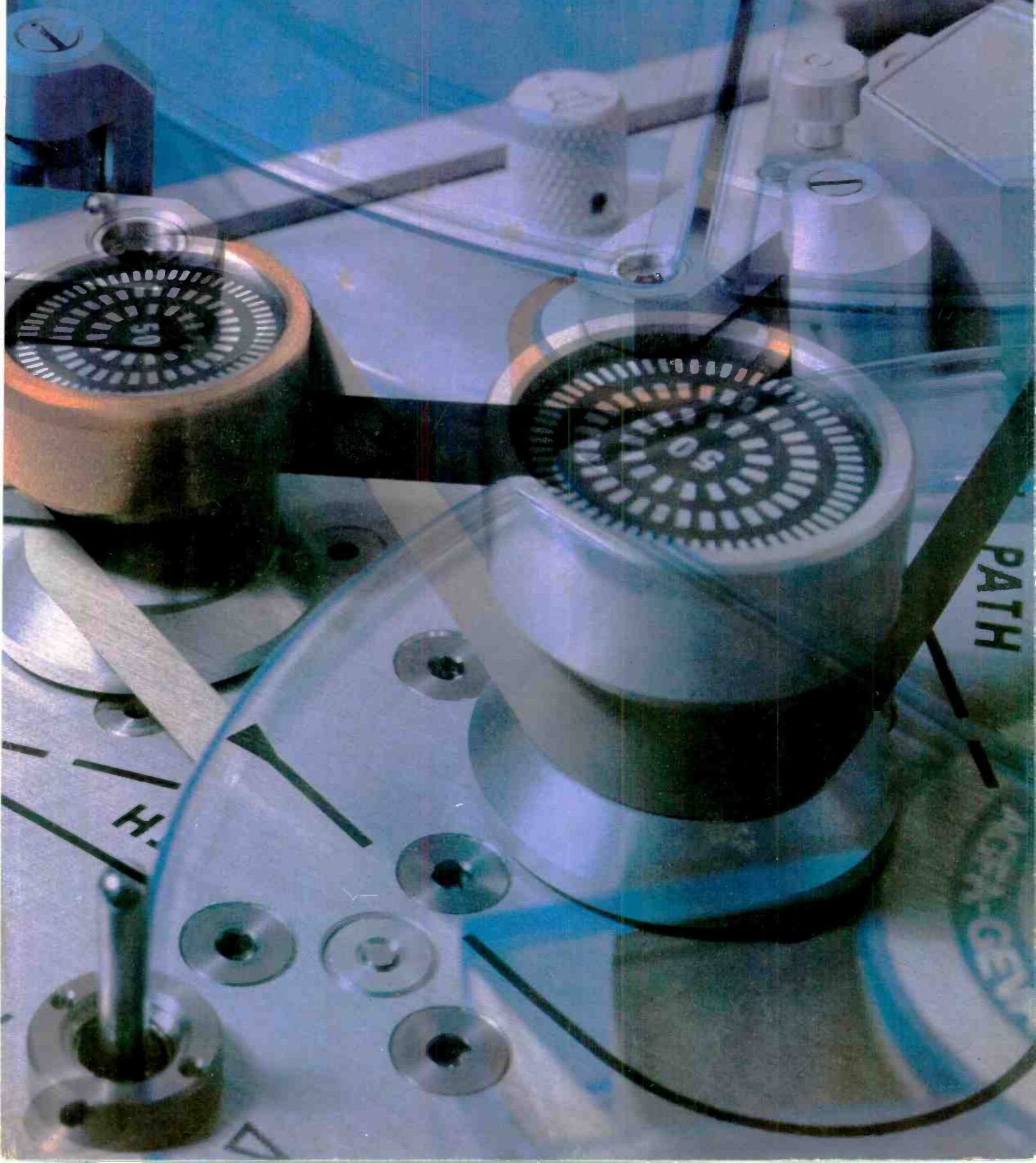


studio sound

February 1979 60p

AND BROADCAST ENGINEERING

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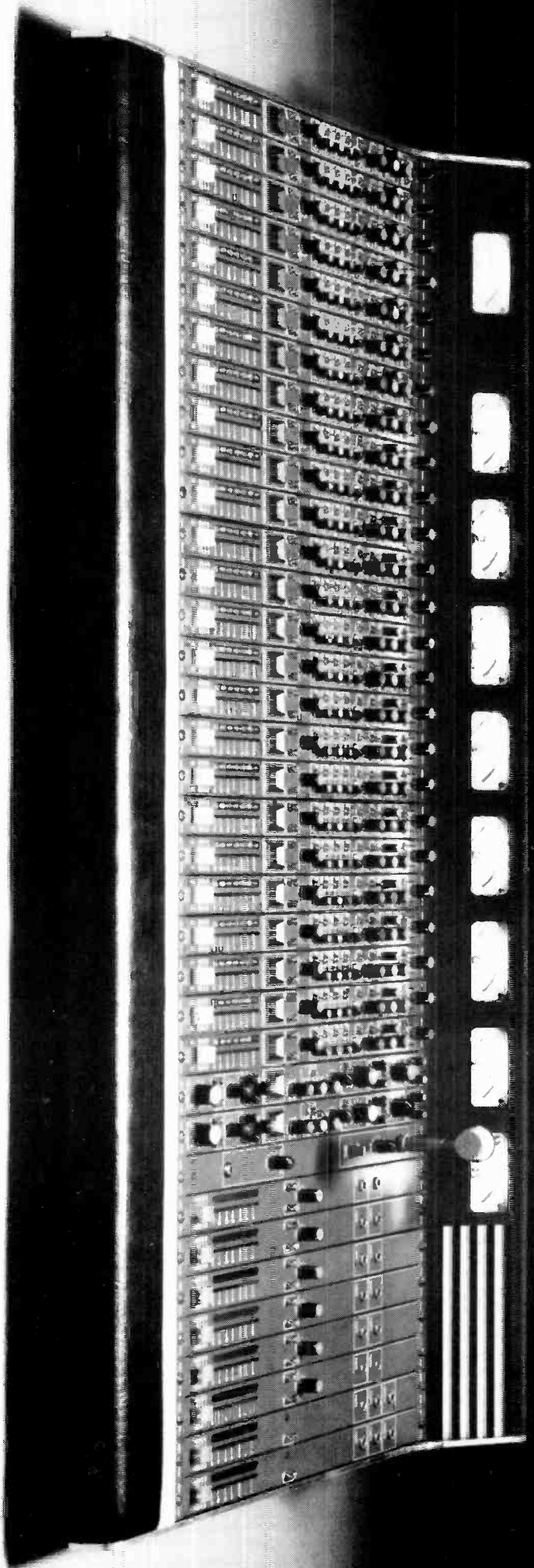


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THE LINK HOUSE GROUP

studio sound

AND BROADCAST ENGINEERING

NEWS	18
STUDIO DIARY	24
HOW THE RING WAS RUNG	John Rushby-Smith 30
AES 61st CONVENTION, NEW YORK—A REPORT	Angus Robertson 36
BUSINESS	50
SURVEY: FILM SOUND EQUIPMENT	52
LETTERS	60
REVIEWS: Hugh Ford	
_____ FEEDBACK EW604 watt meter	62
_____ SONDOR Libra MO3 magnetic film transport	66
_____ STELLAVOX SP8 portable tape recorder	76
REVIEW, OPERATIONAL: Steve Waldman	
_____ AUDIO KINETICS XT24 intelocator	86

When sound is produced as entertainment in its own right, the greatest possible care is invariably taken to ensure high quality at all stages of production, and most records are played on equipment of 'reasonable' quality and fidelity. But when that sound is merely additional to pictures, it immediately takes second place. To be perfectly fair, the producers and engineers on feature films and television programmes generally do their utmost to maintain the highest possible quality, but unfortunately the replay medium provides a finite limitation on the quality heard by viewers and punters. In television's case, the receiver amplifier and loudspeaker *invariably* leave much to be desired and manufacturers claim the additional couple of pounds to install a suitable output socket would make their prices 'totally' uncompetitive—and anyway, nobody *actually* wants good quality sound! And that from manufacturers that continue to heavily promote the virtues of 'hifi'. Many people, such as myself, find ways of providing a high quality output from television receivers using a mains isolating transformer, an audio isolating transformer or more recently an opto-isolator.

Film sound has an even worse history. In the early days of film sound, film emulsion quality and electronics combined to give high noise levels and so the Academy filter was introduced in the replay chain reducing this noise by the incredibly simple technique of severely attenuating all frequencies above about 6kHz. Despite the introduction of vastly superior film emulsions and electronics, this filter is still used in the replay chains of the vast majority of cinemas. Since the demise of the large film studios and the closure of their research and development departments, little finance has been made available for R & D and the improvement of film sound in cinemas has been left entirely in the hands of Dolby Laboratories; but even their valiant efforts leave a high percentage of cinemas using techniques developed in the thirties. And many of those cinemas now equipped with either Dolby SVA optical stereo replay, or Dolby 6-channel magnetic replay equipment, still have amplifiers, loudspeakers and acoustics that leave much to be desired as was clearly apparent from the London premiere of *Superman* where high frequencies were severely limited and the low frequency 'surround sound' had most of the speakers rattling away. Although all prints of *Superman*, and numerous other films, carry the Dolby stereo logo, only a minority of listeners have the privilege of hearing stereo sound while even fewer will benefit from the added surround sound that the dubbing mixers have spent so much time creating. While most films open initially with a 70mm showcase performance and are released nationally a couple of months later, *Superman* was launched simultaneously internationally at some 700 theatres in the USA, and 160 in Britain—most will be in glorious bandwidth restricted mono apart from about a dozen in the UK and perhaps 200 Stateside which are in 35mm Dolby stereo. At the time of the premieres, there was only one 70mm six channel magnetic print (in Hollywood) and most premiere 35mm prints had come directly from laboratories due to late completion of the film. Although 70mm prints provide higher image quality (with larger screen size due to the increased image area) and six magnetic audio tracks, a typical two hour print might cost £15,000 compared with £500 to £800 for a normal Dolby stereo 35mm print. Perhaps this explains distributors' reluctance to make greater use of 70mm prints.

One recent development might however have revolutionary effect on film sound. Holographic techniques are being experimentally used to record several channels of sound superimposed over the picture image (and thus printed simultaneously unlike magnetic tracks which are separately copied). The holograms are invisible to the projection light, but visible under laser light. Problem solved, but will cinemas be prepared to install such complex equipment, and more importantly sound systems of equal quality?

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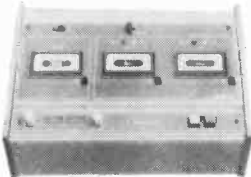
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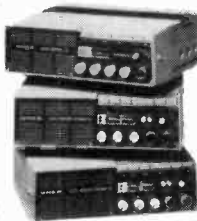
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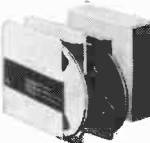
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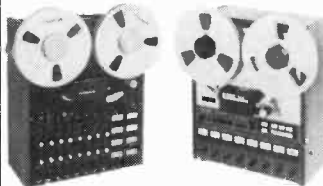
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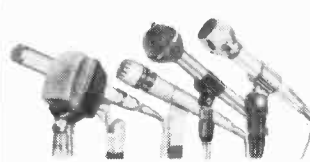
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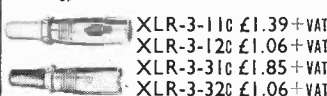
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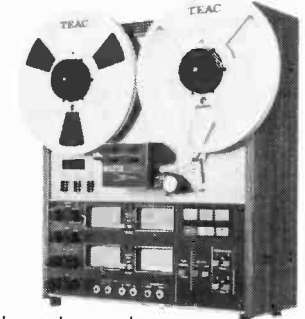
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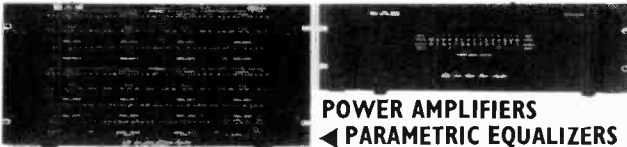
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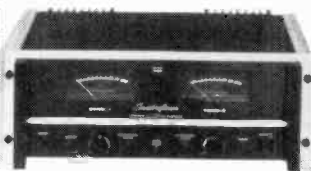
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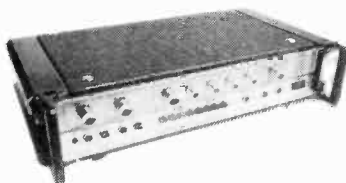
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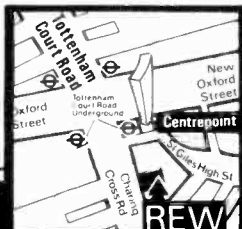
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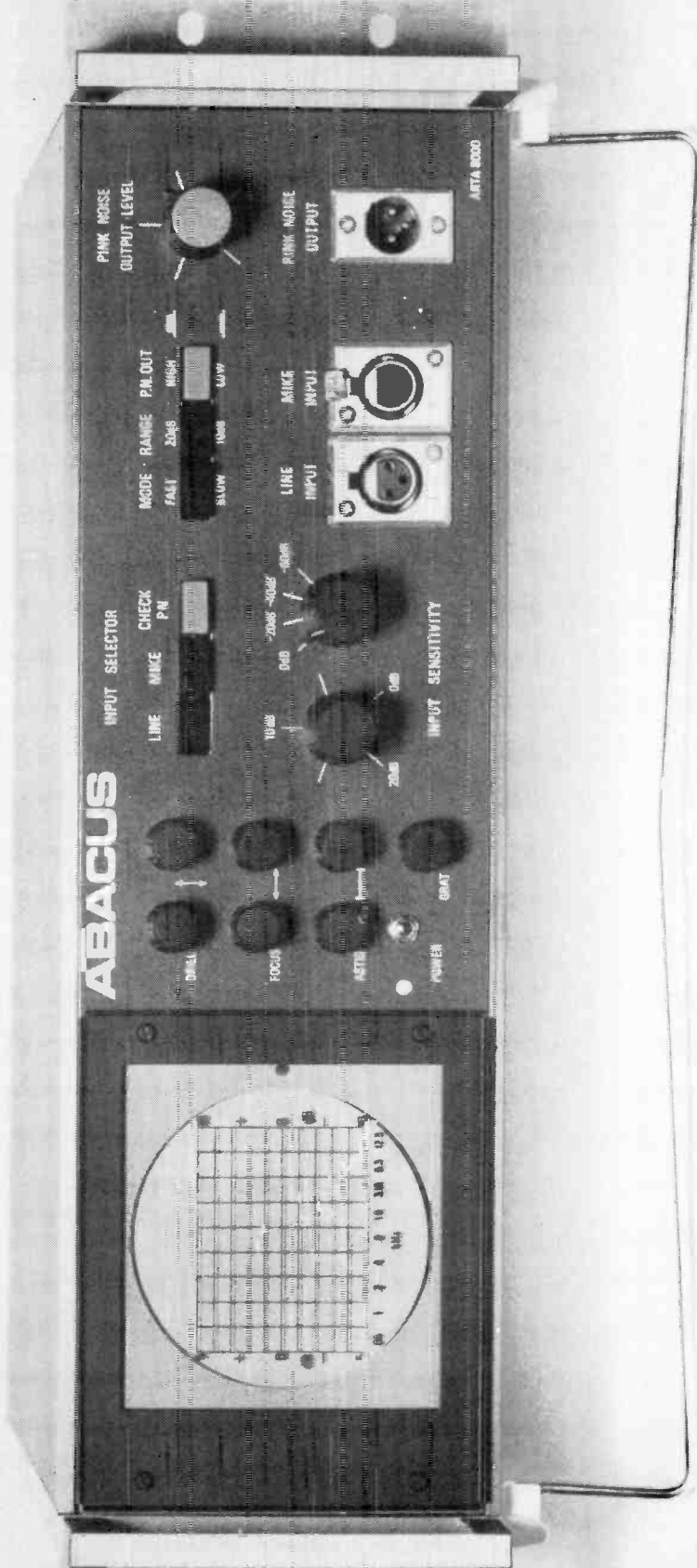
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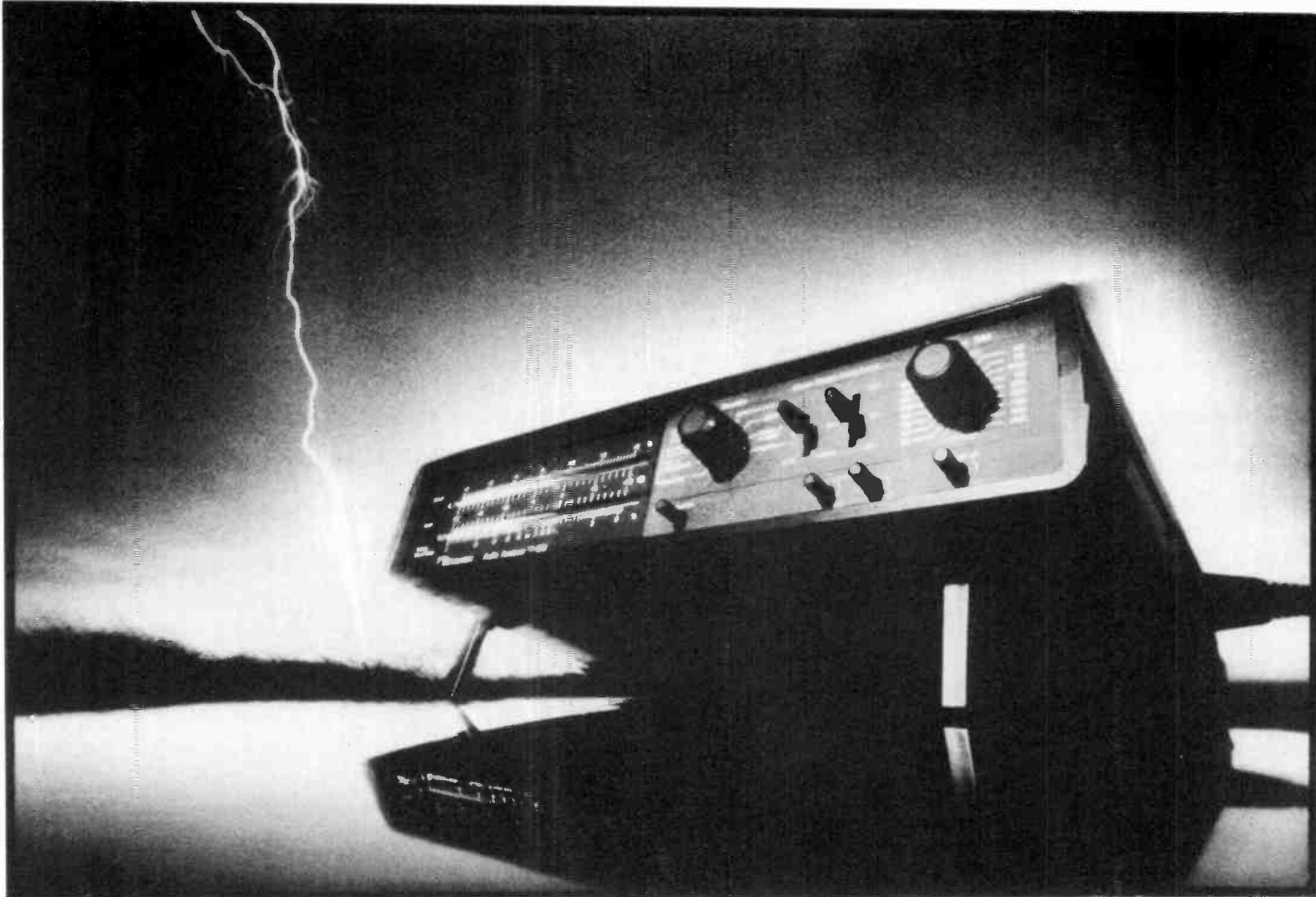
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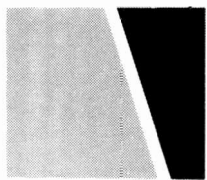
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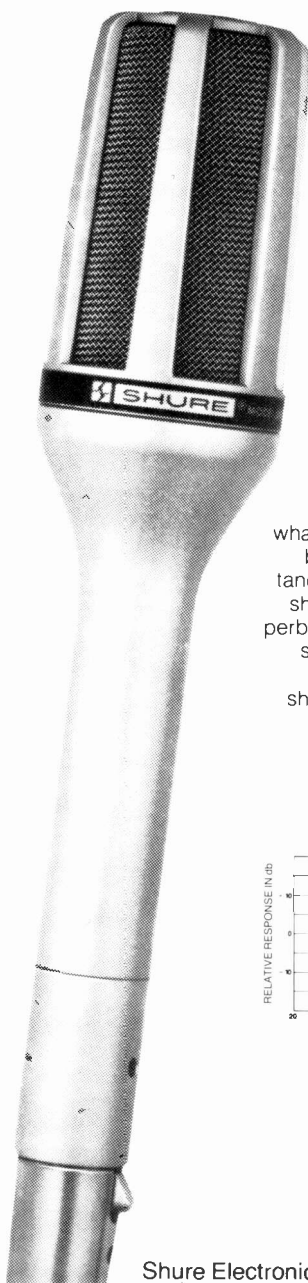
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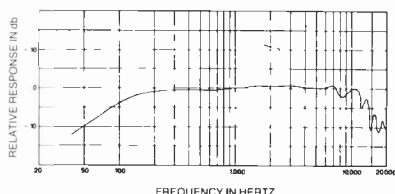
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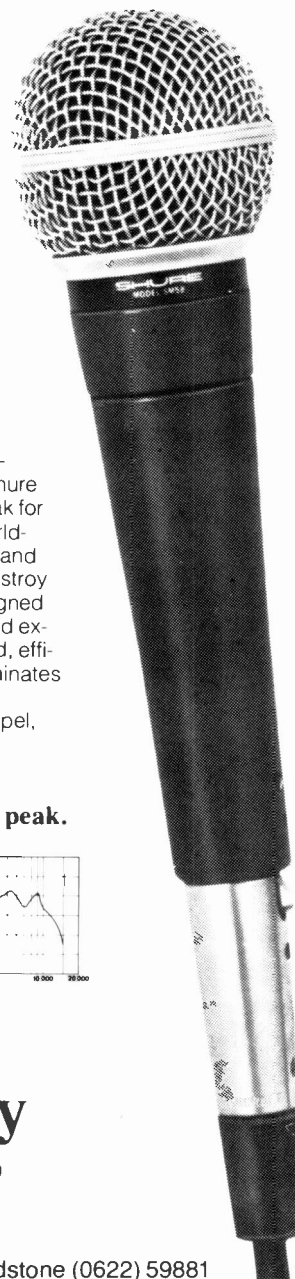
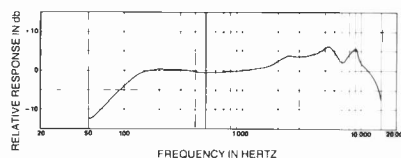


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Probably the most widely used on-stage, hand-held cardioid dynamic microphone. The SM58 dynamic microphone is preferred for its punch in live vocal applications... especially where close-up miking is important. It is THE world-standard professional stage microphone with the distinctive Shure upper mid-range presence peak for an intelligible, lively sound. World-renowned for its ability to withstand the kind of abuse that would destroy many other microphones. Designed to minimize the boominess you'd expect from close miking. Rugged, efficient spherical windscreens eliminates pops. The first choice among rock, pop, R & B, country, gospel, and jazz vocalists.

...some like a "presence" peak.



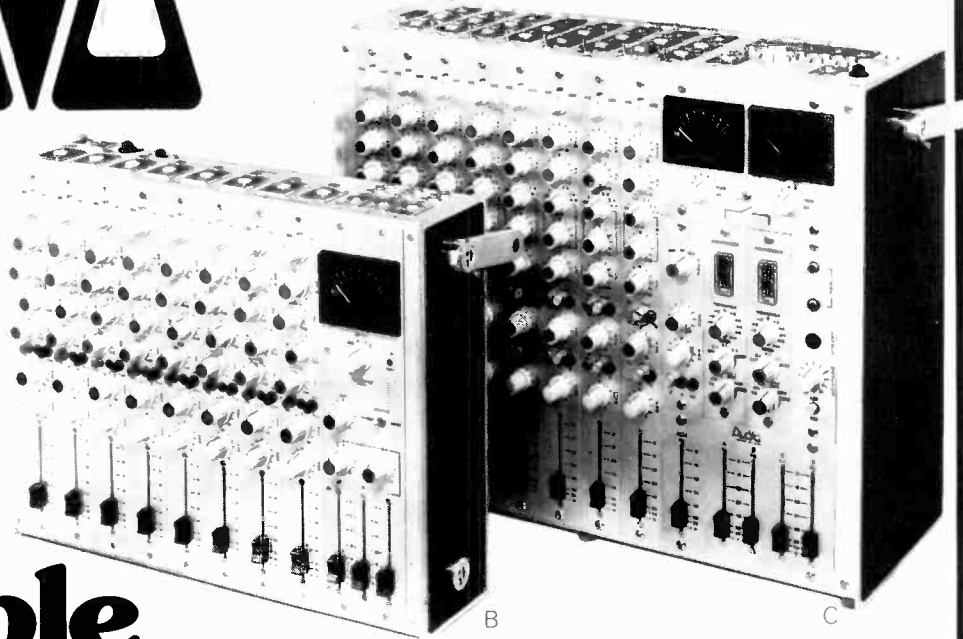
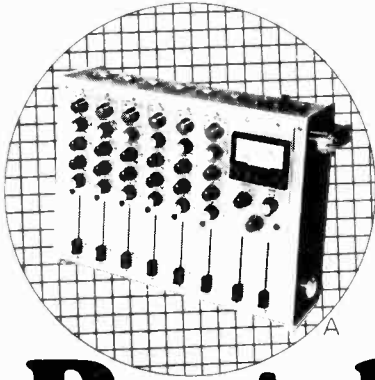
professional microphones...by



Shure Electronics Limited, Eccleston Road, Maidstone ME 15 6AU—Telephone: Maidstone (0622) 59881

Audio

Developments



Portable professional mixers

Designed to team up with professional equipment for studio sound on location

Of advanced design and proven performance these are purpose built battery powered portables, of solid $\frac{1}{8}$ " aluminium with carrying handles. Top quality components, modular construction and stringent quality control ensures the highest degree of reliability. For use on location with professional tape recorders – Nagras/Stellavox etc, outdoor broadcast, stage mixing or to supplement studio consoles when added capacity is required. Over 300 in trouble free use world wide.

MINIMIXER AD 007

8 in 4 out. Compressors. size 540 x 480 x 225mm Weight 22.7 kg

MICROMIXER AD 031

8 in 2 + 1 out + options size 420 x 335 x 127mm Weight 10 kg

PICOMIXER AD 045

6 in 2 out size 340 x 265 x 110mm Weight 6.2 kg

PICOMIXER AD 045

Mk II

AD 075 SuperSystem

AD 055 Stereo Compressor Limiter

A - Picomixer AD 045

B - Micromixer AD 031

C - Minimixer AD 007

New Studio Compressor Limiter

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

Specification

RATIOS 2 1.3 1.5 1 Limit (20:1)
RELEASE TIME Adjustable - 75ms 150ms 300ms 600ms
1.2sec 2.4sec
ATTACK TIME Adjustable () 25ms 50ms 1ms 2ms 4ms
8ms
FREQUENCY RESPONSE 1dB 20Hz to 30kHz NO
COMPRESSION
DISTORTION 0.1% at 1kHz to 10kHz NO COMPRESSION
+ 8dB input
MAX. COMPRESSION 25dB
MAX. OUTPUT + 19dB at 1kHz + 12dB at 20kHz
MAX. INPUT Dependent on the MAX. OUTPUT and MAX
COMPRESSION
NOISE Wideband - 68dB Band Limited - 71dB

Audio

Developments

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

Coherent Communications

Ivan Kruglatt
13733 Glenoaks Boulevard
Sylmar California 91342 USA



NO COMPETITION

The superb 3.77 is the only choice in compact professional recorders.

Who says?

Hundreds of satisfied professional users— Broadcast authorities, studios, record companies, universities etc etc.

What makes it the best?

The 3.77 provides more performance and features for your £ than any other model. Like 3 speeds, flat metal facia with excellent editing facilities, 100% variable speed control, logic control with motion sensing, line-up oscillator.

An **ITA** Product.

1-7 Harewood Avenue, Marylebone Road, London NW1. Tel: 01-724 2497. Telex: 21879



757 ROMFORD ROAD, E12 01-478 7965/6

Crowmay's New 05 Series High-Speed Cassette Duplicating Slave.

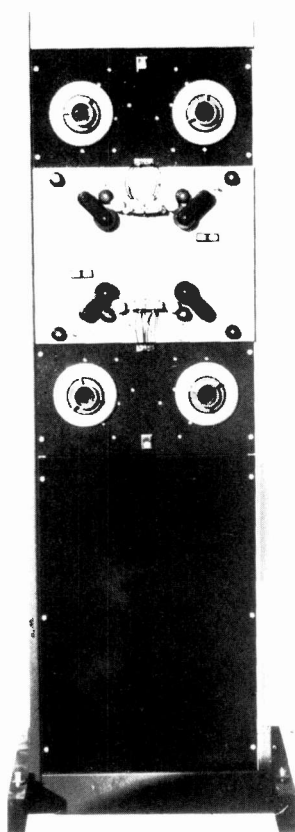
Features

- 19" Rack Mounting
- 32:1 Dupe Ratio
- Full E.O. and Bias Adjustments on all Channels
- Compatible with any of the Crowmay Range of Master Playback Machines.

Current Price

£2,760.00 plus V.A.T.

Picture Shows:-
Two Slaves Mounted in a 19" Rack. (Rack supplied F.O.C.)



CROWMAY MASTER TRANSPORTS

- 1" 4 Channel 240 i.p.s. £5,900.00 plus V.A.T.
- 1/2" 4 Channel 240 i.p.s. £5,100.00 plus V.A.T.
- 1/4" 4 Channel 120 i.p.s. £3,400.00 plus V.A.T.
(For 3 3/4 i.p.s. Masters)

ALL PRICES INCLUDE
LOOP BIN

COMING SOON:-

CROWMAY'S "IN CASSETTE"

MOBILE DUPLICATOR.

R. D. G. PRODUCTION COMPANY

67 UNION STREET
NEWPORT PAGNELL
BUCKS.

Tel. 0908 613009 Telex 826419

MULTITRACK MACHINES

MCI JH100 24T with 16T h/block	...	...	£17000
MCI JH100 24T	...	...	£14000
Studer Mk2 24T, as new	...	...	£18000
Studer Mk1 16T	...	...	£9500
3M M79 24T v.g.c.	...	...	£14000
3M M56 16T	...	...	£9000
3M M79 16T	...	...	£9500
EMI BTR24 8T 1 inch, as new	...	...	£3000
EMI BTR4 4T half inch	...	...	£600

MIXING CONSOLES

MCI 440 40 inputs, 40 outputs	...	...	£25000
MCI 416 16 inputs, 16 outputs	...	...	£9500
Amek 2000 20 x 16 prewired for 24	...	...	£9500
Trident B 16 x 16 x 16	...	...	£9000
Cadac E 26 x 16 x 16 prewired 24	...	...	£18000
RSD 16 x 8, new	...	...	P.O.A.
Allen and Heath modular 2 16 x 8 x 16	...	...	£1950

MICROPHONES

8 Neumann M49, complete with P.S.U., each	...	...	£350
4 Neumann M50 complete with P.S.U., each	...	...	£350
7 Neumann U47 valve, with P.S.U., each	...	...	£350
2 Neumann U67 valve, with P.S.U., each	...	Offers	
6 Neumann KM54 valve, with P.S.U., each	...	...	£150
6 Neumann KM56 valve, with P.S.U., each	...	...	£165
6 AKG C12 with P.S.U., each	...	...	£400
6 AKG C12A with P.S.U., each	...	...	£350

MISCELLANEOUS

Quad 303	...	...	£70
Quad 2 valve preamplifiers, each	...	...	£60
Quad preamplifier valve stereo	...	...	£45
RDG studio flanger, new	...	...	£275
RDG studio comp/limiter stereo, new	...	...	£565

Wanted urgently: All studio equipment. Cash available immediately. V.A.T. not included in prices.

THE EVENTIDE MODEL H910 HARMONIZER

The HARMONIZER employs digital circuitry and random access memories to actually transpose input signals by up to a full octave up or down. Any musical interval can be achieved by the continuously variable control and the optional monophonic or polyphonic keyboard allows real-time 'playing' of the HARMONIZER so that the musician can harmonize with himself. The HARMONIZER can be used to maintain constant pitch in direct ratio when the speed of pre-recorded tape is varied up or down.

DIGITAL DELAY

In addition the HARMONIZER is a low cost, very versatile delay line. The delay is variable in 7.5 ms steps up to 112.5 ms. A second output is optionally available that varies up to 82.5 ms.

SPECIAL EFFECTS

Simultaneous use of feed back, delay and pitch change can be used to create previously unobtainable effects.

Other devices available in the Eventide range include the
1745M Digital Delay System
FLANGER
OMNIPRESSOR



U.K. Distributors



Feldon Audio Limited

126 Great Portland Street, London W1. Telephone: 01-580 4314. Telex: London 2866E

Eventide, Instant Flanger, Omnipressor and Harmonizer are trade marks designating the products of Eventide Clockworks Inc.

Digital standardisation stop-go

All has not been peaceful recently on the digital standardisation front. In the October issue of *Studio Sound*, we reported on the different and incompatible digital sound coding standards being adopted around the world and referred to moves by the Audio Engineering Society intended to bring order out of chaos by setting a standard. Soon after, on October 28 to be precise, the chairman of the AES Digital Standards Committee wrote to all members of the committee stating that: "It is with a great deal of concern that I must inform you that, as a result of the Justice Department's complaint filed by Mr Steve Temmer, it is necessary to stop all procedures in regard to digital standards". Thereby, as they say, hangs a tale which is far less straightforward than would appear from the bare, and somewhat bitter, words of the Chairman's bald statement.

Stephen Temmer, president of Gotham Audio Corporation in New York, has had reservations on the AES involvement in digital standardisation ever since the committee was first organised in late 1977. Essentially Temmer was concerned on two counts, one technical and one legal. On technical grounds Temmer believed it was wrong for a body as powerful as the AES to set a standard which reaches far into the future on the strength of current and limited experience by the industry of digital encoding. In Temmer's view standardisation moves at this early stage will deter research and development work by small firms.

He argues that the proper path is for large firms to market their best ideas. The industry should then try them out in studios. This leaves the field open for whatever bright ideas may emerge from practical experience gained from using available systems in situ. On the question of legality, Temmer believed that the AES was at risk of violating the very strict anti-trust laws which exist in the USA. Under these laws it is illegal for any group of people to take any collusive action that may be to the detriment of the public or consumer. The US takes anti-trust very seriously, probably more seriously than any other country in the world. The courts are quite likely to jail the president of a company (or for that matter society) if anti-trust activities are proven.

According to Temmer, he wrote to John McKnight of the AES in January 1978 explaining his technical and legal reservations. McKnight replied, essentially disagreeing with Temmer's view but acknowledging no factual information on the legality point. So far so good. But next and in an effort to clarify the facts of the legal situation Temmer consulted with the Justice Department of the USA. That was in February 1978. Not so good. To approach the US Justice Department and ask advice over anti-trust illegality is akin to asking the local police about the legality, or otherwise, of murdering your wife. Once the question is asked, unstoppable legal wheels are set in motion. The Justice Department became very interested in the anti-trust aspects of technical standardisation and in what Temmer describes as his

"nightmare"—that ten years after standardisation we may find out that too little was known about the subject at the time when the irrevocable standardisation decision was taken. In this context, he cites the question of what would have happened if the AES or any other body had standardised on any one of the relatively primitive quadraphonic systems which were offered to the public at the beginning of the ill-fated quadraphonic boom. Temmer's contention, then, is that the AES should confine itself to *discussing* a topic and not reach out into *standardisation* decisions which could stymie all future progress in some sectors of the industry.

While the Justice Department pondered these points through the summer of 1978, the AES Board of Governors met in Los Angeles, called for Temmer's resignation and urged the Digital Standards Committee to pursue its assignment with even greater vigour. By now, however, the AES lawyers were in on the act and, doubtless with an eye to the Justice Department involvement and the now-not-to-be-sneezed-at possibility of AES officials languishing in jail for violating the US anti-trust laws, recommended that the committee meetings be called to an abrupt halt. This, as they say, is where we came in, because it was this decision that prompted the October 28 letter from the Digital Standards Committee Chairman to all members of the Committee, announcing that "as a result of the Justice Department complaint filed by Mr Steve Temmer" a halt had been called to the Committee's activities.

Stung by its tone, Temmer suggests that the letter could more appropriately have expressed gratitude for his vigilance. But with the degree of bad feeling now existing, such an expression of gratitude is about as likely as adoption of a two-bit coding standard.

The latest news, following a meeting of the AES Board of Governors in New York on November 3, is that the AES will continue to discuss the issue of digital coding techniques but with the emphasis on investigation rather than standardisation. Legal wheels in the Justice Department will doubtless continue to turn for a while but it is unlikely now that any AES governors will see the inside of a jail cell. The audio industry will continue to research and develop different approaches to digital encoding of which hopefully only the fittest, rather than the hardest sold, will survive. Probably most firms will follow 3Ms recently announced lead and offer digital equipment on *lease* rather than for sale until some kind of rationalisation emerges from the disputes inevitably ahead. There is a smell of bad blood within the AES and moves towards a break-away group are afoot. Temmer's action has proved yet again that anyone who questions the authority of upper officialdom in a body as august as the AES does so at their peril. But hopefully this will not deter others from doing just that if they feel sufficient justification and good cause exists. Upper officials of august bodies are not *always*, by divine right, right.

