November 1974 25p

studio sound

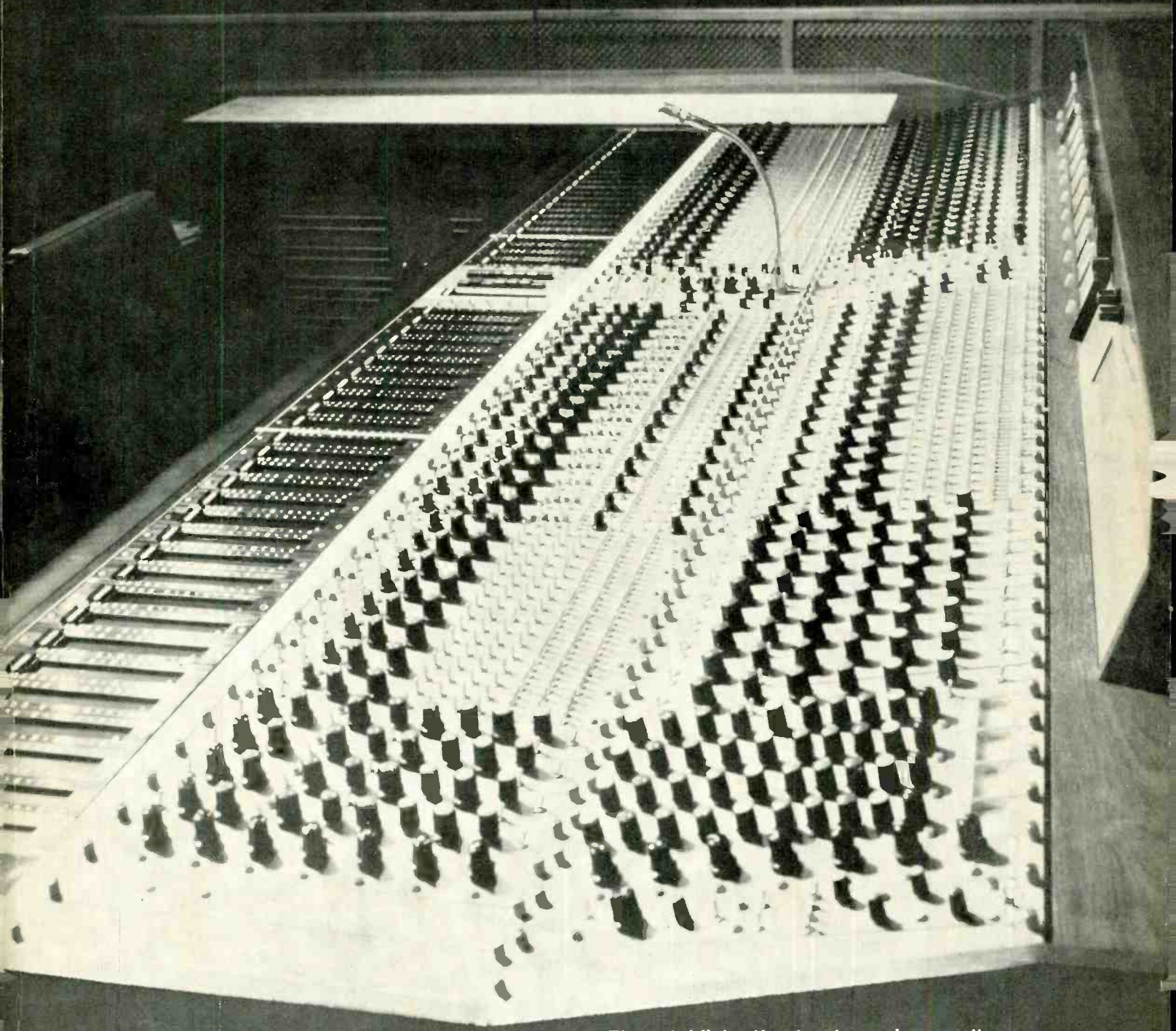
AND BROADCAST ENGINEERING

GRAPHIC EQUALISERS SURVEYED AND REVIEWED

Cadac and Quadraphonics

RCA Rome – the choice was Cadac for their multi-track quadraphonic music recording console in Studio D. Not a standard stereo console format with some joysticks added, but one specifically designed and system engineered to facilitate all types of recording in this medium – incidentally we have also equipped their studios B and C with custom built consoles.

Our close relationship with studio practices and techniques is consequently reflected in the console engineering and logic systems, making Cadac the natural choice of people engaged in the art of sound recording.



The established leaders in music recording consoles and techniques.

cadac

Cadac (London) Ltd.
141, Lower Luton Road Harpenden Herts AL5 5EL
☎ Harpenden (STD 05827) 64351 Telex 826323

studio sound
AND BROADCAST ENGINEERING

EDITOR DAVID KIRK
DEPUTY EDITOR MICHAEL THORNE
EDITORIAL PRODUCTION DRUSILLA DALRYMPLE
ADVERTISEMENT MANAGER RICHARD WESTBROOK
MAGAZINE SALES MANAGER DON BAILEY

THE LINK HOUSE GROUP

Editorial and Advertising Offices: LINK HOUSE, DINGWALL AVENUE, CROYDON CR9 2TA. Telephone: 01-686 2599

NOVEMBER 1974 VOLUME 16 NUMBER 11

CONTENTS

FEATURES

COLUMNS

REVIEWS

SUBSCRIPTIONS
STUDIO SOUND, *published monthly, enables engineers and studio management to keep abreast of new technical and commercial developments in electronic communication. The journal is available without charge to all persons actively engaged in the sound recording, broadcasting and cinematographic industries. It is also circulated by paid subscription to manufacturing companies and individuals interested in these industries. Annual subscription rates are £3 (UK) or £3·30 overseas.*

CORRESPONDENCE AND ARTICLES
All STUDIO SOUND *correspondence should be sent to the address printed on this page. Technical queries should be concise and must include a stamped addressed envelope. Matters relating to more than one department should occupy separate sheets of paper or delay will occur in replying.*

BINDERS
Loose-leaf binders for annual volumes of STUDIO SOUND *are available from Modern Bookbinders, Chadwick Street, Blackburn, Lancashire. Price is £1·25 (UK and overseas). Please quote the volume number or date when ordering.*

THE POPULAR belief that all journalists are Moaning Henrys is not entirely true, this being so only of leader-writers. Once or twice in the lifetime of these latter, disaster strikes when the realisation dawns that All is Well with the World. They whose task it is to disgorge heated opinion . . . to harangue and pontificate and have their copy ready by Friday . . . suddenly have nothing to complain about. Resort is then made to a mental file of Aunt Sallys, never normally revealed *en masse*:

Advertising copy (deplorably low standards of).
Background music (almost as annoying as the internal combustion engine).
Cassettes (even worse than gramophone records).
Deutsche Industrie Norm (commendable standards but abominable connectors).
Equalisation (to the devil with NARTB).
Feedback (too common in public address systems).
Gramophone records (almost as bad as cassettes).
Hi-fi (do those four letters have *any* meaning?).
Independent broadcasting (independent of whom?).
Jargon (confusing already but we still need more).
Kirchoff's laws (ever found a mixer-jockey who knew them?).
Loudspeaker reviews (we know they're all bad but who can do better?).
Music critics (big ears, big heads, but no qualifications).
Noise (change Heathrow flight paths to avoid West End studios?)
Omnidirectional loudspeakers (leave this one to *Hi-Fi News*).
Psuedo-quadraphony (standing joke; strictly for the dummy-headed).
Quadraphony (another standing joke only please stand in the middle).
Radio (banality of much modern broadcasting).
Sophistry (our *Mark 3* is more sophisticated than our *Mark 2* which had fewer belts).
Television (banality of much modern broadcasting).
Union (need for a strong one for sound recordists and a weak one for electricity power workers).
Valves (kept the room warm and were easier to identify when they died).
Weighted specifications (dubious way to improve poor figures).
X-rays (insufficient public awareness of crt radiation).
Young people (deplorable musical taste of).
Zero level (beyond human wit to conform to a true standard?).

The foregoing file is, of course, selectively updated as circumstances permit. Is *Pseudo-quadraphony* really more distressing than the endless gaggle of misguided *Politicians* who dare to criticise a broadcasting corporation noticeably less biased and less inefficient than they are themselves? And where is one to file the freelance broadcaster who the other day equated a 15 per cent inflation rate and the disinterment of Colonel Blimp with 'the break-up of modern civilisation'? Didn't catch the fellow's name but there is a man with the makings of a leader-writer.

STUDIO SOUND *is published on the 14th of the preceding month unless that date falls on a Sunday, when it appears on the Saturday.*

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

Total average net circulation of 7,641 per issue during 1973.

REVOX

REVOX A77 SERIES

Available in a wide variety of configurations, inc. $\frac{1}{2}$ track, full track, $\frac{1}{4}$ track. Choice of tape speed.

Backed by ITA Service

IMMEDIATE DELIVERY— ALL MODELS

(ALSO AVAILABLE FOR HIRE)

THE NEW REVOX A-700 SERIES

3 tape speed configurations
Full deck logic
Four inputs
Crystal servo control
Tape footage counter
Servo tape tension

Write for full information

IMMEDIATE DELIVERY— ALL MODELS

(ALSO AVAILABLE FOR HIRE)

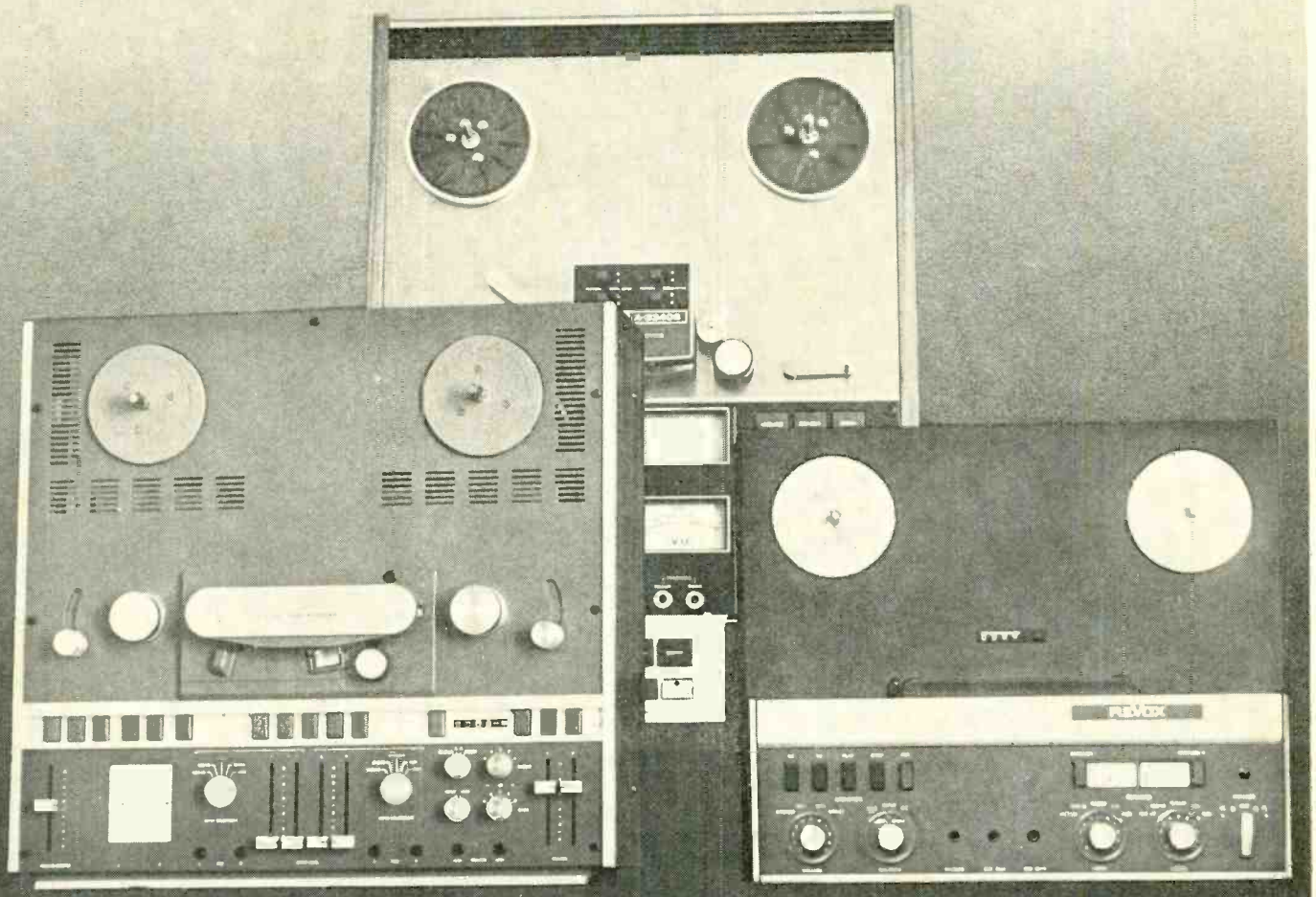
Scotch 207 LOWEST UK PRICES

NOTE NEW ADDRESS-

ITA

Industrial Tape Applications
5 Pratt Street, London NW1 OAE. Tel: 01-485 6162 Telex: 21879

TAPING IT EASY



We don't just supply the best models of Teak and Revox tape decks.

We also run one of the fastest, most reliable servicing operations in the business.

And we modify your equipment to any specifications you require.

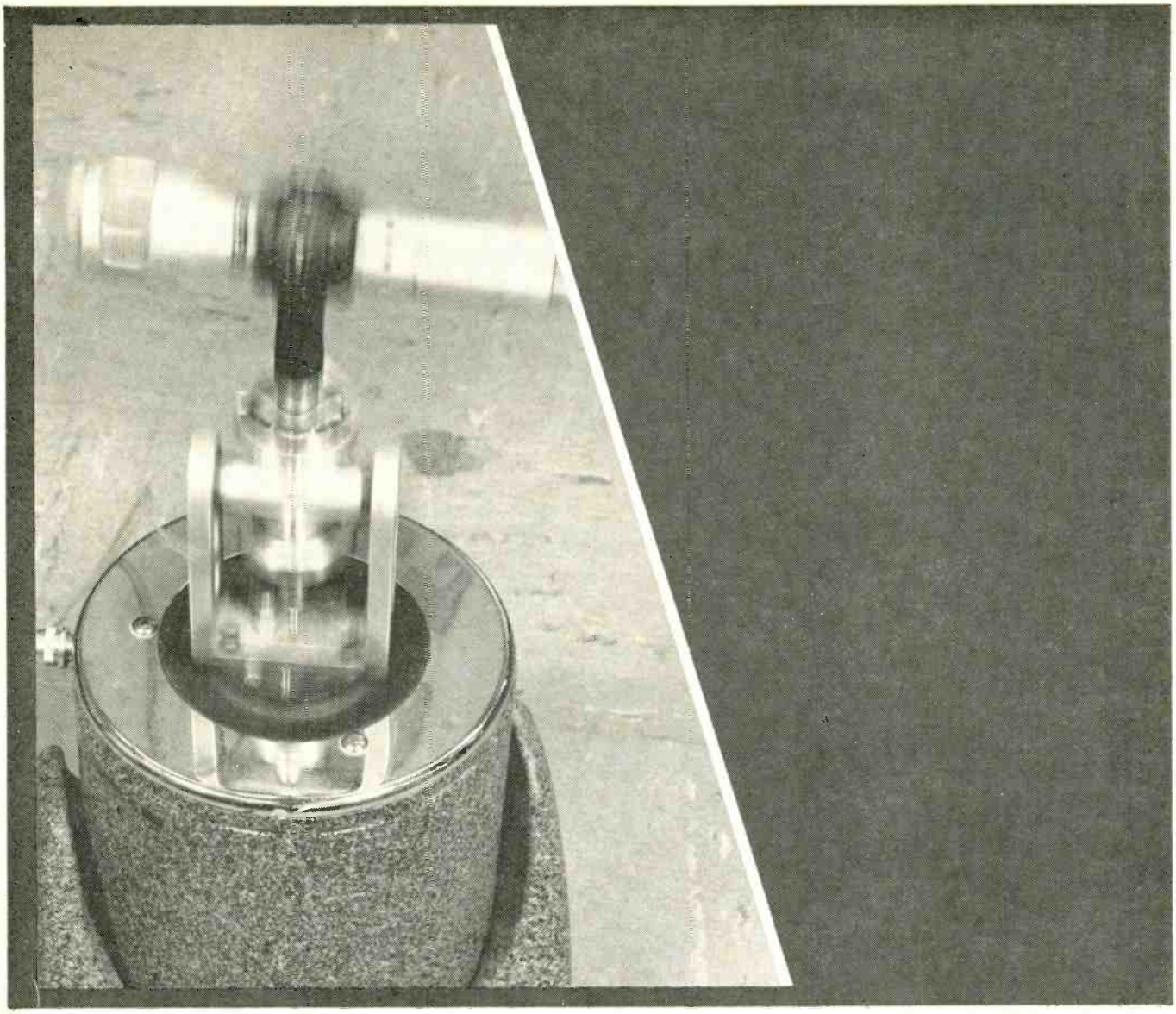
If you live in the London area, we'll collect your machine and do our best to re-deliver in 24 hours.

We also keep a comprehensive stock of accessories.

That's why you can tape it easy with.

TAYLOR HUTCHINSON LTD

105 High Street, Eton, Bucks., SLA 6AF. Phone Windsor 51403



Shake. rattle & roll.

Welcome to our chamber of horrors. Inside the Shure Quality Control laboratory, some of the most brutal product tests ever devised are administered to Shure microphones. The illustration above shows a "shaking" machine at work on a Shure microphone and noise-isolation mount. It's only one in a battery of torturous tests that shake, rattle, roll, drop, heat, chill, dampen, bend, twist, and generally commit mechanical, electrical and acoustical mayhem on off-the-production-line samples of all Shure microphones. It's a treatment that could cause lesser microphones to become inoperative in minutes. This kind of continuing quality control makes ordinary "spot checks" pale by comparison. The point is that if Shure microphones can survive our chamber of horrors, they can survive the roughest in-the-field treatment you can give them! For your catalog, write:

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

SHURE®

Not every country qualifies.

There are top men in sound engineering all over the world.

Men in the USA, Canada, Holland, Italy, Portugal, France, Japan and South Africa.

Take South Africa.

We recently delivered a 38 input, 24 track quadrophonic 'A' Series Console to a division of Satbel.

They're big in the leisure and entertainment industry over there.

The Triad 'A' Series is superbly engineered, ergonomic and ultimately flexible.

Satbel's engineers found it to be just what they liked.

A challenge like this is just what we like.

TRIAD

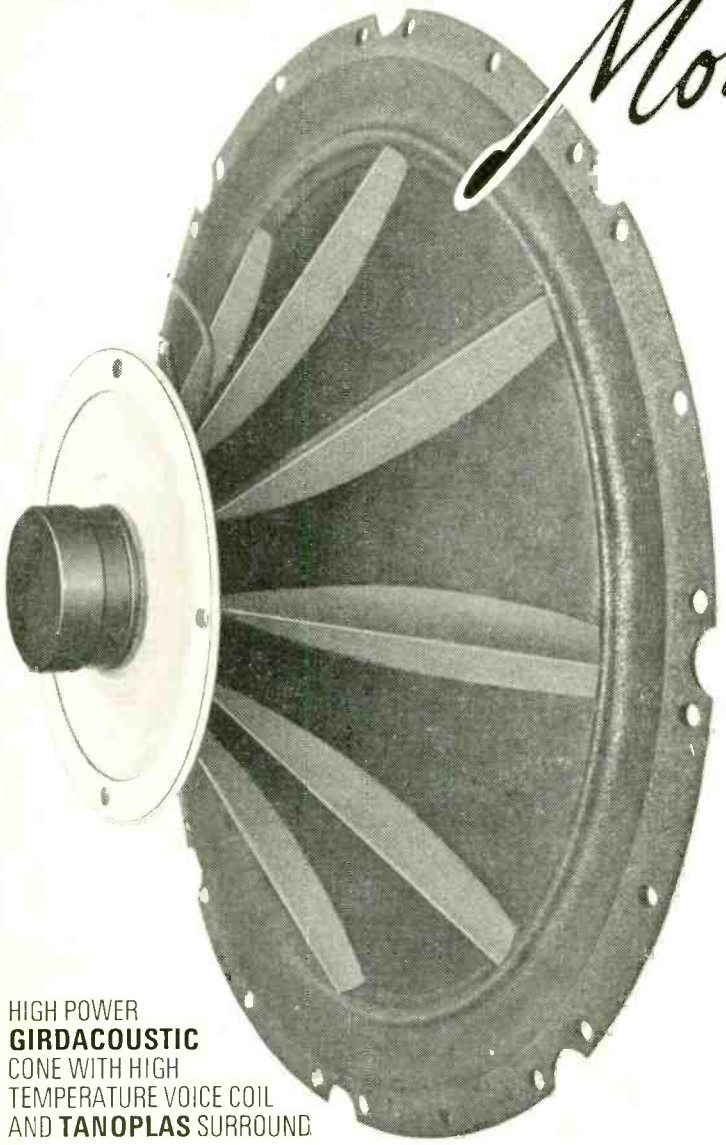
More than most guys can handle.

Trident Audio Developments Limited, 4-10 North Road, London N7 9HG. Telephone: 01-609 0087. Telex: 27782.

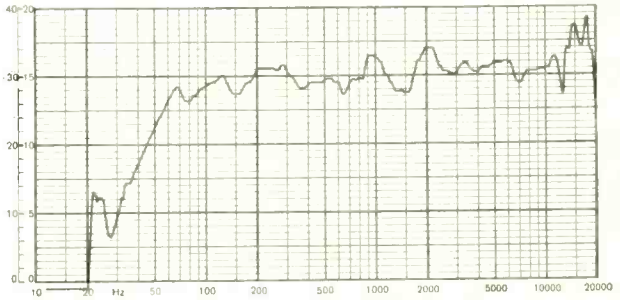
TANNOY

THE OUTSTANDING NEW *Monitor*

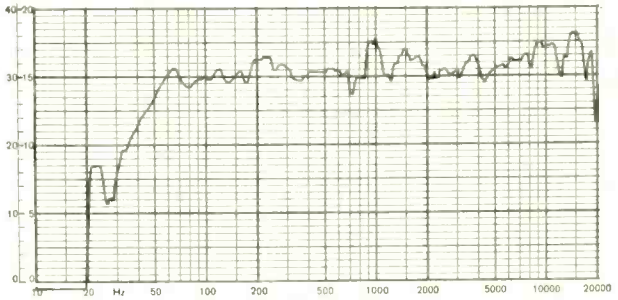
HIGH PERFORMANCE DUAL



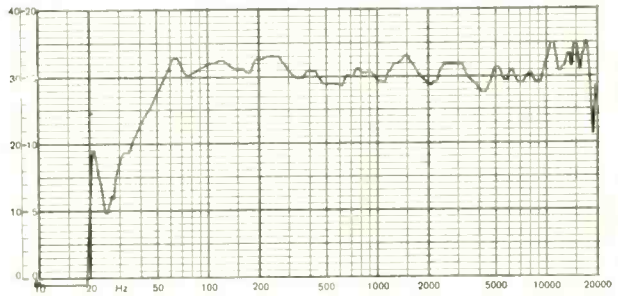
HIGH POWER **GIRDACOUSTIC** CONE WITH HIGH TEMPERATURE VOICE COIL AND **TANOPLAS** SURROUND



TYPICAL RESPONSE 260 mm HIGH PERFORMANCE DUAL (10″)



TYPICAL RESPONSE 310 mm HIGH PERFORMANCE DUAL (12″)



TYPICAL RESPONSE 410 mm HIGH PERFORMANCE DUAL (15″)

- ✻INCREASED POWER HANDLING CAPACITY
- ✻HIGH TEMPERATURE VOICE COILS
- ✻**GIRDACOUSTIC** CONE FOR SMOOTHER RESPONSE (310 mm and 410 mm models only)
- ✻**TANOPLAS** SURROUND FOR HIGH STABILITY AND LOW BASS RESONANCE
- ✻IMPROVED AND UP-RATED CROSS-OVER NETWORK

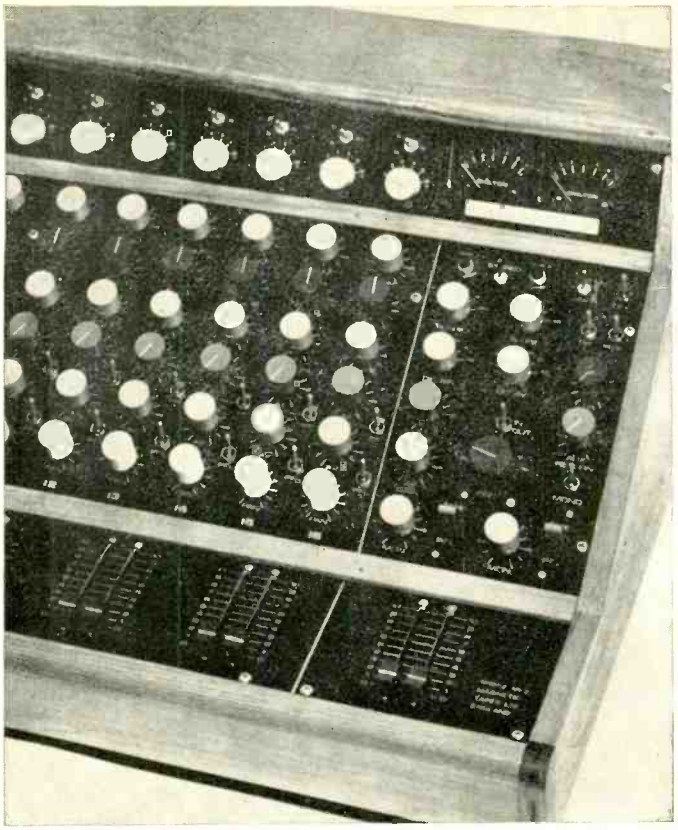
	260 mm 10″	310 mm 12″	410 mm 15″
Power Handling Capacity*	50W	60W	85W
Frequency Response	27-20,000 HZ	25-20,000 HZ	23-20,000 HZ
Intermodulation Products	less than 2%	less than 2%	less than 2%
Impedance via Crossover network	8 ohms (5 ohms min.)	8 ohms (5 ohms min.)	8 ohms (5 ohms min.)

✻INTEGRATED PROGRAMME MATERIAL

ALL SPECIFICATIONS SUBJECT TO ALTERATION WITHOUT NOTICE

TANNOY®

NORWOOD RD. WEST NORWOOD. SE 27. 01-670 1131



WHY CHILTON MIXERS?

We are manufacturers in the true sense of the word; producing Teak Cabinets, Sheet Metal Work, Tooling, Front Panel and Printed Circuit Artwork etc., our products are accurate with an attention to detail that is second nature to us.

The popular M10/2 (10in 2out) portable mixer shown is supplied as a basic unit with 10 Line inputs inc PPM, Oscillator, LF/HF Equalisers, 1 Aux and PFL. You choose the number of Microphone or Gram inputs, the channels to have Presence, Switchable HF/LF Filters or Ducking. In addition a 2nd Aux channel, Talk-Back, and/or Compressors can be fitted.

Ring or write for full information, if however our standard range is unsuitable it may be possible to modify one to suit your requirements.

M10/2 Mk3 BASIC ..... **£295.00+VAT**
16 input version ..... **£455.00+VAT**
12 in 4 out ..... **£515.00+VAT**

MAGNETIC TAPES Ltd., Chilton Works, Garden Rd., Richmond, Surrey, TW9 4NS

Telephone 01-876 7957

SESCOM'S NEW CABLE TESTER

TESTS FOR:
- Continuity
- Opens
- Shorts
- Phasing

MODEL CT-1

Just plug a standard cannon type 3 pin male to female extension cord into box, depress three push buttons. Compact cast aluminum box. Uses standard 9V transistor battery. Professional Net $21.50.

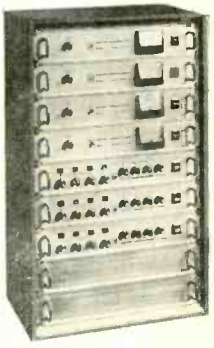
Send for Spec Sheet

Quality Engineered Sound Products

SESCOM, INC.

P.O. Box 590 Gardena, CA 90247 U.S.A.
Telephone (213) 770-3510 · TWX 910-328-6189

"sounds perfect"



AT LAST your search is over. If second best just will not do, you should be using our range of high reliability equipment which includes power amplifiers, 100v. line transformers, microphone transformers, rack cabinets, and some superb electronic lighting control units. Delivery—usually ex-stock.

Write now for the full details.

MUSTANG COMMUNICATIONS
NELSON STREET · SCARBOROUGH
YORKSHIRE · YO12 7SZ
Telephone (0723) 63298

HAMPSTEAD HIGH FIDELITY FOR THE HIGHEST QUALITY STC MICROPHONES

Main distributors of STC professional microphones. The complete range is available from stock. Professional terms available.

HAMPSTEAD HIGH FIDELITY
91 Heath Street, Hampstead, London NW3 6SS
Telephones : 01-435 0999 and 01-434 6377

4105
Cardioid microphone
Small, lightweight and robust, suitable for high quality sound reinforcement
Impedance 30 Ω

4104
Broadcast quality commentator's noise cancelling lip microphone
Sensitivity –84 dB ref IV. Impedance 30 or 300 Ω
A highly damped ribbon unit ensures freedom from non linearity and low frequency surges

4037 A & C
Omnidirectional
Moving coil
Frequency response : 30 Hz - 12 kHz. Sensitivity : –84 dB ref IV
Suitable for interviewing

4115
Lightweight Broadcast quality noise cancelling ribbon microphone
Impedance 30 Ω
Sensitivity 85 dB ref IV

4021
Omnidirectional
Moving coil 40 Hz - 12 kHz. Impedance : 30 Ω. Output : –80 dB ref IV/dyne/cm²

TOP
4001 G
High frequency pressure unit 15 Ω as used by leading loudspeaker manufacturers

BOTTOM
4001 K
High frequency pressure unit 8 Ω as used by leading louuspeaker manufacturers

4038
Bidirectional Ribbon
30 Hz - 15 kHz
Impedance : 30 Ω or 300 Ω. Output : –80 dB ref IV at 30 Ω

A compact console for the audio professional who won't compromise quality

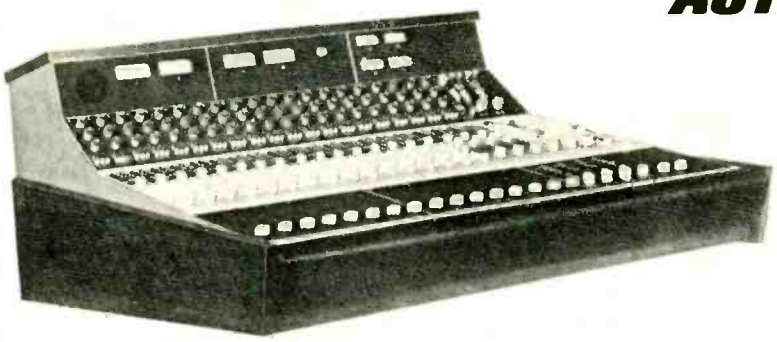


TABLE OR PEDESTAL MOUNTING,
36¾" WIDE x 35" DEEP x 18¼" HIGH.

AUTOMATED'S AUDIO CONTROL CONSOLE

Model 1604

Never before so much for so little.
Flexibility, quality and dependability at a cost that makes this console a completely practical investment.

The Model 1604 is designed to be used in a studio, as a remote field unit, or as a production or on-the-air console with quad or two simultaneous stereo outputs.

FOR RECORDING it will accommodate 16 inputs, 4 echo channels, 2 foldback circuits, 4 output channels, 4 submasters, 4 speaker monitoring, slate, tone and intercom circuits . . . as well as audition and cue facilities.

FOR BROADCASTING it offers foldback, audition, intercom and program interlock features, with options for remote control of tape machines and turntables . . . as well as remote input pre-selection.

Choose from a variety of modular, interchangeable equalizers to provide the flexibility you require. The Model 1604 can be changed or expanded to meet various operating conditions with no compromise in quality, performance or function. Modularity also means ease of servicing. All external connections are plug-in to allow rapid installation. Available table-top or pedestal mounted, and options are factory pre-wired permitting easy incorporation in the field.

Why not get the console with the features you need... at a price you can afford... from the company whose business is serving the audio professional with equipment built to a standard... not to a price.

AUTOMATED PROCESSES, INC.
80 MARCUS DRIVE, MELVILLE, NEW YORK 11746 · 516-694-9212

United Kingdom: 3M U.K., London, England

Europe: 3M FRANCE, Paris, France

The Big PDM-Compressor EMT 156 has inspired a new Family of Console Components:

EMT 256 II
Compact compressor with program dependent release time, low level noise reduction by expander, and compression gain and ratio adjustable over wide range. Uniquely applicable for all types of music and speech program material; directly insertable in the microphone input channel.

EMT 257
Compact limiter featuring adjustable attack times to 50 microseconds and loudness dependent release time. For automatic, low distortion limiting of program peaks.

NEW: EMT 258
Automatic noise filter, featuring program controlled low-pass cut-off frequencz and dynamic expander function. A highly up to date circuit principle for suppression of background noise and improvement of signal-to-noise ratio.

EMT 258 delivery: beginning mid 1975

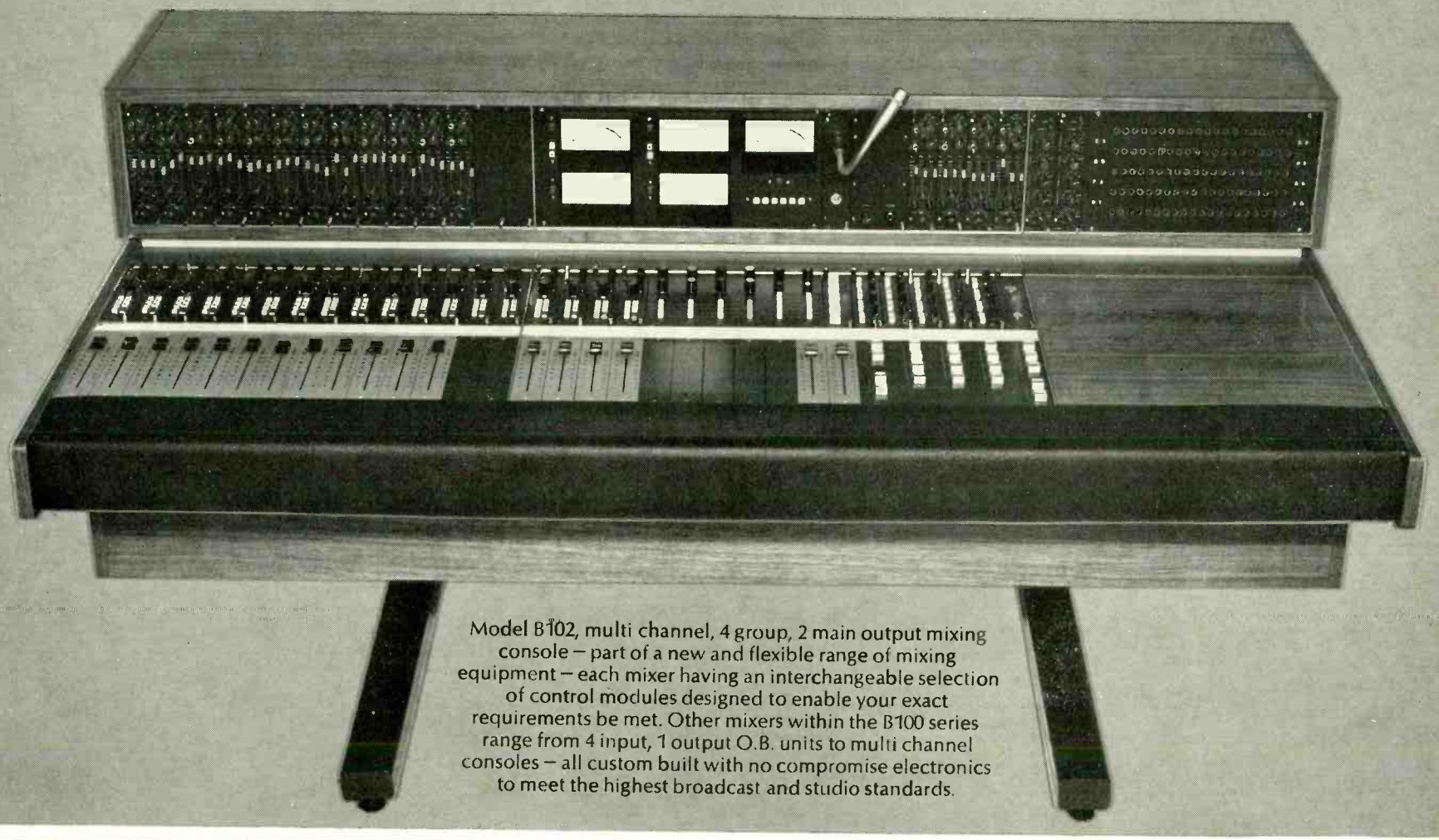
Additional export program:
- Reverberation units
- Studio turntables and pickup cartridges
- Specialized tape machines for endless loop cassettes and logging purposes.
- Digital audio signal delay units
- Auditorium microphone winch systems
- Electronic tuning fork and polarity tester
- Test equipment for wow and flutter measurement

FRANZ Vertriebsgesellschaft m.b.H.
D-763 LAHR 1, P. O. BOX 1520, West Germany

B100 SERIES AUDIO MIXING CONSOLES

audix

SOUND SYSTEMS AND ELECTRONICS



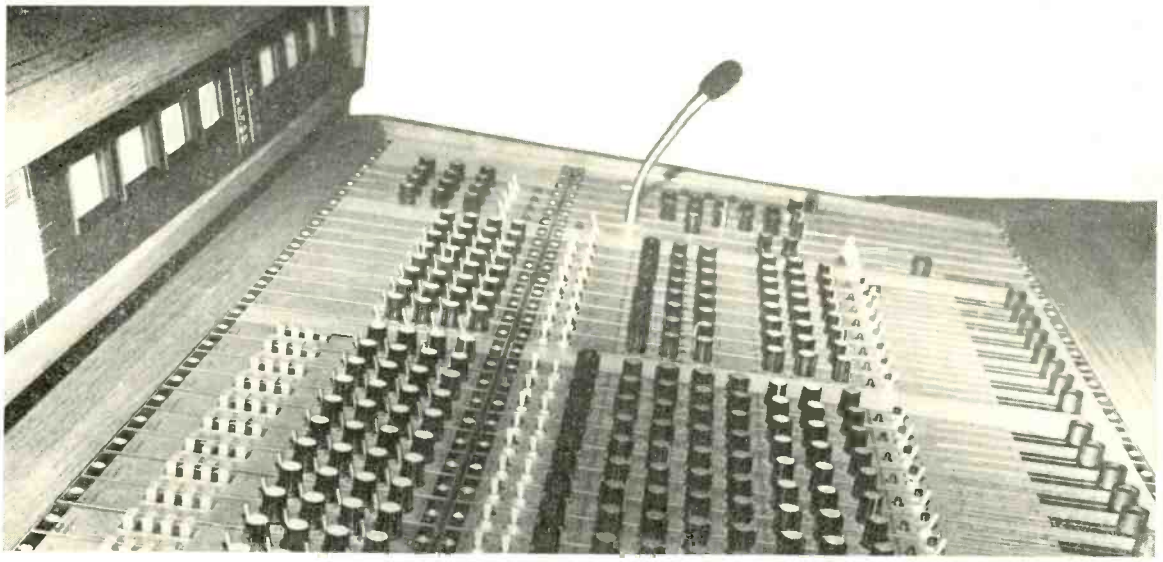
Model B102, multi channel, 4 group, 2 main output mixing console – part of a new and flexible range of mixing equipment – each mixer having an interchangeable selection of control modules designed to enable your exact requirements be met. Other mixers within the B100 series range from 4 input, 1 output O.B. units to multi channel consoles – all custom built with no compromise electronics to meet the highest broadcast and studio standards.

audix

MANUFACTURERS OF SOUND SYSTEMS AND ELECTRONICS

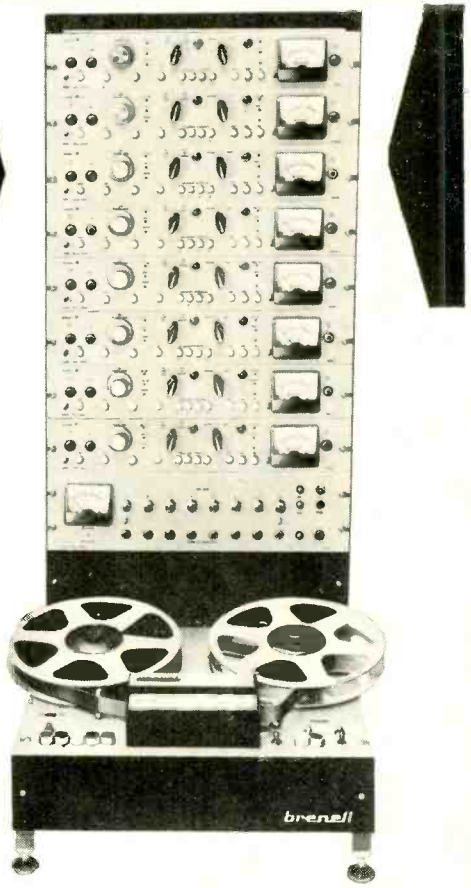
AUDIX LIMITED · STANSTED · ESSEX CM24 8HS
TELEPHONE: BISHOP'S STORTFORD 813132
(4 lines) (STD 0279)

Alice AM-Adaptable Modular



Alice **(Stancoil Limited) Alexandra Road, Windsor, Berks.**
Tel. Windsor 51056

NEW equipment for the professional sound-recording studio from *brenell*



DESIGNED AND MADE IN THE U.K.

