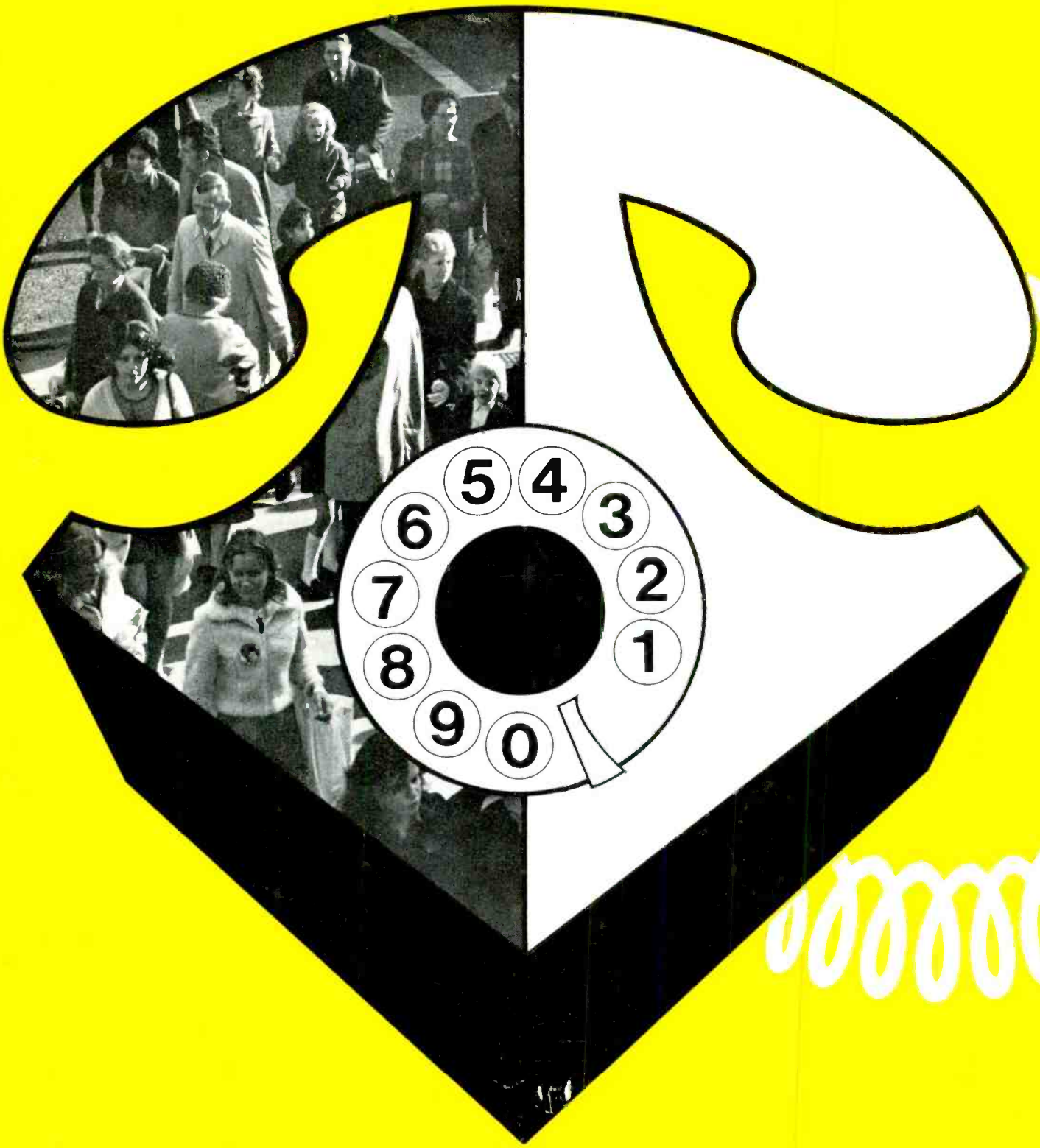
January 1973 25p

studio sound

Telephone balancing: the technical problems of long-distance audience participation

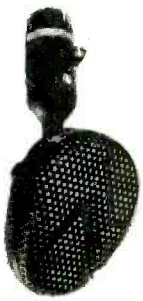


Local radio: American style

one good name deserves another

Hampstead High Fidelity/STC

We are main distributors for all STC high quality professional microphones. The complete range is available from stock and can be seen in our Hampstead Showrooms. Professional terms available.



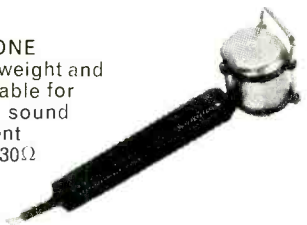
4038
BIDIRECTIONAL
Ribbon
30 Hz - 15 kHz
Impedance: 30Ω or 300Ω
Output: –80 dB ref IV at 30Ω

4104
BROADCAST QUALITY COMMENTATOR'S NOISE CANCELLING LIP MICROPHONE
Sensitivity –84 dB ref IV
Impedance 30 or 300Ω

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

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

4105
CARDIOID MICROPHONE
Small, lightweight and robust, suitable for high quality sound reinforcement
Impedance 30Ω



4115
LIGHTWEIGHT BROADCAST QUALITY NOICE CANCELLING RIBBON MICROPHONE
Impedance 30Ω
Sensitivity 85 dB ref IV

65/1B
LIGHTWEIGHT STUDIO MOVING COIL HEADPHONES
Omnidirectional
Frequency Response
50 Hz to 15,000 Hz
Impedance: 300Ω per earphone
Sensitivity +45 dB ref V/dyne/cm²
Weight 11oz. (300g.)

4001G
HIGH FREQUENCY PRESSURE UNIT
as used by leading loudspeaker manufacturers

hHIFI

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

Also at **DESIGN AUDIO**
36 Marylebone High Street, London, W.1
Telephone: 01-935 4058

studio sound
INCORPORATING TAPE RECORDER

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American Office: 2980 Jackson Street, San Francisco, California, 94116, U.S.A.

JANUARY 1973 VOLUME 15 NUMBER 1

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COLUMNS

REVIEWS

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 enveiope. Matters relating to more than one department should occupy separate sheets of paper or delay will occur in replying.*

Articles or suggestions for features on all aspects of communications engineering and music will be received sympathetically. Manuscripts should be typed or clearly handwritten and submitted with rough drawings when appropriate. We are happy to advise potential authors on matters of style.

'THE NEW WORD and the new sound is quadraphsonic.' 'With four speaker hi-fi you get stereo wherever you sit in a room.' 'Our scientists found there was sufficient information on a stereo disc to give quadraphsonic sound. All they needed was a four-channel amplifier to interpret it.' Three mis-statements and a twice-repeated mis-spelling in the space of one full page advertisement (*The Times*, November 15).

In our own experience, with four speaker 'hi-fi' you do *not* get stereo wherever you sit in a room. Indeed with horizontal surround sound, listening position can actually be more critical than it is for normal two speaker stereo since the listener must balance the relative levels of both front-back and left-right planes instead of merely the latter.

'Our scientists' have perhaps covered the ground already explored by David Hafler? In which case, they set an unhappy precedence by equating quadraphonic with pseudo-surround reproduction; if the 'quad' prefix has any meaning, it must surely apply to the number of information channels carrying the audio signal.

The one attraction of the Hafler 'difference at the rear' reproduction arrangement is its cheapness. For the price of a length of wire and one loudspeaker (routed across the live terminals of a two channel system), stereo difference signals can synthesise a 360° sound stage well enough to convince the general public that they are hearing at least three discrete channels.

The present preoccupation with pseudo-surround systems, leaving aside our advertisement, is tied to the difficulties of printing four discrete channels on a disc. Cartridges offer an obvious alternative medium for the immediate future; thankfully, early talk of an eight track (stereo compatible) cassette has come to nothing. In the longer term, an fm coded disc based on Teldec video disc technology seems an obvious format for inexpensive multi-channel audio.

SUBSCRIPTION RATES

Annual subscription rates for STUDIO SOUND are £3 (UK) or £3.30 ($8 or equivalent) overseas. Six monthly home subscriptions are £1.50. Our associate publication Hi-Fi News costs £3.24 per annum (UK) or £3.66 ($8.64 or equivalent) overseas.
STUDIO SOUND is published on the 14th of the preceding month unless that date falls on a Sunday, when it appears on the Saturday.

PAST ISSUES

A small number of certain past issues may still be purchased from Link House, price 31p each including postage.
Photostat copies of any STUDIO SOUND article are available at 25p including postage.

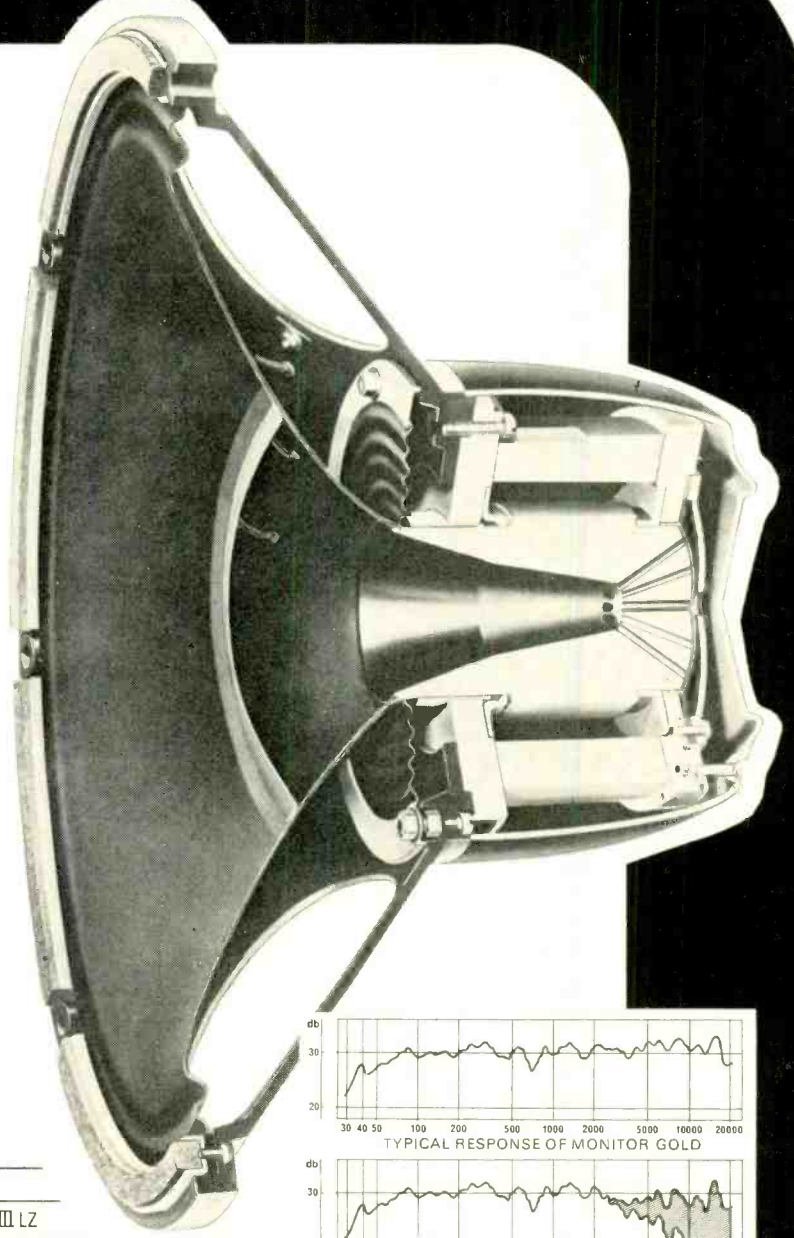
BINDERS

Loose-leaf binders for annual volumes of STUDIO SOUND *are available from Modern Bookbinders, Chadwick Street, Blackburn, Lancashire. Price is 85p. Please quote the volume number or date when ordering.*

TANNOY®

DUAL CONCENTRICS

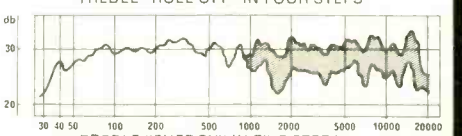
Versions of the Tannoy Dual Concentric loud-speaker have formed the basis of many of the best studio monitors for more than 25 years. The unit is incorporated in a variety of enclosures made by leading manufacturers both in the U.K. and abroad, as well as being incorporated in "package studios" produced by foremost U.K., European, U.S. and Japanese manufacturers. The unit not only has the advantages of high power handling capacity and long term consistency, but the level frequency response, good polar distribution and exceptionally low intermodulation products make it ideal for the highest quality studio monitor systems. Apart from the current range of Monitor Gold units specified below the Monitor 'Red' 15 is still in production and can be supplied upon request in its original 15Ω version.



SPECIFY TANNOY DUAL CONCENTRICS FOR YOUR STUDIO MONITOR

TYPICAL RESPONSE OF MONITOR GOLD

TREBLE "ROLL OFF" IN FOUR STEPS



TREBLE "ENERGY" IN FIVE STEPS

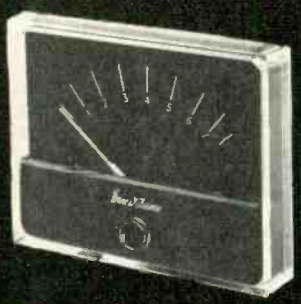
TECHNICAL SPECIFICATIONS			
	FIFTEEN	TWELVE	III LZ
Frequency Response	23-20,000 Hz	25-20,000 Hz	27-20,000 Hz
Polar Distribution for 60° inc. Angle	—4dB at 10,000 Hz	—3dB at 10,000 Hz	—2dB at 10,000 Hz
Power Handling Capacity	50 watts*	35 watts*	25 watts*
Impedance Via Crossover Network	8 ohms (5 ohms min.)	8 ohms (5 ohms min.)	8 ohms (5 ohms min.)
Intermodulation Products	less than 2%	less than 2%	less than 2%
Bass Resonance	26 Hz	28 Hz	30 Hz
Crossover Frequency	1,000 Hz	1,000 Hz	1,200 Hz

* Depending on type of enclosure.

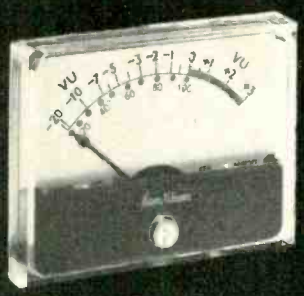
TANNOY®

WEST NORWOOD
LONDON SE 27 9AB
TEL: 01-670 1131

PEAK PROGRAMME METERS to all B.B.C. specifications



AND **VU METERS** TO THE BELL SPECIFICATION



OVERSEAS AGENCIES

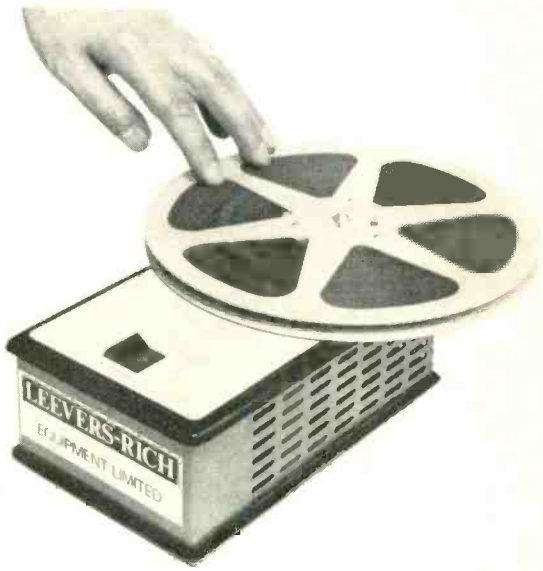
R. Schmidt	Copenhagen	Denmark
Oy Chester	Helsinki	Finland
Theal N.V.	Amsterdam	Holland
Vianello	Milan	Italy
Rieck	Bergen	Norway
Eltec	Lisbon	Portugal
Nordstrand	Stockholm	Sweden

Ernest Turner
ELECTRICAL INSTRUMENTS LTD
CHILTERN WORKS
HIGH WYCOMBE
BUCKS
ENGLAND

how do you clean your tapes?

LeeRaser
Bulk erasure is the only way to get rid of background noise and build-up of incompletely erased signals.

Ask for details of the new LeeRaser LR70 and LR71 tape demagnetisers



Contact ***Nick Nichols*** *at our London office, telephone* ***01-874 9054*** *He will be glad to help.*

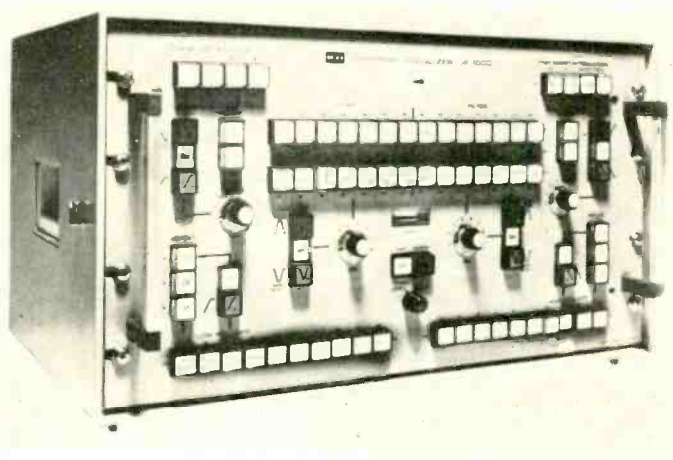
LEEVERS-RICH
EQUIPMENT LIMITED
A Member of the MCP Group

LEEVERS-RICH EQUIPMENT LIMITED
319 TRINITY ROAD, WANDSWORTH,
LONDON SW18 ENGLAND

NEWS

Inaugural meeting

THE NEWLY-FORMED Guild of Television Cameramen held their first meeting at London Weekend recently. Present were television cameramen from ITV and the BBC, who elected officers and national council members. Richard Hibberd, head of cameras at HTV, who was largely responsible for starting the Guild, is the chairman. Vice-chairman is Kenneth Manning of LWT and secretary is David Rogers of Thames. The treasurer is David Higgon of ATV Elstree. The national council members, comprising the above and ten council members, will meet three times a year. In a statement, the Guild said that their aim would be to ensure the professional status of the tv cameraman and to liaise with manufacturers about future developments in camera equipment design.



New filter unit

Appointment

GARY ANDERSON has been appointed project engineer of the systems division of Sound 80's, a Minneapolis firm. The company make mixers as well as providing other services for the manufacture of records. They have three divisions: systems, for making electronic devices and systems; recording studios and record production; and creative services, which offers 'composing and arranging talent'. Mr Anderson will be mainly concerned with theatre sound systems. Sound 80 started by designing the Minneapolis Tyrone Guthrie theatre and then did work for universities and businesses.

Shepperton settlement

BARCLAY SECURITIES have partly lost their battle to redevelop most of the site of Shepperton studios. Lion International, formerly British Lion, were taken over by Barclay earlier this year. Shepperton was reported to be losing about £12,000 a week but, ironically, the land on which it stood was worth about £4,000,000. When Barclay took over they said they would develop 22 hectare (55 acres) of the 24 ha site at Shepperton, which has the largest silent stage in Europe. Now the National Film Finance Corporation has exercised its veto of the sale, with the approval of the government.

This still means, however, that to make Shepperton pay 16 ha of the site will have to be developed and the studio lot thus reduced to a less expensive 6 ha. Up to March this year British Lion, as it then was, suffered a trading loss of £250,000.

New Mullard publication

MULLARD ANNOUNCE a second edition of their *Transistor Audio and Radio Circuits*. New circuits have been added that have been developed since the first edition appeared in 1969. Many of these use integrated circuits. Three new power amplifier designs have been included; one each for powers of 15W, 35W and 50W. An extra chapter has been added on loudspeakers.

There are 300 pages and the price of the book is £1.80.

A NEW EQUALISER with eight audio frequency filters arranged in six modules is now available from F. W. O. Bauch. Each module has a separate function and any combination of the filters can be put into the audio signal path. The unit has 14 low filter frequencies, 14 high filter frequencies, ten low cutoff frequencies and ten high cutoff frequencies.

The *UE1000*, as it is called, has slopes of 12, 24 and 36 dB per octave and will deal with signals up to levels of +22 dBm corresponding to 10V with built-in overload protection. Frequency range is from 20 Hz to 20 kHz at less than 0.3 per cent distortion up to +22 dBm. One switch enables the signal to be equalised or passed through unaltered, allowing comparison between the two states.

Agent: F. W. O. Bauch, 49 Theobald Street, Boreham Wood, Herts WD6 4RZ.

EMI contract

EMI WILL supply £750,000 worth of television equipment to Hong Kong. Rediffusion (Hong

10 ▶

Part of the recently extended Tannoy production facility at West Norwood, South London.

One touch and it's a fade accompli.

Penny & Giles linear motion studio faders fade so smoothly, so noiselessly, with so little effort that a touch is all that's needed for a perfect fade.

Their smoothness, infinite resolution and freedom from noise come from mirror finish conductive plastics wiped by multi-finger precious metal wipers.

The lifelong reliability comes from Penny & Giles' experience in the exacting world of avionics.

The full details of Penny & Giles' studio faders come when you send the coupon.

So why not send it?

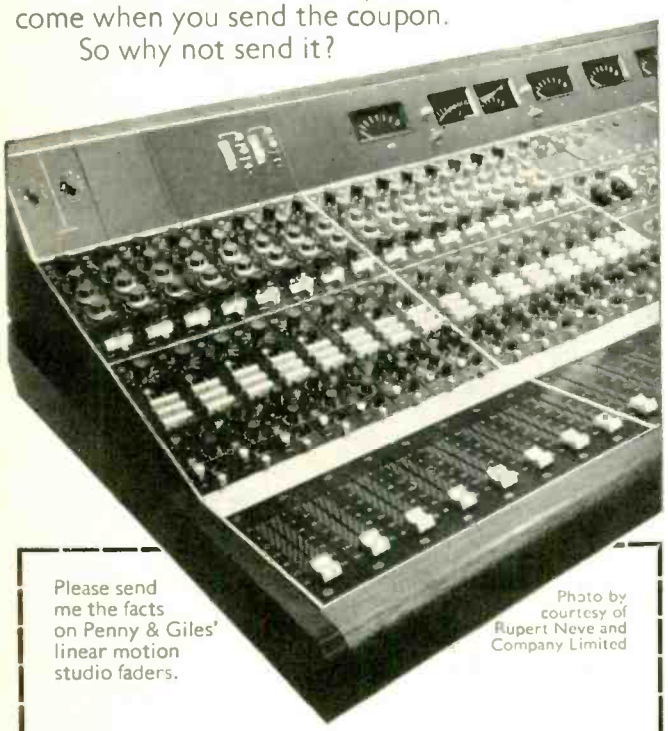


Photo by courtesy of Rupert Neve and Company Limited

Please send me the facts on Penny & Giles' linear motion studio faders.

Name_____

Position_____

Company_____

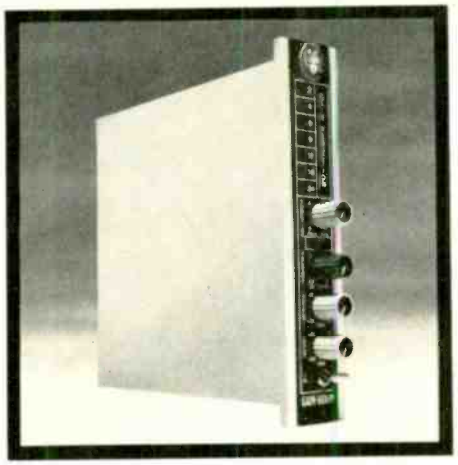
Address_____

Telephone_____

Penny & Giles Conductive Plastics Limited,
Newbridge Road Industrial Estate, Pontllanfraith,
Blackwood, Monmouthshire, South Wales NP2 2YD
Telephone: Blackwood 3771-4 Telex: 49135

A member of the Penny & Giles group of companies

SS 1/73



Gain Brain
Limiter Module

combines peak and RMS limiters

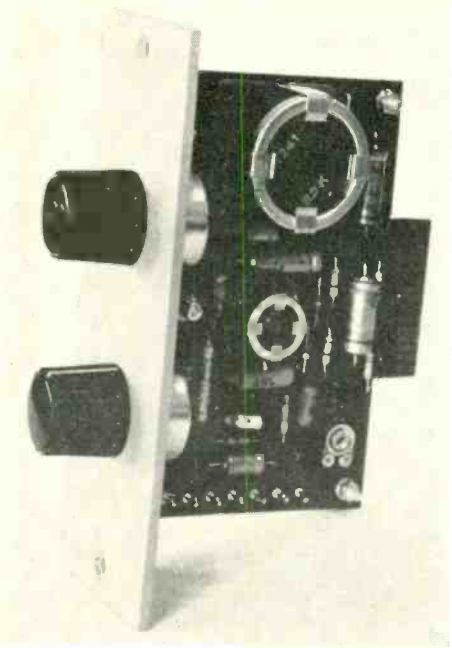
LED devices permit fast, accurate, reliable readout

particularly effective on complex signal sources such as drums, horns and electronic music

ALLISON RESEARCH

F.W.O. Bauch Limited
49 Theobald Street
Boreham Wood Herts.
Tel: 01-953 0091

continued



Above: Cryslon microphone amplifier.
Left: Combined cleaner and degausser for eight track cartridge transports. Model 288 is handled by Ampex Great Britain, Acre Road, Reading, Berkshire.