Adrian Hope

Abacus ARTA 8000

Abacus Electrics has introduced the *ARTA 8000* $\frac{1}{3}$ -octave real time audio spectrum analyser for use in the design, evaluation, maintenance and installation of audio circuits and systems. These include loud-speaker and microphone electro-acoustic response measurements; tape machine alignment; signal, hum and noise tracing; cable high frequency loss measurement; filter, tone control and equaliser design; amplifier response checks; crosstalk measurement in circuits, cables and magnetic recorder heads; loud-speaker crossover design and other specialist audio and acoustic engineering applications. The unit features a CRT display with a 10dB/20dB switchable 'window' and fast or slow ballistics. Signal levels between -70dBm and +30dBm may be displayed and for frequency response measurements a built-in pink noise generator is

provided. A variety of microphones may be interfaced with the unit. Price of the *ARTA 8000* is £1,950. UK Agents: Kirkham Electronics, Mill Hall, Mill Lane, Diss, Norfolk, UK. Phone: 037976 594.

John Maunder

It is with deep regret that we report the death in early October of John Maunder, the managing director of Shure Electronics Limited, after a long illness following a stroke in

1975. John, who was 62, began his business career with the London Electricity Board and during the war years served with the Admiralty Signal Establishment, joining the design department of Vitavox after the war. At Vitavox John rose to be sales manager, prior to leaving to become the UK distributor for Shure Brothers Inc in 1959. In 1961 John became the managing director of the newly-formed Shure Electronics Limited and he played a substantial role in the success of the company. Amongst his contributions to the audio world John was instrumental in initiating the first Audio Fair at the Washington Hotel in 1955 and was also a founder member of the British section of the AES. John had a great love of classical music, his other main interest being cricket. We extend our deepest sympathies to his family and his colleagues at Shure Electronics.



Alice — 10 QUIET YEARS?

ALICE is 10 years old this year — our reputation for making quiet mixers dates back to January 1969 when four talented enthusiasts got together in a shed in Windsor to design and build their own mixer.

Ten years and several sheds later, there is still a group of talented enthusiasts designing and building mixers in the Royal Borough, and in 10 not-so-quiet years ALICE has equipped theatres, recording studios and broadcasting stations throughout the world.

ALICE BROADCAST transmission and production mixers are used by 11 of the 19 commercial radio stations now on-air in the U.K. The original ALICE MODULAR system has become a standard by which others are judged.

Now, only one year after its introduction, the new ALICE CUSTOM MODULAR system has achieved the unique distinction of being chosen by the I.B.A. for their experimental mobile surround sound facility, as shown below.



ALICE has grown a lot in 10 years — and we'd like to thank all our customers, amongst whom we number many of our friends in the industry — we'd like to mention especially:—

Radio Clyde
Radio Forth
Metro Radio
Radio Tees
Beacon Broadcasting
Swansea Sound
Plymouth Sound
Capital Radio

Independent Broadcasting Authority
L.B.C. Parliamentary Broadcasting
Broadcast Marketing Services
London Radio Productions
J. Walter Thomson
R.C.A.
Rediffusion Industrial
I.T.A.

British Broadcasting Corporation
Broadcasting Corporation of New Zealand
British Forces Broadcasting Service
Bray Sound Studios
E.M.I. Records
C.B.S. Records
U.C.A. Studios, Cape Town S.A.
Kersten Records (W.Germany)

Alice (Stancoil Ltd.)

38 Alexandra Road, Windsor, England

Tel: Windsor (075 35)51056/7 Telex: 849323 a/b Aegis G

New BGW agent in UK

Court Acoustics Limited, the London-based specialist in studio monitoring and sound reinforcement loudspeaker systems, has been appointed sole UK distributor for BGW Systems Inc. Court informs us that servicing and technical advice will be available for previous BGW customers and that deliveries of BGW amplifiers are available ex-stock.

Court Acoustics Limited, 35-39 Britannia Row, London N1 8QH, UK. Phone: 01-359 0956.

Bulgin Electronics Soundex Ltd

The Bulgin Group of companies has launched a new company, Bulgin Electronics Soundex Ltd, to specialise in the design and production of a diverse range of electronic and audio equipment. The new company has been formed by pooling the design and electronic engineering teams of two other Bulgin companies (Broxlea Ltd and Soundex Ltd) in the fields of instrument design and audio, and by setting up a new design laboratory under Tony Barns, joint MD of the new company. In the audio field Soundex Ltd, which was formed in 1969 to produce small, high quality audio mixers of which the *Unimixer* range is the most widely known, will continue to develop and market its product ranges within the new company.

The new company has introduced a free standing PPM with an illuminated Ernest Turner movement which conforms to BS4297 and BBC specifications and also complies with IEC468 for the measurement of noise in audio circuits. The PPM will accept either floating or unbalanced inputs (input impedance—minimum 16k Ω), has a frequency response of 15Hz to 35kHz, rise and fall times of 4 μ s and 1s for zero level, and is scaled in either dB (-22dB to +4dB) or PPM 1-7.

The company will be introducing new mixer designs later this year but in the meantime offers the *Series 1300* four channel mono/stereo mic line mixer for a stereo pair and two 'pan' mics; the *Series 1400* six channel mono/stereo mixer designed for OB, small studio and theatre use; and the company's PPM and mixer power supplies. Regarding the mixer power supply a splash-proof model, suitable for damp field conditions (ie OB use), is presently under development.

Bulgin Electronics Soundex Ltd, Park Lane, Broxbourne, Herts EN10 7NQ, UK. Phone: 09924 64455.

Furman Sound parametric equaliser/preamp

New from Furman Sound is their *PQ-6* stereo parametric equaliser/preamp. The unit features three continuously variable and overlapping frequency controls per channel (bass 25Hz-500Hz, mid 50Hz-2.5kHz, treble 600Hz-10kHz), with each band allowing up to +20dB boost or - ∞ dB cut, with infinitely deep notching capability and non-reciprocal equalisation curvature. Bandwidth varies from $\frac{1}{2}$ to 4-octave in the boost mode and $\frac{1}{2}$ to 1-octave in the cut mode, making the *PQ-6* suitable for use as a notch filter if desired. Each

channel has a separate bypass switch and LED indication of eq in. Other features include high and low level inputs and outputs, $\frac{1}{4}$ -inch phone jacks, and calibration adjustments. The *PQ-6* may be used as a stereo music instrument preamp with either a stereo power amp or conventional music instrument amp, as general purpose patchable eq for studio or broadcast applications, in a PA system for feedback suppression, or for studio or home room equalisation. Furman Sound products are distributed worldwide by Rothchild Musical Instruments, 10 Ivy Lane, Englewood, New Jersey 07631, USA. Phone: (201) 871-3366.



People

● Bill Wood MBE, head of the BBC Engineering Information Department, has retired after 32 years with the BBC. Bill joined the BBC Research Department in 1946 and became Head of Engineering Information in 1971. He was awarded the MBE in 1971 and is an Honorary Fellow of the BKSTS and a Fellow of the RTS and SMPTE.

● Dr Hermann Franz has been appointed senior vice president of Polygram BV/GmbH. Dr Franz has responsibility for the areas of manufacturing, recording technology and development.

● Technology for Communications International of California has appointed Mr Lance Phillips as European and Middle East area sales manager. Mr Phillips is based at TCI's London office.

● AKG Acoustics Limited has appointed Bart Moolenbeek as product executive, professional equipment. John Cowan has been appointed sales office manager.

● John Donnelly has joined Minneapolis-based Magnetic Controls Company as vice president responsible for sales, marketing and engineering functions.

● James Broderick has been appointed audio product manager for the Audio - Video Systems Division of Ampex Corporation. In addition John Frazer has been appointed sales engineer for professional audio equipment and tape for Ampex's UK and Ireland region.

● Apex Systems Limited has appointed Jon Sanserino director of original equipment manufacturing products.

● Steve Snook, formerly with the BBC Designs Department, has joined Oaks Industrial Holdings Limited as group chief engineer.

● SAE has appointed Barry Thornton as chief engineer with responsibility for research and development, and Don Jackson as professional products applications engineer. In addition, SAE has reorganised its sales department with Warren Pompei becoming director of sales and Andrew McKinney becoming national sales manager.

Actilinear not so new . . .

In November news, we carried a short item describing the new Tandberg Actilinear recording system which has also been featured in several advertisements. Meanwhile, Revox has discovered that the new Actilinear circuitry bears a remarkable resemblance to circuitry used first in the Revox F36 (with valves) in 1962, the Studer C37 (again with valves) in 1964, the A62 in 1965, and both the Revox A77 and B77 tape recorders. All these circuits use an equaliser network in a pre-amplifier, an output stage working as a voltage to current converter, and a suppression filter in the output circuit. So what's new you might ask?

Intercom systems

RTS Systems Inc of North Hollywood manufacture a range of *TW* two-wire intercom systems which can either be used in fixed installations or just as conveniently on location. The system comprises a power supply producing an output of 32V across which all the communication stations are paralleled—speech and call signals are sent along the same cable pair, so that either 10 or 50 stations operate in parallel. A variety of stations are available including belt packs for headphones, rack mount for headphones, portable and rack mount with mic and speaker, and stations for building into different types of equipment. All portable systems provide two channels, while rack mount systems provide three.

RTS Systems Inc, 4167 Fair Avenue, North Hollywood, Cal 91602, USA. Phone: (213) 980-0511.

Center for the Recording Arts

Hard on the heels of our recent article on training, news reaches us of a number of short courses being run in Schaumburg, Illinois at the *Center for the Recording Arts*. The courses include an introductory course designed to familiarise participants with current recording equipment and techniques; and courses on recording, mixing, disc mastering, and studio management. All the courses are part time with the longest being eight weeks. The survey, recording and mixing courses are held at Hedden West Recording Studio, whilst the remainder are held at The Diskwerks. Cost of the courses is \$300 per course.

Center for the Recording Arts, 1244 Remington Road, Schaumburg, Illinois 60195, USA. Phone: (312) 885-1330.

Contracts

● Amcron has supplied 57 *DC300A* amplifiers for a new PA system being built for Rod Stewart. 10CC have also taken delivery of amplifiers.

● Neve has received orders from TV Asahi of Tokyo for two Model 5315 consoles. In addition Fuji TV in Japan has ordered a 20/16 Model 8066 console.

● Neve is to design, commission and install a further three radio broadcast centres at Wabag, Vanimo and Daru for the National Broadcasting Corporation of Papua New Guinea. These are in addition to centres already being installed at Port Moresby, Manus, Karema and Garoka.

SOUND ADVICE



THE PEAVEY PLUG-IN MODULE SYSTEM

Our Plug-in Module System has made the normally complicated and very costly procedure of achieving a bi-amplified sound system, very simple and relatively inexpensive. The CS-400 and CS-800 power amps are equipped with accessory sockets to accommodate these plug-in modules and when properly displayed and demonstrated will prove to be a value unmatched in today's sound reinforcement market.

Further details available from the United Kingdom and Ireland distributors:

**Commercial Division,
Peavey Electronics (UK) Ltd.,
Unit 8, New Road,
Ridgewood, Uckfield,
Sussex TN22 5SX.**



Normally, an electronic crossover is a device which requires its own power supply, chassis, control functions, A/C mains cable and must be properly interfaced with the other audio chain components for satisfactory operation.

With the CS-800 and the new CS-400, this bulky, fairly complex situation may be reduced to merely purchasing the proper plug-in crossover module for your power amp and speaker system and utilizing the electronic crossover circuitry built into your CS-Series amplifier.

Court Acoustics Limited

Court Acoustics has moved to new premises consisting of offices, workshops, equipment stores, and an acoustically treated listening and measuring room with extensive test facilities. New projects on which the company is working include provision for a new custom-built monitoring system for De Lane Lea Studios, and a 6000W sound reinforcement system for a major London record company.

In addition the company has announced the introduction of the *RC610* and *RC612* high power colinear arrays for club, theatre, concert hall and large auditorium use. The loudspeakers, which are available in a wide range of finishes including portable flight cases, are distributed port reflex enclosures. The units have four 305mm bass drivers (254mm drivers in the *RC610*) covering the range 20Hz-900Hz, two 202mm aluminium dome radiators covering the range 800Hz-2.5kHz, and two 51mm magnesium alloy compression drivers covering the range 2.5kHz-20kHz. The loudspeakers' crossovers provide 12dB/octave attenuation and allow HF level to be adjusted in five switched steps. Specification of the *RC610* is frequency response 40Hz-18kHz ± 3 dB, power handling 300W (continuous programme music), sensitivity 102dB (1W input at 1m),

impedance 8 Ω , size of the unit is 1,220 x 406 x 305mm. Specification of the *RC612* is frequency response 30Hz-18kHz ± 3 dB, power handling 420W (continuous programme music), sensitivity 105dB (1W input at 1m), impedance 8 Ω , size of the unit is 1,524 x 457 x 381mm. Court Acoustics Ltd, 35-39 Britannia Row, London N1 8QH, UK. Phone: 01-359 0956.

Symetrix Phase Filter

Symetrix Inc has introduced the *Phase Filter*, a phasing device intended for studio or live performance applications. The unit uses frequency spectrum notching (four notches, produced by eight 90° phase delays) to give notches related by constant frequency bandwidths. This, it is claimed, gives strong phasing effects without pitch-bending. The unit features input level control with LED overload indication, two low frequency oscillators, a manual/auto sweep selector for the second LFO, a blend control, and depth and resonance controls. Inputs can be accepted from low level sources such as electric guitar or bass, plus line. External sweep control and an optional in/out footswitch may be connected to the unit. Price of the *Phase Filter* is \$299. Symetrix Inc, 109 Bell Street, Seattle, WA 98121, USA. Phone: (206) 682-3076.

TA multiband audio processor

TA Track Audio Inc has introduced its *Discriminate Audio Processor II*, a multiband processor offering variable gain (-30 to +30dB), compression ratio (2:1-30:1), attack time (2-20ms), release time (1-2s), output (-20 + 18dBm), and crossover points. Split into three flexible control sections (low/mid/high) the unit is designed without a peak limiter. Input of the unit is 600 Ω or higher, output being 600 Ω . Two versions of the processor are available, the *DAP II-AO* giving 0 level output and the *DAP II-A8* giving +8 level output which is necessary for some landline operations. The latter version also gives transformer output. TA Track Audio Inc, 33753-9th Avenue South, Federal Way, WA 98003, USA. Phone: (206) 838-4460.

New SAE models

SAE has added two models to its range: the model *2300* power amplifier and model *2900* preamplifier. The amplifier delivers 150W per channel into 8 Ω (20Hz-20kHz) with no more than 0.05% THD and features an LED display to monitor output power. The preamplifier quotes THD and IM as being less than 0.01%; phono signal to noise ratio being 90dB (IHF 'A' weighted). The preamp features parametric

equalisation which can also be switched in between source and tape to allow special effects to be created. Suggested retail prices of the units are: model *2300* \$700 and model *2900* \$500.

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

Windt Audio turnkey service

Los Angeles based Windt Audio Inc who offers a complete turnkey studio service—from the inception of design through to final equipment installation and checkout—has introduced a range of high quality audio accessories. The range consists of two direct boxes to act as interfaces between high power amp and mic level mixer input, and high impedance pickup and low impedance mixer input—one for studio use and one for sound reinforcement use; the *HP* series of headphone distribution boxes; their model *CT-1* cable tester; a range of guitar, speaker, headphone and mic cables; and their range of snake cables using Belden cable. In addition Windt also informs us that it offers a modification service for Yamaha *PM-1000* consoles. Windt Audio Inc, 1207 N. Western Avenue, Los Angeles, CA 90029, USA. Phone: (213) 466-1271.

Allison Research 65k Console Automation Programmer

Nearly one hundred units in world-wide daily use with API, Harrison, Helios, Sphere, Trident and other fine mixing consoles.

Allison Research's 65K second generation programmer accepts and processes control voltages in the range 0 to 5.6 VDC from VCA type faders. These analogue control voltages are converted by the 65K programmer to data words which can be stored on any non-critical tape medium. Upon replay of the data the original DC levels are re-created accurately, and unerringly.

Applications of the 65K programmer to any recording console fitted with suitable VCA faders permits comprehensive and reliable level automation. The 65K Programmer illustrated can be expanded from a basic 16 fader capacity (UK list £2362) to 64 fader capacity (UK list £3153) simply by the insertion of expander cards.



Unlike other console automation programmers, the Allison 65K when fully expanded can handle 8000 analogue functions or 65,000 digital bit functions - sufficient capacity to allow it to be used with subsequent generations of programmable equalisers and other devices.

For full information on Allison Research's Industry Standard Automation programmer, contact:

Scenic Sounds Equipment
97-99 Dean Street
London W1V 5RA
Telephone: 01-734 2812

FADEX

**From Allison Research—
Makers of the recording
industry's most widely used
Automation Programmer—
The fader that brings Level
Automation, VCA Sub-
Grouping and other facilities
to any professional recording
console.**

Retrofit or OEM

FADEX converts existing consoles for automation with the industry standard Allison 65K Programmer.

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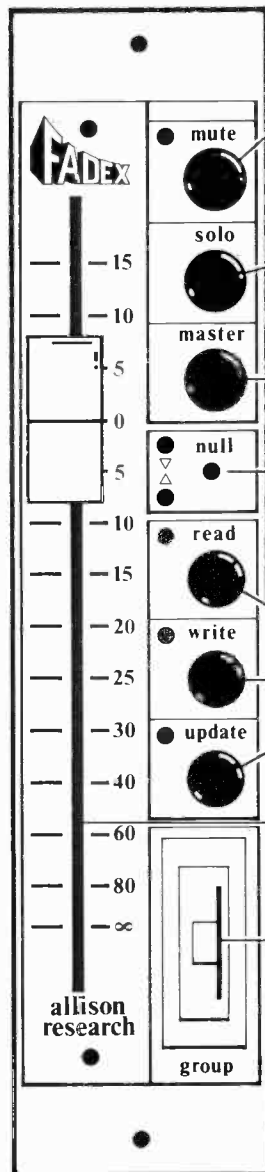
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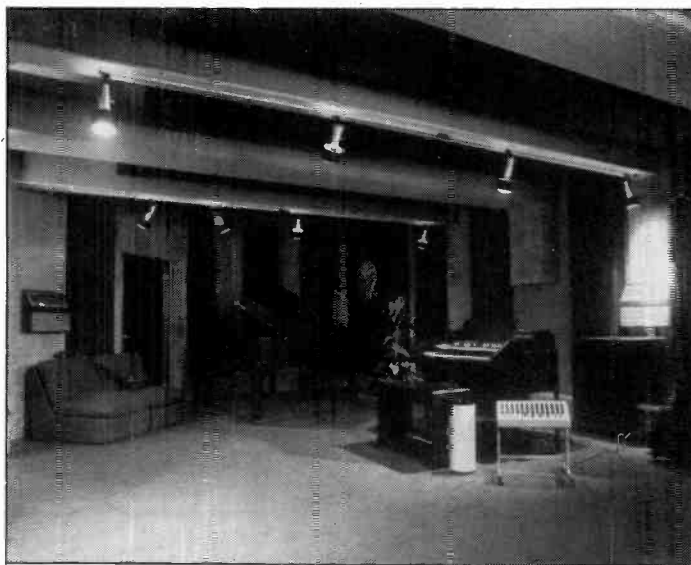
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studio diary

CBS/Sony, Tokyo

One area that the Japanese have never become deeply involved with is professional audio. It is therefore somewhat pleasant to be able to report on the new CBS/Sony Studio in Tokyo which is virtually totally European designed and equipped. The complex includes three Eastlake studios with identically equipped control rooms with Neve 32/24 consoles expandable to 40/32, Studer tape recorders with what appears to be the first A800 deliveries in the world, with a variety of A80 2-tracks. Monitoring is Eastlake TM-3s. Studio 1 can only be described as substantial in size and includes four areas with different acoustics, one for rhythm instruments centred on the drum booth, with areas for bass instruments, woodwind, and strings. There is also an isolation room with amazing ceiling height and a marble floor. Studio 2 has similar areas for different instruments but enables greater separation to be obtained while Studio 3 is designed primarily for rhythm recording. In addition to the three studios, there is an Eastlake mixdown room equipped again with a Studer A800 and Neve 32/4, this time fitted with Necam automation and also an isolation booth for additional vocal or chorus dubbing. Other areas around CBS/Sony include a mastering room with CBS 'Discomputer' providing computerised pitch control on a Neumann lathe, six editing rooms, one small and one large 'lesson' rooms for rehearsals which include an acoustic trap for absorption of low frequencies preventing the sound becoming muddy, two large studio lobbies and a 40 seater cafeteria. CBS/Sony can be contacted in Tokyo on 03 (358) 8071.



Amazon Studio 24, note headphone mixing systems on walls and trolley



Amazon Studio 24 control room with Amek M3000 console



CBS/Sony remix room with Neve Necam console and Studer A800

36/32 (the studio being prewired for 32-track). VCA faders and VCA echo facilities allow addition of an automation system later if deemed necessary. Monitoring comprises a Crown DC300A/Lockwood/Tannoy system with the alternative of smaller Tannoys and Quads. Other equipment in Studio 24 includes the Lyrec 24-track recorder with full Dolby-A, two MCI 110A stereo machines, Klark Teknik graphics, Urei limiters and compressors, A & D Complex stereo comp/limiter, Coghlan Audio comp/limiters, Meyer noise gates, Allison Gain Brains, AMS micro-processor digital delays and stereo phaser, and EMT, Master Room and Orban Parasound echo. Studio instruments resident include a Steinway Concert Grand and Hammond C3. The Studio 24 control room measures 400ft² while the studio is 1200ft². One unusual feature of the studio (apart from the wide abundance of scatter cushions around the floor which are rather more preferable than seating) is a Coghlan Audio headphone system which allows five separate headphone mixes to be obtained from the first 26 channels of the main Amek console enabling each musician to separately control his or her own stereo headphone mix.

Amazon's established 8-track studio has also been extensively refurbished and re-equipped (the paint was still wet while I was there). Studio size is a respectable 600ft² although the control room is slightly tight. Equipment in Studio 8 includes an Amek 16/8 console, MCI 8-track, Coghlan Audio monitors, Orban Parasound echo, and AMS stereo phaser with a Pearl Studio drum kit, Peavey amp, upright piano and an assortment of guitars and percussion in the studio. Other facilities include kitchen, shower, relaxation/games room complete with TV games, KitKat machine and ample free parking. Despite its address, Amazon Studios is on the outskirts of Liverpool near Kirkby, some 40 minutes journey from the centre. Owner is Jeremy Lewis who also runs Green Dream Music (music publishers), chief engineer is Phil Ault, while Geoff Higgins and Frazer Henry are resident engineers. Rates for Studio 24 are £35 per hour (£38 after hours), while Studio 8 is only £10 per hour (£12 after six). Amazon Studios, I.S.D. Stopgate Lane, Simonswood, Liverpool L33 4YA. Phone: 051-546 6444/0434.

Amazon Studios, Liverpool

For over 15 years, Liverpool has unleashed considerable musical talent into the recording business. Perhaps it was always group's ambitions to 'travel to the big lights', and the large investments in recording studios have mostly been in and around London; it is only in the past few months that the first 24-track studio has appeared in Liverpool. Amazon Studios has been operating an 8-track studio for some time, and recently made the plunge into the bank balance with the opening of an additional 24-track studio. As mentioned last month, Amazon Studios have installed the first Amek M3000 automation ready 28/24 console updatable to

Angus Robertson

Caribou Ranch

Late September in the Colorado Rockies offers such a display of natural colours, in the changing leaves of fall, that it would shame the most adventurous coiffures in The Kings Road. Taking a 2½-hour ride into the mountains out of Denver, the views and crisp air distracted me enough that I drove right past the front gate to the 3,000-acre complex called Caribou Ranch.

I arrived in the first week of operation of their new Neve console, modified and installed to the specialised needs of The Ranch and now hard at work for Gary Lyons (Foreigner, etc). The console, at this time, is without computer function so as to allow the staff to determine which functions shall merit automated operation. This holds special attention, since many modifications have been made, with more in the future. Greg Edwards, resident technician, engineer and all round pilot, described the most prominent modification as being keyed insertion points on the desk for interface with the vast abundance of ancillaries and special effect units. This is in an isolation format giving the producer the chance to lock in any function or series of functions at the touch of a button, with the selection of controls being preprogrammed at the patch bay. This instantaneous control is of obvious merit, especially when you find four Pultecs, two Gain Brains, two Cooper Time Cubes, four 1176LN Limiting Amps, four Urei 565's, various phasers, DDLs and so on.

With over 45 different microphones, two Ampex 24-track machines, Ampex and 3M 2-track and 4-tracks, Westlake, JBL, Altec and good ol' Academy's and much more than practical to mention, Caribou offers not just a state of the art facility (Aphex included), it presents to you a facility with attention given to the complete marriage of art and science in the recording and creation of music. Greg stressed the fact that while he is always in the market for new developments in the industry, he strives to maintain a room and facility that offers to the artist exactly the tools that he requires in either sound or ease (familiarity) of operation. The control room is quite spacious with outstanding eye contact (though drummers are often at ground level on CCTV), and with their variety of monitor systems and humidification control compensating for the 8,000ft above sea level location, you have a fine sound, just a touch on the bright side.

At \$1,500 per 24-hour period, Caribou is not inexpensive, though for variety and versatility it is good value. And with horses, Grover Washington's bed, cows, and those Rockies Caribou is an experience... if only you can get any work done.

David Clamage



Caribou Ranch



TW Studios with VCJH440 console. The payphone is hanging from the screw

TW Studios, London

Like many, TW Studios of West London owes its present format to a steady growth from small beginnings. How small, I discovered when visiting the studios recently to have a look around for myself and to meet co-owners Gary Wilson and Clive Tomkinson, studio manager Alan Todd, and engineer Alan Winstanley. Gary explained, "originally Alan Todd and I played together in a band. We had a mate on an American base who sold us a Gibson guitar for £50. Being fairly capitalistic we thought that if we could get guitars on a regular basis we could sell them and make some extra cash. This started us off and as business began to grow, so we then found a shop in Fulham Palace Road and started selling on a much more regular basis. Then through a chance meeting with Alan Winstanley, then an office junior with Decca, we discovered that Decca and most other record companies hired a large quantity of musical instruments. Well we managed to get on to Decca's hiring list and from there we moved on to cover nearly all the record companies." Such was the success of the business at this time that they bought their premises in

1970 and since then have never looked back.

Gary realised that the equipment hire market would eventually become flooded so it was decided that TW Music (the studio's parent company) would start a small studio to complement the equipment sale and hire business. This development took place in 1972, using 4-track equipment including a couple of Revoxes, the strategy adopted to get the studio off the ground being simply to undercut their competitors' rates. Since these early days the studio has grown considerably, being updated on a regular basis. The first step being 8-track, followed by 16-track in January 1975, and then on to the present set up, 24-track, in early 1978.

Enough of the history though, what of the facilities? The studio has grown organically with constant improvements. Rather than design from scratch using a studio designer, as Gary put it, "when we started, the Tom Hidley's of this world just weren't around", so the studio has been built and designed by TW themselves. The studio consists of a 27ft x 15ft studio with a 15ft x 12ft control room both of which are air conditioned. The

studio can accommodate up to 15 musicians and when I was there had an acoustically screened Steinway grand piano at the left rear with an acoustically screened drum booth at the right rear. Design and furnishing were such that the studio appears to be much larger than it actually is, making for very pleasant working conditions. As for the control room this had excellent acoustics for mixing.

Equipment includes an MCI JH440 28/24 mixing console; 3M M79 24-track recorder with Intellocator; a Studer 2-track as well as several Revoxes; Amcron DC300 amplifiers; JBL 4333 loudspeakers with White room equalisers; BX20 reverberation unit; Dolby-A noise reduction; Audio and Design limiter/companers; Eventide Harmonizer, flanger, and digital delay; Marshall Time Modulator; various Neumann and AKG microphones; and Beyer DT100 headphones. With regard to instruments, the studio can supply almost any item from TW Music's large hire stock, doing so at no extra charge. Incidentally the hourly hiring rate is £30, £35 per hour after 6pm and at the weekends.

Artists who have used the studio recently include The Stranglers, 999, Elaine Page, and Ian Gomm; past users have included Alvin Stardust, the Bay City Rollers, Marmalade, and Blue. As to the future, Alan Todd informed me that the main aim was to improve the studio even further. Whilst there is a possibility that they may move to new studio premises, present intentions are to increase studio space to 39ft x 15ft with a new high level control room being built alongside the present control room. Unfortunately these plans are in abeyance at the moment awaiting the verdict of the local planning authority.

During my visit, I took advantage of the fact that engineer Alan Winstanley wasn't tied up in a session to discuss with him and Alan Todd the general state of the studio recording art at present. Normally engineers are far too busy to allow such a luxury! Firstly I asked Alan how he liked to work. Alan said that whilst this depended upon circumstances, in general he liked to do the rhythm tracks first, then vocals, and then brass, and finally strings. Did he feel that he would like to work with more tracks, say 32-track or 48-track, or would he like to use an automated console? More tracks he thought weren't really necessary although he didn't have anything against them per se. He was perfectly happy with 24-track. As for automation, Alan had used an automated desk at Air Recording Studios and liked it. Unfortunately

though, he felt that it led him to seek more complex mixes than were really necessary. An interesting point I thought.

With regard to the question of what their recordings sounded like when issued by the record companies, both felt that a lot of their efforts in the studio were made partially redundant. Their view being, why engineer and produce to such a high standard when the finished disc usually comprises the original recording to fit it to the average playback system. Although they saw this as being unavoidable at the moment, they did feel that this problem was less likely to happen with classical recordings. Regarding playback systems both felt that disc was better than cassette, despite disc pressing problems. However, they also felt that the advent of 'all-metal' cassettes and domestic digital audio would probably change matters considerably in the future.

Departing from TW Studios, several thoughts came to mind. Whilst it is not the most salubrious of studios, it offers excellent facilities, it achieves good results, everyone knows what they are doing, and they are looking constructively to the future. All in all not bad progress from fairly small beginnings.

TW Studios, 211 Fulham Palace Road, London W6. Phone: 01-385 4630.

Noel Bell

Aquarium Studio, Paris

Aquarium Studio is located in the south of Paris and was originally designed as a shop but found favour for recording because there were no neighbourhood problems. It was sound proofed without expensive work: indeed gardens are above and there is an underground car park on the floor below. So the place became a recording studio in 1972. It includes a small lobby, an office of the same size, the control room with 270ft² of floor area and on the other side of a double glass window the studio itself. With 1076ft² of floor area and a high ceiling it's roomy, but not of outrageous size and still feels cosy—it's the opposite to studios like Barclay or Pathé Marconi that seem like halls.

Dominique Blanc-Francard, who worked at Hérouville in times past, has been Aquarium's engineer for four years and is also one of the shareholders. With his 14 years of experience in the recording field, he is partially accountable for the studio's reputation. I asked him what was his opinion about acoustics.

"The inner acoustic of the

studio has been designed by a broadcasting engineer named Armagnac. It's live. I like it. I don't like damped sounds. It's pleasant to have drums picked up by the piano. We have no drum booth at Aquarium. I use only screens when necessary," said Dominique. "The control room's acoustic has been modified because there was sound dispersion. When I came here, I replaced the Lockwoods with Altec 9846 monitors. I have indeed a partiality for these speakers but sadly the level of sound was inadequate and I had to put the desk against the double glass with monitors on each side of the desk. It was not convenient."

Today there are two JBL custom built monitors powered by Amcron DC300A, DC150A and D60 amplifiers for bass mid and top respectively. There are also Amcron VFX crossovers and EQ2 equalisers. The desk has been pulled back and Dominique has finally decided to improve the control room. It will shortly be redesigned by Eastlake with two DM7 monitors because space is limited. The principle equipment at Aquarium is from the MCI range. There is an MCI JH500 28/32 desk that has now been operational for one year. "The desk is unsurpassable on a level of use and quality, and further the automation system is a jewel, we previously had an MCI JH440 36/36 that gave us satisfaction," said Dominique, "but 36 inputs are not necessary here."

With the new desk there was no necessity for external equalisation, so Dominique has sold his Urei graphic equalisers. The three tape recorders are also MCI—there is a 24-track with remote control and autolocator and two 2-track tape machines chosen for their facilities (varispeed, three speeds, digital counter) and reasonable price. One of the 2-track machines is used for echo with a DBX 177 noise reduction unit. A 24-channel Dolby-A unit feeds the MCI 24-track and there are also two Dolby 30's. On the left of the desk we have ancillary equipment that looks really impressive.

From Urei there are six 1176LN limiters, two LA3A comp/limiters, one Little Dipper 565T and a Cooper Time Cube. Dominique has also chosen two excellent limiters from a French manufacturer, Plus 30. They also have an Orban Parasond sibilance limiter, Eventide Flanger (unbeatable he said) and Harmonizer (with keyboard), eight Kepex, a Marshall Time Modulator, Klark Teknik DN34 analogue time processor (often used with Fender Rhodes) and a Lexicon Delta T digital delay line. "The Lexicon,"

he commented, "was very expensive (£3,200 for 160ms) but its signal-to-noise ratio is truly excellent." Reverb is provided by an EMT 140 plate and by an AKG BX20.

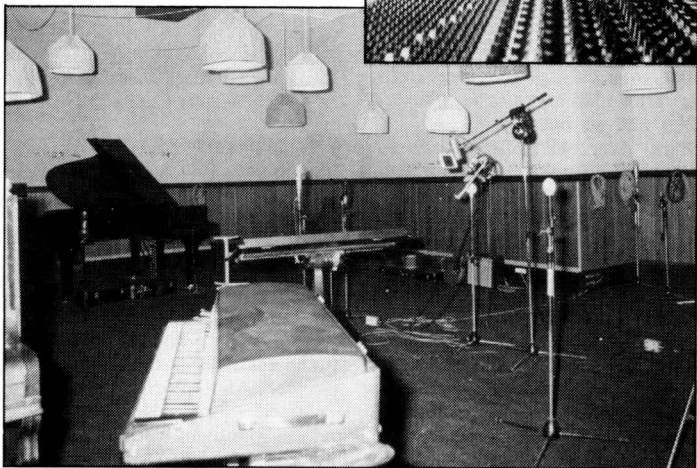
The studio offers a Yamaha piano, Fender Rhodes, the eternal Hammond C3 organ with Leslie, two Fender twin reverb and Champ amplifiers, and Syndrum.

I asked Dominique about his choice of microphones. "We have around 35 mics," he said, "of which 20 are capacitor. I use Neumann U47 fets for voices and tom-toms, U87s for a lot of application including piano and KM84s for snare drum. I also have a partiality for old valve Schoeps—they are excellent for acoustic guitar, cymbals and for the overall picture of the drum kit. From Beyer I use the M160 ribbon mic for brass and M201 for bass drum, electric

recorders and a French Plus 30 desk. But I hope to leave Paris in a few years and build two recording studios in the open country with facilities including lakes, tennis courts . . . I want to develop custom and to attract foreign customers. But it's not easy. French recording studios are expensive. First, tax is 33% on tape recorders and then a lot of studios are built by musicians. We graze amateurism—they are not experienced managers but they feel they want a good bargain and put the cart before the horse. They must pay for an engineer and repay the loans. So prices become out-



Dominique Blanc-Francard at Aquarium Studio, Paris. No prizes for guessing who equipped the studio



guitar and sometimes for voices. The Sennheiser MD441 is dry and useful for hi-hat and bass drum. The AKG D202 is good for electric or bass guitar."

Dominique, who is very exacting, works with the MCI 24-track at 30in/s and with Dolby—tape is Ampex 456 at 320nWb/m. He finds dbx excellent and less expensive. "But it is a dangerous policy in a studio nowadays to have only dbx. The two systems are necessary to give a choice," he said.

I asked him about future plans "We have purchased another studio named Studio Geneix in the West of Paris. I want to make it into a moderate 24-track studio with MCI

rageous. Others are built by engineers. They don't have fresh money. On the other hand people that invest their royalties, like Studio 92 in Paris, do not have these problems. I have twice hired the Maison Rouge mobile at reasonable rates but otherwise the equipment is as good in France as in the USA or in England", concluded Dominique.

