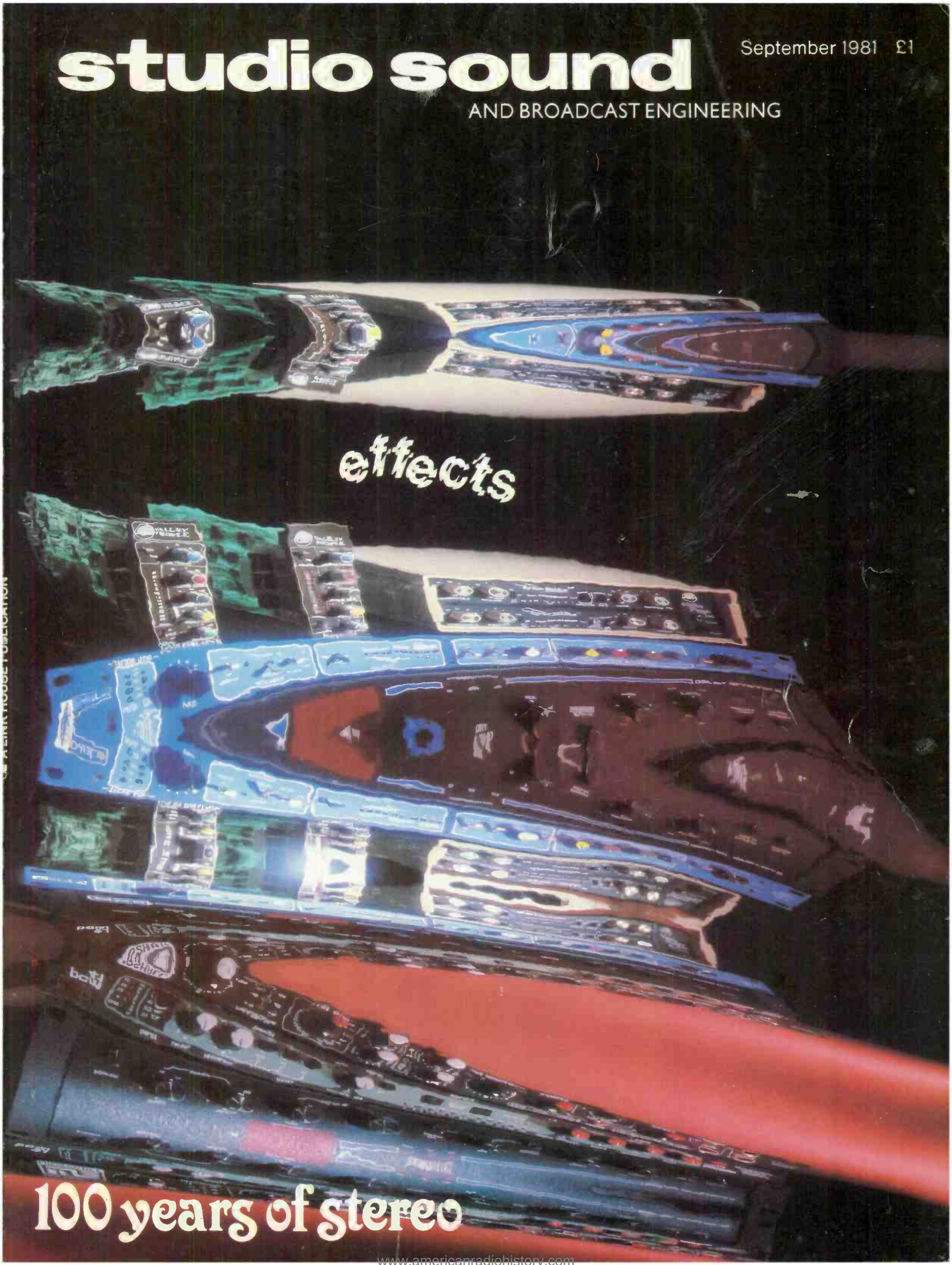
studio sound

AND BROADCAST ENGINEERING

September 1981 £1



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studio sound

AND BROADCAST ENGINEERING

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The old and the new

This month, 100 years ago, Clément Ader staged the first demonstration of what we might call 'broadcast stereo' with his relays of music from the Paris Opera via telephone lines to the Paris International Exhibition of Electricity of 1881. The performances, which ran from September to November, are commemorated by Tony Askew's remarkable thoroughly-researched article which begins this month. Whilst it concentrates on Ader's stereo experiments, brought to life by reports of the time (and including what must be the first review ever published to comment on mic technique), the article also gives a great insight into the mind and personality of this great inventor, whose work spanned audio, aviation and road and rail transport.

In addition, we are introducing, in this issue, our 'New Products' section, as promised earlier this year. From now on, new products will appear in their own department, separate from non-product-related news items (which will appear under the heading 'Diary'). Studio Diary becomes 'Studiofile'. Additionally, from this issue, we are discontinuing our normal survey style and replacing it with two new sections: a Product Guide giving manufacturers' and agents' addresses plus basic details of the equipment range surveyed; and an additional part of the New Products section with expanded details covering items introduced since our last survey. We hope that this change of format will make our information more accessible to readers. We intend, in addition, to alter our coverage of exhibitions from the January 1982 issue. Previews will continue as before, including all products on show with a note to indicate items on display for the first time. Equipment released at exhibitions will appear in the New Products section in the next available issue after a show, and the present exhibition report format will be discontinued. A general item on an exhibition will appear in the Diary section after the event, while papers and convention details (AES Conventions for example) will continue to be written up in their present form. This will enable us to cover new items at exhibitions in greater detail, and we welcome comments from readers and manufacturers on the value of the changes which, we hope, will make the magazine even more useful than before. Of course, as a result, the show previews will rely on information being supplied by manufacturers in advance as at present, and we hope that manufacturers will continue to supply full details to assist in the compilation of these features.

Richard Elen

Cover photograph by Roger Phillips

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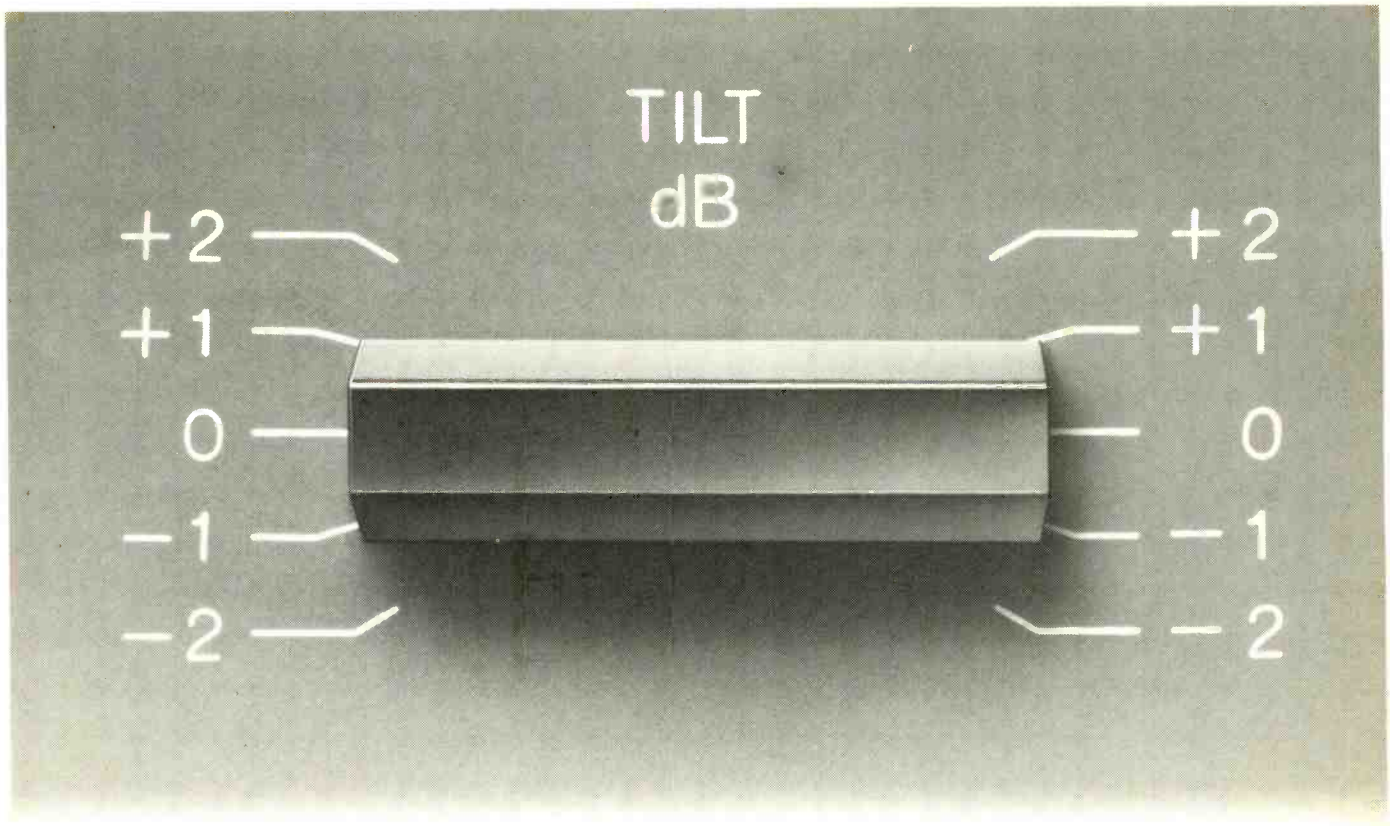

Tilt.

Nothing to do with pinball wizardry, has a great deal to do with programme balance.

The recording or broadcast engineer attempts to capture the ambience of the studio or concert hall but what the listener perceives is the aggregate of this and the reverberation characteristics of his listening room.

If all listening rooms were equal the engineer could make due allowance, but since some listening rooms are more equal than others, the engineer has to assume some arbitrary norm, and the chances are that further correction and compensation will give improved results. Thus a reverberant recording reproduced in a 'live' listening room will sound overbright and a dry recording reproduced in an overdamped or 'dead' room will sound dull and bass heavy.

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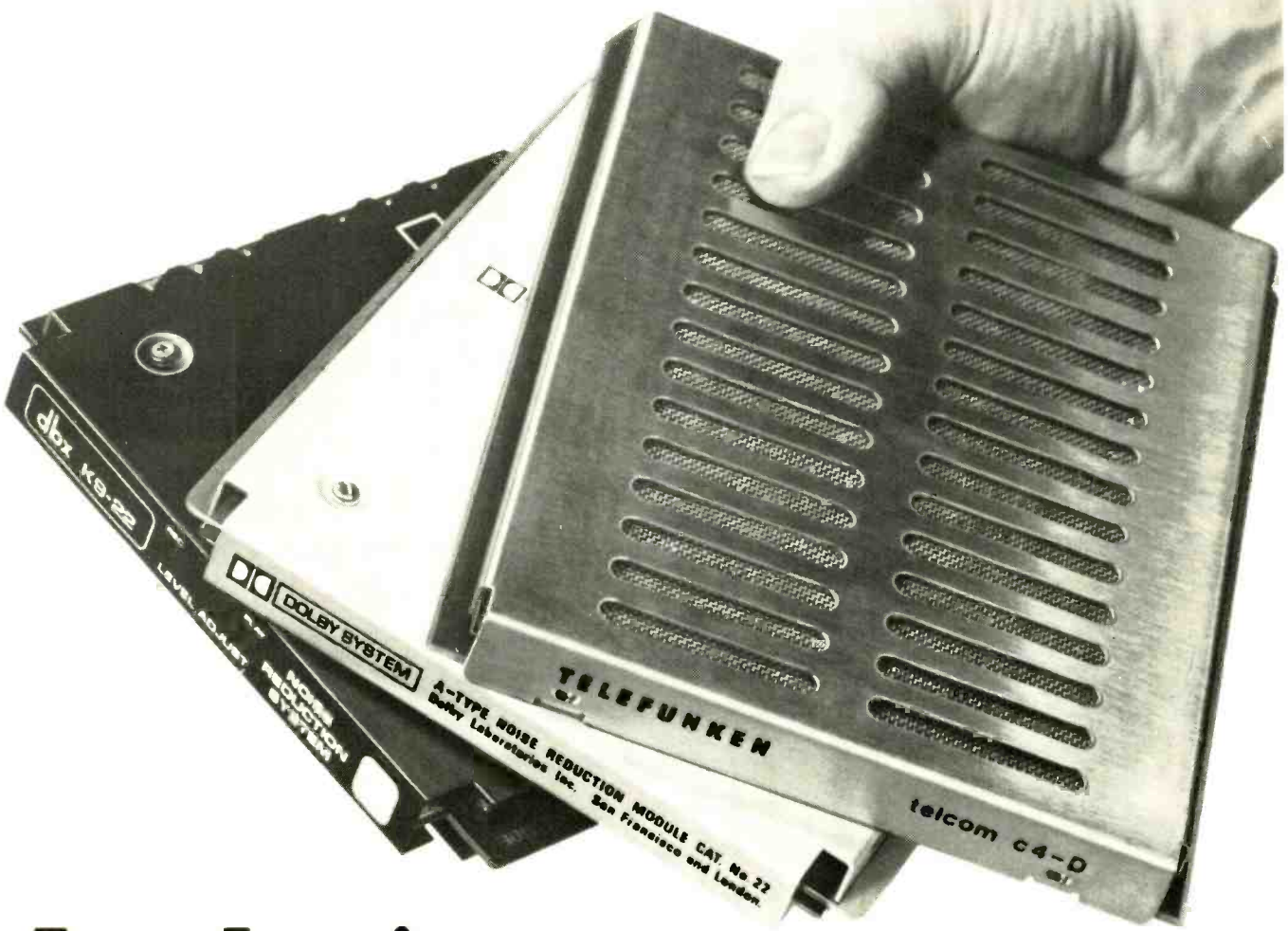

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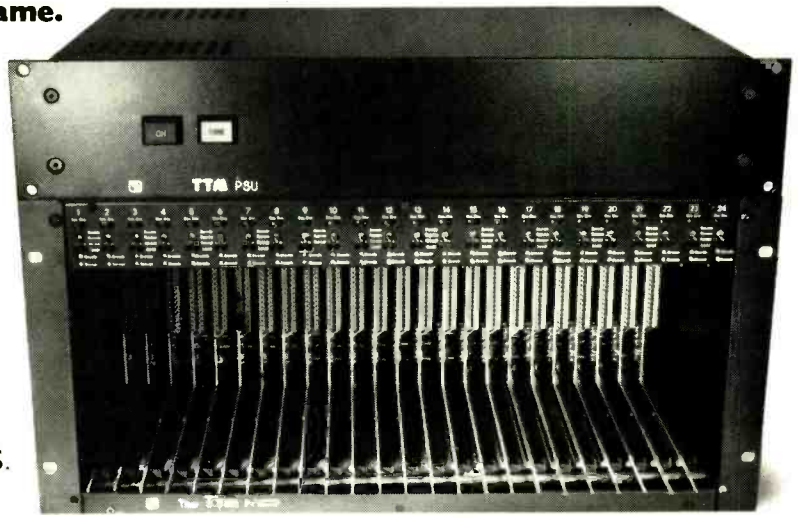

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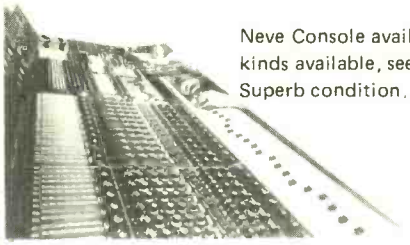

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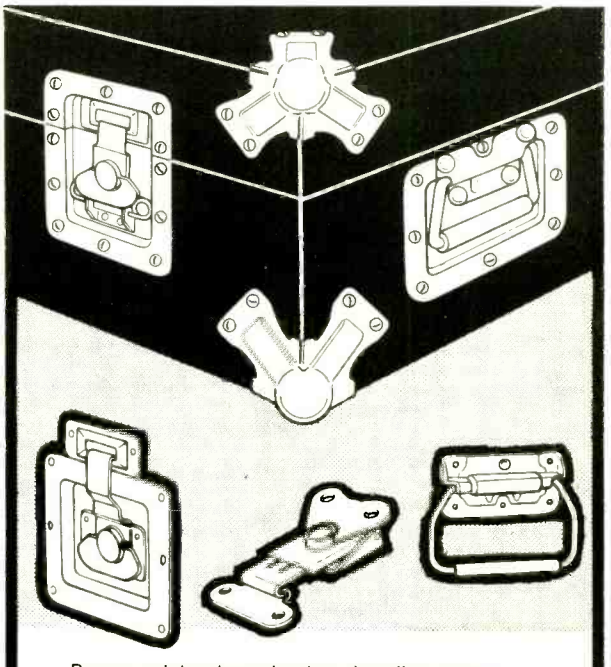

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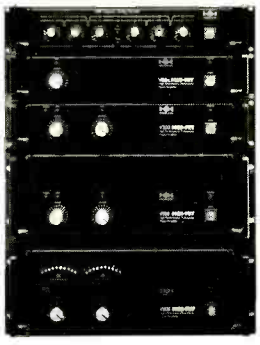

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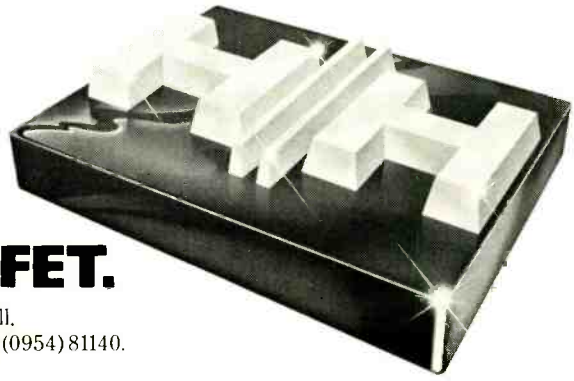

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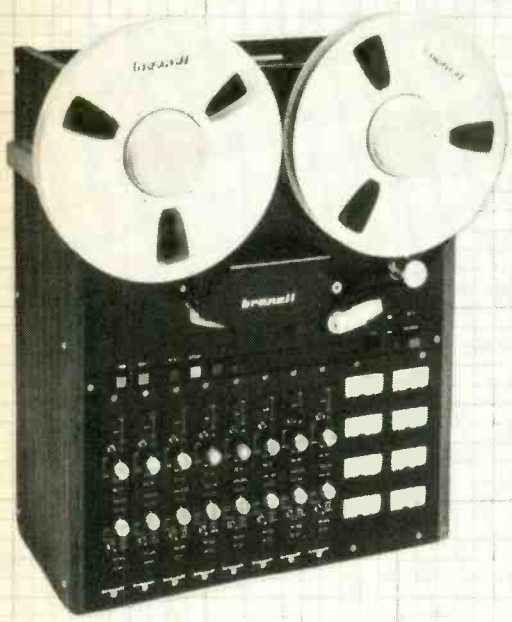

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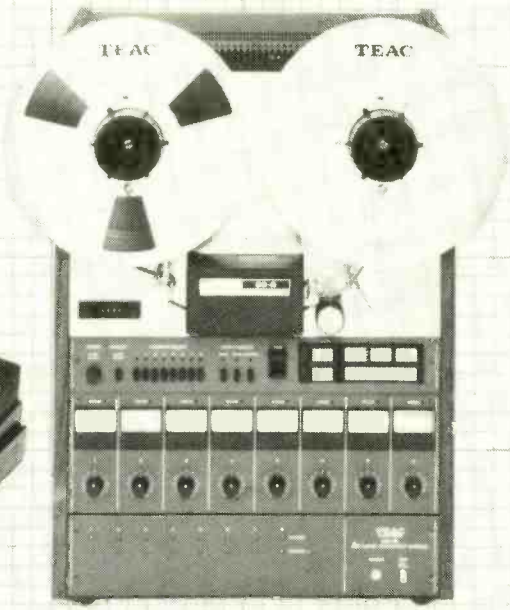

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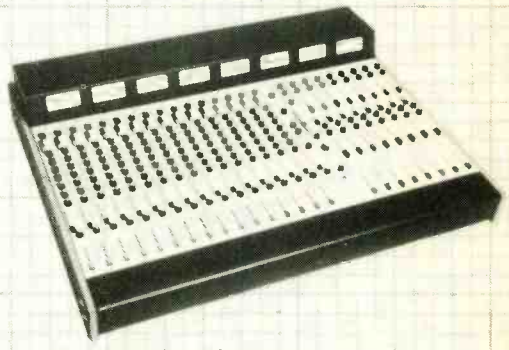

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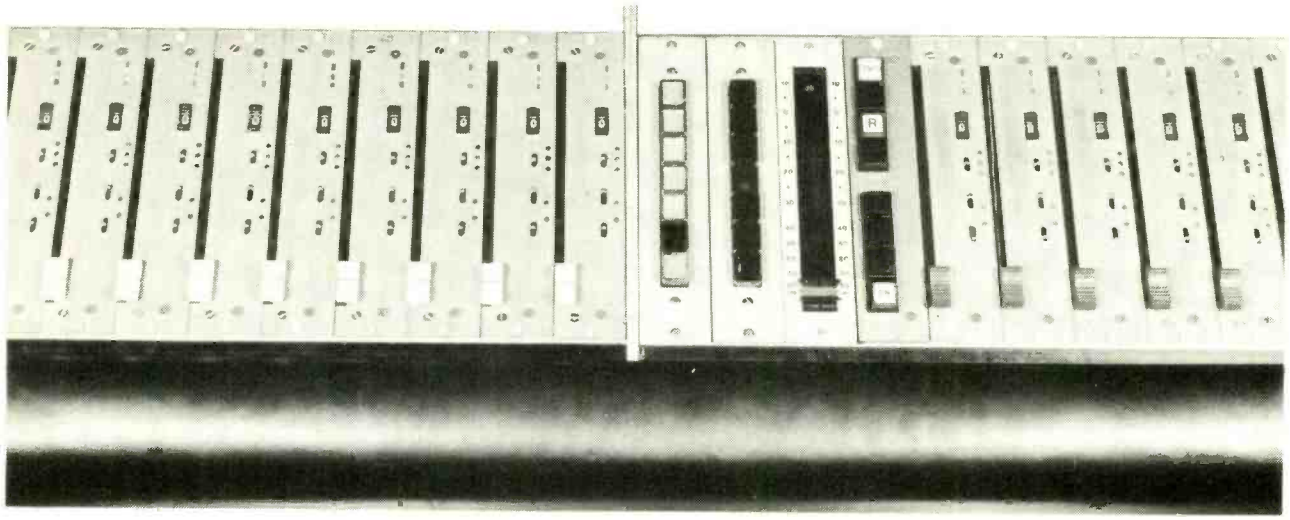

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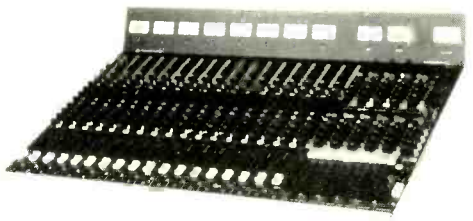
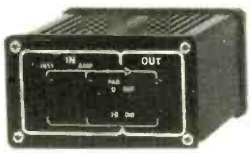


TRIDENT TRIMIX

Announcing the arrival of Trident's new flexible console, Trimix a smaller version of the highly successful Series 80. Expandable from standard frame size: 18 inputs, 8 groups, 16 monitors, completely modular. Long throw conductive plastic faders, 4 band EQ plus high pass filter. 4 sends, LED indicated level on each channel. Attractive ash-clad frame. Full patching facilities. A medium price mixer with the full back-up of Trident. Highly recommended and can be seen and demonstrated in our showroom.



THEATRE PROJECTS ACTIVE DI/SPLITTER BOX

Phantom or battery powered. Virtually unbreakable. Ground compensating circuitry. At last a 100% reliable professional quality DI box.

TANNOY STUDIO MONITORS

Superb speakers for the discerning studio owner who insists on an accurate monitoring system. Dual concentric drivers. From single 10" driver units to twin 15" driver units. Internal passive or external active crossovers giving complete control.

AMPEX ATR 700

High quality stereo mastering machine, switchable NAB/IEC. Varispeed. 4 balanced 600 Ohm mic inputs with separate level controls allows machine to be used without a mixer for mobile applications. Broadcast quality at a reasonable price.

REVOX B77

No studio is complete without a Revox, the ideal machine for tape delays, tape loops, copies and used in many sound studios as a mastering machine. Versatile as an egg!

WEBER TEST TAPES – Manufactured in the U.K. Available ex stock.
EQUIPMENT RACKS – Lightweight high quality 19" racks available ex stock.
ROCKWOOL ACOUSTIC FIBRE – Available at competitive prices. Delivered direct to your premises.
JVC VHS VIDEO RECORDERS – Immediate delivery £433 + VAT. Other makes also available.

fact: this condenser microphone sets a new standard of technical excellence.

The Shure SM81 cardioid condenser is a new breed of microphone. It is a truly high-performance studio instrument exceptionally well-suited to the critical requirements of professional recording, broadcast, motion picture recording, and highest quality sound reinforcement—and, in addition, is highly reliable for field use.

Shure engineers sought—and found—ingenious new solutions to common problems which, up to now, have restricted the use of condenser microphones. Years of operational tests were conducted in an exceptionally broad range of studio applications and under a wide variety of field conditions.

As the following specifications indicate, the new SM81 offers unprecedented performance capability—making it a new standard in high quality professional condenser microphones.

SM81 puts it all together!

- WIDE RANGE, 20 Hz to 20 kHz FLAT FREQUENCY RESPONSE.
- PRECISE CARDIOID polar pattern, uniform with frequency and symmetrical about axis, to provide maximum rejection and minimum colouration of off-axis sounds.
- EXCEPTIONALLY LOW (16 dBA) NOISE LEVEL.
- 120 dB DYNAMIC RANGE.
- ULTRA-LOW DISTORTION (right up to the clipping point!) over the entire audio spectrum for a wide range of load impedances. MAXIMUM SPL BEFORE CLIPPING: 135 dB; 145 dB with attenuator.
- WIDE RANGE SIMPLEX POWERING includes DIN 45 596 voltages of 12 and 48 Vdc.
- EXTREMELY LOW RF SUSCEPTIBILITY.
- SELECTABLE LOW FREQUENCY RESPONSE: Flat, 6 or 18 dB/octave rolloff.
- 10 dB CAPACITIVE ATTENUATOR accessible without disassembly and lockable.

Outstanding Ruggedness

Conventional condenser microphones have gained the reputation of being high quality, but often at the expense of mechanical and environmental ruggedness. This no longer need be the case. The SM81 transducer and electronics housing is of heavy-wall steel construction, and all internal components are rigidly supported. (Production line SM81's must be capable of withstanding at least six random drops from six feet onto a hardwood floor without significant performance degradation or structural damage.) It is reliable over a temperature range of —20° F to 165° F at relative humidities of 0 to 95%!

Send for a complete brochure on this remarkable new condenser microphone!

SM81 Cardioid Condenser Microphone

® SHURE ®

Shure Electronics Limited, Eccleston Road, Maidstone ME15 6AU—Telephone: Maidstone (0622) 59881

222

Triple Two's the One

Syntovox 222 (Triple Two) is a simplified vocoder system, created as a result of feedback from performing musicians who needed a flexible, easy-to-use machine for on-stage and session work.

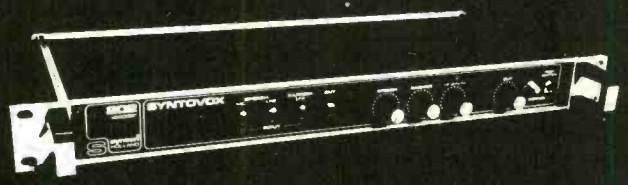
Triple Two allows vocal control over each played note or chord, featuring an unequaled dynamic response and clarity of sound. It is the interface between musician and his instrument, translating articulation into musical sounds.

■ Syntovox Triple Two - trend setter for budget vocoders. Triple Two's the One.

SYNTOVOX
vocoders by synton
HOLLAND

202

The Incredible Machine



Syntovox 202 is the latest development in vocoders by Synton. It was designed primarily to make a match between a polyphonic keyboard, a boosted bass or a fuzzed guitar and its player.

Syntovox 202 introduces the elegant way of moulding musical sounds into the shape of vocal articulation, enabling the user to impose his timbre upon cliché sounds - instantly!

We could have called Syntovox 202 'The Little Imposer'. We didn't. We called it 'The Incredible Machine'. You'll find out why.

■ Syntovox 202 - a thrilling effect at rock bottom price.

SYNTOVOX
vocoders by synton
HOLLAND

221

The Intelligible Machine

Syntovox 221 is a 20-channel vocoder system which already has made its way to numerous sound recording studios, radio stations, composers and scientific institutions for its outstanding quality and its unexcelled intelligibility.

Syntovox 221 includes 54 dB/octave filters, a feature not found in any other vocoder on the market. It also offers the versatility of a built-in pulse generator for direct speech synthesis, and several control units for pitch modulation.

Syntovox 221 features matrix patching for formant shifting, and a highly precise voiced/unvoiced detector system, and it offers extreme flexibility by the multiway connector which gives access to the analyzer and synthesizer sections and the control terminals of the voiced/unvoiced detector.

■ Syntovox 221 - The Intelligible Machine - has set standards in vocoder techniques.

SYNTOVOX
vocoders by synton
HOLLAND

SYNTON USA
269 LOCUST
NORTHAMPTON, MA 01060
(413) 586-3777
TLX 5102902462

CANADA
RADIO SERVICE MONTREAL
MONTREAL (514) 3424503

BRAZIL
CENTELEC
RIO DE JANEIRO
(021) 2876198

S. AFRICA
ELTRON LTD
JOHANNESBURG
(011). 293066

KOREA
GU MI -SOUND CO.
SEOUL - 754848

FRANCE
LAZARE ELECTRONIC
PARIS (01) 8786210

UK
FELDON AUDIO LTD
LONDON (01) 5804314

SWITZERLAND
INTRASON
CHAVANNES (021) 352276

AUDIOVIDEO
LUGANO (091) 523827

DENMARK
TC ELECTRONIC
AARHUS (045) 6244288

SWEDEN
ELFA
SOLNA (08) 7300700

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P.O.B. 83
3620 AB BREUKELEN
☎ 03462 3499
TELEX 40541 SYNTO

SYNTOVOX
vocoders by synton
HOLLAND

diary

Bach-Simpson catalogue

Bach-Simpson (UK) Ltd has published a new revised illustrated catalogue covering its range of panel meters, multimeters and test instruments. Copies are available on request from: Bach-Simpson (UK) Ltd, Trenant Estate, Wadebridge, Cornwall PL27 6HD, UK. Phone: 020881 2031/3. Telex: 45451.

Theatre Projects Ltd

Theatre Projects Services Ltd, the division of Theatre Projects Ltd responsible for equipment design and manufacture for live media applications has moved to: Electrosound House, 11 Marshalsea Road, London SE1. Phone: 01-407 6781. Telex: 885659. The move has been necessitated by an increase in workload, with major specials such as a 60 input film post-production console for Pinewood Film Studios currently in hand, and the expansion of the company's product range including a new intercom system.

In addition to the above, Stage Sound Ltd, the division of Theatre Projects responsible for the design and supply of sound and lighting systems has acquired TFA Electrosound, this company being renamed TFA Ltd. TFA sound and lighting systems are currently being used on a number of major UK/European tours including those of George Benson, Bruce Springsteen and The Pretenders. TFA will continue to operate from its premises at Electrosound House, with Brian Croft formerly managing director of TFA Electrosound becoming managing director of Stage Sound Ltd.

Free Studio Time

Klogo Motion, a 16-track studio situated in Leatherhead, Surrey, has come up with a novel idea to encourage new business. The studio is offering artists 7½ hours of studio time plus the services of an engineer, all for the cost of tape hire (2in and ¼in) ie £60. At the end of the session, artists availing themselves of this service walk away with a high quality demo cassette. While Klogo Motion also offer the normal studio services, this new approach opens the way for aspiring bands to obtain demo cassettes at a reasonable cost—a laudable aim which deserves every success. Full details of the service are available from Kelvin Wright. Phone: 53 73665. Equipment used by the studio comprises a custom Mayfair 20/16 console; Scully 16-track; Dolby-A noise reduction; Ampex *AG440* 2-track; a wide selection of mics and effects units; and Tannoy and electrostatic monitors.

Loft products

John Roberts, president of Phoenix Audio Laboratory, has announced that the aforementioned company is now manufacturing and marketing the Loft range of ancillary processing units. In addition to the established *Model 440* delay line/flanger, the company are marketing a second generation update of this unit, the *Model 450;* plus the *Model 401* parametric equaliser and *Model 402* stereo crossover. John Roberts also informs us that a complete range of professional signal processing equipment is planned for the future. Phoenix Audio Laboratory Inc, 91 Elm Street, Manchester, Connecticut 06040, USA. Phone: (203) 649-1199.

Recording & Production Facilities

A new partnership has been formed by Allen Stagg and Ray Prickett to offer a recording and production service worldwide. Although the partnership is recent, their professional collaboration dates from their days at IBC Studios, where Allen was managing director and Ray was senior balance engineer.

After leaving IBC, Allen was general manager of EMI Abbey Road, head of sound at MGM's British studios, then with Deutsche Grammophon latterly as recording studio co-ordinator UK, prior to becoming an independent recording consultant and balance engineer. Ray after leaving IBC was senior balance engineer at Pye Records, then technical manager and chief technical controller at Pye, finally becoming an independent balance engineer and recording consultant.

To date both have carried out a large number of recording assignments throughout the world (but especially in Europe and the USA), and during this period they have worked with a wide selection of prominent classical artists. Although most of their work has been in the classical field including operatic, symphonic and chamber music, their range of experience also covers jazz, military and brass bands, and MOR material.

Recording & Production Facilities, Cranbrook, Marsh Lane, Mill Hill, London NW7 4NT, UK. Phone: 01-959 6620 or 01-300 4081.

Westrex rationalisation

Fred Allen, president and managing director of the Westrex Co Ltd, has announced that following the move of the company to a new factory complex at Greenford, Middlesex, this location has been designated as the headquarters for all the worldwide operations of the company. In line with this move, arrangements are being made to consolidate the manufacture of conventional and high speed recording and re-recording equipment from the company's Italian plant to Greenford. As a result Westrex Italy will operate in parallel with the UK operation until the end of 1981 processing current orders, while Westrex UK will process all new orders. After this date Westrex Italy will be wound down.

Westrex Co Ltd, Bilton Fairway Estate, Long Drive, Greenford, Middx, UK. Phone: 01-578 0957/8/9.

SPARS cancel Nashville Convention

The SPARS Convention *Partners in Progress for Profits* scheduled to take place at the Opryland Hotel, Nashville from August 27 to 30, has been cancelled. This decision was taken in recognition of the depressed economic climate in the recording industry and with due regard for the growing industry opinion that there are too many conventions. In place of the Nashville Convention, SPARS intend developing a continuing road show programme with the objective of taking SPARS to the industry rather than the industry coming to a SPARS Convention. Murray Allen, SPARS president, explaining the thinking behind this decision, stated: "It has become an increasingly difficult financial burden for members of our industry to attend convention after convention. When one takes into account the registration fee, air fare, hotel accommodations, etc, each convention can easily cost an attendee $2,000 or more. Plus, untold amounts are expended by manufacturers—with diminishing returns on their investment as a result of the over-saturation of conventions." Accordingly, SPARS has decided to take a lead in facing economic realities and easing financial burdens for convention attendees, by scheduling the SPARS Road Show for the following locations and dates: Nashville, late August or early September; New York, October 28 to 30; Los Angeles, January 1982; and Dallas, April 1982. Full details are available from Malcolm P. Rosenberg, 215 South Broad Street, 7th Floor, Philadelphia, Penn 19107, USA. Phone: (215) 735-9666. ■

Agency

● Special Audio Products BV has been appointed exclusive distributor of the DeltaLab range in Holland. Special Audio Products BV, Scheldeplein 18, 1078 GR Amsterdam, Netherlands. Phone: 020 79.70.55.

People

● Jim Morrison formerly with Altec has joined Edcor as vice president, marketing.

● Yoshiharu Abe has been named president of the recently formed Fostex Corp of America. Other appointments include Fredrick Huang, executive VP and general manager; Mark Damon Cohen, VP marketing and sales; and Arne L. Berg, product design and development consultant.

● John While has joined AKG Acoustics as sales representative for the Midlands, North and SW of England.

● Quad-Eight has appointed Ned Padwa to the position of executive VP and chief operating officer.

Contracts

● Pye TVT are to supply the BBC with 12 20kW and two 10kW VHF transmitters as part of the BBC's re-equipment programme for its national VHF Network. This contract brings the total of Pye TVT radio transmitters ordered by the BBC to 38.

● Soundcraft in conjunction with Turnkey has supplied a number of top British musicians with Soundcraft consoles. These include *Series 1624* consoles to three members of Pink Floyd, and one member of Status Quo, plus Soundcraft *Series 3B* 32/24 consoles to Rick Parfitt (Status Quo) and Brian Bennett of The Shadows. The majority of these installations are based around Soundcraft/Studer combinations.

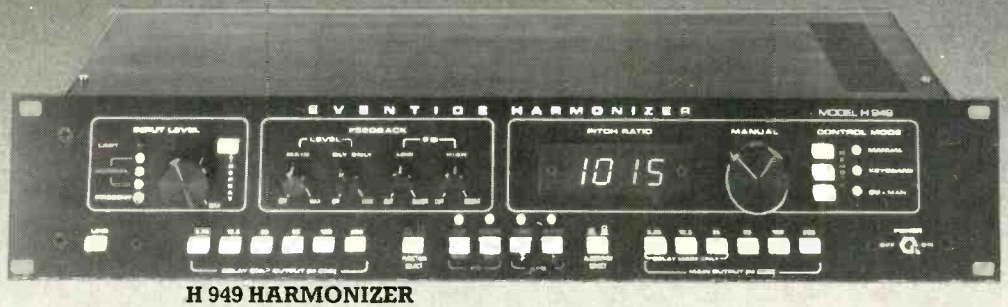
Address changes

● The Otari Corp has moved to larger premises at 2 Davis Drive, Belmont, Cal 94002, USA. The company's telephone number remains unchanged: (415) 592-8311.

● RFW Recording Supplies has moved to Green Acres, Northlands, Sibsey, Boston, Lincs, UK. Phone: 0205 75595.

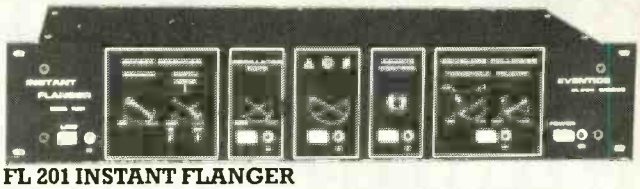
EVENTIDE CLOCKWORKS

Sets the standard for Signal Processing



H 949 HARMONIZER
Pitch change: one octave up, two down. Delay: two outputs each 393.75 ms. Micro pitch change. Time reversal. Repeat. Randomized delay. Flanging. High and low feedback E/Q. Two selectable algorithms. Frequency response: 15 khz. Dynamic range 96 dB.

H 910 HARMONIZER
Pitch change: one octave up, one down. Delay: output one, 112.5 ms output two, 82.5 ms. Frequency response 12 kHz. Dynamic range: 90 dB. Feedback control.



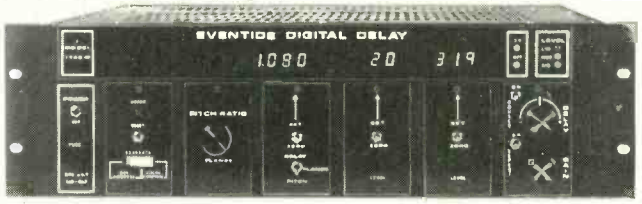
FL 201 INSTANT FLANGER
Simulates true tape flanging, initiated by an internal oscillator, manual control, remote control or envelope triggering. Now available with the interchangeable B.P.C. 101 card which turns the unit into an instant phaser.

BD 955 BROADCAST DELAY LINE
Designed specifically for the broadcast industry and is primarily intended for the policing of live transmissions. There are three maximum delay times available 1.6, 3.2 or 6.4 seconds plus a unique program dump and catch up facility.

2830 OMNIPRESSOR
The Omnipressor combines the characteristics of a compressor, expander, noise gate and limiter in one package.

JJ 193 DELAY LINE
Four outputs, each with up to 510 ms of delay, independently switchable in 2 ms steps. Extra delay is optional to a maximum of 1.022 or 2.046 secs. Frequency response: 12 kHz. Dynamic range: 90 dB.

R.D. 770 MONSTERMAT
Mono/Stereo Matrix unit. The Monstermat solves the problem of tape phasing and noise on cartridge machines.



1745M DELAY LINE
Up to five outputs, each with a maximum of 320 ms of delay (640 ms in the double mode) selectable in 20 μ steps. Optional modules available include a pitch changer, and a remote control module which controls the delay line with a micro-computer. Frequency response: 16 kHz (8 kHz in 'double' mode). Dynamic range: 90 dB.

U.K. Distributors

Feldon Audio Ltd.,

126 Great Portland Street. London W1N 5PH Tel: 01-580 4314. Telex: London 28668.

Harmonizer, Instant Flanger, Monstermat and Omnipressor are trade marks of EVENTIDE CLOCKWORKS Inc.

new products

SGAL audio cables

Steve Graham Audio Ltd has added two cables to its range—*Studioflex* and *Phonoflex*. Like *Musiflex* which was reviewed in our November 1980 issue both cables use a conductive thermoplastic screen which not only provides an effective electrical shield, but also cuts preparation time since there is no braiding to unpick and prepare. The screens are terminated by a drain wire which like the conductors is ready tinned. *Studioflex* is designed for installation work and contains eight individually screened pairs, each jacketed in a different colour to aid identification. Price is £192 per 100m. *Phonoflex* is a single conductor, low capacitance (55pF/m) cable designed for interconnection lead usage, and has an overall diameter of 4.6mm allowing it to fit most phono-type connectors. Price is £20 per 100m, and this cable is available in red, black, blue or white with other colours available to order.

Steve Graham Audio Ltd, 20 Victoria Road, New Barnet, Herts EN4 9PF, UK. Phone: 01-449 3663/4044. Telex: 8955127.

B & O tunable filter

Bang & Olufsen has introduced a new test instrument, the *TF2* tunable filter. This is a variable bandpass filter covering a frequency range of 1Hz to 1kHz in three measuring ranges, and with facilities for manual or automatic sweep. The new filter is suitable for automatic wow and flutter measurements or for the measurement of resonances on moving machinery. The filter width is approximately 10% with a skirt selectivity of approx 40dB/octave and an amplification of approx 1.

Other features of the *TF2* are a provision for optional remote control and the provision of an X/Y output to an X/Y recorder. Used in conjunction with the B & O *WM2* wow and flutter meter and an X/Y recorder the wow and flutter spectrum of tape recorders or record players can be recorded fully automatically.

Bang & Olufsen, DK-7600 Struer, Denmark. Phone: 07 85.11.22.

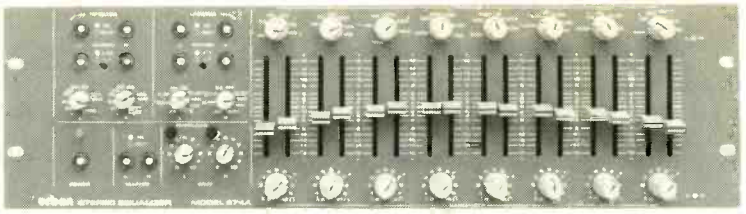
UK: Bang & Olufsen UK Ltd, Eastbrook Road, Gloucester GL4 7DE. Phone: 0452 21591. Telex: 43215.

