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 these 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 '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 premiere, 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. 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.

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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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<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
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<tr>
<td>2800</td>
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PARAMETRIC EQUALIZERS

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<td>2205</td>
<td>2 x 10 Bands, rack mount</td>
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<td>2209</td>
<td>2 x 10 Bands, rack mount, 600 ohm balanced in/out XLR</td>
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NEW CLASS H

POWER AMPLIFIER

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<th>Model</th>
<th>Description</th>
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<td>MA5002</td>
<td>2 x 250 watts, meters</td>
<td>£399.00</td>
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[Graph showing frequency response]

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[Graph showing frequency response]

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- Studer Mk2 24T, as new ... ... £18000
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- MCI 440 40 inputs, 40 outputs ... ... £25000
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- 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
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- Quad 303 ... ... ... ... £70
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- 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 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.

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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 feedback, 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
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THE EVERTIDE MODEL
H910 HARMONIZER

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Feldon Audio Limited

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 techniques 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 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 legality 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 irrecoverable standardisation decision was taken. In this context, he cites the experience gained from using available systems. They 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’s complaint filed by Mr Steve Temmer” a halt had been called to the Committee’s activities.

Abacus ARTA 8000

Abacus Electrics has introduced the ARTA 8000 4-octave real time audio spectrum analyser for use in the design, evaluation, maintenance and installation of audio circuits and systems. These include loudspeaker and microphone electro-acoustic response measurements; tape machine alignment; sound, 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; loudspeaker 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 Mauder

It is with deep regret that we report the death in early October of John Mauder, 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 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 immediately.

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 three 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, and 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 moveable panel 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 10k), has a frequency response of 15Hz to 35kHz, rise and fall times of 4us and 1s for zero level, and is scaled in either dB (+22dB to +4dB) or PPM 1-7.

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 Institute of Electrical and Electronics Engineers (IEEE). His responsibilities included research, development, and engineering functions.

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 Moonenbeek 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.

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 beltpacks for headphones, rack mount for head-phones, 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 remaining are held at The Diskwroks. Cost of the course is $300 per course.

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

Contracts

Amercon has supplied 57 DC700A amplifiers for a new PA system being built for Rod Stewart. 10CC have also taken delivery of amplifiers.

New has received orders from TV Asahi of Tokyo for two Model 53124 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, Karera and Goroka.

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Our Plug-in Module System has made the normally complicated and very costly procedure of achieving a bi-amped 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.

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.

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.
**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 600W 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-20kHz, and two 51mm magnesium alloy dome tweeters covering the range 20Hz-900Hz, two drivers (254mm drivers in the RC610). The 612 has five octave attenuation and allows HF range 2.5kHz-20kHz.

**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 frequency operations. The latter version also gives transformer output.

**TA multiband audio processor**

TA Track Audio Inc has introduced its Discriminate Audio Processor II (DAP 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 to +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 600Ω or higher, output being 600Ω. Two versions of the processor are available, the DAP II-A0 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.

**Windt Audio turnkey service**

Los Angeles based Windt Audio Inc who offers 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 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.

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
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.

FADEX fits in place of standard 1 1/2" x 7" faders and, thanks to the New VCA 5M, Introduces no audio degradation. (In most cases, a considerable improvement is realised in fader shut-off.)

Installation is a snap in those consoles which have standard removable fader modules, and 4" minimum depth clearance.

Not only do you get 65K Automation, FADEX gives you a 9 buss grouping system, group and channel mute and solos, grand master and other good stuff.

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In Europe:
Scenic Sounds Equipment
97-99 Dean Street,
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Telephone: 01-734 2812

Superior VCA built in (Allison VCA 5M) one-tenth the distortion of others. Auxiliary VCA inputs allow limiting, expansion, remote control etc. using FADEX as gain control element.
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 TMJ-3s. Studio I 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 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 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 Tannoy and Quad. Other equipment in Studio 24 includes the Lyrec 24-track recorder with full Dolby-A, two MCI 1104 32-track machines, Klark Teknik graphics, Urei limiters and compressors, A & D Compex stereo comp/limiter, Coghlan Audio comp/limiters, Meyer noise gates, Allison Gain Brains, AMS microprocessor digital delays and stereo phaser, and EMT, Master Room and Orban Paramound 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 Paramound echo, and AMS stereo drum machine 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 (£33 after 6 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. Angus Robertson
Caribou Ranch

Late September in the Colorado Rockies offers such a display of natural colours, leaves of fall, that it would shame the most adventurous coiffures in The Kings Road. Taking a 24-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 bat by 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, 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 390 x 150 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. He felt that he would like to work with more tracks, say 32-track or 48-track, as he used 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 company, 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 they have 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—its 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 stereo monitors. I have indeed a partiality for these speakers but badly 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 301s. On the left of the desk we have ancillary equipment that looks really impressive.

From Urei there are six 1176LN limiters, two LA4A 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 Parasound sibilance limiter, Eventide Flanger (unbeatable he said) and a 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, 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 320mWh/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 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 grage 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-

Dominiqve Blanc-Francard at Aquarium Studio, Paris. No prizes for guessing who equipped the studio
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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 record (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 omni-directional 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 up to Ortofon cutting heads mounted on 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 head capable of cutting from 10Hz-261kHz ±0.5dB 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 Pact 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 ½in tape; an ordinary ½in 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 PCM1 adaptors.