All in all Aquarium is a friendly place and Dominique Blanc-Francard is familiar with the latest developments in techniques (automation and acoustics for example)—it is what brought the studio its name. Aquarium 354 Rue Lecourbe, F-75015 Paris, France. Phone: (331) 531.56.35. Jean Marandet

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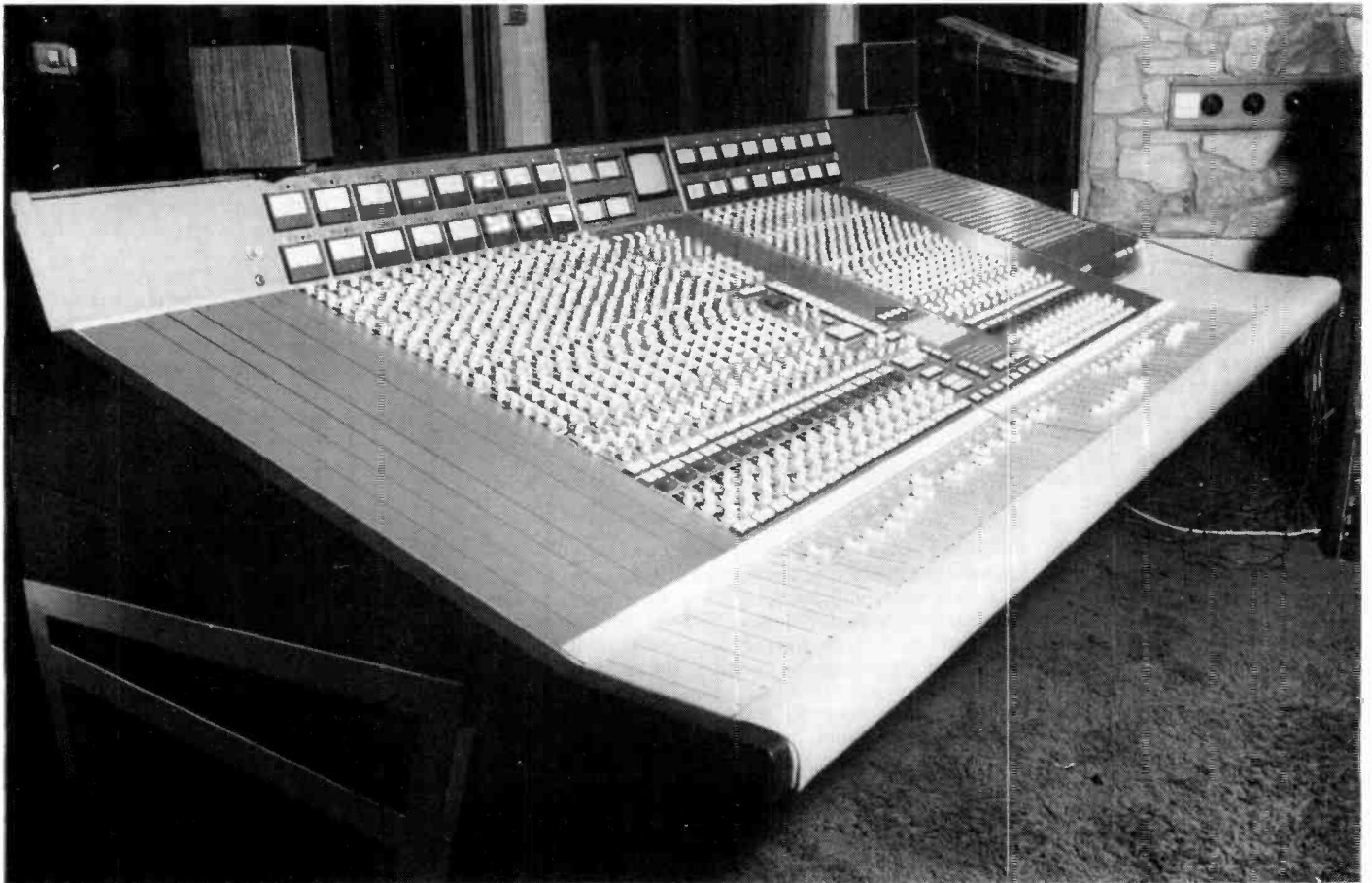
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Direct-to-disc in Watford

Studio Sound published my interview with Ed Wodenjak, producer of the Crystal Clear direct-cut recordings in September, and I met Ed again recently when he was in with the rest of the CC team for a series of recordings with the LPO at Watford Town Hall. This was the first direct-cut orchestral recording (well, the first in modern times) to be carried out in the UK although Crystal Clear, Sheffield and Telarc have done it in the States, and Umbrella in Canada, and so it is worth looking at the methods used and the difficulties encountered.

The acoustics of the Town Hall had been modified slightly by half covering the floor with carpet and the orchestra were arranged with the horns, percussion and brass on the front of the stage, harps and woodwind on risers and the strings on the floor. Only three omnidirectional microphones were used, all on stands around 15ft off the floor and positioned left, right and centre with about 15ft between each pair. The signals from these were fed to three channels of a custom 8/2 console from which the stereo signal went via two pairs of Ortofon amplifiers to two Scully lathes. The phase relationship between the stereo signals was displayed on a scope in the normal way, and while a normal cutting head was in use on the older of the two lathes, a CD-4 head capable of cutting from 10Hz-26kHz ± 0.5 dB was being used on the newer lathe. The mixing console was being operated by engineer Bert Whyte, the newer lathe by John Dent from Island Studios who had worked on the Warsaw Pakt direct-cut sessions at Trident (see *Studio Sound* February 1978), and the older lathe by Tony Batchelor of TAM Studios in London from whom it had been hired. There were also three tape decks being run as back-up to the lathes: a stereo *ATR100*, customised for Bert Whyte by Ampex to take $\frac{1}{2}$ in tape; an ordinary $\frac{1}{2}$ in Ampex with Dolby A being used to produce a master for possible cassette duplication; and finally a Sony *Betamax* video cassette recorder with the Sony *PCMI* adaptor.

After several runthroughs (for the benefit of the engineers as much as the musicians) it was judged time for a take and the team went into the following procedure.

Bert Whyte has the main faders down while the lathe operators have the cutting sapphires poised over the lacquers ready to start the run-

in groove. The cut is started and the assembled tape machines put into record; after about five seconds, Bert Whyte flashes a red light on the conductor's podium. Walter Susskind, the conductor (who is being observed in the control room on closed circuit TV) gives the upbeat to the orchestra, up come the main faders and the lathe operators open the groove pitch to the spacing required for the first few bars of the piece being recorded Ravel's *La Valse*. The groove spacing has to be performed

mechanical pitch control, proved much more amenable to this operating approach. The new all-electronic lathe proved less positive with some backlash apparent.

As the last notes of *La Valse* died away, down came the conductor's arms, down came the main faders and the lathes went into a scroll. The LPO frantically changed the music to de Falla's *Nights in the Gardens of Spain* and percussionists hastily tiptoed to new positions demanded by the changed scoring. On went the red light, up went the

able to clean up the head with the aid of some fine tweezers and a binocular microscope. The takes varied on the musical side, the orchestra taking some time to get used to the procedure, but the third take (only possible after some hasty negotiations as it was going into some eight minutes into overtime) sounded superb. The resulting record, which will also contain the suite from Prokofiev's *Love of Three Oranges*, will be appearing early this year and there will also be a record of works by American composer Morton Gould, recorded the following day.

The sound in the control room, from Kef *R105* speakers driven by bridged Quad *405* amps, was very good with excellent attack and imagery. However, some doubts were raised in my mind by the mic technique employed. With a spaced pair of omnis, a central sound source will be registered equally by both mics but if this source is slightly nearer to one than the other, then the resulting time lead to the nearer mic can lead to the image moving disproportionately to that side, unlike the situation with a crossed-pair where the voltage ratio of the signals in the two mics induced by an off-centre sound source is exactly proportional to its angular displacement. Thus a pair of omnis, unless there are some anomalies with the local acoustics, will not give image positions exactly analogous to original source positions, and there could be a hole-in-the-middle effect. This, of course, will be relieved by the use of a third central mic but this will introduce a whole host of further time delay and amplitude complications, and the resulting stereo image will not be phase coherent as with a crossed-pair, or amplitude coherent as with either a crossed-pair again, or with a close-miked panpotted stereo image. Unless the direct-to-disc process is allied with a rigorous approach to mic techniques, the advantages to be gained are to some extent minimised? It is interesting to note that one of the other American companies involved in classical direct-cut records, Sheffield Labs, has opted for a crossed-pair approach.

However, these are very much purist objections and with the right hall and engineers involved, the resultant recordings can be very satisfying, as was the previous Crystal Clear classical disc of Tchaikovsky and Rimsky-Korsakov. The recordings should now be available from Metrosound Audio Products Ltd, 4-10 North Road, Islington, London N7, 01-607 8141.

John Atkinson



Above, London Philharmonic Orchestra at Watford Town Hall. Below, Ortofon's Fritz Nygaard checking the lathe brought in specially from Denmark



manually as there is, of course, no delay available, and so the pitch required for dynamics changes in the music had to be worked out during the runthroughs. The lathe operators were actually being conducted from a specially marked score, both to avoid overcutting and to make economical use of the lacquer—it would be both annoying and expensive to run out of lacquer with a few minutes of music remaining uncut. Interestingly enough, the older lathe, which had

conductors arms, up went the faders and into the next cut went the lathes. Luckily, all three takes that evening went extremely well on the technical side, the only trouble occurring on the last take when one of the lathes developed a blockage in the suction pipe removing the swarf covering the cutting sapphire in molten plastic. Luckily Fritz Nygaard, from Ortofon's cutter-head department, was on hand to look after the gear being rented to Crystal Clear by Ortofon, and was

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Neve

How the ring was rung

John Rushby-Smith

An account of the broadcasting of Wagner's *Der Ring des Nibelungen* from the Royal Opera House, Covent Garden, last October.

RIGHTLY OR WRONGLY, the one work in the 'classical' repertoire that attracts the maximum attention whenever it is broadcast or recorded is Wagner's monumental Music Drama *Der Ring des Nibelungen*. The spectacular nature of Wagner's own sound lends itself well to the microphone and invariably even the technically apathetic respond to the exciting sound that can result if properly engineered. The fact that Mozart's clarity of line, or Webern's ultra-pianissimo tinklings can present greater technical problems is neither here nor there; it is Wagner who suddenly makes a listener sit up and take notice that sound reproduction is more than just a mechanical function.

The Ring of the Nibelung is probably the biggest cohesive musical work ever written, consisting of four mammoth operas *Das Rheingold*, *Die Walküre*, *Siegfried*, *Götterdämmerung*, which last a total of some 16 hours (not including intervals), and call for a vast cast of essentially powerful singers, an augmented orchestra (including four harps and, of course, the famous Wagner Tubas), and a degree of imagination and skill in the area of stagecraft almost unequalled in theatre.

Every year the complete cycle of operas is broadcast at least once on BBC Radio Three, and some of the most celebrated performances have been those recorded in Bayreuth, Bavaria, at the Festspielhaus which Wagner himself designed along revolutionary lines for the performance of his masterpieces. This theatre, now over a hundred years old, possesses uniquely perfect acoustical properties with a concealed pit allowing the audience an uninterrupted view of the stage, near perfect balance, and affording recording technicians excellent separation between vocal and instrumental forces.

This year it was decided to broadcast the complete cycle live from Covent Garden for the first time since 1950 and our self appointed brief was to achieve sound quality at least as good as the exemplary results achieved in

Bayreuth by the Bayerischer Rundfunk. The performances were also recorded down the line for transmission in Canada, Australia, New Zealand and Germany.

Beautiful though it is, the Royal Opera House is not exactly purpose built for Wagner's *Ring*; its orchestra pit is shallow and exposed, and the huge orchestra has to spill over into boxes on each side — one for the harps and one for the timpani. The stage is coincidentally very similar in dimensions to that at Bayreuth and normally presents few major problems; however, in the adventurous production by Götz Friedrich, it in no way ended up resembling a normal stage. The fashion in *Ring* productions has always been for the revolutionary, both in interpretation and in technical innovation, and this staging was no exception.

Instead of a normal flat stage, Götz Friedrich's designer, Josef Svoboda, had the whole of the centre area of the stage lowered to the level of the floor below, leaving a gaping hole some 40ft². In the centre of this a steel tower, resembling the top joint of a tower crane, was erected, supporting a huge platform 36ft² × 4ft thick on hydraulic rams. The whole thing could be raised, lowered, rotated and tilted to almost any angle by remote control; at appropriate moments its top surface opened out to form flights of steps or jutting rocks, and the underside was covered in reflective plastic enabling the audience at certain times to see what was going on underneath. This last facility was used for the River Rhine, home of the Rhinemaidens, the theft of whose gold initiates the whole tale and also for the subterranean caves of the Nibelungen — underworld people who cast and forge the gold into various objects, among them the ring itself, a curse upon which brings about the eventual downfall of gods and mortals alike. Much use was made of back and front projection, laser effects, dry ice, and echoey amplification — notably for the dragon Fafner, represented by an enormous clawed caterpillar contain-

ing some 20 dancers.

Hardly ideal staging for the even microphone coverage a good sound balance requires, especially for a 'blind' audience. There was barely a moment when the singers came to within 20ft of any of our 13 stage mics, and at times they didn't even face them. These were public performances and none of the mics could be placed 'in shot'.

The normal method of broadcasting an opera from any of our major opera houses is to suspend a stereo mic (AKG C24 or Neumann SM69) above the orchestra pit looking downwards, reinforced with a few spot mics in the pit itself and four to six cardioids lined up in the 'footlights'. For these foam 'mice' can sometimes be used, but of course they must be on a hard surface and not a stagecloth. This technique presumes a fairly conventional stage layout, however, and Covent Garden's *Ring* was nothing if not unconventional.

Using this technique, we would no doubt have produced a sound not dissimilar from that experienced by the audience in the theatre — complete with all its flaws. There are those purists who would champion such a course, but among operatic composers Wagner scored for an almost unparalleled richness of orchestral texture and fullness of sound, and not to realise his intentions to the full over the air would be to do composer and performers a disservice that couldn't be justified on the pretext of capturing faithfully the sound of an inadequate acoustic. In November's *Studio Sound* Malcolm Addey, writing of his days with EMI, highlighted the need to complement first class performance with engineering to match, and this is precisely what we aimed to do.

As a first step towards our goal, we decided to make the pilgrimage to Bayreuth (the Wagnerite's Mecca), so Elaine Padmore (head of the BBC's opera department), my colleague James Hamilton and I were accorded generous hospitality by both the Festspielhaus (still run by the Wagner family) and Bayerischer Rundfunk. For the best part of a week, we savoured Wagner's own acoustic and Bayerischer Rundfunk's realisation of it. We hoped to pick up some tips from BR and indeed we

heard in action an idea we'd often mooted but never tried: the use of ultra directional rifle mics. Prophets of gloom had hitherto ruled these out as unsuitable for indoor use, but after hearing how successful they were at Bayreuth, we determined to ignore the hypothetical objections.

In Bayreuth five mics were mounted in a cluster in the centre of the lighting bridge above and behind the proscenium arch. At first we considered doing the same, but at Covent Garden there are three tiered lighting bridges, the lower two being full of lights, projectors and followspot operators, and the upper one housing in its centre an enormous 10kW spotlight. The lower bridges were obviously not practical, and the position of the lamp prevented central mounting on the upper. Instead we spread our five Sennheisers out (three MKH 815s and two MKH 805s because of availability) and aimed them at the hydraulic platform to give as even coverage as possible. The 'target' areas formed a kind of dice pip figure five configuration, and as the height of the top bridge must have been some 50ft above the stage; the front two mics ended up looking almost vertically downwards.

By this time, we had attended the dress rehearsals sitting in the house annotating scores and generally plotting positions of singers and scenery, so when it came to the first night we knew pretty well what we had to cover and where problems were likely to arise. As it happened, the rifle mics exceeded our expectations, exhibiting none of the theoretical flaws, and, with a bit of judicious eq applied, produced extremely good vocal quality. It is a technique we may well be stuck with henceforward for other opera relays, despite the traumas of rigging — a task more suited to monkeys than men!

Our schedule over some three weeks involved attendance at two complete cycles by way of rehearsal, so we had the unusual luxury of eight complete operatic performances to work on before going on the air with the third and last cycle. After modifications and additions to our original plans, the final array worked out as shown in **figs 1 and 2**.

The C24 was switched to either

How the ring was rung

engineers kindly let us use two of theirs, patching them over to us at their mixing console (a Neve) in the box immediately above the one used for the harps. Our announcer uses a lip mic in the box, yet above this, and this box contains another 10 circuits (likewise the corresponding box on the opposite side of the theatre) so all in all we were able to dangle cables from box to box and box to pit in order eventually to have all our 28 mics, plus four direct feeds of stage effects and a telephone link, arrive somewhere on the jackfield in the BBC control point way up

in the amphitheatre — conveniently placed up a steep staircase above the gallery bar!

Because our mixing equipment does not have 12V A/B phantom powering, we had to insert battery boxes somewhere in the line for each of the Sennheisers. Each box contained nine mercury cells and a kind of battery overkill (for safety's sake) resulted in the consumption of some four dozen cells. *KM84s* and *C45s* were powered direct from the mixer, following normal practice. Miraculously not a single mic went down in all 16 hours of trans-

mission.

The BBC control point is a permanent installation (the BBC have such facilities in all major opera houses and concert halls in London) and it consists of a reasonable sized room housing a comprehensive jackfield, line sending amplifiers and an old mono control desk fitted rather neatly behind a soundproof window affording a somewhat limited view of the stage. This desk is now redundant but is so well built-in that its removal has hitherto been deemed undesirable. It takes up relatively little space, and provides the producer with a comfortable work surface and some semblance of visual contact.

Mixing is performed on portable outside broadcast gear, put in at the expense of much sweat and muscle power, having to be man-handled through labyrinthine corridors and staircases that are uphill all the way. For the *Ring*, we installed 32 channels of standard BBC OB Calrec equipment which was placed in the middle of the room. By dint of an arrangement of mirrors, a periscopic view through the window was still possible, supplemented by a closed circuit TV monitor fed from the house's own video system. Two BBC *LS3* monitor loudspeakers flanked the window, and the overall layout was acoustically comfortable if a little cramped.

The Calrec equipment consists of inter-connectable portable units — 8-channel mixers, group unit and monitoring unit. These were arranged in a curved pattern, leaving room for the all-essential control music score in the centre. Each channel can be switched to any of four groups or to an independent output after the main fader (useful for blending announcements with atmosphere), and in addition there are two separate stereo echo return channels. Each mic channel can also feed two 'miscellaneous' bussbars, and these were used in our case for echo send. Group switching was arranged to place main (overhead) mics on Group I, orchestral mics on Group II, stage mics and direct feeds on Group III, and rifle mics on Group IV. This way whole sections could be mixed in as entities, their internal balance remaining unchanged.

For reverberation we installed a brand new EMT 250 digital unit, and supplemented this with an AKG *BX15*. The *BX15* performed the function of ironing out the slightly stepped decay of the EMT 250 that was noticeable given the comparatively dry acoustic of the opera house. With suitable combinations of delay, decay time and eq, we were able to synthesise a convincingly natural sounding acoustic, adding warmth and depth to the sound without loss of focus.

In case one of us were to fall under a bus or something, James Hamilton and I divided the mixing duties between us taking two operas each and shadowing the other two. *Rheingold* and *Siegfried* were balanced by James, while *Walküre* and *Götterdämmerung* fell to me; naturally, in the interests of consistency we arrived at a basic sound that satisfied both our not dissimilar tastes, and an added benefit was some let-up in the intense concentration demanded by live broadcasting on such a scale. When one gets immersed,



Top, Orchestra pit in foreground, stage apron comes between pit and the hydraulic platform. Above left, *Brünnhilde* (Gwynneth Jones) and *Wotan* (Donald McIntyre) high up on rocks that jut from the hydraulic platform. The spotlamp beams come from the lighting bridge below where the rifle mics were fixed—their aim is very similar to that of the mics. Above right, *Siegfried* (Jean Cox) has just awakened *Brünnhilde* (Gwynneth Jones) from her long sleep. *Brünnhilde's* rock juts from the platform, which is tilted from left to right—a typical case for the rifle mics.



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How the ring was rung

Wagner's Music Dramas almost become a way of life. The time scale used for the unfolding of this magnificent soap-opera is so vast and the musical tension so intense that the mind becomes possessed. Once technical problems are solved, the task of balancing has more to do with performing than engineering. Complex live broadcasting stimulates the balancer's adrenalin much as performance does the artists', and one gets on quite a 'high' while it's all going on.

Wagner's musical writing (forget not that he wrote the words as well, the whole thing taking him 25 years to complete) calls for the voices to be 'borne along by the orchestra like a ship upon the waves'. In other words, the whole sound has to be integrated and there is none of the 'tune and accompaniment' element that characterised nineteenth-century Italian opera, for instance. Perspectives have to be very carefully matched, and this calls for very judicious use of reverb as applied to individual channels; in the end most of it was derived from the main C24, echo on the pit mics being added simply to avoid their

sounding too close.

When mixing, a wary ear had to be kept open for extraneous noises (whirring projectors, creaking machinery, verbal expletives and so on) and control scores were carefully marked up at crucial points; 'Kill guns' or 'Help him here' were typical inscriptions. Some singers needed quite a lot of 'chasing', having stronger higher notes than lower ones. Others on occasion came right down to the front of the stage: George Shirley, as the fire-god Loge, actually succeeding in sitting on one of the KM84s!

Gwynneth Jones, as Brünnhilde, has a terrifyingly wide, if magnificent, dynamic range, and large rings were drawn in the score round her fortissimo top B flats. Limiters were not used, good anticipatory control being preferred; anyway limiters in the BBC's PCM distribution network take care of accidents.

Specific problems involved the Rhinemaidens, wallowing about on plastic 'water' in the well below stage level for which we secreted a couple of mics in amongst a battery of flickering green lamps.

We prayed that none of the stage hands would drop a stage weight on his toe while standing near one! For *Walküre* and *Götterdämmerung*, these mics were moved to positions either side of the proscenium to help cover the 'ramp' in two scenes when the acoustic view of the rifle mics was obstructed by a huge ash tree in the former and by enormous flown plastic screens in the latter. In *Siegfried*, the hero has to forge a sword on stage using hammer and anvil and striking in time to the music. Jean Cox, as Siegfried, put a lot of muscle into his work as a smith and completely obliterated his own voice, since both sounds were emanating from the same place. Nevertheless the result was pretty exciting, and so good was the co-operation between the Covent Garden staff and ourselves that they actually redesigned the anvil to give us a more metallic sound.

This co-operation typified the whole venture, and we were given invaluable assistance by the theatre's administration and sound staff. Eric Pressley, the resident sound engineer, willingly gave us feeds of all his various effects mics and the head of the music staff, John Barker, brought in some of the singers or suitable deputies especially to help us sort out levels

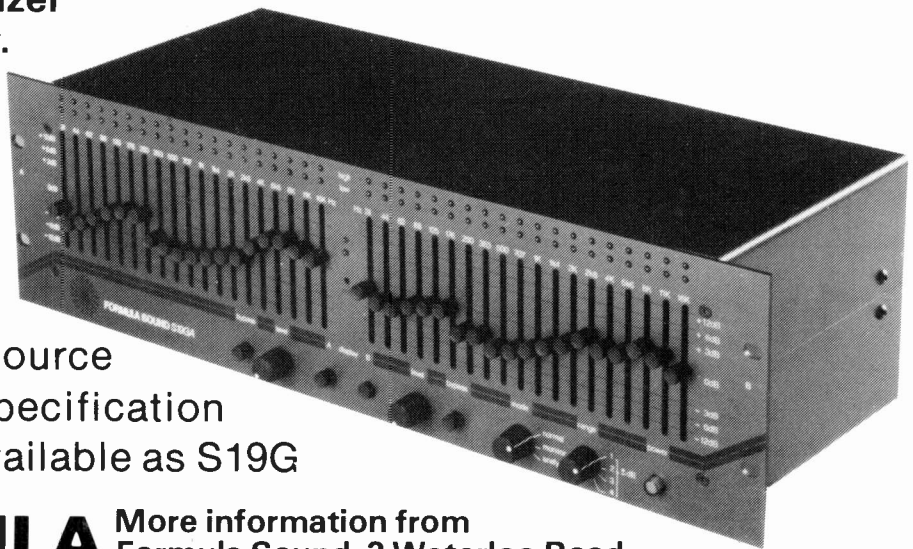
for these feeds. In the end there was still a certain amount of unpredictability in this area, however, and a couple of hastily corrected miscalculations probably infuriated the pirates who must have been enjoying rich plunder from such jewel-laden ether!

Space has permitted description of only some of the elements that challenged our ingenuity. It must be remembered that the listener at home would expect no less than he would get from a good recording made under studio conditions. To judge from letters following the broadcasts, it would seem that we measured up, and we like to think we were able to convey something extra that no studio recording can ever achieve — a sense of occasion. There is no doubt that live broadcasting can extract the best from all participants. Orchestra and cast were very much aware that their efforts were being assessed by every Wagner-phile in the country, and an enthusiastic 'prom' audience sitting for £2 on the floor where the £20 stall seats usually are, further encouraged the pulling out of stops. Colin Davis excelled himself as conductor, and if at the end he looked like a marathon runner at the finishing line, this is small wonder, for marathon it was. ■

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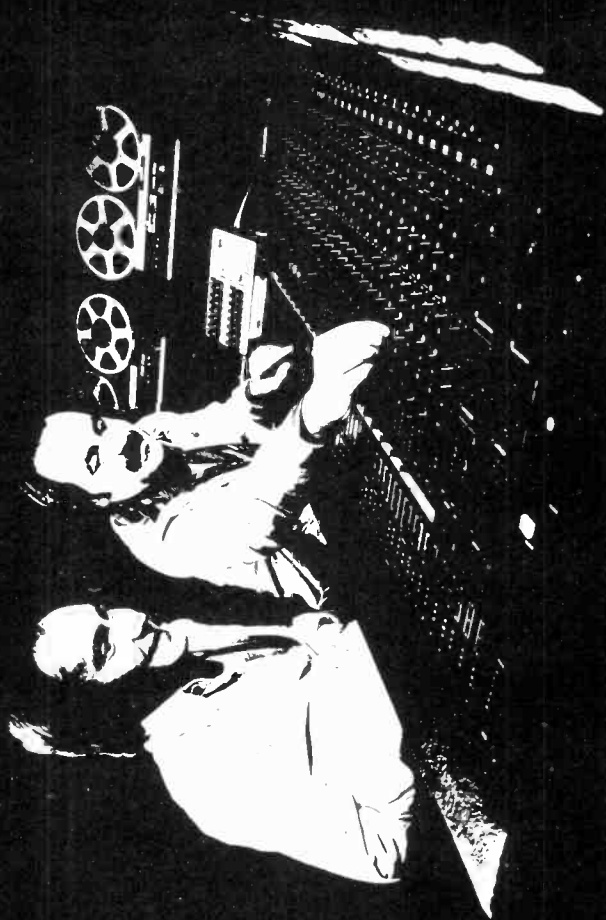
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AES 61st Convention, New York—a report

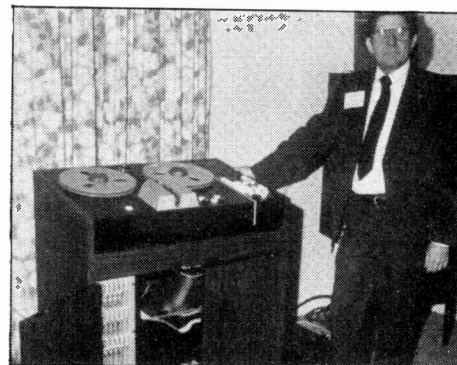
Angus Robertson

The 61st Convention of the Audio Engineering Society took place at the Waldorf-Astoria, New York from November 3 to 6, 1978.

NEW YORK IN November was fortunately rather more bearable than some of us had been led to believe. Exhibitions usually seem to take place during either unbearable heat or while snow is still falling. The result in both cases is that delegates tend to restrict themselves to either the air conditioning or heating of appropriate hotels or restaurants, only braving the weather while diving between door and taxi cab. But this year, weather was not a problem, the exhibition was generally well organised apart from the usual problems of delivery of equipment and material to the stands (or booths), and most exhibitors and delegates returned home feeling rather satisfied after a meaningful and worthwhile long weekend. In fact the convention timing over a weekend is peculiar only to the New York AES show and causes many cases of exhaustion after working umpteen days non-stop with no peaceful, intervening weekends. I'm sure many delegates and exhibitors would appreciate the AES taking careful consideration before announcing the dates for the 1979 New York Convention.

recording and reproduction, magnetic recording, sound reinforcement/architectural acoustics, digital techniques, audio in broadcasting, electronic music, transducers, subjective judgements of audio, signal processing, and applications of digital technology to audio recording.

In fact, and as was expected, digital techniques were much in abundance around the exhibition and were also covered in numerous papers. Activities on this digital front are becoming rather more clear. Although a number of manufacturers were showing digital recorders providing capability for recording two or perhaps four channels, these do not provide editing facilities and are really only relevant for simulated 'direct-to-disc' situations, and certainly not for commercial multitrack recording studios. 3M, Sony and Ampex have each developed multitrack digital tape recorders, all using totally different techniques which are not directly compatible. The 3M/Mincom recorder first shown at last year's New York AES, is only just on the verge of being sufficiently developed for marketing to



3M digital 4-track recorder. 32-track is similar but with wider tape

\$4 per hour actual usage. This has the advantage that 3M will be able to update and modify units more readily than if they had been sold—with the possibility of a 'standardised' format being conceived during 1979—this is also valuable for studios. An electronic editor has been developed for the 3M digital multitrack by ITX Ltd (a sort of technological 'think tank' organisation that also developed the Aphex *Aural Exciter*) which although demonstrated at AES was not actually controlling the digital tape recorder—deliveries are expected in late 1979, some 12 months after the first recorders leave the factory. Donald Davis (ITX) and Robert Youngquist (3M) described the principle in one of the convention papers. Basically the edit console comprises an alphanumeric keyboard, television display screen with four microprocessors controlling various functions of console, 32-track and 4-track mixdown recorders. Using timecode the editor can identify editing locations to 20µs sampling period accuracy and graphically display replayed audio amplitude on the TV screen enabling the all important valleys and peaks to be examined, a cursor then being used to indicate exact edit point. Insert and assemble edits can then be accomplished totally in the digital domain (with 10ms mute over edits) with no loss of quality. Although for various reasons, only electronic editing will be possible with digital recording, there seems no reason why such editing technology should not also be used for existing analogue recorders.

Sony's approach with the PCM-3200 series was described by five gentlemen from the Sony Audio Technology Centre in Japan. As mentioned briefly last month, the Sony digital recorder uses two digital tracks per analogue channel providing 32 or 48 channels on 2in tape, 24 or 16 on 1in, eight on ½in, four or two on ¼in, plus in each case two analogue channels and an SMPTE timecode track. Using 16-bit linear quantisation encoding, performance



Waldorf Astoria Ballroom

But back in 1978, over 130 exhibitors displayed their wares both in the Ballroom and noisy twelfth floor demo rooms, while over 80 papers were presented on topics such as audio in medicine, measurement and instrumentation, management and engineering in studios, disc

commence. Meanwhile, a change of policy within 3M means that rather than being sold outright, the digital multitracks will be instead leased as a package of both 32-track and 4-track recorders for a \$10,000 reservation and installation fee, \$4,000 monthly rental and a

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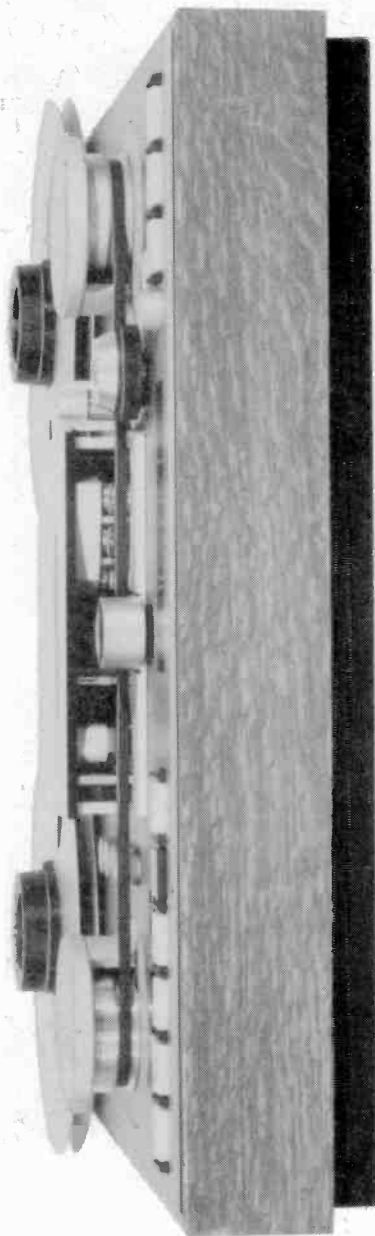
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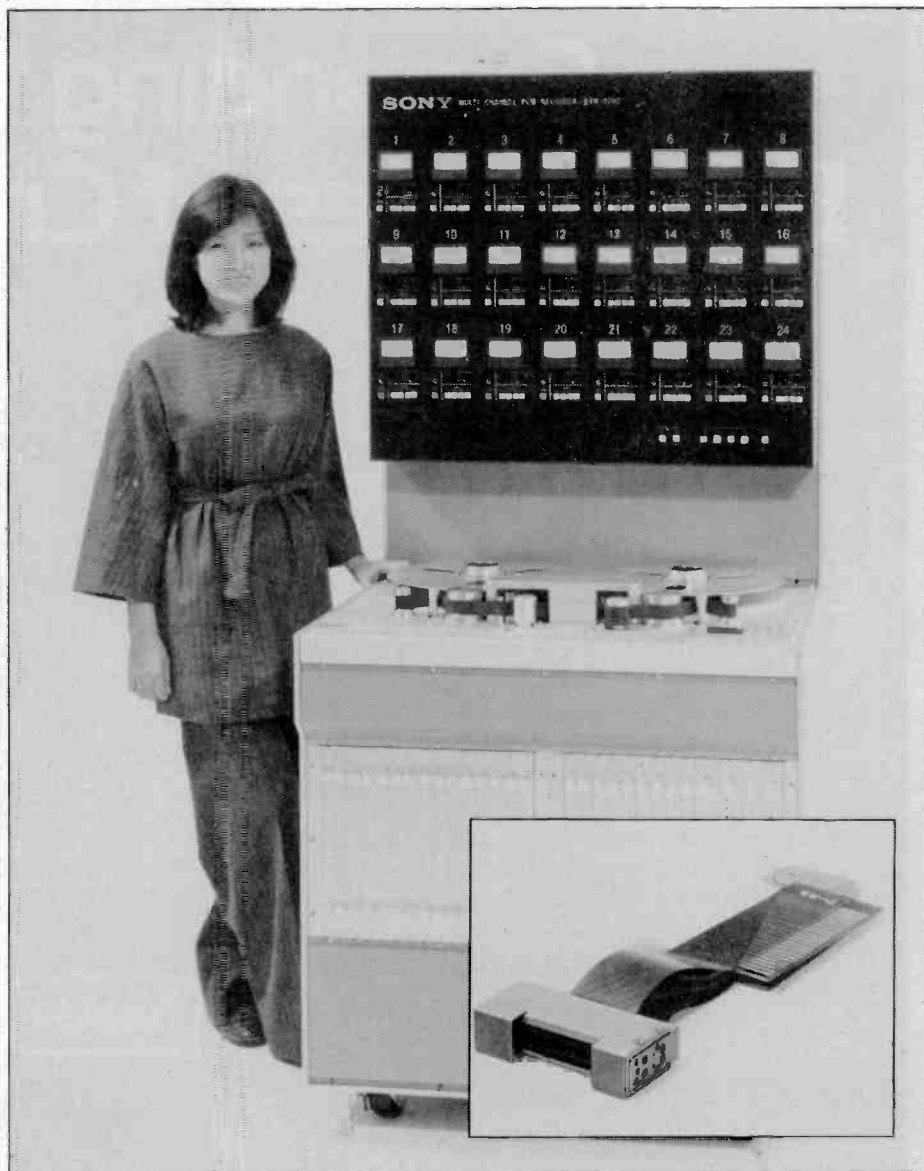
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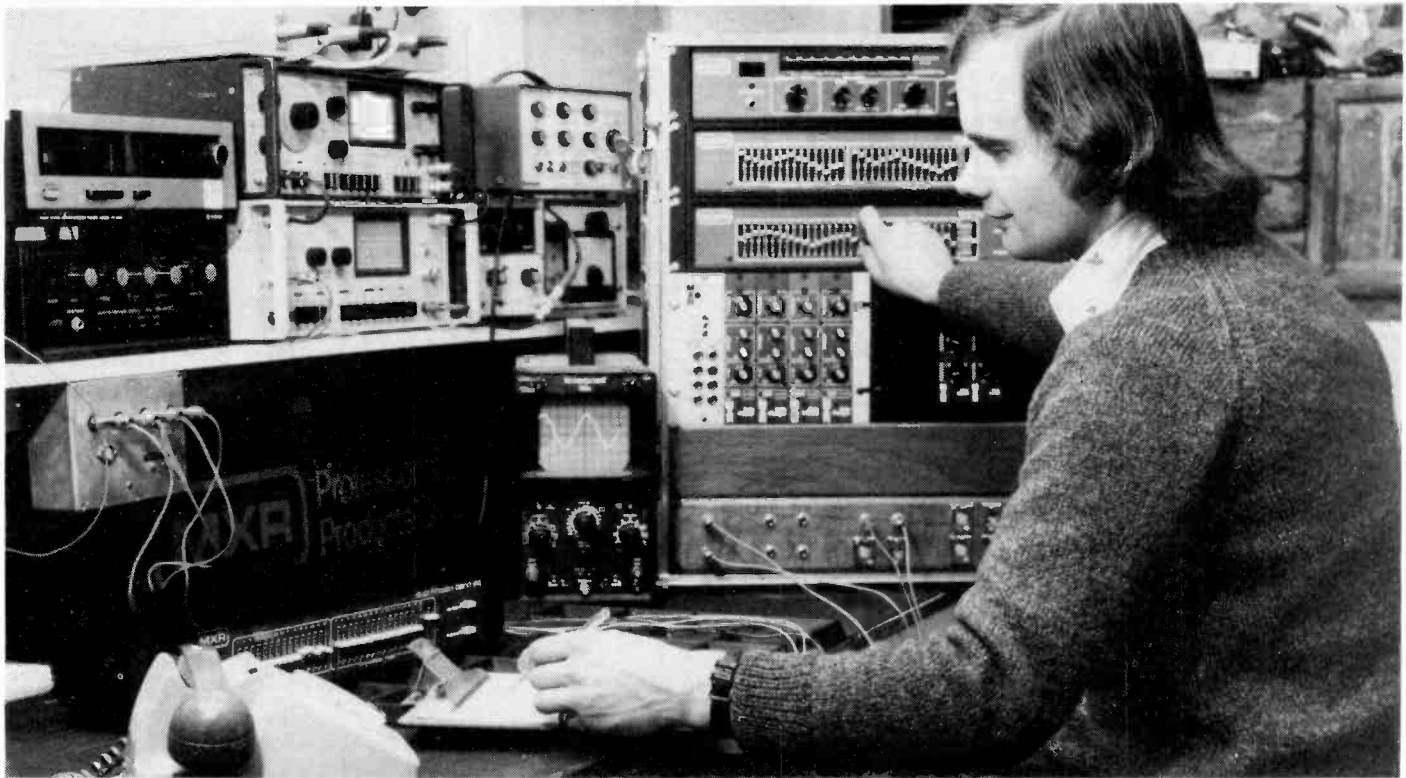


Sony PCM-3200 series digital 24-track recorder—note unusual head connections

claimed is 90dB dynamic range, 0.05% distortion, frequency response 20Hz to 20kHz ± 0.5 dB, -1 dB, -90 dB crosstalk and immeasurable wow and flutter. Switch selectable sampling frequencies of 44,056Hz or 50,350Hz allow compatibility with other equipment, packing density on tape is 30,720 bits/in or 20,480 flux reversals per inch using 3-phase modulation over two tracks—interleaving and a modified crossword error correction code effectively correct dropout errors up to 3,840 bits (more than one inch) in length. Tape speed on the prototype shown at AES is 22.5in/s, but production models will run at 15in/s. Although no details were provided, Sony claims that electronic editing is available but, like 3M, it was not demonstrated. Although the 2-track arrangement per channel means that the tape can be edited or cut vertically while retaining all sense, error correction bits will be lost for 5.5ms over the edit.

