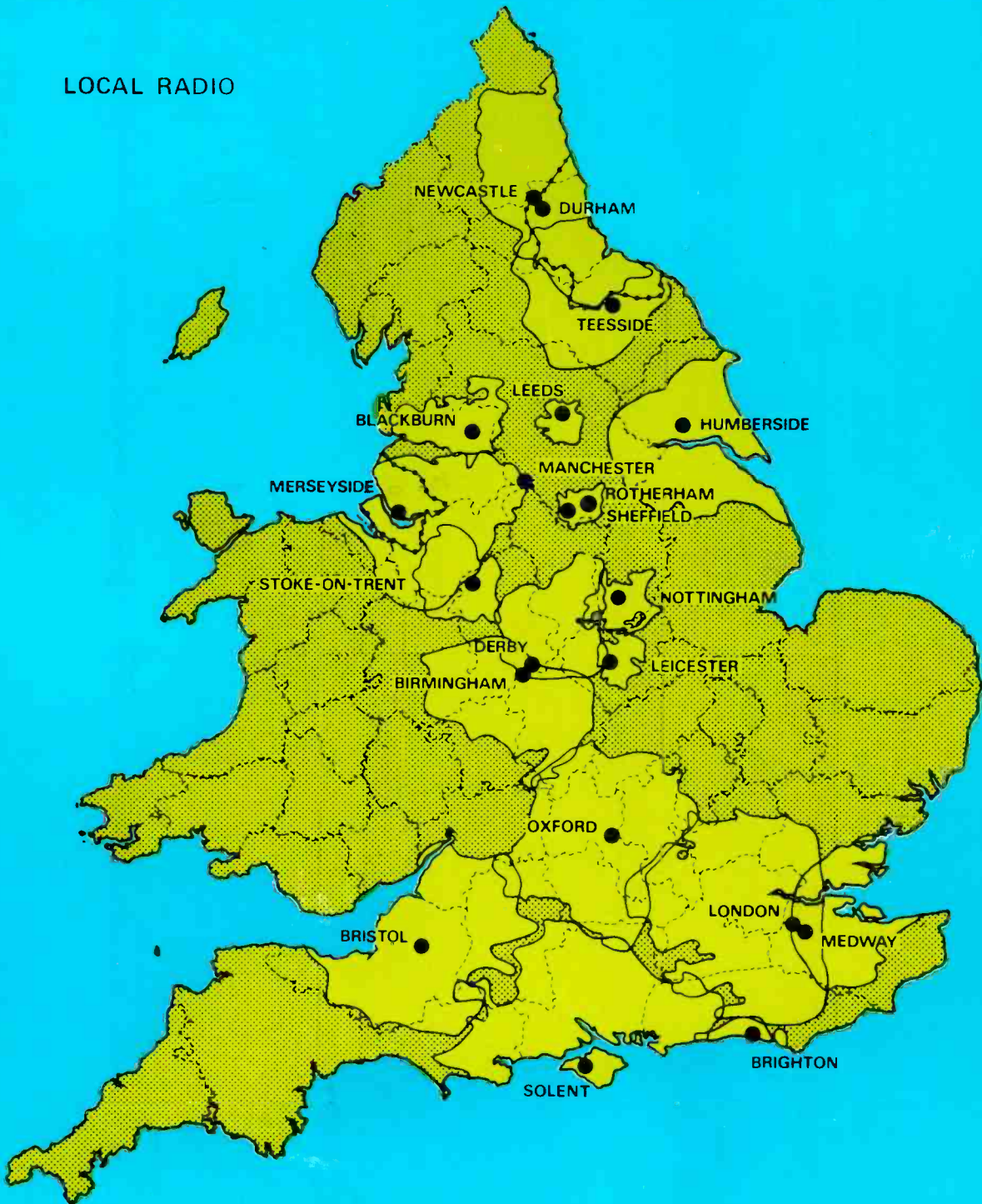


studio sound

LOCAL RADIO



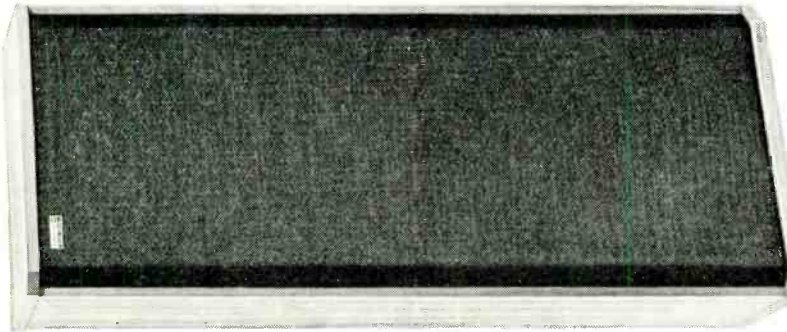
Celestion



Loudspeakers for
the Perfectionist

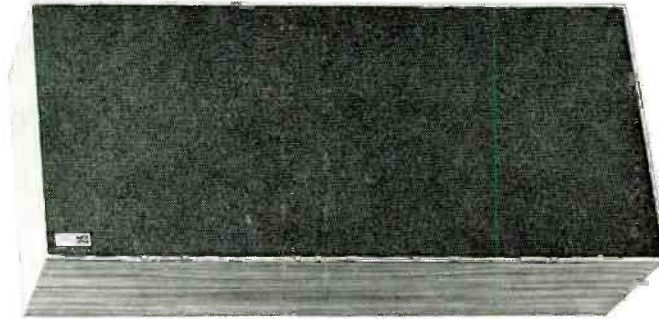
TELEFI

A remarkable innovation exclusive to Celestion for use in conjunction with Hi-Fi and Audio systems for providing high quality television sound reproduction from 625 line television receivers.
*No direct connection to the TV is required, the coupling being effected by an inductive probe.



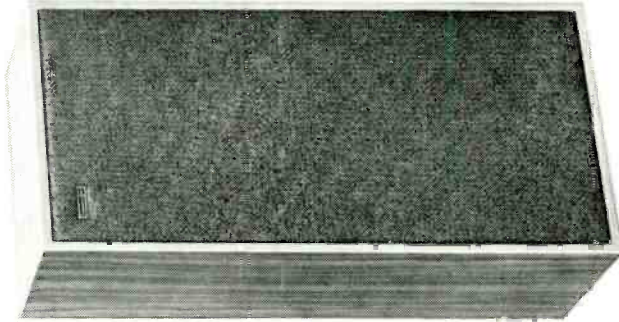
DITTON 66 STUDIO MONITOR

A new Loudspeaker of advanced design suitable for studio use and for home installations of the highest quality.
UNITS: HF 2000 (dome 'pressure' type) MF 500 (Mid-range Driver and 12" A.B.R. The Ultra linear 12" bass driver and 12" A.B.R. The crossover has resulted from considerable research and crossover points are at 500 Hz and 5000 Hz 80 Watts Maximum 4-8 ohm. This monitor loudspeaker system has an exceptionally wide and flat frequency response. Very low order harmonic and inter-modulation distortion. Precise response to transients. Beautifully maintained polar response ensures absence of unwanted directional effects and provides a highly satisfactory stereo image throughout the listening area. Matched pairs. SIZE 40 x 15 x 11 1/2 Natural Teak or Walnut Cabinet



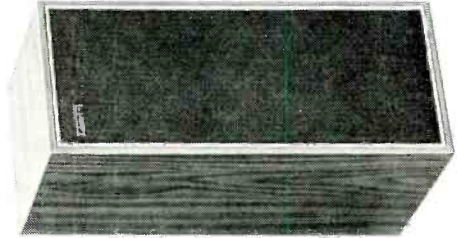
DITTON 25

Recommended for luxury Domestic Hi-Fi installations. A system having extremely low harmonic distortion and high sensitivity. This well established loudspeaker is excellent value and will delight the most fastidious audiophile. Noted by reviewers for complete absence of 'listener fatigue', smooth and effortless in performance.
UNITS: HF 2000, HF 1300 MK II (two), long throw 12" bass driver plus 12" A.B.R. (auxiliary bass radiator) Substantially level response from 35 Hz to 30 kHz 60 watts maximum 4-8 ohms. Matched pairs. SIZE 32 x 14 x 11 Natural Teak or Walnut Cabinet



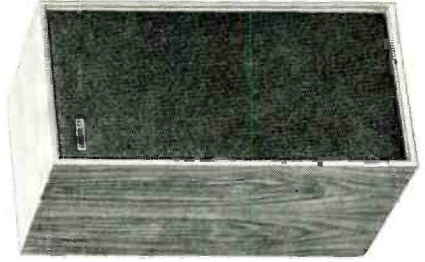
DITTON 44 MONITOR

Designed for the discriminating listener... wide, smooth frequency response. Exceptional transient performance, superbly controlled bass, accurate mid-range—and smooth extended highs.
UNITS: HF 2000, MF 6 and Ultra linear 12" long throw bass speaker. Crossover system superior design at 500 Hz and 5000 Hz. Substantially level response from 30 Hz to 30 kHz 44 watts maximum—4-8 ohms.
SIZE 30 x 14 1/2 x 10 Matched pairs Natural Teak or Walnut Cabinet



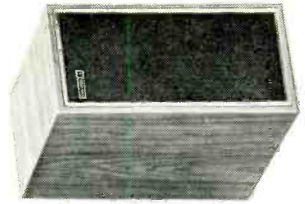
DITTON 15

The world famous high performance 'bookshelf' loudspeaker 30 watts maximum, 4-8 ohms.
UNITS: HF 1300 MK II, heavy duty 8" long throw bass speaker plus A.B.R. (auxiliary bass radiator). Substantially level response 35 Hz to 15 kHz.
SIZE 21 x 9 1/2 x 9 1/2 Matched pairs
This truly remarkable loudspeaker never fails to impress. Natural Teak or Walnut Cabinet



'COUNTY'

Designed for budget Hi-Fi systems but without sacrificing quality.
UNITS: HF 1300 MK II and special 8" long throw speaker. Substantially level response from 45 Hz to 15 kHz, 25 watts.
SIZE 19 x 10 x 9 1/2 Natural Teak or Walnut Cabinet. Matched pairs



DITTON 10 Mk II

True Hi-Fi Sound from a tiny precision speaker. 20 watts, 4-8 ohms.
UNITS: HF 1300 MK II and heavy duty 6" long throw bass speaker. Substantially level response from 45 Hz to 15 kHz.
SIZE 17 1/2 x 6 3/4 x 8 1/2 Matched pairs Natural Teak or Walnut Cabinet

Write for details of Celestion sound equipment.

ROLA CELESTION LTD. DITTON WORKS, FOXHALL ROAD, IPSWICH, SUFFOLK IP3 8JP

studio sound

INCORPORATING TAPE RECORDER

SEPTEMBER 1972 VOLUME 14 NUMBER 9

EDITOR DAVID KIRK

ASSISTANT EDITOR JOHN DWYER

CONSULTING EDITOR JOHN CRABBE

AUDIO GROUP ADVERTISEMENT MANAGER ROBIN WELLS

ADVERTISEMENT MANAGER TONY NEWMAN

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

© Link House Publications Ltd 1972. All rights reserved.

TWO IFS. *If* the Teldec video disc gets off the ground as a technically viable medium for low-cost canned television and *if* the medium can be adapted for ultra-long-play audio, then all previous forecasts regarding growth trends in the electronic entertainments industry need drastic alteration. Until recently, we stood by our 1970 prediction that gramophone records would gradually be phased out during this decade in favour of 4.75 cm/s cassettes, followed eventually by an improved (probably incompatible) cassette. On the video side, we expected videocassettes to form the first successful domestic vtr medium . . . despite doubts raised when Sony and Philips failed to standardise. Teldec cannot offer the low-cost recording facilities of video tape (or at least do not claim to; nothing is impossible) but could provide a solution to the mass duplication difficulties inherent in audio and video tape media.

It is too early to speculate upon the kind of canned television consumers would wish to play more than once. Broadcast television at its best, of the BBC *Horizon* and *Elizabeth R* calibre, will stand perhaps two viewings in the space of two months . . . if you have nothing better to do. Television at its usual standard will not. This is not meant to imply mediocrity on the part of tv program planners; rather, their output, like a newspaper or a novel, is only intended to be experienced once. Future canned programs, whatever the medium, should be conceived for repeated viewing. Music (abstract sound) to an electronically-derived abstract visual accompaniment is the most obvious program form. Doubtless the voltage-controlled synthesiser can achieve for video what it has already accomplished in audio.

The rumour that video discs would accept long duration audio material has now been confirmed, albeit unofficially. As a spoken word medium, such a disc would have so high an information density that it could supercede the printed book.

The prospects for Teldec are attractive, though we should not underestimate the time which will be required to develop today's prototype into tomorrow's saleable commodity. If we have learned nothing else from videocassettes, Selectavision and Instavideo, we must accept that an optimistic 'next year' can mean anything up to five years, assuming nothing better arrives in the meantime. Have Teldec come up with the 'something better' that will kill domestic vtr?

STUDIO SOUND, SEPTEMBER 1972

FEATURES

- 30 PIRATES WITHOUT SHIPS
By Adrian Hope
- 35 APRS '72 REPORT
- 43 SOUNDS LIKE NEWS
By Terence Bracey
- 49 THE SHAPE OF SOUNDS TO COME
By Mike Anthony
- 51 LOCAL RADIO
By John Dwyer
- 57 IBC PREVIEW
- 65 A PEAK OVERLOAD INDICATOR
By David Robinson
- 69 MINIMISING PRINT-THROUGH
By Michael Gerzon
- 73 SURVEY: POWER AMPLIFIERS

COLUMNS

- 25 PRECIS
- 26 NEWS
- 28 PATENTS
- 33 DIARY
By John Dwyer
- 45 RECORDING STUDIO TECHNIQUES
By Angus McKenzie
- 83 FIELD TRIAL: TRIADIX MUSE
ELECTRONIC MUSIC SYNTHESISER
By David Kirk

COVER

Reception areas of BBC local radio stations. John Dwyer discusses the present and future states of local radio on page 51.

CORRESPONDENCE AND ARTICLES

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

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. Payment is negotiated on acceptance.

SUBSCRIPTION RATES

Annual UK subscription rate for STUDIO SOUND is £3 (overseas £3.80, \$8 or equivalent).

Our associate publication Hi-Fi News costs £3.24 (overseas £3.66, \$8.64 or equivalent). Six monthly home subscriptions are £1.50 (STUDIO SOUND) and £1.62 (Hi-Fi News).

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.

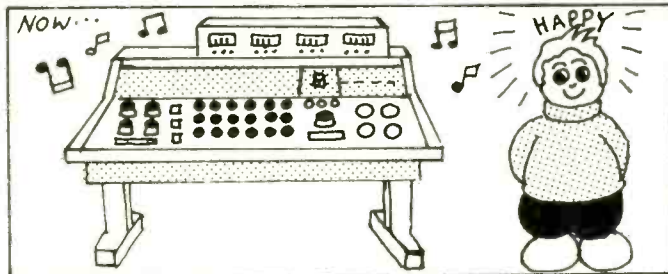
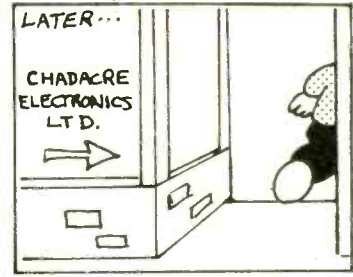
Photostat copies of any STUDIO SOUND article are available at 25p, including postage.

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.



LITTLE HENRY IN Chadacre Wins The Day



TAKE A TIP FROM HENRY-- SOLVE ALL YOUR PROBLEMS AND INVEST IN A CUSTOM BUILT CHADACRE MIXING CONSOLE -- OR BUILD ONE YOURSELF

From our vast range of high quality modules supplied built, tested and guaranteed, or kit-form complete with all capacitors, resistors, transistors, printed circuit board and illustrated data sheets. For more detailed information on any of our Audio Products send only 25p. for our illustrated catalogue. "IT'S MONEY WELL SPENT"

Microphone Amplifier 4310 from £9.00
Equaliser 4311 from £7.50
Stereo Output Amplifier 4312 from £7.50
Stereo VU Meter Driver Amplifier 4315 from £7.50
Stereo High Impedance Headphone Amplifier 4317 from £6.00
Mixing Amplifier 4316 from £6.00
Audio Compressor 9521/M from £19.50
Low Distortion Line-up Osc. 9501 from £15.00
High Quality Sliders Mono £1.00. Stereo £1.50
Mini-Mixer (see Allen & Heath Adv.) £85.00

Phasing Simulator 4300. Manual/Auto-Drive Voltage controlled from £5.50
I.C. Ring Modulator/Frequency Doubler 6301 from £7.50
Sub-Octave-Generator 6345 from £26.00
Envelope Shaper 6306 from £13.50
V.C. Osc. 6303 from £8.50
V.C. Amp 6319 from £12.00
Filter/WaaWaa Unit 6317 Manual/Voltage controlled from £6.50
White Sound Generator 6315 from £6.25
Automatic Fader 9521 from £19.50

chadacre
electronics
limited



AUDIO DIVISION
63 Stratford Broadway,
London E15 4BQ
Tel: 01-534 1207

A SELECTION FROM OUR WIDE RANGE OF MICROPHONE STANDS AND ACCESSORIES DESIGNED FOR THE PROFESSIONAL USER.



BSI/B

BS2/B

[MSPA/B

BSI/B Banqueting Stand. 4½lb base. Matt black finish. 20in max height. Stem may be fixed upright or angled.

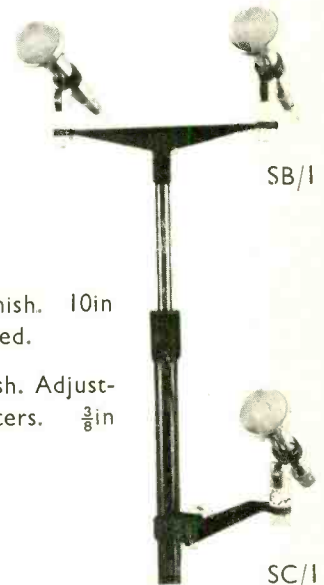
BS2/B Banqueting Stand. 7lb base. Matt black finish. 29in max height. Stem may be fixed upright or angled.

MSPA/B Angle Floor Stand. Matt black finish. 80in max height.

SB/I Stereo Bar. Matt black finish. 10in long. ⅜in locking screws provided.

SC/I Side Clamp. Matt black finish. Adjustable for different tube diameters. ⅜in locking screw provided.

For further details write to



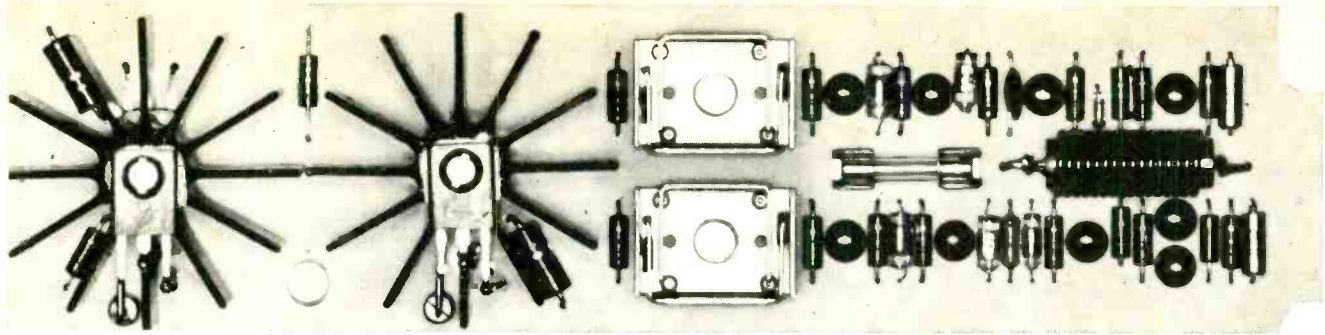
SB/I

SC/I

KEITH MONKS (AUDIO) LTD

26-30 READING ROAD SOUTH · FLEET · HANTS

Telephone: Fleet (02514) 7316 and 3566



Today's requirement for hi-power/hi-intensity sound cannot be accomplished with yesterday's amplifier. Today you will need the amplifier of today!

The all new SPECTRA SONICS Model 700 Amplifier is **Beyond the State of the Art**

- **New Specifications . . .**
 - Continuous Power Output** . . . 60 watts RMS delivered to a load
 - Bridged Configuration** (2 amplifiers) 120 watts RMS delivered to a load
 - Power Response** Within $\pm .1$ dB, DC to 20kHz into 8 ohms at full output
 - Total Harmonic Distortion** . . Unmeasurable—less than 1/100th of 1% DC to 20kHz at full output
 - Signal-to-Noise** Better than 100dB below 30 watt unweighted, 20Hz to 20kHz typically better than 120dB

- **New Flexibility** A modular design concept, the SPECTRA SONICS Model 202PC Card Holder offers flexibility of design for bi-amp, tri-amp, quad-amp or multiple speaker installations. Modular additions in the field can be accomplished with ease for upgrading to higher power requirements. Less mounting space is required. Eight Model 700 Amplifiers mount in 3½" of rack space. The total result is less cost per unit and overall savings.

- **New Crossovers** The SPECTRA SONICS Model 505 Electronic Filter improves the damping factor and eliminates inductive and capacitive reactance loading on power amplifiers. An additional bonus of the Model 505 Filter is reduced weight, no iron core inductor, and no power loss. More power is transferred directly to the voice coil. Each Model 505 Filter has two inputs and four individual outputs, and is available in all standard crossover frequencies.

- **Outstanding Results . . .** In just a few short months the list of satisfied users of SPECTRA SONICS sound has grown. It now includes many of the leaders in recording studio, and performing art centers around the world. London Decca, Vienna — Toronto Pavilion, Canada — Blossom Center, Ohio — Hollywood Bowl, California — National Public Radio, Washington, D.C. — Denver Symphony, Colorado — Motown Record and Larrabee Sound, Hollywood, California.

To obtain additional information contact SPECTRA SONICS at 770 Wall Avenue, Ogden, Utah 84404 or 6430 Sunset Blvd., Suite 1117, Hollywood, California 90028

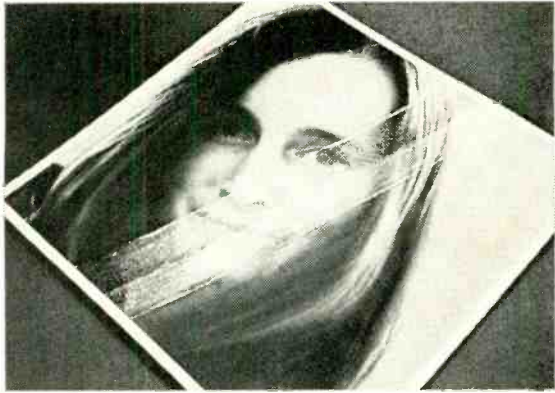
SPECTRA SONICS

LEADER IN ADVANCED TECHNOLOGY

STUDIO SOUND, SEPTEMBER 1972



What you get when you use



Very Visible. Ordinary tape makes a very visible join and spoils the appearance of the item.

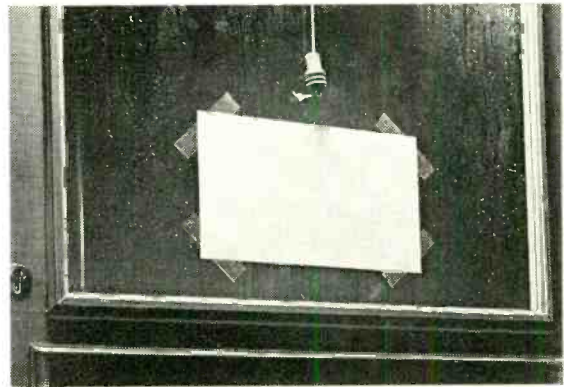


Not 'Waterproof'. If exposed to moisture ordinary tape tends to crinkle and peel off.

What you get when you use



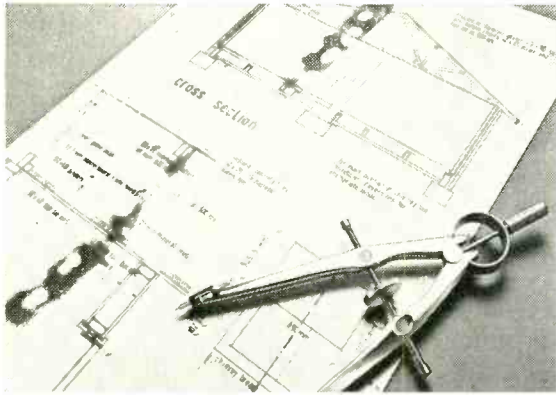
Almost Invisible. Magic Transparent Tape is much less obvious. It tones in with the background so the join becomes almost impossible to spot.



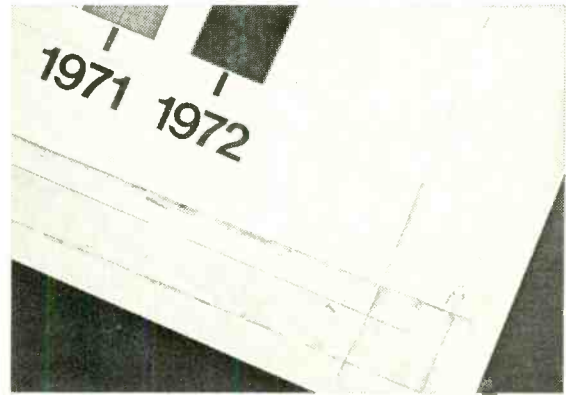
'Waterproof'. Magic Transparent Tape is unaffected by moisture. If it gets dirty you simply wipe it clean again with a damp cloth.

*You notice the improvements.
Not the tape.*

ordinary transparent adhesive tape

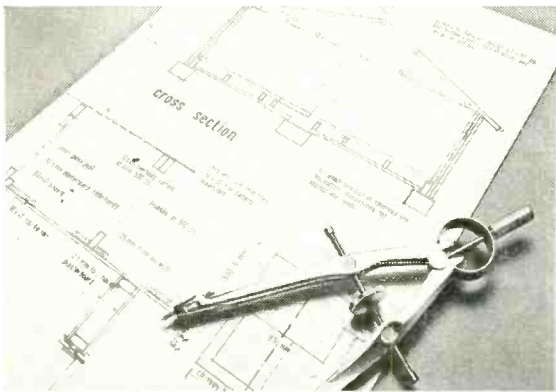


'Ghost' effect on copies. Ordinary tape gives a ghost effect on copies and photographs making the subject underneath difficult to read.



Shrinks and discolours. Ordinary tape shrinks and yellows with age leaving an unsightly black line round the edges.

Scotch Magic Transparent Tape



'Ghost free' copies. You get perfect copies with Magic Transparent Tape. The taped section is just as legible as the rest.



It's permanent—so it won't shrink or discolour. Magic Transparent Tape isn't affected by sunlight or temperature change. It stays just the way you stick it down no matter how long you leave it.



If you would like a free sample of Scotch Magic Transparent Tape and details of how you can get an attractive tape dispenser absolutely free, fill in this coupon and send it to: Commercial Trades Marketing, 3M United Kingdom Ltd., 3M House, Wigmore Street, London, W1A 1ET.

Name

Company

Position

Address



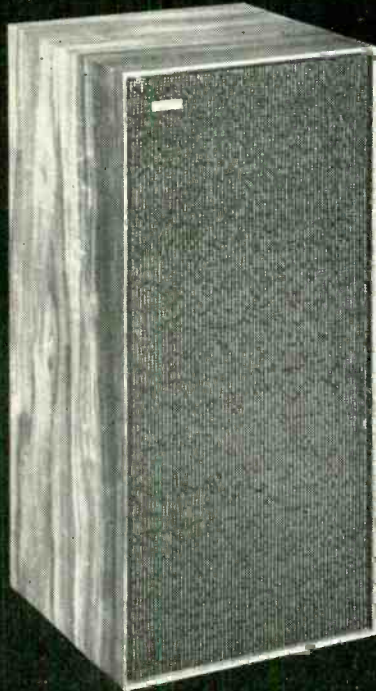
S3/9/72

3M2049

3M and Scotch are trademarks

The world's finest medium size studio monitor speaker

The Rogers BBC Studio Monitor Speaker offers a standard of performance unequalled by any speaker of similar size. The speaker combines all the qualities sought in a unit designed for monitor use; ultra smooth response, excellent transient response, a most remarkable lack of colouration and very low harmonic and intermodulation distortion. Based on a design of the British Broadcasting Corporation's research department, the speaker is the



result of many years research into speaker cone behaviour, the most significant aspect of the design being the main drive unit employing a special plastic cone. The speaker is produced under licence from the BBC and conforms to their specification LS3/6, but, with the important addition of a third drive unit, a modification exclusive to Rogers. Intended primarily for monitoring purposes in the smaller studios, where high power levels are not required, the speaker will give superlative reproduction in domestic high fidelity installations where the associated equipment is of a sufficiently high standard. Each speaker is supplied with an individual response curve graph taken on Bruel & Kjaer automatic curve tracing equipment. Retail distribution of the speaker is restricted to a limited

number of carefully selected specialist high fidelity dealers.

Brief Specification: Overall Frequency Response: 40Hz-25kHz. ± 3 dB 50Hz-14kHz. Power Handling Capacity: 25 watts, speech and music. Impedance: Standard 15 ohms, to order 8 and 25 ohms. Drive Units: Three. Overall Dimensions: Enclosure 12" x 12" x 25". Height including stand 37". Finish: Teak.

ROGERS

BBC

Rogers Developments (Electronics) Limited,
4-14 Barmeston Road, London SE6 3BN.
01-698 7424/4340.

Please send me a copy of the colour
leaflet describing the Rogers B.B.C.
Studio Monitor Speaker in detail.

NAME _____

ADDRESS _____

SS/9

Recommended U.K. Retail Prices
(including stand) £83.50 + £12.81 P.T. (less stand) £77.00 + £12.35 P.T.

CHILTON

M10/2 Ten Channel Mixer

Inputs (interchangeable boards) · 30/600 ohm floating balanced mic. 10K line bridging. RIAA gram.

- ★ PPM level meters.
- ★ Five spot frequency line-up oscillator.
- ★ +12 dBm maximum output at 0.05% distortion.
- ★ 121 dBm equivalent input noise (20 kHz bandwidth).
- ★ 30 Hz to 18 kHz ± 1 dB frequency response.
- ★ Basic price is only £220.



MAGNETIC TAPES LTD.

Chilton Works, Garden Road, Richmond,
Surrey. Telephone 01-876 7957

EST. 12 YEARS

BRAND NEW—SUITABLE FOR ALL MACHINES

RECORDING TAPES & CASSETTES

ALL TOP QUALITY 100% TESTED
BY SUPERIOR AMERICAN AND BRITISH MANUFACTURERS
GENEROUS QUANTITY DISCOUNTS

BASE—TENSILISED POLYESTER and PVC
EXTRAS—NO CHARGE—FITTED LEADERS EX 3"

FREE ROLL OF LEADER WITH ALL TAPE ORDERS
24 HOUR DESPATCH SERVICE

	St'rd Play	Long Play	Double Play	Empty Spools
3"	150' 10p	210' 11p	320' 20p	4p
4"	300' 20p	420' 24p	550' 30p	9p
5"	600' 30p	900' 40p	1200' 56p	10p
5 1/2"	900' 37p	1200' 49p	1800' 78p	11p
7"	1200' 44p	1800' 64p	2400' 95p	12p

3" and 4" APPROX LENGTHS

CASSETTES MANUFACTURED by EMI MASTERTAPE

ALL IN PLASTIC LIBRARY CASES

C60 EMI PLAYRITE	34p	3 for £1	} 10p P/P on all orders
C90 MASTERTAPE	50p	3 for £1.45	
C120 MASTERTAPE	65p	3 for £1.90	

If any goods are found at fault in any way money refunded in full.