Quad-Eight 248 consoles

Quad-Eight has introduced a new *Component Series* of consoles, the *248 Series*, comprising a 'building-block' frame which can be configured in various ways allowing recording, broadcast, sound reinforcement or hybrid configurations to be produced. Starting from two basic requirements—the number and kind of inputs and outputs—the 'building-block' housing sections each feature slots for four module strips with three dedicated modules in each strip. Any series of modules may be replaced with any other in its series and input and output sections can be added as needed, ie eight to 32 inputs; two outputs, four outputs, or eight outputs; plus four auxiliary outputs for echo, cue, foldback, etc. Full details of the modular *248 Series* are available from the manufacturer.

Quad-Eight Electronics, 11929 Vose Street, North Hollywood, Cal 91605, USA. Phone: (213) 764-1516.

UK: Audio Kinetics (UK) Ltd, Verulam Road, St Albans, Herts AL3 4DH. Phone: 0727 32191.



Orban 674A

Orban has introduced a new split-stereo version of its popular *672A* mono equaliser, the *674A* stereo equaliser. The new unit features twin 8-band graphic eq controls with a continuously variable centre frequency and bandwidth in each band. Wide range high and lowpass 12dB/octave Butterworth filters follow the eq section allowing the filters to be used as a 2-way electronic crossover. Stereo operation of the equaliser is simplified by the provision of ganged controls and each of the eight bands tunes over a 3:1 frequency range and offers ±16dB of boost or cut with reciprocal curves. The Q is variable between 0.3 and 20 for extra-narrow notches. The high and lowpass filter sections are continuously tunable over a 100:1 frequency range in two decades, and each section is independently switchable. Frequency range of the equaliser is 20Hz to 20kHz, with nominal output level being +4dBm (max output level before clipping is >+19dBm). Inputs are electronically balanced with outputs being unbalanced (balanced optional). Specifications include total noise at the output <−78dBm, giving a dynamic range of >97dB, while THD and SMPTE IM are both less than 0.08% at +18dBm output. Price of the *674A* stereo equaliser is $1,149.

Orban Associates Inc, 645 Bryant Street, San Francisco, Cal 94107, USA. Phone: (415) 957-1067. Telex: 17-1480.

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

Imaginearing Audio

Two new products of interest to musicians have been introduced by American manufacturer Imaginearing Audio. The first is the *Alphatone Jr* chromatic note monitor, a chromatic tuning unit which reads the letter of a note being played in any of four octaves chromatically. The unit features an LED display of note name with indication of whether a note is sharp, flat, or in tune, plus constant note-by-note monitoring instead of one-note-at-a-time tuning. Retailing at under $100, the *Alphatone Jr* operates from a 9V battery or from the Alphatone's *BE-101* battery eliminator.

The second new unit is an *Echo/Digital Recorder,* a digital storage unit with a microprocessor control keypad programming section. This unit offers echo, delay, reverse echo, record and playback (forward or reverse) in segments of 1ms minimum to 16.777s maximum. Priced at under $2,000, the unit is available as two models with 16s or 8s memory. Optional accessories are the *REM/1* keypad remote controller ($600) and the *REM/2* pedal remote controller ($800).

Imaginearing Audio, 5558 SE International Way, Milwaukie, Oregon 97222, USA.

Encoder completes UHJ system

You may already know that the Calrec *Soundfield* mic is somewhat unusual in that it can be used as a stereo microphone in which such parameters as distance from the source, polar diagram and orientation may be varied *after* the recording—the signal from the mic may be recorded, and then modified later with the control unit provided.

A new unit from Calrec now makes it possible to utilise the microphone for its prime purpose—originating material for Ambisonic surround-sound reproduction. The *Soundfield* mic enables four channels of Ambisonic information to be recorded: this 'B-Format' signal consists of an omnidirectional mono signal, W, and three difference signals, left minus right, front-back, and up-down, referred to as X, Y and Z respectively. The new Calrec *Ambisonic UHJ Encoder* takes three of these signals—excluding the Z (height) information, leaving horizontal surround information only—and encodes them into the 2-channel UHJ format which is compatible with stereo and mono replay, yet reveals full horizontal Ambisonic surround information when the encoded material is reproduced via a suitable UHJ decoder. Four UK companies already, or are about to, market domestic decoders: Minim Audio, IMF Electronics, Meridian and Integrex. Minim have also announced a professional Ambisonic decoder for studio and broadcast monitoring use.

The Calrec encoder is a small rack-mounting unit with no controls other than a power switch. It operates at standard line levels, requiring a 3-channel B-Format input and offering a 2-channel encoded output suitable for recording, direct disc-cutting or broadcast operation.

Use of the encoder is not limited to the *Soundfield* mic as a source: any B-Format signal may be used, allowing the use of the mic for Ambisonic capturing of the soundfield at a live performance, or the encoding of an artificial Ambisonic soundfield created by mixing down a conventional multitrack master via a mixdown console equipped with B-Format localisation controls ('Ambisonic panpots').

Calrec Audio Ltd, Hangingroyd Lane, Hebden Bridge, Yorks HX7 7DD, UK. Phone: 0422 842159. Telex: 51311.

26 ▶

six of the best!

from Orban

111B Dual Spring Reverb
A professional reverb with an excellent price/performance ratio

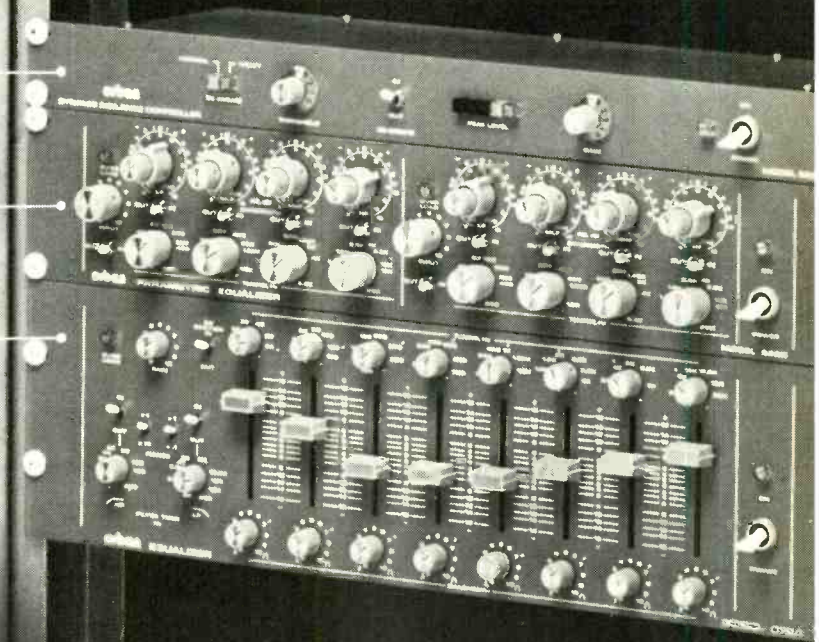
245E Stereo Synthesizer
Creates a seductive, mono-compatible pseudo-stereo effect from mono sources

418A Stereo Compressor/Limiter
For smooth, undetectable level and high frequency control in recording

526A Dynamic Sibilance Controller
Clean, inaudible de-essing of vocals with consistent action regardless of levels

622B Dual Channel Parametric EQ
Constant-Q design makes it an exceptionally versatile EQ

672A Equalizer
A Parametric EQ with graphic controls, including variable high and low-pass filters usable as an electronic crossover



European Master Distributor

SSE

Scenic Sounds Equipment Limited
97-99 Dean Street London W1V 5RA Telephone: 01-734 2812/3/4/5 Telex: 27 939 SCENIC G

England Industrial Tape Applications **Belgium** Trans European Music SA (Dilbeek) **Finland** MS-Audiotron (Helsinki)
France Schaeffer, Riesser & Cie/3M France Mincom Div (Paris) **Germany** Estemac (Hamburg) **Greece** Audiolab Hellas (Athens) **Holland** Cadac Holland (Hilversum)
Italy Audio Products International (Milan) **Spain** M. Llewellyn-Jones (Madrid) **Sweden** Tal & Ton (Gothenburg)

new products

Soundcraft Series 2400

Further to our AES Hamburg report, we have now received additional details on the new Soundcraft *Series 2400* console. The new console which is based on the successful *Series 1624* console (introduced in 1979 and with over 150 sold to date) combines the results of user feedback on the earlier console with technical developments which have occurred since that console's introduction. Available in two frame sizes (28/24 and 24/16) to meet the requirements of both 16 and 24-track studios, the *Series 2400* is of modular construction with the facility that removable panels on all modules allow post-installation of the newly introduced Soundcraft automation system.

The larger frame versions is configured with 28 input modules, 24 group/monitor channels, plus master module and patchbay facilities; while the small frame holds 24 input modules, 16 group/monitor channels, plus master module and patchbay. An optional module provides 24-track monitoring facilities allowing tracks 17 to 24 to be assigned either directly from the input modules, or via groups 1 to 16, via the patchbay. Metering for the console may be either VU, or optionally an LED bargraph system which includes a 27-band ⅓-octave spectrum analyser, and a phase meter.

Soundcraft Electronics Ltd, 5-8 Great Sutton Street, London EC1V 0BX, UK. Phone: 01-251 3631. Telex: 21198.

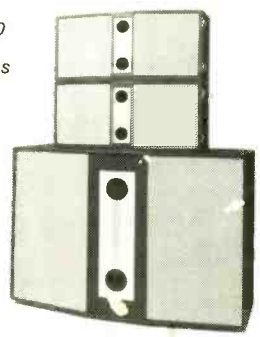
USA: Soundcraft Inc, 20610 Manhattan Place, No 120, Torrance, Cal 90501. Phone: (213) 328-2595.

Court Proflex system

Court Acoustics has announced the introduction of a new 'all British' compact high power handling modular PA music loudspeaker system known as *Proflex*. The new system is produced in four basic system modules: the *Proflex 200* with two 12in lf drivers in a ducted port reflex enclosure and two horn loaded compression drivers with magnesium alloy diaphragms for mf and hf, together with an in-built passive crossover; the *Proflex 400* sub-bass system with two 15in bass drivers mounted in a folded exponential horn; the *Proflex 300* lf horn system with two 15in bass drivers; and the *Proflex 100* foldback floor wedge or side fill unit with a 12in lf driver and a co-axially mounted, horn loaded compression driver for mf and hf. Designed as a complete system allowing for flexibility of unit usage depending on the size and type of venue, the loudspeakers are finished in textured black with a light grey front cloth and backed by a steel grill to protect the drivers.

Prices of the loudspeakers are *100* £280, *200* £415, *300* £480.20 and *400* £492.15. Additionally, *Proflex 102* stands are available at a cost of £45 for the smaller *100* and *200* models.

Court Acoustics Ltd, 35/39 Britannia Row, London N1 8QH, UK. Phone: 01-359 0956. Telex: 268279.



Proflex 200 and 400 PA systems

Synth it yourself

The trouble with most synthesisers is that you have to be able to play an instrument, normally keyboards, to do anything useful (unless you want to investigate the strange worlds of computer synthesis or effects), and while various types of synthesiser have turned up in recent years designed to take some other mechanical input besides keyboard-thumping, they never seem to have caught on to such a great extent. Yet many musical people are not keyboardists, but would like access to the sounds of the synthesiser.

One solution to this dilemma has been obvious for some years: the pitch-to-voltage converter, which could take a note in and produce a voltage proportional to pitch which could be used to control the frequency of a VCO. This would enable the synthesised sound to follow, or harmonise with, the pitch of the original instrument, be it flute, guitar, vocal or whatever. But P-to-V units never really seemed to work. They were always too good at following harmonics rather than fundamentals (at the most annoying moments), and so on.

Finally, however, someone seems to have cracked the problem. With the introduction of the *Resynator* 'instrument-controlled synthesiser', Musico of Indianapolis claim to have produced a device whose sound is simply 'awesome'. It takes an input signal from a wide range of sources—guitar, voice, piano, brass, bass—and tracks level and pitch with the aid of a pair of microprocessors, generating control signals which may be used to operate on a VCO and effects oscillator (FXO).

On the input of the unit is a frequency analyser with level control, which drives the 'Select a sound' section of the instrument. This latter contains the majority of basic synthesiser facilities. The VCO offers sawtooth, square, variable pulse and pwm signals, and these sounds may be blended with the effects oscillator. The FXO offers harmonised interval playing, phase sync and a harmonic synthesis system called 'CM Synthesis'. After this, the picturesquely-named Timbral Image Modulator allows dynamic sound-character control with one of eight complex waveshapes, plus VCA and VCF. The output circuitry allows a mix of direct and synthesised sounds to be produced. The *Resynator* may be hooked up to other synthesisers and the like, having a standard 1V/octave control requirement, triggers ins and outs, and so on: an interesting unit, which has been praised highly since its appearance in the USA in late 1979.

Musico, 1225 N Meridian Street, Indianapolis, Indiana 46204, USA. Phone: (317) 924-1300.

UK: Syco Systems, 20-21 Conduit Place, London W2. Phone: 01-723 3844.

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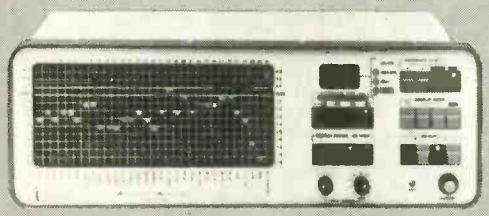

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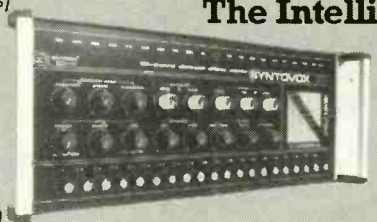
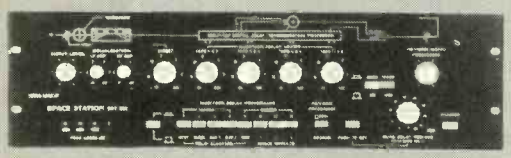
The combined digital metronome and chromatic tuner. Dual readout in frames/beats and beats/mins. Measures tempo of music. Programmable beats/bar. Polyrhythmic outputs. Fully chromatic tuning octave. Quartz micro-computer for accuracy. Ideal for click-track, jingles and film scores etc.

SYNTOVOX 221 – The Intelligible Machine



which is a 20-channel vocoder system already in wide use in sound recording studios, radio stations, scientific institutions, and by leading composers, for its outstanding quality and unexcelled intelligibility.



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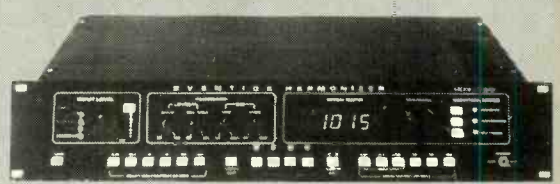
A complete processing centre providing comprehensive reverberation, multi tap delay, repeat echo plus a multitude of other effects. The most comprehensive digital reverberation and effects unit available at a price you can afford.

EVENTIDE Harmonizer. Model H949

Eventide's Model H949 starts where the H910 left off . . . with outstanding new features like time reversal, randomised delay, flanging and repeat. New digital circuitry and random access memories now actually transpose input signals by one full octave up and no less than two full octaves down.



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126 Great Portland Street, London W1N 5PH Tel: 01-580 4314. Telex: London 28668.

new products

Woelke cue-track heads

Following a recent IEC suggestion that cue-tracks should be recorded inbetween a 2-track recording on ¼in tape, Woelke has produced new cue-track heads for professional ¼in tape recording. The new Woelke system is arranged such that a cue-track can also be recorded in-between stereo tracks according to the DIN specification. The cue heads are glass bonded and constructed in a solid ferrite/ceramic material. In order to save room in the head assembly and to accommodate the new heads with the same wrap angle, Woelke have combined the cue playback head with an audio erase head. For updating the cue-track Woelke offer a separate cue erase/write/read head. A feature of the heads' construction is their capability to read the cue-track in the fast wind mode.

Woelke Magnetbandtechnik GmbH, Woelkestrasse 2-3, D-8069 Schweitenkirchen, West Germany. Phone: 08444 394. Telex: 55547.

UK: Lennard Developments Ltd, 206 Chase Side, Enfield, Middx EN2 0QX. Phone: 01-363 8238.

USA: Audicon Inc, 1200 Beechwood Avenue, Nashville, Tennessee 37212. Phone: (615) 256-6900. Telex: 554494.

Edcor AM 400

American manufacturer Edcor has introduced a new automatic mic mixer, the *AM 400*. The new unit is a 19in rack mount mixer with four balanced mic inputs as standard, although the unit can be modified to accept line level or telephone level inputs. Utilising digital control and analogue circuitry the *AM 400* may be 'daisy-chained' to a total of seven units providing 28 inputs, with one unit acting as the master and controlling the digital logic of the other six units which are switched to the slave position.

Useful features of the mixer include logic outputs allowing certain speakers to be muted by activating relays when channels are opened or closed; and variable attenuation depth controls for each input. Available controls include individual channel gain controls; master gain control; power on/off switch; automatic/manual mixer mode switch; attack threshold controls; attenuation depth controls; LED indication of channel status; and a slave/master switch. Outputs include four individual logic outputs on screw taps; a switchable line/mic level balanced output; a 600Ω monitor output; mic buss input/outputs; and digital attenuator input/outputs for slave/master hook-up. Price of the *AM 400* is $500 and specifications include: frequency response 20Hz to 20kHz ±0.5dB (THD 0.02%); and S/N ratios of −126dBm (all controls at minimum) and −86dBm (all controls at maximum).

Edcor, 16782 Hale Avenue, Irvine, Cal 92714, USA. Phone: (714) 556-2740.

Klark-Teknik RT60 analyser

Klark-Teknik has introduced its new *RT60* reverberation decay analyser which is designed to be used in conjunction with the *DN60* realtime analyser. The *RT60* gives user control of many decay analysis parameters including a cursor switch allowing a choice of measurement using either any single ISO ⅓-octave frequency or the total bandwidth. Features include selectable time window over the range 0dB to −30dB in 2dB increments; and an LED time display incremented in seconds. The *RT60* plots the decay curve, displaying the results on the *DN60*, with the *RT60* offering user control of the horizontal resolution of the plotted curve with the facility to switch between 16, 64 or 208ms display time. A further function of the unit is the facility to accumulate up to 32 separate RT_{60} curves, enabling users to measure a true averaging of different point measurements.

Klark-Teknik Research Ltd, Walter Nash Road West, Coppice Trading Estate, Kidderminster, Worcs DY11 7HJ, UK. Phone: 0562 741515. Telex: 339821.

USA: Klark-Teknik Electronics Inc, 262A Eastern Parkway, Farmingdale, NY 11735. Phone: (516) 249-3600.

Shure SM85 mic

Shure has introduced a new cardioid condenser vocal mic, the *SM85*, suitable for broadcast, recording or stage use. The new mic has a frequency response of 50Hz to 15kHz and features an integral multistage pop filter, midrange presence peak, and an internal shock mount for reduced handling noise. The mic can be powered from a wide range of simplex voltages, ranging from 11 to 52V dc. The *SM85* is supplied with an accessory foam windscreen and swivel adaptor; weighs 180g (6.3oz); is 192mm ($7\frac{9}{16}$in) long; and costs £129.20. Other features claimed for the mic by Shure include low distortion characteristics, very low rf susceptibility, excellent high level signal handling capability, and a tight cardioid pick-up pattern with improved separation and isolation from off-axis sources.

Shure Brothers Inc, 222 Hartrey Avenue, Evanston, Illinois 60204, USA. Phone: (312) 866-2200. Telex: 724381.

UK: Shure Electronics Ltd, Eccleston Road, Maidstone, Kent ME15 6AU. Phone: 0622 59881. Telex: 96121. ■

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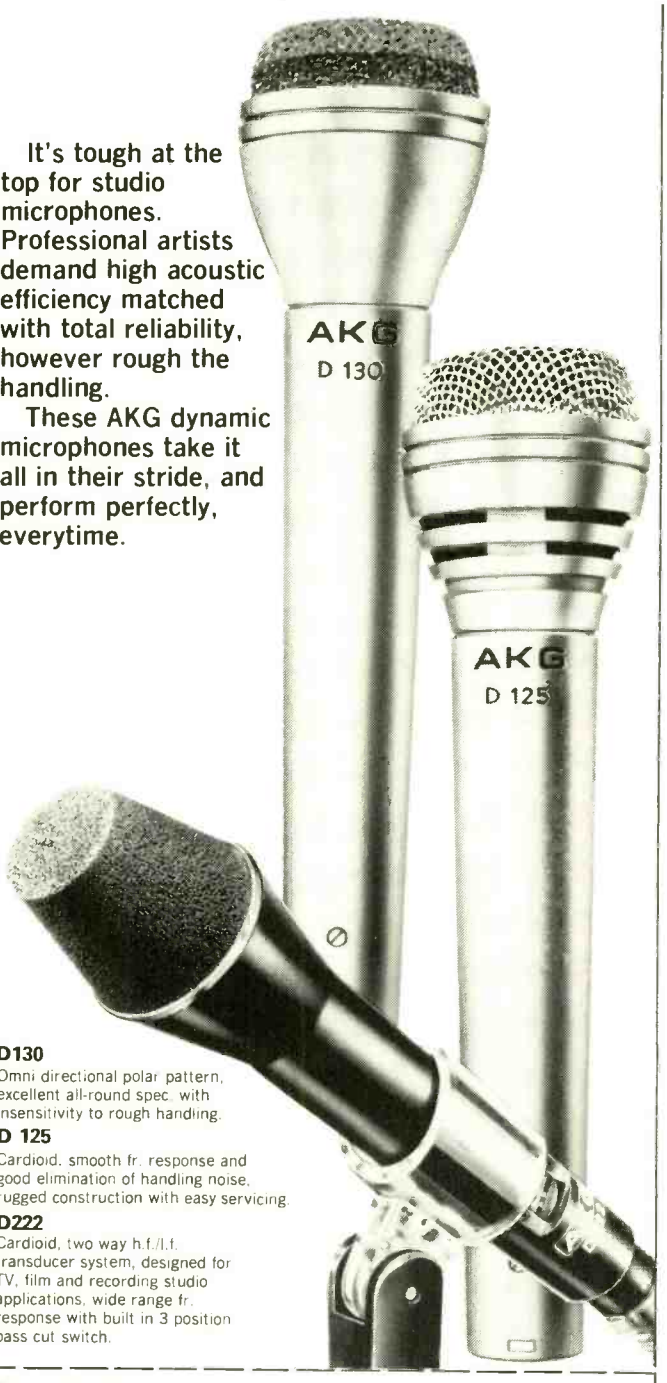

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Accessit reverb unit

Reverb unit employing a miniature spring with two elements to provide a random reverb signal. Includes echo send, equalisation, mix balance and output controls. Decay time 3.5s. Input from –30dBm at 33kΩ; output 0dBm into 600Ω; Noise –58dBm max.

AKG BX22

Mechanical reverb unit utilising the AKG torsional transmission line principle. Unit has a single input and two non-coherent outputs with a continuously adjustable reverb decay time of between 2 and 4.5s. Includes a built-in limiter to avoid reverb section overload.

Specifications: input level –22, –6, 0, +6 and +12dBm switchable; limiter operation 6dB above input level; max input level 22dBm above nominal level; reverb output level +6dBm; max output level 20dB above nominal output; input impedance >1kΩ balanced; output impedance < 50Ω balanced; recommended load impedance >200Ω; frequency range 30Hz to 10kHz; S/N ratio > 69dB rms (C-weighted).

AKG BX25

Two channel mechanical reverb unit using the torsional transmission line principle. Features include an independent channel operation facility, remote control unit, reverb section input/output frequency response shaping facility, built-in limiter with LED indication, and reverb section separate from electronics to aid servicing. Decay time adjustable between 1.5 and 3.5s with a switchable frequency range of either 50Hz to 4kHz, or 50Hz to 8kHz.

Specifications: input level –22, –6, 0, +6 and +12dBm adjustable; max input level 35dB above nominal level; input limiter range 30dB, threshold 6dB above nominal level; input impedance >10kΩ transformer balanced; output level –6, +6 and +12dBm adjustable; max output level 20dB above nominal level; output impedance <15Ω to <300Ω transformer balanced; recommended load impedance >50Ω to >600Ω; S/N ratio > 76dB rms weighted; bass control range ± 10dB at 150Hz; treble control range ±5dB at 5kHz; crosstalk > 60dB.

AMS DMX 15-80SB

Stereo broadcast delay line with identical specifications to the AMS *DMX 15-80S*. Uses two sets of incremental 'nudge' controls operating in 1 or 20ms steps to enter delays rather than the keypad fitted to the *DMX 15-80S*. The system has two displays indicating the delays on each channel at any one time. Unit accepts 100ms or 400ms delay cards offering a maximum delay of 2s per channel. Unit designed and built to BBC specifications.

Specifications: input impedance 10kΩ, electronically balanced; output impedance 150Ω, electronically balanced; max output level +24dBV; dynamic range 90dB; frequency response 15Hz to 18kHz ±3dB; distortion < 0.025%.

AMS Digital Loop Editing System

'Loop Editing System' for the *DMX 15-80 Series* allowing the creation of vocal/backing/drum loops. System allows musical information to be stored in the system memory and non-destructively edited via the keypad. Loops may be run continuously, or triggered for special effects and drop-ins. Also possible to 'varispeed' the loop for tempo or pitch corrections.

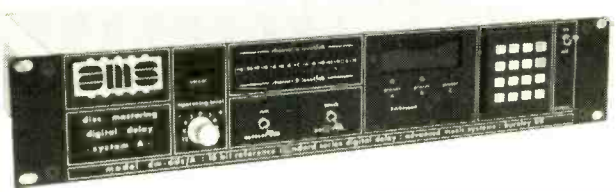
AMS DM-DDS

Stereo disc mastering digital delay line using a 16-bit linear encoding system. Available in two versions offering either 27kHz or 22kHz bandwidth. Unit may have both analogue and digital input/outputs and has two phase matched channels. Three preset delays may be summoned from the unit's non-volatile memory via the keypad, or delays may be directly keyed in. Unit automatically calibrates 0dB and an operating level control may be used to maintain overall system gain. Maximum delay is 1.6s although further memory expansion to 10s is possible. Unit features a peak latching or tracking LED level display.

Specifications: input impedance 10kΩ, electronically balanced; output impedance 150Ω, electronically balanced; frequency response 10Hz to 24kHz ±0.5dB (version I), 10Hz to 20kHz ±0.5dB (version II); dynamic range 96dB; distortion < 0.02% at 1kHz, full output; peak display hold 100ms or indefinitely (switchable; gain-unity; analogue level control 0dB automatic calibration.

AMS DMX 15R

Digital reverberation system which may be interfaced with any of the *DMX* DDL's. Offers nine reverb programs with a bandwidth of 18kHz. Unit allows modification of the pre-delay, decay time, and hf and lf decay profiles. Features keypad entry of reverb parameters and 99 non-volatile memory locations.



AMS DM-DDS

AMS DMX 15R

Aphex II

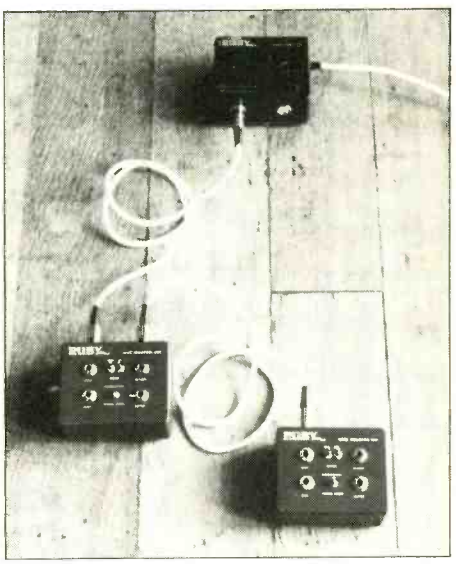
New Studio Aural Exciter, phase shift and delay unit (broadcast model also available). Features the following controls: drive level; tuning (corner frequency of the highpass network); damping (controlling the damping ratio of the side-chain); timbre (varying the balance of odd/even harmonics); and input/output mix.

Specifications (side chain disabled): frequency response 15Hz to 50kHz +0/–0.2dB; THD 0.05% at max input/output; IM distortion 0.05% at max I/O; output noise < 110dB below max I/O; crosstalk < 80dB. Max input/output level selectable +21, +24, +27dBm or special interface; input impedance selectable 600Ω or bridging, 40kΩ balanced, 60kΩ unbalanced; output impedance 50Ω balanced floating or 50Ω unbalanced. Side chain access nominal +21dBV max level, single ended input/output.

BEL BA40 delay line/flanger

Mono input analogue delay line/flanger with pseudo stereo outputs. Unit also offers ADT with continuously variable delay time. Features include dc controlled bypass switch; delay/flange mode switch; and mix, regeneration, and manual/auto sweep controls. Delay range settings are selected by four push buttons with fine delay tuning set by the manual operating mode. Delay range is 0.5 to 5ms, 1 to 10ms, 1.5 to 15ms, and 2 to 20ms in the flange mode, while in the delay mode the switchable ranges are 4 to 40ms, 8 to 80ms, 12 to 120ms, and 16 to 160ms. Bandwidth is 18kHz at the minimum settings falling to 4kHz at maximum delay.

Specifications: inputs/outputs ¼in jacks and *XLR* parallel; max input level +18dB; input impedance 47kΩ balanced bridging (pin 2 connected to ground unbalances); max output level +20dB; output impedance 600Ω; gain unity (at certain frequencies +6dB); dynamic range 90dB; distortion 0.5% (1kHz, 0dB, 40ms delay).



Noise reduction for stage effects

Another system, but one with a difference: the *Ruby* Noise Reduction Unit is designed to reduce the noise of stage effects boxes, flangers, phasers and the like. Made by Database of Bath, the *Ruby* NRU is fitted with an instrument-level input, an effects send (sent to the first effect in a

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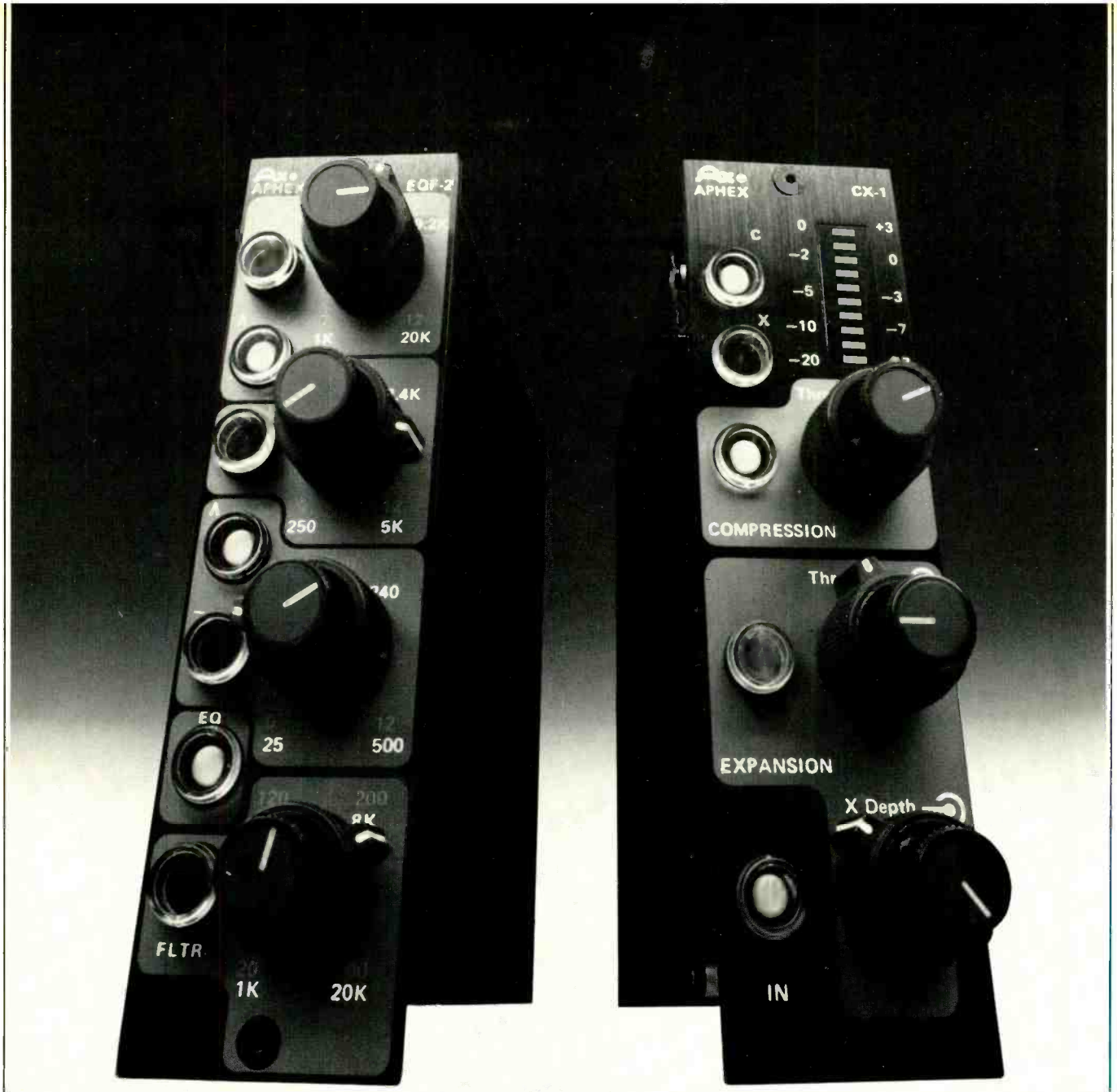

TOOLS...NOT TOYS

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

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

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daisy-chain of more or less any length), an effects return and an output with 600Ω drive capability.

On the face of it, the unit is just another compander but a couple of extra functions make it more useful for instruments, notably a compensation function which adjusts for level alterations when an effect is switched into the chain. Bypass switches are also fitted and each *Ruby* NRU has independent supply regulations, the PSU being capable of driving a number of NRU's (and other *Ruby* units). The NRU is £42.50 and the power unit £20. The pair are available for £60.

DeltaLab DL5 Harmonicomputer

First shown at the last New York AES Convention, the *DL5 Harmonicomputer* is a comprehensive pitch-changing effects unit. Features include keyboard type rocker switches for the control of musical intervals, with the facility to disable the keyboard and use the associated fine tune control as a full range manual pitch shift control. The time base processor section has a feedback control, which recirculates a harmony to create chords and/or an arpeggio effect, plus speed and width 'vibrato' controls. Other features include input and mix controls, LED indication of peak slew headroom, and external control inputs for pitch shift, bypass and additional delay (the latter for example allows the unit's feedback control to offer many impressive effects when used in conjunction with the DeltaLab *DL4* or similar delay units).

Specifications: frequency response 20Hz to 15kHz, +1, −3dB with no pitch shift (response varies dependent upon percentage of pitch shift); dynamic range min 90dB (A-weighted); headroom above 0dB, 6dB; input level 0 to 18dBm high level, −20 to 0dBm low level, unbalanced; input impedance 47kΩ; output level 18dBm max unbalanced; output impedance 50Ω; pitch shift, full range ±1 octave min, fine tune ±½ tone min; vibrato width 0 to max depth; vibrato speed 0.1 to 10Hz; feedback recirculates pitch shifted signal 0 to approx unity.

Drawmer DMT 1080

The Drawmer *DMT 1080 Multi-tracker* unit is an analogue delay line based system capable of creating various stereo effects from a mono input. Effects available include: ADT, chorus, phasing, enhanced phase/flange/ADT, tuned drainpipe effect, flanging, echo, pitch modulation, and combined phasing and triple tracking. The unit's delay range is variable from 0.3 to 80ms with selection of the delays being via front panel touch buttons.

Specifications: inputs/outputs electronically balanced *XLR* or unbalanced jacks; input impedance 100kΩ; output impedance variable with level (+15dB, 200Ω, +18dB 600Ω, +20dB 10kΩ); input level range −25dB to +20dB; CMRR 40dB. Feedthrough mode: 30Hz - 25kHz ±3dB bandwidth; noise −75dB; level variable to +6dB above main delay level; distortion 0.1%. Main Delay: delay time 80ms max; delay control ratio 30:1; bandwidth 50Hz - 12kHz ±3dB; noise −75dB; headroom +12dB; dynamic range 87dB from clipping to residual noise level; distortion >1%. Phase Delay: delay time 0.5 to 10ms; bandwidth 50Hz - 12kHz ±3dB; level variable to +6dB above main delay level.

Eventide SP2016

Eventide has introduced a new programmable effects processor, the *SP2016,* a digital reverb offering a wide range of programmable effects. The new unit which is a stereo 2-in/2-out unit features plug-in 'Reverb Library' ROM software programs with full control of all parameters, in addition to the basic reverb programs; plus the Eventide *Digiplex Echo* simulation of multiple-head echo. In addition the unit offers flanging and phasing facilities, plus multiple chorus effects with each voice being varied randomly in time, amplitude and space. Full bandwidth delay up to 16kHz offers 0 to 1.6s delay in 25μs steps with the option of an 8kHz bandwidth over a delay range of 0 to 3.2s in 50μs steps. Additionally the unit offers a new effect—selective band delays, where a signal can be separated into a number of bands, each band having the facility of independent delay up to 3.2s. As the system is fully programmable, a program subscription service will be available. Microprocessor control of all functions (a step at a time) aids usage, while an alphanumeric 'marque' readout simplifies control. Program parameters can be preset or 'live-edited', and up to 32 different programs can be stored in non-volatile memory, each offering up to 18 preset effects. A further feature is the provision of an extensive self-test feature, which will even pinpoint the part number of a suspect IC.

Basic Specifications: dynamic range 86dB; bandwidth 16kHz or 8kHz dependent on program; input impedance 10kΩ nominal balanced; max input level +24dBm (full dynamic range available from −10 to +24dBm); output impedance 150Ω nominal, electronically balanced (suitable for driving 600Ω at +18dBm).

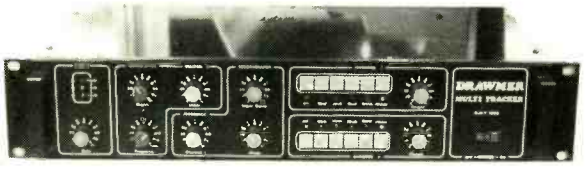
MXR Model 151 Delay System II

Digital time delay unit providing various effects including flanging, chorus, Doppler shifting, doubling, and hard reverb and echo. Features a four-digit display indicating the actual time delay in use while LEDs indicate the bandwidth of the system at each delay setting. Other front panel LEDs indicate optimum operating level, delay bypass and repeat-hold. Standard time delay is 1.6s but can be expanded to 3.2s with a plug-in memory option. The expanded memory capability allows echo effects of up to 800ms to be created at a 16kHz bandwidth, or alternatively 1.6s at 8kHz and 3.2s at 4kHz bandwidth. The unit is housed in a usual style MXR rack mount case and features *XLR* and phone jack inputs and outputs and a level switch to optimise S/N ratio for line and instrument level operation.

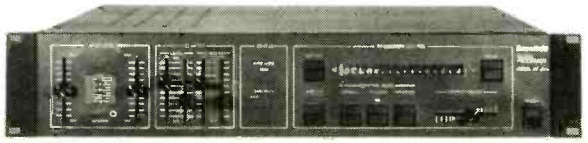
Specifications: max input +20dBm; input impedance 40kΩ balanced, 470kΩ unbalanced; max output +16dBm; output impedance 100 ; dynamic range 85dB; THD 0.2% at 1kHz; sweep frequency range 0.1 to 20Hz (triangle waveform); frequency response 20Hz to 22kHz ±1dB (dry).

Quad-Eight System 5

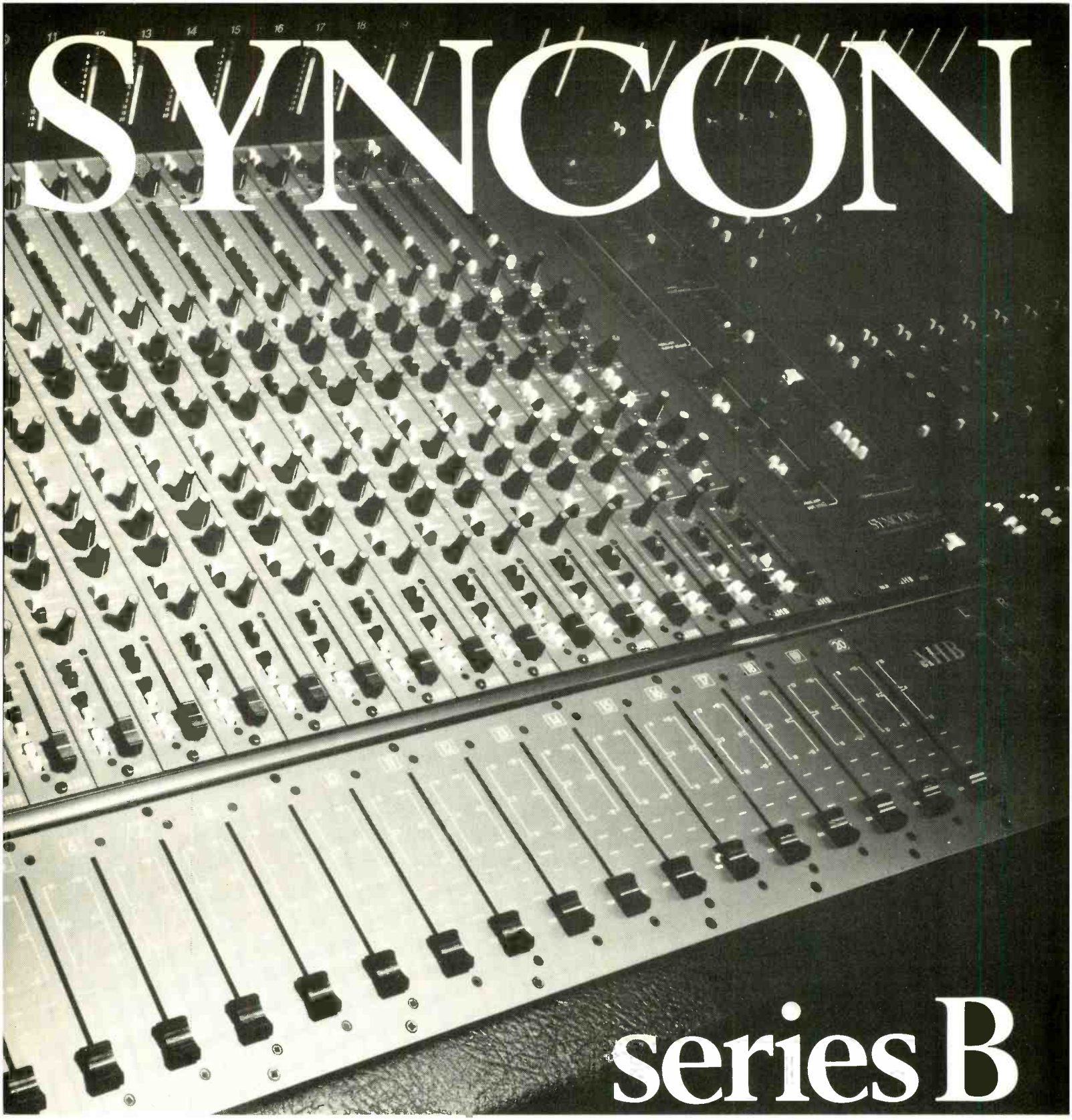
Quad-Eight has announced that its *System 5* digital reverb introduced at the last New York AES Convention is now available. The *System 5* reverb comprises two units, a 5¼in rack-mounted electronics mainframe processor with pull-out circuit card drawer and a remote calculator style controller. The reverb is a 15-bit digital design with a 14kHz bandwidth and its specifications include a dynamic range of 103dB and S/N ratio of 83dBV. The unit includes four individual reverb programs—(1) plate; (2) medium density reverb; (3) low density reverb; and (4) straight echo. Further features include four presets, 16 equalisation settings, and microprocessor control. The remote and mainframe are connected through normal audio lines with no multi-connector being required. As an additional facility the *System 5* generates a tape or disk compatible data signal allowing users to record settings into memory for recall at a later date. ■



Drawmer DMT 1080



Eventide SP 2016



Designing a console to follow one of the worlds best selling 16/24 track consoles is obviously not an easy task. Syncon series B, however, proves that it is not impossible.