MULTI-CHANNEL EQUIPMENT

We have set a new price/performance standard with our 4, 8 and 16 channel studio recorders offering full facilities for the production of master recordings. PPM or VU meters on each channel. Equalisation to CCIR, NAB and IEC characteristics. Remote control for tape transport and record functions. The equipment is in full production and studio use in both U.K. and overseas.

STUDIO RECORDERS

for 2-channel reducing, field recording and full track mastering.

TAPE TRANSPORTS

We offer a widened range of 2 speed and 4 speed modules from 15/16 to 60 IPS, $\frac{1}{8}$″ to 1″ tape width, with heavy duty solenoid operation and remote control facilities.

brenell

BRENELL ENGINEERING CO LTD
231-5 Liverpool Road, London N1 1LY Tel. 01-607 8271 (5 lines)

NEWS

Two new ARP synthesisers

AIMED AT THE lower cost end of the market, these synthesisers offer limited facilities in comparison to the other models in the ARP range. The *Explorer 1* synthesiser will operate in either the preset or manual mode. In the preset mode, it is capable of synthesising the sound of instruments such as trumpets, flutes and clarinets; in the manual mode, it offers many of the facilities of its bigger brothers. These include an envelope generator, white noise generator, voltage controlled filters, pitch and waveform controls and tremolo/vibrato etc.

The other new synthesiser from ARP is the *String Ensemble*. Fully polyphonic, it was designed to create string sounds and is claimed to create the effect of an entire string orchestra. Preset stops select violins, violas, cellos or contrabass strings individually or in any combination. In addition to the string sound, two horn stops are also provided which simulate trumpet and french horn choruses. Because the cellos and contrabass are played only on the lowest octave and a half of the keyboard, it enables the musician to play these instruments with his left hand, and the other instruments with his right. Slider controls adjust the attack and sustain of the keyboard giving expression to the music. ARP Instruments Inc, 320 Needham Street, Newton, Massachusetts 02164, USA. Phone: (617) 965 9700. UK agents: Boosey & Hawkes, 118 Colindale Avenue, The Hyde, London NW9 5HB. Phone: 01-205 8826, and FWO Bauch, 49 Theobald Street, Boreham Wood, Herts. Phone: 01-953 0091.

Compact tape synchroniser

AUTOMATED PROCESSES has introduced an electronic synchroniser for running two tape machines in synchronisation. Called the *Minimag*, it measures 480 x 45 x 305 mm and costs under $2,000. The machine is supplied as a complete unit, self-powered from 115/230V ac, and comes with a built-in code generator. It has a capture range of ±50s and will maintain sync or variable offset for any length of time regardless of tape stretch or shrinkage. Although intended for use with tape transports speed controlled by dc signal, an optional power amplifier can be supplied for synchronous motors. Designed for rack mounting, it is claimed that *Minimag* can be installed in 15 minutes. Don Richter, Automated Processes Inc, 80 Marcus Drive, Melville, New York 11746, USA. Phone: (516) 697 9212. UK agents: 3M Company, 3M House, Wigmore Street, London W1. Phone: 01-486 5522.

New mic from Beyer

CLAIMED TO BE suitable for professional recording applications the Beyer *M201N* moving coil microphone has a hypercardioid polar pattern with a claimed side response attenuation of 20 dB at 120°. Sensitivity is said to be above average with quoted frequency response from 40 to 18k Hz. The output impedance is 200Ω balanced. The unit is available with either a DIN or a Cannon connector and is provided with a swivel adaptor and a foam plastic windshield. The *M201N* has been designed with a built-in hum bucking coil to neutralise the effect of electrically noisy environments on hum pickup. Weight is 220g, and the dimensions are 160 x 24 mm diameter. Price: £47.63 (DIN) and £49.10 (Cannon). Beyer Dynamic (GB) Ltd, 1 Clair Road, Haywards Heath, Sussex RH16 3DP. Phone: 0444-51003.

Tin Pan Alley studios

WEDNESDAY, AUGUST 14 was TPA day in Denmark Street, a day that saw the official opening of a new recording studio deep in the heart of music land, 100 yards north of Oxford Street. 16 track, expandable to 24 input, the studio was masterminded by Ralph Elman who started Regent Sound Studios across the street many years ago. Ralph says that he has no further connection and that he welcomes his former baby as competition. The equipment was specified and is now run by brothers Colin and Robin Freeman. Colin, formerly an engineer with Decca, shares the mixing at TPA with his brother who is responsible for a lot of the maintenance at the studio.

At TPA, there are two studios which are each completely self-contained and acoustically isolated. One of them is eight track and the other is 16. In the main studio, the centre-piece is a 24 input Midas mixer mixing down to 16 channels selected by thumb wheel switches on each input channel; panning is effected between groups nominated in this fashion. The main tape recorder is a 3M 16 track fed from a desk controlled *M16* Dolby A. For double tracking purposes, independent foldback circuits can be set up from either the master 16 track, or any of the 24 inputs; a similar arrangement exists for the monitoring facilities which are handled by Amcron *D150s* feeding Altec custom cabinets.

In the special effects department, there are two EMT stereo echo plates and a modified Revox which is used to make some interesting echo effects by running the machine at 70 cm/s. At lower speeds, the machine is used for editing purposes. Masters are copied by an Otari stereo machine operated from the control console.

Colin is particularly proud of his operating floor; it has been cast in thick concrete and seems to be immune to all vibrations regardless of source. He thinks that this is probably the reason for the 'really good sound that we get with heavy rock groups'. The walls are decked out in an unusual studio fashion; in this case, the use of straw bricks to inhibit reflections results in a very flat-sounding room although no figures to bear this out are available. The uncluttered look of the studio floor is enhanced by a single drum booth, and a Bluthner piano standing in the corner of a fairly large room.

The other smaller studio is used mainly for jingles although it has all the basic facilities of an advanced recording studio. The Helios 16 into eight console feeds a 3M eight track machine with monitoring by an Amcron - Lockwood

ARP Explorer 1

system. Effects are provided by stereo echo plate and electronic metronome. The master production is by a Philips *PRO 30* machine.

Connecting centre

FOR USE IN creating a good quality lash-up between two tape recorders, the *RCS 2* control box from Audio Techniques provides an elegant solution to the problem of copying from one machine to another. The basic effect of the box is to expand the function switch of the individual tape recorders to compound their functions. A further switch allows A-B comparisons on monitoring. The box is stereo and all connections are made by five-pin DIN connectors. The price of the *RCS 2*: £11.95.

A recently-introduced range of continuity mixers is offered by the same company. These mixers are said to fill the requirement for high quality mixers with the correct equalisation for use with mic, tape and pick up cartridges used in discotheques and small radio stations. Construction is modular with the price varying to specification. Audio Techniques, 63 Greyhound Road, London W6 8NH. Phone: 01-385 2302.

Ferrograph tape recorders for UK

PREVIOUSLY AVAILABLE for export only, the Super Seven series is now being released in small quantities on to the home market. These stereo machines are comprehensive in function and sport 268 mm diameter reels. The optional facilities on offer include Dolby B, low or high speed versions, and internal power amplifiers. All machines are available in either two or four track format. Ferrograph Company Ltd, Auriema House, 442 Bath Road, Cippenham, Slough, Buckinghamshire SL1 6BB. Phone: 06286-62511.

Change of address

CETEC HAS recently moved house and is now residing at: 16 Uxbridge Road, Ealing, W5. Phone: 01-579 9145.

Low cost compressor

NEW FROM CHADACRE Electronics is a dynamic compressor, model *9521*, which is available as a pcb module or a complete self-powered unit. Of compact physical size, the basic module has a quoted specification that includes a compression ratio variable up to 6:1, a frequency response from 2.5 to 50k Hz at ±3 dB, and a maximum compression of 20 dB. As standard, there is a provision for a three-position attack/decay switch that controls attack down to a minimum of 5 ms. The maximum decay is 3s. The 100Ω impedance output has a maximum level of 10 dBm, returning a signal-to-noise ratio (weighted) of 116 dB referred to input.

The one-off price for the module is £19.47; the corresponding price for the complete unit £47.15. Both are available direct from: Chadacre Electronics Ltd, Audio Division, 63 Stratford Broadway, London E15 4BQ. Phone: 01-534 1207.

Forthcoming Paris shows

THE SOCIETE POUR la Diffusion des Sciences et des Arts, is organising three international exhibitions which will be held in Paris next year.

The sixteenth International Sound Festival (Festival International du Son) will be held at: Centre International de Paris, Palais des Congres, Porte Maillot, Paris from March 10 to 16. (March 10 is to be reserved for trade and press.) The exhibition will cover musical demonstrations of hi-fidelity equipment and musical instruments, arts programmes and recitals.

The eighteenth Salon International des Composants Electroniques (International Electronic Components Exhibition) will be at Parc des Expositions, Paris from April 2 to 8, 1975. Items of interest for 'researchers and specialists in the electronic world' include: electronic components, measuring instruments, materials specially made for the electronics industry, and equipment and products specific to the manufacture and application of electronic components.

The fourth Salon International Audiovisuel et Communication (International Audiovisual and Communication Exhibition) will be held at the same time and place as the International Electronic Components Exhibition.

For further information contact: S.D.S.A., Press Service, Jean-Pierre Duclos, 14 rue de Presles, 75740 Paris. Phone: 273 24-70.

Galactron from Goodmans

AS A RESULT of collaboration with Galactron, the Italian electronics firm, Goodmans is to market a range of audio equipment aimed at the very top end of the domestic market. There is claimed to be some possibility for applications in studio monitor and foldback systems. The range is backed up by a three-year guarantee. At the moment, there are three models on offer; the *MK10*, a 90W rms per channel conventional domestic preamp power amplifier; the *MK16*, a preamp that boasts two separate ten-band octave graphic equalisers, a five input mixing capability and quadraphonic code/decode facility, and to match the *MK16* is the *MK100* power amplifier that is claimed to push out 100W/channel at 0.2 per cent im distortion. A control providing variable damping is fitted. Prices of the units: *MK10* £364.45, *MK16* £490.75, *MK100* £241.67.

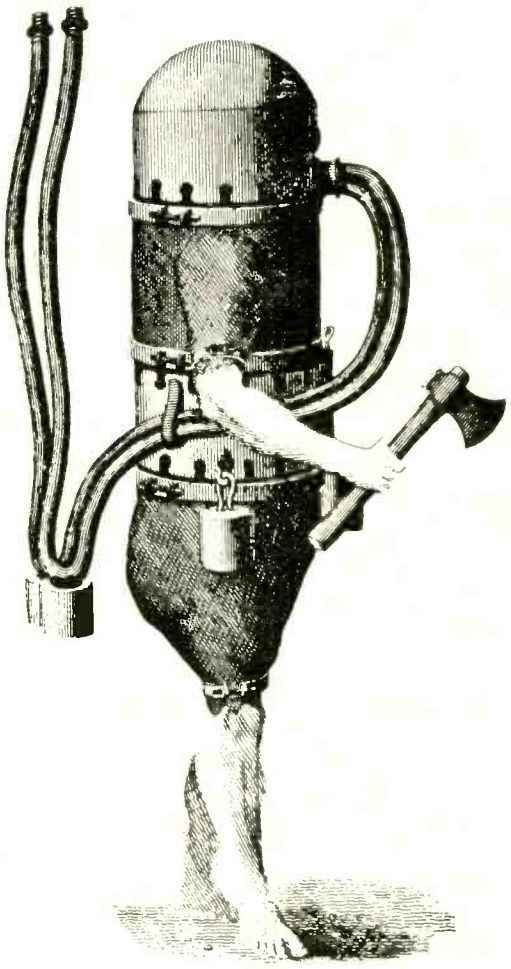
For transducing, Goodmans have brought out a new loudspeaker model that is claimed 'to give an uncoloured and natural sound'. Called the *Achromat 400*, the speaker is constructed from a 25 cm bass unit with two dome radiators to cover the mid and high frequencies. It is priced at £79.47. Goodmans Loudspeakers Ltd, Downley Road, Havant, Hampshire PO9 2NL. Phone: 07012-6344.

Autumn Audio Fair

THE 1974 INTERNATIONAL Audio Festival and Fair (sic) is to be held at Olympia from October 28 to November 3. Admission on Monday from 12.00 to 21.00 hours, press preview is from 10.00 to 12.00; the following days from 10.00 to 21.00 except the last day when the show is open from 11.00 to 19.00 hours. Entrance 50p.

22 ▶

Yes, John, it's coming through. Rear left, I should say.



NEWS

De Lane Lea

DE LANE LEA'S staff say they and their management are united in their determination to prevent the sale of De Lane Lea's Dean Street premises. They say the management of Humphries Holdings has attempted the sale over the heads of the board of De Lane Lea. The managing director of Humphries, Mr John Nutman, was reported to have described press reports about the sale of the Dean Street Premises as having 'no bearing on the truth'. This year's chairman's report on the Humphries group, which owns De Lane Lea and is itself a subsidiary of British Electric Traction, said that negotiations were in progress 'for the disposal of all or part of De Lane Lea'.

Mr Nutman and the rest of the Humphries management maintain that the Dean Street studio has never made a profit and has been soaking up cash now totalling £½ million. The staff, on the other hand, say that they have been saddled with costs on their balance sheet which properly belong elsewhere. Figures going around the Dean Street building, record that the turnover of De Lane Lea has increased steadily from 1968, when the figure was £313,000, until the latest figure available, which puts the turnover at nearly £600,000. The same figures record trading and pre-tax profits declining no less steadily than the turnover has risen. Trading profit was £37,000 in 1968 and declined to a loss of £159,000 by 1972.

When the Dean Street site had been bought by Jacques de Lane Lea the price had been around £175.000 for the freehold. By 1971 De Lane Lea Ltd had become a subsidiary of Humphries, and the site was sold by Humphries and leased back. The reputed sale price was £440,000; De Lane Lea say the money never went back into the firm but back into the coffers of Humphries, who was just about to open the music centre at Wembley. It seems certain that the Music Centre was soaking up a lot of cash until CTS arrived on the scene, and there were some serious equipment problems at the beginning. The Humphries accounts covering the period record that £40,000 was lost as a result of equipment failures. This must be considered a conservative estimate.

De Lane Lea's staff say that the money from the sale of Dean Street went to the Music Centre, which John Nutman has said 'will make a profit eventually'. Meanwhile, Dean Street has had to pay its own rent and rates bills.

The Dean Street office has been occupied by the staff, who say they aren't prepared to allow the place to be sold. Louis Elman, originally a Dean Street man, is acting as go-between for De Lane Lea staff and Humphries. Dean Street is festooned with placards outside and covered with letters of support inside. Mr Alan Sapper's union, the ACTT, has held a general council meeting—the highest level meeting of the union—to pledge support. Following the meeting a letter was sent out to all branches of the ACTT urging members to give support to De Lane Lea. The support would probably take the form, Mr Sapper said, of blacking any film work diverted elsewhere from Dean Street.

AES lectures for Autumn 74

BOTH LECTURES WILL be held at the Institution of Electrical Engineers, Savoy Place, London WC2 at 7.15 pm. Monday, November 11 'Normal hearing and its susceptibility to damage' by J. J. Knight-Phd., F.Inst.P. (physicist to the Institute of Laryngology and Otology at the University of London). Tuesday, December 17: 'Audio Oscillators' by Peter J. Baxandall, B.Sc.(Eng), C.Eng., FIEE, FIERE (Electro-Acoustical Consultant).

Improved Tannoy

DESIGN CHANGES TO the range of dual concentric loudspeakers are claimed to have resulted in an increased power handling capability and a smoother bass response. The higher power handling stems from the use of a higher temperature adhesive that bonds the voice coil to the former, resulting in a permitted running temperature of 180°C. The earlier limit was about 100°C. The maximum 'integrated programme material' power input is now 85W for the 41 cm unit, 60W for the 31 cm unit and 50W for the 26 cm unit.

To improve the bass characteristics of the range, the cones have been modified to increase the rigidity. On the 41 cm and 31 cm speakers, backing ribs are now fitted to the rear of the cone extending radially from the speech coil; the 26 cm model has a new profile.

The claimed fundamental bass resonance of all models now occurs at 23 Hz as opposed to the previous 30 Hz. Tannoy says that this is due to a modified suspension material; they state that this material also reduces ageing effects.

The final change is to the crossover unit where all the capacitors are now solid dielectric components used in conjunction with higher power inductors. Tannoy Products Ltd, Norwood Road, West Norwood, London SE27. Phone: 01-670 1131.

Tweed

MANUFACTURING IN SCOTLAND, a new name to mixer making is Tweed Audio. At present, the firm manufacturers custom built mixers and ancilliary equipment but hopes to introduce a regular production range of gear. The model for immediate introduction is a portable mixer that is claimed to provide facilities which make it suitable for use as part of a mobile recording studio. Construction is modular for all mixer models giving the scope of specification that is associated with this format.

In addition to mixers, Tweed produces a series of limiters and compressors for use with professional equipment. The company states that one of its chief aims is to give value for money in its products. Tweed Audio Electronics, 2 Roxburgh St, Kelso, Roxburghshire, Scotland. Phone: 057 32 2983.

Consulting the Oracle

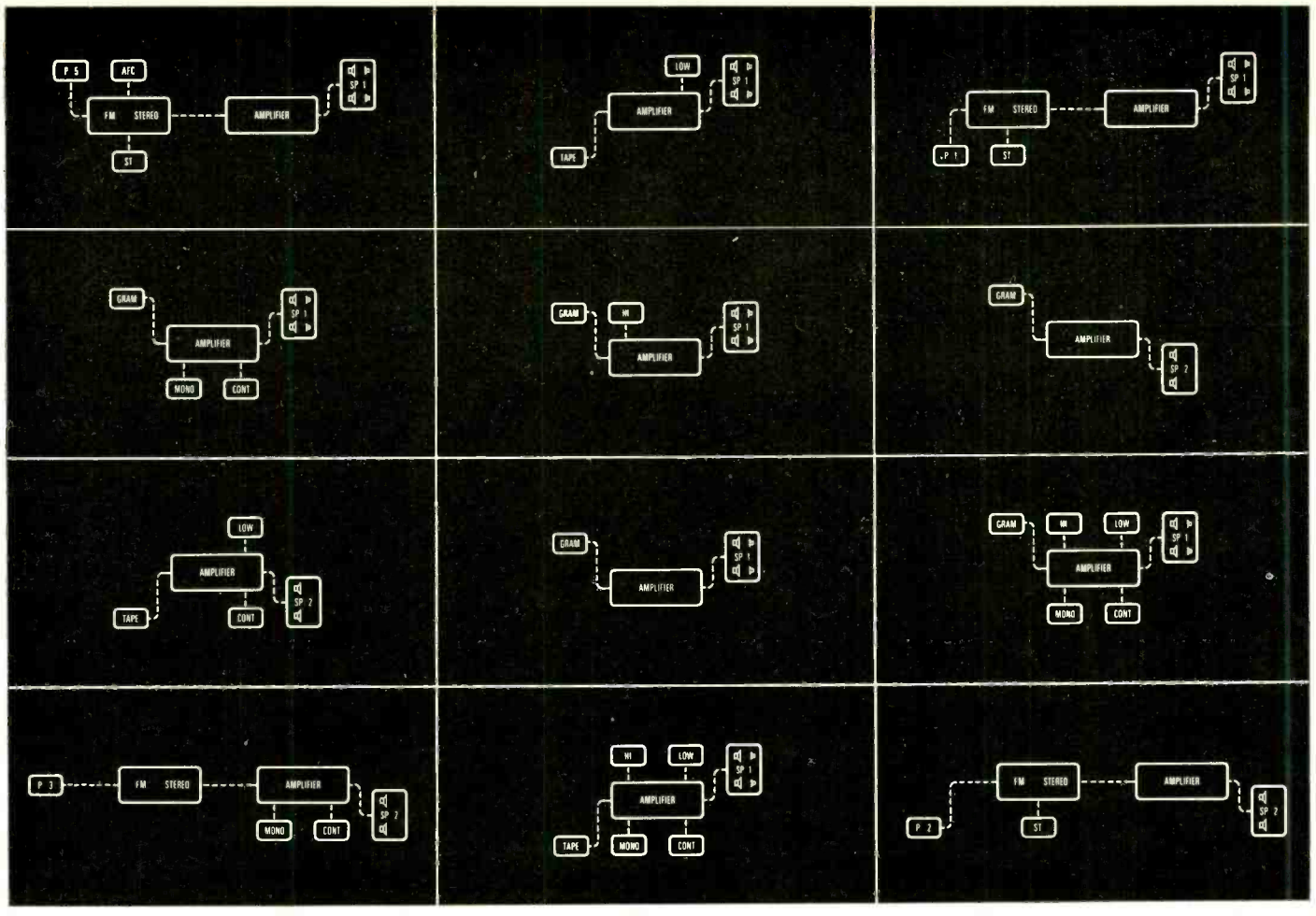
ORACLE—THE SOUBRIQUET derived from Optional Reception of Announcements by Coded Line Electronics—is the IBA approach to the dissemination of written information by the existing television networks. The big advantage of the system, shared by the BBC version CEEFAX, is that there is no increase in the total bandspace required by television transmitters broadcasting the service. By suitably decoding the video signal, Oracle gives direct access to 99 pages of information consisting of up to 150 words per page, updating the whole file every 30s. In addition to written messages, Oracle is said to cope with the transmission of simple graphics.

Technically, there are minor differences between CEEFAX and Oracle but both rely on the transmission of the information at those times of video picture cycle that correspond with timebase flyback in the receiving set. By gating the video signal at the correct time, a pulse train is collected and stored in a digital memory. The contents of this memory address a standard character generator locked in synchronisation with the picture timebases; this turns the domestic receiving set into a visual display unit on line to the broadcast station. To elect a particular page for view, the observer types in the relevant page number on a small numerical keyboard. When the memory has collected all the information relevant to that page (it does this within 30s) the monitor will display the page, superimposed on a normal broadcast if required, until a new page is chosen or the machine is turned off.

Although primarily an information and news service, Oracle has certain social applications such as providing captions for deaf people or crib sheets for teachers. To increase the speed of introduction, there has been much cooperation between the BBC and the IBA to engineer a unified system. To this end, a committee was set up which included engineers from both corporations and officials from the former Ministry of Posts and Telecommunications. The Oracle system started test transmissions to the London area in April 1973, just marginally ahead of the BBC; but now both corporations are said to be about to test a unified system that contains the best of both the others.

GIM MOS catalogue

THE LATEST condensed catalogue from GI is available from any of the company's European offices. It covers the six main categories of microcircuit; memories and shift registers, counter display, data handling, telecommunications, calculator and organ products. General Instrument Microelectronics Ltd, 57-61 Mortimer Street, London WIN 7TD. Phone: 01-636 2022.



"Stereo in Pictures"

Introducing stereo in pictures.

What you're looking at is a visual information panel for a stereo system.

If you think this is some kind of experimental idea for the year 1984, you couldn't be more wrong.

It's part of the Philips RH 837 radio/record playing system.

We had so many pushbutton features we couldn't see the trees for the forest until our designers hit upon a brilliant solution.

An illuminating information panel connected up to the pushbuttons. So every time you pushed a button it would automatically light up on the screen.

Now for the technical data:-

The stereo amplifier section delivers 2 x 30 watts Music Power. Pushbutton filters suppress interference - whether from low note (rumble) or high (scratch). A contour switch compensates for the apparent loss of low and high notes when playing music quietly.

The radio tuner section receives VHF/FM, including stereo broadcasts (the stereo decoder switches on automatically). Automatic Frequency Control simplifies tuning and prevents station drifting. Up to 5 FM stations can be pre-tuned and selected at the touch of a button. A Silent Tuning button cuts inter-station noise when tuning manually.

The record deck section has a Hi-Fi two-speed player with a belt driven turntable. A viscous damped pickup allows accurate, safer cueing.

The RH 431 loudspeaker enclosures each have an 8" woofer and two 1" tweeters. Treble tones can be directed upwards to avoid absorption by carpets and soft furnishings.

The Philips RH 837 stereo radio/record playing system costs £249.00 including VAT.

See it at your Philips dealer.

PHILIPS

Simply years ahead

PATENTS

THE FOLLOWING list of complete Specifications Accepted is quoted from the weekly *Official Journal (Patents)*. Copies of specifications may be purchesed (25p) from the Patent Office, Kent BR5 3RD.

July 31, 1974

1366901 Licentia Patent-Ver-Waltungs-GmbH.
Multiplex terminal equipment with calling and information signal presence detection.
1366925 RCA Corporation
Magnetic transducer core fabrication technique.
1367002 Nippon Victor KK.
Compression and/or expansion system and circuit.
1367014 Opsonar Organ Corporation.
Musical instrument keying assembly.
1367157 Philips Electronic & Associated Industries Ltd.
Device for producing acoustic power.
1367191 Sony Corporation.
Multisound reproducing apparatus.
1367216 Raytheon Co.
Phased array system.
1367232 Matsushita Electric Industrial Co Ltd.
Antenna means.
1367295 Matsushita Electric Works Ltd.
Ultrasonic detection apparatus.
1367304 Agfa-Gevaert AG.
Cine cameras.
1367331 Nippon Telegraph & Telephone Public Corporation.
Antennae.
1367334 Matsushita Electric Industrial Co Ltd.
Magnetic heads.
1367429 Siemens AG.
Radio systems for transmitting and receiving quadraphonic signals.
1367464 EMI-Varian Ltd.
Microwave processing of material.
1367467 Marconi Co Ltd.
Switching systems.
1367484 Nihon Denshi KK.
Method and apparatus for recording and reproducing a plurality of signals.
1367497 Magnavox Co.
Record member for a colour imaging system using spatially modulated component images.
1367564 Hazeltine Corporation.
Tone reproduction in graphic arts process simulator.
1367567 Musikindustriell Forskning Migo AB.
Keyboard musical instrument.
1367595 Bosch Fernsehanlagen GmbH, Robert.
Television camera.
1367630 Tektronix Inc.
Circuit for accurately detecting the time of occurrence of a waveform.
1367651 Stanton, W O.
Stereophonic phonograph pickups.
1367676 Soc D'Etudes Recherches Et Constructions Electroniques.
Electronic circuit for predetermining the amplitude of samples of analogue signals.
1367705 Dynaco Inc.
Audio reproduction signals.

August 7, 1974

1367792 Vockenhuber, K and Hauser, R.
Film handling apparatus.
1367798 Teldec Telefunken-Decca Schallplatten GmbH.
Methods for manufacturing sound and video record discs.
1367822 Thomson-CSF.
Continuous film drive for a telecine equipment.
1367906 Yugen-Kaisha Watanabe Kenkyusho.
Record-player.
1368003 Sony Corporation.
Magnetic recording and/or reproducing apparatus.
1368028 Muirhead Ltd.
Recording system.
1368070 Borisenko, A V.
Stereophonic sound-reproducing system.
1368075 BSR Ltd.
Automatic record players.
1368135 Marconi Co Ltd.
Selective calling units.
1368136 Werk Fur Fernseh-Elektronik, VEB.
Use of nematic crystalline-liquid substances.
1368211 Messerschmitt — Bolkow — Blohm GmbH.
Method and apparatus for transmitting command signals.
1368360 Honeywell Inc.
Optical scanning apparatus.
1368363 Goodyear Tire & Rubber Co.
Belt damage and misalignment detector.
1368378 United States Atomic Energy Commission.
Ferroelectric-type optical filter.
1368441 Buhmann Elektro-Apparatebau GmbH, Walter.
Storing means for use with a magnetic tape for storing digital information.
1368466 Marconi Co Ltd.
Automatic radio direction finders.
1368503 Eastman Kodak Co.
Strip feeding apparatus and method.

August 14, 1974

1368565 Ricoh, KK.
Optical sensing arrangements.
1368585 Philips Electronic & Associated Industries Ltd.
Device for the digital subtraction of frequencies.
1368595 Westinghouse Electric Corporation.
High speed cartridge.
1368598 Unilever Ltd.
Softening compositions.
1368623 Canada, Minister of National Defence.
Electrically steerable antenna systems.
1368677 International Standard Electric Corporation.
Frequency selective signal receiver.
1368678 Sperry Rand Corporation.
Spread spectrum linear fm communications system.
1368718 Carl-Zeiss-Stiftung (trading as Jenaer Glaswerk Schott & Gen).
Process and apparatus for optically transmitting images with constant magnification.
1368757 Honeywell Information Systems Inc.
Electronic amplifiers.
1368769 Siemens AG.
Apparatus for use with a cathode ray oscillograph to display simultaneous representations of two signals.
1368811 RCA Corporation.
Colour image reproducing apparatus.
1368820 Hewlett-Packard Co.
Method of and apparatus for diffracting light.
1368821 National Research Development Corporation.
Radio-isotope scanners.
1368864 Centre Technique Des Industries Macaniques.
Process and device for non-destructive measurement of the extent to which a surface layer of a material has been affected by a superficial treatment.

August 21, 1974

1369363 Motorola Inc.
Transducer.
1369377 Philips Electronic & Associated Industries Ltd.
Microphones.
1369400 Motorola Inc.
Multiple control point switching system having automatic access.
1369443 Bentley-Beard, J M.
Control systems.
1369463 Process Peripherals Ltd.
Communications systems.
1369571 Magnavox Co.
Colour image reproduction.
1369743 Rockwell International Corporation.
Adaptive electronic hybrid transformer.
1369791 Taylor, W J.
Change-speed friction drive means.
1369813 National Research Development Corporation.
Reproduction of sound.
1369839 Sony Corporation.
Recording and reproducing colour picture information.
1369847 Soc Italiana Telecomunicazioni Siemens Spa.
Fault location system for pcm transmission lines.
1369880 Nippon Columbia KK.
Television image transmission systems.
1369909 Thomson-CSF.
Acousto-optical deflection system.
1369928 Bertagni, J J.
Diaphragms for sound transducers.
1369946 Mel Equipment Co. Ltd.
Noise-muting device for telegraphy receivers.
1369988 Sanders Associates Inc.
Optical display apparatus.
1370004 Honegger, M.
Sounding note board for music instruction.
1370065 International Business Machines Corporation.
Character display apparatus.
1370084 Searle & Co, G D.
Radiation imaging devices.

26 ▶

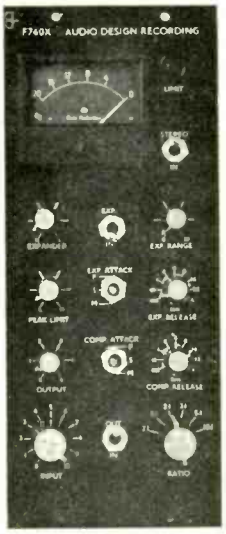
professionally canned from ear to ear

The DT 1-00 is only one of an extensive range of headphones manufactured by Beyer Dynamic, in use in studios throughout the world . . . . .

- Frequency Response: 30-20,000 Hz
- Output Level at 100 HZ and 1 mW: 110 db over 2. 10^{-4} μbar
- Rated Input: appr. 600m V per cartridge
- Peak Power Load: 1W or 20V per cartridge
- Impedance: 2 x 400Ω (2 x 8, 2 x 100, 2 x 800, 2 x 2,000Ω upon request)

BEYER DYNAMIC

BEYER DYNAMIC (GB) LIMITED
1Clair Road, Haywards Heath, Sussex. Tel: Haywards Heath 51003



F760X-N module (80 x 190mm)

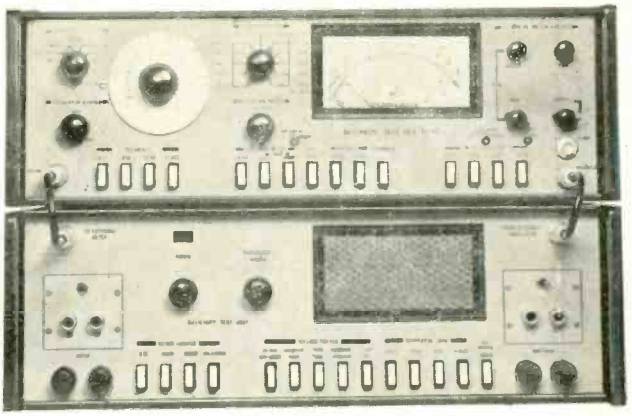
F760X

Limiter-Compressor Expander

A truly remarkable little package; ideal for reduction work. Any function can be used independently or a combination of all three functions can operate simultaneously. Technically superb: physically compact and financially attractive. Who wants more?

AUDIO DESIGN RECORDING
St. Michaels, Shinfield Road, Shinfield Green, Reading, Berks.
Tel: (0734) 84487

Audio Test Set



for amplifiers, mixers tape recorders

Checks . . . frequency response
signal/noise ratio
distortion
cross-talk
wow & flutter
drift
erasure
sensitivity
output power
gain
. . . in one compact unit.

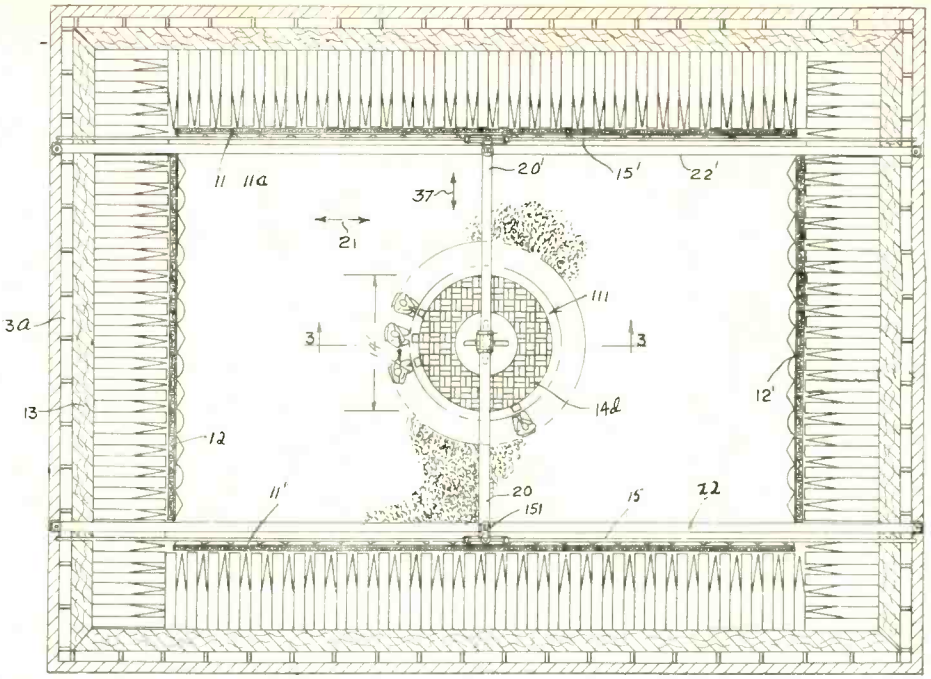
Auxiliary Unit provides extra facilities for Studio testing.