Kong), who will take delivery of the equipment, are replacing much of the equipment installed since they first began to operate a wired tv service on the colony in 1957. The new equipment will use the 625 line standard. Rediffusion have been using Thames Television as their consultants on the project, which involves new technical areas, apparatus rooms, presentation suites and master control, telecine and videotape suites. Video switching and mixing will be done by EMI's *7000 series* equipment, first shown at IBC 70.

Synthesiser guarantee

DEWTRON ARE guaranteeing all their synthesiser modules for two years. The guarantee will apply to all the modules, whether they have been bought individually or in finished equipment. The range of modules includes sample and hold, envelope shapers, precision voltage controlled oscillator *VCO2*, voltage controlled amplifiers, and reverberation and phase units. Dewtron make custom-built synthesisers as well as the Gipsy unit, which was demonstrated at this year's Musical Instrument Fair.

Bell and Howell appointment

BELL AND HOWELL have appointed a new director of applied research for their electronics and instruments division. Mr R. Catherall, 49, was formerly director of research for Solartron. The new applied research department, of which Mr Catherall will be in charge, will develop new products, 'possibly involving new fields of business but allied to our particular skills and technology'.

The electronics and instruments division is one of Bell and Howell's three divisions, and other appointments to the divisional board are: chairman, Mr G. E. A. Perutz; managing director, Mr W. J. Fry; engineering director, Mr D. J. Collins; financial director, Mr B. F. G. Finlay; marketing director, Mr A. L. Knight; and chief financial officer, Europe, Mr B. H. Sweetman.

Bell and Howell's trading figures for the last quarter show net earnings of 5,082,000 dollars on sales of 96,375,000 dollars.

Mic amplifier

CRYSLON ELECTRONICS, a Midlands firm, have added a new series of audio modules to its range of equipment. The mic amplifier, for example, has push button selection, lf and hf boost and cut, and a line input. Two types of equaliser unit are offered, as well as a line amplifier, power supplies, 15W power amplifiers and a ten input, 20 output mixer. All the terminations are via edge connectors.
Manufacturer: Cryslon Electronics, The Firs, Rother Street, Stratford-on-Avon, Warwicks.

AES Convention

THE 44TH AES CONVENTION will be held in Rotterdam from February 20 to 22. Participants must register by January 15. Application forms are available from the secretary, Mr H. A. O. Wilms, Zevenbunderslaan 109, B-1190 Vorst-Brussels, Belgium.

Cadac

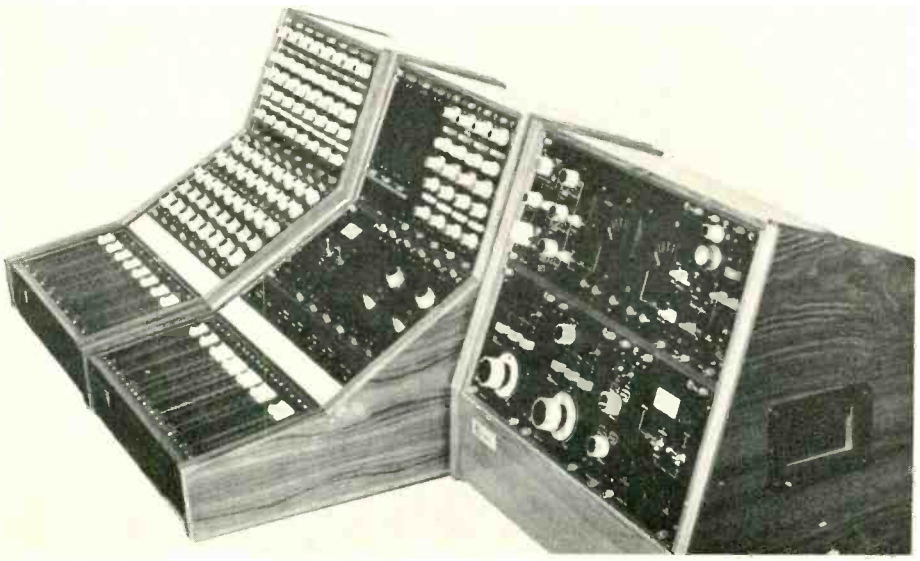
Apologies to Cadac from our advertisement staff for three errors in one line of Cadac copy (page 29, December). The line in question should read: Console designed for Studio Van de Water, Baarn, Holland.

Disco amp

LINEAR HAVE made a 70W disco/amplifier which has been designed to stand up to rough handling. The unit, the *T80/100D*, has two volume controls, one per input, a mic input and mic volume control, a monitor volume control and monitor output, a master volume control and bass and treble controls. A toggle switches between gram inputs. There is a smaller version available which delivers 40W rms and costs £49.50. The unit described above is priced at £69.75.
Manufacturer: Linear Products, Electron Works, Armley, Leeds.

Future Film agency

FUTURE FILM have been appointed as distributors for Colclene cleaning products. Colclene are made by Alexander Cole Ltd and the range includes *TF* aerosols and *33* and *88* lint free cloths for professional audio uses. Further information can be obtained from Mr C. S. Young of Alexander Cole, 257 Cranbrook Road, Ilford, Essex.



Left: the BBC Radio Two desk, built by Calrec and first used to broadcast from the audio fair, is in three units. Inputs can be added in groups of eight, as in the far left of the picture. Other features include full equalisation, metering and monitoring, four stereo routed groups, four stereo ancillary groups and two clean feeds.

PATENTS

THE FOLLOWING list of complete Specifications Accepted is quoted from the October issues of the Official Journal (Patents). Copies of specifications may be purchased at 25p each from The Patent Office, Orpington, Kent BR5 3RD.

October 4, 1972

1296034
Post Office
Speech communication systems

1296072
Telestrator Industries Inc
Electronic teaching systems

1296101
Raffaeli, C and Somigli, G
Mechanical amplifying gramophone devices

1296114
RCA Corporation
Automatic chroma control circuits

1296132
Wescom Inc
Echo suppressor

1296144
Bell Accordion Corporation
Musical instrument

1296164
Singer Co
Antenna array system for generating shaped beams for guidance during aircraft landing

1296174
International Business Machines Corporation
Text display device

1296298
Hollandse Signal-Apparaten, NV
Procedure for sealing waveguide nozzles and ends

1296359
RCA Corporation
Signal polarity switch

1296364
RCA Corporation
Colour amplitude control circuits

1296405
Instrument Systems Corporation
Entertainment service system

1296406
Instrument Systems Corporation
System including a self test arrangement

1296407
Instruments Systems Corporation
Closed loop control system

1296408
Instrument Systems Corporation
Service system for a plurality of discrete stations

1296535
Kolbe & Co, Hans
Aerials

1296551/2
Elliott Bros (London) Ltd
Display apparatus

1296567
International Standard Electric Corporation Pal
Switch and colour-killer

1296570
Haberkern, O
Cinematograph projector

1296593
Thomas Organ Co
Electrical instruments

1296644
Retention Communication System Inc
Audio-visual projector

1296646
Compagnie Industrielle Des Telecommunication Cit-Alcatel
Capstan drive arrangement suitable for a high-speed intermittent tape drive

1296674
Hitchcock, K
Organ speaker cabinets

1296730
Matsushita Electric Industrial Co Ltd
Magnetic recording and reproducing device

1296741
International Business Machines Corporation
Electronic circuits with controllable slope transfer functions

1296781
Phonocopy Inc
Electrostatic facsimile printer

October 11, 1972

1296854
National Research Development Corporation
Tape Storage devices

1296882
Standard Telephones & Cables Ltd
Microphone headsets

1297013
Mead Corporation
Method and system for reconstruction of images

1297023
Hell, DR Ing Rudolf
Method of obtaining and processing control data for electronic phototype-setting apparatus

1297028
Marconi Co Ltd
Electro-mechanical transducers

1297054
RCA Corporation
Television colour differences signal encoding system

1297055
Hitachi Ltd
Electrically operated optical shutter

1297058
TelfonAktiebolaget L M Ericsson
Electric filter element

1297060
RCA Corporation
Video processing circuits for a television camera

1297076
Licentia Patent-Verwaltungs—GmbH
Circuit arrangement for a character-writing cathode-ray display

1297093
Standard Telephones & Cables Ltd
Acoustic earpiece

1297211
Doring, E
Recorded audio medium in particular for instruction purposes

1297292
Nippon Telegraph & Telephone Public Corporation
Frequency group branching filter device using dielectric elements

1297319
Kakehashi, I
Automatic rhythm performance device

1297321
Murata, S
Mode changeover apparatus for a miniature type cassette tape recorder

1297450
Ampex Corporation
Magnetic tape duplicator

1297481
Tapecon Inc
Device for adapting a cassette tape recorder to operate with cards bearing a recording medium

October 18, 1972

1297633
EMI Ltd
Hydrophones

1297674
Compagnie Des Comteurs
Phase comparing devices

1297675
Motorola Inc
Colour television signal demodulation system

1297683
Sony Corporation
Tape loop forming mechanism for use with a tape record/playback mechanism

1297684
Sony Corporation
Tape recording and/or reproducing apparatus

1297685
Sony Corporation
Tape guiding mechanism for use with a magnetic recording and reproducing apparatus

1297686
Sony Corporation
Tape record/playback mechanism with tape loading device for use with cassettes

1297693
RCA Corporation
Colour television signal generating system

1297753
AKG Akustische U Kino-Gerate GmbH
Headphones

1297766
Jakubovicz, J
Musical instrument

1297774
Philips Electronic & Associated Industries Ltd
Wave transmission time delay device

1297832
Xerox Corporation
Imaging system

1297852
Licentia Patent-Verwaltungs GmbH
Telecommunication signal circuit arrangements

1297877
Hitachi Ltd
Facsimile transmission system

1297879
North American Philips Corporation
Image sensor

1297914
American Danish Oticon A/S
Hearing aids

1298024
Burroughs Corporation
Multiple transducer magnetic head

1298113
Witmer, W H
Electronic image-producing apparatus

1298118
Pioneer Electronic Corporation
Magnetic recording and reproducing device

1298163
Industrie A Zanussi SPA
Safety device for preventing radiation leakage from microwave producing apparatus

1298167
Bookman, J
Cassette-type tape recorder

1298225/6/7
Norris, E G
Phonograph record player apparatus with radial arm

1298276
Matsushita Electric Industrial Co Ltd
Magnetic tape duplicating apparatus

1298371
Tennelec Inc
Analogue to digital conversion systems and methods

1298385
RCA Corporation
Constant velocity vector generator

October 25, 1972

1298428
Ampex Corporation
Cassette feeding apparatus

1298451
Netherlands, Applied Scientific Research for State Defence
Generator producing a quasi random series of zeroes and ones

1298457
National Research Development Corporation
Optical scanning systems

1298471
International Business Machines Corporation
Multiplex switching systems

1298500
RCA Corporation
Stabilised biasing arrangements for kinescopes

1298509
Sony Corporation
Transistorised signal-control circuits

14 ▶

A new 4-channel recorder from Teac under £500. Unique!

TEAC® A-3340

Full sel-sync on all 4 channels. Unparalleled mixing flexibility.
VU meters switchable between tape/input.

Sole U.K. distributor for the TEAC A-3340.
Industrial Tape Applications, 105 High St., Eton, Windsor, Berks. Tel. Windsor 52663

PATENTS

continued

1298522
Nippon Victor KK
Arrangements for use in magnetic recording and reproducing
1298537
Philips Electronic & Associated Industries Ltd
Television receiver
1298562
Matsushita Electric Industrial Co Ltd
Recording and playback apparatus
1298568
Audio Arts Inc
Acoustic transducer
1298588
Agrati, E and Sala, E (trading as Polistil Snc de Agrati Eugenio E Sala Ennio)
Cinematograph projector particularly for reduced gauge films
1298647
Mondo KK
Endless tape cartridge
1298696
Fuji Photo Film Co Ltd
Magazine for an endless film
1298716
Singer Co
Laser multicolour television display apparatus
1298770
Graphic Science Inc
Telephonic transmission of data in graphic form
1298794
Nixdorf Computer AG
Recording medium for the reproduction of information
1298824
Matsushita Electric Industrial Co Ltd
Magnetic recording and playback apparatus
1298839
Philips Electronic & Associated Industries Ltd
Characters transmission system
1298853
Industrie A Zanussi SPA
Apparatus for monitoring a remote scene in both sound and vision
1298902
Goto Optical Mfg Co Ltd
Panoramic motion picture camera assembly
1298914
International Business Machines Corporation
Tape storage cartridges
1298939
EMI Ltd
Frequency divider circuits
1298962
Ri-El Richerche Electrouiche SRL
Record player turntable construction
1299005
Roos, M J
Film cartridge loading machine
1299055
Storage Technology Corporation
Dynamic amplitude control for magnetic tape system
1299066
Eastman Kodak Co
Strip take-up device
1299073
Dallas & Sons Ltd John E
Acoustic resonators for sound producers
1299088
Thomson-Csf
Signal spectral multiplexing and demultiplexing system
1299124
Philips Electronic & Associated Industries Ltd
Electro-acoustic transducer

Controlling film motion

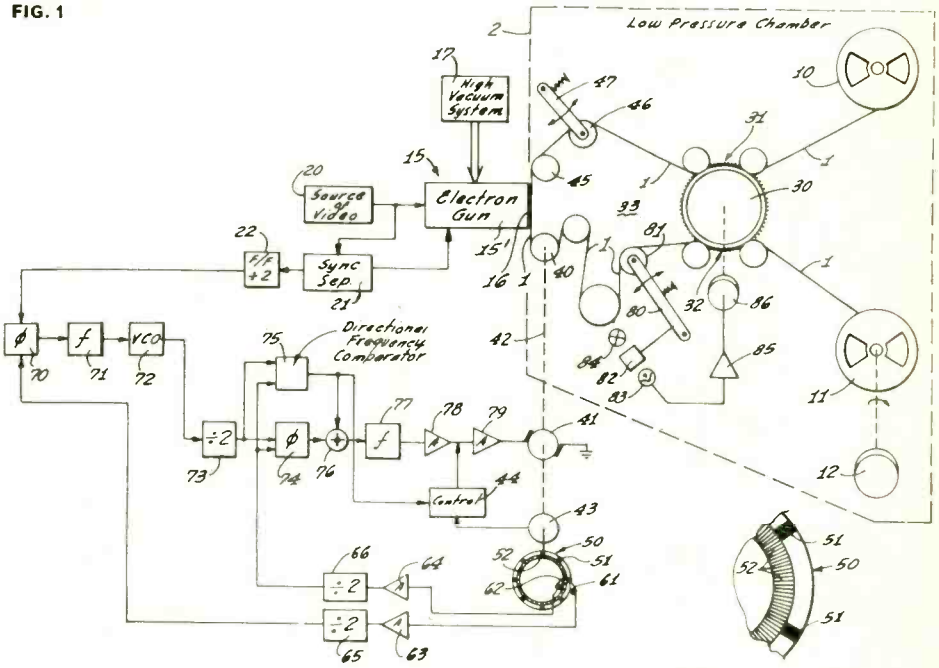
PATENT 1,287,030 is concerned with electron beam recording and describes a 3M refinement of the film transport servo which holds the recorded picture in a fixed relationship to the film sprockets. Three ways of using the idea are described, one of which is shown in **fig. 1**. Here the film is pulled through the recording gate *16* by a drive sprocket *40* coupled to a low inertia dc motor *41*. The motor shaft also carries a tacho wheel *50* with one set of low frequency markers *51* which are detected by a photocell whose output drives an electronic servo in the usual way. This same tacho wheel also carries a finer set of markings whose detected output is used by the servo in a novel manner.

The lf part of the system is similar in principle to a vtr head drum servo in the record mode and simply ensures that each recorded picture *starts* at the right place on the film. It cannot control errors that occur *during* the 40 ms of the television field. To correct these errors, a second servo loop with a much more rapid response time 'rides on the back' of the main system, adding short-term positive or negative currents to the basic dc motor supply. Thus the first servo loop synchronises the film to the video field frequency and controls wow, while the secondary hf loop controls the flutter which, as in audio tape equipment, is normally suppressed by a flywheel.

This seems attractive for other uses than film recording but it does depend upon having a motor and drive sprocket with incredibly low inertia to respond to the high frequency flutter correction signals . . . but then ideas need not actually work to be patentable!

Roderick Snell

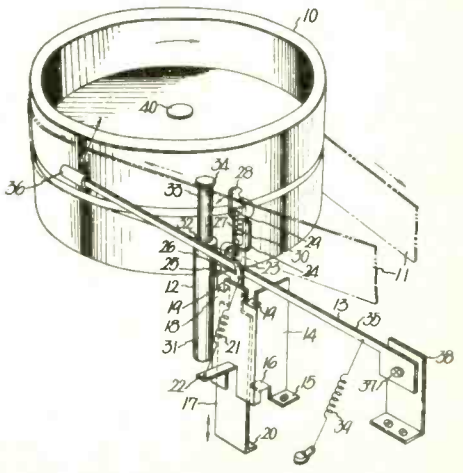
FIG. 1



Lacing up video tape

THE TAPE in a helical scan video cassette recorder has somehow to be automatically extracted from the cassette at the start of playing, then unwrapped from the drum and fed back into the cassette at the end. This is a knotty problem and some video player systems, for example EVR and the Toshiba/Ampex Instavideo, avoid it altogether by building the take-up reel into the machine. The attendant disadvantage is the impossibility of removing the cartridge or cassette without rewinding to the beginning of the program. Both Sony and Philips have ingenious methods of lacing and un-lacing the tape from the drum and in patent 1,290,044 Sony describe a simple rubber-tipped (*36* in **fig. 2**) arm which winkles the tape off the top of the drum in one movement so that, providing it is not buckled or scratched, it can easily be wound back into the cassette. **R.S.**

FIG. 2



Video media

THE EVR Corporation were first in the field with television players of low enough cost to make educational and home use possible. The invention of Dr Peter Goldmark uses 8.75 mm film recorded in a vacuum and played back on small flying spot telecine machines which produce modulated rf suitable for feeding directly into the aerial sockets of tv sets. It was described in greater detail in STUDIO SOUND, December 1970. The system is unusual

16 ▶

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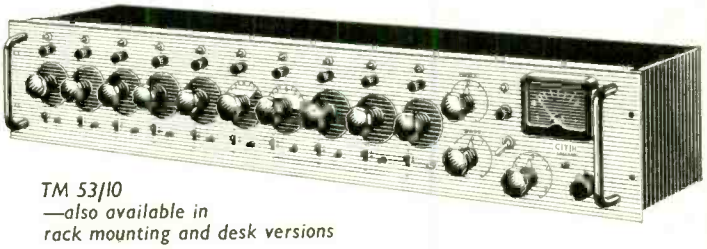

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in employing 50 f/s instead of the 25 f/s of normal film. This makes EVR less economical than conventional 8 mm film, which runs at 9.14 cm/s as opposed to 12.7 cm/s for EVR. Patent 1,289,779 attempts to reduce film costs by recording signals on the film which trigger a still frame facility whenever the sound and vision content will allow—as, for instance, when a chart is being shown. It is intended that the player be manually restarted after each auto still frame. On manually selected still frames the raster of the flying spot scanner has to be reduced to half its normal height, as it no longer needs to compensate for the film motion, but the triggered still frames can be recorded with twice the normal height to prevent unequal burning of the scan tube face. Additionally, when colour recording is not needed, EVR film can carry two monochrome programs side by side and the recorded still frame trigger can be arranged to switch tracks. This seems a fairly obvious improvement that could well be added to other kinds of video player. **R.S.**

Digital information transmission

THE BANDWIDTH needed to take full advantage of 625 line television is about 5 MHz. Much effort has been spent looking for ways of reducing bandwidth while maintaining the subjective sharpness and signal-to-noise ratios of current tv systems. This BBC patent (1,289,015) describes just such a reduction in a digital transmission and reception chain.

The assumption made is that the viewer takes more than one tv frame (i.e. 20 ms) to perceive the detail in a new scene, so the first frame of any new scene is transmitted with a low bandwidth. The following frame is then compared with the first and only the *difference* is transmitted. Thus the second and successive frames transmitted are only fine adjustments until the next scene change. A six digit binary code (i.e. 2^6) would normally be needed to transmit 6^4 discrete brightness levels. Using the BBC system (**fig. 3**) a three digit code would set the level to the nearest of the eight possible values in the first frame, the processor would then change mode and, for the next frame, use its eight possible levels as a 'vernier' adjustment, giving the required resolution of 64 levels over a period of two frames.

The communications engineers' dream of sending only the *changes* in a television scene rather than repeating the whole thing every 40 ms comes a step nearer with this invention. **R.S.**

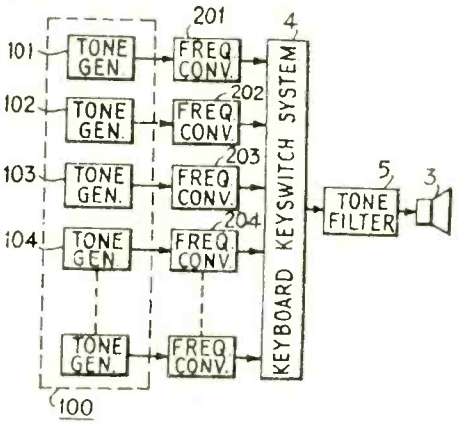
Electronic music

ELECTRONICALLY SYNTHESISED musical tones are nearly always easily distinguishable from acoustically generated tones, regardless of any attempt at imitation. One reason is that the mechanical and acoustical vibrations in a conventional musical instrument do not have exact harmonics, overtone frequencies being not exactly positive integral multiples of that fundamental frequency. The greater the order of the harmonic, the greater the inharmonicity. Hence the distinctive 'impure' sound of a real musical instrument. Electronically synthesised harmonics, on the other hand, are exact.

Matsushita Electric Industrial discuss this and other differences between real and synthesised musical sounds, in BP 1,286,128. For instance, they suggest that octave musical intervals should not always be exactly in the ratio 2:1. As an improvement on known synthesisers, the Japanese patent suggests using a generator which produces a tone consisting of a fundamental together with a series of exact harmonics. The tone generator output is fed to a frequency shifter which moves all the frequencies up or down by a given amount, which is usually a sub-audio frequency. This creates inharmonicity and can enhance the musical interest of the sound for the reasons explained above. The Japanese claim that it is possible to match the inharmonicities of acoustic instruments in this way. Usually a number of tone generators and frequency shifters will be combined together with a keyboard switching system and a tone filter to replicate a musical instrument (see **fig. 4**). The sequence of exact harmonics generated by the tone generators *101*, *102*, *103*, *104*, etc, are biased so that their output frequencies make a musical scale. The shift for each output tone can be either constant or variable and of course the output tones can be subjected to all manner of further treatment. The patent also gives details of how four frequency bands can be employed, the lowest being shifted downwards and the higher two shifted upwards with the one remaining band unchanged. This is intended to produce octaves at each extreme of the frequency range which are wider than the exact 2:1 ratio of the generators.

Adrian Hope

FIG. 4



Electronic tremulant

THERE IS ALL manner of confusion in the pop world over the difference between vibrato and tremolo. To set the record straight, vibrato is frequency modulation and tremolo low rate amplitude modulation. Tremolo is far easier to produce than vibrato but on the whole less satisfying.

In BP 1,288,959, Messrs Miller and Key of Oklahoma, USA, give some useful USA patent numbers relating to known systems. They also say something to which I'll drink: because of the inadequacy of most electronic tremolo systems, the mechanical systems (such as that originally patented by D. J. Leslie) are still hard to beat. Which is why organ players the world over transport mammoth Leslie speakers with them.