In its most basic format, the series B is the ideal choice for all professional 8 and 16 track studios and yet with no factory modification can be expanded to a 44 x 24 fully automated console with full function patchbay.

Price? We think you will be surprised.

AHB

ALLEN AND HEATH BRENELL LTD.

Pembroke House, Campsbourne Road,
Hornsey, London N8
Tel: 01-340 3291 Telex: BATGRP G 267727

Main selling Agents UK: Studio Equipment Services, 100 Hamilton Road, London NW11, Tel. 01-458 9133.REW Professional, 114 Charing Cross Road, London, WC2. Mr Neil Hassell, Tel. 01-836 7851. Music Laboratory, 72/74 Eversholt Street, London, NW1. Mr Paul Eastwood, Tel. 388 5392. Audio Services, 25 South Meadway, High Lane, Stockport, Cheshire. Mr Alan Cheetham, Tel. (066 32) 2442. **Main Warranty and Service Agent**: Studio Equipment Services. **USA. East Coast**: Audiomarketing Ltd, Stamford, Connecticut 06906, USA, Tel. (203) 359-2312. **W. Germany**: Studio Sound & Music, Frankfurt, Main 1, W. Germany, Tel. 0611/28 49 28. **Japan**: Otari Electric Company Ltd, Tokyo 167, Japan, Tel. (03) 333 9631. **Australia**: Audio Mix Systems (Int.) Pty. Ltd, Tel. Sydney (02) 371-9009. **Holland**: Special Audio Products, Amsterdam, Holland, Tel. 020 79 70 55. **Italy**: Audio Consultants SPA, Modena (Italia), Italy, Tel. (059) 225762. **Spain**: Fading, Madrid 15, Spain, Tel. 4579568 or 4468325. **Sweden**: Intersonic AB, Stockholm, Sweden, Tel. 01-88 03 02.

product EFFECTS guide

ACCESSIT (UK)

Bandive Ltd, 8 East Barnet Road, New Barnet, Herts. EN4 8RW. Phone: 01-440 9221. Telex: 25769.
USA: The Mike Shop, PO Box 366, Elmont, NY 11003. Phone: (516) 437-7925.

Accessit Reverb: miniature spring reverb, 3·5s decay time.

ADVANCED AUDIO DESIGNS (USA)

Advanced Audio Designs, 3890 Steward Road, Eugene, Oregon 98402. Phone: (503) 485-4251.
UK: Turnkey, 8 East Barnet Road, New Barnet, Herts. EN4 8RW. Phone: 01-440 9221. Telex: 25769.

Model D-250: digital delay line, 0 to 250ms delay range in 1ms increments.

AKG (Austria)

AKG GmbH, Brunhildengasse 1, A-1150 Wien. Phone: 0222 92.16.47. Telex: 11839.
UK: AKG Acoustics Ltd, 191 The Vale, London W3 7QS. Phone: 01-749 2042. Telex: 28938.
USA: AKG Acoustics Inc, 77 Selleck Street, Stamford, Conn 06902. Phone: (203) 348-2121. Telex: 84451121.

BX5: stereo reverb unit, 1, 2 or 3s reverb decay time.
BX10: 2-channel mechanical reverb unit, 1·5, 2·5 or 3·5s reverb decay time.
BX15: 2-channel mechanical reverb unit, reverb decay time variable in 0·5s steps from 1·5 to 3·5s.
BX20: 2-channel mechanical reverb unit with remote control, 2 to 4·5s continuously variable reverb decay time.
BX22: 2-channel mechanical reverb unit, reverb decay time 2 to 4·5s continuously adjustable.
BX25: 2-channel mechanical reverb unit with remote control, 1·5 to 3·5s adjustable reverb decay time.
BXM: mono reverb unit for stage usage. Reverb time 1·5 or 20s, delay time 50, 100, 150 and 200ms or combinations thereof.
TDU 7000: modular digital time delay unit using 12 + 2 bit system. *M710* input, *M720* output, *M730* delay extension, *M740* remote control, *M750* effects modules and 8-bay *N700* mainframe unit. *M720* features 399ms max delay, *M730* extends delay by 200, 400, 600 or 800ms. *M750* provides time base modulation plus VCO facilities and adjustment of nominal delay time.

ALTEC (USA)

Altec Corp, 1515 South Manchester, Anaheim, Cal 92803. Phone: (714) 774-2900. Telex: 655415.
UK: Theatre Projects Services Ltd, 10 Long Acre, London WC2E 9LN. Phone: 01-240 5411. Telex: 27522.

Model 1640 Time Delay System: sound reinforcement delay unit for stage usage. Six 20ms delayed outputs, max delay 120ms. Units may be cascaded to a max of 600ms.
Model 1660/1661 Time Delay System: digital sound reinforcement delay unit for stage usage. Six delayed outputs continuously variable from 0 to 510ms. *Model 1661* tamper-proof version.

AMS (UK)

Advanced Music Systems, 1 & 3 Wallstreams Lane, Worsthorne Village, Nr. Burnley, Lancs. Phone: 0282 36943. Telex: 63108.
USA: Quintek Distributors Inc. 4721 Laurel Canyon Blvd, Suite 209, North Hollywood, Cal 91607. Phone: (213) 980-5717. Telex: 194871.

DM 2·20: flanger/vibrato/delay generator. Features twin delay path and manual or automatic flanging. Max delay 20ms, 80ms with optional memory module.
DM 2·28: as *DM 2·20* but with 80ms max delay.
DMX 15-80: modular programmable 15-bit DDL/harmoniser. 18kHz delay bandwidth. Accepts 102 or 400ms delay cards, 16s max delay.
DMX 15-80S: stereo version of *DMX 15-80*. Facility to incorporate two pitch change modules for multiple harmonising.
DMX 15-80SB: broadcast stereo version of the *DMX 15-80*, max delay 2s per channel.
Digital Loop Editing System: loop editing system for the *DMX 15-80 Series*.
DM-DDS: stereo disc mastering DDL, max delay 1·6s expandable to 10s. Two bandwidth versions available.
DMX 15R: programmable digital reverb system for interface with any of the *DMX Series* DDLs.

APHEX (USA)

Aphex Systems Ltd, 7801 Melrose Avenue, Los Angeles, Cal 90046. Phone: (213) 655-1411. Telex: 910-321 5762.
UK: AKG Acoustics Ltd, 191 The Vale, London W3 7QS. Phone: 01-749 2042. Telex: 28938.

Aural Exciter 602B: phase shift and delay unit (broadcast model and leasing available).
Aphex II: studio Aural Exciter, phase shift and delay unit (broadcast model available).

AUDICON (USA)

Audicon Inc, 1200 Beechwood Avenue, Nashville, Tenn 37212. Phone: (615) 256-6900. Telex: 554494.
UK: Trad Electronic Sales Ltd, 149b St Albans Road, Watford, Herts WD2 5BB. Phone: 0923 47988. Telex: 262741.

The Plate II Reverb System: second generation plate reverb system with remote control unit. Adjustable reverb time 1 to 4s.

AUDIO & DESIGN (UK)

Audio & Design (Recording) Ltd, North Street, Reading, Berkshire RG1 4DA. Phone: 0734 53411. Telex: 848722.
USA: Audio & Design Recording Inc, PO Box 786, Bremerton, Washington 98310. Phone: (206) 275-5009. Telex: 152426.

S24 Time Shape Module: ADT/flanger and time domain processor from *Scamp* range. 1.2 to 45ms delay range.
S23 Pan Effects Module: variable pan patterns with trigger, speed and envelope-following: from *Scamp* range.

AUDIO MACHINERY (USA)

Sound Workshop Inc, 1324 Motor Parkway, Hauppauge, NY 11787. Phone: (516) 582-6210. Telex: 649230.
UK: Trad Electronic Sales Ltd, 149b St Albans Road, Watford, Herts WD2 5BB. Phone: 0923 47988. Telex: 262741.

Shared Access Memory System: modular digital memory system. 16kHz bandwidth, 400ms delay standard, expandable to 6s.

BANDIVE (UK)

Bandive Ltd, 8 East Barnet Road, New Barnet, Herts. EN4 8RW. Phone: 01-440 9221. Telex: 25769.
USA: The Mike Shop, PO Box 366, Elmont, NY 11003. Phone: (516) 437-7925.

The Great British Spring: mechanical spring reverb unit, 3·5s reverb decay time.

BARTH (West Germany)

R. Barth KG, Grillparzerstrasse 6a, D-2000 Hamburg 76. Phone: 040 229 8883. Telex: 0212095.
UK: Eela Audio Industries Ltd, 13 Molesworth, Hoddesdon, Herts. EN11 9PT. Phone: 09924 68674.
USA: Audicon Inc, 1200 Beechwood Avenue, Nashville, Tenn 37212. Phone: (615) 256-6900. Telex: 554494.

Audios: sound storage memory, transposer and time delay unit. Delay section 0.3 to 100ms delay per channel. expandable to 410ms.

BEL(UK)

BEL Electronics, 48 Aylesbury Street, Bletchley, Milton Keynes, Bucks. Phone: 0908 641063.
UK: Don Larking Audio Sales, 50 Cheapside, Luton, Beds. Phone: 0582 27195/26693. Telex: 825488.
USA: The Mike Shop, PO Box 366, Elmont, NY11003. Phone: (516) 437-7925.

BF20 Mk2 Stereo Flanger: switchable mono. Delay variable 0.25 to 10ms.
BA40 Delay Line/Flanger: mono analogue delay line/flanger with pseudo stereo outputs. Delay 0.5 to 20ms (flange mode) 4 to 160ms (delay mode).

BIAMP (USA)

Biamp Systems Inc, 9600 SW Barnes Road,

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The Unlimited Limiter.

In keeping with MXR's expanding commitment to the professional recording industry, our engineers have designed and built the Dual Limiter. A world class mono-stereo limiter offering total flexibility and ease of operation, the Dual Limiter produces a musically natural response in any compression-limiting application. All of this versatility is built into a compact, rack-mountable package.

The totally unique VCA's at the heart of the Dual Limiter provide an exceptionally wide dynamic range with low levels of distortion. Continuous bass distortion is much lower in level than typical compressor-limiters, allowing more freedom in setting release characteristics.

The Dual Limiter is also a forgiving limiter. Attack and release characteristics dictated by the front panel controls are modified by program dynamics and compression requirements. The slope increases smoothly past the threshold point, allowing a *gradual* transition into compression. Varying the Dual Limiter's threshold region produces a variety of intermediate slopes with the primary slope being that chosen by the slope switch. These features permit apparent dynamics to be maintained even though the dynamic range is being controllably limited.

The Dual Limiter's remarkable versatility is based on the fact that it can be viewed as two independent mono limiters that can be patched together via front panel switches for stereo limiting applications. Each channel has an In/Out switch, Slope switch, Input, Output, Attack and Release controls and an LED display, showing the amount of gain reduction. On the rear are both XLR and ¼" phone jack (ring-tip-sleeve) input and output connectors. Each channel's detector is accessible via rear panel phone jacks to permit external tailoring of the detectors' frequency response. This feature allows for de-essing (reduction of vocal sibilance) and a wide variety of frequency dependent limiting needs.

Because virtually every form of musical signal was used to evaluate the Dual Limiter's response during the initial stages of development, its sophisticated internal circuitry enables it to sound musically *natural* — even at extreme compression settings.

Balanced inputs, the ability to drive 600 ohm loads, +19 dBm input and output and standard rack dimensions (1¾" high) allow the Dual Limiter to be easily integrated into any professional system. With an extremely rugged case, metal knobs and reliable internal construction, the new MXR Dual Limiter reflects the highest professional standards and has been fully designed and built in the U.S.A.

The Unlimited Limiter — MXR's natural response to the question of performance and versatility in a space-efficient and cost-effective package. See the MXR Dual Limiter at your nearest MXR dealer.

MXR Professional Products Group

MXR Innovations, (Europe)
34 Bancroft, Hitchin, Herts
SG51LA, Eng.
Phone 0462 31513, Tlx 826967

product EFFECTS guide

Portland, Oregon 97225. Phone: (503) 297-1555.

SR/240: stereo reverb system. 2·5s decay time.

DATABASE (UK)

Database, 1 Vale View Place, Claremont Road, Bath BA1 6QW. Phone: 0225 316102.

Ruby: noise reduction unit for stage effects.

DATATON (Sweden)

Dataton AB, PO Box 257, S-58102 Linkoping. Phone: 013 10.07.11.

System 3000: series of 13 modules including — microprocessor-based 'program sequencer': *3002* VC Sound Generators; *3103* 4-channel Filter; *3104* 4-channel Envelope Shaper; *3107* Quad Equaliser/Preamp; *3203* 2/4-channel Joystick Module; *3205* 4-channel Mixer Module; and *3314* Quad Signal Analyser.

dbx (USA)

dbx Inc, 71 Chapel Street, Newton, Mass 02195. Phone: (617) 964-3210. Telex: 922522.
UK: Scenic Sounds Equipment Ltd, 97-99 Dean Street, London W1V 5RA. Phone: 01-734 2812. Telex: 27939.

▲ **Model 906 Flanger:** from *900 Series* of modules. Delay range 20 to 100ms flange mode, 4 to 40ms delay mode.

DELTALAB (USA)

Deltalab Research Inc, 27 Industrial Avenue, Chelmsford, Mass 01824. Phone: (617) 256-9034.
UK: Scenic Sounds Equipment, 97-99 Dean Street, London W1V 5RA. Phone: 01-734 2812. Telex: 27939.

DL1: DDL with three independent outputs, 5 to 160ms delay.
DL2 Acousticomputer: DDL/effects processor. 16 reverb programmes, 0.25 to 240ms delay.
DL3: DDL, 0 to 120ms delay.
DL4 Time Line: DDL/effects processor, 1 to 512ms delay range.
Memory Module: rack-mounting memory for *DL2* and *DL4*, expanding delay range to 2·5s.
DL5 Harmonicomputer: digital effects/pitch transposing unit. May be used with an external delay unit such as the DeltaLab *DL4*.

DRAWMER (UK)

Drawmer Electronics, 183 Cobden View Road, Sheffield S10 1HT. Phone: 0742 668520.
UK: Studio Equipment Services Ltd, 100 Hamilton Road, London NW11 9DY. Phone: 01-458 9133. Telex: 87515.

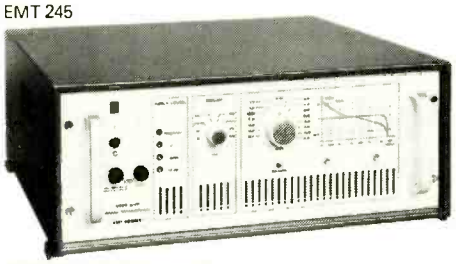
DMT 1080 Multi-tracker: analogue delay line based system able to create various stereo effects from a mono input. Variable delay range from 0.3 to 80ms.

DYNACORD (West Germany)

Dynacord Electronic GmbH, Sienmensstrasse 41-43, D-8440 Strubing. Phone: 09421 3103.
UK: Beyer Dynamics (GB) Ltd, 1 Clair Road, Haywards Heath, Sussex RH16 3DP. Phone: 0444 51003.
USA: Dynacord Electronics Inc, PO Box 26038, Philadelphia, Penn 19128. Phone: (215) 482-4992.

DRS78: digital echo/reverb unit. Delay range 0 to 320ms.
TAM19: time axis manipulation device.
TAM21: 2-channel analogue phaser/flanger unit with remote control facility.
SRS56: stereo echo/reverb system. Delay range 30 to 560ms, reverb time 30ms to 20s.

EMT 245



EMT (West Germany)

EMT-Franz GmbH, Postfach 1520, D-7630 Lahr. Phone: 07825 512. Telex: 754319.
UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts. WD6 4RZ. Phone: 01-953 0091. Telex: 27502.
USA: Gotham Audio Corp, 741 Washington Street, New York, NY 10014. Phone: (212) 741-7411. Telex: 129269.
EMT 140TS: stereo reverb plate with adjustable 1 to 4s reverb period. Optional remote control.
EMT 140Q: quadraphonic version of *EMT 140TS*.
EMT 240: stereo reverb plate, adjustable 1 to 4s reverb period.
EMT 245: digital reverb, decay range 0·4 to 4·5s in 16 steps (frequency dependent).
EMT 251: digital reverb. Four programmable outputs, decay time variable 0·2 to 4·5s dependent on frequency. Initial delay 0 to 80ms or 40 to 120ms.
EMT 444: digital delay unit, delay time 1 to 255ms in 1ms steps.
EMT 446: digital signature tune repetitor available in three versions with either 5s, 6s, or 12s store.

EVENTIDE (USA)

Eventide Clockworks Inc, 265 W 54th Street, New York, NY 10019. Phone: (212) 581-9290.
UK: Feldon Audio Ltd, 126 Great Portland Street, London W1N 5PH. Phone: 01-580 4314. Telex: 28668.

Model 1745M Digital Delay: delay time 0 to 320ms continuously variable.
Model H910 Harmonizer: delay time 0.3 to 60ms pitch shift mode, 0 to 112ms in 7.5ms steps delay mode.
Model 2830 Omnipressor: dynamic modifier combining compressor/expander/noise gate/limiter characteristics.
Model FL201 Instant Flanger: delay time 200μs to 10ms, 50ms max. May be altered to an *Instant Phaser* by inserting the *BPC 101* phaser card.
BD955: broadcast delay line with max 6·4s delay. Versions available with 1·6 and 3·2s delay.
H949 Harmonizer: delay time 0 to 300 ms in 50ms steps pitch change mode. 0 to 393.75ms in 6.25ms steps delay mode.
Model JJ193: DDL, delay time 0 to 510ms in 2ms steps. Optional 1·022 and 2·046s.
Model CD254: DDL, delay time 0 to 254ms in 2ms steps. Two outputs.
HM80 Harmonizer: delay range 0 to 270ms.
Model SP2016: digital reverb/programmable effects processor. Non-volatile memory stores up to 32 programs. Delay range 0 to 1·6s in 25μs steps (16kHz bandwidth) or 0 to 3·2s in 50μs steps (8kHz bandwidth).

EXR (USA)

EXR Corp, 11523 Dexter-Pinckney Road, Pinckney, Michigan 48169. Phone: (313) 878-9445.
UK: Turnkey, 8 East Barnet Road, New Barnet, Herts. EN4 8RW. Phone: 01-440 9221. Telex: 25769.

EXR Exciter Model EXIII: signal clarification and boosting unit.
EXR Exciter Model SP-1: 2-channel unit for small studios and live usage.

FURMAN (USA)

Furman Sound Inc, 616 Canal Street, San Rafael, Cal 94901. Phone: (415) 456-6766.
UK: Atlantex Music Ltd, 34 Bancroft, Hitchin, Herts. SG5 2LA. Phone: 0462 31511. Telex: 826967.

RV-1: mechanical reverb system. Decay time 1·8s with 30 to 40ms initial delay.

GELF (UK)

Gelf Electronics Ltd, Unit 5 Mount Avenue, Bletchley, Milton Keynes MK1 1LS. Phone: 0908 77503/647262.

Auto Phasing Unit GP14: voltage-controlled phasing unit, decay range 30ms to 3s.

HH ELECTRONIC (UK)

HH Electronic, Viking Way, Bar Hill, Cambridge CB3 8EL. Phone: 0954 81140. Telex: 817585.

Digital Multi Echo Unit: mechanical reverb, analogue electronic CCD delay. Delay range 21.5 to 312ms.
Digital Echo Unit: analogue electronic CCD delay. Delay range 34 to 208ms plus repeat effects.

INDUSTRIAL RESEARCH PRODUCTS (USA)

Industrial Research Products Inc, 321 Bond Street, Elk Grove Village, Illinois 60007. Phone: (312) 439-3600.
UK: Knowles Electronics Ltd, Victoria Road, Burgess Hill, Sussex RH15 9LP. Phone: 04446 5432. Telex: 87460.

DA-4006, DA-4007 Audio Signal Delay: electronic digital, rack-mounting delay units.
DA-4008 Audio Program Delay: electronic digital delay with 240ms max delay.

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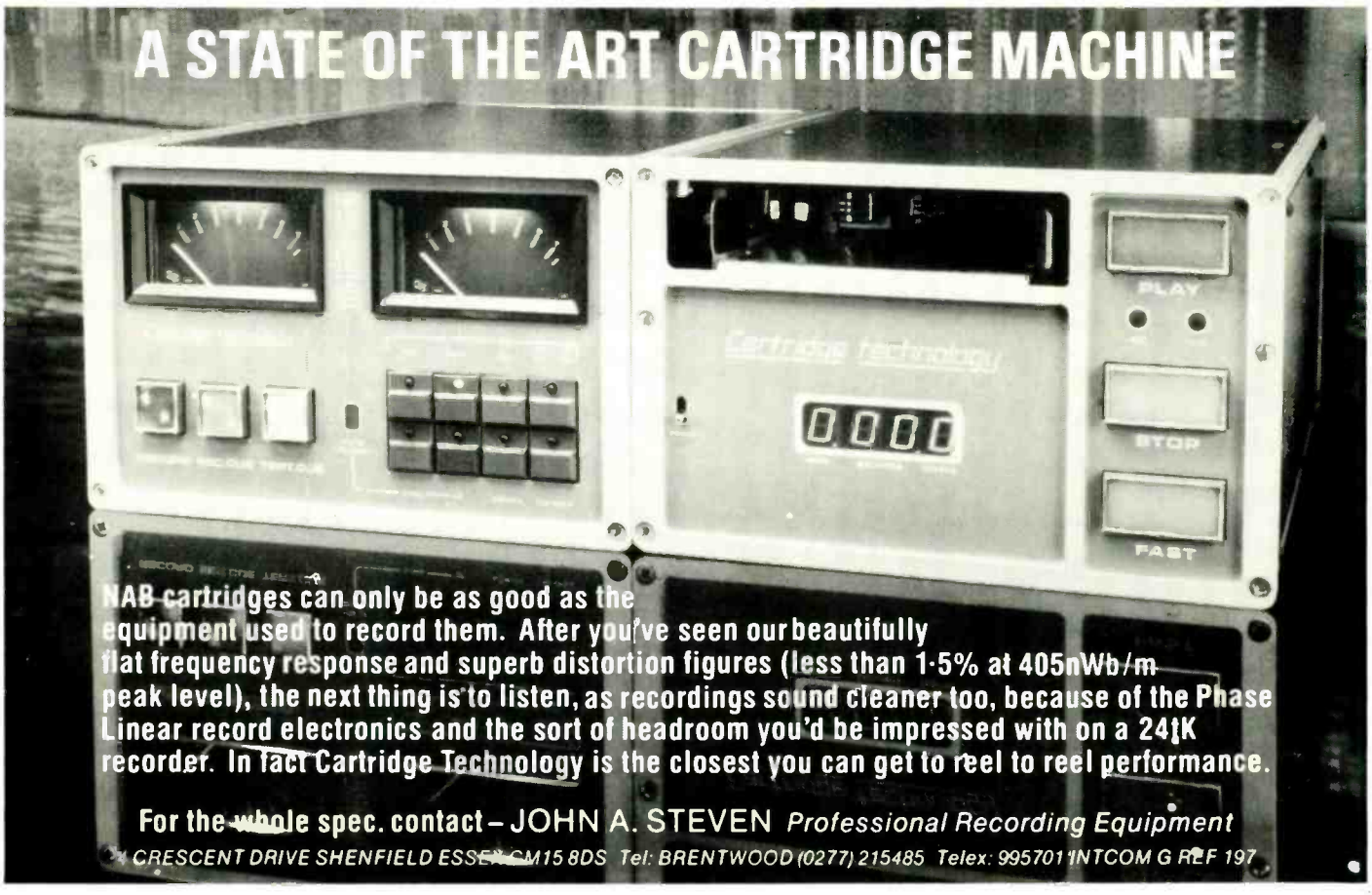
COMPLEMENTARY PAIR

The 828, a high quality stereo output mixer with 8 or 12 mono mic/line inputs, HF, MF & LF equalisation, echo and foldback sends, PFL on headphones, limiters on outputs. PPMs & phantom power optional.

The 828-S, a broadcast quality stereo output mixer with 3 mono mic/line inputs and 5 stereo RIAA (phono) or line inputs. Comprehensive monitoring facilities include stereo 'B' check input with gain control, phase reverse, mono and dim, PFL on meters, VU's or PPMs to order. 48v phantom power standard. LS mute by fader micro-switch available.

Alice (Stancoil Ltd.)

Alexandra Road, Windsor, England. Tel: (075-35) 51056/7 Telex: 849323 Aegis G.



product EFFECTS guide

DC-4011 Audio Program Delay: digital CCD delay. Delay range 96ms in 4ms steps.
DD-4012 Sound Delay Module: digital CCD delay. Delay range 64ms in 4ms steps. Optional 96, 128 and 160ms delay range.

KLARK-TEKNIK (UK)

Klark-Teknik Research Ltd, Walter Nash Road West, Coppice Trading Estate, Kidderminster, Worcs. DY11 7HS. Phone: 0562 741515. Telex: 339821.
USA: Klark-Teknik Electronics Inc, 262A Eastern Parkway, Farmingdale, NY 11735. Phone: (516) 249-3600.

DN34: analogue time processor, delay time 0·38 to 53ms continuously variable.
DN36: analogue time processor, delay time 0·5 to 50ms continuously variable.
DN70: digital time processor. Combines three separate digital delay times, delay range 163ms, or optionally 326 or 652ms.
DN71: add-on control unit for *DN70*, offering delay setting in 20ms steps, plus pitch control, time sweep effects and freeze control.
DN72: add-on memory bank for *DN70*, giving 18 pre-selected non-volatile memories.

LAWSON (USA)

Lawson Inc, 842 Reeves Road, Antioch, Tenn 27013. Phone: (615) 834-8614.

LP-1 Plate: plate with adjustable 1 to 4s reverb time.

LEXICON (USA)

Lexicon Inc, 60 Turner Street, Waltham, Mass 02154. Phone: (617) 891-6790.
UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts. WD6 4RZ. Phone: 01-953 0091. Telex: 27502.

Model 91, Model 92 Digital Delays: single-channel DDL's. *Model 92* has two outputs. Delay time 0 to 120ms in 7.5ms steps.
Varispeech Model 27: real time pitch shifting unit.
Model 93 Prime Time: digital delay/processor/mixer. Delay capacity 0 to 128ms, with add on *Delay Module Memory* 256ms.
PCM 41: digital delay processor. Delay time 0 to 400ms or 800ms with 6kHz bandwidth.
Model 122 Digital Delay: DDL with mono or stereo versions. Delay time 40 to 320ms in 5ms steps (mono), 40 to 160ms in 2.5ms steps (stereo).
Model 1200 Audio Time Compressor: allows recorded material to be played back at different speeds without pitch change.

LEXICON MODEL 224

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

Model 224 Reverberation System: electronic digital reverb system with interchangeable programs. Pre-delay up to 256ms, decays from 600ms to 70s.

LOFT (USA)

Phoenix Audio Laboratory Inc, 91 Elm Street, Manchester, Connecticut 06040. Phone: (203) 646-7806.

Model 440 Analogue Delay Line/Flanger: wide variety of effects with noise reduction. Delay time 0.5 to 150ms in four ranges.
Model 450 Analogue Delay Line/Flanger: updated version of the *Model 440*. Details still to be announced.

MARSHALL (USA)

Marshall Electronic, 1205 York Road, Suite 14, Lutherville, Maryland 21093. Phone: (301) 484-2220.
UK: Feldon Audio Ltd, 126 Great Portland Street, London W1N 5PH. Phone: 01-580 4314. Telex: 28668.

Minimodulator: digitally programmed time modulator.
Model 5402 Time Modulator: development of the *Model 5002* time domain modifier. Delay continuously variable up to 400ms. Two delay lines with 3 taps and 72.1 sweep range.

MICMIX (USA)

MicMix Audio Products Inc, 2995 Ladybird Lane, Dallas, Texas 75220. Phone: (214) 352-3811.
UK: Scenic Sounds Equipment, 97-99 Dean Street, London W1V 5RA. Phone: 01-734 2812. Telex: 27939.

Dynaflanger 265: Versatile amplitude/frequency enabled/sweep flanger.
Master-Room XL-305: stereo rack-mounting mechanical reverb system, decay time 3·5s.
Master-Room XL-500: stereo reverb system using analogue and digital techniques. Three operating modes — plate 1 to 3s; room 2 to 4s; and hall 3 to 7s.
Master-Room XL-210: mechanical reverb system, stereo/mono switchable. Decay time 3s.

MXR (USA)

MXR Innovations Inc, 740 Driving Park Avenue, Rochester, NY 14613. Phone: (716) 254-2910. Telex: 978451.
UK: Atlantex Music Ltd, 34 Bankcroft, Hitchin, Herts. SG5 1LA. Phone: 0462 31511. Telex: 826967.

Digital Delay: electronic DDL with effects processing. Delay capacity 160ms (20kHz bandwidth), max delay 1·28s with 2.5kHz bandwidth
Model 151 Delay System II: digital time delay unit with effects processing. Delay capacity 1·6s expandable to 3·2s.
Flanger/Doubler: signal processing unit providing variety of time delay effects. Delay range 17.5 to 70ms (doubling), 0.25 to 5ms (flanging).
Pitch Transposer: real time pitch shifter.
Auto Phaser: phase shifting module, for *Professional Products Rack*.
Auto Flanger: auto flanging module for *Professional Products Rack*. Time delay range variable 0.2 to 2ms.

NEUTRIK (Liechtenstein)

Neutrik AG, Oberglass 16, FL-9494 Schaan. Phone: 075 2.63. 83. Telex: 77771.
UK: Eardley Electronics Ltd, Eardley House, 182-184 Campden Hill, London W8 7AS. Phone: 01-221 0606. Telex: 299574.
USA: Philips Audio Video Systems Corp, 91 McKee Drive, Mahwah, New Jersey 07430. Phone: (201) 529-3800.

AD4: analogue delay line. Four separate adjustable outputs, delay time 12.5 to 50ms, 25 to 100ms, 37.5 to 150ms and 50 to 200ms.

ORBAN (USA)

Orban Associates Inc, 645 Bryant Street, San Francisco, Cal 94107. Phone: (415) 957-1063. Telex: 171480.
UK: Scenic Sounds Equipment, 97-99 Dean Street, London W1V 5RA. Phone: 01-734 2812. Telex: 27939.

111B Reverb: 2-channel spring reverb unit. Decay time 2s, delay time 30ms between direct/reverb.
245E Stereo Synthesiser: generation of simulated stereo from mono sources.
526 De-esser: dynamic sibilance controller with two levels of de-essing.
516EC De-esser: 3-channel single-level de-esser.

PSE (UK)

Production Studio Equipment Ltd, 72-74 Eversholt Street, London NW1. Phone: 01-388 5392.
Worldwide distribution: Steve Graham Audio Ltd, 20 Victoria Road, New Barnet, Herts EN4 9PF, UK. Phone: 01-449 3663/4044. Telex: 8955127.

Studio Reverb: mono input/dual output mechanical spring reverb. Multiple 33, 37 and 41ms delay, decay time 2·5 to 3s.

PUBLISON (France)

Publison Audio, 5-11 Rue Crespin du Gast, F-75011 Paris. Phone: (1) 375.64.07.

DHM89B2: stereo, digital manipulation unit of memorised sounds. Dual digital delay, max 1·2s.
DHM83B: similar to *DHM89B2* but lower delay 600ms max, quasi stereo delay.
Fullmost: relief enhancer to increase brightness of music or speech.

QUAD/EIGHT (USA)

Quad/Eight Electronics, 11929 Vose Street, North Hollywood, Cal 91605. Phone: (213) 764-1516. Telex: 662446.
UK: Audio Kinetics (UK) Ltd, Verulam Road, St Albans, Herts. AL3 4DH. Phone: 0727 32191. Telex: 299951.

CPR-16A: programmable electronic reverb system. 250ms to 20s adjustable reverb decay time.
TM499A: electronic DDL, 85ms delay per module (max six) selectable in 1ms steps.

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The UREI Equalizers

In the hands of a professional, an equalizer can work wonders. For the person who owns a UREI equalizer, miracles are often made.

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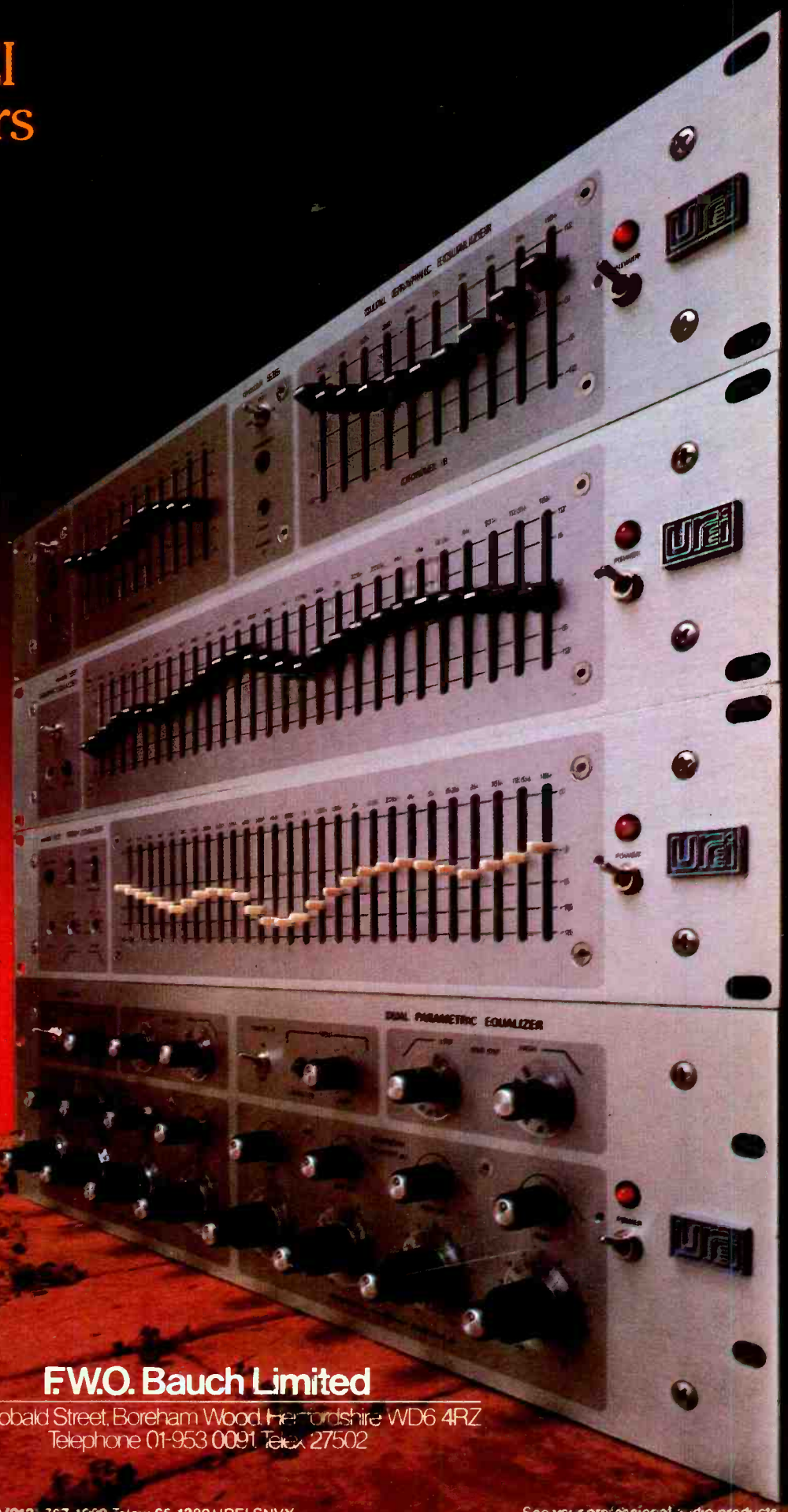

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QA-201 Reverb: stereo chamber using two *Accutronics* reverb units, each channel having its own input level and hf tone controls.

REBIS (UK)

Rebis Audio, Kinver Street, Stourbridge, West Midlands DY8 6A. Phone: 0384 71865.
UK: Scenic Sounds Equipment, 97-99 Dean Street, London W1V 5RA. Phone: 01-734 28112. Telex: 27939.
USA: Klark-Teknik Electronics Inc, 262A Eastern Parkway, Farmingdale, NY 11735. Phone: (516) 249-3600.

RA200 Series Delay System: delay system using two *RA205* ADT/Delay modules, *RA208* Modulator and *RA209* Mixer module. *RA208* can control *RA205* and *RA209* to create various effects. *RA205* has internal feedback and mix controls, variable delay time in two ranges – 2 to 40ms and 40 to 80ms.

ROLAND (Japan)

UK: Roland (UK) Ltd, Unit 6, Great West Trading Estate, 938 Great West Road, Brentford, Middlesex TW8 9DN. Phone: 01-568 4578. Telex: 888941.
USA: Roland Corp US, 2401 Saybrook Avenue, Los Angeles, Cal 90040. Phone: (213) 685-5141.

SRE 555

Roland Rack System: includes *SRE-555* Echo unit, *SDD-320* Dimension D chorus effect, *SBF-325* Stereo Flanger.

SONY (Japan)

UK: Sony UK Ltd, Pyrene House, Sunbury-on-Thames, Middlesex TW16 7AT. Phone: 09327 89581/876441. Telex: 266371.
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DRE-2000: 2-channel programmable digital reverb unit with digital and analogue I/O capability. Four modes of pre-programmed reverb can be selected with up to 50 programmable stores.

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262 Stereo Reverberation System: mechanical stereo reverb system with extended lf and hf response, two channels of eq with ±15dB sweepable from 50Hz to 1kHz and 500Hz to 10kHz.

STATIK (UK)

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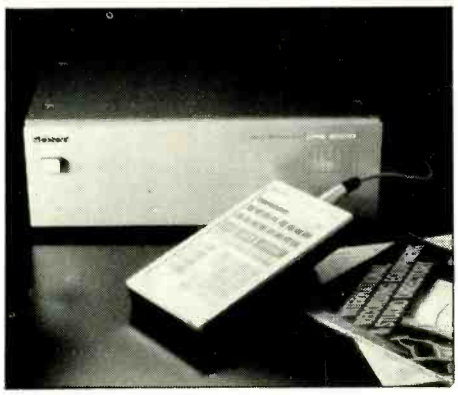
USA: Klark-Teknik Electronics Inc, 262A Eastern Parkway, NY 11735. Phone: (516) 249-3600

SA100 Dynamic Delay/Flanger: single output analogue delay-based system. Delay mode: 16kHz 4 to 40ms, 8kHz 8 to 80ms, 4kHz 16 to 160ms; flange



Sony DRE-2000

mode: 16kHz 0.66 to 6.6ms, 8kHz 1.3 to 13.3ms, 4kHz 2.67 to 26.7ms.
SA20 Dual Reverberation System: multiple spring mechanical reverb system, hf & lf controls, initial delay 35ms, decay time 2s.

STOCKTRONICS (Sweden)

Stocktronics Electronik, Grevgatan 49, S-11458, Stockholm. Phone: 08.60.01.11.
UK: Industrial Tape Applications, 1-7 Harwood Avenue, Marylebone Road, London NW1. Phone: 01-724 2497/7368. Telex: 21879.

RX4000 Reverberation Plate: portable stereo reverb plate with decay time of 4s at 500Hz (option for 2s).

STRAMP (West Germany)

Peter Struven GmbH, Bornheide 19, D-2000 Hamburg 53. Phone: 040 801028.

Echo-700: combined stereo echo (plus reverb), phaser and vibrato unit. Delay and effects sections can be linked to create other special effects.

STUDIO TECHNOLOGIES (USA)

Studio Technologies, 6666 North Lincoln Avenue, Lincolnwood, Illinois 60645. Phone: (312) 676-9400.
UK: Turnkey, 8 East Barnet Road, New Barnet, Herts EN4 8RW. Phone: 01-440 9221. Telex: 25769.

Ecoplate: reverb plate with adjustable reverb time from 1 to 7s, horizontal or vertical mounting.
Ecoplate II: smaller version *Ecoplate* with reverb time from 1 to 6s.

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

Autopanner: quad/stereo automatic panning unit which can slave or be slaved by other effects units. Will also duck and vibrato.

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Phase Filter: phaser using frequency notching techniques.

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UK: Feldon Audio Ltd, 126 Great Portland Street, London W1N 5PH. Phone: 01-580 4314. Telex: 28668.
USA: Parasound Inc, 680 Beach Street, San Francisco, Cal 94109. Phone: (415) 673-4544.

Phaser 203: analogue phase shifter.

TECNICOBEL (France)

Tecnicobel, 8 rue de la Croix-Matre, BP26, F-91122 Palaiseau Cedex, Paris. Phone: (1) 920.80.39. Telex: 692543.

CRA 60 Echo Chamber: rack-mounting mechanical reverb system with adjustable reverb time. Features stereo operation, remote control of reverb and eq, adjustable initial delay 0 to 33ms.

TIME TUNNEL (USA)

Wang Voice Communications Inc, Executive Plaza, Hudson, New Hampshire 03052. Phone: (617) 459-5000.

Model 150: broadcast DDL with 6s fixed delay.
Model TDG-1: modular digital delay system converted to stereo by adding modules.

UREI (USA)

United Recording Electronics Industries, 8460 San Fernando Road, Sun Valley, Cal 91352. Phone: (213) 767-1000. Telex: 651389.
UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Herts. WD6 4RZ. Phone: 01-953 0091. Telex: 27502.

Model 927: DDL with delay capacity of 0 to 127ms, four outputs individually adjustable in 1ms steps.

URSA MAJOR (USA)

Ursa Major Inc, Box 18, Belmont, Mass 02178. Phone: (617) 489-0303. Telex: 921405.
UK: Feldon Audio Ltd, 126 Great Portland Street, London W1N 5PH. Phone: 01-580 4314. Telex: 28668.

SST-282 Space Station: digital electronic processor for reverb, multitap delay line, feedback delay and echo, 16 programs of eight delay tap times, taps can be mixed with direct sound and reverb/echo added. Delay capacity of 255ms, 0 to 2·5s decay time.
8X32 Digital Reverb: programmable digital reverb unit featuring hf and lf decay, pushbutton control of decay time, LEDs show settings in use with readout of decay time and peak signal level, up to 19·9s decay time.

WMS (USA)

Wasatch Music Systems, 805 East 3300 South, No 4, Salt Lake City, Utah 84106. Phone: (801) 467-4722.

900-A: digital delay producing flanging, doppler, vibrato and chorus, pitch shifting, ADT, 'Leslie' and cardboard tube echo. Variable delay to 20ms max.

YAMAHA (Japan)

UK: Ban Electromusical Services, 89-97 St John Street, London EC1M 4AB. Phone: 01-253 9410/9079.
USA: Yamaha International Corp, PO Box 6600, Buena Park, Cal 90620. Phone: (714) 522-9105.