Send for leaflet RTS2
Ferrograph Company Limited Auriema House 442 Bath Road Cippenham Slough Buckinghamshire SL1 6BB
Telephone: Burnham 062 86) 62511 Telex: 847297

FERROGRAPH
A member of the Wilmot Breeden group

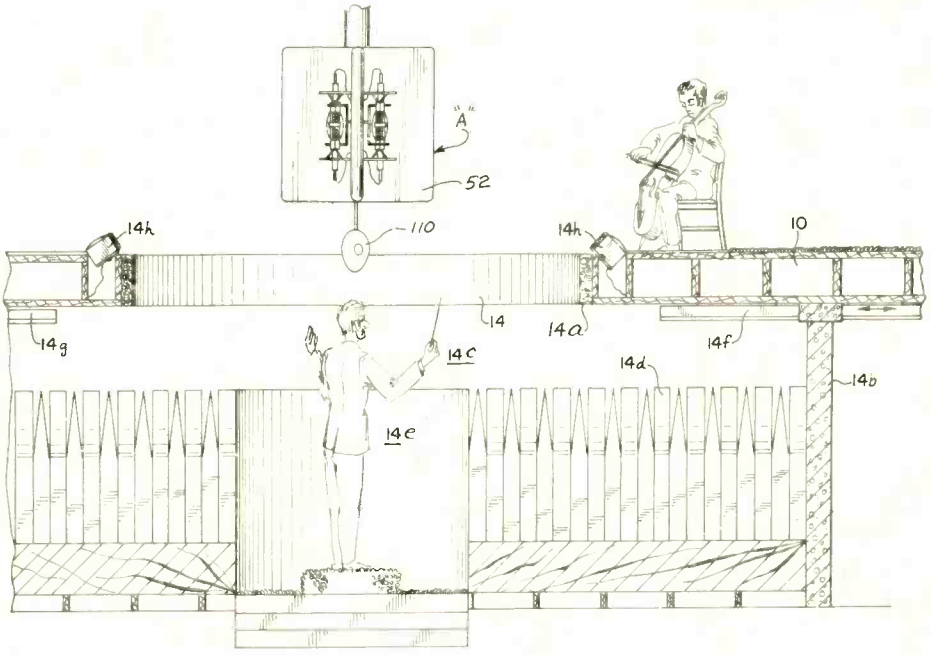
■ PATENTS

BP1,352,031 from Pioneer Electronic Corporation of Tokyo is brief and to the point. Essentially it claims a method of stereophonically recording a programme source in an anechoic chamber. The patent explains how a recording is acoustically influenced by the characteristics of the room in which it is recorded and by the room in which it is played back. In other words a recording of a musician made in an acoustically live room and played back in any listening room will not sound the same as the musician would sound if he actually played in that listening room. Or to put it another way, the acoustics of the recording studio and the acoustics of the listening room add together. But don't we all know that? Also don't we all know that one answer is to record in an anechoic chamber, which is what the Pioneer inventors are claiming? So will every future recording made in a dead studio infringe BP1,352,031?



BP1,351,804 showing central circular well

BP1,351,804 showing microphone complex



BP1,351,804 runs to 25 pages of text and nine sheets of drawings, all concerned with studio recording. So it is rather better value at the fixed price of 25p post free than the Pioneer patent, which runs to 1½ pages with no drawings.

The inventor behind BP1,351,804 is David Goldsmith of Chicago, USA, and his idea can best be described as an automated studio technique for producing out of the ordinary recordings. The studio has a central circular well in which the orchestra sits in a circle round the conductor. A soloist to be highlighted can perch upstairs on the edge of the well. Above the centre of the well, and suspended from a motor-driven system of mobile carriers on a fixed cross netework of girders, is a complicated arrangement of microphones. Briefly, this takes the form of two crossed baffles with a vertical pair of microphones mounted in each of the four quadrants. The inventor suggests Neumann *M269* or AKG *C12* microphones and describes in detail how the baffle and microphone complex can be moved as a whole unit by the carrier along the network of girders. Thus the microphones can be moved virtually anywhere in the studio—towards, away from, and over the orchestra in the well. Additionally the microphone pairs can be swivelled by motors acting on pull and push rods. This swivelling is about the horizontal axis, the upper and lower microphones of each vertical pair moving in opposite directions (clockwise and counter-clockwise). As a final refinement a dummy head or cephaloid microphone is suspended below the baffle and the four pairs of mics.

All the mounts are damped and cushioned to prevent motion noise being recorded and a computerised programming and pacing system enables all the movements to be preprogrammed. But the programme has a degree of flexibility to allow for musical licence. Thus although the microphones will move automatically into preprogrammed positions at a preset feed rate (to put them in preselected positions at predetermined points through a musical performance) the feed rate is adjusted to changes of musical pace by automatic comparison of musical landmarks and prerecorded command signals.

According to the inventor, the movements of the microphones and the variation of their polar response pattern by swivelling can produce effects such as 'plural groups of musicians moving in opposite directions relative to each other' with the example of 'in a composition such as a fugue, each musical part may be identified not only by its unique melodic or rhythmic identity, but also by its apparent relative spatial motion caused by spatial baffle movement during recording'. The mind boggles somewhat but the patent makes fascinating reading for studio engineers.

Adrian Hope

WHO'S WHO IN SOUND

AIR STUDIOS

KEITH SLAUGHTER:
"Playback and recording automatically includes the appropriate noise reduction unit."

PETER SULLIVAN:
"Capacitor microphones are used to provide high quality signals for talkback and foldback circuits."

GEORGE MARTIN:
"The channel amplifiers have sufficient equalisation to meet all advanced recording techniques."

JOHN BURGESS:
"With the Neve unit we can produce high quality quadrophonic tapes for disc or film sound tracks."

BILL PRICE:
"There are 32 input channels mixing down to 24 groups for multi-track recording."

Who's Who in sound know what's what when it comes to a sound recording system. Only the best is good enough for AIR Studios. Which is why they chose Neve. This 32 input, 24 track quadrophonic music recording console was specially designed to fit AIR's most advanced studio at Oxford Circus. It looks magnificent. The results speak for themselves.

Neve internationally sound people

Rupert Neve, Cambridge House, Melbourn, Royston, Herts. Telephone: Royston (0763) 60776. Or Cambridge (0223) 53454. Telex 81381. Cables Neve Cambridge.
2719 Rena Road, Malton, Ontario L4T 3K1, Canada. Telephone: 416 677 6611. 06968753
Berkshire Industrial Park, Bethel, Connecticut 06801, U.S.A. Telephone: (203) 7446230. Telex 969638. Hollywood Office: Telephone: (213) 465 4822.

CLEAN FEED

by Cross Patch

Robbing Peter . . .: It doesn't seem so long ago that studios were being plagued by bad debts and very slow payers. Some studios were tardy in recognising the seriousness of the situation and suffered losses in consequence. Managements pulled their socks up, tightened up credit control and the situation improved. The incidence of bad debts seems to have declined sharply compared with, say, three years ago and is remaining reasonably in proportion to turnover. The slow payers have been shown the error of their ways and studio trading is back on a more solid foundation provided the bookings keep on coming in. That is the general impression always open to correction if anyone has other opinions. Now, just as a few leaves blowing in the wind can foretell the onset of Autumn, stories are floating round the Trade, as stories will, that there are studios not paying their bills or trying to play for ridiculously extended credit. That is bad, bad news. If the cause is inefficient accounting then get it together now, this day! If it is shortage of cash then the very last thing any business should do is to try to go on living at the expense of suppliers. Not only can this course of action lead rapidly to the Bankruptcy Court but it puts irresistible pressure on suppliers to raise prices to all the supplied to pay for the money some are, in effect, borrowing on interest-free terms. Delay in settling accounts is one of the most significant symptoms of a business sliding into deep financial trouble, whether the delay is deliberate or due to plain stupidity. So, if by the remotest chance these remarks could apply to you, you must do something about it at once and if you can't then call in someone who can.

Silly question: If it is considered to be perfectly fair and reasonable, nay almost statutory, to belong to a Trade Union why might it be thought suspect to belong to a Trade Association? Mrs Shirley Williams, a conscientious and hard working Government Minister (at the time of writing) has ordered a comprehensive investigation into 'restrictive practices' possibly employed against customers' interests by various trades . . . like it could be companies in the same line of business, competitors even, ganging up to peg prices to their mutual advantage or something similar. One of the naughty trades to be looked into, brothers, is recording studios. Was it something somebody said?

Glad handing: The word 'convention' conjures pictures of portly middle-aged men in shirt sleeves and braces wearing funny hats bearing legends such as 'Union of Elbowraisers' and behaving like rowdy adolescents. Something alien to the British way of life. The Audio Engineering Society, a dignified academic body based on New York in our North American colonies and which seems to be permanently in the convention business, is holding one in London next year 'for the first time ever, folks!'. Reports are circulating among UK members that the place chosen is the new and rather splendid Cunard Hotel hard by Hammersmith in West London. The time will be early March. These AES conventions always attract world-wide interest and it is not surprising to hear a queue of equipment manufacturers is already forming, all eager to display their goods to an international audience predominantly American. The grand finale of the convention is to be a banquet at the Guildhall. This must call for a VIP as guest of honour. Could the choice depend on the result of the next General Election? Brother Harold, Grocer, Hoverthorpe, Big Benn even? . . . These are exciting times.

Independent independents: The latest survey to come to hand from the Association of Independent Radio Contractors has not made encouraging reading for those recording studios which were looking to independent radio programming as a source of additional bookings. The stations are rapidly increasing the use of their own facilities to record programmes, commercials and jingles, both for themselves, syndication and the agencies. This makes good sense. If a lot of money has been spent on plant and equipment then it must be worked at maximum capacity to ensure a satisfactory return on capital. It is not beyond the bounds of possibility that the independent radio stations could be in competition with recording studios in some areas of the country. It is still a free economy so why not?

Pitch and toss: The other evening there started one of those arguments which always seem to happen after the second pint at the end of a hairy day when the new tape op has mixed up the track numbers and a good customer has poured coffee all over the console. Someone, who should have known better, complained that a certain recently released orchestral recording sounded off pitch. Gulping back another pint and with it the ever present desire to prick pomposity with witty repartee such as ribald shouts of 'Cloth ears' or 'It must have a weak spring' or even 'Who cares' we attempted to discuss the point soberly; anyway it was his round. International Concert Pitch is 440 Hz, right? When all the preliminaries are complete Leader nods to Principal Oboe who plays an A and everyone tunes to it. But is that A invariably 440 Hz? Well, no it need not be because there are occasions when it is subject to adjustment by circumstances or tradition. Is that any more than a matter of interest to those immediately involved? Whatever the intimate techniques employed, is not the aim to produce a recording that will give the average listener the happy impression he is hearing the performance the way it was and just as the composer intended? The technicalities can so easily get in the way of the music. Of course there is always an outside chance that a pitch change has been caused by speed variations in the production chain but quite a few people would all have to be very careless for that to happen. Come to think of it very few studios seem to have a positive and convenient method of checking pitch, not even a humble tuning fork.

Shell film: A training film for the retail garage trade has just been released by Shell. Its purpose is to give a boost to independent radio as a local advertising medium. Featuring those well known djs Dave Cash and Kenny Everett, the film is intended to show would-be advertisers how to reach the listeners and persuade them to become customers. There has been an impression prevalent for some time that more businesses might use radio advertising if only they knew how to go about it. This film will go a long way towards overcoming the natural reluctance there is to use something new. One thing the film does say, rather surprisingly, that to use an advertising agency is unnecessary. Does this mean a lot of account executives will be running their cars on Esso in future?

Volts, amps and wattnots: The latest National Coal Board report shows coal stocks to be adequate. A careful analysis gives the impression that stocks may well be 'adequate' provided the winter weather stays mild, the miners stay at work, transport keeps on rolling and our friends the Poles continue to send us generous supplies of that good old Silesian stuff. Come to think of it, maybe that is why we have just sold them a tractor plant at a bargain basement price, but back to the subject. It is not a situation to inspire confidence in the mind of the conscientious studio manager with bitter memories of power cuts and the three day week. A blown session is a blown session. Whatever the cause the effect is bound to be considerable embarrassment and somebody's financial loss. No point in sueing the CEGB even if you could afford it. Not to worry though; just instal standby power supplies. But wait! Before you rush round to your local friendly surplus merchant to exchange a wad of old pound notes for that ex-WD diesel generator (guaranteed against mould, borer beetle and easy starting) pause for thought. There are likely to be local regulations governing the installation and operation of private power plants. Have a quiet word with the Town Hall staff. They are certain to be helpful if you explain what you have in mind. The Chief Fire Officer is responsible for the safety of all fuel storage so it is essential to have a word with him too. Then there is the choice of machinery to be made with the greatest care to avoid being lumbered with the wrong thing. If it all sounds complicated, it is, but to those with the money and the space it could be well worth the effort. You never know you might be able to generate your own cheaper than you can buy mains supply. Ah, but if you could the Men from the Ministry would find a way to stop it, that's for sure. Lucky man is he whose studio stands by the old mill stream.

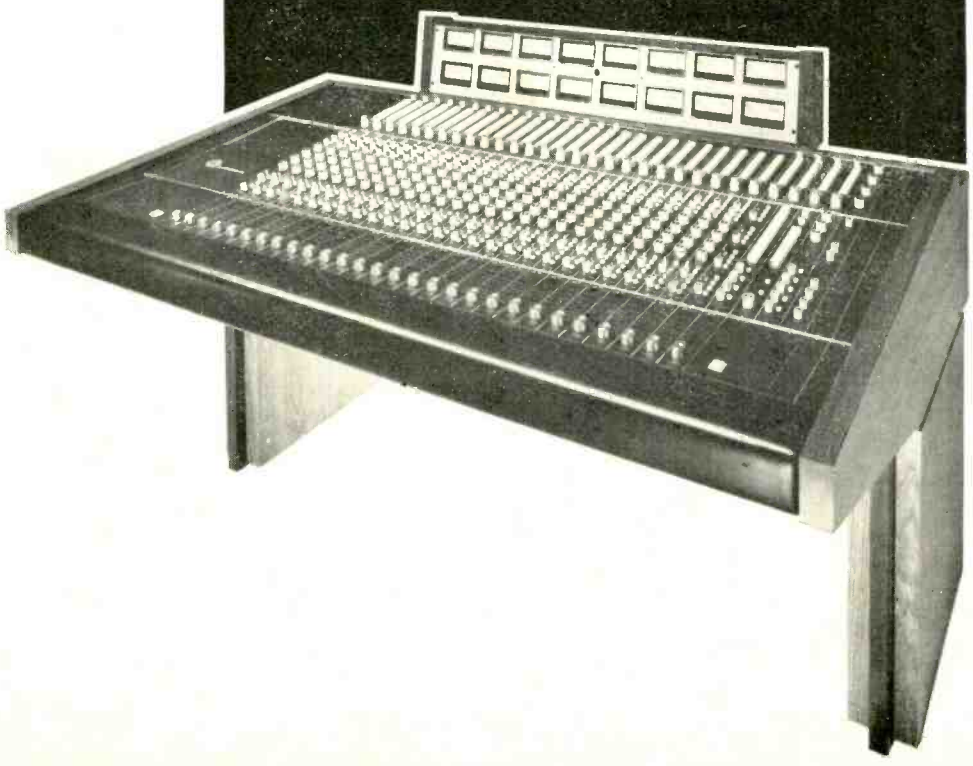
TRINIDAD TO BANGKOK-TORONTO TO MEXICO CITY

Auditronics, Inc. sound mixing consoles are in use around the world.

More than 60 studios depend on Auditronics systems and equipment for ease of installation, reliability, performance, and quality.

Now is the time to find out what makes Auditronics products accepted worldwide in professional audio.

auditronics, inc.
P.O. Box 12637 • Memphis, Tenn. 38104
901/276-6338



BOOK REVIEWS

BRITISH BROADCASTING by Anthony Smith. **Publishers:** David and Charles. Price: £4.75.
THE SHADOW IN THE CAVE (The Broadcaster, the Audience and the State) by Anthony Smith. **Publishers:** George Allen and Unwin. Price: £5.25.

'THERE IS AN assumption that radio and television must necessarily, of their nature, provide a means of expression and self-expression for a tiny group addressing a vast multitude.' That is the assumption Anthony Smith attacks in his book 'The Shadow in the Cave—The Broadcaster, the Audience, and the State'.

Smith's other book *British Broadcasting* is an essential reference work which comprises extracts of all important documents relating to British broadcasting since the wireless telegraphy act of 1863.

Assumptions are what *The Shadow in the Cave* is all about. Its scholarship makes Green's *Universal Eye* seem sketchy and complacent. Green is one of the 'British television is the best in the world' brigade who, when they speak of British Television, mean the BBC, though even Smith seems to think a good deal less of ITV than they seem to deserve. Milton Schulman put it so much better not long ago when he described it as the 'least worst' television in the world. Both Smith and Schulman, whose *Ravenous Eye* isn't mentioned in Smith's 26 pages of bibliography, see broadcasting as a creature requiring examination rather than comparison, unlike their predecessors who, when asked to describe a horse, say that it is not a terrapin, and that it is better than a ferret and so on.

Broadcasting seems to have taken two paths since its inception. It became either the public service propagated by Reith or the competitive commercial service chosen by the Americans. Though the two might seem fundamentally opposed, Smith argues, they both revolve around the desire to create 'one vast audience', which can then be delivered to the broadcaster and subjected to the cultural (Reith) or commercial (Daz) message you wish to cudgel it with.

The way broadcasting was established was bound to have been affected by the difference in nature between broadcasting and the press, and by lessons learned from giving the press its present relative freedom. More crucial, and less obvious, was the effect of the first world war, when it was discovered with horror how susceptible people were to propaganda, not all of it German—Hitler wrote in *Mein Kampf* that he learned all his own propaganda techniques from the methods used by the British in the first war.

The result was a determination not to allow the new broadcasting medium to fall in to the 'wrong' hands. Supporting this was the already established Victorian notion of 'middle class enthusiasts that the world, or, as a good and vital start, the English working classes were to be made over in their image'.

The means by which governments, not just in Britain but everywhere, exercise this control is the wavelength, its allocation and the constant need for its renewal. The wavelength produces a relationship between broadcaster and government which makes continuing active censorship unnecessary. Once an organisation has been granted the licence to broadcast, those who work in it 'thereafter depend on its health as an organisation, its profitability or its political security, for the carrying on of their work'. The resulting impotence is then canonised as 'balance'.

The externally imposed need for balance has allowed Governments to castigate or cripple broadcasting for political reasons in a way they could not with the press. That is one reason why broadcast news—The Ugly Mirror, Smith calls it—provides the basis for the best chapter in the book. The adversary principle on which a free press functions in a democratic society can't be exercised by the broadcaster: 'The broadcast journalist is free neither to express opinions nor to allow any other opinion to prevail. The whole art of advocacy is therefore lost on him; the broadcast journalist is a eunuch in the harem of ideas'.

It doesn't much matter, Smith concludes, what system you broadcast under, how much freedom you have. In Holland their concept of free access, magnificent though it be, falls short of impact, the stuff of television. In America, the freedom to bid for a licence to broadcast has produced a situation in which the networks made a total profit of $117 million dollars from an ad revenue of less than three times that from their own stations. And in which companies like RCA, the epitome of a large corporation with a big stake in high defence expenditure owns NBC, which is just two per cent of its total turnover, as well as Hoffman La Roche—who considered they had to charge vast sums for librium and vallium to our NHS to afford research—and many other things. CBS own film studios, publishing houses, Fender musical instruments and large amounts of shares in General Motors, Ford and Chrysler, as well as 'a major subsidiary which fulfills contracts in aerospace and defence'.

No matter what your system, the problem of broadcasting is that the present technology allows only one-way communication. The alternative, cable tv, which would open the possibility of two way communication, is being strangled by vested interests.

Smith proposes that the concept of political 'balance' has been the death of good broadcasting; balance being determined from the top rather than assumed from the bottom. 'A broadcasting industry is healthy only when it is free to hold discourse with its society and when that society is free to influence it, to criticise it and to be challenged and at times affronted by it'.

Mary Whitehouse please note.

'The prerequisite of any effort to render more democratic the enormous unitary aggregations of editorial power in broadcasting is the ending of the fusion of content control with administration of the means of dissemination. Those who control the wavelengths and the cables should not necessarily be the programme controllers'.

He admits the impossibility of having genuine access broadcasting without the help of the professional broadcasters through whom any message has to be passed: 'It is the broadcasters' minds which have to be opened up. Broadcasters and producers need to become a breed who cease to look inwards to their institutions and its codes but to take their own honest sounding of their own social environments as a path towards repersonalising the mass audience whose features they have never truly examined'.

John Dywer

THE LOCAL RADIO HANDBOOK
By Edwin Robertson.
Publishers: Mowbray (£2·25).

IT IS ALMOST enough to say that the bibliography of this book contains just five titles. To describe it as a book, indeed, is to place it in company it does not deserve. The 'useful addresses' comprises those of the BBC Local Radio Development office, the IBA Local Radio office and no less than four religious organisations. In addition, Appendix One lists the addresses of the local radio stations, but these could be found in any library or, if you ask for them, in free handouts from the two broadcasting organisations.

What this slim (68 pages including an index) volume amounts to, apart from being outrageously expensive, is a propaganda tract on behalf of the Churches' Advisory Committee on Local Broadcasting. The stated aim is to provide a practical guide to getting your message across on local radio. The BBC's 'Writing for the BBC' is better value at 40p, either the BBC or IBA handbook is more comprehensive at a pound or less, and a good telephone directory is more useful at no cost at all.

The booklet concentrates almost entirely on religious broadcasting, which would be all right if that were the stated intention. The dust jacket gives no hint that the book is not of general interest to potential broadcasters and, on the inside of the jacket, even goes so far as to suggest that the pamphlet can be applied to the work of Citizens' Advice Bureaux, Women's Institutes, or the Red Cross, or to someone who

32 ▶

■ BOOK REVIEWS

wishes to get local airtime to complain about a hole in the road outside his house. There is a dedication in the front to the organisation mentioned earlier, and one of the appendices is a summary of the religious broadcasting available from each BBC local broadcasting station. This appendix is six valuable pages long—a good percentage of this souped-up circular—and useless to anyone who wishes to act in local radio on behalf of any of the organisations mentioned. It certainly wouldn't help you get the hole filled.

It doesn't stop there. In the paragraphs on 'How to prepare a programme', there is an advertisement for a course at the Churches' Radio and TV Centre: 'The course is mapped out in detail to cover all the elements mentioned and it costs £10 plus the cost of the meals.' The author then has the temerity to write: 'Britain had little experience of advertising on radio until the advent of ILR and, for that reason, it is not as suspect as tv.' The chapter 'How to Include the Local Community' seems to be largely an attempt to justify the existence of the CACLB.

Enough. The perpetrator of this milestone in the decline of publishing is one Edwin Robertson, formerly the Assistant Head of Religious broadcasting at the BBC and now associate director of the World Association for Christian Communication. In a generous moment one might have assumed that the redoubtable Mr Robertson had managed to have his tract accepted by an over-secular publisher who, much to Mr Robertson's dismay, pushed the thing on to an unwilling public in a form which belied the high moral tone of its contents. Not so. The publisher's entry in The Writers' and Artists' Year book mentions theology and religion as their first preferred subjects.

John Dwyer

MICROPHONES: DESIGN AND APPLICATION—LOU BURROUGHS. First Edition published 1974 by Sagamore Publishing Company Inc, 980 Old Country Road, Plainview, New York 11803. Edited by John Woram. Library of Congress Catalogue Card No. 73-87056. ISBN 0-914130-00-5. 260 pp. Casebound. Price $20.00 (USA); add $1.00 postage for overseas orders. Available in UK from Sun Recording Services, 35 Edgcumbe Park Drive, Crowthorne, Berks. Price £10 inc. p & p.

DESPITE THE off-putting claims of the dust-cover that this is 'the most important microphone book ever published' and that it covers 'every significant aspect of theory and use' which 'will be used every time a new or unusual microphone problem is presented'—apart from this extravagant and totally unnecessary advertising propaganda, which would be more at home on a detergent, cosmetic or baby product, Mr Burroughs's book is well worth reading.

In the 26 chapters of this slim volume, which is clearly printed and nicely laid out, Lou Burroughs deals with polar response, microphone types, microphone loading, microphone sensitivity, overload, proximity effect, temperature and humidity extremes, phasing, interference, acoustic cancellation and the single microphone, simple microphone care and maintenance, comparing dissimilar microphones, the monitor loudspeaker, wide versus controlled frequency response, choice between omni and cardioid patterns, the omnidirectional microphone and the orchestra, a superior bi-directional microphone, 'the two-to-one ratio', drama technique, audience reaction microphones, wind screens, microphones on booms, acoustic separators and their effect on microphone performance, the hand-held microphone, the lavalier microphone and ruggedness. There is an ample index.

Lou Burroughs is Vice-President, Professional Products, of Electro-Voice Inc.—well known US microphone manufacturers. He has done a good deal of work on the development of microphones, in particular dynamic types, holds many patents on electro-acoustic products, is a charter member of the Society of Broadcast Engineers and a Fellow of the Audio Engineering Society: in short, his credentials could hardly be better. The book is the outcome of years of lecturing and advice.

It is perhaps inevitable that one compares this book with A.E. Robertson's standard work on the subject, 'Microphones' (published by Iliffe). In Britain, at least, Robertson's book has the advantage of being cheaper in the cased edition and very much cheaper in its soft-cover student edition. The Burroughs work is substantially shorter, and many quite simple illustrations are full-page. While some of the line drawings are a little clearer than Robertson's at first glance, he does not go so fully into the theoretical aspects of the design of microphones and the information contained in Robertson's appendices is entirely lacking. Burroughs does deal with cardioid dynamic coaxial double-element microphones, such as the AKG *D202* (without ever mentioning manufacturers' names), while Robertson does not; but on the other hand Robertson deals with reflectors and lenses, which Burroughs does not.

In short, Mr Burroughs does not go so deeply into the theory of microphones or the design of particular models as does Robertson. Where he does score particularly is on readability. This is not to say that one cannot enjoy reading Robertson, merely that it is quite possible to delve into Mr Burroughs's book for a particular point and find oneself reading right to the end. It is never dry, it is always practical and frequently thought provoking. Burroughs is primarily concerned with the practical side of using and maintaining microphones, rather than their design (his job), even though he does deal briefly with the principles of many of the major types and some lesser known ones.

While never actually advocating a pure coincident-microphone-only technique, Mr Burroughs repeatedly draws attention to the dangers of the haphazard use of too many microphones, to deterioration of sound quality through undesired cancellations at particular frequencies due to pickup out of phase by two or more microphones or due to reflections from floors, music stands etc. I don't see many people setting up microphones in a studio while clutching his book for inspiration, Maoist fashion, but it is well worth reading again and again to avoid falling into the pitfalls that abound for the unwary. He gives practical advice for checking the performance of microphones in the absence of laboratory facilities, and guidelines for avoiding unnecessary damage and for repairing the simpler faults such as dust pollution. He also draws attention to the dangers of balancing at excessively high listening levels, which is refreshing to see in an American publication, and to the problems of artists with hand-microphones.

I have only two real criticisms of this book: the first is the price, which does seem a bit excessive, particularly when compared with Robertson's more detailed treatment of the design aspects of the subject, and which seems likely to deter many people who would enjoy and benefit from reading this book; the second is the ending, which didn't seem to exist—the chapter on lavalier microphones and their use just runs into several paragraphs on the robustness and vulnerability of various kinds of microphone, and then stops short of the index, as though something terrible happened to the manuscript at this point. I found myself counting the pages to see they were all there!

To conclude: an excellent practical description of the theory and use of studio microphones and microphone techniques, that can be read with enjoyment from cover to cover—perhaps alongside Robertson—rather than used as a technical reference. There would seem to be an excellent case for a cheaper edition.

John Fisher

amcron

800 SERIES RECORDER

AVAILABLE IN
MONO, STEREO, OR
FOUR TRACK IN-LINE

* Computer Logic Control. Prevents tape breakage by providing fool-proof operating controls.
* Feather touch push-button mode controls.
* Photo-cell, automatic shut-off in all modes.
* Take-up reel motor shut-off switch for editing.
* Motor shut off switch (electronics remain on).
* Cue lever for controlling tape-to-head contact.
* Professional styling and colour combinations.
* Fully remote controllable.
* Patented electro-magnetic brakes.
* Plug-in modules for all functions: mic modules optional.
* Built in remote record (CX-800's) for no thumps on tape at beginning or end of record mode.
* Echo controls built in.
* Front panel bias adjustment.
* 3-speed equalization.
* Treble and bass controls with "flat" detents.
* Available with 600 or 250 ohm balanced XLR cannon inputs and outputs as an accessory.

NEW!

VFX-2

DUAL CHANNEL CROSSOVER/FILTER

The Amcron VFX-2 provides continuously variable filters which can be used to perform either crossover or band pass functions. The dual channel unit employs two filters per channel, each continuously variable from 20 Hz to 20k Hz. Filter rolloff is at a fixed 18dB/ octave.

Our London stockists for all AMCRON equipment are REW (Audio Visual) Ltd., 146 Charing Cross Road, London WC2. Tel. 01-240 3883, and also at 10-12 High Street, Colliers Wood, London SW19. Tel. 01-540 9684.

or Direct to sole agents:

MACINNES LABORATORIES LTD.
MACINNES HOUSE, CARLTON PARK INDUSTRIAL ESTATE, SAXMUNDHAM, SUFFOLK IP17 2NL
TEL: (0728) 2262 2615

In an industry where enthusiasm and involvement are high, the business and managerial aspects are often overlooked. But managing a studio is a skill in itself.

Sound recording studios: managing

DENIS COMPER

'HOW ARE YOU managing?' The question usually seeks knowledge of your welfare rather than expressing polite interest in how you are running the place. Again, 'how are you managing?' can be one of those irritating, tipsy, bar-side rhetorical enquiries made with clammy hand on flinching shoulder when the receiver is in already, struggling to keep the creditors at bay because you haven't been—or managing properly either. Take it whichever way you wish; on how you manage depends the success of your recording studio, or any other venture, and that success can only be measured ultimately in terms of net profit. Of course there are several pointers to success. Top of the list is job satisfaction, then a long forward booking period, a few hits in the Top Ten, and a high reputation among established and potential customers. However comforting and ego-lifting any or all can be, they really add up to only one thing and that is net profit. Agreed there are also other considerations which contribute to your success like your brilliant technical expertise which has made you the very Faustus of the faders and your captivating personality which has your customers clammering for bookings, but it just doesn't mean a thing unless it produces a profit. Without good management you are unlikely to see a profit and even if you do it is unlikely to stay around for long. Yes, good management, that fascinating phrase in the name of which Business Schools prosper and academic degrees are bestowed. Expensive consultants seeking attention at noisy Board meetings are known to whisper those magic words knowing there will be an instant, tremulous, silence. So what, precisely, does it mean this good management thing? And how, exactly, do you go about it?

It is often said that engineers should never be given the management of a business. Some headline examples of this contention can be quoted. The fact that the opposite can also be true is seldom sensational enough to be newsworthy. You are an engineer, albeit of a rather special kind, faced with the problem of running a recording studio. You must be an engineer to appreciate the subtleties of the day-to-day situation and cope with them efficiently, which after all is the basis of management. If you have the wit and wisdom to deal successfully with your customers as a personal relationship, then management skills should come easily to you. The trouble is, though, that you can be so busy with details you become like the man who lives in the middle of a forest so close to the trees his horizon is at arm's length. He is so involved he cannot see the black clouds gathering until the storm breaks, finding him quite unprepared. You can avoid getting wet by the practice of management disciplines which will not only protect you from inclement commercial weather but keep you out of the path of the storm. And it is most unwise to think you are doing all right as you are so why bother. You may just be in happy ignorance of the fact that you are enjoying freak trading conditions and, anyway, you can always do better.

The Duke of Wellington is supposed to have said armies are defeated only by having bad officers never by having bad soldiers. Likewise businesses go bust because they have bad managers not bad staff. Managers who have never learned until too late that it is people who are the business not buildings and machines. So the manager's top priority is the welfare of the staff, not forgetting that you, the manager, are also a member of the staff. The only difference between you and anybody else is the amount of responsibility you carry, and the final responsibility is all yours. From the start you must have a clear picture in your mind of your relationship with every staff member and the foundation of that relationship must be trust. Results are obtained through people working as a team and it is your job to weld your staff into a team. Some of your staff, such as the senior balance engineers, are certain to be great individualists. In no way try to impose your will on such people. You must achieve your purpose by gentle persuasion and example and your example will be followed. Make sure your example is right and a good one. Mutual confidence is an important factor in building and maintaining a successful team. Mutual confidence means you must know the job or you cannot tell others how it should be done. Mutual confidence means keeping the staff well informed. Everybody likes to know what is going on and how it might affect them. It is your job to tell them, to tell them well in advance of possible changes in status or routine, and see to it that everybody really knows what he is supposed to be doing and how his activities affect and relate to everyone else. And remember, if there is a task to be done, however menial, and you seem to be the only one around not too busy, then you do it and don't make a fuss about having to do it. Any privilege you enjoy as a manager must be hard earned and trumpet blowing can only strike a discordant note with the rest of the team.

Staff relations

Your staff must all fit in as members of the team, each making his or her contribution to the benefit of the whole. If anyone does not fit in then it is your duty as manager to have the courage to tell him he would be better off elsewhere. This will be the most unpleasant job you will ever have to do but there are times when it has to be done. You must make every reasonable effort to retain goodwill between you, the team and the departed, and if you succeed you are a very good manager indeed.

With all this talk about the team it must not be overlooked that the team members are all individuals with different personalities. You must recognise and respect those differences and treat each one accordingly. Decide what you expect of each individual, let him know now and again how he is getting on and don't let him drift along from day to day. A deserved pat on the back is a wonderful stimulus, and don't you ever take the credit for the efforts of another. The rule is if a team member does something special he gets the credit, but if you, as manager, do likewise the team gets the credit. While, in the interests of morale, you must give encouragement and due praise without under any circumstances appearing to have favourites there is a hidden danger to be avoided. That danger is known in some political circles as the cult of personality and it manifests itself by customers flatly refusing to work with anyone but a certain engineer even to the point of cancellation. There are

complex reasons for this state of affairs inevitably pointing to a lack of real professional competence among some engineers and quite a few record producers. It doesn't make the job of management any easier but do not be deterred from your main task of making the best use of each member's ability and providing opportunities for the development of that ability in parallel with the development of your studio as a Company.

Adequate financial backing

'Look after the staff and the business will look after itself.' That is one of those glib sayings which means well but is only partly true. Businesses do not look after themselves, managers have to do that. A contented and enthusiastic staff is an essential asset and a manager's constant concern, but so is the business itself. If you, as manager, don't look after both there will be nothing else to look after but the retreating backs of your customers.

One of the most common troubles afflicting small companies these days is shortage of working capital. Perhaps the company never did have enough financial fat tucked away to take care of the unexpectedly large expenditure, or it may have become a victim of its own success. Staggeringly good sales of facilities, studio time and tape, may be to a few important customers who turn out to be such slow payers that the cash flow can't keep up with suppliers' bills. Then the proforma invoices start coming in with the occasional terse letter, the bank manager asks you to see him, and you are in trouble. And the name of the trouble is liquidity, lack of. This sort of trouble is very difficult to get out of, if only because those to whom you might turn for extra capital to see you through are not going to have much confidence in your managerial capabilities; in other words you are a bad bet. A good manager will never get his company into this situation. Easy to say? Maybe, but it has got to be true. If you practise the management skills available to you in the right way at the right time the problems arising from lack of liquidity should never trouble you, certainly nowhere near to the point of disaster.

When companies get into rough water, nearly always because of inefficient management, it is a popular practice to call in an expert to advise on what remedies should be taken. Some companies call in the expert when they seem to be doing well, just to get an outside opinion on whether they really are doing that well or could they be doing even better. As manager of a studio you will have to be your own expert which is difficult because of your intimate involvement with events. To get the best view you must be able to stand back or things get out of focus. So here you are trying to be detached and involved both at the same time. To help you achieve the apparently impossible it is a good idea to formulate a plan, a sort of check list, to enable you to diagnose symptoms of approaching business troubles. If you do that then you have every good chance of recognising a bad trend early enough to take remedial action. Take the example of your actual expert called in by a client in trouble. Say in this instance he has been called in to deal with a case of general commercial malaise rather than a specific and isolated problem. He will use sophisticated techniques peculiar to his profession but he will also work to a basic plan, a check list, which with marginal amendment might suit your purpose very nicely.

The expert will start by getting a feel of the place and looking for outward signs of how it is run. The standard of housekeeping should match the required customer impression. A recording studio doesn't need to look like a hospital or a rubbish dump either. It is nice to see someone bothers about disposing of empty beer cans and the lavatories are clean. The morale of the staff will obviously be high, you will have seen to that, and health records good. What was that again? What about health? Yes indeed, what about it? Studios make very heavy demands on nerves and stamina. The physical health of your staff is vital. What are you, Mr Manager, doing about it, to protect it, to insure it, to have it checked even to the tricky point of intrusion into privacy? You check the machines don't you and they are easily repaired, but what about the people? And, incidentally, what about yourself?