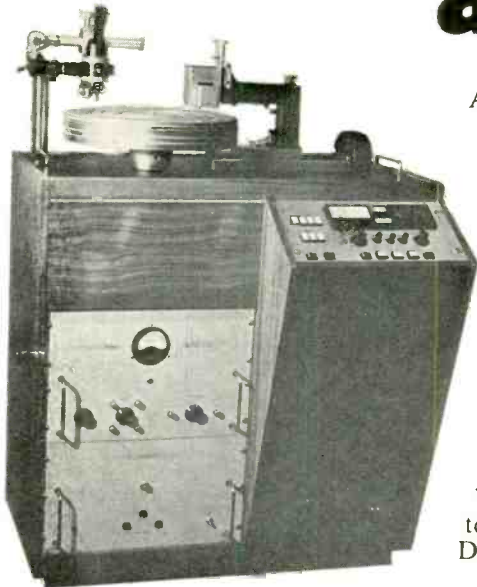
SPECIAL OFFER—EMI AFONIC LOW NOISE REEL TAPES
and PRE-RECORDED CASSETTES AT LESS THAN HALF PRICE

CALLERS WELCOME

WALKERS

16 WOODTHORPE ROAD, ASHFORD, MIDDLESEX
ASHFORD 52136

not just a pretty face!



Design Engineers to the
Recording Industry

MEETING HOUSE LANE
BALSALL COMMON
NR. COVENTRY
WARWICKSHIRE, ENGLAND
STD 0676 32468

MSR 

At long last a brand new disc-cutting lathe is on the market (and one that doesn't look like a cross between the kitchen sink and a sewing machine!) the MSR series 1000.

Of course we've already told you about its features like a 16" turntable with adjustable sized vacuum, varigroove and a direct driven servo controlled D.C. motor (still the only speed control system of its type on a disc-cutting lathe).

But those of you who came to APRS '72 were amazed not only by its specifications, but by its beautiful appearance, with easily cleanable leatherlook deck top, control panels which were arranged for best possible position by recording engineers, and the whole machine is housed in a walnut floor standing console.

Why is it so good looking?

The reason is simple, the MSR series 1000 was *designed* not evolved, every aspect was long thought out before the first drawings were made. Yes, at long last a new disc-cutting lathe is on the market with looks to match its performance.

Drop us a line and we'll send you full details of the 1000 & 2000 series lathes.



TEAC R-340 Series Tape Decks bring you the ultimate in professional performance. Frequency response is as wide as 30 to 20,000Hz at 15 ips with a variation of only 2 dB, and wow and flutter is a surprisingly low 0.03% at the same speed. Signal-to-noise ratio is 60 dB on full-track and 56 dB even on the 4-track version. Variation of tape speeds does not exceed 0.3%. 2,400 ft. tape can be spooled in less than 100 seconds.

TEAC
R-340

PROFESSIONAL TAPE DECK

Tape Deck R-340 Series £450
Amplifier AR-15 £140

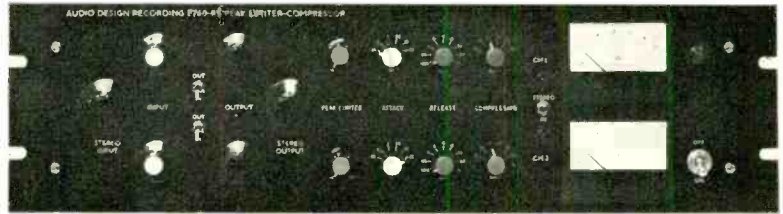
For full details of TEAC equipment, write to sole U.K. distributors:

ACOUSTICO ENTERPRISES LTD.
6-8 Union Street, Kingston-upon-Thames, Surrey
Tel. 01-549 3471/3 (3 lines)

LEVEL CONTROL EQUIPMENT

Put an **X** on your Reduction Problems—
Compress and Equalise off tape without worsening noise

X is for Expander now available on F700/F760 Series Compressor-Limiter. Channel noise is attenuated by 20dB eliminating increased noise due to compression.



F700X is a 40mm channel module providing compression or limiting plus the variable threshold 2:1 expander.

F760X is an 80mm module ideal for use on groups, having Peak Limiting, Compression and Expansion. Three units in one.

X-RS designates Rack-mounting, stereo, dual mono, self powered units with Expander.



AUDIO DESIGN RECORDING LIMITED

St. Michaels, Shinfield Road, Shinfield Green, Reading, Berks.

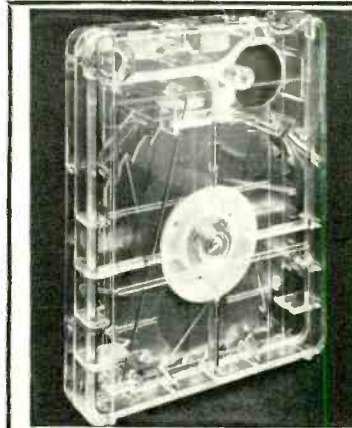
Telephone: Reading (0734) 84487

STUDIO INSTALLATIONS

T. B. Technical, *Audio Systems Consultants*, can provide engineers for planning, installation, and maintenance of all professional audio equipment.

Also
Audio Test Equipment Hire

T. B. TECHNICAL LTD.
90 Wardour Street, W1V 3LE
01-437 1892/3



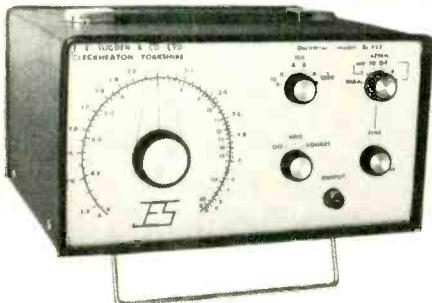
"Air Check"

N.A.B. Type A Cartridges

- ★ PRECISION QUALITY
 - ★ RELIABILITY PLUS
 - ★ LONG LONG LIFE
 - ★ LOW-LOW-LOW PRICE
- Loaded or blank, spares, ex stock. Ex' 1 off 30 sec Nett 65p. Order NOW.



Maidenhead (0628) 33011



JES AUDIO INSTRUMENTATION

Illustrated the Si453 Audio Oscillator
SPECIAL FEATURES:

- ★ very low distortion content—less than .03%
- ★ an output conforming to RIAA recording characteristic
- ★ battery operation for no ripple or hum loop
- ★ square wave output of fast rise time

£40.00

also available

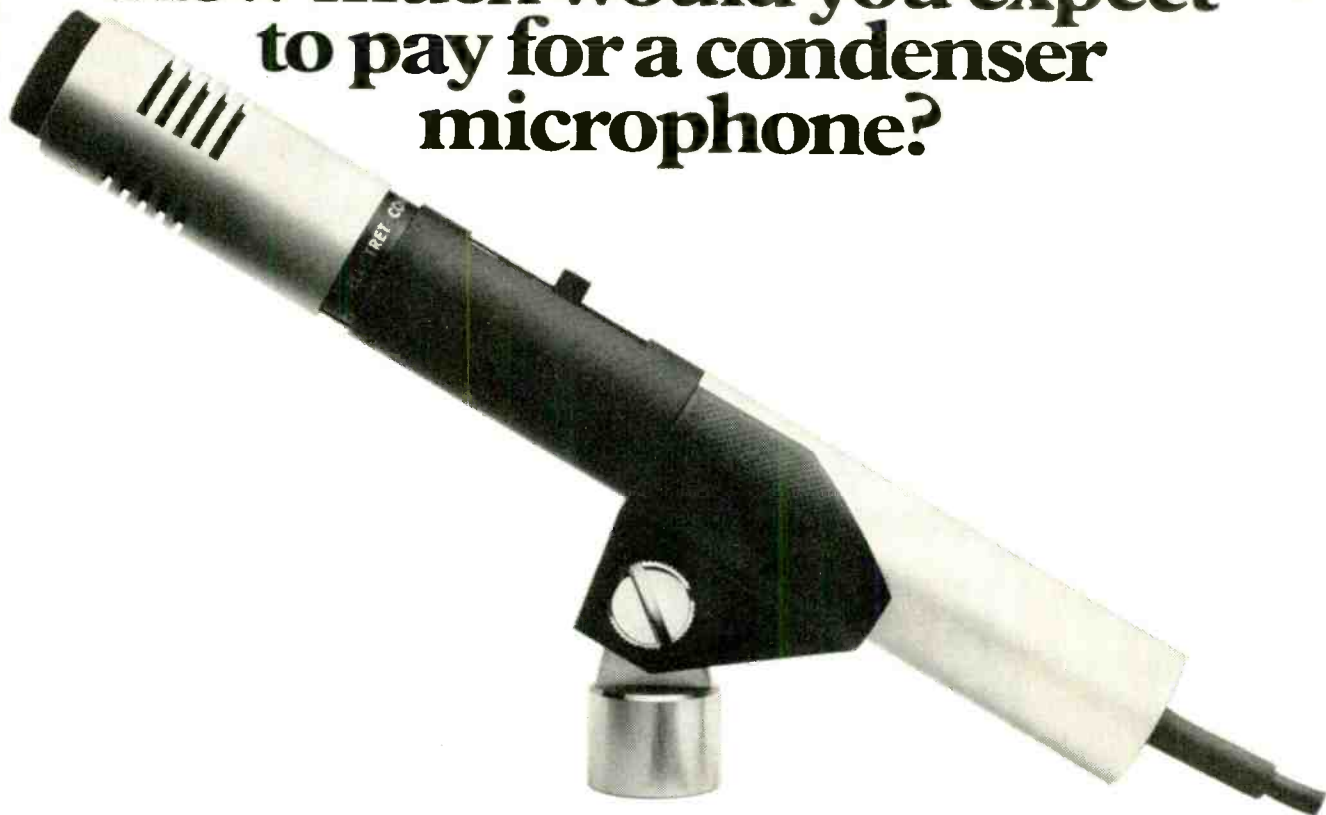
Si451 Millivoltmeter
★ 20 ranges also with variable control permitting easy reading of relative frequency response **£35.00**

Si452 Distortion Measuring Unit
★ low cost distortion measurement down to .01% with comprehensive facilities including L.F. cut switch etc. **£30.00**

J. E. SUGDEN & CO. LTD., CARR STREET, CLECKHEATON, YORKS. BD19 5LA.

Tel: 09762-2501

How much would you expect to pay for a condenser microphone?



Our C096 is just £15.*
It's that inexpensive because of what you don't get.

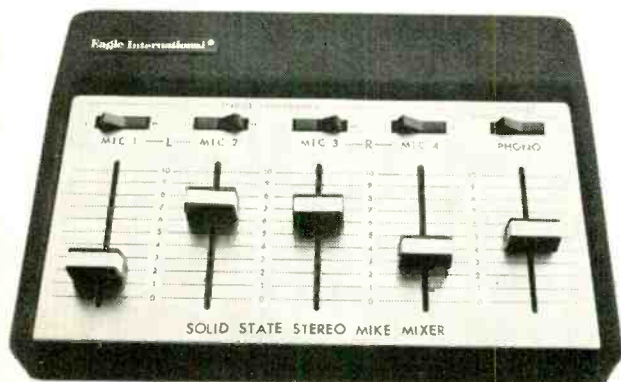
It uses a lightweight diaphragm of polymerized film powered by a single dry cell and built in low noise FET pre-amplifier.

This dispenses with the costly and bulky power supplies usually associated with ordinary condenser microphones.

What you do get is a cardioid response of better than -20 dB.

You get equally good value from our MP12 Stereo Mike Mixer at £26.40*.

It offers an advanced transistorized circuit incorporating the latest type of silicon transistors for low noise performance from internal batteries.



These batteries will give you well over a month's normal daily use.

Slider controls operate all four inputs independently and the MP12 is switchable Stereo or Mono.

If you would like more details of other Eagle units, send for our catalogue.

That won't cost you anything.

C096 Specification

Frequency Range: 30 - 16000 hz
Sensitivity: -70 dB
Output Impedance: 600 ohms.
Power Source: IHP7 Dry Cell or equivalent mercury
Overall Consumption: 800 micro amps
Dimensions: 22 x 108 mm.

MP12 Specification

Inputs: Microphone - 4 switched inputs (high or low impedance)
Phono - 1 stereo input (magnetic)
Input Impedance: Microphones - 600 ohm (low) 50 Kohm (high)
Phono - 47 Kohm RIAA
Input Level: Low Impedance - 72 dBV at 1000 hz
High Impedance - 55 dBV at 1000 hz
Phono Stereo - 55 dBV at 1000 hz
Freq. Response: Microphone - High or low Impedance 30 to 20,000 hz ± 2 dB
Phono Stereo - 30 to 20,000 hz ± 1 dB (RIAA)
S/N Ratio: Microphone - High or low impedance better than 48 dB (max. volume)
Phono Stereo better than 52 dB (max. volume)
Output Level: 500 mV at 47 Kohm
Batteries: 2 x PP3 or equivalent
Current Consumption: 2.8 mA
Semiconductors: 12 Low Noise Silicon Transistors
Dimensions: 250 mm. wide x 190 mm. deep x 45 mm. high
Net Weight: Approx 1.7 kg.

* Recommended retail price

 **Eagle International**

Dept. P.4., Eagle International, Precision Centre, Heather Park Drive,
Wembley HAO ISN Telephone 01-903 0144

C-60 COPIES IN ONE MINUTE!

The Telex Cassette Copier is a desk top unit designed for use by non-technical personnel.

Simple two button controls, track selector and automatic rewind make the cassette copier ideal for educational, industrial and library use.

The Telex Cassette Copier I provides master control, and copies out cassettes.

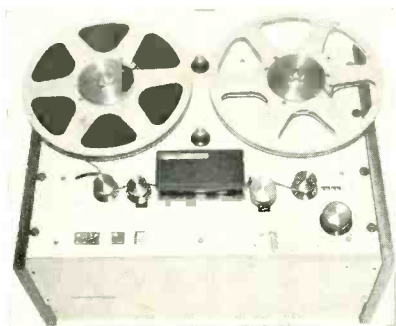
The Cassette Copier II draws all power and control from unit I and provides up to two copies simultaneously.



Duplicating speed: 30 ips
 Rewind speed: 60 ips
 Frequency response: 30-10 kHz
 S/N Ratio: 45 dB below record level (3% T.H.D.)

Head configuration: 1/2 track 2 channel, erase, record, play
 Weight: less than 35 lb
 Dimensions: 15 1/2" wide x 17 3/4" deep x 7 1/2" high

Avcom Systems Limited Newton Works, Stanlake Mews, London W12 7HA 01749 2201



BIAS ELECTRONICS B.E.1000 PROFESSIONAL RECORDER

- ★Wow and Flutter RMS Total 38 Cm/Sec 0-06%
- ★Frequency Response Overall 38 Cm/Sec 40 Hz to 18 kHz ±2 dB.
- ★Noise Overall unweighted below 32 mM/mm Full Track -60dB
- ★Separate Sensitivity EQ and Bias Adjustment for each speed
- ★Plug in Electronics ★Plug in Head Block.
- ★Precision Cast Tape Deck ★Electronic Tape Tension.

Illustrated: STEREO TRANSPORTABLE **£508.00**

BIAS ELECTRONICS LTD
 Unit 8, Coombe Trading Est., *Distributor to Studios*
 112-120 Coombe Lane, of KEITH MONKS AUDIO
 London SW20 01-947 3121 Microphone Stands, Etc.

BATTLE OF BRITAIN Give for those who Gave



Thousands of our finest men and women in the Royal Air Forces have given their service, their health, and in many cases, their lives for their Country and in defence of Freedom. Today many of them and their dependents are in urgent need of the R.A.F. Association's Welfare Service. Please give all you can for an emblem during Wings Week or send a donation direct to Headquarters.



WEAR THIS EMBLEM
 ON SATURDAY

Wings Appeal SEPTEMBER 11th - 16th 1972



CENTRAL HQTRS., ROYAL AIR FORCES ASSOCIATION
 43 GROVE PARK ROAD, LONDON, W4 3RU.
 (INCORPORATED BY ROYAL CHARTER)
 (REGISTERED UNDER THE WAR CHARITIES ACT, 1940
 AND THE CHARITIES ACT, 1960)

PROCEEDS TO BE DEVOTED TO CHARITABLE & WELFARE PURPOSES

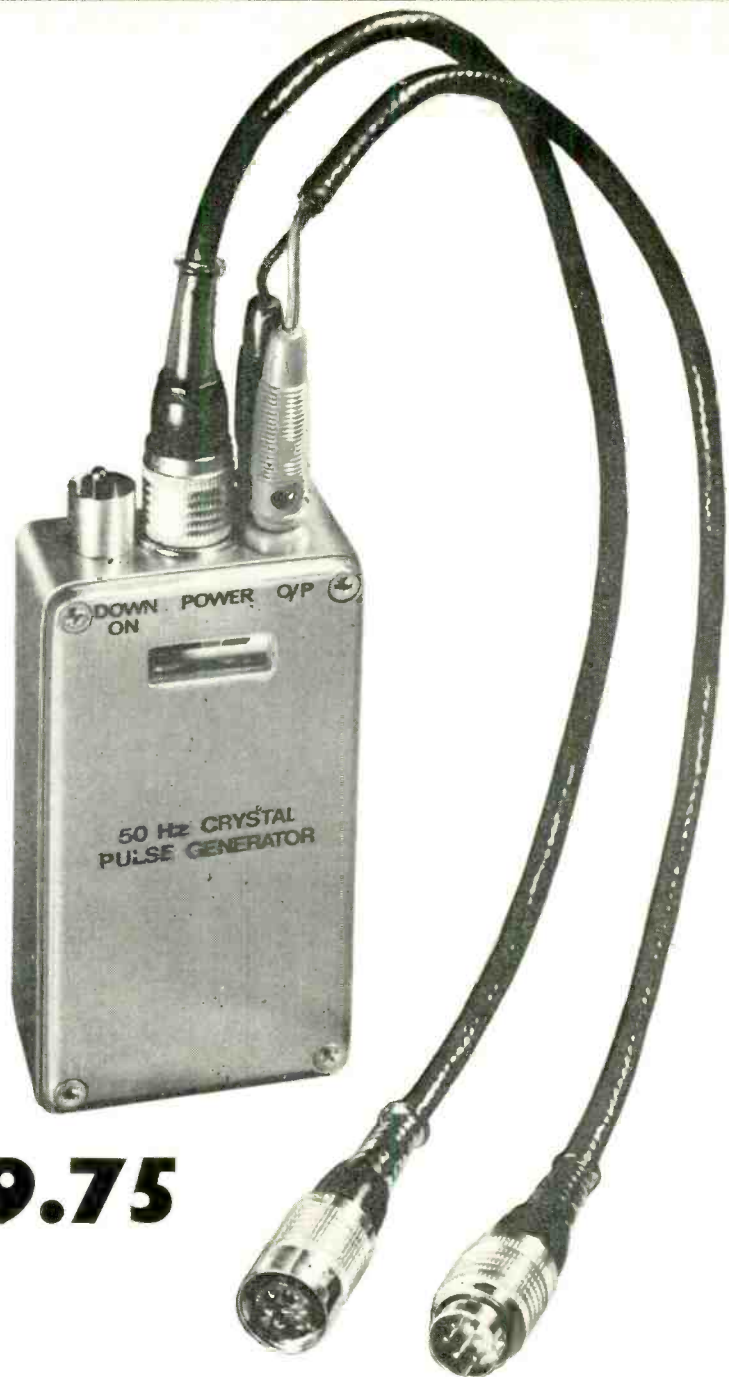
Space donated by: **STUDIO SOUND**



We can untangle your problems with our

50 Hz Crystal Pulse Generator

£59.75



SPECIAL FEATURES :

- ★ High accuracy achieved by using a 2 Mc/s crystal. When used in association with 35mm film it will provide synchronisation better than one frame in 1,000 feet.
- ★ Low output impedance and short circuit protection.
- ★ Metered indication of output pulse amplitude.
- ★ Designed to take its supply from the NAGRA III accessory socket (and with a suitable cable from a NAGRA IV).
- ★ On/off switch.
- ★ Fully guaranteed.
- ★ Sole distributors.
- ★ 60 Hz model to order.
- ★ SN model shortly available.

SPECIFICATIONS :

- STABILITY** (see above) Guaranteed better than 30 parts per million over a temperature range of 30°F to 140°F.
- CURRENT DRAIN** 50 MA.
- SUPPLY VOLTAGE** Internally stabilised to operate from 6 to 18 volts and is therefore operational throughout the life of the NAGRA's internal batteries.
- OUTPUT** 1.5 volts R.M.S. Source impedance 100 ohms. The output signal is sufficiently pure to eliminate cross talk.
- METER** The signal is metered at the output sockets to give an indication that the unit is functioning correctly and to guard against faulty cables or connections.
- SIZE** 4½" x 2½" x 1¼".
- WEIGHT** Approximately ½lb. or 228 grams.

J. J. Francis (Wood Green) Ltd., 123 Alexandra Road,
Hornsey, London N.8. Tel : 01-888 1662

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

DESIGNED AND MADE IN THE U.K.

MULTI-CHANNEL EQUIPMENT

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

STUDIO RECORDERS

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

TAPE TRANSPORTS

We offer a widened range of 2 speed and 4 speed models from 15/16 to 60 IPS, 1/2" to 1" tape width, with heavy duty solenoid operation and remote control facilities.

brenell

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



Budget Priced Philips type compact cassettes from 24p

- Low noise
- Library case
- Fully guaranteed
- Available from stock
- Screwed not welded



Prices	1	10	100
Post & Package	C60 27p	26p	24p
1-100 cassettes 10p	C90 37p	35p	33p
	C120 50p	44p	42p

fpa

Fraser-Peacock Associates Ltd
94 High St. Wimbledon Village
London SW19 947 1743/2233

PLEASE SEND ME (BLOCK CAPS PLEASE)

C60	C90	C120
<input type="text"/>	<input type="text"/>	<input type="text"/>

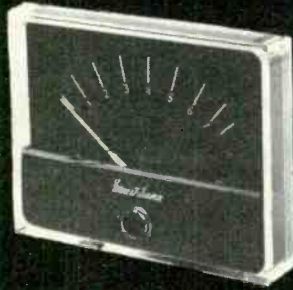
CHEQUE/P.O. for

NAME

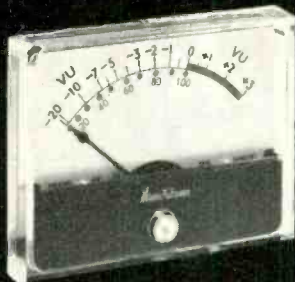
ADDRESS

PEAK PROGRAM 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

RADFORD

AUDIO MEASURING INSTRUMENTS

Two instruments having a superior performance than any others of this type regardless of price. Now accepted as standard equipment by Broadcasting Authorities, recording studios, magazine equipment test laboratories and audio research and development laboratories all over the world.

LOW DISTORTION OSCILLATOR



An instrument of high stability providing very pure sine waves and square waves, in the range of 5 Hz to 500 kHz. Hybrid design using valves and semiconductors.

Specification
 Frequency Range: 5 Hz-500 kHz (5 ranges).
 Output Impedance: 600 Ohms.
 Output Voltage: 10 Volts r.m.s. max.
 Output Attenuation: 0-110 dB continuously variable.
 Sine Wave Distortion: 0.005% from 200 Hz to 20 kHz increasing to 0.015% at 10 Hz and 100 kHz.
 Square Wave Rise Time: Less than 0.1 microseconds.
 Monitor Output Meter: Scaled 0-3, 0-10 and dBm.
 Mains Input: 100 V.-250 V. 50/50 Hz.
 Size: 17½ x 11 x 8in.
 Weight: 25lb.
 Price: £150.

DISTORTION MEASURING SET



A sensitive instrument for the measurement of total harmonic distortion, designed for speedy and accurate use. Capable of measuring distortion products as low as 0.002%. Direct reading from calibrated meter scale.

Specification:
 Frequency Range: 20 Hz-20 kHz (6 ranges).
 Distortion Range: 0.01%-100% f.s.d. (9 ranges).
 Sensitivity: 100 Mv.-100 V. (3 ranges).
 Meter: Square law r.m.s. reading.
 Input Resistance: 100 kOhms.
 High Pass Filter: 3 dB down at 350 Hz.
 Frequency Response: 30 dB down at 45 Hz.
 Frequency Response: ±1 dB from second harmonic of rejection frequency to 250 kHz.
 Power Requirements: Included battery.
 Size: 17½ x 11 x 8in.
 Weight: 15lb.
 Price: £120.

Descriptive technical leaflets are available on request.

RADFORD LABORATORY INSTRUMENTS LTD.

BRISTOL BS3 2HZ

Telephone: 0272, 662301



700 Series Tape Machines

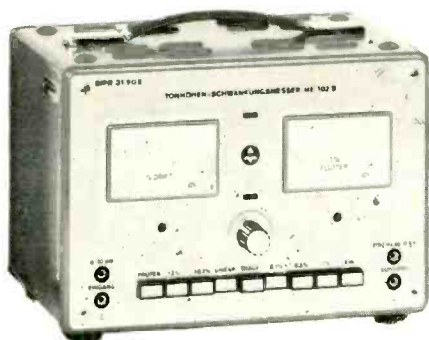
The TRD 700 machines are designed primarily for the discerning professional and industrial user. The rugged new transport has a 10½" spool capacity, and is DC solenoid controlled from finger touch illuminated push buttons. These, incidentally, are easily incorporated in a remote control unit. The head bridge will accept up to four heads. Three Bogen half track heads are normally fitted but others are available to customer's choice. Special care has been taken in achieving good tape handling and tolerance of misuse, and as with previous TRD machines the tape path makes for exceptionally easy editing.

The complete 700 stereo recorder embodies many features normally considered extras on other machines in its price range; full self-sync, twin PPM or VU metering, switchable NAB—DIN equalisation, high quality balanced microphone inputs and balanced line outputs. The electronics are assembled on glass-fibre printed circuit boards and plug into a mother board carrying all interconnections. Equalisation is adjustable to compensate for head wear and bias pre-sets are brought out to the front panel. The machine is supplied in a Teak finished carrying case and is suitable for horizontal or vertical operation.

TRD

**Tape Recorder
Developments Limited**
Hall Lane, Walsall Wood
Staffordshire
Telephone Brownhills 5351-3

WOW and FLUTTER METERS



Illustrated is the ME 102B, one of the three types of Wow and Flutter Meters distributed by us exclusively in the U.K. It is widely used by all the leading Broadcasting, TV and Recording Studios, manufacturers of tape-deck-tape recorders, turntables, record-changers—in fact by anyone concerned with the accurate measurement of drift and wow and flutter. Fuller details on application.

LENNARD DEVELOPMENTS LTD.
LOCKFIELD AVE., BRIMSDOWN, ENFIELD,
MIDDX. Tel. 01-804 8425

Rycote *for* 805's Windgags *Sennheiser* 405's

are light weight **POLYTHENE** and other
almost indestructible capacitor
microphones

Write to **RYCOTE**, POOLHEAD LANE,
TANWORTH-IN-ARDEN, SOLIHULL, WARKS.

or leave your name and address on our recorder on Earlswood 2339

WE SPECIALISE IN BRAND NEW

TOP QUALITY BRITISH P.V.C. MYLAR & POLYESTER RECORDING TAPES WITH FITTED LEADERS, Etc., EX 3"

Thanks to bulk purchase we can offer tensilised HI-FI tapes, manufactured by a British firm of world repute. All boxed individually (sealed if required) in polythene. Our tapes are not to be confused with imported sub-standard or used tapes. Full money refund if not delighted.

This month: "DRY SPLICE" (19p) given FREE with every order.

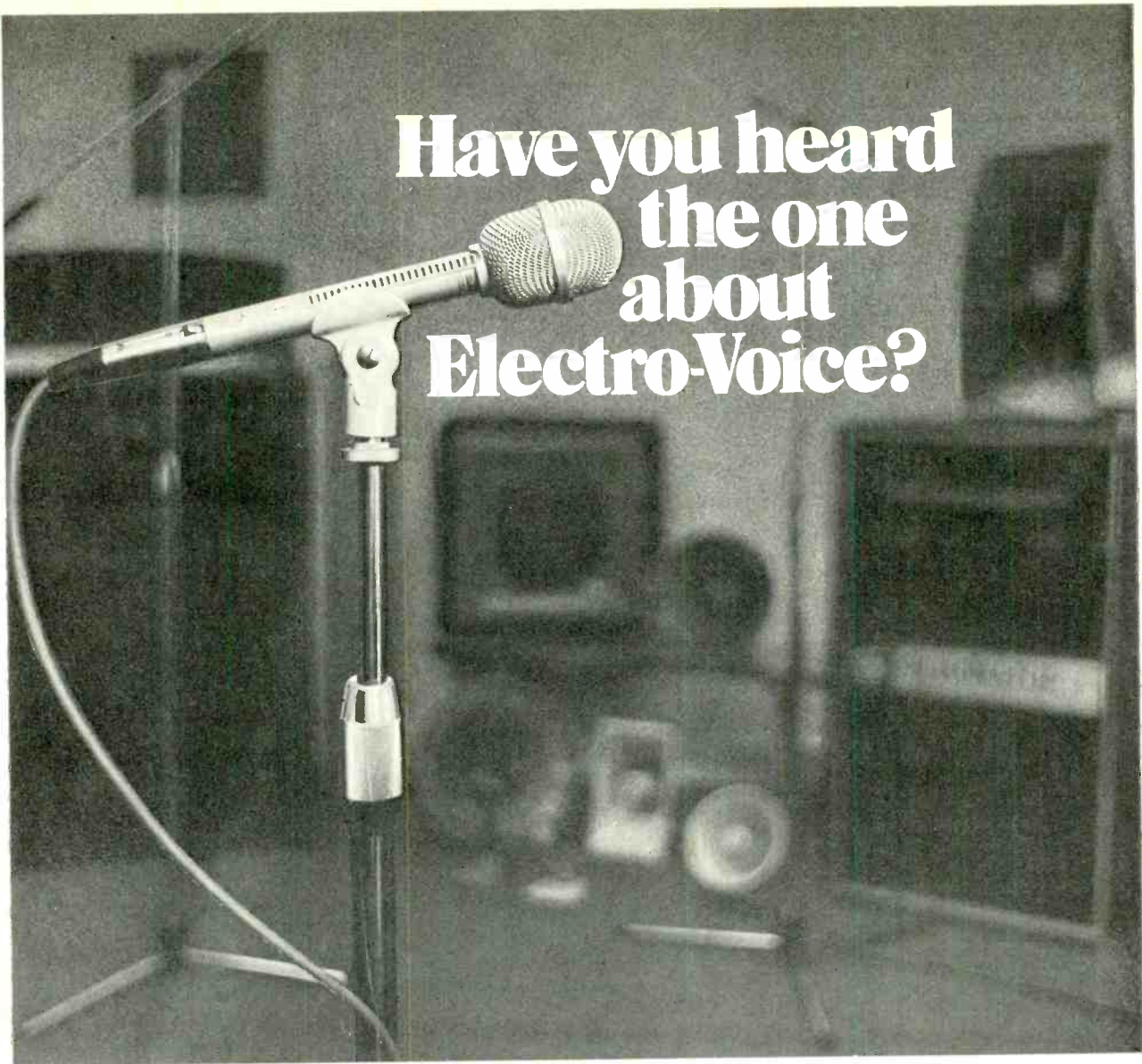
Std.			L.P.			D.P.			Boxed				
Length	ea.	3 for	Length	ea.	3 for	Length	ea.	3 for empty spls					
3"	150'	10p	29p	3"	220'	12½p	35p	3"	400'	22½p	65p	3"	3p
4"	300'	20p	50p	4"	450'	25p	70p	4"	600'	34p	97½p	4"	8p
5"	600'	30p	87½p	5"	900'	40p	£1.17½	5"	1200'	62½p	£1.85	5"	9p
5½"	900'	35p	£1.02½	5½"	1200'	52½p	£1.52½	5½"	1800'	85p	£2.50	5½"	9p
7"	1200'	45p	£1.27½	7"	1800'	65p	£1.92½	7"	2400'	£1.05	£3.05	7"	10p

All orders despatched by return.