The new patent seems to try and create Leslie mechanical effects by purely electronic means. In **fig. 5** they show their basic schematic for tremolo. The undoctored input audio signal (e.g. from an organ) is applied at *30* and fed to transformer *32* with a centre tapped secondary earthed at *34*. One terminal of the secondary is connected to variable resistor *36* and capacitor *38* is connected between *36* and earth

FIG. 3

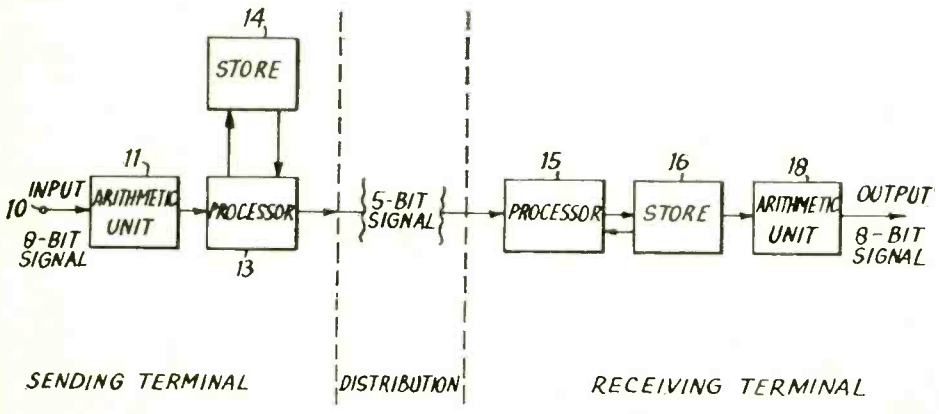
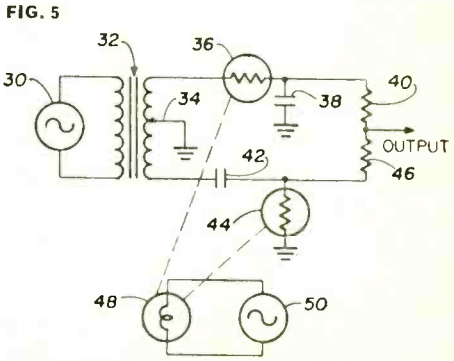


FIG. 5



to form a low-pass filter. The output from the low-pass filter is fed via resistor *40* to the circuit output. The other terminal of the secondary is connected to capacitor *42*, one terminal of which is connected through variable resistor *44* to earth. This provides a high pass filter, the output of which is fed via resistor *46*, also the circuit output.

The variable resistors *36* and *34* are photo-sensitive and a light source *48* powered by generator *50* provides a variable illumination of the resistors. Obviously any variations in illumination of the resistors *36* and *44* will alter the frequency responses of the high and low pass filters. As both the resistors are being varied by the same light source, the frequency response of one filter will go up while the response of the other will go down, and vice versa. This in turn varies the waveform rollover and crossover points. Crossover changes will cause phase change effects and these will produce a tremulant effect.

To provide a more exciting result, the unmodulated signal can be mixed with the modulated signal. For anyone interested, there are pages of details given in the patent of the frequency characteristics necessary for filters to simulate the working effect of a mechanical rotating speaker. With present-day electronic techniques as flexible as they are, it is a relatively easy step to providing for virtually infinite flexibility of the phasing effect to allow fine control by individual musicians. **A.H.**

Bottled music

IT MIGHT BE argued that you can get all the sounds you need by the imaginative use of everyday objects. Up to a point, this holds water. And while on the subject of water, BP 1,283,818 from Tadashi Funakoshi of California, USA, is worth mentioning. Mr Funakoshi begins by saying that it seems a pity to discard packs of no-return bottles. He has patented a way of making a musical instrument out of them.

A mouthpiece rather like a harmonica is made from a plastic block with a series of through holes—ideally at least 13 to correspond with a chromatic octave. Each of the through holes is connected at one end to a flexible pipe and a small plastic gadget which holds the remote end of the pipe traverse to the open mouth of a bottle (**fig. 6**). By selectively blowing into the mouthpiece holes, air will be blown across the bottle mouths to set up stationary waves and produce tones (each bottle constituting a quarter wave column length).

Tuning can of course most easily be achieved by slowly pouring water into a bottle until it is correctly pitched. I have fond memories of a long night spent at the Edinburgh Festival trying to find and tune up a full octave's worth of empty milk bottles. BP 1,283,818 suggests an easy approach. If all the bottles are the same size, a template can easily be made and sold with the rest of the gadgetry in a kit. The bottles can then be filled up and tuned by sight. **A.H.**

Ear defenders

NO ONE DOUBTS the potential danger of high level sound to the human ear, but wearing simple earplugs is a poor answer. In BP 1,289,993, Cosmocord Limited suggest a refinement. An ear-covering helmet is worn by the subject, the helmet being formed from an inner and an outer shell spaced apart by sound absorbent material (**fig. 7**). The ears thus receive very little direct sound. Most of the sound they do receive is via small loudspeakers fixed like headphones on the inside of the helmet. The loudspeakers are powered by small amplifier modules *10* fed from microphones on the outside of the helmet. By using plug-in limiter-amplifier modules, the helmet can be adapted to protect the user against signals which exceed a predetermined threshold level. Thus anyone working next to very high powered sound systems (e.g. at pop concerts) would be sure of hearing only up to safe levels. A frequency limiting module could cut out excessive top frequencies but still let through other frequency bands in their entirety. And, of course, by using radio receiver modules the helmet could be used for communications. **A.H.**

Self adjusting flywheels

IN BP 1,288,046 RCA Corporation of New York patent an allegedly new idea in flywheel mounting for tape recorder capstans. During tape drive, a flywheel will tend to rotate in a plane through its centre of gravity. Any variation of the capstan alignment from a right angle to this plane will therefore cause eccentricity of the tape contacting surface with respect to the shaft. Audibly the result will be wow and/or flutter. Hence precision tolerances are necessary—and precision tolerances are expensive and sometimes difficult to control in mass production.

RCA suggest using a flywheel which fits fairly loosely on its shaft. To each side of the flywheel, a flange disc is rigidly connected to the shaft. In the **fig. 8** embodiment each of these discs is connected to the flywheel by a resilient washer so that the end product is a sandwich of disc/resilient-washer/flywheel/resilient-washer/disc. By virtue of the resultant resilient connection between the flywheel and the shaft, the flywheel should be able to rotate in a plane about its centre of gravity even if the shaft and flywheel are imperfect. **A.H.**

Video disc system

PATENTS 1,288,769 and '70 cover a magnetic recording system in which a disc (*10* in **fig. 9**) is used as the medium. Record/play heads (*14* and *15*) traverse both sides at the same time. Each head is driven by a separate worm gear (*18* and *19*) coupled to a stepper motor (*16* and *17*). Each movement of a head is initiated during the frame blanking period and the stationary head on one side records a concentric circle of video information while the head on the other side moves inwards in preparation for the next frame. For slow-motion playback, each field can be played as many times as needed. For speeded up playback, the heads are moved in by an integral number of tracks so that some of the frames are skipped. A claim made for the system is that, unlike the Ampex variable speed disc recorder with which the patentees are clearly familiar, properly interlaced pictures are achieved at all playback speeds without complex electronic correction. A disadvantage seems to be that, with this system, the playback speed has to be n or 1/n times the recorded speed, where n is an integer. It *is* useful to have infinitely variable speed adjustment. **R.S.**

FIG. 6

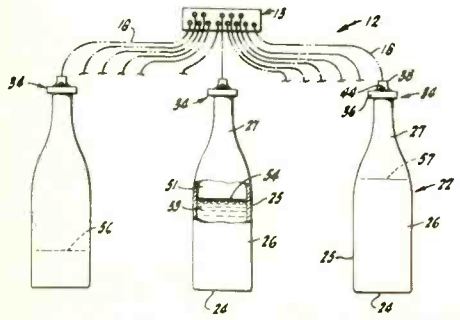


FIG. 7

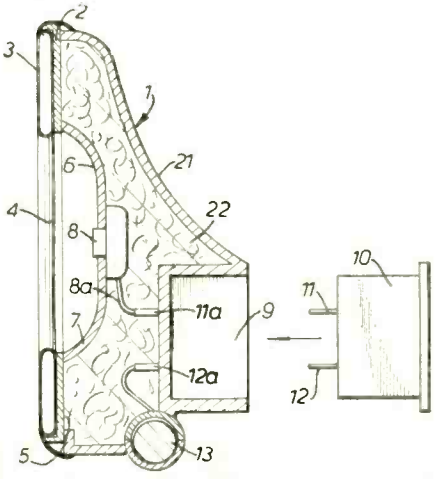


FIG. 8

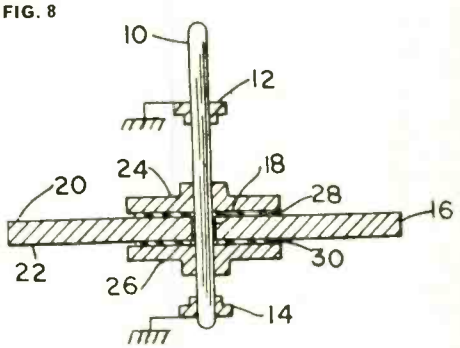
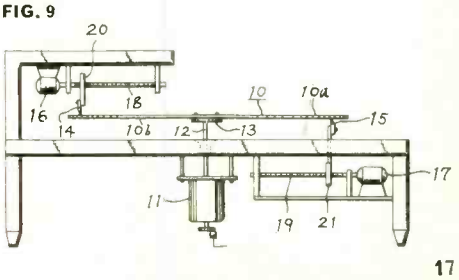


FIG. 9



DIARY

By John Dwyer

SINCE I TOOK over this column from K. Wicks I've heard a lot of talk about **De Lane Lea.** You can't pay much attention to rumours —there's more than a remote chance that they've been kindled by jealousy—but the way people talked it did seem, at times, as though the only way De Lane Lea were going to get anyone as far out as Wembley was to ask Princess Margaret to open the place a second time.

Now, as reported in last month's STUDIO SOUND, we hear that **CTS Studios**, formerly of Bayswater, have moved in with De Lane Lea. The property company that took CTS over in March decided at last to close the studio. But many of the staff decided that to close would be a disservice both to the people who worked at CTS and to the film industry. Thus CTS have formed a company within De Lane Lea that will use De Lane Lea's facilities. CTS's own equipment will be sold.

CTS is a frantically busy concern, with a list of credits that includes all the Bond pictures, *Images*, *Nicholas and Alexandra*, *Goodbye Mr Chips*, *The Boyfriend*, *The Devils*, *Ebenezer Scrooge*, *A Touch of Class*, and work for tv series like *The Protectors*. Now they are busy on *Marco Polo*, *Alive Alive Oh*, and some of the work for *Big B, the Biggest Dog in the World*, which has partly been done at **Anvil.**

The activities of the two studios should complement one another and put an end to the speculation about both CTS and De Lane Lea. De Lane Lea, unlike EMI and CBS, has to make its own way without the backing of a massive record company. On the other hand, the assistant manager of one of the large studios put it to me that the independents tend to have a less fusty image than the tied studios, an image which works to the independents' advantage. If De Lane Lea has problems they can be traced to its remoteness from the city centre. I know of one producer who, like most of his colleagues, greatly admires what De Lane Lea has to offer but he rarely books a session there because, so he says, it is difficult to get session men to go to Wembley. They would rather work in the West End where there's usually only a ten-minute cab ride between sessions.

Dave Siddle, of course, not quite happy with doing admin work, has gone back into the technical side and Louis Elman has taken over the paperwork. Despite a rather strange denial of any staff changes by Mr Elman, Martin Birch and Louis Austin have left.

Recent sessions at De Lane Lea have included recordings by the London Philharmonic and the band of the Coldstream Guards, produced by Dave Miller and engineered by Dave Hunt; music and post-production work for the Merlot film *Mistress Pamela*, produced by Jim O'Connolly; and work on Michael Sloane's *The Assassin*, directed by Peter Crane and starring Ian Hendry, Frank Windsor and Edward Judd. Music for Thames's Mike and Bernie Winters show was directed by Ronnie Aldrich and engineered by Dave Hunt.

Advision seem to be pretty busy. Charlie Drake, for example, has cut a new single and other sessions have been held by Peter Straker, Soft Machine, Dave Dee, Gentle Giant, Sacha Distel, the Searchers, Richard Harris, Billy McPhail and, inevitably, Shirley Bassey, who rarely seems to work anywhere else.

In the dubbing theatre the Home Pride Flour Men have had three sessions, bringing their total appearances to 55. The series of flour films, which has been running for six years now, is made by Wyatt Cattaneo for the Geers Cross agency.

Cat promotion

A promotional film for Cat Stevens's *Teaser and the Firecat* album was dubbed by Charlie Jenkins of Trick Films. The film is about five minutes long and is called *Moonshadow*. The commentary is by Spike Milligan.

Other dubbing work included films in English, Spanish, French and Arabic for Pearl and Dean. The clients were Chrysler (UK). Production was by Quartet Films, who were also responsible for a Barclays Bank film for Nigeria, also dubbed at Advision. Walter Speight of McKay and Partners has made a series of films for Rothmans in French, Arabic, English and Hebrew. New magazines need promotion too and Sierra Productions have done a promotion film for Candida on behalf of Ogilvy, Benson and Mather. A radio commercial for Look Now, which featured Emperor Rosko, was recorded for Radio Luxembourg. The work was done by Andy Whetstone and his assistant Graham Middleton. Advision say they have dubbed over 100 films this month.

Back in the music studio, Sammy have made their first single, *Sioux Eyed Lady*, for Philips. It was produced by Advision Engineer Martin Rushent. Garry Martin is now working on solo albums for Emerson Lake and Palmer and Geoff Young has engineered Peter Straker's *Private Parts* for RCA. A group called Hands of Dr Teleny are working on a new four channel album for Howard and Blaikley. Their first album, a quadraphonic job called *Stolen Goods*, was released in December.

Gilbert and Sullivan at Anvil

Among other things, **Anvil** have been recording Gilbert and Sullivan for the new BASF label. The label was launched on September 27, about 18 months after the parent company in Germany went into the gramophone record market. As yet, most of the recordings available on the BASF label have been in other catalogues; BASF have taken over the Harmonia Mundi and MPS labels. The MPS catalogue includes those great Oscar Peterson sessions that were privately recorded in Europe and were previously released in this country on Polydor, as well as *High Voltage* and *Basic Basie* by Count Basie's band. The list also includes work by the Kenny Clarke, Francy Boland big band, Horst Jankowski, and a group of expatriate Americans which includes Albert Nicholas and Nelson Williams.

There are a number of light orchestral releases on the way from Arno Flor, Dieter Zimmermann and Robert Stolz. There will be ten classical releases this year, including Frederick Gulda playing Beethoven and Debussy, and the Collegium Aureum Orchestra, who play on the remaining eight albums with the original instrumentation specified by the composers. The recordings were made in Cedar Hall, Kirkheim Castle, which BASF claim has a near-perfect acoustic for recording.

The Gilbert and Sullivan releases were recorded by The Gilbert and Sullivan Society For All, and the cast includes Don Adams, Thomas Round, Valerie Masterton, John Cartier, Anne Hood and Gillian Humphries.

I visited **Chalk Farm Studios** recently and had a look round. I noticed a hum in the control room which the manager, Vic Keary, said was caused by the transformer of a defective power supply. He emphasised that the hum was mechanical, not electronic, and did not appear on any of their recordings and, from the recordings that I heard, this seems to be right. The offending power supply, Vic said, would shortly be replaced.

I also asked about the traffic noise you could hear a little of and Vic said: 'That, too, is a fair question. All I can say is that it has never affected our recordings.' He went on to explain that traffic noise was no problem if you used good microphone stands that were properly decoupled from the floor.

Chalk Farm hits

The Billboard directory shows that Chalk Farm has collected an impressive list of hits, many of them on the Trojan label. These include Horace Faith's *Black Pearl;* Bob and Marcia's *Young Gifted and Black* (for Harry Johnson's Harry J label); *Love of the Common People* by Nicky Thomas; *Let Your Yeah be Yeah* by the Pioneers; Bob and Marcia's *Pied Piper;* and *Moon River*, performed by Greyhound and produced by Vic Keary himself. One of their latest successes was Katrina's *Don't Stroke My Pussy* single, which Norton York produced for the Cactus subsidiary of Bruce Ruffin's Rhino label.

Thus it seems fair to say that there can be little wrong with the tapes that come out of Chalk Farm. But the people I met there, a very friendly bunch, were honest enough to admit that the place could be tidier.

It seems a shame that producers should be put off using a studio by its appearance and if Chalk Farm smartened up a bit there's no telling what they might do. To be fair, I should

20▶

continued

add that by now Chalk Farm may have made changes. They tell me they're going 16 track, for one thing, and I would think that's a splendid opportunity to get some paint in and the beer crates, admirable as they are, out.

I also called in at **CBS's** new studios this month. I was given a three-hour guided tour by George Balla, the technical manager, and Don Horne, the assistant studio manager. You need three hours to look round it too. The CBS complex has been so well publicised that I need hardly go into details here. But I found the desk very impressive and the way the acoustics can be altered even more so. Then again, what do you expect for £998,000? It would not be exaggerating to say that CBS have plenty of work. Classical sessions have been held by Daniel Barenboim with Pinchas Zukerman and the English Chamber Orchestra. Production was by Paul Myers. Philippe Entremont finished an lp of Chopin piano sonatas.

John Paul Jones has just finished voice tracks for an album by his new singer Tom Grimm. The Tremeloes, Mark Almond, Mott the Hoople and Iggy Popp and the Stooges have put down tracks. Ashley Kozaks produced a Tranquillity album for Columbia which Don Horne said was really superb, and Rosko came in with a new group called Smooth Loser. Graham Fields has just finished an lp and a real name from the past, Dave Berry, has surfaced with a new band produced by Eric Wolfson. Bob and Marsha, produced once again by Harry Johnson, have been in, as have Billy Day and Mike Leslie, who did a single. Other visitors have included FF&Z, Tommy Leonetti, Jeff Beck, Silk, Arrival, Roger Charles, Worth and Don Bradshaw.

The Philips at Phonogram

Phonogram also showed me their set-up this month. Their desk is a Philips job that would take an article of its own to explain and would have people ringing up like mad to order one. But these desks aren't for sale; Philips make them solely for the use of their own recording studios. More about that in coming months.

Meanwhile the studio is busy; studio manager Tom Stevenson was very proud of the fact that there isn't a blank space in the book for weeks ahead. Recent visitors have included Val Doonican, Scott Walker, Marsha Hunt, Jefferson, Vicky Leandros and John Gregory.

Viking seems to be a busy little studio. For its size it gets a lot more master work, as opposed to demos, than you would think. Viking's control room is above the studio, which is in the basement. The studio ceiling is very low and manager Bernard Proctor told me that that was responsible for excellent separation.

At the moment the control room views the studio by closed circuit television. The desk is Allen and Heath and Bernard Proctor says that, when he gets a new desk, he will still choose Allen and Heath.

'That mixer's worked wonders with us,' he said. 'We've had no problems with that.' The mixer is two years old.

Viking have a CBS lp on the market by 22nd Street. The album was produced by Ivan Chandler for April Music. Les Reed has done a rock and roll lp for Chapter One, and Bernard, once a member of the original Morton Fraser Harmonica Gang, says that Les will be sending all his groups to Viking to record. Al Gallico has produced a banjo, fuzz violin and voices version of, wait for it, the Brahms Waltz. Viking have two lps out on Ember and two more are on the way.

One of the final visits of the month was to **Sound Developments** at Chalk Farm. Adrian Sear of Sound Developments told me that the company is expanding fast into the commercial radio and equipment side. Altogether there are three other companies associated with Sound Developments: Supersounds, who produce jingles; Brent Sinclair Installations, who will install anything from private hi fi to electrical fittings in shops—past contracts include the Guys and Dolls shop in Oxford Street, John Michael, and the Old Vienna restaurant in Bond Street—and Scott Sinclair Broadcasting is the final member of the quartet. This was formed to produce commercial radio program tapes for the US, Canada and Australia.

As well as the recording studio, which went eight track at the beginning of August, Sound Developments have just finished a broadcast studio for recording commercials and programs. One of the features of the desk in that studio is a remote control for carousel slide projectors, which controls all the functions on the projector, including focus.

The directors of the firm are Roger and Peter Sinclair, hence the surname cropping up in two of the four companies. One of Sound Developments' biggest undertakings was to install a private 24-hour radio station for the United Biscuits Network factories at Osterley and Harlesden. A GPO music circuit was used to relay the program to Harlesden. There are three dj consoles with Gates turntables, and the public address system feeds over 1000 speakers, each of which is fitted with its own volume control. The speakers are driven by 70W amps built to an RCA circuit. Each amplifier drives about ten speakers.

I heard a relay of the UBN program and it really was professional. News bulletins are put out every hour, and these are compiled by a news copy writer who has access to agency tapes. Every so often there is one of a number of commercials to make the factory workers more aware of the need for safety.

In the studio, Sound Developments have done demo work for Simon Dee and record labels like Bell and WEA. Ivor Raymonde appears to use the studio quite a bit and Allan Caddy and Hal Carter of Avenue records have also been in. Danny Street tracks which were mostly recorded over at Majestic had the voice-overs done at Sound Developments. A bunch of session men made some recordings as The Cheeky Handbag Show. There have been a lot of commercials for Birds Eye, Ford and Gulf and Esso petrols, as well as recordings of nursery stories like Winnie the Pooh.

Studio roundup

Marquee—Johnny Worth produced Dad's Army single; Desmond Dekker's *Beware* single engineered by Geoff Calver; Bruce Baxter produced 24-hour session for Pickwick; Chelsea did *Blue is the Colour* album; Marquee club session recorded and filmed featuring Rare Bird, Al Matthews and Andy Fernbach prior to British tour; Phil Dunne engineered Liverpool and Manchester United football team records for Larry Page on Pennyfarthing; Mike Wilkinson produced C & W group Union Pacific; Harvey Andrews single produced by John Worth for Straight Ahead Productions; Paul Brett produced a single of self and Mike Piggott; Ashman Reynolds titles produced by Bruce Baxter; Christmas single by Mary Hopkin produced by husband Tony Visconti; Little Angels of Korea album, again for Christmas; Howard and Blaikley finish Eurovision Pong Contest entry; Private Eye Christmas album finished; Sally Oldfield album started with Jimmy Horowitz; Another Top of the Pops cover version album; Mick Audsley album produced by Robert Kirkby; Polecat album engineered by Phil Dunne for Kaplan Kaye.

Other Marquee news is that Mike Jackson has been appointed marketing manager to handle all the bookings and, as an extra added attraction this winter, Marquee have installed their own generating facilities should the trade union lads feel we're too warm for our own good.

Biology at Sutton

Sutton—Virginia McKenna session to record self-penned song; gruelling three-day session for shoe design firm slide show; interview with Elaine Morgan, authoress of *The Waiting Room*, *Rest You Merry*, *The Soldier and the Woman*, *A Chance to Shine*, *Licence to Murder* and *Love from Liz*, conducted by Alex Hamilton for Souvenir Press. Forty-minute interview consisted of 20 minutes' discussion of the female orgasm. Lucky Mark Sutton; other work included large helpings of product promotion, tv jingles and other commercial work.

Radio Luxembourg—Alan Bailey engineered an album by the Monty Python's Flying Circus team. The production co-ordinator was André Jacquemin.

R. G. Jones—Troy Dante produced lp tracks by the Barbados Troubadours for release in Barbados; new Pye single for Jungle Jim called *Linda Love; Summertime Woman* single finished by producer Ronnie Scott (no relation) for UK label; Tony Secunda produced Steve Took, formerly of T. Rex; Francis Matthews put down his Paul Temple magnifying glass to record a song; Klol Coxhill and Steve Miller of Caravan recorded film music for United Motion Pictures; album tracks and a possible single by Christie for CBS.

Craighall, Edinburgh—It's rather old news but Christyan, an Edinburgh group, have been in for Decca. The producer was Ray Horricks, who is also working on an album with Ironclaw for release next spring.

MSR, Balsall Common—Backing tracks for Stavely Makepeace alias Lieutenant Pigeon and brass band work for the recently released Thoresby Colliery band lp; lots of advertising work for free flimsy discs; the disc cutting side is on overtime; MSR intend to go four track next year; recent alterations include redecorating and recarpeting both studio and control room; Studio takes 18 musicians and rates are £5.25 an hour for mono or stereo; Demos cut within 24 hours if not sooner, they say.

The Village, New York—£44,000 quadra-

phonic mixing room just opened which was started in June; engineers Baker Bigsby and Tony Reale have been working hard on four channel mixes; sessions done by Alice Coltraine, John Lee Hooker and B. B. King. Quadraphonic console is a 20-input Quad Eight and other equipment includes Lang and Pultec equalisers, limiters by Teletronics, Spectra Sonics, Creatonics and Urei, EMT plates, 20 Dolby units and Altec 604E, JBL 4310 and L100 speakers. Producers can choose which set of speakers they wish to listen to.