A good look at the books will reveal the health of the company. You will be checking them daily. Drawing little graphs can help a lot if you don't like the look of columns of figures. Those profit figures may not be as juicy as they seem because they are being eroded by creeping costs. It may be costing more than you thought to allow extended credit to a valued customer. Customers are not very valuable, whoever they are, if they don't show a tangible profit. And how about the forward cash flow projections? Are they adequate and reasonably accurate? One day you will have to find the money for up-dating and replacing equipment so will it be there when you want it?

Some studios, it would seem, decide to charge £(x–1) per hour simply because the nearest competitor charges £x per hour. It is essential to cost accurately the services you offer. To attempt to obtain custom by price-cutting without having precisely defined your true costs is stupid. Customers don't really book on price alone or, if they do, they are the ones who will give you hassles over paying the bill. Study your costings! Pricing by guesswork instead of on a firmly-based cost-accounting principle leads to insolvency.

How much in stock?

Closely related to costing is stock control. Materials held in stock are losing money every day they lie on the shelves. Make sure the loss is justified by calculating what amount of stock you really need. You will know your average off-take, and the supplier's delivery time; allow what you think is a reasonable minimum buffer stock and there you have the amount of money which should be tied up in the stores at any one time. Do not forget that the money itself has a price which is part of your costs. Which raises the point of suppliers' prices. Buying from a cheaper or the cheapest source may not be so smart. That old '1p off' routine could be costing you something, unless of course the supplier really is a philanthropist in disguise.

Maintenance stock must be kept separate from production stock, and keeping control of it is not easy. It will be the direct responsibility of your chief maintenance engineer and he will be both meticulous and methodical, prepared at all times to meet the ultimate technical catastrophe. In consequence he is likely to collect boxes full of every conceivable component and sub-assembly well in excess of the requirements shown up by the equipment log books. How you tackle the problem of steadily-growing quantities of bits and pieces depends on the sort of person your chief engineer is. And while you are keeping an eye on that aspect of his activities what about equipment performance in general? Is all of it paying its way and performing as it should? An engineer's instinct is to keep a thing going rather than to scrap whatever it is and get a new one. While this instinct is commendable it can also be expensive. It is always cheaper in the long term to buy a new machine than to keep patching up an old one that might break down at any time. Get your chief engineer to keep proper log books which will give you the management information you must have.

Efficiently operated

How efficient is the staff? They will all be good team members of high morale because you have established and will maintain that happy state. But are you also providing the right working conditions in which they can operate efficiently? No good waiting until someone complains, it is up to you to provide the necessary facilities and listen to suggestions for improvement. Watch for symptoms of inefficiency, like high scrap rates, late completion of minor jobs, mislaid tapes, or reworking required because instructions were misunderstood. Before placing blame for inefficiency you, as manager, must discover the true cause, and in almost every instance it will be bad communications. Now it is a management responsibility to ensure good communications so before you begin cursing all and sundry think carefully, it is more than an even chance you are the one at fault. On the other hand if the staff member concerned is an absolute idiot you take the blame for employing him in the first place.

The length of working hours suffered in recording studios would not be tolerated in almost any other industry, even counting hospitals as an industry. The people who work in studios are deeply involved in their work, they have to be to be good at it, and they accept exceptionally long hours as a norm. Then there is the money to be earned in overtime. But working consistently long hours in noisy conditions and under nervous strain is a bad thing only sustained by enormous enthusiasm for the job. Thus the manager is faced with a dilemma, how to prevent the staff from overworking without dampening enthusiasm and restricting earnings. There is simply no copy-book answer to this one. It is up to the individual manager to recognise the problem and do whatever can be done to alleviate it. A good path to finding a solution is to keep a chart of hours worked by whom at what; it will also be a useful cross check on the wages component of your costings.

Fortunately studios are not great generators of paper work. A certain amount is unavoidable, like invoices (perhaps the most important bits of paper in the business), which must be

42 ▶

DECCA, PARIS

By John Dwyer

THE FRENCH leisure market is booming. A report published at the end of last year showed that incomes in France had quadrupled since 1959. The income of your average Pierre or Claude had overtaken that of our Tom or Dick by 1969, and the British now earn about a quarter less than their French counterparts. A third of all salaries are paid in the Paris region and the Parisian earns about 40 per cent more than other Frenchmen.

All this is good news for the electronics industry. Motorola's electronics plant at Toulouse, which they set up in 1967, will have doubled its capacity by 1975 and will employ 3,000 workers. Another company which has benefited from the boom is Decca, who are involved in the Teldec disc, and who started producing quadraphonic discs just over a year ago. Their new pressing plant in Normandy had grown to three times its original size in the space of two years, making 25,000,000 pressings a month, a quarter of them for Decca. On the same site, 12 four-colour printing machines are needed to print the required number of sleeves and labels.

Strangely the cassette market in France seems to have grown less than that for discs. Jean-Claude Certes, technical, administrative and commercial director of Decca's studios in Paris, told me that in the last two years the sales of cassettes had been rather static, but that Decca's disc production had grown by 36 per cent.

But the most fascinating aspect of Société Française du Son-Decca's operation in France—is their adoption of the Sansui encoding system for quadraphonic records. The decision was made just over a year ago.

M. Certes told me why: 'We have this requirement from French hi-fi fans for classical music. What can we do? If we stay in the same position and only issue stereophonic discs, we are losing this market; and we'd like to prove that the quality of Decca France is better than that of any other French manufacturers.'

Quadraphony, like video, is big business in France. I understand that even French Radio, ORTF, have started their experiments in quadraphonic broadcasting. I'm not allowed to tell you which matrix system they are using.

Next I asked M. Certes why Société Française du Son-Decca had gone for Sansui's QS matrix. He said there was, to begin with, one good commercial reason, that being that the number of QS systems sold in France was much bigger than the number sold by CBS and Sony. The Sansui distributor, Henri Cotte, had made a very effective assault on the market and the other distributors had not been so successful.

Jean-Claude Certes

The technical reasons were many: he decided that he would have to choose a matrix system, not because the JVC system was a bad system but because it introduced complications in the manufacturing and reproducing chain. The final listener had to buy a special pickup head as well as his demodulator and two extra channels.

'Concerning the cutting itself, you know that there are very high frequencies on the disc. It is very difficult to cut those high frequencies near the centre of the disc and so the playing time of the disc is reduced, if you want a good result. That's not enough if you plan to use the disc half for quadraphonic and stereophonic use. If the disc is for both quadraphonic and stereophonic customers it may be necessary to reduce the length of the record and to use, for a symphony, two discs instead of one!'

The price of the installation was rather high for the manufacturer as well. As far as the CBS or Sansui systems were concerned the installation cost was low: 'It's practically the same machine. For cutting we add a little decoder, that's all. We cut using the 6.25 mm tape on two tracks as before and we only need the encoder for coding from four to two tracks. But if you use the JVC system the price is more than 15 or 20 times as much, and I have six cutting rooms here . . .' So although the technical possibilities of the JVC system were very good, they had had to settle for a matrix system.

Having chosen a matrix system he decided that Sansui were a little ahead of CBS, particularly as regards separation: 'Separation from front to back is better than 20 dB, which is sufficient. That is, 20 dB cut on a disc, 20 dB played back on a professional or semi-professional system and 17 dB with the consumer's cheaper system.'

He sees the English market as battling between two groups, the JVC system and the matrix systems, and is optimistic about Sansui and CBS issuing a compatible system, something about which many readers might have heard rumours themselves. Having issued French Decca's discs in the Sansui encoding he says he has increased his market, even among those who are buying stereo discs: 'They know they are buying the disc of the future'. The records will not be useless when they find they want to buy quadraphonic equipment.

One of the first records issued under the new policy was of the four concertos (Opus 4) by the 18th-century composer Locatelli, of which M. Certes was good enough to give me a copy. The recording was made by the Ensemble Instrumentale de France, a chamber orchestra who are under exclusive contract to Decca and for whom it was the first recording to be issued worldwide.

M. Certes gave credit for the undoubtedly excellent quality of this recording, and that of many others (more than 30 QS quadraphonic records these last months!) to the artistic producer for the sessions, Ivan Pastor. 'He is the most important man in our company concerning music. He is the man of quadraphony and he has specialised in classical music. It was impossible to do anything without his help.' M. Certes told me that M. Pastor had the most critical ear he had come across in 20 years in the music business and that Pastor and his engineers had been responsible for all Decca France's best recordings. 'He has produced the best records we have made in many years.'

The rest of the series of 30 records were of albums by Jean Costa (organ), Patrice Fontanarosa (violin), Jean Pierre Wallex (violin), Andre Bernard (trumpet), Daniel Bourgue (cor anglais), Bruno Rigutto (piano), Susanna Mildonian (harp), Maxence Larrieu (flute), Michel Dintrich (guitar), Raphael Puyana (harpsichord), the Munich Chamber Orchestra, the National Orchestra of Monte Carlo, and the great RTL orchestra. Four more albums were released these last weeks.

M. Certes explained French Decca's approach to quadraphony: 'The point is, if you're going to demonstrate quadraphony, it's wrong to do so by demonstrating ping-pong effects and so on—that's obsolete. It was all right for stereo in the beginning but not any longer. Now what we want to create is the normal sound that you hear in a room and no more. That is to say, when you are recording classical music in quadraphony you have the orchestra in

The Neve desk in Studio A's control room. The speakers are now Cadac monitors. Note the view of the studio.

front of you and a little at the sides, but not all round you. For our market it is better to have the normal sound of a classical orchestra with the sound coming from the front and a bit from the sides plus the reverberation and other things, except for special classical music such as a Mass where you might have the organ in front, the orchestra or other instruments at the sides and choirs at the back; where it's absolutely necessary to have the sound coming from all four corners of the room. But this situation usually arises only in religious music.'

Variety of music

Not that all Decca's output is of classical music. Nearer home for the bulk of the population not just of France but of the world, it seems, is Mantovani, who has made big selling albums at Decca France. The studio holds a maximum of about 80 musicians. M. Certes also told me that the number of hours the studio was booked by groups increased after the studio installed their Neve desk at the beginning of 1973. 'I see that before we were specialising much more in classical music and less in pop music. Since we have installed the Neve desk the situation has entirely changed—entirely.' The previous desk was a Neumann, which has now been installed in their second studio. The reason for choosing a British console instead of one made in France or Germany, was that the broadcasting organisations in those two countries had too much of a hold on the desk manufacturing market. Many continental desk makers concentrate all their production in selling to radio or television and for that reason the consoles tended to be unsuitable for music recording. M. Certes said it was also true that the new desk had attracted more business and he produced a computer readout to prove it. The studio, before the console had been put in, was doing about 250 hours a month compared with about 430 hours a month afterwards.

To return to the point, 'sometimes we do 90 per cent pop. This month, though, we have an important lot of classical sessions and we have no time for the pop sessions. The biggest problem is getting time for maintenance—generally we try to leave Monday mornings for maintenance in studio A, and Tuesdays for Studio B.' Studio B, he said, did not work as flat out as Studio A—about 170 hours a month, of which about 100 hours were for copying work.

The Decca Studio A laid out for a session. The cabins are not shown. Note the acoustic treatment on walls and ceiling.

Two unusual features of the Decca studio Paris strike the visitor straight away. These are the two cabins which have been erected in the studio itself. I've never seen them used anywhere else. M. Certes told me they were originally made as small studios for the commentators at the Munich Olympics. The cabins arrive in eight parts, each of which can be carried through a normal-sized doorway. They have a pine floor, and the only acoustic treatment which had to be added to them was the acoustic tiles, the carpets, and one bass absorber in each of the four corners. 'They're much cheaper than you could make yourself in wood, and you get a surer result.' They are used for isolating a chorus of up to six or eight people—they put a fan in there to keep them cool—and for low-level sounds such as the flute, piccolo and acoustic guitar. 'Another advantage of the cabins is that they give a panoramic view of the conductor.' The cabins are made by Algeco of France.

The acoustic treatment of the rest of the studio is achieved by using a combination of three absorbers, as shown in the photographs. One of the modules is pyramidal: the other two are tectiform, or wedge-shaped, with one set of wedges vertical and the others horizontal. A fourth surface is provided by the absence of a wedge. Each of the absorbers has been tuned: 'In order to extend the range we use heavy weights at the centre of some of the faces of the absorbers so that the resonance of one absorber is at a certain frequency and the resonance of another is at a different frequency. The location of each absorber is calculated so that you have a flat curve.'

Suspended ceiling

The ceiling is suspended on springs and acts like a huge diaphragm to absorb bass frequencies. Upon the ceiling are grey and white

38 ▶

squares arranged in a checkerboard pattern. The white squares are low frequency absorbers each of which has been weighted in a similar way to the faces of some of the bass absorbers on the wall, but with lighter, fibreglass weights. The grey squares have a porous surface and absorb both bass and very high frequencies. The problem with high levels of absorption, of course, is that, for a musician, it's rather like playing into a blanket. For this reason, high frequency reflectors have been used to modify the sound at certain points in order that the musicians might hear themselves.

The total reverberation time of this massive studio—its volume is 1,800 m^3—is only 0.52s. This varies according to who is using the studio. The floor can be progressively carpeted from bare floor, for classical music, to heavily carpeted, for rock bands. Beneath the wooden floor is between 5 and 7 cm of concrete. The floor is not floating but there are no underground trains anywhere near, and although heavy building work was going on right outside the studio while I was there I heard nothing of it.

There are 30 microphone lines from the studio. Decca use 100 microphones, mainly Neumann, AKG, Sennheiser, Shure and Schoeps. They use a variety of speakers for playback, preferring to use portable units rather than any fixed in the studio. They can choose from models by Altec, Lockwood or RCA.

Control room

The control room is high up one wall of the studio and gives an exceptionally good view. Monitoring here is on two Cadac loudspeakers at the front—about the biggest monitoring speakers I've ever seen, and with a bass response to match—and Lockwood loudspeakers at the back, all controlled by Altec graphic equalisers to get a flat curve in the room.

In a rack at the back of the room is the small Sansui encoder, an EMT variable delay unit and a Tuchel patch panel. I have reported before on Tuchel patch panels. Phonogram of London use them, to my knowledge the only British studio that does. Each of the sockets is bigger than that of a GPO jack, but then each of them provides input and output, or a parallel connection where a GPO field would require two sockets and cables, so the Tuchel patch panel is much less than double the size. Also in the rack are 30 Dolby *361* units.

The mastering machine is an 8/16/24 track Studer with a remote control on the desk. Another Studer is used for playback only of eight track, four track 12.5 mm and four track 25 mm tapes. Another Studer is used for four track recording on 6.25 mm (for quadraphony) and 25 mm tape. Two Ampex machines of uncertain age are used for editing and copying.

Concerning the desk, Neve had supplied limiters with an extra-fast attack time. The standard is about 5 ms, and these had been supplied with an extra attack time of 100 µs. This is now being offered as an option to the British market although an attack time so short can affect the beginnings of percussive notes such as those of a piano or guitar. M. Certes explained that this was a French requirement 'corresponding to the French sound', characteristically, whereas German recordings tended to be very bright, much brighter even than American recordings. This is not a measure of the poverty or otherwise of French or German engineering. It is just that the French and German public have preferences for different sounds. 'We don't use this on piano. When we have sharp attacks in the music we prefer to use the slow attack time. But when the sound is not rich in attacks we prefer to use the fast attack.'

M. Certes was happy with his limiters—he ordered two more to add to the four he already had while I was there—and ecstatic about his equalisers, Neve *108*s. 'Very very very happy' was how he put it, particularly with the fact that all the equalisation was available on just five knobs.

Best seller: Mantovani in Decca's Studio A, Paris.

There were no transformers originally—it was unbalanced. They have now added transformers which has helped to clear the hum problem.

Each channel has full routing to any number of groups from one to 16, solo prefade, solo afterfade and cut. With multitrack recording it's possible to put out simultaneously a complete stereo mix with separate panning and so on, on to two additional tracks, entirely separate from what goes on to the rest of the tape. Four joysticks pan between the first four groups.

Overdub facilities

On monitor there are also the normal overdub and sync facilities, with two reverberation channels available just for the monitor, independent of what goes on tape. Two other reverberation channels have been designated for the foldback circuits in conjunction with a foldback mixer which offers four mono or two stereo foldback mixes.

There is one phase meter but it has rather interesting associated circuitry. The phase meter unit looks at the output of all four monitor tracks. Of the six possible pairs which can be taken from four, it compares the phase of four of them: one and two, three and four, one and three and two and four; there are four pushbuttons on the phase unit, each of which is marked with the symbol for one of those pairs. If one pair shows a phase error, the pushbutton marked with the symbol for that pair lights up, and the pair can be seen on the phase meter when the button is pressed. 'When we're recording on two tracks we're only interested in the first pair, but when we are doing quadraphonic recording we have to watch the phase very closely. We have to change a microphone position by 20 cm sometimes so that the phase is correct, and the biggest problem is the placing of the microphones. Recording classical music in quadraphonic we use eight microphones—maybe more maybe less but about that. We find this system very useful and we're having it on our next console.'

There are 16 VU meters on the desk, although M. Certes told me that they would be able to use more than 16 tracks at once. If ever it were necessary, they could use the meters on the tape machines, but most of the work on the 24 track machine involved retracking.

M. Certes also told me he had done some work with BASF to produce a tape with optical markings at the back. I saw a tape of this kind at the AES Convention in Copenhagen. The optical markings were used to synchronise two tape machines to provide a large number of tracks. Running up to speed was achieved by having a section of tape at the beginning on which the markings gradually increased in frequency and the phase between them was compared. 'But . . . I prefer to use 24 tracks,' he confessed. 'It's much easier, much easier.'

The rest of the Decca complex houses the six cutting rooms, a copying room and Studio B, which now has the Neumann console that used to be in Studio A. Studio B is smaller than Studio A, being about 250 m^3 in volume. The building work that was going on when I visited Paris has now finished, and on the site of what used to be a beautiful salon in Napoleonic times (in England it would have had a preservation order slapped on it before you could say Jacques Robinson) is a new bank, a record shop and Decca's offices, disc store, restaurant and cafeteria.

Computed architecture

The building work was supervised with the help of a computer in one of Decca's premises to the south of Paris. The computer is still used for stocktaking and for adding up studio time, comparing one month with the next for the studios as well as the cutting and copying rooms.

Although he is likely to give the credit for Decca's apparent success to others in the organisation, I have little doubt in my mind that M. Certes is responsible for much of it. There was a time, not so long ago, when Decca France were behind other manufacturers, particularly Philips, regarding quality, sales and just about everything else. Not any more. The only thing that remained to nag at M. Certes when I met him was delivery dates, and I gained a fair idea that he had little intention of allowing Decca to fall behind on that score for very long.

The modular mixer

Take a good look at this mixer. Under that eye-catching console is a system that reflects the technical expertise gained from years of experience in the studio sound business.

Here, at last, is a mixer tailor-made to your requirements, but costing no more than a standard production model.

It's the Schlumberger UPS 4000, giving you real state-of-the-art technology at your fingertips. Fully modular, with plug-in units made of die-cast aluminium alloy to ensure highest accuracies, it's the system that has everything – integrated circuits, field-effect transistors, printed circuit cabling.

And modularity means you get the facilities you need now . . . with the flexibility you could need later.

Just specify your system requirements, and leave the rest to us. We custom-build the mixer *you* want. At a price you can afford. With filters, reverberation, foldback and much, much more.

Find our about this new concept in studio mixers. Contact Schlumberger, now.

Schlumberger

Schlumberger Instruments and Systems, 296, Avenue Napoleon Bonaparte, 92500 – Rueil – Malmaison, France. Tel. 977 92 23. Telex Labophy 26 649

Inside Birmingham Broadcasting

JEFF BARRON

BIRMINGHAM BROADCASTING, more commonly known as BRMB, operate the commercial franchise for Birmingham. They operate from old ATV premises in Aston, so before my visit I assumed they would probably have a respectable music studio. On arriving I discovered the remains of ATV's studios—a pile of rubble and a hole in the ground from the orchestra pit. BRMB has taken over four floors of the old administration building and constructed studios, offices, a newsroom, and naturally a bar.

The chief engineer, Dave Wood, has been working for BRMB for over a year now, and all equipment was ordered in early summer ready for a proposed opening on February 1 this year, but actually opened two weeks later. Most of the equipment ordered was diverted to the London stations who were due on the air earlier. Then the three-day week slowed construction down, and instead of a month's leisurely run-throughs in preparation for the grand opening, engineers were working round the clock preparing for it.

BRMB was conceived to entertain with recorded music, local news, and to produce community style programmes. The three studios are certainly not large and music is recorded with difficulty, although there are plans to improve matters soon—more later. Station output is originated from two identical studios which are self-op with an associated talks studio, and a separate production studio is equipped to record commercials, music, interviews etc.

Most of BRMB's equipment was supplied by Audix Ltd, the station's major contractor engineering-wise. The two announcer-operated studios are identical in layout and facilities, thus enabling operators to change rapidly from one studio to the other without need for familiarisation. The desks are stereo and have four mono microphone channels with a comprehensive equaliser unit providing three stages of equalisation. Each has five switched frequencies and continuous rotary controls to give ±14 dB of peak or trough, which may be patched into any microphone channel. Each announcer has taken a voice test and determined which settings of the equaliser most enhance his or her particular voice. There are two *C451* microphones on an interview table in the associated studio and this number is to be increased. Mounted on an anglepoise above the Audix desk is a *D202*, commonly used in such situations, and further around the console is an interview table with another *C451*, thus enabling the announcer to conduct more personal interviews than is possible talking to someone behind sheets of glass in another room. The microphones all appear as mono, panable sources and are switched with preset gain controls; however, faders are on order. Other monophonic sources include the associated news booth (news is presented from this booth into both studios), Independent Radio News, and the phone-in system.

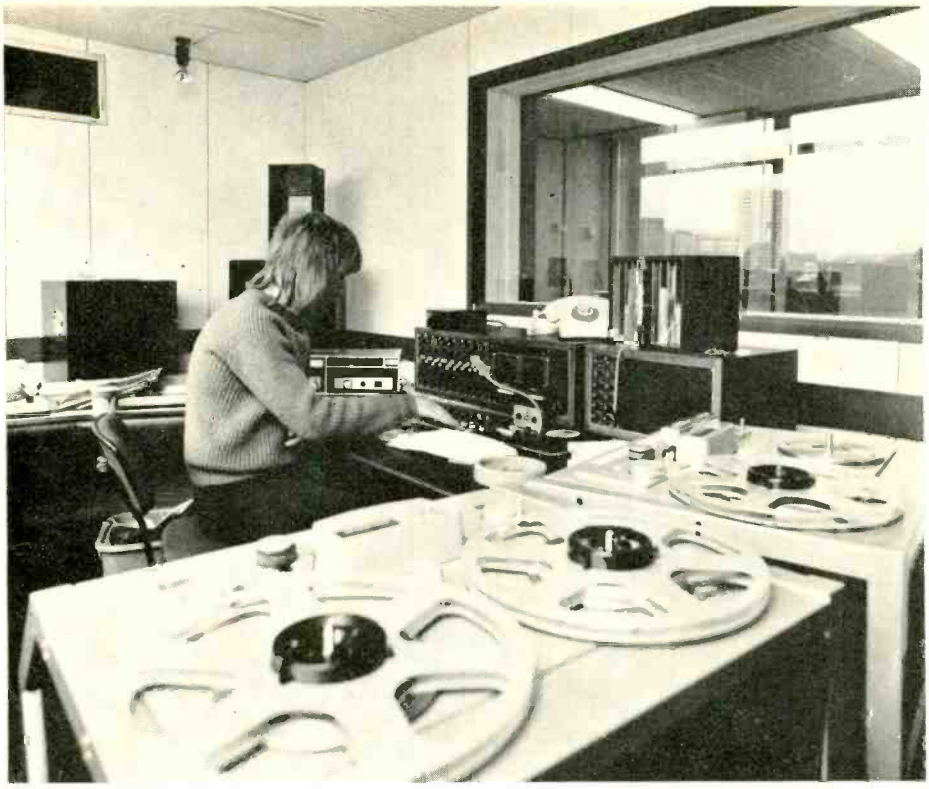
Local stereo sources include three Gates turntables with clutches and *G800* cartridges with individual stereo faders, two ITC triple cartridge stacks (a total of six players) paralleled to one stereo fader, and a remote-started Studer *B62*. A Revox *A77* in the master control room appears as a stereo source, and a single channel for other external stereo sources is switchable to four different inputs. The local stereo sources are sub-grouped and taken via two voice-over or ducker units. Control for these is derived from the announcer's microphone channel and gives automatic reduction of main programme level when the announcer speaks.

A Grampian spring reverberation unit is mounted in one wing of the console and allows echo to be added to the announcer's microphone or to the local stereo sources. Compressor limiters are included in each output line and also in the clean feed output for feeding the phone-in system.

Prefade listen is available on all input channels by means of push buttons which operate electrically interlocked relays. Stereo prefade listen is available to headphones and to the main monitor circuits and monophonic pfl to a small desk-mounted loudspeaker. For headphone operation when the announcer's microphone is in use, the output from the desk is switchable into the pfl system. Normally, monitoring is from two Kef *LS5/1AC* loudspeakers which sit on stands behind the console, but these are cut when the microphones are live. The main monitoring circuits may be switched to the vhf and mf 'off-air' receivers in addition to console output and prefade listen. While in normal operation, monitoring is always off-air, thus proving the whole programme chain. Two stereo peak programme meters are switchable to any of the monitoring circuits.

In addition to talkback between control console and studio and vice versa, an intercom is provided linking the various technical areas. Talkback is received on headphones, but a light signifies a call on the intercom rather

Table in adjoining studio area with phone-in and talkback facilities



Control room for Studio B

than a verbal call through the loudspeaker which in this application is impractical. One cartridge stack in each studio has starts remoted to the news booth in order that newsreaders may start their own inserts into bulletins. A PO key and lamp unit is actually built into the console and BRMB's phone-in lines appear here together with two PABX extensions. There are five phone-in lines on 021-359 4011 and four of these have access to the phone-in system. This system, which was designed by BRMB Assistant Chief Engineer Malcolm Salmon, is soon to be enlarged and more lines added. Another snag arose when sports reporters rang in to give live commentaries on football matches and found all the lines continuously engaged, so a few ex-directory lines will also be added. The key and lamp unit is also repeated in the studio enabling someone else to answer calls. To put a call on-air, a button associated with that particular number is depressed and lights up white. The caller now receives studio output enabling them to hear the programme. When depressed a second time, the button lights up red and the call is fed to a HES telephone balance unit from where it appears on the desk and programme changes to clean feed so the caller doesn't hear his/her own contribution. A third pressing releases the call from the phone-in system, but it is still on the key and lamp unit and may be reused if required.

The production studio in its present form can only record programmes and not originate live material, but this is to be changed. A standard Audix *B101* mixer is fitted, providing ten channels to two groups. For maximum flexibility, all inputs are mono with provision for routing via a pan control to the two groups. Echo send and foldback are also incorporated and an *AKG BX20* stereo reverberation unit feeds two echo return inputs. As in all the studios, Penny and Giles conductive plastic faders are used and to fade up a source the fader is pulled towards the operator. There's a school of thought that says when your sleeve knocks a fader it's better to fade down the source rather than risk putting something inadvertently on air. Generally, engineers with similar thoughts have worked for a large Broadcasting Corporation. Comprehensive monitoring on stereo ppms and Kef loudspeakers complete the programme chain. Facilities are provided for talkback to the studio and also reverse talkback. Two Gates turntables are mounted in a side wing to the desk and two Studer *B62* console-mounted tape machines and a single ITC record / replay machine provide recording facilities.

The studio is not large and only accommodates a few musicians, although this doesn't rule out music recording entirely. However, now the station has been broadcasting for a while, the deficiencies have been thought about at length. A 3M eight track tape machine is to be purchased, thus enabling musicians to lay tracks down separately, and comprehensive routing will also be installed.

A system of warning lights is incorporated throughout the station, and the colour coding is rather unusual. A red light signifies a studio to be operational or on-air, while an adjacent green light indicates a microphone operational. Green lights are also repeated on interview tables, while both lights are repeated in cabinets together with a clock in each studio. When one is used to blue and red rehearsal and transmission lights respectively, to sit in the BRMB reception and watch the green and red lights above the production studio door changing without apparent reason is rather mysterious. However, when the system is explained it is immediately obvious; green lights are used for cueing and while a microphone is faded up someone ought to have been cued and thus speaking, so green lights appear all over the place.

The central technical area is situated between the two presentation studios and comprises a mixer with studio outputs appearing, the news presentation booth and a small apparatus room. Another Audix *B101* with adjacent channel faders mechanically linked can give overall control over station output. Normally, however, a matrix system is used enabling the presentation studios to switch themselves directly to air. This system is fail-safe, and buttons in both studios must be depressed in sequence before control is transferred thus reducing the likelihood of transferring station output to an unattended studio. While the *B101* is overridden by engineering, it is freed for other uses—sub-mixing outside broadcasts in complicated programmes. A special ten output clean feed matrix is also provided for complicated programming. This has ten inputs and provides on each output a mix of all the other inputs except the associated input in order that a clean feed of cue programme is available to return to an ob who does not, of course, want to hear himself coming back. This eliminates the possibility of howl-round. Mounted between a pair of Spendor *BC3* loudspeakers above the Audix desk, are a stereo ppm and a mono ppm which are permanently monitoring the lines feeding the transmitters.

Bay-mounted in the apparatus room is a BRMB modified and patented Revox *A77* which provides a four-second profanity delay for phone-in programmes. Between the record and playback heads is a specially designed guide which leads the tape out vertically between the two spools and around another guide mounted above the machine on a protruding strut. Tension is increased to compensate for increased drag around these new guides. Of course none of the ordinary Revox functions are impaired and tape doesn't have to be threaded around these new guides if a delay is not required. Below the modified Revox is an ITC cartridge machine loaded with a four-second jingle which is played instead of the tape output when a censor button is pressed, thus losing the previous four seconds of programme of tape and hopefully the offending remark. Pressing the censor button automatically removes the incoming call from phone-in equipment. Switching between tape and cartridge is automatic and this system is stereo capable. Three HES telephone balance units are mounted below in the rack and provide the interface between caller and studio, returning studio clean feed down the phone line, while rejecting it from the desk feed of the caller. Other apparatus installed includes two RCA logging tape machines recording four track at 2.375 cm/s for IBA reference, Armstrong receivers feeding a ring main around the station, and a McMartin crystal controlled off-air receiver monitoring transmissions on 94.8 MHz from Lichfield. As with most commercial broadcasting, transmitters are the IBA's responsibility and an over-air signalling system using frequencies around 14k

42 ▶

■ MANAGING

correct and issued promptly. In case of query you must be able at once to produce supporting evidence proving your charges. Always keep an eye on the paper work; it has a habit of slowly increasing itself without any obvious benefit to anyone but the paper merchants. Correspondence will be minimal but are your letters brief, to the point, and neatly presented? The reader will be looking at the image of your Company. Above all, is the paper work being dealt with effectively, and filed so that back reference is easy?

A phenomenon peculiar to the entertainment business, of which recording studios are part, is the reluctance of people to be frank and risk hurting the feelings of others. It's the 'Dahling, you were wonderful! (Why can't the old bitch retire?)' syndrome. Very understandable why this attitude should prevail and it is a rare quality unknown in many other business circles, but it can be a problem. A major customer stops booking at your studio. You hear on the grapevine that he is booking at another studio. There has been no complaint. Your direct enquiries are met with evasion. You must make a determined effort to find and correct the cause. You must have a marketing policy. Without an active marketing policy you will become the victim of whim, fashion, and the unspoken complaint. A popular studio when new but with your customers drifting away as the novelty wears off and the little irritations, which are bound to occur, take their silent toll. If you rely on your engineers to bring in their own customers, while this will be a valuable contribution, those customers may well follow your engineers when they leave you for fresh pastures. It is vain to think your staff will stay with you for ever, however good an employer you are. So don't let your engineers' direct sales efforts get out of proportion, very helpful though they be. Do not let hidden rebates and kick-backs become part of your marketing, no matter how great the temptation, it leads to all sorts of trouble. One more thing—never try to sell a dud product.

What of the future? It is easy for a company to drift along just reacting to events as they occur but you must have a plan for continuity and development. Short-term plans should include such considerations as reliability of raw material supplies. Suppose your supplier of some essential requirement is hit by a crippling strike, a fire, or political upheaval, have you an alternative source lined up? Perhaps you have been getting some basic material from overseas. Suddenly a steep tariff is imposed or a world shortage of feed stock appears. So you rush along to a UK supplier who already has an order book filled from here to Christmas time. Have you thought of that possibility and planned accordingly? This is not to say foreign suppliers are any more or less reliable than their UK competitors. Customer service is more important than country of origin.

Even short-term plans need a long-term view. The wise manager who studies the trends is seldom surprised by the turn of events. And what of the long-term plan? Your studio cannot stay just as it is for ever, it will either get bigger or smaller. Only a strictly one-man business can be content happily to jog along never getting any bigger, but not without a plan or the jogging will soon stop. Your plans will include expansion into record production, music publishing, promotion, agency, artists' management, anything which is a logical extension of the studio activity, each new venture generating work for the others. There is an important, often sadly neglected, factor in this long-term planning. It is the responsibility of management to provide opportunities for career development. Your engineers are young men of above average intelligence who are most unlikely to be content sitting at a control console all their working lives. Can you offer them a future within your long-term plans? If you cannot perhaps they will find another employer who can and take their customers with them.

Broadly, along these lines the expert would have assessed the health and well-being of your business, your studio, before making his recommendations. You are doing the same thing daily, not necessarily in the same order or all at once, but much the same thing nonetheless, with a big difference. You do not make recommendations, you make decisions and take appropriate action. Good managers do not go back on decisions once taken, neither do they break promises. Decision-making is a day-to-day management function in no way to be confused with jumping to conclusions which has no part whatever in a well run business. Decision-making is an art and, like all art, is subject to a discipline. It has four parts to be taken in order. First, assemble the facts, all the facts including the opinions and feelings of those to be affected. Second, fit the facts together comparing the effect of alternatives on staff and work, never losing sight of your objective. Third, take action and do not evade responsibility. Fourth, follow up the action by checking results to establish that the decision was correct and the action effective.

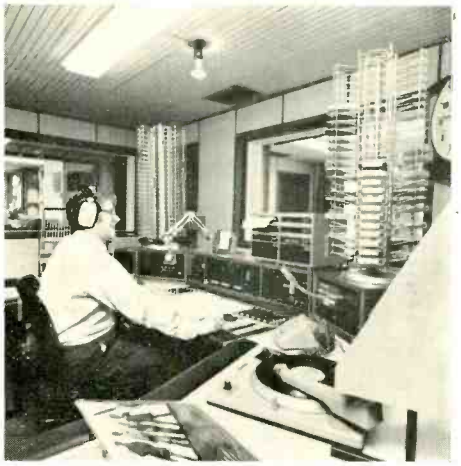
So, how are you managing after all? Pretty well no doubt and you have the figures to prove it. A little self-criticism now and again is always a good thing. To those who aspire to be managers—now you can see what you are in for. To those who do not share that ambition—how is your present manager shaping up?

■ INSIDE BIRMINGHAM

Hz enables the transmitters to be interrogated and reveal possible faults. Additionally there are various amplifiers, equalisers, jackfields and U links associated with internal communications, studio outputs and PO lines.

BRMB have a radio car or will have by the time this article appears. Philips communication equipment is used; a 20W base station on Turners Hill, and 10W portable transceivers, and these should give a range of 20-odd miles.

The BRMB newsroom is unlike any other newsroom that I remember visiting. There are four positions for sub-editors and each position has all facilities required for producing their news. A Revox *A77* mounted on a console at each position can record any of a number of incoming sources including off-air, various other radio and television broadcasts, four news telephone lines on key and lamp units, and incoming land lines including Turners Hill, reception point for the radio car. Recordings made on a Revox are then cued up and transferred to cartridges for transmission in bulletins. An ITC record/replay machine with remote start facilities is shared between two positions and located between them. There's also a typewriter in each position together with other typical items used by subs. By using this arrangement BRMB have brought together in one place all facilities required for news production, rather than the more commonly encountered situation, where subs are rushing about all over the place making up their stories. The newsroom was engineered by Tim Mason of BRMB.



Audix console in control room of presenter operated studio

Tape used by the station consists mostly of 3M *262*, which is an excellent tape (and incidentally green) so long as you don't set fire to it. Where very high quality is required, as on the Revox delay machine, Ampex *444* is used.

Generally, the station is well constructed and considerable thought has been given to producing pleasant working surroundings, especially lighting.

Finally, I should like to thank Dave Wood and Mike Williford of BRMB for their invaluable help in preparing this article.

Loudspeakers in studio monitoring

STEPHEN COURT

THERE HAS ALWAYS been a lot of controversy in the field of studio monitoring and about loudspeakers in general. When their quality evaluation is so subjective, the situation is not being helped by the variance or even lack of useful specifications from manufacturers. We are all familiar with specifications such as 'frequency response 20-20 kHz' without amplitude deviations, and 'power handling 50W'. Since the same speaker can legitimately be described as anything from 10 to 150W depending upon the measurement parameters used; without quoting speaker efficiency, the whole thing becomes rather academic anyway.

Having ascertained that a given speaker can meet the basic requirements in these fundamental terms, the only test that will usefully validate the system is extensive listening from the actual positions in which the speakers will be used. However, problems only start here. At the usual levels and distances, the engineer will not just be listening to the loudspeakers, but a combination of them and the control room acoustics, which will vary according to speaker position and radiation characteristic. He will also be listening to tapes recorded via other loudspeakers, where he balanced the sound according to his tastes, and by so doing inadvertently corrected for any deficiencies in the original monitoring system. Such corrections will show up on the new speaker, usually giving him a totally different balance.

This situation is partially solved by listening to individual instruments from a multitrack master where relatively little correction has previously been applied, as well as providing a musically useful source unbiased by the aesthetics of the final production. This usually provides a more helpful basis for evaluation, but still entails a compatibility between the speakers and the room acoustics. With A-B tests, one would imagine this to be constant for all loudspeakers, but since radiation characteristics change with shape and intensity of the wavefronts, different room modes are likely to be excited.