Finally, Ampex was demonstrating a wide variety of analogue tape recorders and tapes in its booth, but the digital recorder reputedly developed must have remained in Redwood

City. However, Edwin Engberg presented a paper on Ampex digital developments. It might be expected that Ampex would be devoting considerable research effort into digital recording since its 25 year-old Quad-ruplex video tape format is currently being superseded by new technology (without royalties) and Ampex has also extensive experience at producing data and digital instrumentation recorders. The Ampex digital multitrack recorder uses 50kHz sampling with 16-bits per sample representing 96dB dynamic range using linear encoding. Using 30in/s longitudinal recording speed, the recorded bit density becomes 50kbit/in, but Ampex experience has shown that this rate is too high for typical audio recording environments, so the data stream is split between two tracks (like Sony) producing a final recorded density of 25kbit/in. The recording format is thus two digital tracks per analogue channel, and production recorders will provide four channels on 1/4in tape, eight on 1/2in, 24 on 1in and 48 channels on 2in tape. In addition one extra



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track is provided on the $\frac{1}{2}$ in configuration, and two on the remainder, which can be read in all tape transport modes for timecode.

Considerable thought has been given by Ampex into the problems of digital editing—Ampex also developed the first electronic editor for video tape. Data is recorded on the tape in blocks with clearly definable gaps between them allowing the recorder to go into and out of record without disturbing adjacent blocks (as happens with the other two multi-tracks). Loss of synchronisation during dropouts is another digital problem, and so Ampex repeats a synchronisation pattern within each data block every 250 μ s. Comprehensive error correction is also included.

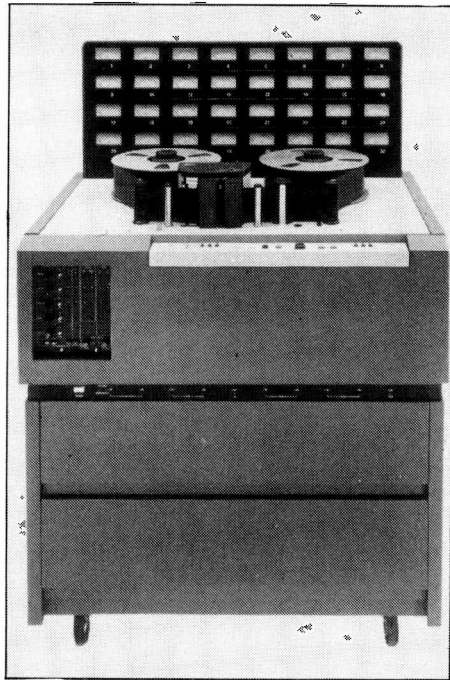
The problems of digital recording are becoming increasingly apparent. Edwin Engberg summarised them rather succinctly in his paper: "To achieve economical operation and conventional recording time for the user, longitudinal digital audio recorders must record at relatively high data densities to minimise tape consumption. This results in recorded wavelengths of 50 to 150 micro-inches. During playback the reproduced signal amplitude decreases at the rate of 55dB per wavelength of separation between the tape surface and the reproduced head gap. To minimise these spacing losses, the head-to-tape contact must therefore be held to less than 10 to 20 micro-inches. Fingerprints can easily cause a spacing of 100 micro-inches and smoke particles are typically 25 micro-inches in size.

"Because of the problems of preventing tape contamination, Ampex believes editing of multichannel digital audio tape using conventional cut-and-splice techniques will not be considered practical for professional recording applications. Instead editing mechanisms such as those now used in the production of video tapes will become the accepted and desired procedure."

The AES is once again considering the implications of digital techniques and recording technology and will presumably eventually come up with one, or perhaps two, recommended digital formats. It is already apparent that unlike 3M, Ampex and Sony are already considering formats that are 'broadly' similar and could possibly be adapted, taking the better points of each, to form a combined format—this is exactly what the two companies did a year ago when the SMPTE (the television and film society) formed the Type C video tape format taking the best features of Ampex and Sony technology. Perhaps it will happen again.

Meanwhile, one manufacturer still developing analogue tape recorders is MCI. Although shown for the first time at the New York AES, full details were available a year ago and appeared in these pages during the 1977 New York AES report. The *JH-32* series two and three inch mastering tape recorder will be available with headblocks for 16, 24 and 32-track recording (or should it be channels), auto level adjust, NAB/CCIR switching without need for re-equalisation, record card adjustments by variable resistive elements rather than suboptimal variable capacitors, improved response with strict adherence to standardised eq curves, true phase integrity, separate sync and repro equalisers, complete automation capability, and three speeds—15, 20 and 30in/s. Being first with a three inch transport, MCI has been able to select an optimum recording speed providing economy of record-

ing time with sufficiently high signal-to-noise to not necessarily require noise reduction. MCI claims the *JH-32* to be the most cost effective 32-track on the market—cost is \$47,000, compared with the Telefunken *M15A* 32-track at \$70,370 without noise reduction, or the 3M digital 32-track at \$150,000 (although this is now only being leased as explained earlier).



MCI *JH-32*-track on 3in tape

MCI is now producing a range of auto-locators and synchronisers for different applications—*Autolock* is an SMPTE/EBU generator/reader/synchroniser for all MCI tape recorders and can lock most other transports additionally. Lock accuracy with MCI transports and SMPTE code at 15in/s is better than $\pm 50\mu$ s with locking in four seconds. *Autolocator III* and *IV* are microprocessor based options for the *JH-16* and *JH-32* recorders respectively and provide 10 memories, tape speed indicator, simultaneous $\frac{1}{4}$ semitone pitch indicator and shuttle functions. *RTZIII* is standard on MCI's *JH-110* series of recorders and includes return to zero, four memories, tape speed indicator and presettable up/down counter, while the *RTZIII/M* is standard on the *JH-110M* disc mastering reproducer and includes an additional 20 memory locations to control special disc cutting lathe functions.

The Studer *A800* was seen for the first time at a US AES convention, while Industrial Tape Applications (ITAM) of London introduced what must surely be the cheapest one inch 16-track tape recorder in the world at £5,500. The tape deck is built on a highly stable aluminium base plate upon which all mechanical components are pre-aligned before assembly. Featuring electronic switching throughout, the ITAM *1610* uses channel cards with plug-in equalisation control cards electronic tape/source and sync/monitor switches, three speeds ($7\frac{1}{2}$, 15 and 30in/s), and claimed frequency response ± 2 dB 35Hz to 22kHz at 15in/s with 64dB A weighted S/N at 2% distortion.

Allen & Heath/Brenell will shortly be introducing a 16/24 track recorder using 2in tape which should satisfy those who have resisted using a non-standard 16-track one inch format machine—estimated cost is

44 ▶

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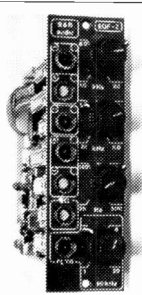
Parametric Equaliser

A very versatile instrument for getting sounds just right. It's modular and directly retrofits APSI 550.

EQ is peak or shelf. Filter is high or low pass, tunable.

Bandwidth is 20Hz to 20kHz.

Reciprocal cut or boost on EQ.



Input	High level	+ 30dBm (max) at 34K Ω
	Low level	+ 20dBm (max) at 11K Ω
Output	High level	+ 30dBm with - 93dBm noise
	Low level	+ 20dBm with - 103dBm noise
Frequency response	EQ & filters out	10Hz to 20kHz, \pm 0.1dB
	EQ & filters in	20Hz to 20kHz, - 1dB
Distortion	Harmonic & IM	< 0.1%
Transient response	Slew rate	> 10V/sec.
Power		\pm 12V to \pm 18V at 75mA

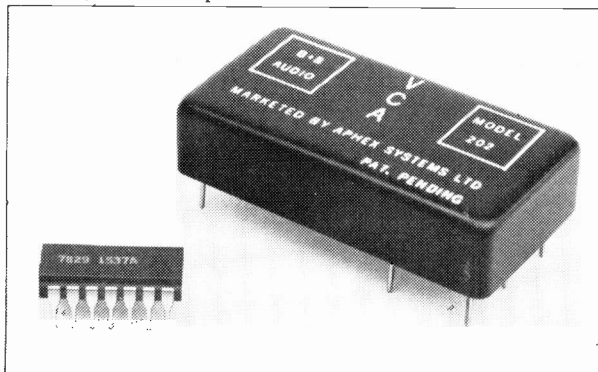
Voltage Controlled Attenuator

The first high quality VCA in the professional audio market.

It's available in chip form for OEM, or in a complete module, with full input and

output facilities for direct fitting to any automated console with existing VCA's. However, we can design a VCA package to fit any other manufacture.

Band width	Module	DC to 200kHz; \pm 0.1dB
	Chip	DC to 50MHz; \pm 0.1dB
THD	+ 10dBm input	0.004% (20Hz to 20kHz)
IMD	- 14dBm input	0.03%
Noise	Unity gain	- 90dBV; \pm 1dB
Modulation noise		6.5dB
Overshoot & ringing		None
Slew rate		> 10V/ μ sec.
Input impedance		20K Ω
Input level		+ 20dBV
Gain		0dB (+ 15dB available on special order in module form)
Attenuation	Module	> 94dB; 20Hz to 20kHz
	Chip	> 100dB; 20Hz to 20kHz
Control voltage		Can be scaled as needed
DC shift	Vs Attenuation	\leq 5mV
Power		Regulated \pm 15V at + 25, -33mA



Grouping and Automation System

With this system, you can now add semi-automation to your console at a fraction of the cost of a new one. Adaptable logic and extensive matrix grouping make up to ten 24-channel presets available.

And since the unit is portable, it can be moved from one studio to another in minutes, for the most efficient use of studio time.

It's expandable from 8 channels and it's just as useful for PA grouping as studio mixdown.

For MCI equipment, a compatible automation package is available.

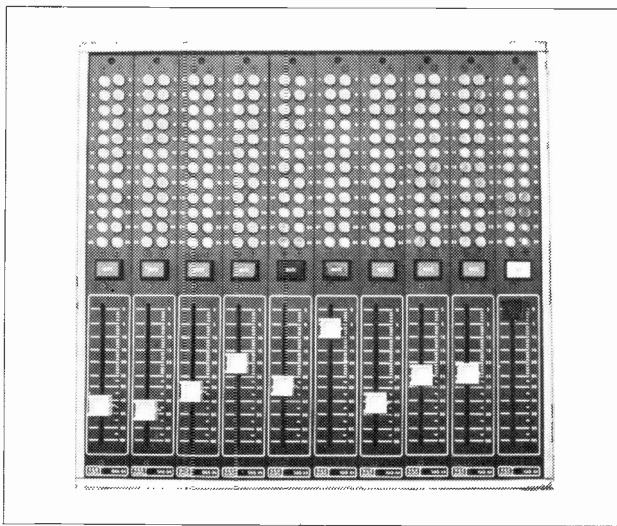
Our own Voltage Controlled Attenuators (VCA) are used throughout, whose high quality assure minimal sound degradation.

Maximum output is + 24dBm.

The system comes in two parts - control console and VCA case.

The control console has group control modules, each containing grouping switches, mute switch and fader, and a master control module with master fader.

The VCA case is self powered and houses the appropriate number of VCA cards and all the input/output XLR connectors.



Aphex

The Aphex Aural Exciter

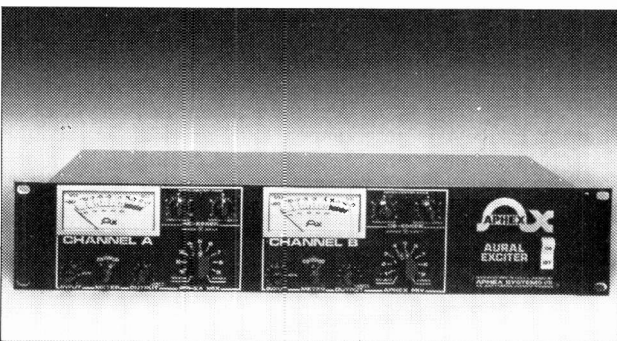
One of the most exciting signal processors to have been invented.

It brings sound to life and makes it louder, without any actual change in level.

It does it by introducing phase information in the form of a series of minute delays whose magnitude depends on frequency.

The formula by which the Aphex device selectively processes the audio signal has been arrived at after considerable research into the mechanisms of the ear. In particular as to how it receives complex phase information relating to the actual location of a sound source.

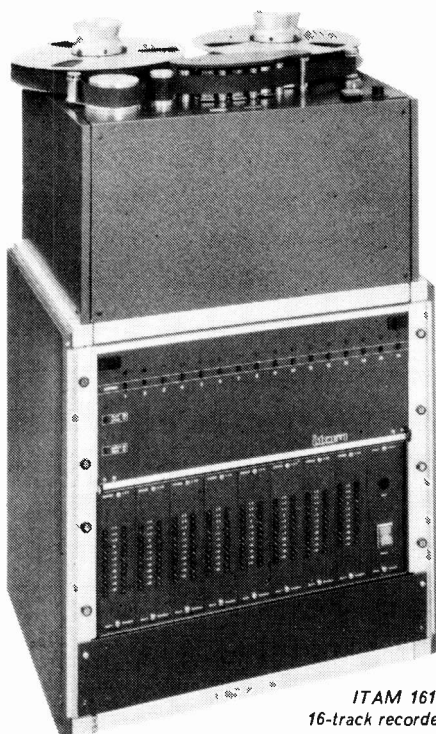
Aphex sounds amazing on most instruments, including the human voice.



Aphex
Audio Systems (UK) Ltd
35 Britannia Row
London N1 8QH
Telephone: 01-359 5275
Telex: 268279 Britro G.



AES NEW YORK



ITAM 1610
16-track recorder

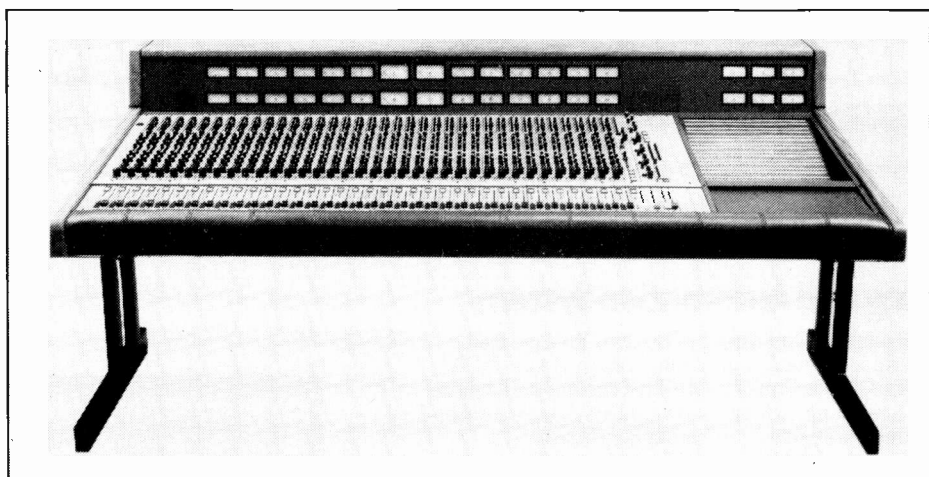
£13,500. Grandy Inc in New Jersey manufacture a wide range of studio mastering multi-track heads in eight, 16 and 24-track formats, including the *Promix 1* multitrack head mounting assembly which is also available as a retrofit for MCI recorders and which allows rapid alignment of azimuth, zenith, tape wrap and track height all independently adjusted by linear type controls with large knurled knobs (no more slipping screwdrivers).

While still thinking about digital technology, Sony introduced the first digital audio mixer, the *DMX-800*. Designed to mix 16-bit digital signals in real time, this is a prototype mixer designed for eight inputs and two outputs operating with the *DRX-1000* digital reverberator, also introduced. The mixer has conventional slider faders with 280-element plasma displays for metering and can be synchronised either internally or externally. The *DRX-1000* offers a range of initial delay from 0 to 100ms, with reverberation up to 20s, totally digitally.

Perhaps the most innovative digital product at AES however was a new shared access digital delay line memory system developed by Audio Machinery (who also developed the MCI automation system) and marketed by Sound Workshop. A variety of electronic delays are required in most recording studios, and while many units provide substantial delay times, often, rather less than 100ms is required. What Audio Machinery has done is to provide a mainframe accepting up to eight various input modules which can each access a common memory under microprocessor control. A maximum of six seconds of RAM can be housed (at 16kHz), built-up in 400ms blocks. Each input module digitally requests the precise amount of delay it requires, leaving the remainder for further modules. If this available delay is used-up, the available bandwidth can be automatically reduced for each module allowing additional delay time. Thus full dynamic range is available using 16-bits without recourse to companding, and maximum

utilisation is made of the available memory. The mainframe with 400ms memory costs \$2,600 with additional 400ms boards being \$750. Numerous effects are available on a variety of modules including pitch/delay, reverberation, 2-output delay, and a 3-out module—modules are around \$1,600 each. Using minimum bandwidth and when fully equipped, a one minute digital delay can be created—sufficient for profanity?

MCI introduced the *JH-600* console (wonder if JH in MCI model numbers originates from the initials of Jeep Harned, MCI's founder and president?) which is MCI's first stock automated console. Available in 18 and 36 channel frame sizes, the *JH-600* series use the input/output module in-line approach with the VCA fader assemblies mechanically separated from the rest of the module. Features include differential line inputs, optional differential mic preamps, 24 channel busses with panning, six sends, multiway connectors, true parametric eq, and *JH-50* automation as standard. The *JH-600* series is also somewhat more 'cost effective' (ie cheaper) than the *JH-500* series, starting at \$28,000 for 18 channels with VU meters.



MCI JH-600 console

Another aspect of console design that is becoming more important is the role of OEM companies. Penny & Giles cornered a vast proportion of the fader market several years ago, and it looks as if one or two other modules might be finding their way into consoles before long. The Valley People *Transamp* is one such product providing substantial gain, while B&B voltage controlled attenuators operate with 0.004% distortion providing a 114dB dynamic range, the B&B *EQF-2/EQF-3* parametric equaliser/filter provides tunable peak/shelf eq, tunable hi/lo pass filter, constant Q (1.5 octave), available in stepped (\$475) or stepless versions (\$375). B&B has also developed a small 'operational module' which can deliver a full watt into 62Ω with a 4MHz bandwidth and -113dBm noise. B&B are marketed by Aphex.

Allison Research has developed a programmable fader system called *Fadex* which interfaces directly with the Allison Research *65k* programmer and provides in addition to programmable level control up to nine VCA subgroups, channel mutes and solos, VCA grand master, precision nulling indicators, 145dB gain control range—it uses the *VCA-5M* module which can provide gain variable from

+35dB to -125dB with 0.02% distortion, price \$45 one off, \$27 3,000 up, while the *Fadex* module is \$400 one off, \$310 100-300 up. Allison intend to introduce the *Keplex II* unit during 1979—it will include a real VCA, lower noise and distortion, variable attack, ratio control automation ready, and a lin/log release control.

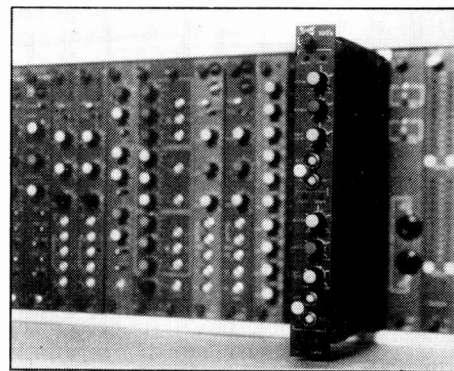
Psychoacoustic audio processing has been the domain of Aphex for the past couple of years, but now the EXR Corporation has introduced the *EXR Exciter* which is claimed to "interact directly with the psychoacoustic circuitry in the brain of the listener and stimulate psychoacoustic activity to enhance perception of the audio signal". It is however available for sale at \$1,690, unlike the Aphex which is rented per second of the finished recording.

Sescom produces a vast number of assorted blue boxes that appear to connect any lead to any multiple combination of others, and much else besides. Sescom claims to have produced over 25,000 direct boxes to date, and still sell 900 a month. It also has a new agent in Britain, Atlantex Music Ltd.

Dolby is still plugging away at Dolby-B FM

radio, and will be introducing the *Cat55* module shortly—this is similar to the *Cat22* with a Dolby-A processor, but less the 'peripherals' such as amplifiers which are not required when the module is built into a tape recorder, or perhaps video tape recorders which, almost without exception, have abysmal sound quality when compared to professional audio recorders.

46 ►



Audio & Design (Recording) S100 dual gate

Publison Audio Professional Manufacturing

DHM 83 – DIGITAL DELAY LINE – HARMONIZER – MEMORY MODE



STEREO DIGITAL DELAY LINE with continuous variation, 0 to 600 mS for option A and 0 to 1,2 second for option B.

HARMONIZER: from -2 to $+1$ Octave – a micro computer operates a sophisticated phase coincidence of joining points, taking into account both the instantaneous phase and the envelope phase, so that transition "glitches" are eliminated.

VARIOUS REMOTE CONTROLS include in particular

two digital V.C.A. inputs allowing separate voltage control of the gain of the two outputs.

REVERSE POSSIBILITY, by setting crosspoint I, smaller than crosspoint II, reading direction is inverted, which is the electronic equivalent of a magnetic tape running reversed.

MEMORY MODE with keyboard remote control, one can play any memorized sound – it is also possible to obtain rhythms with any existing sound.

TRUE DYNAMIC RANGE 100 dB by means of a quasi 16 bits flying comma A/D converter of prime quality.

E.C.L. 20.A – EXPANDER – COMPRESSOR – LIMITER – NOISE GATE



The heart of the system is an exclusive digital V.C.A., featuring: very low noise (-96 dB), very low distortion (0,02%), fast response time (1 microsecond), logarithmic response.

Compressor Limiter: threshold from $+20$ -30 dB – Attack time from 0,01 to 20 mS – Release time from 0,05 to 4 S.

– Ratio (1–2–4–6–12–20).

Expander: Threshold from $+10$ to -40 – Attack time from 0,01 to 40 mS – Release time from 0,03 to 2 s – Gain reduction from 0 to 30 dB – Ratio 2.

Noise gate: Uses previous setting but ratio is 20.

C.L. 20C COMPRESSOR LIMITER PUBLISON



Stereo-Compressor Limiter with fast photocel – very low noise: 102 dB and low distortion when compression operates: 0,05% – use FET operational amplifier bandwidth 100 kHz even for $+20$ dB – insertions in side-chains – stereo-coupling

– display of compression 6 ratio 2 – 3 – 4 – 6 – 10 – 20 – by II led – special circuitry to suppress distortion on low frequencies – X.L.R. connectors.

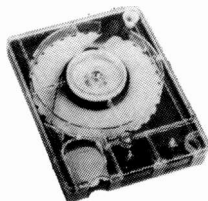
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AES NEW YORK

Scamp, otherwise known as Audio & Design (Recording), introduced two modules at AES—the *SO2* mic preamp providing 70dB gain with -125dB noise, and the *S100* dual gate with 10µs attack with release, attenuation range, and threshold all being variable. Two LEDs indicate whether the gate is open or shut.

Ursa Major demonstrated its *SST-282 Space Station* 'processing centre' which provides a multitap digital delay line featuring 16 'Audition Delay Programs' providing effectively room delays, combs, delay clusters and space repeats, together with feedback echo and reverb. Total delay is 255ms in 1ms steps, cost is \$1,995 and UK distribution is by Feldon.

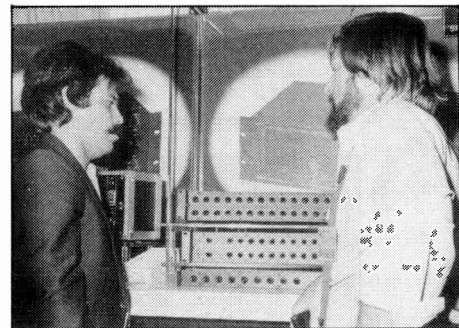
Orange County based in Winnipeg, Canada, manufacture a range of audio processing equipment including vocal stressors, stereo processors primarily for broadcast operation, parametric equaliser, comp/limiter/expander/noise gate module, graphic equaliser, stereo HF limiter, and stressor switcher.

Symetrix Professional Audio Products in Seattle introduced a new range of processing equipment including the *CL-100* comp/limiter (\$299) which features side chain insertion, true infinite compression ratio, VCA gain control element, stereo interconnect and optional balanced inputs and outputs (\$3,490). The Symetrix *Signal Gate* (\$199) provides adjustable threshold noise gate, signal gate and special effects externally controlled. Symetrix also manufacture a *Phase Filter* (\$299) and dual channel *Headphone Amplifier* which provides 10W into a minimum of 4Ω with separate level and jack sockets for outputs together with one combined stereo jack (\$139). MicMix showed an improved version of the *Dynaflanger* which features improved stereo reverberation. Furman Sound, distributed by Rothchild Musical Instruments in New Jersey, showed a tunable crossover/bandpass filter Model *TX-2* which provides two crossover points, both of which may be independently tuned between 20Hz and 20kHz with 12dB octave roll-off. Model *PQ-6* stereo parametric equaliser/pre-amp which provides three continuously variable overlapping controls providing +20dB gain and up to -40dB cut with variable bandwidth. Finally, Furman manufacture a reverberation system complete with limiter, which uses a 16in dual spring assembly.

Deltalab Inc (whose *DL1* digital delay line was reviewed in *Studio Sound* last month) introduced the *DL2* and *DL3* units which provide further digital effects—the *DL2 Acousticcomputer* provides two independent delay channels and pre-reverb delays, variable time base with VCO, sustain, long delays, stereo imaging, footswitch control (\$1,750), while the *DL3* is a low cost (\$700-\$750) digital delay with a single input and output.

Ashley Audio Inc manufacture a range of 'space age signal processing' equipment including parametric equalisers, peak limiter compressors, electronic crossovers and instrument preamps.

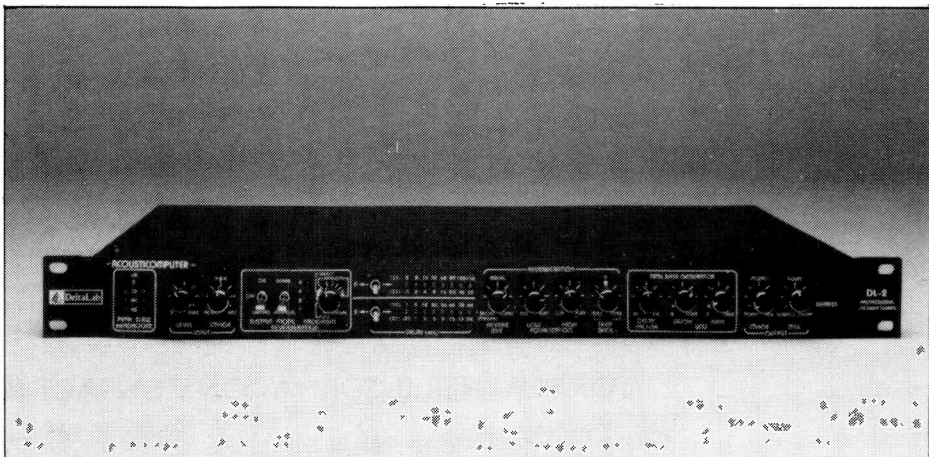
Signal analysers were much in evidence at AES, including the hand-size Ivie *IE-30A* analyser with *IE-17A* microprocessor accessory, and the Inovonics *Model 500* acoustic analyser which includes two separate memories—both will shortly be reviewed in *Studio Sound*.



White Instruments room equalisers

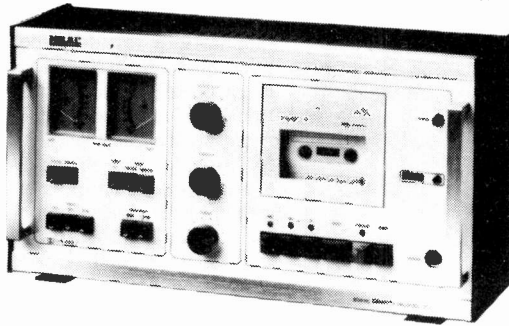
White Instruments will also be introducing its Model 200 signal analyser which is micro-processor-based with a personality totally dependent on software, all analysing and display functions being controlled by twin 6800 microprocessors which may be simply reprogrammed in the future by changing one circuit card containing the PROMs. Features include switched full or 1/2-octave filters, and a set of 1/2-octave filters ranging from 40Hz to 1,250Hz can also be added, LED matrix 16x31, 45dB, 20dB or 15dB dynamic range, simultaneous analysis in both average and peak modes, and storage in eight memories, simultaneous display of up to three curves, numerous options.

Deltalab *DL2 Acousticcomputer*



You always perform better with the right equipment

With Neal Ferrograph you get the right equipment for the job, and the best in its class. A good formula for success, of which you can be assured every time you choose from the fully - integrated range of specialist recording and ancillary equipment in the NEAL FERROGRAPH range.



The NEAL 302.

Incorporating a 3-motor mechanism, controlled by a full solid state logic system actuated by ultra light touch buttons, this is the machine used by top recording studios and broadcasting stations, for quality cassette copies and for in - cassette duplication masters.

Studio 8

A professional studio tape recorder logic controlled for superb tape handling characteristics, offering a choice of stereo, twin track and full or half track mono heads, PPM or VU meters, IEC (CCIR) or NAB equalisation, console or transportable models.



The Ferrograph Logic 7.

A transportable tape recorder of unrivalled facilities; taking all spool sizes up to 27 cm, and providing three speeds, plus positive action push buttons in association with logic circuits ... for fast, safe tape handling under all conditions.



The RTS 2.

Combines in one easy to use compact instrument the measurement of gain, noise, frequency response, input sensitivity, output power, distortion and the parameters relating to recording equipment, such as wow and flutter, crosstalk, drift and erasure. Its range of application can be extended even further by the addition of the Auxiliary Test Unit ATU 1.

NEAL FERROGRAPH
TOTAL TAPE TECHNOLOGY

SIMONSIDE WORKS · SOUTH SHIELDS · TYNE & WEAR NE34 9NX Telephone: SOUTH SHIELDS (0632) 566321 Telex: 537227

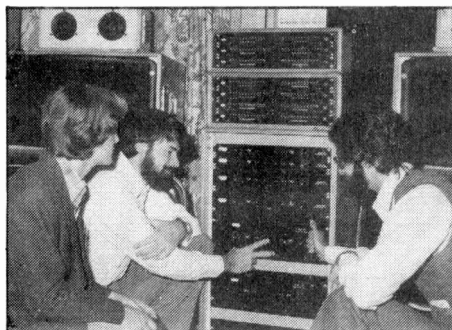
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AES NEW YORK

Meanwhile Barclay Analytical Ltd introduced *Badap 1*, an audio microcomputer with built-in 9in colour monitor display which can be programmed to display $\frac{1}{3}$ -octave real time analysis, peak v average mixdown, and such applications with future programmes allowing RT₅₀ computation, chromatic spectral analysis, wow and flutter spectral analysis, and many others. Television output is however only NTSC so *Badap 1* cannot be used fully in Europe.

Audio Developments International of Palo Alto showed a range of full and $\frac{1}{3}$ -octave analysers together with graphic equalisers. *1003* is a $\frac{1}{3}$ -octave precision real time spectrum analyser with four memories, 31 ANSI filters with two average times, noise generator and battery pack.



Uni-Sync Model 100 amplifier

Numerous manufacturers were showing amplifiers of many varieties including Crown who will be introducing the *PSA-2* self analysing amplifier with a temperature measurement loop that will be able to deliver 440W into 4Ω and almost 600W into 2Ω. AB Systems Design Inc manufacture a range of power amplifiers which include *The Four-Ten* which provides two channels of 205W into 8Ω, while *The Eight-Ten* offers 200W into 4Ω. The Model *2400* electronic frequency divider was introduced at AES and provides panel setable controls for both left and right systems, hf and lf with independent controls of 'internal sub woofer output'. Uni-Sync also manufacture a range of PA equipment including power amps with ratings between 50W and 350W per channel, *Trouper* monitor and PA mixers, direct boxes and microphone splitter boxes, and metering systems.

Also with the PA market in mind, Calzone Inc were exhibiting a range of custom cases manufactured from high impact laminate with 24 gauge steel trays, specially fastened caster brackets and available for most musical and electronic instruments. Wireworks of New

Jersey showed a range of wire, surprising enough—what makes this somewhat different is that PVC microphone cables are available in 12 colours, in addition to normal black rubber and black neoprene. Microphone multicables are available with 3, 6, 9, 11, 15, 19 and 27 pairs terminated in either multitails with XLRs or multiboxes which can have optional multipin connectors.

The BTX Corporation were showing a range of timecode and synchronising equipment which allow one or more tape recorders to be locked together. The *4500* synchroniser is a microprocessor based system with integral SMPTE timecode readers, while the *4600* SMPTE tape controller allows as many as 30 consecutive instructions using either keyboard or automatic capture of timecode locations. BTX also manufacture SMPTE timecode generators and digital displays. Polyfonic Sound Industries introduced the *PY-10* and *PY-55* (stereo version) acoustic simulators for room simulation and sound enhancement. Applications vary from correcting overly close microphone techniques to creating an ambience effect on dry sounding tapes. In live applications, the units can actually vary the apparent room environment acoustically enabling users to provide for their own personal taste. Swintek manufacture a wide range of radio microphone transmitters and receivers including a handheld with *SM58* head, bodypac transmitters available for either VHF or UHF, receivers matching all transmitters, various antennas including diversity systems, and a full-duplex communicator system for use with most headsets allowing handfree communication over $\frac{1}{2}$ -mile distances. UK distributor for Swintek is Oakside Electronics.

dbx Inc introduced the *RM-155* 8-track noise reduction system for \$1,100 in pro-format, Model *208* professional eight channel noise reduction with simultaneous record and replay (\$3,300), Model *148* playback only dbx system for broadcast use with cart machines and such like, available in eight channels for \$3,000, the Model *165* professional comp/limiter with 'over easy' compression circuit that provides a gradual turnover at the threshold point, and feed forward gain reduction (\$550), and finally the Model *163* 'one knob squeezer' comp/limiter with a single front panel knob which increases the output gain automatically as compression is increased to maintain a constant output level (\$189).

Studio design consultancies were represented by Sierra Audio of Burbank who is Eastlakes exclusive agent in North and Central America, Japan, Australia and Asia, and Jeff Cooper, 'consultant in acoustics' who previously worked for Westlake, and has designed a wide variety of studios on the West Coast of America. ■

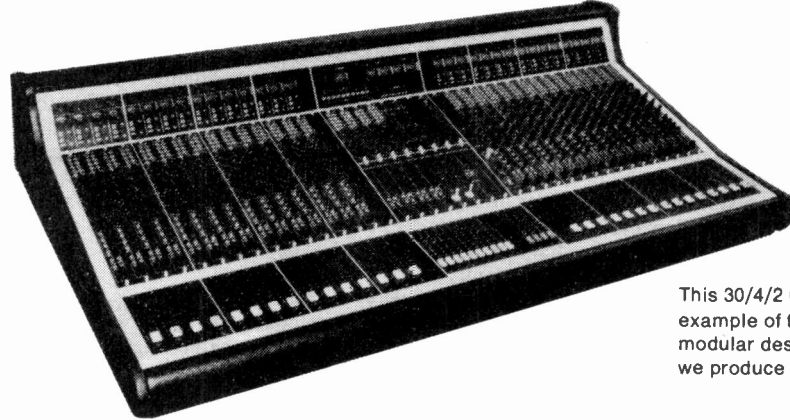
dbx Inc Model 208 8-channel noise reduction system





ELECTRONICS LIMITED

The Manufacturers of Professional Audio Equipment



This 30/4/2 Quad is an example of the high quality modular desks we produce to order.

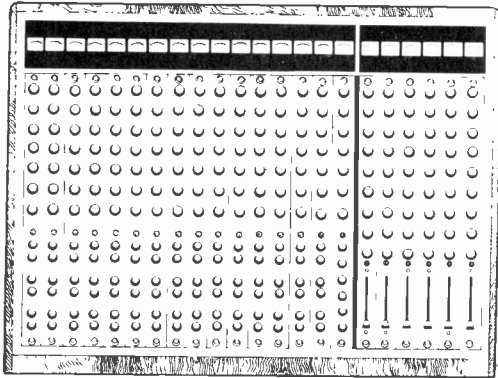
We now produce a range of non-modular consoles at a surprisingly low cost.