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 head in a position 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 mechanically and 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 posted to new positions demanded by the changed scoring. On went the red light, up went the mechanical pitch control, proved 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 recording was for possible cassette duplication; the result, 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 again, or with a close-miked panpotted stereo image. Unless the direct-to-disc process is allied with a rigorous approach to mic technique, 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 recordings, 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 5141.

John Atkinson
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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 staging and 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 unequaled 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 designed for 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 was 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 Nibelungs — underworld people who cast and forge 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 containing 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 cardiods lined up in the 'footlights'. For these foam 'mice' can sometimes be used, but of course they must be fixed in situ and not spill over into boxes on each side. Thanks to a fair amount of 'footlights', this technique has in general produced excellently balanced and well-separated sound, but one for the timpani. The stage is divided 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 was 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.

According 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 the critics of Wagner's Ring, scored for an almost unparalleled richness of orchestral texture and fullness of sound, and not to realise its 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 Adley, 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), to Elaine Padmore (head of the BBC's opera department), for an hour or two we knew pretty well what we had to cover and where obstacles 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
figure eight or hyper cardioid according to which of us was actually mixing (one of the few details about which James and I agreed to differ) and any narrowing of the picture caused by its distance from the pit was compensated for by cheating the panning of the pit mics. Also because of its position the C24 sounded rather sogger than its paper specification, and in the end the response was lifted by some 3dB at 10kHz at the mixing end. Two AKG C451s (marked 451 (above) on figures) were attached to house light brackets outside the third tier boxes above the pit serving as useful providers of width as well as plausible standby's for the C24.

Most mics received some eq treatment — all the stage mics had bass rolloff at 60Hz to reduce bumps and thumps, the Sennheisers had a presence boost introduced at 3.5kHz to improve matching with the KM84s, and the pit mics got whatever treatment their applications called for. Naturally all such treatment was arrived at empirically.

Built-in BBC circuits in the Royal Opera House allow for six stage mics and eight pit mics. In the roof, from where the C24 is slung through holes, there are five mic circuits, two being taken up by the C24 and we were able to run a 7-way multi through a hole in a dividing wall down on to the lighting bridge for the Sennheisers. This meant that we had to find two extra roof circuits and the house
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 (like a soundproof window, which is now open for the all-essential control music score in the centre. 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 perisopic 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,
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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 sound engineer, willingly gave us 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-ophile 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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AES 61st Convention, New York—a report

Angus Robertson


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 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.

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 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 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 delivery of equipment and material to the stands (or booths). 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 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.

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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 1in, four or two on 1in, plus in each case two analogue channels and an SMPTE timecode track. Using 16-bit linear quantisation encoding, performance 3M digital 4-track recorder. 32-track is similar but with wider tape

Waldorf Astoria Ballroom

Previously described 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.

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Expanding the Boundaries of Creativity

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

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

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

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

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

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

MXR Professional Products Group
claimed is 90dB dynamic range, 0.05% distortion, frequency response 20Hz to 20kHz +0.5dB, –1dB, –90dB 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 Quadruplex 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 1in tape, eight on 34in, 24 on 1in and 48 channels on 2in tape. In addition one extra
If it’s not quite right, he’ll be the first to know.

Our servicing facilities as you can see from the picture are second to none. We believe that when we’ve sold a product that genuine after-sales service, though not often needed, should always be available. We say not often needed simply because every item that leaves the shop is fully tested and aligned.

We have found that by offering a friendly and helpful service instead of simply selling boxes and getting you out of the shop as quickly as possible that we have built up a reputation that has become the envy of our competitors.

As one of the leading sales and installation companies with clients that include recording and audio visual studios, government departments, educational authorities, radio stations, theatres and P.A. companies we are happy to give advice on equipment and room acoustics.

Our prices on anything from a microphone right up to a fitted 8 track studio are hard to beat, package deals, part-exchange and installations are all part of the ‘Studio Equipment Service’.

One product group that we are the main agent for is the MXR Studio range, before we put our reputation behind any product we sell we give it a thorough testing for both specification and reliability. We can honestly say that the MXR range offers probably the highest specification available, but as you will see from our special prices, at considerable savings over other manufacturers.

---

MXR Dual Fifteen Band Graphic Equaliser
The Dual Fifteen band controls fifteen frequency bands at 2/3 octave intervals; each channel having its own level control slider. Cut and boost range is +12 to -12 dB. Equivalent input noise is better than -95dBm with less than 0.02% THD. £275.67

MXR 31 Band Graphic Equaliser
For even more exact control, this single channel equaliser has 31 bands of adjustment at 1/3 octave intervals with an overall level control. Cut and boost range is +12 to -12 dB. Equivalent input noise better than -90dBm with less than 0.01% THD. £293.73

MXR Stereo 10 Band Graphic Equaliser
This compact Stereo Equaliser is one of the most versatile and technically superior available in its price range. With overall level controls and tape monitoring facilities, the unit is attractively finished with a layout that will fit in with any system, from home to professional studios. £202.21

MXR Phaser Flanger
Probably the most used Stereo Phasing Flanging rack available. The Phaser and Flanger are available as separate units to be built into your own desk, rack, or as a complete mono/stereo package with its own power supply. The units can be used in a fully adjustable automatic mode, or switched to manual for ultimate control on sensitive passages. Phaser £146.15, Flanger £213.58

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

MXR Mini Limiter
A low cost, low noise, low distortion, compact unit with fast response that effectively controls signal peaks. The variable release time is dependent upon the amount of gain reduction, continuously indicated by four L.E.D.’s. £103.02

At Studio Equipment Services, we hold stocks of all these MXR products, plus many more ranges including Revox, Brenell, Teac, Neal, Ferrograph, Shure, Beyer, Tannoy, JBL, Quad, Sonifex, AKG, Uher, Studiomaster and Sescom.