The apparently obvious solution of comparing loudspeakers on playback only often creates more problems than it solves, for the engineer will inevitably listen to whichever speaker pleases him most, or flatters his recording. As one manufacturer said, 'we don't build monitor speakers to freak out balance engineers—but to let him know exactly what is going on to tape'. Although this is a highly commendable attitude from a design point of view, it doesn't help matters if his monitor shows up faults in the balance, while the other speaker which was 'tuned for maximum smoke' happens to 'sound better' despite being a less accurate monitor.

Using a tape that was recorded at another studio is of no real help either, since the engineers don't know exactly what they are listening to as the recording technique may be unfamiliar to them.

This must sound rather confusing to some, but then the subject itself can be very confusing, especially since we are concerned with small degrees of difference. Having installed a system to everyone's satisfaction, it occasionally happens that an engineer will do a session at another studio and prefer their sound, even though they are using identical equipment. It is becoming increasingly popular for engineers and tapes to go from one studio to another,

Measuring response in the control room at Kingsway Recorders

and it is certainly an education to hear the same tape sounding radically different on identical loudspeakers.

The solution to this particular problem is partially provided by equalising each control room to cater for acoustical differences; this is the greatest single contributor to the overall sound and is, belatedly, becoming a standard part of control room design.

The use of equalisers between the desk and power amplifiers helps to solve the problem so far as consistency of the final product is concerned, and will eliminate most of the equipment/room aberrations. As with all forms of electro-acoustic correction they will not make a bad system sound good, but will only improve an inherently good system. When severe correction is required, although the considerable phase shift introduced can be argued as being imperceptible, providing it is approximately the same in both speakers, the inevitable reduction in headroom and therefore dynamic range must be taken into consideration where more than 5 dB or so correction either way is required.

To make all control rooms sound exactly the same would arguably approach a sterility and lose the individual character of each studio so while it is true that an artist will record at a particular studio because he likes their sound, one would hope that it is derived from the studio itself and the engineer's technique rather than the sound in the control room. Occasionally, control room equalisation to within 2 dB of the IEC specification loses its character, and gives a dry and rather boring sound. In one such studio, the only answer was to find which control room pleased the engineers and their clients, and reproduce that response in the control room under consideration. The fact that the graphic equaliser used looked like a cross-section through the Alps didn't seem to deter their enthusiasm for the final result.

One might be adamant about the need for consistency in loudspeaker manufacture, but for as long as competition exists and our ears and tastes differ as do methods of product evaluation, such consistency is unlikely to occur. One contributory factor is the method the manufacturer used to evaluate his product. When installing monitors one tries to preach

the gospel of flush mounting, so that the control room walls become an extension of the speaker baffle. Since the hf radiation is typically narrow the engineer will listen to a large percentage of the total hf radiation. The mid-range radiating into a slightly larger field will provide the listener with slightly less, but since there is a lot more information in this part of the spectrum, the difference is minimal. However, at the low frequency end of the spectrum, since the radiation is naturally spherical when used in the free standing mode, the engineer will only hear a small percentage of the total radiation. This may give the impression of being bass light. Flush mounting the monitors, giving an angular radiation characteristic between π and 2π (ie into a quarter or half sphere), will provide a theoretical 3 dB increase of bass on axis, as well as eliminating back radiation which can often give severe aberrations in the speaker's low frequency response by phase cancellation and addition. The improvement in lf response and 'tightness' is noticeable, but the actual amount is variable, since the room itself can provide by reflection gain or losses at these frequencies.

The important thing is the way in which the manufacturer measured his product. If he designed it to exhibit flat power characteristics under these (2π) conditions—usually by mounting the speaker in a flush baffle on the roof because anechoic chambers are none too reliable at these frequencies—it will often appear by comparison to be lacking in bass if used in the free standing mode on a frame stand out in the control room floor. By the same token, a speaker designed for the flattest response under anechoic 4π conditions, will usually sound better from the 'concert hall' point of view, but almost certainly bass heavy if flush mounted.

All this rather suggests that the only way to obtain some kind of consistency in the final product is to select a speaker that gives the best performance in terms of dynamic range and low distortion, then tailor the system to suit the room in which it will be used. Naturally manufacturers are aware of these problems and attempt to provide a sufficient choice to suit all conditions and tastes. Inevitably, custom modification will slightly increase the costs of the total system. But when one considers the importance of accurate monitoring and just how much it affects the final balance, it appears that very little is spent on monitors compared with the rest of the control room equipment.

The use of electronic crossovers is also an advantage, not only reducing distortion and increasing system efficiency, but also providing a small element of control of the overall tonal balance.

All these forms of correction in the monitoring system, while providing versatility from a room/equipment point of view, still provide the problems of who sets it up, and in what way. Not only do engineers' tastes differ, but also those of the producer who sometimes insists that a particular monitor system be used before he will record in a particular studio. Not an unreasonable request so far as he is concerned if he is unfamiliar with the existing monitors—even though the room acoustics contribute so largely to the sound they give.

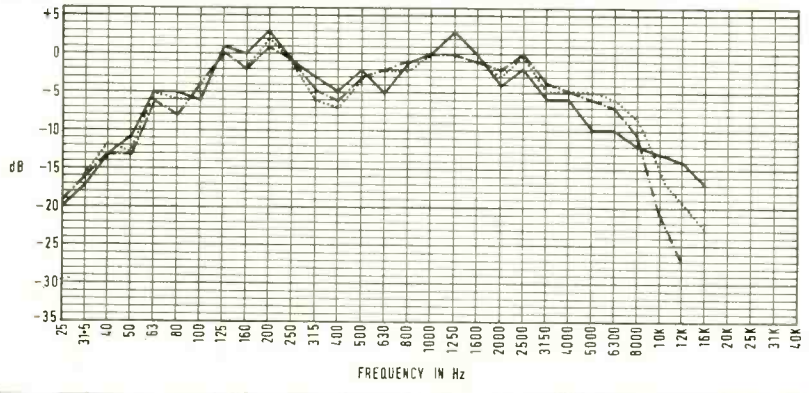
It would appear that the only solution would be to provide a speaker with infinitely wide dynamic range, and low distortion, with a switch providing degrees of equalisation, so whether he preferred a 'Tannoy', a 'JBL', an 'Altec' or whatever sound, he could choose the necessary characteristic. Alternatively, a pair of graphic equalisers could be fitted after the mixing console, and the engineer makes up a template which, when fitted over the equaliser's faders, provides a monitor sound which gives him the best balance. Far fetched as it all sounds, one enters into the almost farcical world of hi-fi where it was once suggested that a hi-fi speaker be fitted with a switch saying 'classical', 'pop' and 'magazine reviewer'.

In reality though, the general concensus is that different types of music do put different requirements on loudspeakers, accounting for the large number of monitors on the market (not to be confused with those called 'monitors' as part of a sales aid) and also for the apparent success in system equalisation in a number of studios.

In terms of compatibility there is another aspect, and one very often neglected—the power amplifier/speaker interface. The majority of most commonly-used loudspeakers in music

50 ▶

A NOT UNTYPICAL CHARACTERISTIC FOR CONTROL ROOM MONITORS USED MEASURED AS 40 TO 20kHz ±3dB IN THE LABORATORY. THREE POSITIONS ARE SHOWN.



Sir Joseph Lockwood retires in November after 20 years as chairman of EMI

Sir Joseph Lockwood

DENIS COMPER

IN CONTRAST WITH the bright sunlight shimmering in Manchester Square, the boardroom seemed sombre and quietly remote from the bustling traffic six floors below. The rows of gold discs in their modest frames gleamed on the panelled walls and reflected in the glossy surface of the long table. No clamouring telephone to rend the calm with unconsidered trivia. Here informed opinions are weighed and weighty decisions made.

On the dot the door opened and in came Sir Joseph, erect and with a briskness of pace which belies his age (70? I can't believe it) and his 20 years (does time pass so quickly?) as chairman of EMI. The room seemed to brighten. A warm handshake that was no mere courtesy. We seated ourselves comfortably and began our talk.

Sir Joseph is one of those rare people who have a natural authority which can be inherited, perhaps, but not acquired. That much abused term 'born leader' comes to mind but must be rejected as an inadequate and inaccurate description. My carefully rehearsed opening gambit was to have been to ask what qualities he possessed which others of lesser eminence obviously did not. The question was unnecessary, almost impertinent. The silent answer was provided by the air of self-confidence lacking any trace of conceit and a quiet dignity without the slightest degree of pomposity. There were moments when the steely glint of an unshakeable determination showed through but he is an essentially friendly man with an ease of approach which seemed to give just a tiny hint of how lonely it can be at the top.

His biographical details are common knowledge. The cousin of a well-to-do family of flour millers, he started work at 16. Posted off to the South American mill at the tender age of 20, it didn't take long before he was running the place while successfully learning to cope with the problems of controlling staff older and more experienced than himself.

On to a job with Henry Simon's, the milling machine people, and upwards through the company to a seat on the board. Arduous war service followed by the task of helping to feed the hungry of devastated Europe. Back to Simon's as chairman and managing director of the world's biggest maker and builder of flour mills with the authorship of a pair of standard text books for good measure. Enough, one might think, for even an out-of-the-ordinary man to have achieved by the age of 50—but there was to be more, a lot more, to come.

The anecdotes flowed with a quiet modesty. Stories of little triumphs enjoyed and big successes won. The dollar bet on the recognition of a rare type of grain gained at the expense of a wealthy Texan who could well afford his loss. Sir Joseph has a keen eye and a retentive memory. The Belgian who refused to pay for plant delivered until someone could be found to make it work after months of frustration. Sir Joseph made it work and got the money. Through it all ran a thread of enthusiasm for the job which can only come from dedication.

In the early 1950s, Sir Joseph became a member of a government appointed committee. His function was to prevent senior research scientists spending too much public money with too little result and he proved very good at it. A fellow member was Sir Edward de Stein, a merchant banker with a problem. The problem was an untidy, inefficient company called EMI Ltd losing half a million pounds a year. Lockwood (he was dubbed in 1960) would be the right choice to shake some good commercial sense into it. To a man at his happiest with a fistful of finely milled flour, the suggestion did not make good commercial sense and his answer was a polite but firm negative. A clever man is he who recognises his own limitations. He knew very little about electronics and next to nothing about music. He was approaching the end of a distinguished career. Sir Edward persisted and Sir Joseph relented becoming chairman of the sadly ailing EMI. A new lease of life started both for Sir Joseph and for a company, rescued from the very kerbside of Carey Street, which has become the multi-national giant we know so well today.

The early days were grim. Half the work force at Hayes had to be sacked. 'Redundancy' had not been invented. Nine thousand men would be out of work and Sir Joseph accepted it as his duty to tell them so, personally. With the active cooperation of the union shop-stewards he saw to it that there would be no cases of hardship, and there were not. To him people come first. It is people who run factories and not machines. Perhaps that is why there has never been a strike at EMI.

On the record side he quickly became aware that it was the classical department who were the officers and those engaged with pop music merely other ranks. That situation changed quite soon. He was appalled by the surface noise on the discs pressed at Hayes. The staff hadn't really noticed, being busy listening for other things, but the surface noise was radically reduced. To learn the job for himself he attended a prerecording rehearsal session at Kingsway Hall for the first stereo issue of *Fidelio*. He watched proceedings intently, found the sound dull, undramatic and lacking in perspective. He got a duplicate set of equipment down from Abbey Road and made his own recording. Which version was finally used is still in doubt.

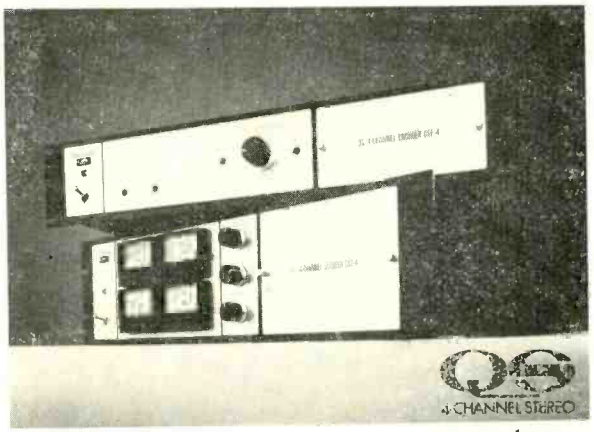
Now if that seems a bit high-handed it must be accepted that a good chief executive must be able to show who is boss, not by mindlessly barking orders down a long distance telephone, but by being able to do the job and thus appreciating the worries and problems of those lesser mortals whose daily task it is. Sir Joseph has a talent for understanding people and making them want to do what he wants them to do. Together with this he has the ability to reprimand without causing loss of dignity. Above all, he maintains, the boss must always set the best example. However elevated his position may appear to be he must know when to be humble and to seek, and listen to, the views and advice of his staff. This is the secret of how Sir Joseph has generated enthusiasm and loyalty in a great company once so badly demoralised.

The perspective is too short in which to judge the influence Sir Joseph has had on the development and direction of the record industry as a whole. Future industrial and social historians will do that and many of us will not be here to read and dispute their judgement. Whatever they write it is certain his contribution to the industry has been immense. Without it it is doubtful if the

50 ▶

Sir Joseph Lockwood

Within 2 years, 4-channel sound will be the rule. Sansui QS system puts you 2 years ahead.



Now your listeners can enjoy the extra depth of 4-channel sound with the minimum of 2-channel conversion costs on your behalf.

Thanks to the Sansui QS 4-channel system. Now available for the first time in the United Kingdom.

Keep your equipment

The Sansui QS 4-channel system is used with all current stereo transmitters/receivers, cutting equipment and hardware. So there's no need to upgrade. The listener only requires a 4-channel receiver and 4 speakers to obtain astounding quadraphonic effects.

Excellent separation

Both encoding and decoding matrices are symmetrical. Together with the new QS Vario-Matrix in the decoder, an inter-channel separation of 20dB or more is no problem.

Maintains present hi-fi standards

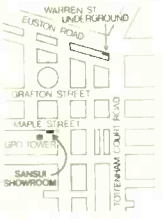
High standards are maintained. Because of a unique phase shift technique, the quality as well as the quantity of input information is preserved. In fact it gives better stereo perspective than conventional 2-channel sources.

Proven performance

In both Japan and the United States where 4-channel sound is becoming the rule rather than the exception, QS type matrixing is standard.

Listen to this remarkable equipment at the London showroom of Sansui.

It's right next to the GPO tower. Our technical experts are ready and willing to give advice on specifications and prices. Or send in this coupon for full information.



Vernitron Ltd., Thornhill Southampton S09 QF England

Sansui Audio Europe S.A., Diacem Building, Vestingstraat 53/55 - 2000 Antwerp Belgium

Sansui Electronics Corporation 55-11 Queens Boulevard, Woodside, N.Y. 11377, U.S.A.

Sansui Electric CO., Ltd. 14-1, 2-chome, Izumi, Suginami-ku, Tokyo 168, Japan.

To : Sansui London Showroom,
39/41 Maple Street, London W1P
5FU (Freepost) Telephone : 01-580 5353

Please forward all technical and price details on the new QS 4-channel encoder and decoder.

My name :

My address :

Postal code :

Sansui

Sansui equipment is distributed in the United Kingdom by Vernitron Ltd., Thornhill, Southampton.

The circuit to be described was originally made up to remove 50 Hz hum from a recording of some historic interest. Because of its simplicity and the sharpness of the notch filtering obtained, the circuit may find many other applications in cleaning up recordings containing spurious tones, and in the laboratory and workshop. The author has made up a board covering three frequency ranges.

Selective filter for programme cleaning

JOHN FISHER

ESSENTIALLY, THE CIRCUIT splits the signal into a direct and indirect path, filters the indirect path, and recombines the signals in a mixing stage. It is of course possible to add a number of refinements including balanced inputs and outputs, but these are details which need not concern us here. As drawn the circuit uses two inexpensive consumer op-amp ics, the popular 741 types.

The signal paths may be seen in the block and circuit diagrams. The signal in the 'indirect' path is inverted with respect to the direct path, and the frequency of the bridge filter is set by the value of *C1* and *C2*, and adjusted by *VR1*. Fine control of the setting may be achieved with *VR1A* if desired; alternatively a vernier drive may be used if the track of the potentiometer is sufficiently large to give adequate resolution in this way, and a single control is certainly easier to use.

The mix of the direct and indirect signals is adjusted by *VR2* (or *VR2* and *VR2A*), and careful adjustment will allow a very deep null with minimal attenuation at frequencies within 10 per cent of the tuned frequency; it is not difficult to achieve around 30 dB attenuation of the tuned frequency, and better rejection has been achieved with some care and proper choice of components.

The direct and indirect signals are mixed in the virtual earth amplifier (*IC2*), which also provides a low-impedance output (unbalanced of course). This may be used directly or with a buffer amplifier and transformer. The input impedance of the circuit is a little under 10k It may be matched to a 600Ω line with suitable 1:1 transformers and input load resistor.

Operation

Assuming maximum rejection is required, the notch depth control is set to about mid-travel; the appropriate capacitors *C1* and *C2* are chosen for the frequency range to be covered (these may be switched), the values given being for the range 45 Hz to 120 Hz approximately. The tuning potentiometer is then adjusted for the best null at the frequency to be rejected, and the notch depth control is then adjusted for optimum rejection. The adjustments may be carried out either by listening to the output or by observing the effect of the filter on a millivoltmeter and oscilloscope.

It may happen that because of speed drift in a recording, for instance, or because of temperature dependence of a particular spurious tone, the frequency of the unwanted signal drifts slightly; it is very difficult to track such a signal manually with any great accuracy, and it may be preferable to accept a poorer rejection figure with a wider null, so that after initial adjustment the circuit will still provide adequate rejection over the range in which the spurious tone drifts.

Precautions

It is most important that the circuit should be well screened from stray fields, and that well-screened input and output leads, and leads to the control potentiometers, should be used.

50 ▶

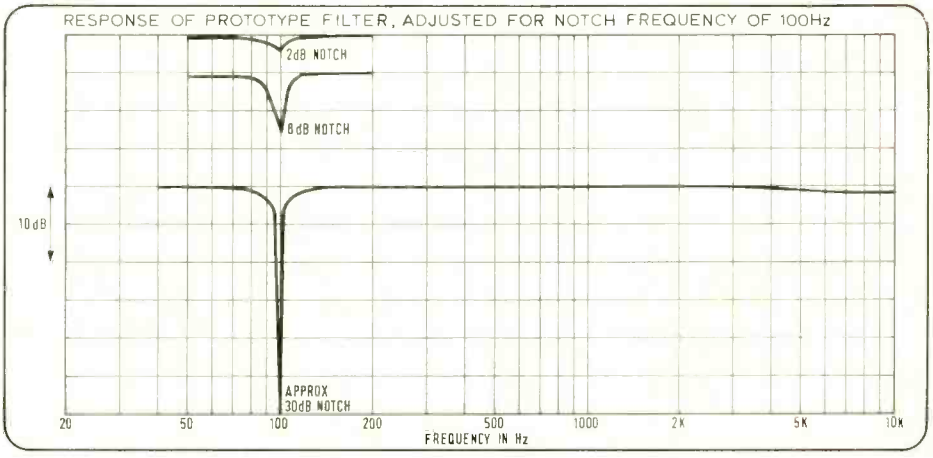


FIG. 1

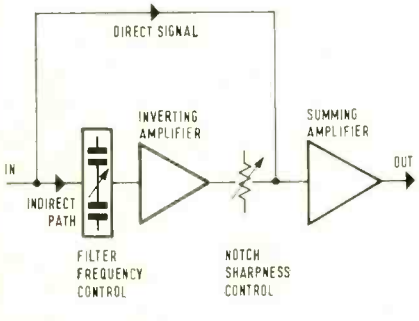
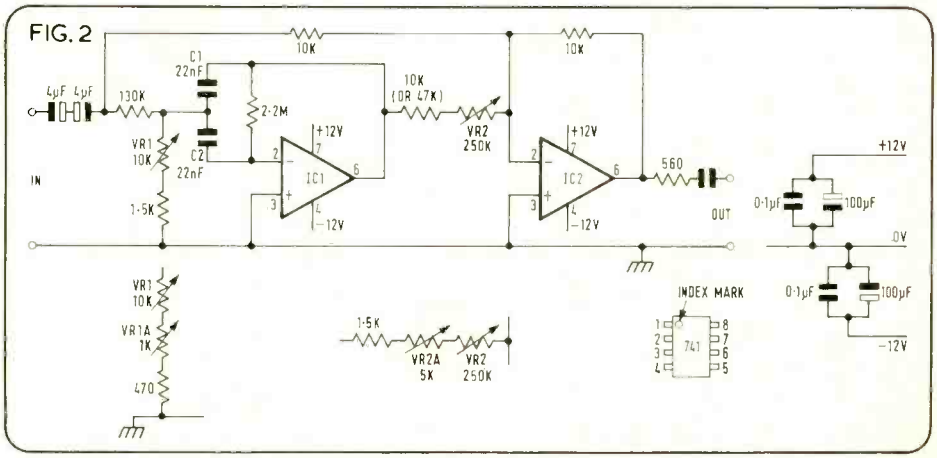


FIG. 2



Scully Shows You How To Be Perfect

Without Paying The Price.

As a professional, you want the finest in a professional recorder. The best sound reproduction possible. Simplicity of operation. Reliability coupled with ease of maintenance. And, you don't want to pay a fortune to get it. In short, you want perfection at a perfect price. You want the new 280-B Recorder/Reproducer.

Unmatched Performance.

By designing the 280-B electronics around the new high-energy tapes. The S/N ratio is perhaps the best available in any recorder at a comparable price. Up to 72 dB on full track .25" tape at mastering speed. A sharp 68 dB on two-track .25" and four track .50."

The 280-B also features more head room and an increased record level for maximum signal utilizing the high output tapes. And band widths are a very flat ± 2dB, 30Hz to 18 KHz. It all adds up to greater performance than you've ever been used to.

Quick, Simple Operation.

The more sophisticated we've made the 280-B, the simpler we've made it for you to operate. Our new **Optac**™ motion sensing system gets a new standard of efficiency in tape motion control. Now you can go from one transport mode to another without touching the Stop button. And enter and leave Record while the transports in Play. **Optac** and the 280-B's new logic circuitry make the exact moves for you at the right time.

Easy Maintenance.

New solid state circuitry and mother-daughter board architecture give the 280-B a greater reliability factor. They also make testing, repair and replacement easier. All signal electronics are in slide-out drawers. No more bending down and reaching around. Individual channel modules go in and out easily, too.

If the 280-B sounds too good to be true, wait till you hear it. And wait till you find out the price. We've made it very easy for you to get the best.

For more detailed information and prices on the 280-B, call or write: Scully/Metrotech, 475 Ellis Street, Mountain View, California 94040. (415) 968-8389. TLX 345524.

Scully|Metrotech

Recording Divisions of Dictaphone

■ SELECTIVE FILTER

It is very easy to get misleading results because of pick-up of AF and RF signals in unscreened leads, and in filtering out hum to pick up more in the leads than is rejected from the original signal! This can be extremely frustrating!

It is suggested that the unit should be fed from batteries, or at least a very well smoothed supply, and the capacitors shown between the earth line and the supply rails should be mounted on the pcb and not omitted.

The value of the output capacitor will depend on loading. For small values it is convenient to use polyester capacitors; otherwise a reversible electrolytic or two tantalum capacitors back-to-back must be used, as at the input.

Finally, any available version of the 741 ic may be used; the prototypes used 8-pin dil plastic versions. Alternative ics would be the 748 or 709, but the 709 is more easily damaged and may latch up if over-driven, and both the 709 and 748 require high frequency compensation for stability, although they are capable of better high frequency performance than the 741.

Conclusion

In addition to hum filtering, for which the circuit was originally required, the circuit may be adapted for heterodyne and television whistle filtering, multiplex output filtering, and rejection of unwanted signals in workshop measurements. It can be assembled on a very small pcb; it is suggested that capacitor switches and the variable potentiometers should if possible be mounted on the pcb, and the whole unit should be well screened in, for example, a die-cast box.

■ SIR JOSEPH LOCKWOOD

gramophone record would have become the massively popular entertainment medium it has in quite so short a period of time.

In November Sir Joseph retires as chairman while remaining on the board. He has earned a rest. Of course, he will have a few interests to keep him out of mischief. He will still be a director of Smiths Industries, and Hawker Siddeley, and Beechams, and the Laird Group. He will continue to be a Governor of the Royal Ballet School and chairman of its Endowment Fund, and a Governor of the Central School of Speech and Drama. There will be his directorships of a number of racecourse management companies. Racecourses! Sir Joseph a gambler? Yes, in the sense that he believes all business to be a gamble, but, and this is the important difference with the ordinary punter, the gamble must be within strict limits and the possible loss must be known. He makes distinction between a calculated gamble and incautious optimism. Optimists go broke, gamblers do not. After all, what bigger gamble could there be than record production, except films maybe. EMI is in both.

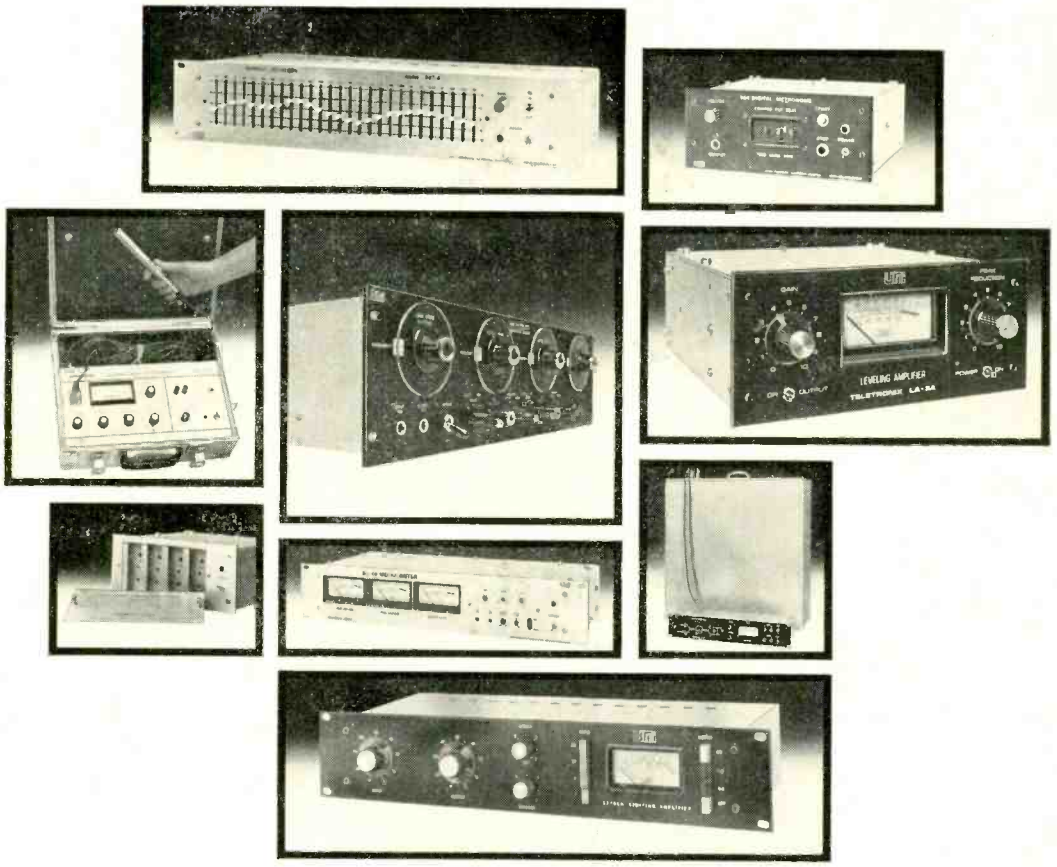
It's never quite the same when a great man goes. Well, he isn't going far and, as he said himself, the management of the company will be broader, better and more professional—and he will have more time for gardening—that's what he said. Yes, Sir Joseph, I am sure you are right. You have made a practice of being right for half a century and there are very, very many of us grateful for the benefit. Still, it's never quite the same . . .

■ LOUDSPEAKER MONITORING

studios, while being highly efficient and requiring less power, are very sensitive to peculiarities in the amplifiers being used. For example, even minute dc offsets are sufficient to bias the cone of an efficient speaker and impair the lf performance, which can be aggravated by the poor damping from which even some well known amplifiers suffer. It is not uncommon to see such amplifiers being used with long lengths of thin cable, which only serves to reduce damping even further. Placing the power amplifiers next to the monitors, and checking for dynamic and static offsets upon installation, helps to reduce such problems.

One hesitates to suggest that a speaker should be selected for the best transient response, lowest distortion, and widest dynamic range—for it might seem obvious. But consider: the majority of cost in speakers is in these features, yet the overall 'sound' or frequency response is the one specification on which a lot of people judge the initial performance. It is the most inconsistent factor and the easiest one to change. Ironically, a manufacturer will go to great lengths to reduce distortion, improve impulse response and so on in his product, while the whole system is ultimately judged on factors that can originate from fittings in the control room.

All these factors point to the idea that while an 'off the shelf' system might appear to do the job adequately, it is always worthwhile to have the system measured, and equalised if need be. Even when the monitors are built into the control room using already proven transducers in enclosures to suit, the extra cost is usually very small. At present, a lot more studios are paying extra attention to the monitor-room interface, especially from the point of view of room construction, but even so a little more attention to the existing monitoring system will eliminate the bugs most commonly encountered.



UREI~Instrumental in Audio

A comprehensive range of proven audio processing equipment, universally acclaimed and offering performance second to none.

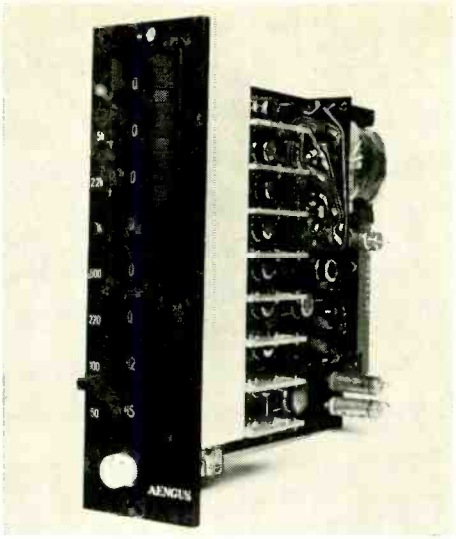
Graphic Equalizer
Digital Metronome
Sonipulse
Little Dipper
Leveling Amplifier
Cross-over
Modulimiter
Cooper Time Cube
Limiting Amplifier

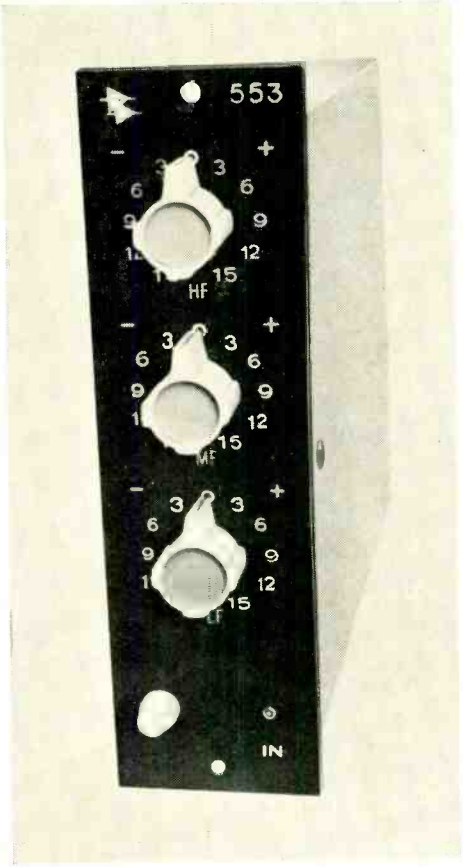
UNIVERSAL AUDIO

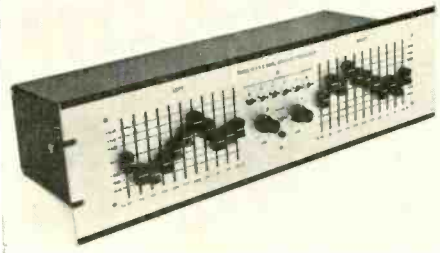
F.W.O. Bauch Limited

49, Theobald Street, Boreham Wood, Hertfordshire. Tel: 01 953 0091

Survey: graphic equalisers







Top: *Aengus graphic equaliser*

Middle: *Automated Processes 553 equaliser*

Bottom: *Klark Teknik's 11+11S dual graphic equaliser*

AENGUS
Aengus Engineering Inc, 50 Oak Hill Rd, Fayville, Mass 01745, USA.
(UK) Scenic Sound Equipment, 28 Bryanston St, London W1.
Phone: 01-935 0141.

Aengus
Number of channels: one
Band centre frequencies: 50, 100, 220, 500, 1k, 2.2k, 5k, 10k Hz.
Control response: +15 to —12 dB.
Input level: +4 dBm.
Overload point: +21 dBm.
Signal-to-noise ratio: 86 dB.
Distortion: 0.1% thd at +4 dBm.
Power requirements: ±15V at 75 mA.
Dimensions: faceplate 38.1mm x 133.4mm. Depth behind panel 146mm.
Price: £147.

ALTEC
Altec Corporation, 1515 S. Manchester Ave, Anaheim, California 92803, USA.
(UK) Theatre Projects Sound Ltd, 10 Long Acre, London WC2E 9LN.
Phone: 01-240 5411.

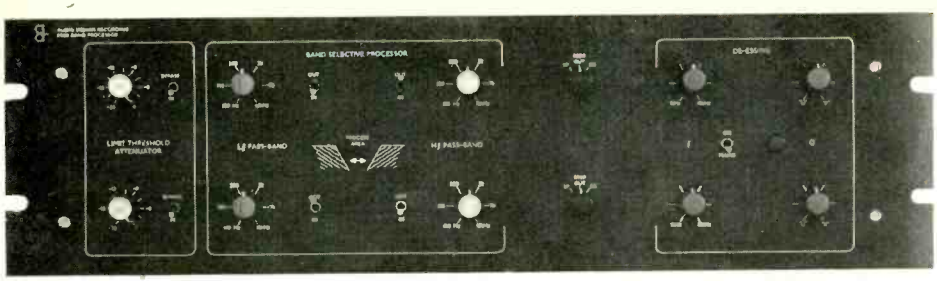
9860A
Number of channels: one.
Band centre frequencies: ⅓ octave ISO centres from 40 to 12l5k Hz. Highpass filter at 40, 80, 120 Hz, lowpass filter at 6, 12.5, 16k Hz.
Control response: 15 dB of pass band attenuation Filters slope at 18 dB/octave.
Input level: —2 dBm.
Input overload point: +18 dBm.
Signal-to-noise ratio: 82 dB.
Distortion: 0.5% thd at +15 dBm.
Power requirements: 240V ac, 24/28V dc at 1A.
Dimensions: 134 x 483 x 204mm.
Weight: 7.7 kg.
Price: £499.86.

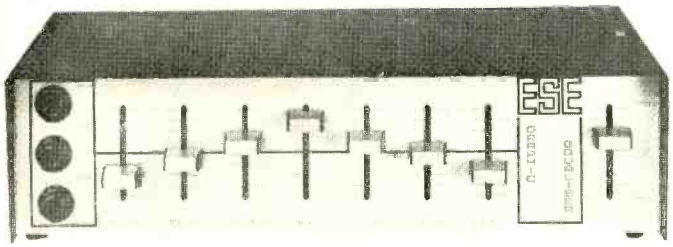
9062A
Number of channels: one.
Band centre frequencies: 50, 130, 320, 800, 2k, 5k, 12.5k Hz.
Control response: ±8 dB.
Input level: 16 dB insertion loss. —70 to +24 dB.
Input overload point: passive.
Optional extras: escutcheon panel.
Dimensions: 89 x 254 x 134 mm.
Price: £410.10.

AUDIO & DESIGN
Audio & Design (Recording) Ltd, Shinfield Rd, Shinfield Green, Reading, Berks.
Phone: 0734-84487

E500 Series, Band Selection processor/ de-esser
Number of channels: one.
Band centre frequencies: variable 20 Hz —20k Hz.
Control response: 24 dB/octave lowpass and highpass or notch with a variable Q up to 10.
Power requirements: 240/120V ac.
Optional extras: limiter.
Dimensions: 485 x 144 x 270 mm.
Price: £485.60.

E900 Series, Sweep Equaliser
Number of channels: one (stereo available).
Band centre frequencies: 40 to 1.4k, 800 to 16k Hz. Q=3,80 to 1.6k, 400 to 14k Hz. Q=1.5 Peak or trough response.
Control response: ±20 dB.
Input level: adjustable.





Above: *Audio & Design's E500RS series*

Left: *E.S. Electronics' graphic equaliser*

Overload point: +18 dBm.
Signal-to-noise ratio: —88 dB (ref. +8 dBm).
Power requirements: +24V at 50 mA.
Optional extras: as rack mounted unit with internal power supply.
Dimensions: 480 x 95 x 215 mm (rack mounting)
Price: *E900N* £160, *E900RS* £325.

APSI
Automated Processes Inc. 80 Marcus Drive, Melville, N.Y. 11746, USA.
Phone: (617) 481 6656.
(UK) 3M Company Ltd, 3M House, Wigmore St, London W1.
Phone: 01-486 5522.

553
Number of channels: one.
Band centre frequencies: bass, middle (3 kHz) treble.
Control response: ±15 dB.
Input overload point: +24 dBm.
Power requirements: ±15V at 30 mA.
Dimensions: 38 x 132 x 152 mm.

559
Number of channels: one.
Band centre frequencies: 35, 75, 160, 350, 750, 1.6k, 3.5k, 7.5k, 16k Hz.
Control response: +15 to —12 dB.
Overload point: +24 dBm.
Signal-to-noise ratio: —90 dB.
Distortion: less than 0.25% thd at +24 dBm.
Dimensions: 38 x 134 x 153 mm.
Price: £184.

CATHEDRAL SOUND
Cathedral Sound, Fourways, Morris Lane, Halsall, Ormskirk, Lancashire L39 85X.
Phone: Halsall 328.

