by direct mail from us. Please use the order form supplied or write directly to;

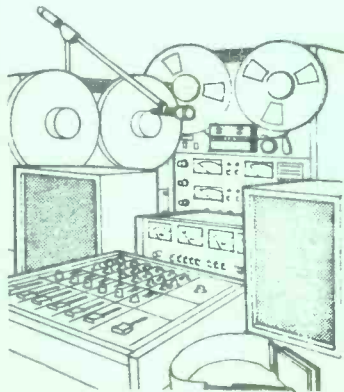
TURNKEY

8, East Barnet Road.

NEW BARNET

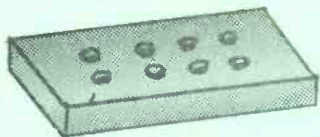
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Barclaycard or Account orders;
(01) 440-9221 Telex 25769



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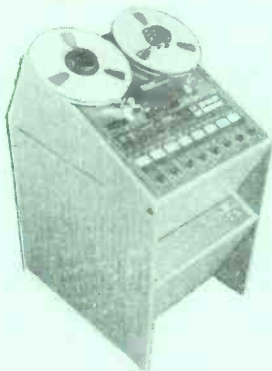
headphone box



An all important piece of hardware for the studio. The headphone splitter box accepts the output of a stereo amplifier for up to 20 Watts and feeds up to 8 sets of 8 ohm headphones.

£13.20+£1.05VAT+60p.P&P

rolling console



The TK842 console is a free standing cabinet, mounted on castors, designed to mount any TEAC tape recorder for convenient studio operation.

The lower section can accept noise reduction processors or be used for tape storage. The sturdy construction uses high density chipboard and is

micro monitor



The amazing micro-monitor by AURATONE can be found in the control rooms of most leading studios. This pint sized system equals the sound of monitor speakers many times the size and price.

Available only in pairs.

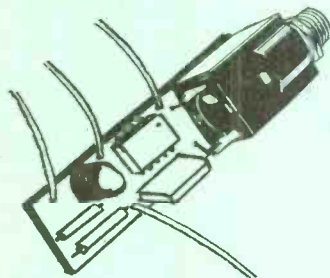
£38.00+£3.04VAT+£1.80P&P

freebie



Here is one that we don't sell to anybody, but if you buy any four channel sync recorder from us we will supply this four channel mixer with tone pan and echo controls to you **Absolutely free of charge!**

jack with gain



A miniature high performance amplifier mounted on the back of a standard jack socket. This is designed to fit internally to equipment which needs extra 10 to 40dB of gain on input or output. The unique circuit layout permits direct replacement of an input or output jack and single or dual rail powering at 12 to 30 volts. The input impedance is high (47kohm) and the output low (600ohm) to suit all applications. Use for mike or line boosting.
£5.80+46p.VAT+20p.P&P

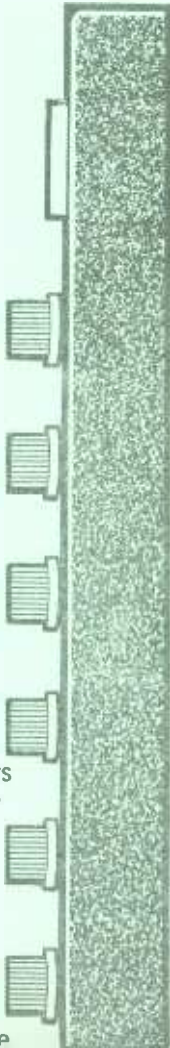
phono cables



Though Phono Cables are a very simple and reliable way of

The
8 Hour
6 In
2 Out

PROKIT 62 is a stereo mixer which is designed for recording and P.A. applications. Gain, treble, bass, cue, pan and echo controls are featured on each channel. Slide faders are used for inputs and main outs. Echo return and VU meters feature on the outputs. PROKIT can be built in about eight hours with the minimum of tools by following the comprehensive



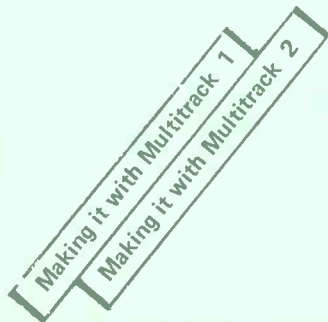
direct box



The high impedance output of a guitar or other instrument should not be plugged directly into a low impedance mike input. The EMO direct injection box solves this problem of matching and ensures the best quality for stage or recording purposes. Available exclusively from TURNKEY.

£31.00+£2.48VAT+45p.P&P

info cassette



Following the highly successful 'Are you ready for Multitrack?' book www.turnkeyradiohistory.com

digital delay



The MXR Digital Delay Line is one of the most accepted DDL units available throughout the US and Europe. Used by the top studios and live bands, the DDL will give a whole variety of effects from the slightest echo to an infinite repeat of passages. Vocal doubling, hard reverberation, flanging, pitch alteration and frequency modulation are all features of this versatile and easy to use unit.
£783.16+£62.65VAT+£6.00P&P

track planner

A pack of 50 printed track planning sheets, designed for use on four or eight track sessions.

£1.30 incl. VAT and P&P

mike transformer



fospro spray

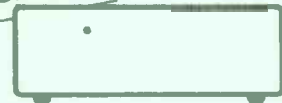
This spray can contains almost half a litre of what is probably one of the most useful liquids (other than alcohol) known to man. We have had more than 5 years personal experience of this, and it has been known to cure everything from bicycles to noisy faders. It dispels moisture, lubricates, and deposits a protective film that prevents moisture and condensation.

400 ml. can of FOSPRO spray.
£2.00+16p.VAT+25p.P&P.

Accessit

ACCESSIT is a complete range of budget signal processors. They are available on a 30 day money back trial offer. All prices shown include VAT and post and packing. Request further data on our order form or order at no obligation today!

£25.34

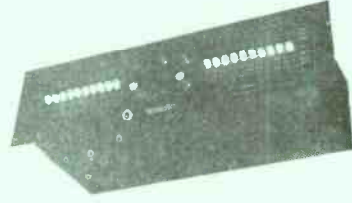


POWER SUPPLY

£28.58

Price includes VAT and P&P.

graphic eq



The STATIK ten band stereo graphic equaliser is produced by a leading British manufacturer. The unit features bypass and level controls, anti click relay and the highest specs. For rack mounting or free standing applications. £250+£20.00VAT+£2.80P&P

Kit £99.95

Kit £99.95
Aoud £149.95



£3.20+25p.P&P

Produced two months ago in fine detail. complete eight track session technique, and goes through a 'Making it with Multitrack' which explain the whole story with examples, explains mike technique, and goes through a

mike box



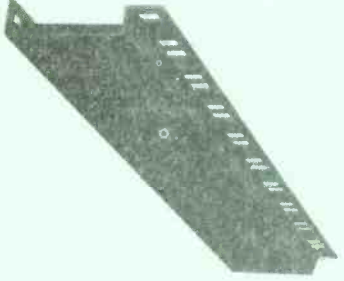
This heavy gauge metal box is pre-punched to accept up to 8 female canon type sockets and 4 standard jacks. Fixing and access holes are provided for wall mounting use or on the end of a multiway. Finished in contemporary light and dark brown colours.

Box only; 17x13x4.7cm.
£12.15+97p.VAT+70p.P&P
Complete kit with connectors £27.00+£2.16VAT+90p.P&P

turnkey shirt

Become one of the gang!
TURNKEY Tee Shirts are now available with our logo and studio graphic, printed green on white or white on green. £2.00 incl. VAT and P&P

rack strips



Chassis mounting, 3/8ins can. £5.90+47pVAT+30p.P&P
In-line, jack in/female canon. £9.10+72p.VAT+30p.P&P

Standard racks for mounting equipment can be prohibitively expensive. We have found an economical solution. Make a simple wood or Dexion cabinet with a 19 inch wide front opening and we will supply our 'rack strips' which you mount along the front edges... and hey presto, a custom standard rack to mount all your access-ory equipment. 5 ft. rack strip with 12 nuts. £12.00+96pVAT+£1.20P&P



EQUALISER

£27.50



BOOSTER

£28.58

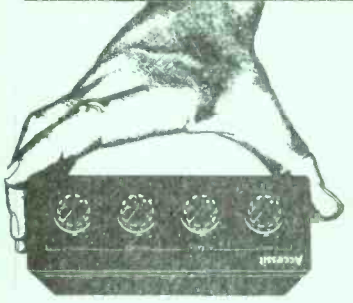


COMPRESSOR

£29.66

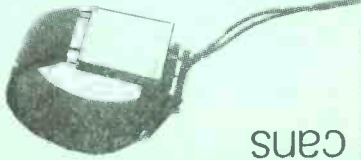


REVERBERATION



Call us with your requirements

cans



We would not claim that the DH-61S headphones have the best response characteristics in the world, however they are lightweight and comfortable to wear, pretty rugged, and don't cost the earth. Ideal for a musicians cue system (8 ohm).

power amplifiers

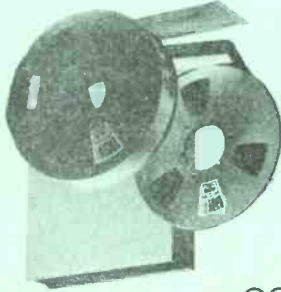


QUAD amplifiers are used as a standard in recording studios. The complete range is available ex-stock from TURKKEY.

405 Current Dumper Amp.
£145.00+£18.12VAT+£3.00P&P
303 Stereo 30W+30W
£98.00+£12.25VAT+£3.00P&P
Special - 303 100W Mono
£100.00+£12.50VAT+£3.00P&P

wood grain laminate.
£60.00+£4.80VAT+£7.00P&P

tape

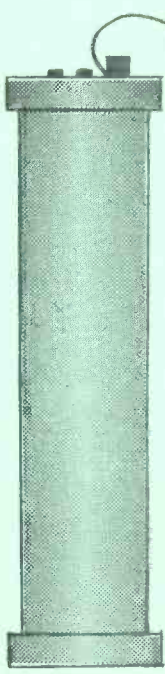


406 is a high quality AMPLEX back-coated tape, supplied on economical plastic spools. A full range of tape accessories is also available.

406 ½ inch on 10% inch NAB £7.73+62p.VAT+70p.P&P
406 ¾ inch on 10% inch NAB £13.33+£1.06VAT+£1.20P&P
406 1 inch on 10% inch NAB £23.33+£1.86VAT+£1.90P&P
Metal ½ inch 10% inch spool £5.99+48p.VAT+50p.P&P
Metal ½ inch 10% inch spool £6.53+52p.VAT+70p.P&P
Three roll splicing tape £2.00+16p.VAT+20p.P&P
7 inch reel leader red or white £4.70+38p.VAT+30p.P&P
EMI ½ inch editing block £3.00+24p.VAT+20p.P&P

The Great

British Spring



This stereo reverb unit has been developed for use in studios where a natural sounding echo is essential. Six spring lines are used with a new signal drive circuit to minimise the usual ping-ponging sounds.

£159

But dont take our word for it! We have prepared a demo cassette which is full of the effects which can be produced. Fitty Pence brings you a copy, (refundable if you decide to buy).

making connections in budget studios, hi-fi cables leave a lot to be desired. The connectors are physically weak and the cable capacitance is high (this causes high frequency loss). The ACCESSIT custom cables are made from low capacity cable (55pF/m), have moulded connectors and are packed in tubes of various lengths.

12ft.phono/phono. 2 pack £3.48+28p.VAT+30p.P&P
6ft.phono/phono. 4 pack £4.68+38p.VAT+30p.P&P
18ins.phono/phono. 8 pack £6.12+49p.VAT+35p.P&P

connectors



We stock in depth a wide range of professional connectors for every application. For quantity prices please ask for quotation.

NEUTRIK (XLR type) male £1.30+10p.VAT+15p.P&P
NEUTRIK (XLR type) female £1.70+14p.VAT+15p.P&P
Metal,pro type,single jack 60p.+5p.VAT+15p.P&P
Phono socket to jack adaptor 48p.+4p.VAT+10p.P&P
Phono type Y adaptor 48p.+4p.VAT+10p.P&P

**STOP
PRESS
FROM
NEVE**

New 48 track console from Neve

Neve's new 48 track model 8098 is the ultimate in standard mixing consoles. Featuring 56 input channels and enhancements such as Neve's powerful NECAM and VCA options, this new L-shaped console is designed to meet the growing demand for high quality 46 track recording.

Write now for details and see for yourself.

Consoles at reduced delivery times

Following a further increase in Neve's production capacity, Neve can now offer the following standard consoles with reduced delivery times.

Music Recording

- Model 8078 – 40 channel/32 track
– 8068 – 32 channel/32 track
– 8058 – 28 channel/24 track
– 8066 – 20 channel/16 track

Broadcast

- Model 5316 – 24 or 36 channel, 8 group, 2 main outputs for TV, radio or 8 track recording.
– 5315 – 12 or 24 channel, 4 group, 2 main outputs for TV, radio or 4 track recording.
– 5402 – 12 channel announcer-operated radio console.
– 5422 – 8 channel suitcase OB mixer.
– 5442 – 8 channel desk top mixer.

Custom Consoles

Neve are the most comprehensive builder of custom consoles. We invite you to discuss your requirements.



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

Rupert Neve Inc.,
Berkshire Industrial Park,
Bethel, Ct 06801 USA
Tel. (203) 744 6230.
Telex 969638

Rupert Neve of Canada Ltd.
2721 Rena Road, Malton, Ontario
Tel. 416 6776611.
Telex. 21 06 983502

Rupert Neve GmbH.
D-6100 Darmstadt,
Bismarckstrasse 114,
W. Germany
Tel. 6151 87038 Telex 419581

SURVEY: COMPRESSORS AND LIMITERS

dbx cont'd

Agents in Belgium, Denmark, France, Netherlands, Norway and Sweden.

Model 160/161

Both units are single-channel and use true rms sensing and feed-forward circuitry. The latter is claimed to eliminate noticeable distortion even at high compression ratios. The Model 161 is a lower-priced version of the 160, which features balanced high-impedance differential input stage and balanced 250mV output, plus turn-on and turn-off transient protection. Two units may be ganged for rack-mounting.

Equivalent input noise: -78dBm, typical unweighted.

Distortion: 0.075% 2nd harmonic at infinite compression and +40dBm output; 0.5% 3rd harmonic typical at infinite compression ratio.

Attack time: 15ms for 10dB level change above threshold; 5ms for 20dB change; 3ms for 30dB change.

Release rate: 120dB/s.

Compression ratio: 1:1 to infinity.

Threshold: -38 to +12dBm.

Price: Model 160: £205/\$360.

Model 162

A 'true-stereo' unit utilising true rms sensing, feed-forward circuitry and ganged threshold, compression and output gain controls. Two or more units can be linked for quadraphonic operation. Specification virtually identical to Models 160/161.

Price: £400/\$715.

Model 163

One knob only on the front panel which increases or decreases the amount of compression automatically maintaining a consistent output level. Features 'over easy' transfer curve gradually adds compression over several dBs around the threshold point. 12 LED level display.

Input noise: -78dBm 20Hz to 20kHz.

Threshold: -36dBm to -4dBm.

Output: -18dBm into 2k Ω .

Attack time: 5ms for 20dB level change.

Release time: 120dB/s in ∞ compression region.

Ratio: automatically varies from 1:1 below threshold to ∞ :1 above threshold.

Price: £100/\$189.

Model 165

Professional comp/limiter featuring automatic or manual control of attack and release rates, 'over easy' compression.

Input noise: -90dBm 20Hz to 20kHz.

Threshold: -40 to -10dBm.

Ratio: 1:1 continuously variable to ∞ :1.

Output: -23dBm into 600 Ω .

Attack time: manual 1 to 400dB/ms, automatic mode 15ms for 10dB level change, 5ms for 20dB, 3ms for 30dB.

Release time: manual 10 to 4000dB/s, automatic 120dB/s.

Features: stereo coupling facility.

Price: £280/\$550.

DUKANE (USA)

Dukane Corp, International Division, 2900 Dukane Drive, St Charles, Ill 60174, USA.
Phone: (312) 584-2300. **Telex:** 720426.

Model 2A80B COMPRESSOR/NOISE GATE

Described as a 2-input line amp combining a compression amplifier with an 'instantly operating' noise gate that reduces the no signal noise by 15dB.

Noise: -70dB at threshold of compression, -80dB dynamic noise level with amp on.

Distortion: 0.5% with 40dB of compression.

Gain: channel 1:5:15 \pm 2dB at threshold of compression; channel 2:39 \pm 2dB with 600 Ω matching transformer.

Attack time: 30 μ s.

Release time: 1.5s.

Compression ratio: 10 and 5:1.

Model 2A103 COMPRESSOR MODULE

Noise: -65dBm from threshold.

Distortion: 1% max.

Gain: 34dB at threshold.

Attack time: 1ms.

Release time: 1.5s.

Compression ratio: 10:1.

Power: \pm 24V, 20mA via octal plug.

Model 2A165 COMPRESSOR AMPLIFIER

A pcb module designed to plug into standard 19in rack-mounting chassis.

Noise: 80dB below output, 20kHz bandwidth.

Distortion: 5% \pm 5dB into compression.

Gain: 20 \pm 2dB below threshold.

Attack time: 500ms.

Release time: 3-5s.

Compression ratio: 20:1.

Power: \pm 22.5V, 20mA.

DYMA (USA)

Dyma Engineering, Route 1, Box 51, Taos, New Mexico 87571, USA.

Phone: (505) 758-2686.

LDA-31 LIMITER/DUCKER

A 'ducking' feature, independent of limiting section, uses the same gain reduction circuitry to reduce the amp output by an amount proportional to a control voltage. About 5ms of attack time is available, and release time is factory set to between 250ms and 3s. Threshold of limiting is adjustable from 0-30dBm. Nominal gain is 10dB, but may be factory set to any specified value. The unit is available as a pcb in a variety of formats.

Price: \$69.

EMT (West Germany)

EMT-Franz GmbH, Postfach 1520, D-7630 Lahr, West Germany.

Phone: 78025 512. **Telex:** 754319.

UK: FWO Bauch Ltd, 49 Theobald Street, Borehamwood, Herts WD6 4RZ.

Phone: 01-953 0091. **Telex:** 27502.

US: Gotham Audio Corp, 741 Washington Street, New York, NY 10014.

Phone: (212) 741-7411.