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Telex: 21879

FRANCE: Son Professionnel,
2 Rue des Tennerolles,
92210 Saint Cloud (Paris).
Tel: 602 6815.
The need for re-equalisation, record card adjustment available with headblocks for 16, 24 and 32-track recorders is MCI. Although Sony technology. Perhaps it will happen again. Formats taking the best features of Ampex and Sony are already considered practical for professional recording applications, instead of cutting and splicing techniques will not be minimised 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 contamination, Ampex believes particles are typically 25 micro-inches in size. As the problems with 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 recorders 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 equalisation, record card adjustments by variable resistive elements rather than suboptimum 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-
**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.

<table>
<thead>
<tr>
<th><strong>Input</strong></th>
<th><strong>High level</strong></th>
<th>+ 30dBm (max) at 34KΩ</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low level</strong></td>
<td>+ 20dBm (max) at 11KΩ</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Output</strong></th>
<th><strong>High level</strong></th>
<th>+ 30dBm with −93dBm noise</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low level</strong></td>
<td>+ 20dBm with −103dBm noise</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Frequency response</strong></th>
<th>EQ &amp; filters out</th>
<th>10Hz to 20kHz, ±0.1dB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EQ &amp; filters in</td>
<td>20Hz to 20kHz, −1dB</td>
</tr>
</tbody>
</table>

| **Distortion** | Harmonic & IM | <0.1% |

| **Transient response** | Slew rate | > 10V/sec. |

| **Power** | ±12V to ±18V at 75mA |

---

**Voltage Controlled Attenuator**

The first high quality VCA in the professional audio market. It's available in chip form for OEM, or in a complete module, with full input and output facilities for direct fitting to any automated console with existing VCAs. However, we can design a VCA package to fit any other manufacture.

<table>
<thead>
<tr>
<th><strong>Band width</strong></th>
<th><strong>Module</strong></th>
<th>DC to 200kHz; ±0.1dB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chip</strong></td>
<td>DC to 50MHz; ±0.1dB</td>
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</table>

| **THD** | +10dBm input | 0.004% (20Hz to 20kHz) |

| **IMD** | −14dBm input | 0.03% |

| **Noise** | Unity gain | −90dBV; ±1dB |

| **Modulation noise** | 6.5dB |

| **Overshoot & ringing** | None |

| **Slew rate** | >10V/µsec. |

| **Input impedance** | 20kΩ |

| **Gain** | 0dB (+15dB available on special order in module form) |

<table>
<thead>
<tr>
<th><strong>Attenuation</strong></th>
<th>Module</th>
<th>&gt;94dB; 20Hz to 20kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chip</strong></td>
<td>&gt;100dB; 20Hz to 20kHz</td>
<td></td>
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</table>

| **Control voltage** | Can be scaled as needed |

| **DC shift** | Vs Attenuation | <5mV |

| **Power** | Regulated ±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, route 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.

---

**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 N18QH
Telephone: 01-359 5275
Telex: 268279 Britro G.
The dynamic range is available using 16-bits without recourse. Each input module digitally requests the precise remainder for further modules. If this available amount of delay is around $1,600 each. Using minimum bandwidth and when fully equipped, a one minute digital delay can be created—sufficient for proficiency.

MCI introduced the JH-600 console (wonder if JH in MCI model numbers originates from the initials of Jeep Harried, 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 buses with panning, six sends, multi-way 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.

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 JH-600 series use the input/output module shortly—this is similar to the Cat22 which, almost without exception, have abysmal sound quality when compared to professional audio recorders.
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 4 Octave - a microcomputer 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.

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 (2 microsecond), logarithmic response.

Compressor Limiter: threshold from +20 to -40 dB - Attack time from 0.01 to 20 mS - Release time from 0.03 to 2 s - Gain reduction from 0 to 30 dB - Ratio 2.

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.

Stereo-Compressor Limiter with fast photocell - 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 LED - special circuitry to suppress distortion on low frequencies - XLR connectors.

FOR FURTHER INFORMATION CONTACT PETER DEAN
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 10ms 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, comb, delay clusters and space repeats, together with feedback echo and reverberation. 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 low into a minimum of 40 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/preamp which provides three continuously variable overlapping controls providing +20dB gain and up to -40dB cut with variable bandwidth. Finally, Furman manufacture a reverb 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 Acousticomputer 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 300 acoustic analyser which includes two separate memories—both will shortly be reviewed in Studio Sound.

White Instruments will also be introducing its Model 200 signal analyser which is microprocessor-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 ±octave filters, and a set of ±octave filters ranging from 40Hz to 1,250Hz can also be added, LED matrix 16x31, 45dB, 26dB 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.
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.

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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 1-octave real time analysis, peak v average mixdown, and such applications with future programmes allowing RT 1s, 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 1-octave analysers together with graphic equalisers. 1002 is a 1-octave precision real time spectrum analyser with four memories, 31 ANSI filters with two average times, noise generator and battery pack.

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 8Ω 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 8Ω. The Model 2400 electronic frequency divider was introduced at AES and provides panel setable controls for both left and right systems, h/f and if 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 multi tails 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 FY-10 and FY-15 (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, bodypack 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 handheld free communication over 1-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 ($3,000), the Model 163 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 ations, 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, bodypack 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 handheld free communication over 1-mile distances. UK distributor for Swintek is Oakside Electronics.