Model E1010: analogue delay line with bass and treble eq, feedback and mixing controls with frequency/depth modulation controls, 10 to 300ms delay. ■

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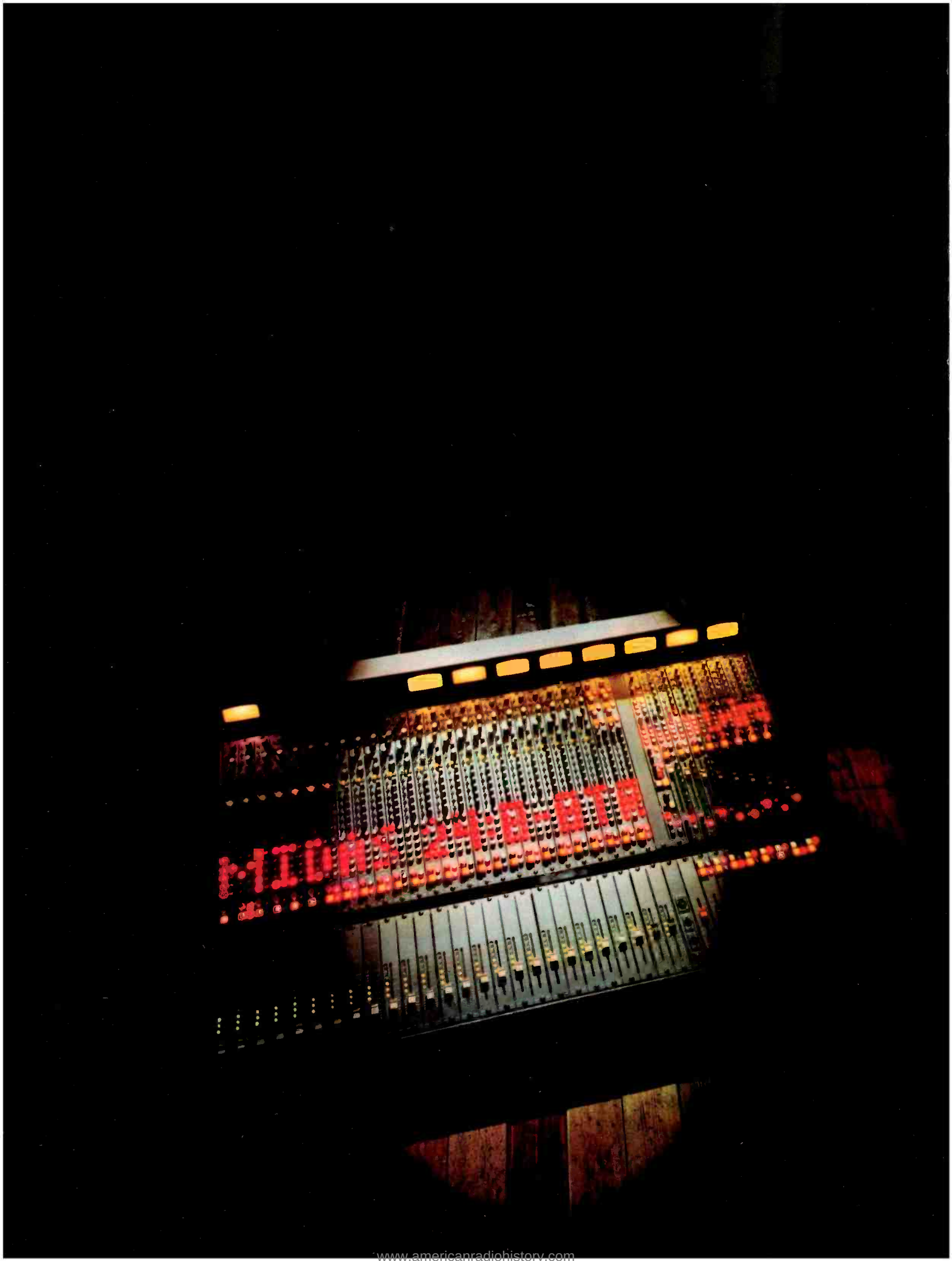

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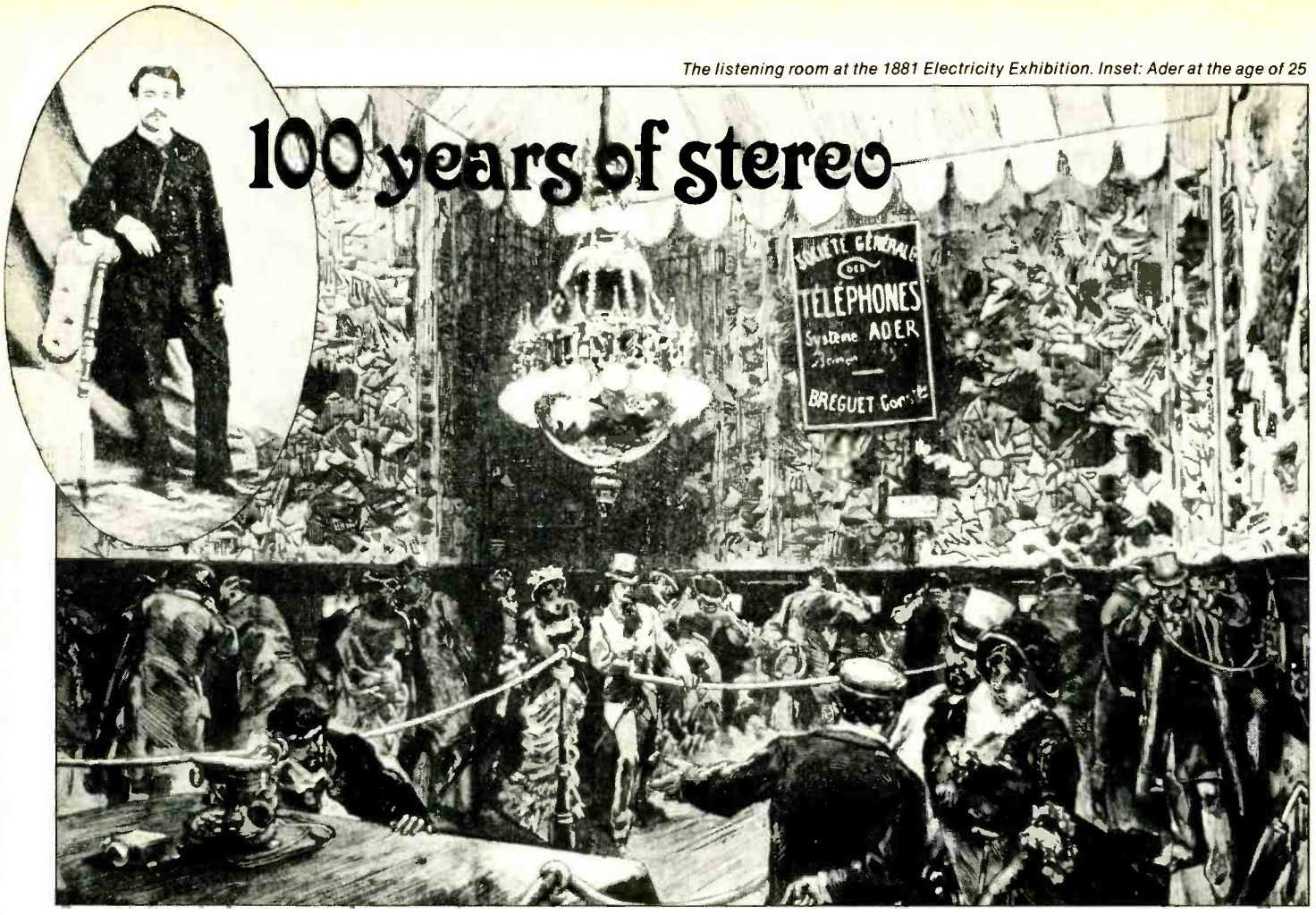


The listening room at the 1881 Electricity Exhibition. Inset: Ader at the age of 25

The Amazing Clément Ader

Antony Askew ARCM, MIBS

The writer had known of the 1881 Ader stereophonic demonstration for some years and had frequently wondered what equipment had been used and indeed what it had sounded like. During an enforced period of a much reduced work-load during the summer of 1980 he decided to look into it more closely. As documents, mostly in French, were translated, it became clear that not only were the demonstrations very successful in the context of the then 'state of the art', but they had become the outstanding attraction of what had been a dazzling international exhibition.

This article attempts to convey not only the techniques Ader used, but also something of the man himself and his other activities as well as a hint of the aura of the Exhibition, of which the "Auditions Téléphoniques" formed only a very small part, and of the reactions of those people who went to hear for themselves.

ONE'S immediate thoughts about the genesis of stereophony go to the Bell Telephone Laboratories and to Alan Blumlein. In America, Bell with their spaced omnidirectional microphone approach and their association with Leopold Stokowski, that doyen of electronically-minded conductors, led to some fascinating experiments—the cartoon feature film *Fantasia* and von Braunmühle's work with the stereophonic *Magnetophon* in Berlin in the '40s—they leave, too, an inheritance that can sometimes be the despair of certain schools of thought. At the same time the Gramophone Company at Hayes had Alan Blumlein on its research staff. This multi-handed electronics genius went on to become a key member of the team that produced the H_2S airborne radar system during the war. He was killed together with four of his colleagues when their Halifax *V9977* crashed near Ross-on-Wye on Sunday, June 7, 1942. An enormous blow to that particularly vital project but the tragedy could have been greater. Their take off from Defford airfield had been watched by the team leader.

It was his flying test laboratory and he should have been on it, but was over-tired. Had he gone we would not have the Jodrell Bank radio telescope today, for he was Bernard Lovell.

In the thirties, Alan Blumlein was working on stereophony and in December 1931 lodged his provisional patent that became Patent No 394,325. It was a classic document that covered very nearly every aspect of the subject almost exactly 50 years ago.

Thus 1981 is a very fitting anniversary for stereo. However, you may be forgiven for raising your eyebrows when you learn that 1981 is also the centenary of the first demonstration of broadcast stereo. Broadcast? Well, yes, in the sense that the relays were intended to be heard by a large number of people simultaneously.

This article is about that first demonstration—and the man behind it, but there are several personalties and sub-stories with a bearing on it. Alexander Graham Bell, the Scot who went to seek his fortune in America, takes credit for inventing the telephone. Indeed, today we refer to a 'phone call as 'giving someone a bell'! Bell lodged his patent for "an improvement in *Telegraphy*" (author's italics) at the US Patent Office on February 14, 1876. The patent was for an instrument that had yet to work. That same day, a Mr Elisha Gray deposited specifications and drawing in the form of a caveat for a similar device. An omission on the part of the US Patent Office resulted in the expiry of the caveat and gave Bell the lead.

(Had Gray won might we today speak of 'giving someone an elisha'?!) Bell's device was made to work the following month. It was born on March 10, 1876, uttering the words: "Mr Watson, come here! I want you!"—a phrase that could almost rate alongside "Dr Livingstone, I presume".

Professor David Edward Hughes, Canadian born, was living and working in London. A discovery of his contributed greatly to telephone technology and it was he, incidentally, who first showed, in 1879, the existence of radio waves up to nearly half a mile from a transmitter at his home at 40 Langham Street, London, a stone's throw from the site that would, nearly 50 years later, become the headquarters of the BBC. No one believed him at the time and it is another who has had the immortality thrust upon him—Hertz, who described and demonstrated the phenomena 10 years later, in September 1889, at the same time averring that *they could be of no practical use.* (Vote now for the One kilo-Hughes LU tone and the insanity of 27 MegaHughes!!)

Hughes' part in the story is his finding that when loosely coupled bits of carbon (or earlier, 3in nails) were connected in series with a battery and a Bell-type earpiece a very sensitive acoustic/electric transducer was formed. He gave a lecture to the Royal Society on May 9, 1878, and showed his devices to which were attached box resonators in which insects could be trapped. The scratching sounds were so 'amplified' by the apparatus that Hughes likened them to the microscope as they acted for the ear as did the microscope for the eye. He thus coined the word *microphone.*

One newspaper account of the demonstration was very coloured:

..the breathing of a fly was heard through the instrument as an elephant bellowing through his proboscis in an Indian Jungle . . .

It was Bell's invention that took the world by storm. It was exactly what the world had been waiting for for centuries. It fired the imagination of many—and the avaricious thoughts of not a few. One man who was fired by a little of both was our hero—Clément Ader.

Ader, notable *and* notorious

Notable, for he was an imaginative and competent engineer in many fields and, as we shall see, contributed many devices and ideas to society. He became the first man in the world to get a piloted flying machine to take off under its own power from level ground and coined a word that has become the generic name in French for any aeroplane—for he called his flying machines *Avions.*

Notorious, for he became the centre of one of the greatest scandals and *causes celèbres* in aviation history.

Clément-Agnes Ader was born in Muret near Toulouse on April 2, 1841. The family was artisan; father was a carpenter and his two grandfathers were a weaver and a miller. He went to school in Toulouse where he developed his aptitude for drawing and things mechanical. He wavered in his choice of career, uncertain whether to become an artist or an engineer. He chose the latter, but the former served him well throughout his life and indeed there is a creditable self-portrait in oils he painted when 25.

He went to work for the railways in 1862 as a superintendent of bridges and tracks and was involved in the construction of the railway line from Toulouse to Bayonne. He devised and patented a machine for setting up rails, which was used extensively; he brought new ideas to bridge building. In 1868 he patented the world's first bicycle with rubber tyres—the *Modélé Trés Elegant* sold for 200 francs. One of his customers was the celebrated acrobat Leotard.

The Franco-Prussian war of 1870 interrupted the bicyclemaking and Ader turned his inventive mind to the war effort; steerable balloons for the siege of Paris and a vehicle with an endless rail track which was rejected by the reactionary War Ministry—thus they threw away the tank nearly 50 years early!

He was also a very keen ornithologist and became fired with an obsessive dream—to fly himself. In 1873 he constructed a tethered man-carrying glider with wings made from goose feathers—an indication of the monomania with nature that would continually lead him along the wrong aviation road.

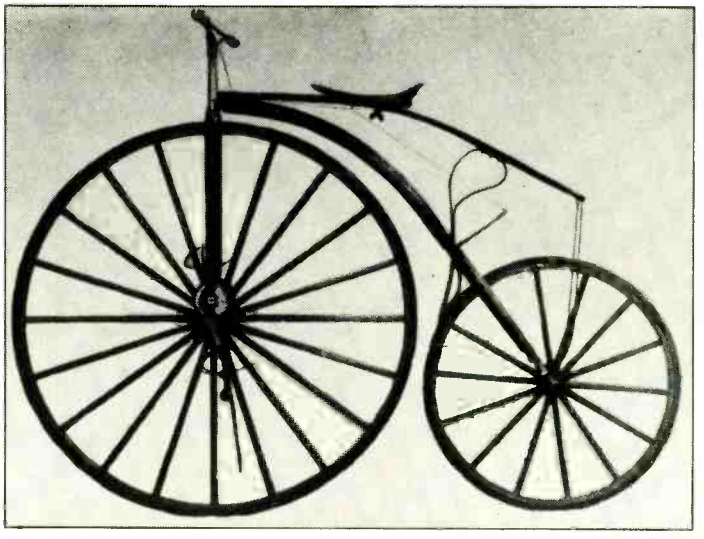
He realised that the large sums of money needed to finance 'The Great Dream' would not come as long as he remained a salaried minion. He resigned from the railway in 1876 and went to Paris to seek some sphere of engineering that would bring him a fortune.

But to what branch of Science should he turn? Which would become the 'wet nurse' to aviation? The Fairy seemed to be electricity. Enthralled by accounts of what had just been discovered in America by Bell, he threw himself into the development of the telephone.

In 1880, under an agreement with the Minister of Posts and Telegraphs, M. Cochery, a company called the Société Générales des Téléphones (The General Telephone Company) was set up and used Ader's discoveries. The new communication revolutionised the life of Paris and the company prospered, being the only one in the field. An installation was put in the office of the President, M. Grévy, with whom Ader became friendly. They dined and played billiards together and, following the success of the music relays at the Exhibition, a 'Théâtrophone' (as it became known) was fitted into the Elysée Palace connecting it with the Opéra, the Théâtre Français and the Odéon Theatre. The press had a little snipe at Grévy, for he had a reputation of being somewhat mean and this was seen as a means of entertaining at the Palace without having to pay artistes!

In 1880, the Academy of Sciences had awarded Ader the Prix Vaillant for his work on the telephone and after the Exhibition he was made a Chevalier of the Legion of Honour. At the same time his interest appears to have been 'bought out' by the bankers involved and his connection with telecommunications came to an end. But he was now famous and sufficiently wealthy to finance The Dream.

Ader's bicycle with rubber tyres (1868)



The father of aviation?

His first flying machine, Avion I, carried the name *Éole*—God of the Winds. It took him eight years to build and a model of it may be seen today in the Science Museum in London.

Based on his preoccupation with nature, it was built like a bat—the wings were folding like an umbrella and could change shape by means of levers and wheels—some might say a forerunner of the variable geometry aeroplanes of today—but far too many controls for the pilot, Ader himself, to operate successfully. Neither was there any forward vision, the pilot being placed behind the boiler—for this was a steam-powered machine and the engine designed by him was the best part of it. It had an extremely good power/weight ratio for its day, developing 20hp, and drove a single propeller made of bamboo constructed like a bird's feather.

On the afternoon of October 9, 1890, *Éole* struggled into the air some 8in and 'flew' about 165ft in the grounds of a chateau at Armainvilliers near Grez. The 'flight' was due more to the power of the engine than its aerodynamic capabilities. But a small aviation 'first'. A flying machine carrying a man *had* left level ground under its own power for the first time. But:

> "The whole conception of the machine—except for its engine—seems to have been the result of a romantic fantasy of flight that Ader harboured, unrealistic in every particular. Enginewise the *Éole* was a brilliant achievement: aeroplane-wise it was . . . a freak."[1]

Ader was then commissioned by the War Ministry to build an improved model. Avion II was never completed and a new commission for Avion III was obtained. This was finished in 1897. The wing movements of *Éole* had been simplified and there were now two steam engines, each driving a propeller. Ader had also demanded that a special *circular* runway, 450m in diameter, be built for the trials on the military camp at Satory. To anyone with the most rudimentary knowledge, this must seem very silly, for any wind would, to a machine trying to achieve takeoff, have appeared coming from the full 360°; let alone giving the pilot, again Ader, the added problem of having to steer round the track whilst, at the

46 ▶

Ader

same time, attempting something 'Man Had Never Done Before'.

Two officially observed tests were made on October 12 and 14, 1897. On neither occasion did Avion III fly, and on the second day was blown off the runway and seriously damaged. The officials departed and wrote their report. The Ministry refused further money; Ader had already had more than 650,000 francs. The report, stating that Avion III was a failure, was kept secret until some years later.

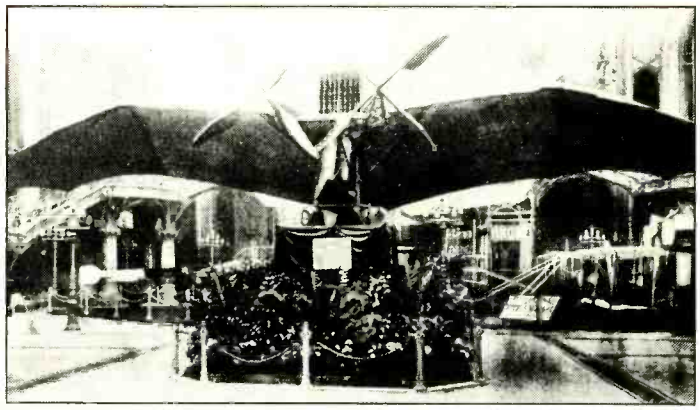
He was embittered, destroyed much of his aviation research work and turned to other matters: a Bateau Glisseu design anticipated the hydrofoil craft of today; a submarine telegraph system which was used to link Brest and Newfoundland; some fearsome aerial torpedoes; and he designed the first V-engine which powered the 'Voiture Ader' which was shown at an exhibition in 1902.

However, he exhibited Avion III in the years following the abortive trials; indeed, at one viewing, the Exhibition of 1900, the sight of it was to be the inspiration for Gabriel Voisin.[2] But it was the success of the wealthy Brazilian living in France, Santos-Dumont, with a 'hop' lasting 21⅓s in 1906 and this being hailed as the first in France, that put Ader on the road to notoriety.

He was furious and claimed that he, Ader, *had* flown, *not* in 1890 with *Éole,* but at Satory with Avion III on October 14, 1897, and had in fact achieved a controlled flight of 300m. Later, he claimed further flights at Satory *with Éole.* The myth was given substance by a number or articles he wrote and by pressurising one of the official observers at the 1897 trials, the by now ageing General Mensier, who later gave an interview to a journalist supporting Ader's claims. Three weeks after the interview, the secret report, signed by Mensier himself, was published but ignored.

For the French were looking for a French hero. They had an obsessive desire to maintain, into true flight, the inheritance of the Montgolfiers. This warped their outlook and sense of objectivity and the Ader claim became first-rate fodder for their need for 'La Gloire'. The myth grew, was fed, and flourished.

Present-day investigation of the Avion III, preserved in the Air Museum in Paris, has proved conclusively that it *never* could have flown. However, Charles Dollfus, the eminent French aviation authority, has looked at the steam engines and has reported that they are a brilliant design. He knew Ader and had the task of examining all his papers following his death. Ader



The Avion III *on show in 1908*

emerges as a very stubborn and intensely chauvinistic man. "He was no one's pupil and he had no disciples."

In 1924 he was made a Commander of the Legion of Honour and he died the following year on May 3, still regarded by the French as the Father of Aviation. In 1936, his mendacious claims were further bolstered by the publication of a 'deplorable' biography written by his son-in-law, Georges de Manthé. By this time there was a monument by Landowski at one side of Le Square Clément-Ader at his birthplace, Muret; and a Salle Clément-Ader in the local museum.

In 1948 Charles Dollfus produced for the first time documentary evidence that Ader's claims were a fabrication. This was disregarded by the French for, in 1950, they erected a plaque at Satory.

HERE, ON THE PLATEAU OF SATORY, ON OCTOBER 14th, 1897, CLÉMENT ADER SUCCEEDED, ON THE AVION—A MACHINE CONCEIVED AND CONSTRUCTED BY HIM—IN SPITE OF RAIN AND WIND, IN LEAVING THE GROUND AND MAKING A CONTROLLED FLIGHT OF 300 METRES

The real story was not brought to light properly until 13 years ago when, in 1968, Charles Gibbs-Smith published his magnificently researched and elegantly argued Science Museum book.[1]

It seems a pity that Ader had his obsession with flight so directed by fantasy as to become little more than a distant relative to aviation. Had he stayed in telecommunications he might have become rather more than a grandfather to stereophony.

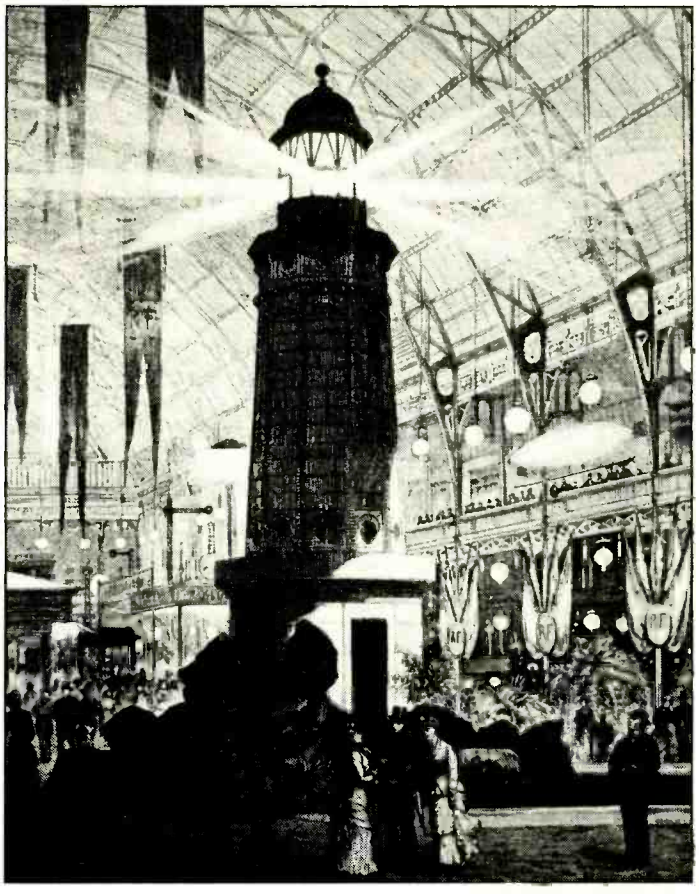
The Exhibition of Electricity

The year 1881 was eventful. An American president was assassinated. There was a comet, which was thought to bring a fine vintage; and things augered well for the Paris International Exhibition of Electricity to be held in the summer and autumn. Many countries were going to exhibit: Great Britain, America, Belgium, Austria-Hungary, Russia, Sweden, Norway, Italy, Spain, Switzerland, Holland, Denmark and even Japan, as well as the host country, France. And people were interested in 'Things Electrical'.

Everybody is interested in Electricity, that babe in Swaddling clothes . . .
. . on the point of outstripping his elder sister, Steam.

Times

An electric lighthouse, fitted with Fresnel's lenses, was a centrepiece of the Exhibition in 1881



The venue was to be the Exhibition Hall near the Champs Elysees. It was 660 × 160ft with an upper gallery divided into smaller rooms. It was to be converted as soon as possible after the closure of the summer art exhibition, the Paris 'Salon'. The centrepiece of the main hall was to be a great electric lighthouse complete with Fresnel's lenses and surrounded by a basin of water on which an electrically propelled boat would move. Above, Gaston Tissandier's electrically driven balloon would fly. The Palace would be illuminated by electricity using many different systems some with still familiar names: Edison, Brush, Swan, Lane-Fox, Maxim, Crompton, Werdermann, Brockie, Pilsen—some arc, others incandescent—all to be powered by steam-run generators. Edison also had two entire rooms devoted to displaying his various light fittings. Every conceivable use of the new wonder was to be displayed—civic, domestic, agricultural, medical and industrial. Telegraph and telephone systems, fire alarms, clocks, sewing machines, measuring instruments, batteries, insulating materials, dynamos, motors, theatrical lighting, electric photography, historical items, trains and tramways—there was to be one such tramway installed by Siemens

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to convey visitors to the Palace from the Place de la Concorde, a quarter of a mile away. There were to be lectures and demonstrations. A wonderful attraction for Paris in 1881.

> **Every square yard of the huge building has been claimed for exhibits, and there is only too little ground left for the perambulations of the public.**
>
> **Telegraphic Journal**

Ader and the Telephone Company wanted to lay on something very special. Those interested in the telephone in those days were, very definitely, a pre-'Busby' lot; they had not grasped the fact that its *real* use as we know it today is "to make somebody happy"—they tried all sorts of things. In 1878:

> **The opera "Don Pasquale" was heard well by means of the telephone in Bellinzona and, in its travel, the charming music had lost none of its delicacy . . .**
>
> **Du Moncel**

In fact this idea was developed afterwards when a number of European capitals had a service of wired broadcasts via the telephone system. Paris naturally had such a one; Budapest had some 14 hours a day of scheduled news, stock market reports and music; and London telephone subscribers could participate in the 2-tier tariff *Electrophone* service, at £10 or £5 a year, and eavesdrop on concerts, music halls, theatres or church services. The London system ran from 1899 until radio finally killed it in 1925. (Bournemouth, incidentally, had its own system which finally came to a halt when the last subscriber died in 1937.)

Theatre relay problems

Ader had been involved in theatre relays prior to the Exhibition and had run into a number of problems which are outlined in his patent of 1881:

"The telephone allows us to convey songs, music and the spoken word to distant places and interesting experiments have already been carried out. But, if with the aid of telephonic devices, one seeks to reproduce singing, music, discourses and theatrical productions, one encounters a great number of obstacles and the means of overcoming these are the subject of these intended improvements aiming at establishing telephone networks for theatres.

"First of all, there is the fact that the batteries will not supply power for the entire duration of a theatrical presentation.

"One therefore has to be able to change the cells in the course of a performance. This change will however cause interruptions in the receiving apparatus which will be unpleasant for the listener. This drawback may be avoided by using a special device."

Ader goes on to mention one of the other principal problems encountered:

"The transmitter must not be affected by any shaking of the stage caused by the footsteps of actors or ballet dancers since when transmitted by the telephone, the resulting noise would have a disagreeable effect. For this reason, the transmitter is placed into a little box, the bottom of which is filled with a mass of lead which inhibits the vibrations; moreover, these boxes rest on the floor with rubber feet."

He also sets out the 'stereophonic' aspects of the Improvement, but disregards any significance in maintaining the correct left/right relationship; this was to be noticed by a music critic who wrote about the exhibition demonstrations.

"If equipment is set up so that the listener's earpiece is connected to a transmitter on the stage, the sounds heard through the system would vary in loudness depending on whether the performer is close to, or distant from, the transmitter. In some cases the sounds will be very loud and in others very soft, or even inaudible.

"The inventor seeks to avoid this defect by arranging the transmitters and receivers in a very particular manner.

"The transmitters on stage are placed in two groups, one group on the left, the other on the right and one of the subscriber's earpieces is connected to a transmitter of one group, the other to a transmitter from the other group. This way, the listener is able, using both ears, to follow the various sounds, and the variations in loudness heard by the listener will correspond to the movements and displacements of the actors on the stage. This double hearing via the equipment is, in effect, analogous to the visual effect produced by a stereoscope.

"The details of the construction of a telephone network for theatres are illustrated in Figs 1 to 10. *(Diagrams not reproduced here—Ed)*

"Fig 1 illustrates the whole installation in section and, in Fig 2, in plan, indicating the way in which a theatre may be connected to a subscriber's dwelling."

The last proposition indicates that Ader had some kind of 'broadcasting' network in mind. A charming drawing was produced showing actors waving swords, etc.

He summarises his claims as follows:

PATENT CLAIMS:

1. The arrangement of the open boxes filled with lead and resting on rubber feet which house the transmitters and whose purpose it is to counter crackling noises resulting from vibration.

2. The grouping of the transmitters into two series so that a transmitter of one series is connected to one of the subscriber's receivers and a transmitter from the other series is connected to the other receiver with the intention of rendering the stage effects and actors' movements audible.

3. The arrangement of battery and switching apparatus so that instantaneous changeovers may be made of the batteries to the spare cells.

4. The arrangement of the circuit breaker in the lines connecting transmitters to receivers.

To lay on a demonstration in keeping with the scale of the Exhibition—this herald of a new era, and of a new power that was to revolutionise the way men thought and lived—the Telephone Company invested some 160,000 francs in equipping the Opéra, the Opéra Comique and the Théâtre Français.

They ran some preliminary trials some months beforehand and invited various people to take part as listeners. The journal *La Nature* wrote:

"We have the good fortune this week to be involved in an experiment that M. C. Ader organised in the vicinity of the Théâtre Français. Thanks to M. Ader's perfected equipment, we heard almost the whole of one act from the witty play by M. Pailleron, *Le Monde ou l'on s'ennuie*. The voices of each artiste could be perfectly distinguished as could the frequent applause of the audience. The truly admirable results obtained will, without doubt, contribute greatly to the success of the Electrical Exhibition."

Gaston Tissandier, whose balloon was going to fly over the heads of the visitors to the Palace of Industry was also invited to a preliminary hearing: *"It is marvellous; it is magic."*

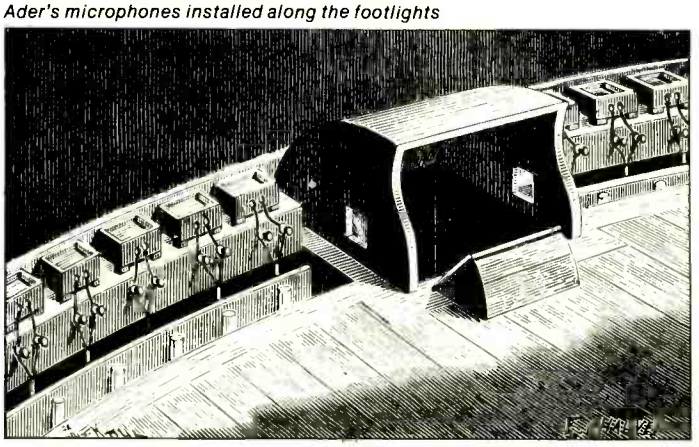
Count Theodore du Moncel, the distinguished electrician and writer on matters electrical had known Ader for some time. Indeed, it was he who by showing Ader an article on the very early work being done in America, had started Ader thinking about telephonic communication. In his book *Le Téléphone* he describes the preparations:

"Since it was necessary to satisfy a large public demand—it is always avid for these sorts of experiences—it was necessary to install many microphones to energise a great number of earpieces and, since one wanted to listen by means of placing one telephone to each ear, it became necessary to install transmitters for one hundred of these double telephones.

"Experience had shown that, over the distance that separated the Opera House and the Exhibition Hall (about 2km), one of these transmitters was, once connected to a suitable battery and a 2-wire circuit, able to energise eight telephones and thus 24 transmitters, each with its own battery and induction coil, were installed in the Opera House. They were set along the footlights on each side of the prompt-box and connected by twin wires that ran underground or in convenient gutters, to rooms fitted out for the purpose in the Exhibition Palace." ■

To be continued

Ader's microphones installed along the footlights



Notes

(1) Charles Gibbs-Smith: *Clément Ader—His Flight Claims and his Place in History.*

(2) Gabriel Voisin: *Men, Women and 10,000 Kites.*

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letters

Compact Disc and Surround Sound

Dear Sir, To clear up any misunderstanding with reference to your comments in the July issue on the subject of digital discs, could I point out that the Philips/Sony Compact Disc will allow surround sound capability. The time duration available will be 30min in surround sound (4-channel) or 60min in stereo (2-channel). The Compact Disc player, together with the appropriate software, should be available during the second half of 1982.

Yours faithfully, Mike Bennett, Sony Broadcast Ltd, City Wall House, Basing View, Basingstoke, Hants RG21 2LA, UK.

Jobs for the future

Dear Sir, Your June editorial directs questions to studios and studio associations. Through the studio members of the APRS executive, I will attempt to provide some answers and opinions.

Although most studios receive a considerable volume of letters from young people wishing to enter the recording industry, only a low percentage of the writers have the ability to clearly communicate what they have to offer to a prospective employer; the exception generally being applicants from the USA who mostly include a detailed curriculum vitae. Applicants should appreciate that they are selling themselves against stiff competition—there are many more suitable applicants than jobs.

Most studio managers endeavour to reply to those who include a stamped reply envelope. Those letters judged to be 'possibles' are filed away and reviewed when a vacancy arises, to produce a short list of candidates for interview.

Very few jobs are filled because of 'who you know'; no employer can afford to be saddled with inferior staff just to please a friend.

Obviously, different studios look for different things in a young applicant; a typical set of requirements would be:

- *'O' levels (or good CSEs) in English Language, Maths and Physics;*
- *a feel for music, with playing skills or the ability to read music as a bonus;*
- *a pleasing personality, able to communicate and get on well with other staff and clients and able to cope with stress situations;*
- *a clean and tidy appearance;*
- *a great deal of self-motivation, as there is little formal training within the industry;*
- *some idea of how the equipment works—a technical background is another bonus;*
- *residence within a reasonable distance of the studio;*
- *under 20 years of age, if inexperienced.*

Some entrants will have undertaken relevant formal training before applying. The industry is not supervised by any of the Government Training Boards and very few universities and polytechnics provide courses aimed particularly at the needs of the industry (a directory of available full and part time courses in the UK would be an excellent subject for a future Studio Sound survey). However, it should be pointed out that some employers are not keen on taking ex-students of too advanced an age.

Although many applicants aim for the recording studios, the radio and TV organisations are a significant source of jobs. Many of these establishments do provide internal training.

What should not be dismissed, as your editorial appears to, is the maintenance side. This is one area where there is a shortage of applicants with the right qualifications and attitudes and it is probably the easiest way of currently entering the industry—but, be warned that most studios are not impressed with those who only wish to use maintenance as a stepping stone to the operational side.

Assuming an applicant meets the criteria and gets the job, it may be several months before the employer knows if he made the correct choice. Therefore, the young entrant must be prepared for possible disappointment after a trial period. Even if successful, it may be a long wait for 'dead man's shoes' before progression from tape-op to engineer.

APRS does not have the resources to function as an employment agency, but is always willing to provide a list of members and their addresses to prospective applicants—don't forget the return stamp!

The ILEA issue a Careers Guide Booklet (No 18) on this industry, although it was written some years ago and the rates quoted are well out of date. Nevertheless, the sentiments expressed and the review of the industry are as true today as when it was compiled.

Other local authorities may have similar publications; for example, the Careers and Occupational Information Centre, of Sheffield, expects to publish a new guide early next year.

Yours faithfully, Peter C Harris, APRS, 23 Chestnut Avenue, Chorleywood, Herts WD3 4HA, UK.

Dear Sir, I am writing to you primarily as a broadcast engineer, but also with the interests of my company in mind.

It is quite clearly indicated by the amount of recruitment advertising Studio Sound carries that the word of mouth system continues. Having read your magazine for several years now the lack of this form of advertisement has always surprised me considering the total readership that you enjoy.

Right or wrong the industry still appears quite content to recruit in this fashion and I doubt if it would be willing to change overnight. Unfortunately it is a fact that technology and systems are changing at that pace, and this is where the problem will lie in future years.

To quote a section of advertisement copy from your last edition, "The entertainment industry is changing radically. We are creating a world of global-satellite simulcasts, digital multitrack motion picture scoring stage, fibre-optic cable networks and laser-scanned rock-and-roll videodiscs. . ."

The question of training in the industry is directly related to the complexity of 'new generation' equipment. If training is not correctly implemented from within, recruitment of new-technology engineers from outside is inevitable.

Microprocessor based technology used in the correct way should release engineers from the burden of many processes and allow time for more creative innovation and activities associated with the end product.

As recruitment is our concern we would be interested in any developments and ideas arising from your long overdue editorial.

With the coming expansion of the industry there might not just be enough trained and competent engineers to go around.

Yours faithfully, Michael J Taylor, Hunter-Walker Ltd, 130 High Street, Eton, Windsor, Berks SL4 6AR, UK.

Understanding noise

Dear Sir, In reply to letters from John Roberts, and Winn Schwartau and Ted Hammond (July Letters) I promise to wear sackcloth and ashes for a week for missing the error in my original draft of 'Understanding noise in mixers' (Steve Dove checked it too!). Correctly, they point out the non-coherent noise in the square root of the sum of the squares of the contributions.

John Roberts has problems approaching the 0.9dB noise factor on mic amps; we approach the figure consistently in production using a high quality transformer and NE5534 devices. It is true that my article ignores the contribution of input noise current specifically. If significant current exists in parts of the circuit that will be affected by the short circuit test, then the results will be misleading; however, I still consider the test to be useful.

The purpose of the computer program was only to indicate the lower physical noise limit of a resistor under known conditions and as such it is a useful tool in amp design because it shows how close the practical results come to the theoretical. I accept wholeheartedly the modifications suggested (including the step 5000 error caused by the removal of another humorous perversion that was not printable).

Thank you for your replies, gentlemen—as I have often said of my old dog; she would rather be beaten than ignored.

A hasty postscript to my article 'Thoughts in Phase'. Yes, the circuit diagram is misleading, the diode should be connected across the tone generator after the 600 Ω resistor. Someone ran out of black dots.

Additionally, an absurd statement has been pointed out to me in paragraph 2, the offence being a reference to 'negative pressures'. I refuse to apologise as the use of the correct term 'depression' would be less easy to understand in context. Ian Pettman of Mercia Sound beat me with that one—but then, I suppose I am an old dog.

Yours faithfully, Ted Fletcher, Alice (Stancoil Ltd), 38 Alexandra Road, Windsor, Berks, UK.

■

Studiofile:1

Green control room

Stone Castle Studios, Italy

In a quiz on the most likely place to build recording studios, I doubt whether 14th century residential castles would figure high up on the list. However, this is the case with the aptly named Stone Castle Studios in Carimate, near Milan. Though situated near to Milan, Como, and Lugano, Carimate is a small town—or large village—tucked well away in the countryside on a hill and offers a real getaway atmosphere. At the same time, the fleshpots of civilisation are just down the road for the looners! Stone Castle is the brainchild of producer Tony Casetta and after some difficult birth pangs the studios are now well on their way and probably account for about 30% of the Italian hit parade.

On the outside nothing suggests the highly modern recording complex within. Access to the castle is, surprise, surprise, across the still operational drawbridge and through the gatehouse. The castle itself is built entirely around a large inner courtyard and one of the secondary entrances brings you into a small entrance hall off which are the entrances to the two studios, Red and Green. My host for the visit was chief engineer Allan Goldberg, who originally hails from South Africa, and who was engaged in finishing off an album in Green studio. Allan was assisted by Nick Lovallo, who also met me at the station!

The hall opens directly on to the entrance to Green control room and the 20th century with a full Eastlake studio. The control room is in a quad configuration with a decor to match the surroundings, even to the extent of keeping the original fireplace underneath the monitor bridge! I was to spend some three days in the room and the experience was interesting and certainly not wearing. Recording axes around a Cadac 32/24/24 console and Studer *A80* recorders. The console was also the first example of Melkuist automation that I had seen. Allan explained that the system and its computer were the result of collaboration between Melkuist in England and Stone Castle, and that its main advantage is that one can write or update at the required place in the song rather than always going through start to finish, in Allan's words, "The only automatic automation system." As I was able to hear for myself, the operating speed is very fast enabling precise level and muting changes, such as cutting out single notes. It is also possible to do subgrouping within the groups in order to permit complex crossfades. The computer uses two floppy discs and SMPTE code. At present the console has automation on the 32 input channels, four echo sends and eight returns and eight VCA groups.

Dolby is used on all recorders and Allan explained how he lined up the 24-track. Dolby tone is at 185nWb/m with OVU on the machine at 320nWb/m. This way the Dolby's are only working at low level and are thus unnoticeable in operation. In addition recording is at 30in/s for better transient operation. The room is not short on outboard gear and you can take your choice among UREI *LA3A* and *1176* limiters and compressors as well as Audio & Design *Compexes* and *Vocal Stresser*, Lexicon *Delta T* DDL and *Prime Time*, Eventide *Harmonizer* and flanger, Klark Teknik 27- and 11-band graphics, Orban parametric and sibilance controller, UREI *Little Dipper* filter, *Kepexes* and *Gain Brains*, Pultec *EQP-1AC* and Fairchild *663* compressors. Odd jobs are handled by a wall mounted Studer *B67* and Teac *C-3* cassette recorder. As well as the 'fixed' equipment there is a certain amount of 'mobile' gear that is used by each studio as need arises and for this session Deltalab's *DL-1* DDL and *DL-4* units were in evidence, as well as Aphex. Allan was also using a 4-way multiplexer, unusually used for mics when analysing, for the setup of some special effects. As might be expected, the actual analyser itself was there, an Inovonics, perched on top of the desk (in fact, there is one in each control room). Reverberation effects are available via AKG *BX20* and EMT *251* and *140*. Monitors are Eastlake *TM-3*s powered by SAE professional amps and using JBL crossovers that have been house-tuned to be within a ¼dB over the crossover range. For setting up a mix Allan likes to use the same speakers he has at home, JBL *4311B*s "not so much for colours but levels". The rhythm section is first balanced up at a reasonable level on the *TM-3*s and the mix continued on the JBLs with a once through on the *TM-3*s again when levels have been set. As well as the usual dimmer controlled mood lighting, the control room has the useful feature of a large display strip between the front monitors that lights up the numbers of the mic channels that are plugged up—as well as letting you know when the phone is ringing!