THE KESS RANGE

16/6 and 24/8 Monitor desks and 20/2 and 20/4/2 front of house desks.

20/4/2

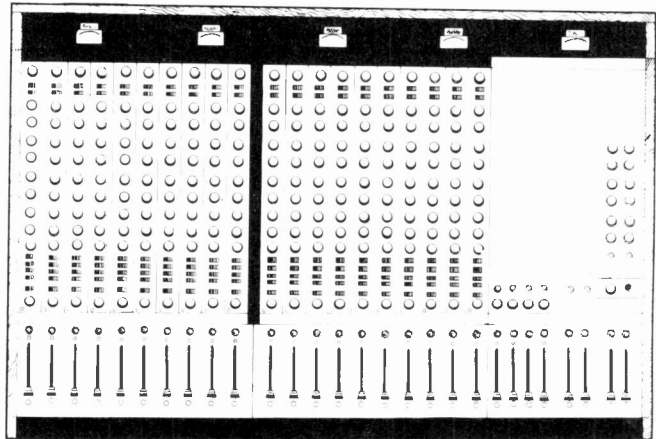
16/6



Purpose built stage monitor desk.

Features:

- VU on every channel
- All outputs with 9 band EQ
- @ 50, 100, 200, 400, 800, 1600, 3200, 6400 & 12800 Hz.



Purpose built front of house desk.

Features:

- LED overload indicators on every channel.
- Routing direct to the Stereo Masters in addition to the 4 sub-groups.
- 2 foldback sends on each channel (pre fade)
- 2 effects sends on each channel (post fade)

SPECIFICATION EXAMPLES

- Input attenuation, Channel mute/PFL
- EQ: TREBLE ± 20 DB 8K Hz
- MID ± 16 DB Sweep
- BASS ± 22 DB 100, 170, 250 Hz

ENQUIRIES:

THE GELF SALES AGENTS Power house, Ref: KESS
 300/320 Acton Lane W4 5DJ
 CONTACT: SIMON NATHAN
 01-995-4712

TRADE ENQUIRIES WELCOME

Loudspeaker reflections

AN UNEXPECTED high spot of the 1978 Harrogate audio festival was a lecture by USA loudspeaker designer Roy Allison, organised by the firm Audio Pro of Cheshire, who are the UK distributors for Allison speakers. Although not even Allison's best friend could call his lecture technique riveting, what he had to say could well provoke a few studio engineers to the kind of dissension for which they are famous.

In a nutshell Allison is arguing that the ideal loudspeaker puts flat power into the room and that the easiest way of radiating flat power is to utilise rather than minimise, the effect of boundary reflections; that is to say reflections from the walls, the ceiling and the floor. For many people the idea of jamming a monitor on the floor and as tight into the corner of a room as possible is anathema. But Allison thinks otherwise.

Inevitably any solid boundary will reflect some sound and equally inevitably where the reflections are in phase with the direct radiation they will boost it and where they are out of phase they will attenuate it. Don't fight the reflections, says Allison, join them. Put the speaker system bass unit as close as possible to the floor and wall—ie mount the bass driver in the bottom of the cabinet and use it flat on the floor without a stand and backed up close to the nearest wall or corner. The spacing between the woofer and the reflective surfaces is now very small, so the reflective propagation path is very short and the reflective waves and direct radiation stay in phase up to around 400Hz. If the speaker system crossover turns over at around 350Hz, the bass unit will only ever handle frequencies below those affected by reflections. The mid and high frequency units are lifted relatively high above the floor and their crossover frequency chosen so that they only handle frequencies above those affected by reflections. All this sounds so obvious, logical and sensible, that there must surely be a flaw, mustn't there? Perhaps not, because another American speaker firm, Acoustic Research, is clearly thinking along very similar lines with the new AR9 4-way system. This also has its bass unit (actually a pair) deliberately down at floor level so that the attenuation dip caused by reflection occurs above the 200Hz crossover frequency used. Similarly the low mid-range driver is placed so that the dip in its response occurs at below the 200Hz crossover frequency. So once again the outcome is radiation of flat power into the room. In other words according to both the Allison and AR design philosophies, no attempt is made to achieve the impossible; that is to say to eliminate the attenuation dip caused by reflection attenuation from the wall surfaces. Instead the dip is manipulated into a part of the audio spectrum where it is of no consequence.

The coincidence of approaches is in fact no coincidence. The AR9 is largely the result of computer analysis by Bob Berkovitz of Acoustic Research. Allison and Berkovitz worked together in the AR design team around eight years ago before Berkovitz went temporarily to Dolby Labs and Allison started his own company. This is where the ideas behind the current designs first

originated. AR has an ongoing programme for computer analysis of room reflections and some of the AR computer programmes have been put onto cassette format for use on a microcomputer which AR use for public demonstrations. This shows up the effect of room reflections on a speaker system in dramatic fashion, by drawing the worst and best speaker positions for any room size and shape fed into the computer. Small studios who cannot afford an acoustic consultant, might do well to check out with AR when they are next using the computer at a public demonstration. The chances are that, if asked nicely, the AR demonstrator will feed your own particular studio control room measurements into the computer and plot you the best and worst speaker positions for that room.

Finally a curiosity. At the Harrogate lecture Roy Allison was astonished to find the demonstration cassette that he had brought over from the USA totally blank. It had been shipped over in a crate along with some loudspeakers, but can stray flux from a driver in a cabinet completely wipe all traces of a prerecorded programme from a tape in the same crate? I doubt it. Could it be that the cargo was X-rayed with radiation so powerful that it wiped the tape? More likely. But perhaps readers have other ideas. In the meantime bear Allison's experience in mind when considering the despatch of tapes by freight.

Croat, croat

ANY MENTION of British broadcasting to far off lands inevitably calls to mind the apocryphal story of the man who was fluent in Serbo Croat and employed by the BBC World Service to broadcast British news once a night in that obscure language. As the years wore on he became understandably frustrated with the job. He'd sit alone in the studio broadcasting to people he never met and never heard from. For all he knew none of his carefully chosen words ever got further than the Bush House control room. So to relieve the boredom he'd once in a while drop in the odd deliberate mistake, just to see if anyone out there noticed. *Anything* to get some feedback. At first it was all very innocent. The odd cricket or football score would be slightly wrong. But there was no reaction so he got a little more adventurous. "Big Ben chimed 13 times today," he informed the Serbo Croats. No reaction. "Prince Charles got married today." No reaction. "The Thames has dried up." No reaction. "Under the new vegetarian laws it is now illegal to eat meat in England." No reaction. By the time he was finally found out thanks to the inevitable spot check by a visiting Serbo Croat diplomat, every newscast each and every night was complete fiction. That man, wherever he went, will go far. Does anyone know where he went? Although the programmes are intended for the forces, they can of course also be picked up by anyone in the area and far across the water for island stations like Cyprus. Quite often cruise ships will have a piped station on board tuned to the nearest BFBS transmitter, and in many countries the locals

use the BFBS programmes as an aid to learning English. The result—a worldwide listening audience of a staggering 20M.

At the Dean Stanley Street studio there is a Neve desk and the whole network is standardised on Ferrograph *Series 8* recorders. The studio master tape is copied at eight times speed on a batch of slave Leavers Rich machines and shipped off round the world by service planes whose air crews know not to put the tapes near any stray fields. I was in the studio a couple of times recently (while ex-Capital DJ Tommy Vance was doing a very professional job on recording his now daily BFBS programme) and noticed one fascinating "why didn't I think of it first" gadget. The programme producer sits at a work desk behind the Neve console and engineer. Normally both engineer and producer have a clear line of sight through the control room window to the DJ who self-ops his mic, jingles and turntables. But when, as so often happens in a busy studio, someone tall stands by the engineer (there is a continual stream of visitors through the control room waiting to be interviewed on air by the DJ) the producer's direct view is blocked. But on his desk there is a mirror which is angled to sight onto another angled mirror high up on the ceiling above the producer's desk. This in turn is angled to point down at the DJ through the control-room window. In other words it's a periscope. I wonder why on earth more crowded studio control rooms don't have a simple periscope built in where there is any risk of blocked views.

Incidentally, because BFBS is controlled by the Ministry of Defence and not the BBC, there is no taboo on brand names. There's no actual advertising, of course, but there is freedom to call a spade a spade by its trade name. And this does make for more punchy interviewing with people relieved of the need to think of a generic word for Rolls Royce or Austin Seven.

BFBS also has an interesting attitude to taping. Although by definition every show has to be prerecorded, show like the Tommy Vance programme are recorded exactly as if live. Everyone just think and talks about Friday as "today" if the show has to go out on Friday. There's no tape editing and everything is locked onto tape, for better or worse. Usually, I suspect, for better.

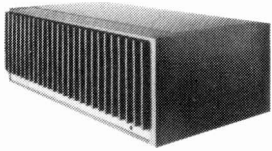
BFBS calling

I CHANCED recently on the British Forces Broadcasting Service, a little known (in the UK at least) branch of the Ministry of Defence that operates from studios and offices in Dean Stanley Street just round the corner from Parliament. We may no longer have an Empire but we do still have forces stationed all round the world. To relieve them from the boredom of local radio and TV, and provide a link with home, the BFBS records programmes in the UK and flies out the tapes to British forces stations all round the world. The tapes can be recorded one day and played abroad the next. Broadcasts are in stereo, with transmitters in countries like Malta, Cyprus, Hong Kong, Germany and the Middle East—often quite powerful beasts, several kilowatts at least.

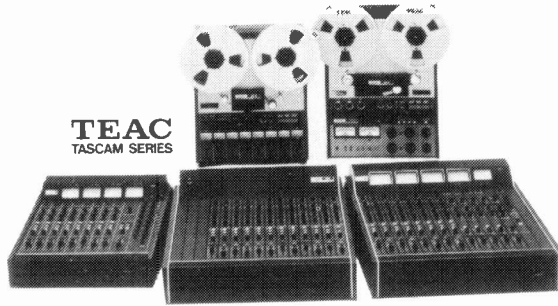
turnkey

Our business is helping you with yours...

Considering or upgrading a multitrack system? We offer a select range of studio equipment, backed with advice, demonstration and service. Turnkey sell, install, lease or hire.



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

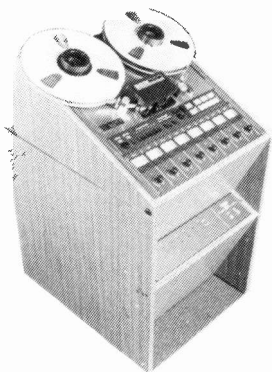


We supply and install the TEAC TASCAM multitrack system. Mixers Models 2, 3 and 5, and tape recorders 3300S, 3340S and 80-8 are suitable for both multichannel and audio production applications.

VARISPEED

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

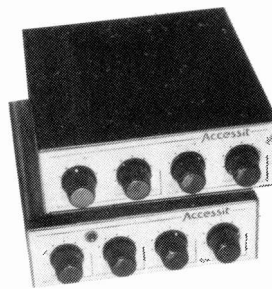
The hand held remote switches between fixed speed operation and a plus or minus 15 percent pitch control.



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



Low capacitance cables prevent high frequency loss. Now available in standard Tube-Paks. 8 Pack 18 ins, patch 4 Pack 6 ft, interconnect 2 Pack 12 ft, interconnect



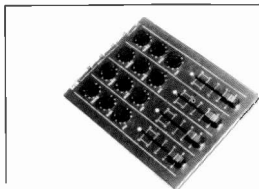
A new range of signal processing equipment designed specifically for budget installations. A versatile, expanding system that features quality and low cost.

Limiter/compressor - input, output, attack and release controls.

Parametric Equaliser - Two band boost cut control with peak frequency tuning.

Reverb Unit - For mic or line application with equalisation and mix controls.

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



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

Stop Press - Just announced, the budget stereo ten band graphic from Statik Acoustik. Phone now for details.

Monitoring Systems



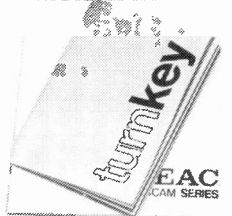
Microphones and Accessories



Signal Processing



Are you ready for Multitrack?



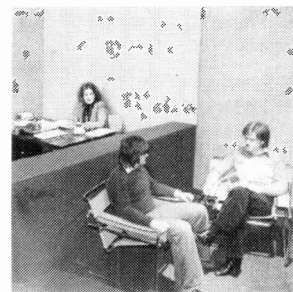
The Turnkey book includes comprehensive information about our products and accessories.

Please write or call for your free copy.

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

Call Andrew Stirling at:

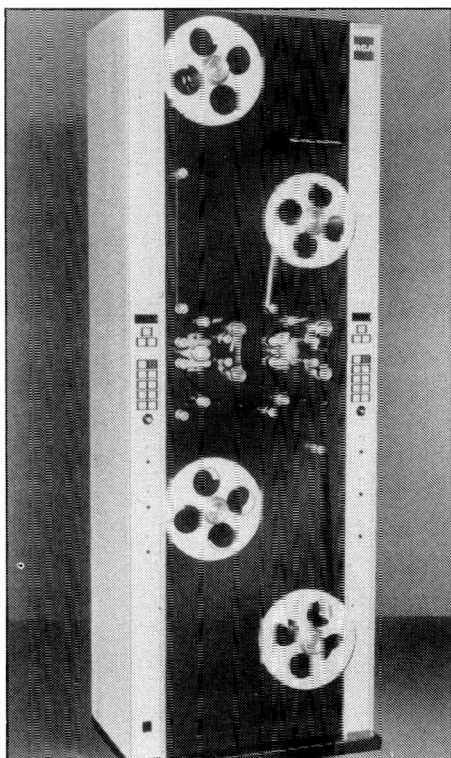
turnkey



8 East Barnet Road, New Barnet, Herts EN4 8RW Supply & Installation of Recording Equipment Telephone : 01-440 9221 Telex : 25769

SURVEY: FILM SOUND EQUIPMENT

Wow and flutter: 0.1%.
Capacity: up to 900m.
Film speed: 24 or 25 frames/s, servo driven.



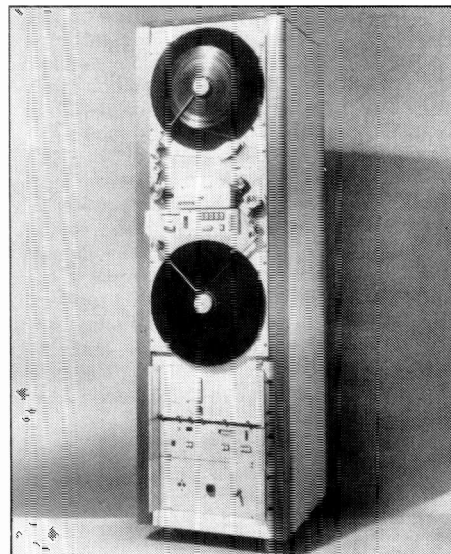
Frequency response: 35mm 40Hz to 12kHz ± 2 dB, 16mm to 10kHz.
S/N: 45dB.
Synchronisation: may be locked to power line, TV vertical sync or external drive source.
Price: on application.

SCHLUMBERGER (France)

Compteurs Schlumberger SA, 296 Avenue Napoleon Bonaparte, F-95205, Rueil-Malmaison, France.
Phone: 977 9223. **Telex:** 203404.

DS16/DS17.5

Type: magnetic film recorder.
Format: DS16 16mm magnetic film, DS17.5 17.5mm magnetic film.
Tracks: one or two.



56 STUDIO SOUND, FEBRUARY 1979

Film speed: 25 frames/s, variable between 0 and 250 frames/s.
Drive motor: electronically controlled.
Frequency response: 60 to 10,000Hz ± 1 dB.
S/N: 60dB with 1% distortion.
Synchronisation: mains, external frequency, crystal or TTL level pilot signals.
Capacity: 1,200m.
Features: full electronic remote control, real time display remoted.
Price: on application.

PPS-C

Type: post synchronisation programmer. By counting film frames, the PPS-C provides full searching remote control for up to four slave magnetic film recorders, slave synchronisation with follow the leader, and manual frame offset.
Price: on application.

F240 series

Type: transportable magnetic film recorder.
Format: 16mm magnetic film.
Tracks: centre or edge, 5mm or 2.5mm, stereo twice 4mm.
Speed: 25 frames/s, 7 $\frac{1}{2}$ in/s.
Drive motor: DC speed slaved.
Power supply: mains.
Wow and flutter: 0.15%.
Frequency response: 50 to 10,000Hz ± 1 dB, -4dB at 15kHz.
S/N: 60dB.
Capacity: 10 $\frac{1}{2}$ in spools.
Synchronisation: pilot tone from mains, crystal, generator, etc., sensing tape punching.
Features: uses basic $\frac{3}{4}$ in type tape transport with smooth capstan drive and no sprockets. Available with mic or line inputs.
Price: on application.

SELA (Sweden)

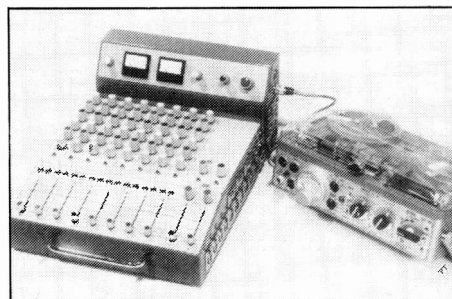
Svenska Elektronik-Apparater AB, Fact, S-12206 Enskede 6, Sweden.
Phone: 08/94 02 70.
 Range of mixers for film industry and Nagra recorders.

2880BT

4-channel mixer designed specifically for use with Nagra portable tape recorders from which it obtains power. Each channel accepts wide range of balanced mics and provides dialog filter, lf and hf in each channel rotary faders, line outputs which may be used for cans.

2880ST

8-input portable mixer with two groups, balanced input with phantom powering, hi-pass filter, lf and



hf equaliser, auxiliary send (or echo), two returns into groups, line-up oscillator, two PPMs power supply which also powers Nagra and phantom mics.

2880-IS

Minimixer for professional applications, six mic inputs and which will operate directly from Nagra recorders, balanced inputs, phantom powering, roll over filter.

58 ▶

JBL PROFESSIONAL DEALERS IN THE U.K.

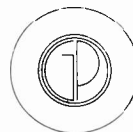


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 Telephone
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GET IT ALL

A JBL MONITOR KNOWS ITS PLACE.

A studio monitor is only a tool. It is not supposed to enhance, add to, subtract from, or in any way modify sound.

That's your job.

What a studio monitor is supposed to do is tell you precisely what's on tape. Because you have to know everything that's there.

And everything that isn't. Before it's too late.

That's why JBL monitors are in thousands

of recording and broadcast studios around the world. In fact, according to a national survey by Billboard Magazine, JBL's are in more recording studios than any other brand.

A JBL monitor plays what it's told. Nothing more. Nothing less. If that sounds good to you, contact your nearest JBL Professional Products Studio Equipment Supplier.

And put a JBL monitor in your place.

The 4301: Our newest 2-way monitor. Compact and efficient, for small broadcast control rooms and home studios.

The 4311: The most popular monitor going. A compact, full-range 3-way.

The 4315: An ultra-shallow 4-way, for maximum sound in minimum space.

JBL studio monitors come in three other models, too. All fully compatible for accurate cross referencing.



GET IT ALL.



James B. Lansing Sound, Inc. / Professional Division, 8500 Balboa Boulevard, Northridge, California, U.S.A.

SURVEY: FILM SOUND EQUIPMENT

SIEMENS (West Germany)

Siemens, 7500 Karlsruhe 21, PO Box 21 1080, West Germany.

UK: Siemens Ltd, Siemens House, Windmill Road, Sunbury-on-Thames, Middx TW16 7HS. Phone: 09327 85691. Telex: 8951091.

Duocord

Type: magnetic film recorder.
Format: 16mm, 17.5mm and 35mm magnetic film.
Tracks: centre and edge 5mm, edge track 2.4mm. Options for many other track formats.
Wow and flutter: 0.1%.
Capacity: basic 600m extendable.
Film speed: 24 or 25 frames/s.
Frequency response: 40Hz to 14kHz ± 2 dB.
S/N: 62-67dB.

Synchronisation: uses three-phase mains motors or may be driven from Rotosyn system for external synchronisation.
Features: various versions available including optical sound and vidicon picture scanner using polygonal prism.
Price: on application.

Duocord-E

Basically similar to Duocord but providing faster run-up, and simple synchronisation with other units and operate off single phase power supply.

SONDOR (Switzerland)

Sondor, Gewerbezentrum, CH-8702 Zollikon, Zurich, Switzerland.

Phone: 01 658090. Telex: 55670.
UK: Hayden Laboratories, Hayden House, Churchfield Road, Chalfont St Peter, Bucks SL9 9EW. Phone: 02813 88447. Telex: 849469.

M2prOMA3

Type: magnetic film reproducer.
Format: 16mm magnetic film, M1 17.5/35mm, M12 dual.

Tracks: centre, edge and others.
Wow and flutter: 0.08%.
Capacity: 54cm spool.
Film speed: 24 or 25 frames/s, up to x10in sync, x20 spooling.
Frequency response: 40Hz to 12.5kHz ± 1.5 dB.
S/N: 56dB.

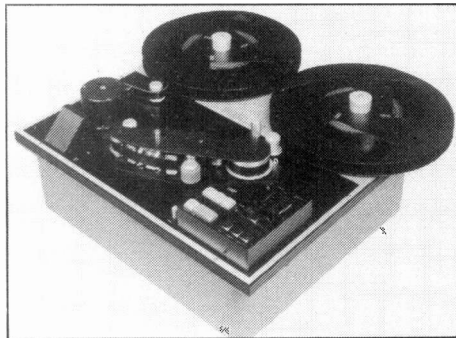
Synchronisation: interlocked to mains sync or pulse generator.
Features: up to eight channels with pre-listening.
Price: from 30,520 Swiss francs.

M2prOMA3

Similar to above but restricted facilities and max two record channels.
Price: from 33,830 Swiss francs.

Libra

Type: transportable magnetic film recorder.
Format: 16mm magnetic film.



Tracks: centre and edge, total three. Transport mechanism uses sprocket wheel drive associated with a capstan pinch wheel arrangement which considerably simplifies threading.
Price: from 17,300 Swiss francs.

STELLAVOX (Switzerland)

Stellavox, 2068 Hauterive, Neuchatel, Switzerland.

Phone: 33 42 33.
UK: John Page Ltd, Wesley House, 75 Wesley Avenue, London NW10 7DA. Phone: 01-961 4181. Telex: 24224.

SM8/SQ7

Tracks/speeds: 2 (SM8), 4 (SQ7) on $\frac{1}{2}$ in, $7\frac{1}{2}$ and 15in/s.
Frequency response: ± 2 dB, 20-28kHz at 15in/s.
Noise: ≤ 70 dB (SM8) or ≤ 66 dB (SQ8), A weighted, at 15in/s.
Wow and flutter: $\pm 0.04\%$, DIN weighted, 'typical'.
Features: battery or mains-powered portable; built-in loudspeaker; twin ppm or VU metering; single transport control; mic/line inputs.
Price: £2,998 SM8, £4,910.50 SQ7.

SP8

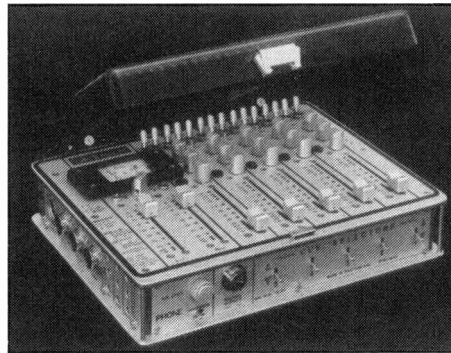
Tracks/speeds: 1 or 2 on $\frac{1}{2}$ in; $3\frac{3}{4}$, $7\frac{1}{2}$ and 15in/s.
Frequency response: ± 2 dB, 30-18kHz in stereo mode.
Noise: ≤ 65 dB, A weighted, at $7\frac{1}{2}$ in/s in stereo mode.
Wow and flutter: $\pm 0.07\%$, DIN weighted at $7\frac{1}{2}$ in/s.
Features: similar to SM8 with 50/60Hz pilot generator and cue track playback amp of synchroniser; EBU time code recording option also available.
Price: £2,137.85 less head assembly (£200 up).

TD88 TRANSPORT

Tracks/speeds: 1 (with or without Neopilot) or 2 (with or without Synchrotone) on $\frac{1}{2}$ in, 2 or 4 on $\frac{3}{4}$ in, and Perfotape for 16mm magnetic tape; $1\frac{1}{2}$, $3\frac{1}{2}$, $7\frac{1}{2}$, 15, and 30in/s, plus 24 and 25 frames/s.
Features: battery or mains-powered semiportable transport without electronics; logic control and motion sensing; interchangeable head blocks; remote control and varispeed options; electronic counter; available in free-standing or rack-mounting versions.
Price: on application.

AMI48

Five inputs for 12V AB or phantom powered capacitor mic, 48V capacitor mic, dynamic mic. XLR or Preh connectors. Bass roll-off, bass/treble lift/cut,



pan, 20dB pad each input. PFL, individual post-fade outputs. Switchable stereo compressor on two channels, limiters with LED indication on each input. Stereo limiters with LED indication on master group outputs, 880Hz line up osc. Two illuminated PPM meters. 3 x 8.2 x 10.6in, weight 1.9lb.
Price: £2,509.30 with limiter £3,272.90.

WESTREX (Italy)

Westrex Co, 65 Via C Maes, 1-00162 Rome, Italy.

Phone: 83 92 990.
UK: Westrex Co Ltd, 152 Coles Green Road, London NW2 7HE. Phone: 01-452 5401. Telex: 923003.

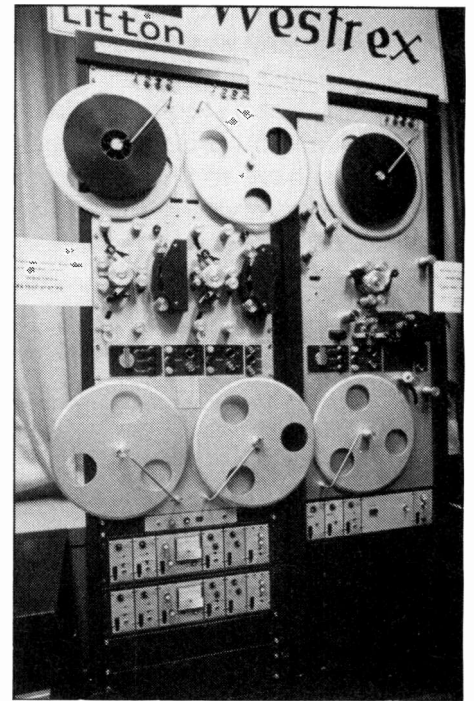
LRA1551/2 series

Type: magnetic film reproducer (1551 series), recorder/reproducer (1552 series).
Formats: available for 35, 17.5 and 16mm.

Tracks: single or multitrack.

Speeds: 24 or 25 frames/s.

Wow and flutter: 35mm 0.08%, 16mm 0.1%.



Drive motors: single or three phase.

Capacity: 720m.

Frequency response: 30Hz to 15kHz ± 2 dB (35mm), 40Hz to 10kHz ± 1 dB (16mm).

S/N: 35mm 65dB, 15mm 60dB, optical 50dB.

Synchronisation: synchronous three phase motors composite, sync interlock, and interlock with forward/reverse operation.

Features: post sync option, insert record facility optical reproduce option on LRA1551 only.

Prices: Italian lira, single, single track recorder/reproducer 6,750,000, triple track 11,350,000, dual transport triple track 14,500,000.

ST510

Similar to above, but three transports driven from a single motor, mechanically coupled, max capacity only 360m.

Prices: Italian lira, one rec/rep, two reproduce, triple track 17,750,000.

ST4000 series

Type: magnetic film transport, reproducer (ST4001 series), recorder/reproducer (ST4101 series).

Formats: 35, 17.5, 16mm.

Tracks: single or multitrack.

Speeds: 24 or 25 frames/s.

Wow and flutter: 0.1%, run-up time 1s, sound stability 3s.

Drive motors: DC servo motor.

Capacity: 600m. 35mm version, 720m 16mm.

Frequency response: 30Hz to 15kHz ± 2 dB (35mm), 40Hz to 10kHz ± 1 dB (16mm).

S/N: 35mm 65dB, 16mm 62dB.

Synchronisation: normally uses Westrex Synlock system which incorporates a low voltage three phase six pole motor, three DC/AC power amplifiers and a switching unit, enabling interlock machines to run at up to four times normal speed in forward/reverse.

Features: solenoid activated device to accelerate or brake the flywheels, mechanical speed change.

Price: Italian lira, single recorder/reproducer, single track 9,400,000, triple track 14,000,000.

ST6000 series

New series using servo motors to permit running at up to 10 times normal speed, uses ST6200 Tape-Lock motor system.

Prices: Italian lira, triple track recorder/reproducer 16,200,000.



"The original A77 had set a standard by which I have judged other domestic and semi-professional recorders for many years. It is now clear that the new B77 sets a new standard not easily surpassed at its price"

Angus McKenzie (March 1978)

REVOX

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Letters

Overhead v side stack for PA

Dear Sir, Regarding Mr Harris's article on *Hearing Matters* in November *Studio Sound*, I should like to clarify my preference to an overhead sound system. We perceive the direction of a sound source by observing the time shift of a point source as it arrives at our ears. There is also a subconscious and involuntary movement of the head to pinpoint a sound source mainly because we are more sensitive to relative phase shift than absolute phase shift. There is also the neurological aspect in that our central nervous system is more sensitive to a change of stimulus, so if the sound image moves from say left to right, but visually the artist doesn't, we are sensitive to that to the point of distraction.

We can also perceive direction in the vertical plane by much the same process, but since our ears are located on a horizontal axis, the sensitivity is considerably less. In any event with an overhead sound system wherever the artist stands, he will bear a constant relationship to the sound source in terms of vertical displacement and therefore stimulus, to which our ear/brain becomes very quickly accustomed.

Also, the actual elevation from the stage to an overhead array, even to those in the front rows, is only a few degrees—I did in my article of course refer to overhead from the performers' point of view—not the audiences. There are other reasons for preferring an overhead array under most circumstances. Such a system is more likely to provide equal path length to the audience and therefore more even distribution. Also a single stack of say 10 speaker systems will give more acoustic output than two separate systems of five speakers by virtue of the mutual coupling that exists between them when they are closely stacked.

In addition we have to consider multipath (acoustic) distortion which occurs when you have more than one sound source. To the majority of the audience, stereo is largely academic and whilst two separate sound systems can give a very pleasing spacial effect, this only occurs at specific frequencies and only when the sounds 'envelope' is wider than the time shift. On short envelope sounds such as percussion, these are heard as two or more discrete signals which are inevitably out of time with the music. This is especially important if you consider the abominable acoustics (from a contemporary music point of view) of most concert halls and auditoria. There are enough discrete reflections from the room itself without doubling them each time you add another sound source.

Possibly the best (or worst) example of this was the Stone's concert at Earls Court last year (not an easy venue) since it probably has the worst acoustics in the world. But something like eight separate sound systems were used and no matter how careful you are with delay lines to account for the different signal paths—just a single sound, say a snare drum, presents the ear with literally hundreds of sound images over a period of seconds. I supervised a concert there the following week, and a single overhead cluster was used. Apart from requiring far fewer speakers, considerably better intelligibility was achieved.

There are of course situations when side stacks are expedient, but as in all situations, the best

results are achieved with an intelligent selection of compromises, and the overhead cluster with or without separate sub-bass from experience gives generally better results.

Yours faithfully, Stephen Court, Court Acoustics Ltd, 35/39 Britannia Row, London N1 8QH.

Rock festivals

Dear Sir, It seems to me that the article *Making the Most of a Rock Festival*, was actually a letter wherein the author confessed his lack of ability and experience and finally resigns his post with the Beeb (or is this a typical BBC remote man?).

I found myself in complete sympathy with the 'Tall (obviously competent) American' who was aware of a very fundamental thing that the author was not. A concert audio engineer's prime directive is to deliver the best sound he can to the audience and the musicians themselves. The audience is the reason for the concert.

The sound crew's concern is rightly directed towards the audience, who paid to see the show not obviously bumbling radio remote twits. It seems that the author could use a little more insight into how high power music reinforcement systems are moved and operated.

Understanding what the PA engineer needs to accomplish could have possibly led to an opportunity to humble petition for any needed information and likely get it.

In general, the mixing and monitoring desks and auxiliary equipment are an ergonomic arrangement designed to fulfill the prime directive earlier stated. Any crew that ignores this is simply not going to exist for long in this business.

An engineer who lets anyone connect anything to his system without his checkout is always running at a risk to his and his firm's reputation. Any outsider's gear must of necessity be connected at the PA engineer's sufferance, and if there is indication of loading or interference, it must be pulled.

All too often, I and others on our crew have been told to connect this or that bit of recording gear to our system. In most cases, there is little inconvenience, but there is a minority who tell us that they are only bridging when they actually have terminated or unbalanced (or done worse to) a console feed. Perhaps the Tall American rightly identified the author for one of this type. In light of the contents of the article itself, I would never admit to such inept technical blundering as the author writes of, so I assume that the Tall American could see this too and did what any dedicated engineer would do, as with or without damp trousers, the show must go on . . .

Yours faithfully, Donald E. Person, Cathedral Sound Studios, 1575 5th Street, Rensselaer, NY 12144, USA.

Most rock concerts breed conflict, whether it be between management and crew, local licencing authority and management, band and crew, or PA crew and recording truck. Perhaps everybody could make consideration to others despite their inbuilt selfishness to their own

task and realise that although obviously the audience is the immediate concern, long-term survival of the band is usually in the hands of record companies (often with live albums and also with media coverage whether it be radio or TV). Poor recordings mean no live albums. Mixer manufacturers could perhaps make this recording task (which is obligatory) somewhat simpler by providing accessible high level transformer isolated multiple outputs on each channel. Loading, noise and hum loops should be considerably eased over the current trend of passive microphone splitting between monitor mixer, PA mixer and often multiple recording trucks.—Ed.

Automated mixing

Dear Sir, I read Richard Dean's article about *Automated Mixing* with great interest. It provided a good overview of the general state of affairs regarding computerised mixdown. I would like to clarify one point, however.

It was stated, and rightfully so, that: "... the automation system is an aid to mixing that remembers fader and mute position, whatever the engineer might do to them, throughout the mix".

Mr Dean seems to presuppose that all automation systems are able to deal with fader levels and mutes properly. This is not the case. Specifically, most systems, including the Allison 65K and the Harrison, do not store the mute information separately. The *Sound Workshop* system, which we call ARMS (Auto-Recall Mixdown System), writes the fader level and channel status independently. If a channel is muted, a 'mute' is stored leaving the fader level intact. On most systems when a channel is muted, a 'fader full attenuate' is stored thereby destroying the fader level data. If that channel is to be 'unmuted', it must also be unwritten. This is a great detriment to the purpose of the automation in the first place.

Systems that handle the mute data separately include *Sound Workshop's* ARMS, Neve's Necam, and MCI's JH-50 (when installed in their 528 Console).

I thank you for this opportunity to add to the article.

Yours faithfully, Michael Tapes, President, Sound Workshop Professional Audio Products Inc, 1324 Motor Parkway, Hauppauge, NY 11787, USA.

FM Acoustics amplifier

Dear Sir, In the September issue of *Studio Sound* you published a review on our FM600A which we read with interest. As there were some strange anomalies in the tested sample we would like to comment on them. First two points we know of:

1. Hugh Ford's measurement of output noise is correct (and we trust him in all other measurements too!) and represents a value that is typical for production units. The output noise of the FM600A may be a few dB's higher than other amplifiers, but from a practical point of view, this has no significance (do you know a source with 100dB S/N ratio?).

2. At the time your sample was manufactured, the short circuit limit was set relatively low and therefore the power rating at 2Ω is low. In the meantime we have changed this, and the amplifier now delivers around 400W into 2Ω single channel driven (this modification can be done by a simple resistor change in the circuit, the amplifier itself has enough reserves).

Now to the test results that are non-typical:

1. Hugh Ford writes that the amplifier tripped after 15 minutes of program power into a load of 4Ω and even into 8Ω . This is not the case normally as all our amplifiers do handle the heavy American FTC standard power test without thermal interruption.

2. The distortion measurements, although satisfactory, do indicate some kind of instability at high frequency and so does the squarewave test too. Although our amplifiers do exhibit a small overshoot, like every other good amplifier, it never reaches a level as high as in your photograph.

3. You indicate a power bandwidth of 24kHz. This is very strange as we achieve a minimum of 55kHz normally (we are using a specially manufactured 9MHz transistor)!

4. A further indication of a fault is the DC offset of 90mV. In the two final tests the DC offset is set to 20mV.

5. The 'fast rise time' and 'slow slew rate' does also indicate some strange phenomenon. Although we cannot decide definitely what the fault was, it is clear that all these anomalies are interrelated and do indicate an HF problem. It therefore might be that a compensation capacitor

or something similar has been damaged.

That the FM600A does normally not have the problems as it did have in your test is manifested in the fact that we have replaced amplifiers by a British manufacturer (which was actually very well received in your test series!) in some very critical studios, and this despite our product's much higher price. A good solution would probably be a retest of a factory-shipped FM600A if this is possible for you.

I thank you for being able to comment and would suggest that people who are interested, and able to spend the money, compare our amplifiers against every competitor's by themselves, preferably in a controlled listening situation.

Yours faithfully, Manuel Huber, FM Acoustics Ltd, PO Box 18, CH-8702, Zollikon, Switzerland.