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

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Purpose built stage monitor desk.
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- VU on every channel
- All outputs with 9 band EQ
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Features:
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Input attenuation, Channel mute/PFL
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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 about how to choose a monitor for the floor and to eliminate the attenuation dip caused by reflection occurred at below the crossover frequency used. 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 different listening locations, by drawing the worst and best speaker positions for any room size and shape fed into the computer. Small studios where you cannot afford an acoustic consultant, might do well to check out with AR when they are next using the computer at a public demonstration in your area. Of course, ARAR use their crossover frequency chosen so that 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 half inch slave Leader 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. 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 Spitfire.

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 programme is recorded 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 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.
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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.

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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.

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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.

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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 ±2dB, 16mm to 10kHz.
- S/N: 60dB.
**Synchronisation:** may be locked to power line, TV vertical sync or external drive source.
**Price:** on application.

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

**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, 7.5fps/s.
**Drive motor:** DC speed slaved.
**Power supply:** mains.
**Wow and flutter:** 0.15%.
**Frequency response:** 50 to 10,000Hz ±1dB, -4dB at 15kHz.
**S/N:** 60dB.
**Capacity:** 1016 spools.
**Features:** uses basic type tape transport with smooth capstan drive and no sprockets. Available with mic or line inputs.
**Price:** on application.

**SELA (Sweden)**
**Svenska Elektronisk-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, HF and LF 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, HF-pass filter, HF and LF 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**
Minimiser for professional applications, six mic inputs and which will operate directly from Nagra recorders, balanced inputs, phantom powering, roll over filter.

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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.

James B. Lansing Sound, Inc. / Professional Division, 8500 Balboa Boulevard, Northridge, California, U.S.A.
SURVEY: FILM SOUND EQUIPMENT

SIEMENS (West Germany)
Siemens, 7900 Karlsruhe 21, PO Box 21 1680, West Germany.
UK: Siemens Ltd, Siemens House, Windmill Road, Sunbury-on-Thames, Middx TW16 7HS.
Phone: 03927 88691. Telex: 851901.

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 800m extendable.
Film speed: 24 or 25 frames/s.
Frequency response: 40Hz to 14kHz ±2dB.
Film: 35mm.
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.
UK: Hayden Laboratories, Hayden House, Churchfield Road, Chalfont St Peter, Bucks SL9 9EW.
Phone: 02813 88447. Telex: 849469.

Sondor 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.

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.

SM/SQ7
Tracks/speeds: 2 (SM8), 4 (SQ7) on 35mm, 71 and 15in/s.
Frequency response: ±2dB, 20-20kHz at 15in/s.
Noise: ≤70dB (SM8) or ≤68dB (SQ7), A weighted, at 15in/s.
Wow and flutter: ≤0.04%, DIN weighted, 'typical'.
Features: battery or mains-powered portable; built-in loudspeaker; twin pmm or VU metering; single transport control; mic/line inputs.
Price: £2,990 SM8, £4,910.50 SQ7.

TP8
Tracks/speeds: 1 or 2 on 35mm, 71 and 15in/s.
Frequency response: ±2dB, 30-18kHz in stereo mode.
Noise: ≤65dB, A weighted, at 7in/s in stereo mode.
Wow and flutter: ≤0.07%, DIN weighted at 7in/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 Synchrontone) on 35mm, 2 or 4 on 35mm, and Perfofame for 16mm magnetic tape; 16, 31, 71, 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.

AM48
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 1.91h.
Price: from 30,520 Swiss francs.

M2rOMA3
Type: magnetic film reproducer.
Format: 16mm magnetic film, Mf 17.5/35mm, M12 dual.
Tracks: centre, edge and others.
Wow and flutter: 0.08%.
Capacity: 56cm spool.
Film speed: 24 or 25 frames/s, up to x10in sync, x20 spooling.
Frequency response: 40Hz to 12.5kHz ±1.5dB.
S/N: 68dB.
Synchrontone: interlocked to mains sync or pulse generator.
Features: up to eight channels with pre-listening.
Price: from 39,520 Swiss francs.

M2rOMA3
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.

STUDIO SOUND, FEBRUARY 1979
"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)
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. This is also true of musical aspect in that our central nervous system is more sensitive to a change of stimulus, if so 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 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 thereby, therefore, a spatial aspect, 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. 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 accurate 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. In the majority of the audience, stereo is largely academic and whilst two separate sound systems can give a very pleasing special effect, this only occurs at specific frequencies and only when the sound 'envelope' is wider than the time shift. On stage and for recording purposes, such as in that our ears are located on a horizontal axis, 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 the concert 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 this is 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 muted.

I have always, 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 dumb trousers, the show must go on . . .

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

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 rewritten. 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 MCT's JH-30 (when installed in the tape 308 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 Forrester's measurement of output noise is incorrect (we were unable to get 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?).
Letters

2. At the time your sample was manufactured, the short circuit limit was set relatively low and therefore the power rating at 25Ω 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 45Ω 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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24 Inputs

8 Out 16 Track Monitor

Input noise 200ohm source-128-5dBu (1-2dB NF)

*Mixing noise 16 Ch, routed at unity gain -85dBu

Output noise -98dBu All at 20kHz bandwidth

A very quiet mixer for the small studio or Self-Op Musician. 24/8 size 176 x 70 x 30cm

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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 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: 225 x 116mm (width).