EMT 156

Two-channel unit with identical controls of dynamic compression and limiting to avoid any displacement of stereo image. Limiting or compression, or both, are pushbutton controlled.

Limiter threshold: -2 to +7.5dB (referred to internal reference level of 0dB).

Attack time: 0.1ms max.

Release time: 250ms to 2.5s adjustable, for 10dB gain variation.

Compressor gain: 0-18dB, adjustable.

Ratio: 1.5 to 4:1.

Rotation point: -6 to -1.5dB (0dB internal reference).

Attack time: 1-4ms, internally adjustable.

Release time: 500ms to 3.5s, adjustable, for 10dB gain variation.

Expansion ratio: 1.5 or 2.5:1.

Rotation point: -35 to -55dB (0dB internal reference).

Attack time: coupled with compressor release time.

Release time: 1.5-7.5s, adjustable, for 10dB gain variation; about 4.5s in automatic mode.

Distortion: 0.6% at 1kHz, 0dB gain.

Crosstalk: 35dB between channels at 1kHz and nominal level.

Other: internal gain can be varied over 40dB range by means of a 6V DC signal applied to a rear-panel socket.

EMT 257 LIMITER

In 'equalisation' mode an amp with a frequency-weighting network is inserted into the control loop. Components for the pre-emphasis are fabricated on a plug-in unit, and can be changed for any desired frequency weighting of the limiting threshold.

Attack time: 50-500 μ s.

Release time: 250ms to 20s/10dB.

Threshold: -2 to -10dB relative to internal zero.

Range: 20dB max.

Other: can be switched between linear or pre-emphasised mode.

Power: 24V DC (either polarity).

EMT 260 FILTER-LIMITER

Comprises an amplifier and limiter linked by means of a frequency crossover network. Below the limiting threshold, if components are fed via the amp branch and hf via the limiter. If the threshold is exceeded, gain is reduced in the hf branch.

Attack time: 50-500 μ s/10dB.

Release time: 0.25-10s/10dB.

Range: 15dB at 20kHz.

Control: responsive to average value below threshold; peak value above threshold.

Turnover frequency: 4.5kHz.

Weighting: 60 or 180 μ s.

Power: 24V DC (either polarity), approx 130mA.

EMT 258 NOISE FILTER

Comprises a bandpass, highpass and lowpass filter, all three set for the same frequency between 1 and 20kHz, linked to an expander circuit. The latter is automatically switched in and out as necessary, and functions in the range below 1kHz to supplement the effects of the lowpass filter. Thus the unit adjusts itself in such a way as to leave the signal modulation unchanged, while attenuating the hf noise components.

Noise: 80dB rms (unweighted) at 0dB internal level.

Distortion: 0.5% at 0dB internal level.

Expander release time: 50ms for 10dB.

Filter release time: 50ms to 2s, adjustable.

Turnover frequency: 1-20kHz, dependent on signal amplitude; threshold of signal that determines turnover frequency is adjustable between -25 and -65dB.

Power: 24V DC (either polarity).

EMT 261 COMPRESSOR-LIMITER

Provides limiting, compression and expansion in a minimum size with variable adjustment of static and dynamic characteristics.

Ratio: 2:1 to 20:1. 1:2.5 expanding.

Attack time: 400 μ s limiting, 2.5ms compression.

Release time: 250ms to 10s (or automatic).

Threshold: 3dB above normal level for limiter, expander -35 to -55dB.

Signal-to-noise: better than 69dB for 12dB compression gain.

Gain: compression 0 to 12dB.

Power requirements: 24V DC, roughly stabilised.

EVENTIDE (USA)

Eventide Clockworks Inc, 265 West 54th Street, New York, NY 10019, USA.

Phone: (212) 581-9290.

UK: Feldon Audio Ltd, 126 Great Portland Street, London W1N 5PH.

Phone: 01-580 4314. **Telex:** 28668.

OMNIPRESSOR

Combines the characteristics of a compressor, expander, noise gate and limiter in a rack-mounting unit. Also capable of dynamic reversal +10dBm input produces -10dBm output and vice versa.

Noise: -90dBm below output at unity gain.

Distortion: 0.05% 20-20kHz, and typically 0.02% at 1kHz with AGC disabled.

Attack time: 100ms to 100s, continuously variable.

Release time: 1ms to 1s, continuously variable.

Compression ratio: 1:1 through infinity to -10:1, continuously variable. (Infinite compression setting

Expanding the Boundaries of Creativity

New levels of musical imagination present themselves to the creative musician with the application of the MXR Digital Delay. The diverse effects offered by the Digital Delay, when used with individual instruments, vocals, PA and recording mixes, offer a whole new range of musical creativity.

The MXR Digital Delay gives the musician a tool for creative application that is unparalleled in versatility, precision and ease of operation. The MXR Digital Delay is designed for a wide variety of applications including; amplified musical instruments, vocals, PA and recording mixes. The basic unit delays a sound between 0.08 milliseconds and 320 milliseconds, fully variable while retaining the dynamic range of the program source. The delay range is expandable to 1280 milliseconds in increments of 320 milliseconds by means of up to three additional plug-in memory boards. These boards are available from MXR and may be installed by the user.

Effects that can be obtained with fixed time delays include echo, vocal doubling and hard reverberation. The MXR Digital Delay contains sweep circuitry which allows additional effects such as flanging, vibrato, pitch bending and frequency modulation. The MXR Digital Delay is also capable of repeat hold (infinite non deteriorating regeneration).

Rack mountable for sound studio installation, it is also available with an optional road case for onstage use or location recording mixes.

MXR's Digital Delay can lead the way to new possibilities in creative sound at a price considerably lower than any comparable delay.

For more information see your MXR dealer.
Atlantex Music Ltd
16 High Street
Graveley, Herts.
Telephone 0438 50113

MXR Professional Products Group



SURVEY: COMPRESSORS AND LIMITERS

Eventide cont'd

gives constant output ± 1 dB for 60dB change in input level.)

Expansion ratio: 1-10:1, continuously variable.

HARRIS (USA)

Harris Corporation, Broadcast Products Division, PO Box 290, Quincy, Ill 62301, USA.
Phone: (217) 222-8200.

MSP-100 AUDIO PROCESSOR

A stereo broadcast unit incorporating a tri-band AGC and broadband peak limiter with pre-emphasis compensation. Changing a single module (protection section) converts the unit from fm to am operation. Asymmetrical limiting allows 125% positive peak modulation in the latter mode.

Noise: 70dB below +10dBm output, 30-15kHz.

Distortion: 0.25%, 30-50kHz, +10dB output.

Gain: 23 or 43 ± 2 dB, switched.

Intermodulation distortion: 0.25%, 60 and 7kHz mixed 4:1 at +10dBm output.

Three-band AGC section

Crossover frequencies: low 73-316Hz; high 1.7-7.2kHz; both in seven switched positions.

Attack time: 250, 800 μ s, 2.5, 8 and 25ms, compression or expansion.

Release time: 800ms to 12s, compression or expansion; a dual recovery mode dynamically increases period recovery time up to 10x value selected.

Compression ratio: 12:4, 12:2, 12:1, 12:0.5dB/dB at centre of range.

Expansion ratio: 12:24dB/dB, fixed.

Compression threshold: adjustable over 12dB range.

Expansion threshold: -30dB relative, adjustable ± 12 dB.

Compression range: 24dB.

Expansion range: 12dB.

Limiter section

Attack time: 10 μ s to 3.6ms in preset automatic mode; 40 μ s to 3.6ms in manual mode.

Release time: 10 μ s to 3.6ms in preset automatic mode; 0.8-12s in manual. Dual recovery mode functions in same way as AGC section.

Ratio: 12:0.5dB/dB min.

Range: 12dB.

FM and AM protection section

FM module features flat, 25, 50 and 75 μ s compensation curves, 100 μ s attack and recovery time, and parallel split-band (450Hz crossover) operation. AM module utilises 100-130%, asymmetrical limiting, 40ms attack time and 30ms to 1s recovery time.

ITAM (UK)

Industrial Tape Applications Ltd, 1-7 Harewood Avenue, Marylebone Road, London NW1, UK.
Phone: 01-724 2497. Telex: 21879.
France: Son Professionnel, 29-31 avenue André Morizet, 92100 Boulogne, Paris.
Phone: 605 3363.

COMPLIMENT

Only available in Europe. For specifications see Audio & Design's entry for *Gemini Compact* stereo compressor limiter.

ROGER MAYER (USA)

Roger Mayer Associates, 225 East 57th Street, New York NY 10022.
Phone: (212) 486-1544.
UK: Scenic Sounds Equipment, 97-99 Dean Street, London W1V 5RA.
Phone: 01-734 2812. Telex: 27939.

Model RM68

Noise gate with 150ns attack capability and 'exceptionally musical sound'.

Release time: 30ms to 5s.

Attenuation range: adjustable 0 to 30dB.



Neve 33609 compressor/limiter

Distortion: 0.05% under normal operating conditions.

Output noise: -96dB 20Hz to 20kHz.

Power requirements: +24V DC at 40mA.

Auxiliary keying input: permits ducking.

Sensitivity: adjustable -56dBm to 20dBm.

Price: £69. RM68X is retrofit for other manufacturers' racks, price £81.

RM58

Stereo limiter with carefully matched characteristics, VU meters.

Noise: 80dB.

Distortion: 0.5% at 40dB, limiting action.

Attack time: adjustable 50 μ s to 10ms.

Release time: adjustable 120ms to 6s.

Threshold: limiting above -20dB input, internally adjustable to -40dB.

Input range: up to +20dBm.

Limiting range: 40dB.

Price: £449.

MOSELEY ASSOCIATES (USA)

Moseley Associates Inc, Santa Barbara Research Park, 111 Castilian Drive, Goleta, Ca 93017, USA.
Phone: (805) 968-9621. Telex: 658448.

TFL-280 AUDIO LIMITER

A single-channel broadcast limiter for fm mono, stereo, quadraphonic and sca applications, plus tv sound. The unit is supplied with 75 μ s pre-emphasis, but can be converted for other time constants. An output de-emphasis network can be switched in when flat response operation is required.

Noise: 70dB (de-emphasised).

Distortion: 0.7%, 50-15kHz at any degree of limiting.

Attack time: hf controller 20 μ s; wideband controller 20 μ s to 2ms (factory set to 100 μ s).

Release time: hf controller 50-500ms, programmable; wideband controller 200ms to 5s, programme-operated triple-timing.

Filtering: plug-in lowpass filter located prior to hf AGC.

Control range: 35dB.

MXR (USA)

MXR Innovations Inc, 277 N Goodman Street, Rochester, NY 14607, USA.
Phone: (716) 442 5320.
UK: Atlantex Music Ltd, 16 High Street, Graveley, Herts.
Phone: 0438 50113.

MINI LIMITER

Noise: 73dB below threshold.

Threshold level: -30 to +10dBm.

Attack time: approx 1ms.

Release time: variable via rear-panel trim pot, and dependent upon amount of gain reduction.

Other: four leds indicating gain reduction.

Power: +15 to 30V, 22mA.

NEVE (UK)

Neve Electronics International Ltd, Cambridge House, Melbourn, Royston, Herts SG8 6AU, UK.
Phone: 0763-60776. Telex: 81381.

Canada: Rupert Neve of Canada Ltd, 2721 Rena Road, Malton, Ontario.
Phone: (416) 677-6611.

US: Rupert Neve Inc, Berkshire Industrial Park, Bethel, Conn 06801.
Phone: (203) 774-6230. Telex: 969638.

West Germany: Rupert Neve GmbH, D-6100 Darmstadt, Bismarckstrasse 114.
Phone: 06151 87038.

22 SERIES

Available in a variety of formats: 2254/E standard version with 133 x 137mm panel dimensions; 2264, repackaged version with 222 x 46mm panel; 3314, another repackaged version with 222 x 35mm panel; 2254/S, a variant of the 2254/E with pre-emphasis in the compression side chain to reduce sibilance; 2264/X, a variant of the 2264 for use in 150 Ω systems; and LCR2P, a 133mm, rack-mounted package of two 2254/Es with power supply and stereo link option. All models can be linked for stereo or multichannel operation. Independent limit and compress functions are also featured. The compression section samples ahead of the output amp, thus enabling mean programme level to be raised after compression.

Noise: better than -75dB, rms unweighted, unity gain.

Distortion: 0.08% in linear condition, up to 0.5dB under limit ceiling; 0.2% with compression 6:1, 800ms release, +80dB output, +20dB input, -14dB threshold.

Compression threshold: -20 to +10dB in 2dB steps.

Ratio: 1.5, 2, 3, 4 and 6:1.

Attack time: 5ms (nominal).

Release time: 400, 800ms and 1.5s, plus 'auto' (50ms/5s).

Gain: 0-20dB in 2dB steps.

Limit ceiling: +4 to +12dB in 0.5dB steps.

Attack time: 'fast': 100 μ s to 5ms, programmable.

Release time: 100, 200 and 800ms, plus 'auto' (50ms/5s).

Slope: 'at least' 100:1.

33609/10/11/12

Range of limiter/compressors that may be linked for stereo and multichannel operation and which sample ahead of the amplifier allowing the mean output level to be raised after compression.

Noise: without gain make-up -75dB 20Hz-20kHz.

Distortion: 0.2% compress, 0.4% limit.

Threshold: limiting +4dBm to +15dBm, compression -20dBm to +10dBm.

Attack: limiting 2ms, 4ms, compression 3ms.

Recovery: limiting 50ms, 100ms, 200ms, 800ms and auto, compression 100ms, 400ms, 800ms, 1.5ms and auto.

33609 double unit with power supply, 33610 single unit with power supply, 33611 double unit less power supply, 33612 single unit less power supply. 66 ▶

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GO FOR THE 100B, 250D & 750B/C

They're the BGW amps. The Industry Leaders. Four different models with only one philosophy: The Best. The best engineered and designed; the best and most sophisticated electronic test equipment available to test the dreams of an audio engineer's imagination; the best support for an engineer that money can buy - from complex computer modeling to the back-up personnel who refine and distill the inventor's visions. In every BGW product there is a lot you can relate to. Like the quality of every component part. Every one meticulously selected for uncompromised reliability - a simple resistor or a complex soldered modular teflon harnesses and precision standards. From our imitated front panels to our imitated back panels, assemblies are built to exacting standards. From our imitated front panels to our imitated back panels, you'll find a heavy steel chassis and massive heatsink modules.

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BGW Systems, Inc.
13130 South Yukon Avenue,
Hawthorne, California 90250
In Canada: Omnimedia Corp.,
9653 Cote de Liesse
Dorval, Quebec H9P 1A3

SURVEY: COMPRESSORS AND LIMITERS

NTP

NTP Elektronik A/S, 44 Theklavej, DK-2400 Copenhagen NV, Denmark.
Phone: (01) 101222. Telex: 16278.

179-120 COMPRESSOR

In order to operate with long attack times, a fast symmetrical limiter is provided. Control voltages of two units can be linked for equal gain stereo operation.

Noise: 80dB(A) at compression threshold.

Distortion: 0.5% up to 20dB gain reduction.

Gain: up to 15dB.

Attack time: 100µs to 200ms/20dB, adjustable in 11 steps.

Release time: 60ms to 4s/20dB, plus 'auto' (200ms upon 15s), in 11 steps.

Release delay: 0 or 50ms, switched.

Compression ratio: 1, 2, 3, 5 and 20:1.

Threshold: +6dB (normal); +19dB ('normal').

Power: 24V DC, either polarity, approx 100mA.

179-230 LIMITER

Incorporates a combination of a relatively long attack time with a symmetric log clipping curve to eliminate transient noise during striking. Recovery circuit is programme dependent based on a dual-time constant principle, said to eliminate pumping and similar effects. Control voltages of two units can be linked for stereo operation.

Noise: 80dB(A) at limiting threshold.

Distortion: 0-20dB limiting, 0.3%; 20-30dB limiting, 0.5%; 20-20kHz steady conditions.

Attack time: 1.5ms.

Release time: T1: 100, 200, 400ms, 1, 2 and 4s; T2: 1, 2, 4, 10 and 20s, and 'off'.

Threshold: +6 ±0.5dB, referenced to output.

Range: 30dB.

Pre-emphasis: 50µs (normally not connected).

Power: 24V DC, either polarity, approx 75mA.

179-300 LIMITER CARD

Based on same circuitry found in 179-230 limiter.

Noise: 82dB(A) at limiting threshold.

Distortion: 0.2% up to 20dB limiting, 40-20kHz.

Attack time: 1.5ms.

Release time: dual time constants, 200ms upon 15s.

Control voltage: 1V/5dB; may be linked for stereo operation.

Power: ±15V DC, 60mA.

ORANGE COUNTY (Canada)

Orange County Electronics Corporation Ltd,
1125 Empress Street, Winnipeg, Manitoba R3E 3H1, Canada.
Phone: (204) 775-8151.

USA: Parasound, 680 Beach Street, San Francisco, Cal 94109.
Phone: (415) 673-4544.

VS-1 STRESSOR

A combined single-channel equaliser, limiter, compressor, expander and gate. The equaliser can be routed 'pre' or 'post' compressor-limiter, or inserted into the latter's control side chain.

Noise: -84dB below limit threshold, -91dB with expander.

Distortion: 0.1% for 15dB gain reduction at +18dBm output.

Attack time: compressor 250µs, 2.5 and 25ms; limiter 10µs; expander 20µs, 2.5 and 40ms.

Release time: compressor 25, 50, 100, 200, 300, 400, 800ms, 1.6 and 3.2s, plus 'automatic'; limiter 20ms; expander 25ms to 8s, continuously variable.

Threshold: compressor 0 to -20dB ref peak limiter in 2dB steps, or frequency sensitive; limiter +18dBm output unattenuated; expander -40 to +30dBm input, continuously variable.

Compression ratio: 1, 2, 3, 5, 10 and 20:1.

Price: \$1,855.

CLX-S-FM STEREO PROCESSOR

A combined limiter, compressor, expander, gate and high-frequency limiter. The two channels may be used independently, or coupled for stereo operation.

Noise: -84dB below limit threshold, -91dB with expander.

Distortion: 0.1% for 15dB gain reduction at +18dBm output.

Attack time: compressor 250µs, 2.5 and 25ms; limiter 10µs; expander 20µs, 2.5 and 40ms; hf limiter 10µs.

Release time: compressor 25, 50, 100, 200, 300, 400, 800ms, 1.6 and 3.2s, plus 'automatic'; limiter 20ms; expander 25ms to 8s, continuously variable; hf limiter 20ms.