Ultra Sonic, New York—Series of live concerts sent out over WLIR from Ultra Sonic. Series started on June 20 for a 23-week season, and has featured Randy Newman, Tim Buckley, The Incredible String Band, Harry Chapin, Dan Hicks and his Hot Licks, Kenny Rankin, Fairport Convention, Brewer and Shipley, Chambers Brothers, Jake Holmes, Elephant's Memory, and Richie Havens, which last came back to give a 25-minute encore and so set a record performance time for the series of 90 minutes. The concerts are broadcast in stereo and produced by Mike Epstein. The director of the series is Mike Colchamiro and engineering has been done by John Bradley, Steve Goetz and Jeff Kracke. Ultra Sonic recently formed their own production company and the first signings was Baxter, a group that has played with Alice Cooper, J. Geils Band and Led Zeppelin, among others.

Agency Studios, Cleveland, Ohio—computer installed for tape library print out and all customers have been sent a list of all the tapes in the library. Agency services include 16 track recording, stereo mastering and high speed cassette duplication.

RCA, Toronto, Canada—Norma Barnett tells of a 'northward surge' of artists from the US—Ohio's Pure Prairie League were produced by Bob Ringe of RCA, New York; Duke Ellington, no less, put down tracks for future release; Westbound Records of Detroit brought in Teegarden and Vanwinkle; Gordon Lightfoot finished an album; Noah, of ABC Dunhill, have recorded another album produced by Randy Bachman, formerly of Guess Who; Randy's own group is Brave Belt, who have also put tracks down; *Belfonte Live* recorded by remote to the O'Keefe Centre in Toronto and Norma says it's a gas.

Kolinor Studios, Tel Aviv, Israel—they've sent me the Israeli hit parade to show that they've recorded 18 of the songs in the top 20. I'll take their word for it because the list's in Hebrew. All information from the Middle East gratefully accepted, except that my secretary doesn't like opening letters from Palestine.

REC studio, Barbados—REC is owned by a group called the Merrymen and has been open for about a year. Most of the work has been Calypso recordings, closely followed by Reggae. There is news, however, of a new local craze called Spouge; I can't wait. Christopher Gibbs, a Director of the studio, tells me that most of the Spouge recordings to date have been made at REC.

The studio is equipped with an Ampex *AG440* four track tape machine, 16/4 Audio Developments desk, Revox *77*, Grampian spring reverb unit—shortly to be replaced by the ubiquitous AKG *BX20*—microphones by AKG, Shure, Electro-Voice, and Neumann, and monitor speakers by Spendor and Wharfedale.

One small item; the tapes for the Sound Search competition on the EMI stand at the Audio Fair were recorded by **Roger Squire.** Squire are also organising a series of programs for the US. These will be sold to a number of fm stations over there. Squire are making plans for an improved studio.

Finally, **SARM,** the Barry Ainsworth and Gary Lyons company, say they will soon be announcing big expansion plans. Watch this space.

Above: The Gooseberry studio in Gerrard Street, Soho (see November 'Diary'). Derek Austin of Caravan on piano, Francoise on guitar, Robin Williams on violin. Female friend on couch.

Right: Beck's Vic White with the Leevers-Rich eight track machine, now about six months old. Visits to the Northampton studio have been made by producer Chris Andrews, who stayed a week, Hardin and York, African Steam, and others. Beck are now planning expansion of their facilities to 16 track. They will probably opt for a Studer.

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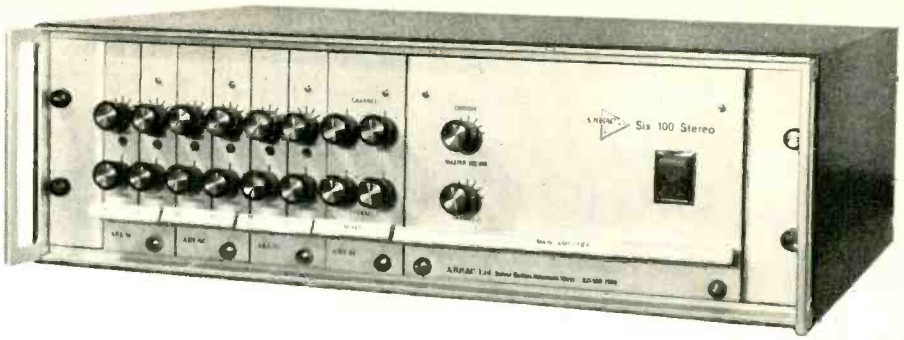

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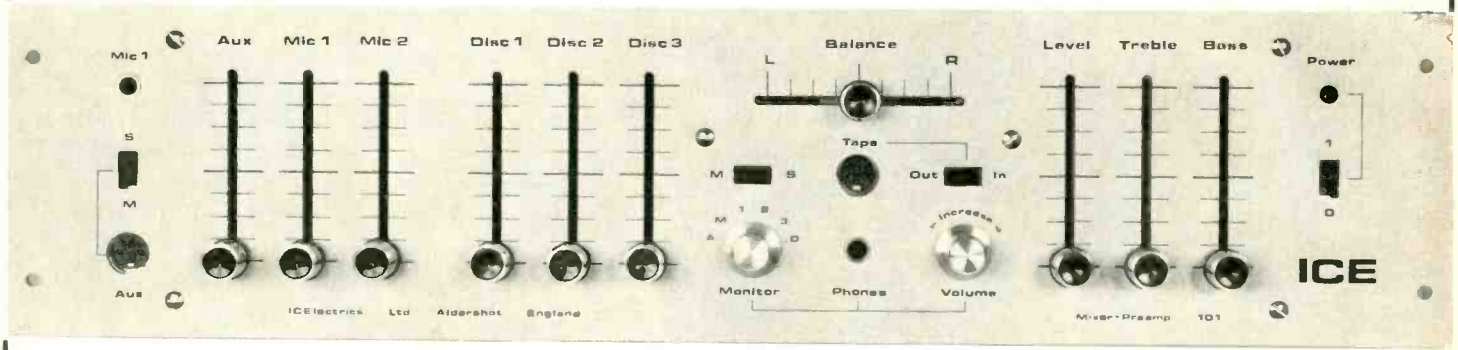

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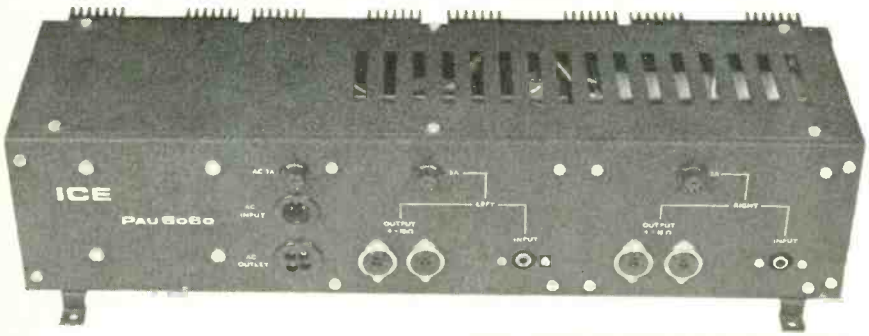

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Telephone Balancing - the Problems and a Solution

LUDWIG DE KESEL* & C. E. GRIMSHAW**

Increasing use is being made of the telephone as an aid to broadcast program origination, both for public participation interviews and long distance news reports. The medium has presented technical difficulties, notably noise, and the authors describe methods of improving quality.

*Hes Electronics, Brussels, Belgium
** Allotrope Ltd, 90 Wardour Street, London W1V 3LE.

USE OF THE public telephone network to permit remote participation in radio and television programs produces some interesting signal rejection problems. These had not been solved to a satisfactory extent until comparatively recently.

One of the requisites of using the telephone in this way is that the compere be heard with studio quality even while speaking to a caller, who is identified by the telephone quality of his voice. The caller's signal extracted from a telephone line should therefore contain no detectable remnant of the studio signal being fed to the caller, any remnant being termed sidetone. An appreciable sidetone also causes mixing problems and possibly howl-round when the mixing desk feeds a public address system. A telephone balancing or rejection unit is necessary to perform the signal extraction, and the use of such a unit is illustrated in **fig. 1.**

During the outside call an auxiliary mixer output, containing the compere's microphone signal and perhaps other channels, is fed into the telephone line at about −10 dBm. This output is the clean feed. The balancing unit adds the clean feed to the line at the correct level, extracts and amplifies the caller's signal, and terminates the line with the correct impedance. Its sidetone rejection must be particularly good since line or local attenuation reduces the caller's signal to roughly 15 dB below the clean feed, before it arrives at the studio. In broadcast applications, the unit should also be capable of working on a sequence of different lines with little or no adjustment necessary as each line is switched in.

The major problem to be solved in designing a balancing unit is derived from the fact that, of the two signals on a telephone line, the one required is about 15 dB down and arrives with a Post Office line as its source impedance. A level of sidetone 15 dB below the caller's signal is virtually undetectable when the clean feed makes a direct contribution to the mixer output, and is about the minimum acceptable separation. Hence sidetone rejection in the unit must be about 30 dB. A limited rejection can be achieved quite easily. For example, some is included in the circuit of most telephones to limit the self deafening effect of the sidetone due to series connecting the microphone and earpiece. However, 30 dB rejection is a far more difficult problem.

Fig. 2 shows a compensation method of isolating the remote signal. Ignore, for a moment, the differential amplifier and attenuator p. Vb is the caller's microphone signal, the remainder of his telephone set is not shown. Vb passes through the Post Office network, suffering some attenuation, and then via the local switchboard to the isolating transformer and rejection circuitry in the studio. The transformer has a unity voltage ratio and it is assumed that it can withstand the dc line switching current without saturating. Zb represents the line impedance as seen from the studio, and Zt is a terminating impedance which is necessary to match the line. Va, the clean feed signal, is from a low impedance isolated source.

If Zt exactly equals Zl, be they real or complex, then, since they form a potential divider, the line signal Vl contains half of the attenuated Vb and half of Va. The component of Va in Vl will be in phase with Va for all frequencies so that, theoretically, infinite rejection of Va is possibly simply by subtracting half of Va from Vl. In the method shown this

25 ▶

FIG. 1

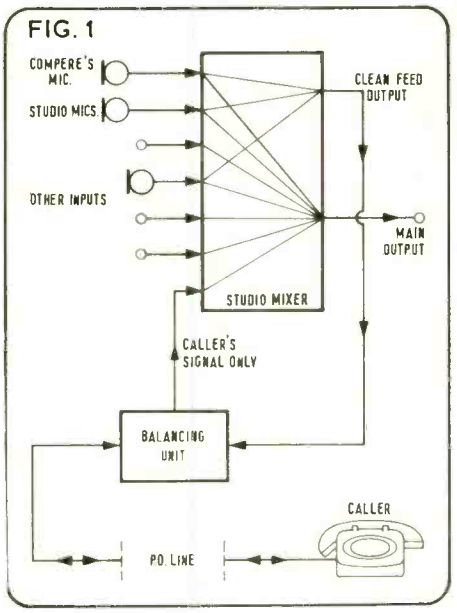
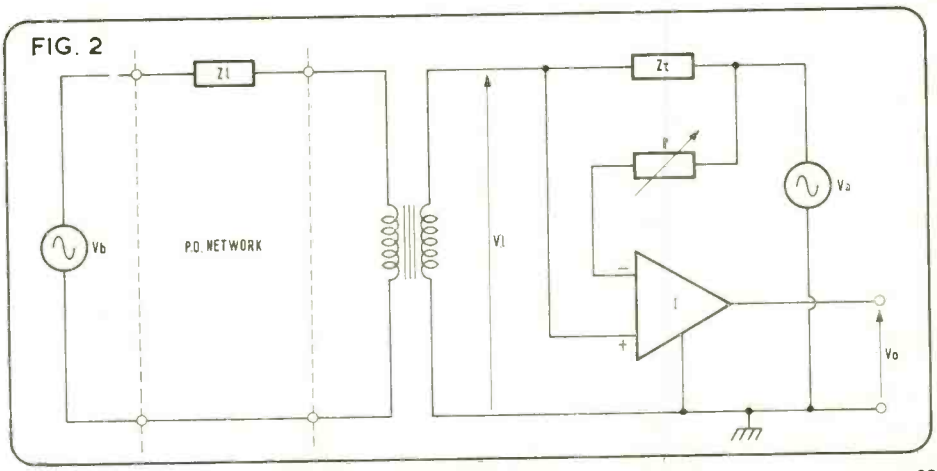
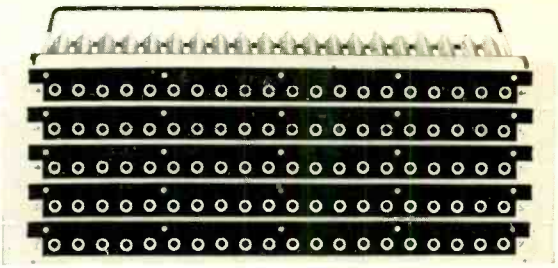


FIG. 2





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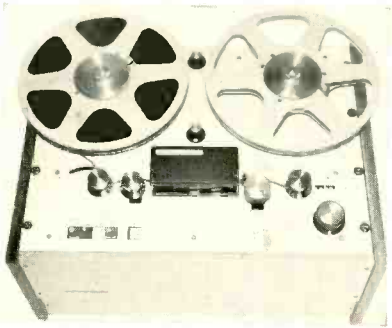

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continued

would entail setting attenuator p to 0.5, the subtraction then being performed by the differential amplifier. A hybrid transformer could be used with almost equal effect provided that the impedance match still holds.

The effectiveness of the method relies entirely upon the degree of matching between Zl and Zt, for although a change in magnitude of the component of Va in Vl is easily compensated by adjusting attenuator p, a change in phase results not only in poor rejection but also in distortion of the remaining sidetone. Any phase difference is almost certain to be frequency dependent so, for non-identical Zl and Zt, the output will contain a frequency-sensitive amplitude-distorted residue of the clean feed, a very dirty feed indeed.

The impedance of a telephone line Zl, though nominally a resistive 600 ohms, almost always contains a reactive term. Post Office telephone lines do not meet the distortionless condition and are normally capacitive, partial compensation being achieved by inductive loading in the telephone at each end. This results in an unpredictable impedance and means that synthesis of Zl must be performed to give Zl for each line, a tedious task, further complicated by the multiple break points exhibited by some lines. A further undesirable characteristic is that, due to rerouting, the impedance may change during a call with disastrous results for rejection. The extreme phase sensitivity of this method means that additional break points due to a mismatch cause severe frequency dependent rejection and the resulting sidetone can cause the compere to sound distinctly nasal.

A compromise solution is to use a resistor for Zl and to accept the poor rejection resulting from highly resistive lines, for at least the number of break points will not then be augmented. **Fig. 3** shows Zl replaced by variable resistance R and Zl as a single complex term A+jB. It is clear that any phase difference between Va and Vl will be reduced as the value of R is decreased, becoming zero as R reaches a short-circuit. Fine, but as the value of R falls, so does the caller's signal, roughly exponentially. Meanwhile, the improvement in system rejection is composed of two functions. Let the caller's signal be a short-circuit since it is of no concern, then the component of Va on the line is:

$$Vl = Va\left[\frac{A+jB}{R+A+jB}\right]$$

and output Vo is:

$$Vo = Va\left[\frac{A+jB}{R+A+jB}\right] - Va\,p$$

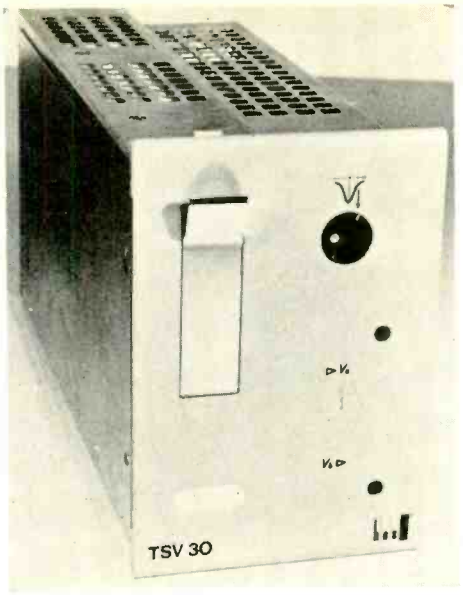
Rearranging:

$$Vo = Va\left[\frac{A^2+RA+B^2}{(R+A)^2+B^2}\right] - Va\,p + j\frac{RB}{(R+A)^2+B^2}$$

So, for perfect rejection:

$$p = \frac{A^2+RA+B^2}{(R+A)^2+B^2} \quad \text{and} \quad \frac{RB}{(R+A)^2+B^2} = 0$$

The second condition will obviously not be met for a reactive line and phase error must be accepted. The expression for optimum value of p contains terms B^2 which are dependent on both impedance and frequency, hence there can be no ideal setting for p. However, as the value of R tends to zero, so do the compensation errors. There is unfortunately a lower limit to R after which the poor impedance match causes noticeable reflections over a long line, hence the Post Office regulations prohibiting termination in less than 600 ohms.



Hes TSV30 balancing unit

A practical application of the compensation method using resistive Zt and variable p results in a rapidly adjustable system, but it can give only 10 to 15 dB average rejection. This is obviously inadequate since sidetone is left at the same level as the caller's signal. A method which is less sensitive to line impedance is required.

Hes Electronics have devoted considerable energy to the solution of this problem. The rejection circuitry of the patented Hes *TSV 30* telephone balancing unit is shown in **fig. 4**, and there follows a condensed version of the designer's approach.

Resistor Rx has a much lower value than resistors R which are 600 ohms, so that the line sees a real impedance R. The network is symmetrical about the centre point S so there is no phase shift between Va and its component in the signal at S. This condition holds for all impedances Zl and is used to obtain a small line signal of reduced phase shift, which is developed across Rx. A second differential amplifier is now necessary to isolate and amplify the line signal.

Having obtained a signal with reduced phase shift, the designer was then able to introduce a reactive correction network Zc into the compensation amplifier's feed without fear of an excessive frequency-phase relationship in cases of mismatch. This circuit is capable of some 30 to 35 dB rejection of clean feed and, due to the improved stability of rejection in the face of line impedance variation, it is unnecessary to optimise the rejection setting for each line, an average adjustment is sufficient.

The Hes units incorporate some additional processing of the extracted caller's signal, a bandpass filter 300 Hz to 3 kHz and 8 dB boost at 2 kHz are used to simulate the frequency response of the fictitious receiving telephone. Output is balanced, as is the clean feed input, and all levels are adjustable so that the unit forms a complete interface between studio and telephone network, with the exception of a dialling mechanism.

This solution to the problem is not completely independent of line impedance but research is still going on and Hes hope to produce completely independent rejection in the near future.

FIG. 3

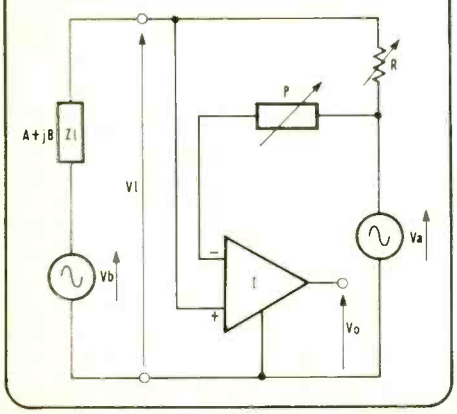
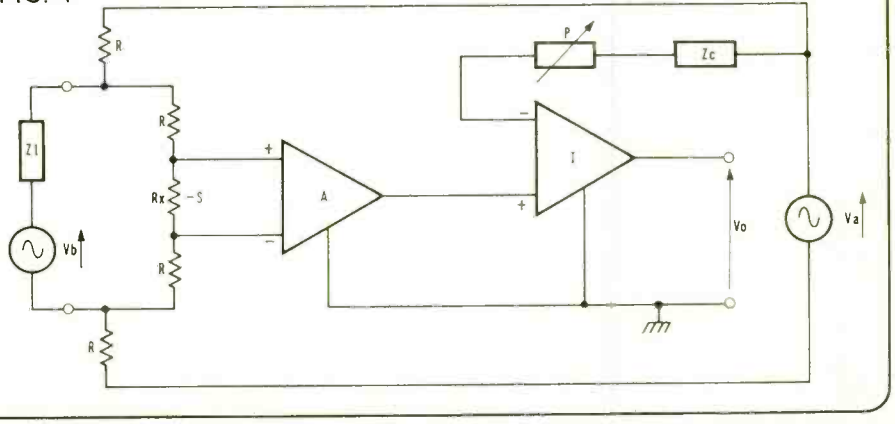
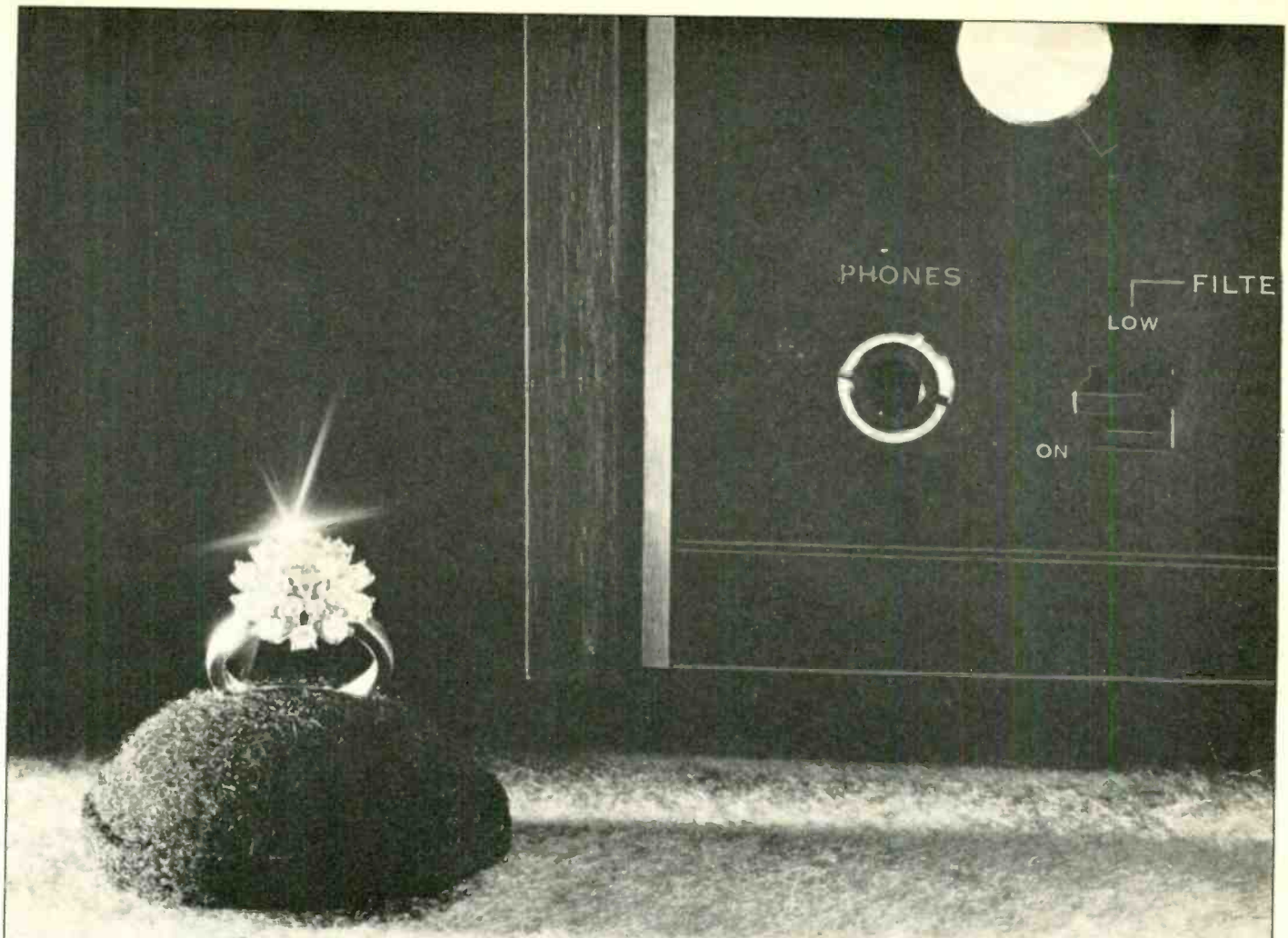


FIG. 4





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AROUND THE STUDIOS

PATHE-MARCONI

LOOKING AT THE Pathe-Marconi studios in Paris seemed like as good an excuse as any to have a couple of days in that pleasant city. Especially as British musical directors who have worked in French studios usually have strange tales to tell of the experience. Most of these tales originate from a general bewilderment at the price structure of session rates and how it may all relate in some complicated way to Value Added Tax. Until recently, the idea of VAT applying to the complexities of overdubbing at sessions seemed a pretty remote concept.