Weight: 1.9kg.

Price: £150.

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

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 10kW (±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 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 50kHz.

Burden: all voltage ranges 5kΩ/V, all current ranges less than 60mΩ.

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: ±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: 225 x 116mm (width).

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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 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.

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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.
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."

Of course, these things have little or nothing to do with good or bad amplifier design, and are not at all what you might overhear in our laboratory . . . . zzzzzzzzzz

For further details on the full range of QUAD products write to

The Acoustical Manufacturing Co. Ltd.,
Huntingdon, Cambs. PE18 7DB.
Telephone (0480) 52561

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QUAD is a Registered Trade Mark
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. Investigations into the behaviour with out-of-phase voltage and current components showed that the overall accuracy remained good, Table 3.

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.

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.

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.

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

TABLE 1

<table>
<thead>
<tr>
<th>Voltage range</th>
<th>Nominal impedance</th>
<th>Actual resistance</th>
<th>Actual capacitance</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>250Ω</td>
<td>4.9kΩ</td>
<td>4.7pF</td>
</tr>
<tr>
<td>10</td>
<td>500Ω</td>
<td>9.8kΩ</td>
<td>9.5pF</td>
</tr>
<tr>
<td>20</td>
<td>1000Ω</td>
<td>19.6kΩ</td>
<td>19.1pF</td>
</tr>
<tr>
<td>50</td>
<td>2500Ω</td>
<td>49.0kΩ</td>
<td>48.5pF</td>
</tr>
<tr>
<td>100</td>
<td>5000Ω</td>
<td>98.0kΩ</td>
<td>97.5pF</td>
</tr>
<tr>
<td>200</td>
<td>1MΩ</td>
<td>196.0kΩ</td>
<td>195.5pF</td>
</tr>
<tr>
<td>500</td>
<td>2.5MΩ</td>
<td>490.0kΩ</td>
<td>489.5pF</td>
</tr>
<tr>
<td>1000</td>
<td>5.0MΩ</td>
<td>980.0kΩ</td>
<td>979.5pF</td>
</tr>
</tbody>
</table>

TABLE 2

<table>
<thead>
<tr>
<th>Indicated watts</th>
<th>Actual watts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1kHz</td>
</tr>
<tr>
<td>250mW</td>
<td>251mW</td>
</tr>
<tr>
<td>500mW</td>
<td>501mW</td>
</tr>
<tr>
<td>1W</td>
<td>1.00W</td>
</tr>
<tr>
<td>2W</td>
<td>1.996W</td>
</tr>
<tr>
<td>4W</td>
<td>4.004W</td>
</tr>
<tr>
<td>10W</td>
<td>10.098W</td>
</tr>
<tr>
<td>20W</td>
<td>20.086W</td>
</tr>
<tr>
<td>50W</td>
<td>50.666W</td>
</tr>
</tbody>
</table>

TABLE 3

<table>
<thead>
<tr>
<th>Phase angle</th>
<th>Percentage error</th>
</tr>
</thead>
<tbody>
<tr>
<td>+60°</td>
<td>+1%</td>
</tr>
<tr>
<td>+45°</td>
<td>+1%</td>
</tr>
<tr>
<td>0°</td>
<td>0%</td>
</tr>
<tr>
<td>-45°</td>
<td>+2%</td>
</tr>
<tr>
<td>-60°</td>
<td>+1%</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Indicated watts</th>
<th>Actual watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>5W</td>
<td>4.99W</td>
</tr>
<tr>
<td>4W</td>
<td>4.01W</td>
</tr>
<tr>
<td>3W</td>
<td>3.12W</td>
</tr>
<tr>
<td>2W</td>
<td>1.99W</td>
</tr>
<tr>
<td>1W</td>
<td>0.995W</td>
</tr>
</tbody>
</table>

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 would be retitled Out of Continuity and would finish at 055730 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.
The Music Laboratory is England's main Revox Centre serving the recording industry. We hold large stocks of equipment and accessories for rapid delivery. We are the official Revox Service Centre London, holding vast stocks of spares for fastest service turnaround; 24 hour collection service. If you are out of the area, we will send you a flight case for safe transportation.

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Once again the Music Laboratory have been appointed main London Centre for the entire Teac/Tascam professional range of studio products. We have on permanent demonstration the whole range of 4 and 8 track recorders and mixers; also we hire out complete systems.

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The Sondor Libra MO3 magnetic film transport 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 pinch roller (as if the unit were a tape recorder) followed by a sprung tension roller and sprocket drive. The sprocket is directly driven by a stepping motor which maintains synchronisation with the capstan motor which 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, R for external, P for pilot and S for spool, the latter function only being available with the film path open when the film spoils at 30 times normal speed in either direction as set by the fast wind pushbuttons.
SERIES 4000 ACTIVE EQUALISER

FEATURES:
- 27 1/3 octave bands on ISO centers from 40 Hz through 16 kHz.
- 10 dB boost or cut on continuous control. Equal Q in both boost and cut conditions.
- Variable high-pass filter from 20 Hz to 160 Hz with 12 dB/octave roll-off.
- Filter Q optimized for best summation with adjacent bands.
- Noise guaranteed to be -90 dBm or better.
- Sealed MIL-Spec pots.
- EQ IN/OUT switch on front panel.
- PLUS OPTIONAL CROSSOVERS FOR BI-AMPING!
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- Accessory socket to permit insertion of 12 dB/oct. or 18 dB/oct. low level crossover for bi-amp outputs.