Cathedral graphic equaliser
Number of channels: one.
Band centre frequencies: 50, 100, 200, 400, 800, 1.6k, 3.2k, 6.4k, 12.8k Hz.
Control response: ±12 dB at band centre frequency
Input level: 0 dB. Output level 0 dB.
Input overload point: 2.8V clipping level.
Signal-to-noise ratio: better than 90 dB.
Distortion: 0.05% at rated output.
Power requirements: 240V, 50 to 60 Hz.
Dimensions: 267 x 165 x 165 mm.
Price: £85.

EAGLE
Eagle International, Precision Centre, Heather Park Drive, Wembley HA0 1SU.
Phone: 01-903 0144.

FF11
Number of channels: two.
Band centre frequencies: 40, 200, 1.2k, 6k, and 15k Hz.
Control response: ±10 dB.
Input level: mag phono 3 mV at 47 kΩ. Auxiliary 200 mV at 100 kΩ. Tape 200 mV at 100 kΩ.
Input overload point: 200 mV at 50 kΩ.
Signal-to-noise ratio: 50 dB.
Power requirements: two 9V batteries.
Dimensions: 250 x 180 x 46 mm sloping to 28 mm.
Price: £34.

ESE
E. S. Electronics,
2 Upper Fant Rd, Maidstone, Kent.
Phone: 0622-58903

Equaliser (seven filter)
Number of channels: one.
Band centre frequencies: 60, 180, 450, 1k, 2.4k, 5k, 10k Hz.
Control response: ±14 dB.
Input level: —20 dBm, 0 dBm.
Signal-to-noise ratio: 85 dB.
Power requirements: 18V (2 x 9V batteries).
Price: £30.

GALE
Gale Electronics and Design Ltd, 39 Upper Brook Street, London W1Y 1PE.
Phone: 01-499 9966.

Soundcraftsmen 20-12
Number of channels: Two.
Band centre frequencies: 30, 60, 120, 240, 480, 960, 1.92k, 3.84k, 7.68, 15.36k Hz.
Control response: ±12 dB.
Signal-to-noise ratio: Better than 90 dB at 2V input.
Distortion: Less than 1% at 2V.
Dimensions: 128 x 457 x 279 mm.
Price: £165 (retail).

ITALTEL
Italtel spa, 20149 Milan, Italy, Piazzale Zavattari 12.
Phone: Milan 4388.

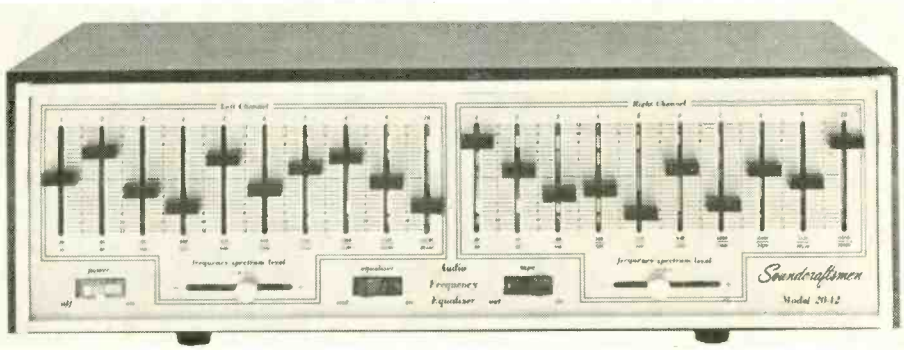
Filtro Universale
Number of channels: one.
Band centre frequencies: 125, 180, 250, 355, 500, 710, 1k, 1.4k, 2k, 2.8k, 4k, 5.6k Hz. Shelf boost or cut at corner frequencies: 45, 90, 180, 355, 710. Shelf boost or cut at corner frequencies: 2.8, 4, 5.6, 8, 12k Hz.
Control response: ±14 dB on bandpass ±21 dB on shelf response.
Input level: 0.6 dBm.
Overload point: +18 dBm.
Signal-to-noise ratio: 85 dB (CCIR).
Power requirements: 220V ac.
Dimensions: 320 x 120 x 230 mm.
Weight: 8 kg.

KLARK TEKNIK
Klark Teknik Ltd, MOS Industrial Site, Summerfield, Kidderminster, Worcs.
Phone: 0562-64027.

Teknik 27s
Number of channels: one.

54 ▶

Gale Electronics' Soundcraftsmen 20-12



■SURVEY

Band centre frequencies: 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1k, 1.25k, 1.6k, 2k, 2.5k, 3.15k, 4k, 5k, 6.3k, 8k, 10k, 12.5k, 16k Hz.
Control response: ±12 dB.
Input level: adjustable.
Overload point: +21 dBm.
Signal-to-noise ratio: —80 dBm unweighted.
Distortion: less than .01% at +4 dBm, .03% at +18 dBm.
Power requirements: 240V ac.
Optional extras: rack mounting or portable.
Dimensions: 483 x 133 x 170 mm.
Price: £325.

Teknik 11s

Number of channels: two (Dual 11s.).
Band centre frequencies: 50, 90, 160, 300, 500, 900, 1.6k, 3k, 5k, 9k, 16k Hz.
Control response: ±12 dB.
Input level: adjustable.
Overload point: +21 dBm.
Signal-to-noise ratio: 86 dBm.
Distortion: .01% at +4 dBm, .03% at 18 dBm.
Power requirements: 240V ac.
Optional extras: rack mounting or portable.
Dimensions: 11s: 255 x 155 x 185 mm Dual 11s: 483 x 133 x 170 mm.
Price: 11s £205. Dual 11s £325.

Teknik 9s

Number of channels: one.
Band centre frequencies: 50, 100, 200, 400, 800, 1.6k, 3.2k, 6.4k, 12.8k Hz.
Control response: ±12 dB.
Input level: adjustable.
Overload point: +21 dBm.
Signal-to-noise ratio: 88 dBm.
Distortion: .01% at +4 dBm.
Power requirements: ±12 to 17V at 25 mA.
Optional extras: available as a bank of units.
Dimensions: 152 x 95 x 135 mm.
Price: £185.

Teknik 7s

Number of channels: one.
Band centre frequencies: 51, 128, 320, 800, 2k, 5k, 12.5k Hz. 100 Hz highpass and 10k Hz lowpass filter as standard, second, order response.
Control response: ±12 dB.
Input level: adjustable.
Overload point: +21 dBm.
Signal-to-noise ratio: 90 dBm.
Distortion: .01% at +4 dBm.
Power requirements: ±12 to 17V at 25 mA.
Optional extras: available as a bank of units.
Dimensions: 152 x 95 x 135 mm.
Price: £165.

F.W.O. Bauch's MES-430 graphic equaliser

LEEVERS RICH

Leevers Rich Equipment Ltd, 319 Trinity Rd, Wandsworth, London SW18 3SL.
Phone: 01-874 9054

LR 720

Number of channels: one.
Band centre frequencies: 40, 100, 250, 630, 1.6k, 4k, 10k Hz highpass filter at 70 and 100Hz. Lowpass filter at 7 and 10k Hz. Filters slope at 18 dB/oc ave.
Control response: ±9 dB.
Input level: unity gain.
Input overload point: 20 dBm.
Signal-to-noise ratio: —60 dBm.
Power requirements: 240V ac.
Optional extras: rack mounting version.
Dimensions: 330 x 135 x 235 mm.
Price: £235.

UNIVERSAL AUDIO

United Recording Electronics Industries, 11922 Valerio St, NO, Hollywood, California 91605, USA.
Phone: 213-764 1500.
(UK) FWO Bauch Ltd, 49 Theobald St, Boreham Wood, Hertfordshire WD6 4RZ.
Phone: 01-953 0091

527A

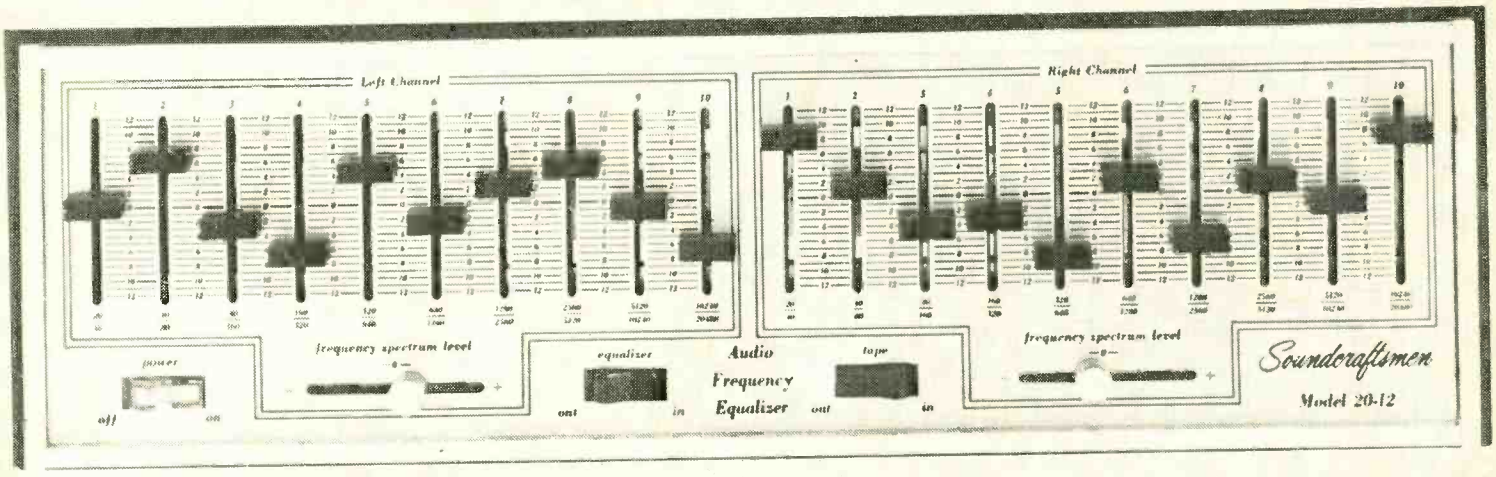
Number of channels: one.
Band centre frequencies: 40, 50, 63, 80, 100, 125, 160, 200, 250, 400, 500, 630, 800, 1k, 1.25k, 1.6k, 2k, 2.5k, 4k, 5k, 6.3k, 8k, 10k, 12.5k, 16k Hz.
Control response: ±10 dB.
Input level: —20 to +20 dB.
Overload point: +32 dB.
Signal-to-noise ratio: 90 dB.
Distortion: 0.5% at +24 dBm.
Power requirements: 230/115V ac.
Optional extras: push-on knobs, security cover panel.
Dimensions: 480 x 89 x 203 mm.
Price: £350.

Soundcraftsmen presents...

the new component that is a "must" with every fine stereo system...

the new Audio Frequency Equalizer

guaranteed to improve any stereo system and guaranteed to improve any listening area environment!



ROOM EQUALIZATION, SPECIAL EFFECTS, PLAYBACK and RECORDING

EQUALIZING FOR ROOM CHANGES: For example, here are some factors that would call for definite changes in your Equalizer settings: (1) Draperies open or closed. (2) Sliding glass door open or closed. (3) Room full of people. (4) Seating arrangements changed. (5) Major changes in furniture arrangement. (6) Relocation of speakers.... **EQUALIZATION OF RECORDS:** You can compensate for old 78 record deficiencies (surface noise, absence of highs or lows, etc.) or favorite recordings that have never sounded quite the way you felt they should sound.... **COMPENSATING FOR RADIO STATIONS:** Some stations are noted for excesses in either low or high frequencies. Make out a Computone Chart for each of your favorite stations so that you can easily achieve the ideal tonal response each time you change stations.... **EQUALIZING TAPES:** Compensating for pre-recorded, or home-recorded, tapes that are under or overemphasized in certain frequency areas.... **CHANGING OVERALL BALANCE:** You can make up for many deficiencies in recordings to more accurately duplicate the sounds of the original performance, or shape each curve to your own listening interests to greatly enhance your enjoyment of your recordings.... **SPECIAL EFFECTS:** You can boost or cut the loudness of a specific instrument or groups of instruments to obtain more pleasing instrumental balance or to add presence to a solo.... **IMPROVING RECORDING OF TAPES:** Use the Equalizer for tape dubbing, to create a near-perfect tape out of one that may have serious deficiencies. (Make your own corrected recording of records, station programming, or other tapes, and no further adjustment of the Equalizer will be needed for playback.) (See Operating Instructions).... **COMPUTONE CHARTS:** After you have achieved the equalization of sound that you prefer use the Computone Charts, supplied with each Equalizer, to mark the settings, so that you can duplicate the settings easily.

SPECIFICATIONS and SPECIAL FEATURES

TOROIDAL and ferrite-core inductors, ten octave-bands per channel.
FREQUENCY response: ± ½ db from 20-20, 480 Hz at zero setting.
HARMONIC DISTORTION: Less than .1% THD @ 2 v., Typ: .05% @ 1 v.
IM DISTORTION: Less than .1% @ 2 v., Typ: .05% @ 1 v.
SIGNAL-TO-NOISE RATIO: Better than 90 db @ 2v. input.
INPUT IMPEDANCE: Operable from any source 100K ohms or less — (any Hi-Fi Pre-amp, Receiver or Tape Recorder.)
OUTPUT IMPEDANCE: Operable into 3K ohms or greater — (any Hi-Fi Amp, Receiver or Tape Recorder.)
CIRCUIT BOARDS: Military grade G-10 glass epoxy.
RESISTORS: Low-noise selected carbon-film.
RANGE: 12 db boost and 12 db cut, each octave.
MASTER OUTPUT LEVEL: "Frequency-spectrum-level" controls for left and right channels, continuously variable 18 db range, for unity gain compensation from minus 12 db to plus 6 db.
MAXIMUM OUTPUT SIGNAL: variable Master "frequency spectrum level" Controls allow adjustment of optimum output voltage for each channel, to exactly match amplifier capability, up to 7 v.
SIZE: designed to coordinate with receivers, comes installed in handsome walnut-grained wood receiver-size case, 5¼" x 18" x 11", or rack-mount
WARRANTY: 2-year parts and labor.

Send for FREE BOOKLET: "Why's and How's of Equalization"
Plus list of Franchised Dealers to Sole UK Distributor:

Soundcraftsmen Dept SS10
Gale Electronics & Design Limited
39 Upper Brook Street London W1Y 1PE

LEEVERS RICH LR720

By Hugh Ford

MANUFACTURERS' SPECIFICATION

Input: 600Ω, bridging or terminating, balanced or unbalanced.
Gain: Unity, adjustable ±10 dB.
Output: Isolated, to feed 600Ω load at +20 dBm max.
Frequency range: 30 Hz to 20 kHz ±2 dB (controls at zero).
Noise level: below —60 dBm.
Centre frequencies: 40, 100, 250, 630, 1.6k, 4k, 10 kHz.
Control range: (each band) +8 dB to —8 dB.
Highpass filter: Off, 70 Hz, 100 Hz.
Lowpass filter: 7 kHz, 10 kHz, off.
Low level switch: Reduces both maximum output and noise level by 20 dB. Other parameters are not affected.
Dimensions w x h x d: *501T:* 33 x 13.5 x 23.5 cm. *501R:* 48.25 x 13.3 x 23 cm.
Finish: *501T:* Dark grey stove enamel, teak sides. *501R:* Dark grey stove enamel.
Power supply: 200 to 250V ac 40 to 60 Hz. 3W.
Mounting: Standard version: (model *501T*) in table mounting cabinet, with teak trim, recessed panel and terminations at rear. Relay rack version: (Model *501R*) on standard rack panel.
Price: Model *501T* as reviewed £235.
Manufacturer: Leevers-Rich, 319B Trinity Road, Wandsworth, London SW18.

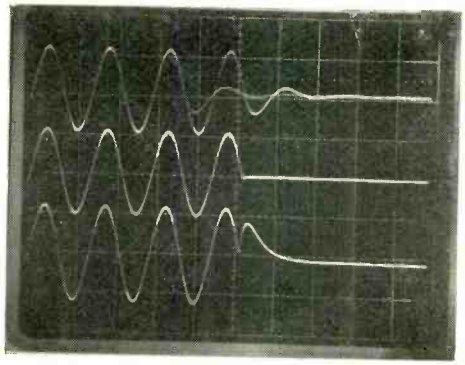
THE LEEVERS-RICH type *LR720* equaliser is a graphic type equaliser with additional highpass and lowpass filters and is particularly intended for correcting recorded material for dubbing, disc cutting etc. The seven slider-type equaliser controls have their curves centred on the logarithmic series of frequencies 40 Hz, 100 Hz, 250 Hz, 630 Hz, 1.6 kHz, 4 kHz and 10 kHz, while the turnover frequencies of the high and lowpass filters has been chosen to perform useful functions such as mains hum reduction in conjunction with the equalisers.

All functional controls are located on the front panel, the centre section of which is occupied by the seven equaliser controls mounted in traditional graphic fashion with horizontal lines at 3 dB intervals. To the left is the highpass filter switch with three positions: 'Lin', 70 Hz and 100 Hz, and also a rotary mains on/off switch with its associated pilot light. To the right of the equalisers is the lowpass filter switch with its three positions 'Lin', 10 kHz and 7 kHz and also the equaliser in/out switch which literally shorts the input to the output in the 'out' position. Personally, I do not like this function and feel that in the 'out' position, it would have been better to leave the input and output amplifiers in circuit; the operation of the in/out switch can have disastrous effects on the line matching at both the input and output.

Inputs and outputs are duplicated on the rear panel giving the alternative of either a terminal block connector or standard three-pole jacks, the insertion of which disconnects the terminal block connections. The terminal block also provides for remote operation of the equaliser in/out function by shorting two connections. Access to a screwdriver operated gain control can be gained through a hole in the rear panel, which also accommodates the fixed mains lead (why not a socket?) and the mains fuse which is not of the standard 20 mm type, but of the miniature imperial variety! All functions are properly identified with the exception of the rated mains voltage which is in fact fixed at 200/250V.

The overall standard of construction is good. All components, including the mains transformer, are mounted on glass fibre printed boards with clear identification. The boards plug into the main chassis which is of solid construction and neatly wired; however, the capacitors on the power supply board are located such that one large can electrolytic is actually in physical contact with the terminal of the mains fuseholder; this presents an electrical safety hazard because the only insulation between the bare mains terminal and the signal circuits is the sleeve over the capacitor, which could be easily punctured by a sharp point of solder on the fuseholder terminal!

1ms/div 630 Hz tone burst



Unlike the usual slider potentiometers, the equaliser controls are of an interesting design in that the slider knob operates a moving switch contact which operates on a series of 19 contacts on the plug-in equaliser boards. This provides an 18-way switch which is wired as a step attenuator. Only time can tell if this is a more reliable system than slider potentiometers, but I must say that my experience of printed board type switches has not been particularly satisfactory.

Inputs and outputs

The input to the equaliser is a floating, transformer-coupled input, the primary of the transformer being shunted to obtain the nominal 600 ohm impedance, which was measured as 602 ohms at 1592 Hz. Removal of this shunting resistor makes the input suitable for line bridging, the input impedance then being measured as 12,200 ohms at 1592 Hz. The maximum input level at 1 kHz before severe waveform distortion (not clipping in this case) was satisfactory at +21 dBm.

Like the input, the output is also transformer coupled and floating, the output impedance being 113 ohms and intended for driving into 600 ohm lines. At 1 kHz the maximum output level at the onset of clipping was more than adequate for normal use at +23.5 dBm into 600 ohms, or +25 dBm into high impedance loads.

Overall gain of the equaliser can be adjusted by means of the internal gain potentiometer which has a useful range of over 20 dB. The maximum equaliser gain with the equaliser controls at the centre position is 9.3 dB into high impedance loads or 7.8 dB when loaded into 600 ohms.

Frequency response

The overall response with all controls in their flat position and the equaliser loaded into 600 ohms was found to be within ±0.1 dB from 50 Hz to 10 kHz and within ±0.5 dB from 20 Hz to 20 kHz, the 3 dB points being at 10 Hz and 35 kHz.

Operation of the highpass and lowpass filter switches gave the responses shown in **fig. 1,** from which it appears that the specified turnover frequencies for the filters are the −5 dB points. The choice of the highpass filter characteristics appears to be excellent, but the 7 kHz lowpass filter is really fierce and I would have thought somewhat excessive for the vast majority of applications.

The full set of equaliser characteristics is shown in **fig. 2** from which it is to be seen that all the curves have a good shape, and that the crossover points are at the −3 dB points, or very close thereto. This means that very smooth equalisation characteristics are obtained, without any sharp changes in frequency response.

Distortion and noise

With the equaliser set for unity gain, the second and third harmonic distortion was below 0.1% over the entire audio band at an input/output level of 0 dBm loaded into 600 ohms. At the maximum rated output of +20 dBm the distortion products rose to a maximum of 0.3% up to 2.5 kHz. Above this, both the second and third harmonics increased, with the predominant third harmonic reaching 0.6% between 10 kHz and 20 kHz.

The distortion performance is certainly quite adequate, and it was furthermore found to be solely related to output level and independent of the filter or equaliser settings. Intermodulation distortion as measured by the SMPTE method showed a similar pattern with the following quite satisfactory figures being measured:-

Input/output level (equivalent rms sinewave)	IM distortion
0 dBm	0.11%
+10 dBm	0.40%
+15 dBm	1.0% (0.07%)***
+20 dBm	3.0% (0.24%)***

It should be noted that the equaliser was operated at unity gain for the above measurements: the figures in brackets *** above are in fact more realistic figures because they were obtained using boost in the equaliser and thus reducing the distortion products introduced by driving the input stages at a high level.

On the subject of noise, it is to be seen from the following table that the equaliser noise appears to be relatively constant at the output independent of the settings of the equaliser controls; it would therefore appear that the major noise source is around the output stages, and that perhaps this department could be improved to give a better performance which would not come amiss.

Equaliser controls	Noise at output	
Maximum boost	−64.0 dBm	−75.0 dBm (A)
Flat	−65.2 dBm	−71.5 dBm (A)
Maximum cut	−65.6 dBm	−75.7 dBm (A)

The noise referred to the input can be determined from the above figures by adding the effective gain of the equaliser with all controls in the maximum positions: this means adding ±18 dB, which implies that the maximum input that can be applied to the equaliser before the output department runs into severe distortion under maximum boost conditions is about +2 dBm. This means that care must be taken to control the input level rather than attenuating the output if maximum boost is likely to be used.

Mains hum components in the output were satisfactorily low, with the 100 Hz level being at −73.5 dBm and the remaining mains components at less than −90 dBm.

The final investigation was the performance of the equaliser when it was fed with tone bursts. Here the performance was excellent, as is to be seen from **fig. 3** which shows the result of feeding 630 Hz tone bursts at 0 dBm with the 630 Hz equaliser control in its centre position and its two extreme positions.

Summary

While the Leevers-Rich equaliser is not perhaps outstanding in some parameters, its general overall performance is certainly good, and with the exceptions of the matter of electrical safety and the possible lack of overload margin in the output stages, it is difficult to fault it.

Furthermore, the standard of construction is high and servicing is made a very simple task with the plug in modules and clear component identification.

FIG. 1
LEEVERS RICH FILTER CHARACTERISTICS

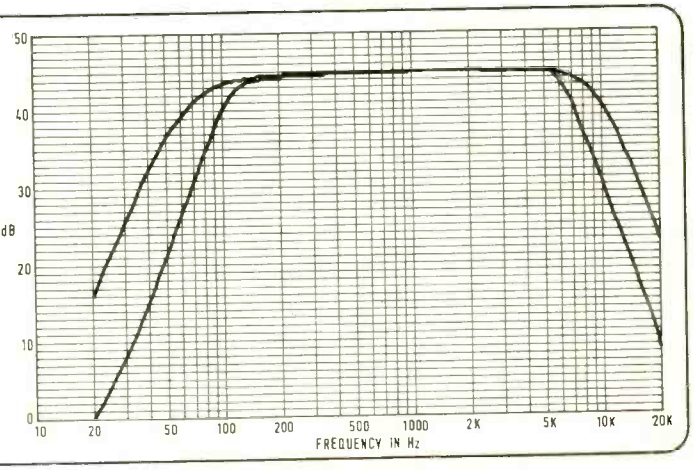
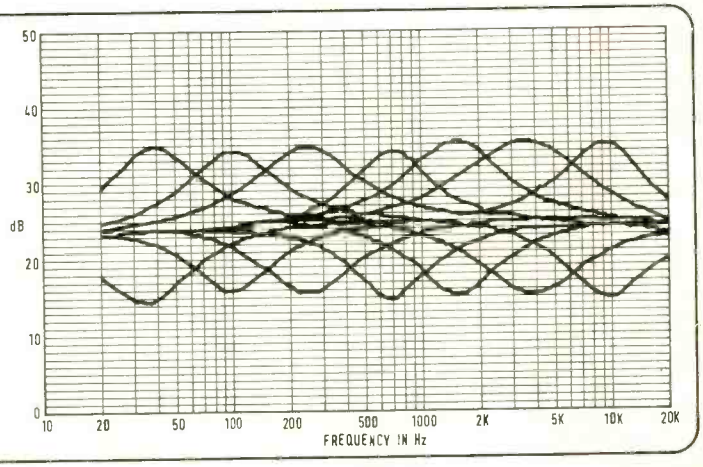
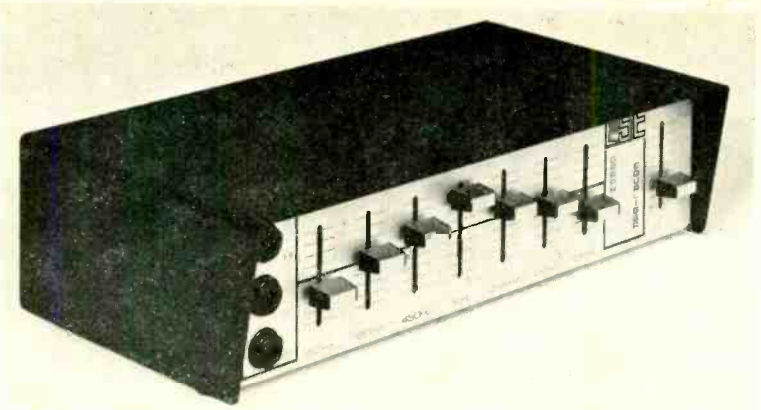


FIG. 2
LEEVERS RICH FULL SET OF EQUALISER CHARACTERISTICS



ESE GRAPHIC

By Hugh Ford



MANUFACTURERS' SPECIFICATION

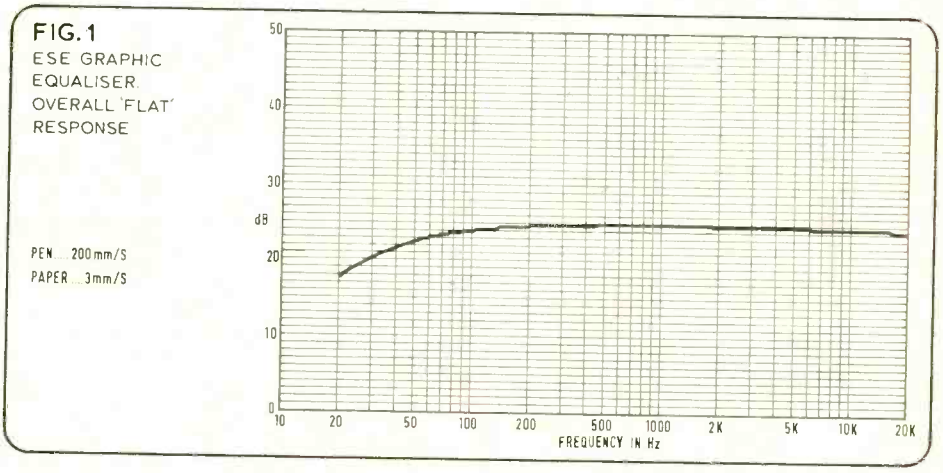
Maximum output: Terminated in 600Ω +10 dBm. 6V peak-to-peak. 2.5V rms.
Signal-to-noise ratio: —70 dB with input terminated in 47K resistor. All filters at maximum.
Frequency response: All filters at central ±2 dB.
Filter slope: Better than ±13 dB per octave.
Filter ranges: Max ±15 dB at 60, 180, 480 Hz, 1, 2.4, 5 and 10 kHz.
Power supply: 2 PP3 batteries which last for ages
Price: £30.
Manufacturer: E.S. Electronics, 2 Upper Fant Road, Maidstone, Kent.

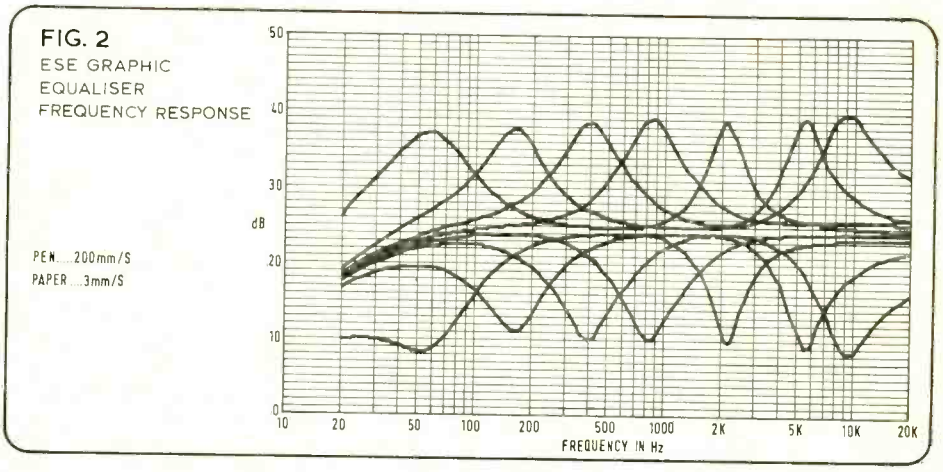
THIS EQUALISER IS not one of those cheap and nasty devices; certainly it is very cheap, but for its price tag it has a surprising amount to offer . . . so read on!

Both the two inputs and the output from the equaliser are unbalanced jack sockets, the insertion of the output jack plug switching on the electronics which are driven from two 9V PP3 batteries with a calculated life of about 100 hours operation. The actual equaliser controls comprise eight slider potentiometers, one of which is the output level control, and the remainder offering a nominal ±15 dB equalisation at the seven centre frequencies of 60 Hz, 180 Hz, 450 Hz, 1 kHz, 2.4 kHz, 5 kHz and 10 kHz.

All the controls and the electronics (which are minimal) are mounted on a single domestic quality printed board, which is secured behind the front panel. There is therefore very little wiring, but that which does exist could be to a higher standard. Access to the batteries is by removing screwed-in panels at the rear, the panels comprising battery clips for holding the batteries in position.

While the function of the controls and jack sockets is clearly identified, no attempt has been made to calibrate the controls; there is however a simple set of scale marks associated with each control.





Frequency response and equalisers

The frequency response of the unit from either input to the output with all the equaliser controls in their mechanical centre position is shown in **fig. 1** from which it is to be seen that the response from 50 Hz to 20 kHz is substantially flat to within ±1 dB. The response does however fall off below 50 Hz, and I would suggest that the manufacturer could easily improve this matter.

Fig. 2 shows the frequency response of each individual equaliser in the maximum boost and maximum cut positions. Generally, the response of the equalisers is satisfactory and to specification, but it is felt that the characteristics of the 2.4 kHz and the 5 kHz controls are rather peaky. Also, as is to be expected from the frequency response in the 'flat' position, the performance of the 180 Hz control is rather peculiar.

Noise and distortion

Measurement of the noise in the unit's output showed that with the equalisers in the 'flat' position the noise was –71 dBm unweighted or –86.5 dBm(A) weighted: this performance decreased to –53 dBm unweighted or –71.5 dBm(A) weighted with all equalisers in the maximum boost position. Having regard to the maximum signal handling capability of the equaliser, this performance is perfectly adequate for most likely applications of this unit.

Investigation into the harmonic distortion in the output at an output level of 0 dBm showed that second harmonic predominated and remained at a virtually constant level of 1 per cent over the audio band, with the third harmonic also remaining constant at 0.15 per cent. While this distortion performance leaves something to be desired, it is adequate for

60 ▶

PARTRIDGE ELECTRONICS

wish all success to

CHELMSFORD HOSPITAL RADIO SERVICE

with their new studio mixer

Yet another hospital radio station chose a custom built audio mixer to meet their special requirements built and designed by :—

PARTRIDGE ELECTRONICS

21-25 Hart Road · Benfleet · Essex · SS7 3PB

---

* Dolby A361 for hire *

* REVOX A77 Mk III Recorders, standard and high speed model in stock. Sel-Sync model available.
* New REVOX A700 1372 and 1374 now available.
* NEAL 102 professional cassette deck from stock.
* All leading equipment at competitive prices including A.K.G., Beyer, Ferrograph, Teac A3340, Quad, Tannoy, Spendor, Uher 4000/4200/4400, Report IC, and CR210 cassette recorder with facility for chrome tape.

131 The Parade, High Street, Watford WD1 1NA
Tel. Watford 34644

BAILEYS

Magnegraph Recording Company Ltd.

8 Hanway Street, London W1 01-580 2156 or 01-323 0888
(Junction Oxford Street & Tottenham Court Road)

Sound People with Vision - for 25 years.

MAGNEGRAPH

- Audio Cassette Duplication 10-100,000.
- Tape & Cassette Recorder Rentals.
- Video Tape Sales.
- Video Design and Installation Service.

—TURNER—

STUDIO AMPLIFIER

MODEL A300

A professional stereo power amplifier designed and manufactured to a very high standard, achieving the maxima of technical, artistic and purposeful parameters.

Power output:	150+150 watts R.M.S. into 4 ohms 100+100 watts R.M.S. into 8 ohms 60+60 watts R.M.S. into 15 ohms
Power response:	±0.1dB 20Hz–20kHz at 75W. 8 ohms
Frequency response:	±0.1dB 20Hz–20kHz at 1W. 8 ohms
Distortion:	Less than .01% at full rated output into 4, 8 or 15 ohms (typically .003% at 75w. into 8 ohms)
Hum and Noise:	110dB below rated output 20Hz–20kHz (unweighted)
Crosstalk:	100dB below rated output 20Hz–20kHz
Damping Factor:	400 at 1kHz 8 ohms

Mixers by —TURNER—

May we build a Mixer to your requirements?

TURNER ELECTRONIC INDUSTRIES LTD
175 Uxbridge Road, London W7 3TH
Tel: 01-567 8472

■ ESE GRAPHIC

disco and some pa work. However, once that battery voltage drops there is a very substantial increase in distortion with the second harmonic rising to about 3 per cent at 8.5V.

Loading the output with 600 ohms had little effect upon distortion, and did not appear to have any undesirable effects on other performance parameters.

Inputs and outputs

The input sensitivity for the high and low inputs for 0 dBm output at 1 kHz was found to be 16.5 mV and 155 mV respectively with associated input clipping points at 180 mV and 2.6V. This performance is obviously inadequate for operation with standard line voltages, but on the other hand it is compatible with domestic voltage levels as are the input impedances of 44.5 kΩ for the 'high' input and 95 kΩ for the 'low' input.

On the output end, the output impedance was at 42 ohms adequately low for any applications with an associated maximum output level of 2.7V rms at clipping point with new batteries. The output level control had a usable range of 20 dB, with its operation becoming exceedingly coarse if more attenuation was attempted.

Distortion at 0 dBm output was previously said to be adequate for some applications; however, it is to be deduced from the following figures that any increase above the 0 dBm level is somewhat disastrous:-

Output level	Harmonic distortion (1 kHz)	
dBm	Second	Third
—10 dBm	0.4%	0.02%
0 dBm	1.0%	0.15%
+ 3 dBm	2.3%	0.63%
+ 6 dBm	5.0%	2.1%

It is clear from the above that 0 dBm is probably the optimum maximum level, and that the manufacturer's claim of +10 dBm would produce completely intolerable results.

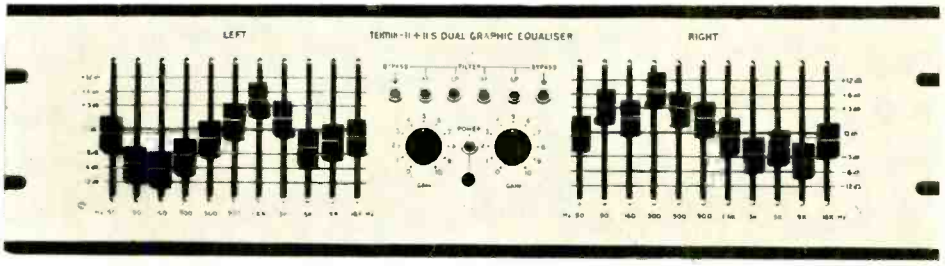
Summary

The performance of this equaliser is clearly not good enough for any form of studio use, but at a cost of only £30 it is extremely cheap and its performance is adequate for communications systems, disco use and some pa applications provided that its limitations are borne in mind.

Had it cost much more I would have been using my 'vitriol pen' but I am not aware of anything else that offers similar equalisation facilities at such a low cost—in fact, if E.S. Electronics can sort out their distortion performance this becomes an exceedingly good buy.

TEKNIK DUAL 11S GRAPHIC EQUALISER

By Hugh Ford



MANUFACTURERS' SPECIFICATION

Controls

11 filters with centres at: 50, 90, 160, 300, 500, 900, 1.6k, 3k, 5k, 9k, 16 kHz.

On/off mains switch with indicator.

Bypass switch: Bypasses equaliser stage.

Highpass filter: 12 dB/octave turnover at 100 Hz.

Lowpass filter: 12 dB/octave turnover at 10 kHz.

Level: Continuous adjustment of input level.

Audio connector at rear: Input Switchcraft *D3M* or equivalent. Output Switchcraft *D3F* or equivalent.

Supply: 240V (or 110V) nominal via Cannon XLNE socket.

Features

Noise: Better than —86 dBm (15 Hz-15 kHz) unweighted.