Postage and Packing 9p per order

STARMAN TAPES, 421 Staines Road, Bedfont, Middlesex

Have you heard the one about Electro-Voice?



It's more than likely that you have because most people in this business have heard of or experienced the world famous Electro-Voice range of products. So they don't need any introduction.

Gulton Europe are now manufacturing and marketing Electro-Voice broadcast,

p.a. and recording microphones together with a range of sound reinforcement speakers.

This most important development means that Electro-Voice and their customers are already benefiting from Gulton's wide, technical and electronic experience.



ELIMINATOR 1



FC100



MUSICASTER



SR015



PM16 GAC



602TR



RE85



635A



RE20

As an expert you really do need a copy of our new product information brochure, so why not contact Gulton Europe for yours.

Your personal contact is Len Cole.

Gulton
EUROPE

Gulton Europe Limited
ELECTRO-VOICE DIVISION
The Hyde, Brighton BN2 4JU
Telephone: 0273 66271 Telex 87172



Electro-Voice®

MICROPHONES AND PUBLIC ADDRESS EQUIPMENT



The experts put Philips magneto-dynamic cartridges in the top class.

Read what they say about the Philips GP412 Super M.

From the technical point of view, Philips may be cordially congratulated on this magnificent element, which certainly belongs to the top-five. The sound character proved beautifully transparent; sufficiently well balanced at very low frequencies, brisk in the middle, brilliant in the high notes and not too pronounced in the extremely high range.

*Sinus
DISK*

The Philips GP412 has an excellent frequency response, good crosstalk attenuation throughout the entire frequency range and combines excellent tracking with a pleasingly high sensitivity. Also when judged on tone it is to be placed among the best in the world.

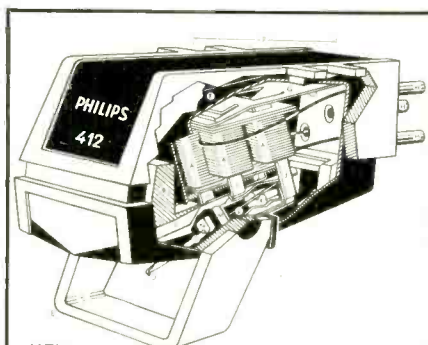
*BR.
Hi-Fi Stereophonie*

The overall sound quality was immediately impressive with plenty of bite and attack in the highs and extraordinarily clean, firm and extended bass. The first few hours of use were spent in listening to a wide variety of fairly serious, well recorded music. The very best of my records sounded first rate—as good as, if not better than I had ever heard them before.

*John Wright
Hi-Fi Sound*

The only fault I found with this cartridge was a loose stylus guard (which I would remove anyway!). Its performance is excellent and if you are seeking the best, hear this one for yourself before making a final choice.

*Norman J. Clayton
S. A. World of Sound*



KEY :

- A Pickup coils, 2,500 turns each, wire half as thick as human hair.
- B High precision moulding for accurate mounting of coils and stylus assembly.
- C Stylus assembly enclosed in precision-fitting square brass tube for exact positioning and easy replacement.
- D Accurately ground diamond stylus tip.
- E Stylus guard.
- F MU-metal casing prevents hum pickup.
- G Fixing jig and earth bar.
- H Five contacts.
- J Right and left channel MU-metal pole shoes.
- K Rubber damping block, precision moulded to 0.05 mm.
- L Guide wire of 0.08 mm CrNiFe for controlled compliance.
- M Suspension block.
- N Super M ticonal XX magnet, a high-energy magnet generating a strong field, so that only 7 mg need be used.
- O Stylus bar of thin-walled (0.05 mm) aluminium alloy tube.
- P $\frac{1}{2}$ distance between mounting centres.

Technical measurements of the system produced on the whole good figures, among which the excellent crosstalk suppression (even at high audio frequencies) is particularly worthy of note. The tracking performance of the cartridge is also very good. Both in combination with the pick-up arm SME 3012 and with the Sony PUA 286 the stylus force did not have to be raised above 1 g. The sound produced by the GP412 was balanced and clear with strong low notes and brilliant high ones.

*Stratos Tschanglou
Fono forum*

The sound quality was extremely pleasing, and the little extra brightness of tone in the upper-register compared with some other high quality moving magnets proved attractive to some listeners. The nature of the sound which it produces is slightly, subtly, different from that of other members of the same family and this cartridge is worth serious consideration and a careful listening test if the purchase of a new high quality pick-up is contemplated.

*B. J. Webb
Hi-Fi News*

There are three Philips Super M magneto-dynamic cartridges. The GP400, GP401 and GP412. Write now for a Super M Brochure to Philips Electrical Limited, Dept SP, Century House, Shaftesbury Avenue, London WC2H 8AS.

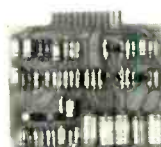
**We want you
to have the best.**

PHILIPS



richardson

ANNOUNCE A NEW RANGE OF PRINTED CIRCUIT PLUG-IN MODULES
FOR PROFESSIONAL AND INDUSTRIAL APPLICATIONS



This rationalised system allows numerous applications for mixing and amplification—the modules have been developed over the past four years and successfully used in discotheque mixers, studio mixing/recording equipment and custom-built installations. The system now features a universal Mother Board which is designed to accommodate these modules, enabling the manufacture of a wide range of equipment from standardised units.

The modules are constructed on fibre glass printed circuit boards with gold plated edge connectors. These have outstanding performance in respect of extremely low distortion, less than 0.01% at rated output, together with high overload capabilities and overall frequency responses of ± 0.5 dB.

This range of modules includes switchable microphone/line amplifiers—mono and stereo gramophone amplifiers, R.I.A.A. equalised—impedance converters/buffer amplifiers—tape replay and record amplifiers with electronically switched equalisation—tape oscillator systems—P.P.M. drive amplifiers.

Mixing amplifiers and tone controls are available on either combined or individual modules.

Output amplifiers include line amplifiers up to 10V into 600 Ω —monitor and power amplifiers up to 200W into 8 Ω .

In addition a range of stabilised power supply modules are available. Mains and line matching transformers, faders, meters, etc. are available ex-stock.



J. RICHARDSON ELECTRONICS LIMITED

57 JAMESTOWN ROAD, LONDON N.W.1

01-267 0723/4874



12 CHANNEL, STEREOPHONIC/
QUADROPHONIC TRANSPORTABLE
MIXER DESK, WITH INTEGRAL
"DOLBY A" NOISE REDUCTION
SYSTEM. RECENTLY SUPPLIED
TO ANGUS MCKENZIE
FACILITIES LTD.

CALREC MIXER DESKS — THE PROFESSIONAL'S CHOICE

CALDER RECORDINGS LIMITED, REGENT STREET, HEBDEN BRIDGE HX7 7DG

Phone 042-284 2159

Southern Distributors: Beyer Dynamic (GB) Ltd., 1 Clair Road, Haywards Heath, Sussex

Phone 51003

FRANCIS OF STREATHAM

DECKS WITH PRE-AMPS

(Microphone extra)
Akai 8 Tr. Cartridge CR.800
Akai 4000D
Brenell Mk.6
Ferrograph 702/4
National RS803 US 8 Tr. Cart.
Pioneer HR82 8 Tr. Cart.
Philips N.4500 3 sp. 4 Tr.
Revox 1102/4 2 sp.
Sharp RD 712D 3 sp. 4 Tr.
Sony 366D 3 sp. 4 Tr.
Sony 266D 3 sp. 4 Tr.
Tandberg i800 4 Tr.
Tandberg 3000X 3 sp. 2/4 Tr.
Tandberg 6000X 3 sp. 2/4 Tr.
Telefunken 205 3 sp. 4 Tr.
Telefunken 203 Studio

MAINS SPOOL RECORDERS

*Akai 4000 3 sp. 4 Tr.
*Brenell Mk. 6
*Ferrograph 713
*Ferrograph 722/4
Grundig 141 4 Tr. Mono
Grundig TK. 121 2 Tr. Mono
*Grundig TK.248 2 sp. 4 Tr.
Grundig 146 4 Tr. Mono Auto
Philips 4303 2 Tr. Mono
Philips 4307 4 Tr. Mono
Philips 4308 3 sp. 4 Tr. Mono
Philips 4404 2 sp. 4 Tr.
Philips Cassette 2401 Auto.
Philips Cassette 2400
Philips 4407 3 sp. 4 Tr.
*Philips 4408 Prof. 3 sp. 3 Tr.
*Revox 1222/4
Sharp 706 3 sp. 4 Tr. Mono
Sharp 708 3 sp. 4 Tr.
Sharp 711 3 sp. 4 Tr.
Sony 630 3 sp. 2/4 Tr.
Sony 540 3 sp. 4 Tr.
Sony 252 3 sp. 4 Tr.
*Tandberg 15 2 or 4 Tr./3 sp./Mono
*Tandberg 4000X 3 sp. 2/4 Tr.
*Telefunken M207 2 sp. 4 Tr.
Telefunken 203 2 sp. 4 Tr.

Telefunken 201 Mono 4 Tr.
*Uher 714 4 Tr. Mono
*Uher 724 4 Tr. 2 sp.
*Uher Royal de luxe 4 Tr. 4 sp.
*Uher Varicord 263

MAINS CASSETTE MODELS

*Philips RH882 Tun./AM/Cass.
*Sony HST399 Tun./AM/Cass.
*Sony TC330 Cass./Spool
*Sony TC160
*Sony TC165 (+ auto rev.)
*National RS256US
*Keller Dolby
*Rank Wharfedale Dolby
Philips 2400
Philips 2401 Auto with ski-slope
*Sony TC127 Deck and Pre-amp.
*Sony TC122 Deck/PA
*Grundig CN222 Deck/PA
*Alpha CD500 Deck/PA
*Sony TC146 Deck/PA
*Philips 2503 Deck/Pre-amp.

BATTERY MAINS CASSETTE

Philips 2204
Philips 2205
Sony TC60
Sony TC80
Sony TC100
Sony TC100A
Sony TC95
Sony TC146 mono
ITT R.G.D. TC400
Grundig
*Uher 124
Sony CF300 + AM/FM
Philips RR290 with AM
Sony CF100 with AM/FM
Sony CF200 with AM/FM
BATTERY CASSETTES
Philips N2000 Mono Player
Philips EL3302 Mono
Philips N2202 Mono
Sony TC12 Mono
Sharp 418 Mono

⊗ All stereo, except where stated ●

* Microphones extra

FOR A FAIR AND DEPENDABLE DEAL IN

TAPE and HI-FI

- ★ NO INTEREST OR SERVICE CHARGES ON H.P. UP TO 18 MONTHS
- ★ Free Service during Guarantee period
- ★ Fair Part Exchange Allowance on your old Recorder
- ★ Reconditioned Recorders available to personal shoppers only

AMPEX TAPE OFFERS

(P—Polyester; M—Mylar; A—Acetate)
7" D.P. 2400 ft (P) ... £1.50
7" L.P. 1800 ft (P) ... £1.05
5 1/2" L.P. 1150 ft (M) ... 88p
5 1/2" L.P. 1150 ft (A) ... 75p
5 1/2" Standard 850 ft (A) ... 63p
5" D.P. 1200 ft (P) ... 88p
5" L.P. 900 ft (P) ... 63p
5" Standard 600 ft (P) ... 50p
Postage on orders under £3 add 10p,
orders over £3 sent post paid U.K.

Splicers, Defluxers, Bulk Erasers,
Accessories of all kinds.

● MIXERS by
Uher, Eagle, Sony, Grundig, etc.

● MICROPHONES by
AKG, Grampian, Reslo, Acos, Beyer,
Sennhuiser, Telefunken, etc.

● HEADPHONES by AKG, Nikko,
Philips, Koss, Eagle, TTC, Beyer, Akai

● MUSICASSETTES. All leading
makes. Pre-recorded 8 track cart-
ridges and tapes. RECORDING tapes
and cassettes—All leading makes.

HI-FI DEPT.

● AMPLIFIERS
Quad, Rogers, Philips, Good-
man, Nikko, Armstrong, Leak,
Tandberg, Teleton, Alpha,
Wharfedale, Discosound.

● TUNERS
Quad, Rogers, Leak, Arm-
strong, Nikko, Goodman,
Huldra, Alpha.

● LOUDSPEAKERS
Quad, Ditton 15, Sonab, Kef,
Wharfedale, Goodman, Tan-
noy, Lowther, Leak, Tandberg,
Celestion, Keleton.

● MOTORS, PICK-UPS
GARRARD inc. S.P.25 Mk. III
Goldring Macdonald
Sonab J.P.
Connoisseur Shure
Audiotec Thorens
Neat Sonotone
Acos SME
Dual Pickering
Grado

Diamond styli, Microlifts, Pressure
Gauges, Cleaning Accessories,
Cabinets, etc.

169-173 STREATHAM HIGH ROAD, LONDON, S.W.16

Between St. Leonard's Church and
Streatham Station

01-769 0466 : 01-769 0192

Please note this is our only address. Free parking Prentis Road, 2 min. away
OPEN ALL DAY SATURDAY—CLOSED ALL DAY WEDNESDAY

High speed, high quality cassette and reel to reel duplicating

AUDIONICS

160 Ewell Rd Surbiton
Surrey Tel: 01-390 0291

Studio Sound

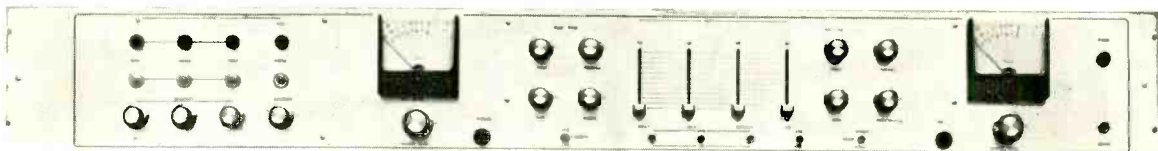
ANNUAL SUBSCRIPTION RATES

Australia	7 Dollars	Japan	2,850 Yen
Austria	200 Schillings	Norway	57 Krone
Belgium	400 Francs	Portugal	230 Escudos
Brazil	42 Cruzeiro	South Africa	5.75 Rand
Canada	8 Dollars	Spain	560 Pesetas
Denmark	60 Krone	Sweden	41 Kronor
France	44 Francs	Switzerland	33 Francs
Germany	28 Marks	United Kingdom	£3.00
Greece	240 Drachma	United States	8 Dollars
Holland	28 Guilders		
Italy	5,000 Lire		

Ensure regular delivery of your monthly copy through a direct
subscription from

STUDIO SOUND
LINK HOUSE, DINGWALL AVE., CROYDON
CR9 2TA, ENGLAND

STEREO STUDIO/DISCOTHEQUE MIXER — £96.00 COMPLETE



200/400 Watt Stereo I.C.
slave amplifier,
£70.00/£180.00

Mixer Inputs; 2 x stereo mag. phono, 1 x stereo
tape, 1 x mono cassette, 1 x mono mic with
ducking and overload limiting. Variations on
standard spec. available. Mixer also available
with lighting unit as illustrated £117.00

Chymes Audio Electronics (C.A.V.D. Ltd.) 320 Barham Road, WOKINGHAM, Berkshire
Tel: Wokingham 1970

MCI

FOR THE FIRST TIME IN BRITAIN



24-TRACK RECORDER MODEL JH-24

We are proud to announce the introduction in the U.K. of M.C.I. sixteen-track model JH-16 and twenty-four track model JH-24. . . two unique multi-track recording systems that for performance and price are far ahead of everything else.

M.C.I. multi-track professional recording systems are already in extensive use all over the U.S. and in several major studios on the continent.

JH-16 PRICE £8,004 JH-24 PRICE £11,450

FELDON AUDIO LTD

126 GREAT PORTLAND STREET
LONDON, W.1 01-580 4314

Shibaden's new video tape recorder



Model SV-610 E(K)

This new SHIBADEN Video Tape Recorder designated SV-610 E(K) is the black and white version of the very successful SV-620 colour video tape recorder.

The SV-610 E(K) is a self-contained, high quality solid state video tape recorder which has a two rotary head scanning system.

This unit is specially designed to record and play back OFF-THE-AIR TV programmes supplied from a SHIBADEN TU series receiver/monitor as well as CCTV camera signals.

The specifications include $\frac{1}{2}$ " tape width, a tape speed of 6.4 inches per second, whilst the 2,400 ft. tape gives 76 minutes continuous play. The SV-610 E(K) weighs 13.5kgs, and is available as a centre piece of a complete CCTV system.

Just look at these features

Specially developed ferrite video heads which offer superior picture reproduction and long life. Variable slow (1/5-0) and still capabilities.

Automatic gain control on both video and audio (Manual control available on audio).

Audio after-recording available.

Built-in 2:1 sync generator for driving a CCTV camera assures excellent playback. Fully compatible with other EIAJ European type VTR units.

Less power consumption 55W.

If you would like further details write or telephone today



SHIBADEN (U.K.) LIMITED
BROADCAST & CCTV EQUIPMENT MANUFACTURERS
61-63 Watford Way, Hendon, London,
NW4 3AX. Telephone: 01-202 8056

One touch and it's a fade accompli.

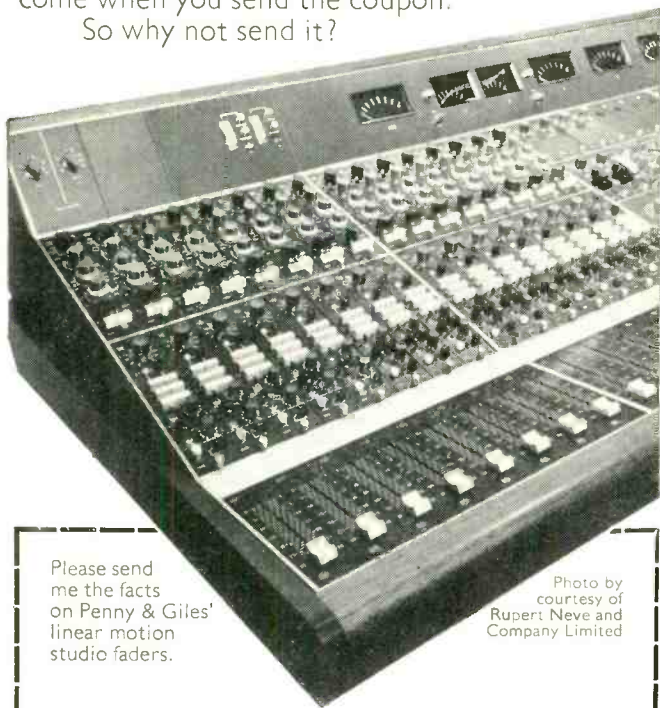
Penny & Giles linear motion studio faders fade so smoothly, so noiselessly, with so little effort that a touch is all that's needed for a perfect fade.

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?



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

Photo by courtesy of Rupert Neve and Company Limited

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 9/72

JUST A MINUTE!

In one minute, you can have two duplicates of a master cassette. Infonics' new, low cost Cassette Copier has just three foolproof push buttons. Duplicates both tracks in one pass.

High-speed Cassette Copier



Write for brochure or phone

fpa Fraser-Peacock
Associates Limited

94 High Street Wimbledon Village London SW19

01-947 2233 sole UK distributors of Infonics

The Quietest Revox

One of the most compelling reasons for buying a Revox is the sounds it doesn't make.

No spurious pops or clicks. No wavering, fluttering tones. No distracting hum. And best of all, virtually noise-free electronics.

Take our new A77 Mk III for example. We manufacture it to such close tolerances and with such exacting attention to detail, that it is generally regarded as one of the quietest tape recorders ever made.

Unfortunately, no matter how quiet our electronics are, there is still the inherent problem of tape hiss.

And that's where our new Revox A77/ Dolby B recorder comes in.

By now, the virtues of the Dolby Noise Reduction system are too well known to require any elaboration on our part.

Suffice it to say, for all practical

purposes the last major stumbling block to quality, noise-free recording has finally been eliminated.

Listening to tapes on the new Revox/Dolby B is a revelatory experience. Tape hiss is virtually non-existent. The music seems to emerge from a background of velvety silence. And at 3-3/4 i.p.s. the absence of extraneous noise is truly startling.

But no mere description of the Revox/Dolby B can adequately convey the experience awaiting you the first time you listen to a tape made on this remarkable machine.

Your nearest Revox dealer will be delighted to audition the Quietest Revox

for you. Once you've heard it, you'll understand why we say...

Revox delivers what all the rest only promise.

The Revox/Dolby B



Revox at Lamb House, Church Street, Chiswick, London W4 2PB

Revox Corporation in USA, 155 Michael Drive, Syosset, N.Y. 11791 and 3637 Cahuenga Blvd. West, Hollywood, California 90068

Revox Sales and Service in Canada, Montreal P.Q.

ARTICOLI SPECIALI

- 35 RELAZIONE APRS 72**
Una relazione sulla Mostra della Associazione degli Studi Professionali di Registrazione tenutasi a Londra lo scorso giugno.
- 47 LA NATURA DEI SUONI A VENIRE**
- 49 UNA PARVENZA DI TELEGIORNALE**
T. E. Bracey descrive l'allestimento di un bollettino tipico di notizie per il video.
- 51 RADIO LOCALE**
John Dwyer passa brevemente in rassegna la storia della radiotrasmissione locale nel Regno Unito. Egli descrive anche le sue impressioni in merito alle visite a 6 stazioni locali della BBC e discute le prospettive della radio commerciale.
- 57 ANTEPRIMA IBC**
La Convenzione Radiotrasmissioni Internazionali 1972 avrà luogo presso la Grosvenor House, Park Lane, Londra W1, dal 4 all'8 settembre. L'anteprima tratta la nuova attrezzatura che verrà esposta e comprende un programma provvisorio delle relazioni.
- 63 PROVA DI CONSUMO: TRIADEx MUSE**
David Kirk illustra un nuovo tipo di sintetizzatore elettronico basato sul sistema digitale.
- 65 UN INDICATORE DI SOVRACCARICO DI MASSIMA**
David Robinson espone in dettaglio la costruzione di un indicatore di livello audio per lettura di massima, il quale fa uso di diodi di poco prezzo emittenti luce. In alternativa, il circuito può dare l'energia necessaria a convenzionali lampadine.
- 69 MINIMIZZARE LA TRASPOSIZIONE**
Michael Gerzon descrive i metodi per minimizzare la trasposizione di strati adiacenti—un problema di particolare rilievo per alcuni tipi di nastro a basso fruscio.
- 73 ESAME: AMPLIFICATORI DI POTENZA**
Una lista aggiornata degli amplificatori audio industriali attualmente disponibili in Inghilterra.

SPEZIALARTIKEL

- 35 APRS 72 BERICHT**
Ein Bericht über die im Juni in London stattgefundenen Ausstellung des Fachverbands für Aufnahmestudios.
- 47 DIE TONE DER ZUKUNFT**
- 49 WIE SICH NACHRICHTEN ANHÖREN**
T. E. Bracey beschreibt die Produktion einer typischen Fernseh-Nachrichtensendung.
- 51 ORTSRUNDFUNK**
John Dwyer gibt einen Überblick über den Werdegang örtlicher Rundfunksender in England. Ausserdem beschreibt er, welche Eindrücke er bei seinem Besuch von sechs

BBC-Ortssendern erhalten hat, und diskutiert die Aussichten für den Werbefunk.

- 57 IBC VORSCHAU**
Die Internationale Rundfunk-Tagung 1972 wird vom 4. bis 8. September im Grosvenor House, Park Lane, London W1, stattfinden. Die Vorschau erstreckt sich über neue Geräte der Ausstellung und enthält ein vorläufiges Programm der geplanten Vorträge.
- 63 PRAKTISCHE VERSUCHE: TRIADEx MUSE**
David Kirk betrachtet eine neue Art elektronischer Musik-Synthesierer, die auf digitaler Technologie gründet.
- 65 EINE SPITZEN-UBERLASTUNGSANZEIGE**
David Robinson beschreibt den Bau einer Spitzenablesungs - Anzeige des Audio - Stands, für die billige lichtgebende Dioden verwendet werden. Alternativ kann der Kreis auch mit herkömmlichen Lampen betrieben werden.
- 69 MINDESTMASS AN DURCHDRUCK**
Michael Gerzon beschreibt Methoden, den Durchdruck nebeneinanderliegender Schichten auf ein Mindestmass zu bringen, ein Problem, das besonders bei bestimmten modernen geräuscharmen Tonbändern vorherrscht.
- 73 BERICHT: LEISTUNGSVERSTARKER**

ARTICULOS SELECCIONADOS

- 35 INFORME APRS 72**
Un informe sobre la Exposición de la Asociación de los Estudios Registradores Profesionales que tuvo lugar en Londres durante el mes de junio.
- 47 LA FORMA DE LOS SONIDOS A VENIR**
- 49 LOS SONIDOS QUIEREN NOTICIAS**
T. E. Bracey describe la producción de un boletín típico de noticias.
- 51 RADIO LOCAL**
John Dwyer da una historia breve de emisiones locales en el Reino Unido. También describe las impresiones de sus visitas a seis emisoras locales de la BBC y discute las perspectivas de la radio comercial.
- 57 VISTA PREVIA DE LA IBC**
La Convención Internacional de Radiodifusión de 1972 tendrá lugar a Grosvenor House, Park Lane, Londres W1, desde el 4 al 8 de Septiembre. La vista previa abarca el equipo nuevo a exhibirse y abraza un programa provisorio de conferencias.
- 63 PRUEBAS DEL UTILIZADOR: TRIADEx MUSE**
David Kirk mira a una nueva forma de sintetizador de música electrónica basado sobre la tecnología digital.
- 65 UN INDICADOR DE MAXIMA SOBRECARGA**
David Robinson detalla la construcción de un indicador-lectura del nivel máximo

auditivo con el empleo de diodos emisores a efecto óptico no muy costosos. Alternativamente se pueden emplear bombillas comunes en el circuito.

- 69 REDUCIR EN LO MINIMO LA TRANSPOSICION**
Michael Gerzon describe los métodos para reducir en lo minimo la transposicion a las capas adyacentes, un problema que existe sobretodo con ciertas cintas modernas de bajo ruido.
- 73 EXAMEN: AMPLIFICADORES POTENCIADOS**
Una lista al día de amplificadores auditivos actualmente disponibles en Inglaterra.

ARTICLES PRINCIPAUX

- 35 RAPPORT SUR APRS 72**
Un rapport sur l'exposition 1972 de l'association des studios d'enregistrement professionnels (1972 Association of Professional Recording Studios Exhibition) tenue à Londres en juin.
- 47 LE GENRE DES SONS A VENIR**
- 49 ON DIRAIT DES NOUVELLES**
T. E. Bracey décrit la fabrication d'un bulletin d'information télévisé type.
- 51 RADIO LOCALE**
John Dwyer raconte brièvement l'histoire de la radio-diffusion locale en Grande Bretagne. Il donne aussi ses impressions de ses visites aux six stations locales de la BBC et discute l'avenir de la radio commerciale.
- 57 AVANT-PREMIERE DE IBC**
La convention internationale de radio-diffusion de 1972 (International Broadcasting Convention) se tiendra à Grosvenor House, Park Lane, Londres W1, du 4 au 8 septembre. L'avant-première couvre le nouvel équipement qui y sera exposé et comprend un programme provisoire des conférences.
- 63 ESSAI D'UTILISATEUR: TRIADEx MUSE**
David Kirk parle d'une nouvelle formule de synthétiseur de musique électronique basée sur la technologie digitale.
- 65 UN INDICATEUR DE SURCHARGE DE POINTE**
David Robinson détaille la construction d'un indicateur de lecture de pointe de niveau sonore qui utilise des diodes émettrices de lumière, bon marché. Alternativement, le circuit peut alimenter des ampoules normales.
- 69 REDUCTION DE LA TRANSPOSITION**
Michael Gerzon décrit les méthodes de réduction de transposition de couches adjacentes, un problème particulièrement important pour certains rubans modernes à faible bruit.
- 73 REVUE: AMPLIFICATEURS DE PUISSANCE**
Une liste à jour d'amplificateurs sonores industriels actuellement offerts en Grande Bretagne.

Transformers and transducers

TWO RECENT AES lecturers took a look back at audio fundamentals. The first, entitled 'Transformers and the Audio Engineer' was given by Peter Baxandall, electro-acoustical consultant, and covered aspects of audio transformers, both familiar and obscure. Among the latter, a demonstration using a 100H 5,000 turn inductor showed that the noise due to Barkhausen 'jumps' (first observed in 1919) was audible for current reversals giving flux densities of ± 700 , 200 and 100 gauss but was non-existent at ± 70 gauss (1 gauss = 10^4 tesla). Since many devices such as input matching transformers often work at flux densities as low as ± 1 gauss, any fear of hearing a residual 'Barkhausen Effect' could be ignored, as was also the case with many variable reluctance pickups. The lecture covered many detailed points about transformer operation and showed their advantages over active circuits where accuracy and stability of voltage ratio was essential. With modern techniques, using the Blumlein type of transformer ratio bridge, it was possible to achieve a given ratio within one part in 10^8 .

An extra AES meeting was organised for July 11, being delivered by Richard Small of the University of Sydney. In view of the time of year and short notice, his audience of about 40 gave an indication of the perennial interest in the subject of his lecture, entitled 'Performance and Limitations of Direct Radiator Loudspeaker Systems'. This dealt with fundamental considerations governing the 'trade-off' between efficiency, bandwidth (i.e. f_c 'cut-off' frequency, or -3 dB point), and enclosure volume of relatively simple systems of the 'lumped' variety—e.g. ib and vented enclosure. Mr Small demonstrated that the efficiency of such systems was well defined, being proportional to the product of their cut-off frequency (f_c) cubed and enclosure volume V_B . It was also shown that the maximum acoustic power output was proportional to the product of f_c^3 and V^2/D ($V_D = \frac{1}{2}$ peak-to-peak volume displacement of the diaphragm).

Despite various types of 'optimisation', chosen to modify the shape of the overall response, it was clear that the true measure of performance of a system was limited by choice of electro-acoustic efficiency, maximum diaphragm displacement, and power rating from a heating viewpoint. It was emphasised that, because pressure at a distance was proportional to the second derivative of diaphragm displacement, systems in which this was non-linear with respect to the input signal gave four times the displacement distortion, the audibility of this at f_c being aggravated by the ear's rapidly diminishing sensitivity with decrease of frequency below about 200 Hz and particularly

in the first musical octave from 16.35 to 32.7 Hz.

Although the lecture demonstrated clearly how systems could be optimised for Q under ideal radiation conditions, in practice such niceties are swamped by listening room resonances below about 200 Hz, where the Q may typically exceed 15. The ear/brain combination has poor discrimination between source and reverberant contributions.

String synthesiser

ONE OF many instruments to be seen and heard from August 13 to 17 at the Imperial Hotel, Russell Square, is the *Freeman* string synthesiser. The venue is the British Musical Instrument Trade Fair (10.00 to 18.00 daily). Exhibited at the 1971 Frankfurt Music Trade Fair, the *Freeman* synthesiser fell foul of manufacturing disagreements but is now being made by Chicago Musical Instruments. Development was by Audio Synthesisers Ltd, 14a Broadwalk, Pinner Road, North Harrow, Middlesex HA2 6ED. AS describe their instrument as 'capable of reproducing the complex tonal structure of a large number of instruments of the same family playing in orchestral harmony'. An entire cello, viola or violin section may be synthesised by pressing just one note of the five-octave keyboard. A remarkable instrument, if the claims are met.

Budget cartridge machine

A LOW PRICE cartridge reproducer of British manufacture is now available from Sound Incorporated Systems, 12 Military Road, Northampton. The *S100* is designed to meet studio requirements and operates at 19 or 9.5 cm/s (to specification). Head format comprises upper track program and lower track cue, claimed wow and flutter being 0.35 per cent rms. The unit accepts NAB Size C cartridges (SM4/SP4) and feeds 0 dBm at 600 ohms unbalanced (balanced to order). Start/stop time is approximately 500 ms.