ANALYSERS
- MODEL 140 1/3 OCTAVE ANALYSER FOR ROOM EQ
- MODEL 142A SIGNAL MONITOR
- MODEL 150 OCTAVE BAND ANALYSER

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Contact us for full illustrated technical brochures.
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 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 expected 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 releasing 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 a 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 detected.

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 cue microphone 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 provided in front of 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 of 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.

Headphone monitoring is provided by a stereo 1/4in 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 10V to 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 Sondor 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 70s 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 flux of 320nWb/m 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.
Trident Audio Developments Limited cordially invite you to view their FLEXIMIX at your own premises on any date and time to suit you and put it through its paces on your own work.

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We guarantee you won't be disappointed. Just clip the coupon and return to us — TODAY.
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 Magnetifilm 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

---

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

<table>
<thead>
<tr>
<th>Channel</th>
<th>Cue track</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Machine only without film</strong></td>
<td>1</td>
</tr>
<tr>
<td>20Hz to 20kHz bandwidth rms</td>
<td>67.5dB</td>
</tr>
<tr>
<td>'A' weighted rms</td>
<td>74.0dB</td>
</tr>
<tr>
<td>CCIR weighted quasi-peak*</td>
<td>63.0dB</td>
</tr>
<tr>
<td>CCIR weighted rms*</td>
<td>67.5dB</td>
</tr>
<tr>
<td><strong>Machine recorded film</strong></td>
<td>1</td>
</tr>
<tr>
<td>20Hz to 20kHz bandwidth rms</td>
<td>58.0dB</td>
</tr>
<tr>
<td>'A' weighted rms</td>
<td>63.0dB</td>
</tr>
<tr>
<td>CCIR weighted quasi-peak*</td>
<td>50.0dB</td>
</tr>
<tr>
<td>CCIR weighted rms*</td>
<td>54.0dB</td>
</tr>
</tbody>
</table>

---

**FIG. 1**

SONDOR LIBRA MO3 REPLAY EQ RANGE

---

**FIG. 2**

SONDOR LIBRA MO3 NORMAL & SYNC PLAYBACK RESPONSE
Rebis
RA201 Noise Gate

SENSITIVITY -60dBm to +20dBm
ATTENUATION 5dB to 40dB
RELEASE TIME 40mS to 10secs
ATTACK TIME 15µS to 4mS
OUTPUT +23dBm into 600ohms
FREQ RESPONSE ±0.5dB 20Hz to 20kHz
DISTORTION 01% THD at +12dBm at 1kHz
POWER SUPPLY 24V to 40V DC at 52mA
DIMENSIONS 5.25"×1" module

UK PRICES: RA201 £62. 16-channel rack £50. Power supply £78

Also illustrated: RA301 Compressor Limiter £400. RA402 Parametric Equaliser £400

For further information contact:
Rebis Audio, Kinver Street, Stourbridge, W. Midlands DY8 5AB, England. Tel. Brierley Hill (0384) 71865
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, giving a maximum output level for 3% third harmonic distortion of +5.5dB 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 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.

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>INPUT NOISE dB ref 0.775V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel 1</td>
<td>Channel 2</td>
</tr>
<tr>
<td>20Hz to 20kHz rms</td>
<td>-113.5dB</td>
</tr>
<tr>
<td>'A' weighted rms</td>
<td>-114.5dB</td>
</tr>
</tbody>
</table>

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Bee Gees (bé'jēz) N. 1. Maurice, Robin, and Barry Gibb. 2. Singers, songwriters, and musicians who have made an important impact on the music industry. 3. Professionals who have displayed an almost uncanny awareness of the directions music is travelling. (see talent, creativity, and perfectionism)

talent (tal'ent) N. 1. A mental or physical aptitude; specific natural or acquired ability. 2. Natural endowment of ability or superior quality. 3. Gifted people collectively.

creativity (krē-a-tiv'i-te) N. Characterized by originality and imagination.

perfectionism (par-fek'sha-niz'am) N. A propensity for setting extremely high standards and being displeased with anything less. (see perfection)

perfection (par-fek'shen) N. The highest degree of excellence. (see MCI Professional Recording Equipment. Designed for professionals like the Bee Gees)

MCI
54-56 Stanhope Street, London NW1 3EX #1-388 78678 Tx: 261116
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 Wow and flutter meter. The resulting output was displayed on a 10kHz recorded tone to reveal scrape flutter and lines.

Ance was to measure the phase jitter between the two audio tracks by recording a 10kHz tone and measuring the phase jitter. The constant input impedance was far too low at 1120 whilst the low sensitivity level control giving a range from +9.5dBm to +4dBm into an input impedance of 8V p-p. 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 1870Ω. This is because the manufacturer has for some reason set all the inputs with 2200Ω 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 low 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 10μV 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 to 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
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**Stellavox SP8 portable tape recorder**

**MANUFACTURER'S SPECIFICATION**

- **Maximum reel diameter:** 5in (13cm), with ABR accessory 11in (30cm).
- **Speed stability:** ±0.1% or 1.0% between -4 and +15°C.
- **Wow and flutter:** ±0.07% DIN.
- **Fast motorised rewind:** approximately 45s per 600ft (180m).
- **Power supply built in:** with 15 cells accumulators.
- **Rewind current:** 70mA.
- **Power consumption:** 90 to 110mA (average).
- **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 AAS 'A' filter, relative to 510nWb/m, mono 65dB, stereo 65dB DIN weighted.
- **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 AWP) 130mV to 12V.
- **Outputs:** (symmetrical with SOT 8) 1.55 + 4.4V at 200 + 600Ω. Direct 1 + 2 (unsymmetrical) 1.59V maximum 3.8V. Pilot (and with crystal with SX1213) 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 3-speed mono head £218.21, 1-speed stereo £261.86, 2-speed stereo £234.14, with synchronotone £457. 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.