Distortion: Less than .01% at 1 kHz +4 dBm into 600Ω load. Less than .05% (15 Hz-15 kHz) at +18 dBm into 600Ω load.

Clipping point: +21 dBm.

Output impedance: Nominal 25Ω.

Notes:- 1) All measurements taken with gain control set at MID position ie unity gain. 2) High level distortion figure measured with input of +12 dBm, all equaliser controls being moved to boost output to +18 dBm. 3) Input level should be kept below +18 dBm as input overload occurs at approximately 4 dB below output clipping point. 4) 11 + 11sH version available for use at higher levels. Input overload occurs at +22 dBm and output clipping at +26 dBm.

Construction: Engraved aluminium front panel satin natural finish. Rugged aluminium frame and case black anodised finish. Teak veneered outer case.

Dimensions w x h x d: 482.6 x 133 x 170 mm.

Price as reviewed: £325.

Manufacturer: Teknik, MOS Industrial Site, Summerfield, Kidderminster.

THE TEKNIK Dual *11s* graphic equaliser is one of a series of five different graphic equalisers which vary in complexity from seven to 27 filters, the latter on third octave centres. All these graphic equalisers are principally designed for broadcasting and recording studio use, but will obviously find various other applications where very low distortion and a good signal-to-noise ratio are of prime importance.

In addition to the facilities contained in the review sample (which are in many instances common to the Klark range of equalisers) various other facilities are offered such as balanced inputs and outputs, alternative operating levels and bypass arrangements.

The review equaliser is in fact a dual channel equaliser with two independent channels with identical facilities, the only common parts being the mains input wiring and the mains transformer which feeds seperate power supplies on each of the two glass fibre printed equaliser boards. Each of the two boards accommodate the 11 active LCR filters which are individually trimmed by presets on the printed boards.

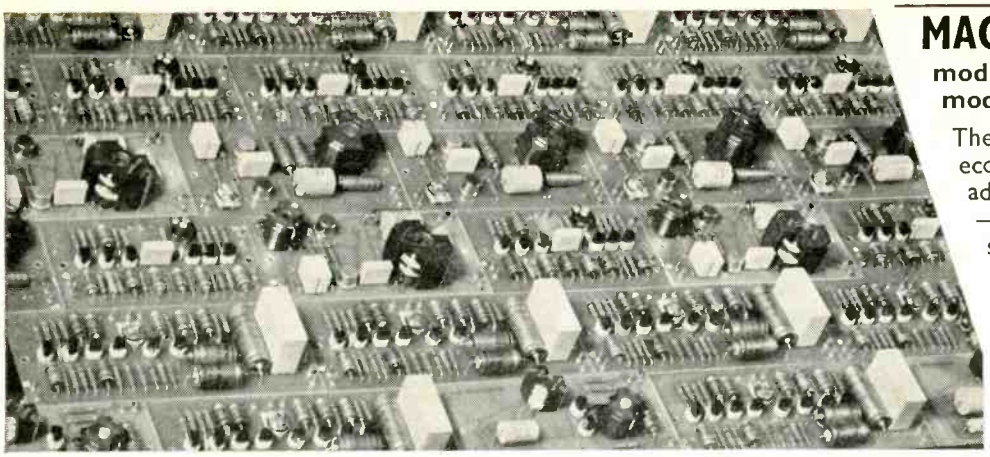
Layout of the boards is clean and uncluttered but they do not bear the component identifications which would aid any necessary servicing. The boards are wired into the chassis cableforms, but this is of little disadvantage because all components are readily accessible and the active components in the form of integrated circuits are mounted in sockets. The overall standard or wiring is reasonable and I do not have any complaints about any aspects of electrical safety.

Mechanically it is entirely satisfactory, the complete equaliser being of solid construction and intended for mounting in a standard 482.6 mm rack, or alternatively in an optional portable case. All controls and facilities are clearly identified and it is a pleasant surprise to find an engraved front panel where so much modern equipment is only marked with screen printing which eventually disintegrates.

Furthermore, the layout of the front panel is very clean, with the two sets of 11 equaliser slider potentiometers based on a 5:9:16:30 frequency distribution mounted at each extremity of the front panel. Grid lines are at the ±3 dB, ±6 dB and ±12 dB offsets from the zero decibel marking. Working into the panel centre, there are then toggle switches for the highpass and the lowpass filters and a further toggle switch for the 'bypass' function which bypasses the equalisers but not the highpass and the lowpass filters. There are then the two gain controls in the form of rotary potentiometers with an arbitrary calibration from 0 to 10, and the single mains on/off toggle switch and its associated pilot light.

The rear panel houses the XLR type input and output connectors which provide unbalanced male input sockets and unbalanced female output sockets in the review sample. The mains input socket is the common XLNE type and is mounted adjacent to the fuse holder.

62 ▶



MAGNETIC RECORDING

modules for updating and modification of tape decks

The **MEG** system provides an economical and flexible means of adapting to multi-channel systems —up to 24 channels with full sel-sync and silent drop-in drop-out. Special head assemblies for BTR2, BTR4 and Ampex 300's.

MINIFLUX **electronics ltd**
8 Hale Lane London NW7 England
01 959 5166 - 2991

STUDIO ACCESSORIES

WE SUPPLY HEADPHONE BOXES, MIC. BOXES, WALL BOXES, LEADS, SWITCHING BOXES, OR ANY SMALL CUSTOM BUILT BOXES TO ORDER.

WE SPECIALIZE IN SUPPLYING, SERVICING AND MODIFYING REVOXES.

We also supply mic. cable in 10 colours (ex-stock), and all other studio equipment.

RADIO RECORDINGS 01-722-7574

ONE INCH SCOTCH 206
(Ex master once used)
10½" NAB **£9·50**

QUARTER INCH SCOTCH 202
(Ex master once used)
10½" NAB **£3·00**
P & P 10p

AUDIO TRANSCRIPTIONS

177 Torridon Road, London SE6
01 697 0079

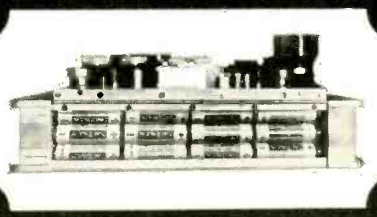
future proof

With its all-modular construction and plug-in pre-equalised head blocks your Stellavox recorder need never be obsolete.

Any current or future tape standard or format can be accommodated by simple exchange of units, without taking the recorder out of service.

Available in stereo, mono, with or without pilot track, or quadraphonic.

Illustrated: SM7 Stellamaster, music mastering recorder.



STELLAVOX

A.V. Distributors (London) Ltd.
26 Park Road, Baker Street,
London NW1 4SH.
Tel.: 01-935 8161.

Please send me further Stellavox details.

Name .....

Address .....

.....

.....

.....

SS/11/74

■ TEKNIK DUAL 11S

Inputs and Outputs

The unbalanced inputs feed directly to the gain controls, providing a nominal 10 kΩ input impedance suitable for line bridging. The measured impedance was 10.5 kΩ on the left channel and 8.7 kΩ on the right. In both instances, the input impedance was virtually unaffected by the gain control setting and the input clipping level was found to be satisfactorily high at +18 dBm with the input gain setting adjusted for unity overall equaliser gain in the flat settings. The performance of the gain setting potentiometers was found to be rather coarse about the unit gain setting. Some careful handling being required to set the overall gain to within, say, 0.5 dB.

On the output end, the unbalanced output offered a very low source impedance in the order of only 0.7 ohms with a drive capability of +22 dBm at clipping point when operating at the nominal mains input voltage. This drive capability fell in proportion to the incoming mains voltage (as did the input overload capability) but in practical studio use this shortcoming should be of little significance.

Because of the 4 dBm margin between input and output clipping points, it is important in operation to limit the degree of equalisation boost that is applied if output overload is to be avoided when operating the equaliser as a unity gain device. Alternatively, one must reduce level at the input to the equaliser rather than at the output of the equaliser.

In this context it should be noted that as a result of the excellent noise performance it is quite reasonable to operate the equaliser at lower than unity gain, the available range of the gain controls being from +6 dB gain to infinite loss.

Frequency response

The overall frequency response with the equaliser controls in the 'flat' positions was remarkably flat at ±0.2 dB from 2 Hz to 20 kHz falling to −3 dB at 130 kHz as shown **fig. 1.** This performance of the equaliser calibration is so good that the response with the bypass switch in either position was to all intents and purposes identical. Loading the equaliser with a 600 ohm resistive load made no detectable difference to the response, and for that matter made negligible difference to the output level in view of the very low output impedance.

Operation of the highpass and the lowpass filters was found to give the −3 dB points at 100 Hz and 10 kHz respectively, with ultimate attenuations of −12 dB per octave. The choice of turnover frequencies and rate of attenuation is most practical, but alternative frequencies can be provided by the manufacturer.

Fig. 2 shows a complete set of equaliser characteristics with the individual equalisers set to the maximum boost or cut. The alignment of the equalisers is good from the points of view of attenuation and centre frequency, but the frequency response of individual filters is rather peaky at full cut or boost, the curves becoming more broad at intermediate degrees of cut or boost. The result of this is that the use of adjacent equalisers in their maximum conditions leads to a peaky characteristic, with in the worst case a ±3 dB ripple in the response curve.

Distortion and noise

With the equaliser set for unity gain and the individual equalisers set at their mid positions, the second and third harmonic distortion with 0 dBm input and output was below 0.01 per cent from 400 Hz to 20 kHz and fell to below 0.005 per cent at 1 kHz. Furthermore, there is no reason to believe that the distortion rose appreciably below 400 Hz, the individual harmonic analysis being limited by the capability of the testgear. Even at +18 dBm input and output the mid frequency distortion was below 0.05 per cent, reducing to less than 0.03 per cent between 150 Hz and 20 kHz when 10 dB of internal boost was used, the distortion measurement at the lower frequency being limited by testgear.

Similarly excellent results were obtained when measuring intermodulation distortion by the SMPTE method, as is shown in the following table:

Input/output level (equivalent rms sinewave)	IM distortion
0 dBm	0.004%
+10 dBm	less than 0.002%
+18 dBm (with 6 dB internal gain)	0.046%

All the above distortion measurements appeared to be completely independent of any control settings, but the incoming mains voltage limited the distortion at ±18 dBm output levels: it is important to maintain the nominal mains voltage if the full output capability is to be used.

The tone burst performance of the equaliser is also very good, as is shown in **fig. 3,** which displays the results of applying a burst of 900 Hz tone with the 900 Hz equaliser control in its mid position and also at maximum boost and cut.

Before dealing with the noise performance, crosstalk between the two independent channels was investigated. It was found here that when running one channel at +18 dBm into a 600Ω load, the induced crosstalk in the other channel was at −86 dBm from 20 Hz to 6.3 kHz and increased at 6 dB per octave to −74 dBm at 20 kHz—certainly no cause for complaint here.

As is to be seen from the following figures, the noise performance is very good, and it was furthermore found that mains hum and its harmonics were at extremely low levels.

64 ▶

FIG. 3
900 Hz tone burst 1ms/div

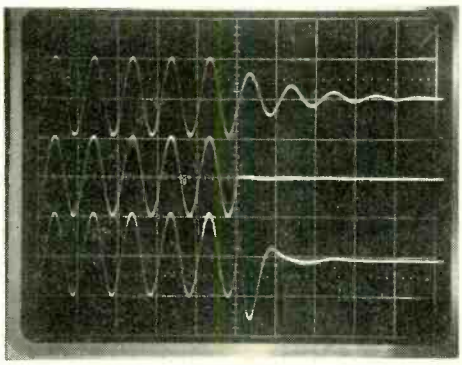


FIG.1 KLARK TEKNIK FREQUENCY RESPONSE IN 'FLAT' POSITION AND FILTER CURVES

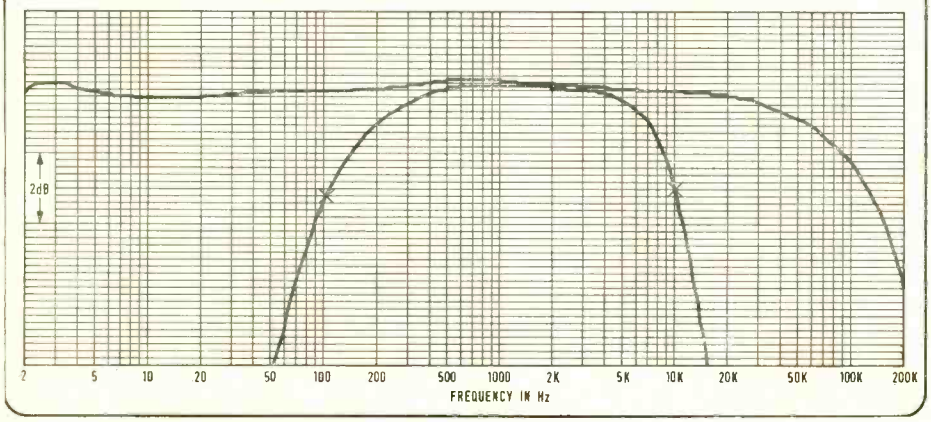
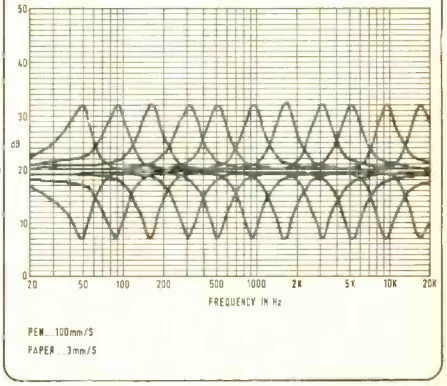


FIG. 2
KLARK INDIVIDUAL EQUALISER CHARACTERISTICS



■ TEKNIK DUAL 11S

Summary

This review showed that in all parameters the Teknik equaliser has very good performance and is particularly outstanding in its distortion performance. Overall the design is well conceived and the layout and operation are good, but the internal presentation could be improved.

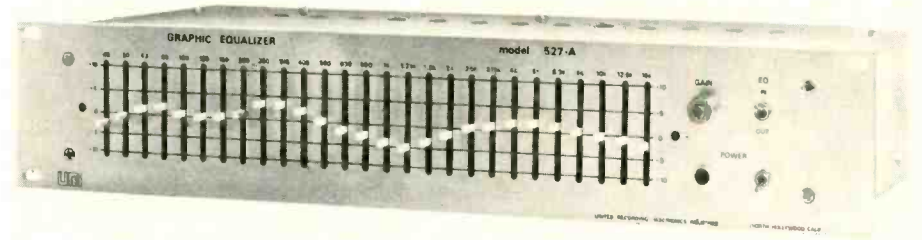
However, at a price of only £325 for a two-channel equaliser, it offers really excellent performance, the single channel version being priced at £205 and having identical facilities.

Overall there is only one possible cause for complaint, and this is the amount of frequency response ripple when adjacent equalisers are near their maximum conditions—this however is not particularly likely with the available ±12 dB equaliser range.

Equaliser controls	Noise referred to input	
	Left channel	Right channel
Flat 0 dB Gain or Bypass	—87 dBm (20 Hz to 20 kHz)	—86.2 dBm
	—90.0 dBm(A)	—89.8 dBm(A)
Flat Max Gain (+6 dB)	—92.5 dBm (20 Hz to 20 kHz)	—92.3 dBm
	—95.7 dBm(A)	—95.9 dBm(A)
Maximum boost	—91.7 dBm (20 Hz to 20 kHz)	—90.1 dBm
	—97.1 dBm(A)	—95.3 dBm(A)

UNIVERSAL 527A

By Hugh Ford



MANUFACTURERS' SPECIFICATION

Gain: Adjustable to +10 dB (with controls set flat or eq. switched OUT).
Distortion: 0.5% maximum at +24 dBm output.
Frequency response: ±1 dB 20 Hz to 20 kHz (with no eq.).
Noise: Less than —90 dBm equivalent input noise in 0 dB input position; less than —70 dBm in ±20 dB position. (eq switched IN; 15.7 kHz noise bandwidth)
Calibration: Within 1 dB of indicated attenuator setting up to 5 dB boost or cut; within 1.5 dB up to 10 dB boost or cut.
Rated load: 600Ω resistive.
Rated output: +24 dBm.
Maximum output: +30 dBm (before clipping).
Input impedance: 600Ω or 10 KΩ, unbalanced to ground.
Output circuit: Floating (transformer isolated).
Equalisation centre frequencies: 40, 50, 63, 80, 100, 125, 150, 200, 250, 315, 400, 500, 630, 800, 1k, 1.25k, 1.5k, 2k, 2.5k, 3.15k, 4k, 5k, 6.3k, 8k, 10k, 12.5k, 16 kHz.
Frequency tolerance: ±3% of centre frequencies.
Filter bandwidth: ⅓ octave at 3 dB points, with 6 dB boost or cut.
Filter type: LC active feedback type equalisers.

CONTROLS

Equalisation: 27 vertical slider potentiometers, continuously variable ±10 dB.
Gain: Screwdriver adjustable control with lock nut.
Eq in/out: Toggle switch.
Power: Toggle switch with pilot light.
Input impedance: Rear panel switch 600Ω or 10 KΩ.
Input level: Rear panel switch 0 dBm or +20 dBm maximum.
Mains voltage: Rear panel switch 115/230V ac (50/60 Hz)
Terminations: Rear panel barrier strip in/out. 1.8 m 3-wire power cable.

DIMENSIONS

Size: 480 mm x 89 mm rack panel. Depth behind panel 203 mm.
Weight: 5.9 kg.
Price: £350.
Manufacturer: United Recording Electronics Industries, 11922 Valerio Street, North Holywood, California 91605, United States of America.
UK agents: FWO Bauch Ltd, 49 Theobald Road, Boreham Wood, Hertfordshire.

TO QUOTE THE manufacturers' operating instructions, the type *527-A* graphic equaliser was designed 'primarily for room equalisation of sound playback and sound reinforcement systems, but has other obvious applications in professional recording, broadcast and motion pictures'. While this statement largely reflects upon the ergonomics of the device, it most certainly does not decry the versatility of the equaliser.

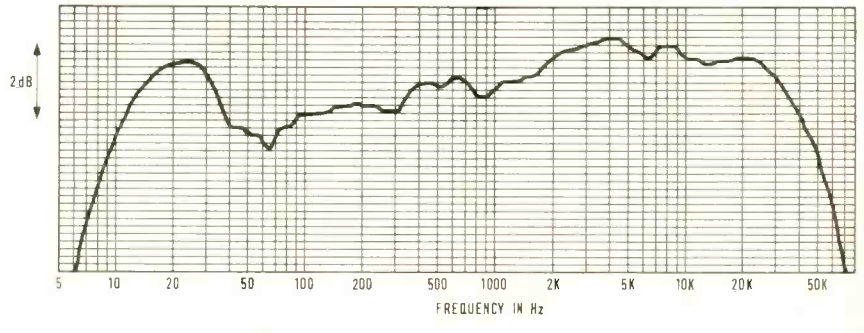
The 27 equaliser controls are arrayed in a 'graphic pattern' on the front panel with their centre frequencies clearly identified. The amount of cut or boost is determined from horizontal calibration lines at 5 dB intervals representing +10 dB, +5 dB, 0 dB, −5 dB and −10 dB; while at first sight these calibration marks may appear to be rather far apart, it is in fact perfectly adequate as a result of the design of operating controls. In standard form these are small spigots, but knobs or a protective cover are available as optional extras.

Also on the front panel: a master gain control, which is a screwdriver operated control with a collet type locking device (spanner operated), an equaliser in/out toggle switch and the power on/off switch with its associated pilot light.

What one might call installation controls are arranged on the rear panel and include slide switches for selecting the input impedance (600Ω or 10 kΩ) and the maximum input level (0 dB or +20 dB) the input and output connections being in the form of a block connector. Personally I would prefer to see Cannon connectors here, as I do not like flying leads and uninsulated connections! The same comment applies to the mains input which is a fixed length of cable associated with a two-position mains voltage selector and the mains fuse.

The external appearance of the equaliser is pleasant and workman-like, and all controls, fuses, and terminations are clearly identified. The same remarks apply to the internal appearance, the electronics occupying two good quality glass fibre printed boards which are identified with component references etc. There is however one matter which does not meet with my approval (and is not an un-

FIG. 1 UNIVERSAL AUDIO GRAPHIC EQUALISER 527-A FREQUENCY RESPONSE



common complaint with American equipment). This is the question of electrical safety when operating on 240V mains supplies, and in the case of this equaliser there is only a small clearance between the tags on the mains voltage selector and the chassis which would not meet the requirements of either British Standard 415:1972 which relates to household sound and vision equipment or British Standard 4743:1971 'Specification for Safety Requirements of Electronic Measuring Apparatus'. While it may be argued that these standards do not strictly apply, the fact remains that this is a potential hazard.

Inputs and outputs

The unbalanced input offers alternative input impedances of 600 or 10 kΩ which were measured as being 568 and 9.9 kΩ respectively, being satisfactorily close to the nominal values for most purposes. The maximum input level for the onset of input clipping was independent of the input impedance adjustment and was found to be +13.8 dBm with the input level switch in the 0 dBm position, and some 20 dB higher with the input switch set for +20 dBm input. The intention of the input level switch is to optimise the input level in relation to noise, and as will be seen the equaliser may be operated over a very wide range of input levels with satisfactory noise performance.

On the output end, the equaliser output is a floating transformer-coupled output offering a low output impedance in the order of 90Ω at 1592 Hz. The maximum output available depends upon the input level switch setting and was found to give the following clipping points:-

Load	Input level switch	Output level
600Ω	0 dB	+23 dBm
1 MΩ	0 dB	+25 dBm
600Ω	+20 dB	+30 dBm
1 MΩ	+20 dB	+36 dBm

As with the input to the equaliser, the output offers a more than adequate drive for any normal purpose and very sensibly has 10 dB higher capability than the input so that it can cope with the potential 10 dB boost in the equaliser when the equalisation controls are set for maximum boost.

While the equaliser is intended to be operated as a unity gain device, the maximum available gain is in the order of 10 dB. However, it was found that the operation of the equaliser in/out switch altered the overall gain by almost 3 dB when the equaliser controls were set to zero cut or boost. This is of course most unsatisfactory, but probably can be simply corrected by some internal adjustment.

Frequency response

The overall response with the equalisers switched out was found to be within ±0.1 dB from 40 Hz to 10 kHz falling to −1 dB at 18 Hz and 25 kHz from whence the response falls off at 6 dB per octave so all was well in this department.

Fig. 1 shows the situation with the equalisers switched in and adjusted to their zero positions when the frequency response is within ±1.5 dB from 10 Hz to 40 kHz; allowing for errors in mechanical adjustment this performance is really quite satisfactory but is on the verge of the manufacturers' implied specification.

Fig. 2 shows a complete set of the individual

FIG. 2
UNIVERSAL AUDIO
GRAPHIC EQUALISER
527-A
FILTER RESPONSES

PEN....200mm/S
PAPER....3mm/S

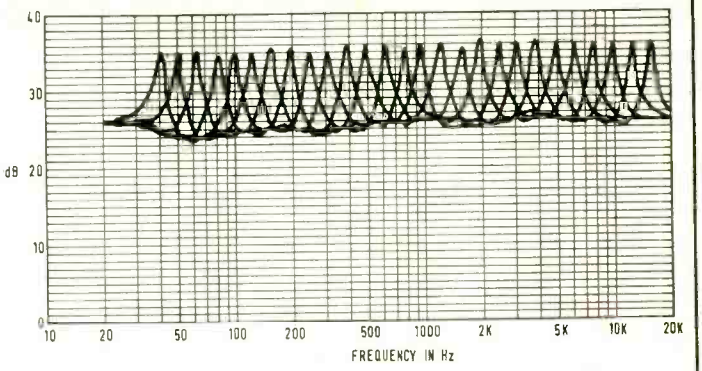
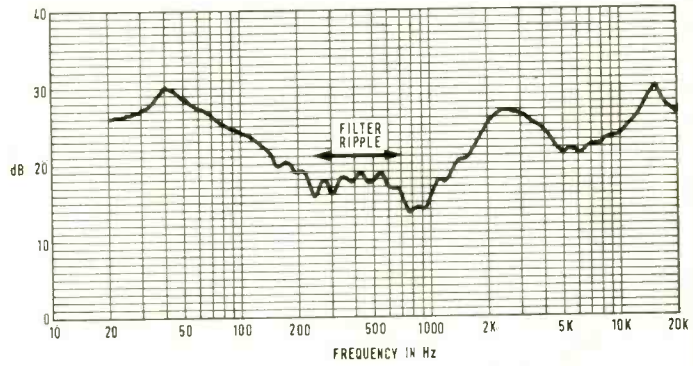


FIG. 3
UNIVERSAL AUDIO
GRAPHIC EQUALISER
527-A
TYPICAL POSSIBLE
CORRECTION CURVE

PEN....200mm/S
PAPER....3mm/S



equaliser boost curves with each control set to maximum boost. It is to be seen from this plot that the curves overlap at points 6 dB below the peaks with the result that setting adjacent controls near their maximum boost position (a similar situation exists at maximum cut) leads to a ripple in the frequency response as shown in **fig. 3.** It is however confirmed by **fig. 3** that this defect only occurs at maximum cut or boost settings. It would appear that the cause of this is that the filter shape varies according to the equaliser setting.

Distortion and noise

Plotting the second and third harmonic distortion at both 0 dBm and +20 dBm output into 600Ω showed that the individual harmonics were below 0.1 per cent between 100 Hz and 10 kHz, increasing to 0.3 per cent when driving +20 dBm into 600Ω at 30 Hz and 20 kHz. Similarly, with the equalisers at their zero positions the intermodulaton distortion as measured by the SMPTE method was very low at less than 0.03 per cent for output levels up to +20 dBm into 600Ω.

However, it was found that the equaliser settings affected distortion and that crossover distortion appeared to be introduced at maximum cut settings, the following being the total

66 ▶

■ UNIVERSAL 527A

harmonic distortion with 0 dBm input at 1 kHz in relation to equaliser setting:

Equaliser position	Total harmonic distortion
+10 dB	0.17%
ZERO	0.08%
−10 dB	0.30%

While these figures are well within the manufacturers' specification, it is possible that they may be a cause for concern.

This matter first came to attention when undertaking tone burst testing and is clearly shown in **fig. 4** which shows the effect of applying a burst of 1 kHz tone with the +10 dB, 0 dB and −10 dB equaliser settings. It is to be seen from this figure that the anticipated ringing associated with any lc type filter occurs, but that the performance in the maximum cut position is quite well controlled and that no defects are apparent at the zero setting of the equaliser.

Turning to the subject of noise, the overall performance was really good and residual mains hum was extremely low and in fact below noise. The following figures represent the noise measured at the output in terms of an equivalent input noise, this taking into account the equaliser's gain.

Conditions	Equivalent input noise input setting +20	input setting 0dB
Equalisation out	−93.7 dBm(A)	−97.5 dBm(A)
Equalisation in all at 0 dB	−73.8 dBm(A)	−92.0 dBm(A)
Equalisation in all at +10 dB	−74.4 dBm(A)	−91.7 dBm(A)

These figures confirm that there is no instability with maximum boost of the equalisers, and that the noise performance is virtually unaffected by the setting of the equalisation controls.

Summary

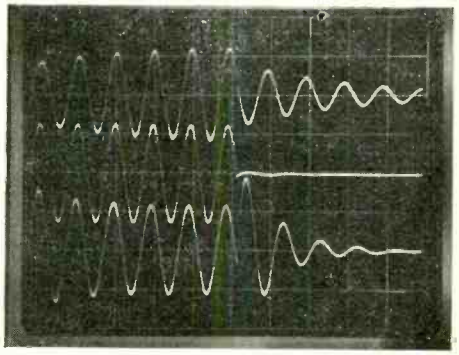
The Universal Audio graphic equaliser is a very versatile piece of equipment offering all that is required in the way of equalisation for correcting rooms and other applications in acoustics. However, use of the full available cut or boost does lead to a ripple in the response curve which is distinctly undesirable.

On the credit side the input and output levels and impedances have been carefully chosen to cope with all normal line requirements and offer an exceptional overload capability. The noise performance is very good and distortion is reasonably low in that it is more than adequate in comparison with loudspeaker installations, although perhaps not all that is required of studio installations.

However, having regard to the price of £350, the Universal Audio graphic equaliser undoubtedly offers very good value for money in terms of its versatility and overall performance.

FIG. 4

1 kHz 1ms/div end of burst



YAMAHA NS690

By John Fisher

SPECIFICATION to DIN 45500
Frequency response: 35-20 kHz.
Power handling capacity: 60W.
Nominal impedance: 8Ω.
Type: 3-way.
Lf: 300 mm dia cone (JA-3056).
Mf: 75 mm dia soft dome (JA-0701).
Hf: 30 mm dia soft dome (JA-0509).
Crossover frequencies: 800 Hz, 6,000 Hz.
Crossover rate: 12 dB/octave.
Fundamental resonance (fo): 40 Hz.
Operating power (for 96 dB spl at 1 m.): 4W.
Domensions h x w x d: 630 x 350 x 291 mm.
Finish: Walnut veneer.
Weight: 22 kg.
Price: £272.72 (pair).
Manufacturers: Nippon Gakki Co Ltd, Hamamatsu, Japan. UK Agents: Jonathan Fallowfield Ltd, Strathcona Road, North Wembley, Middlesex HA9 8L. Phone: 01-904 0141.

On axis sensitivity
Terminal voltage for 74 dB SPL at 1m on tweeter axis.

Speaker	No.	Rms voltage	Stereo balance
NS690	10833	0.46	0.2 dB
NS690	10834	0.45	

Intermodulation distortion
To SMPTE method with 50 Hz and 7 kHz in voltage ratio 4:1.

Speaker	IM at SPL 84 dB	94 dB
NS690 10834	0.7%	1.9%

Frequency response data
Measured on tweeter axis 1m from tweeter at 74 dB SPL at 1 kHz under anechoic conditions with B & K equipment. Both speakers of stereo pair measured and similar.

Impedance
Measured at constant current (100 mA) under anechoic conditions.

Tone bursts
The oscillograms show some evidence of an echo, but the rise time is of particular interest.

Hugh Ford

THE YAHAMA *NS-690* is intended as a quality domestic loudspeaker, covering a wide sound spectrum and capable of producing very loud sounds under domestic conditions. It was nevertheless submitted by the importers for review as a monitor loudspeaker, or more precisely as a loudspeaker whose performance they felt merited its consideration for professional applications.

Design

The *NS-690* employs three drive units mounted in a substantial cabinet. Low, mid and high frequencies are handled separately, with continuously variable controls providing adjustment of the output from the mid-range and hf units. A nominal ±3 dB adjustment about a nominally flat response is provided, and the controls are tucked away out of sight behind the speaker grill, which is an attractive knitted (? woollen) material; the grill frame is held in place by four plastic studs.

Connections at the rear are by captive spring-loaded flex clips, as on much Japanese equipment and these are certainly easy and quick to use, although flex is fairly easily pulled out by a sharp tug. The connector panel is recessed. Also at the rear are a number of shorting links between crossover elements and the drive units. If these are removed, the speaker can instead be driven using an active crossover network and separate amplifiers for lf, mf and hf; this facility was not investigated as it seems reasonable that the amplifiers and crossovers should be specifically tailored to the drive units. The review samples were finished in semi-matt varnished walnut veneer, with charcoal grill, and the appearance was most pleasing.

The midrange and hf units are soft domed types, incorporating fabric diaphragms double-coated with a thermosetting resin and a viscous rubber resin and with hot-pressed tangential edges. It is claimed that this method of construction reduces peaks in the response at the upper end of the ranges handled by the respective units. The voice-coil of the mid-range unit will, according to the manufacturers, withstand temperatures up to 200°C. The lf unit has a high compliance suspension and a long throw voice coil; nominal free air resonance is 20 Hz, becoming 40 Hz when mounted in the infinite baffle enclosure. Front and rear panels are 25 mm thick—the front plywood and the rear treated chipboard; side panels are 18 mm ply. Ferrite cores are used in the crossover inductors, but metallised paper capacitors, desirable for stability, are used rather than electrolytics.

Test conditions

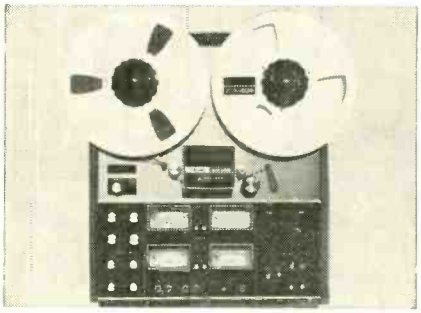
The performance of the Yamaha *NS-690* was assessed subjectively using direct comparison between live and reproduced sound, live broadcast material and tapes considered to be of good quality. The material included speech, applause, music of all kinds and a musical box. The speakers were also used for some months for general listening—including discs, broadcasts and tapes. Comparisons were made with other high-quality loudspeakers, in particular the Spendor *BC1*.

The performance notes include the views of a number of listeners with backgrounds which are musical, technical and otherwise. Listen-

68 ▶

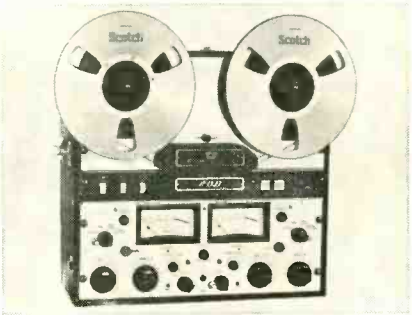
REW AUDIO CONTRACTS

LONDON'S LEADING CONSULTANTS AND DISTRIBUTORS FOR P.A., STUDIO AND PROFESSIONAL AUDIO EQUIPMENT



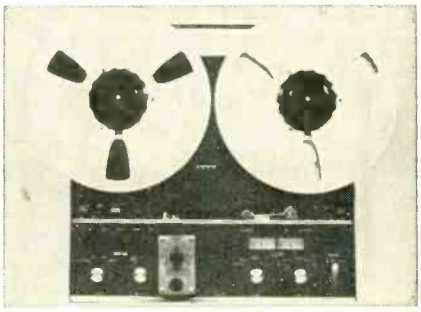
TEAC 3340
The Teac A 3340 professional model is a very high quality, 4 track (separate) recorder. Operating at 7½ and 15 i.p.s. with full built-in sel-sync facility. Potential 8 input source (4 line and 4 mic) incorporating separate mixing controls on front panel. In stock.

NETT PROFESSIONAL PRICE ON APPLICATION



AMCRON
The long awaited Amcron tape deck and latest addition to the REW Audio Contracts Family of mini-studio high quality recorders. REW are able to offer this 800 and 700 series of decks with choice of CX or SX electronics.

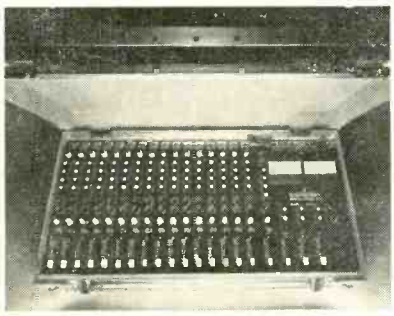
NETT PROFESSIONAL PRICE ON APPLICATION



REVOX A77
The world famous A77 1102 Series III semi-professional recorder, available in 3¾ and 7½ i.p.s. or 7½ and 15 i.p.s. speeds + sel-sync and varipitch conversions. This machine proves a long standing favourite with the REW Audio Contracts range of mini-studios. In stock.

NETT PROFESSIONAL PRICE ON APPLICATION

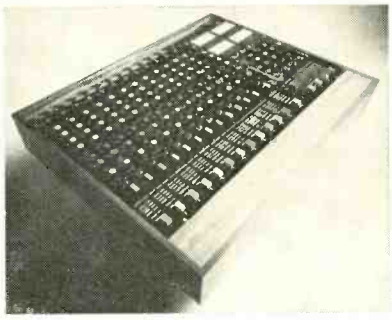
MIXERS BY SOUNDCRAFT ELECTRONICS



SOUNDCRAFT 16/2

New 16/2PA. Complete in flight case incorporating 16 mic channels, stereo output channels, foldbacks output plus two echo return channels. Full monitoring facilities; pfl; balanced input; 4-band eq; f/b send; echo send; channel switch; pan pots and faders. Input and output XLR sockets plus 37 way socket for multicore connection.

NETT PROFESSIONAL PRICE £992 + VAT

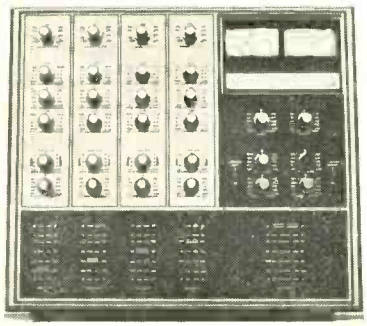


SOUNDCRAFT 12/4

Just arrived—12/4 Recording Console which is built into a teak case, incorporating 12 input and 4 output channels, output limiters, and full monitoring facilities. All input and output connectors are Switchcraft (XLR equiv.) except line input which are ¼" jack. 200 ohm mic. inputs are balanced. 4 band E.Q.; f/b send; echo send; pfl; channel switch; pan pots and faders.

NETT PROFESSIONAL PRICE £875 + VAT

SCOTCH 207 at very competitive prices.



LAMB PML 420 MIXER
This high quality inexpensive 4/2 mixer incorporating 3 band e.q.; pan pots; faders; limiters and echo send controls make it a good starting point for the basic mini studio set-up.

NOW IN STOCK

NETT PROFESSIONAL PRICE ON APPLICATION

REW Audio Contracts are able to offer the following microphones at professional prices (subject to stock) to bona-fide pro users.

AKG	AKG	SHURE	CALREC	BEYER	RESLO
D190	D707	515SA	CM652	M160	S80
D160	D900	588SA	CM655	M500	CABARET
D109	D1200	545		M260	S91
D12	D2000	565		M101	
D90	D202E1	548			
D200	D224E	SM57			
D202	C451*	SM58			

Available in DIN or CANNON (XLR) connectors.