British directors arriving in Paris are usually whisked by taxi out to the requisite studio and, wishing to do in Rome as the Romans do, show no surprise at the manner in which French sessions tend to get under way. Something officially or unofficially called the 'consultation hour' seems to start off most orchestral sessions, with coffee and cognac engendering a relaxed mood for the musicians while the director, producer and sound balancer talk shop. Eventually the session gets under way in mellow mood and afterwards there is some confused negotiation about who should and should not get the extra session rates for things like improvisation or soloing.

I asked around before going to Paris and the general concensus of opinion was that the place 'where it all happens' is the Pathe-Marconi studio in Boulogne. This Boulogne is on the outskirts of Paris, a taxi ride out from the centre through the beautiful Bois de Boulogne. The Pathe-Marconi studios are run by EMI and the man in charge is Jean-Jacques Timmel. One of his assistants, Philippe Constantin, was there producing a French group called Komintern for the Harvest label. Constantin spoke good English and made me feel very welcome during the Komintern session. I was given a fairly free run of the studio but technical problems had to be discussed in French. So if I have got something wrong, please blame my linguistic ability rather than whoever I am quoting.

At Pathe-Marconi there are four studios. I saw studio three, which is the same size as studio one and similarly equipped. Whereas studio three uses an eight track Telefunken machine, studio one has a 16 track Studer. Studio two is smaller with a four track machine and studio four very small with a two track machine. Four is used mostly for dialogue recordings.

Studios one and three are very large with high ceilings. Space round all the walls is a sound-proofing system composed of numerous isolated islands, each built up from pyramid-like foam blocks in parallel rows of three covered in loose weave textile; nine per island. Without these, the studios are very live. Although Komintern were using close miking for individual overdubbing while I was there, the studio is often used for recording more traditional style performers like Petula Clark, with large conventional orchestral backing.

The control box is large and roomy enough to hold the obligatory bunch of band wives and girl friends. Two 150W JBL studio monitors are set high up on the wall over the window. I noticed Universal Audio limiters. Ortofon treble limiters and Wilhelm Franz compressors (EMT *156*).

French sessions differ from English but *la difference* is not confined to France. In Germany, for instance, I am told that any vocal groups (two or more girls, for instance) are obliged to bring with them a gentleman who goes under the title of 'choirmaster'. The arranger and producer stay in the box and messages to the girls are passed out into the studio where the choirmaster relays them to the girls. In Germany that is the norm.

In France, soloists get a bonus, as do those whose parts are *difficile*. Apparently the producer judges what is a solo and what is *facile* or *difficile*. Organ players automatically get double rates for any session, in addition to transport rates where applicable. Pathe-Marconi have their own Hammond, vibes, tymps and piano. But no drum kit. In fact the drummer seems to come rather badly out of all this because, as far as I can see, he is one of the few musicians who gets nothing extra except for transport rates. Bass clarinet and first violin for instance automatically get a supplement of 25 or 50 per cent. And first trumpet and first bass trombone come in for between 25 and 50 per cent while bass guitars get a 50 per cent supplement but string bass players are unlucky. Apart from transport allowances, they get the flat rate; presumably unless they have a difficult part or a solo. Bells are available in the studio for anyone playing them but I never did establish the rate bell-players can claim. In fact by this point I was more concerned with trying to establish some logical working basis for the supplement system. So I asked the very helpful tape operator and various of the Komintern group why it was that the organist was entitled to double rates. Their concensus of opinion seemed to be that I should explain why in England the organist should *not* get double rates. I left it at that.

The normal session time is three hours with two hours 40 minutes theoretically set aside for playing and 20 minutes break. There is a maximum of four cuts per session but this is hardly likely to be exceeded by the average pop group. While I was there, for instance, Komintern laid down individually several different maracca tracks, a tympany track, several different sax tracks, a classical-style violin track and a shouted vocal track that may well have been as unintelligible to French ears as it was to mine.

Only later did it occur to me that at no time had I seen any two musicians actually playing instruments together. It seems that times have changed in all countries. The composite sound was good which is, after all, the object of the exercise. But does anyone share with me a slight feeling of nostalgia for the days when bands went into a studio and made a record of what they actually sounded like?

Mixing down is done in the studio control room; there is no special reduction room. The mics used are mainly Neumann and AKG with the occasional Sony.

As I left the very friendly studio three atmosphere, the commissionaire in the main foyer proudly showed me the display of disc sleeves kept there. 'All recorded here,' he told me. He had seen most of the artists involved and was very proud of the studios. Weren't they very fine studios, he asked? Were they better than studios in England? Had I been pleased with what I had seen?

Enthusiasm that extends as far as the doorman is a healthy sign in any organisation.

Adrian Hope

Constructing a Peak Program Meter

HUGH WALKER

The origin of peak program and Volume Unit audio level meters is outlined. Details are then given for the construction of an inexpensive ppm with a peak detector and logarithmic amplifier employing four transistors and one integrated circuit.

THE STANDARD peak program meter (ppm) was originally developed about 35 years ago by the BBC for checking peak audio modulation levels at transmitters.[1] The VU (Volume Unit) meter was developed at about the same time by the Bell Telephone Laboratories[2] (in collaboration with CBS and NBC) for standardisation of signal levels in program circuits; both are now in general use in audio equipment.

Extensive subjective tests were carried out by Bell Telephone,[2] and it is interesting to note that, although the peak reading indicator was preferred (particularly with line amplifiers exhibiting sharp limiting, i.e. with large amounts of negative feedback), the 'average-reading' VU meter was finally adopted because of the absence of electronics and its insensitivity to waveform distortion caused by phase non-linearity on unequalised land-lines—neither of which are important considerations in modern studio equipment.

The BBC peak program meter has a charge time constant of 2.5 ms (thus registering peaks of about 4 ms duration) and a decay time constant of 1s (a fall-back rate of approximately 8.7 dB/s or 1 dB in 100 ms). A faster response time was found unnecessary[1] since the ear is not sensitive to peak clipping lasting less than 2 ms, and this allows average modulation levels to be increased. My own experimental work showed that, with a response time of a fraction of a millisecond, not only did the circuit respond to the slightest transient in speech or extraneous noise, but also the needle movement became 'jittery' and hard to follow. A decay rate of 1 dB/100 ms requires the meter itself to have a rapid response time of about 80 ms and a small overshoot so that isolated transients will be registered accurately.

An important feature of the ppm is the logarithmic scale divided into six approximately equal divisions of 4 dB, as shown in **fig. 1.** It is normal practice to use full-wave rectification in the peak-detector since some sounds, such as speech, have positive and negative peaks differing by up to 8 dB.[1] Other specifications are given in BS 4297[3] which includes the circuit of a BBC peak program meter also described in BBC *Monograph No. 46*.[4]

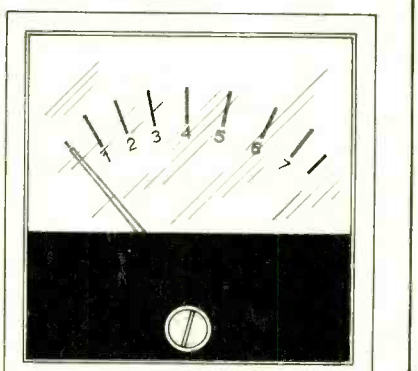
Circuit description

The object of this design was to meet the general specifications suggested in BS 4297, to avoid the use of a transformer* often employed for phase splitting before peak detection, and to allow the connection of several different metering circuits at the output.

The amplifier/phase splitter, peak detector and logarithmic amplifier are shown in **fig. 2.** Q1 and Q2 form a shunt-feedback pair with a gain of ten, equal antiphase signals being derived from the emitter and collector of Q2. Input sensitivity is set by R1; low-frequency response is controlled by C1 and high-frequency turnover by C3. Emitter followers Q3 and Q4 provide low-impedance voltage drive to the peak detector via dc blocking capacitors C4 and C5, which are made sufficiently large in value that, when charge is transferred to the hold capacitor C6, only a small error in the peak voltage of a transient results: in this case $v = 1/40 = 2.5$ per cent $\simeq 0.25$ dB. R13 and R14 bypass leakage currents and re-establish the equilibrium charge after a unidirectional transfer of charge via the detector has taken place.

Since the circuit is designed to operate from a single supply rail, a subrail of about half the supply-line voltage is derived from zener diode D10. This establishes a suitable bias level for

FIG. 1 PPM SCALE



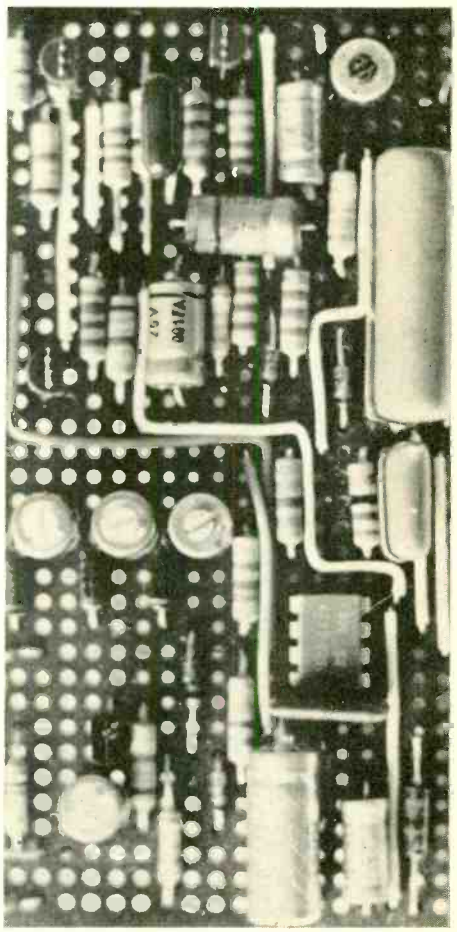


Fig. 4: Author's layout of the ppm amplifier

the input of the operational amplifier, IC1, and thus for the peak detector. The decay time of the hold circuit is defined by C6R18 = 1s and the charge time constant by R17 plus the diode forward resistance (a non-linear function, $R_f \simeq 25/I_{f(mA)}$ ohms for small currents) multiplied by C6, approximately 2.5 ms.

Silicon diodes are used for the detector so that reverse leakage does not affect the discharge time constant as would occur with the higher reverse current of a germanium diode. The germanium diode D4 provides a measure of temperature compensation since its temperature coefficient is approximately −2 mV/°C which is similar to that of the silicon diodes. Since the forward voltage is lower, the detector diodes, D2 and D3, do not conduct appreciably in quiescent state. Drift amounts to about 1 dB at level '2' in the absence of temperature compensation whereas when present the drift is less than 0.5 dB up to ambient temperatures of 65°C though some shift in the master zero occurs above 50°C.

Logarithmic amplification is achieved by means of a piecewise-linear approximation embodied in feedback components R21 through R24 and D5 through D7 around an operational amplifier. This arrangement has much better temperature stability than the more conventional circuits using silicon diodes to obtain the logarithmic function. IC1 is arranged as a non-inverting configuration to provide a high input impedance for the hold circuit, the feedback voltage being developed across R19. R20 is present to balance the effects of input bias currents in IC1. The voltage swing at the output of IC1 for full scale deflection of the meter is 10V (from 15V to 25V, clamped by D8) which occurs for a peak voltage of about 2V across the hold capacitor C6. The circuit may be operated from a 24V supply if zener diode D10 is reduced to 9.1V and D1 from 27V to 22V.

Two meter circuits are shown in **figs. 3(a)** and **(b)** and are intended for the older type of reverse-zero meter to BBC specification *ED1415* and for the modern 1 mA fsd meter respectively. In **fig. 3(a)** the signal from the logarithmic amplifier is applied to the base of current source Q1 via diode D1, present to compensate the V_{BE} drop of Q1. Being a reverse-zero meter, the zero is set by adjusting the current with R2. Thus as the output of IC1 rises, the current is reduced until at full scale deflection Q1 is cut off and no current flows.

In **fig. 3(b)** the zero is set by adjusting R4, points 'A' and 'C' being at approximately the same potential, that of the subrail (D10). Full scale deflection, equivalent to maximum output voltage from IC1, is set with R2. Of course several meter circuits may be driven from the logarithmic amplifier, provided the current limit of IC1 is not exceeded (~20 mA).

(1) Set R22, R23 and R24 to maximum resistance (maximum output from IC1 with signal applied).

(2) Set zero on the meter circuit and, in the case of **fig. 3(b)**, adjust full scale deflection by applying a large signal at the input of **fig. 2.** 500 mV should be sufficient with R1 set at maximum sensitivity.

(3) Decide on the peak modulation level for the particular application. It is normal BBC practice to set the meter to read '4' with a constant tone and then the corresponding program level would be such as to cause the meter to peak to '6'. However the user may wish to calibrate the meter in terms of peak distortion from a tape system in which case level '6' would be used as a calibration level. In either situation, having decided on the relevant maximum level, apply a sinusoidal signal at 1 kHz 16 dB below the '6' level or 8 dB below the '4' level and adjust R1 for a reading of '2'.

(4) Increase the level another 8 dB and adjust R22 for a reading of '4'.

(5) Increase the level another 8 dB and set R23 for a reading of '6'.

(6) Increase the level a further 4 dB and set '7' with R24.

(7) Repeat steps (3) to (6) until no further adjustment is required and check that intermediate markings '3' and '5' are at the appropriate 4 dB steps within ±0.3 dB.

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** When a fully isolated balanced input is required, an input transformer is the only really satisfactory way of achieving this.*

FIG. 3 (a) CIRCUIT FOR REVERSE-ZERO METER

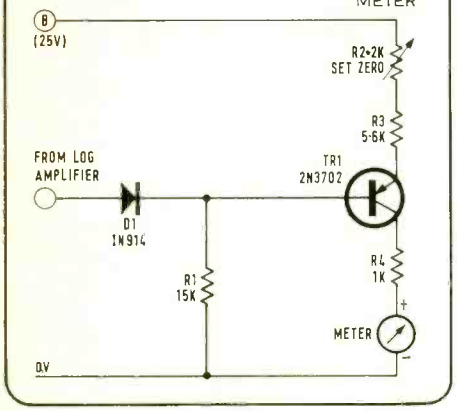


FIG. 3 (b) CIRCUIT FOR USE WITH MODERN 1mA METER

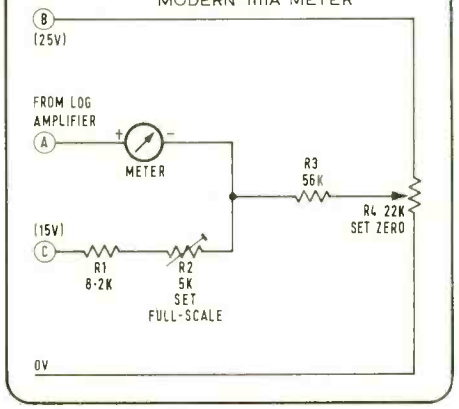
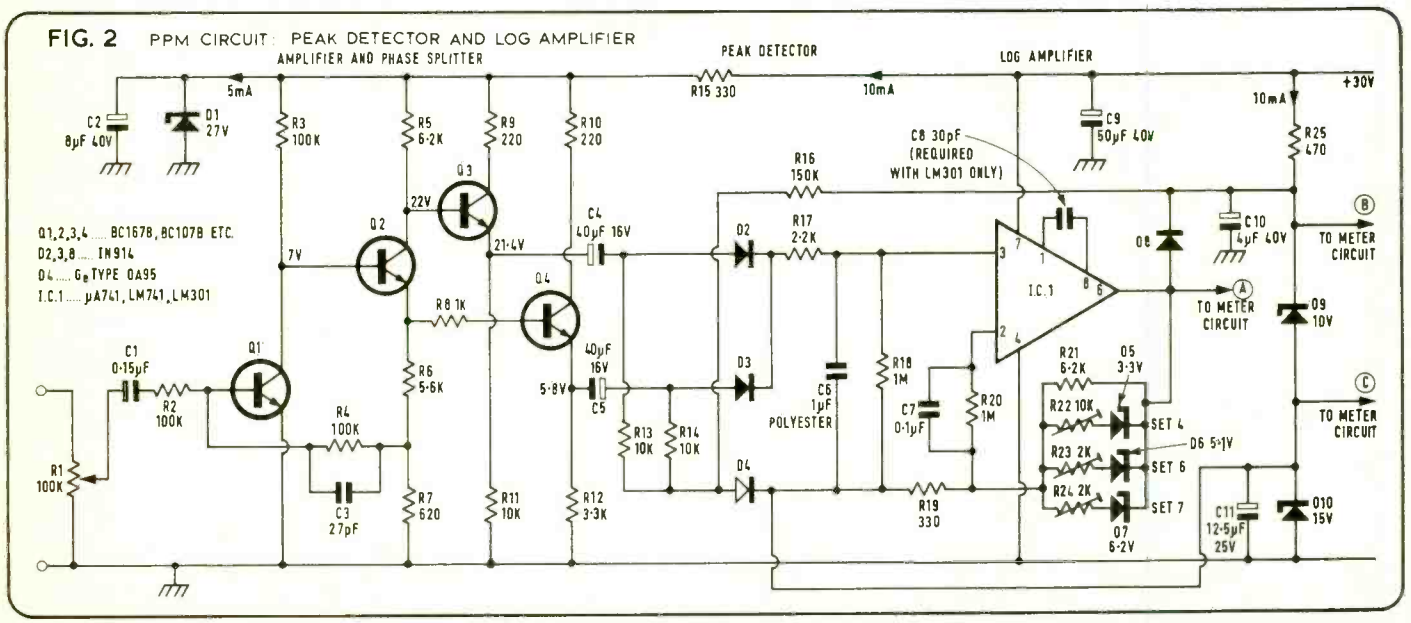
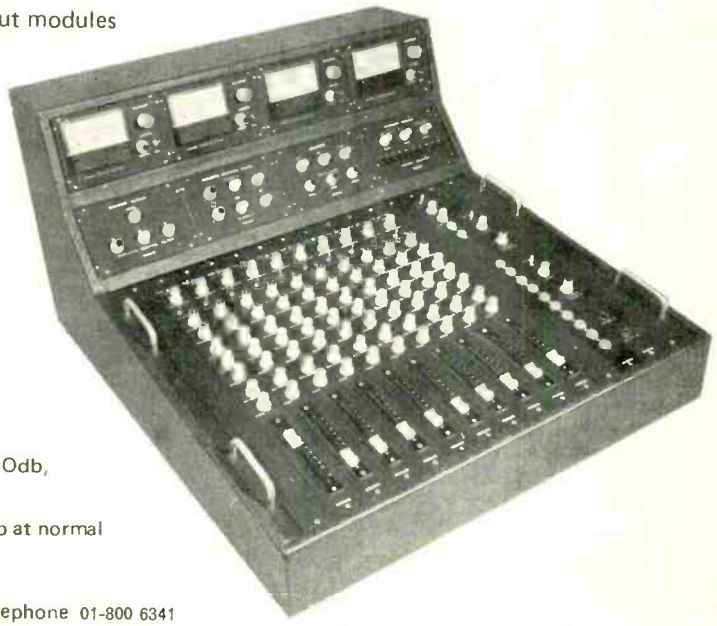


FIG. 2 PPM CIRCUIT: PEAK DETECTOR AND LOG AMPLIFIER



An example of the Midas modular system mixers.

Medium scale chassis, with space for sixteen inputs. The input modules shown include, sensitivity control and fader, pan and output group switch, fold back with pre-fade/post-fade switch, bass, treble, presence equalisation and reverb/ echo mix.



The top level has four output modules with PPM calibrated Vu Meters and compressors.

The middle level accommodates the fold back output, talk back and headphone facilities, acoustic compensation filters and triple range crossover network. The lower level also includes a send and return panel.

Specifications

Inputs 0.2 mV into 200 ohms, 10 mV into 50K ohms.
Outputs normally OdbM into 600 ohms.
Overload range 60 db, low and high Z, channel outputs 16 db above Odb, Vu indication.
Line outputs Max level + 16 dbM
Signal to noise Ratio At maximum channel gain 66db, Typically 80db at normal gain settings
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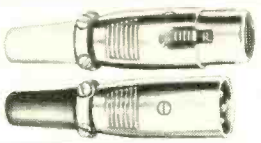

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Confessions of a Third Line Service Engineer

ADRIAN HOPE

The BBC have recently been considering the formation of a three line engineering maintenance scheme comparable with that used in the armed services. Adrian Hope points out the ease with which a large organisation can carry a dead weight of idle employees —supported by the few who really know their job. Doubtless the BBC will run things very differently . . .

THE NOVEMBER 1972 issue of STUDIO SOUND carried reports of a possible BBC move towards a three line maintenance scheme with first line maintenance in the studio, second line simple and routine workshop repairs, and a third line brought in only when all else has failed. The Editorial of that issue drew a parallel with Services (i.e. military) servicing and suggested that the latter should be studied closely before the BBC committed themselves to a similar scheme. Too true.

It is with little pride that I claim to have been part of third line servicing teams run by the RAF 15 or so years ago. But how I came to be there, how I was trained, and how we operated make a cautionary tale in the context of what the BBC has in mind for the future.

We were some of the last to be called up for National Service. In between stamping our booted feet during basic training, we were given iq aptitude tests. These were intended to sort out the wheat from the chaff and, among other things, the electrically from the mechanically minded. In this respect the tests were not entirely successful and at least one graduate statistician was marked down as ideal material for the catering corps. I was lucky, scoring enough marks to be sent on a radio fitter's course that lasted nearly a year. This guaranteed to keep me semi-student for half the time the RAF were planning to employ me.

The course itself was intensive and provided a valuable ground work in electrical and wireless theory. We also learned how to file down square bakelite blocks into smaller square bakelite blocks (far more difficult than you'd imagine), to solder joints and tune up a transmitter with its grid dip meters. This tuning game was especially good fun because the dummy loads used were 100W bulbs that flickered impressively when the transmitter was going full blast.

One memorable day, someone briefly unplugged his flickering bulb and hitched his transmitter up to the real aerial wall socket to transmit a quick May Day or two. The signal was DF'ed within minutes, the Military Police were there within a quarter of an hour, and the inconclusive enquiry lasted three months. No one was ever shot because everyone who had been there accused a different person by name. The matter was eventually dropped and dummy loads welded into the transmitter output sockets.

The course muddled on, month in, month out, with occasional examinations to weed out those who could not master the RAF multiple choice examination system. For the uninitiated, this involves a paper with 50 or 100 questions, alongside each of which are four possible answers. All the candidate has to do is put a cross in a box alongside the answer he considers appropriate. On the whole examinations like this can be gloriously easy to pass, because all one needs is a vague recollection of what the right answer should be. Unfortunately the system breaks down once in a while. One question, I remember, was:

Question: Which way does electricity flow in a circuit?

Answers:
1. Upwards.
2. Sideways.
3. From positive to negative.
4. From negative to positive.

All round the examination room, hands shot up from skilled electronics engineers drafted into National Service and pushed into the course to learn what they already knew backwards.

'Do we consider electron flow as electric current?'

The drill sergeant's answer was always the same: 'Anyone who asks a stupid question will be disqualified, sent off the course, and posted to Aden'.

And just to ensure that no one ever got too cocky through getting 100 per cent in an exam, each paper ended with the inevitable question: 'What is the difference between a duck?'.

Answer:
1. Nothing
2. Something.
3. Everything.
4. One of its legs is both the same.

Eventually most people on the course did qualify, although several were put back a couple of weeks to resit the paper on an ununderstandable mechanical coding system taught by a bored corporal in a hut surrounded by barbed wire. This was supposedly so secret that all notes taken while he was talking were collected and ceremoniously destroyed at the end of the lesson. This, and the fact that talking among ourselves about obsolete equipment was presumably contrary to the Official Secrets Act, made revision for the examination somewhat difficult and accounted for many first-time failures. Fortunately most people passed at their second attempt because the exam questions were more or less the same each time.

At the end of the course, we were qualified fitters and reasonably able to tune two particular types of transmitter, mend one or two particular types of service radio, and file down bakelite blocks with incredible precision. We then waited for a few weeks and were posted for 'active service'. Around this time, Suez was being invaded and rumours abounded of cooks being woken in the night, handed a rifle, and flown off to the desert. I seem to remember the drummer with Humphrey Lyttelton's band being recalled for active military service. He was posted to the Middle East to perform sterling services as a pianist in the Officers' Mess. I never went to the Middle East. I went instead first to a radio servicing station 'somewhere in Staffordshire'. It was the archetypal third line service station. Housed in a vast hangar, teams of us were presented with radio lorries which had been shipped back from remote airfields, at great expense to the taxpayer, for repair and general servicing. These trucks were equipped with transmitters, receivers and other electronic gadgetry, none of which any of us had seen on our training course.