Disc cutting

Dear Sir, Readers who like myself are concerned with high quality disc cutting may be interested in an observation I have recently made. It is now well known that lacquer masters lose their high frequency detail in time, due to material 'flow', and should be plated as soon as possible after cutting. However I have observed that lacquer discs themselves vary in frequency response at the moment of cutting. Using a Kerr Research Analyser to give immediate indication of frequency response it was noted that not all lacquers were the same. Presumably this is a function of the constituents of the

lacquer material and also characteristics presumably related to the temperature of the cutting stylus.

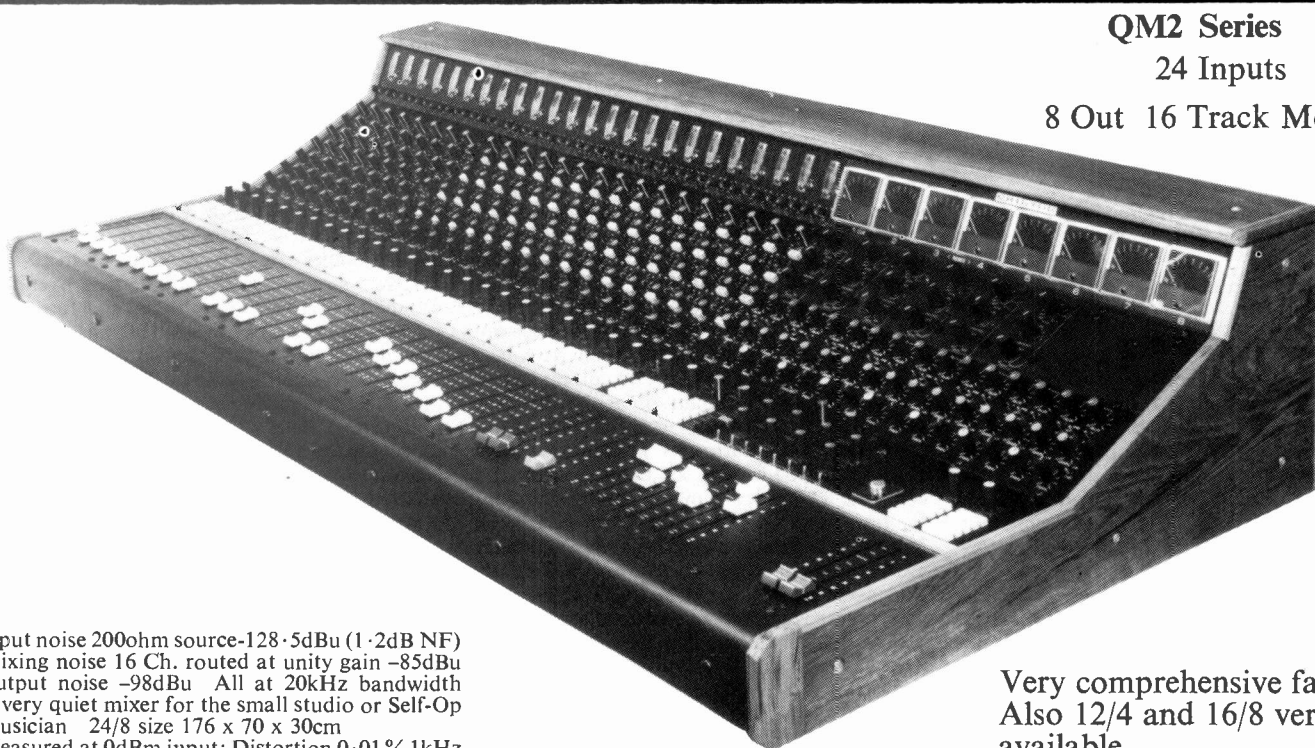
The impedance seen by the cutting stylus and therefore the response over the whole frequency range, could be affected by these factors. It would be interesting to learn if others have observed, or are working on, this problem.

Yours faithfully, John Martin, County Recording Service, London Road, Binfield, Bracknell, Berks.

Sandy Nelson

Dear Sir, In the Business section of December 1978 Studio Sound, the question is posed: was drummer Sandy Nelson right- or left-handed? The answer is, simply, that he was both. In the sixties he was injured in a motorcycle accident and had part of his leg amputated. He then changed his drumming from conventional to 'southpaw'—a complete 'relearning' of the techniques of drumming. The cover picture of The Very Best of Sandy Nelson was probably taken after the accident and therefore is not photographically transposed left-to-right.

I hope this will be of some interest to you. (A full account of Nelson's career appeared in a recent issue of New Gandy Dancer, a privately published magazine available from David Peckett, 256 Kells Lane, Low Fell, Gateshead.) Yours faithfully, George T. Geddes, Jordanhill College of Education, Southbrae Drive, Glasgow G13 1PP.



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Reviews

Feedback EW604 wattmeter

MANUFACTURER'S SPECIFICATION

The EW604 is a 3-terminal wattmeter (one terminal common to voltage and current ranges) connected to four front panel binding posts, two for connection to the supply and two for connection to the load.

Watts range: 250mW to 10kVfsd ($\pm 5\%$ of fsd) dependent upon current and voltage ranges selected.

Voltage ranges: nominal 5, 10, 20, 50, 100, 200, 500 and 1000V.

Current ranges: nominal 50, 100, 200, 500mA, 1, 2, 5, and 10A.

Overload indication: input peaks of voltage or current in excess of 1.5x the nominal range can cause overload which is clearly indicated by the appropriate voltage or current overload LED.

Overload protection: all current circuits are protected by a 10A slow blow 1 $\frac{1}{2}$ in fuse mounted on the rear panel. The circuit is designed to withstand the transient associated with normal rupturing of this fuse on all current ranges. The voltage range will withstand the nominal 250V AC supply indefinitely.

Frequency range: DC to 20kHz.

Burden: all voltage ranges 5k Ω /V, all current ranges less than 60m Ω .

Meter: 82.5mm mirror scale graduated 0 to 1.0 in 50 divisions. Reading given by Watts = (meter deflection) x (voltage range) x (current range). Push-button to give x2 scale expansion and pushbutton meter reversal.

Accuracy: $\pm 5\%$ of fsd for ranges selected.

Monitor: a 4mm socket provides an output voltage proportional to the instantaneous power. The mean value of the waveform of this voltage is 1V for full scale meter deflection.

Carrying handle: a dual purpose handle is fitted for use in carrying the instrument or serving as a table stand to present the instrument panel at a convenient working angle.

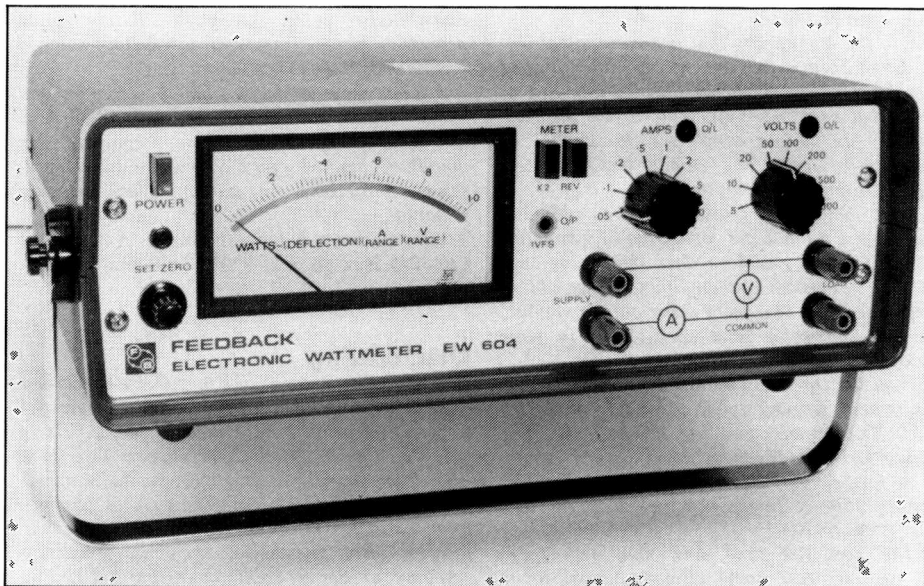
Power requirements: line voltage 200/250V or 100/125V rms, 50 or 60Hz, 4VA.

Dimensions: 300 x 225 x 115mm (width).

Weight: 1.9kg.

Price: £150.

Manufacturer: Feedback Instruments Ltd, Park Road, Crowborough, Sussex, England.



suitable at audio frequencies and also present a significant loading. The Feedback Instruments Electronic Wattmeter reviewed here is a very different kettle of fish since its current measuring system only introduces about 60m Ω series resistance over the current ranges 50mA up to 10A peak or dc, whilst the voltage measuring system has a nominal sensitivity of 5k Ω per volt over the range 5V to 1kV.

Voltage and current cannot be measured by this instrument, but it internally multiplies instantaneous voltage by instantaneous current by means of an analog multiplier and displays the result of the multiplication on a moving coil meter calibrated 0 to 1 in 50 graduations. Determination of watts requires the voltage range to be multiplied by the current range to be multiplied by the meter reading—the careful choice of voltage and current ranges makes this small amount of arithmetic very simple.

The complete wattmeter is contained in a moulded plastic case of solid construction and complete with a carrying handle/angled foot for tilting the unit when on a bench. On the front panel to the left of the moving coil meter are the pushbutton POWER ON/OFF switch with associated indicator lamp, in addition to which there is a METER SET ZERO potentiometer. To the right of the meter are two meter push-buttons—one being spring loaded for doubling the meter sensitivity and the other locking for reversing the meter's polarity when measuring highly reactive circuits.

A standard 4mm socket on the front panel provides a monitoring output with 1V DC corresponding to full scale meter deflection, but in some circumstances this could be difficult to use because the common rail for this output is commoned with the input to the voltage and current measuring circuits. In

fact because this monitoring output is not shielded it is felt that it could be a dangerous source of electric shock.

The connections to the measuring circuits are in the form of four terminals/4mm banana sockets, the two upper connections being coloured red and being the voltage input whilst the bottom two connections are the current input—this arrangement being clearly illustrated on the front panel.

The remaining controls are the voltage and current range switches with their overload indicators in the form of red LEDs. The current ranges extend from 50mA up to 10A in a 1, 2, 5 sequence with an indefinite overload capability of 10A on any range and fuse protection at 10A by means of an Imperial size fuse located in a holder on the rear panel. Similarly the voltage ranges from 5V to 1kV in a 1, 2, 5 sequence having indefinite protection against 250V AC on all ranges. Overload indication becomes operative when the peak current or voltage exceeds 1.5x the range selected.

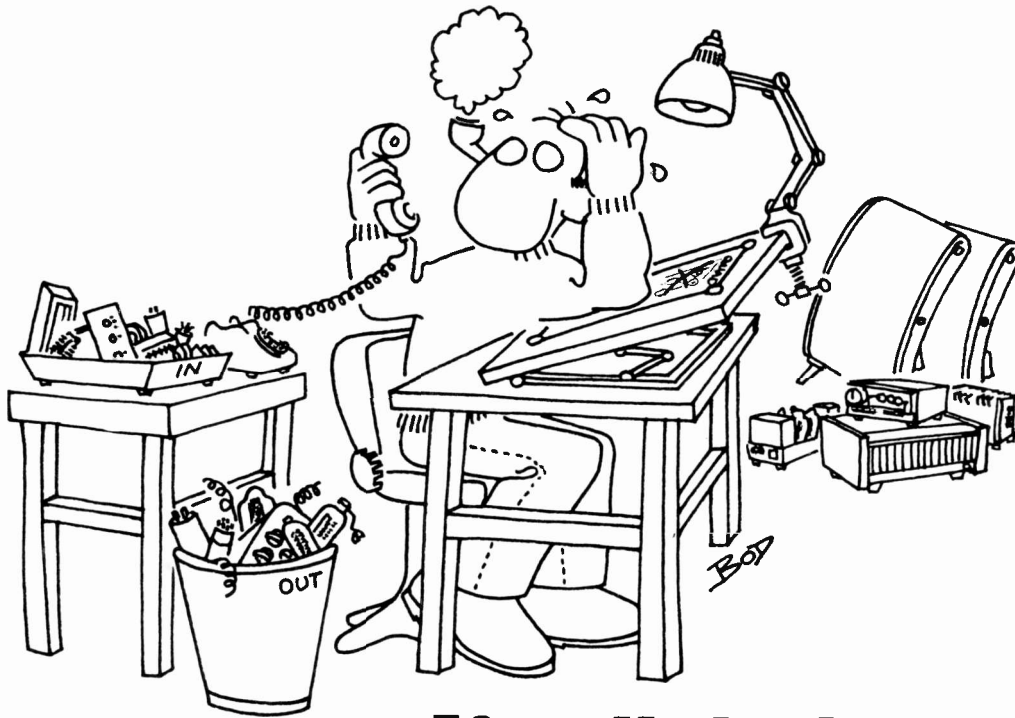
At the rear of the unit there is the aforementioned 10A protection fuse for the current ranges plus an external fuseholder which contains two spare 10A fuses. Other than these, there remains the fixed mains power lead of adequate length.

Access to the internal parts for servicing or changing the mains operating voltage is gained by removing six screws, the electronics within the unit comprising high quality components mounted on a good quality printed circuit board. The instruction manual gave a clear board layout complete with component identifications, and a full parts list in addition to operating and servicing instructions.

WHAT IS A WATT? Many people assume that if you measure the voltage across a load and the current in a load and multiply them together, this is the power in the load in watts. All too often this assumption is not true—if the waveform is not a pure sine wave, only true rms reading meters can be used and most laboratory meters are not true rms meters but average reading meters calibrated rms for sine waves only.

A second assumption is that the voltage and current are in phase which assumes that the load is purely resistive, and also that the source impedance of the drive circuit is also purely resistive. All too often these assumptions are not valid and the figure quoted for watts is not in fact true power but volt amperage (VA). Naturally this can be used to derive watts if we have a phase meter to determine the power factor, but such an arrangement is not very convenient.

It is here that the true wattmeter comes into its own, but many traditional wattmeters are electrodynamic instruments which are not



If walls had ears?

"We can't possibly use an output condenser, it must cut the bass mustn't it? And what about the damping?"

"And no output transformer, what with all that hysteresis and iron distortion."

"Pentodes? Tetrodes?"

"No, No, nothing but triodes will do."

"Triodes then, but wait, we can't have all that accumulated Miller effect."

"Transistors then?"

"Oh no, this year's crop are all hard and brittle."

"And that see-saw phase splitter, it's asymmetrical; if we fed a square wave..."

"But what have square waves to do with programme?"

"Shut up, that's irrelevant."

"Class B? But doesn't that always produce crossover distortion?"

"Ah! Feedback will cure all;"

"No, No, we've read that too much feedback causes TID or something."

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TABLE 1

Voltage range	Nominal impedance	Actual resistance	Actual capacitance
5	25kΩ	24.95kΩ	12.4pF
10	50kΩ	49.9kΩ	13.5pF
20	100kΩ	100.0kΩ	15.6pF
50	250kΩ	249.9kΩ	17.4pF
100	500kΩ	499.2kΩ	18.0pF
200	1MΩ	998kΩ	18.2pF
500	2.5MΩ	2.49MΩ	18.4pF
1000	5.0MΩ	4.98MΩ	18.0pF

TABLE 2

Indicated watts	Actual watts		
	1kHz	10kHz	20kHz
250mW	251mW	244mW	
500mW	501mW	480mW	
1W	1.00W	960mW	
2W	1.996W	1.935W	
4W	4.04W		
10W	10.09W	9.36W	10.5W
20W	20W	18.8W	21.3W
50W	50.66W	50.7W	55.7W

Voltage and current inputs

Investigations into the accuracy of the voltage attenuator in terms of the input impedance showed that on all ranges the input impedance (and therefore attenuator accuracy) was very well within the nominal requirements, Table 1.

The impedance of the current carrying terminals was found to be 53.4mΩ in series with 400nH, the latter being clearly insignificant at audio frequencies and the combined impedance being constant with current range selection. The use of ±1% resistors at negligible power rating in the current attenuator defines the accuracy of the current ranges.

Because in the case of the current and voltage ranges the overload indicators are located after the attenuators, the overload indication always occurs at a given percentage overload in relation to the selected ranges. In the case of the voltage ranges, overload indication commenced when the peak input was 170% of the selected range whilst with the current ranges overload occurred at peak currents of 210% of the selected range.

Frequency response and accuracy

Using accurate digital voltmeters, the indicated wattage was compared with the actual wattage at 1kHz, 10kHz and 20kHz at various frequencies, Table 2.

From the above it is to be seen that the accuracy at 1kHz (and it follows no worse below 1kHz) is excellent for in-phase voltage and current components with the worst case errors at 20kHz being less than 0.5dB. Investigations into the behaviour with out-of-phase voltage and current components showed that the overall accuracy remained good, Table 3.

TABLE 3

Phase angle	Percentage error
+60°	+1%
+45°	+1%
0°	0
-45°	+2%
-60°	+1%

The accuracy (or linearity) of the meter was checked on the 5W range with 1kHz in phase signals at 1kHz and using the ×2 pushbutton for deflections less than half scale, Table 4.

TABLE 4

Indicated watts	Actual watts
5W	4.99W
4W	4.01W
3W	3.13W
2W	1.99W
1W	0.995W

With regard to the readability of the meter, these results are good as was the monitor

output voltage at 0.998V DC for the nominal 1V at full scale meter deflection.

Other matters

This instrument is easy to use for power measurement into any form of load, but from an audio point of view it cannot handle really high powers due to the peak current handling capacity which limits the instrument to a nominal 10A which will be found when delivering 400W into 4Ω.

Similarly due to the minimum voltage and current ranges, it is of little use on for instance 600Ω lines. However, it is a very useful instrument for testing the more common power amplifiers into resistive or reactive loads such as loudspeakers.

Using a Bruel & Kjaer level recorder and oscillator, in conjunction with the wattmeter, produced fig 1 which is a plot of the actual power delivered into a loudspeaker at constant drive into an amplifier—it's no surprise that this curve does not tie-up with the plot of the modulus of the impedance.

Summary

This is an inexpensive but accurate instrument for measuring true power into resistive and reactive loads from DC to 20kHz with the limitation that the meter cannot be read at frequencies below about 10Hz due to jitter.

The instrument performed well within its specification and was well constructed and very simple to operate.

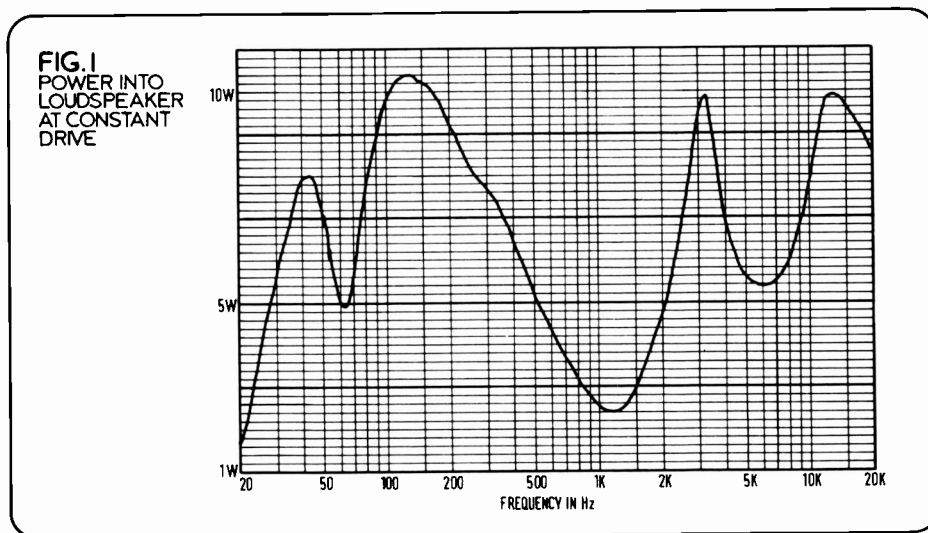
Hugh Ford

agony

A spokesman for Radio 4 said that in an attempt to make news bulletins brighter and more easily understood all false inflections and mispronunciations were to be dropped forthwith. This in no way reflected upon the newsreader concerned but was a positive high level decision.

The Radio 4 policy of 'Hunt the Programme' would continue. *Up to the Hour* was to be retitled *Out of Continuity* and would finish at 065730 and 075730 respectively. *Start the Week* would move to closedown on Thursdays, *Morning Story* would be heard just after lunch, *Afternoon Theatre* would be retimed to mid morning, *The Monday Play* would be presented on Tuesdays and there would be a summary of *The Archers* every hour on the hour.

Apart from these minor changes the familiar pattern of Radio 4 would remain the same. A listener who had written to the Head of Drama to complain about 'the most boring, badly produced and miscast soap opera he had ever had the misfortune to hear', was not in fact referring to *Waggoner's Walk* as was first surmised, but to *Prime Minister's Question Time* in the House.



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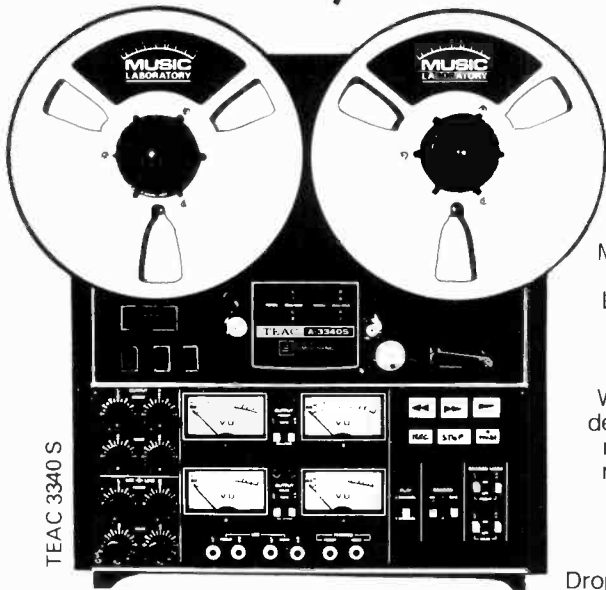
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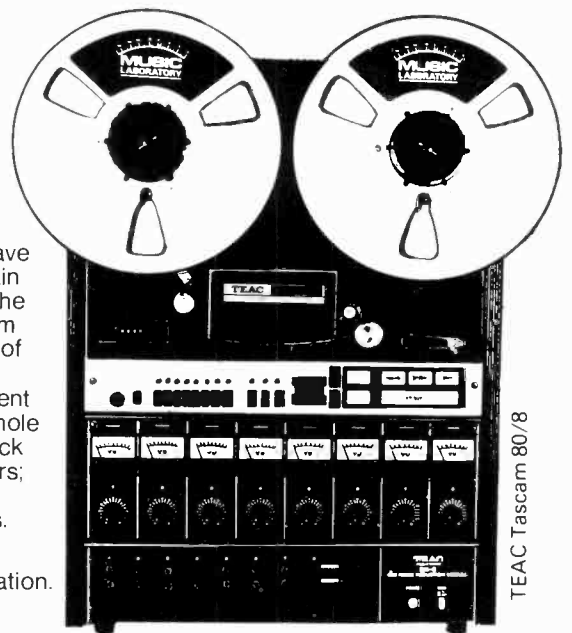
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MANUFACTURER'S SPECIFICATION

Power: 220V $\pm 10\%$ at 1A or 117V $\pm 10\%$ at 2A.
Climatic conditions: $+10^\circ$ to $+40^\circ\text{C}$, 30% to 90% humidity.
Sound carrier: magnetic film 16mm to DIN 15655/1, thickness 0.05mm to 0.1mm. Cores 100mm diameter to DIN 15531.
Magnetic heads: erase, record and reproduce head with plugs. To DIN 15910/1, 2.
Track configuration: 2 x 4mm sound tracks and one cue track, according to DIN 15655/3 and EBU 3098 compatible with previous standard 16 SEPDMAG to ISO 142 (centre track 5mm and edge track 5mm and 2.5mm).
Film speed: 25 and/or 24 frames/s.
Wow and flutter: $\pm 0.12\%$ or less to DIN 45507, peak value weighted.
Starting time: 3s or less to reach specified wow and flutter value, 0.005 seconds or less to reach nominal film speed.
Tape tension: operational 1N (100g) or less. Maximum tape tension 4N (400g) or less (fast spooling start/stop).
Noise level: within 1m with film 40dB(A) or less to DIN 45633.
Inputs: (a) Line, balanced and floating (60dB at 1kHz), impedance 10k Ω , level switchable 0, +6, +8, +15dBm ± 6 dB, mating plug LEMO FX 3.303/3 pin. (b) Unbalanced, impedance 100k Ω , level 0dBm ± 6 dB, mating plug DIN 41524/5 pin. (c) Microphone, balanced and floating (40dB at 1kHz) impedance 200 Ω , level -66dB to -40dB, fader +3dB to infinity manually controlled or 0dB to infinity with limiter, range 20dB, mating plug DIN 41524/3 pin.
Inputs for cue track: (a) unbalanced, impedance 100k Ω , level 0dBm ± 6 dB, mating plug DIN 41524/3 pin. (b) microphone (switched on by 3.5mm diameter mini-jack) unbalanced, impedance 200 Ω , level -50dB.
Outputs: (a) line, balanced and floating (40dB at 1kHz and 600 Ω), level switchable 0, +6, +8 and +15dBm, mating plug LEMO F 3.303/3 pin. (b) Unbalanced, impedance 600 Ω , level 0dB ± 2 dB,

mating plug DIN 41524/5 pin.

Output for cue track: unbalanced, impedance 30 Ω , level 0dBm ± 6 dB, mating plug DIN 41524/3 pin.
Harmonic distortion of amplifiers: -46dB or better at +12dBm, third harmonic less than 0.5%.
Sound tracks: frequency response adjustable conforming to CCIR or NAB standard, 40Hz to 14kHz replay only ± 1 dB, record/replay ± 1.5 dB, harmonic distortion at 0dB, -40dB (1%) or better. Signal-to-noise ratio unweighted without film 60dB or better, weighted to DIN 45405 record/replay 54dB or better. Erasure efficiency 70dB or better. Cross-talk rejection—record head to replay head 40dB or better, sound track to sound track 50dB or better, sound track to cue track 65dB or better.
Cue track: frequency response ± 3 dB 63Hz to 12kHz, signal-to-noise ratio unweighted 46dB or better without film, weighted record/replay 40dB or better. Erasure efficiency 60dB or better.
Film capacity: half hour with 0.085mm thick film, one hour with 0.05mm thick film.
Overall dimensions: 483mm x 444mm x 245mm.
Weight: 25kg.
Operating positions: horizontal or vertical.
Power consumption: 200W.
Price: £6,418 at 3.35 Swiss francs to £1.
Manufacturer: Sondor, Gewerbezentrum, CH-8702, Zollikon/Zurich, Switzerland.
UK Agent: Hayden Laboratories Ltd, Churchfield Road, Chalfont St Peter, Bucks.

THE SONDOR LIBRA MO3 16mm film recorder is a 3-track recorder equipped for simultaneous recording and replay with two 4mm wide audio tracks to the accepted standards, and an edge track outside the sprocket holes which may be used as an audio track or a control track. Operation at the standard film speeds of 24 frames/s or 25 frames/s is achieved by replacing the sprocket drive wheel, an operation which is extremely

simple and does not require tools.

A novel design of film transport leaves only a single sprocket and permits a straight film path without the use of complex damping devices and loops to reduce wow and flutter. With the exception of the feed and take-up motors, all the film transport components are mounted onto a 4mm thick plate mounted within the frame of the Sondor which also includes a card cage for the audio and control electronics—these are based upon a mother board into which the individual boards are plugged.

The complete film recorder is a compact, lightweight unit which can be either used as a portable recorder when a tough plastic cover is bolted over the rear, or mounted into a standard 19in rack when, because of its small height, several recorders can be fitted into a single rack.

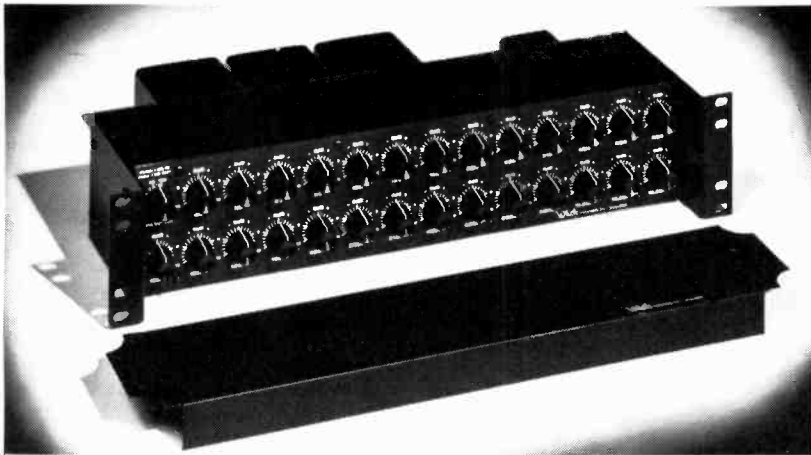
Reverting to the design of the film transport, the film is held on standard 100mm cores and these slide onto the drive shafts of the Papst outer rotor type spooling motors, push-on plates being provided to protect the film. From the pay-off motor, the film passes over a sprung damping roller and thence to a flutter roller located before the plug-in heads. Following the heads is a capstan and pinch roller (as if the unit were a tape recorder) followed by a sprung tension sensing roller and sprocket drive. The sprocket is directly driven by a stepping motor which maintains synchronisation while the capstan motor is servo controlled by the tension sensing roller position such that the sprocket is cunningly and effectively mechanically decoupled from the heads by this roller, capstan and pinch roller.

The capstan is belt driven by a separate motor equipped with an electromagnetic brake driven by the tension sensing roller servo, the capstan shaft being fitted with a heavy flywheel and the sprocket drive shaft with an opto sensor which drives the film timer. Following the drive sprocket there is a further sprung damping roller before the take-up reel.

For film loading a lever withdraws all but the flutter roller from the headblock providing a very simple path to thread—this path is also used in the fast spooling modes with the film out of contact with the sprocket wheel but, perhaps surprisingly, in contact with the heads; at the same time the pay-off and take-up drives are braked.

Film motion and the main electronics controls are fitted to a plug-in control box at the right bottom corner of the transport, and all functions included in this control box can be remotely controlled. Alternatively a simplified remote control box may be used, this box only containing the film motion controls.

Before operating the transport it is first necessary to select the PROGRAM by depressing a pushbutton selecting a red display which runs through the letters F for forward, E for external, P for pilot and S for spool, the latter function only being available with the film path open when the film spools at 30 times normal speed in either direction as set by the fast wind pushbuttons.



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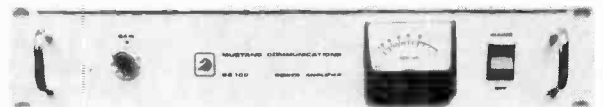
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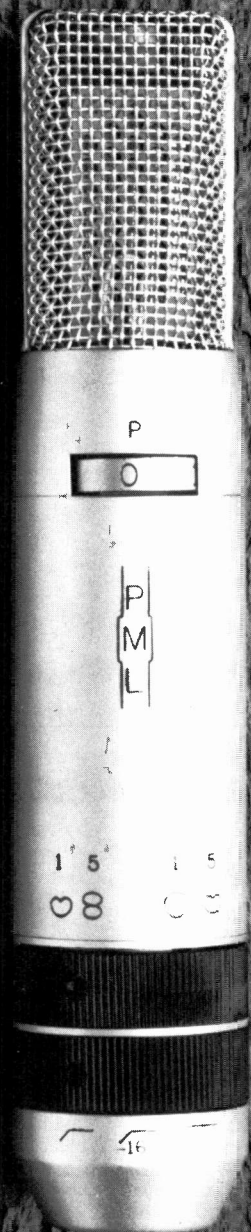
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In addition to this fast spooling function, the film may be driven in synchronism at up to 10 times normal speed when other programs are selected, the direction of spooling being controlled by the two fast wind buttons and spooling speed by how long either direction button is depressed.

In the **F** forward program, the running speed of the film is controlled by either mains frequency, an internal quartz crystal or by an external single phase 10V p-p signal in accordance with the setting of a three position switch at the rear of the transport. In the **P** pilot program, film speed is controlled by the application of an external pilot signal input the presence of which is indicated by two red lamps adjacent to the displayed program letter. In the absence of an adequate pilot input, the transport automatically reverts to an internal reference with a smooth transition. In the **E** external program, film speed and direction are controlled by the application of a suitable pulsed input which may be derived from other *Libra* recorders or from a rotary pulse generator such that any number of machines may be run in synchronism in either direction at up to 10 times normal film speed.

Control of the transport is such that the stop mode must be entered between any function expect in some circumstances, fast rewind. This function ties up with the film timer such that if fast rewind is selected, the film rewinds until the timer passes the zero indication, goes into play and stops at zero timer indication. By resetting the timer at an appropriate point in a recording, the function can therefore be used as a search function.

Peculiarly, the timer is a four digit up/down counter working in half second increments and I would certainly have preferred to see minutes and seconds with the available running time extending to one hour when using thin 0.05mm polyester film, or half an hour with normal 0.085mm thick film.

Further control box features include two LED level indicators for the audio channels, these indicators normally being connected to the replay chain but being switchable to the input by means of a spring-loaded pushbutton switch. Adjacent to these indicators are slider controls for setting record level on the microphone inputs, input selection being by means of separate 3-position paddle switches which allow either channel to be driven from line input or microphone input with manual or automatic level control. Finally there is the record function selection which operates in conjunction with red record indicators for the two audio channels and cue channel. Next to each indicator is a record button and the record mode is entered by first pushing a 'record key' button while at the same time pressing the required channel button. Interlocking is such that the machine comes out of the record mode if any film movement other than normal forward speed is selected.

Further functional controls are located above the reels of film. These consist of three toggle switches enabling any of the three tracks to be replayed from the record head, two microphone attenuator toggle switches providing 0dB, 10dB or 20dB attenuation and a further switch and potentiometer associated with the cue track in addition to three monitor level potentiometers. The latter control the level at the three monitor loudspeakers under the film reels (one for each track) and normally monitor

off the replay heads; however when the controls are depressed, monitoring is from the input to the recorder.

The switch associated with the cue track allows use of the microphone on the cue track or an external cue input in lieu of recording the normal guide signal derived from the recorder's internal crystal reference. The potentiometer is used to control the level of the input pilot signal and also when depressed records a cue signal.

Preset equalisation and level controls are located behind small plugs and are multiturn screwdriver-operated controls. Treble, mid frequency and bass equalisation controls are provided in the three replay chains in addition to level controls, but no separate equalisation is provided for the sync mode when replaying from the record head. Record preset controls consist of bias, level and high frequency equalisation controls.

All connections are located on the top surface on the recorder with the balanced audio inputs and outputs at line level being in the form of 3-pin Lemo connectors. In addition to the balanced connections, both of the audio inputs and outputs are available unbalanced at a single 5-pin DIN socket. Similarly, the microphone inputs are DIN sockets providing balanced low impedance connections. Head-phone monitoring is provided by a stereo ¼in jack socket for the audio tracks and by a further jack socket for the cue track, the use of these facilities muting the internal monitoring loudspeakers. The cue microphone connection is by means of a miniature jack socket providing a low impedance unbalanced input whilst the normal pilot input is via a DIN socket which gives a balanced input with two alternative sensitivities of 10µV into 100Ω or 10mV up to 10V. Adjacent to the pilot connection is a 3-position toggle switch for selecting the sync mode from alternatives of an external source, power line frequency or the internal quartz oscillator. Two further DIN connectors provide sync inputs and outputs for locking Sendor machines to each other as well as the external sync input and a remote cue line. Finally there is the multiway connectors for remote control, the IEC mains power connector and a mains fuse which is not identified in value.

Replay performance

The frequency response of the replay channels was checked using a BASF calibration film to the modern 70µs standard and for the two audio tracks found to be within better than ±0.5dB from 40Hz to the upper limit of the film at 14kHz with the lowest frequency of 31.5Hz being 2dB down. As received, the cue channel was 1dB up at 12.5kHz but this could be readily corrected by the replay chain equalisers which had a sensible range of adjustment as is shown in fig 1. As can be seen from fig 2 which shows the replay response of normal and sync modes, the frequency response in the sync mode is rather poor with -3dB points at 600Hz and 7kHz, but for most purposes this performance is adequate.

As received the line output level when replaying a recorded fluxivity of 320nWb/m was +3.5dBm, but the output level can be internally switched to increase this by 7dB or decrease it by 2dB or 8dB, there also being the fine level adjustment alongside the equalisation adjustments. In the case of the cue track,



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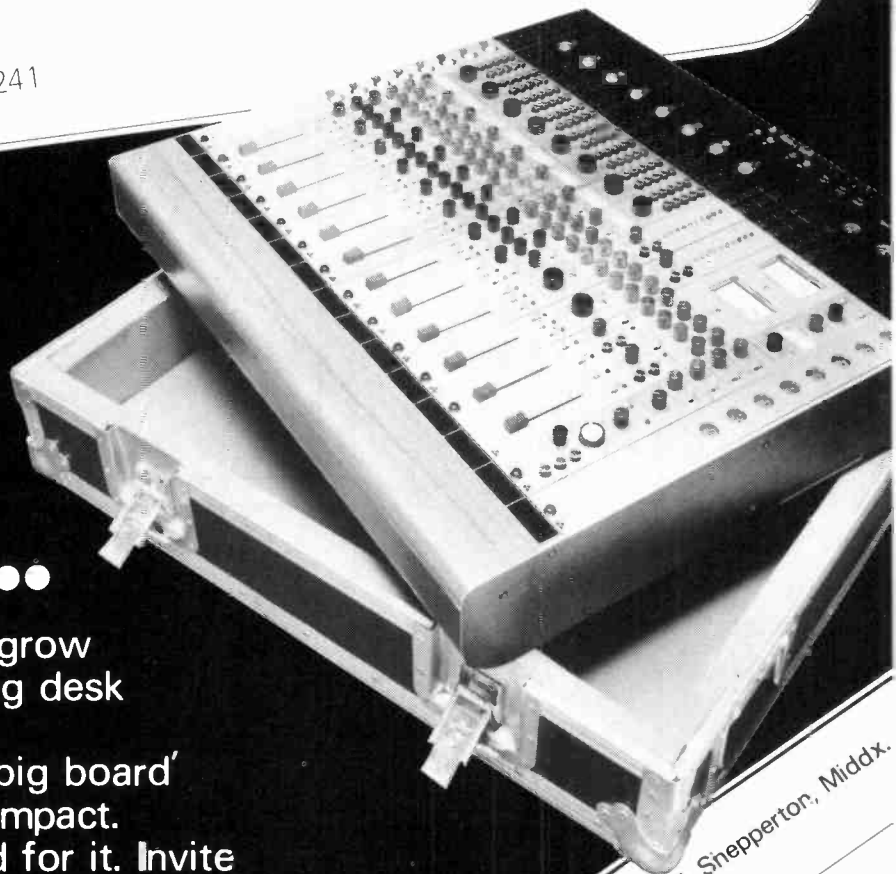
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there is only the potentiometer adjustment as is the case with the unbalanced outputs from the audio tracks.