***VERY SPECIAL PRICE WHILE STOCKS LAST**

ALL PRICES ON APPLICATION
Full range of mic stands and accessories by KMAL.

ALL PROFESSIONAL AUDIO EQUIPMENT AT

*NOTE REW Audio Contracts and REW Video Contracts are registered trade names and are part of The REW Group of Companies.

REW Audio Contracts, 146 Charing Cross Road, London WC2. Tel: 01-240 3883

VIDIO, INDUSTRIAL AND STUDIOS AT

REW Video Contracts, 10-12 High St., Colliers Wood, London SW19. Tel: 01-540 9684/5 Telex 896194

ing was done by individuals rather than a formal panel; this enabled all listeners to enjoy similar listening positions and freedom of movement while losing the advantage of the same material being presented in identical ways to all listeners. The method was adopted as being the most practical, and comments were both solicited and unsolicited.

The speech tests were carried out using recordings made with various capacitor microphones under nearly anechoic conditions, to enable a good comparison to be made with the live voice. Similar comparisons were made with a small musical box.

Performance

Initially, the mf and hf controls were set to the nominally flat positions; tests with programme and white noise showed up coloration in the mid range that was unaffected in degree by the control setting. It was felt that the hf control was marginally better set to about $\frac{1}{3}$ travel in the direction of plus 3 dB. A higher setting resulted in slight shrillness while the flat setting resulted in dullness; the effect of these slight changes in setting was more than the reviewer expected. The mid-range control was felt to be best set at the flat or central position.

The speakers were placed on small stands, 25 cm off the floor. They normally stood some 60-90 cm out from the wall, with a curtained french window on either side. Positioning them in the corner of the room gave a booming quality to the sound.

Balance

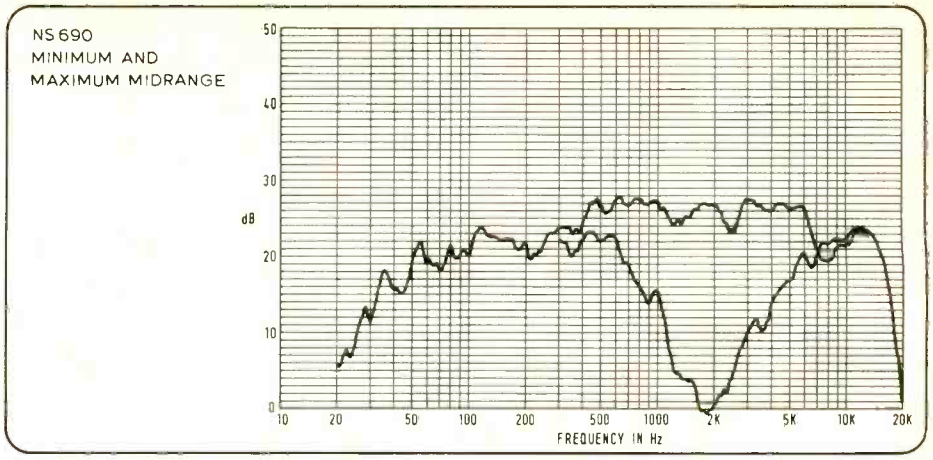
With the controls set as above, the balance was good but not exceptional. There was an apparent woolliness to the sound which was not improved by higher settings of the hf control or the mid-range control, and the bass had a suggestion of tubbiness on some material or warmth on other. Music in general lacked bite yet acquired a rough edge in the upper regions and a slight coarseness below. There was the usual tendency to beaming at high and upper mid frequencies, though less badly than on some speakers.

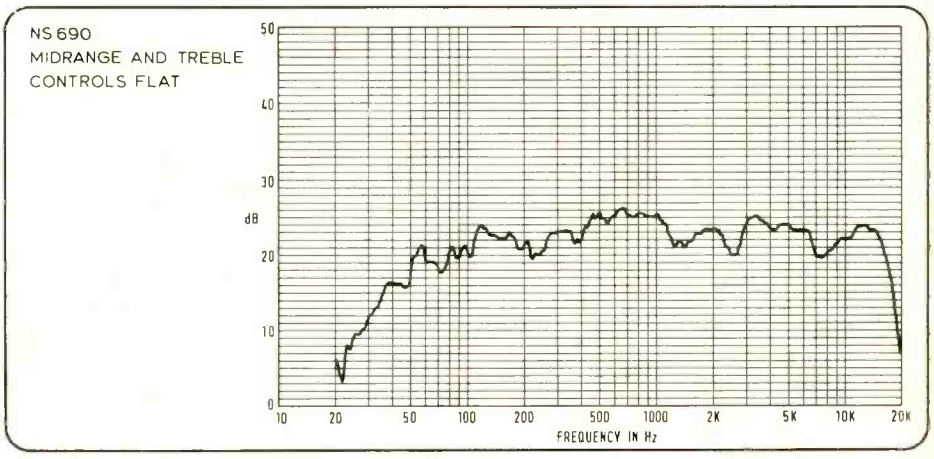
Coloration

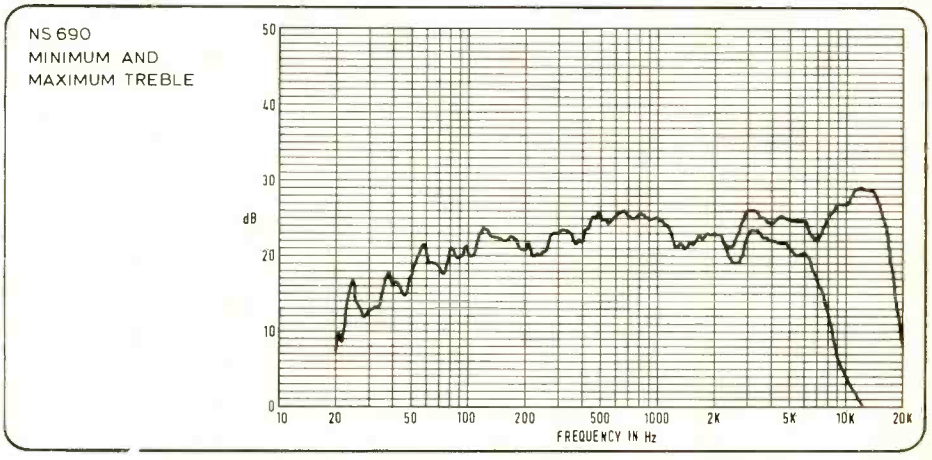
Some signs of coloration have already been mentioned. This was most apparent in the mid-range units, which on white-noise almost honked. This was surprising in view of the claims for soft domes. Speech produced a slightly 'gassy' and at the same time hard quality, and both midrange and hf units seemed to be in some degree to blame. Bass was sometimes warm, sometimes tubby, but sometimes also cardboardy or slightly coarse—I do mean 'slightly', and I am considering the speakers in the context for which they were sent for review. I would expect comment elsewhere to be more generous in some respects. The quality of sound was never as transparent as is achieved by the *BC1* or the handful of other quality loudspeakers.

Image

Stereo images were generally well defined. Two-speaker mono gave a firm central image.







Just occasionally, the intrusion of a sibilant or emphasised harmonic would mar the illusion, but this was never serious.

Sensitivity

Apparent sensitivity was substantially better than that of the Spendor *BC1* or AR *LST*. Indeed, quite a modest amplifier will produce a loud noise with these speakers. During the test period, the speakers were used to good effect for sound reinforcement and replay in a church. Adequate power to drive speakers should not present great problems these days, but sensitivity can still be an important point to consider. No difficulties were encountered in driving the speakers through a Quad *303*.

Similarity

White-noise showed up slight differences in quality towards the lower end of the spectrum,

70 ▶

VIDEO RECORDER GUIDE

Make & Model	Tape Size	Colour	B & W	Mains	Portable (battery)	Edit	Slow Motion	Time Lapse	General	Compatability code	Price £ (At Press)
IVC 705P (P/C)	1″	(o)	o	o					Will play 525 line 60Hz tapes, 2 audio tracks, stop frame, studio quality.	A	1968 mono (2270) colour
IVC 711P (P/C)	1″	(o)	o	o					2 audio channels, stop, frame.	A	1491 mono (1793) colour
IVC 741P (P/C)	1″	(o)	o	o				o	High quality, 2 audio tracks, stop, motion.	A	2547 mono (2849) colour
IVC 761P (P/C)	1″	(o)	o	o		o			Assemble edit, 2 audio tracks, stop, frame.	A	2170 mono (2472) colour
IVC 801PSM	1″	(o)	o	o			o		2 audio tracks, stop, frame.	A	2124 mono (2426) colour
IVC 821P	1″	(o)	o	o					2 audio tracks, stop, frame, off tape monitoring.	A	2763 mono (3065) colour
IVC 871P (P/C)	1″	(o)	o	o		o			Insert edit, 2 audio, stop, frame.	A	4052 mono (4354) colour
IVC 900	1″	(o)	o	o		o			Ultra high quality, broadcast options.	A	7518 to 20760
IVC 100	1″ cartridge	(o)	o	o					2 audio channel high performance cartridge loading.	A	tba
Ikegami 321	½″		o	o					Remote control option.	B	420
Ikegami 321C	½″	o	o	o					Remote control option.	B	595
Ikegami 321L	½″		o	o				o	Remote control option, 12+ 24 hours record.	B	720
JVC KV 350	½″		o	o		(o)			Mechanical edit, built in SPG.	B	368
JVC KV360	½″		o	o		(o)	o		Mechanical edit, built in SPG.	B	432
JVC PV 4500	½″		o	o	o				Includes hand held camera, mic., mains/charger unit.	B	745
JVC CR 5000	¾″ cassette	o	o	o					Remote control option, 2 audio tracks, player only.	C	664
JVC CR 6000	¾″ cassette	o	o	o		(o)			Remote control option, 2 audio tracks.	C	749
National NV 3020E	½″		o	o					High quality, audio dub.	B	350
National NV 3040E	½″		o	o					Remote control option.	B	495
National NV 3030E	½″		o	o		o	o		Insert edit, Audio dub.	B	535
National NV 1070	½″		o	o				o	12 hour record.	B	590
National NV 3082	½″		o	o	o				Includes camera, mic., mains charger unit.	B	750
National NV 5125	½″ cartridge	o	o	o					Cartridge loading, stop, frame, auto repeat.	B	595
National NV 3000	¾″ cassette	o	o	o					Complete with off air tuner, monitor, auto colour lock, RF output.	C	890
Shibaden 610	½″		o	o			o		Audio dub, variable speed playback.	B	380
Shibaden 610 KD	½″		o	o		o	o		Insert & assembly edit.	B	620
Shibaden 620	½″	o	o	o			o		Audio dub, variable speed playback.	B	595
Shibaden 620 KD	½″	o	o	o		o	o		Insert & assembly edit.	B	880
Shibaden 612K	½″		o	o				o	6, 12, 24, 48 hours record.	B	810
Shibaden	½″ cartridge	o	o	o					Cartridge loading.	B	580
Sony CV 2100	½″		o	o		(o)			Mechanical edit.	D	365
Sony AV 3620	½″		o	o					High resolution.	B*	380
Sony AV 3420	½″		o	o	o				High resolution, complete with camera, mic., mains/ battery charger.	B*	510
Sony CV 5600 P	½″	o	o	o		o			Mechanical edit.	D	745
Sony AV 3670	½″		o	o		o			High resolution, insert & assembly edit.	B*	575
Sony EV 320 CE	1″	(o)	o	o		o	o		Studio quality, insert & assembly edit, still frame, colour & remote option.	E	1850
Sony VO 1200	¾″ cassette	o	o	o					PAL/NTSC playback, auto repeat search, 2 audio channels.	C	640
Sony VO 1810	¾″ cassette	o	o	o					PAL record/playback, NTSC playback, 2 audio channels, search, auto repeat.	C	735

This chart has been compiled by Action Video for your convenience. We are suppliers for all of the video recorders listed above as well as for an even larger range of cameras, monitors, mixers, lenses and ancillary equipment. So if you want video equipment you know where you can get it. Telephone Brian Speck on 01-734 7465/6/7.

Action Video Limited 45 Gt Marlborough Street London W1V 1DB

ACTION VIDEO LIMITED

Telephone: 01-734 7465/7

but these had not been noticed in general listening and would probably not be important.

Speech

Speech tests involving a comparison between live voice and a recording of that voice made under almost anechoic conditions gave results which were felt to be very good, without ever being quite good enough to cause doubt as to which was which. There was a very slight clouding and added warmth to male speech, and a slight hardness of some consonants, noticed particularly in one-speaker mono. Speech in stereo radio drama was well reproduced, the sound tending to be more 'forward' than with some speakers.

Musical box

Similar comparisons to the speech tests were made using a dead recording of a small musical box. Reproduction was not particularly convincing, although it was difficult to pinpoint why, apart from a slight accentuation of the tinniness of one or two notes. Without the original for comparison, reproduction would almost certainly have passed muster.

Solo voice

Solo singing voices, male and female, reproduced well with the Quad control unit set flat, without ever being really clear; consonants were occasionally slightly hard and male voices disappointing in quality. There was a slight hairiness about voices, boys' in particular.

Solo strings and string quartet

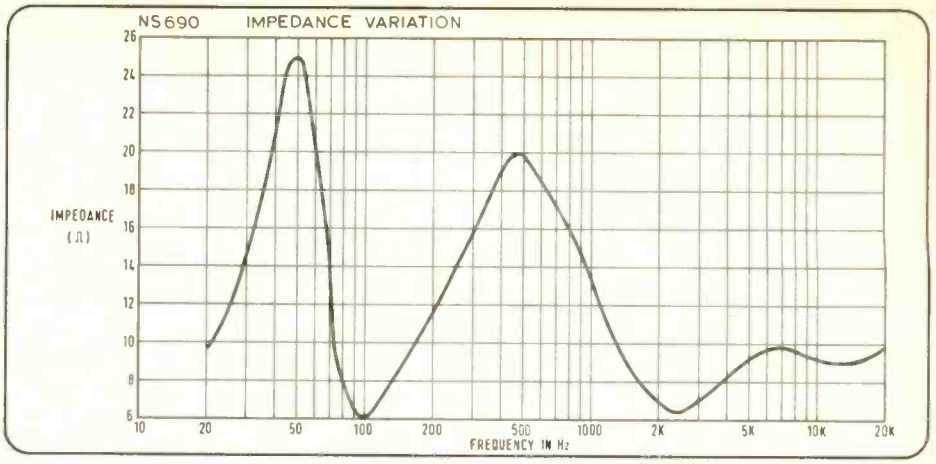
Reproduction was not as natural as with the *BC1*. The cello in particular sounded a cardboardy-sort-of-warm (oh, forgive that clumsy description) and fiddle was not quite as sweet as in real life, even at its best.

Organ

Convincingly reproduced, with a slight lightness in the extreme bass pedals as might be expected. No distress at high sound levels. Wind noise from the organ slightly accentuated.

Chamber orchestra

Reproduction pleasant but lacking edge and immediacy. Lower strings disappointing. Woodwind a trifle pinched. Trumpet well reproduced.



Choral music

Large scale choral music was marred only by a slight clogging of the sound in the mid-range. The sound was full but not totally clear. The sound was very slightly tiring to listen to. Boys' voices were inclined to sound hard.

Large orchestra

Handled well. Upper strings lacked the sweetness of the real thing, and double bass and cello their firm impact, but the sound could be very satisfying.

Percussion

Reproduction of the bass drum was disappointing after the *AR-LST* and the *BC1*—smacked of cardboard. Cymbals and triangle were splendid.

Plucked instruments

As with the musical box test there was something wrong with the pluckings of the guitar and harpsichord, different as they are. Guitar tone was subtly less satisfying than it can be, particularly in its lower registers.

Piano

The sound was warm but dead, and needed help with some treble lift. Even then it was lacking in clarity. The sound was quite different from that of the *BC1*.

Pop music

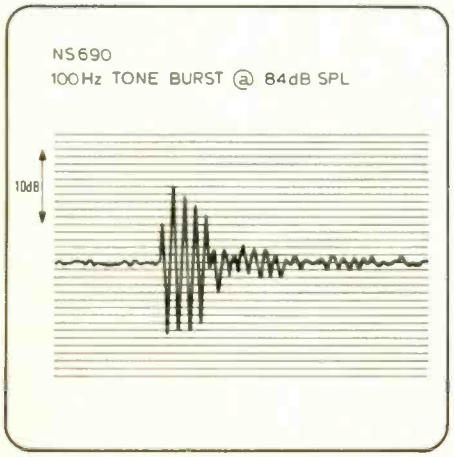
The speaker gave as pleasing an account of pop and 'sweet' music as my tastes will allow me to judge. There should be little to complain of for domestic reproduction purposes (except on the part of neighbours), but I would take the importers' or manufacturers' advice before considering the speaker for studio monitoring of pop music, despite the claimed high temperature capabilities of the voice coils. It could well be suitable for sane level quality monitoring of light music. There is no protection system incorporated.

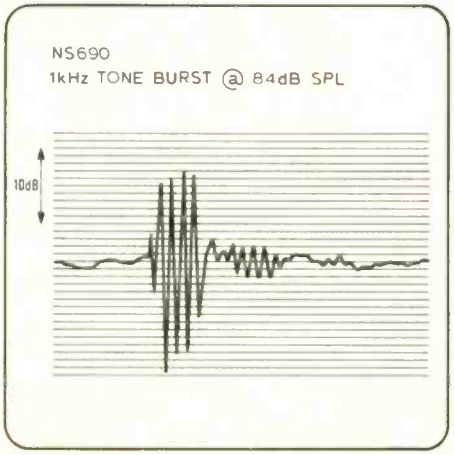
Conclusion

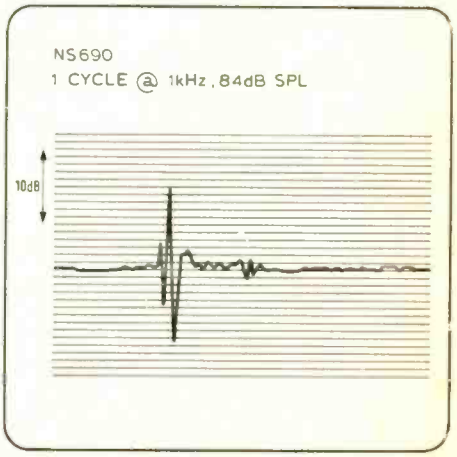
The speakers were assessed in the belief that the approximate price quoted to me was for a pair; it came as a shock to learn subsequently that the price of each speaker was £136.36. Despite a reasonable if not exceptional performance by domestic standards, and its attractive finish, the *NS690* appears at this price to represent poor value for money, whether as a domestic or professional monitoring unit—certainly by comparison with the better domestic and professional speakers by KEF, Rogers, B&W, Spendor and Quad, to name but a few British manufacturers. While the sound quality is no worse than that produced by certain other high-price loudspeakers, there appears to be little justification for the cost on grounds of performance when there are as good or better speakers at below or around the price of the *NS690*.

To sum up—an attractive, expensive but not outstanding loudspeaker.

John Fisher







Classified Advertisements

Advertisements for this section must be pre-paid. The rate is **8p** per word, minimum **80p**. Box Nos. **20p** extra. Semi-display rates on application. Copy and remittance for advertisements in **DECEMBER 1974** issue must reach these offices by **16th OCTOBER 1974** addressed to: The Advertisement Manager, **Studio Sound**, Link House, Dingwall Avenue, Croydon CR9 2TA.

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

Replies to Box Nos. should be addressed to the Advertisement Manager, Studio Sound, Link House, Dingwall Avenue, Croydon CR9 2TA, and the Box No. quoted on the outside of the envelope. The district after Box No. indicates its locality.

FOR SALE—TRADE

★**Nagra III** and IV and SN models available. Immediate delivery. Write or phone J. J. Francis (Wood Green) Ltd., Manwood House, Matching Green, Harlow, Essex. Tel. Matching 476.

★**A.K.G.** D25 £30, A.K.G. D24 £25, A.K.G. D12 £15, A.K.G. D19 £10, S.T.C. 4021 £10, S.T.C. STICK £15, R.C.A. 10002 £40, Neuman KM254C £80, Neuman KM56 £65, Neuman KM54A £70, Electro Voice 668 £45, Electro Voice 10001 £95, Electro Voice Gun Mike £60, Audio Radio Mikes RMS £70, Sony Rover Video Camera, Recorder, Colour Monitor £450, Braun TG1000 (new) £230, Leevers-Rich Console £60, Leevers-Rich Portable £40, Leevers-Rich Stereo Portable £200, Perfect Tone Mixer £400, E.M.T. Mixer £280. All goods plus V.A.T. J. J. Francis (W.G.) Ltd., Manwood House, Matching Green, Harlow Essex CM17 0RS. Tel. Matching 476.

★**A new dB tamer** from Cathedral . . . Compressor/Limiter module CLA 1, £15.50 post and VAT paid. Low distortion oscillator module OSC/2 £15.50 post and VAT paid. Quantity discounts available. S.A.E. details Cathedral Sound, Fourways, Morris Lane, Halsall, Lancs. L39 8SX.

RAC MIXERS

Custom-built mixers for groups, P.A., hospital broadcasting, recording, discos, etc.

RAC plug-in audio modules for building your own mixers.

Sony, Akai, TEAC, Tandberg, Marantz, Lux, Nikko, Dual, Quad and Armstrong dealers. Shure, Calrec, AKG mikes and stands, etc.

APRS Manufacturing members.

RUGBY AUTOMATION CONSULTANTS
19 Freemantle Road, Bilton, Rugby, Warwickshire CV22 7HZ
Tel. 0788-810877 (Rugby)
Call, write or phone us

★**Audiofact No. 1!!** You can build 8 Cathedral Complimiters into your mixer for LESS than the cost of one medium price competitor. P.S. Ask about our new Graphic Equaliser. Cathedral Sound. Tel. Halsall 328.

BUILDING or PURCHASING an AUDIO MIXER, pre-amp, autofade, V.U. or audio monitor, V.E. mixer, driver or power supply, etc. First consult

PARTRIDGE ELECTRONICS
(Ref. S.S.), **21-25 Hart Road, Benfleet, Essex.** *Established 23 years*

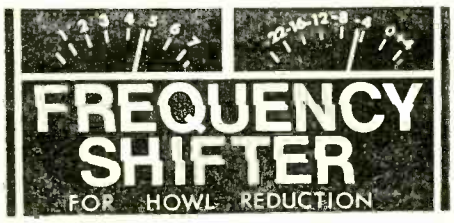
NAB CARTRIDGES
Suitable for all Broadcast Jingle Machines.
30sec. ex-Factory Fidelipacs.
100+**90p,** 50+**£1,** 20+**£1·25.**
Vat extra. Mail Order and C.O.D. Service.
ROGER SQUIRE'S
176 Junction Rd., London N19. Tel 01-272 7474

PEAK PROGRAM METERS TO BS4297

also 200KHz version for high speed copying:
Drive circuit, 35 x 80mm, for 1 ma L.H. zero meters to BBC ED 1477. Gold 8-way edge con supplied.

		4 off	10 off	50 off
Complete kit	**£10·00**	**£9·50**	**£9·00**	**£8·50**
Built and aligned	**£14·00**	**£13·30**	**£12·60**	**£11·90**

ERNEST TURNER PPM meters. Below scalings stocked
Type 642, 71 x 56mm **£10·90**: 643, 102 x 79mm **£12·90**
TWIN MOVEMENT, scale 86 x 54mm **£31·00.**



PUBLIC ADDRESS : SOUND REINFORCEMENT
In any public address system where the microphones and loudspeakers are in the same vicinity acoustic feedback (howl-round) occurs if the amplification exceeds a critical value. By shifting the audio spectrum fed to the speakers by a few Hertz the tendency to howling at room resonance frequencies is destroyed and an increase in gain of 6-8dB is possible before the onset of feedback.
SHIFTERS IN BOXES with overload LED, shift/bypass switch, BS4491 mains connector and housed in strong diecast boxes finished in attractive durable blue acrylic. Jack or XLR audio connectors.

Type	A	B	C
Input impedance	200Kohm	200Kohm	10Kohm Balanced
Output impedance	2Kohm	20or600ohm	20or600ohmBAL
PRICE	**£58**	**£68**	**£84**

SHIFTER CIRCUIT BOARDS FOR WW July 1973 article
Complete kit and board **£21** Including p.s.u. and
Board built and aligned **£28** mains transformer
DESIGNER APPROVED
SURREY ELECTRONICS
The Forge, Lucks Green, Cranleigh, Surrey GU6 7BG
(STD 04866) 5997
CASH WITH ORDER less 5% U.K. post free, add VAT

★**A complete** 4-track installation. One 16 Itno 8 Studio Mixer. One Teac 3340. Two AN180 Dolby's. One JVC MCA 9VE Amplifier. £2,000 the lot. Will split. 01-897 9670.

★**One 8-track** Leevers-Rich Recorder, £5.500; One Alice 10-channel Mixing Consule, £1,500. One 2-track Leevers-Rich Recorder, £1,200. Box No. 685.

FOR SALE—PRIVATE

★**Revox A77111** HS-V-S-P Half Track, eight months old; power amps illuminated remote control. £280.00 o.n.o. AKG Capacitors. Two off C451E CK5 Capsules. N10 PSO, new in manufacturers boxes £150. Four AKG D202CS £35 each. Three D202E1 £30. (18 months old). Alice AD62 £150. Ring Colin 01-602 3066. Sensible offers considered for parts or whole.

★**Ampex A.G. 440** ¼″ two track machine (can be adapted to four or eight-track) with custom electronics, in professional console. Exceptionally good condition, £520. Phone 01-789 9053.

WANTED

★**Lee Electronics.** The Tape Recorder and Hi-Fi Specialists wish to purchase good quality Tape and Hi-Fi equipment for cash. 400 Edgware Road, W.2. Phone PAD 5521.

★**Secondhand Disc** cutting equipment wanted, suitable for Neumann AM32 Lathe. Disc Cutting Amp.: Neumann VG2 mono or VG1 stereo or similiar stereo amp. cutterhead: Neumann Sx68 or Sx74, Haeco Sc2, Westrex 3D or 3DII, Ortofon Dss661 or Dss732 or similar. Also wanted, any suitable suspension. Decibel Recording Studios, Katarinavagen 20, Stockholm, Sweden, Phone 08/233435.

STUDIO FACILITIES

EDEN STUDIOS LTD

QUALITY recording tape to disc and pressing services, all at very reasonable rates. Please write or 'phone for leaflet.
20-24 BEAUMONT ROAD, CHISWICK, LONDON W4
01-995 5432
Member Assoc. of Professional Recording Studios

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

★**County recording service** stereo and mono masters and lacquer discs from your tapes. Telephone Bracknell 4935. London Road, Binfield, Bracknell, Berks.

RECORDS MADE TO ORDER

DEMO DISCS MASTERS FOR RECORD COMPANIES	VINYLITE PRESSINGS

Single discs, 1-20, Mono or Stereo, delivery 4 days from your tapes. Quantity runs 25 to 1,000 records PRESSED IN VINYLITE IN OUR OWN PLANT. Delivery 3-4 weeks, Sleeves/Labels. Finest quality NEUMANN STEREO/Mono Lathes. We cut for many Studios UK/OVERSEAS. SAE list.
DEROY RECORDS
PO Box 3, Hawk Street, Carnforth, Lancs.
Tel. 2273

STUDIO FACILITIES
(Continued)

S.G.S. RECORDING STUDIO
DEMOS AND MASTER PRESSINGS
MULTITRACKING FACILITIES 01-778 0450
Complete studio service. Mobile studio service engineers. Music publishing. Independent production Group P.A. and amps serviced and sold. Disco equipment installed.
131A ANERLEY ROAD, LONDON S.E.20
Studio 01-778-0450 Messages 01-688 0728

★**J & B Recordings.** Tape to disc—latest high level disc cutting, all speeds. Master pressings, studio, mobile. 14 Willows Avenue, Morden, Surrey. MITcham 9952.

★**Sound News Productions.** Britain's oldest full-time Tape/Disc/Tape transfer service. Direct transfers, pressings for private and for the trade. Fund raising advisory service for societies, choirs, bands. 18 Blenheim Road, London W4. Tel. 995 1149.

COMPACT CASSETTES
PROFESSIONAL HIGH-SPEED DUPLICATION
Dolby B—compression and equalisation available—competitive prices on small runs—full productions undertaken—music and language specialists.
Contact Chris Sands
AUDIO EDUCATION COMPANY
01-723 6635

★**All Nagra** Equipment urgently required for cash. J. J. Francis (W.G.) Ltd., Manwood House, Matching Green, Harlow, Essex CM17 0RS. Tel. Matching 476.

★**Tape and Cassette Recorder Repairs** by Specialists. The Tape Recorder Centre, 82 High Holborn, London, W.C.1.

SITUATIONS VACANT

HAYDEN LABORATORIES LIMITED

Sole U.K. distributors for Fisher Radio

o O o

A vacancy has arisen in our London service department for an engineer to carry out servicing work on the above products. We are seeking an enthusiastic and conscientious worker with a good understanding of amplifier and receiver techniques and a standard of workmanship consistent with the quality and reputation of this product range.

Good working conditions; 4 weeks annual holiday; salary by negotiation; interviews to be carried out in London.

Please reply in writing to:
The Sales Director,
Hayden Laboratories Ltd.,
Hayden House,
17 Chesham Road, Amersham,
Bucks.

SITUATIONS VACANT
(Continued)

★**Audio International** Recording Studios Ltd require experienced multitrack recording engineer. Millard, 01-486 6466.

WEST END RECORDING STUDIOS
have vacancies for Mixing and Transfer Engineers.
Applicants should be experienced in Programme Operations and be able to work on their own without constant supervision. In addition, a knowledge of electronics and ability to edit Speech and Music is required. These posts offer varied and interesting work together with good promotion prospects for the successful applicants. For further information please write to
BOX No. 687

F. W. O. BAUCH LIMITED

have a vacancy for a

SERVICE ENGINEER

seeking interesting and varied work in the professional broadcasting and recording industry. Applicant would be responsible for servicing high quality condenser microphones and should have a good basic knowledge of electronics and some mechanical aptitude. Experience in broadcasting or recording engineering would be an advantage, but is not essential, as training would be given. Excellent working conditions and above average salary.

Apply to:—

F. W. O. Bauch Limited
49 Theobald Street, Boreham Wood, or call 01-953 0091

EVERSHED POWER-OPTICS LTD.

UK Agents for Manufacturers of Film and Television Equipment require:—

SENIOR MAINTENANCE ENGINEER

for their agency service department. Applications should have good theoretical knowledge of electronics to minimum of ONC or C and G Intermediate Standard and experience in studio engineering techniques allied to sound recording and projection equipment.

Knowledge of French and/or German is desirable but not essential. A certain amount of travel throughout the UK and Europe is involved.

Salary negotiable according to experience and qualifications. Excellent conditions of employment, monthly staff appointments, contributory pension scheme, initially 15 days holiday rising to 20 days after 5 years service, plus bank holidays. Five day 37½ hour week 8.30 to 4.45. Lunch ¾ hour.

Applications giving brief details of experience to—
Evershed Power-Optics Limited, Bridge Wharf, Bridge Road, Chertsey, Surrey KT16 8LJ.

CLASSIFIED ADVERTISEMENTS ORDER FORM

Please use this coupon for your private sales and wants. Rates 8p per word. Box Nos. 20p extra.

To: *Studio Sound*, Classified Advertisements Dept., Link House, Dingwall Avenue, Croydon CR9 2TA. Please publish the advertisement indicated below for ..... insertion/s under the heading .....

Name .....

Address .....

.....

Cheque/P.O. enclosed £ .

Is a Box No. required Yes/No. If no, please include remittance to cover name and address and/or Tel. No.

Please write in block capitals.

Link House Publications Ltd., Registered in England, No. 96948. Registered Office: 10/12 South Crescent, Store Street, London WC1E 7BG.

Published by the Proprietors, Link House Publications Limited, 10-12 South Crescent, Store Street, London WC1E 7BG, and Printed by Arthurs Press Limited, Woodchester, Stroud, Glos. GL5 5PB.

TEAC 4-CHANNEL INDUSTRIAL RECORDER

The complete mobile recording studio
4 totally independent channels.
Sel sync on all channels.
Mixing facilities 63dB signal to noise ratio.
Wide flat band width.

Backed by ITA Service

SOLE SUPPLIER

SEMI-PRO "S" VERSION NOW AVAILABLE IN 240V

ITA 10-4 MODULAR MIXER

Now in use in 15 countries throughout the world.
Ten inputs.
4 output groups.
4 limiters. Base, mid, treble EQ.
Balanced inputs.
Modular construction.
Headphone monitoring.

£590 + V.A.T.

IMMEDIATE DELIVERY

NOTE NEW ADDRESS-

ITA

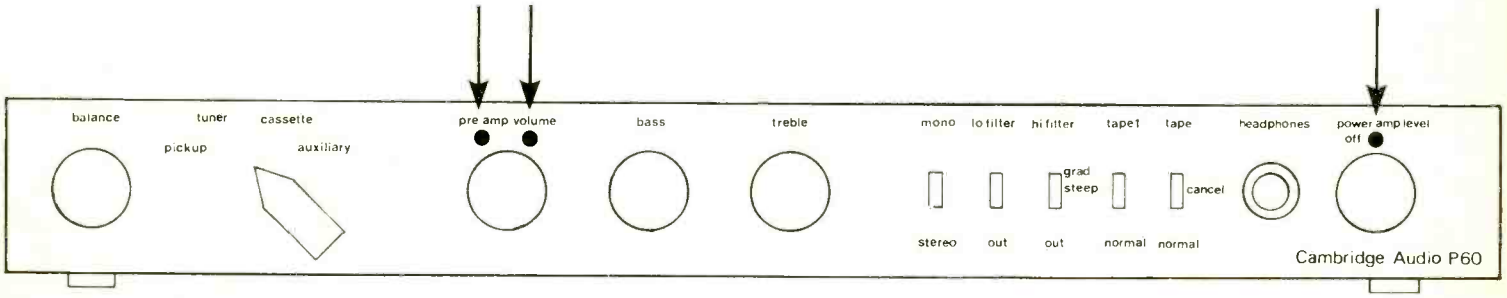
Industrial Tape Applications
5 Pratt Street, London NW1 OAE. Tel: 01-485 6162 Telex: 21879

NEW ARCHITECTURE IN STEREO AMPLIFIERS

The new Cambridge P60 brings radical changes to stereo amplifier design and operational concept

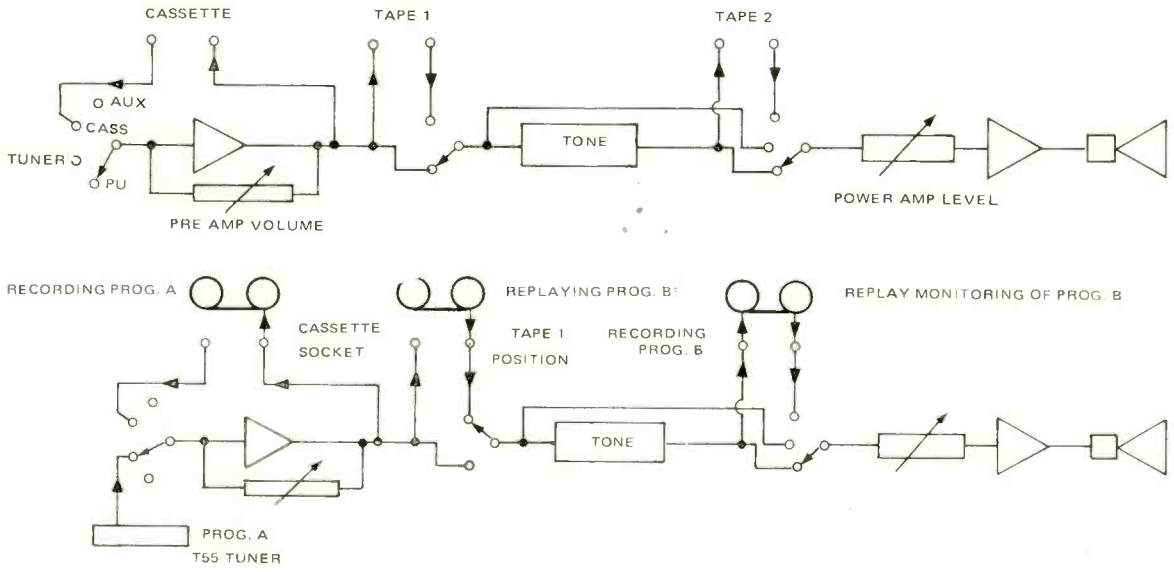
1. Split Section level control with normal and overload indication

The new Cambridge Audio P60 Integrated Amplifier represents the outcome of radical rethinking of conventional audio amplifier architecture. For many years now the fundamental fixed gain pre-amplifier with its attendant inadequate headroom bringing limiting, clipping and unwanted distortion has been the order of the day. The volume control, placed after most of the pre-amplifier stages could not be turned down to correct a signal that was already in overload and therefore distorted. Cambridge Audio amplifiers are different. To begin with our compensation for disc equalisation to the R.I.A.A. standard is more accurate than that of virtually all our contemporaries. For instance, we employ a buffer stage to eliminate the differences in cartridge inductance that plagues other amplifiers (See Readers Letter W.W. December 1973). In the new P60 Stereo Amplifier separate main and pre-amplifier level controls each with L.E.D. indicators permit the user to optimise all signal levels precisely – thereby catering for every variable-without compromise. The result is audibly less distortion with the added bonus of monitoring just where distortion can be introduced first and at what level.



2. Record and Playback facilities for three tape recorders used individually or combined.

The following block diagram best explains the logic. At first sight the flexibility of the arrangement above is clearly apparent. In addition, interesting new possibilities arise – hitherto unavailable on other products such as the ability to record programme A on Tape Recorder 1 whilst at the same time replaying programme B on Tape Recorder 2 and recording it on Tape Recorder 3, with full monitoring facilities and the ability to modify the frequency response.



Cambridge Audio

for people who listen to music

Cambridge Audio Limited The River Mill, St. Ives, Huntingdon PE17 4EP Telephone: St. Ives 62901