On our arrival at the station, we were each taken secretly on one side by the sergeant in charge (fondly christened the Mekon, which name will ring a bell with those old enough to remember the old *Eagle* space crook). The Mekon confided to each of us that certain persons on the station were inadequate and he was out to get them. What we had to do was report back to him if we saw anyone showing signs of incompetence.

The next thing that happened was that we

Inside Rosser

JOHN DWYER

visits Rosser Electronics, a Swansea-based manufacturer of audio control equipment. Formed in 1967 by Douglas Rosser and Dafydd Evans, they have hitherto specialised in broadcast desks. Rosser were recently involved in equipping nine studios at the Brussels headquarters of Nato.

WHEN NATO fitted out their headquarters in Brussels the contract for the communications and broadcasting equipment went to a firm in Swansea with a staff of five. The firm that showed the enterprise to go after such a contract, never mind getting it, were Rosser Electronics.

Now Rosser are starting to equip recording studios, having confined their activities, till now at any rate, to supplying commercial television stations. And with commercial radio nearly here, Rosser have an extra advantage: their premises, once owned by the BBC, are obviously suitable for commercial radio when Swansea's station is set up.

One of the first disc studios to be supplied with a Rosser desk was Mayfair sound studios in South Molton Street, London, and it was at the opening of Mayfair that I met Doug Rosser and was invited to Swansea to see what they were doing.

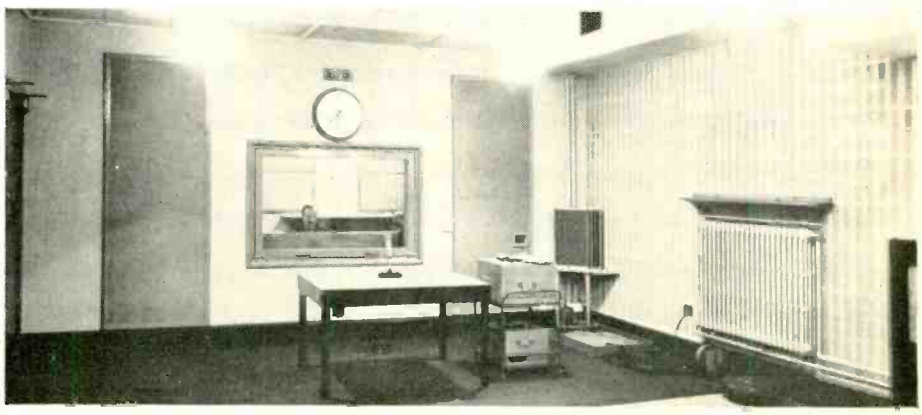
Rosser's headquarters are in a Victorian building in the centre of Swansea. On each side of the entrance is a sign telling you what the building is; one sign in English, one in Welsh. Inside, up a stone staircase, is a large studio which Rosser use for recording classical and choral works. The studio measures 18 x 9 x 9m and, although it's a long job, the acoustics can be altered simply by plugging or unplugging resonant cavities on the walls. Since there are, at a guess, about 50,000 of these holes it doesn't do to try and change them between sessions, though, and once the best acoustic has been decided for the whole room, it's set like that. More usual alterations for sessions are made with acoustic screens. There are also two smaller studios and control cubicles forming a complete studio suite.

Up more stairs are offices and workshops. The workshops are where Rosser's electronic products are developed. The Rosser range of recording studio equipment includes microphone amplifiers, three types of line amplifier, auxiliary channel modules, tone generators, mixing bus amplifiers, limiter-compressors and faders. They also manufacture a ready-tooled system for racking the equipment, which can be custom-built to house a mixing console built from the modules, all of which are 'plug-in' and readily interchangeable.

As an example of what you could expect from one of Rosser's modules, the microphone amplifier, for example, has adjustable equalisation at eight frequencies. At 10 kHz a potentiometer gives continuous variation between plus and minus 14 dB, and another pot gives the same variation at 60 Hz. Mid-range equalisation is provided at 0.7, 1, 1.5, 2.8, 4 and 5.6 kHz with a six-position switch. Just below it is another six position switch which selects lifts of 0, 3, 6, 9 or 12 dB and there is an 'equaliser out' position.

The gain is variable up to 76 dB. It can be switched in ten steps down to 0 dB. A fine gain control provides variation of 10 dB between these steps. The frequency range is 30 Hz to 20 kHz within half a decibel. The maximum output level is +21 dBm at an output impedance of 100 ohms.

Distortion is below 0.1 per cent up to 12 dBm and 0.2 per cent at full output of 21 dBm. Noise is better than −128 dB with the input terminated in 600 ohms.



Far left: BBC buildings, Swansea.

Left: Douglas Rosser (left) and Dafydd Evans.

Right: Transformer testing at Allen Components.

Far right: The Rosser desk at Mayfair Studios.

Rosser's circuit design originated in the mind of Doug Rosser, now 53 years old, whose knowledge of the audio industry, and record making in particular, ranges from balancing the recording to producing a finished pressing, including all the interim processes, each of which he knows intimately. Doug was educated at Heath Technical College, near Swansea, where he subsequently lectured for some years. At 19 he joined Rediffusion. where he became involved in engineering broadcast relay systems supplying a total of 150,000 subscribers. His enthusiasm for 'anything electronic' led him to build audio amplifiers and radio sets and he started doing pa work in his spare time, building amplifiers with powers of up to 2 kW, which in those days was a gigantic amplifier.

During the war he was a wireless operator and instructor in the RAF. He devised the closed circuit broadcast system for the camp he was stationed at and he tells me he was visited by HRH Duke of Kent, who congratulated him on the concept and its achievement. His system was later accepted as the pattern for similar systems throughout the RAF.

More outside broadcast and public address work followed and then he went over to the United States and worked in a local broadcasting station in Charlottetown, Prince Edward Island, Canada, where he was seconded to a branch of forces broadcasting. After the war he started his own business, making audio, recording and disc-cutting equipment.

Around this time he built two factories for making records. He tells me he and a pipe fitter actually erected and fitted these factories themselves. Another of Doug Rosser's record factories, a bigger one which he designed but did not actually construct himself, was later opened by the Secretary of State for Wales.

Just before the Katanga crisis he was commissioned as a consultant to build a gramophone record factory and recording suite at what was then known as Leopoldville. In this he tied in with EMI Electronics.

The work got far enough for the Congolese Minister of the Interior to come to Wales to see the work in progress. Shortly afterwards, the former Belgian colony was laid waste by further strife over Katanga after its tragic war of independence.

The contract was, of course, shelved. Doug tells me, though, that the plans for the unfinished work are still waiting for the job to be completed, which could happen any time. He tells me he has many friends amongst press and galvanic processing manufacturers throughout Europe, particularly in Sweden and Germany.

With EMI, he was involved in discussions on setting up further pressing plants in Kuwait, Algeria, Turkey and Libya. In 1958 he started a firm called Qualiton, which dealt in everything from the microphone to the finished disc and made tapes of large scale orchestral works. The balancing was done by Doug and his staff.

After a policy disagreement with his board he resigned as technical director of Qualiton and started Rosser Electronics in 1967.

It was at Qualiton that Doug met his partner in Rosser Electronics, Dafydd Evans. Dafydd's background is rather different. He joined the Keith Prowse organisation and learned all about the record retail business. During his five years at Qualiton he studied production techniques and factory procedures, though his main concerns were recording, as a balance engineer, and marketing.

Dafydd explained how Rosser started. 'We had built our own mixing equipment designed by Doug Rosser. We decided that there was room for high quality, reasonably priced equipment based on designs we'd made for our own use. We always made equipment to European standards because we'd had experience of Continental standards, you see. What happened was that, really, we were rushed into forming a company by the pressure of orders. Three companies wanted equipment from us and so, resigning from Qualiton, we decided to set up a company.'

He went on to explain that the company never advertised until August 1972 as they were able to conduct business on the basis of recommendations by word of mouth. These, in the early days, were of course the best form of advertisement.

He told me something more of the early work they did. 'In making mixers we used a modular format built to European standards, which we thought had elasticity of application. Our earliest customers were television companies. We did two desks for record companies and then tv took over. Up to now we have done more broadcast desks than recording desks. We have supplied Harlech, Anglia and

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Below left: Studio three seen from studio two.

Below: Studio one.

continued

others.' Rosser's brochure shows a photo of a Harlech Mobile console they built.

Rosser will take on any kind of job from acoustics consultancy work to building a record factory from scratch. At the moment there is a work force of five people. I asked how they could possibly manage to take on all the work they have done. Dafydd explained. 'We have a well tried and tested system of subcontracting and taking on extra labour from an established pool when it's needed. The Nato contract testifies to its efficiency. In this way we keep our overheads very low and contrive to keep our prices realistic without sacrifice of quality.'

Doug told me later that he had arrangements with many of the factories in the area to use some of their labour for intensive work over short periods. 'With a small amount of personnel you have to work fast but I've always been used to small firms.'

There were nine studios to be equipped at the Brussels headquarters of Nato, and over 50 line distribution amps were needed. Nato wanted reliable routing amplifiers which showed low noise and low distortion. They had to have a logical means of operation, and had to be built to European dimensions.

The equipment was to be used for broadcasting through Nato network, and other requirements included the provision of 60 mic channels, six six channel, one 12 channel and an eight channel desk. Balanced lines had to be used throughout.

Switching had to be provided from studio to studio. The system had 26 transmitters for which nine desks provided multilingual transmission facilities. In the event, Doug told me, the quality of the foldbacks or clean feeds was good enough for transmission.

All these requirements were known only two months before the work was due to be commissioned.

In this case the input requirement was: to accept up to +21 dB or down to −70 dB; to provide alterable gain in steps of 10 dB, the last step to be 6dB; frequency bandwidth of 20 kHz, after which there had to be a slope of 12 dB per octave; low-pass fine gain control; a noise level of −126 dB with reference to the input; a source resistance of 200 ohms and a pass band of 20 kHz. The inputs and outputs had to be balanced and this meant using transformers.

The switching modules had to have good separation and low cross talk, and the line amps had to have a source resistance of less than an ohm. The transformer for that had to deliver −22 dBm at an output impedance of 22 ohms very accurately balanced.

Doug said he could see that the input stage would prove difficult and he solved it by using a ring of four transistors and applying feedback to control the level of the input. Typically, he said, the noise was −128 dB with reference to 1V when terminated in a 200 ohm input. The lower the mic impedance, of course, the lower the noise, because the source resistance across which the noise voltage appears is lowered. The noise factor of the units was between 2 and 3 dB.

The output stage was required to deliver a typical maximum output of 21 dBm. Doug explained that the input transformer had to be of small dimensions for the module size and handle zero dBm when you were putting +21 into the mic and input. Those transformers were obviously the biggest problem of all. Doug said that at this time he pretty well lived in the transformer factory. They had tried plenty of transformer manufacturers up and down the country and in England but in the end they decided to make them at the factory of Allen Components of Port Talbot. For one thing it was near and for another, Doug said, it had a friendly atmosphere.

The small size of the units made them very tough to design. Where the main competition, a large German firm, failed was in being unable to design the transformers properly. 'The German work was over-engineered and it seemed they couldn't make the transformers small enough while maintaining performance,' Doug explained.

Since the Nato contract the amplifier, which has formed the basis of much of Rosser's custom-built equipment, has been slightly altered in function and considerably improved.

Allen Components now make all the transformers for Rosser Electronics, and Doug took us to Allen's Port Talbot factory to look round. I was pleasantly surprised by how friendly it was; I was expecting the usual sullen, resentful silence to descend as we nosy parkers looked over shoulders at what the workers were doing. But it didn't. Doug Rosser was very well known and, it seemed, just as well liked.

Later he talked about his approach to designing equipment. 'The specs we issue are very liberal. The typical values are at least twice as good . . . but specs on the limit are creeping in. You see distortion figures quoted of 0.001 per cent. It's a lot of rubbish. What's needed is not a ridiculous distortion figure like that but equipment with the correct balancing, good facilities and, vitally, reliability. The engineer wants what he wants, not what you want to give him. If what he wants is poor engineering, of course, you have to tell him. It may lose you a sale, but . . .' and he shrugged his shoulders.

He has very definite views about our membership of Europe. 'The common market is very important. If any European company can do it we can do it. Knocking Britain is silly. We're the best in the world. It's only the tariff that keeps us out of European markets and the British market has become far too small. We must *think* European, in dimensions, for example.'

I asked him if he found any snags in working so far from London. 'It suits me to make stuff locally. We have friends here, and we have interests in other companies in the district. Elsewhere the arrangements are rather distant but here the people on the shop floor know you and that makes a difference.' Another consideration, which he didn't mention, was that both he and Dafydd Evans have such an affection for Wales they couldn't bring themselves to leave it. Dafydd showed us some of the countryside one evening while we were there and I don't blame them for staying. It's hard to believe that, not far from this splendid coastline, a firm is making recording equipment as good as that available in London. But true, nevertheless.

Local Radio: American Style

KEVIN MORRISON

contributes impressions gained during a recent visit to West Coast radio stations. The theme is specialisation. KABC offer the best kind of chat, KJOI the best kind of automation, and Russ (disc jockey) Syracuse some kind of sex. More ambitious are the activities of station KCIN whose staff of eight broadcast from sunrise to sunset, seven days a week, and also produce a newspaper.

IF YOU OPEN a newspaper in Los Angeles, somewhere near the back you will find a list of the local radio stations. Since there are over 70 of them, details of the programs are not included. In any case, they would be superfluous. Stations are classified into groups according to the kind of programs they broadcast. There are music stations—constant rock, pop, jazz, sweet, soul or country music—and speech stations. The latter specialise in education, news, religion, sport, commentary, variety and chat.

It is surprising just how many stations do cater for speech, since the image we have in Britain is of constant pop and very little else. KABC are a radio station in Los Angeles, one of the most successful in the States. They broadcast nothing but phone-in conversation programs, together with news and advertisements, 24 hours a day. Owned by the ABC network, KABC occupy a transmitter site in an area of the city tight with factories and warehouses. From the outside it is more like a fortress than a radio station.

Say it with a brick

The KABC management discovered long ago that people with something to say invariably like to say it with a brick. For this reason there are no windows and the front door is left locked at all times. You state your business into an intercom and, if satisfied, the receptionist activates the electric bolt on the door.

There is security on the air as well. The entire program output goes through a tape loop delay before reaching the transmitter. This way, a slanderous or obscene caller is vetoed before any real damage is done. Once inside, your attention is taken by the facing wall which is completely covered by citations and awards.

At the time of my visit, the presenter was an Englishman, Michael Jackson. He sits in the inner sanctum from just after 9.00 each morning until 13.00. His only rest from the constant telephone dialogue with his listeners is the time during which the commercials and news are on. Rarely is there a shortage of calls. The mixing board had a capacity of well over 40 lines and they all seemed to be busy. Jackson, like his colleagues, is a veritable one man band. He must know something about anything a caller may ask—or seem to—and how to handle his callers intelligently and fairly. The whole thing is given just the right amount of tongue in cheek to make it entertaining, and there it is—the number one conversation station.

Sex by radio

KABC offer possibly the best kind of chat but there are others. Less worthy, perhaps, but almost as successful, is sex by radio. It all started some years ago in San Francisco when a disc jockey revelling in the name of Russ 'The Moose' Syracuse invented a new game. Several girls would ring in and describe themselves on the air, aided by the Moose's semi-suggestive questioning. Then male listeners had a chance to say in a few choice words why they would like a date with any particular girl. The girls called back, chose a stud, and presumably each pair lived happily ever after. Nowadays, the show has dozens of imitators. A more unusual show in the same vein is Bill Ballance's 'Feminine Forum'. This deals with highly delicate problems of an emotional, medical or sexual nature. As might be expected, the audience draws a high percentage of fascinated males, especially since absolutely nothing seems to be barred from the discussion.

Stations choose different formats for different reasons. Certain kinds of programming—notably continuous 'nice' music—require a minimal staff. Announcements are limited to timechecks, advertisements are prerecorded, and the music itself is on long long tapes. Staff savings are tremendous—indeed, the most successful West Coast 'nice' music station is almost fully automated. Called KJOI, it operates on a human minimum. In the midst of the whirring machinery is one announcer. He spends his time recording agency news stories on cartridges and feeds them into a carousel from which commercials and other interruptions are selected auto. Some stations don't even bother with news. The music, I discovered, is not chosen on the station. The tapes are syndicated from somewhere on the East Coast.

Away from the cities, stations with small staffs are active as well. There is not the

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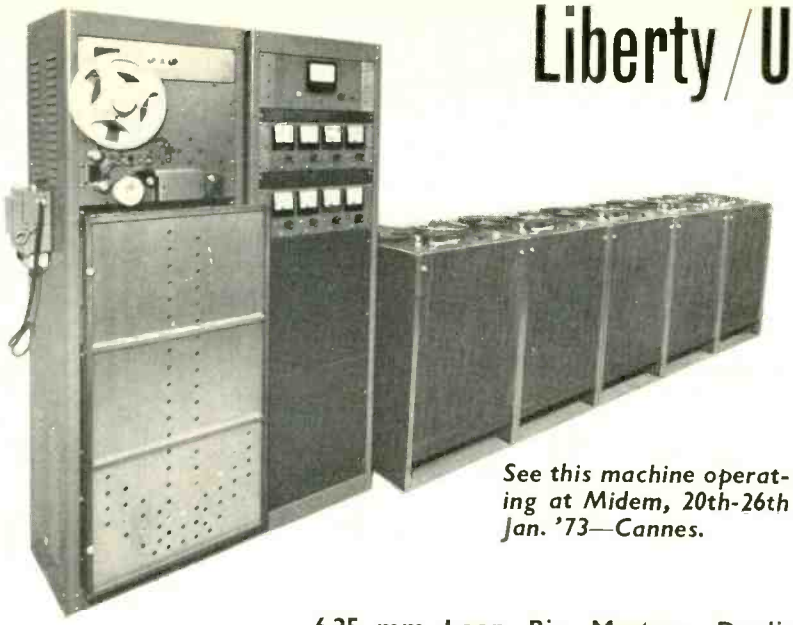
Michael Jackson of KABC Los Angeles interviews a studio guest.

Liberty/UA Tape Duplicators



See this machine operating at Midem, 20th-26th Jan. '73—Cannes.

The Liberty/UA 1600 Series Duplicator is designed for the Mass Reproduction of Cartridges and Cassettes on a Reel to Reel basis, to be broken down after duplication. This method provides a higher quality finished product than can be achieved with "In-Cassette" or "In-Cartridge" duplication.

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LOCAL RADIO: AMERICAN STYLE

continued

feeling that a small staff should limit the programming. KCIN are a tiny station in a desert town. Operating with one studio from the lobby of a hotel, they find the resources to do a wide range of shows and provide a comprehensive news service. They also publish their own newspaper and spend time covering outside events. All this on a total staff of eight. Of these, three are on-air men who maintain radio output from sunrise to sunset, seven days a week. The time limitation is not self-imposed but a condition of licence. Night broadcasting would cause interference to a station on the same frequency. News comes from the UPI wire service and KCIN subscribe to the ABC network, 'opting in' on the hour for the round-up. This is purely a subscriber service: ABC have no share in the station. Other news comes from local newspapers. They have no share in the station either but receive on-the-air credits.

From this grass-roots level up to the biggest city stations, one thing stands out. Radio, of whatever kind, is alive and well in the United States. It was saved from the jaws of television by the car. The pattern of urban development determined that, whoever you were, you would be spending a large part of your day on the road. It also saved itself by fragmenting and specialising. In Britain, the BBC local stations currently have that car audience. Commercial radio is on the way. There are many reasons, geographical, commercial and technical, why the American situation can never be duplicated here. But, whatever does happen, the proliferation is about to start.

THIRD LINE SERVICING

continued

were taken openly on one side by those already working there and told not to take any notice of what the Mekon had asked us. So no information about incompetence, real or imaginary, ever got back. When I eventually left, the Mekon was involved in a new scheme. This followed from his theory that airmen were spending too much time in the lavatories. He had the idea (wholly true) that airmen were sleeping and smoking there for the best part of each working day, emerging only for teabreaks and lunch. He devised a clever time and motion scheme which involved complicated signings in and out for those answering the call of nature. But with several hundred airmen all claiming diarrhoea, the mass of paperwork involved soon got out of hand. I learned later that the scheme had collapsed and the Mekon with it.

The radio trucks (desert-stained and electronically defective) arrived by boat and were driven in convoy up to Staffordshire. One team of three or four technicians was allocated to each truck after they had been parked inside the hangar. The first priority was to get the medium and long wave receivers which they carried licked into first-class working order. That way we could listen to the BBC Light program inside the truck while we set about priority number two—scrubbing the floor, cleaning the windows and polishing everything inside. On the principle of the weakest going to the wall, the newest recruits were usually pushed into cleaning the outside of the truck, a dirty job out of earshot of the radio. With the trucks spick and span inside and out, the third priority was to fix the headphones, their leads and jacks and the sockets on the receiver. All was then set for several days idle ecstasy and bliss before the week allocated per truck was up and we had to start on the next.

During those few wonderful days, life became really worth living again. With headphones on, a screwdriver in one hand and a soldering iron in the other, we could lie or sit around the inside of a truck with our backs to the door. We soon got the hang of sleeping quite soundly within immediate reach of impressive-looking electronic tools. A complicated alarm system of mops and brooms, leant against the inside of the outwardly opening truck door, foiled the Mekon when he pounced on a truck. At worst there would be a warning clatter of falling broom handles to wake us and at best a shout of agony from the good sergeant as he was repelled by whatever had been balanced against the door.

Once in a while one of the more enthusiastic electronic boffins would get bored and mend something. But I now shudder to think of the hardware that was shipped straight back to the Middle East to glitter, gleam and glint like a new pin in the tropical sunlight; hardware that was electronically reliable only at or around the Light Program wavelengths.

As I said earlier, I am not particularly proud of all this. What matters is that it happened and that it could happen. Possibly it still happens. At around that time, I was an enthusiastic amateur drummer and read how my idol Gene Krupa had developed his left hand strength simply by keeping his right hand in his pocket and doing everything with his left, however awkward it proved. So throughout my whole time at that service station, any screws that I negotiated or joints that I soldered were done with my left hand. They doubtless came adrift before long.

Eventually I was posted to a happy little transmitting station on Dunstable Downs where sheep grazed decidedly unsafely beneath masses of high power aerials which stretched over them across the fields. Every now and then an aerial would come down in a high wind and fry an unsuspecting sheep. Probably equally unsuspecting were the pilots of gliders who took off enthusiastically from higher up on the Downs and soared dangerously close to those aerials. The actual powers involved were I think around 50 kW. I remember that the twin feeders from the transmitters were always decorated like a Christmas tree. Electric light bulbs hung on them with string glowed impressively as if by magic, a result of proximity to all that rf energy.

I suppose at that station we would have been classed as first, second and third line engineers all rolled into one. The transmitters were massive things with enormous water-cooled valves and high tension voltages so large that a moth straying between the anode and the earthed chassis could destroy itself in a most spectacular way with a flash like lightning and a bang like thunder (all the transmitters were closed down by banks of fail-safe relays opening in unison). It was our job to tune up the transmitters so that they would not interfere with other wavelengths; we soon had the GPO on the phone if we drifted off frequency. It was also our job to keep the things on the air at all costs and mend whatever went wrong. During that whole original course I had never seen any of the transmitter types on that station. My demob came through before I mastered anything more subtle than the warmest place to curl up for a sleep on night duty (near the water-cooled output valves). Taking men out of their civilian lives and forcing them to work long hours in an itchy uniform for £2 or £3 a week was never calculated to bring out their best. It also showed conclusively how an organisation can carry the dead weight of bluffing passengers if it is large enough to lose them among the few who really know their job. In the services, the few who did know their job were the well paid regulars and a few more with over-developed loyalist tendencies. They carried the rest of us.

The BBC will doubtless run things very differently. They will need to.

CONSTRUCTING A PPM

continued

Sensitivity: 250 mV rms (sinusoidal) minimum input for level '6'.

A prototype circuit is shown in **fig. 4**. All components, with the exception of the integrated circuit and the meter, are obtainable from Electrovalue Ltd, 28 St Judes Road, Englefield Green, Egham, Surrey. The integrated circuit may be obtained from A. Marshall & Son Ltd, 28 Cricklewood Broadway, London NW2. The meter can be supplied by Ernest Turner Ltd and could for example be their model *642* or *643*, priced at about £8 and £10 respectively.

References

1. *BBC Engineering Training Supplement No 6*, 'Programme Meters' by H. D. M. Ellis.
2. 'A New Standard Volume Indicator and Reference Level' by H. A. Chinn, D. K. Gannett and R. M. Morris.
   Bell System Technical Journal, January 1940, pages 94 to 137.
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4. 'The Application of Transistors to Sound Broadcasting' by S. D. Berry. *BBC Engineering Monograph No 46*, February 1963.