Teldec colour

ON THURSDAY, June 29, 500 members of the Royal Television Society and others attended a demonstration of the Teldec colour videodisc held at the ITA headquarters in Brompton Road, London.

Briefly, the groove of the disc is hill and dale modulated and, as the stylus passes over each bump, these bumps are compressed then, at the stylus's sharp trailing edge, released. This sudden release of the grooves creates a voltage pulse in the stylus of about 20 mV.

The minimum recorded wavelength is 2μ and from peak dip to peak white the carrier varies from 2.75 to 3.75 MHz. Sound is carried on a 1 MHz carrier at ± 25 kHz. Groove signal

velocity is about 100 times that in an audio disc.

The disc is driven from its centre at about 100 rpm and still frames are achieved by repeatedly jumping the groove. Colour is obtained by sequential switching and combining the resultant signal with the luminance signal.

Subjectively the picture and sound quality were fair; the colour of the first disc shown was blotchy and registered poorly, and a 'bad edit' suggested there was some groove jumping. Later discs were much better but in one sequence bands across the picture turned green and yellow. The cause of this was unknown: 'We've never seen it before; it's something quite new to us'.

This does little to diminish the achievement of Telefunken and Decca, however, for the picture quality and sound quality could have been improved at greater cost to the consumer; the disc will cost about the same as an ordinary lp.

The significance of the Teldec disc is that there is no longer any reason why audio-only records should not be far better than any pre-recorded tape now on sale. Signal to noise ratios of 100 dB are within reach. But will record buyers get them?

Sweep generator

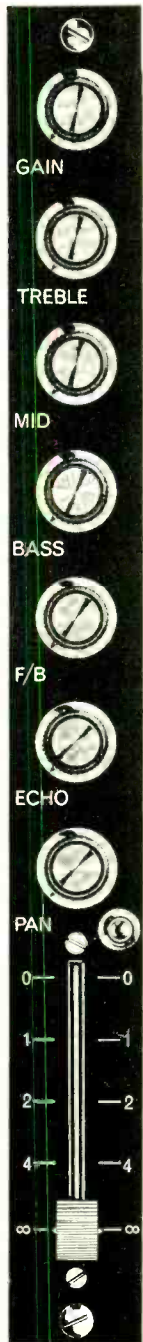
A SWEEP GENERATOR covering 400 Hz to 2.2 MHz at any repetition rate between 1 and 30 Hz is now being offered by 3M. Facilities include adjustable sweep width, direct crt synchronisation and accessible plug-in circuit boards with an extender board to simplify maintenance and calibration. Further information: W. R. Bowles, 3M UK Ltd, 3M House, Wigmore Street, London W1A 1ET.

Boobs

APOLOGIES TO J. M. Bowsher for a typographical error in his letter 'In favour of the dBV' (August, page 19). His second paragraph should start as follows: Mr Wilms's statement 'output level equals +12 dBm into 30 ohms' is thus precise and unambiguous; it means that the output voltage is such that 20 times the logarithm to base 10 of the ratio of that voltage to the rms voltage needed to dissipate a power of 1 mW in 30 ohms is equal to +12. If we put numbers in we find that 1 mW in 30 ohms is equivalent to a voltage of 0.173V rms.

Apologies also to AV Distributors for omitting the Stellavox *AMI* from the survey of audio mixers. Selling at £562 basic, this incorporates five balanced inputs with slide fader, bass cut switch, presence filter, Baxandall bass and treble control on each channel. The *AMI* is designed to feed the *Sp7* battery stereo recorder and will be reviewed in our October issue.

Are you MIXING with the right people?



THEN SOUND US OUT

INPUT MODULE A/I

£25.00 The basic system module for both stereo and multi-track mixers.

Input 200 ohms balanced or 100K ohms unbalanced for levels -65dBm to $+10\text{dBm}$. Sensitivity adjustable by stepped gain switch.

Equalisation Treble, Mid, Bass at selected frequencies, offered continuously: variable lift and cut.

Auxiliary Outputs Prefade foldback or cue send and post fade echo controls to feed external mixing networks.

Main Outputs Linear fader buffered, and followed by low impedance panpot, connection directly to main mixing busses, or to routing control.

Provision is made for inclusion of channel or EQ cut, prefade listen etc. To individual specification.

We build sound mixers by incorporating modules from our range in whatever configuration may be desired, from permanent studio installations through a variety of mobile applications.

Please write or phone for complete system specification.

ALLEN & HEATH LTD.

Pembroke House,
Campsbourne Road, Hornsey
London N8

Tel. 01-340 3291



Make your own magnetic shields in minutes

Telshield is an efficient, easy to use, ferromagnetic foil which provides a simple, quick and economical answer to shielding components from unwanted and spurious signals. It is easily cut with scissors, formed into cones or cylinders etc., which can be fixed with adhesive tape clips or spot welds to provide a permanent efficient shield.

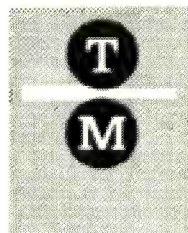
When formed into a complete enclosure around a device, it carries the stray fields around it because of its high conductance to magnetic flux.

It is especially useful for experimental, small-run, research and development applications which do not merit the tooling involved in the production of fully fabricated shields.

Telshield is supplied in convenient packs in a standard thickness of 0.5mm., in widths of 150mm, 50mm and 25mm, 3.66m in length, costing about £5.00

Telcon have full facilities for fabricating shields to customers' own specifications and also offer a range of standard boxes and cans.

Please send for further information



TELCON

Telcon Metals Ltd
Manor Royal, Crawley, Sussex
Crawley: 28800

Patents

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

1972, June 1

1280963

Stereodyne Inc
Reduced speed magnetic tape cartridge

1280972

M-O Valve Co Ltd
Signal storage devices

1281170

Key Developments Ltd
Automatic visual indicator and transposing device for organ, electronic organ and pianoforte

1281207

RCA Corporation
Penetration colour television displays

1281239

RCA Corporation
Colour television cameras

1281245

Marconi Co Ltd
Power amplifiers

1281258

Ampex Corporation
Tape reel and tape threading system

1281331

Bolkow, L
Method of radio transmission of signals unaffected by interference

1281340

Marconi Co Ltd
Apparatus utilising information recorded on a record medium

1281368

RCA Corporation
Magnetic recording and reproducing

1281405

Columbia Broadcasting System Inc
Laser scanning system including rotating reflector

1281409

Matsushita Electronics Corporation
Solid-state microwave generating device

1281472

Singer Co
Method of clearing dust from a magnetic record disc or the like

1281659

Ampex Corporation
Tape transport for a helical scan tape recorder

1281664

Philips Electronic & Associated Industries Ltd
System for the accurate reproduction of pulse code modulation signals received as an unfavourable signal-to-noise ratio

1972, June 7

1281912

Tokyo Shibaura Electric Co Ltd
Pickup devices

1281945

Wyle Laboratories
Underwater electro-acoustic transducer

1281984

Marconi Instruments Ltd
Peak detection circuits

1281991

United Kingdom Atomic Energy Authority
Method and apparatus for storing information

1282115

Cartridge Television Inc
Tape recording and reproducing system

1282159

Marconi Co Ltd
Voltage stabilised power supply units

1282358

Compagnie Internationale Pour L'Informatique
Magnetic tape read-out signal processing systems

1282364

Ranzato, M
Electronic instruments for simulating stringed instruments

1282371

Bunker-Ramo Corporation
Coaxial circuit construction and method of making

1282408

International Business Machines Corporation
Magnetic recording and reproducing apparatus

1282416

Marconi Co Ltd
Group delay equalisers

1282438

Davis, A V C
Stereoscopic viewing apparatus with single axis optical system

1282481

British Broadcasting Corporation
Drive mechanisms

1282487

Standard-Triumph Motor Co Ltd
Audio frequency analyser

1282516

Philips Electronic & Associated Industries Ltd
Methods and apparatus for measuring surface roughness

1282533

Messerschmitt-Bolkow-Blohm GmbH
Magneto-optic elements for the storage of information

1282599

RCA Corporation
Projection of colour coded black and white transparencies

1282641

Patterson, T
Speech encoding and decoding

1972, June 14

1282716

RCA Corporation
Holography

1282721

Marconi Co Ltd
Mains driven DC voltage supply stabilisers

1282759

Lachaussee, M and Maigret, A
Method of manufacturing discs from wire

1282816

Marconi Co Ltd
Apparatus for the manufacture of printed circuits

1282841

Rohde & Schwarz
Measurement of noise in video signals

1282963

Blaupunkt-Werke BmbH
Delay-line decoder for PAL colour television signals

1283017

Bell & Howell Co
Film reel support assembly for projectors

1283023

RCA Corporation
Frequency sensitive apparatus

1283091

Marconi Co Ltd
Magnetic printing arrangements

1283220

Eastman Kodak Co
Apparatus for ultrasonically splicing film

1283404

Audio-Technica
Stereophonic pickup cartridge

1283522

EMI Ltd
Gramophone record bagging machines

1972, June 21

1283612

Blaupunkt-Werke GmbH
Tape Recorders

1283623

Philips Electronic & Associated Industries Ltd
Logical building block

1283649

Sony Corporation
Cover for selectively exposing an opening in a cassette

1283818

Funakoshi, T
Musical tone producing device

1283848

Asahi Glass Co Ltd
Process for soldering difficultly solderable metals

1283888

Pache, F.
Musical instrument

1283960

Philips Electronic & Associated Industries Ltd

Image pickup tubes

1283985

RCA Corporation
Hologram storage

1284020

Sony Corporation
Cassettes

1284022

RCA Corporation
Automatic video signal gain controlling apparatus

1284824

Magnavox Electronics Co Ltd
Magazine spindles for automatic record changers

1284158

ZCM Corporation
System for conveying sound information to the brain

1972, June 28

1284401

Plessey Co Ltd
Gramophone record players

1284556

Cia Industrial de Novedades Plasticas Y Metalicas
Sound reproducing apparatus

1284626

Sony Corporation
Magnetic recording and reproducing device

1284779

Matsushita Electrical Industrial Co
Magnetic tape duplicating apparatus

1284885

Eastman Kodak Co
Sound reproducing system

1284886

RCA Corporation
Camera tube having a storage target

1284905

Hollandse Signaal-Apparaten
System for recording and reproducing radar video signals

1284906

Kronfield, L E
Magnetic head assembly

1284911

British Broadcasting Corporation
Display devices

1284998

Philips Electronic & Associated Industries Ltd
Recording and/or playback apparatus

1285067

Hell, Dr-Ing Rudolf
Reproduction of a picture

1285108

Licentia Patent-Verwaltungs-GmbH
Method and device for reproducing signals stored on a transparent medium

1285116

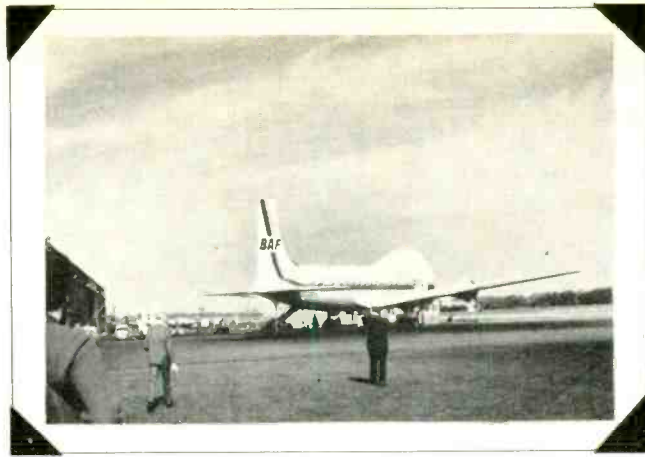
Philips Electronic & Associated Industries Ltd
Magnetic tape tensioning apparatus

1285138

Ampex Corporation
Line tracking system



Peter Moody in Paris 1971



en route to Europe



TVE Madrid



Staff in USA

The Neve Album

from the home of the world's finest
sound control equipment our consultant
sales engineers journey out to bring home
the reality that the sound of Neve
is worldwide



One of two 32-input multi-track
consoles designed and built for
RCA (Records) New York, and installed
in their Hollywood studios



Neve

Rupert Neve & Company Ltd.,
Cambridge House,
Melbourn,
Royston,
Hertfordshire SG8 6AU,
England
Tel Royston (0763) 60776 (10 lines)
Telex 81381

Rupert Neve of Canada Ltd.,
7528 Bath Road,
Malton,
Toronto, Ontario,
Canada
Tel 416-677 6611

Rupert Neve Incorporated,
Berkshire Industrial Park,
Bethel,
Connecticut 06801,
U S A
Tel (203) 744 6230 Telex 969638

Pirates Without Ships

By Adrian Hope

TRUE story. The place, a field on top of the Sussex Downs. The time, early last summer. A large, off-duty policeman lies sun-bathing on a glorious hot Sunday. Half way through the afternoon he notices a strange copper wire leading from the top of a tree down to a parked van. Suspicions aroused, he follows the wire down from the tree into the van where he finds a cassette tape recorder happily playing away into a black box. Out of one end sprouts the copper wire. What he's found is one of the literally dozens of inland pirate radio stations operating round the country, and, as he tries to wrench the cassette from the recorder (difficult because the recorder will not release the cassette until it is switched off), the culprits arrive back on the scene of the crime, having just driven round the neighbouring town to check reception of their transmission.

In this case, the people concerned were lucky and got off with a warning. Had it been the GPO who caught them, tracking them down with a direction finder, the result would almost certainly have been prosecution and confiscation of all the equipment directly or indirectly involved. They could have lost not only the hardware but also their discs, tapes and just about anything else in reach.

Why do the people involved in the inland pirate stations persist in putting out programmes with risks like these involved? And just how many stations are there? After hearing the summer Sunday story, I looked a little more closely into it and was frankly astonished to find the number of stations that are still transmitting quite illegally. The Marine Offences and other acts make it impossible to give too much information on what is still being broadcast illegally. According to the letter of the law, not only transmitting a station but listening to it (even direction finding on it), supplying it with equipment, or advertising it in any way can also be an offence.

Really there are two big questions. Why should anyone want to transmit illegally and why listen to the inferior quality inevitably associated with illegal transmissions? Probably the best way of explaining it is to call to mind the episode that the late Lenny Bruce used to recount when he had trouble with his telephone. After insulting the hopeless operator, Bruce was finally put down by her ultimate weapon: 'If you don't like the service, go to another phone company'. What the champions of free radio want is another phone company in the shape of free radio. Frankly they haven't a hope in hell of getting it and some of them will probably end up in prison trying. However much one sympathises with their distrust of the proposed commercial networks, one finds it hard to have too much sympathy with what they are doing.

The happenings up to the Marine Offences Act are pretty well known. Ships and estuary forts pumping out vast quantities of needle time round both the clock and medium wave dials. It started in 1964 with Simon Dee introducing Radio Caroline on 199m and finally ended on Monday, August 15, 1967, when all the stations except Caroline went off the air. In March 1968, Caroline herself was silenced by the Weismuller Salvage Company, who threatened to tow the Caroline ship to Japan. The transmitting power being used ranged from 1 kW (as put out by the ignoble Screaming Lord Sutch from Shivering Sands Fort in the Thames Estuary) to the 50 or 60 kW of which the largest stations were capable.

During the heyday of the marine pirates, some of the ships were reputed to be earning £600,000 per year. A lot of this came from the record companies, who were taking advantage of the 'cash for guaranteed plays' system worked out by most of the stations. After Radio Caroline disappeared, two other ships defied the law by relying on Dutch-based control. In fact both ships had close connections with music-publishing concerns, an ideal tie-up from the commercial point of view but hardly likely to produce ideal programming.

There has been occasional talk of pirate television transmissions from *B17* planes circling over the North Sea. It is not surprising that these plans have never come to much. To be accurate, though, some pirate transmissions were put out by the Dutch station TV Noord Zee. This continued until the Dutch Parliament passed a bill outlawing them. In 1964, army helicopters landed on the transmitter platform anchored off the Dutch coast and silenced it.

The final score on all the feuding and fighting over the last few years is that there are now virtually no pirate ships or platforms operating from the North Sea or anywhere else within radio or TV range of this country. Whether or not this is a bad thing I leave as an entirely open question, because I have never been able to work out just how much of the interference caused to shipping bands and the like was real and how much was a convenient peg to hang the legal hat on.

It would seem that most of those concerned with free radio in this country are resigned to the fact that any future pirate stations will have to be land borne. In the summer of 1971 there were at least two dozen separate mobile stations operating in London and the home counties in the South of England. They were mobile to reduce the risk of detection but were methodically closed down by the GPO. With confiscation obviously expensive, the standard technique appears to be to record everything onto cassette, hitch that up to a simple transmitter with a wire aerial and keep all fingers crossed for an hour or two that it is reckoned

safe to transmit. Not surprisingly, the audio quality is generally pretty poor and the low-power transmitters involved do little to ensure good reception. 50W seems to be about the top whack, with figures as low as to 15W often all that the broadcasters can muster.

One of the main problems of transmitting is holding the frequency steady. Where VFOs are used, there is always a tendency for the frequency to wander or drift, especially as the equipment is usually being run in the back of a van off flagging car batteries. Wherever possible, the on-shore pirates use a crystal tuned to a convenient fixed frequency. Up to a few months ago it was relatively easy and cheap to buy suitable crystals in the medium wave band. These were all dated round about 1950 onwards, so a reasonable guess is that they were intended for Civil Defence work. Presumably, if the nuclear balloon had gone up, the Civil Defence would have communicated with anyone left on small crystal-controlled medium-wave transmitters. Now, quite suddenly, the radio surplus stockists have for one reason or another become very reluctant to sell crystals to suspicious looking customers. Crystals can still be had in the USA and there is also some pirate activity over there.

Usually Britain follows the USA in trends and technology but we have the dubious distinction of setting trends in the field of pirate radio. Pirate radio stations have been few and far between in the States, probably because there are so many legal stations that there is no point in going outside the law. But in New York some young bloods had the idea recently of starting up pirate fm and am broadcasts from their own homes in Yonkers. The result at first was total confusion, because the FCC do not have powers equivalent to the British GPO in that their terms of reference extend only to keeping a tight rein on *legal* stations. By definition, a pirate radio station is outside the jurisdiction of the FCC. For a while the stations transmitted happily but they are now off the air following harassment of the broadcaster and, more to the point, their parents. The word was round that arrests were imminent for both generations and obviously the stations had to close.

Frankly, I find it a little sad that so many supporters of Utopian 'free radio' are beating their heads against the brick wall of wavelength allocation. I am sure they see it another way, and perhaps they're right. Really the only way out of an article like this would be to suggest that everyone listen for themselves, but it is illegal for me to do this. Instead, I will pass the buck on to the Southern Independent Radio Association, 91 Park Street, Horsham. If they feel that they can give you more details of stations and wavelengths without risk of prosecution, that is up to them.

Open Reel or Cassette? If it's a new Sansui deck, the choice could be tough.

The new Sansui SD-5000 open reel deck is one of the finest taping components ever built.

Designed to deliver optimum performance from both standard and low noise tapes, it provides for tonal quality, tape protection and operating convenience on an unprecedented scale.

In tonal quality features alone the SD-5000 offers large-core wide-range contourless heads, expensive EENF equalizer, precision 4/8-pole hysteresis synchronous capstan motor, recording bias/level selector, push-pull bias oscillator circuit and an S/N ratio of better than 60dB.



But the new Sansui SC-700 stereo cassette deck is also one of the finest taping components ever built.

Designed to deliver optimum performance from both standard and low noise tapes, it incorporates the famed Dolby Noise Reduction System* and handles chromium dioxide tapes for performance that surpasses many open reel decks.

In tonal quality features alone the SC-700 offers a wide-band contourless head, solid state synchronous DC servo motor, high recording bias frequency and an S/N ratio of better than 56dB.

Open reel or cassette? The decision is yours at your nearest authorized Sansui dealer.

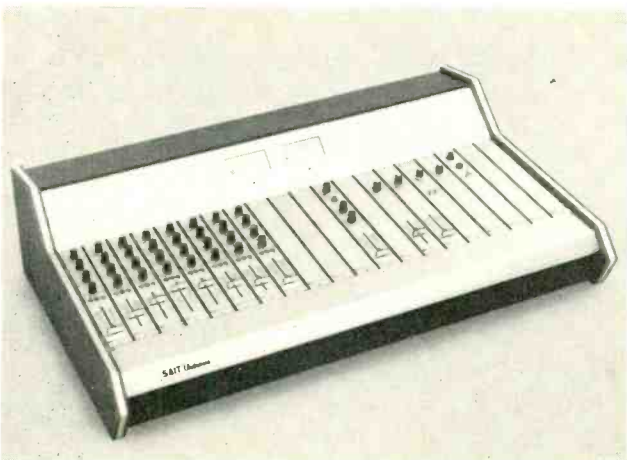
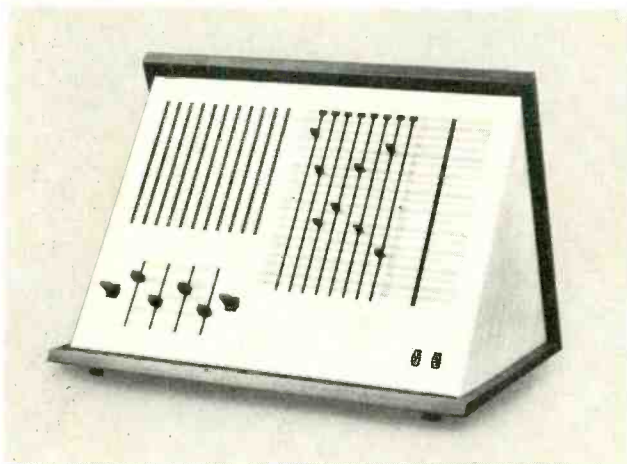
	SD-5000	SC-700
Tape speed accuracy:	Within 0.5%	Within 1%
Wow and flutter:	less than 0.08% at 7½ ips	0.12% weighted RMS
Frequency response:	15 to 23,000Hz	40 to 16,000Hz
Crosstalk:	better than 45dB	better than 47dB

*Dolby is a trademark of Dolby Laboratories Inc.



England: VERNITRON LTD. Thornhill Southampton SO9 5QF Tel: Southampton 44811 / Ireland: INTERNATIONAL TRADING GROUP LTD. 5 Cope Street, Dame Street, Dublin 2 / West Germany: COMPO HI-FI G.M.B.H. 6 Frankfurt am Main, Reuterweg 65 / France: HENRI COTTE & CIE. 77, Rue J.-R. Thorelle, 77, 92-Bourg-la-Reine / Luxembourg: LUX Hi-Fi 3, rue Glesener, Luxembourg / Austria: THE VIENNA HIGH FIDELITY & STEREO CO. A 1070 Wien 7, Burggasse 114 / Belgium: MATELECTRIC S.P.R.L. Boulevard Leopold II, 199, 1080 Brussels / Netherlands: TEMPOFOON N.V. Tilburg, Kapitein Hatterasstraat 8, Postbus 540 / Switzerland: SONOVOX AG Wallstrasse 11, 4051 Basel / Greece: ELINA LTD. 59 & 59A Tritis Septemvriou Street, Athens 103 / Italy: GILBERTO GAUDI S.A.S. Corso Di Porta Nuova 48, Milano 20121 / Cyprus: ELECTROACOUSTIC SUPPLY CO., LTD., P.O. Box 625, Limassol / Spain: COMERICA S.L. General Cabrera 21 Madrid 20 / Portugal: CENTELEC LDA. Avenida Fontes Pereira de Melo, 47, 4º. dto., Lisboa-1 / Malta: R. BRIZZI 293, Kingsway, Valletta / South Africa: GLENS (PTY) LTD. P.O. Box 6406 Johannesburg / SANSUI AUDIO EUROPE S.A. Diacem Bldg., Vestingstraat 53-55, 2000 Antwerp, Belgium / SANSUI AUDIO EUROPE S.A. FRANKFURT OFFICE 6 Frankfurt am Main, Reuterweg 93, West Germany / SANSUI ELECTRIC CO., LTD. 14-1, 2-chome, Izumi, Suginami-ku, Tokyo 168, Japan

Triadex Inc.
MUSE music synthesiser.



SAIT Electronics
S9 range of portable mixers.

Sole agent for
Pearl microphones.

Allotrope Ltd.

5B Thame Industrial Estate,
Thame, Oxon.
Sales Office: 01-437 1892.

For professional
recording facilities
in the Midlands

Hollick & Taylor Recording Co Ltd

8-track 4-track 2-track
Stereo-Mono Recording
Leavers-Rich — Studer — Stereo Nagra
Neumann and AKG Microphones
Comprehensive Mobile Unit
Independent Production
Demos and Pressings
Producers of Grosvenor Records

HOLLICK & TAYLOR
16 Grosvenor Road, Handsworth,
BIRMINGHAM B20 3NP
021-356 4246

Switchcraft Audio Connectors



Now available ex-stock, all popular
Switchcraft audio connectors for
studio and ancillary equipment.
Featuring the high specification, ready
inter-changeability and standardised
fitting demanded by the
connoisseur. At truly low cost:
only 75p for the A3F cord plug,
with other 3, 4 and 5 pole plug and
socket connectors in the same price
bracket. Delivery ex-stock, with
quantity discounts.



Switchcraft connectors for stream-lined
strength and efficiency: providing
positive contact, safety lock,
self-polarisation and cable
clamping. The professional
design for the professional user.

Sole U.K. Agents
for Switchcraft QG connectors

F.W.O. BAUCH LIMITED

49 Theobald Street,
Boreham Wood, Herts.

Tel: 01-953 0091

Telex: 27502

FOR 18 months Keith Wicks has kept this column supplied with news despite small encouragement and an even smaller return on time spent. Now, my knees trembling, he has handed over to me. Keith will continue to contribute occasional articles, though when he will be able to deliver his copy is in the hands of fate.

From Hempstead, New York, we hear that **Ultrasonic** have done a couple of singles: *Endless You* produced by Adam Knieste and engineered by Jeff Kracke, and another by Elmer Parker for Black Falcon Records. This was produced by Bill Seabrook and engineered by Mike Colchamiro. Mike was also the engineer for a group session produced for ISB Productions by Mark Gluckin and Bruce Leventhal. The studio is also used for live broadcast work. Every Tuesday evening at 20.00, since October last year, a stereo rock concert has gone out live over station WLIR. On June 6 they presented the Fabulous Rhinestones and, on June 20, Randy Newman. The series is produced by Mike Epstein and directed by Mike Colchamiro. Ultrasonic are 16 track and recorded Vanilla Fudge's *You Keep Me Hanging On* as well as hits by Iron Butterfly.

Strawberry Studios in Manchester have been very busy with a Neil Sedaka album reproduced by Donnie Kirshner and engineered by Eric Stewart. Barclay James Harvest produced an album themselves for EMI, engineered by Pete Tattersall. Eric also engineered a Barron Knights single which was described as 'heavy'. Granada recorded for The Comedians and a northern Pop show called 'Lift Off'. Hotlegs also came in to do some tracks for possible singles, again engineered by Eric Stewart. Strawberry have been booked solidly by one organisation from September to December and from the end of December to January. They will be going 16 track very soon and a new desk is being built for the studio by Helios Electronics.

Other northern news is that **Cam Records** have been taken over by 'a group of businessmen'. The name of the company has been changed to **Liverpool Sound (Enterprises)** and the studio is now at Security House, ISD, Stopgate Lane, Simonswood, Liverpool 33. Equipped with an eight track Ampex machine, they started to operate at the beginning of June and can take 30 musicians comfortably. Twenty cars can be parked outside the building. Those who wish to use the studio should contact Des Williams at 051-546 6444.

The Bee Gees have been recording at **IBC Studios** for the Robert Stigwood Organisation. The sessions, spread over some three weeks, were engineered by Damon Lyon-Shaw. Jimmy Horowitz has produced material by his wife,

Leslie Duncan, for Gaff Masters—Faces manager Billy Gaff's company. Richard Barnes has been doing some sessions for Gerry Bron's company, Bron Music, which were produced by Bill Landis and engineered by Mike Claydon. Songwriters Guy Fletcher and Doug Flett have been producing a group called Hamilton Jones for Egg Productions.

John Baldry and Joyce Eveson have been in, again for Gaff Masters, as has Rod Stewart. The New Seekers have been into the studio and John Keen has done singles and an album for Track records. Freddy Davis, the comedian, has done a ballad single.

The news from **Trident** is that they are building a 24 track mixer for their reduction room. The manufacturing half of Trident, Triad, already has four firm orders for the Trident mixer. The studios have been doing sessions with Mama Cass, Elton John and David Bowie. Trident also cut the master for Marc Bolan's 'The Slider' lp.

At **Air Studios** Scaffold have been recording a single and Congregation's latest single was recorded there. Procol Harum, who have an lp and a single going up the Cashbox chart at the moment, also came into Air, as did the Casuals, who recorded their next single. Ashton Gardner and Dyke also recorded a single.

A heavy group composed of ex-Quartermass members that call themselves Hard Stuff put down some tracks and the Peddlars finished an album. Osibisa also worked on an album and John Williams came in to record. Others that have been in include Pink Floyd, Steel Eye Span and Family Dogg.

Marquee have been recording a Jimmy Young single for Dick James Music. Kaplin Kaye have produced an album by Moon Williams which was engineered by Phil Dunne. Paul Ryan has been working on an album for Ryan Music. Producer Chris Demetron has

produced a group called Sunrise for A & M. Producer Gus Dudgeon, who produced Elton John's 'Rocket Man' single, has been mixing a John Congas single called Great White Lady and Jack Baverstock has been producing Union Express, a group who are entering the Knokke song festival. Ray Hendricks has been producing Carl Wayne.

Gary Glitter has been doing a lot of work at **Mayfair**, the South Moulton Street studio run by John Hudson. He started an lp in early July and wants to do another. Jess Stephens recorded a couple of tracks for Bill Martin and Phil Coulter. The studio has also been busy doing backing tracks. Mayfair hope to go 16 track very soon. They are selling the mixer they used before the new one was installed as well as their eight track Leevers-Rich tape machine. Any offers ring John Hudson at 499 7173.

The usually busy **Roger Squire** outfit have had their busiest months ever in June and July. They did a show for an Italian National Radio company RIA—which consisted of half an hour of heavy music from albums made by British groups. A package tour of six British groups will be touring the States soon and Squire were asked to do the commercials which will be used as part of coast to coast pre-tour promotion. The show, called the Great British Rock Circus, will include Budgie, Jonesy, Patto, Skid Row, Thin Lizzy and Writing On the Wall. They also did a pilot show for consumption in Miami—a programme of British pop news similar to 'Scene and Heard'.

Roger's DJ courses are going very well, it would seem. They run on Monday and Tuesday nights in two one-hour sessions between 20.00 and 22.00. Two people are instructed on each session. The studio is doing a great deal of work on radio commercials now and they are looking forward to the coming of the commercial radio stations. They have already done some work for Radio Luxembourg, including an ad for Cinzano Bianco.

At **Advision** Gary Martin engineered a Mike Westbrook session and a Searchers album, which they produced themselves. Arrangements for a Sacha Distel were done by Peter Knight and the session was engineered by Advision manager Roger Cameron. Johnny

continued over



Pictured with Mike Ford (Sound Techniques) at APRS 72, Ted and Richard Roffey of **Escape**. Recently opened at Egerton, Kent, **Escape** offer an alternative to the claustrophobic environment of Central London. They are equipped with full 16 track facilities including a **System 12** desk. You escape by phoning 023 376 259.

continued

Harris finished an album he was making of his own, engineered by Martin Rushkent, and he also arranged and produced an lp for Shirley Bassey. A Yes session was engineered and produced by Eddie Offord and Jonathan King produced a session with Mike Vickers and a Moog. Stone the Crows, whose lead guitarist was killed during a recent performance, also came in.