Noise in the outputs was measured with reference to the recorded fluxivity of 320nWb/m for the replay chain alone and also with BASF Magnetfilm P which had been recorded on the

machine without any audio input; table 1.

As can be seen, the noise performance of all three tracks in the normal record and replay modes is very good, but in the sync mode this is substantially degraded quite largely due to hum pickup resulting from the lack of a head shield over the record head. However noise in the sync mode is not likely to be of great interest and the performance is more than adequate.

In the review machine, a peculiarity was found in the replay chain which led to apparent crossover distortion which appeared to be level sensitive. The nature of this distortion is shown in fig 3 which shows a 2kHz tone recorded 10dB below 320nWb/m together with the distortion products which measured 0.6% total harmonic distortion and noise. At the time of writing this is being investigated by the manufacturer in Switzerland and it is hoped that this is only a sample defect peculiar to the review machine.

Record/replay performance

The overall record/replay frequency response of the audio tracks as received is shown in fig 4 which illustrates a good performance which could be improved upon by careful adjustment of the record equaliser which

72 ▶

TABLE 1 REFERENCE LEVEL TO NOISE
RATIO (320nWb/m)

Machine only without film	Channel		Cue track
	1	2	
20Hz to 20kHz band-width rms	67.5dB	67.5dB	50dB
'A' weighted rms	74.5dB	74.0dB	60dB
CCIR weighted quasi-peak*	63.0dB	62.0dB	50.5dB
CCIR weighted rms*	67.5dB	66.5dB	55.0dB
Machine recorded film			
20Hz to 20kHz band-width rms	58.0dB	58.0dB	41.5dB
'A' weighted rms	63.0dB	63.0dB	49.0dB
CCIR weighted quasi-peak*	50.0dB	49.5dB	36dB
CCIR weighted rms*	54.0dB	54.0dB	40.5dB
Sync mode without film			
20Hz to 20kHz rms	42.0dB	44.5dB	33dB
'A' weighted rms	59.5dB	57.5dB	53.5dB
CCIR weighted quasi-peak*	53.5dB	52.5dB	44.5dB
CCIR weighted rms*	57.5dB	56.5dB	49dB

*Unity gain at 1kHz

FIG.1
SONDOR LIBRA
MO3 REPLAY
EQ RANGE

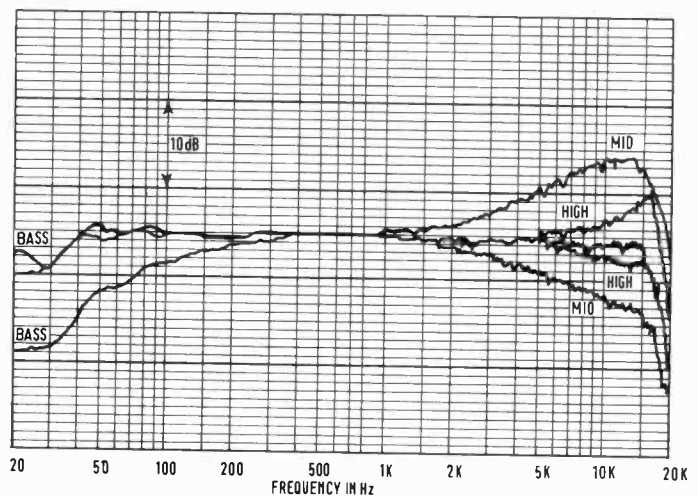
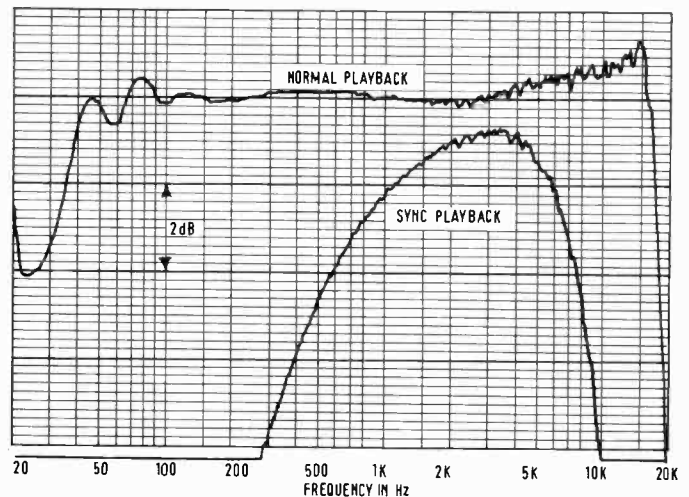


FIG.2
SONDOR LIBRA
MO3 NORMAL &
SYNC PLAYBACK
RESPONSE



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provides a well chosen range of equalisation and, like the other pre-set controls, was easy to set accurately. With the exception of the low frequency response which fell to -2dB at 50Hz , the performance of the cue track was similar to the audio tracks.

For the above and other record/replay testing BASF Magnetfilm P was used, this giving a maximum output level for 3% third harmonic distortion of $+5.5\text{dB}$ above the reference fluxivity of 320nWb/m . The third harmonic distortion when recording at 320nWb/m is shown in fig 5 which shows satisfactory levels of distortion. Similarly the intermodulation distortion to the CCIF twin tone method was satisfactory at 1% at 1kHz at 320nWb/m .

Recording and replaying a 1kHz square wave gave the result shown in fig 6 which

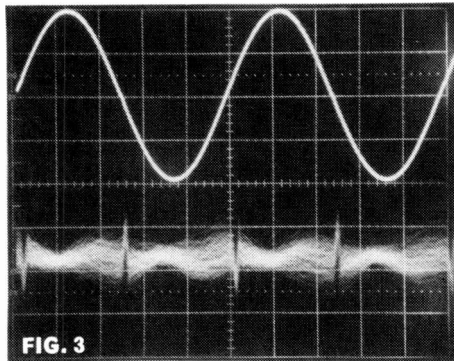


FIG. 3

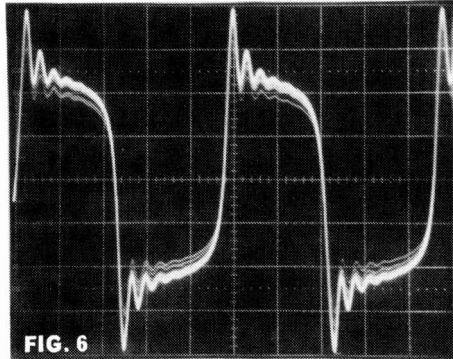


FIG. 6

suggests a larger amount of ringing than might be desirable, but this sort of result is typical of many recorders.

The crosstalk when recording one track with signal and the other track without signal and replaying the film is shown in fig 7 which is a commendable result with the erasing capability at 1kHz being in excess of 70dB for either audio track.

Investigations using the microphone inputs revealed that both inputs were rather noisy with a significant difference between the two inputs, the equivalent input noise being shown in table 2.

	Channel 1	Channel 2
20Hz to 20kHz rms	-113.5dB	-109.5dB
'A' weighted rms	-114.5dB	-109.5dB

74 ▶

FIG. 4
SONDOR LIBRA
M03 OVERALL
RECORD/REPLAY
RESPONSE

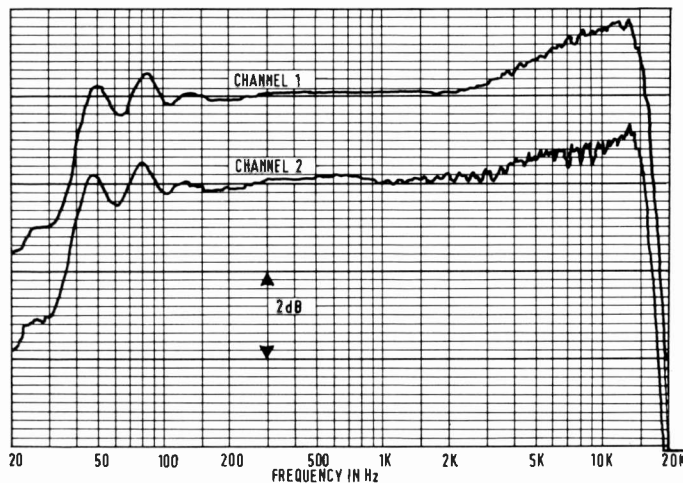
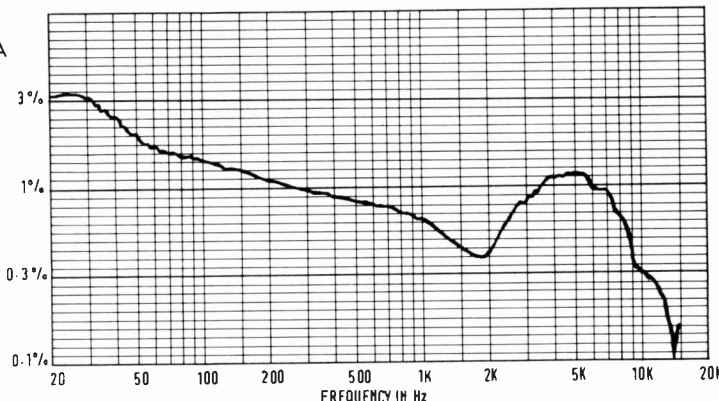


FIG. 5
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per•fec•tion•ism (pər-fek-shə-niz-əm) *N.* A propensity for setting extremely high standards and being displeased with anything less. (see perfection)

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The subjective performance of the automatic level control associated with the microphone inputs showed that this was a useful feature which did not give excessive breathing effects and reacted with suitable speed to avoid distortion on transients.

A final check of the record/replay performance was to measure the phase jitter between the two audio tracks by recording a 10kHz tone and measuring the phase jitter of the replayed tone with a Bruel & Kjaer phase-meter. The resulting output was displayed on an oscilloscope to produce fig 8 which demonstrates an excellent performance.

Wow and flutter

Checking the wow and flutter throughout a full roll of film gave a consistent 0.07% to the IEC quasi-peak weighted standard—a good performance by film standards and far better than the manufacturer's specification. However, a narrow band spectrum analysis of a 10kHz recorded tone to reveal scrape flutter produced fig 9 which, by tape standards, is not a good performance—however I have not done this measurement on other film recorders and suspect that worse results may well be common.

Inputs and outputs

The input level required at the balanced line inputs to record a fluxivity of 320nWb/m was found to be +4dBm into an input impedance of 11.2kΩ with the record amplifiers variable level control giving a range from +9.5dBm to -14dBm in addition to the internally switchable sensitivity. This flexibility together with the sensible sensitivity and impedance of the unbalanced input (-4dBm into 120kΩ) provides an excellent interface.

However investigating the microphone input showed that whilst its sensitivity was sensible (switchable -80dBm, -69dBm, -61dBm) the constant input impedance was far too low at 187Ω. This is because the manufacturer has for some reason seen fit to shunt the inputs with 220Ω resistors and these should clearly be altered to bring the impedance up to about five times the nominal microphone impedance.

In the case of the cue track, the microphone input impedance was 10kΩ approximately into an unbalanced input with a sensitivity of -62dBm, there being an automatic gain control associated with this input but not the cue input which had a sensitivity of -1.5dBm into 120kΩ.

The output level at the line outputs was found to be set to +3.5dBm when replaying

a fluxivity of 320nWb/m with the replay amplifier being capable of giving up to +16dBm with this internal switch setting of output level, the output impedance remaining low but varying with the switch settings.

Other matters

The pilot tone input is a fully floating input with two sensitivities, the high sensitivity input requiring a minimum of 10μV into the input impedance of 112Ω whilst the low sensitivity input requires a minimum of 10mV into 100kΩ. In both cases, the sensitivity is adjusted by the front panel control for the LED pilot indicator to illuminate adjacent to the film timer.

Synchronisation with external sources is by the external sync input which accepts sine

waves or square waves and requires a minimum of 8V p-p into a measured input impedance of 570Ω. In the cases of the sync and pilot inputs, the frequency range over which locking occurred was found to be 47Hz to 54Hz irrespective of input level—certainly an adequate range.

Checking the characteristics of the so-called 'VU meters' which are not even specified as genuine VU meters, showed that they had an average rectifier characteristic with a rise time of approximately 80ms and a fall time of 800ms. As zero level was set to be 3dB above a fluxivity of 320nWb/m, this means that the maximum indication of +3dB approximates to the 3% distortion point which would appear to be a satisfactory setting.

Summary

The Sondor *Libra* was found to be a delight to operate as it is a well conceived machine with practical controls and with the great advantage of being extremely simple to load in view of its ingenious mechanical design.

Generally the performance of the electronics was good, but the microphone inputs were not entirely satisfactory and the crossover distortion in the replay amplifiers is hopefully only a sample defect.

The synchronisation facilities were excellent and highly versatile, and in addition the ability to silently drop in and out of record should prove to be a great asset.

Hugh Ford

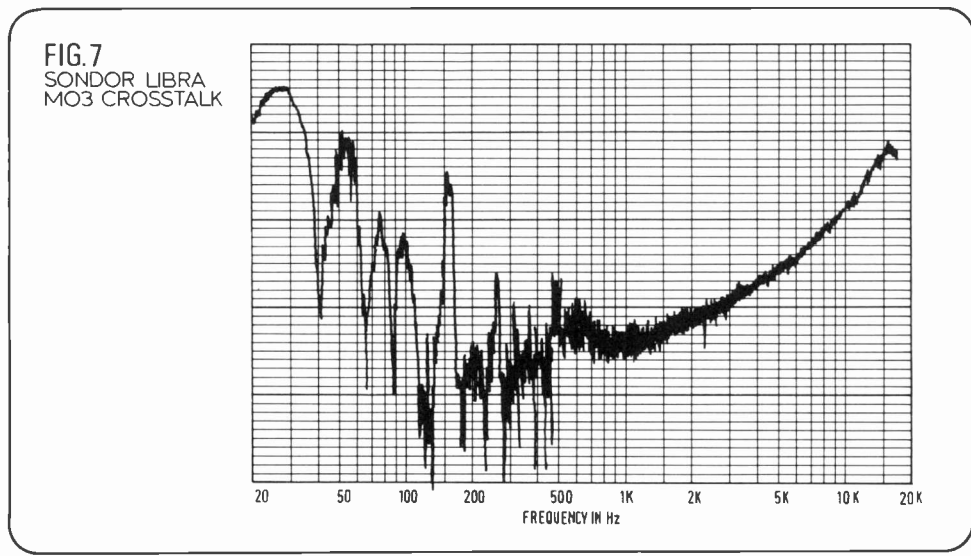
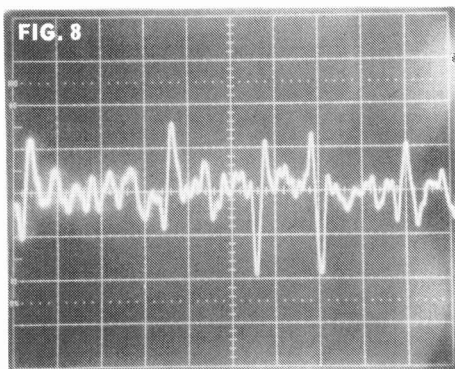


FIG. 7
SONDOR LIBRA
MO3 CROSSTALK

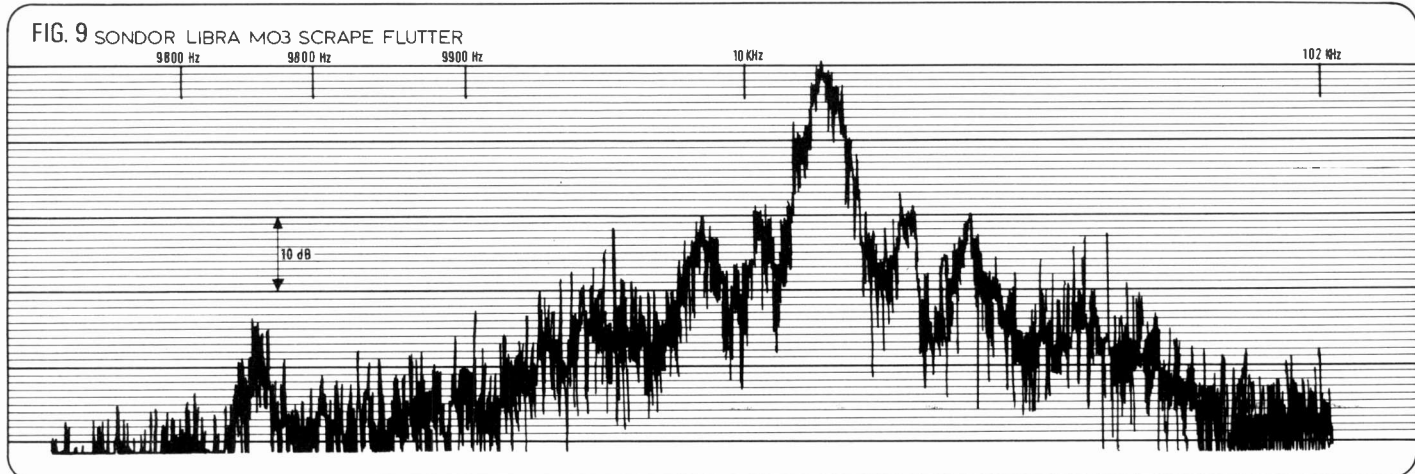


FIG. 9 SONDOR LIBRA MO3 SCRAPE FLUTTER

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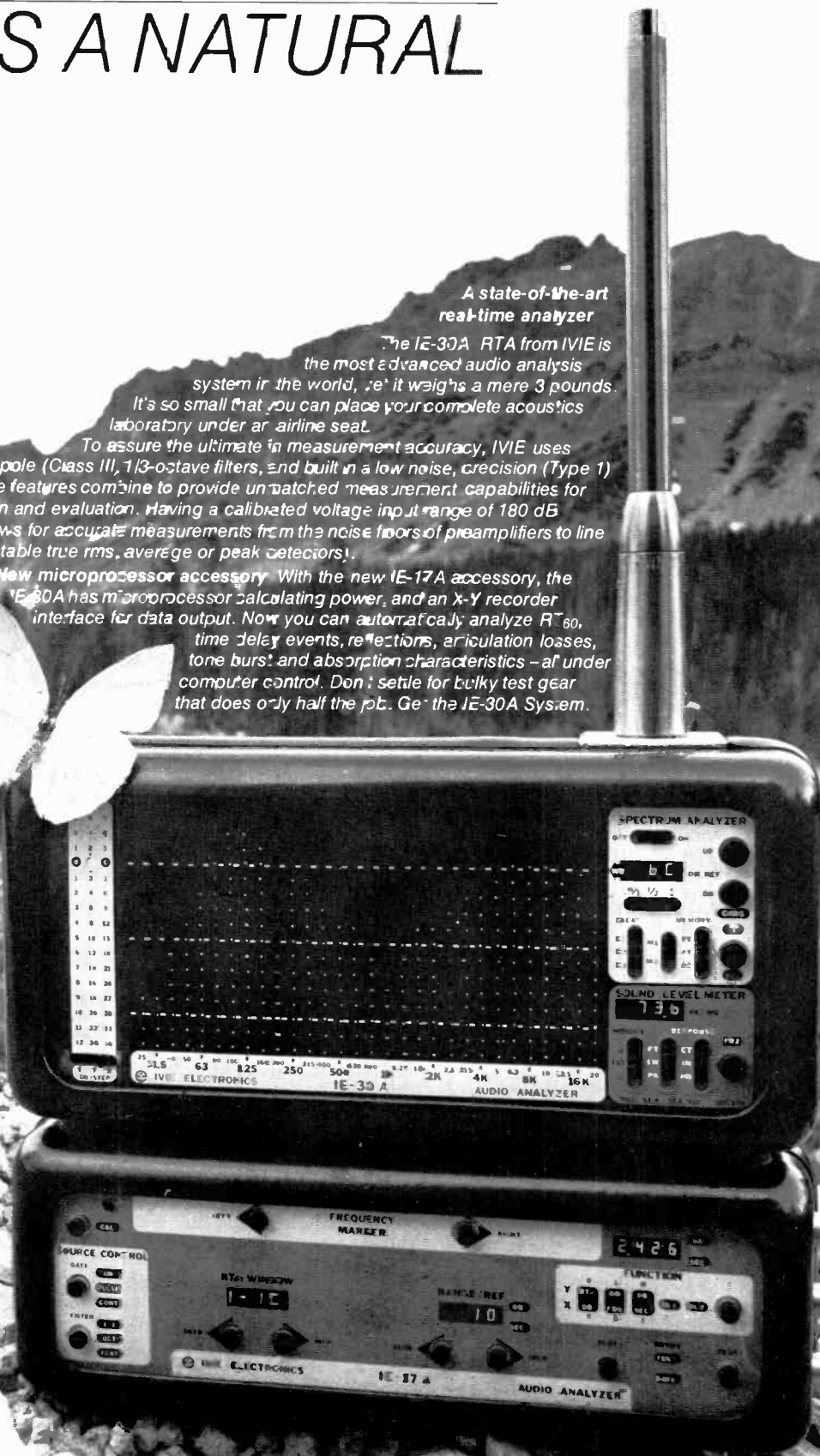


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Stellavox SP8 portable tape recorder



MANUFACTURER'S SPECIFICATION

Maximum reel diameter: 5in (13cm), with ABR accessory 11½in (30cm).

Speed stability: ±0.1% or 1.0% between -4 and +158°C.

Wow and flutter: ±0.07% DIN.

Fast motorised rewind: approximately 45s per 600ft (180m).

Rewind current: 70mA.

Power supply built in: with 15 cells accumulators AA size or external power supply 15 to 25V.

Power consumption: 90 to 110mA (average).

Double modulometer: with light about 1ms for -1dB.

Frequency response: overall ±2dB at 19cm/s mono 20Hz to 16kHz, stereo 30Hz to 18kHz.

Total harmonic distortion: at 1kHz with modulation at 510nWb/m less than 2%.

Overall crosstalk: stereo greater than 45dB at 1kHz.

Erase efficiency: at 1kHz 80dB.

Signal to noise: with ASA 'A' filter, relative to 510nWb/m, mono 69dB stereo 65dB DIN weighted mono 62dB, stereo 60dB, unweighted 20Hz to 20kHz mono 62dB, stereo 60dB.

Inputs: mics 1 and 2 symmetrical 200Ω, max sensitivity 180μV, overload possibility +7.5dB re +6dBm (+5dB with SOT 8). With dynamic mics and switchable supply for condenser mics parallel

and phantom fed, separate switching 12(option) 48V. Mixer 1 and 2 1.55V. Pilot 0.5 to 2.0V. Clapper +10 to +20V. Lines 1 and 2 with controls (or two additional microphones with accessory ALP) 130mV to 12V.

Outputs: (symmetrical with SOT 8) 1.55 + 4.4V at 200 + 600Ω. Direct I + II (unsymmetrical) 1.55V maximum 3.8V. Pilot (and crystal with SXQ123) frequency switchable.

Crystal generator: (SX 123) frequency switchable 50 + 60Hz.

Range of compressor: 1.5 to 40mV, frequency response 20Hz to 20kHz ±1dB.

Distortion: at an input of 20mV, less than 0.1%.

Frequency response: 20Hz to 20kHz ±1dB.

Weight: with batteries, tape and carrying case 4.6kg.

Overall dimensions: 83 x 215 x 270mm.

Price: basic machine without heads £2137.85, one speed mono head £218.21, 1-speed stereo £261.86, 2-speed stereo £349.14, with synchrotone £437. Batteries £35.00, power supply and charger £130.93, large reel adaptor ABR £130.93.

Manufacturer: Stellavox, 2068 Hauterive, Switzerland.

UK Agent: John Page Ltd, Wesley House, 75 Wesley Avenue, London NW10.

mechanical protection for the controls and connectors, and a rear hinge enables the perspex lid to be lifted off. Also at the rear is the battery compartment (with hinged cover) which holds 15 AA size batteries which may be of the nickel cadmium rechargeable type and be charged in situ by means of the accessory power supply/battery charger.

Tape drive is by means of a single servo motor with an integral capstan together with a dual belt drive to the tape spools up to a maximum diameter of 130mm. Tape tension at the spools is controlled by mechanical clutches operated by servo arms and rollers, the design being such that the spools do not rotate whilst the recorder is being transported in the stop mode.

From the pay-off spool, the tape passes over the pay-off tension roller (fitted with a 60Hz stroboscopic disc) and from there over a roller arm which is automatically retracted in the fast wind mode so that the tape is out of contact with the heads. The plug-in headblock is secured by three Allen screws with the main deck plate being used as a reference face. The mounting of the four heads is solid with azimuth adjustment by means of screws located under the head cover where the equalisation and bias setting components are soldered onto a small printed circuit board. In the case of dual speed headblocks, a rotary 2-position switch is fitted at the headblock rear. In the case of mono and stereo headblocks, there is a full track ferrite erase head while the remaining record, replay and pilot heads are metal—fixed tape guides are located between the four heads.

Upon exit from the replay heads the tape passes directly to the capstan and pinch roller, the latter being on a swinging arm similar to the roller at the entrance to the headblock, but this time the arm is hinged so that the pinch roller can be withdrawn from the capstan and locked in the withdrawn position so that the tape can be shuttled by hand for editing.

While access to the replay head is impossible for editing, the tape can be marked under a black dot on the headblock and then moved by hand for one half turn of the roller at the entrance to the headblock locating the edit point under the black dot on the headblock—the entrance roller is marked with black dots for measuring half turns.

From the capstan the tape passes to the servo roller controlling take-up spool tension, this roller having a 50Hz stroboscopic marking. Extremely low tape tensions are used (in the order of only 20g including the fast rewind mode) with the result that the use of standard play tape would be asking for trouble, and the head to tape contact with long play is not particularly happy.

The controls on the main deck plate consist of a 3-position toggle switch which in one direction initiates a fast forward function when in the play mode and in the other position records a 1,223Hz 'beep tone' at a level of 320nWb/m. Next is a switched potentiometer for the internal loudspeaker under the deck plate with the potentiometer acting as a volume

THE STELLAVOX SP8 recorder is the successor to the SP7 model which has been on the market for several years and is the main competition for the various Nagra recorders.

One attraction of the Stellavox is its very light weight when compared with other professional portable machines, and for its size there are an amazing number of facilities included within the case. Whilst the tape transport is 3-speed (15, 7½ and 3¾in/s or 38, 19 and 9.5cm/s), the complete recorder can only be a single or dual speed machine because bias and equalisation components are located in the headblock. A variety of mono, stereo and double track mono heads are available for

single or dual speed working, with or without pilot track facilities in the form of either 'neopilot' or Stellavox's own 'synchrotone' pilot system.

A large collection of other accessories are available (some of which were fitted to the review machine) including a crystal generator, clapper oscillator and pilot pre-amplifier, including a synchroniser which copes with up to ±3% speed variation and is capable of operating at either 50Hz or 60Hz.

The tape transport is based on a single alloy plate onto which transport components are bolted and which mounts onto a diecast alloy box forming the recorder's case. The front and the two sides of the case are recessed providing

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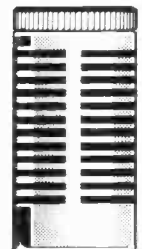
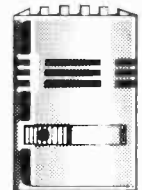
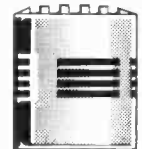
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control with an off position. Finally there are two microphone input attenuator switches (one for each channel) each with four positions providing 0dB, -10dB, -20dB and -30dB input attenuation—a very sensible idea.

At the front of the recorder, on the left is a twin illuminated level meter with both movements calibrated in decibels at +4dB, 0dB, -5dB, -10dB and -20dB and also from zero to 3% for use with the internal synchroniser—the left movement is also calibrated from zero to 2.5V for use with the pilot system. To the right of the meters is a swinging needle type pilot signal indicator plus a small, 4-position rotary switch which controls the meters' functions. This has in addition to a 'level' position, positions for measuring pilot in, pilot output voltage, and the speed correction being used by the internal synchroniser—these facilities working with the aforementioned meter scales. An additional feature is a red indicator lamp illuminated when the recorder is running in synchronism which can nominally be held over a $\pm 3\%$ speed range.

The next features are two small and rather fiddly potentiometers which control the line input levels for each channel, the microphone inputs being controlled by two easy to operate and calibrated arrow type knobs—these cannot however normally be ganged for stereo level changes but a ganging option is available. Whilst these operate as microphone record level controls in the record mode, in the replay mode they control the level of the line outputs depending upon the setting of the adjacent TAPE/DIRECT switch. Miniature push-button switches allow internal battery voltage to be monitored and illuminate the meters, however the latter switch is not of a locking type so that when working in the dark, you only have one free hand for manipulating controls, holding microphones and so on (an option allows the illumination to hold on for 25s and then fade).

The final front panel control is another arrow type knob which controls the tape transport functions with in clockwise order REWIND, PLAY, STOP, TEST, RECORD and AUTOMATIC RECORD with the latter including an automatic level control in the record electronics. When this knob is in any position other than STOP, a bright red fluorescent spot is uncovered to

indicate that the recorder is switched on.

Tape speed is controlled by a rotary switch to the right of the recorder with positions for 15in/s, $7\frac{1}{2}$ in/s and $3\frac{3}{4}$ in/s plus an EXTERNAL position which allows the use of an accessory speed control via an adjacent miniature co-axial socket. The remains of the right hand side are occupied by the headphone monitor jack of the 3-pole stereo $\frac{1}{4}$ in variety and also by the transformer coupled floating line output with nominal ratings of 4.4V into 600 Ω and 1.5V into 200 Ω via 4mm banana sockets.

All other connections are to the left of the machine, there being two XLR microphone sockets (with the option of plugs) associated with a SPEECH/MUSIC switch for inserting a highpass filter and two 4-position coin operated switches in the base of the recorder. These two switches provide for dynamic microphones, 12V A/B powering or phantom powering and finally 48V phantom powering for capacitor microphones.

Located next to the microphone connections is a screwdriver operated MONO/STEREO switch and four Tuchel locking sockets. The first of these identified as AUX provides for the line inputs controlled by the small front panel potentiometers and in addition there being two fixed level 'mixer' inputs and a supply voltage output so that these inputs can be used with accessory microphone pre-amplifiers. The OUTPUT socket provides a voltage supply together with two line outputs switched by the DIRECT/TAPE switch in addition to headphone outputs. The SYNCHRO connector simply has pilot tone input and output plus a pin for actuating the clapper signal. A 3-position screwdriver operated switch beneath the machine selects the synchronisation mode such that the tape can be synchronised to either the internal 50/60Hz oscillator (the frequency being selected by a switch within the machine) or to an external signal. In addition there is the oscillator position where the pilot tone is recorded from the internal oscillator.

In spite of the large number of controls and connectors, the machine is simple to connect and operate with the possible exception of the line level controls which are rather too small and fiddly. The identification of all features is very clear and the overall standard of mechanical finish really excellent. The majority of the

80 ►

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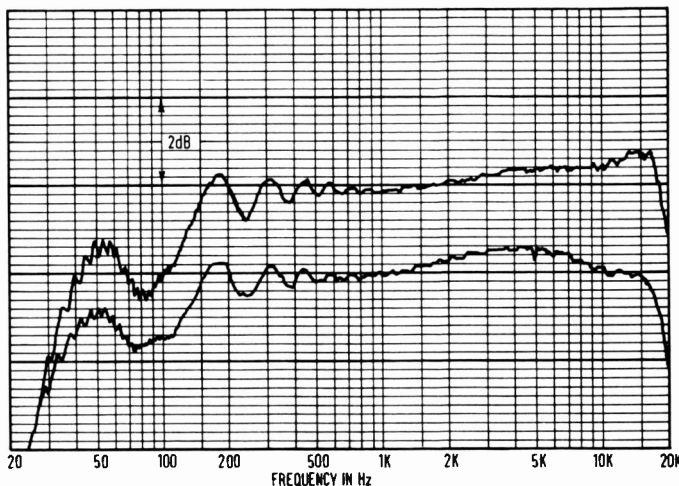
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FIG. 1
STELLAVOX SP8
OVERALL STEREO
RECORD/PLAYBACK
RESPONSE AT
7 $\frac{1}{2}$ in/s



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electronics within the machine are contained in plug-in modules with virtually the whole of the back of the transport plate being covered by the glass fibre printed mother board which interconnects the various modules. There is a minimum of hand wiring which is quite tidy, but two large capacitors were noted floating in the air near the pay-off spool clutch.

The separate power supply/battery charger is a neat unit housed in a rectangular alloy tube with one face bearing the operating instructions and two lights—one illuminates when power is applied to the charger and the other when battery charging is in action, the charging rate being 50mA and requiring a minimum 14 hour charging period. One end of the tube contains an IEC mains connector together with two properly identified fuse-holders, whilst the other end has the Tuchel connector for connecting to the recorder and the multiway mains voltage selector. The standard of construction is neat both internally and externally, and the safety aspects of the charger appeared to be satisfactory.

Also supplied with the review machine was the ABR large reel adaptor unit which consists of a plate clamping underneath the recorder and to which are fixed two raised hubs for holding the tape spools. In use, the hubs on the recorder have drive pulleys/tape guides screwed over them and these are used to belt drive the hubs on the large reel adaptor designed for cine centres, but NAB adaptors are also available.

In view of the very low tape tension at which the recorder operates, I don't like the idea of this adaptor and feel that should a tape which has been wound on this adaptor then be wound on a high tension mains machine, it is likely that tape damage could occur.

Replay performance

The replay chain frequency response to the line output was initially investigated using the stereo headblock at 7½in/s, and the mono full track headblock at both 7½in/s and at 15in/s using BASF calibration tapes. Using the mono headblock at 15in/s, the response from 31.5Hz to the upper limit on the tape of 18kHz was good at ±1dB but at 7½in/s with either headblock, the high frequency performance was erratic. Checking the replay equalisation with a flux loop showed that the equalisation was in fact correct and it is considered that the erratic replay performance with the calibration tapes is due to the stiffness of the calibration tapes combined with the very low tape tension over the heads.

Whilst the review machine was equalised to the IEC standard of 35µs at 15in/s and 70µs at 7½in/s other equalisations are available using different headblocks. When replaying a tape fluxivity of 320nWb/m, the output level at the line outputs was found to be +6.5dB ref 0.775V with either headblock at a tape speed of 7½in/s or +6dB at 15in/s, but when using the transformer coupled outputs, the output level may be varied by the record level controls for the microphone input and it is all too easy to run the outputs into clipping at the tape fluxivity of 320nWb/m.

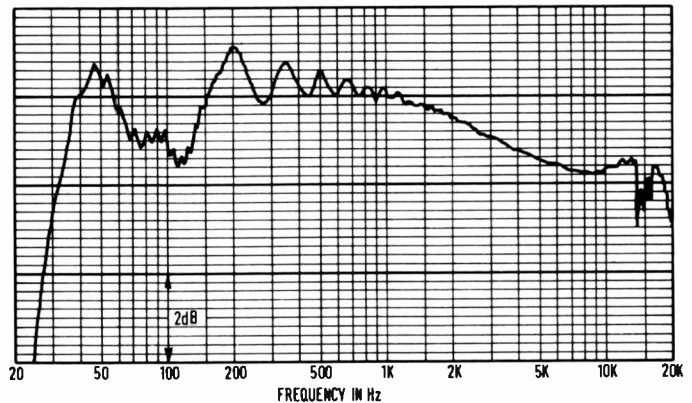
As is to be seen from Table 1, the weighted noise performance of the machine is really excellent, but particularly with the stereo headblock the unweighted noise is not so good. The figures quoted for this represent the

TABLE 1 REFERENCE LEVEL (320nWb/m) TO NOISE PERFORMANCE

Machine without tape	15in/s mono	7½in/s mono	7½in/s stereo
Unweighted rms 20Hz to 20kHz	62dB	60dB	49.5dB*
'A' weighted rms	76.5dB	75dB	69dB*
CCIR weighted quasi-peak ref 1kHz	66.5dB	64.5dB	62dB
CCIR weighted rms ref 1kHz	71dB	68.5dB	66dB
Machine erased 3M 207 tape			
Unweighted rms 20Hz to 20kHz	57dB	56.5dB	49dB*
'A' weighted rms	64.5dB	65dB	62dB*
CCIR weighted quasi-peak ref 1kHz	51.5dB	51.5dB	49.5dB
CCIR weighted rms ref 1kHz	56dB	56dB	53.5dB

*Worst channel due to motor noise

FIG. 2
STELLAVOX SP8
OVERALL MONO
RECORD/REPLAY
RESPONSE AT
15in/s



worst channel with the other channel being 6dB better, this large difference being due to low frequency noise picked up from the motor. (The UK agent states that this was due to electrical misalignment of the head block.)