Threshold: compressor 0 to -20dB ref peak limiter in 2dB steps; limiter +18dB output unattenuated; expander -40 to +30dBm input, continuously variable; hf limiter varies dynamically with frequency, follows 25, 50 or 75µs characteristic.

Ratio: compressor 1, 2, 3, 5, 10 and 20:1; limiter 250:1; expander 1:2 and 1:20; hf limiter 250:1.

Price: \$2,275.

CLX MODULE

A combined single-channel compressor, limiter, expander and gate.

Noise: -84dB below limit threshold, -91dB with expander.

Distortion: 0.1% for 15dB gain reduction at +18dBm output.

Attack time: compressor 250µs, 2.5 and 25ms; limiter 10µs; expander 20µs, 2.5 and 40ms.

Release time: compressor 25, 50, 100, 200, 300, 400, 800ms, 1.6 and 3.2s, plus 'automatic'; limiter 20ms; expander 25ms to 8s, continuously variable.

Threshold: compressor 0 to -20dB ref peak limiter

in 2dB steps; limiter +18dBm output unattenuated; expander -40 to +30dBm, continuously variable.

Ratio: compressor 1, 2, 3, 5, 10 and 20:1; limiter 250:1; expander 1:2 and 1:20.

Price: \$720.

VS-2 STRESSOR

Combines the features of several units into one while maintaining uncomplicated set-up and operation. Programme controlled comp/limiter and expander/noise gate loudness contour mode.

Noise: 97dB unweighted.

Distortion: less than 0.1% with 15dB gain reduction.

Limiter: ratio 250:1, attack 10µs, release auto.

Compressor: internal adjustments for ratio 2:1 to 20:1, attack 250µs to 25ms, release 25ms to 4s or auto.

Expander: internal adjustments ratio 1:2, 1:20, attack 20µs to 40ms, release tracks with compressor.

Stereo couple: on barrier strip.

Price: \$976.

VS-3

Similar to VS-2 but stereo with additional HF limiter using 25, 50 or 75µs characteristics, ratio 250:1, attack 10µs, release 20ms.

Price: \$1,148, with lowpass filter \$1,298.

ORBAN (USA)

Orban Associates Inc, 645 Bryant Street, San Francisco, Cal 94107, USA.

Phone: (415) 95-1053. Telex: 171480.

UK: Scenic Sounds Equipment, 97-99 Dean Street, London W1V 5RA.

Phone: 01-734 2812. Telex: 27939.

418A STEREO LIMITER

Noise: -80dB, typical.

Distortion: 0.05% at 1kHz.

Attack time: hf limiter 3ms; broadband limiter 1-2ms programme controlled.

Release time: hf limiter varies around 15ms according to programme history; broadband limiter continuously variable.

Compression/limiting ratio: 200:1.

Hf time constant: 75, 50, 37.5 and 25µs, and 'flat'.

Price: £498/\$795.

PACIFIC RECORDERS (USA)

Pacific Recorders and Engineering Corporation,
11100 Roselle Street, San Diego, Cal 92121, USA.

Phone: (714) 453-3255. Telex: 695008.

MULTIMAX

A tri-band audio processor and AGC amplifier. Four meters display low-band, mid-band and high-band compression plus output level. Two units can be coupled for stereo operation.

Noise: 72dB below +4dBm, ref 6dB compression at 1kHz.

Distortion: 0.2%, 30-15kHz at +24dBm.

Attack time: fast section 100ms; slow section 500ms.

Release time: fast section 200ms; slow section 1s; 'retired' 5s.

Band filters: 18dB/octave, Butterworth type; division frequencies at 309 and 6kHz.

MULTILIMITER

A broadcast compressor-limiter available in two versions for FM or AM application. The FM version is designed to operate with TV, FM or FM-Dolby transmissions, and has facilities for 25 and 75µs pre-emphasis plus special circuitry to compensate for the 2dB possible modulation loss due to lowpass filters in the stereo modulator. The AM version automatically selects the polarity of the signal so that the majority of the peak material is positive-going, thus allowing positive modulation in excess of 100%; an 'automatic polarity correlator' ensures that the switching takes place inaudibly during momentary pauses in the programme.

Noise: 72dB for -20dB input.

Distortion: 0.25% below threshold of limiting, 50-15kHz at +24dBm output; 0.5% with 6dB rms

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FEEDBACK UNDER CONTROL

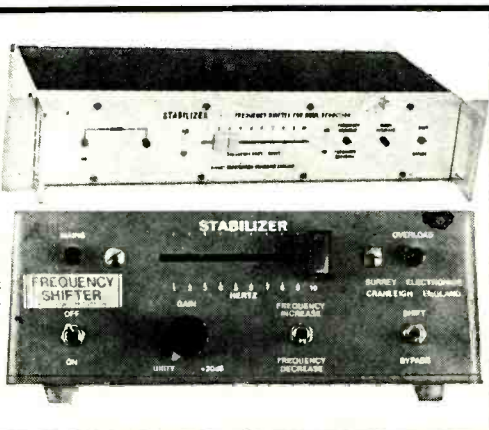
An extra 4-8 dB gain with the inclusion of a Surrey frequency shifter. There are no notches in the frequency response and no sound coloration so these units may be used in every howl-round prone public address system.

The Stabilizer provides frequency shifts either upwards or downwards between 1 and 10 Hertz and allows optimisation of the shift for the acoustics and sound sources involved. Box and rack versions.

5 Hz FIXED SHIFT CIRCUIT BOARDS as WW July 1973 article but improved noise level. Small enough to be built inside the cabinets of many amplifiers. Complete kit and board £30. Board built and aligned £38. Including psu and mains transformer. DESIGNER APPROVED. C.W.O. less 5% VAT 8%.

SURREY ELECTRONICS

The Forge, Lucks Green, Cranleigh, Surrey
GU6 7BG
Telephone 04866 5997



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**SURVEY: COMPRESSORS
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compression and 3dB fast limiting 50-15kHz (1kHz ref).

Attack time: rms fast section 100ms; rms slow section 500ms; fast limiter 5ms; peak limiter 5µs; hf limiter (fm version) 50µs.

Release time: rms fast section 200ms; rms slow section 1s; fast limiter 50ms.

Asymmetric operation (AM): positive voltage peaks 100-150%, continuously variable.

Pre-emphasis operation (FM): flat, 25 and 75µs, switchable.

PUBLISON (France)

Publison Audio Professional Import, 5-11 Rue Crespin du Gast, F-75011 Paris, France.

Phone: 357 6407/8.

CL20B

Uses a photoresistor with low distortion and fast response time driven by an LED and FET operational amplifiers. Compression ratio displayed on scale of 11 LEDs. Stereo operation with 0.5dB matching. **Output noise:** less than 100dB with unity gain, 20Hz to 20kHz.

Distortion: without compression 0.02%, with compression 0.1%.

Ratio: 3:1 to 20:1.

Attack time: 50µs to 10ms variable.

Release time: 200ms to 4s variable.

Insert level: 0dB.

PYE (UK)

Pye TVT Ltd, The Broadcast Company of Philips, PO Box 41, Coldhams Lane, Cambridge CB1 3JU.

Phone: 0223 45115. Telex: 81103.

US: Philips Broadcast Equipment Corp, Audio Division, 91 McKee Drive, Mahwah, NJ 07430.

Phone: (201) 529-3800.

LDM0090 COMPRESSION AMPLIFIER

Available as a stereo (2-channel) or mono unit.

Noise: better than -60dB at 0dB threshold setting; typically -78dB at -24dB threshold setting. (Values weighed to CCIR 468.)

Distortion: 1% at 30, 1k and 8k with 600Ω load.

Attack time: compression 0.5ms; limiting 1s ±0.5ms.

Release time: 100ms to 3.2s in six switched steps.

Compression ratio: 1, 2, 3, 5:1 (switched), plus linear for line-up.

Threshold level: compression -24 to +16dBm; limiting -16 to 24dBm; both controls calibrated in 2dB steps.

RAC (UK)

Rugby Automation Consultants, 19 Freemantle Road, Rugby, Warwickshire CV22 7HZ, UK.

Phone: 0788 810877.

LIM1 BOARD

A pair of pcbs for incorporating a limiter into existing equipment.

Noise: -80dB (no conditions).

Distortion: generally less than 0.5%.

Gain: 13dB unlimited.

Attack time: 20µs.

Release time: 33ms/700ms combination.

Compression ratio: 4:1 at -10dB threshold, to 25:1 at +13dB threshold.

Power: 24V DC.

Price: £14.25 (\$26).

RACLIM 2 MODULE

A mains powered unit for rack-mounting.

Noise: -80dB (no conditions).

Distortion: generally less than 0.5%.

Gain: 20dB.

Attack time: 20µs.

Release time: switchable, four positions.

Compression ratio: 1-25:1

Threshold: -20 to +10dB in six switched positions.

Price: £69 (\$130).

REBIS (UK)

Rebis Audio, Kinver Street, Stourbridge, West Midlands DY8 5AB.

Phone: 0384 71865.

Export: Scenic Sounds Equipment, 97-99 Dean Street, London W1V 5RA.

Phone: 01-734 2812. Telex: 27939.

RA 301

A 2-channel 3½in rack-mounting unit for independent compression and limiting, or ganged for stereo operation. VU metering of input, output and compression.

Noise: -75dBm 20Hz to 20kHz.

Distortion: 0.6% at 5dB compression; 0.2% at 20dB compression.

Attack time: 20µs to 1.5ms.

Release time: 50ms to 3s.

Compression/limiting ratio: 1-40:1.

Minimum threshold: -20dBm.

Max gain: 38dB.

Price: £420.

RA202

A 5½in by 1in module compatible with the Rebis rack. Spec as for RA301 except LED indicators for 1dB and 10dB of compression and threshold control instead of separate input and output controls.

Price: £115.

SESCOM

Sescom Inc, PO Box 590, Gardena, Ca 90247, USA.

Phone: (213) 770-3510. Telex: 910-346 7023.

UK: Atlantex Music Ltd, 16 High Street, Graveley, Herts.

Phone: 0438 50113.

C-2 COMPRESSOR MODULE

A plug-in, octal-based unit with adjustable AGC time constant between 0.1 and 1s by means of an external resistor.

Noise: -90dB below rated output.

Distortion: 0.5%, 20-20kHz.

Compression range: input varying between -43 and +14dBm provides constant 0dBm output.

Power: +24V DC.

Price: £24.57.

SHURE

Shure Brothers Inc, 222 Hartrey Avenue, Evanston, Ill 60204, USA.

Phone: (312) 328 9000.

UK: Shure Electronics Ltd, Eccleston Road, Maidstone ME15 6AU.

Phone: 0622 59881. Telex: 96121.

Agents in most countries.

SE30-2E GATED COMPRESSOR/MIXER

Combines a 3-input mono mixer and a gated memory compressor in one unit. A 40dB compression range is featured, with a ratio of approx 10:1 in the normal operating range. The response rate (averaging time constant) is adjustable to compensate for various types of programme material. Attack and recovery are variable between 100ms and 8s, and in the 'hold' condition the gated memory holds the gain recovery to less than 20dB after 60s to prevent pumping. A stereo parallel jack allows two units to be synchronised.

SPECTRA SONICS

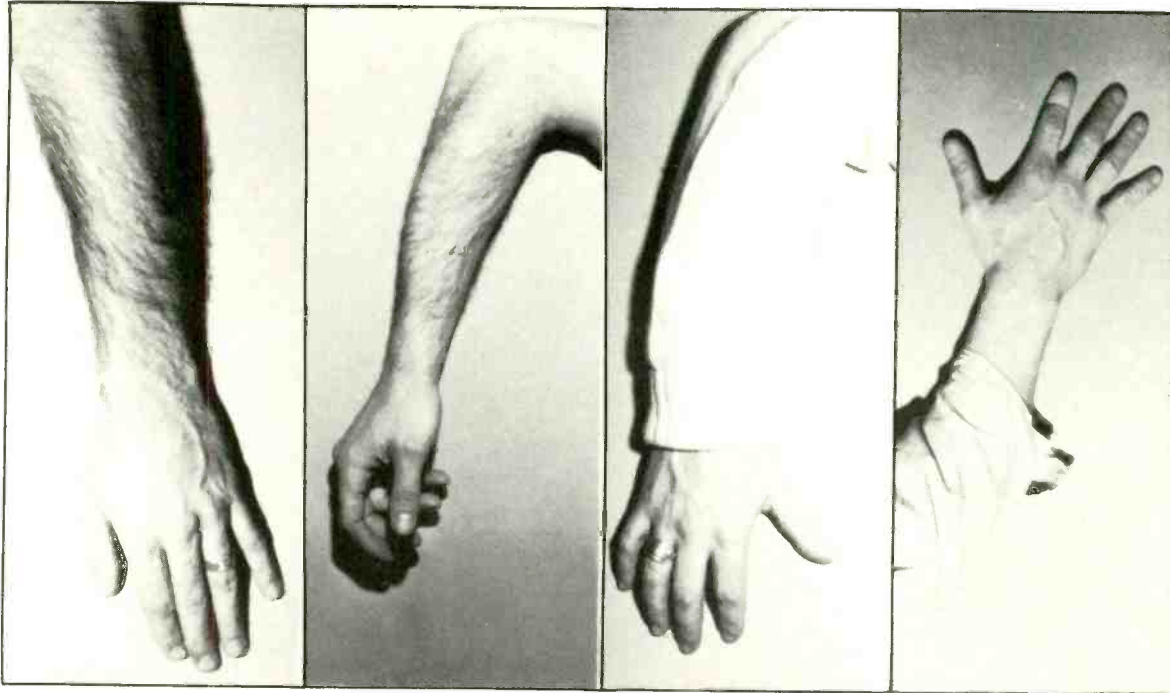
Spectra Sonics, 3750 Airport Road, Ogden, Utah 84404, USA.

Phone: (801) 392-7531.

Model 610 COMPLIMITER

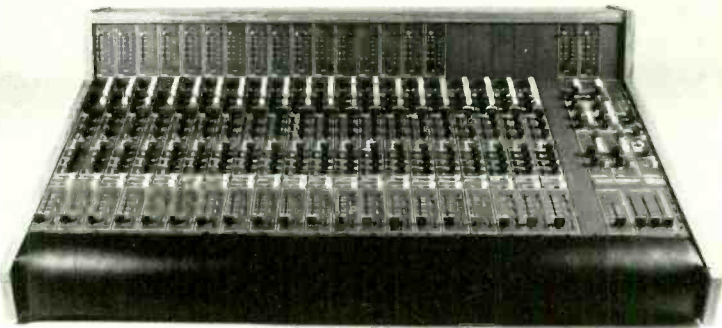
The unit can be used for peak-limiting and volume-compression, either independently or simultaneously.

Sound Workshop introduces its arms.



The Auto-Recall Mixdown System brings computerized mixing to the Sound Workshop Series 1600.

The Series 1600 is a high-performance, automation-ready audio recording console available in several mainframe sizes, all fully expandable to a maximum configuration of 36 x 32, and all ready for direct interface with both the VCA input sub-group package and the ARMS Automation Processor.



During mixdown, ARMS stores fader levels which can be recalled for track by track update of the mix.

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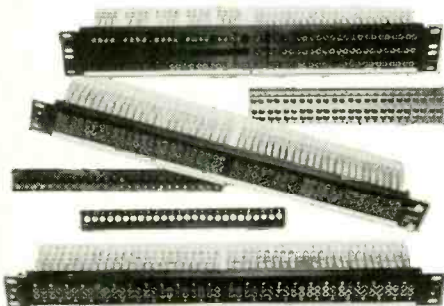
Tapes processed with ARMS are compatible with MCI's JH-50 Automation System.

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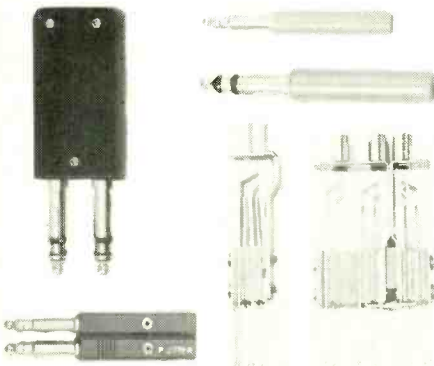
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SURVEY: COMPRESSORS AND LIMITERS

Noise: 80dB below +4dBm output with -40dBm input (threshold), 20-20kHz, unweighted.

Distortion: 0.1%, 30-20kHz, at +16dBm and up to 30dB compression.

Compression/limiting ratio: 1.1-100:1, continuously variable.

Attack time: limiter 0.1-2µs; compressor 0.1µs to 1.2ms; both automatically variable.

Release time: limiter 0.09µs; compressor 50ms to 10s, continuously variable; both for 90% recovery.

Threshold attack level: -40dBm.

SYMETRIX (USA)

Symetrix Professional Audio Products, 109 Bell Street, Seattle, Wash 98121, USA.
Phone: (206) 682-3076.

CL-100

Comp/limiter using monolithic VCA gain control element (not an FET) with additional D-ESS control and side chain insertion allowing the control signal to be passed through an external equaliser etc, 5 LED indication of gain reduction.

Noise: -84dBV with 20kHz bandwidth.

Distortion: no greater than 0.1% with any combination of settings at +18dBm.

Ratio: 2 to 50:1.

Attack: 100µs to 1s.

Release: 1ms to 5s.

Stereo: interconnect.

Price: \$299, balanced input and output \$349.

Signal gate

Rack mounting signal gate with external control input providing optional special effects.

Noise: -84dBm with 20kHz bandwidth.

Distortion: 0.2% with 2V in.

Attack time: 100µs to 1s.

Release time: 50ms to 3s.

Threshold: -40dBm to +10dBm.

Price: \$199.

THOMSON-CSF

Thomson-CSF Laboratories Inc, 37 Brownhouse Road, Stamford, Conn 06902, USA.

Phone: (203) 327-7700. Telex: 4743346.

France: Thomson-CSF, DRT, 94 Rue du Fosé Blanc, 92231 Gennevilliers.

Phone: 790 6549. Telex: 620573.

VOLUMAX Model 4101/4111 LIMITER

A limiter for monaural (Model 4101) and stereo (Model 4111) fm broadcasting.

Noise: 70dB below maximum output level.

Distortion: 1% with normal gain-reduction levels, 50-15kHz.