Tony Back has just finished a new album for Jackson's own Ad-Rhythm label. Tony plays Hammond and harmonica and the third album should be coming out soon. Harold Smart has also been into Jackson for the same label and the result was released towards the middle of July. The record is an up-tempo version of the theme from the Brando picture, 'The Godfather'. A Keith Beckingham single, also on Ad-Rhythm, has reached number 19 in the Italian charts and 12 on the Radio North Sea International chart. The record will soon be released in Holland but release dates for France and the UK are uncertain as yet.

Guy Fletcher and Doug Flett, who wrote Hollies hit 'I can't tell the Bottom from the Top', also did a session at Jackson. Their company, Big Secret Music, used the studio to do demos for the States. Ken Freeman, maker of the synthesiser of the same name, finished an album using a synthesiser and a rhythm section, and recorded a synthesiser piece for

the Burke Special tv program.

Jackson are still looking for a technically able, communicative young man to fill a vacancy at Jackson for a studio manager. If you're interested ring Malcolm Jackson at 79 72351.

At Majestic studios it has been a month of cover versions. Allan Caddie has been acting as musical director for an album of cover versions for Avenue Records and the studio also did an album of Rolling Stones hits. The Mike Morton Congregation did an album called 'Non-Stop Hits' for RCA—Mike Morton is the owner of Majestic's studio in Clapham High Street. Palmer Records produced, among other things, a reggae version of Don McLean's 'Vincent' and Hal Carter did a Rocking Horse single for Fury Records, who produced Billy Fury's last single of October last year.

John Entwistle of the Who has been into Nova to record and to do some reductions as part of an album. He was produced by John Alcock for Track records, and the Engineer was Mike Weighell. Mike was also the engineer for two other sessions at Nova: one when Deke Arlon produced a Michael Blount single for York records and the other when Paul Ryan came in for Ryan Music to a couple of singles produced by Phil Wainman.

Gooseberry studios have been redecorating. 'We've made the place more comfortable, more smart,' Peter Houghton told me. 'It used to look like a typical demo studio but we've changed all that. And we're getting some great sounds on the eight track.' Gooseberry recently

installed a Brenell machine with Richardson Electronics.

Mike Pratt, who plays the living partner in 'Randall and Hopkirk (Deceased)', came in to do some work and Robin Williams produced some demos by Barbara Windsor, the actress in the Carry On series of films.

SARM, who cut Gary Glitter's 'Rock and Roll' single, recorded the Swinging Blue Jeans, Johnny Hackett and Raspberry for Music Enterprises. SARM's Barry Ainsworth has produced and engineered a Rupert Bear lp for Philips and been to Dublin to do pa for Richard Harris.

Viking Sound Studios, who used to be known as the Tooting Music Centre, have done a single called 'Tooting Kamen'. The record was produced by Ray Dexter for Viking Productions. Viking are doing a lot of budget label recording and mastering, they tell me, and are doing some mastering for CBS.

Steve Vaughan, by the way, who recently left Viking to work in Canada, found his new place of work burnt down recently and he is now freelancing.

Orange have been recording Barry Ryan, who was doing a programme for German television. Shock Productions did a number from the musical 'Don't Just Lie There', recorded by Alfred Marks and Brian Rix. John Miles also did an album.

The Young Generation have been into De Lane Lea's Dean Street studio recording things for their stage musical 'Pull Both Ends' and Stanley Donen Enterprises hired the studio to

continued 84

CTH TM 50 MK2 SERIES AUDIO MIXERS

Single or multi-output mixers with up to 40 input channels made to professional standards and incorporating the following features:

- | | |
|--|---|
| <input type="checkbox"/> 'XLR' input connectors | <input type="checkbox"/> +12 dBm floating output |
| <input type="checkbox"/> Prefade listening | <input type="checkbox"/> 0-30-60 dB input attenuators |
| <input type="checkbox"/> 180° self-evident dials | <input type="checkbox"/> 0-30 dB preset channel gain |
| <input type="checkbox"/> Back contacts | <input type="checkbox"/> 30Hz-20kHz ± 2 dB |
| <input type="checkbox"/> 'Channel on' lamps | |
| <input type="checkbox"/> Peak programme meter | |

OPTIONAL FEATURES INCLUDE:

- | | |
|---|---|
| <input type="checkbox"/> Tone Controls | <input type="checkbox"/> Limiter/compressors |
| <input type="checkbox"/> Extra P.P.M's | <input type="checkbox"/> Battery operation |
| <input type="checkbox"/> V.U. meters | <input type="checkbox"/> Portable field units |
| <input type="checkbox"/> Disc and tape inputs | <input type="checkbox"/> Rack mounting units |



TM 52/5
5 channel mixer

CTH also manufacture a range of modular mixing units, consoles, distribution amplifiers, studio disc player units, speaker amplifiers, cable drums and many other items of studio equipment.

CTH ELECTRONICS

Industrial Estate, Somersham Road, St. Ives, Huntingdonshire, PE17 4LS Telephone: St. Ives 64388 (0480 64388)

APRS '72 Report

THIS year's APRS exhibition, held at the Connaught Rooms in Great Queen Street, London, attracted about 2,000 visitors. By any standards this, the fifth show held by the Association of Professional Recording Studios, was a great success.

In answer to a questionnaire the organisers sent to the exhibitors all 50 of them said that the exhibition had come up to their expectations. Most said they would certainly exhibit again next year and the only disagreement was about the necessity of providing separate rooms for sound—most listening was done on headphones. In spite of these differences of opinion there were three times as many exhibitors who considered the provision of demo rooms unnecessary as there were of those who would like to have them.

The questionnaire also revealed that most exhibitors would like the show to last longer. A number suggested that the exhibition should be run jointly with the APAE exhibition. But there seems no reason, in view of the high standard of this year's APRS exhibition, why such a joint exhibition could not be run by the APRS, the APAE and the AES as well.

The centrepiece of the AKG stand was the *BX20* reverberation unit. Its price is £975 and it has already been used by DGG to record the Haydn's Salomon Symphonies with the LPO, conducted by Eugen Jochum. You could also see the new *C114*, an fet version of the well-known *C12A*.

On the Alice stand there was the *AD62* mixer, which sells for £236 and is built using printed cards. The Alice *SM2* series of mixers were also shown. The model on display was a 16 channel, two group unit which sells for about £1,200, but the range can be bought from six to 20 channels and from up to four group outputs. Prices start at around £502.

Allen & Heath's amazing miniature mixer, which sells for £100 and gives six in, two out, could be seen at stand 52A, on which you could also look at the desk used for 'Clockwork Orange', a 16 channel, eight group job priced at £1,500 and available with vus or ppms.

Allotrope have just been appointed agents for Pearl microphones and showed some of the range. The variable pattern, phantom powered

DC63 attracted most attention, they tell us, closely followed by the prepolarised miniature *FP92*. Tim Blackham demonstrated the Muse to a sometimes large crowd and Malcolm Hodges showed how the *EDIT 900* located cues on an eight track tape machine. A Sait electronics 12 channel broadcast studio mixer was also on show and attracted engineers from many radio and tv companies.

Amity Shroeder is the parent company of Orange, who developed the 16 track on 25 mm tape recorder. What Amity had to show at the exhibition, though, was their new 24 track machine. This, more conventionally, uses 50 mm tape. It will cost you £9,500 to buy and is fitted with vus and Dolby cards.

Audio Design recording's *P100* Autophase unit created considerable interest; at the flick of a switch it was automatically producing some remarkable phasing effects. Phasing control is derived from the input signal, so the same effect will be repeated on subsequent takes. This unit, and a stereo version of it, will be available in September. Audio & Design also showed a manual phaser which is available as a 40 mm desk module—the *P200*. The *F700/760* series of compressors now have an expansion facility. This provides 20 dB channel attenuation and operates from a variable threshold point on a 2:1 slope. Its main purpose is to prevent increased noise in compression but it can be used just to reduce noise and to improve separation while giving overload protection.

They also demonstrated the new *F768-R* 'vocal stresser' which is a combination of equaliser and compressor limiter. The equaliser, the same design as the *E800*, can be switched into the side chain of the compressor as well as before or after it.

The Walsall Wood firm of Audio Developments were another of many companies at the exhibition that showed a mixer. This one was an eight channel mobile unit which will feed an eight, four or two channel recorder for £750. The *TRD 700* tape machine by Audio

Developments is obviously suitable for use with the mixer but others can be used with it as well. The *700* takes 27 cm spools and has switched DIN/NAB equalisation, selsync, linear faders and twin Turner ppms.

The *MXT 800* Mark II modular mixer, seen on the Audix stand, is available with either a vu or a ppm and with rotary or slide faders. The lamps used are solid state, a type of lamp becoming very popular. Audix also showed some local broadcast equipment, including a new broadcast mixing console and cassette and disc players.

One of the most interesting stands was that of AV Distributors. Visitors had the opportunity to see some of the Stellavox mixing and recording equipment and they could meet George Quellet, the designer of the remarkable Stellavox *SP7* recorder. He was willing to explain the design principles of the machine to anyone interested at whatever technical level he was asked. Controversially, M Quellet said that the machine was designed so that the use of Dolby units would be unnecessary.

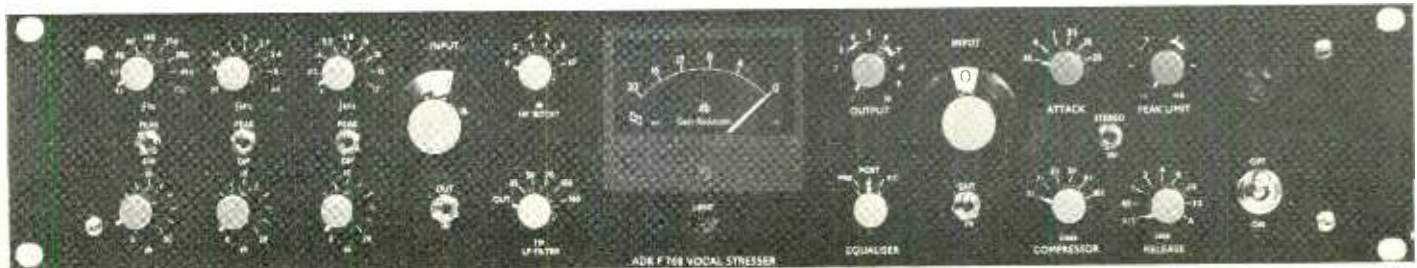
What is special about the Stellavox is that all the parts are plug in motors and the mechanical parts as well as the electronics. The machine weighs only 3.2 kg, is small and flat and has no protruding parts that might be damaged or cause damage.

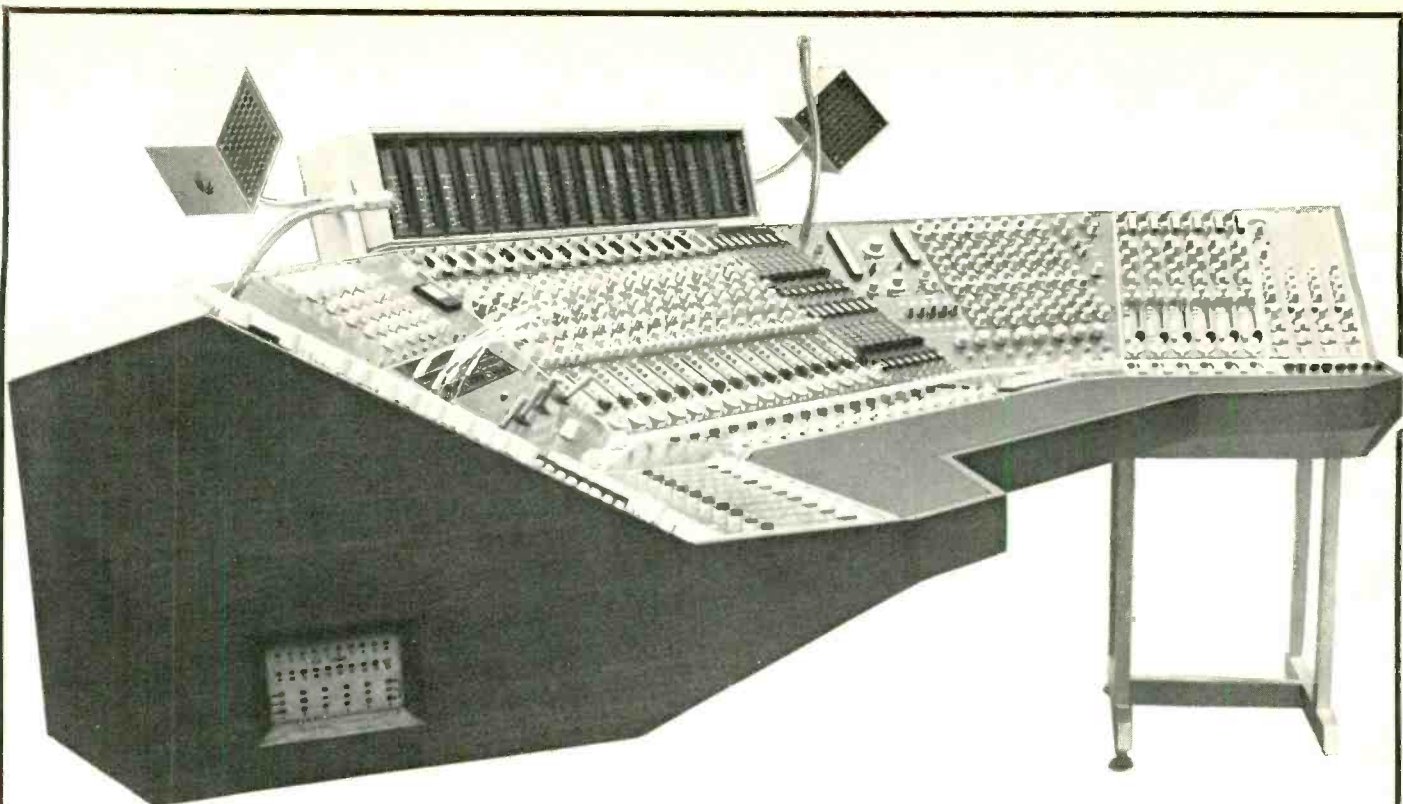
AV also showed some of the capacitor microphones made by Schoeps which they are now importing. In one Schoeps, three polar diagrams are available by switching a mechanical control. Only one capacitor capsule is used and the diagrams are continuously variable between stops. The *CMT411*, a mono mix, has been priced at £126 and the stereo version at £267. Distortion is about 0.5 per cent and noise is from 22 to 24 dB. There were also some plastic 28 cm spools.

The pass limit of the *SPR 50LH* tape made by BASF, and shown on their stand, is better than -55 dB unweighted at 1 kHz and a speed of 38 cm/s using DIN equalisation. The tape is low noise and high output as well as low print. They also showed their new range of compact cassettes.

Audio & Design (Recordings)
ADR *F768 Vocal Stresser*.

continued 37





PACKAGED DEAL

You're looking at the 32 input 16 track recording console just supplied to A & M Records for their largest Hollywood Studios.

It's going to be installed in L.A. in the one-time Chaplin film studios which have now been converted into a recording studio with facilities for live audiences.

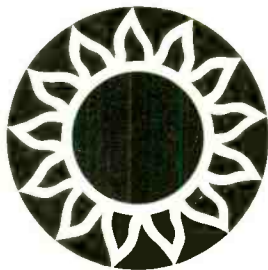
What the picture doesn't show is that the console has facilities for 16 simultaneous group outlets plus stereo record from the monitor system; 4 echo stereo send/return systems with equalisation and tape delay insert; 3 headphone foldback groups from channels and/or tracks, with echo to headphones; compatibility check from 16 track

through quad down to mono and 16 light beam VU meters giving parallel display of all tracks.

For quadrophonic mixdown all tracks may be panned to any position—four of the groups can be fed through 'joysticks' for moving sound effects.

Equalisers can also be switched from channels into the monitoring system without loss of inputs.

And to put the whole deal together for A & M we've designed the complete package into a compact ergonomic shape for easy operation. Helios are in business to deal with your problems.



helios

Helios Electronics Limited

161 High Street, Teddington, Middlesex

England: Phone 01-977 7841 and 01-977 7877.

continued

The inevitable Neumann fets were on the Bauch stand, as well as a fairly new EMT plate, first shown at George Martin's AIR studios, which uses gold foil 30 cm² in area.

The BE1000 6.25 mm tape machine was shown by Bias Electronics. The price of the unit is £508.

The corresponding 12.5 mm machine, the BE2000, will cost you under £1,000 for the complete machine, £1,500 for full sync facilities, or £500 for the transport mechanism only. The mono machine is convertible to stereo in ten minutes. There was also a six channel mixer selling for £85 and a four channel job for £65. Bias tell us they will soon be selling an electronic counter for around £100.

Brenell were exhibiting a typical deck and its associated electronics. Their master recorders are available with up to 16 tracks on 25 mm tape. An eight track machine, without heads, will cost its buyer £450. With heads and electronics the machine will come to £2,200.

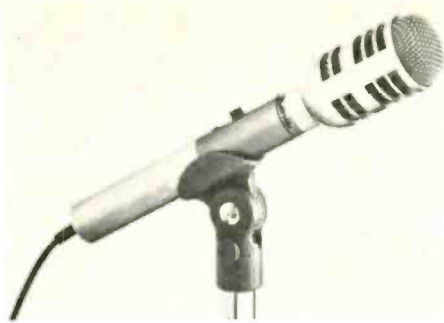
Brenell claim that this is about half their competitors' price and is possible because all the parts are all made in the same factory.

The British Homophone company has a charmingly archaic name though there is nothing archaic about the industry that they are involved in. The firm make custom pressings in mono or stereo from your own lacquers or those they will make for you.

A very attractively lit mixing desk was the heart of the Cadac display. Adrian Kerridge talked to potential customers about the Cadac service, which ranges from designing studio equipment to commissioning it, whether it is a desk, a speaker or a monitoring amplifier. The desk on display was 30 input 16 group and incorporated a new quad pot and limiter compressor.

Across the gangway from Cadac were the similarly named Calrec, who showed the desk they built for Angus McKenzie. The desk is 12 channel with two or four groups for stereo or quad and has two Calrec Dolby A modules built into it, each of which has two Dolby Cat 22 cards.

Carl Heinlein of CTH had a mound of equipment to show visitors, including the



TM 50 Mark 2 mixers, which were chosen for the Commonwealth conference. They are available in 100 input and 50 input versions and have six separate outputs as well as other facilities. These mixers were some of the few units that had rotary faders on them.

This year they were showing their 364 cinema noise reduction unit, a very simple device which boasts only five buttons, of which three are the most that need to be operated at once. If all five are pressed they will not lock up. The Dolby A unit, which only takes up 4.5 cm of rack space, is available as a function board for about £150. The board, which is neat and well made, measures 15 by 17.5 cm.

It could be said that APRS '72 was just about the last occasion on which EMI could justifiably call 816 'new'. They also showed some lacquer discs for mastering and other items from the EMI magnetic tape range.

Feldon showed visitors the MiniMoog, a



new ppm, and, of course, the JBL monitor speaker. The new ppm is made by NTP, for whose products Feldon are the sole agents, and uses a standard Sifam instrument. It sells at £37. There was also a light beam unit on display. Feldon are now importing MCI equipment and this firm were on an adjacent stand to Feldon. Feldon gave a demonstration of the MCI recorder and mixer in the Portman Hotel a few days after APRS '72.

Fraser Peacock specialise in duplicating equipment and they demonstrated some of the duplicating services which they are willing to undertake. This includes reel to cassette or reel to reel or, indeed, cassette to cassette. They have a new duplicating machine that is in the last category of those three. It provides two copies in as many minutes, is simple to operate and rewinds quickly. The price is £900.

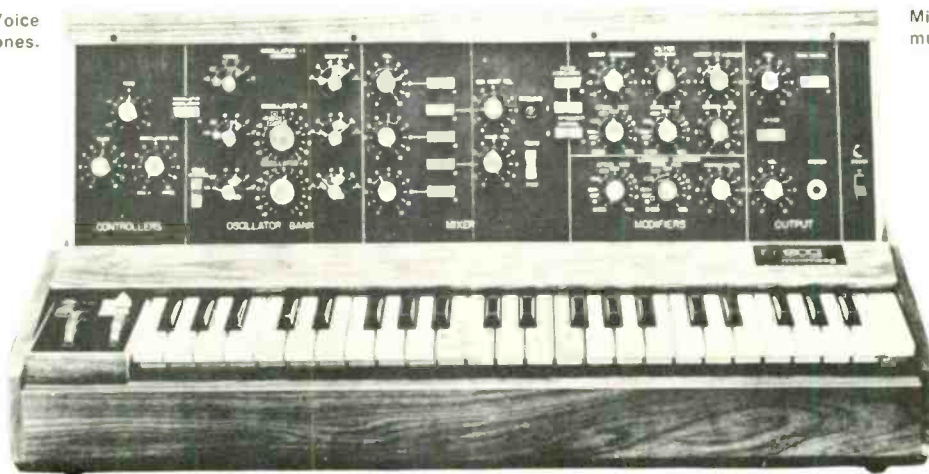
For the first time Future Film Developments were showing their 24-way jackfields and the now well established microphone cable. These attracted a lot of attention, especially from overseas visitors; the French company Tradelec placed a large order for jackfields and cords. You could also see Switchcraft and Amphenol XLR connectors, Tuchel and Hirschmann connectors, Amphenol's new miniature lever key—BPO type 1000—and a new miniature installation cable—twisted twin solid, lapped screen and in a choice of ten sheath colours.

The Freehurst stand was placed next to the Alice stand, since the two firms work in close association. What they make has the name Trackplan and it includes pa and studio consoles as well as the importing of fibreglass pa horns from the USA. This aspect of the firm's work is interesting since it appears that some importers of audio equipment operate a monopoly in certain items, making profits large and working against the interests of the customer. Trackplan, it would seem, have found it difficult to get some of the equipment they want to incorporate into their own designs.

The small studio desk they were showing is designed for groups who wish to install a small recording studio in their own houses so that they can produce demo tapes of their own. The desk is uncomplicated, though it has all the functions that non-engineers could reasonably require. The striking thing about the desk was the freshness of the graphics. It was very

continued 39

Above: Electro-Voice 1750 and 635A microphones.



Minimoog portable electronic music synthesiser.

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



LEEVEERS-RICH

EQUIPMENT LIMITED

A Member of the MCP Group



Highest attainable technical performance

QUICK AND EASY

No major repair facilities available?

This professional tape recording equipment needs none and can be used with confidence anywhere in the world.

In the past a fault in sophisticated equipment could mean expensive down time, but in the E200 any fault can be quickly isolated and the part or circuit replaced.

All major mechanical components and sub-assemblies are quickly and easily changed. Many circuits simply plug-in.

Contact **Nick Nichols** at our London office, telephone **01-874 9054**

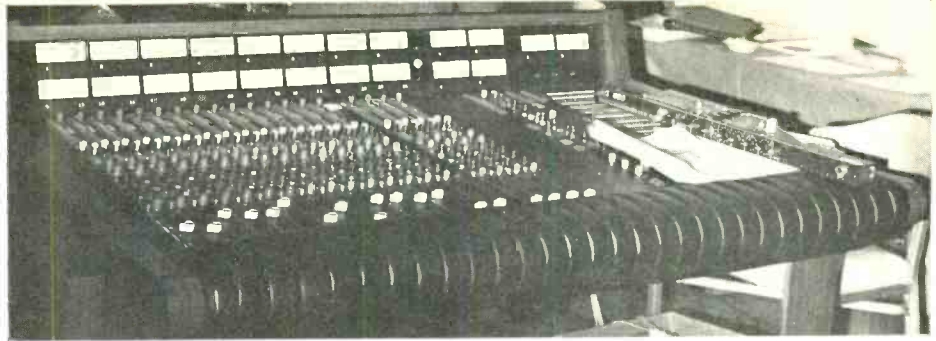
He will be glad to help.

LEEVEERS-RICH EQUIPMENT LIMITED
319 TRINITY ROAD, WANDSWORTH,
LONDON SW18 1YQ ENGLAND

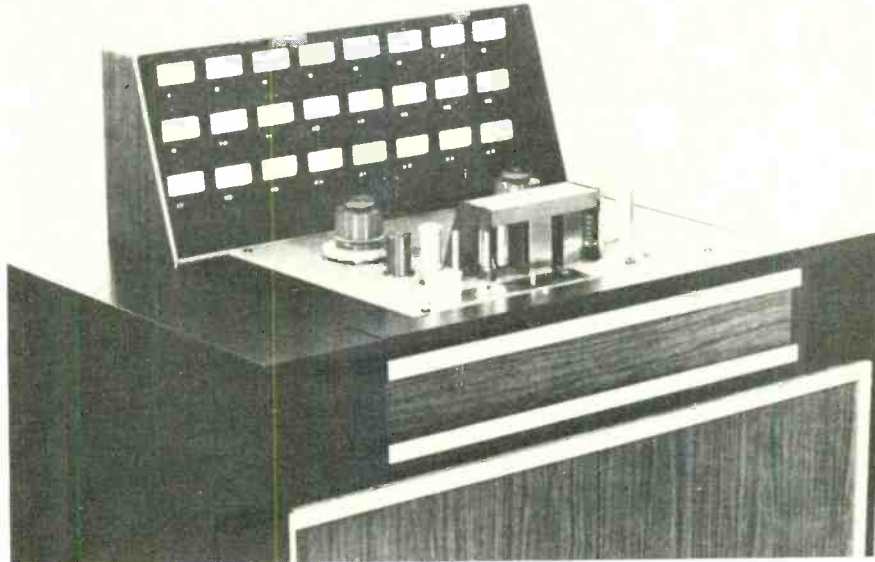
continued

easy to read and pleasant to look at, quite a change from the usual funereal black that many companies seem to offer.

The pa mixer is the first, Trackplan claim, to be built with studio quality. It has been used by 'The Who' and by 'Elton John'. A 16 track version of it is priced at £3,000, though anything from 12 to 40 channels are available. The desks are built to order, based on a number of



MCI audio mixing console.



24 track MCI recorder, available with electronic program-start search.

modules.

The most well-known thing that Gramplan make is the reverberation unit. The firm also make microphones and power amplifiers and all these were on stand 56. The power amplifiers use integrated circuits and will drive into circuits offering a reactive phase shift of up to 35°.

Gulton Europe acquired Electrovoice some time ago. They were showing the new RE20 studio microphone, a dynamic unit which has a performance, Gulton claim, similar to that of a capacitor model. It sells at £174. They also showed some electret capsules and some studio monitors, the Sentry 4, with a chipboard bass horn.

Hayden Laboratories displayed items of Nagra equipment, including the Nagra SN, a tape recorder which even beats the Allen & Heath mini-mixer for engineering on a reduced scale. Its price is £425. They also exhibited Plessey cartridge equipment and Sennheiser microphones.

Helios is one of the best known names in recording consoles and they chose to show a 32/16 desk fitted with a vertical light beam vu. There are four joystick pan-pots and the monitoring system is provided with separate equalisation. Like most Helios desks, except that at Apple and one or two others, the desk is a wrap-around design—one wonders when desks are going to be fitted with pedals.

It is common to see HH Electronics power

amps driving studio monitors. On their stand at APRS '72 they had a TPR100D amp which delivers 200W into 4 ohm loads and 180W into 8 ohms. The output stages of this particular design have a power ic included. This is also true of the TPA 250 and TPA 50D amps. The stand also featured the MA 100 5C mixer amplifier which is capable of 130W output. There is reverberation on each channel and full tone controls. The price is £119. HH also make a frame which holds four systems for £25.

Malcolm Jackson concentrated on selling second-hand tape and other items. He was very good at it. His 'sold out' notice was up well before the end of the exhibition and he was also offered a valuable amount of equipment.

Jacques Levy, the Chairman of the APRS, is a distributor of equipment, particularly that related to disc cutting. On stand 42 you could see Audioclip and Emidisc recording blanks and Capps and Gramplan cutters.

Tape-Music Distributors were showing Koss headphones, including the ubiquitous 4AAs. They were also giving visitors a chance to hear their K 2+2 four channel phones. These have two dynamic units at either side of the head. They make a clean and transparent sound and switching between two and four channels does make a difference to the spaciousness of the sound, though it is hard to say what that difference is. Koss hope to be selling in the autumn a new unit, the K747, which will have fluid-filled cushions, volume controls on each

earpiece, and a price of £20.

Leevers-Rich showed their new J1600 tape machine, a 16 track. You could also see an exploded model of the E200 6.25 mm tape deck.

Lennard Developments are importers of Woelke equipment, made in Germany. The range includes the ME 102B and 104 wow and flutter meters and the ME 301 wave analyser. Also on show was a new instrument, the ME 105 wow and flutter meter, first seen at the Hanover fair.

Lockwood were showing their usual range, apart from two new models which visitors saw for the first time. One was a miniature monitoring loudspeaker and the other was a high power unit.

Macinnes, a name more often misspelt than any other manufacturer, were showing the complete range of Crown amplifiers, of which they are the importers. The M600 will deliver 1 kW into 4Ω and is priced at £730. You could also see the Crown CS150 monitor speaker, which handles 150W at 4Ω and is designed for use with the D150. It sells at £156. Macinnes also make their own speakers and they showed items from their range.

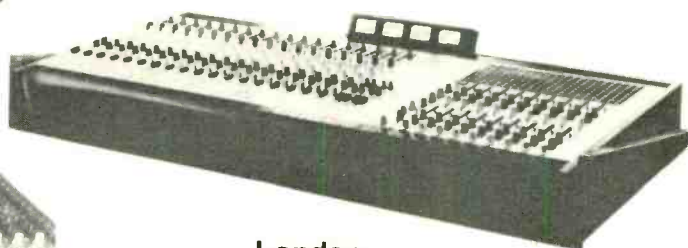
MCI's equipment is available here for the first time, through Feldon Audio. The MCI stand at the exhibition demonstrated the JH416 mixer and the JH16 tape recorder.

continued 41

From Newcastle to Johannesburg people are turning on to System 12 for multitrack operation



Manchester

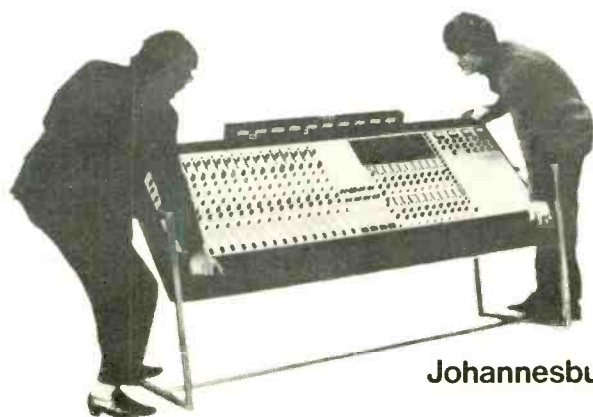


London

Kingston Jamaica



Newcastle



Johannesburg South Africa

Above you can see some of the System 12 desks that have been supplied to worldwide users. They realize that with System 12 they can rapidly get down to make 8 and 16 Track Masters without frustration at a down to earth price.

Complete with a free standing console including a 180 hole jack bay, *fully* modular construction, and all the Equalization, Echo, Fold Back and Monitor facilities you need, System 12 enables you to start making 8 and 16 Track Masters as soon as you plug it in.

All this, backed up by our own past six years making desks adds up to value for money second to none. We can probably offer you a System 12 desk to meet your requirements NOW.

System 12 is a 16 track desk.

For further information contact:
Sound Techniques Ltd., Industrial Estate, Mildenhall, Suffolk.
Telephone: 0638-713631 Telex: 81509

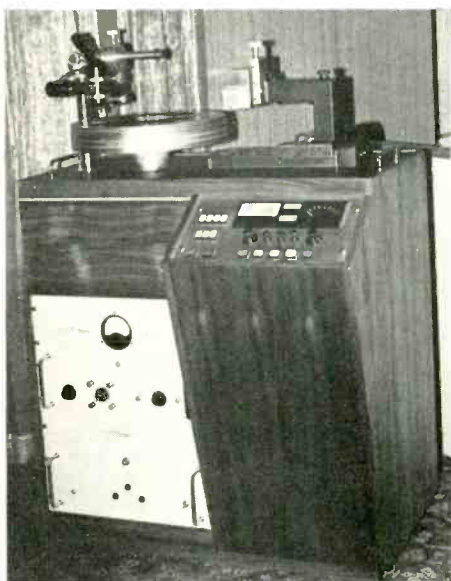
Sound Techniques

continued

Top: Stellavox designer George Quellet (left) talks to his UK representative, Dieter Shaw (AV Distributors).