Record replay performance

The available dynamic range can be determined by adding the maximum output level for 3% third harmonic distortion at 1kHz with reference to 320nWb/m to the above figures for 3M 207 tape. This was found to be +4.5dB for the stereo headblock or +6.5dB at 15in/s and +6.5dB at 7½in/s for the mono headblock. Examining the record amplifier's drive capability showed that serious distortion set in at a recording level 8dB above the level required to record 320nWb/m at 1kHz on 3M 207 tape—a very narrow margin for many high output tapes!

Overall record/replay frequency response with the stereo headblock for the two tracks is shown with 3M 207 tape in fig 1 which illustrates a good matching between the two tracks

but with the mono headblock at the same speed of 7½in/s there was a 1dB drop at 10kHz increasing to 3dB at 15kHz. At 15in/s the performance could also be bettered, a 2dB drop at high frequencies as shown in fig 2.

Overall record/replay third harmonic distortion at a level of 320nWb/m was found to be satisfactory as shown in fig 3 for 15in/s, the results being similar at 7½in/s but with the dip in distortion occurring one octave lower. Similarly the CCIF difference frequency distortion was satisfactory as shown in fig 4 for 15in/s.

Using the stereo headblock at 7½in/s produced a very good crosstalk performance between tracks with a level of -50dB at 1kHz as shown in fig 5, and at no time was there any significant crosstalk from the pilot track with either set of heads.

Recording and replaying a squarewave of 1kHz at 15in/s produced a small degree of ringing as shown in the oscillogram fig 6 but there is nothing unusual about a performance such as this.

82 ▶

ASTONISHING STEREO DISC AMPLIFIER 2

FOR BROADCASTING, DISC MONITORING AND TRANSFER WITH THE HIGHEST QUALITY

Stereo Disc Amplifier 2 is a self contained mains powered unit which accepts cartridge inputs and produces balanced line level outputs. Permanent rumble filtering and switched scratch filtering is included.

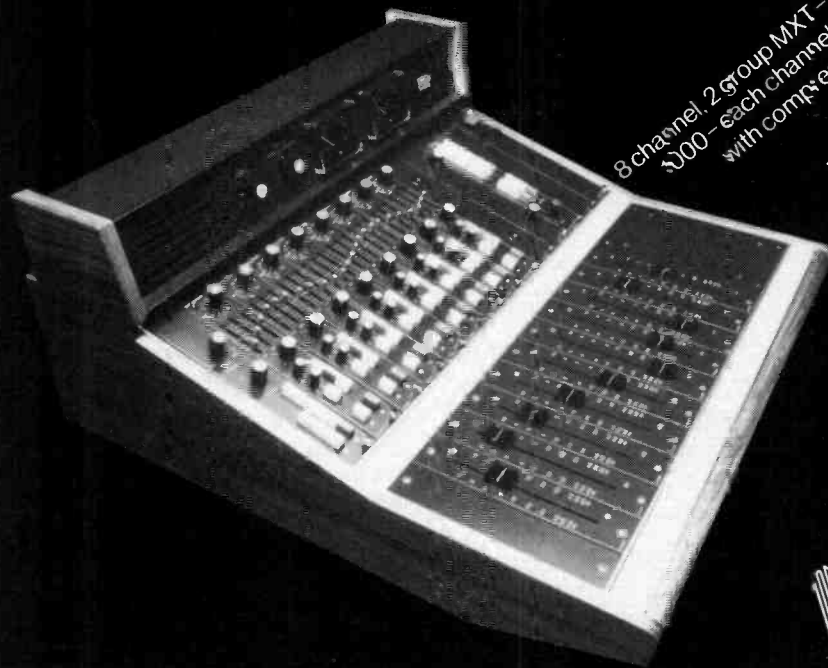
1kHz at 6 mV set for 0dBV.7 output. Loaded 600 ohms.

Total harmonic distortion
Output +10 dBV.7 30 Hz-20kHz below noise
Output +20 dBV.7 1 kHz -88 dB, 0.004%
30Hz-20 kHz -82 dB, 0.008%
Static intermodulation distortion 50 Hz+7 kHz,
4:1 Output +10 dBV.7 -90 dB, 0.003%
Dynamic intermodulation distortion 3.18 kHz
square wave (single pole -3 dB at 100 kHz) +15 kHz
sine wave, 4:1. Relative to 15 kHz component.
Pre-emphasised input 500 mV pk-pk -70 dB, 0.03%
Frequency response RIAA accuracy
30 Hz-20 kHz Within 0.5 dB

Cartridge impedance interaction on frequency response
High inductance cartridge, 1H Less than 0.2 dB.
Clipping at 1 kHz Output +24 dBV.7
Clipping point complementary to RIAA curve
-A 30 Hz-20 kHz Within 1 dB.
Clipping determined by onset of peaky distortion products or THD exceeding -80 dB.
Differential phase shift
50 Hz-20 kHz Within 0.5°
Worst error at LF and HF filter turnovers Within 5°

SURREY ELECTRONICS

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8 channel, 2 group MXT-
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The MXT-1000
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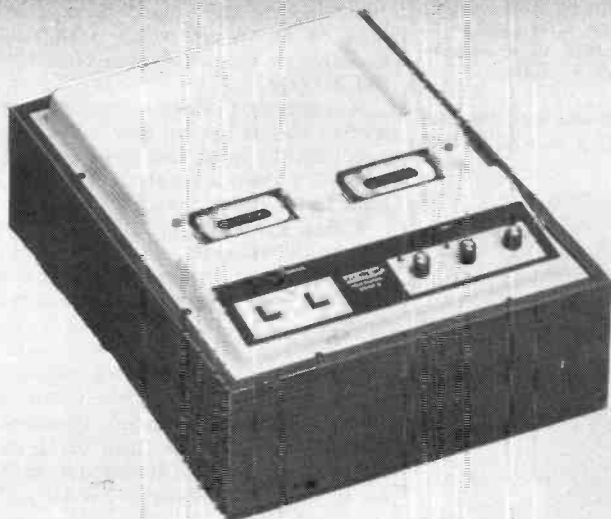
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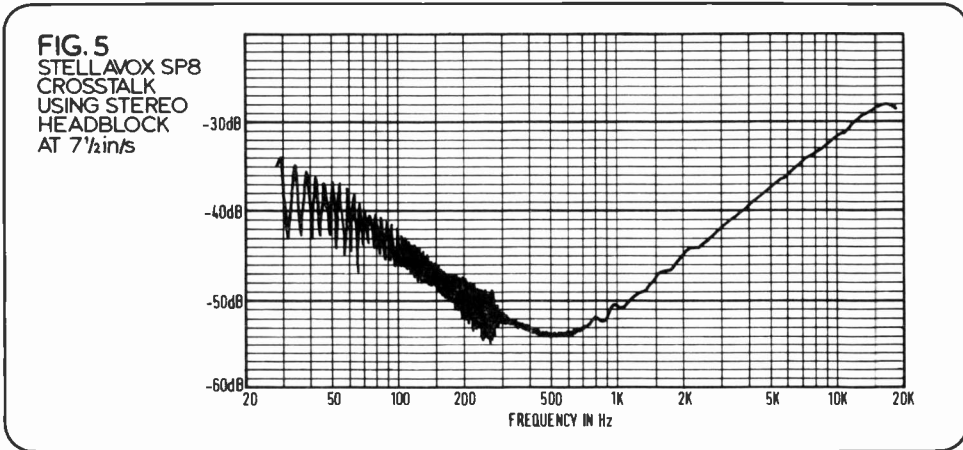
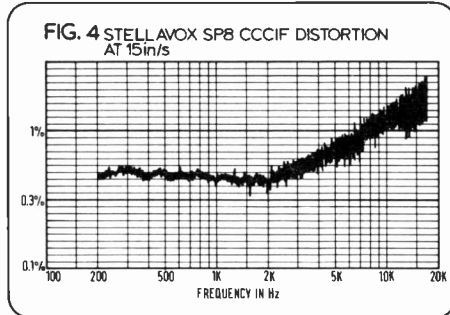
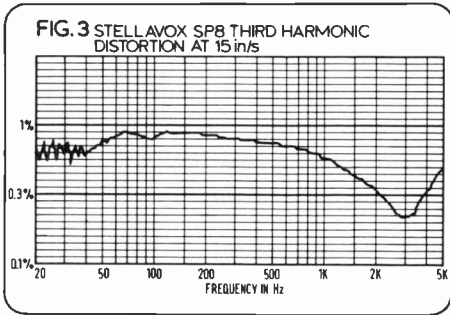


The Telex Copier IV will duplicate both sides of a stereo cassette at 20 i.p.s. simply and reliably. With two-button control, automatic erase, automatic rewind and individual track selection, the main function controls have been kept to a minimum to simplify operation and help maintain consistency.

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For further details on the full telex tape duplicator range contact:

AVCOM SYSTEMS LTD
STANLAKE MEWS, LONDON W12 7HS
01-749 2201 Telex: 896691 AVC



Inputs and outputs

The speech filter, switchable at the microphone inputs, was found to have a -3dB point at 100Hz with a 6dB/octave rate of attenuation which is a useful feature, the microphone inputs have a most excellent noise performance of -126dBm over the band 20Hz to 20kHz , or -128dBm 'A' weighted both when shunted by 200Ω . Unfortunately the microphone attenuator is placed before the amplifier so that the effective input noise increases in 10dB steps with the attenuator steps. However the input impedance for dynamic microphone was satisfactory and virtually constant with the attenuator or level control at $8\text{k}\Omega$. Similarly the input impedance in the A/B 12V powering position was satisfactory at 380Ω with the voltage being 13V . In the phantom powering positions, the 12V impedance was $1,100\Omega$ with 13V applied, and in the 48V position $5,000\Omega$ with 48.5V applied.

The input levels for recording 320nWb/m and overload input levels for the various inputs are shown in **Table 2**.

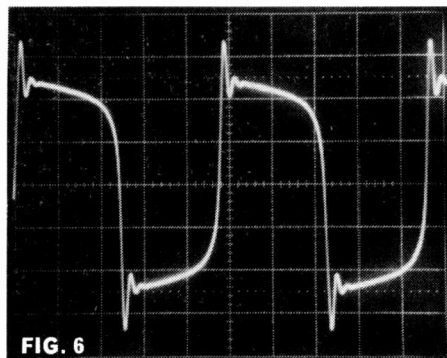
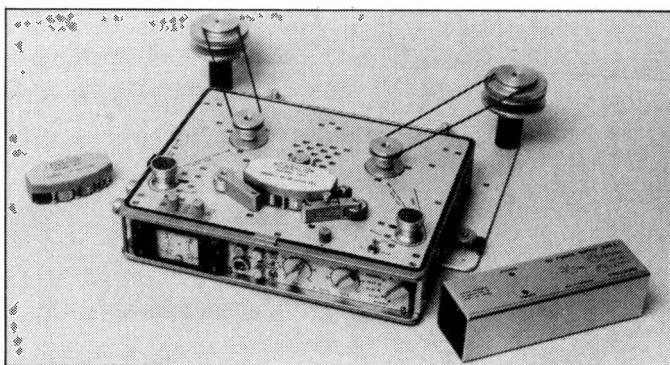


Table 2

	Sensitivity	Overload
Dynamic microphone	-71dBm	-35dBm
Line	-31.5dBm	over $+22\text{dBm}$
Mixer	$+2.2\text{dBm}$	N/A

Being a fixed level input, the impedance of the mixer input was constant at $670\text{k}\Omega$ with



the impedance of the line input being normally in the order of $9\text{k}\Omega$ but dropping to $6\text{k}\Omega$ at minimum gain, both these being a little on the low side.

On the output end, the line outputs delivered in round figures $+6\text{dB}$ ref. $.775\text{V}$ for a recording level of 320nWb/m with the output impedance being extremely low. The floating transformer outputs in the fixed level mode delivered 5.2V from the 600Ω output (impedance 85Ω) and 1.7V from the 200Ω output (impedance 17Ω) for the same level with output clipping points at 11V and 3.7V respectively leaving very little margin between normal output levels and output clipping.

Drive to the headphone output was satisfactory with a maximum output of 1.5V for 320nWb/m from an impedance which varied with the setting of the headphone level control up to 260Ω .

Looking at the pilot system, the input impedance was adequately high at about $1,000\Omega$ with the level up to 2V being accurately metered, similarly the 2V pilot output was accurately metered with the internal generator being within 0.01% of the nominal 50Hz . When locking in synchronism with external sources, the lock was satisfactorily maintained over the specified $\pm 3\%$ frequency range without significant deterioration in the wow and flutter performance.

Other matters

Wow and flutter was substantially worse than the manufacturers' test sheet with 0.11% at 15in/s and 0.07% at $7\frac{1}{2}\text{in/s}$ to the IEC quasi-peak weighted measurement—there being little difference throughout a reel of tape of any size including the use or otherwise of the ABR large reel adaptor.

This is not particularly good and neither was the scrape flutter performance shown in **fig 7** which is a narrow band spectrum analysis of a 10kHz recorded and replayed tone at 15in/s . It is suspected that these complaints originate from the very low working tape tension. A further complaint which should also reflect this problem is the phase jitter between tracks as shown in **fig 8** for a 10kHz tone at $7\frac{1}{2}\text{in/s}$ —not a good performance.

Record level metering was found to be good with the meters having a risetime to -1dB of 10ms and the 0dB mark being a recording level of 320nWb/m which, with the $+4\text{dB}$ available on the meter, is satisfactory for the **3M 207** tape.

A matter that caused some concern was the level of bias and motor tone in the stereo outputs with the worst case being shown in **fig 9** which is a spectrum analysis of the line output noise in the replay mode.

A final matter of interest was the performance of the automatic record level feature and this was found in practice to have a most practical time constant with minimal noise 'pumping'.

Summary

The Stellavox *SP8* is a very nicely made machine which packs a large number of features into a small lightweight unit. However I have the impression that it may not stand up to the hard life suffered by professional portables.

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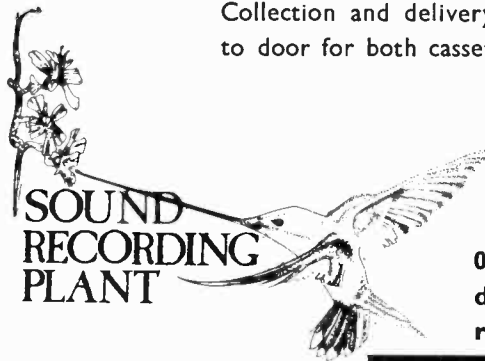
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FIG.7 STELLAVOX SP8 SCRAPE FLUTTER

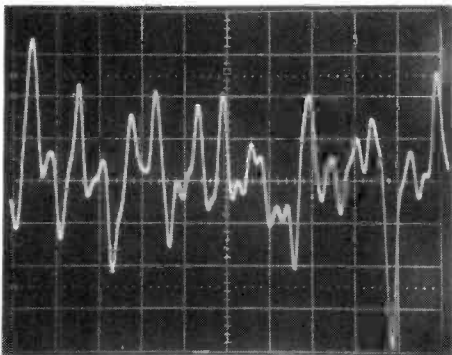
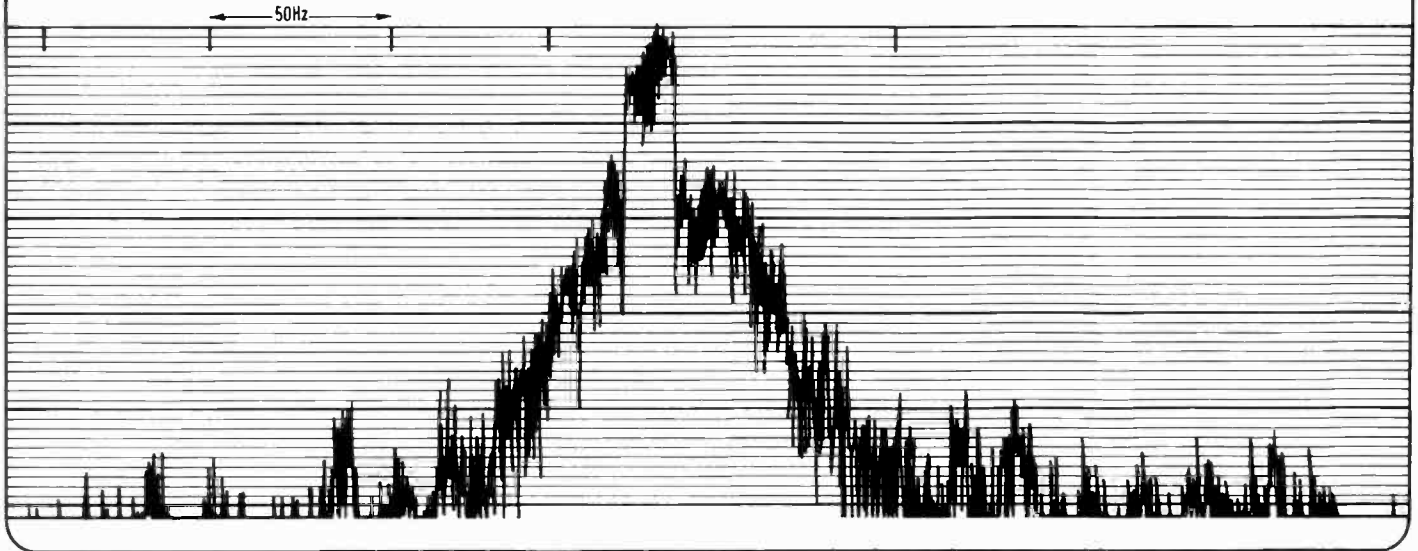
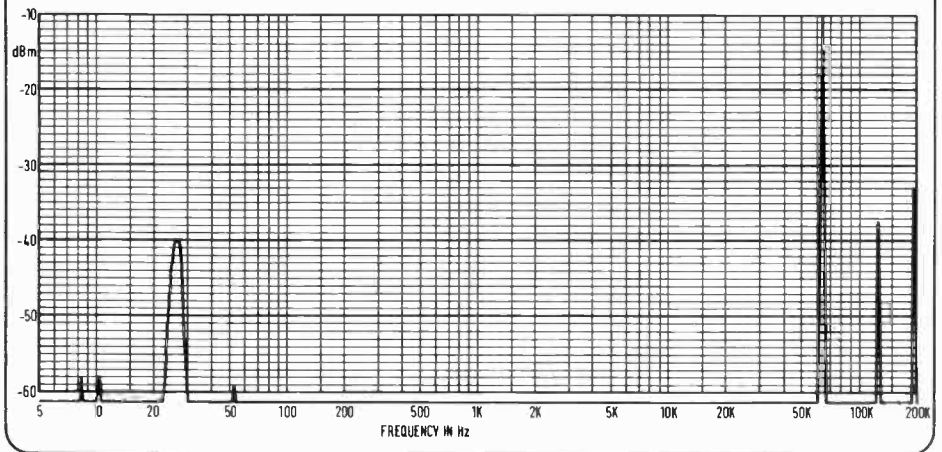


FIG. 8

FIG.9 STELLAVOX SP8 SPECTRUM ANALYSIS OF OUTPUTS



From the point of view of electronics the performance was good but I would have liked to see more headroom in the amplifiers—mechanically the review sample suffered from very low tape tension and exhibited poor scrape flutter and not very satisfactory head-to-tape tension. I do however have the impression that increasing the tape tension at the expense of battery life might overcome these troubles and improve the wow and flutter. **Hugh Ford**

Additional comments

Subsequent checks on a further sample of the Stellavox *SP8* showed that the payoff tape tension had been increased to 40 or 50g. Measurement of wow and flutter on this machine to the IEC quasi-peak weighted

standard gave a consistent 0.05% at 15in/s or 0.06% at 7½in/s throughout a full reel of tape. These results showing a good standard of performance. The phase jitter between tracks remained poor as did the scrape flutter performance.



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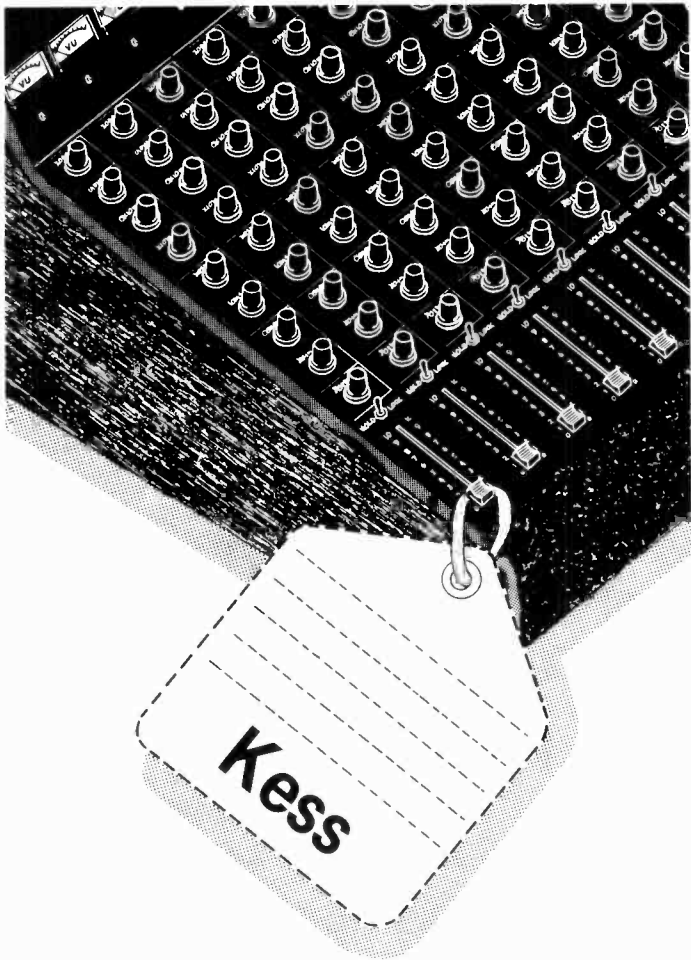
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Audio Kinetics XT24 intelocator

SPECIFICATION SUMMARY

Intelligent autolocator that interfaces with 3M M79, Studer A80, Lyrec TR532, Ampex MM1100/1200, Ampex ATR-100/104, MCI JH-16. Uses two separate counters, master and intelocator, both operating in minutes and seconds. Four pre or immediate load memories. Inches per second speedometer for varispeed reference. Full standard tape transport remotes with LED indication, leverwheel numerics for faster entry of location points, high accuracy of ± 2 seconds over 30 minutes of tape at 38cm/s, automatic compensation for high or low speed. The XT24 comprises two parts: a compact control unit and a brain separated by 8m of multicore cable.

Price: £1,300.

Audio Kinetics (UK) Ltd, Verulam Road, St Albans AL3 4DH.

Phone: 0727 32191.

3M (UK) exclusively distribute the 3M M79 version of the Intelocator throughout Europe.



THE FIRST contact I had with Audio Kinetics was at the APRS '77 show, when they showed me their autolocator using CMOS logic. It was a very complicated package of integrated circuits but I was told that they were also bringing out a microprocessor-based model.

It was very comprehensive software that Tim Whiffin of A-K had written for the new autolocator and I was very impressed. I've written software and know what's involved in writing a comprehensive program as opposed to just writing something really straightforward. I thought it was fabulous and felt we should get one in Konk Studios as fast as we could, because basically we operate as a one-man studio. The Studer A80 24-track is such an expensive machine and having bought one they expect you to be able to afford a tape operator as well—actually, we had to get Eddie Veale to build a remote panel into the desk for the machine.

Our problem was that while the Studer is good, it is slow in operation. If you are doing a lot of dropins over the same place, you're virtually tied to the machine—you can think of nothing else but the dropins and running the tape back. People frequently make little comments behind you and you can't think about what they are because you are constantly trying to get back to the same spot on the tape. You've only got the number on the counter to remember, but no matter how quickly you jockey you can never get back to the same place. If you want to go two bars before a certain dropin, the A80 is so slow that to do it by hand you would end up 2½ bars back. The result is that the artist gets thrown off and you get thrown off—it's just not musical. A tape machine should be like conducting a band, 1-2-3 and in it goes. The XT24 is much faster than any hand, plus the fact that once it's 'learnt' a sequence, it's not only fast but really easy.

The way in which the box works is all explained on the back and operating it couldn't be easier. To go-to-zero you simply press 'zero'; similarly with go-to-lever, the location set by the thumb-wheel levers. Pressing 'reset' defines the master zero at the beginning of the tape, subsequent local

zeros and memory locations all being referenced to this position. The 'set' button allows you to put the current location or the 'lever' setting into any of the four memory locations. There are also 'cycle' and 'recycle' buttons that let you set up single or multiple-pass sequences in either play or record modes for rehearsing dropins or whatever. In fact John Mills, an engineer I worked with at Motown in the States, came over recently and was able to operate it within 10 minutes of reading the instructions and asking a couple of questions.

The biggest problem caused by the A80's slow speed of operation is dropouts, ie getting out after a line you want to keep, or if you just want to clean a bit of the noise in a string piece before they come in. The distance between the erase and record head on an A80 is so wide that after you've heard the point at which you want to come out, it's already erased half a second or so of music. Often with vocals someone will do a sustained phrase, like an 'oohh', and then run into another word. Now if you try to catch all of the 'oohh' and then stop where you think the next word starts . . . forget it. You can try and use the numbers on the tape counter but it still isn't accurate enough.

Let's say I had a really critical dropin and dropout. I'd play the tape until I found the spot where I wanted to get out. I would then go over to the tape machine and mark the tape at the sync head and wind it back a shade until the mark was opposite the erase head. (When the Studer comes out of record it really does come out quickly.) I'd then note that exact location by pressing, say, 'set 1' on the box. Then I would tell it to 'set cycle between zero and 1': so I've got the vocalist who's going in and I hit 'cycle'. As soon as the autolocator comes to that mark it stops and pulls the tape out—spot on.

If a singer does 10 passes on a piece, he's always going to make five mistakes—he'll carry the 'oohh' over too long, or the 'oohh' will be too short, or someone distracts your attention and normally you'll do a bad dropout. As soon as you get two or three of these little 'oohhs', the next thing you know is you finally get the take you wanted but

there's a little 'aah' after it, which just kills the whole purpose of the thing. The XT24 pulls out precisely at the same spot every time, and is infinitely better because it takes all the error away from you.

I don't like to leave all the noise and hum and everything. I like to get it off the tape because you might be in the middle of a beautiful take and forget to take that channel out. I like a master tape to be clean.

The software is pretty fail-safe. There is no way it can drop into record and screw up a master unless a certain sequence of events has happened. For example, if there are any problems on the interface between the machine and the autolocator it won't inadvertently go into record—it'll fail. The whole thing about writing software for this sort of unit is very much a case of what happens if this?—what happens if that? etc, etc. Like if you hit two buttons at once it answers 'huh', because it doesn't understand the command. That's very important in software: it doesn't allow you to enter an improper sequence of buttons. If you tried to enter 'set rewind', for example, there's no such thing. In so many microprocessor-based systems you'll find that somewhere the designers have forgotten to look at what happens when a guy presses a particular sequence. When it happens the machine thinks, maybe that is saying 'set 1' and everything will come up wrong. And the guy'll think, what have I done? There's something wrong with the box.

Tim Whiffin, the system's designer, has covered everything from an operational point of view—that's the beauty. There are two kinds of designer; there's the guy who can write a program that only he can operate very successfully and have no trouble at all; or you can write a program that can be operated by someone else. Tim's really done a marvellous job on the box; he's been very thorough and has understood fully the technology of the new device he's using—the microprocessor—and used all of its capabilities to the fullest.

The other great thing is that when you turn on the autolocator, it initialises that location as zero, and automatically its memory has already been told to cycle between zero and 'lever'. So, if a guy doesn't even know anything about memories 1, 2, 3 and 4, all he knows is it automatically goes to zero and he can set whatever the end count is in 'lever'. So for the first week, until he is used to it, he can use those two functions; it's not as if the box were dead and it does the standard commands of play, rewind, etc.

You can interrogate the memories while the tape is running by holding the 'stop' button down plus the relevant memory number. And if you want you can preload into the memories while the machine is doing something totally unrelated. For example, you can put any number that's in 'lever' into the memory at any time. Also while the tape is running you can hit 'set', plus '1', '2', '3' or '4' and it will remember any of those locations in store.

The 'edit' button is like a normal edit function plus the fact that when told to go-to-zero it automatically drops into the edit mode for a fast start. It then holds that for 30 seconds before dropping out to save overheating of solenoids. In this way it speeds the machine up. On a 3-hour session with lots of tight dropins, you can easily save about half-an-hour of that time. It's as good as having the best tape operator in the world—someone who knows the song inside out, because you can program it in advance. It's fabulous.

Steve Waldman

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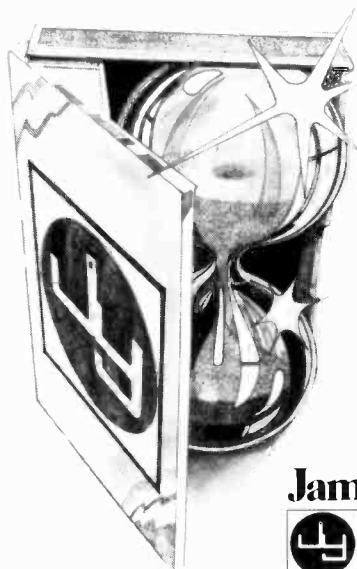


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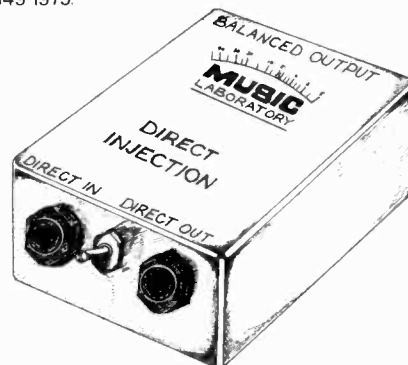
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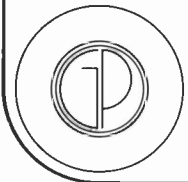
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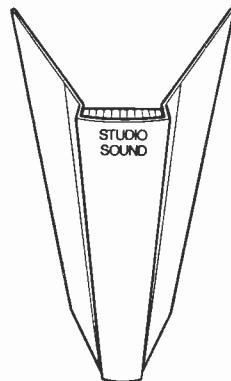
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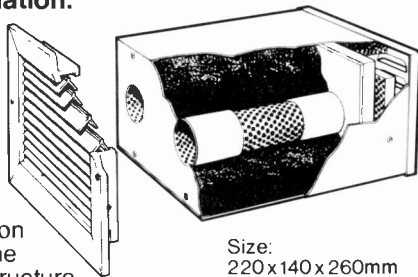
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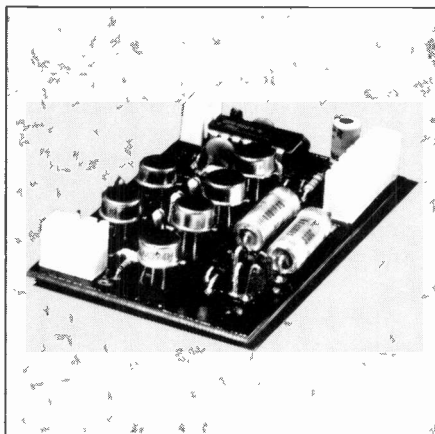
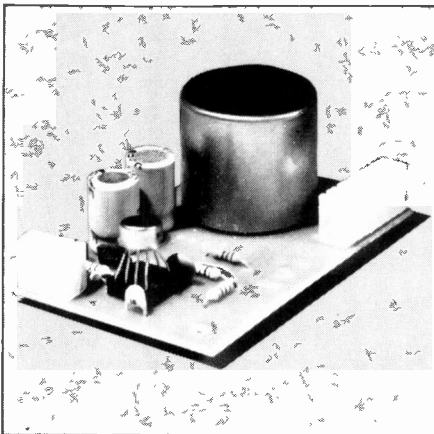
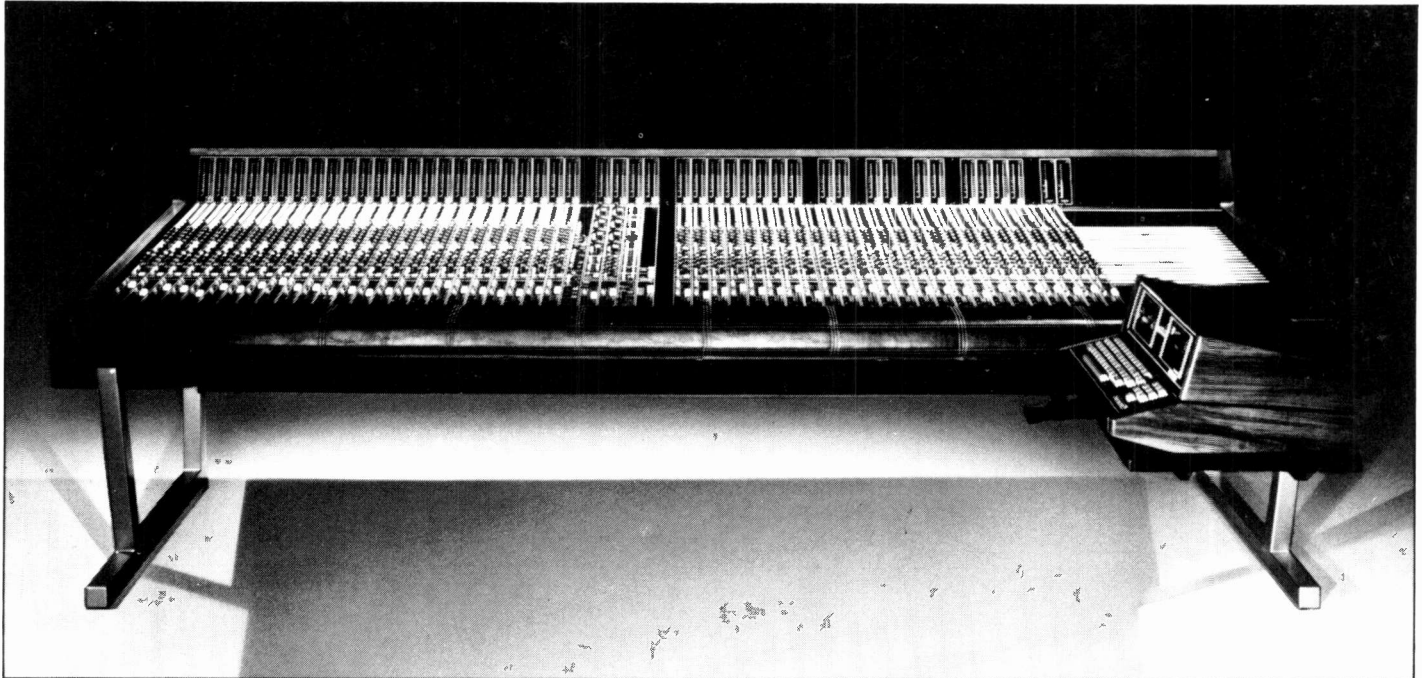
INDEX TO DISPLAY ADVERTISERS

A		H		P
Abacus	7	Harrison	IBC	Page, John
Acoustical Manufacturing	63			Peavey
AKG	5	I		Publishon
Alice	19	I.T.A.	15, 40, 41	
Allen & Heath Brenell Ltd.	35	Ivie	75	R
Aphex	42, 43			Raindirk
APRS	87	J		RDG
Audio & Design (Recording) Ltd.	78, 79, 87	JBL	56, 57	Rebis
Audio Developments	14			Revox
Audix	81	K		R.E.W.
Audio Product	48	Kennard & Sons	88	
Avcom	77, 81	Klark Teknik	OBC	S
B				Scenic Sounds
Bauch, F. W. O.	53	L		S.E.S.
Beyer Dynamics (G.B.) Ltd.	8	Larking, Don	8	Shure
BGW	55	Leavers-Rich	33	SME
Broadcast Inc.	54	Lennard Developments	67	Solid State Logic
C		Lexicon	4	Sound Communication
Cara International	68	M		Sound Recording Plant
Cathedral Sound	85	Magnetic Tapes	61	SQN
Chrom Audio	85	MCI	72, 73	Surrey Electronics
Court Acoustics	83, 85, 87, 89	Midax	IFC	
Crowmay	16	Miniflux	84	T
F		Music Labs	65, 88	Tecsonic
Feldon Audio Ltd.	17	Mustang Communications	67	Trad
Formula Sound	34	MXR	37	Trident Audio
Fraser Peacock	83			Turnkey
Future Film Developments	12	N		
G		Nakamichi	9	W
Gibson-Brittain	89	Neal Ferrograph	47	White Instruments
Grahams Professional	89	Neve Electronics International Ltd.	29	
Granet Communications	46	O		Y
Greenwood Vent	89	Otari	11	Yorke, James

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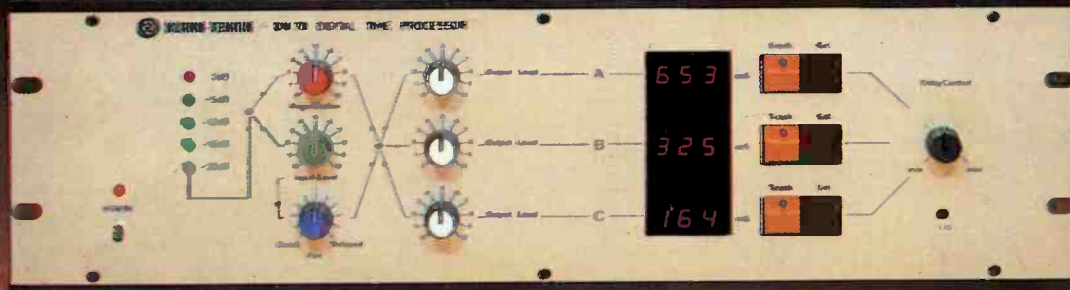
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