Attack time: between 1µs and 3ms, depending on programme waveform and rise time.

Release time: 200ms (low frequencies); 10ms (mid frequencies); 2ms (high frequencies); all field changeable.

Compression ratio: 10:1/infinite.

Control range: 15dB.

Price: Model 4101 \$1,225; Model 4111 \$2,330.

VOLUMAX Model 4300 LIMITER

A limiter for am broadcasting.

Track Audio Inc LM-1R comp/limiter

Noise: 70dB wrt max output level.

Distortion: 1%, 50-15kHz.

Attack time: between 1µs and 2ms, depending on programme waveform.

Release time: 200ms.

Compression ratio: 10:1/infinite.

Maximum gain: 50dB.

Control range: 15dB.

Threshold level: selectable; 100, 115 or 125% of negative peaks.

Price: \$1,115.

AUDIMAX Model 4440A/4450A COMPRESSOR

A compressor for monaural (Model 4440A) or stereo (Model 4450A) broadcasting.

Noise: 70dB with normal gain.

Distortion: 0.5%, 50-15kHz at +16dBm output.

Attack time: 10-150ms, depending on programme.

Release time: 0.9, 1.5, 3s, gated and adjustable.

Compression ratio: 10:1.

Control: ±12dB of gain.

Gating threshold levels: adjustable from -20dB to normal input.

Price: Model 4440A \$1,060; Model 4450A \$1,890.

TRACK AUDIO (USA)

Track Audio Inc, 33753 9th Avenue South, Federal Way, Washington 98003, USA.

Phone: (206) 838-4460.

LM-1R

Rack mountable comp/limiter, illuminated VU meter switchable to read actual output level, or gain reduction. Connections by barrier strip

Ratio: variable 2:1 to infinity.

Attack time: 200µs to 20ms.

Release time: 100ms to 2s.

Price: \$350.

TRIDENT (UK)

Trident Audio Developments Ltd, Shepperton Studio Centre, Squires Bridge Road, Shepperton, Middx TW17 0QD.

Phone: 09328 60241. Telex: 8813982.

Agents in USA, Australia, Belgium, Canada, France, Germany, Holland, Italy, South Africa, Spain, Sweden, Japan.

CB9146

Compact comp/limiter occupying only 3in of rack space, versatile operation, VU meter indication of gain reduction, XLR connectors.

Ratio: cont variable 1:1 to 20:1.

Attack: cont variable 20µs to 200ms.

Release: cont variable 25ms to 500ms.

Threshold: internally set at -20dBm.

Input and output: cont variable over 40dB range.

Distortion: 0.3% with 20dB limiting.

Price: £297.

TWEED

Tweed Audio, Pinnaclehill Industrial Estate, Kelso, Roxburghshire, Scotland.

Phone: 05732 2983. Telex: 727633.

USA: Tweed Audio USA, 1640 Fifth Street, Santa Monica, Cal 90401.

Phone: (213) 451-0688. Telex: 652337.

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| Cadac 24 channel 16 group | ... | £10,000 |

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| Tannoy/H.P.D. in cabs | ... | £500 |
| Crown D 150A | ... | £300 |
| Sound Techniques Poweramps, ideal for monitor or foldback, each | ... | £50 |

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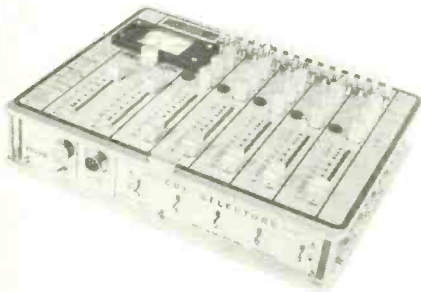
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SURVEY: COMPRESSORS AND LIMITERS

CL603 LIMITER MODULE

A side-chain pre-emphasis option is available for fm broadcast applications. Two units can be supplied in a 19in rack for ganged operation.

Noise: -78dB, 20-20kHz.

Distortion: 0.3% at 20dBm limiting into 600Ω load; residual typical 0.05%.

Attack time: 20, 200μs and 2ms.

Release time: 70ms to 2s, variable, or automatic self-adjusting 70ms/5s.

Threshold: 0-12dB above reference level in 2dB steps.

Ratio: 100:1.

CL604 COMPRESSOR-LIMITER MODULE

Two or more units may be linked to track for stereo or quadraphonic applications.

Noise: -87dBm (or better) at 0dBm gain.

Distortion: 0.1% operating, residual 0.03%

Attack time: 5ms (CCITT method) but self-adjusting on programmes.

Release time: 100ms to 3s variable, or automatic self-adjusting.

Threshold: -20 to +10dBm in 5dB steps.

Ratio: 1.5, 2, 3, 4, 6 and 9:1, plus 'limit' (20:1).

Power: ±15V, 30mA.

CL605 noise gate

Noise: -87dB 20Hz to 20kHz.

Attack time: 50μs.

Release: equal hold and fade times 100ms to 2s.

Threshold: -10dB to -5dB.

Depth: 10 to 30dB.

Bypass: switch provided with LED.

UREI (USA)

United Recording Electronics Industries, 8460 San Fernando Road, Sun Valley, Ca 91352, USA. Phone: (213) 767-1000. Telex: 651389.

Export: Gotham Audio Corporation, 741 Washington Street, New York, NY 10014, USA. Phone: (212) 741-7411.

UK: FWO Bauch Ltd, 49 Theobald Road, Borehamwood, Herts WD6 4RZ.

Phone: 01-953 0091. Telex: 27502.

LA-3A AUDIO LEVELLER

Utilises an electro-optical attenuator for independent gain reduction and control. Limiting frequency response is adjustable to allow up to 10dB gain reduction at 15kHz compared to those below 1kHz—said to be advantageous in fm transmission where pre-emphasis is used. Characteristics of unit can be changed from those of a compressor to those of a limiter by throwing a rear-panel switch. Two units may be linked via attenuators for stereo operation.

Noise: 80dB at threshold of limiting, 30-15kHz.

Distortion: 0.5%, 30-20kHz.

Threshold of limiting: -10 or -30dBm; dependent on gain setting.

Attack time: 250μs to 0.5ms.

Release time: 0.5-5s.

Price: \$396.

LA-4

Like the LA-3A, utilises an electro-optical attenuator for 'smooth, predictable performance coupled with ease of operation'. Because the unit's gain reduction circuitry is rms-responding, it is not recommended for overmodulation protection of transmitters, disc or optical recorders, unless followed by a peak limiter, such as model 1176LN. Two units can be linked for stereo application.

Equivalent input noise: 90dBm, 15.7kHz bandwidth.

Distortion: 0.25%, 30-15kHz.

Attack time: 1-10ms for 63% correction, depending on waveform.

Release time: 100ms to 1s for 63% return, depending on duration of limiting.

Compression ratio: 2, 4, 8, 12 and 20:1, front-panel switched.

Threshold of limiting: -30 to +20dBm.

Price: \$396/£280.

LA-5 AUDIO LEVELLER

The unit has a fixed compression and is designed for sound reinforcement applications. Like the LA-4, this unit is not recommended for protection of transmitters, disc or optical recorders.

Equivalent input noise: 90dBm, 15.7kHz bandwidth.

Distortion: 0.25%, 30-15kHz.

Attack time: 1-10ms for 63% correction; depending on waveform.

Release time: 100ms to 1s for 63% correction; depending on duration of limiting.

Compression ratio: 20:1.

Threshold of limiting: -30 to +20dBm.

Price: \$336/£238.

BL-40 MODULIMITER

Designed specifically for am broadcasting, but with TV and signal processing applications. A 'phase optimizer' circuit automatically maintains most favourable signal polarity, reversing phase whenever negative peaks exceed positive ones by a pre-set amount. Independent controls (plus meters) for rms and peak limiting, and variable positive modulation up to 125%.

Noise: 70dB at the threshold of rms limiting; equivalent input noise less than -100dBm.

Distortion: 0.5%, 30-15kHz, +24dBm output.

Attack time: rms section 1-50ms for 63% correction, dependent on signal; peak section 5μs for 10dBm limiting.

Release time: rms section 50ms to 2s for 63% return, dependent on duration of compression; peak section 100ms.

Price: \$696/£491.

1176LN PEAK LIMITER

Utilises an fet as a voltage-variable resistor ahead of the first stage of amplification. Two units can be coupled for stereo applications.

Noise: 81dB at threshold of limiting, 30-18kHz.

Distortion: 0.5%, 50-15kHz with limiting at 1.1s release and +24dBm output.

Attack time: 20-800μs for 100% recovery.

Release time: 50ms to 1.1s for 63% recovery.

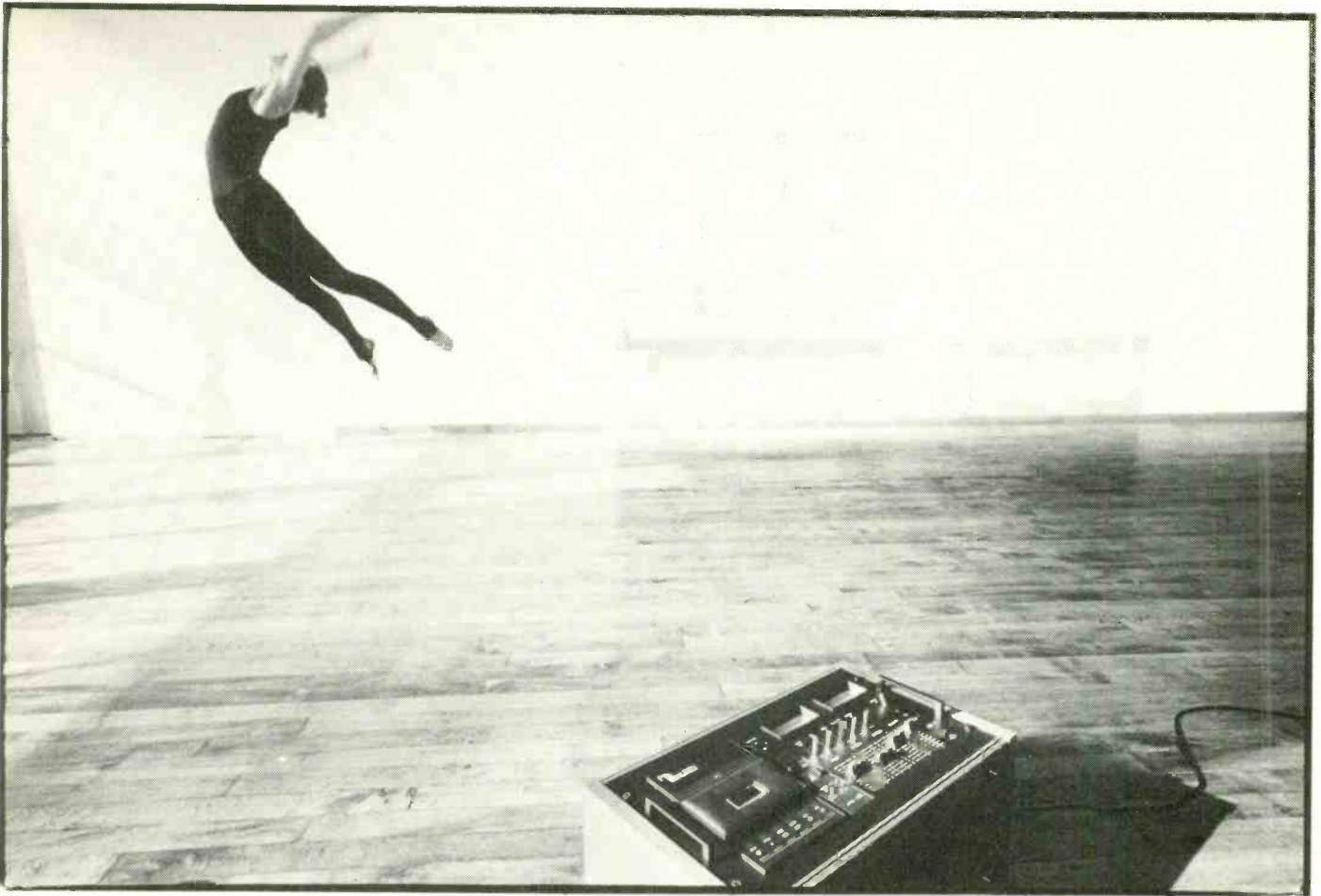
Threshold level: dependent on input and output levels and compression ratio setting.

Price: \$488/£345.

Urei 1176LN limiting amplifier



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Otari MX-7800 8-track recorder

MANUFACTURER'S SPECIFICATION

Heads: three 1in, 8-track heads.

Reel sizes: 10½in NAB.

Tape speeds: 15 and 30in/s or 7½ and 15in/s.

Tape speed deviation: less than ±0.1%.

Rewind time: approx 90s for 2500ft (760m) NAB reel.

Wow and flutter: to IEC peak weighted standard, 30in/s less than 0.04%, 15in/s less than 0.06%, 7½in/s less than 0.08%.

Motors: DC servo direct drive capstan motor, two tension servoed 6-pole reel motors.

Frequency response (record/replay): 30in/s 50Hz to 25kHz ±2dB, 15in/s 30Hz to 20kHz ±2dB, 7½in/s 50Hz to 18kHz ±2dB.

Frequency response (sync reproduce): 30in/s 50Hz to 12kHz ±2dB, 15in/s 50Hz to 12kHz ±2dB, 7½in/s 50Hz to 10kHz ±2dB.

Signal-to-noise ratio: greater than 63dB measured from 520nWb/m unweighted, synchronous reproduce greater than 60dB measured from 520nWb/m unweighted.

Distortion: less than 0.7% at 1kHz measured at 185nWb/m.

Line input: minimum -10dB into 10kΩ unbalanced. Balanced 600Ω with optional transformer.

Microphone input: minimum -70dBm unbalanced, applicable microphone impedance 150Ω to 10kΩ.

Outputs: +4dBm (0VU) 600Ω balanced.

Bias and erase: 133kHz.

Test oscillator signals: 700Hz and 15kHz.

Equalisation: NAB standard or AES (30in/s only), IEC/CCIR also available.

Pitch control: variable range ±12%.

Weight: 260lb (118kg).

Power requirements: 100/117/220/240V, 50/60Hz. Approximately 280W.

Mounting configuration: console type.

Price: £5,415.

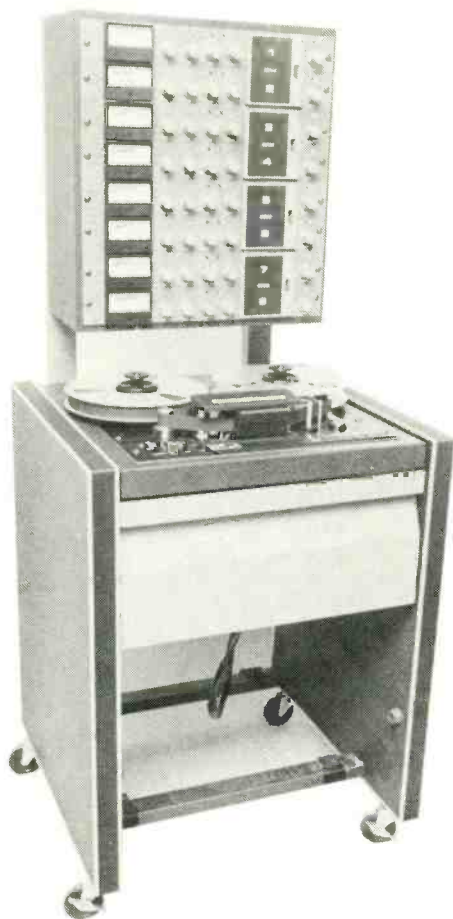
Manufacturer: Otari Electric Co Ltd, 4-29-18 Minami Ogikubo, Suginamiku, Tokyo 167, Japan.

UK Agent: ITA, 1/7 Harewood Avenue, Marylebone Road, London NW1.

THE Otari MX-7800 is an 8-track machine utilising 1in wide tape on NAB reels of up to 10½in diameter, there being two versions of the machine offering either 30in/s and 15in/s or the combination of 15in/s and 7½in/s, the review machine being the latter version. Normally the machine is supplied as a console version, but, the machine itself and its electronics may be mounted into a standard 19in rack.

The audio electronics are divided into four modules, each of which handles two tracks, the tape transport control logic being mounted on the tape transport and the power supplies being a further potentially rack-mounted module at the rear of the console. All units are interconnected by plug-in leads and there is extensive use of plug-in subunits within the modules—thus easing any servicing problems.

Turning to the tape transport, this is based on a relatively heavy duty alloy casting, the faces of which are machined to provide reference faces for mounting the main tape transport components. Both tape reels are mounted directly onto large DC servo motors which ran remarkably cool, each motor being



equipped with a band brake and a tachometer disc for feeding the motion sensing control logic. From the pay-off reel, the tape passes a sprung tension arm and then over a rubber-covered roller to which is attached an optical sensing disc for feeding the optional tape timer, there being a domestic type tape position indicator fed by the pay-off reel as standard. Before entering the fixed headblock, the tape then passes over a fixed guide post and a large diameter roller equipped with a damping flywheel.

Within the headblock there is first a fixed guide before the erase and record heads and then further fixed guides either side of the replay head, the three heads being metal types and secured to a heavy plate by a spring compression azimuth adjustment. Two tape-lifting pins are located near the heads and automatically lift the tape from the heads in the fast wind modes, there being a cue control for listening in the fast modes. From the exit guide within the headblock, the tape passes to a relatively small diameter capstan and large solenoid-operated pinch roller before reaching

a final fixed guide and a damping arm adjacent to the take-up reel. In spite of a tape lacing diagram printed onto the tape transport, it was quite easy to thread the tape incorrectly around this rather tortuous tape path.

Tape motion is controlled by the usual play, record, rewind, fast forward and stop buttons, all of which were properly interlocked and had memories such that it is unnecessary to go through the stop function when changing modes. Furthermore tape handling in all modes was really excellent with a clean wind always being achieved even in the fast wind modes. In case of mains power failure the tape came gently to a halt without any loop throwing or spillage.

Full remote control of the transport functions is provided, in addition to remote control of tape speed which may be varied over a ±12% range by a coarse and fine potentiometer control on the tape transport. A 3-position switch selects either fixed, variable or remote tape speed, a red indicator light being illuminated when the fixed speed is abandoned; however, it is possible to accidentally record at incorrect tape speeds, there being no interlock.