Centre: MSR Electronics disc cutting lathe.

Bottom: Sound Techniques' Mike Ford (again) receiving a confirming order from Bob Woolford.



The *JH16* will not spill tape while reeling or playing even if the power fails; even if the power level drops for an instant the machine will stop until the mains disturbance has not recurred for a few seconds. It will then start again automatically. During a demonstration Dag Fellner showed his confidence in the machine by turning off the power while spooling a Shirley Bassey master.

As an extra the machine can be supplied with an automatic location device on a remote control panel. The panel can fit into a mixing desk. The machine is available with a Datatron video unit to lock it to helical scan or quad videotape machines. This adds £3,000 or so to the basic price of £7,480.

The *JH16* is a 24 in 24 out desk in which all the modules plug into a connector on the mother board beneath; this board contains all the wiring except that to the 240 jack patch bay and to the terminal blocks which lie in a recess behind the console.

The desk has constant bandwidth equalisation, full track selection, solo and overdubbing facilities and quadrasonic panning on each channel. There are 16 input and six output vu meters; four output vus for quadrasonic and two for two track use. The design principle was to make a versatile console for as low a cost as possible. The price of the desk is £17,000.

The 3M company showed a new tape machine. They have kept to their isoloop drive system and added a dc servo controlled capstan, speed variation between 0 and 114 cm/s, remote lift and cue and reeling at 5 m/s.

MSR Electronics are associated with Midland Sound Recording. They built a cutting lathe for Midland Sound and have been manufacturing ever since. Their new lathe, illustrated left, is available for mono or stereo mastering. The 41 cm turntable is driven directly by a dc motor which is servo-controlled. Varigroove cutting is used; there are the usual two replay heads on the tape machine. The mono version costs its buyer £3,000 and it would be a pleasant change to see a British cutting lathe making some impression on a market that seems to be dominated by foreign makers.

As we stated in our preview, Pye TVT were showing a 12 channel, four group desk. There was also the *PRO 36*, which we reviewed two months ago; the particular model on show was a portable, stereo version. Pye also showed compressors, smaller mixers, and amplifiers.

Radford is not a name that you usually associate with studio equipment. They are set on increasing the range of products they make and at APRS '72 they showed transistorised versions of measuring equipment which, in their original valve form, have been highly thought of for many years. The new equipment has been designated *Series 2*.

Richardson Electronics not only make a wide range of card modules, they design each circuit from scratch. Their products include the simplest microphone amplifier and a mixer and eight track tape machine. Typically, the electronics of the tape machine are rack mounted. Each board is of fibreglass and has gold plated edge connectors.

Rola Celestion showed some multi-cellular horns which handle 50W and the price of which is £48. 100W twin horns cost £68.

Neve, of course, occupied two stands, like



nine or ten of the other 49 exhibitors. They had some loose samples of the modules that go into their standard range of desks as well as part of a new transportable console.

The latest microphone that Shure have to offer is a hand-held model for which the makers claim complete mechanical isolation between capsule and case. This is to eliminate handling noise. It is an omnidirectional design and has a built-in 'pop' filter.

SNS showed a new discotheque unit, among other items of pa gear.

It is unusual at any exhibition to get large orders while on the stand. This is especially true in the electronics industry, where unit prices are high and the customer is likely to want extensive alterations even to a standard model, if it is offered. Sound Techniques, nevertheless, managed to attract a great deal of business and at least one substantial order for their new desk, the *System 12 mark 2*.

The desk was ordered by Bob Woolford for that gentleman's new mobile unit. Ted and Richard Roffey, who have just opened a 16 track studio called 'Escape' in Kent, have also installed a *System 12* desk, as have Indigo in Manchester, who opened earlier this year.

Trident are quite new to the mixer-making game, having built their own desk and decided to go into the manufacturing business on a larger scale. The trading name of the young company affiliated to Trident Studios is Triad. They already have firm orders for the new desk.

The desks are available in two types; the *A* range is more expensive and consists of the same parts as were used in the original Trident desk, and the *B* range uses the same circuitry but less costly mechanical components.

Tape Recorder Developments showed two new tape decks. The *800* series is meant to be mounted in a mixing console for mastering on 50 mm tape and is available with two, four or eight track electronics. Like an increasing number of decks it is logic controlled. The back tension is servo controlled. The *700* is a less expensive version of the *800*.

The only criticism one could make of the exhibition is that the power supplies were less than adequate. If the same venue is chosen for next year, and there is no good reason why it shouldn't be, then it would be a good idea to improve the mains supply.

If you are thinking of buying video tape recorders.. **DON'T**

until you have read this important announcement from Action Video—the CCTV people.

We know that you have a bewildering choice and you may be hesitant because you are not sure which system to spend your money on.

So it is with great pride we announce the first ever truly compatible half inch video tape recording system. In practical terms, this means that, regardless of the manufacturer, you can now buy a range of machines which won't date and will give you full video interchange, with all the technical facilities you are ever likely to want—colour, slow motion, portability (both recording and playback), remote control and electronic editing. Cassettes are on the way too!

From now on your choice is dictated only by your preference. So far there are five different makes available on this new EIAJ 1 standard on the UK market and we have got them all under one roof. Come and see this new range for yourself any time. We will give you impartial advice and sell you the best equipment for the job you want to do.

Just telephone 01-734 7465/7 first, to make sure the unit you want to see is not out on demonstration.

AV ACTION VIDEO LTD
45 Great Marlborough St., London W.1.
Telephone: 01-734 7465/6/7

PRODUCTIONS • SALES • SERVICE • HIRE

PHASING

WITH A DIFFERENCE

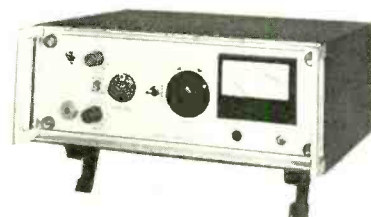


P200 Phaser

In the format of a desk 40mm module, this manually operated phasing unit produces a full phasing effect, with a multiple action filter. Other controls include input attenuator; in/out switch and variable mix facility. Unit available on short delivery.

P400 AUTOPHASE

P400-M MONO
P400-S STEREO



A completely new approach to phasing, the P400 Autophase provides the usual manual control in addition to its unique automatic function. Phasing action is controlled by the signal being processed or from an external signal source. The truly remarkable effect can be identically reproduced time after time. Ideal for recurring or live performances.



AUDIO DESIGN RECORDING

St. Michaels, Shinfield Road,
Shinfield Green, Reading, Berks.

Telephone: Reading (0734)-84487.

Sounds Like News

By Terence Bracey

MUCH effort is put into finding new ways of presenting television programmes these days and quite often sound is the forgotten partner. But, attempted assassinations apart, one usually finds more information in 15 kHz of audio than 5.5 MHz of video.

This is particularly so with news where, because it deals in the unexpected, the reporter and camera crew are more likely to arrive after the event than before it. In this situation how can the story be told? The usual answer is first to have the reporter talk to the camera to set the scene followed by an interview with a taciturn eye-witness and/or a cautious official spokesman. The reporter then sums up the situation, talking under general views of the location concerned. The story hinges on the sound. For news work sound recording must be flexible, easy to work with and above all intelligible.

Fig. 1 shows the sequence of events that our imaginary news film sound would take from the site of filming to the tv studio sound mixer. I should point out at this stage that not all film sound would pass through all the events listed in the diagram. The following merely illustrates the most that could happen to the sound if there was time and all the facilities were available.

Camera commag

More often than not, the sound is initially recorded on 'commag' film. This word describes normal 16 mm film stock with a magnetic stripe approximately 3 mm wide deposited on it along the edge where one would expect to find the optical sound track on normal 16 mm sound film.

The sound unit in the camera, besides containing a recording and monitor head, has a flywheel and tension arms arrangement for damping the flutter caused by the gate claw/shutter. Claimed specifications of commag are 45 dB s/n ratio, 0.25 per cent wow and flutter and a frequency response of ± 3 dB 60 Hz-10 kHz. I spoke to a camera sound maintenance engineer at one of the major tv news organisations and he expected the figures to be nearer 25 dB s/n ratio, 0.4 per cent wow and flutter and 'unlikely to record anything above 8 kHz'. It is difficult to ascertain which set of figures is correct but listening to tv news film reports on a quality monitor does tend to suggest that the latter set of figures are nearer the truth.

I can only put forward two suggestions as to how the performance of commag may be affected. Firstly, film stock is not an ideal base for magnetic recording; it does not allow the intimate head to oxide contact that modern, polyester backed tapes enjoy. Secondly, normal tape recordings do not pass through a high speed, colour processing tank and dryer before

being replayed. The recording electronics are separate from the camera and a typical unit would accept microphone inputs at -70 dBm and provide recording current and bias for the head in the camera. A jack socket at the side would accept headphones, allowing the recordist to monitor either the incoming or 'off tape' signal. A further socket would provide a zero level output for a separate 6.25 mm recorder. The unit is battery powered and would house either rechargeable nickel-cadmium cells or conventional dry cells, depending on manufacturer.

bulb next to the shutter for one frame duration and simultaneously to send a pulse of tone to the 6.25 mm recorder. This is arranged to happen a short time after starting the camera and recorder to allow each to reach its operating speed. Alternatively, if the sound is recorded both commag and sepmag then the commag can be used as the guide for sepmag synchronising. There is little doubt that sepmag can offer much more in terms of quality than commag; indeed the reader may be left wondering why commag has attained such popularity within tv news organisations.

The answer is time. Although commag sound is normally transferred to a separate 16 mm magnetic track for editing purposes, should a film arrive late from processing there may well be insufficient time to edit picture and sound separately. In this situation, the film would be cut in its commag form. This presents problems in timing as the vision edit point proceeds the sound edit point by nearly one second. This, however, is infinitely preferable to no sound at all.

Film editing

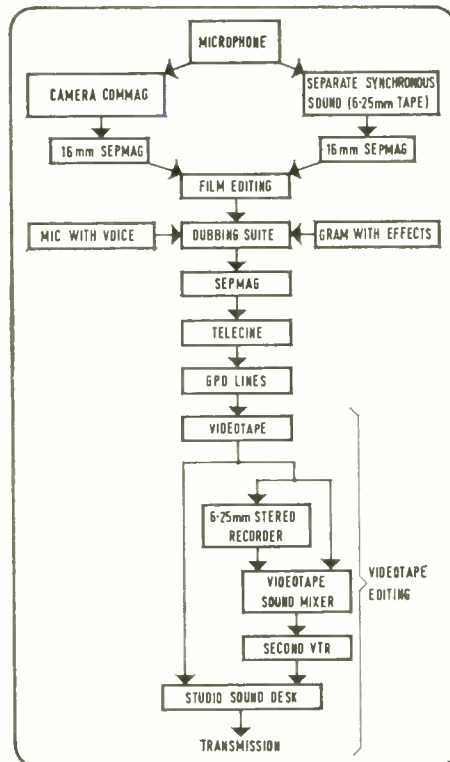
Assuming time is on the side of the film editor, he will receive the film and one, or possibly two, 16 mm magnetic sound tracks. The main track will be a copy of either the film commag sound or separate synchronous sound, depending on which system was used at the time of filming. The additional track would be a copy from 6.25 mm tape of extra 'wild' sound. This latter sound is not necessarily synchronous with any of the pictures; indeed it may have been recorded at a different time to the filming. An example of 'wild' sound would be a continuous recording of a marching band. The camera at the time may only have been filming short isolated shots and in any case may not have been in the best position to have recorded a well balanced sound.

After editing there will be three reels, namely the film and two sound tracks—the latter requiring sound mixing. In addition, extra voicing from the reporter is likely to be needed over some of the pictures, together with effects off discs. All these functions are performed in the dubbing suite.

Dubbing suite

The suite consists of a sound mixer fed by the microphone, several gram units for playing effects from 33 $\frac{1}{3}$ rpm discs, and the replay heads on the dubbing machines where, along with the film, the 16 mm magnetic tracks have been loaded. The dubbing mixer views the film, mixes the 16 mm tracks at the correct point, brings in extra voice where required and organises effects off grams if necessary. The

continued over



Separate Synchronous Sound (Sepmag)

Many of the cameras used by both the major news organisations have a built-in pilot tone generator which produces pulses which can be fed to a pulse track of a separate 6.25 mm tape recorder, the audio track being used to record the 'actuality' sound. This gives both synchronous sound and the quality normally expected from a 6.25 mm recorder, usually a Uher 1000 or 1200.

The news equivalent of clapping the traditional clapper board for marking the start point of the sound and vision is to fire a peanut lamp

SOUNDS LIKE NEWS

continued

completed sound track is recorded on an additional 16 mm magnetic track, thereby reducing the total news film to two reels ready for replay or transmission.

Telecine

Telecine machines are usually capable of replaying either commag, sepmag or comopt (optical sound) film. In our case, sepmag would be used and, depending on the model and type of telecine machine in use, the sound and vision tracks would either be loaded on the same machine and locked mechanically, or the sound track would be replayed from a sepmag machine locked electronically to the telecine machine. It should be remembered that if the film is late it would be edited and replayed in its commag form; if extra voicing is required then this would be added from the regional tv studio. The sound mixing of the telecine sound and studio voice would then be replayed live with 'on air' sound mixing. Under normal circumstances, however, GPO lines from the region to London would be booked and the complete item recorded on video tape.

GPO Lines

Separate circuits, and often different routes, would be used for the vision and sound. A useful simplification would be to have the sound and vision share one circuit and a recent innovation, the sound-in-syncs system, achieves this. The audio is coded into a ten digit pulse

code modulated signal and inserted into the line sync of the video wave form. After the coded signal has been extracted at the receiving end the video line sync is restored to its original form.

Video Tape

The sound channel on a video tape recorder has a claimed response of 50 Hz to 12 kHz ± 2 dB and a s/n ratio of 53 dB. As the tape runs at 38 cm/s, these figures do not appear very good. The explanation is that the grain orientation of the oxide is transverse to the direction of movement of the tape, in other words parallel to the head gap. This is because broadcast quality, quadrature head, video tape recorders record the vision across the tape and understandably the tape is manufactured with this criterion in mind.

With the film now recorded on video tape, modern electronics have effectively transported that film from the region to London in an infinitesimal amount of time. The sound and vision are permanently locked together, the pictures are indistinguishable from the original film and the whole item can be rewound in seconds.

The news film item now on videotape may well be required in a different form for a later news. Editing of the videotape provides an alternative to recutting the film with the consequent need to rebook the lines and rerecord.

Editing videotape is a very different procedure from that used for film. Instead of physically cutting the tape, editing is performed electronically; a videotape machine is made to

change from play to record at a specific point. Two machines are required: one for playing and one for editing. The play machine dubs over, in sequence, to the editing machine those pieces required to make up the edited story and the editing machine records these pieces to make a continuous item. This method of editing can be very quick but it results in second generation recordings.

For mechanical reasons the record head is also the replay head. To eliminate 'thump' the erase and bias voltages are arranged to build up over a period of about half a second. This has the effect of producing a swift mix which is particularly effective when editing from a noisy to a quiet scene or vice versa.

In a complicated sequence the sound may be taken off the vtr sound track and recorded on 6.25 mm tape. This can then be mixed with another part of the vtr sound from the play machine to the editing machine. This can be effected using standard dubbing suite facilities or, as with one organisation, use a stereo Ferrograph Series 7 6.25 mm recorder built into a trolley with a three channel mixer. It should be remembered that the 6.25 mm recorder is in no way synchronised with the vtrs. The easiest way to deal with lip sync material is to keep it strictly on the vtr audio tracks as they are run locked to station picture syncs. Two vtrs, a 6.25 mm recorder and a sound mixer make a very versatile unit and can effect vision and sound editing and sound mixing very quickly. However, the expense of two vtrs encourages the continued use of film as a sound and vision medium for television.

continued 50



AUDIO CONNECTORS

BROADCAST PATTERN JACKFIELDS, JACKCORDS PLUGS & JACKS. QUICK-DISCONNECT MICROPHONE CONNECTORS. AMPHENOL (TUCHEL) MINIATURE CONNECTORS WITH COUPLING NUT. HIRSCHMANN BANANA PLUGS & TEST PROBES. XLR COMPATIBLE IN-LINE ATTENUATORS. LOW COST SLIDER FADERS BY RUF.

Please note our new address

FUTURE FILM DEVELOPMENTS LTD.
90 Wardour Street, London W1V 3LE
01-437 1892/3

INSTALLING A DOLBY CAT 22

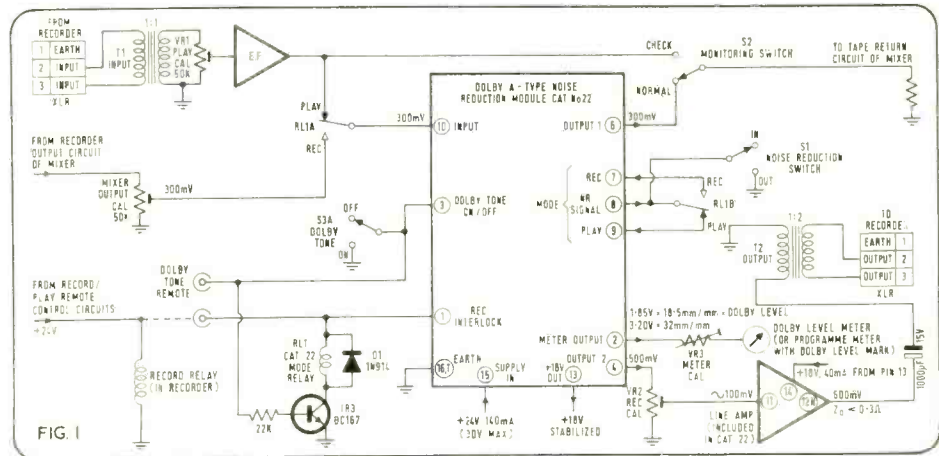
UP to a year ago it was necessary to provide a considerable amount of valuable space for rack mounting the Dolby A301 units, particularly when multitrack installations were in use. Even with the release of the later Model 361 a large number of interconnecting leads were still necessary and the expense of a complete installation could amount to thousands of pounds for each control room. Most engineers will by now be convinced of the benefits of a noise reduction system, and it becomes a matter of economics as to whether or not the system is installed to run with existing equipment not containing built-in Dolby Units.

Several manufacturers have announced, or will shortly be announcing, models of professional tape recorders with the A system built in. However, there are hundreds of studios around the world which have excellent multitrack machines which could be easily modified to incorporate the A system or, perhaps better, in many instances could be driven with a processed signal from a control desk fitted with Dolby processing.

This article is intended to show the feasibility of installing the Dolby module into various types of system. I would like to emphasise, however, that Dolby Laboratories supply a complete folder of information on the installation of their modules into equipment when a module has been purchased.

To understand the Cat 22 module clearly it is best to consider the elements of the complete circuit in blocks, describing the purpose of each block and the external connections to the edge connector supplied with each printed circuit. The Cat 22 module with its edge connector has both numbered and lettered pins, though only the numbered pins are normally used when operating the machine, the lettered ones being used almost entirely for test purposes.

The input appears on pin ten, the input impedance being approximately 500 kΩ with a sensitivity of 300 mV for Dolby level of 185 nWb/m. The input amplifier is an impedance converter and also includes a steep low pass filter coming in above 30 kHz. This input amplifier drives an operational amplifier whose output is referred to as output one, which appears on pin six. Signals are taken from this output to the four processing side chains and also to an additional operational amplifier whose output is referred to as output two, which appears on pin four. A completely independent line out amplifier, which can be interconnected by an external switch to various



points in the circuit as required, is also included on the board. This line out amp has an output impedance of only an ohm or so, which is unbalanced and appears on pin 12. This can be transformed up if necessary to give a balanced line output well above +20 dBm.

Between 19 and 30V dc are required for the main electronics; the board contains its own stabiliser to give a smoothed and regulated internal 18V ht supply. If necessary the line out amplifier can be fed independently with ht of up to 40V for special purposes such as driving landlines at high output levels. The lower input limit of 19V must include the most negative part of the rough dc; up to 3V p-p ripple can be tolerated on this supply.

The board also contains a Dolby tone oscillator having a basic frequency of 850 Hz with frequency modulation in an upward direction at a fixed rate. This oscillator is intended to operate only when the Dolby unit is switched to the record mode. A logic circuit allows this provided an external nominal 24 volts is applied to pin one in the record mode only, in which case earthing pin three injects Dolby tone into a section of the output two amplifier.

The output one point also feeds a buffer amplifier whose output appears on pin two for feeding an external Dolby level meter. The voltage on pin two is directly related to Dolby level and hence to the flux on the tape. With 300 mV at the input to the module (corresponding to a tape flux of 185 nWb/m) this voltage is 1.85V ac. The DIN reference tape will produce a pin two voltage of 3.2V ac for its flux. A cheap rectifying meter can be used since it is only required to be accurate on steady tone calibration.

The outputs of the processing side chains are added together and eventually appear on pin

eight as the noise reduction signal. In the record mode this pin must be connected to pin seven externally, allowing the processed portion of the signal to enter a section of the output two amplifier thus adding it to the main path signal coming internally direct from output one.

In the replay mode the noise reduction signal on pin eight must be externally connected to pin nine which connects to a point in between the input amplifier and the output one amplifier. It will thus be seen that in the replay mode the processed signal becomes a negative feedback chain around the output one amplifier. It should therefore be appreciated that output one under all conditions represents the normal, i.e. deprocessed, signal, which can be metered and monitored in the normal way. Output two, however, will be processed on record and deprocessed on replay, the level being 500 mV for Dolby level. The only additional component required to make the equipment operational is therefore a source of approximately 24V and external switches which can be passive types or relays and any necessary external audio transformers for balanced line working.

Should the equipment be required for installation into a tape recorder the record replay Dolby switch should transfer the audio input pin ten to either the output of the tape recorder's input pre-amplifier or the output of the recorder's replay pre-amp. The same switch should also inject 24V on to pin one in the record position, while also changing over pin eight to pin seven for record, and to pin nine for replay. The Dolby processing on and off switch should simply earth pin three. The Dolby tone on then be connected to the

continued 47



OUR MIXER DESIGNS USE A THIRD KIND OF FEEDBACK

We call it "Engineer Feedback", and in addition to the more usual positive and negative types, we have used an awful lot of it in the design of our two mixer ranges. Associated, as we are, with a major recording studio, we are in constant touch with some of the leading recording engineers in the country. Engineer Feedback is the continual flow of information, comments, likes and dislikes that they pass on to us, and is based on their using just about every type of desk known to man. From this, we have learned just what these engineers require of a desk—whether a particular E.Q. curve is steep enough, whether the monitoring facilities offer enough flexibility, or the routing system is comprehensive enough—the list is endless...

After many hours of discussion, designing, prototype building, throwing away and starting again, we have introduced two ranges of mixing consoles, designed to cater for the needs of everyone.

Our 'A' Range, the channel module of which is illustrated top left, is a no compromise, extremely comprehensive range of desks, designed for larger studio installations. It features an equalizer section with a choice of sixteen frequencies, four being variable at any one time; completely free routing, so that any channel can be assigned to any group, or panned across any two or more groups; full monitoring facilities with equalization; dual scaled meters

which can be switched to either V.U. or P.P.M. operation and automatic selection of machine returns to either monitors or to the appropriate channels for re-mixing.

The highest quality components are used throughout, with metal oxide resistors and cermet potentiometers being the rule rather than the exception. Every module has a voltage stabilizer built in, and phase shifts have been kept to a minimum by using as few transformers as possible. An average channel will weigh in at less than .01% distortion, with a signal to noise ratio of -87dBm (Line input to channel output with fader at maximum.) The drop in level when switching up to 30 channels to one group is less than .1dB, and the noise at a group output with ten channels selected to that group is -75dBm. Frequency response from input to output is ± 1 dB from 20Hz to 20KHz, and at any attenuator setting, a 20dB overload margin is allowed.

The console construction is of metal with cladding to suit individual requirements. The modules are totally enclosed, with all panels easily removable for ease of servicing.

Maybe this all sounds fine, but if you're just starting a small studio, and your bank manager isn't an old school friend; or even a friend of any kind, you are more likely to be interested in a somewhat simpler type of mixer—so let's talk about our 'B' range.

These have been designed to the same standards as the "A" range, and use the same sophisticated circuitry. They offer slightly less in the way of facilities, and the module and console construction has been simplified—that is all. The channel module (top right) contains an equalizer section with three frequencies variable at any one time, high pass filter, echo and foldback sends, input attenuator etc. Monitoring facilities are similar to the "A" range except that no equalizer is included.

Routing is also simplified, but is as comprehensive as on many large studio desks. V.U. meters are fitted as standard, although the A type dual meters can be supplied upon request. Full patching facilities are available on a 9X20 G.P.O. jack bay.

Interested? Then whatever your requirements, we would be pleased to discuss them with you and give you our quotation. Contact either Malcolm Toft or Barry Porter.

TRIADA

CREATED FOR ENGINEERS BY ENGINEERS

Trident Audio Developments Division
Trident House, 17 St Anne's Court, Wardour St., London, W1
01-734 9901/4

continued

normal/check tape switch whose output feeds back to pin 11, which is the input to the line out amp, via a potentiometer. The check position of this switch should connect permanently to the output of the recorder's replay preamplifier, which allows the monitoring of the tape during recording—in the encoded condition, of course.

It will be necessary to have a preset calibration record level control in the recorder's input circuitry to set the required input level of the recorder to a level of 300 mV into the module (i.e. 500 mV for Dolby level out of *Cat 22*). Output two should then feed the machine's record equaliser section containing this level preset to adjust the record gain such that Dolby level represents 185 nWb/metre. The replay preamplifier with its built-in equaliser should have an output level calibration control allowing a Dolby level set tape to replay into the *Cat 22* module at 300 mV. The line out amplifier of the Dolby module then becomes the main line out amplifier of the recorder and the normal/check switch allows off-tape monitoring during recording in the encoded state. On playback however the switch should be on normal to allow deprocessing to occur before the line output.

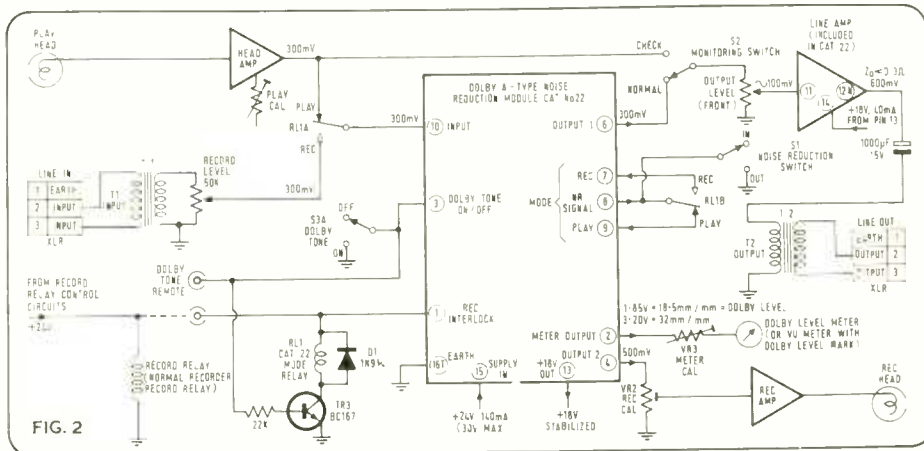
It may be found convenient to use the existing record ht to energise the record/replay for the Dolby thus automatically switching the Dolby to the record mode when the record button of the recorder is depressed or remotely controlled.

The cost of installing the module in this way into a tape recorder should only be an extra £150 plus the cost of a few switches or relays, and it should be remembered that the expense of the tape recorder's line output stages is saved. The total ht consumption of each module is approximately 140 mA at 24V and most professional machines provide this with ease. However, in the case of eight or 16 track this point should be carefully checked.

Many users who already possess satisfactory tape recorder installations may wish to install the *Cat 22* into their mixers, and in this case a slightly different concept becomes necessary. Most mixers employ gain in their line out amplifiers and, since the input sensitivity of the module is fairly high, the module itself can become the mixer's line out stage, having an inherent gain of up to 16 dB. For this application, output two is permanently connected via a potentiometer to the module's line out stage. The outputs of this stage are always connected, via transformers if necessary, to the mixer's line output sockets. The mixer's monitoring amplifier and metering circuits can then be connected to output one with an external check switch to allow monitoring to be carried out off tape in the encoded state. Under these circumstances the tape return sockets should be bridged by a 1:1 transformer and followed by a preset level control to establish Dolby level from tape replay to the input of the module on replay or with the monitor switch in the check position. It will be necessary to install a monitor line amplifier in the desk to bring the monitoring and metering level up to the desired

level. As with the installation in the tape recorder the Dolby level meter should be driven from pin two, but it is not advisable to use this meter for programme level monitoring, since the ballistics of cheap Dolby level meters are not suitable for other than continuous tone. A standard vu meter may however be used as a Dolby level meter in which case a further series resistance should be added such that 0 vu represents 1.85V for Dolby level, and in this case the meter can be used for both

appreciated that the costing of engineers' time should be made when calculating the total cost of installation as opposed to the purchase of complete ready-made units. It will obviously be better to install Dolby units in control desks having at least eight output channels. In smaller installations it will probably only be economic if there is enthusiasm for the project on the part of the engineers, or if there is a desire to simplify connections to and from equipment, particularly with mobile recordings in mind.



programme indication and Dolby level calibration.

The line out amplifier has an available gain of 16 dB so that very high output levels are available, although it is necessary to drive the amplifier with up to 40V if an output clipping level of +26 dBm is required. Output two should not be loaded with less than 5 kΩ as this will affect its clipping level. The same applies to output one.

Input and output transformers can be supplied by E. A. Sower Ltd, 7 Dedham Place, Fore Street, Ipswich IP4 1JP, Suffolk. Dolby themselves use a 20 kΩ 1:1 input transformer, code number *B30/82*. The output transformer number is *B30/81 MR*, and it has a voltage step up of 1:2. The input transformer should be loaded with 20 kΩ on the secondary and the output transformer will give a very flat response into loads from 200 ohms to open circuit, though a very slight high frequency resonance is noticeable above 60 kHz when it operates into an open circuit. This can be damped if required by an RC network on the secondary. Pin 16 on the edge connector is the module earth to which all external necessary earth connections should be made.

Several other useful test signals are available on the edge connector, and these are shown in the accompanying table. The regulated ht will appear on pin 13 and the unregulated ht should be connected to pin 15. Pin 14 should normally be strapped to pin 15. For high line out voltages pin 14 can be driven at up to 40V dc which does not contain more than 3V ripple, measured peak to peak. Pin 15, however, is best supplied with a reasonably ripple free supply, though this need not be regulated since this is done in the module.

It is clear that installing a module can be quite a lengthy business and it should be

Considerable savings can be made if the Dolby units are installed in the mixer rather than in tape recorders if several of the latter are being driven in parallel to provide safety copies.