**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 3½in/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 'synchronotone' 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 ±13% 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 plate with the potentiometer acting as a volume 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 motor 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.
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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 0dB, 0dB, -5dB, -10dB and -20dB and also from 0 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 indicator lamp illuminated when the recorder is switched on. The next features are two small and rather fiddly potentiometers which control the line level—these cannot however normally be ganged for stereo level and operate with the possible exception of the line level controls which are rather too small and operate 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 ±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 ganing 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 pushbutton 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 151n/s, 71n/s and 31n/s plus an external position which allows the use of an accessory speed control via an adjacent miniature coaxial socket. The remains of the right hand side are occupied by the headphone monitor jack of the 3-pole stereo jin variety and also by the transformer coupled floating line output with nominal ratings of 4.4V into 600Ω and 1.5V into 200Ω via 4mm banana sockets.

Other all 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 mon/o 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 synthes 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

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Telex: 847605 a/b Tillex G.
The fuse is a very simple protection device which works, we think, a little too well. Because it would be highly embarrassing, not to say time consuming, to replace one on a big gig or during a heavy session. The ADR Compex Limiter, on the other hand, works equally as well — with the following bonus points:

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**audio & design (recording) ltd.**
84 Oxford Road, Reading, Berks., England

Telephone: Reading (0734) 53411
Telex: 847 605 a/b Tillex G
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 end 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 NEC 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 appear 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 25±5 at 15in/s and 7½in/s at 7½in/s other equalisations are available using different headblocks. When replaying a tape fluxivity of 320Wb/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 320Wb/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 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 320Wb/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 320Wb/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 320Wb/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.

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

<table>
<thead>
<tr>
<th>Machine without tape</th>
<th>15in/s mono</th>
<th>7½in/s mono</th>
<th>7½in/s stereo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unweighted rms 20Hz to 20kHz</td>
<td>62dB</td>
<td>60dB</td>
<td>49.5dB*</td>
</tr>
<tr>
<td>&quot;A&quot; weighted rms</td>
<td>76.5dB</td>
<td>75dB</td>
<td>69dB*</td>
</tr>
<tr>
<td>CCIF weighted quasi-peak ref 1kHz</td>
<td>66.5dB</td>
<td>64.5dB</td>
<td>62dB</td>
</tr>
<tr>
<td>CCIF weighted quasi-peak ref 1kHz</td>
<td>71dB</td>
<td>68.5dB</td>
<td>66.5dB</td>
</tr>
<tr>
<td>Machine used 3M 207 tape</td>
<td>57dB</td>
<td>56.5dB</td>
<td>49dB*</td>
</tr>
<tr>
<td>Unweighted rms 20Hz to 20kHz</td>
<td>64.5dB</td>
<td>65dB</td>
<td>62dB</td>
</tr>
<tr>
<td>&quot;A&quot; weighted rms</td>
<td>51.5dB</td>
<td>51.5dB</td>
<td>49.5dB</td>
</tr>
<tr>
<td>CCIF weighted quasi-peak ref 1kHz</td>
<td>56dB</td>
<td>56dB</td>
<td>53.5dB</td>
</tr>
</tbody>
</table>

**FIG. 2 STELLA VOX SP8 OVERALL MONO RECORD/REPLAY RESPONSE AT 15 in/s**

**ASTRONISHING STEREO DISC AMPLIFIER 2 FOR BROADCASTING, DISC MONITORING AND TRANSFER WITH THE HIGHEST QUALITY**

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- Output: +10 dBV 1kHz 0.04% to 0.06%
- Output: +10 dBV 20 Hz-20kHz 0.02%
- Internal intermodulation distortion 50 Hz-7kHz 0.005%
- 4kHz: Output: +10 dBV 0.005%
- Dynamic intermodulation distortion 3.16 kHz square wave (single pole) 0.005%
- Pre-emphasis input: 500 mV pk-pk 20Hz 0.035%
- Pre-emphasis response RIAA accuracy
  - 30 Hz-20kHz Within 0.5dB

Cartridge impedance interaction on frequency response
- High impedance cartridge, THD 1% Within 0.5dB
- 4kHz: Output: +10 dBV 0.01%
- Clipping determined by onset of peak distortion products or THD exceeding —80dB

Overall performance
- 50 Hz-20kHz 0.05%
- Within 0.5dB
- Filter turnover
- Within 0.5dB

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Inputs and outputs

The speech filter, switchable at the microphone inputs, was found to have a −3 dB point at 100 Hz with a 6 dB/octave rate of attenuation which is a useful feature, the microphone inputs have a most excellent noise performance of −126 dBm over the band 20 Hz to 20 kHz, or −128dBm 'A' weighted both when shunted by 2kΩ. Unfortunately the microphone attenuator is placed before the amplifier so that the effective input noise increases in 10 dB steps with the attenuator steps. However the input impedance for dynamic microphone was satisfactory and virtually constant with the attenuator or level control at 8kΩ. Similarly the input impedance in the A/B 12V powering position was satisfactory at 3kΩ with the voltage being 13 V. In the phantom powering positions, the 12 V impedance was 1,100 Ω with 13 V applied, and in the 48 V position 5,000 Ω with 48.5 V applied.