Further controls on the tape transport comprise the tape speed selector for either high or low speed, an edit switch which disengages the take-up reel for dump editing, a cue switch for listening in the fast wind modes and finally the power on/off switch. As this switch has unprotected connections and it is located near the lever used for tilting the tape transport for access to the underneath, this proved to be a lethal feature providing full mains voltage shocks to the unwary!

Very sensibly the complete tape transport can be locked in tilted positions for servicing, the wiring of the transport being fairly neat and the electronics for the control logic and servo system being housed on three good quality plug-in printed circuit boards which also include the master bias oscillator and the alignment tone generator. As with the audio electronics, all components are properly identified for servicing and a good instruction and maintenance manual is provided.

As previously mentioned each audio electronics module accommodates two audio channels, there being plugs at the rear of the modules to feed signals to the tape transport, a remote control connector, a connector for noise reduction switching and the signal connections. The latter comprise a transformer coupled floating output at an XLR connector with the unbalanced line input (which may be balanced by means of an optional input transformer) at another XLR connector plus a ¼in jack socket for an unbalanced microphone. The remaining features at the rear are switches for terminating the line output into 600Ω and two screwdriver-operated potentiometers for each channel, these adjusting the

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SYNTOVOX 221

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level of the front panel VU meters and the red LED peak indicators.

These LED indicators are within the front panel VU meters which themselves are illuminated, and to the right of which are potentiometer controls for the microphone inputs and the line inputs. To the right of these controls are the mode switches which operate in conjunction with red and green LED indicators. These indicators which represent red for record and green for ready to enter record, are both extinguished in two positions of the mode switch which are identified as SAFE and SEL/REP in which circumstances the particular channel cannot enter the record mode. The remaining positions are TAPE where the line output is only from the replay head, INPUT where the line output is locked to the input and a further SEL/REP position where the line output is from the record head in the replay mode or from input in the record mode. Finally there is a sixth position for use with the optional remote control unit.

Next door to the mode switch is the test oscillator switch which has an off position plus 700Hz and 15kHz positions for machine alignment, these signals replacing any external input signal at an equivalent level of 0dBm. The final operational control is the output level control which has a switched position for 'standard record level' in addition to allowing for up to 8dB gain or infinite attenuation.

The removal of a clip-in plastic door on the audio channel gives access to the preset alignment controls on the bias, record and playback circuit boards; all controls being single turn potentiometers. A single bias control is fitted for each channel with the manufacturer recommending peak output at 700Hz—a bias point which is not easy to set accurately—I would have preferred an over bias point at 10kHz this frequency being provided with the alignment oscillator.

The record circuit board is equipped with the common input level control and record level control allowing proper alignment of the VU meters, plus a single equalisation control for each tape speed affecting the high frequency time constant. The playback circuit board is fitted with similar equalisation controls in addition to level controls for normal replay and sync replay. These three circuit boards plug into a mother board which by means of plug-in connections feeds a further mother board for the input and output interfaces. Widespread use of plugs and sockets makes the audio module easy to service but some of the components, particularly switches, are more to a domestic standard of quality than I like to see.

Replay performance

Checking the replay equalisation by means of a flux loop indicated that the replay electronics of several channels had been accurately aligned to the NAB standard equalisation of 50µs and 3180µs, it being possible to realign to the IEC standards by changing a few components on the replay amplifier boards. As can be seen from fig 1 the available range of the replay equaliser is more than adequate and perhaps excessive with a ±7dB range at 10kHz.

FIG 1
OTARI MX-7800
REPLAY
EQUALISER
RANGE, 15 in/s

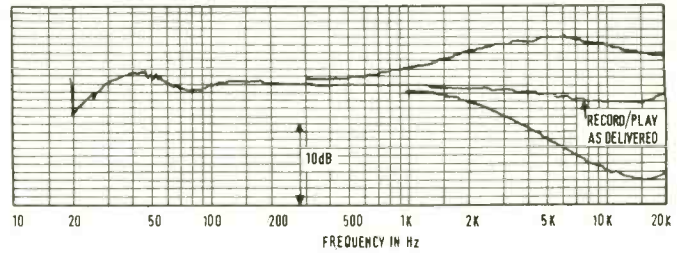


FIG 2
OTARI MX-7800
TYPICAL RECORD/
PLAY RESPONSE

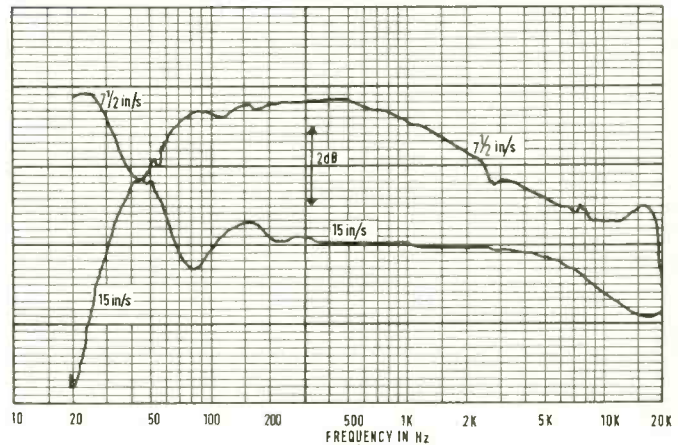


FIG 3
OTARI MX-7800
RECORD
EQUALISER
RANGE 15 in/s

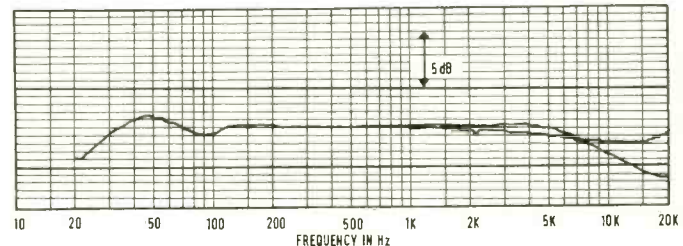
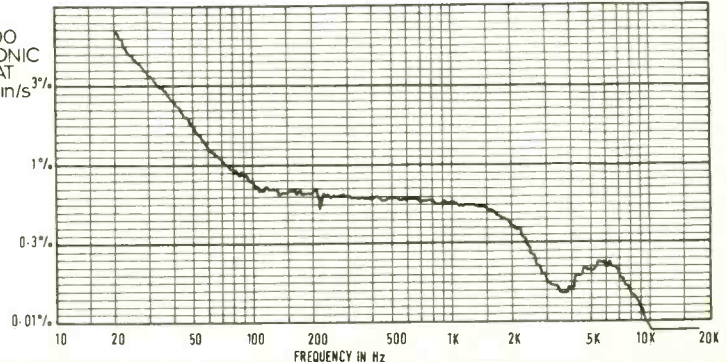


FIG 4
OTARI MX-7800
THIRD HARMONIC
DISTORTION AT
320nWb/m 15in/s^{3 1/2}



Series III De Lux Mixing Console available for 16, 24 or 32 track monitoring. This re-styled version of our very popular standard console features Indian Laurel wood finish, leather armrest, illuminated meters and comes complete with power supply, Penny & Giles faders, XLR connectors and stand. For further details of this low cost, high quality system, contact our agent in your country or direct to the factory.

28 inputs, 24 track monitoring console supplied recently to Olympic Studios (Chelsea).

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Denmark Tel. 134 1622

**Netherlands
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Hastelweg 6, Eindhoven,
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In the standard setting a recorded fluxivity of 320nWb/m gave an average line output of +8dBm (there being minor differences between channels) with the output level controls being able to boost this level by up to 8dB. The maximum fluxivity that could be replayed before saturation of the replay amplifiers was found to be adequate at +13dB above 320nWb/m.

Zero VU indication on replay was found to be correctly set at -4dB reference 320nWb/m corresponding to an output level of +4dBm.

Noise in the replay channels was measured without tape in motion and also with machine erased 3M 206 tape for which the machine had been aligned, the various noise weightings being as shown and the noise performance being virtually identical for the two tape speeds see table 1.

The above figures show a satisfactory margin between machine replay noise and the noise from normally replayed tape, there generally being a margin of about 10dB. In the case of the sync mode, the restricted frequency response in sync replay makes the noise better than normal replay in the presence of tape.

Investigations into the noise spectrum showed that mains hum and other continuous tones were at satisfactorily low levels but not surprisingly track eight at the bottom of the headblock showed higher hum levels even when the effective replay head humshield was hinged into position.

Record/replay performance

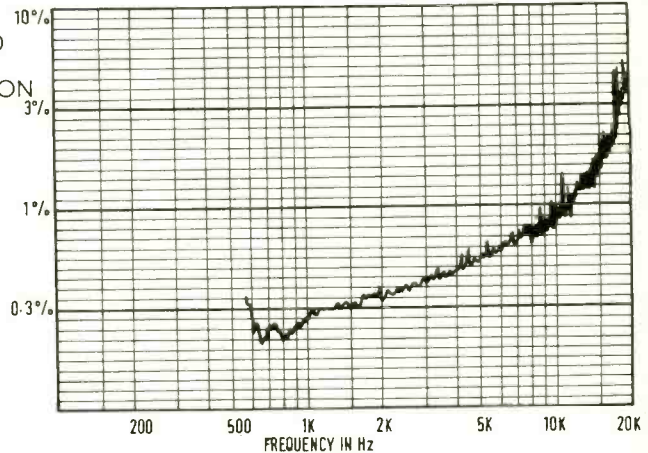
Using 3M type 206 tape with the machine adjusted as delivered, the typical record/replay frequency response is shown in fig 2 for the tape speeds of 7½in/s and 15in/s, the frequency response being within ±2dB from 25Hz to 20kHz at the higher speed and from 20Hz to 18kHz at the lower speed.

It was found that the bias setting was equivalent to 2.5dB over bias at 10kHz at 15in/s and that little extra bias was available, it only being possible to reach 3dB over bias. In addition the range of the record equalisers as shown in fig 3 was completely inadequate for adjusting the machine for alternative tape types.

TABLE 1 NOISE PERFORMANCE

| | Average reference level (320nWb/m) | to noise |
|--|------------------------------------|----------|
| Replay without tape | | |
| 20Hz to 22kHz rms unweighted | 62.5dB | |
| 'A' weighted rms | 67.0dB | |
| CCIR weighted rms ref 1kHz | 58.5dB | |
| CCIR weighted quasi-peak ref 1kHz | 55.0dB | |
| Replay machine erased 3M 206 | | |
| 20Hz to 22kHz rms unweighted | 54.0dB | |
| 'A' weighted rms | 57.5dB | |
| CCIR weighted rms ref 1kHz | 48.0dB | |
| CCIR weighted quasi-peak ref 1kHz | 44.0dB | |
| Sync replay machine erased 3M 206 | | |
| 20Hz to 22kHz rms unweighted | 54.0dB | |
| 'A' weighted rms | 60.0dB | |
| CCIR weighted rms ref 1kHz | 50.5dB | |
| CCIR weighted quasi-peak ref 1kHz | 47.0dB | |

FIG. 5
OTARI MX-7800
CCIF
INTERMODULATION
DISTORTION AT
320nWb/m



Checking the record/sync frequency response showed that this was quite adequate with -3dB points at 10kHz for the 15in/s speed and at 8kHz for the lower 7½in/s. The maximum replay level in terms of 3% third harmonic distortion from tape was found to be +7dB reference a fluxivity of 320nWb/m which corresponds to the limitations of the tape in use with the peak record level indicators becoming illuminated at this level. These indicators were found to be extremely fast in

action, becoming visible with only two cycles of 10kHz burst, whilst the VU meters were too slow in action to meet the ASA standard C16.5 with the rise times being nearer 450ms than the required 300ms, in addition the fall time was too slow but the rectifiers did appear to have the required average characteristic and frequency response was adequate.

Reverting to distortion, the third harmonic distortion at the reference fluxivity of 320nWb/m is shown in fig 4 which clearly illustrates the shortcoming of using NAB equalisation at low frequencies. Intermodulation distortion to the CCIF twin tone method with the tones separated by 70Hz is shown in fig 5 which does not suggest that the machine adds to tape distortion, the intermodulation distortion to the SMPTE method at 320nWb/m also being satisfactory.

The effect upon a 1kHz square wave being recorded and replayed is shown in fig 6 which illustrates rather more ringing than I would consider desirable, possibly resulting from the use of inductive components in the record equalisation.

The crosstalk when recording channels four and six while replaying channel five (a condition

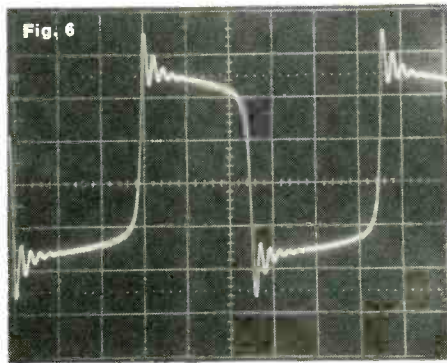
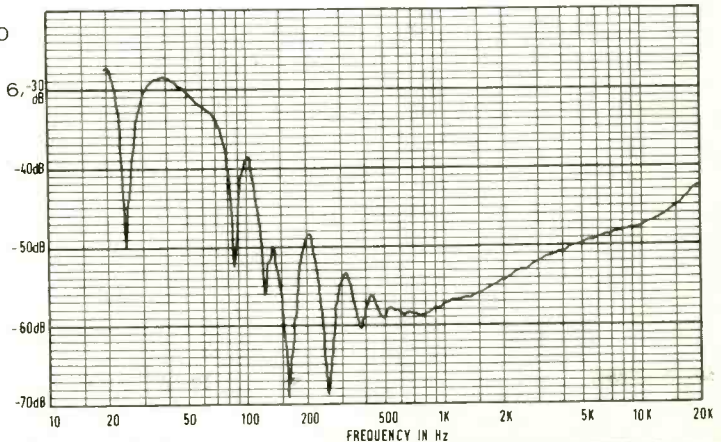


FIG. 7
OTARI MX-7800
CROSSTALK
RECORDING
TRACKS 4 AND 6,
PLAYING 5



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to be avoided in practice) is shown in fig 7 which illustrates a good performance at 15in/s. Similarly the crosstalk in the sync mode which is so often troublesome was found to be good as shown in fig 8 which shows the result of recording on channel six whilst replaying the one but adjacent channel four in the sync mode.

Inputs and outputs

The unbalanced line input was found to have an adequately high input impedance averaging just under 10kΩ with a maximum sensitivity of -15.5dBm for 0dBm output, the overload capability being in excess of +23dBm. It was however noted that the record amplifiers were unduly noisy to the extent that record amplifier noise (irrespective of line gain) was about the same as the replay amplifier noise. This may be at least partly due to the undesirable habit of internally dropping 10dB in level from the line input within the record amplifier.

As far as the microphone input is concerned this had a more than adequately high input impedance of in round terms 200kΩ with a sensitivity of -78dBm for 0dBm output. Whilst the noise factor of this input with a 200Ω shunt resistor was respectable at 4dB it is perhaps unfortunate that this is not a balanced input.

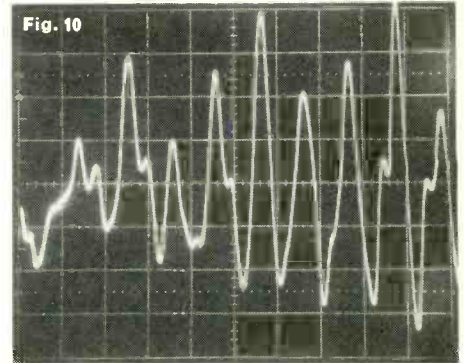
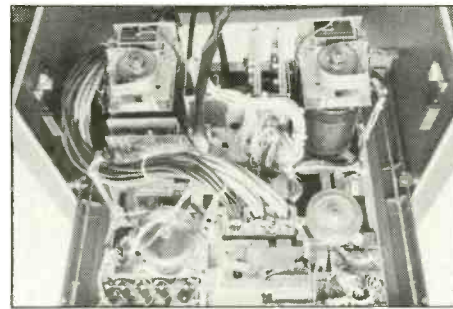
On the output end the line driver had a drive capability of +19dBm or +20.5dB ref 0.775V into a high impedance, more than adequate, from a source impedance of 106Ω with the

internal 600Ω termination in circuit. In this respect the manufacturer's specification is confusing as it suggests a 600Ω output impedance when the real impedance is 130Ω with the output unterminated.

Wow, flutter and speed

Checking wow and flutter to the IEC quasi-peak weighted standard at the beginning, middle and end of a full reel of 3M 206 tape showed little variation within a reel. At 15in/s the wow and flutter was within specification at 0.04% but at 7½in/s the reading of 0.1% was excessive and spectrum analysis showed that this resulted from the rotational rate of the capstan at 8Hz. This could well be a fault peculiar to the review machine.

Spectrum analysis of the recorded and



replayed 10kHz tone in order to assess scrape flutter produced fig 9 which is unusually clean having consideration to the design of the tape transport and probably would be even better had the above mentioned capstan wow not been present.

Speed variation from one end of a full NAB reel to the other was found to be minimal at less than 0.01% but it was noted that the difference between the operating speeds of nominal 15in/s and 7½in/s contained a 0.3% error.

The combination of the fine and coarse speed controls allowed a variation of +13.7% to -12.5% with the fine control having a range of 2.6% and the coarse control 23.5%.

Other matters

Checking the phase jitter between tracks one and eight with a 10kHz tone recorded and replayed at 15in/s produced fig 10 using a B&K phasemeter, the total peak deviation of ±20° being quite respectable.

The internal alignment oscillator with its nominal 700Hz and 15kHz frequencies was found to work at 725Hz and 14.7kHz which is close enough in frequency for practical purposes but the second harmonic distortion of 2% at 725Hz and 1% at 14.7kHz was rather on the high side, the third harmonic being substantially lower.

The bias and erase timing ramps for punching in and out without clicks was most effective when punching in, but punching out left an unrecorded gap of approximately 100ms at 15in/s—clearly this should be bettered.

Summary

Although it would be unfair to compare this machine with the famous quality manufacturers such as Studer and Telefunken, this is a well made machine with servicing clearly borne in mind.

With the exception of the clumsy tape lacing path the machine was very easy to operate with well laid-out controls which are clearly identified and the mechanical performance was generally excellent.

Similarly it is hard to fault the electronics, but the very restricted range of bias adjustment and record equalisation is a distinct disadvantage. Whilst an optional balanced line input is available it seems a great shame that the microphone inputs are unbalanced.