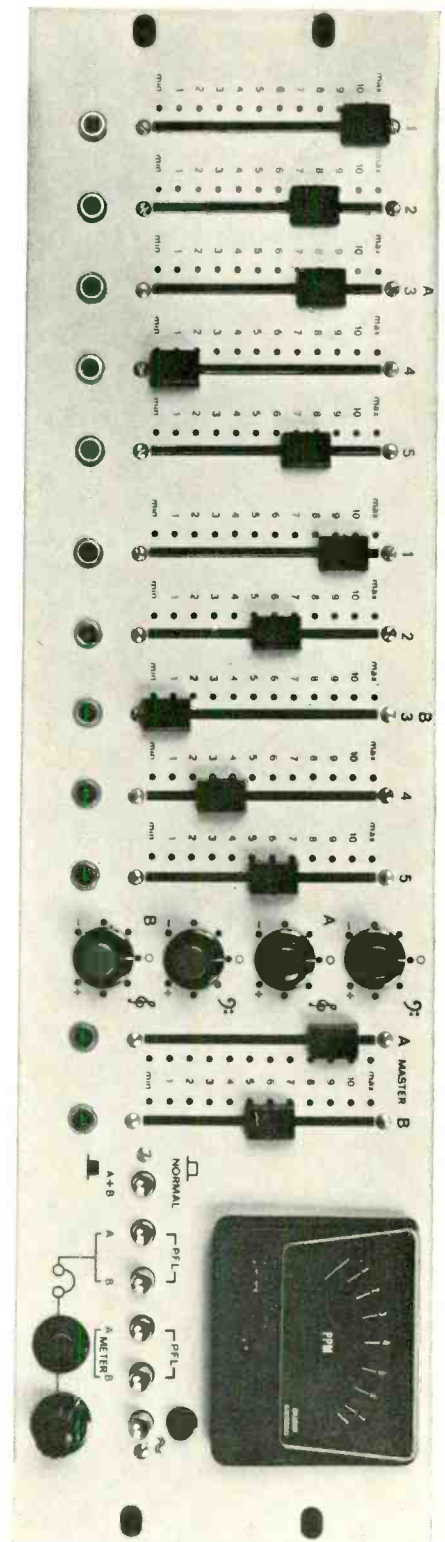
CAT 22 EDGE CONNECTIONS

- A. Dolby tone test point
 - B. Band 1 processor output
 - C. FM cancel/NR over-ride
 - E. Location key
 - F. Band one input test point
 - H. Band two output test point
 - J. Band two input test point
 - L. Band three output test point
 - M. Band three input test point
 - N. Line amplifier output (to be paralleled externally to pin 12)
 - R. Band four output test point
 - S. Band four input test point
 - T. Earth (parallel externally to pin 16)
1. +24V input for record tone oscillator logic
 2. Dolby level meter signal
 3. Dolby tone switch
 4. Output two
 5. Location key
 6. Output one
 7. Record mode input
 8. Noise reduction signal
 9. Playback mode input
 10. Module main audio input
 11. Line amplifier audio input
 12. Line amplifier output
 13. 18V regulated supply (from module)
 14. Line out amplifier ht
 15. Ht main input approximately 24V dc
 16. Earth

A new slant on mixing

- ★ 10 Input Channels
- ★ Choice of Inputs, all Pluggable
- ★ Two Group Mixing
- ★ Stereo Monitoring
- ★ Choice of PPM or VU Metering
- ★ Full Prefade Listen Facilities — including meter monitoring
- ★ Choice of XLR and DIN Standard terminations
- ★ Twin +22dBm outputs, 600 ohm fully floating
- ★ Stabilised Power Supply
- ★ Battery Adaptation Possible
- ★ Standard 3 unit 19" rack height
- ★ Desk Case Available

***. . . that's the new MGC MK III
—want to know more?***



Millbank Electronics Group,
Bellbrook Estate, Uckfield, Sussex.
Tel: Uckfield 4166 (0825 4166)

The Shape of Sounds to Come

By Mike Anthony

NEVER before has the technology of sound information processing advanced so rapidly. The modern recording studio, having abandoned the old shibboleth of 'linear' circuitry, incorporates such invaluable devices as limiters, compressors, de-essers, echo springs and plates, noise reduction systems, level-dependent equalisers and, latest but not least, automatic noise gates. As is well known, this last device, with an uncanny intelligence, can distinguish wanted signals from unwanted background noises, crosstalk or hiss, and will remove these without any effect whatsoever on the wanted signal.

But, advanced as these sophisticated engineering concepts may seem, they pale into a primitive pallor compared to devices now being developed or on the market but not yet taken up by the industry. These wonders, actually the fruit of dedicated engineering researches, should all reach the recording studio by 1980.

One development already on the way is that of voltage- or digital-controlled mixing desks. The principle of voltage-controlled amplifiers, filters and oscillators is well understood due to their use in synthesisers by Moog, EMS, ARP and others. There is no reason why this technology should not be used to make the various gain, echo, equalisation and pan-pot settings of each channel subject to control either by a voltage or by a digital signal. The advantage of this procedure is that it enables all mixing desk settings to be recorded digitally either on a spare tape track, in a shift register or core store, or in a computer. This will enable one man to do mixing jobs at present requiring several engineers, because he can store and 'replay' previous settings of the mixer controls. This facility is, of course, already available on some US mixing desks but this is only the start.

As mixing desks have shot through the £30,000 price level, the cost of small digital computers has descended to around £2,000 (depending on facilities). There will thus be nothing to prevent one or several on-line computers being installed in the typical recording studio. The advantage here is that the computer can easily be programmed to accept the input from a particular control pot and to convert this to any desired control instruction. For example, a control pot A might be made to control the speed at which signal 1 is made to rotate around the quadrasonic image, while control pot B might control the precise amount of echo on signal 2 according to the position of signal 1. It would be easy to program the computer so that, on that particular session, each control knob is made to control an effect or parameter (e.g. envelope shaping, reverb compression or tremolo rate) desired for that particular session. Subsequent sessions

STUDIO SOUND, SEPTEMBER 1972

would require a reprogramming out of the studio's library of useful control facility programs. New programs for new effects could be written or bought as the need arises. Such a technique of making a knob have any desired effect according to the computer program is, I understand, already the subject of development work by one manufacturer. Among other things, a computer-control system is likely to replace conventional compressor/limiter circuitry, and a recurrent problem is likely to be that a larger computer will always be needed for more elaborate control facilities than are possible on the one at present installed in the studio.

Other new studio facilities are constantly appearing, one of the most recent being the short digital or pipe delay line, which no doubt will helpfully fake a non-existent stereo or quadrasonic ambience, and, just possibly, will be used to eliminate the double-sibilant effect obtained when distant mics are combined with close-up spot mics.

One of the most exciting new devices is a great step forward to the ultimate aim of allowing the producer and/or engineer to manufacture his own sound, no matter what the musician does. The new high-quality frequency shifting circuit developed by Harald Bode and Robert Moog means that if, say, a singer hits a flat top note, the singer's pitch can be momentarily sharpened in the dubbing stage by raising its frequency electronically. In principle, this circuit could be used to modify whole melodic lines, although in practice the frequency-shifting causes the musical overtones to become unpleasantly non-harmonic if used to excess. The economic saving in artists' studio time if small errors of intonation can be corrected afterwards electronically is surely worthwhile to the creatively-minded producer or engineer.

A little further in the future, but well within the scope of present technology, are circuits that can raise or lower all frequencies present in the music by an octave without any alteration in speed.

Multiplication

Another use for delay lines will appear once variable and voltage-controlled delay lines appear on the market, such devices being easily designed using available digital methods. A certain recording engineer, well-known for his use of coincident mic techniques and who shall thus be nameless, once nearly damned his soul by dabbling in a form of black magic. He was approached by a businessman with the proposition that they should record world-famous soloists (one to each part) performing the lines of well-known orchestral works and then use electronic means to multiply the recorded lines

into a full orchestra. Fortunately, the costs of the 16 track dubbing procedure using variable speed decks caused the money to run out before this diabolical scheme left the ground but clearly modern variable-delay technology should make this idea feasible at less expense.

Other methods of reducing the number of musicians required are already on the market (Musicians Union please note). One gadget allows the producer or recording engineer to save much of the frustration he has experienced in the past. To quote an example, suppose the musicians have long left the studio and the mixing engineer should only then realise that horns were not the best accompaniment to an item but that cellos should have been used instead. Of course, another session could always be fixed, at great expense, to record the required cello line, but why bother when modern technology has rendered this unnecessary? All you then do is feed the horn track into a handy gadget made by EMS that works out what the fundamental frequency (pitch) is, and gives out a corresponding voltage, along with another output voltage proportional to the waveform envelope on that track. Feed these two signals into a synthesiser set up to imitate a cello and out comes the same melody as on the horn track, but played on the cello. Mix back into the mixdown and the job is done.

Alternatively, this procedure could be used to add another musical line either in unison or, say, a fifth below the one recorded on the tape. Indeed, you may not need any session musicians at all to accompany the singer; just let the EMS gadget plus a few synthesisers manufacture all the musical lines. One-man bands are in for a new golden era.

But, for all the extra control these devices will give him, a truly creative engineer must be frustrated by one apparent limitation: the number of tracks available is never likely to get much beyond 64 tracks on 50 mm tape, whereas several hundred are clearly required for a work like Mahler's *Eighth*. However, a glimmer of hope appears at the end of the tunnel. By now, everyone in the business knows that rather simple non-linear playback circuitry (using variable-gain or variable-matrix circuits) can convert a two-channel matrix recording made via the CBS *SQ* or Sansui *QS* systems back into excellent fully discrete four channel sound. These circuits are the primitive precursors of a new generation of devices that will compress a large number of signals into a smaller number of channels and yet allow full recovery of each signal. The basic idea is that a matrix be used to mix the large number of signals into fewer channels. On playback, each channel is split into a number of fairly narrow frequency bands, and in each band a variable

continued over

continued

matrix circuit recovers the desired signal, adjusting itself so as to minimise crosstalk from other recorded signals at each moment. Another circuit deduces what the envelope of the desired signal in that frequency band was like, without any crosstalk, and makes the envelope of the output waveform conform to this. The various band outputs corresponding to each desired signal are then added together—and, lo and behold—the wanted signals, each with virtually no interference.

By such means, a 16 track tape recorder could in principle store up to 256 separate signals. In practice, one wishes to be able to erase and re-record tracks so that a practical system might record, say, nine signals on each group of three tracks on a 24 track machine.

An even more wonderful prospect should bring a glow to the heart even of our reactionary Editor, for it envisages the return of the coincident microphone technique. In this proposal, recordings are made via a coincident pair of precision microphones on to a two channel recorder. On playback, a multi-frequency-band variable-matrix technique rather similar to that just described can then be used to recover a sound in any desired recorded position with minimal interference from other sounds. The many signals thus obtained can then be processed exactly as one would mix down a conventional 24 track tape, adding echo, limiting, de-essing and what-have-

you, as desired. The advantage of this technique is the economical cost of tape, the portability of the recording equipment, the simplicity of the studio mic technique (just put a stereo pair in the middle of the musicians) and its reliability.

But the real *pièce de résistance* has been left till last. This is an item of equipment that, with the minimum of human intervention, performs all the following complex tasks that at present require much expensive skilled manpower to perform, in a fully automated manner. This equipment receives and processes the impulses of sounds reaching the microphones; the distribution of sounds among the orchestral instruments is carefully and continuously examined and compared with an ideal distribution, and each instrument is automatically panned in its optimal stereo or quadraphonic position. A further analysis of incoming data enables this equipment automatically to optimise the balance between instruments and to adjust the recorded equalisation and dynamics of each instrument accordingly. Another feature of this equipment ensures that the quality and the stereo spread of the recorded reverberation is painstakingly computed to be optimal for the particular performance, and adds it to the direct sound. This item of equipment, which has a very profound theoretical engineering basis, has been developed by the vast technical research laboratories of EMI, and indeed has already been used by that organisation with good results. It is possible that some readers of this journal have already come across references to it under the name of its inventor, Alan Blumlein.

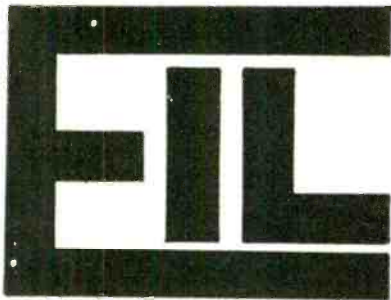
continued

The Future

The future may see the introduction of a commag version of super 8 mm film (type S). This will be purely for economic reasons and then only if the picture quality is satisfactory. The commag stripe will most likely be less than half the width of the stripe on 16 mm film.

Looking even further ahead I expect to see a combined colour video camera and recorder no larger or heavier than today's 16 mm cameras. Quite how the information will be stored remains to be seen; one should look further than tape or anything similar which requires a mechanical transport. A possible line of development could be the use of holography in an information store as quite small areas of film can record large amounts of information using this process. The only moving part in a holographic camera would be a beam of coherent light; the lack of mechanics should result in silent, reliable operation.

Coming back to the sound side of these new breeds of video cameras, if the information store is in the form of magnetic tape then conventional methods can be employed; if the store is of a holographic or similar form then the sound would most likely be coded into the video line sync, as is possible with present day techniques. Whatever the future of news cameras, a move from film to video recording should greatly improve the sound quality while retaining the convenience of a commag system.



**ELECTROCRAFT
INSTRUMENTS
LIMITED**

MANUFACTURERS OF A COMPLETE RANGE OF TELEVISION TEST EQUIPMENT, VIDEO & PULSE DISTRIBUTION AMPLIFIERS, VISION MIXERS & EFFECTS UNITS, ANCHOR THE B.B.C. DESIGNED ALPHA-NUMERIC CHARACTER GENERATOR AND NOW A

NEW RANGE OF COLOUR EQUIPMENT:—

- SINGLE TUBE VIDICON CAMERA
- P A L ENCODER
- COLOUR BAR GEN. & SUB-CARRIER OSC.
- SYNC. PULSE GENERATOR

SALES OFFICE: LISS MILL, LISS, HAMPSHIRE.

TELEPHONE LISS (073082) 3444

Local Radio

By John Dwyer

SOME may remember, at the height of the satire craze of the early sixties, a phoney BBC news bulletin which told us of the outbreak of world war three. There was nothing funny about the details of the end of mankind, the reports of cities being wiped out. What was funny was that it was all delivered in BBC monotone and followed, with no change in tone, by the latest cricket scores.

In those days the BBC seemed terrified of showing any sign of its being run by human beings for human beings. What made the BBC seem so pompous was that this exaggerated sense of dignity had seeped out of the news studios and affected every programme the corporation produced.

When pirate radio appeared, the BBC were forced to change their approach. Radio Caroline first broadcast at 9 pm on March 27, 1964, and last on March 3, 1968. Between these dates the Pilkington report, which was ten years old this June, was taken down from the shelf and the BBC stations started to broadcast.

The pirates were the first to realise the demand for something other than 'light entertainment'. It had been rare for the BBC to play non-British records and listeners had rarely heard anything other than what was produced by EMI, Decca or Pye. Before pirate radio the small but growing coterie of soul and R & B enthusiasts had been forced to search the medium waveband for something other than what they regarded as a dead but unburied version of real music: that form of life found only on the other side of the Atlantic. When the pirates arrived they had to search no more. Others tuned in by accident and liked what they heard.

An independent survey conducted when pirate radio was most popular showed that 27 million people listened to this type of broadcast. In March 1966 National Opinion Polls said that ten million were listening to Radio Caroline alone. There were ten pirate radio stations around the coast that were more or less permanent and of reasonable size. There were also untold numbers of boats, dinghies and other vessels at sea which carried no more than a few bits of wireless equipment and a record deck. The rescue services were kept busy by them all, whatever their size, and this, together with the radio interference they caused more legitimate forms of broadcasting as well as one another, made most Labour and Conservative MPs anxious that the pirates be silenced.

When the pirates first appeared early in 1964 Mr Ernest Bevin, the Postmaster General, told a Conservative radio and tv committee that he would not take action against the pirates. The statement leaked out and was confirmed on

June 2 by Mr Bevin himself; he said that action against the pirates, to be effective, would have to be taken by the whole of Europe. The matter would be dealt with in the next session and, if the Conservatives were returned to power at the October election, he promised to review the possibility of starting commercial radio.

When the October 15 election was won by Labour, the Opposition asked the new Postmaster General, Mr Anthony Wedgwood Benn, what he would do about the pirates. The Conservatives also wanted to know how the demand the pirates had created would be satisfied.

Labour party ideology would not allow Mr Benn to let private enterprise run local radio stations on land. Neither could he simply legislate against the pirates without putting something in their place; his government had a majority of only three and would soon have to hold an election.

In December he announced that he did not intend to introduce commercial radio. He also said that the pirates would not be licensed and that he was ready to act against them. Nothing more was said about the matter until the following March; Mr Benn turned his attention instead to the introduction of colour television.

On May 3, 1965, the BBC published their own suggestions for local radio. The corporation said they were willing to undertake a pilot scheme of nine local radio stations and stated their opposition to broadcasting day-long pop music. In July the government said that they intended to produce a white paper describing their plans for the future of broadcasting.

On July 1, 1966, Mr Benn said that he would introduce legislation before the summer recess. On July 3 he became Minister of Technology and was replaced as Postmaster General by Mr Edward Watson Short. Mr Short said, three days later, that the pirates would not be replaced by commercial radio stations. On July 27 he introduced the Marine Broadcasting (Offences) Bill, which would make it illegal to advertise with or supply provisions to anyone who broadcast illegally.

On December 20, 1966, the delayed white paper was published. It permitted the BBC to run their pilot scheme of nine stations, on vhf only, for a year. Each station was to be financed by the community it served. The paper also said that a pop music station would start on 247m on medium wave, a wavelength previously used for the light programme.

The plan had first been mentioned in July of the previous year. The delay was caused by the large number of conflicting pressures on the Postmaster General from the BBC, the Musicians' Union, the TUC, the Performing Rights Society and, of course, the pirates

themselves. Nevertheless, with the benefit of hindsight it is difficult to understand why Mr Benn saw any difficulty in asking the BBC to carry out the plan it had submitted in May. As it was, the chairman of the BBC, Lord Normanbrook, and its Director General, Sir Hugh Greene, had to persuade the cabinet that the BBC could manage local radio.

Although money must have been talked about a good deal it could not have been the only problem. It is possible that the cabinet were aware of opposition to local radio, and to Radio One, within the BBC itself. Mr Benn, after all, had been a BBC producer for the North American service in 1949-50. What is certain is that in October a disagreement was reported between the cabinet and the BBC, and the Musicians' Union said they were worried that the government were about to set up a new authority to run a pop music service.

When the plans were announced, about 100 local authorities applied for the first nine licences. A notable exception was Birmingham, which was unable to raise the necessary money from local organisations. It must be said that Birmingham City Council is rather unfortunate in matters of this kind; for some years that city has only been able to provide Christmas decorations by hanging illuminated advertisements up with them.

On March 3, 1967, the government announced that stations in Sheffield, Leicester and Liverpool would be open before the end of the year. At the end of the month stations in Brighton, Manchester, Nottingham and Stoke were announced and, in July, Leeds and Durham. On July 5 Manchester City Council, which had just become Conservative controlled, reversed their decision to put £50,000 into the station. Now there were eight.

Radio Leicester first appeared on the air on November 8, 1967. Durham's station, the eighth, first transmitted on July 3 of the following year. These eight stations have an average power of 1.4 kW. The largest, Radio Merseyside, which serves Mr Wilson's constituency, transmits at 5 kW. Radio Sheffield, though it has two transmitters, has a combined power of 39W and Radio Leeds delivers 140W. The pirate radio stations which these local stations were supposed to replace had powers between ten and 55 kW.

On November 13, 1969, the government announced that more stations would be set up. They were named, 13 days later, as Bristol, Manchester, London, Medway, Solent, Teesside, Newcastle, Blackburn, Humberside and Derby. They began to transmit in that order between September 4, 1970, and April 29, 1971. The average power of the final 12 is 5.5 kW. The strongest is Radio London, which delivers 16.5 kW.

continued over

continued

The Conservatives won the June 1970 election unexpectedly. The existence of these stations now depended on a government committed to introducing commercial radio. The Conservatives began their period of office by selling parts of the coal industry to private enterprise and there seemed no reason why the same should not happen to the BBC stations. On September 10, Mr Christopher Chataway, the new Minister of Posts and Telecommunications, said he planned to introduce commercial radio. Lord Hill, the new chairman of the BBC, saw Mr Chataway on December 22, 1970, to seek an assurance, which he did not get, that the BBC stations would not be sold. The following week rumours spread that Radio One was to be handed over to commercial concerns. It was reported that the BBC were taking the stories seriously.

A white paper appeared the following March. It proposed that the ITA would be renamed the Independent Broadcasting Authority and would be responsible for the independent radio stations in the same way as the ITA was for commercial television. The ITA ceased to exist as such on July 12 of this year. The paper also said that the existing or planned 20 stations would continue to exist to serve minority audiences.

There would be up to 60 commercial stations on both medium wave and vhf. One of these would be a news station in London which would supply news to all other stations. Advertising would be spot advertising limited to six minutes in every hour. Local newspapers would be allowed to have shares in the stations to safeguard the interests of those papers.

The white paper stopped all the rumours and it also stopped the BBC stations that would have been opened next. These were Radios Scotland, Welsh Marches, Wales, Gloucester, Swindon, Exeter, Plymouth, Bournemouth, Reading, Luton, Northampton, Peterborough, Chelmsford, Ipswich, Norwich and Dover.

The champion of commercial radio is John Gorst, Member of Parliament for Hendon North and Secretary of the Local Radio Association. He first submitted plans on behalf of the Association in February 1966, when he suggested that there should be 285 local radio stations. Towns of 50,000 people would have one station, those of 200,000 or over would have two, and so on up to cities of a million, which would have five. London would have 12 stations and Birmingham would have six. There would be no local BBC stations unless there was at least one commercial station in that town or area.

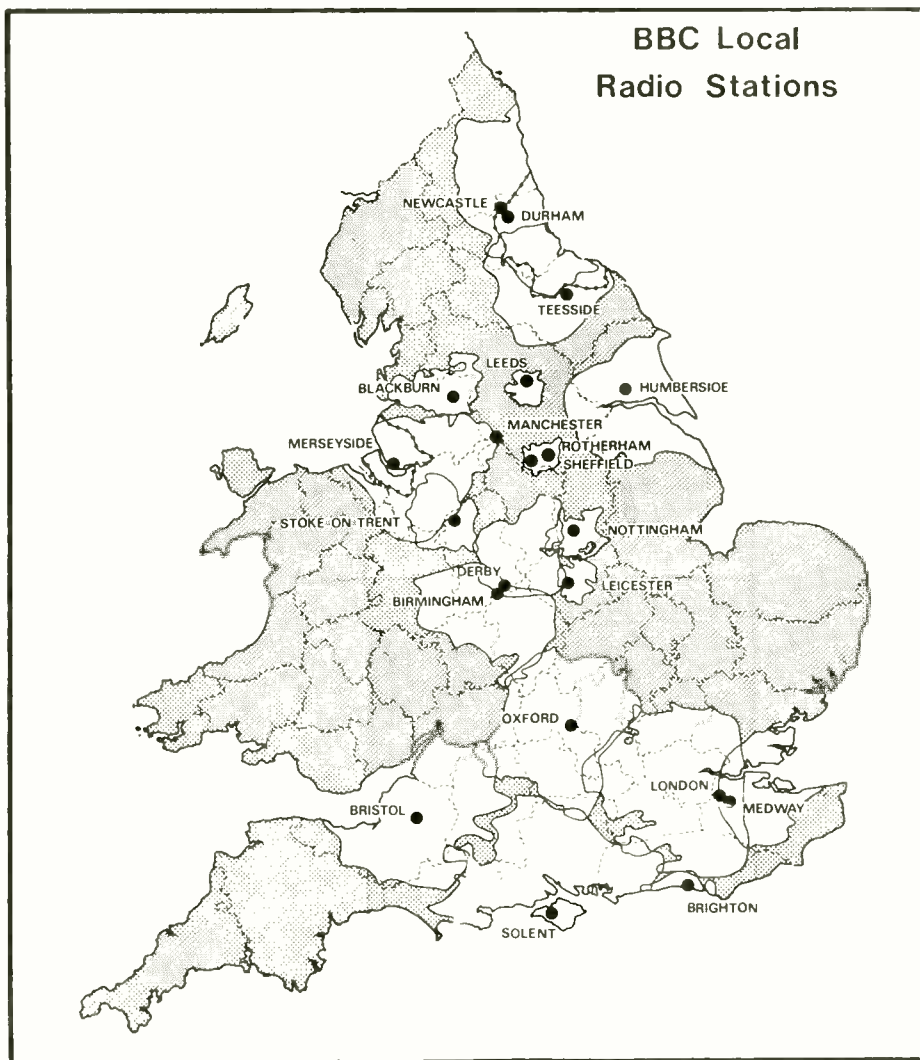
On October 7, 1970, he presented a modified plan for 150 stations to Mr Chataway. Mr Gorst was one of the 20 MPs, 11 of them Conservatives, who were on the committee to discuss the white paper of March 1971. He was concerned that the white paper would produce only regional radio. He wanted the range of each transmitter reduced to eight miles as a step to achieving neighbourhood radio. He also regarded the idea of a London news-only station as an insult to the radio contractors' ability to collect news for themselves.

The reason for the news-only station is that news gathering is an extremely expensive business. Radio Luxembourg, for example, used to spend thousands of pounds every week on this one aspect of their programmes for little result. Their news is now compiled by the *Daily Mirror*.

Mr Gorst contended that it would be extremely difficult to persuade people in Glasgow that they had their own radio station if the news they heard was delivered in a London accent. Another objection was that the advertising to support local radio was meant to come from local businesses: the corner shop

Edinburgh, Ipswich, Liverpool, Nottingham Plymouth, Portsmouth, Sheffield, Swansea and Tyneside. The second will consist of Belfast, Blackburn, Bournemouth, Brighton, Bristol, Cardiff, Coventry, Huddersfield, Leeds, Teesside and Wolverhampton. Applications for licences will be invited in September and the first stations will be on the air at the end of 1974.

At this point it would be worthwhile to look more closely at the existing stations and the way these are run. The map shows BBC stations and the areas they cover. The black dots show transmitter sites.



or garage. The neighbourhood radio lobby believed that Mr Chataway, in producing his white paper, paid too much attention to the large advertising agencies and newspaper and television groups. The result was that each station would cover too large an area.

The Sound Broadcasting Bill was passed on June 12 of this year. Commercial radio, if it is not yet a fact, has arrived.

Five stations were announced last year: two for London and one each for Birmingham, Glasgow and Manchester. The next 21 were announced on June 19. They will be opened in two batches. The first batch is Bradford,

Because the BBC plan was interrupted the allocation of stations is patchy. There are no stations in Scotland, Wales or the West of England, whereas the Midlands and the South have plenty. Carlisle and the industrial towns on the coast south of Carlisle have no stations at all. Nor has Northern Ireland, probably because the plan was made before anyone noticed it was there.

The North East is more than adequately covered as there are three stations whose areas overlap; Durham can be reached by Teesside and is also well into the area covered by Radio Newcastle. Durham, in fact, would seem to

have little justification for having a station of its own, especially when you consider that the other stations have become so regionalised.

The sites chosen for commercial radio will correct the lack of stations in a few areas. Also, the Minister of Posts and Telecommunications is holding informal talks with the BBC and the IBA about a frequency plan for the whole country. Already we know that the BBC stations will be on medium wave in September and the talks should also settle the frequencies that the new stations will transmit on. The Minister will give details to parliament as frequencies become free. When the whole

'We will be competing, in news coverage particularly. We'll give as much time as is needed to minority broadcasting.' Colin Walters of Radio Nottingham told me that if the commercial stations churned out pop music he would not be interested in competing. 'The onus is on commercial radio to compete with Radio One and provide news.' One BBC local producer thought the corporation too complacent: 'When commercial radio comes,' he said, 'they won't know what's hit them'.

Humberside's John Cordeaux has worked in commercial radio in the Caribbean, as well as for Radio Moscow. According to him:

told me that there were five million radio sets in his editorial area of which 60 per cent were equipped for fm reception. Colin Walters of Nottingham said: 'Now we can get to about 55 per cent of the people in our editorial area. When we go on medium wave the potential audience will go up to 99 per cent.'

It could be said that putting programmes out on medium wave, for whatever reason, is short-sighted, especially when dealers in areas where there is a local radio station notice its effect on the sales of vhf sets. At Green's Hi Fi in Birmingham the assistant said customers did ask for sets that could receive Radio Birmingham. One or two per cent? 'Oh, more than that!'

Nevertheless you have to consider the feelings of people like the pensioner who runs the fishing programme on Radio Humberside: 'It would be nice to have more air time,' he said, 'but it would be much better to be on a wave everybody can get'.

One of the most surprising things about a form of broadcasting which, not long ago, was on trial, is the lack of detailed audience research. In every case any information that exists about the audience has been compiled from reaction to programmes, whether this is received by phone or by letter, by personal contact or by discussion at each local radio council.

The BBC explained by saying that audience research of any kind was expensive. For this reason it had been decided that no measurements would be made until the youngest station was at least a year old. All the stations could then be surveyed at once at a cost of between £50,000 and £60,000.

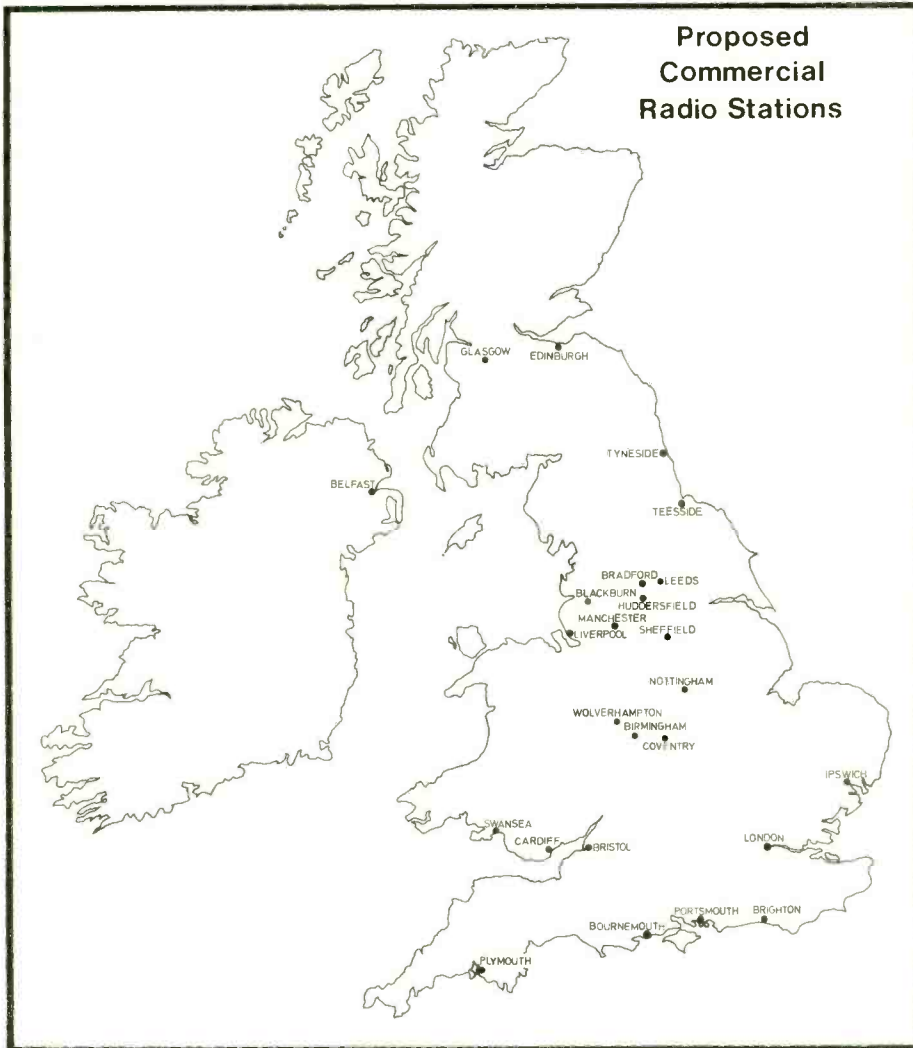
It also seems that the BBC stations will take only a passing interest in the number of listeners they have compared to the number who will listen to commercial radio. This, of course, is how the Minister and his predecessor intended the BBC stations to operate. George Sigsworth, manager of Radio Derby, said: 'We have, for example, a programme for blind people. We're quite happy to run it but I doubt if the commercial stations would be.'