Access to the studio is through double glass sliding doors to the right of the control room. During mix-down, drapes can be drawn to compensate the acoustics. The decor of the studio is a mixture of soft green curtains, wood, bark and natural stone and this, coupled with flexible lighting, makes a very relaxing atmosphere. The ceiling is also high giving a spacious feeling. Towards the back of the studio is the drum cage and beyond that, the isolation room. The latter has glass walls and a marble floor, together with pull drapes and ceiling trapping. This way a 'live' to 'very live' sound can be obtained, either for ensembles or solo instruments. All microphone boxes have the 32 mic lines in parallel with the added luxury of illuminated buttons showing lines already plugged up. Instruments include a small Bosendorfer grand (with a very good sound), *B3* with Leslie and various amplifiers. Other instruments are available at very short notice. Microphones are a good selection of Neumann, AKG, Beyer, Electro-Voice and Shure. Access to the studio for load-in of equipment is no problem either. Pull back the curtains and sliding doors, open the outside ones and there you are in the castle courtyard; so you can wheel it straight in. The space between the glass doors leading from studio to control room is not lost either, as this makes a useful isolation booth. To this effect the ceiling has been trapped and a mic box of four auxiliary mic lines—33 to 36—plus foldback outputs has been installed.

The other side of the entrance hall is the short corridor that leads to Red control room and studio. The two control rooms are identical in dimensions, equipment, etc. though Red room did have some UREI *545* parametrics over Green! Due to placement within the building, access to Red studio is through sliding glass doors—with the same iso facility—situated between the front monitors. The studio itself is squarer than Green and has no isolation room. Piano here is a Yamaha grand. However, the same access to the courtyard is available with sliding glass doors giving onto the original ones and the outside. A side benefit of this for both studios is that daylight working is possible for those who are not bent upon getting a studio tan.

As well as the studios, the castle has its own 250 seat theatre (The Malatesta). This in addition to being very picturesque, has excellent acoustics and has been used with great success for string sections, small ensembles, etc. It gives a very 'authentic' sound for chamber groups, renaissance music, and the like. At present the new mix room behind the stage is in the process of being finished off and this will serve the double purpose of doing mix-downs and live recording in the theatre as the mix room window is set in the rear wall of the stage. With the new room, 46-track is projected with two 24-track machines in the theatre

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Malatesta theatre

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Studiofile:2

Katy Recording Studio, Belgium

In the spring of 1970, Marc Aryan, a well known Belgian singer, decided to transform the stable of his villa into a private 8-track recording studio. The villa and the stable are located in the small village of Ohain, near Brussels, in Belgium. It lies deep in the woods surrounding the fields of Waterloo where Napoleon Bonaparte once lost his final battle. To have his own private recording studio here at his home in the woods, would give Marc the opportunity to record in peaceful, pleasant surroundings, far away from the pressure and hurry of the big studios in nearby Brussels. Indeed . . . an early example of the nowadays very stereotyped and cliché "stressless studio".

Katy's control room

Marc Aryan's friends were very enthusiastic about the little studio: they weren't used to working in such a pleasant atmosphere. They suggested that he might as well set up a professional, commercial recording studio, not just one for private use only. It wasn't a bad idea, thought Marc, and he decided to invest some money to make it real. With the help of very good people, very good equipment, and his name within the industry, the studio grew into a very successful project. 'Katy Recording Studio' was very soon a name in the business. People came from far and wide to make records in the pleasant little studio. Things went so well, that in 1975, the studio went 24-track. Some names that recorded there: Patrick Hernandez (remember *Born To Be Alive* a few years ago), Emly Starr (Belgium's candidate at the Eurovision song contest 1981, with some record sales in Japan and a lot in the Benelux countries), Alain Delon, Machiavell, Adamo, Toots Thielemans (who brought in Weather Report bass player Jaco Pastorius for a few recordings), and others.

The studio quickly switched over to 46-track recording, and is now booked for months. "And," says one of the assistant engineers, "All this without swimming pools, flippers, bars or other things like that!" (but apparently for extreme cases, there is still a small, very cold lake at the back of the garden of Mr Aryan's villa.)

I visited the studio during a maintenance break in April. If I hadn't been told that the whole complex once was a horse stable, I would never have known it. The interior is designed with much taste, and has very functional acoustics. There is a lot of wooden construction, the sound has warmth, good definition and brilliance. There is a great Steinway grand, a 2nd World War Hammond organ, a Rhodes piano, different Fender guitar amps, and a drum kit without snare drum, built up from different makes. Most drummers here in Belgium come to the studio with only their snare, drumsticks and eventually cymbals, and use the studio drums for the rest.

The microphone collection is the usual Neumann, Shure, Electro-voice, Sennheiser, STC and Schoeps composition. Together with the DI boxes, they feed the MCI *5566* console. No noise reduction is used on the two MCI *JH-24* multitrack machines. Monitoring is done via Michaelson & Austin *TVA-1* amps, and JBL/UREI/ROR speakers. Sound shaping is done with the help of a Marshall *Time Modulator,* a Synton phaser, an Eventide *Harmonizer,* Orban equalisers, dbx compressors; also Teletronix, UREI *1178, LA-4* compressors, and an old heart-moving Fairchild compressor, two Lexicon *Prime Time* delays, two Lexicon *Delta-T* time delays, a Deltalab *Acousticomputer,* four *Kepexes,* a Valley People *Gain Brain,* one EMT *140* reverb plate and two EMT *240* reverb plates. The master recorders are: one Otari 2-track recorder and two MCI 2-track recorders, with optional Dolby-A.

As you see, there's plenty of equipment to overhaul in the maintenance break of two days between the weeks and weeks of full booking. That's why I left the crew quite quickly; they really didn't have much time. I asked if there were any plans for the future, since such a lucrative studio may of course quickly respond to the ever changing market of audio products. The answer was that the MCI equipment was still quite new, but that they might eventually go digital in a few years from now. I am sure that if things go as smoothly as they have in the past years, there certainly will be a great future for this studio.

Reinout Goddyn

Katy Recording Studio, Chemin du Moulin, 7, 1328 Ohain, Belgium. Phone: 02 633.32.48.

Stone Castle cont'd

room and an extra 24-track that can be shuttled between Green and Red rooms.

The acoustics in the courtyard are marvellous, especially at night, and it is often used for recording or even as a natural echo chamber. While I was at the castle, the number being mixed one evening needed rain and thunder effects. Unfortunately, the effects record was not really up to it and, believe it or not, nature obliged with a first rate thunderstorm half an hour later! A Neumann *SM69* was quickly installed under the balcony out in the courtyard and the fascination of natural sounds was re-discovered! The rain was followed by the castle bell and various other 'sounds in nature' to great effect. Live records have been done with great success in the courtyard and needless to say, a Calrec *Soundfield* is under strong consideration.

The castle itself is under constant renovation, from the stonework to the wall paintings. By law the exterior of the castle must be kept original,

View from the courtyard—echo chamber?

even though there is no state aid, and this necessitates a lot of money. Even the lifts come out behind the original doors. Staying in the castle is in itself an experience and there is certainly no shortage of room. You can take your choice from huge, centuries-old four posters to modern divans and the air from the mullion windows in the morning is enough to set you up for the day. It is an atmosphere of continuity at the castle—it has never stopped being lived in—that provides much of its charm and more than one musician has found it inspirational. At the time of my visit the large restaurant was also in the process of being finished thus making the premises completely self-contained.

The studios have been open for just over three years and all the initial difficulties appear to have been eliminated. Tony Casetta is now the sole lord of the manor and obviously likes it that way. His aim is to make the castle a viable international studio and " . . . make people take Italy seriously and see that we mean business!" After seeing Stone Castle in operation, I don't think he need have any worries.

Thanks are due to Allan Goldberg for his time in thoroughly showing me around the castle and having me in on his session, as well as to Eddy Orini and his team who were producing the album of music illustrating the life of Salvador Dali. I must not forget Nick, either. Finally, thanks to Tony Casetta for his invitation in the first place and to all for a memorable stay.

Terry Nelson

Stone Castle Studios, Piazza Castello 1, 1-22060 Carimate/Como, Italy. Phone: (31) 790681. ■

TRIMIX

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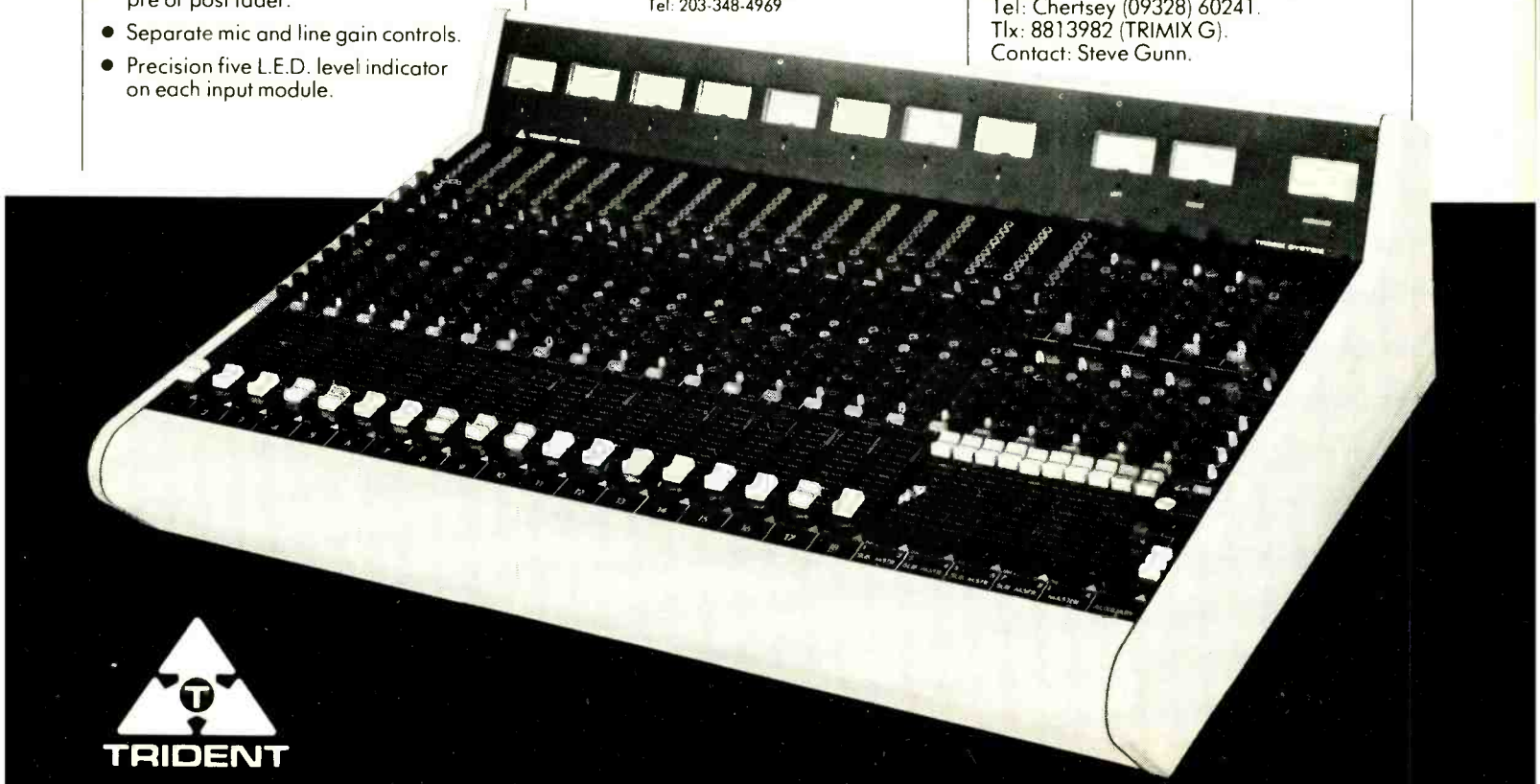


TRIDENT

Console automation — a case study

Lansdowne's automated Cadac console

New aspects of audio technology do not simply fall from the skies: they come into being as the result of a great deal of thought, head-scratching and hard work, as Robin Bransbury describes in this article on the development of the Melkuist *GT800* console automation system (reviewed August 1981).

MELKUIST Ltd was formed in 1978 by a drummer and a keyboard player who, whilst never having played in the same group, found that their technical specialities were a very good match, one being an audio engineer and the other a microcomputer expert. The company's original intention was to exploit the rising market in industrial control projects using microcomputers.

While the company established itself in the industrial control market, a guitarist and a software expert joined the group, followed by two technical engineers from different top London recording studios. (Unfortunately, neither could play bass so that member of the group does not actually work with the company.)

However, the time was now ripe for the company to take a serious look at the rising tide of digital applications in the audio industry. We looked at various different applications of the company's by now wide experience in both microcomputers and audio engineering. One candidate stood out above all others for special study: that of mixing console automation where, in spite of some six different systems on the market, there was not one that we felt was optimised in terms of simplicity of operation and reliability.

Using the experience gained during a number of successful projects such as laser guidance computers, control systems for numerically controlled sewing machines for heavy industrial use, and special computer systems for the automation of some of the processes in the farming industry, the project to design a new mixing console automation system looked attractively simple.

As anyone who has studied the subject of console automation knows only too well, the subject is anything but simple.

The main criteria for any new system are that it must:

- faithfully reproduce manual settings and movements;
- have enough capacity to mix a complex title lasting say, 20 mins;
- be reliable and easy to install and maintain;
- but above all, it must be easy to use.

To quite a large extent, each of these criteria are mutually exclusive. As far as reliability is concerned, IC sockets should be avoided unless absolutely necessary; however, their exclusion tends to make maintenance more difficult. Thus the areas where failure might occur were analysed and the components involved placed in the best available sockets.

Also, to be easy to use, we decided, the operator should not be required to constantly talk to the system in terms of labels or timecode values, he should only need to indicate where he happens to be starting from by giving it a signal from the timecode track and leaving it to look after the search for the relevant data to send to the console. This type of operating system requires that a good deal of the available storage medium is taken up with information the computer needs to reassemble any mix the engineer has selected after starting from a random point in its course. So, ease of operation limits the room for mix data.

Similarly, faithful reproduction of hand movements requires very frequent updating of the computer's 'picture' of the console, so that at any given instant, its version, when given control of the console, will match as closely as possible that created by the skilled hands of the engineer. Frequent updating means that large quantities of fresh data have to be handled even though the changes between one 'picture' and the next are only subtly different, hence reducing capacity still further.

As we delved further and further into the best possible operating system we were constantly faced by the choice between compromise and solution, ie finding a better way to store and retrieve the data.

As a starting point, we found that the established tape-based systems were reasonably easy to use, since the concept of tracks of data, which can be overdubbed to insert small changes, comes very readily to the balance engineer. He can simply run the master machine forward to a cue point he finds by ear, drop in, make his change and then spool back to hear it.

Direct emulation of this technique, using different storage areas of 'tracks' of data still produces a need for a store of gargantuan proportions. True, now that the store is separated from the tape itself, we can store a starting 'picture' of the settings and then only record the changes that occur subsequently. But even given this level of data compression, a system which scans quickly enough for good fidelity is still going to produce formidable amounts of data.

Recent advances in disk store technology have led to units where the capacities required are available; however, the recording studio is not a site renowned for the sort of cleanliness that is required if reliable, very high density recording on a long term basis is to be contemplated.

The shifting about of such massive amounts of data also makes the system rather sluggish in use, so another solution must be found. The well-publicised advances in speech synthesis provided the rather unlikely clue to the vital solution of this problem.

If a vocabulary of some 100 English words is to be encoded for storage in computer memory and the coding is 'direct', that is to say, many samples of the waveform are taken and each converted into its digital equivalent, a store of some 350Kbytes would be needed (about one and a half floppy disks' worth) and the result would still sound rather rough and 'computerised'.

However, in recent times, several toys with this size of vocabulary have appeared in high street shops, costing only a few pounds. Many can produce very good quality speech, at least as good as our one and a half floppy disks' worth of direct encoding.

The reason why so much data can be stored in such a small space, is that the speech is not stored directly. Each word is analysed for its basic characteristics, its 'shape', and it is this 'shape' which is stored.

As the vocabulary is being built, real speech, complete with its accent, is converted directly and then run through a computer program which extracts the 'shape' as a set of digital values which are programmed into the speech chip at the manufacturing stage. To a large extent, it is the conversion program which determines how good the resulting speech

is, although the design of good sound generating circuitry is, of course, another important factor.

By using several of these 'tricks' of analysis, but applied to the varying voltage waveforms from the faders, impressive data-compression ratios are obtained.

The data written to disk is a heavily-encoded version of the operator's actual movements and because of this the store size to accommodate this format becomes manageable. The available space can be used to write enough data about any of eight entire mixes allowing the system to regenerate a previous mix if the current one has been corrupted by a disk error, however unusual such errors are if the disks are treated with the respect they deserve. All of which profoundly contributes to system reliability.

The heavily-compressed format can also contain all the information about the current mix, so that the central processor unit can look after the 'knitting together' of its parts, leaving the operator to concentrate on the music.

As a description of the system as it now exists, the whole design phase sounds so very easy. However, looking back on the final phase of the 'fine tuning' of the movement analysis software, all we can remember is several sleepless nights. We were very fortunate to have the help of a top Italian recording studio who let us borrow their facilities during this final phase. Unfortunately, the only time available was at night, hence the loss of sleep.

Owing to the very complex nature of the analysis process which is managed by three different processors communicating via serial lines, a good deal of hardware had to be set up to run all the program modules under external control. We were fortunate that the studio engineers seemed to have infinite patience, waiting while we tapped away at the terminals setting up the parameters for a new run. The whole of this 'fine tuning' exercise was designed to incorporate an almost wholly unquantifiable quality into the system. Going back to the speech analysis analogue, we were seeking to reproduce each engineer's 'accent' as he moves the controls, without the brute force method of storing thousands of bytes for every gain-riding manoeuvre he makes. All that is required is to define the 'shape' of his movements, tie this shape to the time it occurred and store the result.

One of the headaches was actually deciphering the data the system put on to disk. If, as sometimes happened, we put an irrational value into the compression matrix, the system would 'crash' or lock up. Often the best clues as to the cause of trouble were found by reading the disk record of the data pattern just prior to the crash. The one rule we learned from this exercise was that humans jump to conclusions, whereas computers are totally, sometimes brutally, logical. This phase of the development was a classic example of 'garbage in, garbage out' where results were only obtained by a pedantic attention to detail.

Towards the end of the tuning phase, a certain amount of euphoria began to infect the group; the system began to 'live', it began to make music. Our problem became that of limiting this 'life' to one of sheer mimicry. In the final analysis, used by a really outstanding balance engineer and then given control, the system must then sound like the same outstanding balance engineer when the tape is run. It must neither add any ideas of its own nor produce the 'flat antiseptic sound' that some engineers have complained about with automated mixing.

In fact, the final analysis parameters were determined almost wholly by ear. Much as we would like to write learned theses on the values we selected, each engineer, using various types of material, had to be happy with the final values before we released the system for any actual serious work.

As can be appreciated, very many sleepless nights were involved for all concerned, but through it all, the co-operation was absolutely wonderful. We would like to register our thanks to: Toni Cassetta, Alan Goldberg, Etzio Darosa, Nick, Mario and the lovely Gianna, together with all the staff of Stone Castle Studios Spa of Milan, for their almost endless patience, encouragement and excellent coffee without all of which, the whole project would have been impossible.

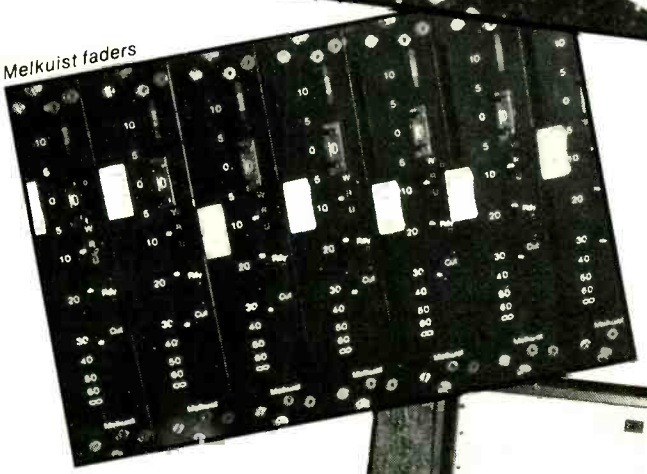
With two Italian systems now fully operational, the time had now come for the system to be fully launched, on a worldwide basis. We knew from our early experiences that automation had acquired a very poor reputation in the industry. Everyone's memories of histrionic systems in studios worldwide testify to this. Our problem was that of convincing a highly sceptical industry that even now, if properly implemented, automation can make mixing easier and improve the quality of the final product, ie it really can help make better music.

London base

One important thing the company needed now was a UK base and Lansdowne Studios in London provided the ideal opportunity.

It happened that Lansdowne had recently been taken over by its present studio manager Adrian Kerridge, and he had embarked on a very thorough and ambitious programme of modernisation. As many in the industry know, the 'Lansdowne sound' owes a great deal to the skills of its personnel together with the signal handling qualities of its wonderful early Cadac console, which is capable of producing sounds that are almost unattainable on more modern equipment. The microphone transformers weigh in excess of 6½lb each and the rest of the circuitry follows suit. Thus to replace the console would have involved the commissioning of a very expensive 'special' from some other manufacturer with, even then, the probability that the sound would not be reproduced with quite the same punch and presence that clients had become accustomed to.

Stone Castle's Cadac automated console



Melkuist faders

Stone Castle's Melkuist computer system with BASF 8in disk drives

Many of us have known the Lansdowne team for some years and we have been impressed by the high standards they seek to keep. We came back from Italy in pretty high spirits and managed to communicate some of this feeling to our friends at the studio. We were naturally delighted when the decision was made to refurbish the grand old Cadac and install our system in it. The other plans to install a video sweetening facility also matched up well with our direction of development.

Until then, we had considered the automation as a synchronised 'slave' to the multitrack. The engineer selects his starting point by ear, or from his autolocator. The first timecode he plays to the system tells it where he is working from; the system then has a little less than 2s to find that data and line up the console with the appropriate levels. The only commands that actually go directly to the computer come from the multitrack machine itself and not the engineer. Under certain circumstances, it is necessary to make the multitrack itself a slave to another machine. The link between the two is formed by the synchroniser which often has to cope with an utterly bizarre set of signals gleaned

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Console automation

from both machines' logic which are meant to inform it as to just what the machines are up to at any instant.

The timing of the various functions of video or film machines are a study in themselves, especially when machines are lining themselves up to a specified start mark. The devious rationale behind some of the manoeuvres undertaken in these circumstances is almost impossible to fathom.

Suffice it to say, by examining the various signals produced by each machine acting both on its own, and in synchronism with the rest, we were able to sort out a set of conditions which defined when mixing was occurring and when a pass had finished. Since these signals are vital to our system, in that we wished to avoid having any 'computer controls' that the engineer has to remember to operate, we were very fortunate to be able to do this work under such pleasant surroundings and with so much help from everyone at Lansdowne, especially Chris, Bob, Richard and Jonathan.

Technique of operation

A track of timecode is recorded throughout the title and the master rewound. The track's output is patched to the timecode return line and the computer placed 'on line'.

If the title has not been worked on before, the operator tells the computer that this is a 'new mix' (as playing the title after a request for a 'new mix' clears all directories on all disks, the computer requests confirmation).

If the title has been worked on before, the relevant disks are replaced in the store and the system reset. Apart from ensuring that the active faces of the disks are opposite the read-write heads of the drive, timecode return patching and pressing 'play' is all that is required to return to the point where mixing finished previously.

As soon as 'play' is selected on the master machine, the central processor inspects the timecode stream looking for a large number of consecutive frame number values. As soon as it finds them, it locks the decoder on to the basic clock frequency of the SMPTE and sounds a short 'bleep' to indicate to the operator that synchronism has been achieved. From this point on, the system is 'live' and will store all movements the operator makes on faders that have a 'write' function active.

All other functions the operator needs to manipulate during mixing are to do with the faders and their controls. Since these vary from console to console, all we need to note here is that 'read' places the computer in control of the channel's level; 'write' places the fader in control and all movements with 'write' active will be reproduced on the next pass in 'read'; and 'update' allows the operator to 'offset' the computer's version of the movements with the fader.

The whole system of 'cuts' or muting is done, channel by channel, by separate control lines which bypass the 'write' functions and allow a channel mute whilst not destroying any of the previously written data. A subsequent 'unmute' brings back all the previous movements.

The operator can inspect the mix numbers in each store and if he wishes to return to a previous version, he simply selects that function on his 0-9 keyboard and answers the questions displayed at the video monitor. If he only wishes to try an idea, he can protect his current version, work back on his previous version, protect that result and go forward again. With eight 'storage areas' on disk, as many as four different chains of thought can be supported, although this does require a fair bit of button pushing and is beginning to enter the confusing realms of 'mixing by sections' which is a feature of all previous disk-based automation systems. If progress is being made, it is usually found to be simpler and quicker to keep only one version for work, with perhaps the first rough run-through for comparison as a protected mix.

If butt-splice context changes are required, these can be obtained naturally using the fader controls rather than as a computer function. This may be done by running the mix up to the point where the abrupt change is to occur in 'read', setting up the new levels required in 'isolate' or 'update', running the tape back again in 'read' and at the right instant, dropping the required faders into 'write'.

By using the fader controls rather than the sectional mixing technique forced upon engineers using present disk based automation systems which suffer from lack of disk capacity, the engineer always knows the point at which the change will occur, the levels just before it and the levels afterwards being in 'realtime'. This aspect is critical when the case of a difficult section is considered.

Suppose we have a section which requires a great deal of work in the middle of a title. As time goes on, ears get tired and parts of the mix get further and further out of context with their counterparts running into and out of the section. When the time comes to merge this section into the main body of the mix, it will often be found that a good deal of 'pushing and shoving' will be required at the joins to make the newly-mixed part tie in with the rest, as sometimes happens with ¼in edit pieces.

With the 'whole mix' concept, the engineer always knows how each section will tie in to the rest.

Operationally, there is little more to describe since there are no other controls involved in getting the system to work. The error display on the central processor will inform the operator of all the obvious faults that may occur such as disks in backwards, damaged disks, etc.

When the system is reset or switched on, it checks that it has communication with all its parts and will report any breaks in lines or loss of power in the front-end fader interface rack.

Whilst we would have liked to be able to write the operational manual on a postage stamp, there is still a certain amount of work yet to be done to attain this degree of automation of the operational side of the system although we feel that we have, at least, come close to this goal. There is also an important need for the number of automated facilities to be very considerably expanded.

As described above, data-compression techniques can be used on most of these applications, cutting down the amount of actual data that must be stored. However, the recent advances in 16-bit processors have provided very timely solutions to some of the partitioning problems we started to encounter in recent work.

Whilst distributed intelligence in the form of very many simple processors managing data-collection and distribution keeps the complexity of the central software package down to a reasonable level, the amount of brute force 'number crunching' involved was beginning to affect the speed of reaction to external stimuli. As all engineers involved in realtime applications know, there must always be room in the cycle for last minute extras and riding too close to the wind will always invite trouble, usually of a data-dependent nature.

Finally, the choice of timing signature used to keep all parts of the system in sync should be that used on the majority of synchronisers. Thus we have very little choice in the matter.

The *de facto* standard code for synchronising events in sound studios is that originally described by the Society of Motion Picture and Television Engineers, or SMPTE code, which was developed with little reference to established data recording standards.

The code is widely recognised as being less than ideal since its format is continuous, that is to say that there is no clear break between one frame and the next. Each frame is defined by a unique set of characters which owe their uniqueness to the fact that the time characters are in BCD rather than binary and that the user bits are in 4-bit 'nibbles' rather than 8-bit bytes.

The lack of start, stop and parity bits does make it rather awkward to decode. Various tries have been made at replacing it with a standard which can be used with UARTs. However, with the increasing use of video in industry and domestic applications, it will not be long before an LSI chip appears with all the decode built in.

The other drawbacks of SMPTE are that the spectrum of the code is spread directly across the ear's most sensitive area, making crosstalk a constant problem, and that the lack of a substantially different-shaped sync pulse makes it difficult to read at high speed.

Nonetheless, in these days of almost wilful incompatibility between various manufacturer's products, at least we should be grateful for this degree of standardisation, even if the standard adopted is very much less than ideal. ■

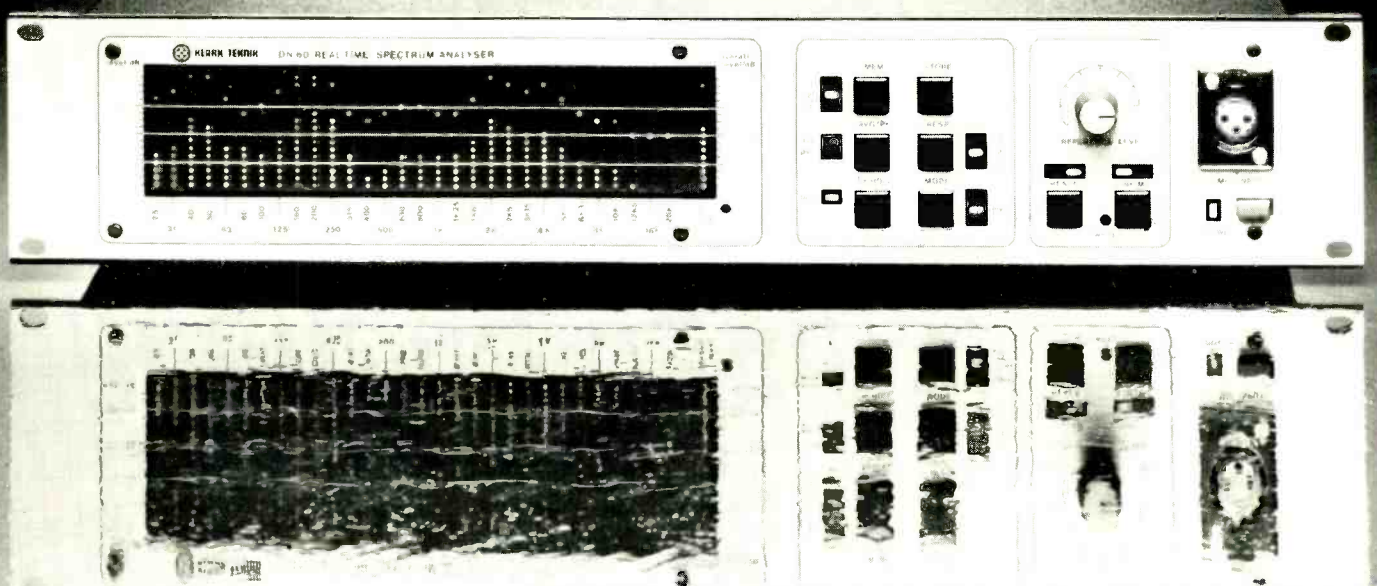
Using timecode

THERE are two golden rules to the use of SMPTE timecode which usually conflict with each other:

1 NEVER use a track adjacent to any low frequency dominant material such as double bass or bass drum;
2 NEVER use a track adjacent to one which has quiet passages and which may require substantial mid or top eq on remix.

In the first case, the 'fringing' effect present in all multitrack tape heads causes crosstalk into the TC track, which will often confuse the decoder and lead to apparent dropouts in the code. In the second, the timecode will be audible in the quiet passages, in spite of noise reduction, owing to crosstalk in the opposite direction. One other point is that timecode can sometimes be salvaged by patching it back through the console and experimenting with both eq and a limiter in that order. Also noise reduction should be used, if possible, on the adjacent tracks but not on the TC itself, in the second case.

Above all, always use the maximum TC level the tape machine crosstalk performance will allow, and never use a track that is 'a bit down and no-one's got round to fixing it yet'. The performance of multitrack machines when used to record data is poor at the best of times, witness the very poor reliability of tape-based automation systems. This is not the tape machine's fault, it has been optimised for sound recording and the techniques used for data are substantially different.



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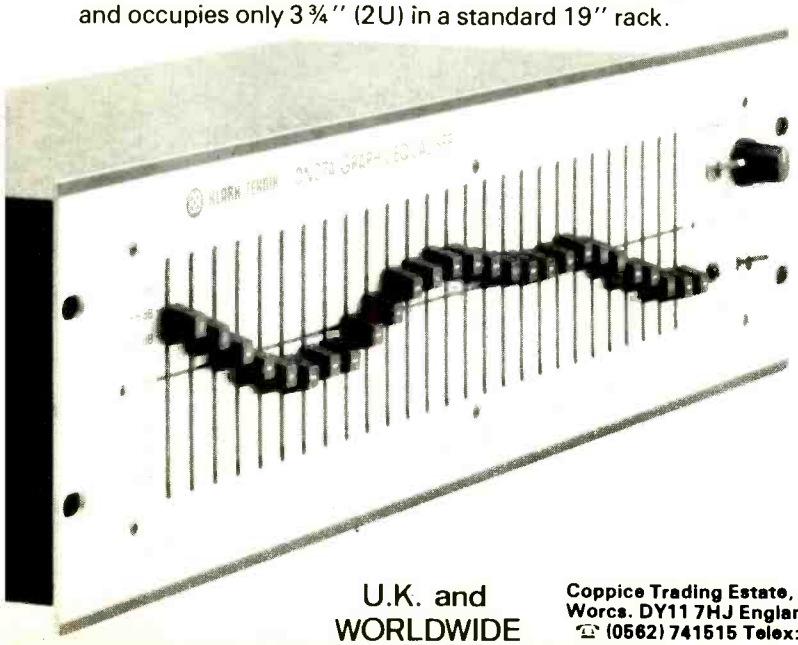

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business

BARRY FOX

Royalties too high?

There's one aspect of the record industry's recession that never seems to get aired. It's the way in which the artists themselves, through sheer greed and avarice, have pushed up the price of records and thereby helped to depress sales. The record companies are usually scared to talk about this because they fear they may lose some of their prize artists. But secretly there's considerable bitterness in some quarters.

When an artist or group negotiates a contract with a record company, the royalty arrangement can be anything between 6% and 20%. Only a handful of the most successful artists command a 20% royalty and only the newest and greenest will have to settle for 6%. On average a successful artist will claim around 15%. The crux is that this percentage is of the final shop price of the record. Phrases like "recommended retail price", "list price" and "guide selling price" are all frowned on these days, so there is a move towards basing percentages on the price which the dealer pays for a record, plus 35% for pop records (and 42% for classical records). In other words if a record is intended to sell in the shops for £5 a 20% royalty will give the artist or group £1 per disc sold. And this is the sting. The real royalty percentage paid by the record company is much higher than the agreed percentage because the record company isn't receiving £5 for each record sold; more likely it's getting around half of that. So a record company that signs on a 20% royalty would in fact be paying 30% or 40% of cash returns to the artist. Where the artist demands heavy advance payments up front, this is an additional financial burden on the record company.

Everyone is now trapped in this inflationary situation because no record company dare go it alone and offer reduced royalties. They would simply lose all their artists. This is one reason why it seems so unfair to talk of dividing any tax collected on blank tape amongst existing royalty earners. The rich will get richer and the new talent, which the companies can't afford to record, will still be no better off.

The BPI has now come out into the open and admitted that it is hoping for a tax of £2 on each blank C90 cassette sold to the public, which is a tax of well over 100%. On current cassette sales this would realise around £75 million a year of free money dumped on the BPI's doorstep. All the more chilling then to note that John Hall QC, Director General of the IFPI, recently told a music industry conference in Berlin that achieving a levy of a substantial amount was probably more important than deciding how it should be redistributed.

New cinema sound

We have previously reported on the move by Kintek to rival Dolby with a new cinema sound system. On the face of things it seems that Dolby has won such a foothold that it's a pointless exercise for anyone else to try to offer a competitive system which will only serve to confuse the trend towards standardisation.

Dolby optical stereo has become the *de facto* standard because the film companies are pleased to have a viable alternative to 70mm 6-track magnetic sound prints. The magnetic tracks have to be recorded in realtime after photographic printing so the cost of a 70mm print is many times that of a 35mm optical print. Exact cost depends on the number of prints being made, but one distributor quotes under £1,000 for a 35mm optical print and around £7,000 for a 70mm version.

I was interested, therefore, to notice in Japan that Kintek is now pushing hard with a cinema sound system. Kintek's *Cinesonic* comes as a system package costing around $6,000. It offers the option to play Dolby, dbx or Kintek's own soundtracks and, according to Kintek's very puffy trade literature, much more besides. For example an expander "automatically restores the missing sound dynamics ordinarily lost in optical film tracks", a "stereophonizer turns normal monophonic soundtracks into a multidimensional presentation" using techniques which are "professionally proven", and "a sub-harmonic synthesizer re-creates the very deep, satisfying bass frequencies usually left off film tracks". Most fascinating of all, Kintek says their system "reduces the noise level of every print, regardless of age".

Exciting claims indeed. But how do you reduce noise on ordinary prints without degrading speech intelligibility? How do you derive surround sound from mono, while keeping speech at centre front? Does the Kintek unit use the CCD sound head, about which John Moseley talked when he lectured on the Kintek system in London a few years ago? Is John Moseley still with Kintek?

I put these questions to Kintek in Massachusetts. In fact I put them to Kintek many times over a period of many months. All I ever got in reply was a telex thanking me for my interest in the Kintek system and promising that when a new manual for the system was available I would be sent a copy. Frankly I'm no longer interested. What does interest me is how any company can try and compete with Dolby in the cinema, put out extravagant technical claims and then studiously ignore technical press interest in those claims.

Pressing standards

Do you ever wonder why you bother to make decent masters? The general record buying public is sick and tired of paying through the nose for bad pressings. Buying records isn't fun any more. "Whenever you buy a record you have to mentally set aside time for taking it back" a music enthusiast told me. This *must* be a contributory factor to home taping off air or from borrowed discs. Everyone knows this—except the record companies. Last year the BPI would still only talk about the "purported bad pressing of records" when cornered. As a sop, a working party met "to ensure that standards are *maintained* in UK pressings" (my italics). A report and recommendations were promised. But nothing ever happened. Now a new technical committee has been set up by the BPI under the same chairman as the last (Monty Presky of Damont) with co-chairman Gerry Bron. The committee list shows that one member is "technical adviser to the BPI". Has the BPI always had a technical adviser? Was he advising while the BPI wasted industry money chasing the wild goose spoiler signal? Interesting thought.

Equally interesting is the committee's admission; "There is little doubt that technological advances on the hardware side have outstripped the progress that has been made on the software front" What can have happened to make the BPI stop talking about "purported" problems and become aware that they should be ashamed of their abysmal standard of UK pressings? There are at least three answers.

That long-awaited Green Paper on copyright was finally scheduled for publication in mid-July and the BPI clearly feared that it would publicly castigate the industry for its poor quality of pressing. Obviously the existence of a recently-formed committee to look at the problem makes a nice little insurance policy. Then there's the little matter of the judges' report for the last MTA Gramophone Record Awards. "Whilst we were impressed with the quantity of entries, the quality control of some companies left much to be desired and the judges were very critical of the number of obvious faults prevailing among the selection," the MTA announced to the press. What hope can there be for a record industry that enters faulty pressings for a prestigious competition? But once again the existence of a technical committee to look at the problem makes a nice little insurance policy.

Finally, and most embarrassing of all for the record industry, was the admirable decision of the Consumers' Association (publishers of *Which?)* to talk freely about public reaction to their *Which?* report (January 1981) on records and home taping. Within a short space of time CA had received 200 letters which, to quote CA, showed "accumulated resentment over the high price and low quality" of British pressing. Then, in another Link House publication *Television and Home Video* (June 1981), David Attwood of the CA reported on how the "plaintive cries (of the record industry) when quoted in a recent *Which?* report released a torrent of abuse from readers about expensive albums and rotten pressings". This admirable frankness is a frightful embarrassment for the record industry, and the BPI in particular, who have so far been quoting the *Which?* report as if it represents unqualified support for the BPI's proposals from the Consumers Association.

The BPI daren't try and discredit CA. So it has done the next best thing, and formed a committee to pussy-foot loudly round the problem. It's perhaps not surprising that no one on the committee has a track record of outspoken and fire-in-belly criticism of the record industry or BPI policies. ■

A New Leader

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Pan Range Switch
selects full, normal or reverse pan field.

Pan Hold Selectors
programme image hold to any combination of quarter, half, threequarters and full cycle positions to define one-shot pattern or final image after free run.

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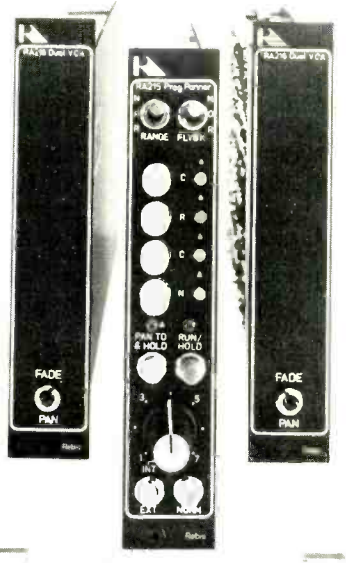
sets panning speed from 30 seconds per sweep to 10 cycles per second.

Rate Int/Ext Switch
allows pan speed to be controlled externally by a D.C. source for modulated or programme related pan speed.



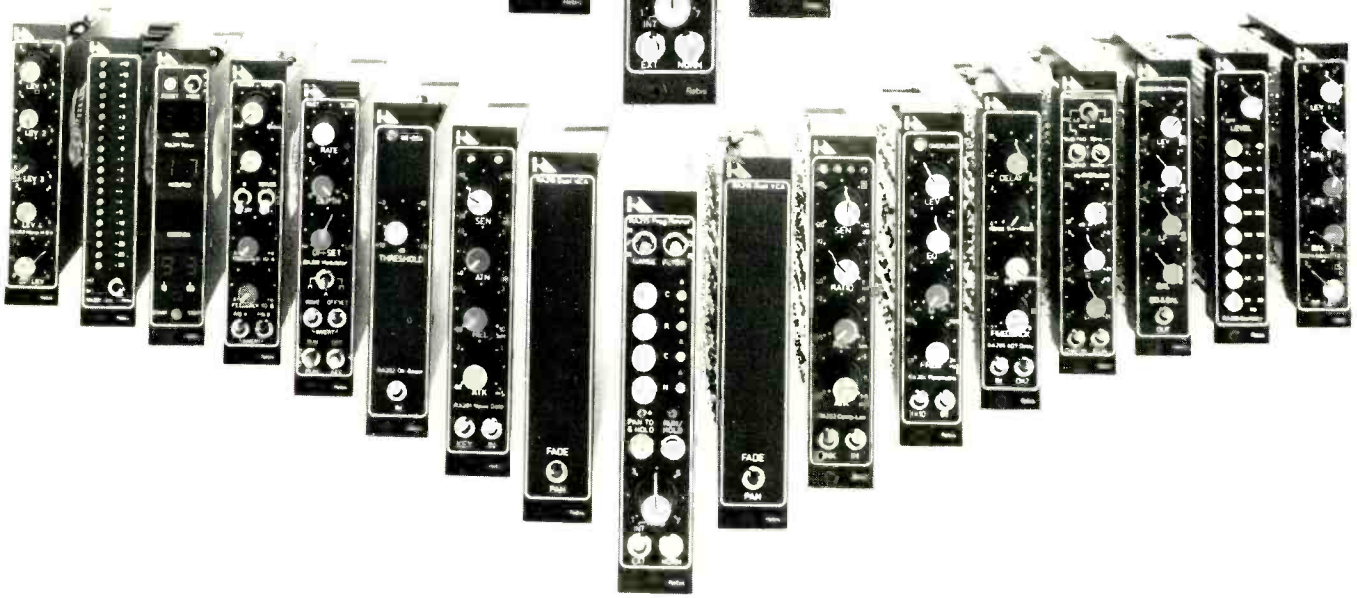
Flyback Switch
selects symmetrical panning or flyback from either normal to reverse, or reverse to normal.

LED's
indicate status of image throughout pan.

Pan Mode LED's
indicate programmed or free run panning action.

Trigger Buttons
for programmed one-shot, run, random hold, programmed hold, all functions can be externally controlled by D.C. or programme.

Normal Image Button
returns signals to normal positions.



The new RA215 Programmable Pan Control module uses the latest in digital technology to put you in creative control of a unique range of stereo effects.

For further information contact: Rebis Audio Ltd., Kinver Street, Stourbridge, West Midlands, DY8 5AB, England. Tel: 0384 71865. Telex: 335494.