Hugh Ford

FIG 8 OTARI MX-7800 CROSSTALK IN SYNC MODE

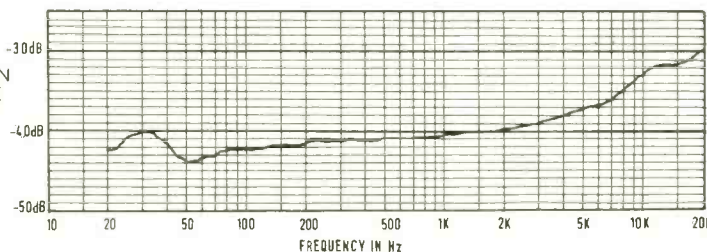
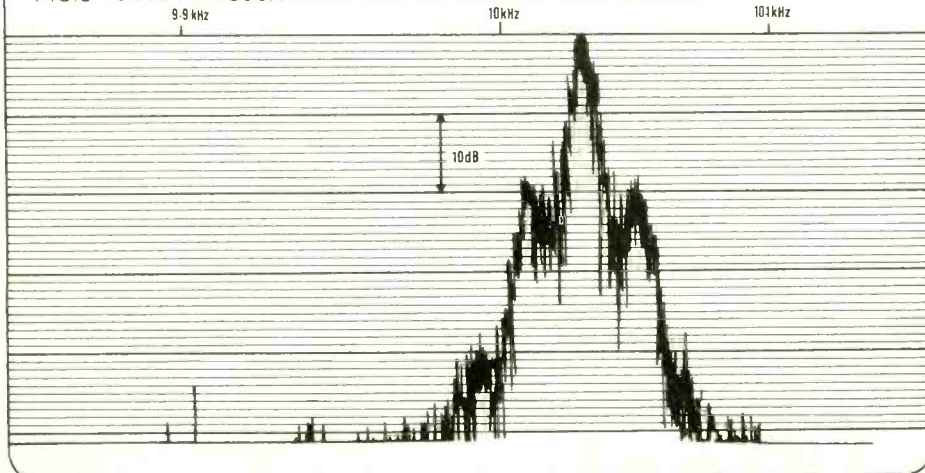


FIG 9 OTARI MX-7800 SCRAPE FLUTTER ON 10kHz TONE AT 15in/s



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....COMPRESSOR/LIMITERS

APPLICATION NOTES

- 1 Tightening up "flabby" bass drums - the SO1 Compressor/Limiter, using a slow attack and release provides make-up gain, controls upper dynamics and effectively modifies the decay characteristic which "trimmed" by the gate provides a more insistent and sharper beat.
- 2 De-essing - through the side-chain access it is possible to modify the frequency response, normally flat, of the SO1 Compressor Limiter using an equaliser (see SCAMP SO3 Sweep, SO4 Parametric and SO7 Octave Equalisers). A peak in the side-chain of, say, 6kHz provides the SO1 Compressor Limiter with increased sensitivity to signal content at that frequency hence gain reduction is more predominant. A fast attack and release together with tight (say 10:1) ratio is recommended. This 'clips' the sibilance in a short, sharp fashion.
- 3 In P.A. work 1) Double your power. A 3dB increase in loudness created by wide range, soft slope (1.5:1) compression with the limiter providing overload protection will tighten the dynamics giving a loudness increase of at least 3dB's hence 4kw becomes 8kw.
2) Compressor Limiter loudness increases by the above method add lots of 'punch' to vocals and improve mic technique since it widens the effective pattern of the curve allowing singers to move to and from the mic.
- 4 D.V.T.E.R.M - Dynamic Vocal To Echo Ratio Modification. By Compressing the vocal post 'echo send' and then mixing with 'echo return' you have a resultant signal whose voice/echo relationship changes with level. Specifically, when the vocalist is loud, gain reduction occurs on the vocal but the echo rises and is allowed to dominate more.

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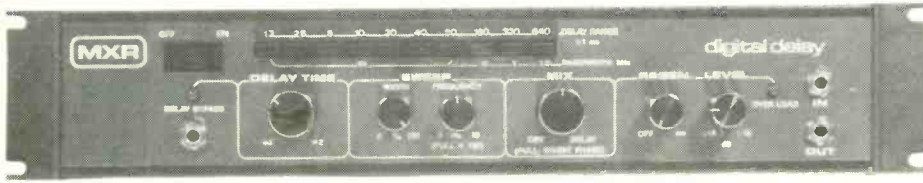
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Reviews



MXR digital delay

MANUFACTURER'S SPECIFICATION

Maximum delay time: depends upon number of delay boards installed and bandwidth required. With one board 40ms at 20kHz, 80ms at 10kHz, 160ms at 5kHz and 320ms at 2.5kHz. With extra boards (up to a total of four) multiply delay time by number of boards.

Frequency response: direct signal 20Hz to 20kHz $\pm 0-1$ dB, delayed signal $+1-3$ dB 20Hz to 18kHz for 20kHz bandwidth, 20Hz to 9kHz for 10kHz bandwidth, 20Hz to 4.7kHz for 2.5kHz bandwidth and 20Hz to 2.4kHz for nominal 5kHz bandwidth.

Input impedance: 200k Ω (balanced, ring or tip to ground).

CMRR: 36dB typical.

Output impedance: 100 Ω , designed to work into 600 Ω or higher.

Maximum input level: $+20$ dBm, LEVEL control past '3 o'clock' or 20dB above limit threshold.

Maximum output level: $+20$ dBm (unloaded), $+18$ dBm (600 Ω load).

Residual noise: greater than 80dB below limit threshold.

THD: less than 0.1% near OVERLOAD level (1kHz), less than 0.5% near OVERLOAD level (40Hz to 7kHz).

IM: less than 0.1% (60Hz-7kHz, 1:1), less than 0.5% (60Hz-7kHz, 4:1).

Level matching range: -20 dBm to $+15$ dBm.

Regeneration range: 0 to 100%.

Variable delay range: 4:1 continuous.

Sweep frequency range: 0.1Hz to 1kHz in two ranges.

Sweep width: 0 to 100% (4:1).

Power requirements: 105-125V AC, 50-60Hz, 0.3A, 37.5W or 210-250V AC, 50-60Hz, 0.15A, 37.5W.

Dimensions: 89mm x 483mm x 178mm (hwd) including knobs and mounting ears.

Weight: 4.1kg.

Price: £783.16 with one memory board, extra boards £116.78 each.

Manufacturer: MXR Innovations Inc, 277 North Goodman Street, Rochester, New York 14607, USA.

UK Agent: Atlantex Music Limited, 16 High Street, Graveley, Hertfordshire.

THIS MXR PRODUCTS digital delay device is of particular interest since, unlike other digital delays which use shift registers as a delay, this product uses random access memories. This technique enables the unit to indefinitely hold information without deterioration—a completely novel feature, in addition to which a store full of information may be repeated at a higher or lower speed by altering the delay time in the 'repeat hold' mode.

Further features include a 'regeneration' function whereby the output from the delay is fed back into the input at a selected amplitude

up to 100%, thus providing a dry reverberation function plus internal or external control of the delay time permitting 'flanging' and other frequency modulation effects.

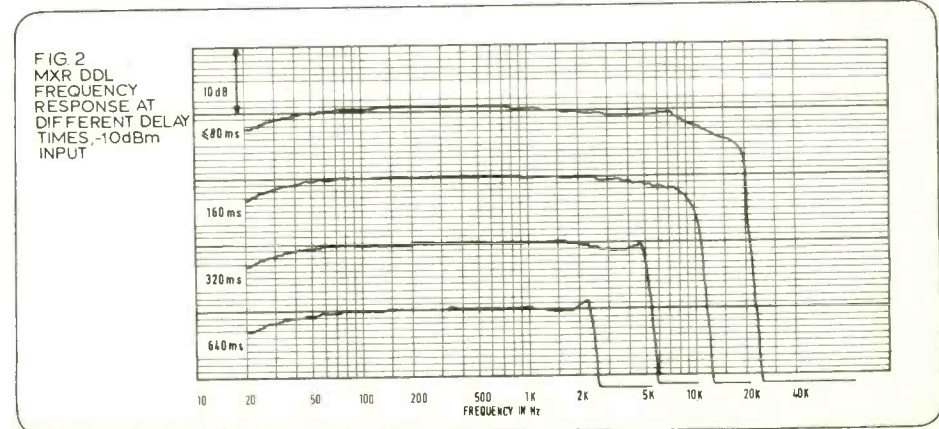
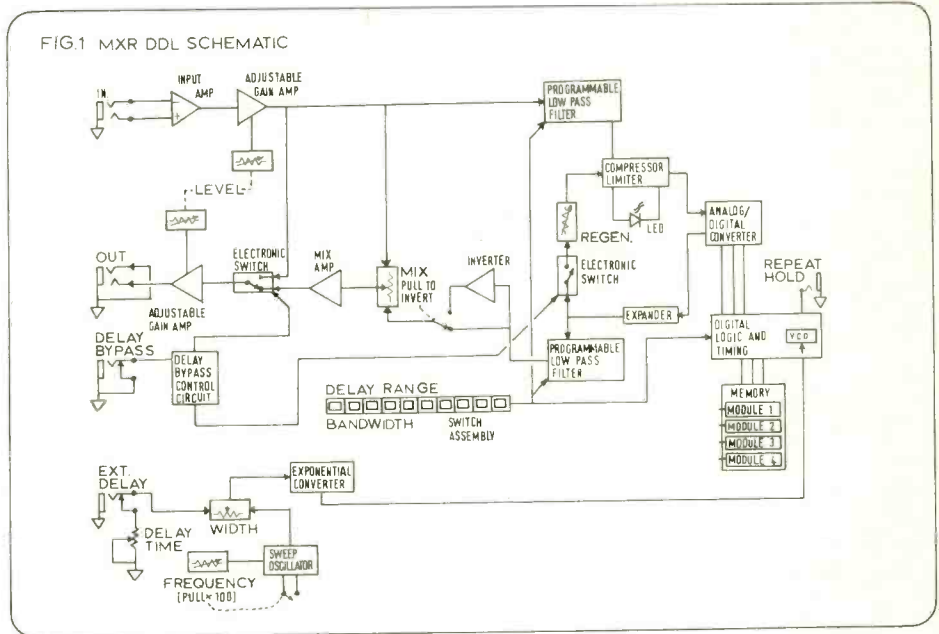
Examination of fig 1 which is a block diagram of the unit shows that the balanced input (transformerless) is fed to a variable gain amplifier, the gain of which is controlled by a ganged potentiometer which also controls the gain of the output amplifier; thus the operating

level of the delay unit can be controlled by this potentiometer which maintains a nominal unity gain in the straightforward delay mode.

The delay elements can be bypassed between input to output amplifiers whilst still filling the delay unit with information; the 'mix' control allows the output to be a combination of the undelayed and delayed signal or either of these in any proportion, with the possibility of inverting the delayed signal if required. The signal to be delayed is fed to a programmable low pass anti-aliasing filter, the turnover frequency of which is controlled by the delay range selected; this being necessary because the longer delay ranges work at a lower sampling frequency and thus need the bandwidth to be reduced to avoid aliasing effects.

Once band limited, the audio signal is passed to a compressor/limiter which performs three functions. Firstly, below limiting, it acts as a straight line compressor which is complemented by an expander at the output of the delay and thus reduces noise. Secondly it acts as a soft limiter when the audio input approaches the

84 ▶



The half-inch eight-track designed for uncompromising recordists. Otari MX5050-8SD.

Recording eight-track masters without compromise requires a machine designed for the purpose from the ground up. The machine like this half-inch MX5050 that incorporates all the functions perfectionists require. With built-in operational convenience, sheer professional performance, reliability and durability to withstand heavy-duty applications.

DC-servo capstan motor for less than 0.05% wow/flutter, with $\pm 7\%$ pitch control for varispeed playback. 63 dB S/N and greater-than-50dB crosstalk. Selective reproduce on all eight tracks for synchronous overdubbing. Foolproof motion sensing logic. Front-panel edit and cue, front adjustable stepless bias and IEC or NAB equalization. 600 ohm +4dBm (switchable to -10dBm) fixed output with 19dBm headroom, with XLR connectors. And plug-in electronics for extra serviceability.

All of which plus pursuit of compactness add up to the ideal eight-track master recorder with nothing left to be desired. For the full story of the half-inch machine, ask anyone who owns it, or get in contact with your nearest Otari distributor.



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Suginami-ku, Tokyo 167



maximum amplitude that can be handled by the analog/digital converter and thus avoids hard clipping. Thirdly, when limiting occurs it illuminates a red LED overload indicator on the front panel.

Analog/digital conversion is followed by the random access memory store which comprises four delay modules when maximum delay times are required. When a bandwidth of 20kHz is required, each module can provide 40ms of delay or 80ms with 10kHz bandwidth, 160ms with 5kHz and 320ms with 2.5kHz bandwidth. These ranges are switch selected with delay times in a 2:1 sequence whilst a voltage controlled oscillator clock provides fine control of delay time. A DELAY TIME potentiometer on the front panel allows the clock frequency to be varied over a 4:1 range such that the delay time associated with a particular delay range can be varied from one half up to twice nominal range.

In addition to this manual control, internal frequency modulation of the delay time is provided by a sweep oscillator which has a nominal frequency range from 0.1Hz up to 1kHz, it being possible to manually sweep the oscillator frequency over a 100:1 range. The

change in delay time provided by this oscillator is fully variable by means of the WIDTH control.

The nominal delay range is selected by 10 pushbuttons on the front panel, which in the review sample with four memory boards gave ranges from 640ms down to 2.5ms in a 2:1 sequence and then 1.3ms. Pushing the 1.3ms and the 2.5ms buttons at the same time gives an even shorter range of nominally 0.63ms with all ranges being variable from x2 to ÷2 by means of the delay time potentiometer. A further large knob on the front panel is the MIX control which allows the output to be any mixture of the direct and delayed signals and which, when pulled out, inverts the phase of the delayed signal.

Two smaller knobs labelled SWEEP control the frequency modulation of the delay time with the WIDTH control affecting the depth of modulation from zero to two octaves time delay whilst the FREQUENCY knob controls the modulation frequency. This has two ranges depending if the knob is pulled out when the range is 10Hz to 1kHz, or pushed in 0.1Hz to 10Hz.

Other than the mains power switch, there

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FIG.3
MXR DDL 2nd
AND 3rd
HARMONIC
DISTORTION

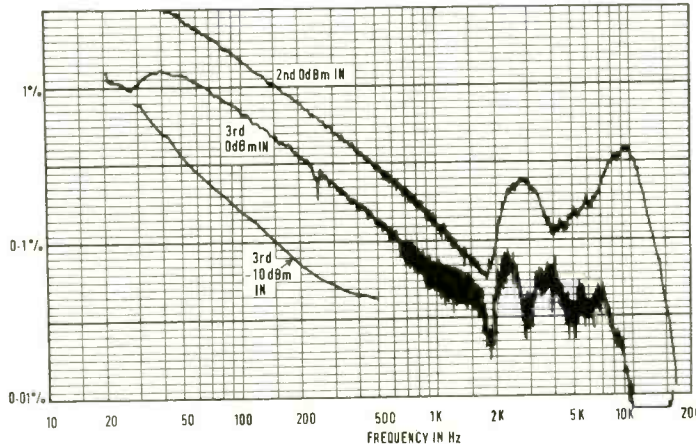
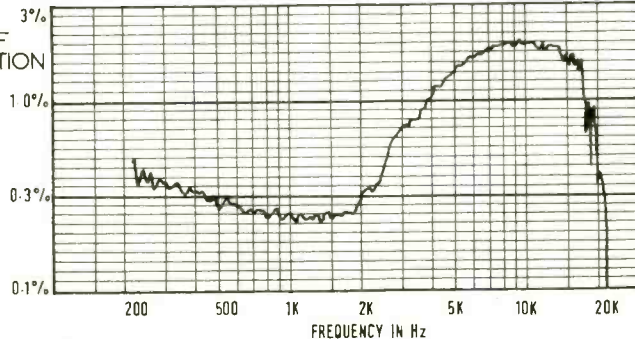


FIG.4
MXR DDL CCIF
INTERMODULATION
DISTORTION
-10dBm IN



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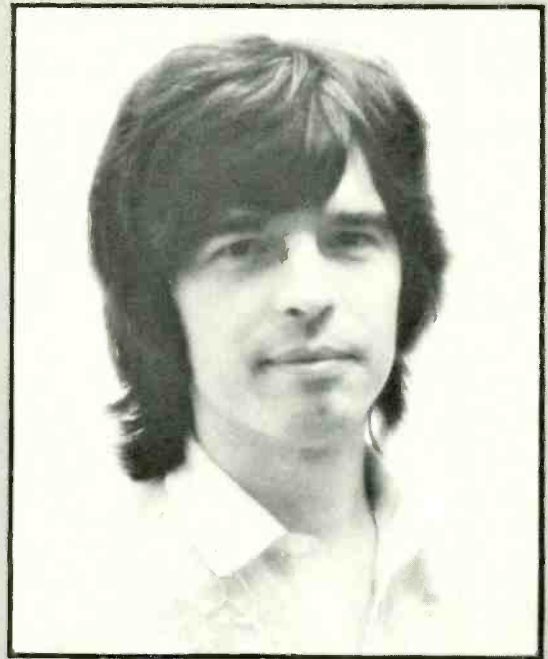
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*Managing Director of Good Earth Productions and freelance producer of many hit records by illustrious pop stars, whose own solo album "Visconti's Inventory" was released in mid October.



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are two further front panel controls. The REGENERATION control feeds the output of the delay back to the input in any desired ratio from zero to 100% whilst the LEVEL control selects the operating level of the delay unit. Adjacent to this control is the red overload LED indicator.

Signal input and output are by means of quarter-inch jack sockets on the front panel, the input being an electronically balanced high impedance input and the output being a low impedance unbalanced connection. A further front panel jack socket allows the delay unit to be bypassed when an open circuit jack plug is inserted, and this function may be remotely controlled by a foot switch or other means.

To the rear of the unit there are two further quarter-inch jack sockets, one of which controls the REPEAT HOLD function in a similar manner to the BYPASS jack, and the other of which allows remote control of the delay time by means of an external 50kΩ linear potentiometer which provides the same features as the front panel DELAY control. Finally there is the properly secured mains power lead with the correct colour code for the UK.