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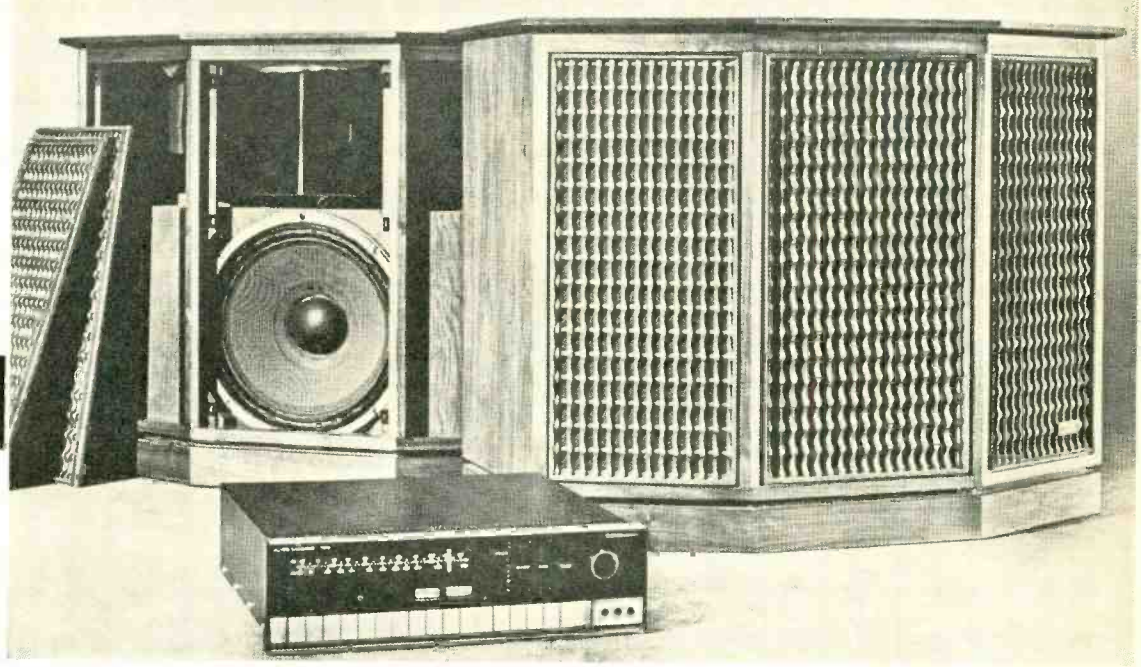

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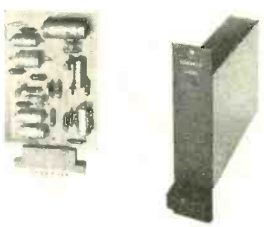

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STELLAVOX SP7 PILOT

THE FIRST thing that makes an impression with the Stellavox *Sp7* is its extremely compact design and secondly its very light weight. Equipped with batteries and tape, it is just over one half the weight of a Nagra *3* and somehow feels much smaller than the Nagra and Uher, in spite of there being little physical difference in size.

Virtually the entire chassis of the recorder is constructed from alloy and the main frame gives the impression of considerable strength. One is not, however, encouraged to drop £600 or so of recorder on to a concrete floor to test its robustness. All the controls and connectors are suitably recessed to avoid damage from mishandling and the hinged clear plastic cover over the transport mechanism appears to be quite substantial.

The left end of the recorder accommodates all the input and output sockets, providing for two microphone inputs, a high level 'diode' input and output, headphone outputs, a synchronisation input/output for use when recording with optical film, and an external power supply input. The front panel is occupied by a twin 'modulometer', a motor speed indicator, a pilot tone indicator, a/b switch, two level controls, and a function control which includes the fast rewind function, as well as battery test and modulometer illumination switches.

On the right hand panel are the speed control switch providing speeds between 76 cm/s and 9.5 cm/s, a socket for connecting a variable speed unit, a recessed potentiometer for fine speed adjustment, and a fairly large removable blank panel for fitting alternative types of sockets that any particular application may require.

In addition to the tape transport, the upper surface of the recorder includes a rotary two-position switch for choosing either dynamic microphone inputs or a/b parallel fed capacitor microphone inputs, a potentiometer with an on/off switch which controls the monitor loudspeaker on both tracks and a three position loaded toggle switch which selects fast forward in one extreme position or 'beep' tone on one track in the other extreme position.

The tape transport itself accepts up to 13 cm diameter spools (without the ABR option which will accept up to 30 cm spools) which are secured by substantial castellated nuts. From the pay-off spool, the tape passes over a rotating tension control which incorporates a 60 Hz strobe marking covering all four tape speeds, then over a further moving roller before it reaches the headblock. This second moving roller offers a considerable reduction in scrape flutter because it is located close to the heads.

The tape then passes over the four Bogen heads (erase, record, pilot and replay) before arriving at the capstan which is pinched by a rubber roller that may be locked out of contact for editing.

Finally there is a further tension control roller, bearing for some reason only tape speed strobe marks at 50 Hz for the three lower tape speeds, and the take-up spool.

The design philosophy of the recorder is such that the headblock, which is secured by three allen screws, contains all the record and replay equalisation components so that, with the exception of mono recording at 19 and 38 cm/s without pilot recording, a different headblock is required for each tape speed and tape type. In the case of mono recording at 19 and 38 cm/s, a switched headblock is available.

This arrangement is fine if one only wants to work with a couple of track configurations at one tape speed, or some similar standard, but it is rather expensive to set up the recorder for other standards with the price of headblocks being between £50 and £100 each. Also, all the bias and equalisation components are soldered within the headblock which makes it a long term operation to change the type of tape in use. The reasoning behind this arrangement is that variable equalisation components might drift when the recorder is subjected to vibration and it must be admitted that it is a nice concept, if a potentially expensive one, if many different configurations are required.

As has already been mentioned, a moving roller is to the left of the headblock and a pinch roller to the right. Both these rollers are mounted on arms which move to bring the tape into contact with the heads when the recorder mechanism is started. They remain in contact until the tape is rewound. It has therefore been necessary to double joint the pinch roller arm so that the pinch roller can be locked out of contact with the capstan, allowing the tape to be inched (millimetered?) for editing. Because the replay head is well and truly buried by the pinch roller arm, it is impossible to make editing marks at the replay head which may be a mixed blessing. To overcome this problem, the left hand roller by the headblock has a circumference of twice the distance between the replay head and a black dot on the headblock. The roller is marked with two symmetrical black dots so, to find the editing point, one simply rewinds the tape one half turn of the roller and the editing point is then under the black dot on the headblock.

Unfortunately there is no support behind the tape at the marking point so it is not easy to make a decent edit mark with wax pencils; alcohol markers solve this problem. It would be worthwhile to add some support just out of

40 ▶

MANUFACTURERS' SPECIFICATION (19 cm/s stereo).

Weight: 3.1 kg (excluding tape and batteries).
Dimensions: 8 x 21.5 x 27 cm.
Maximum reel diameter: 13 cm (26.5 cm with extension accessories).
Speed stability at 20° C: 0.1 per cent.
Tape slip: 0.1 per cent.
Wow and flutter: (DIN peak weighted): better than ±0.1 per cent at 38 cm/s; ±0.12 per cent at 19 cm/s.
Starting time: approximately 100 ms.
Rewind: approximately 4 m/s.
Forward wind: approximately 1 m/s.
Power supply: 12V to 20V dc, 120 mA.
Frequency response of amplifiers: 20 Hz to 20 kHz ±1 dB.
Frequency response overall: 30 Hz to 15 kHz ±2 dB.
Total distortion at 1 kHz, 500 pWb/mm: 2 per cent.
Erasure at 1 kHz (500 pWb/mm): 70 dB.
Signal-to-noise (weighted ASA 'A' filter): 60 dB (stereo) relative to 500 pWb/mm; 65 dB full-track.
Crosstalk overall: 40 dB.
Modulation indicator: Double modulometer.
Stereo compressor rise-time: less than 10 ms, input 1 to 40 mV (distortion approximately 0.3 per cent).
Loudspeaker diameter: 88 mm.
Inputs: *Microphones one and two:* 0.2 to 75 mV symmetrical. *Automatic:* 1 to 40 mV. *Mixer one and two:* 1.55V at 820 kΩ. *Diode one and two:* 440 mV adjustable with potentiometer. *Pilot:* 1 to 1.5V (impedance greater than 10 kΩ. *Clapper:* positive pulse.
Outputs: *Phone I and II (output):* 1.55V (max 2.8V) assymetrical. *Phone one and two:* 1.55V at 5 ohms to 2 kΩ. *Diode one and two:* 440 mV at 470 ohms. *Pilot (with sxq):* 1V to 1.5V.
Manufacturer: Stellavox Georges Quellet Eng.-EPZ, CH-2068 Hauterive, Switzerland.
UK Agents: A. V. Distributors Ltd, 26 Park Road, London NW1.
Prices: Machine less heads and accessories: £457 (pre float).
Equipment as reviewed including two head blocks, power supply, nickel-cadmium accumulators, reel extension for NAB reels, and quartz generator: £810 (pre float).

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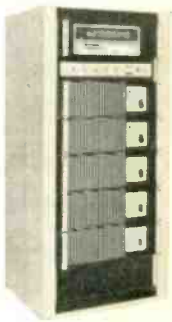

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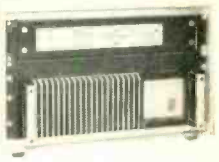

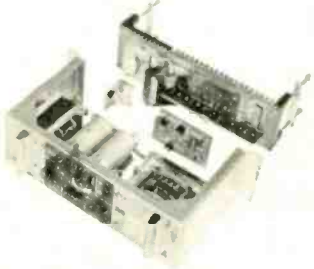

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contact with the tape at this point.

When using 13 cm spools, the tape handling was to a high standard even in the fast rewind mode which moves the tape at some 4 m/s. This is unusually fast for a portable recorder. The only mild defect was a tendency to throw a loop at the takeup spool when starting but this did not in fact cause any real trouble. The winding tensions were sensible and the general quality of tape winding and guidance was good.

While a starting time of approximately 100 ms is specified, this is not realistic due to the wow and flutter caused by the previously mentioned loop slinging problem. The measured time to rated wow and flutter was found to be in the order of 300 ms at the two lower tape speeds, however, and approximately 500 ms at 38 cm/s. Certainly no cause for complaint.

The measured wow and flutter was found to vary slightly throughout a 13 cm reel of tape, worst at the beginning of the reel which produced the following DIN peak weighted figures:

Nominal Tape Speed (cm/s)	Measured Wow and Flutter (per cent)	Measured Tape Speed (per cent)
38	0·07	+0·6
19	0·07	+0·8
9·5	0·23	+0·9

Certainly these wow and flutter figures are to a high standard, and within specification, but the impressive thing was that wow and flutter at 38 cm/s was still less than 0.1 per cent when giving the recorder fairly rough handling.

While the tape speeds quoted above are too far out for pilot tone recording, it is a very simple matter to correct the speed by means of the preset control which is accessible by removing a screw in the right hand side of the recorder. After adjustment, the speed stability was found to be really excellent over a large range of battery voltages and to vary only 0.02 per cent from one end to the other of a 13 cm spool of tape.

There was, however, one thing that played real havoc with the tape speed. Over-driving the monitor loudspeaker led to excessive current drain from the power supply which then lost control.

The additional tape speed of 76 cm/s may be selected by the tape speed control switch but this speed is not intended to be available when the recorder is fed from its internal batteries and the instruction manual states that an external power supply of 24V is required.

All attempts to make the recorder run at 76 cm/s failed with both the Stellavox *APS* power supply and the laboratory stabilised supply. When the latter was varied, the tape speed went above or below 76 cm/s. It was therefore concluded that this sample of the recorder was faulty.

In addition to the fixed speeds, it is possible to vary the speed over a wide range by connecting a capacitor to the 'speed' socket on the right hand side of the recorder and in all cases the correct function of the motor servo electronics is indicated by a miniature meter on the front panel. Finally, it is also possible to start or stop the mechanism remotely (with rapid start) by connecting a switch to the 'synchro' socket.

Replay performance

The recorder contains two complete sets of replay amplifiers and a single loudspeaker drive amplifier for the internal monitor loudspeaker which is simultaneously connected to both channels but may be switched to before or after record.

Logically, one set of amplifiers is connected to each channel when stereo headblocks are fitted—but when a mono headblock is fitted, both channels are connected to the mono replay head.

One output socket fitted to the recorder gives a fixed unbalanced output of about 1.55V at DIN reference level of 320 pWb/mm (38 and 19 cm/s). The socket may be switched to either before or after tape and in either position gives the alternative of a low impedance source in the order of a few ohms or a source impedance about 200 ohms which is intended for driving monitoring headphones. Both left and right outputs are available at the same five-pin socket. There is no level control for the headphone output because, as Stellavox state, 'this will help to develop a subjective feel of the correct recording level . . . but an additional volume control could be installed by the owner'.

A further fixed output rated at 440 mV from a source impedance in the order of 470 ohms is provided at the 'diode' socket for both channels but this output cannot be switched to the playback signal.

The output amplifiers run into serious distortion at an output of +11 dBm which corresponds to a tape flux of +5 dB above 320 pWb/mm; the consequence is that the Stellavox is unsuitable for replaying recordings that have been made using the capabilities of high output tapes such as *LR56*.

At the other end of the scale, the machine noise (and also the noise from bulk erased 3M *207* tape) were measured with respect to a tape flux of 320 pWb/mm using both the full track headblock at 19 cm/s and a stereo headblock at 38 cm/s with the following results:

Machine only (motor running):

Full track 19 cm/s	
Left	Right
64·3 dB	57·0 dB
74·5 dB(A)	76·5 dB(A)
Stereo half track 38 cm/s	
57·5 dB	57·0 dB
70·0 dB(A)	68·5 dB(A)

Bulk erased 3M *207*:

Full track 19 cm/s	
62·5 dB	56·5 dB
71·5 dB(A)	71·0 dB(A)
Stereo halftrack 38 cm/s	
55·0 dB	54·5 dB
66·5 dB(A)	66·0 dB(A)

The above rms weighted measurements demonstrate a good noise performance and similar measurements to the DIN standard method gave figures consistently 3 dB worse, which are only to be expected. The large difference between weighted and unweighted figures was found to be due both to internal motor noise and hum pickup from the local mains supply but both these noise sources are sufficiently low in level to be of little consequence.

Before anyone thinks that it is crazy to quote both left and right figures with a mono headblock, it must be remembered that both replay amplifiers are in circuit with mono headblocks and the following replay frequency response figures clearly demonstrate differences between channels in mono.

Frequency	Full track 19 cm/s (70μS)		Stereo half track 38 cm/s (35 μS)	
	Left	Right	Left	Right
1 kHz	0 dB	0 dB	0 dB	0 dB
31·5 Hz	−0·5	−0·5	+1·5	+1
40	−0·5	−1	+1	+1
63	−0·5	−1	+0·5	+0·5
125	0	−0·5	+0·5	0
250	0	0	0	0
500	0	0	0	0
2 kHz	−1	−0·5	0	0
4	−1·5	−1	0	+0·5
6·3	−1·5	−1	0	+1
8	−2	−1·5	0	+1
10	−2	−1·5	+0·5	+2
12·5	−2	−1·5	+1·5	+3
14	−2	−2	+2	+3·5
16	−4	−3·5	+4	+4
18	−6	−6	+4·5	+5·5

It must be admitted that the high frequency replay performance is rather a disappointment and at considerable disagreement with the performance data provided with the machine and headblocks. In view of the fact that the measured record/replay frequency response is in close agreement with the supplied performance data, the original calibration tapes may be defective.

This suspicion is enhanced by the fact that the supplied data includes a continuous curve for the replay response at 19 cm/s. Such a curve cannot be obtained from any known commercial calibration tapes. Are Stellavox in the unusual habit of making their own calibration tapes?

Record/replay performance

Fig. 1 shows the record/replay frequency response at 19 cm/s with the mono headblock and using 3M *207* magnetic tape for which the headblock had been adjusted. The figure also shows the effect of the speech/music switch.

When the speech/music switch is in the music position, the frequency response is within ±2 dB from 20 Hz to 15 kHz which is just on the manufacturers' specification.

Similarly, **fig. 2** shows the record/replay frequency response with the stereo 38 cm/s headblock, while switching the level recorder from one channel to the other. The balance between left and right channels is good, particularly at high frequencies where difficulties are most common. The 38 cm/s response is extended to 20 kHz but, as is only to be expected, starts to fall off at 20 Hz. It is unusually free from head contour effects.

The process of recording with both input level controls set to minimum gain increased bulk erase tape noise by some 5 dB(A) with the

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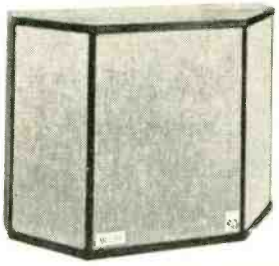

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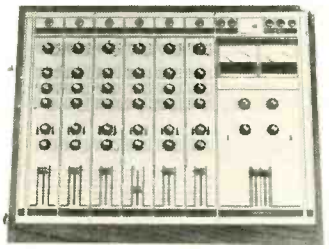

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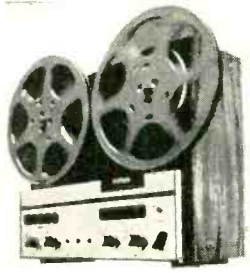

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19 cm/s full track headblock, or an average of 6.5 dB(A) with the 38 cm/s stereo headblock. Both these figures are decidedly on the large side and either indicate that the bias oscillator has excessive even-harmonic distortion or that the record amplifier is noisy; there was no evidence of the heads being permanently magnetised.

The twin modulometer on the front panel was found to indicate +0.75 dB on the left and −0.25 dB on the right channel when recording a level of 320 pWb/mm. This is an acceptable accuracy but could be bettered. The modulometers were found to be peak reading instruments with an attack time such that they under-read 1 dB on 10 ms 10 kHz tonebursts.

Three percent third harmonic distortion at 1 kHz was found to occur on both channels when recording a level of +4.7 dB with respect to 320 pWb/mm on 3M *207* with the 19 cm/s full track headblock. However, the record amplifiers saturate if the record level is appreciably increased beyond this. They are therefore unsuitable for driving high output tapes or insensitive tapes.

When mono headblocks are used, the two record amplifiers are paralleled at the head. If only one input is used, the modulometer therefore under-reads. If correct recording level indication is required with mono headblocks, it is essential to parallel the left and right inputs. On the other hand, if two microphones are used in mono with one microphone intentionally recording at a lower level than the other, it is almost impossible to record the tape to its full level.

There is a similar complexity about the 'beep' tone which ends up at 4.5 dB below 320 pWb/mm with a full track headblock, or about reference level with a stereo headblock where it is recorded on one channel only. The 'beep' frequency was found to be 1.097 kHz with a total harmonic distortion of 5.6 per cent which is enough to sound lousy!

Recording level is controlled by two calibrated potentiometers, which also have a use in the replay mode when the a/b switch is set to before. Under these conditions, the record level controls may be used to adjust the output level, which is at its normal value when the level controls are set to zero. This facility could be used to avoid the distortion problem when replaying high output tapes but it would be all too easy to forget to use it.

There are three input sockets available which offer a useful variety of possible input combinations. The Input One socket provides two microphone inputs which are balanced and can be switched for use with either dynamic microphones or a/b parallel fed capacitor microphones. The Input Two socket is wired in parallel with one of the Input One microphone inputs and also includes high level inputs which are intended for the Stellavox stereo mixer. The third input socket ('diode') provides two high level stereo inputs and also high level outputs from tape.

The following are the maximum input sensitivities for recording a flux of 320 pWb/mm in the stereo mode, clipping points, and input impedances, as measured for the various inputs:

Input	Sensitivity	Clipping point	Input Impedance
Dynamic microphone	230 μV	80 mV	3·85 kΩ
Capacitor microphone	370 μV	110 mV	238 ohms
Mixer	1·9V	Over 12V	806 kΩ
'Diode'	110 mV	Over 12V	38 kΩ

The input impedances and sensitivities are logical and the overload margins entirely satisfactory. The capacitor microphone dc supply was measured at 10.2V which suits many common microphones.

Because the microphone inputs are always in circuit, the recorder is supplied with a shorting plug for the microphone socket so as to reduce input stage noise when the high level inputs are in use.

Fig. 1 shows the characteristic of the speech/music switch as found at the microphone inputs; this degree of bass cut is really rather inadequate to be of practical value. While the speech/music switch should not, according to the circuit, have any influence on the mixer and 'diode' inputs, it was found that it had a slight effect upon the latter.

Stereo crosstalk at 38 cm/s was measured by recording one channel via the microphone input at a level 10 dB below 320 pWb/mm, setting the unwanted record channel to the same gain and loading its input with 200 ohms, and then replaying the unwanted channel. Crosstalk between 25 Hz and 20 kHz was better than −30 dB, increasing to better than −55 dB between 125 Hz and 6.3 kHz which is of course more than adequate for stereo recording.

Using 3M *207* tape, the erasure of a signal recorded at 1 kHz was measured as 74 dB at 38 cm/s. Even using BASF *LGR* the erasure was well in excess of 70 dB. There is thus no cause for complaint in this direction and the machine should be capable of erasing all modern iron oxide tapes satisfactorily.

The final part of the electronics, so far as audio is concerned, is the automatic gain control circuit. This takes the peak value of the largest of the stereo inputs and feeds a dc voltage back to control the gain of the recording amplifiers. The circuit has an extremely fast attack time and a relative slow recovery (between 1 and 2 dB/s depending upon the degree of 'overload'). In spite of these characteristics, the system appeared to be free from clicks which are not unknown in fast acting systems and did not produce any undue 'breathing' effects.

When the agc is in use, the record level controls act as threshold controls. When set to maximum gain, the agc did not lose control until the microphone input had reached some 35 mV.

Synchronous recording with film

In addition to the facility for recording pilot tone, which will be described, the Stellavox includes other facilities which are designed for recording in conjunction with optical film. While the 'external' socket on the recorder is commonly used for the mains unit/battery charger, it also includes the clapper input which records a nominal 1 kHz tone on one track when the clapper pin is shorted to a positive voltage supply on the same socket.

The clapper facility is only included when the optional *SXQ* module is fitted and this module also includes a crystal oscillator which is divided down to 50 Hz with a measured accuracy of two parts in 10^6. This oscillator output is automatically recorded as pilot tone in the absence of an external pilot input from either a camera or the mains unit.

Also included in the *SXQ* module is a pilot tone pre-amplifier, which gives a high level pilot output on replay.