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White Oak Design

Paul D Lehrman
Jane Scobie

A view of An Elizabethan Pageant. Stratford-upon-Avon

Can a small group of self-professed '60s-style radicals find fame and fortune in the field of audio-visual historical exhibits? If the team calls itself White Oak Design, and takes up residence on the seventh floor of an old warehouse overlooking Boston harbour, in Massachusetts, the answer is a resounding 'may-be.' What is beyond dispute, however, is that this company, whose manpower complement ranges from three to forty scenic designers, historians, photographers, graphic artists, carpenters, costumers, music directors, audio engineers and plumbers, has undertaken several unconventional and successful audio and visual ventures in both New and Olde England.

WHITE Oak Design is probably best known for designing and constructing the Elizabethan Pageant that opened in April, 1979, opposite the Royal Shakespeare Theatre at Stratford-upon-Avon in the UK, but that remarkable dioramic tour through the world of the young Bard is just the latest in an impressive string of such projects.

White Oak was born in 1971, when John Jacobsen, who was working as a scenic designer in the professional theatre, and Stephen Rich, who had experience as an actor and stage production manager, were approached by the owner of an old church in Salem, Massachusetts, and asked to design a show for what would become the Salem Witch Museum.

Narration, music, and sound effects for the multimedia show are recorded on one track of a stereo tape, which is then fed to a speaker hanging in the middle of a circular space. The other track contains signals that trip a simple stepping switch, which is in turn connected to several banks of lights. As the tape plays, the lights selectively reveal displays of costumed mannequins in period settings, that, along with the narration, tell the story of the infamous Salem witch trials of 1692, in which the good citizens of that town engaged in the crushing, burning, and hanging of a large number of their community.

"Audio production was very crude," recalls Rich, now White Oak's vice-president. "I took the narration tape, which had been recorded in someone's bathroom, up to Smith College (about 100 miles inland) to mix it. We cued the sound effects to the script and the narration, and got the whole thing down on 35mm mag film, through a home-made movie mixer. After it was done, we transferred it back to ¼in tape." The final result is very effective.

Bunker Hill

The Battle of Bunker Hill, a story in dioramas, projections, and sound, was White Oak's next venture. Designed and built for the Bunker Hill Pavilion in Charlestown, Massachusetts, a museum just across the river from Boston that was built as part of America's bicentennial celebration. The exhibit told the story of the first major conflagration of the American Revolution. The battle was actually fought on nearby Breed's Hill—Bunker Hill, which was razed in the mid-19th century to provide landfill for what is now Boston's Back Bay area, was merely where the rebels had camped the night before.

The project was funded by the industrial-electronics giant Raytheon, who gave White Oak a budget that allowed the quality level and scope they thought it deserved. According to Berred Ouellette, who has been the company's audio engineer since the Bunker Hill project began, all that was asked of Raytheon was that they "give us a black box, air conditioning, power and a control room, and we'll do the rest."

The theatre has a temperature- and humidity-controlled control room hanging from the ceiling. It houses six Xenon light sources, each of which has an angled mirror which rides on a track, permitting cross-fading between two modified Ektagraphic projectors. There are fourteen screens hanging amid the surrounding scenery in the theatre space, which are organised into six projector areas, to correspond with the light sources. The slide mounts designed for each of the projectors consist of up to three images each, with masks to black out those screens not in use in a particular scene. "In that way we could reduce the number of projectors while keeping a tremendous visual flexibility and the punch of the Xenon lights," explains Rich. The downward-pointing angle of the projectors introduces a certain amount of parallax error, resulting in a 'keystoning' effect, so the images on the slides are trapezoidal, to compensate.

Audio is provided by a pair of Ampex *AG-440* 8-track tape decks (main and backup), feeding seven Altec *604*s in custom cabinets, scattered around the 150-seat theatre.

Power is supplied by Crown *150*s, and there is dbx noise reduction and Soundcraftsmen graphic equalisation for each channel.

"Mixing was a problem," recalls Ouellette, "because we didn't have a 7-channel room to work in anywhere." At the time, Ouellette was chief engineer at Intermedia Studios, in Boston's Back Bay, which was one of the first 16-track facilities in the world, but it was only equipped with a stereo monitor system. "We had to mix there anyway, because there was no way we could work in the pavilion. Everyone else had work to do there—carpenters needed it light, the lighting people needed it dark, and everyone needed it noisy." Hence, there were innumerable quick trips back and forth across the river during the wee hours as the opening date loomed.

The eighth audio track provides the cues for the lights and slide projectors. The programming system, designed and built by Audio Visual Services of New York, uses a paper-tape read/write system for the initial programming, which allows fairly easy manipulation. When complete, the program was transferred onto the control track of the audio tape (no, it's not an edge track!). The program process was flexible enough to allow the slide projectors to be cued and faded at any of several speeds. Lighting instructions are stored in a Read Only Memory, which operates voltage-controlled dimmers, taking its cues from the audio tape. "When we were finally able to transfer the light cues from this horrible clunky paper-tape reader onto the audio tape," laughs Ouellette, "we had a hell of a time getting them to sync with the sound properly. The speed of the tape reader was very susceptible to line-voltage variations. It didn't even have a synchronous motor."

The Bunker Hill Pavilion, like every other White Oak multimedia project, is strictly a turnkey operation. Special sensing switches were installed on the Ampexes to stop, rewind, and re-cue the tape, so that all that the operator of the show has to do is to flip one switch when he or she wants to start. There is even an endless-loop cartridge of ambient sound that cuts in automatically if there is trouble with the 8-track tape. White Oak prepared extensive instruction and maintenance manuals, so that the Pavilion's own electricians can perform any necessary work between shows. White Oak are not contractually responsible for the equipment after the shows are completed, but manufacturers' warranties can be, and are, taken advantage of. "Our responsibility technically ends when the show opens and is paid for," says Rich, "but we do have a moral responsibility to make sure that things are going OK. We expect a 10-year life for each of our shows, but that figure has nothing to do with the equipment or the software—it's rather that artistic styles change and we don't want an historical piece to turn into a period piece." The company maintain stocks of slides and master tapes for all of the shows, so that copies can be easily made as those items wear out. "We specify the tape to be replaced after 200 passes," says Ouellette, "which works out to about once a month."


Steve Rich and Bernard Ouellette plan a multichannel mixdown.

India Star

White Oak's third multimedia project, The Voyage Of The India Star, tells the story of the New England pepper trade, and the boats that sailed to Sumatra to get that precious cargo. It opened in April 1978, also in Salem, and like the Witch Museum, it uses dioramas and stationary graphics to tell its story. The sound is on three tracks, and was mixed at Dimension Sound, in Boston.

All of the many sound effects were generated by the company, mostly using location recordings. "We tried a few needle drops," remembers Ouellette, "but they didn't work. The stuff we got from libraries was never quite what we wanted. One scene that gave us a lot of trouble, for example, was a decapitation. We went to a grocery store and bought a cabbage, a hubbard squash, a grapefruit and a couple of pounds of steak.

"After trying every possible combination, we ended up splitting the cabbage with a meat cleaver and following it with a little splash of juice from the grapefruit." On tape, it sounds pretty gruesome. Other effects, like a spinning 'Wheel of Fortune' in an Independence Day carnival scene, and the sounds of birds and wind, were electronically synthesised.

The audio tape is played on an Otari *MX-5050* ½in 4-track machine. Electro-Voice *Sentry III* speakers handle most of the sound, and White Oak built custom subwoofers using E-V drivers to reproduce the low end of the sound of a storm at sea. The whole system is bi-amplified, using Yamaha power amps and custom crossovers, and each channel has dbx noise reduction and White 1/6-octave equalisation. In this installation, clear leader spliced into the audio tape is used to cue a custom made transport computer, that orders the Otari to rewind and re-cue, and also resets the visuals. The lighting board containing 136 voltage-controlled dimmers, is driven by a computer and interface developed by Ithaca Theatre Lighting in Ithaca, New York.

The ITL computer is designed to be completely trouble-free as it stores its instructions in a non-volatile ferrite memory core, which should be able to maintain the program indefinitely. If it should fail, however, it can be quickly re-programmed through a cassette machine hardwired into the computer. Several copies of the programming tape are stored at separate locations, and, in an extreme case, hard copy exists on paper.


Control room for An Elizabethan Pageant

Elizabethan Pageant

The Elizabethan Pageant was constructed during 1978 and 1979, in what had been a garage. There was a high ceiling in the rear of the building, but White Oak's design called for even more vertical space, so the roof was taken off and the walls raised, to provide over 30ft of clear height.

There were plenty of other obstacles. White Oak wanted to use authentic Elizabethan music on the audio track, and several English early-music experts were asked to take on the role of musical director. One gentleman refused, asserting that he would only record in churches or Tudor houses, and only with crossed pairs, and under no circumstances would he go into a recording studio. Adam Skeaping was eventually hired as musical director, and the music was recorded at Riverside Recording Studios in London. "We close-miked everything," explains Ouellette, "which we knew was hardly a purist approach, but we needed that flexibility if we were going to have the proper control in a 7-channel mix."

Ouellette went to the UK a year before production was scheduled to begin, to line up an appropriate mixing studio. The company was determined, this time, to mix the sound properly in a 7-channel environment, and several major studios, such as Air and Abbey Road, turned the project down because they were unwilling to do the necessary rewiring. Finally, Sound Developments in north London agreed to alter their board and wire in seven monitor busses, as well as install extra amplifiers and speakers—the studio's maintenance staff was in for a lot of overtime. The submaster section of the board was wired so that panning, by way of conventional pots and joy-sticks, could be achieved between any combination of channels.

To read the script, which had been carefully arranged so that no adjacent or simultaneous lines would

64 ▶

White Oak

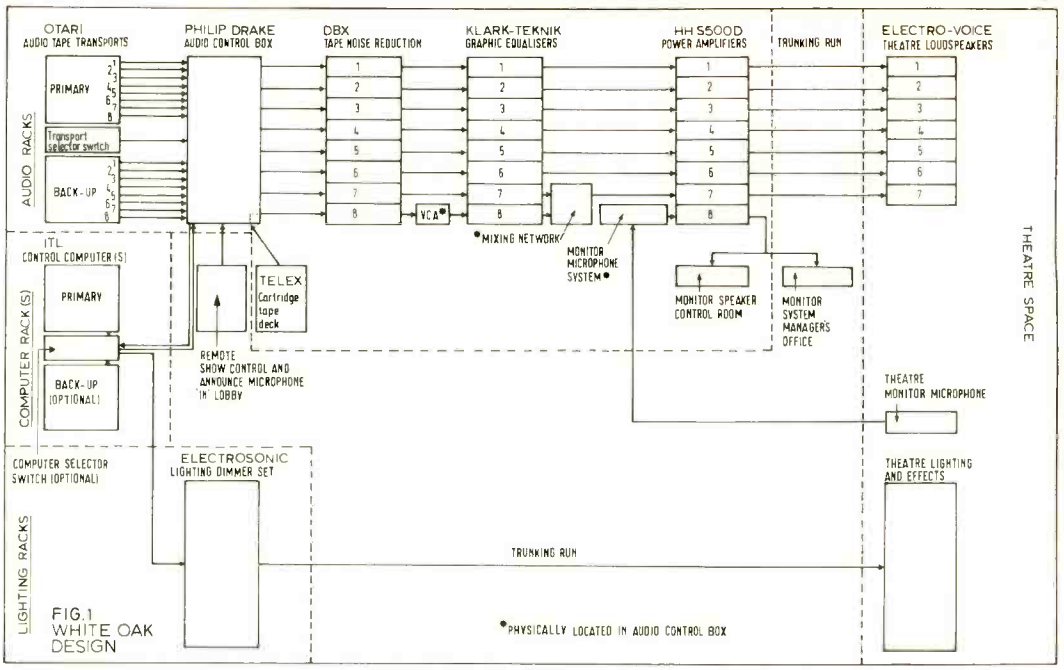


FIG.1
WHITE OAK
DESIGN

end up being read by the same voice, actors were hired from the Royal Shakespeare Company. Their performances were exemplary, but they gave rise to another series of headaches. "When experienced stage actors work together," explains Ouellette, "the results have a life that you cannot get out of disembodied voices feeding separate tracks. Because of their training, however, they have this habit of not leaving spaces between the lines. There was some mic leakage too, of course, and we found when they were done that we were hard-pressed to change the pacing or the timing of the script. Editing was a real pain."

The music, which had been recorded at Riverside on 16 tracks, was bumped up to 24, and the voices and sound effects were added. Using Sound Developments' newly-refurbished facilities, the tape was mixed down to eight tracks on an MCI 1in machine, then transferred to ½in 8-track on an Otari, similar to the ones now in residence at Stratford.

White Oak chooses its audio equipment on the basis of availability and delivery time, reliability and ease of service, and technical specifications, while cost is usually considered a minor factor. The company believes the Otari *MX-5050* ½in transports to be very dependable, while the high isolation between the eight channels of electronics helps keep crosstalk at a minimum. Two decks are used, main and backup (**Fig 1**), and the output and control signals can be instantaneously rerouted by one toggle switch. Crosstalk can be very harmful in this kind of installation, as tracks that are adjacent on the tape may be routed to speakers as far apart as 30ft (**Fig 2**), so dbx *155* noise-reduction units are used to help eliminate that problem, as well as to keep noise down. The tape transport functions are handled by the Philip Drake control box, which also contains the switching for the emergency cartridge-machine override, which provides background sounds in the event of any interruption in the main audio. A real-time analyser was brought in during the final phase of construction to achieve flat response in the theatre, and the equalisation, provided by Klark-Teknik *DN-22* graphics, was later tweaked a bit to favour the programme material. Power amplifiers are HH *S500-Ds*, which were chosen for their low noise levels and sophisticated self-protection circuits.

The speakers are once again Electro-Voice *Sentry IIIs*. They were selected not only for their excellent fidelity, but also because of the fact that a failure of either the tweeter or the mid-range would allow the other to keep operating, thereby maintaining speech intelligibility.

White Oak Design employed separate contractors for the audio equipment, lighting dimmers, and computer, and the problems of interfacing the various sections—such as who was responsible for what, what kind of cable was to be used, how were the various units to be wired together, etc — were complex. Thanks to the free flow of information and the great co-operation between the various contractors, however, the project was completed rather painlessly. The official opening was attended by Princess Anne, and all reports indicate that the Elizabethan Pageant is doing very well indeed.

"We see ourselves as conceptual designers," says Stephen Rich. "We aren't engineers, historians or educators but we try to build our shows with a special sensitivity to those disciplines. When we need those people, we hire them, and that way we know that we're getting the best.

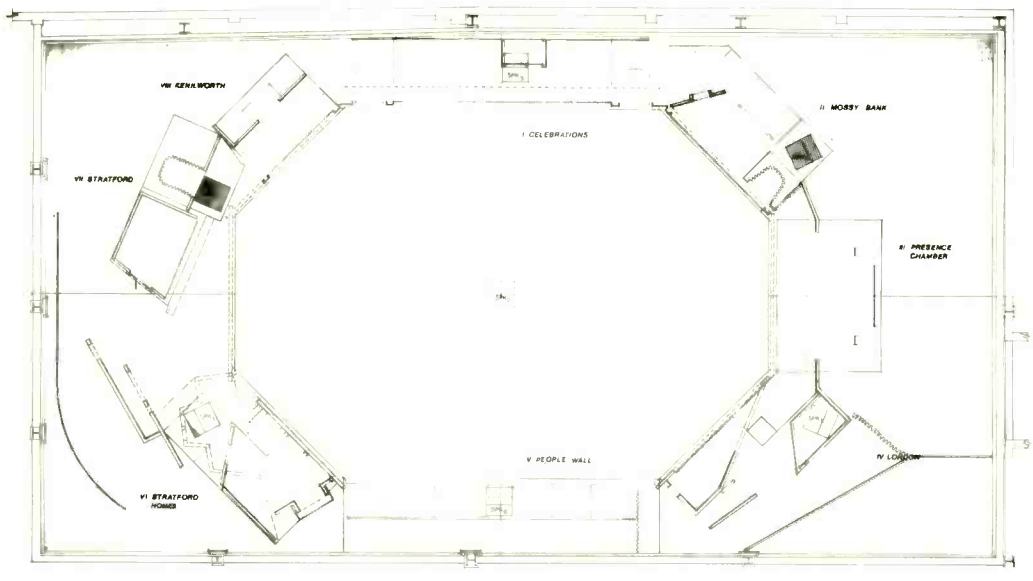
"We don't have a pragmatic approach to our work but we solve problems as we go along. We spend a lot of time re-inventing the wheel, but we also find that we're completely unfettered by the formulae and conventions of the audio-visual world.

"Our approach to business isn't that of a 'mainstream' company, either. We offer our clients a fixed price, and a fixed delivery date, which I understand doesn't happen in the real world. In return, we maintain total artistic control. We've taken our baths, but we will never stick a client for more time or money. We had to invent a way of doing business that we could live with, and that would also keep our clients honest."

White Oak Design's next project is a design for a national historical park to be built in downtown Holyoke, Massachusetts, which was one of the early centres of the industrial revolution in the USA. Although at this time of writing the work is very much in the preliminary stages, the White Oak team is considering using slides, sound, graphics, and lots of real water in a 'please touch' exhibit that will tell the story of the use of water power in industry.

"Above all," says Rich, "we have to live with the work and the results, and we try to make it fun." If you find yourself in Salem or Charlestown, Massachusetts, or in Stratford-upon-Avon, you, too, can have fun with their results. A splendid time is guaranteed for all.■

FIG 2 AN ELIZABETHAN PAGEANT — PLAN VIEW



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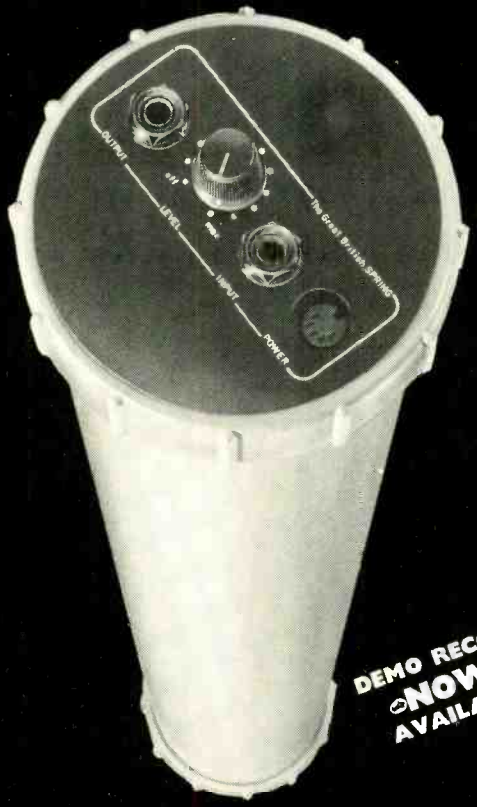

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APRS 14th Exhibition, London-a report

Richard Elen

FOR the first time, this year's APRS Exhibition was held at the Kensington Exhibition Centre instead of its previous venue, the Connaught Rooms. The three rooms gave ample space for a large number of exhibitors without the tedious hunt through the rabbit-warren we have become so accustomed to. Many exhibitors reported that the attendance seemed to be up on previous years, and the number of serious enquiries was up: the British recording industry is still most certainly alive and healthy.

As usual, we have attempted to mention only new products or those which have not been written up before in the magazine. It should not be imagined that companies who do not appear in this report did not exhibit (see our Preview for full details): we simply do not have the space to cover everybody. Of course, we may have missed out one or two manufacturers. If so, we would be grateful if they would let us know for future inclusion.

AC Electronic Services showed their full range of studio and PA equipment, including their 12 and 16-channel PA desks and multitrack studio mixers, and announced a new 16-track 2in tape machine, the *ACTR16*. This unit takes 12in reels, and features Hall Effect motion-sensing elements, electronic braking, 15in/s speed and NAB eq. Wow and flutter is quoted at 0.14% and S/N ratio at 65dB. Frequency response is 3dB down at 30Hz and 25kHz (playback), 50Hz and 20kHz sync. Ins and outs are 600Ω unbalanced via ¼in jacks. The machine retails at £4,500.

Alice presented a new broadcast-quality mixer to the world at APRS: the *2008*. This unit arose from development work being done on their Broadcast Custom Modular range, and represents a new standard in specifications available at low cost. Developed by Ted Fletcher and Steve Dove, the mixer makes use of many new developments in solid-state technology. The *2008* has eight mono mic/line input channels, two output groups with stereo linked limiter, line-up oscillator and comprehensive monitoring. It can be driven by an internal mains PSU or external 12V batteries. Each channel has two balanced inputs, switched via a single transformer for mic or line; both connectors are *XLR*-type. The input gain control is continuous, giving a range of 55dB mic/35dB line, with a zero detent. Virtually no crosstalk is present between inputs. The equaliser is a completely new design utilising similar parameters to the *ACM 2* modular mixer, with an hf shelving response turning over at 12.5kHz and bell-shaped mf and lf curves. The lf response peaks at 50Hz, while the mf is variable from 330Hz to 4.7kHz. All three controls offer about ±14dB, and an eq in/out switch is fitted. Two auxiliary sends are available, both switchable pre/post, and an echo return appears at each out-put group. Group outs are transformer balanced, while the auxiliary send outputs are electronically balanced.

Syncon M24

One of the stars of the show was another recorder, this time a new 24-track from **Allen & Heath Brenell**. The prototype *Syncon M24*, in a very elegant package, was on show, and although there was little technical detail available at such an early stage, the machine design showed a number of interesting features including pinch-roller-less transport, comprehensive remote/autolocate, and LED column VU metering. The audio electronics are all mounted in a penthouse behind the metering, while the tape transport electronics and power supply unit are mounted below the deck. The machine uses 2in tape with a spool capacity of 14in; has switchable NAB, IEC and AES equalisation; three preset tape biasing circuits; separate eq on 30 and 15in/s; varispeed facility covering the range +100% to −50%; and a varispool feature. The recorder additionally features a power failure correction circuit; balanced *XLR*-type input/outputs; a complete interface for noise reduction; close proximity tape heads; and easily interchangeable headblocks, (the latter to accommodate a 16-track headblock). The autolocate uses a similar format to that adopted on the Ampex *ATR 124* and has nine separate memories to control drop in/out, line/sync, etc. The remote controller offers full logic control; has a tape timer with readout in hours/minutes/seconds; and features displays for master/local time, transfer time between memories, and tape speed in the varispeed mode in either % or realtime. Price of the *Syncon M24* 24-track tape machine including autolocate and remote will be in the region of £16,000. We will publish full technical details on the machine when they become available, and hope to review the machine in our January 1982 issue. Looking to the future, AHB inform us that they also plan to introduce a 16-track version of the machine to be termed the *Syncon M16*.

Audix also released a new small mixer, the *MXT500*. A choice of input modules allows up to 14 mic/line ins depending on the facilities required. Two output groups are fitted, with provision for stereo or mono operation. Two line level aux input channels are provided, plus a line-up tone generator, and the mixer may be supplied built into an aluminium flight case, a wooden plinth, or in a 19in racking frame. Inputs and outputs are balanced throughout, and metering is VU or PPM as desired. Mains or battery (24V) operation is catered for.

Audio & Design Recording showed their new *Panscan* effects unit for the first time. In a 1U rack-mounting package, the unit offers automatic panning effects with control of all parameters, including speed, depth, image offset, and a novel idea, trigger-based counting circuitry which can be used to count a certain number of transients (up to 10) before panning takes place: a remarkably useful feature (try it on your next cowbell overdub!). The device has unity gain and offers a panning depth of up to 35dB. Inputs and outputs are unbalanced, line level.

Brooke Siren Systems produce an expanding range of frequency dividing systems and at APRS introduced a new unit, the *FDS 340*. Basically similar to the *FDS 320* 2-channel, 2-way system with full limiter features on all outputs — the *FDS 340* is a single channel, 4-way switchable 3-way frequency dividing system, again with full limiting. Priced at £300, the unit has a balanced *XLR* input and unbalanced *XLR* outputs, with subsonic and high frequency input filters. Level controls for each band are continuously variable over a 12dB range, while the frequencies and slopes are set by programming cards with the slopes available being either 12, 18, or 24dB/octave. In addition to this unit BSS also showed a redesigned version of its *AR125 XLR*/jack lead tester, the new version now incorporating a fuse test facility.

Bulgin Soundex showed some new instruments, notably the *PPM 302* peak programme meter drive

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card and movement, a new encapsulated PPM driver, and the *AMM 200* noise meter. Built to CCIR 468-2 specifications, this latter unit measures audio frequency noise down to −100dB. Mains powered, the unit features high or low impedance balanced input, low drift, and a 'scope monitoring output.

Calrec exhibited a wide range of equipment, including the well-known *Soundfield* microphone, and a new automation system and assignable equaliser module. The *LX800* console automation system is based around the Motorola *Exorset* computer system which utilises the *6809* microprocessor and twin 5¼in floppy disks, one of which stores the program and the other, mix data. The program being stored on disk enables the user to re-run early mixes even if the system has subsequently been updated. A number of display pages offer reel identification, titles, track listing, cues, and timing data. The system, of course, interfaces happily with Calrec's own digital attenuator system, on which no data is currently available. Calrec's assignable equaliser was shown in prototype form, and no information is yet available on it, but it appears to be a remarkably comprehensive system allowing the setting of equalisation parameters via continuously-rotating knobs which indicate their settings on small LED-strip displays. An eq setting may be assigned to a channel by means of a small keypad. The fact that much of Calrec's new equipment includes radically new designs and devices accounts for the current lack of data on these new products. However, we hope to publish further details when they are 'declassified'.

Clyde Electronics have never appeared at an exhibition before: however, they turned up at APRS with a full range of broadcast audio equipment and ancillaries, and very impressive they look. Centrepiece of their display was the *Alpha* mixing console, which is a flexible modular system for fixed or portable use, available in any size with any combination of modules which may be installed anywhere in the frame. Modules include mic/line inputs with fully parametric eq, 'DJ' modules, and multi-input stereo units. For fixed installations, a 'wrap-around' console system can be supplied which includes tape recorders, cart machines, and turntables. Other units in the range include the *CETB1* communications unit, *CEM1* monitor unit, *CEOM2* oscillator, distribution amps, the *Delta* mixer — a self-op news presentation unit with 'intelligent' cart machine control and automatic level control — and the *BTU 1* broadcast turntable unit, based around the Technics *SP10* turntable. Headphone amps, fault indicating supervisory systems, and line interface units are also available. Clyde Electronics are also distributors of the Marti Electronics range of radio link and relay systems.

Canford Audio showed their new catalogue, which includes full details of the wide range of professional audio accessories handled by the company. New additions include patchcords, jackfields, tag blocks, Preh DIN connectors and Theatre Projects intercoms.

Studio Equipment Services demonstrated a new unit from **Drawmer**: the *DMT 1080* 'Multitracker'. This analogue-delay system features delays from 0.3 to 80ms, touch-button delay selection, balanced *XLR* and unbalanced jacks in and out, and the unit is designed for ADT, triple tracking, chorus effects, three types of phasing, 'enhanced' phase/flange/ADT, 'tuned drainpipe' effects, flanging, echo, pitch modulation, and combined phasing and triple-tracking. Stereo and mono effects are available with the unit.

Broadcast equipment from Pacific Recorders

It isn't often that a company distributing audio connectors has much to offer in the way of new product: however, Neutrik and UK distributor **Eardley Electronics** showed several new items. First off, is the *Type NJ FP* 3-pole locking jack socket with quick release facility. This socket features three spring-loaded isolated contacts, solder terminations, and a die cast housing. It is compatible with the Neutrik *D-Series* connectors and mates with all ¼in 2- and 3-circuit jack plugs. Second new product are the *MRC* and *FRC* right-angle male and female cable connectors which will be available in the UK from October. These connectors are the same length as normal DIN connectors making them ideal for rack mounting, and they are available in 3, 4, 5, or 6-pole versions. A feature of these connectors is the facility to rotate them to any of seven 45° positions. A new feature to be incorporated on all Neutrik connectors is the provision of totally enclosed cable sleeves, this arrangement making the connectors completely waterproof and hence ideally suited to OB usage. Further new Neutrik items include a number of *XLR* to DIN adaptors available additionally as screw types for mics.

Electro-Voice showed their compact *Sentry 100* monitor loudspeaker for broadcast/recording studio applications. The unit features a high-power tweeter capable of withstanding the rigours of studio use (eg rewinding tape past the heads with the level up) without collapsing under the strain. This dome tweeter has a 120° dispersion at 5kHz, and responds up to 18kHz. The lf driver is an 8in direct radiator in a special vented enclosure offering extended bass-end response. The cabinet itself is covered in scratch-resistant matte black vinyl and may be rack-mounted with the *SRB-7* kit which also offers wall-mount capability. The unit is a mere 12x17¼x11⅛in (whd).

An ingenious foldback system for the studio was exhibited by **Formula Sound.** Called the *Que-4,* the system consists of a pedestal or wall-mounting control unit taking a −10dBm signal in (eg direct from a desk foldback send) and driving 2x6W into 200Ω headphones. The control unit contains four channel faders with pan controls plus overall level and top/bass eq, enabling the musician to tailor an individual foldback balance.

Gresham Wood Industries are an Audix associate company specialising in wooden consoles and housings for audio equipment. In a field where few manufacturers still exist, Gresham Wood offer a pleasant alternative to cold metal panels and bring a degree of craftsmanship and custom-designed ergonomics to a field where all too often one piece of equipment looks much like another and doesn't match the environment. Apart from one-off custom designs, GW also offer a range of standard consoles and metal equipment housings. Their first appearance at APRS made an impressive showing.

Industrial Tape Applications introduced a new *Itam* professional mixer series, for multitrack applications. Preliminary data indicates that the series includes electronically-balanced inputs with +20 to 80dB calibrated gain control and 20dB pad, phase reverse, mic/line switching, and line input preset gain ±10dB, with high and lowpass filters. Equalisation offers ±15dB in four bands, 10kHz, 530Hz to 7kHz, 170Hz to 2kHz, and 50Hz, with eq cut switch; and four cue sends are provided, switchable pre/post in pairs. Eight groups plus stereo remix buss are provided; in addition a master muting buss is supplied placing channel muting under the control of one master button. The group outs may be switched between two outputs, for 16-track applications, and 12-element LED metering is supplied, switchable VU/PPM. Two echo returns are fitted, each with linear faders, and each offering full routing to groups and stereo buss.

Klark-Teknik now offer bi-amp and tri-amp options for their widely used *DN27A* graphic eq unit. These take the form of internal active crossover modules for use with either 2- or 3-way speaker systems. Level controls are provided inside the *DN27A* for tamper-proof setting, and all outputs are relay-isolated with delayed turn-on. Any choice of crossover frequency is available, with a choice of 12 or 18dB/octave slope, and Bessel or Butterworth filters. Low/mid/high/direct outputs are provided on one 6-pin *XLR*-type socket (matching plug provided!), and the option is rapidly fitted to the *27A*. Outputs are unbalanced, less than 60Ω source impedance to drive a 600Ω load, and give up to +23dBm. Level controls are factory-set for unity gain, but may be adjusted in the range −40 to +6dBm. Noise is better than −90dB for all outs at unity gain, and distortion below 0.03% ref +4dBm 20Hz to 16kHz.

Leevers-Rich are now UK agents for the range of broadcast equipment made by Pacific Recorders in the United States, including the *BMX* range of broadcast consoles and *Tomcat* cart machines. The *BMX* consoles are remarkably easy to use, including pushbutton control of external machines and a very straightforward, uncluttered layout. The range is based around five primary modules, offering mic input, line input, control room monitoring, studio monitoring and talkback, and remote line selection. Most impressive of all, however, were the cart machines. The *Tomcat* series is one of the few ranges of cart machines I have encountered which does not seem to suffer from azimuth errors during replay. Listening to a stereo cart in mono gave none of the phasiness one so often hears on the air and the sheer solidity of the transports made it quite obvious that it would stay that way, even in perennial use. Modular construction of both electronic and mechanical elements is of a very high standard, the latter featuring the use of a rotary solenoid for pinch-roller actuation with a specially-designed cam to give the optimum final approach. Constant-current solenoid drive allows

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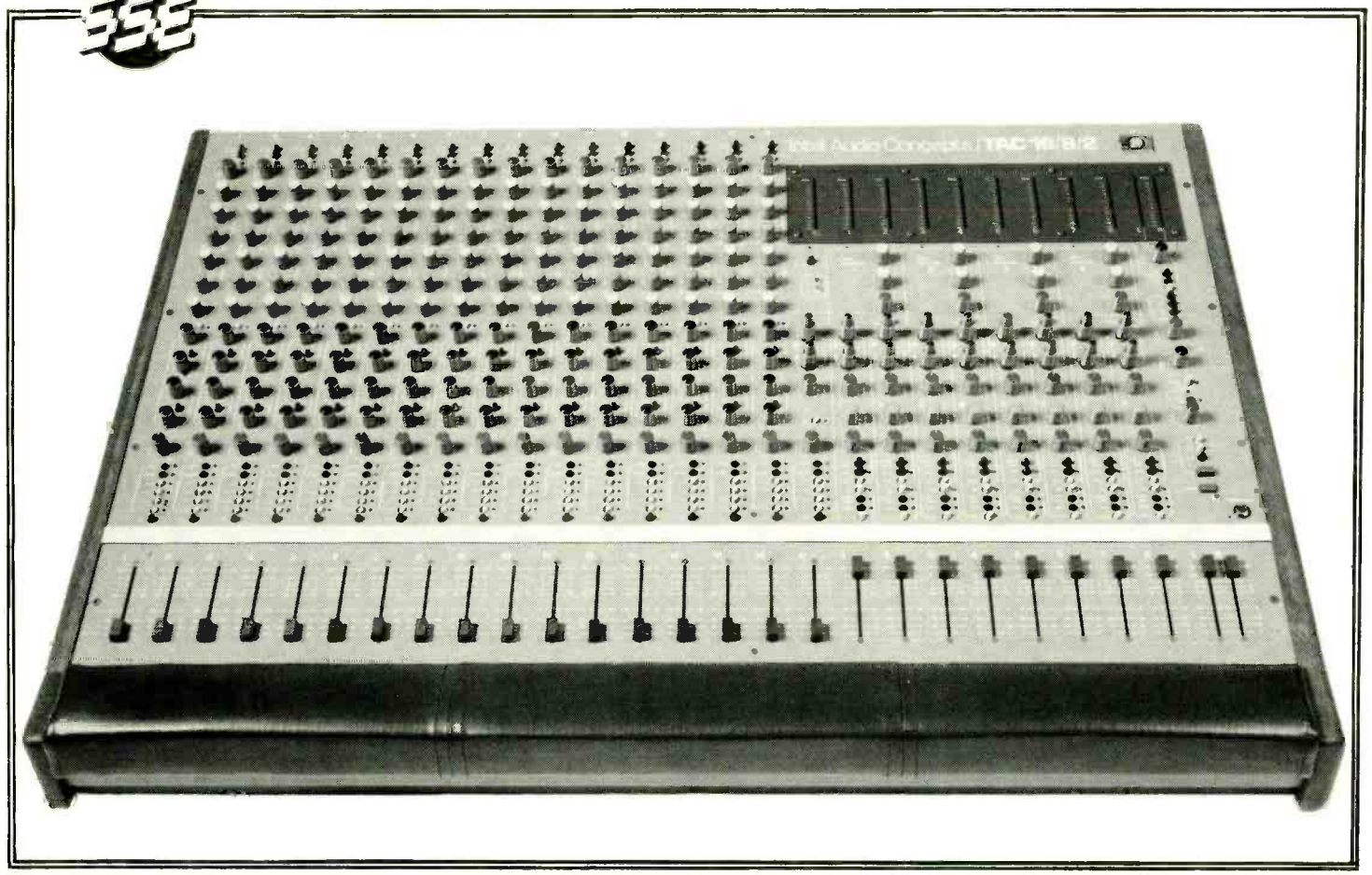

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APRS report

precision setting of the final pinch-wheel pressure. On the electronic side, the head preamp utilises the excellent Jensen *JE-990* discrete op-amp, and liberal use is made elsewhere in the circuitry of the *NE5534* IC amp. The *Tomcat* machines include a number of features in addition to the normal cue-tone standards and left/right or sum/difference recording, one notable extra being a sensing system which detects and warns the operator of faulty carts which are on their last legs. Put quite simply, they are very impressive.

Microtype are better known for their microcomputer cases and equipment than for audio gear, but they were present at APRS, showing the *Studio-Time* studio booking system. This is a software package for the *Apple II* microcomputer, and is supplied on 5¼in diskette. The package, which was shown running on an *Apple* with two disk drives, Hitachi video monitor and driving a Centronics *737* matrix printer for hard-copy, offers the facility to enter new bookings, cancellations, updates and confirmations; in addition, the system has a diary facility, and can search customer records and produce diary and customer reports.

On the **Turnkey** stand, one could see and experiment with a British competitor to the Linn drum machine. The MCS *Percussion Computer*, by **Movement Computer Systems** of Bridgwater, Somerset, retails at around £1,800 +VAT and offers real and synthesised drum sounds under microcomputer control. Based around the British *Nascom* microcomputer (*Z-80* microprocessor), the system allows the composition of fills, verses, time changes, etc, with the ability to assemble a piece on-screen with 300 locations and visual editing; playback in real time or set time; 19 real and synthesised drum sounds (the former may be burned into EPROM from your own tapes); cassette saving of rhythms; and a wide variety of trigger signals to be input and output, allowing synchronisation of sequencers, etc, and over-dubbing. In addition, the machine is a fully-fledged microcomputer, with Microsoft BASIC, 16K RAM, UHF and video monitor outputs, and a wide variety of other programs available including studio track sheet, invoicing and games.

Good news from **Neal Ferrograph** is that the company still exists; it has not gone into liquidation as some rumours had it. A receiver has been called in and the company is to be sold as a going concern, and in the meantime, the Neal Ferrograph range is still in full production. In addition, the company has released a new machine, the *SP744* 4-track recorder. Utilising the same transport as the well-known *SP7S* models, the closed-loop servo capstan system offers three speeds with full logic control and motion sensing. Full remote control is possible, and an external varispeed facility may be fitted. Line ins and outs are provided on *XLR* connectors, while front-panel jack sockets are used for mic inputs. Four large illuminated VU meters read replay and record levels, and a versatile headphone monitor facility is provided with capability for track selection. Channel assignments are simply made with two switches offering record, and source/sync/tape. A noise reduction interface is provided. We hope to review this machine in our December issue.

Progressive Electronic Products showed their new *CM8* series of 16-group console modules, plus a complete console which has been produced for an overseas studio. The new series features four primary units: a channel module, with 16-track routing, routing to stereo buss, balanced line input, transformer or electronically balanced mic in, high and lowpass filters, 4-band sweep eq, programmable muting and comprehensive overload indication; a group module, with mix buss combining amps, line output amp (capable of driving +22dBm into 600Ω), and two monitor sections, plus a 20-element LED-bar meter with switchable VU/PPM characteristics; an echo return module, with two completely separate effects returns, each with its own fader, comprehensive return routing, and electronically balanced inputs, featuring internal ±10dB gain; and a monitor/control module with stereo master fader, monitoring selection controls, talkback, line-up oscillator, cue send masters for the four switchable pre-post sends per channel, and various master controls including programmable muting. This module also houses the light-bar stereo buss metering.

For a mere £391.30 +VAT, **REW** will sell you a new *Portamix*. Specifically designed for portable use, as the name suggests, this unit features an aluminium case with batteries in the lid. Electronically, the specification includes six channels and two groups, with internal mains PSU as well as the battery capability. Each channel features electronically balanced low-impedance mic input with *XLR* connector; unbalanced line input with standard jack connector; gain control offering +30 to 70dB mic, ±20dB line; mic/line select switch; 3-band eq offering ±12dB at 10kHz, ±10dB at 3kHz, and ±12dB at 50Hz; cue send, pre/post; panpot; PFL; and a 60mm carbon-track fader. Each group features integral limiter and VU metering, peak overload LED and aux return; and a battery check function is provided.

Rebis have announced two new units for their rack system. The *RA215* programmable pan controller and *RA216* Dual VCA modules can be used together to produce a fully programmable autopanning system controlling not only mono, stereo and multiple channel fadeout or panning, but also crossfades between effects or tracks. Free-running panning is also available, with random or programmable hold and one-shot panning selectable over ¼, ½, ¾ or full cycle. The run, hold, and 'pan to' functions can be externally dc-controlled, for example from the *RA201* noise gate, to give signal-related triggering. Rate of pan is also externally dc-controllable for 'Leslie'-type effects. A pan range switch offsets the stereo field, and rapid flyback can be selected in either direction to make the signal pan one way and then jump back to its starting position.

Soundcraft announced new, lower-cost versions of their 16-track and 24-track 2in tape machines at this year's APRS. The new models offer all the essential features of the regular machines, but without the interchangeable headblock, 9-position autolocator, individual selection of monitor status, two line outputs and NR control outputs. What you *do* get, however, is a full remote control unit with punch-in subgrouping and monitor control with automuting, plus a search to zero and cycle function. The new machines, type numbers *SCM 162* (16-track) and *242* (24-track) retail for £7,850 and £8,750 respectively, as against £9,750 and £11,500 for the interchangeable-headblock versions.

Future Film Developments were proudly displaying a new machine from **Stellavox**, the *TD88*. This machine has been specifically designed to be easy to use and versatile in operation, all in a remarkably compact package merely a few inches tall. Plug-in headblocks and other parts of the design allow rapid format-changing, including the ability to accept up to eight channels, spools up to 14in diameter (¼in tape) or 10½in spools on ½in —or even 16mm perforated magnetic film. Microprocessor control assists in tape handling and external sync functions. The audio path is designed for both sound and instrumentation purposes, and the machine will operate at many different speeds from ac mains voltages or 24V batteries. A particular feature of the audio electronics is a very low level of intermodulation distortion.

Launched at APRS by **Trident Audio Developments** was the new *Trimix* console. Based on aspects of the *Series 80* design, with the smaller studio in mind, the *Trimix* is expandable from stereo to 4, 8, 16 or 24-track operation at a budget price. Equalisation features four bands with two midrange controls (sweepable); four aux sends are provided, all pre/post switchable; and 8-track routing is catered for with a separate stereo mix buss. The *Trimix* is a successful attempt to offer the full flexibility of a major console line within the budgetary and physical size restraints suffered by the smaller studio. The equalisation, too, is very similar to the Trident design which many American engineers regard as 'the standard'.

Tracktech are a relatively small British company based in Kingston-upon-Thames, who have come very much to the fore over the past couple of years. Beginning with lower-budget, small-studio mixers, they have now announced and exhibited a 24-channel, 16-assign mixer in their *MBM* series. New features include long-throw faders.