The complete unit which is designed for mounting into a 19in rack (with an optional wooden case) is of very sound mechanical construction with the front panel and other features clearly labelled in white on a blue background. Internally, almost the entire base of the unit is covered by a mother board which not only has quite a large number of

components, but also supports the four memory boards and four other boards. Whilst the boards and components are of good quality, no component identifications are provided for servicing and no servicing data was to be found in the operation manual.

Examination of the board layout where mains voltages are present on tracks, gave some cause for concern about electrical safety as an electrolytic capacitor was found to be virtually in contact with the uninsulated mains fuse with only the capacitor's thin plastic cover providing insulation between the mains and the electronics. Similarly, I am not happy about a bare wire from another capacitor which could touch the rather suspect mains voltage selector switch.

Frequency response and noise

In the case of the undelayed signal, no filtering is applied and the frequency response was flat within +0, -1dB from 20Hz to 30kHz falling to -3dB at 100kHz. In the case of the delayed signal, it was found that not only did the frequency response vary with the delay time ranges (as was to be expected at long delay times where the clock rate is reduced) but also that pre-emphasis in the order of 70µs had been applied.

In fig 2 the upper trace shows the frequency response with delay time ranges of 80ms or less with the level control at zero and -10dBm input level. These conditions gave a -3dB point at 10kHz resulting from the pre-emphasis, but at lower signal levels the -3dB point was at 19kHz.

The lower curves show the frequency response at longer delay times, all these being to specification and all curves showing a reasonably sharp anti-aliasing filter.

Spectrum analysis of the noise in the output did not reveal any undesirable signals from the digital system, and it was noteworthy that mains frequency components were also at a very low level.

With the level set to zero, the onset of illumination of the overload indicator (and thus limiting) occurred at -3dBm output at 1kHz. Noise in the output related to this level was found to be reasonable, Table 1.

88 ►

FIG 5
MXR DDL 2nd
ORDER
DIFFERENCE
FREQUENCY
DISTORTION
-20dBm IN

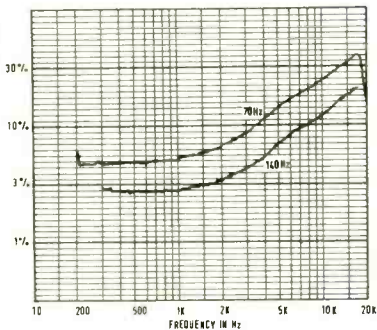
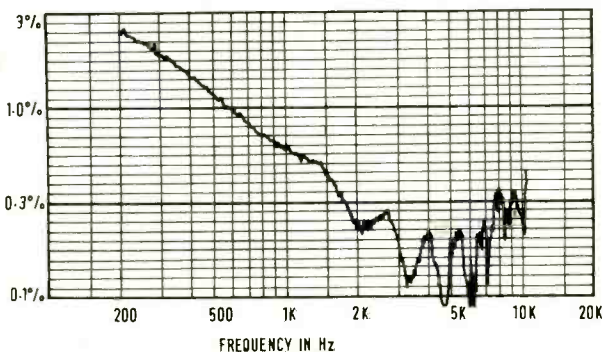


FIG 6
MXR DDL SMPTE
INTERMODULATION
DISTORTION,
-10dBm IN



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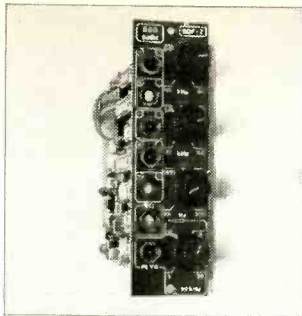
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Parametric Equaliser

A very versatile instrument for getting sounds just right. It's modular and directly retrofits APSI 550. EQ is peak or shelf. Filter is high or low pass, tunable. Bandwidth is 20Hz to 20kHz. Reciprocal cut or boost on EQ.



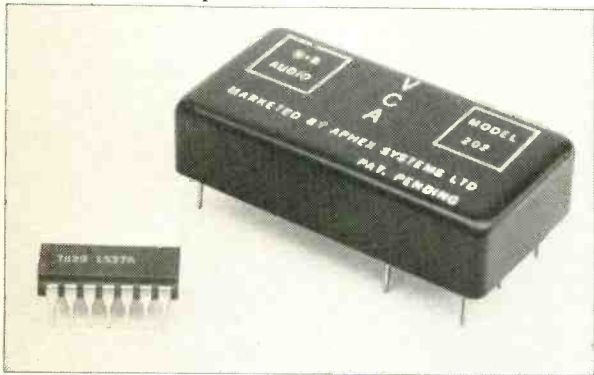
| | | |
|--------------------|------------------|--------------------------------|
| Input | High level | + 30dBm (max) at 34K Ω |
| | Low level | + 20dBm (max) at 11K Ω |
| Output | High level | + 30dBm with - 93dBm noise |
| | Low level | + 20dBm with - 103dBm noise |
| Frequency response | EQ & filters out | 10Hz to 20kHz, \pm 0.1dB |
| | EQ & filters in | 20Hz to 20kHz, - 1dB |
| Distortion | Harmonic & IM | < 0.1% |
| Transient response | Slew rate | > 10V/sec. |
| Power | | \pm 12V to \pm 18V at 75mA |

Voltage Controlled Attenuator

The first high quality VCA in the professional audio market.

It's available in chip form for OEM, or in a complete module, with full input and

output facilities for direct fitting to any automated console with existing VCAs. However, we can design a VCA package to fit any other manufacture.



| | | |
|---------------------|----------------|--|
| Band width | Module | DC to 200kHz; \pm 0.1dB |
| | Chip | DC to 50MHz; \pm 0.1dB |
| THD | + 10dBm input | 0.004% (20Hz to 20kHz) |
| IMD | - 14dBm input | 0.03% |
| Noise | Unity gain | - 90dBV; \pm 1dB |
| Modulation noise | | 6.5dB |
| Overshoot & ringing | | None |
| Slew rate | | > 10V/ μ sec. |
| Input impedance | | 20K Ω |
| Input level | | + 20dBV |
| Gain | | 0dB (+ 15dB available on special order in module form) |
| Attenuation | Module | > 94dB; 20Hz to 20kHz |
| | Chip | > 100dB; 20Hz to 20kHz |
| Control voltage | | Can be scaled as needed |
| DC shift | Vs Attenuation | \leq 5mV |
| Power | | Regulated \pm 15V at + 25, -33mA |

Grouping and Automation System

With this system, you can now add semi-automation to your console at a fraction of the cost of a new one. Adaptable logic and extensive matrix grouping make up to ten 24-channel presets available.

And since the unit is portable, it can be moved from one studio to another in minutes, for the most efficient use of studio time.

It's expandable from 8 channels and it's just as useful for PA grouping as studio mixdown.

For MCI equipment, a compatible automation package is available.

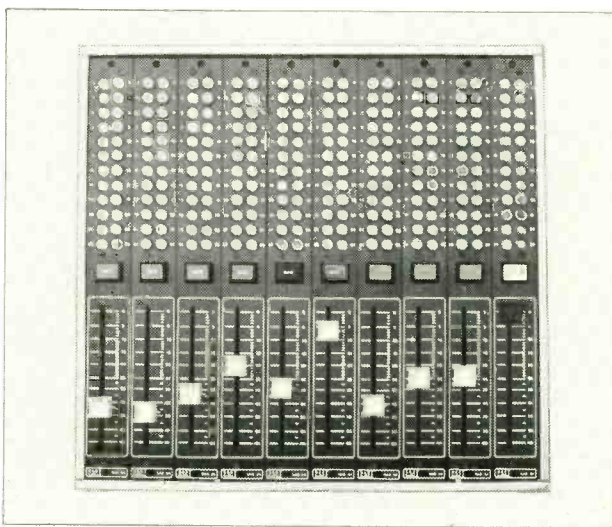
Our own Voltage Controlled Attenuators (VCA) are used throughout, whose high quality assure minimal sound degradation.

Maximum output is + 24dBm.

The system comes in two parts - control console and VCA case.

The control console has group control modules, each containing grouping switches, mute switch and fader, and a master control module with master fader.

The VCA case is self powered and houses the appropriate number of VCA cards and all the input/output XLR connectors.



Aphex

The Aphex Aural Exciter

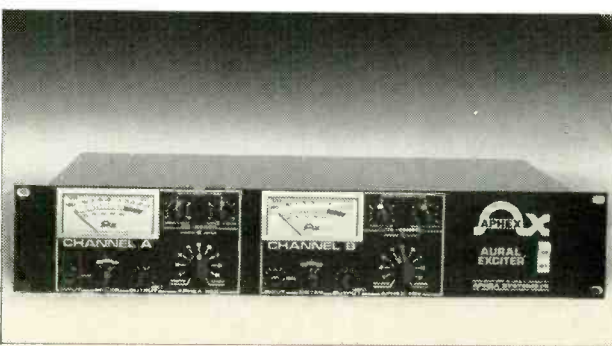
One of the most exciting signal processors to have been invented.

It brings sound to life and makes it louder, without any actual change in level.

It does it by introducing phase information in the form of a series of minute delays whose magnitude depends on frequency.

The formula by which the Aphex device selectively processes the audio signal has been arrived at after considerable research into the mechanisms of the ear. In particular as to how it receives complex phase information relating to the actual location of a sound source.

Aphex sounds amazing on most instruments, including the human voice.



Aphex
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Subjective testing did not reveal any annoying noise breathing effects and indeed measurements of noise in the presence of signals showed little change from the no signal conditions.

Harmonic and intermodulation distortion

Individual second and third harmonic distortions were measured with the level control at zero and with input signal levels of 0dBm and -10dBm on the shorter delay ranges. Whilst the second harmonic stayed virtually constant at both input levels, the third harmonic varied as shown in fig 3. Overall the distortion at low frequencies is rather excessive and worse than the manufacturers not brilliant specification would suggest.

Intermodulation distortion to the twin tone CCIF method varied widely with input level and also with the difference frequency between the swept tones. With the level control set to zero and -10dBm input, the third order difference frequency distortion was as shown in fig 4 which is a reasonable performance. However the second order difference frequency distortion at -20dBm input is shown in fig 5 for difference frequencies of 70Hz and 140Hz with both plots being a rather poor performance and the situation getting worse as the twin tones were set closer.

Using the SMPTE method of intermodulation distortion measurement with a 70Hz low frequency tone and a swept high frequency tone in a 4:1 amplitude ratio produced fig 6 which meets the manufacturer's specification, but, again something goes awry as the tones approach in frequency.

Input and output

The electronically balanced input was found to have a common mode rejection ratio in excess of 41dB within the audio band with this and the input impedance constant with level setting, the latter being 295kΩ. The maximum

input levels varied with the level setting, Table 2.

On the output end, the output level at clipping was found to be +18dBm when loaded into 600Ω or +22dB ref 0.775V into an open circuit with the output impedance being adequately low at 99Ω.

Other matters

The accuracy of the delay time at the mid setting of the delay time controls was found to be generally within 10% of the nominal push-button selected time with a 4:1 range available with the potentiometer on all except the two shortest delay ranges.

Similarly the internal sweep oscillator gave a 4:1 range in delay time but with its lowest frequency being nearer to 0.15Hz than the nominal 0.1Hz. The transmission of square waves through the delay was generally clean with little ringing, but the transmission of tonebursts gave some peculiar results.

Figs 7 and 8 show in the upper trace the input to the delay in the form of a 10ms long burst of 1kHz tone with the delay's output in the lower trace. Levels well below overload were used, but it is to be seen that the isolated burst is severely distorted whilst the presence of a continuous lower level tone eliminates the distortion.

Summary

From the point of view of creating novel effects this is a very interesting delay unit with great versatility. However, as a link in a high quality audio chain there are several sources of distortions although the unit will not significantly degrade the performance of PA systems which are a principal application bearing in mind the cost.

A/B testing made the presence of the delay unit clearly audible with the sound being unclear well below the overload level.

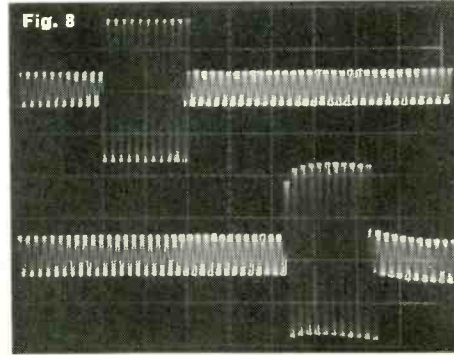
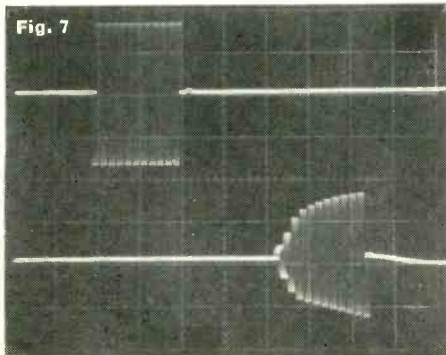
Hugh Ford

TABLE 1 NOISE LEVELS

| Measurement method | Limiting to noise ratio |
|--------------------------------|-------------------------|
| Band limited 20Hz to 20kHz rms | 75dB |
| 'A' weighted rms | 79dB |
| CCIR weighted rms | 73.5dB |
| CCIR weighted quasi-peak | 69.5dB |

TABLE 2 INPUT LEVELS

| Level setting | +15dB | 0dB | -15dB |
|-------------------------------|--------|----------|---------|
| Input for overload indication | +17dBm | -1dBm | -19dBm |
| Input for waveform clipping | +22dBm | +18.5dBm | +1.5dBm |



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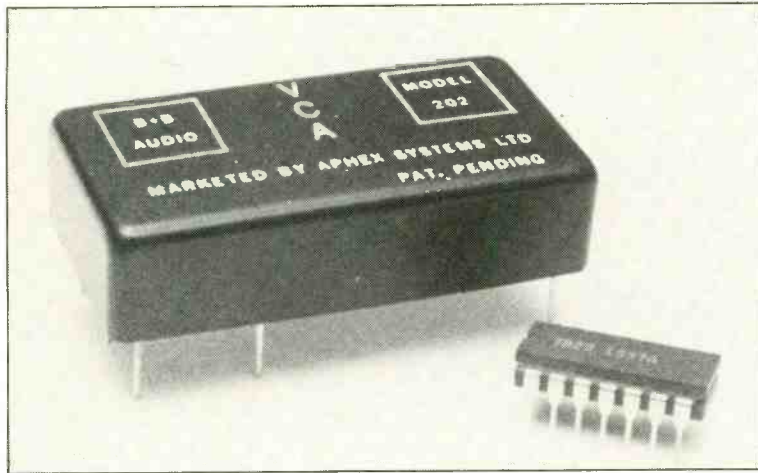
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GET IT ALL.



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B & B 202 VCA module

MANUFACTURER'S SPECIFICATION

Bandwidth: DC to 200kHz ± 0.1 dB.
Total harmonic distortion: 20Hz to 20kHz at +10dBm input and 10dB attenuation 0.004%.
Intermodulation distortion to SMPTE method: at +14dBm input and 10dB attenuation 0.03%.
Modulation noise: difference in output noise from 0V input to 10V peak input at 10dB attenuation 6.5dB.
Noise: -90dBV ± 1 dB (worst case at unity gain).
Overshoot and ringing: none.
Slew rate: greater than 10V/ μ s, symmetrical and constant.
Input impedance: 20k Ω .
Maximum input level: +20dBV.
Gain: 0dB (unity), up to 15dB gain is available to special order.
Maximum attenuation: greater than 94dB, 20Hz to 20kHz.
Control voltage: can be scaled as needed.
DC shift versus attenuation: less than 5mV (select integrated circuits available).
Power requirements: regulated ± 15 V at +25mA and -33mA.
Price: 1 off £25.35, 25 off £23.80 reducing to £17.65 in 1000 quantity.
Manufacturer: B & B Audio, 7801 Melrose Avenue, Los Angeles, Cal 90046, USA.
UK Agent: Apex Systems UK Ltd, 35 Britannia Row, London N1.

THE B & B voltage controlled attenuator is available in a number of different packages all of which incorporate the type 1537A 14-pin ceramic integrated circuit, the type 202 unit being a pin compatible replacement for the dbx 202 voltage controlled attenuator. Alternative packages are available to replace such modules as the MCI, AP and Harrison packages. Marketing is through Apex Systems Ltd and its worldwide distributors.

While the replacement of such modules as the above is one application for this VCA, it will clearly be of interest for the construction of 'home made' desks, compressors and expanders, oscillators, tone burst generators, waveform synthesisers etc. In these applications a minimum of components are required external to the type 202 module. Other than

the ± 15 V power supply (which must be decoupled adjacent to the module) all that is required is a 50k Ω potentiometer for nulling the DC at the output, and a precision resistor for scaling the DC control voltage input. In addition, decoupling capacitors may be required to remove DC at the input and output, and a current limiting resistor at the output. Normal practice requires that the control voltage range is either 5V or 10V and these standards are achieved with control voltage input resistors of 1.25k Ω or 2.49k Ω respectively, giving control voltage sensitivities of 20dB/V or 10dB/V.

Frequency response and noise

The frequency response of the voltage controlled attenuator was found to be independent of the amount of attenuation in use and also independent of level within the operating range, the overall frequency response as shown in fig 1 being extremely flat from 2Hz up to 200kHz.

Noise as measured at the output of the voltage controlled attenuator was found to vary with the amount of attenuation in use, as expected, being lowest at maximum attenuation as shown in Table 1.

| TABLE 1 Measurement Method | Noise at Output | |
|-----------------------------------|---------------------|---------------------|
| | Minimum Attenuation | Maximum Attenuation |
| Band limited 20Hz to 22kHz rms | -90dBV | -101.5dBV |
| 'A' weighted rms | -92dBV | -104dBV |
| CCIR weighted rms ref 1kHz | -83dBV | -95dBV |
| CCIR weighted quasi-peak ref 1kHz | -79dBV | -91dBV |

Having regard to the fact that the module can handle in the order of +20dBV, the above represents an excellent dynamic range. In addition to variations in noise with the degree

of attenuation noise also varied with signal level giving a degree of modulation noise but the measured effect did not exceed 5.5dB in any octave band.