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

<table>
<thead>
<tr>
<th>Dynamic microphone</th>
<th>Line</th>
<th>Mixer</th>
</tr>
</thead>
<tbody>
<tr>
<td>−71 dBm</td>
<td>−31.5 dBm</td>
<td>−2.9 dBm</td>
</tr>
<tr>
<td>−35 dBm</td>
<td>+22 dBm</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 2

Being a fixed level input, the impedance of the mixer input was constant at 670 kΩ with the impedance of the line input being normally in the order of 9 kΩ but dropping to 6 kΩ at minimum gain, both these being a little on the low side.

On the output end, the line outputs delivered in round figures +6 dB ref .775 V for a recording level of 320 nWb/m with the output impedance being extremely low. The floating transformer outputs in the fixed level mode delivered 5.2 V from the 600 Ω output (impedance 850 Ω) and 1.7 V from the 2000 Ω output (impedance 170 Ω) for the same level with output clipping points at 11 V and 3.7 V respectively, leaving very little margin between normal output levels and output clipping.

Drive to the headphone output was satisfactory with a maximum output of 1.5 V for 320nWb/m from an impedance which varied with the setting of the headphone level control up to 2600 Ω.

Looking at the pilot system, the input impedance was adequately high at about 1,000 Ω with the level up to 2 V being accurately metered, similarly the 2 V pilot output was accurately metered with the internal generator being within 0.01% of the nominal 50 Hz. When locking in synchronism with external sources, the lock was satisfactorily maintained over the specified ±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 15 in/s and 0.07% at 71 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 10 kHz recorded and replayed tone at 15 in/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 10 kHz tone at 71 in/s—nor a good performance.

Record level metering was found to be good with the meters having a risetime to −1 dB of 10 ms and the 0 dB mark being a recording level of 320nWb/m which, with the +4 dB available on the meter, is satisfactory for the 3M 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 SPB 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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OURT
ACOUSTICS
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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Audio Kinetics XT24

**SPECIFICATION SUMMARY**

Intelligent autolocator that interfaces with 3M M79, Studer A80, Lyrec TR532, Ampex MM100/1200, Ampex ATR-100/104, MCI JH-16. Uses two separate counters, master and int locator, both operating in minutes and seconds. Four pre or immediate load memories. INCHES per second speedometer for variable speed reference. Full standard tape transport remotes with LED indication, leverwheel numerics for fast 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 5TD.

**Phone:** 0727 32191.

3M (UK) exclusively distribute the 3M M79 version of the Int locator 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 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 computer program as opposed to just writing something straightforward. I thought it was fabulous and felt we should get one on 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—just it's 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 thumbwheel 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 'ahh' after it, which just kills the whole purpose of the thing. The XT24 pulls out perfectly 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 speed', 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 speed' and 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 can you 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 guest has at one point forgotten to look at what happens when a guy presses a particular sequence. When it happens the machine thinks, maybe that is saying 'set speed' and will come up wrong. And the guy'll think, what have I done? There's something wrong with the box.

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 any of the four memory locations. There are also 'lever' into the memory at any time. For example, you can put any number that's 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 guy presses a particular sequence. When it happens the machine thinks, maybe that is saying 'set speed' and will come up wrong. And the guy'll think, what have I done? There's something wrong with the box.

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 speed', 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 speed' and will come up wrong. And the guy'll think, what have I done? There's something wrong with the box.

The 'edit' button is like a normal edit function plus the fact that when told to go-to-zero it automati- cally 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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**APPLICATION NOTES**

1. **Low level source noise reduction**
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2. **Eliminating ambient noise**
   - Especially for complex signals as in live film work. Again, 'auto' mode of F300 is handy for removing camera noise, aircraft and traffic interference or air conditioning/generator rumble/hum.

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**APPLICATION NOTES**

1. **Tightening "flabby" bass drums**
   - In conjunction with limiters (see SCAMP SC:), not necessarily, noise gates can "tighten-up" skins giving an urgent transient characteristic to bass drums. At same time spill from other kit can be excluded for a clean, usable bass rhythm line.

2. **Overdubs cleanup**
   - Eliminating pickup from headphones on overdubbed instruments, tape etc. again provides usable signals that can be confidently mixed without "muddying up" or introducing phase distortion/cancellation.

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Note: Advertisement copy must be clearly printed in block capitals or typewritten.

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For application form please write or telephone: Mike Allen, Staff Relations Officer, Thames Television Limited, Broom Road, Teddington Lock, Teddington, 01-977 3252 ext. 325.

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Write giving details of age, qualifications and experience to: The Director, University of London Audio Visual Centre, 11 Bedford Square, London WC1B 3RA.

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Technical Officer 3
Salary: £5,545-£5,905

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Now, Harrison also gives you a choice. Console Models 4832, 4432, 4032 and 3232 are available with your choice of microphone preamplifiers: with or without input transformers.

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- Perpetual memory of delay settings for permanent or semi-permanent installations.
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- Full control of digital processing available at remote socket.
- Any output can be momentarily set to zero delay time without affecting the actual delay settings.
- High technology semiconductor memory. The 652 option uses 28 x 16K bit Random Access Memories.
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