Overall, a very interesting APRS exhibition, successfully transplanted to a new venue. ■

CM8 series console from Progressive Electronics Products

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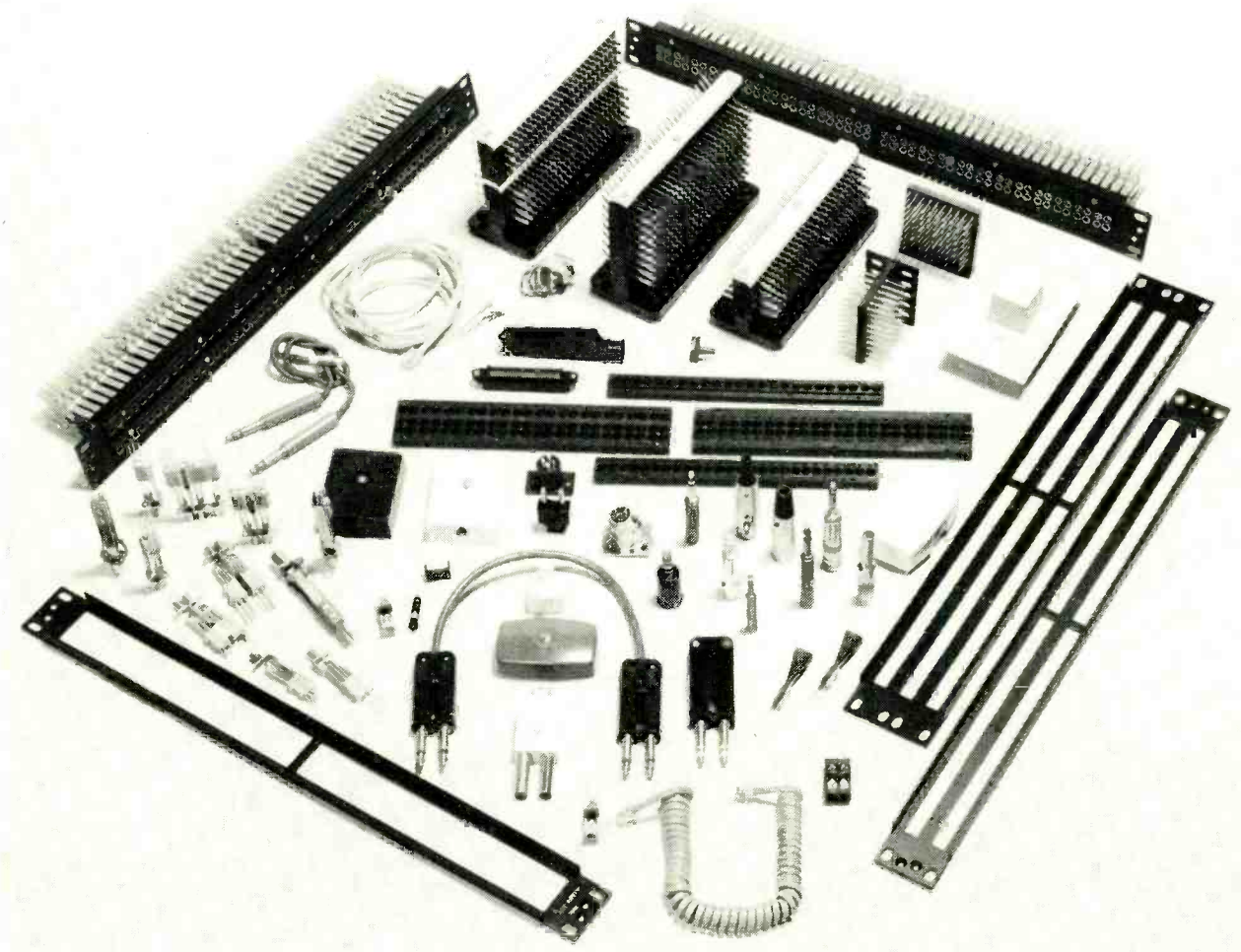

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Designing a professional mixing console

Steve Dove

Part Eleven - The Channel System

A SYSTEM is a means of reducing the versatility of its component parts. Ideally, there should be no system but practicality dictates that there must be one. The thought is mortifying: hundreds of elements, the mic amps, diff input amps, line amps, equalisers, filters and routing matrices roaming loose and needing to be cobbled together for each individual operational requirement.

We need a saving grace and fortunately there is one. Engineering and balancing habits are pretty well entrenched giving rise to a few well defined, commonly used elemental combinations. Rationalising these combinations and arranging to be able to easily select them as necessary is a good compromise. We've not so much lost versatility as gained a family of operating modes.

Which would you rather have? An enormous jackfield and a BSc in knitting or a few cute little pushbuttons? This article describes the channel switching logic that reconfigures the signal paths for the various operating modes.

The entire channel subsystem relies on the electronic switching elements used being entirely transparent—noiseless, distortionless, clickless and other impossibilities.

Noise due to the potentiometric CMOS switching employed here is very largely due to the individual summing amps, scaled by the gain asked of them. The impedances around these switches are low enough to fall somewhat below the optimum source impedance of the devices used. Noise resultant from them is defined to quite low (−100dBu or better) floor levels—fairly meaningless under the stampede of typical front-end or machine noise.

Distortion is primarily due to the CMOS transmission gates' automodulation, ie the path resistance varying with instantaneous signal voltage, but this at zero level is typically a nonsensical value. Both the harmonic and intermodulation products are almost unmeasurably low principally because of the near virtual ground operation of the active CMOS elements. No voltage swing, no automodulation.

The basic switching element, now, can be given the holy water treatment.

Function modes

If possible, reference should be made to **Figs 1** and **2** from Part One of the series (September 1980) during this discussion of the channel system. These show the overall channel in block diagrammatic form and the various ways the circuit blocks are configured for the different functions expected of the channel in use. **Fig 1** has all the reconfiguration represented by diagrammatically accurate but forbiddingly incomprehensible mechanical switching. **Fig 57** replaces those in the main signal paths with

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FIG. 57(a) CHANNEL SYSTEM - SIGNAL PATHS

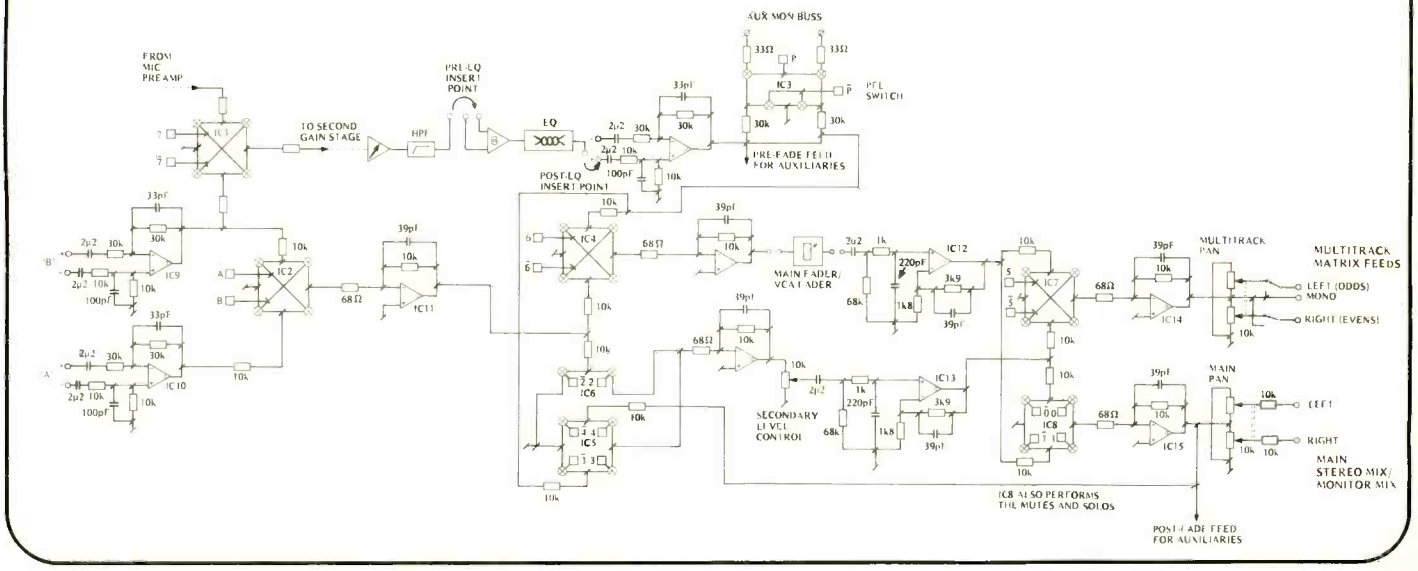
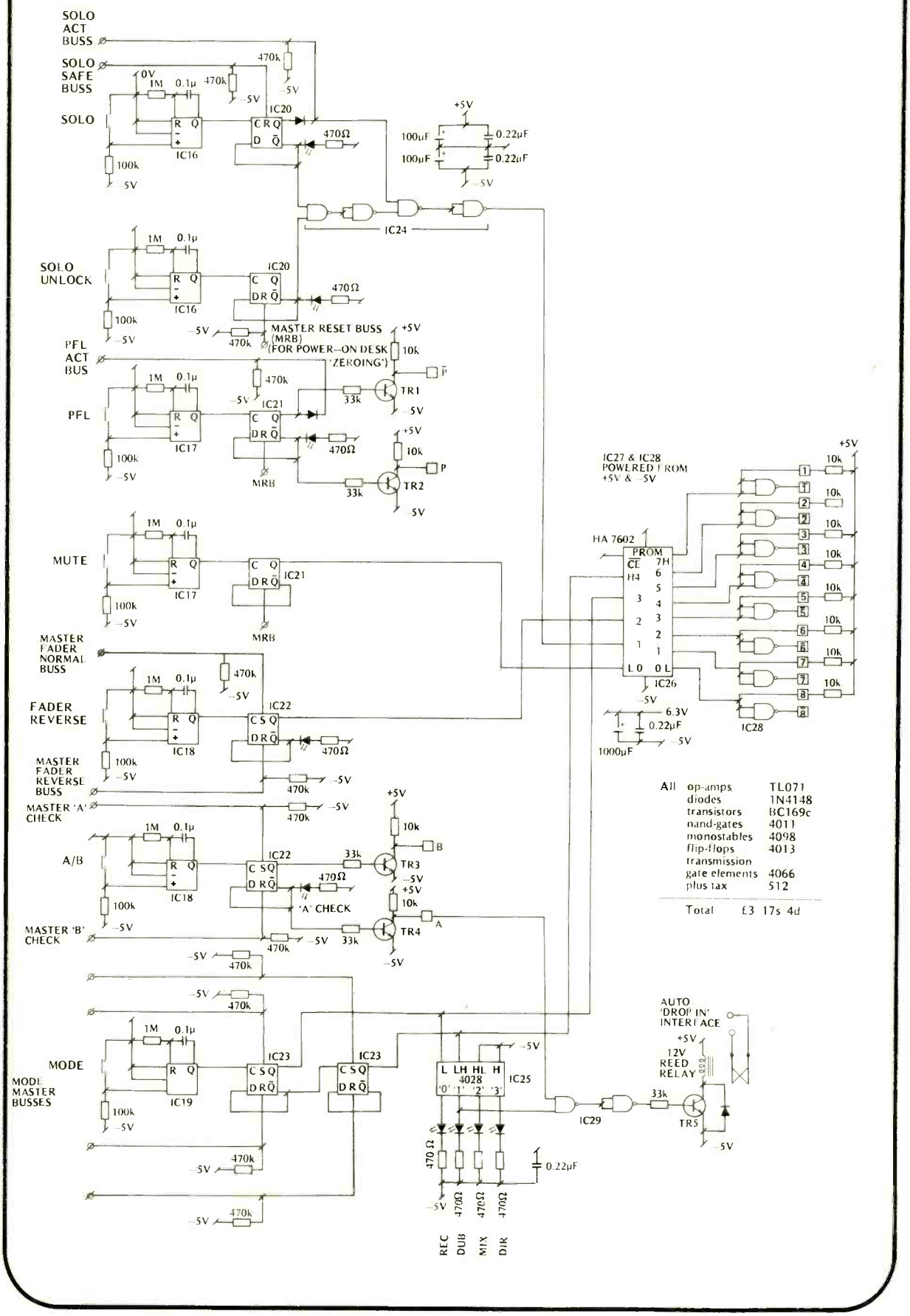


FIG. 57(b) CHANNEL SYSTEM - CONTROL LOGIC



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electronic switching elements, which may seem more or less of a jungle dependent on whether you were brought up on hard-gold contacts or silicon.

Certainly there are fewer electronic switchpoints than there were mechanical. This rationalisation is primarily due to yet another incursion of esoteric (for audio) digital devices. It's osmotic—leave the wretched digital things lying around on the bench and they creep into circuits.

A simplified representation of the four basic channel operating modes is given in **Fig 58a** for recording, **Fig 58b** mixdown/direct to stereo, and **Fig 58c** overdubbing. The little 'x marks the spots' show the switching points.

As a brief resumé (Part One has the lowdown lower down) the main multitrack operating modes and their implementation in this system are outlined here.

Recording (See Fig 58a)

Here the object is to get a 'live' source (eg mic) through the signal modification chain (ie limiting, equalisation) and on to a track or tracks of the multitrack machine. Level control on this path is by the main fader (or VCA fader if automation is applicable). Before and after monitoring of the tape track dedicated to the channel is routed onto the main stereo monitoring/mix buss via the secondary level control.

Mixdown (See Fig 58b)

The machine return is brought through the modification chain and mixed onto the main stereo monitoring/mix buss via the main/VCA fader. The machine monitoring chain is disabled.

Those with sharp eyes or quick memories will notice a system design modification here, made as a result of user input since the original design's incarnation. **Fig 2b** (September 1980) shows the secondary level control feeding the multitrack routing independently of the main stereo mix via the main/VCA fader. Since a major justification for keeping the multitrack routing open during mixdown is to provide additional effects feeds, this would be far better served if the secondary level control is fed post main fader and post mute/solo switching. To enable this, a 'cross-feed' electronic routing is included (fig **58b**). However, independent control is restored when required if a 'fader reverse' is called.

Another mode, 'direct to stereo', is a derivative of 'Mixdown'. It enables live sources to be mixed straight on to the main buss obviating the need to use multitrack routing.

Overdub (See Fig 58c)

A halfway house between 'record' and 'mixdown'. Intended for use when most of the desk is in mixdown but individual channels are being laid or touched up. Signal flow is as 'Record', only with the main/VCA and secondary level controls interchanged. The main/VCA fader in this mode therefore controls the monitor feed into the main stereo mix buss, which ties in with this fader's operation on all the other channels that are in 'Mixdown'.

A handy interlock exists in this mode to facilitate 'single button drop-in'. When the channel system function is selected to overdub and the monitoring path is set to 'A' check (machine input) a relay closing pair is made which may be plumbed into the machine's remote control access. Provided the track is 'armed' ready to record, hitting 'A' check automatically drops the machine in simultaneously. The increasingly prevalent use of machine synchronisers / timers / autolocators /coffee-grinders has dramatically eased multiple pass overdubs previously wearing on fingers and patience. To help it along a bit more, a control buss is run specifically to drop a channel in 'overdub' mode into 'A' check upon a given trigger from the aforementioned teasmade.

Logic control

A separation is made in **Figs 57a** and **57b** between the analogue signal switches and their digital control electronics not purely because of the differing disciplines but for clarity's sake—lots of lines running all over the place.

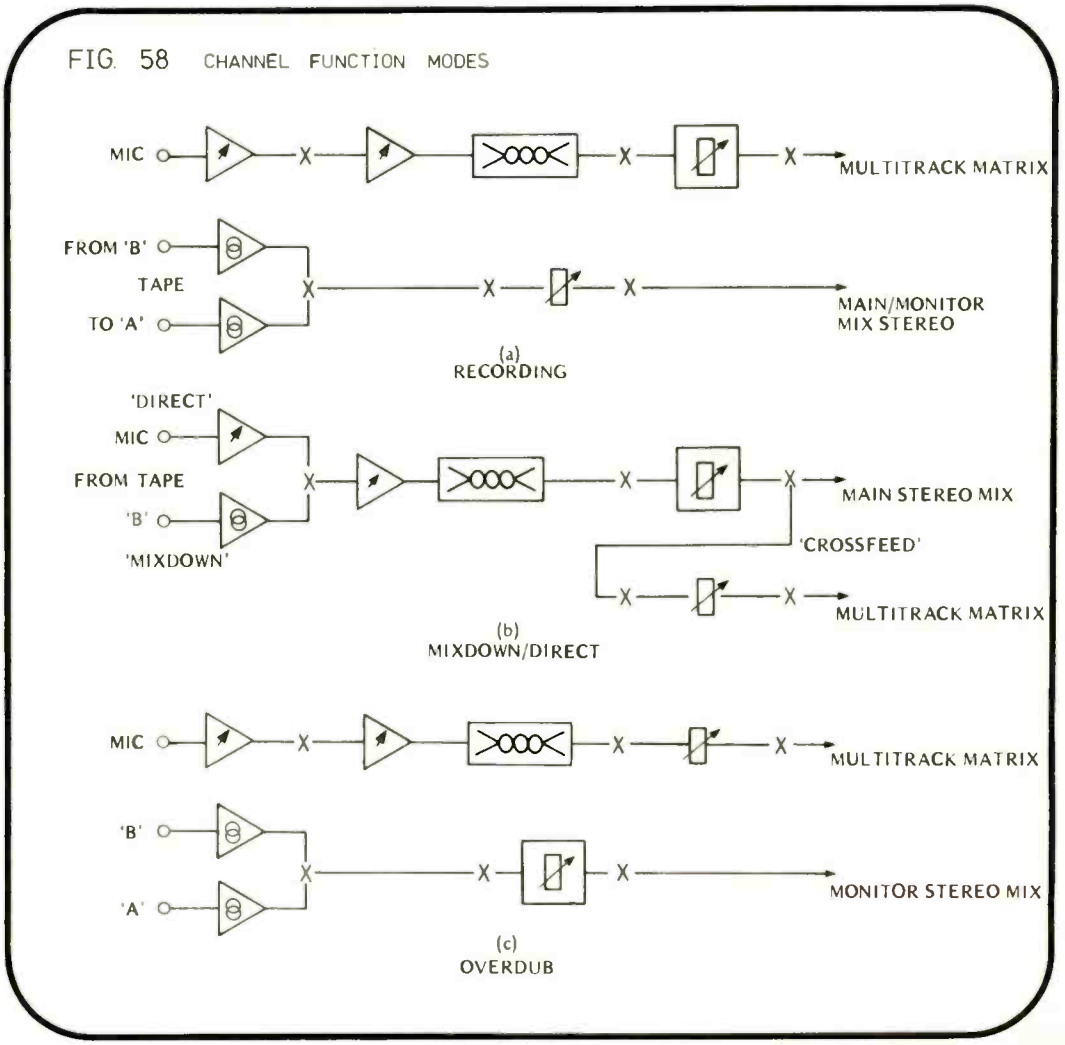
Each top-panel switch is a momentary-action touch switch with an associated LED indicator (with the exception of the function mode switch—more later). The toggle push-on/push-off characteristic is provided by the basic debouncer/flip-flop circuit as in **Fig 59**. This action is not only fun and playworthy therefore fashionable, it scores in a couple of other important respects:

- cost, surprisingly. The combination of a small mechanically simple non-latching push-to-make switch and a fairly small amount of silicon bits has it nearly every time over latching pushbutton switches which are either downright klutzy, staggeringly expensive or slow-boat from Yokohama delivery; and
- versatility. Using electronic latching rather than mechanical catches makes remote/automatic function presetting and triggering a comparative doddle.

Debouncing is removing the ragged

76 ▶

FIG. 58 CHANNEL FUNCTION MODES



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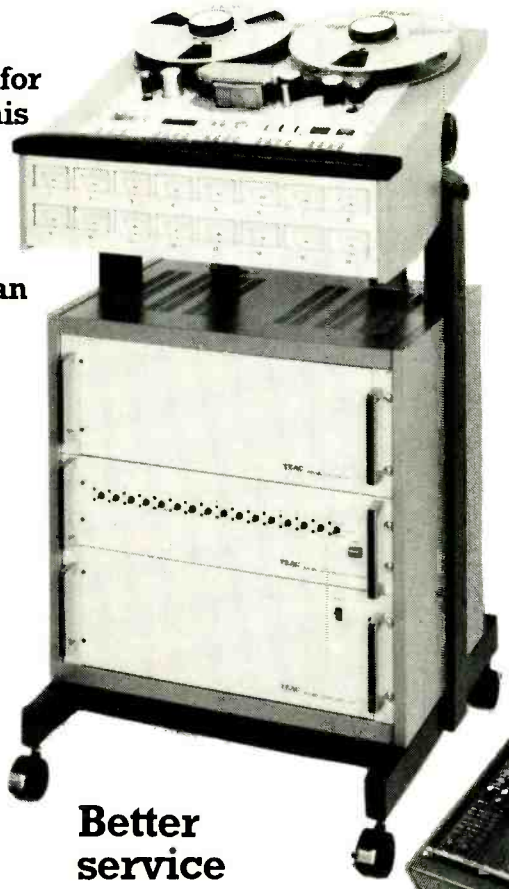

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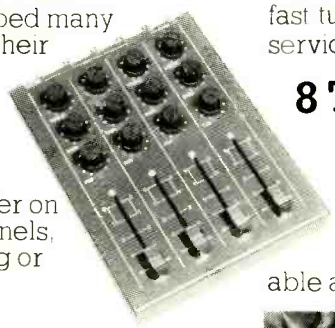

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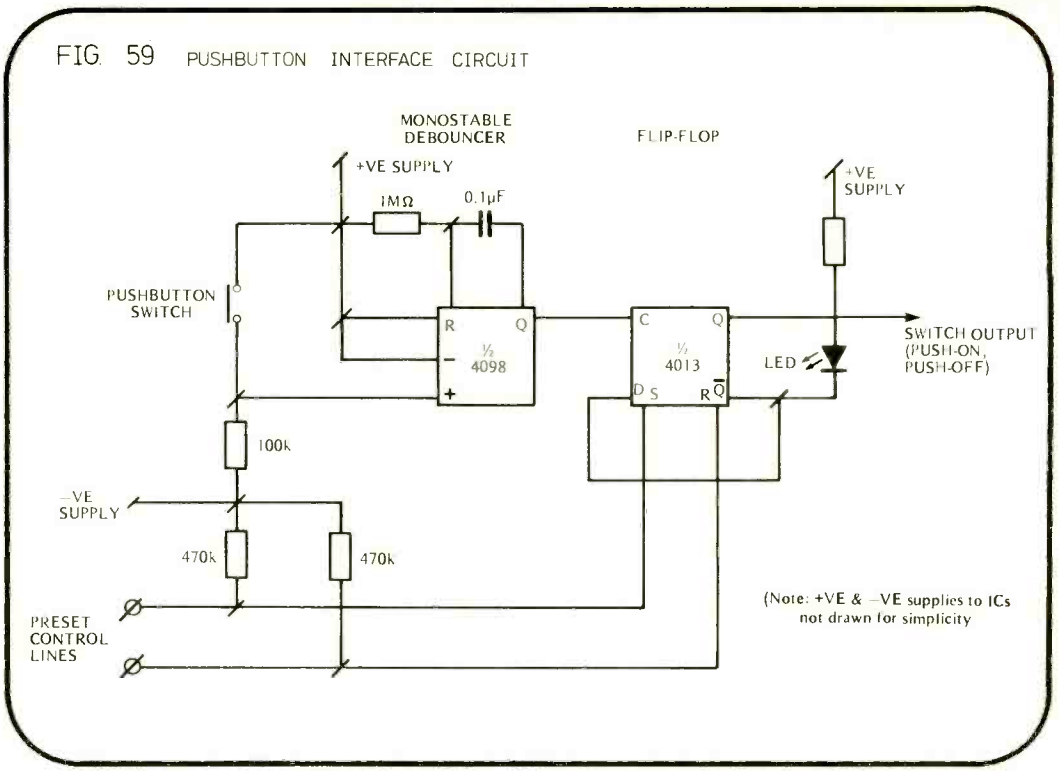
FIG. 59 PUSHBUTTON INTERFACE CIRCUIT



edges from a switching signal. Switch contacts do not, as one would expect and lustfully desire, simply make contact when pressed then break contact on release. The two bits of metal graunch against each other or bounce a few times whilst moving together or apart, resulting in a series of ragged spiky 'almost contacts' rather than simply touch or not touch.

Ordinarily, this doesn't matter too much, but if the switch is feeding a bistable flip-flop (as here) the fun begins. Flip-flops are usually 'edge-triggers', meaning a positive going state—another pulse flops it back and so on. A string of rapid untidy and unpredictable pulses, as kindly provided by nearly any mechanical switch, sends bistables bananas, with a vengeance.

Slugging the switch with time constants is nearly foolproof, but practically faultless is the arrangement in **Fig 59.**

The *4098* contains two monostables (which is handy since the *4013* contains two flip-flops). It can sense either positive or negative transitions, positive in this application, catch the very first input transition and stuff out a uniform, clean, predictable clock pulse for the flip-flop. Subsequent bounces and scrunches merely extend the output pulse slightly, but don't generate any spurious output transitions.

Flip-flops can have their outputs 'jammed' by stuffing the required state up 'Set' (making the Q output go positive) or 'Reset' (negative). Remote control on a plate.

There are a few unconventionalities in the logic design, all done in the name of reducing component count, largely obviating level-shifting transistors and other cheesiness, whilst maintaining the inviolable 'ground for active' law of control interfacing. (This is a common-sense rule that simply means that any accessible control line should just need to be taken to something reasonably groundish in order to activate whatever it's supposed to, not a specific voltage above or below ground. This helps avoid the "should this go to +5 or −24 volts —BANG! oops, sorry . . ." routine whilst greatly simplifying system design—grounds are omnipresent.)

The main reason for the unusual logic powering (**Fig 57a**) stems from the use of a bipolar PROM in the assignment logic. This needs a tightly controlled 5V supply unlike the CMOS ICs which will run off nearly anything with 'volts' written on.

What's a PROM?

PROMS (or Programmable Read-Only Memories) are digital devices used extensively in computer technology for storing lots of individual items of information or sequences of information that are regularly referred to.

'Memory' is self explanatory.

'Read-Only' means that in normal operation it's only possible to retrieve the information that's stored, not to put in new information or modify contents.

'Programmable' means that someone somewhere with the appropriate magic box can stuff already prepared information into the PROM for you. With some types of PROM he can even erase what's in there for you by giving it a quick holiday under a sun-tan lamp, then re-program from clean. The type we're using in this design can't be re-stuffed through, since the programming is achieved by literally blowing tiny internal fuses in the 'shape' of the data. This seeming inversatility is reasonable with such devices where the device cost is cheap compared with programming costs (human time).

The information stored is of course binary in nature—an '0' or a '1', up or down, there or not, etc, and the number of these binary bits contained in each PROM can be up to 65,000 odd, 8,192 and 16,384 being very common. For this channel system control, the PROM used stores a paltry (!) 256 bits which in fact is still a wee bit overkill, but they don't really come much smaller.

This 'baby-PROM', a Harris *7602*, is much like most adult PROMs in that the bits are organised internally in chunks eight wide as a digital word (byte). Eight happens to be the byte width of most popular microprocessors, that's why. In the baby-PROM there are 32 such bytes of stored data ($32 \times 8 = 256$) each being accessible with a specific 5-bit wide address code (given by the binary numbers from 0 to 31). This format is diagrammatically represented in **Fig 60.** For any of up to 32 'command' states, pre-programmed responses for the eight output lines are immediately accessible.

This particular type of baby PROM is usually used at the 'top-end' of microprocessor memory maps where a 'page' (256 bytes) is given over to the processor's function 'vectors', such as interrupts. As an example, if the processor receives a 'non-maskable interrupt' (NMI) it usually means "*Panic!*—the power is collapsing!" or similar. NMI makes the processor 'look' at a certain address in the baby-PROM's page, which tells it where to find in memory a program to 'save the environment', ie hide safely all the crucial operating data, quickly.

In the context of our channel system, the PROM outputs drive the analogue switches (organised per **Fig 57**) to route and control the channel and monitor signal paths through the system elements. This occurs in accordance with and under the command of the PROM address

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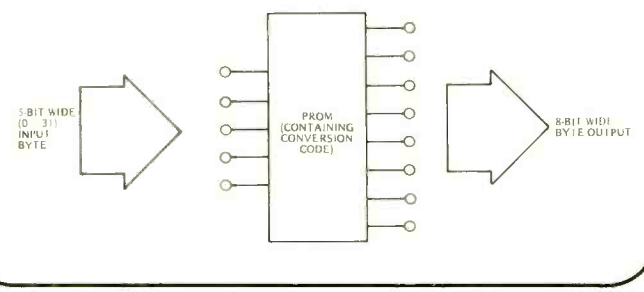
FIG. 60 PROM INPUT/OUTPUT FORMAT



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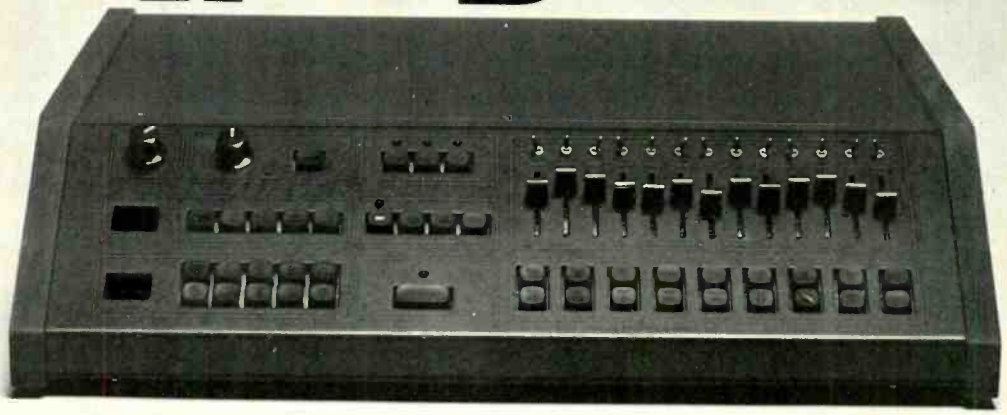

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inputs, which are indicators of selected channel function (Rec/Mix/Dub, etc), local or remote fader reverse commands and, importantly, mute and solo status.

Whatever's happening to *Studio Sound?* First a computer program, now (egad!) a truth table! Signs of the times, one supposes. Digits are here to stay. If you don't like such things, well it's downhill all the way from here.

This is the input/output truth table for the program burnt into our baby-PROM. The input and output binary lines are tagged as a guide to their function in the real world of the channel system. The 'O/P HEX' column is the numerical value in hexadecimal notation of each output word, necessary information for the nice little programming bod.

Insomniacs and other weirdos will be able to pass much time referring the truth table to **Figs 57a** and **57b** working out exactly what happens to the channel under all control conditions. Fear not, it all works.

That just about deals with all the software involved—relatively painless. Most of the control logic is still done in hardware, largely consisting of jammable debouncer/flip-flops. For the channel function control, a single pushbutton that steps through the four functions is realised by a simple 2-bit counter (IC 23 in **Fig 57b**). This generates a 2-bit code that feeds both the PROM control inputs and a *4028* binary to decimal decoder, IC 25, which drives the relative status indicating LEDs.

Solo, solo unlock and solo safe are dealt with in ICs 16, 20 and 24 but the relevant action on the analogue circuitry is still executed via the PROM. It can be deduced that the PROM's 'solo' command and mute do just the same thing—resulting in a fair number of duplicated and redundant program codes within the prom. At least this gives room for expansion or function modification if and when required, by simple card link changes and a differently programmed PROM.

PROM TRUTH-TABLE WITH BIT FUNCTIONS ANNOTATED

	4 INPUT 1					7 6 OUTPUT 3 2 1 0								
No.	H	BINARY			L	HEX	H	BINARY						L
DECIMAL	CHANNEL FUNCTION MODE	FADER REVERSE	SOLO	MUTE		HEXADECIMAL	MIC/LINE	MAIN FADER INPUT	MULTITRACK OUTPUT	CROSSFEED	SECONDARY FADER INPUT	MAIN STEREO OUTPUT		CHANNEL FUNCTION
00	0	0	0	0	0	05	0	0	0	0	0	1	0	1
01	0	0	0	0	1	04	0	0	0	0	0	1	0	0
02	0	0	0	1	0	04	0	0	0	0	0	1	0	0
03	0	0	0	1	1	04	0	0	0	0	0	1	0	0
04	0	0	1	0	0	6A	0	1	1	0	1	0	1	0
05	0	0	1	0	1	68	0	1	1	0	1	0	0	0
06	0	0	1	1	0	68	0	1	1	0	1	0	0	0
07	0	0	1	1	1	68	0	1	1	0	1	0	0	0
08	0	1	0	0	0	6A	0	1	1	0	1	0	1	0
09	0	1	0	0	1	68	0	1	1	0	1	0	0	0
10	0	1	0	1	0	68	0	1	1	0	1	0	0	0
11	0	1	0	1	1	68	0	1	1	0	1	0	0	0
12	0	1	1	0	0	05	0	0	0	0	0	1	0	1
13	0	1	1	0	1	04	0	0	0	0	0	1	0	0
14	0	1	1	1	0	04	0	0	0	0	0	1	0	0
15	0	1	1	1	1	04	0	0	0	0	0	1	0	0
16	1	0	0	0	0	B2	1	0	1	1	0	0	1	0
17	1	0	0	0	1	B0	1	0	1	1	0	0	0	0
18	1	0	0	1	0	B0	1	0	1	1	0	0	0	0
19	1	0	0	1	1	B0	1	0	1	1	0	0	0	0
20	1	0	1	0	0	89	1	0	0	0	1	0	0	1
21	1	0	1	0	1	88	1	0	0	0	1	0	0	0
22	1	0	1	1	0	88	1	0	0	0	1	0	0	0
23	1	0	1	1	1	88	1	0	0	0	1	0	0	0
24	1	1	0	0	0	32	0	0	1	1	0	0	1	0
25	1	1	0	0	1	30	0	0	1	1	0	0	0	0
26	1	1	0	1	0	30	0	0	1	1	0	0	0	0
27	1	1	0	1	1	30	0	0	1	1	0	0	0	0
28	1	1	1	0	0	09	0	0	0	0	1	0	0	1
29	1	1	1	0	1	08	0	0	0	0	1	0	0	0
30	1	1	1	1	0	08	0	0	0	0	1	0	0	0
31	1	1	1	1	1	08	0	0	0	0	1	0	0	0

RECORD
OVERDUB
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DIRECT

Logic meets analogue

The *7602* PROM hangs between logic ground and −5V (of the split ± 5V logic supply) thus necessitating all its input feeds to be similar in swing — 0 to −5V. All the drive logic—flip-flops, debouncers and master buss logic is similarly powered.

Why?

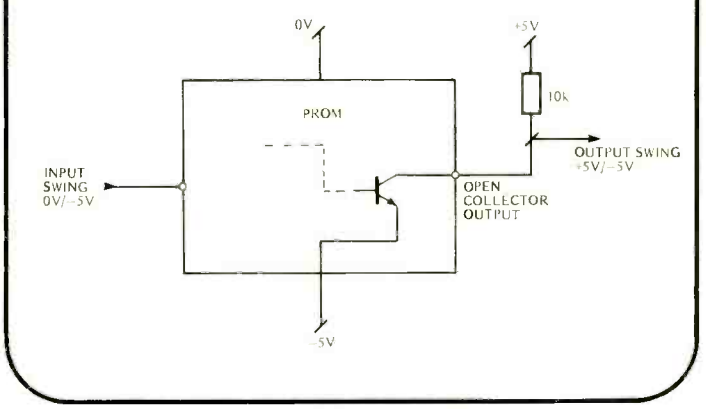
Analogue transmission gates such as the design of **Fig 57** are required to pass (and stop) analogue signals referred to ground and therefore of both polarities, so the gates have to be fed from a split rail (in this instance the ± 5V logic supply).

Converting between the 0/−5V logic and the ± 5V control voltage swing needed by the gates is done fairly cheekily by using the open-collector output drives of the PROM (**Fig 61**). Open-collector is exactly that—there is no positive output pull-up internal to this PROM, the idea being that it may be paralleled with other open-collector devices in a 'wired-OR' buss configuration. When the output transistor is turned off, the collector is at high impedance whilst, when on, it forms a very low resistance path to the negative rail. Advantage is taken here of the high-impedance state to 'pull' the collector up an extra 5V above the PROM's internal supply —up to the + 5V rail in fact. When the transistor turns on the collector dutifully zaps down to the −5V rail. It doesn't care what's at the other end of the load 'pulling' resistor provided it isn't of excessive potential (20-25V as a guess).

Some of the analogue switches are driven directly off the PROM outputs, whilst others have the necessary inverse-switching feed provided by a conventional inverter.

As a note to the unwary, bipolar memories such as the *7602* drink a lot of juice and splash around large amounts of this current when being switched. This explains the large amount of decoupling festooned around it and the logic supply rails generally. Needless to say, the analogue transmission gates are referred to *audio* ground, not the click-infested logic ground, despite the fact that they are powered off the logic supply rails.

FIG. 61 UNIPOLAR TO BIPOLAR CONTROL SWING CONVERSION UTILISING PROM OPEN-COLLECTOR OUTPUT



To Schmitt or not to Schmitt

Throughout the entire console design, a large number of *4011* quad dual-input NAND gates are used, even to the exclusion of other device types such as inverters, where the two NAND inputs are strapped creating an inverting buffer. This is largely for convenience and to minimise inventory types, incidentally resulting in a cost advantage (as a result of the greater number bought) over acquiring lots of small quantities of differing IC types.

*4093*s are a plug-in replacement for the *4011*, with the difference of their Schmitt-trigger action—handy in cleaning up dirty bits and useful sometimes for switch de-bouncing. As a general rule, a *4093* may be used anywhere a *4011* is. A proving exception to this is the caution which must be observed when plugging them into positions where they are used as inverters for analogue transmission gates. The hysteresis (about 2V) intrinsic to the Schmitts can result often in the two potentiometric switching elements both being momentarily in similar states during switching both 'off' or both 'on'—until the Schmitt threshold is reached by the rising/falling control voltage. At this point the gates flip rapidly into their correctly opposing states.

The simultaneous states manifest themselves as switching clicks and splats; both 'off' leaves the series gate vulnerable to signal breakover and potential death from high source programme levels. Both 'on' ties the virtual-earth following amp input via a low impedance to ground, causing the amp to have an abrupt and enormous burst of high gain.

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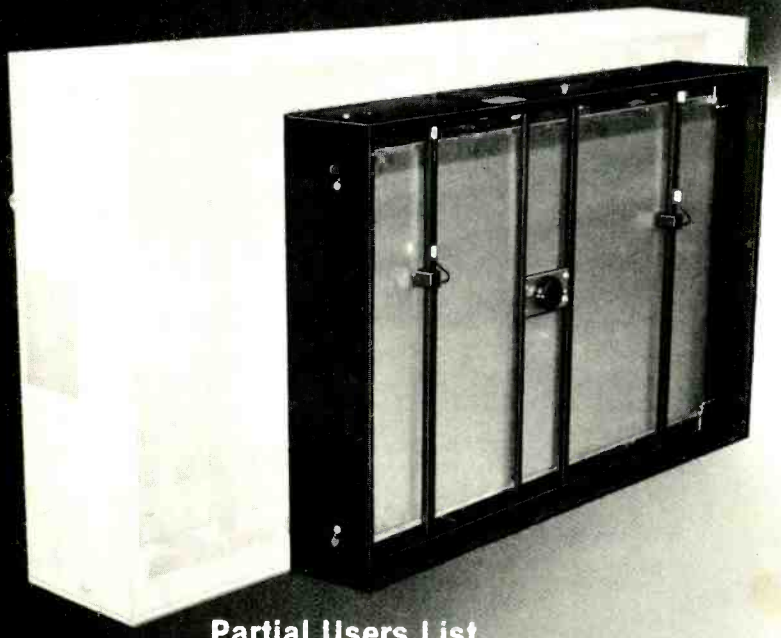

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THD: 0.2% at 1kHz.
Sweep frequency range: 0.1 to 20Hz (triangle waveform).
Frequency response: 20Hz to 22kHz ±1dB dry.

Bandwidth	Max delay	
	standard memory	extended memory
16kHz	400ms	800ms
8kHz	800ms	1600ms
4kHz	1600ms	3200ms

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UK: Atlantex Music Ltd. 34 Bancroft, Hitchin, Herts SG5 1LA.

MXR Digital Delay Line II

THE MXR *Digital Delay Line II Model 151* consists essentially of an 8-bit word A/D converter feeding eight 16K Random Access Memories, a multiplexer and a D/A converter housed (conveniently) in a 19in rack-mountable steel box with, from left to right on the rear panel, a high-low (−10dB) level push-in switch, input and output ¼in GPO jack sockets, balanced *XLR*-type female input and unbalanced male *XLR* output sockets (an engraved flow diagram details wiring), an auxiliary loop section consisting of ¼in GPO jack sockets, and repeat hold and delay bypass ¼in jack footswitch sockets. The mains lead emerges straight out from the right hand side of the unit from the internal mains transformer and rectifier stage.

The front panel is easily discernible, via clear-ish white and blue graphics, into five sections, and red LEDs (which are not apparent when the unit is switched off due to the clever use of translucent black plastic for the front panel) glow when the mains button is depressed. The mains on/off switch is located to the extreme left of the front panel and to the right of it lies the sweep section which incorporates two variable pots labelled 'speed' and 'width' respectively. The speed control varies the frequency of an internal voltage-controlled oscillator between 0.1 and 20Hz and the width control is calibrated between 0 and 100%.

Beneath and slightly to the right of the four numerical delay time LEDs are situated the large click-stepped delay time selector knob and a smaller 'fine' control variable pot which enables the operator to vary manually the selected delay time between 0 and −20%, a variation which is achieved automatically by the triangle generator of the aforementioned sweep circuit. With the delay time selector knob fully anticlockwise and the fine control at 0% position, the minimum delay time indicated is 8ms. When the fine control is turned fully anticlockwise to the 20% position this time is lowered to 6ms and any further delay times selected by the click-stopped selector will be at −20% of their full value until the fine control is readjusted. To the right of the delay time LEDs are three smaller LEDs indicating the amount of bandwidth in operation. They are labelled, from left to right 16K, 8K, and 4K respectively and come into operation as the delay time selector knob is moved clockwise through the range of delay times available: 16K for delay times between 8 and 959ms (figures quoted are those indicated by LEDs) 8K between 959 and 1600ms, and 4K between 1600 and 3201ms. To enlarge upon the relationship between sweep, delay time and bandwidth circuitry in digital terms one must review the digital section of the *151*, which is situated primarily upon the upper pcb. **Figs 1** and **2a** show the analogue and digital paths in the unit; **Fig 2b** shows the upper digital pcb.