Distortion

As anticipated, the harmonic distortion varied with input and output levels, the distortion with +10dBm input and 0dBm output (10dB attenuation) being shown in fig 2 from which it can be seen that the less objectionable second harmonic substantially predominated at around 0.03%. At higher operating levels the second harmonic increased to 0.05% at 20dBm input and +10dBm output with the third harmonic under these conditions varying from 0.007% at 1kHz to 0.02% at 20kHz.

Although the harmonic distortion of the review sample was not to the manufacturer's specification, the levels of distortion measured are in practical terms a quite adequate performance. Furthermore the intermodulation distortion was at a very low level, the SMPTE type intermodulation distortion using a low frequency of 70Hz and a swept high frequency in the normal 4:1 amplitude ratio being less than 0.04%.

Using the CCIF twin tone method produced fig 3 with 10dB attenuation in use and 0dBm output, the performance being to a high standard.

Inputs and output

The input impedance of the audio input was found to be constant at 20k Ω irrespective of the amount of attenuation in use, the maximum input signal handling capacity being +20.5dBm before distortion products began to rise slowly without any hard clipping effects.

The actual output impedance of the module alone was less than 1 Ω with a signal handling capacity of +21dB reference 0.775V which coincides with the input level handling capability as the module was found to have 0.5dB gain at minimum attenuation.

The DC component in the output signal could be nulled to zero with the nulling control, but varying the gain produced a shift of +4.8mV at maximum attenuation—of no significance for most applications.

Other matters

Testing the module with fast square waves did not in any circumstances give any ringing or signs of instability with the measured slew rate being 16V/ μ s and the rise time from 10% to 90% amplitude varying between 700ns and 1.5 μ s.

Maximum attenuation in the frequency range 2Hz to 20kHz was in excess of 106dB dropping to 102dB at 200kHz—an excellent performance.

The final matter to be investigated was the control law in terms of the relation between the control voltage and the amount of attenuation offered, this being shown in fig 4. Comparison of the plotted curve with a straight 10dB/V line shows that the control law leaves something to be desired and fig 5 which is an expanded section in the range up to 10dB

attenuation shows errors of 3dB in comparison with the ideal curve.

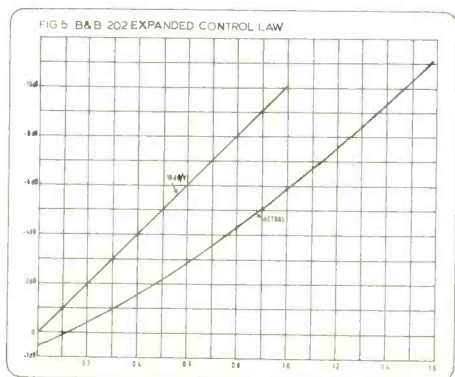
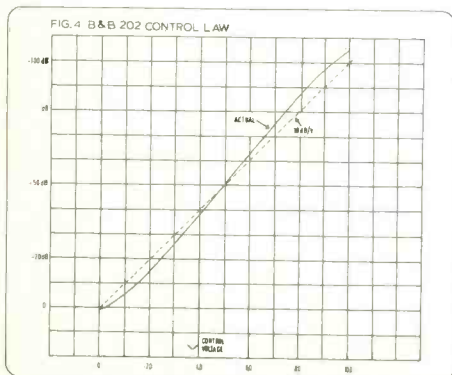
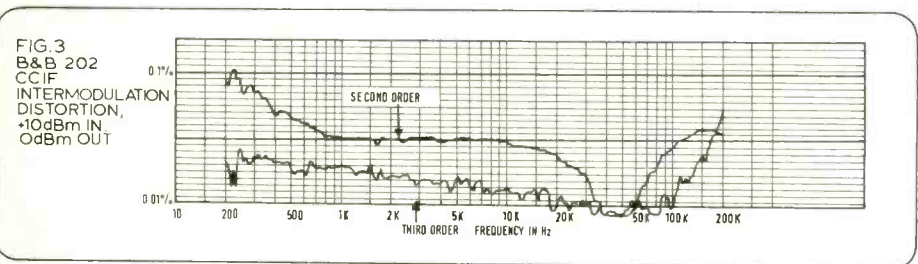
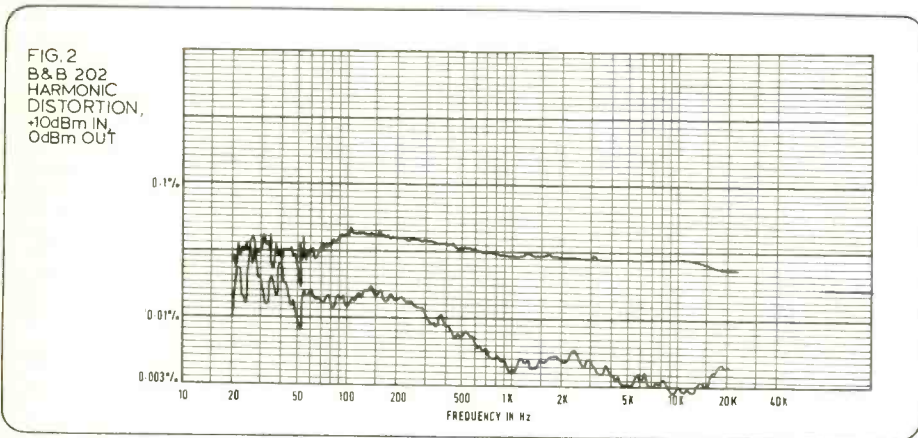
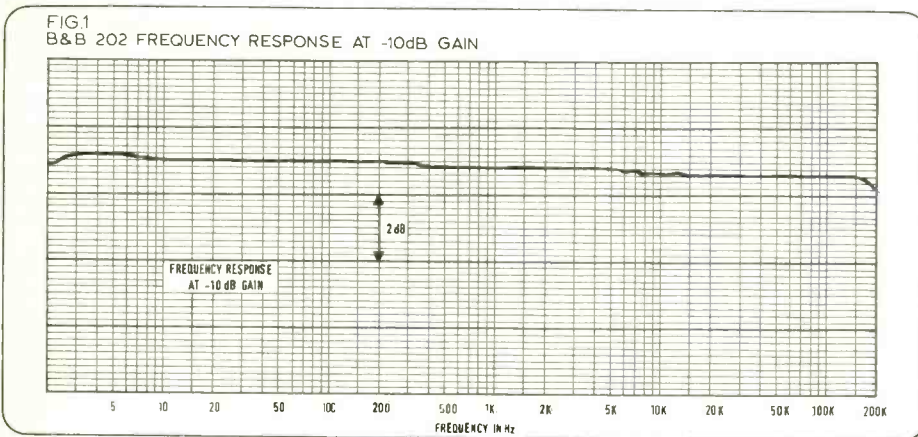
Whilst for many purposes the control law does not matter in itself the question arises of how accurately units match each other and units from other manufacturers.

Summary

Whilst in some respects the voltage control-

led attenuator did not perform to the manufacturer's specification, this is certainly a useful module for many audio purposes. Overall the performance is good by general standards of equipment performance and it would be interesting to be in a position to compare directly the performance of other manufacturers' competitive products.

Hugh Ford



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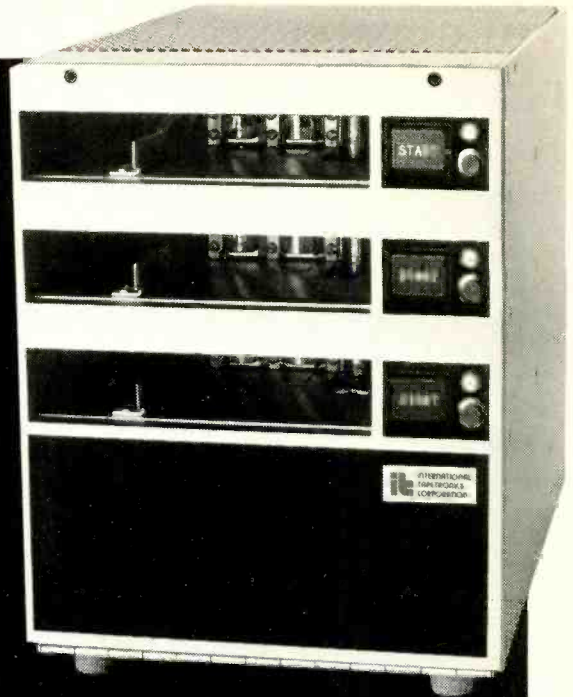
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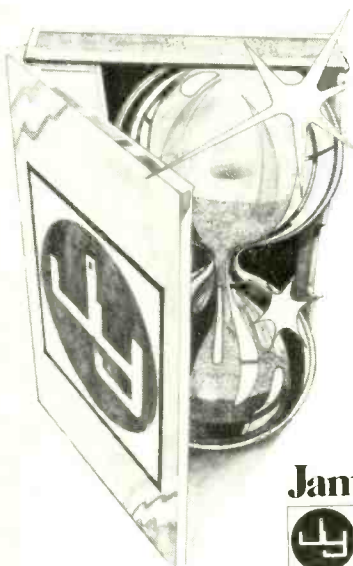
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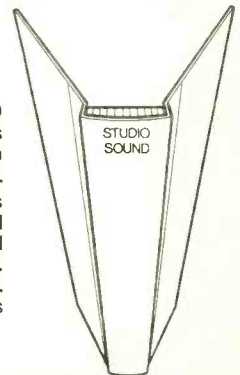
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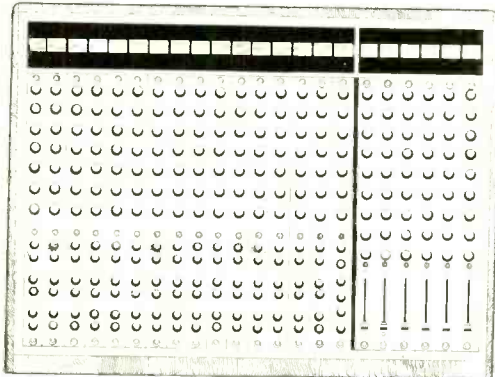
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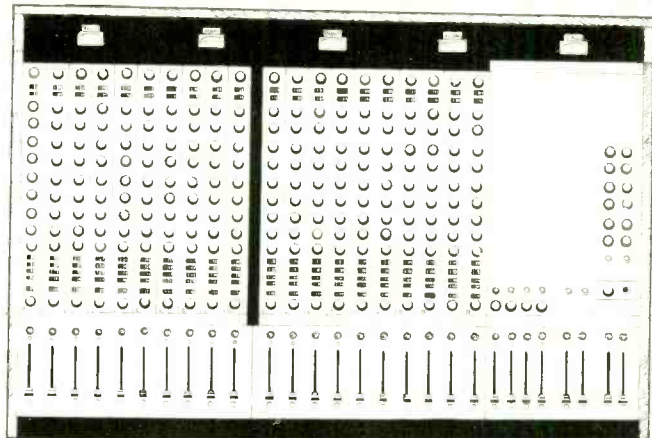
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SPECIFICATION EXAMPLES

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EQ: TREBLE ± 20 DB 8K Hz
MID ± 16 DB Sweep
BASS ± 22 DB 100, 170, 250 Hz

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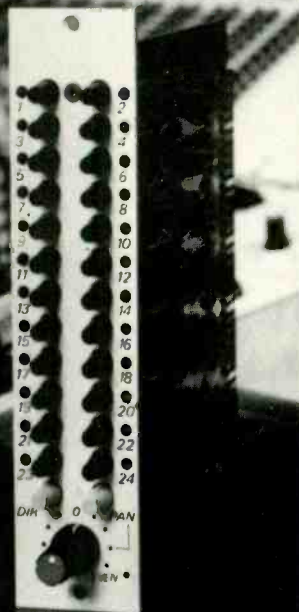
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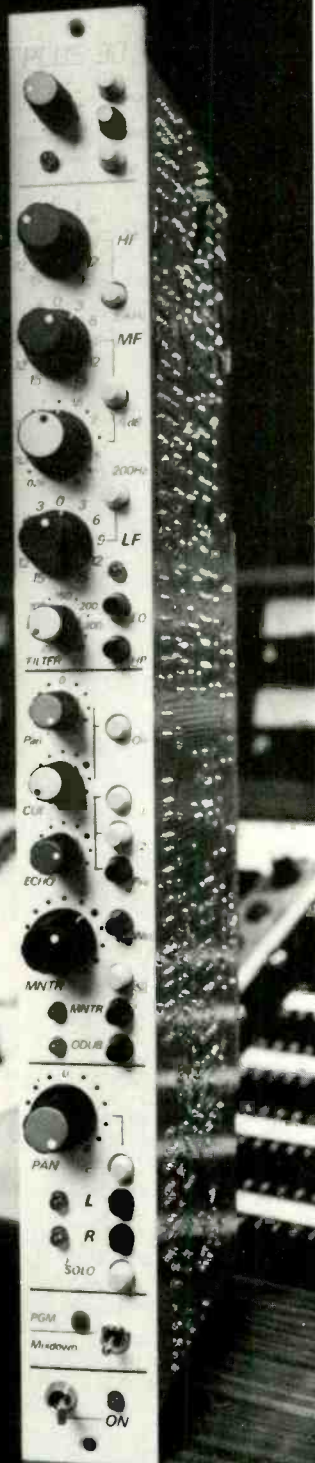
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Tél. 634.01.36

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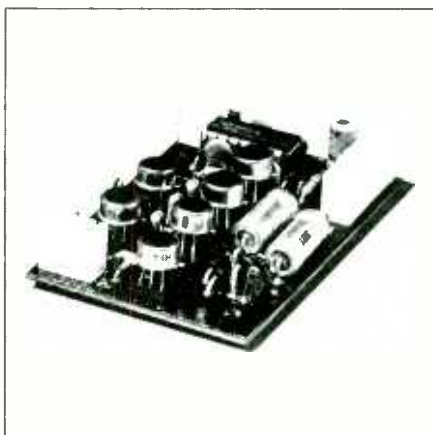
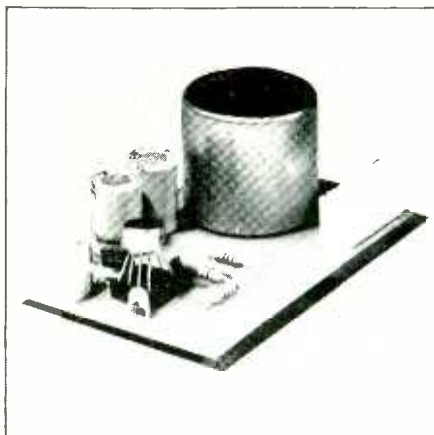
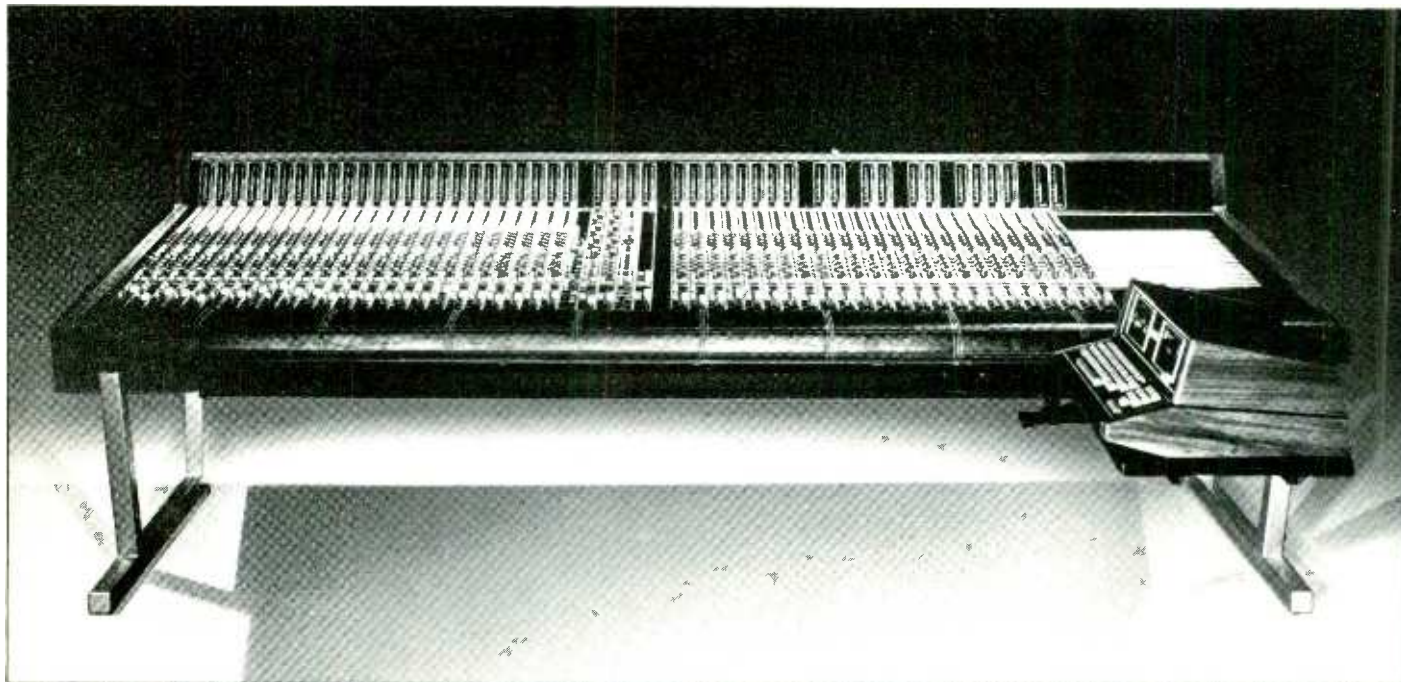
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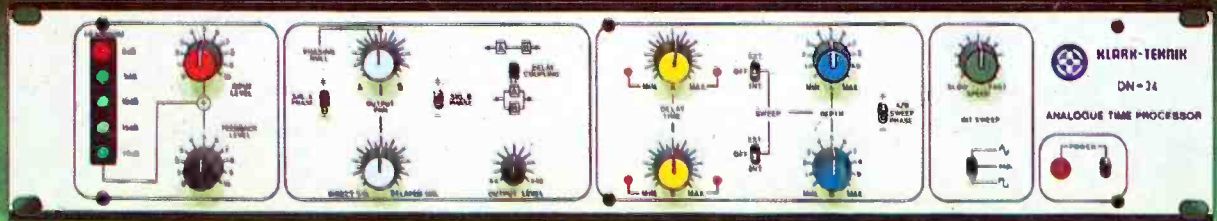
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