The presence of pilot tone from any source is shown by the miniature meter on the front panel, provided with marks which were found to correspond to 700 mV and 1.3V input of 50 Hz sinewave pilot signal. Because of the automatic insertion of local pilot signal in the absence of the camera signal, loss of the

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FIG.1 STELLAVOX Sp7 RECORD/REPLAY RESPONSE AT 19cm/s WITH 3M TYPE 207 TAPE

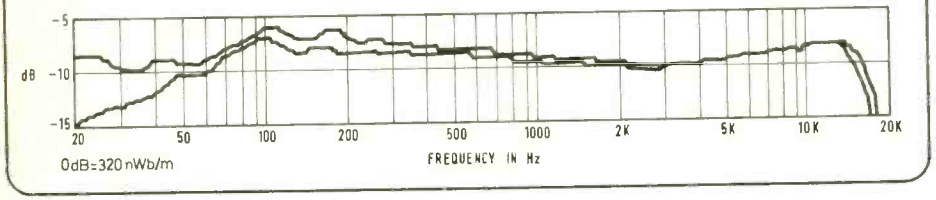
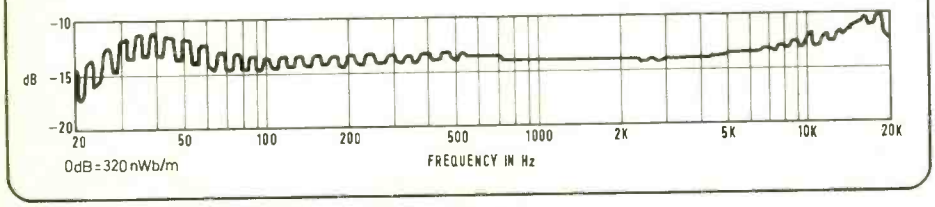


FIG.2 STELLAVOX Sp7 RECORD/REPLAY RESPONSE AT 38cm/s WITH 3M TYPE 207 TAPE



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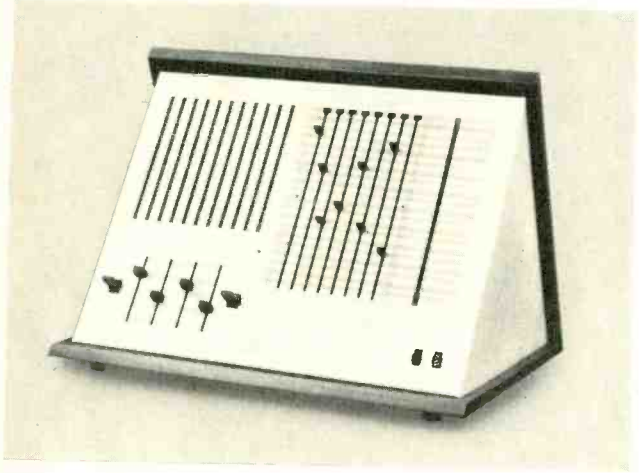

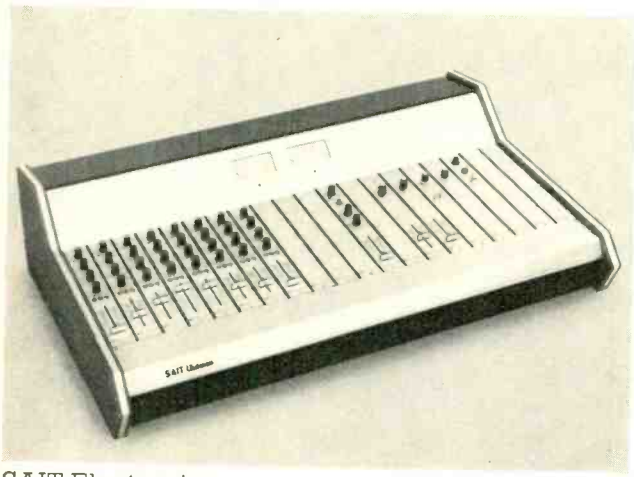

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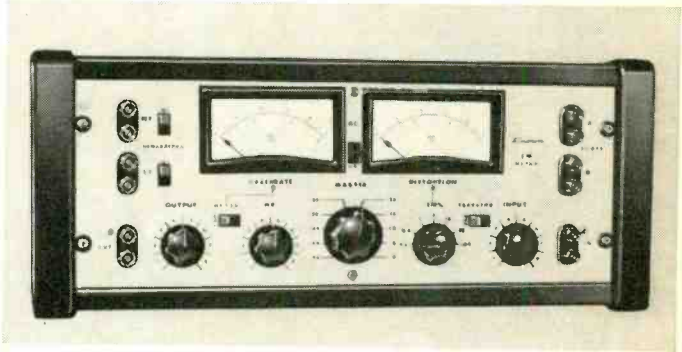

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continued

camera signal would remain unnoticed when recording, but would become noticeable from the pilot meter once the recorder was taken out of the record mode when the local signal was also disconnected.

Two sync systems

Two methods of recording the pilot tone are employed. With mono headblocks, the conventional 'Neopilot' system is used incorporating a standard 500 μm mm track down the middle of the tape with longitudinal magnetisation and using two very narrow push-pull heads. The second system for use with stereo heads also uses a 500 μm wide track between the two audio tracks but, with this new 'synchrotone' system, signals between 40 Hz and 12 kHz may be recorded. It is therefore possible to use this track for other purposes such as a cue track, commentary track, and for operating slide projectors.

Fig. 3 shows the frequency response of the 'synchrotone' track at 38 cm/s which is perfectly adequate for many purposes. However, as with all multitrack systems, crosstalk is a limitation. The measured crosstalk when recording the synchrotone track at +6 dBm was better than 50 dB from 40 Hz to 2 kHz with a slope of about 6 dB per octave from the minimum crosstalk of 66 dB at 300 Hz to 20 dB at 10 kHz. Remarkably, the signal-to-noise ratio of the synchrotone track was measured at 42.5 dB(A) but crosstalk from the audio track was a limitation.

When using the 'neopilot' system at a tape speed of 19 cm/s, the crosstalk to audio was found to be 62 dB below 320 pWb/mm with a camera pilot input of 1.3 V, which is unusually good.

In the replay mode, the *SXQ* module provides a pilot output in the order of 1V when using the neopilot system, or somewhat less than this with the 'Synchrotone' system.

As has already been stated, the speed stability and speed consistency throughout a reel of tape is really excellent; furthermore the wow and flutter when carrying the recorder is extremely low.

The ABR reel extension option

While the 13 cm spool capacity of the recorder will normally be quite adequate for film work, it may well be considered a limitation for normal audio recording, particularly at the higher tape speeds. Stellavox have therefore designed a reel extension plate which fits under the recorder. Upon this are mounted two reel hubs and adaptors for cine NAB spools.

The flat plate is provided with small pins which make location of the recorder on the plate a simple matter. It is then secured to the plate by two swivelling clamps and knurled nuts.

The spool drive is by means of rubber belts which drive the spools by their securing nuts offering two different driving diameters according to which way round they are used (one way for small spools, the other for large). The belts are driven by small pulley/guides which are screwed on to the recorder's spool hubs.

In operation, the tape path is normal except that it is threaded round the small pulley/guides on the recorder before passing to or from the spools. After the tape is threaded, the drive belts are put on and all should be well. The first snag found was pretty serious loop throwing at the takeup spool, in fact positively terrifying when using the calibration tapes. After some time one of the pulley/guides fell off; these need to be screwed on pretty tight. The next operation was to rewind the tape, for which one removes the belt from the original takeup spool; all went well.

However, the tape wind, both after recordng and after fast spooling, was far too slack and I can anticipate serious tape damage when tapes are transferred to larger machines operating at normal tape tensions.

Perhaps surprisingly, the wow and flutter was lower when using the *ABR* unit than without it but the margin was small and this is no recommendation for the *ABR*.

The UK agents for Stellavox tell me that the tape wind problem can be improved by adjusting the recorder's clutches but I have the feeling that this could well lead to problems when the *ABR* is not in use.

Mains power supply

This is the identical *APS* unit to that used with the Stellavox mixer and has been criticised in preceding review. The UK agents for Stellavox inform me that the unit is being modified and, until such time as this is done, it can only be said that the sample unit was dangerous.

The APM Preamplifier

This is a small microphone preamplifier for recording commentary etc with the synchrotone track. The unit is provided with a lead which connects between its output socket and the 'synchro' socket on the recorder, and incorporates a second Tuchel socket for connecting a dynamic microphone.

Also mounted on the preamplifier is a gain control which can be adjusted in operation by noting the deflection of the miniature pilot meter on the recorder.

Because the basic requirements for this amplifier are not demanding, no measurements of its performance were made but a practical test was undertaken. The system was found to be more than adequate for recording speech but care should be taken to record at as low as possible level in order to avoid crosstalk from the commentary to the other tracks. If the recording was made at such a level that the pilot meter on the recorder just peaked at the first marking, the crosstalk was at a fairly acceptable level but could be heard during very quiet passages in the main recording.

In conclusion

With the exception of the loop slinging problem with the normal 13 cm reels of tape, the mechanical design of the Stellavox is absolutely first class and all aspects of the tape transport are to be thoroughly commended. In particular, the wow and flutter are to a high standard on the bench and outstandingly good when the recorder is being carried, when compared with other portable machines.

The *ABR* reel extension unit is also well made but its performance is a distinct disappointment because of the very low winding tension even when recording or replaying the tape. Also, it is a nasty loop slinger.

The construction of the electronics is also to a high standard but the mechanics are let down by the performance of the electronics. Both record and replay amplifiers have a very narrow overload margin; replay amplifier noise levels are good but are let down by noise from the record amplifier system which should give a bias/erase noise at least 3 dB better.

Overall frequency response was reasonable but it is strongly suspected that poor calibration tapes are being used to align the replay

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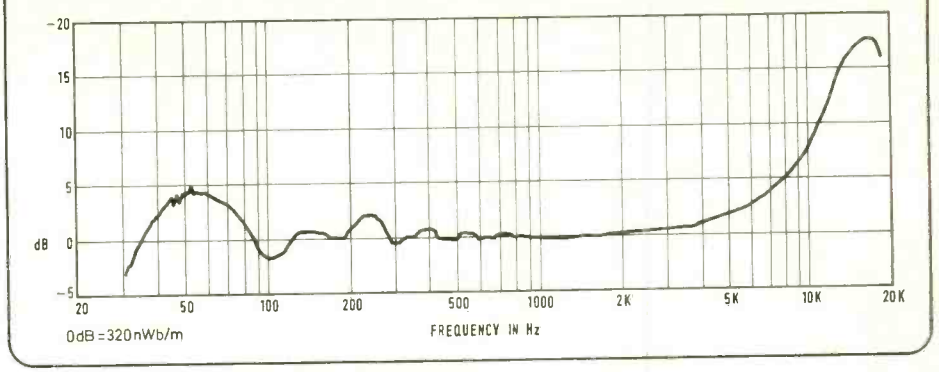
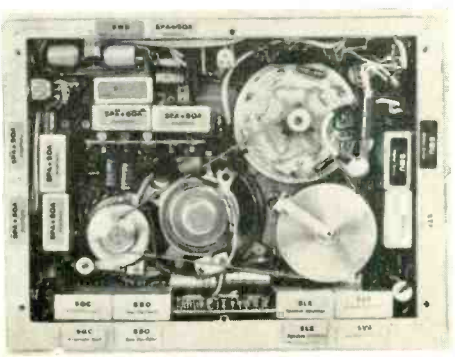
FIG.3 STELLAVOX Sp7 RECORD/REPLAY RESPONSE OF 'SYNCHROTONE' CHANNEL





Internal view of the SP7

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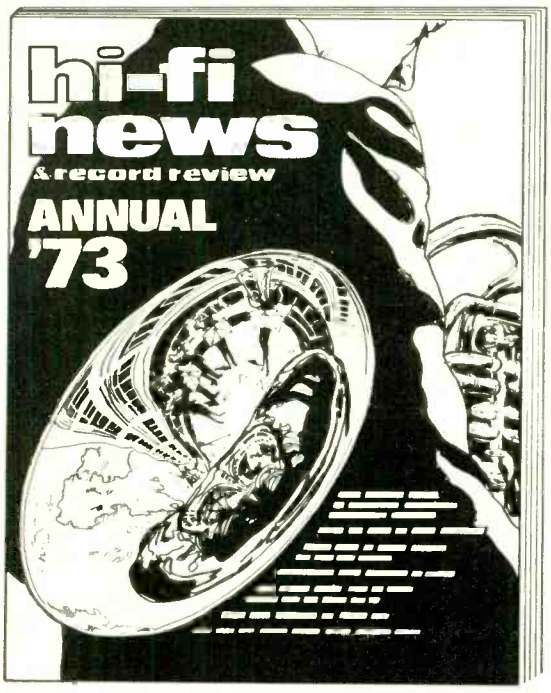

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continued

chain as the high frequency replay response was not accurate.

Inputs and output were at sensible levels. Impedances and input overload margins were satisfactory but output amplifier overload margins were poor.

The synchrotone pilot track system was excellent, as were all other aspects of the pilot tone and synchronisation facilities; also the little *APM* preamplifier provided a very useful facility when the record level was treated with caution.

Mains powering with the *APS* supply is not recommended until Stellavox have modified the insulation and improved the output stability when on the 240V mains tapping.

Without any doubt, the Stellavox *Sp7* has great potential. The sample reviewed had a number of 'bugs' which should not be difficult to get rid of. Once this has been done, it will be a first class recorder. **Hugh Ford**

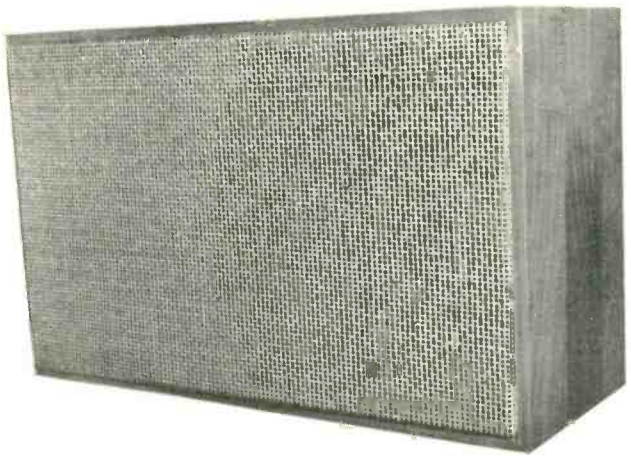
Postscript

Some time after this review, Bob Woolford of AV Distributors re-aligned the frequency response of the review machine and its stereo 38 cm/s headblock and returned the machine for examination.

It was most encouraging to find that the replay response was within ±1 dB from 31.5 Hz to 18 kHz on both tracks; far better than the tolerances of the calibration tapes available.

The associated record/replay frequency response was found to be within ±1 dB from 40 Hz to 20 kHz with the unbalance between tracks being less than 1 dB from 25 Hz to 20 kHz. This corrected alignment had negligible effect upon the signal-to-noise ratio or distortion which was measured as two per cent third harmonic at +5.5 dB above 320 pWb/mm.

SENNHEISER PHILHARMONIC LOUDSPEAKER



SOME time ago a leaflet on the Sennheiser *VKL303* came my way. It described a small monitor speaker with integrated amplifier claiming to give high quality sound at high levels. The monitor proved difficult to obtain and, when I had the chance of trying the Sennheiser *Philharmonic*, it seemed a good second best.

The *Philharmonic* is the domestic version of the *VKL303* having 20W amplifiers instead of the 30W provided in the studio versions. They are otherwise identical. A remote control unit is supplied governing balance, gain, treble, bass, stereo width, rumble and scratch. A preamplifier allows various inputs (tape, radio and gram) to be fed to the speaker-amplifier combinations. These two boxes are part of the domestic system and, except to say that they functioned properly throughout the tests, they will not form part of this review.

The speakers have on/off gain controls on the back and a bass cut to give some correction for room acoustics if required. Each speaker has its own mains lead and, unless one switches off at the mains, it is necessary to switch off each speaker individually after switching off the control unit.

Listening tests were carried out before investigating the system further. This is always done in an attempt to avoid influencing one's imagination with frequency response curves and their like. My usual test tape was played. The general sound quality of the system proved good, coloration being less than on many other expensive systems. The *Philharmonic* did not show up as well, however, when compared with the Quad *ELS*, Spendor *BC1* or Rogers *Monitor*. The sound was not as warm as the Quad *ELS* and there was more coloration in the upper register.

Choir: Brighter and less warm than Quad *ELS*, the sound being more constricted.

Bells: Top frequencies present but transients not quite right.

Organ: Good bass but the two foot stops weren't as bright as the original.

Folk: Singer and guitar. Singer rather nasal and guitar rather dull.

Dance band: Quite accurate, pleasant sound in the lower and middle registers but upper frequencies lack (or gain) something in trumpets not quite right.

Piano concerto: String sound rather constricted and piano not as clear as on the original.

Wind quintet: Hissy but otherwise very realistic.

Voice: More natural than expected after the previous sections.

Full orchestra: Climaxes handled well but some coloration. Upper frequencies slightly suspect; presence not right.

MANUFACTURERS' SPECIFICATION

Output power: 30W continuous sinewave.
Frequency response: 100 Hz to 15 kHz +1 −4 dB ref 1 kHz.
Power amplifier power consumption: 7W quiescent, 70W full output.
Hwd dimensions: 864 x 407 x 254 mm.
Weight: 21 kg.
Price: £220 per loudspeaker.
£113 mixer.
£55 control unit.
£708 complete system.
Manufacturer: Sennheiser Electronic, 3002 Bissendorf, Hannover, West Germany. (Tel: 05130 8011).
Agent: Hayden Laboratories Ltd, East House, Chiltern Avenue, Amersham, Buckinghamshire. (Tel: 0240-3 5511).

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continued

The stereo image was quite good but the sound picture in the orchestral section was not quite right, some instruments sounding further forward than they should have been and others more remote.

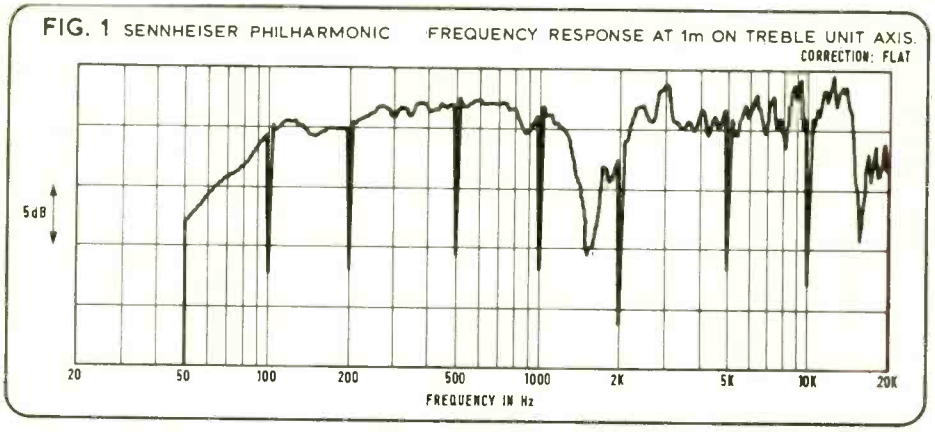
Frequency response curves are shown as taken in an anechoic chamber with the microphone 1m on the axis of the 'treble' unit, room connection controls 'flat' and then with maximum bass out. They show the bass unit to be very smooth but a rather alarming dip in the response at the crossover frequency.

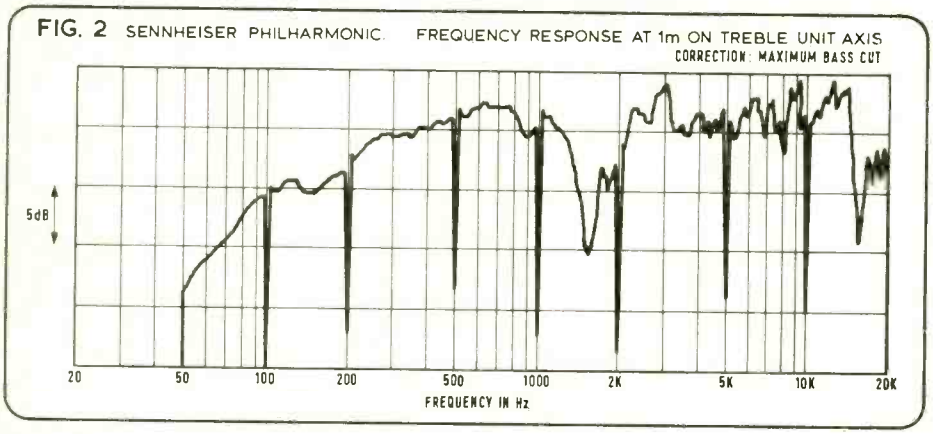
The treble unit is not up to the standard of the rest of the system and the very rough curve obtained at the top end is probably due to this unit 'ringing' at numerous frequencies all along its range.

The cabinets are constructed of thick chipboard and apart from the amplifiers and controls on the back, contain two units: 240 mm bass and a 110 x 70 mm treble elliptical.

The suspension of both these units becomes stiff with any appreciable cone movement, caused either mechanically or by the trapped air in the ib design. This produces a marked change in sound quality at high sound levels, high level sine tone sounding very nasty indeed.

The units are mounted behind the front panel and thus fire into a short tunnel. This, particularly in the case of the treble unit, may be a cause of some of the coloration. There are no tweeters and top response is maintained by equalisation in the amplifiers. There seems a considerable amount of treble boost as with no input the speakers sit there quietly hissing to themselves.





Due to either the large hf boost, or ringing in the elliptical unit, the speakers are not as smooth in top as the best conventional monitor systems and accentuate tape hiss, disc surface noise and other hf noise. The amplifier control unit and cabinet construction are all excellent, and the bass unit is very reasonable.

I suggest that Sennheiser give further thought to the production of high frequencies and would advise them to abandon the elliptical unit as a first step. This basic system, when properly phased and equalised, should be capable of quite outstanding results. Sennheiser make excellent headphones and microphones and must have the facilities for getting things right. I hope they will pursue the *Philharmonic* concept further.

John Shuttleworth

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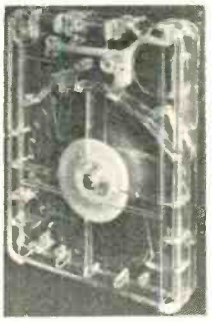

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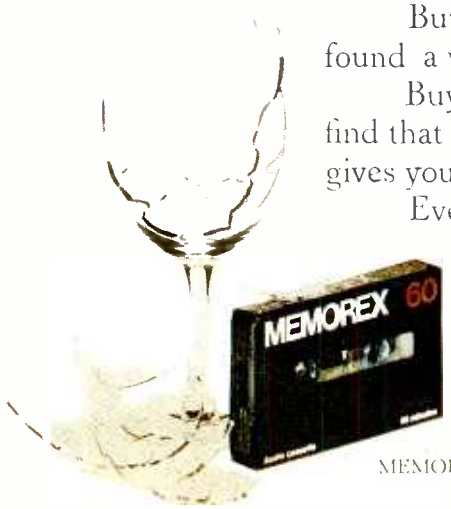

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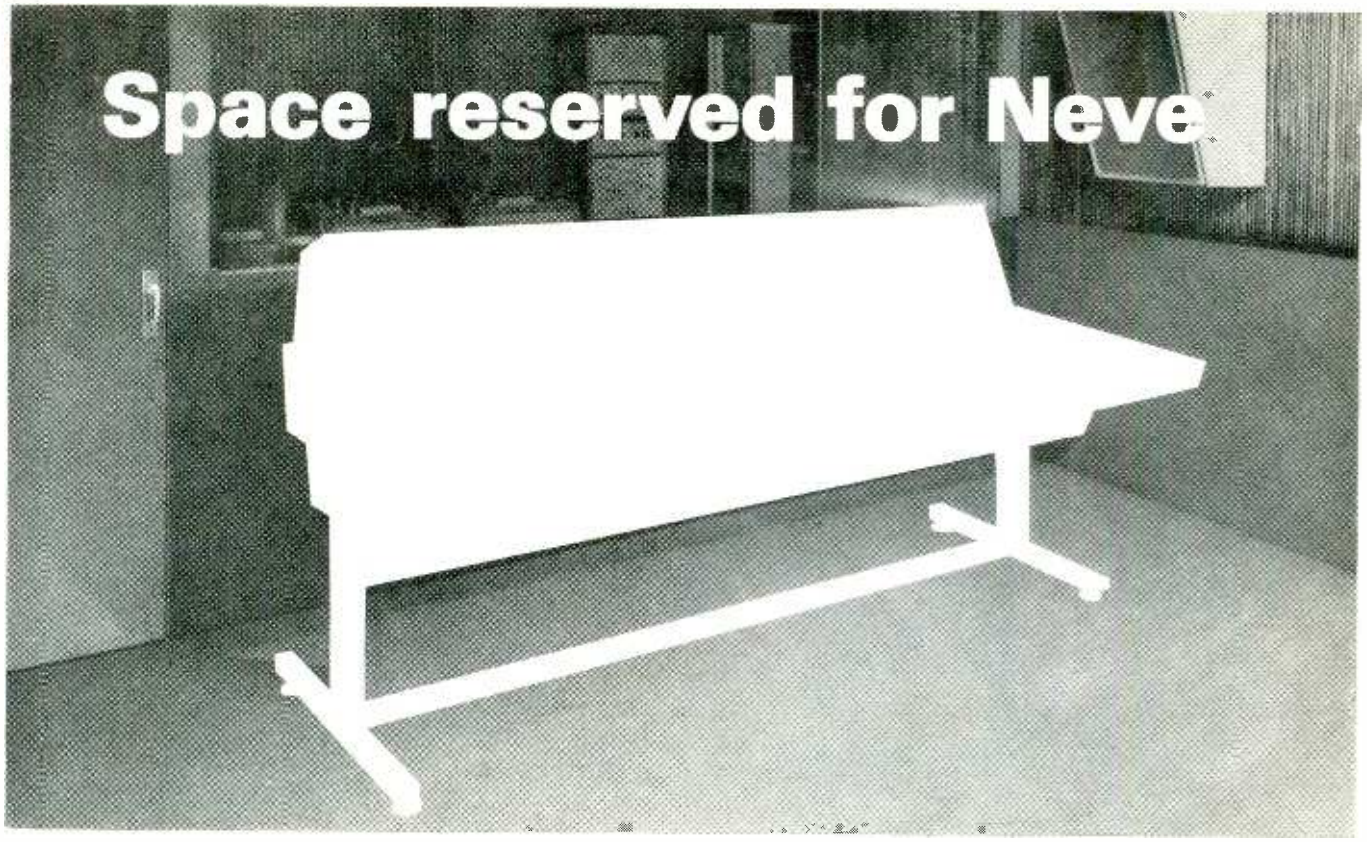

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