The analogue signal is sampled and converted to an 8-bit word and then stored in the eight or expanded 16 (review sample) 16K dynamic RAMs

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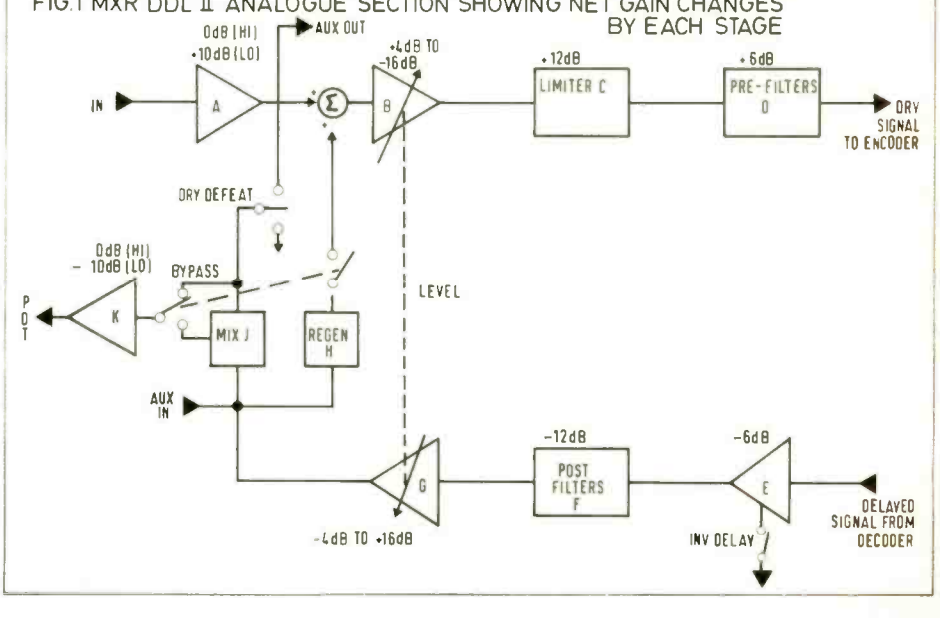
FIG.1 MXR DDL II ANALOGUE SECTION SHOWING NET GAIN CHANGES BY EACH STAGE



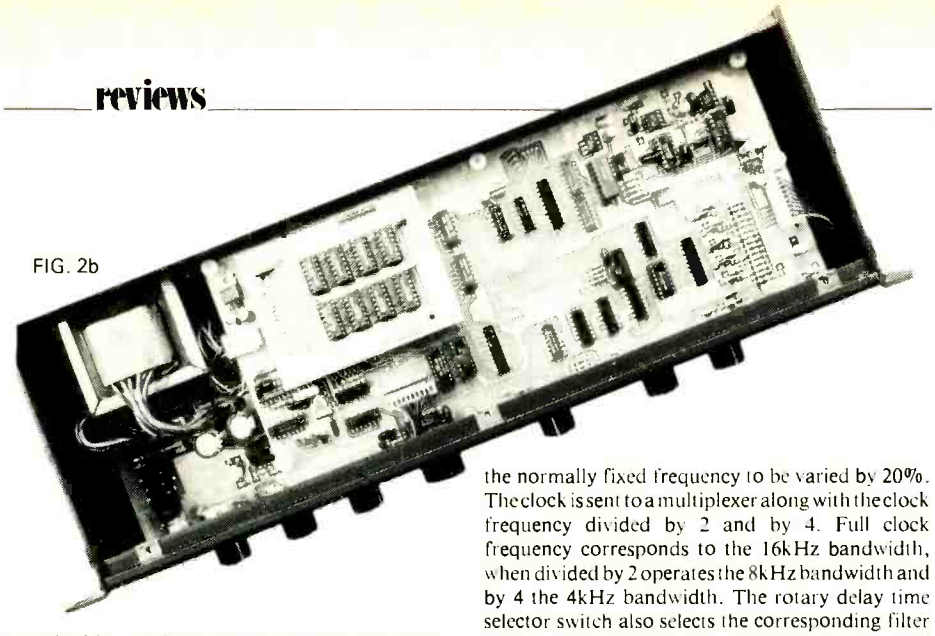


FIG. 2b

organised in the standard memory configuration. The memory receives its information from the SAR and returns it through the multiplexer to the D/A converter. Data is written into and read from memory locations selected by the address circuit which is primarily a counter that increments with every sampling cycle through the memory locations. The count is altered several times each cycle to allow other positions in the memory to be refreshed. The maximum count of the address circuit is determined by the digitally-encoded rotary switch or delay time selector and once the address count reaches the count selected by the delay time selector, the address counters are reset and returned to the address of the first memory location. This determines the length of the time delay. The pulse that is used to reset the address counter is also sent to the display counter driver and thus, the time in ms between reset pulses is displayed on the four numerical LED's as delay time.

The delay time selector also selects the internal clock frequency, which has the lf vco at its input which, via the fine control or sweep circuit, allows the normally fixed frequency to be varied by 20%. The clock is sent to a multiplexer along with the clock frequency divided by 2 and by 4. Full clock frequency corresponds to the 16kHz bandwidth, when divided by 2 operates the 8kHz bandwidth and by 4 the 4kHz bandwidth. The rotary delay time selector switch also selects the corresponding filter rolloff frequencies in the analogue section. The output of the multiplexer will be one of three possible clock frequencies, each of which may be varied over 20%. The clock line from the multiplexer goes to the timing section, which is the 'brain' of the digital electronics and co-ordinates the timing sequence within the sample cycle of the addressing, memory, SAR, DAC, multiplexer and encoder-decoder sections.

In operation the delay time LEDs flickered about their settings, such that 3201 might jump between 3195 or even 3190, or 1594 to 1603 or 1902 to 1930. Whether this is a quirk of the review sample or due to the fact that the sweep section is never out of circuit even at minimum settings is hard to tell. The effect of the latter is indicated when in circuit by the numbers changing at the rate of the selected VCO frequency and width setting. However, the numbers do stand out very clearly against the black background of the front panel and whereas the letters and calibration markings fade into insignificance in low ambient light levels, the experienced operator will have no

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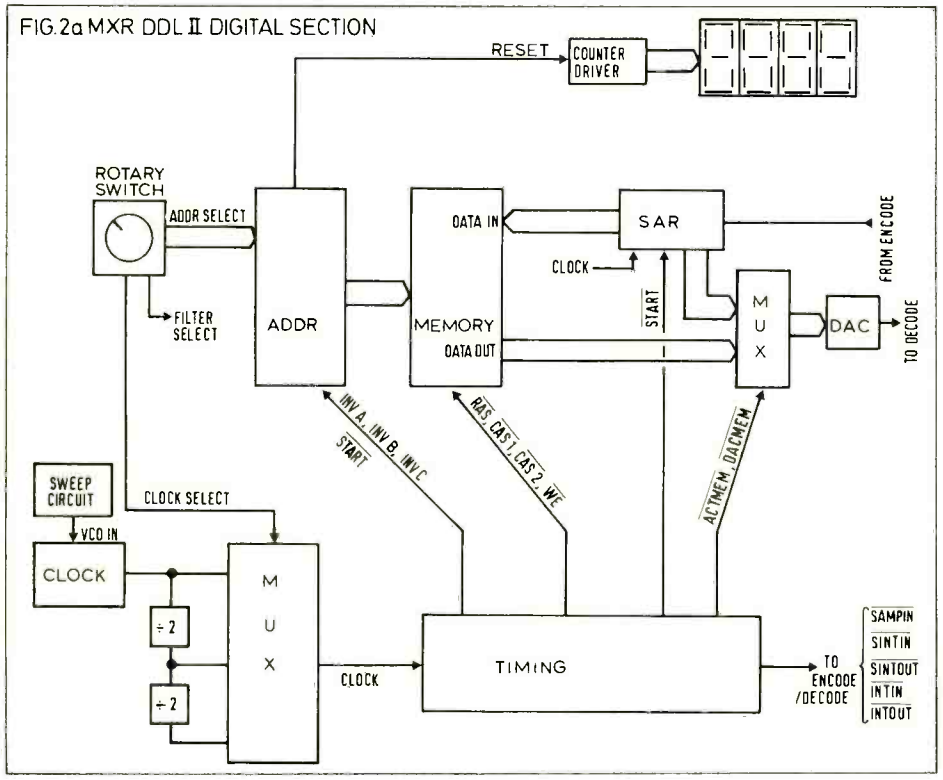
FIG. 2a MXR DDL II DIGITAL SECTION



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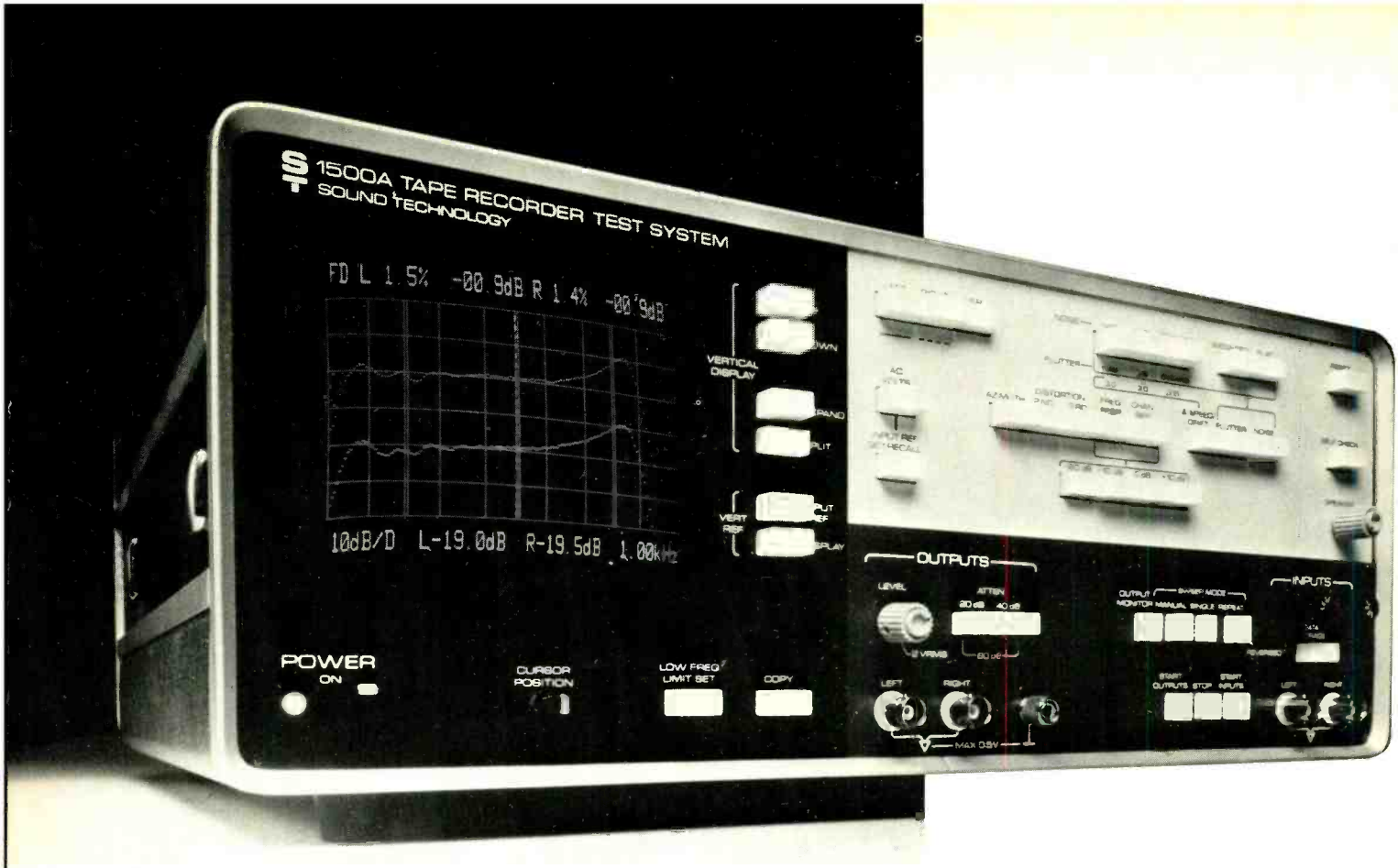

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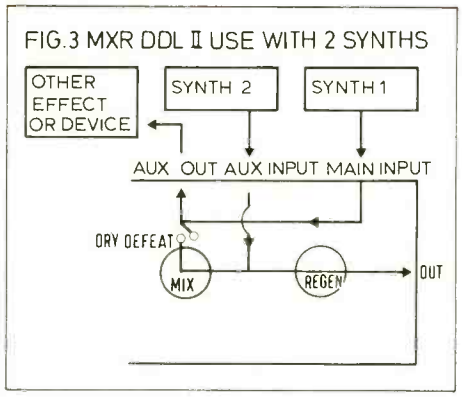
problem placing his or her hands upon the appropriate knobs. I could never understand why it is that equipment manufacturers insist upon using block capitals letters for knob and other graphics as every motorway sign one sees proves beyond a shadow of doubt that upper and lower case lettering makes word identification much easier even in the lowest light levels. I mean, if we are going to find logic inside the box, let's have some logic on the outside too!! Minimise the arbitrary and all that.

To the right of the delay time selection section is a variable pot marked 'mix' and beneath and to either side of it two on/off pushbuttons marked 'dry defeat' and 'invert delay'. The mix knob sums the dry signal from the input stage with any part or all of the delayed and regenerated signal, thus providing the regeneration effect.

The dry signal may be from either a line level source (high) or instrument in which case the low position provides 10dB of gain. The signal from the main input is also routed to the auxiliary output. Pushing the dry defeat button cuts the main input signal completely from whatever balance of dry and regenerated signal the operator has selected, so that only the regenerated or delayed signal is heard at the outputs. The number of repeats or level of regeneration of the delayed signal is controlled by the 'regeneration' variable pot to the right of the invert delay button. An exciting feature of the MXR *II 151* offering excellent creative potential, is that one may insert a signal into the auxiliary input at line level and regenerate it at the already-selected repeat rate, even though the main input signal has been cut with the dry defeat button. Consequently one may, in situations where, for instance, one is using two synthesisers in a particular musical section, route the main synth, arriving via the main input, to another effect or even track, from the auxiliary output, cut it from the mix section but continue to regenerate the second synth (see **Fig 3**). If the 'regenerate' knob is turned fully anticlockwise (off) then only the dry auxiliary input is heard; the mix knob has no effect upon it and will therefore not mix it with any delay effect achieved unless the regenerate knob is brought back into operation. One may mix the two synths together and process them with any of the effects available. If it were possible, it may be food for thought for the designers to provide a trigger pulse from the 'dry defeat' button so that a second synthesiser or sequencer may be pulsed into action.

The level adjust variable pot allows the internal operating level to be adjusted over a 20dB gain range from +4dB to −16dB. Ideally, peak output should be around 0dBm, the point at which the internal limiter comes into operation, indicated by a red LED above the level knob. The limiter limits the signal at 0dBm and then provides +12dB of gain so that the effective limit ceiling is +12dB at a slope of +9. Therefore, the unit can accommodate levels between +16dBm and −4dBm in the 'hi' position and +6dBm and −14dBm in the 'lo' position, effectively handling input levels over a 30dB range (+16dBm to −14dBm).

The output of the limiter is sent to the pre-encoder filter stage which consists of four 2-pole lowpass sections with the highest Q in the front of the line and Qs descending to the output. The rolloff frequency is switchable from 16kHz and 4kHz using CMOS switches. Due to the CMOS supply limitation (±7.5V) the signal swing through the filter is limited to +12dB. The last section of the pre-encoder filter stage provides a gain of 6dB so that the maximum signal to the encoder is +18dBm. The signal is then converted to digital and emerges from the decoder to a 6dB attenuator so that the maximum signal at the output is again +12dBm. At this point the delayed signal may be inverted using the 'invert delay' button. The effect of the invert delay button is particularly noticable when setting up flange effects and in this case notches become resonances and vice-versa. The delay signal then goes to the post-filter which consists of three 2-pole low-pass sections which are simultaneously switched with the pre-filters. Again, the post-filter incorporates the switchable rolloff frequencies of the pre-filter and descending Qs. The post-filter stage incorporates a 12dB attenuator, bringing its output level to 0dBm from a maximum signal level of +12dBm. The level adjustment prior to the pre-encoder filter stage is ganged to the level adjustment stage following the post-decoder filter so that a setting of +4dB on the input stage is equivalent to −4dB, or −16dB on the input stage, equivalent to +16dB on the output, thus the output stage compensates for any gain provided by the input stage and no matter what level settings are used, the *Model 151* provides unity gain. To the left of the 'LED' above the level adjust knob is another LED indicating −12dB operation.



To the right of and below the level adjust knob, are two further on/off pushbuttons labelled 'repeat hold' and 'delay bypass' respectively. The repeat hold facility enables a series of notes to be repeated indefinitely. The number of notes remembered at any one time is dependent upon the amount of memory being accessed as indicated by the delay time LEDs. For example, a run of notes lasting 2.5secs will be accommodated by a setting of 2,500ms.

The delay bypass button routes the input signal directly to the outputs and cuts the signal processing side-chain out of circuit.

The MXR *Digital Delay Line II Model 151* is the logical evolutionary successor to the original MXR *DDL 1* in that, whereas the latter had pushbutton selectable delay times (which in my own opinion were conveniently spaced in x2 octave steps and consequently much better to work with than a sweep selector, allowing an appropriate repeat rate to be found very quickly through careful manipulation of these and the divide by two, multiply by two variable pot), the former, with its numerical delay time readout informs the operator of the precise delay time selected to the ms. Many times have great effects been achieved during demo sessions and, despite meticulous and fastidious logging of all settings on the *DDL 1*, been unachievable at later mastering sessions. Now, this is partly possible. I say partly because the best sounds are always a combination of many variables, the delay time often being the least significant factor, and as yet all of the other knobs are only calibrated at their minimum and maximum settings. In between there is a lot of space to play around with, especially when one takes into consideration manufacturing tolerances and other variables in the chain. With the *DDL 1*, when one switched from one delay time to another, because of their mathematical relationship, any splurge created was still in the same time signature. With the newer rotary control, when one selects another delay time a great deal of out-of-time splurge is injected into the feedback loop, musical and unmusical, and to clear it one has to turn the regeneration knob right off and start all over again, or wait for the splurge to clear. I feel that the original pushbuttons were a much better idea because one could, in an instant, switch the delay repeat to half, quarter or eighth-time from full beat repeat (very useful on reggae dub mixes and the like where the exact repeat beat may have taken a while to get right). However, the rotary switch offers a far greater range of click-stopped settings and on the review sample, with its expanded memory capability, the delays available were, from fully anticlockwise to fully clockwise in 32 steps: 8, 10, 13, 16, 19, 22, 27, 33, 41, 50, 63, 77, 94, 116, 143, 175, 216, 264, 325, 400, 480, 560, 680, 799, 960, 1120, 1357, 1594, 1902—1930, 2237, 2710—2729, and 3178—3201ms. In instances where the LEDs flickered I have quoted the lowest and highest settings indicated. (See editor's note.)

The effects obtained with the device were ADT, chorusing, flanging, doppler effect pitch bending, vibrato, quasi reverberation, slapback echo, repeat echo, infinite repeat and a whole load of indescribable effects in between, mainly due to careless and often silly manipulation of the VCO speed and width control and ever increasing delay times. Pitch-bending gave harmonic richness, particularly to squarewave and sawtooth sources, as one would expect, and because the repeated signal was so clean and undistorted (I never heard any distortion at all, whatever I did) the effects achieved can only be described as beautiful and well worth the price tag. The regeneration control offered about 10s (9.7 according to my £8 digital watch) of regeneration from full level to the point where nothing could be heard. I did notice that even when the mix knob was set at dry and the regeneration knob set to fully off, the regeneration could still be heard at very low level. Infinite repeat was only obtainable with the repeat hold facility. I used the review sample during a session at nearby Wave Studios in Richmond and both myself and Ian the engineer, despite an initial reluctance to accept the 16K bandwidth figure as anything other than boasting rather than fact, grew to accept that, well, maybe they mean it this time, and applied it to vocals, synths, and kit and found it very impressive. It seems that the internal signal filtering and subsequent processing (which operates not unlike a noise reduction system) have enabled a true 16kHz bandwidth, despite the short 8-bit word length, and an increased dynamic range to be realised. It even brings my Casio *VL-Tone* synthesiser into the realms of stardom and I've managed to convince the neighbours that I'm recording the last remake of *Telstar*.

David Hastilow

Editor's note: MXR inform us that the flickering of the delay time LEDs on the review unit is due to the fast slew rate of the unit. Production models do not exhibit this condition as the slew rate has been slowed down through the substitution of a new component not available at the time the review unit was manufactured.

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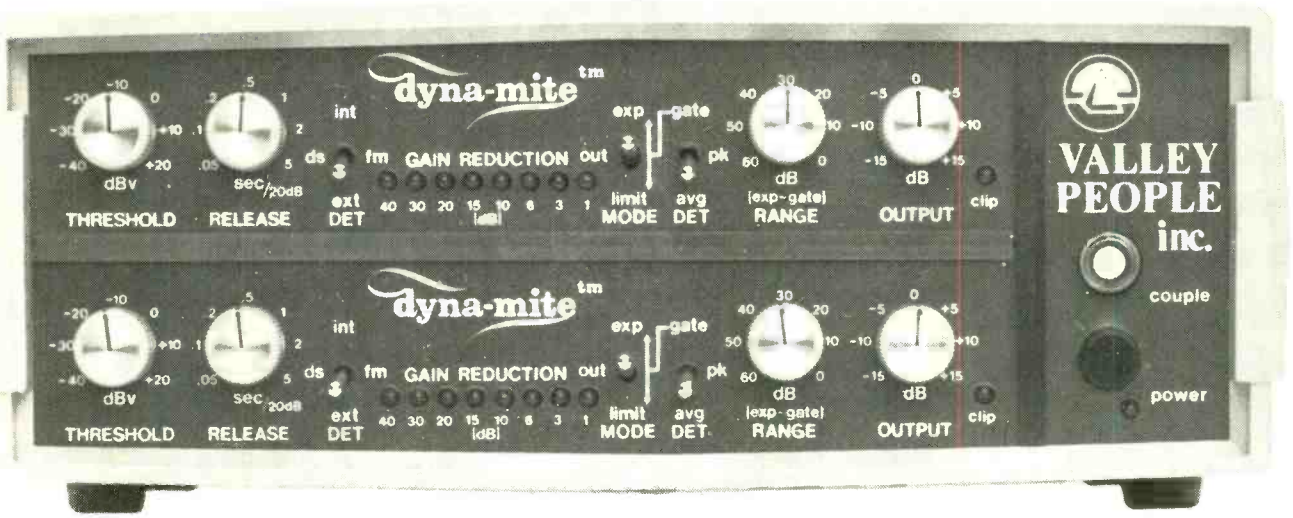

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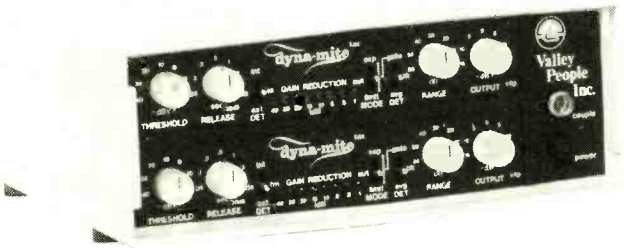

Valley People Dyna-mite

WE were very lucky in obtaining this unit for review following the APRS exhibition. We must point out, however, that the unit we obtained was a pre-production model and certain technical parameters do not correspond to the specifications of the final production units. We feel, however, that the unit is so interesting and valuable as to warrant this preliminary operational review: a full technical examination will be carried out as soon as production units are available. We would like to express our thanks to Valley People and their UK distributors, FWO Bauch, for their help in preparing this exclusive report.

Ahhhhhhhh... I've been bitten by a *Dyna-mite*, the only mite I've met yet that I'd like to make a pet and I've met a few — and I've no doubt I'll be meeting a few more of these. So light and small that insertion into a pocket is feasible so keep yours on a chain: but house it where you like, it'll go anywhere. Session to session, studio to studio, leave your pet set for the next mix, meditate on it sitting in your car (does your car radio pump, from over-compressed hissy transmissions? Then be a boffin — insert one in the frump sump. Not really, but I can see the day coming). Anyway, back to the present. The Valley People *Dyna-mite* consists of two identical compressor/limiter/expander/gates mounted horizontally, one above the other, in a beige-coloured plastic box, 8½x3x9in (whd), with all input/output, external input and control/meter ¼in jack sockets on the rear panel, and a mains lead protruding from the left hand side above a 4-pole external mains socket. The whole unit is extremely light and may be sat in any convenient space or on top of a mixing desk. I carried it around in my hand most of the time, which has considerable advantages over continually having to lean over to, or walk to, rack-mounted gear consequently leaving the listening position in the process (pun not intended). A longer lead may be inserted into the external mains socket allowing free movement, a pricey commodity in recording studios. The whole ensemble of proprietary Valley People circuit principles and engineering achievements is brought to life by pushing the mains on/off button to the right hand side of the front panel beneath the 'Magic Light'-type couple button which enables the two units to be linked for stereo and other more creative mind-shattering tomfoolery.

On the front panel are located, from left to right, the rotary threshold level control calibrated at its −40, −30, −20, −10, 0, +10 and +20dB positions and next to it the rotary release time knob calibrated at 0.05, 0.1, 0.2, 0.5, 1, 2 and 5s. To the far right are the range knobs marked at 60, 50, 40, 30, 20, 10 and 0 and on the very far right the output level knob offering 30dB of gain between −15dB and +15dB calibrated in 5dB steps.

In the central portion are three flick switches, and eight LEDs marked 40, 30, 20, 15, 10, 6, 3 and 1 respectively, which indicate the amount of gain reduction in operation. The three flick up and down switches offer between them 18 types of signal processing, not including other possibilities available when the output of one of the units is hooked to the input of the other and the two units are used on a single mono input. In this latter case, operation of the two units is extremely fast due to the close proximity of all of the controls. The signal processing route is easily determined and firstly, using the middle flick switch located to the right of the LEDs, one may select either the limit mode (lower position), or expand mode in the upper position. The middle position bypasses the unit and routes the input directly to the output at unity gain. Next to it, right, the type of sensing is switched: this may be at peak (middle position), or average (lower position). The upper position selects gate.

The third flick switch, to the left of the LEDs, determines whether the input signal — in the upper position, the high frequency portion of the input signal, de-ess 'fm' middle position, or an external input from the rear jack socket, 'ext' lower position — is being routed to the sensing or detection circuit, and to indicate their relationship with one another this and the 'avg'/'pk'/'gate' flick switch are both labelled 'DET'.

The 18 combinations of these three flick switches and the type of signal processing they allow are as follows.

INT LIM AVG. In this mode the limiting ratio is variable between infinity and 1 with detection derived from the average voltage of the input signal. The limiting threshold is selected by turning the threshold knob. In operation, if the output knob is aligned to 0 and the threshold knob turned to −10 there is a 10dB gain in output and gain increases until a threshold of −20 is reached. Further increase in the threshold level results in no further increase in gain. Consequently the output knob has to be backed off to restore zero or line level output. This is contrary to the manufacturer's specification which states that the threshold/output gain coupling feature computes the amount of make-up gain required to maintain a constant output level as indicated on the output control, regardless of the setting of the threshold control. *(This, and other slight oddities, are no doubt due to it being a pre-production prototype—Ed.)*

INT LIM PEAK. As above except that the peak voltage of the input signal is sensed.

INT LIM GATE. The threshold level is set and when the input level exceeds it there is a 20dB decrease in output level for every 1dB increase, effecting a ratio of 1:20 with peak detection. The range control may be wound in to provide further range up to 60dB. The release time should be chosen very carefully otherwise clicks may occur.

DS-FM LIM AVG. In this mode the hf content of the incoming signal is sensed at its average value and the resulting voltage used to amplitude modulate the programme material. The first thing you'll have no trouble getting in this mode is overshoot clicks and farts which are very difficult to eliminate despite micro micro adjustments of the release time knob. Unfortunately the attack time of the device is internally preset by the manufacturer. Also, the hf envelope tends to pump the rest of the material and it sounds not unlike the automatic gain control of a cheap cassette recorder.

DS-FM LIM PEAK. Similar to the above except less troublesome, oddly.

DS-FM LIM GATE Amazing. Not because it did what it was supposed to (which is the same as the negative limiting mode except that the hf content is sensed rather than the peak voltage), but because, with the range knob, one may increase the ratio to the point where with, for instance, a cymbal playing 16 beats to the bar, the whole incoming signal may be chopped into 16 beats too.

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Rather like keying a track with an external source, bass drum for instance. In the negative limiting mode, instruments with fast attack times, such as piano, may be made to sound like organs, etc. This mode also has a similar effect.

EXT LIM AVG. A signal inserted into the external signal socket provides an envelope. The threshold control setting determines at what average level the envelope is sensed so that a 1dB increase in external signal level over the threshold level results in a 1dB decrease in incoming signal gain: thus the device operates as an inverse envelope follower. Try inserting the same signal from a splitter into both the external and normal input and then routing the output to a channel routed right and another split, again pre-device, to a channel routed left for an interesting pan effect.

EXT LIM PEAK. As above, peak sensing.

EXT LIM GATE. A 1dB increase in external signal level over the threshold causes a 20dB decrease in signal gain. Range control increases effect. Peak detection.

INT EXP AVG/PEAK/DS-FM. Normal expander operation working around average or peak voltage. In the DS-FM mode the hf content is detected and I found it possible to completely lose passages of high notes or roll them off gently. In the *DS-FM EXP GATE* mode one may chop them completely.

EXT EXP AVG. The gain of the input signal is determined by the level of the external signal and a 1dB increase over threshold in external signal causes a 1dB increase in signal level. Average type of detection. Works as an envelope follower and length of derived notes, for instance, may be varied with the range and release controls. Is essentially a soft key process.

EXT EXP PEAK. As above with peak detection.

EXT EXP GATE. Again, the signal gain is a product of the level of the external signal but a 1dB increase over threshold in external signal level results in a 20dB increase in the normal signal gain. This works in much the same way as hard key effect but enables lower level signals to be used as the keying trigger.

It may be seen from the foregoing that the *Dynamite* is not only a multi-function signal processing unit but also an exciting tool for creative and innovative ideas. The fact that one may hold it in the hand and sit and twiddle with it indefinitely with little or no aggravation is probably the best ergonomic and profit making idea in years. It will find application in the professional recording studio, although I think it is probably aimed down-market (especially with a price tag of £360) and it would be untruthful to say that no degradation in the signal was present after I spent time trying to cure overshoot, and clicks. However, as my mum used to say, if you will go trying to gate a violin with a recording from a telephone conversation with peak sensing you are going to get a bit of snap, crackle and pop here and there, son. On the majority of effects, the sound quality was excellent and distortion free. I used it to tighten up a kit by using both units in line and working the first as a compressor (great for getting those huge pumpy drum kit sounds) and the second as an expander gate with and without hi-eq sensing. The fourth socket on the rear panel labelled 'control meter' allows a signal from an external VCA to be metered by the eight LEDs of the front panel. Very novel, but I can't think of a situation in which I'd need to do it!

David Hastilow

	SWITCH SETTINGS S1 (DET)	S2 (MODE)	S3 (DET)	BASIC USE AREAS	FUNCTIONAL MODES PARAMETERS
1.	-	OUT	-	Bypass	Fixed gain. . .OUTPUT control active.
2.	INT	LIM	AVG	Apparent level limiting	RATIO ∞:1, AVG detection of Input signal, RANGE control inactive. See THRESHOLD/OUTPUT GAIN COUPLING*.
3.	INT	LIM	PEAK	Electrical peak limiting	Same as above, except PEAK detection of Input signal.
4.	INT	LIM	GATE	Negative limiting for "organ effects"	RATIO 1: – 20, PEAK detection of Input signal, RANGE control active. As input signal exceeds THRESHOLD, a 1dB increase causes a 20dB decrease in output level.
5.	DS-FM	LIM	AVG	De-essing, FM limiting	Same as No. 2, except Hi Freq EQ inserted in detector path.
6.	DS-FM	LIM	PEAK	De-essing, FM limiting	Same as No. 3, except Hi Freq EQ inserted in detector path.
7.	DS-FM	LIM	GATE	Modified negative limiting	Same as No.4, except Hi Freq EQ inserted in detector path.
8.	EXT	LIM	AVG	Inverse envelope follower, or "soft ducking"	Signal gain is determined by LEVEL of EXTERNAL SIGNAL. A 1dB increase of EXT SIGNAL (over THRESHOLD) causes a 1dB decrease in signal gain. AVG detection, RANGE active.
9.	EXT	LIM	PEAK	Inverse envelope follower	Same as above, except PEAK detection.
10.	EXT	LIM	GATE	Hard ducking	A 1dB increase of EXTERNAL SIGNAL LEVEL (over THRESHOLD) causes a 20dB decrease in signal gain. PEAK detection, RANGE control active.
11.	INT	EXP	AVG	Expanding, soft noise gating	RATIO 1:2, AVG detection of input signal, RANGE control active.
12.	INT	EXP	PEAK	Expanding, soft noise gating	Same as above, except PEAK detection.
13.	INT	EXP	GATE	Hard noise gating	RATIO 1:20, PEAK detection of input signal, RANGE control active.
14.	DS-FM	EXP	AVG	Freq selective expansion	Same as No. 11, except Hi Freq EQ inserted in detector path.
15.	DS-FM	EXP	PEAK	Freq selective expansion	Same as No. 12, except Hi Freq EQ inserted in detector path.
16.	DS-FM	EXP	GATE	Freq selective noise gating	Same as No. 13, except Hi Freq EQ inserted in detector path.
17.	EXT	EXP	AVG	Envelope following soft keying	Signal gain is determined by LEVEL of EXTERNAL SIGNAL. A 1dB increase of EXT SIGNAL (over THRESHOLD) causes a 1dB increase in signal gain. AVG detection, RANGE control active.
18.	EXT	EXP	PEAK	Envelope following soft keying	Same as above, except PEAK detection.
19.	EXT	EXP	GATE	Hard keying	Signal gain is determined by LEVEL of EXTERNAL SIGNAL. A 1dB increase of EXT SIGNAL (over THRESHOLD) causes a 20dB increase in signal gain. PEAK detection, RANGE control active.

*THRESHOLD/OUTPUT GAIN COUPLING (Modes Nos. 2, 3, 5 and 6): In these modes, adjusting the THRESHOLD control to a lower setting causes an increased amount of limiting, or gain reduction, which ordinarily would cause a drop in output level.

The THRESHOLD/OUTPUT gain coupling feature computes the amount of make-up gain required to maintain a constant OUTPUT LEVEL during limiting (as indicated on the OUTPUT control in dBV), regardless of the setting of the THRESHOLD control.

Manufacturer: Valley People Inc, PO Box 40306, 2821 Erica Place, Nashville, Tenn 37204, USA.
UK: FWO Bauch Ltd, 49 Theobald Street, Boreham Wood, Hertfordshire WD6 4RZ.

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

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SERVICES

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Tel. 0455-47298

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10-49	66p	68p	70p	74p	78p	82p	87p	95p	102p	112p	122p	132p
50-99	63p	65p	67p	70p	73p	76p	83p	91p	99p	109p	119p	129p
100-149	62p	64p	66p	67p	69p	71p	78p	87p	94p	104p	114p	124p
150-249	58p	60p	62p	63p	65p	67p	75p	84p	89p	99p	109p	119p
250-499	56p	58p	60p	61p	62p	63p	71p	79p	85p	95p	105p	115p
500-999	54p	55p	56p	57p	58p	59p	66p	74p	82p	92p	102p	112p
1000+	48p	50p	52p	53p	55p	57p	63p	69p	79p	89p	99p	109p
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16mm recorder, solid state, 24/25, twin rack EBU, £4500.
16mm older mechanism, no electronics, £600.
RCA
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MALCOLM STEWART
AUDIO SYSTEMS INTERNATIONAL,
111 HARROWDENE ROAD,
WEMBLEY, MIDDLESEX HA0 2JH, ENGLAND.
01-908 4008

FOR SALE—TRADE

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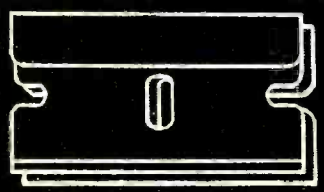

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Phone: 01-958 5476

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Above package complete for **£6,000** including V.A.T.

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3M Wollensak Cassette Copies, also endless loop cassettes, single edged razor blades. Sound Marketing & Services. Tel. Norwich (0603) 45338. X

YORKSHIRE Erricks of Bradford. Tascam, JBL, Bose, AKG, Beyer, Calrec, Revox, Ferrograph, Spendor. Sales, servicing, exchanges, leasing. Bradford (0274) 22972 (Paul). X

MAGNASYNC 3000 series 3-track, 35mm recorder/producer with sync unit. Two years old, hardly used. Offers around £4,500. Also Ampex tape position locator for MM 1100; offers. Also Ampex 351 tape transport only, converted to 1in; offers. Ring Maintenance Dept., 01-734 7443. J

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NEW Ampex tape. Ring for prices. New EM1-815 2in, £29.50. Various brands 2in tape, used once previously as film music masters, £25. Once used 1in BASF-SPR50, £7.50. Guaranteed perfect. All plus VAT. Discounts over ten. Action-Sound, 01-428 3714. J

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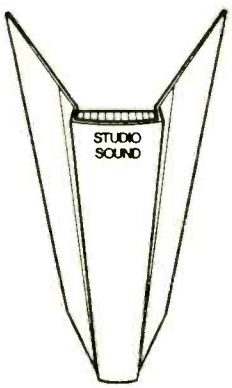

LINK HOUSE GROUP

FOR SALE—PRIVATE

UHER SG520 Varicord stereo tape recorder, after only limited use under studio conditions, £150. Tel. 01-407 9417. J

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CALREC SOUNDFIELD MICROPHONE
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Use it as a SUPER STEREO MICROPHONE or for AMBISONIC SURROUND SOUND recording. UHJ 2CH ENCODERS are also available for use during recording or POST SESSION.
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PROPERTY FOR SALE

IMPORTANT PUBLIC SALE

because of bankruptcy of
RELIGHT STUDIOS
Relight Production Company
Goirlesedijk 12a, Hilvarenbeek,
The Netherlands
by
L. S. T. MATEIJSEN MAKELAARDIJ B.V.

on Tuesday 22nd of September at 10.30 a.m., in Café "'t Centrum" Oranjeplein 2-4, Goirle, by order of Dr. F. M. van Wezel, trustee, in the presence of Dr. Th. P. M. Hoekx, notary, on the general sales terms mentioned in sales catalogue.

Put up for sale is the full inventory, among which:
"Midas" 32/24/4 channel mixing console; "MCI" 24 track recorder; "Studer A80" master recorders; Dolby 24 channel noise reduction; various "Neumann" condenser microphones with stand mount and wind gag; "IBL" and "Lockwood" monitoring; various electronic materials; 8 channel demo electronics; "Sony" video camera DXC-2000A with monitoring; various music instruments; various tapes, etc.
Bar, Canteen and Kitchen inventory.

Inspection: The studios will be open for inspection on
Saturday September 19th from 10.00 a.m. to 15.00 p.m.
Monday September 21st from 10.00 a.m. to 16.00 p.m.
Tuesday September 22nd from 8.00 a.m. to 10.00 a.m.

For more information:

L. S. T. MATEIJSEN MAKELAARDIJ B.V.
Machinery broker, valuer and auctioneer,
P.O. Box 87, 5170 AB Kaatsheuvel, The Netherlands
Telephone 04167-72545

FOR HIRE

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Immediate delivery of
auxiliary equipment,
mixers,
microphones and loudspeakers.
For price list please ring Guy, 380, 0511.

ELLIOTT BROS. (Audio Systems) Ltd.
9 Warren Street, London W1. Tel. 380 0511

FOR HIRE AT BUDGET RATES

LEXICON 224 Reverb Bel Flangers
EVENTIDE HARMONIZERS Roland Tape Echos
LEXICON Primetime DBX 20/20.

Phone Andy or Louise **01-708 0483**
or write for further details:
10 Steedman Street, London SE17 3AF

STUDIO FACILITIES

DISC Cutting master and demos, pressings, cassettes, mobile recording studio. Free brochure. TAM Studio, 13a Hamilton Way, London N.3. Tel. 01-346 0033. X

FANFARE Records. Tape-disc pressings, demo's, masters, any quantity. Studio/mobile Neumann disc cutter. S.A.E. brochure. 1 Broomfield Close, Rydes Hill, Guildford. Tel. 0483 61684. X

SITUATIONS WANTED

KEEN young man seeks post in Recording Studio. Currently "Sound Man" for small amateur band. If required has studio equipment construction experience. Write Box 862 c/o *Studio Sound.* J

ENGLISH ENGINEER/producer, varied experience in multitrack recording, seeks situation in Australia or States. Write Box 864, c/o *Studio Sound.* J

GRADUATE (Physics/Music including Acoustics, E.M. and Studio Techniques), some experience in recording, composition and maintenance, seeks first post for C.V. Write Box 863, c/o *Studio Sound.* J

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"The performance and technology sold me. The sound of the '90 sold my clients."

Guy Costa, Vice President and Managing Director, Motown/Hitsville Studios

"When we first got our hands on the Otari MTR-90 we were impressed. The tape handling is superb. The production features are all there. The electronics and logic are to the highest standard we've come across in all the years of Motown's recording history.

But, as I've learned over the past nineteen years in this music recording business, it isn't just specs that count. The producers and artists have to like the way it sounds. A mastering multitrack machine has got to have a "musical" sound. Transparent. Clean. Performance that has to deliver everything possible — right up to the limitations of the tape.

I'd say that judging from the reactions of the creative people who record at Motown/Hitsville,

Otari's got a platinum record coming up for their New Workhorse.

And one added thing. We bought two because alot of the music product is going 48 track. The '90 synchronizes beautifully through the AudioKinetics controller and interface. Now, all we have to do is figure out how we can juggle this year's budget to get four more!

If you use your ears for a living, use your head too. Listen to the Otari MTR-90. I did."

OTARI

Otari Electric Co., Ltd.
4-29-18 Minami Ogikubo
Suginami-ku-Tokyo 167
Phone: (03) 333-9631
Telex: OTRDENKI J26604

MR-2

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

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

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

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

More Usable Console for the Money?

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

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

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

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

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

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

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

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

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

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

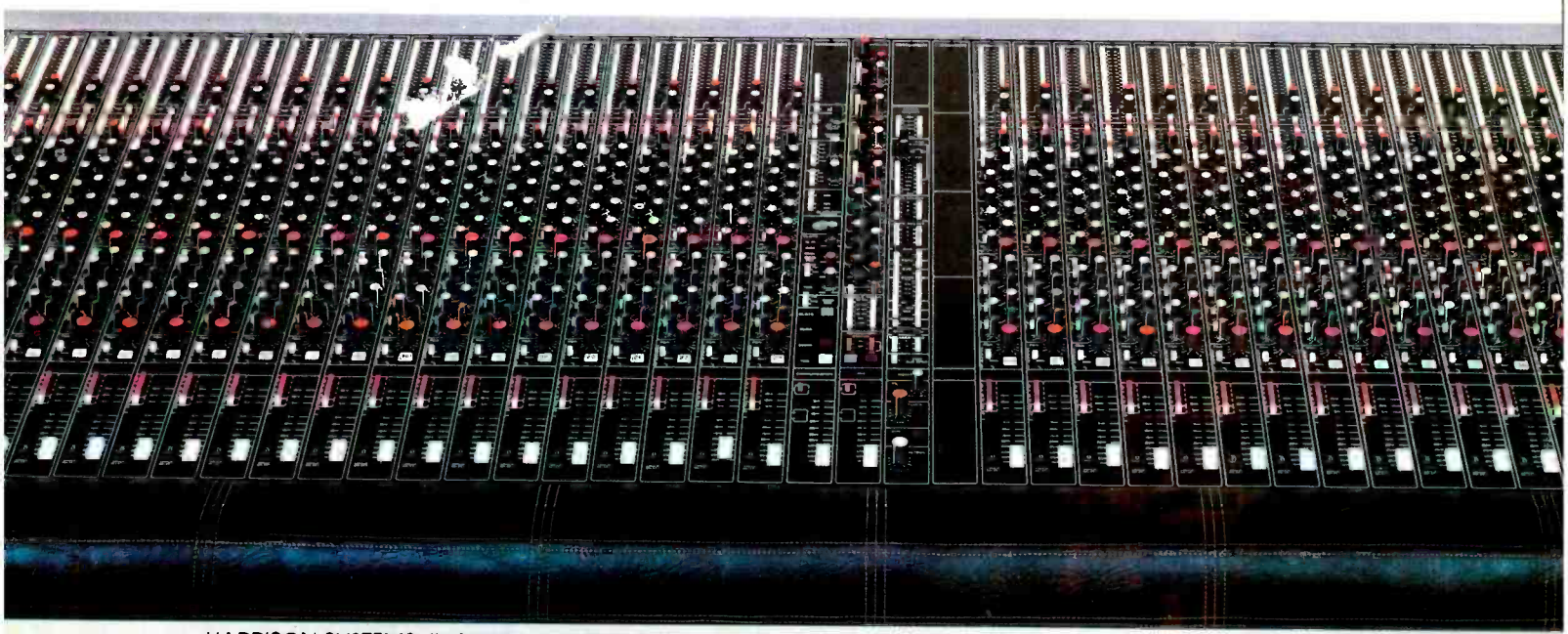
Patch points now operate full line level (+4 dBu or +6 dBu) and are isolated and balanced.

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

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

Harrison

NOW MORE THAN EVER



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