All the same one can detect just a little defiance in the following passage from the BBC Handbook: referring to that part of the white paper which requires the BBC stations to cater for minority audiences the handbook says: 'The BBC will indeed continue to provide such programmes but nevertheless regards its task as serving the totality of the audience so it will also continue to mount programmes on local radio which appeal to the mass audience as well'.

There are as many views of what a local radio station should be doing as there are station managers. The word 'platform' was mentioned in just about all of the six stations that were visited, but what the stations have in common ends there. If there was an impression that visiting as few as six stations sharply corrected it was that the BBC stations are the children of Broadcasting House. This kind of situation was foreseen by the Pilkington Committee, which said in its report that each station must 'resist, if necessary, Broadcasting House'.

It does seem that some resisting was necessary, though most of the opposition has now been overcome. Referring to a meeting with his colleagues early this year one manager said:

continued 55



scheme is known I would not be surprised to see an improvement in the transmitting power of stations such as Leeds and Sheffield. It is also possible that there will be an adjustment to the imbalance of BBC local coverage in the North of England, though any change of this kind would have to be suggested by the BBC.*

BBC local radio does not seem frightened of its rival. The reaction to commercial radio ranges from readiness through complacency to contempt. 'I think commercial radio will be a disaster,' said Ray Beaty of Radio Leeds. 'What value is there in putting out canned pop music?'

Radio Birmingham's Jack Johnston said:

'Commercial radio doesn't provide the service that local radio should do. There is pressure there. We have no pressure on us. We can and do mention the names of stores, firms, consumer goods and criticise them when we see fit. In commercial radio you can't mention them.'

'When I worked in commercial radio, the commercial manager and the head of programmes were continually at loggerheads.'

One of BBC local radio's biggest problems is that it is only available on vhf. Future transmission on medium wave is regarded as a necessary evil. Ray Beaty of Radio Leeds said: 'Medium wave is in the past'. Jack Johnson

BEYER DYNAMIC



M 69 M 69 SM

Unidirectional Studio Microphone

The M 69 is an unusually sensitive microphone with outstanding cardioid characteristics. It makes high-quality transcription possible even under acoustically unfavourable conditions. The well-balanced response curve of the microphone maintains the highest fidelity in the reproduction of speech and music. Version SM with VOICE-OFF-MUSIC switch.

Specifications:

Frequency Response: 50-16000 Hz. Output Level at 1 kHz: (0 dbm Δ 1 mW per 10 μ bar) 0.24 mV/ μ bar (-50 dbm). Polar Pattern: Cardioid. Output Impedance: 200 ohms. Connections: 3-pin plug T 3262 1+3=200 ohms, 2=ground. Dimensions: 6.7" x 0.9" ϕ , head 1.7" ϕ . Also available with Cannon connector XLR-3-50T.



M 88 N

Dynamic Moving Coil Microphone

With hypercardioid characteristics and unusually high sensitivity. Due to its very good front to back ratio it is less subject to feedback and provides excellent discrimination against unwanted sound. It is used by broadcasting and TV-studios recording artists, bands and instrumentalists.

Specifications

Frequency Response: 30-20000 Hz. Output Level at 1 kHz: (0 dbm Δ 1 mW per 10 μ bar) 0.25 mV/ μ bar (-50 dbm). Polar Pattern: Hypercardioid. Output Impedance: 200 ohms. Connections: 3-pin plug T 3262 1+3=200 ohms, 2=ground. Dimensions: 6.5" x 0.9", head 1.8" ϕ .

Also available with cannon plug XLR-30-50 T (M 88 N (C))



M 260 M 260 SM

Dynamic Unidirectional Ribbon Microphone

The M 260 is especially suited for speech and music reproduction. It has excellent transmission qualities. The dampening effect backwards is almost constant over the whole frequency range. Version SM with 3 position Voice-Off-Music switch.

Specifications:

Frequency Response: 50-18000 Hz. Output Level at 1 kHz: (0 dbm Δ 1 mW per 10 μ bar) 0.09 mV/ μ bar (-58 dbm). Polar Pattern: Hypercardioid. Output Impedance 200 ohms. Connections: 3-pin plug T 3262 1+3=200 ohms, 2=ground. Dimensions: 6.5" x 0.9", head 1.7" ϕ . Also available with Cannon connector XLR-3-50T.



M 500 N

Dynamic Unidirectional Ribbon Microphone

A ribbon microphone designed for capturing the full intensity of modern music while suppressing undesirable side effects such as popping, breath noise and hissing. Flat frequency response, high sensitivity and excellent front-to-back ratio are the distinguishing features of this new BEYER-DYNAMIC product.

Specifications:

Frequency Response: 40-18000 Hz. Output Level at 1 kHz (0 dbm Δ 1 mW per 10 μ bar) 0.13 mV/ μ bar (-55 dbm). Polar Pattern: Hypercardioid. Output Impedance: 500 Ω \pm 15%. Load Impedance: > 1000 Ω . Connectors: 3-pin Tuchel T 3262, 1+3=500 Ω , 2=ground M 500 N (T) = Tuchel T 3007 spez., 1+2 = 500 Ω , 3 = ground M 500 N (C) = Cannon XLR - 3 - 50 T, 2+3 = 500 Ω , 1 = ground. Dimensions: Head diameter 56 mm, shaft diameter 28 mm, length 180 mm, weight 210 g.



M 160

Dynamic Unidirectional Microphone for Studio Purposes

By using the double ribbon principle the highest possible reproduction quality of music and speech is guaranteed. Non-linear distortions are imperceptible.

Specifications:

Frequency Response: 40-18000 Hz. Output Level at 1 kHz: (0 dbm Δ 1 mW per 10 μ bar) 0.1 mV/ μ bar (-57 dbm). Polar Pattern: Hypercardioid. Output Impedance 200 ohms. Connections: 3-pin plug T 3262 1+3=200 ohms, 2=ground. Dimensions: 6" x 0.9", head 1.5" ϕ . Also available with Cannon connector XLR-3-50T.

To: BEYER DYNAMIC (G.B.) LTD
1 CLAIR ROAD
HAYWARDS HEATH, SUSSEX

Please send me full particulars and illustrated brochure of BEYER DYNAMIC Products.

NAME

ADDRESS

STUDIO MICROPHONES

continued

'Last year they were new, now they're battle hardened'. Other managers denied that they had ever had any difficulty with Broadcasting House. 'The senior ranks are 100 per cent behind us,' said Colin Walters of Radio Nottingham. Harold Rogers of Radio Medway said relations were 'Good, if they keep out of one's hair'.

It seems incredible now that local authorities and organisations were once expected to finance each BBC station. Even if a local authority could have found the money from the rates to run a station this would have threatened the independence of the station. One cannot imagine a local authority giving money to a station which was continually berating the local council, no matter how balanced each programme.

Each station is now run with money provided from the licence fees and each costs, on average, £100,000 a year. The amount seems to be no more or less than adequate. Jack Johnston said that anyone who thought that the BBC weren't putting enough money into local radio 'must be raving. I can assure you that the BBC is putting money into local radio—as much as it can afford'.

Harold Rogers of Radio Medway didn't think there was enough. 'Tv would not miss a few thousand pounds, but it would be wealth to us in local radio.' This seemed a general view, though everyone who said that resources were limited realised that no amount of money would be too much.

These remarks show a certain candour which indicates, to me at any rate, that being financed from London is not a restriction on freedom. They also point up the differences between one station and another, which even extend to how necessary it is to balance programmes. Jack Johnston said that all his programmes had to be balanced whereas Colin Walters said that this was only necessary during election time. This does not mean that the stations editorialise; at least, no more than does the 'World at One' programme on Radio Four. It is just that in recent years the BBC has felt able to include news features where one party declines to, or is unavailable for, comment.

In local radio this is bound to affect the style and content of each station's programmes. The Pilkington report said: 'Local controversy will find expression, as it must if the service is to be worthwhile'.

I asked if stations would be prepared to campaign. John Cordeaux, of Humberside, had a typical reaction: 'Of course we'll campaign. If you, say, had rats in your house we'd put you on and let you say your piece—but we'd put your landlord on as well'.

There are not as many programmes in which listeners participate by telephone as you might think, though every station holds at least one. At Radio Medway I was told that this type of broadcast was of most benefit, naturally enough, to those who had telephones. In this country, unlike North America, that means a larger proportion of middle class contributors than there should be.

At all the stations a great deal of effort and

expense is devoted to giving good sports coverage, especially to local teams. Derby gives live coverage to all Derby County's matches and Birmingham will soon be doing the same for all six local teams; at present a reporter goes to all the foreign games to give reports on the matches once every half hour or so: the result of a match in Turin last season was broadcast within three minutes of the final whistle. Birmingham hopes to extend this to complete live coverage this year.

Most of the stations produce about eight hours of their own programmes a day. More are broadcast at weekends than in the middle of the week. If the stations were given more money they would, without exception, increase the proportion of local programmes. There are problems, though. Some stations, like Nottingham and Humberside, go out on the Rediffusion link. Nottingham has 50,000 and Humberside has 65,000 of these listeners. At Humberside they hear local radio instead of Radio Two. Because they want to hear some Radio Two programmes—'Waggoners Walk' is an example—Humberside has to stop its programmes for 15 minutes to let them do so. It must drive the producers mad.

The amount of news and current affairs each station produces varies as much as anything else. Most of the managers have been, and consider themselves as, journalists and the programmes that come from these stations reflect this. Jack Johnston of Birmingham said: 'If I could I'd put out news 24 hours a day'. News is, after all, the heart of local radio. Harold Rogers of Medway, on the other hand, regards news as an important part of Medway's output, 'but we consider that a local radio station should present a varied diet of programmes, reflecting all aspects of the community it serves'.

Transmitter power

How successful the stations are depends on a number of physical considerations. One that we have already looked at is whether a station goes out on medium wave or vhf. Another, closely related, is the power of the transmitter. I asked 20 people who were walking close by the offices of Radio Leeds if they listened to their local station and only one said he did. Ray Beatty, the station's manager, said he was hardly surprised since Leeds had such a weak transmitter; in most parts of Leeds the signals from adjacent Humberside and Manchester are stronger than that from Leeds's own station.

Mr Chataway was asked a number of questions about the Leeds transmitter and related topics in the House of Commons on March 1 this year. Leeds City Council have also discussed the problem at length. So far nothing seems to have been done, and it seems nothing will be until the Minister finishes talking to the BBC and IBA.

Leeds was one of the first stations to be set up. To show that BBC local radio would be truly local the powers of these first stations were kept low. For similar reasons the area coverage map for each station shows the areas of coverage to be far smaller than they actually are. 'The map doesn't mean anything,' said George Sigsworth of Radio Derby. In freak conditions many stations have been received in Scandinavia.

The editorial area of each station has little to do with the reception conditions, real or

imagined. In a similar way to the other managers George Sigsworth, for example, defines his area as that region which looks to Derby as the centre of its activities. If people who live near a town support its football team, come to shop there or read its evening paper, they are regarded as in the editorial area of that town's station.

Most of the stations have an unmanned studio or two in nearby towns and some members of staff rarely visit their stations but report from and about the places where they live.

For some stations the area they serve is too large. Radio London is an obvious example. Most areas have, or should have, some local characteristic, some common background with which all the inhabitants can identify. London is too large an agglomeration to have such a characteristic; Chatham and Hull live from the sea, Leeds is an old mining and industrial town, but what characteristic does London have apart from the grubbiness of its trains and the number of strangers it attracts? The difficulty of providing for the tastes of those who live in London must be immense.

Another physical limitation to the success of a station must be its site. When the first stations were set up in March 1967 Mr Donald Edwards, who was put in charge of the project by the BBC, said: 'The first thing about a local radio station is that it must belong to the community. I would like to see a big notice in the foyer of every one of them: the BBC welcomes you to your station'. This of course is an ideal. When there is work to be done you cannot have people wandering about as they please.

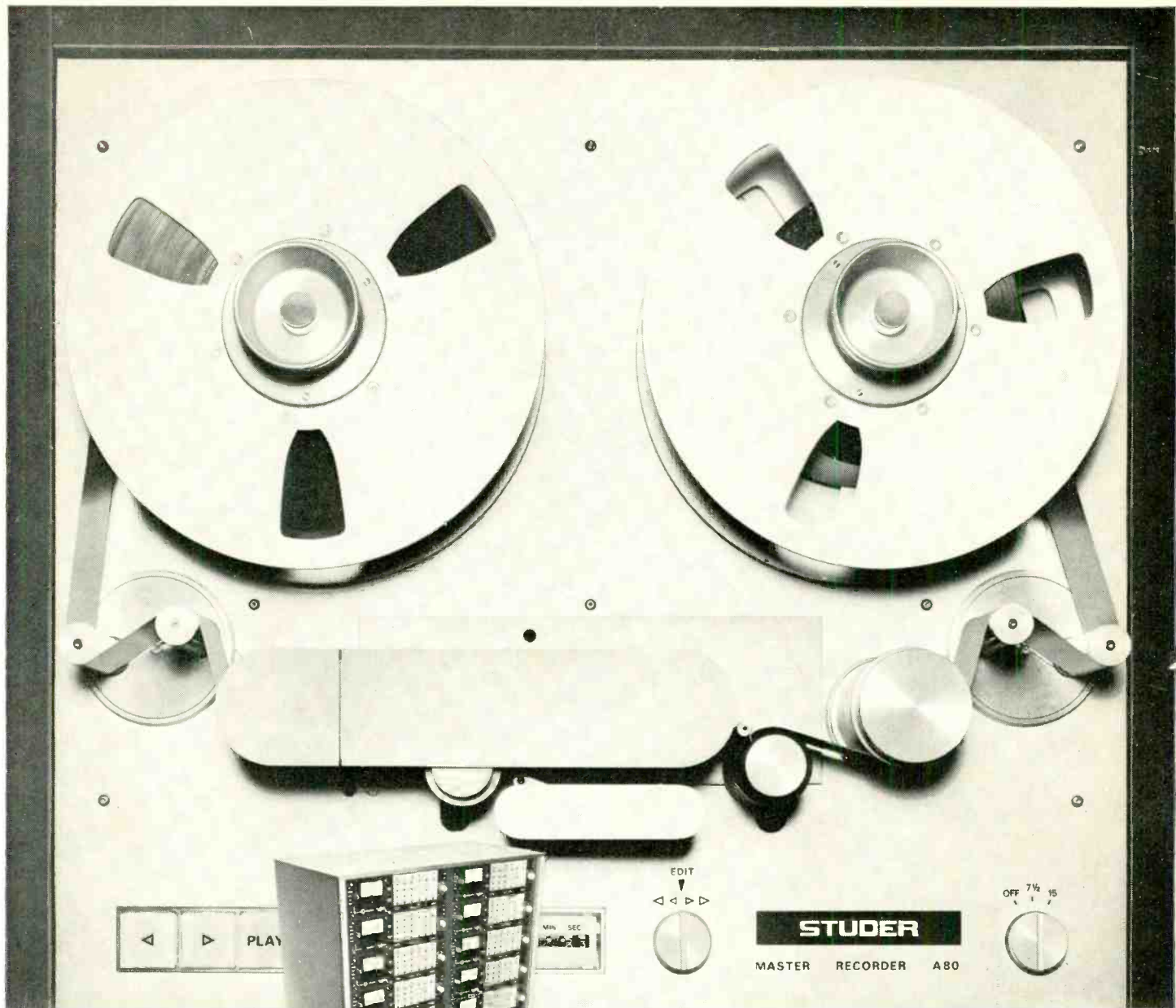
Nevertheless the attitude of at least one station, Radio Brighton, is hardly in the spirit of local radio: when researching for this article I was told I could not interview the station manager and could only visit the station as part of a party. A station must be easy to get at if those who have something to say are to take advantage of the opportunity it offers. Two of the most successful stations, Medway and Humberside, open directly on to busy streets in the middle of their respective towns. The editorial area of Radio Humberside, for example, is cut in two by the river Humber. They have set themselves the task of repairing the animosity that exists between rival towns on opposite sides of the river. They would have had less success had the station not been in a central part of Hull.

In Birmingham the issues are unemployment and immigration. Radio Birmingham appears to deal with these issues as successfully as any other station deals with its own, but their task must be made more difficult by the size of the building from which the station broadcasts and its remoteness from the city centre.

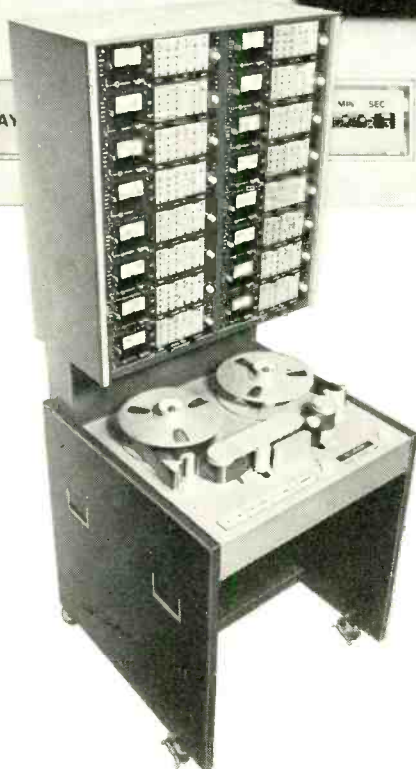
Equipment sharing

The studios are in a large building at Pebble Mill, three miles from Birmingham, which also houses the BBC's Midland tv and radio networks. One advantage of this arrangement is that Radio Birmingham can borrow equipment from the network studios and so is less likely to feel the lack of resources that plagues other stations. Also, as Jack Johnston explained, the Birmingham conurbation is so large that those who travel from its edges to appear in programmes are unlikely to be worried by the

continued 63



Stand B3-4 at I.B.C. '72



F.W.O. Bauch Limited
Tel: 01-953 0091

IBC Preview

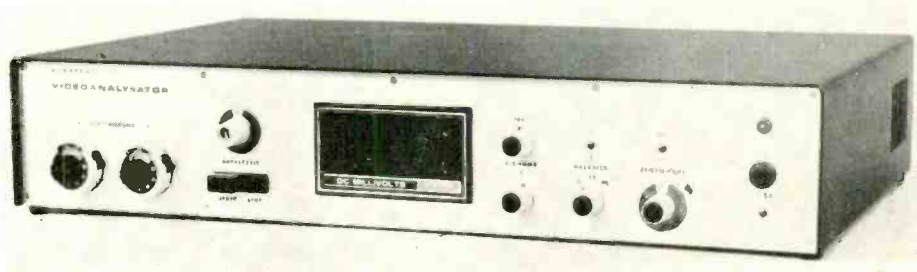
THE 1972 International Broadcasting Convention will be held at Grosvenor House, Park Lane, London W1, from September 4 through 8. This will combine a program of lectures with an exhibition of film and broadcasting equipment.

Albrecht are to exhibit a variety of television instruments including the *Video Analyser*. This permits manual or automatic sampling of selectable lines by a measuring spot of 5 ns width. The *FAM* set is designed for colour recording on 12.5 and 25 mm vtrs while the *Pegime* is a combined unit for tv camera noise and level measurements. Albrecht will show a *ZG* character generator, *KG* identification generator, *SMPIE* time code generator and *ESP* edit simulation and program unit.

A program prepared from live inserts, recorded news items and commercials, special announcements and sports highlights will be shown by Ampex as part of the first European demonstration of the *ACR-25* colour broadcast cassette vide tape recorder. This twin-transport unit provides random access to 24 cassettes of ten seconds to six minutes duration. The *AVR-1* third generation colour broadcast vtr will be demonstrated working with the *ACR-25*. Also on the Ampex stand, the new *VR-1200S* compact broadcast vtr, narrow enough to stand two-abreast across an ob vehicle and still leave room for a 48 cm service rack. The *VPR-7903* is a 25 mm helical vtr featuring a new time-base corrector assembly and capable of working to PAL broadcast standard. The *BC-230* colour camera designed for studio or remote use completes the broadcast video display. Ampex audio equipment being shown for the first time in Europe includes the new *MM-1100* 16 channel master audio recorder. Another planned exhibit is the new *CD-200* high speed audio cassette duplicator. The *CD-200* claims the highest speed and output of any cassette duplicator available and can produce up to 375 C30 cassettes per hour or 3,000 per eight-hour day. Similarly, C60 cassettes are copied at a rate of 225 per hour or 1,800 per day, and C120 at 120 per hour or 960 per day.

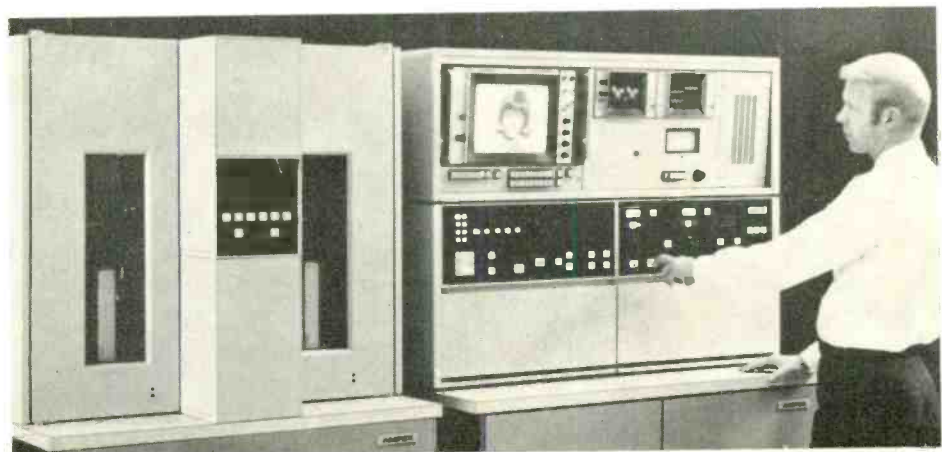
New from Autocue, the *800* scanner displays up to 32 305 x 230 mm caption cards, scanning area being 254 x 178 mm. Sequential time change is under 200 ms, maximum change time on random selection being 3s. External studios cameras (two, each scanning 16 cards) may be used or broadcast quality internal cameras fitted as permanent installations. Facilities include local or remote mix, cut and fade, caption roller and studio clock

continued 59



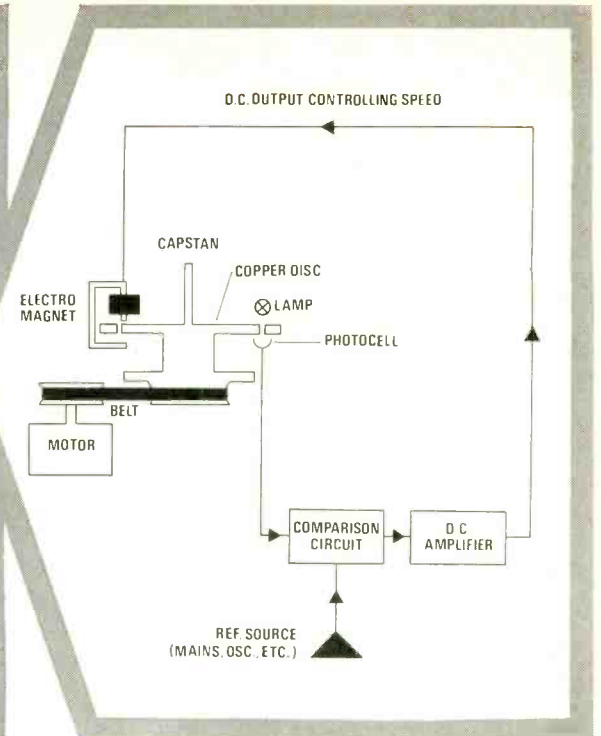
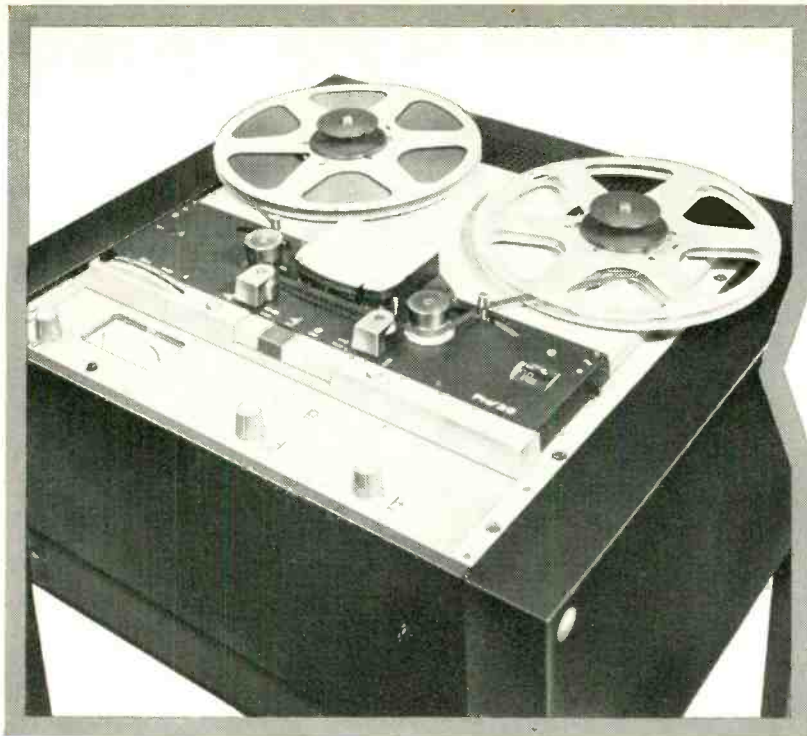
BC '72 Exhibitors:
 Aksjeselskapet NERA
 AKG Acoustical
 Albrecht Elektronik
 Alexander Cole
 Allotrope
 Ampex Great Britain
 Aston Electronic Developments
 Audio Engineering
 Audio
 Autocue
 AV Distributors (London)
 Ballancroft Film and TV Equipment
 F. W. O. Bauch
 Belling and Lee
 Berkey Technical
 Bosch
 G & E Bradley
 BBC
 Broadcast Electronics
 Central Dynamics
 Conrac Corporation
 Michael Cox Electronics
 Datavision Systems
 Decca Radio and TV
 Dynamco
 Dynamic Technology
 Electrocraft Instruments
 Electronic Visuals
 Elektromechanikai Vallalat
 EMI Electronics and Industrial operations

Engineering Designs and Supplies
 English Electric valve
 Evershed Power-Optics
 Feldon Audio
 Grass Valley Group
 Independent Broadcasting Authority
 International Video Corporation
 Intertec
 ITT Components Group Europe
 Lee Engineering
 Link Electronics
 Marconi Communications Systems
 Marconi Instruments
 Matthey Printed Products
 Micro Consultants
 Microwave associates
 Mullard
 Rupert Neve
 Plymouth Polytechnic
 Prowest Electronics
 Pye TVT
 Rank Organisation
 Richmond Hill Labs
 Rintoul Electronics
 Schlumberger
 Shure Electronics
 Tektronix UK
 Telemation International
 Thorn Lighting
 Video Electronics
 W. Vinten



Above: Albrecht Video Analyser.

Right: Ampex ACR-25 twin-transport video cassette recorder.



Pro'36 from Pye TVT

The new Philips multi-speed recorder

brings your sound to you the way you want it

OUTSTANDING FEATURES

The most important of the Pro' 36's features are:

- Servo-controlled capstan speed
- Facilities for synchronization with other equipment
- Three motors – three speeds and up to four heads
- Solenoid operated pinch roller, brakes and cue facility.

CHARACTERISTICS

Three motor tape drive. Mains frequency: 50 and 60 Hz. Three tape speeds $3\frac{3}{4}$, $7\frac{1}{2}$ and 15 in/s, electrically switchable. CCIR plates 300 mm diameter with 100 mm hubs (acc. to DIN standard). NAB reels 10 $\frac{1}{2}$ -inch diameter. Cine reels 7-inch diameter. Wow and flutter peak value 0.04% at 15 in/s. Tape slip less than 0.1%. Signal-to-noise ratio 62 dB. Optimum bias setting separate for each speed and each track. NAB or CCIR

equalisation by switchable correction networks. Tape speed selection automatically switches equalisation and all corresponding preset controls by semiconductor switching. Monitoring by VU meters. Remote operation on all functions. Plug-in head assembly with pre-amplifier. Digital tape coupled time counter reading minutes and seconds.

To: Howell Jones, Pye TVT Limited,
Coldhams Lane, Cambridge CB1 3JU.
Please tell me all about Philips' Pro' 36 studio
tape recorder.

NAME _____

COMPANY _____

ADDRESS _____



Pye TVT Ltd., Coldhams Lane, Cambridge CB1 3JU
Tel: Cambridge (0223) 451115. Telex: 81103

continued

display, and fibre-optical card selection. A complete 800 installation comprises scanner, caption roller and clock units. Other Autocue exhibits will include the Direct Vision prompter. This accepts a typewritten script and reflects it onto a glass screen immediately in front of the camera, visible to the artist yet undetectable on monochrome or colour transmission. Comparable equipment is also available for live presentation, typically conventions.

On the CBS Laboratories stand, the new Volumax 4000 automatic peak controller. This combines the features of earlier Volumax units with a new automatic controller of speech asymmetry. The 4000 monitors the asymmetrical polarity of the program and, while this inclines to positive, passes the signal through a non-inverting variolossor circuit. In the case of predominantly negative polarity, the signal is passed through an inverting channel. The switching occurs during the momentary pauses which occur throughout speech sequences and the resultant switching action, CBS claim, is completely silent. Other CBS equipment to be shown: the 450 dynamic presence equaliser and Audimax automatic level control. The 450 measures the relative signal level of the 2 kHz to 4 kHz presence band and, if this falls below a predetermined level required for good intelligibility, generates a control voltage which boosts the presence level by up to 10 dB at 3.4 kHz. On the video side, the 6000 NTSC automatic colour corrector is claimed to eliminate the errors caused by short human colour memory.

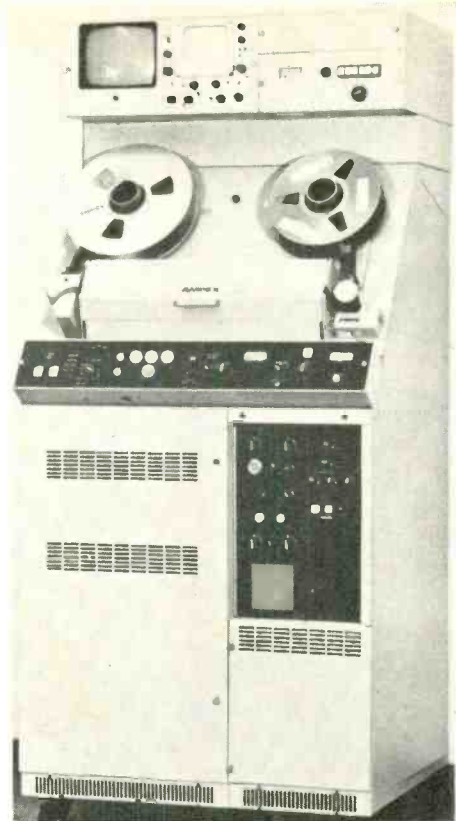
The Conrac Corporation specialise in broadcast television monitors and will be introducing a 5000 series of colour units using a single gun three-beam crt. The RHE series of colour monitors will also be featured. Both series are available to PAL, SECAM, NTSC or RGB standards. Monochrome SNA and ENA monitors will be shown.

Datavision's D-2400 is a low cost television display generator capable of storing up to four individual display pages. Any one of the stored pages may be randomly displayed on the program output channel while another page is being composed or edited on the video preview channel. Page format is eight rows of 16 characters per row, each character occupying 32 scan lines. A single row of information may be crawled across the lower third of the display area, right to left, stopping automatically or continuously repeating. Four messages can be stored for separate crawl presentation. Character information can be stored on any audio tape machine, open reel, cassette or cartridge, eliminating the need to retype frequently-used information.

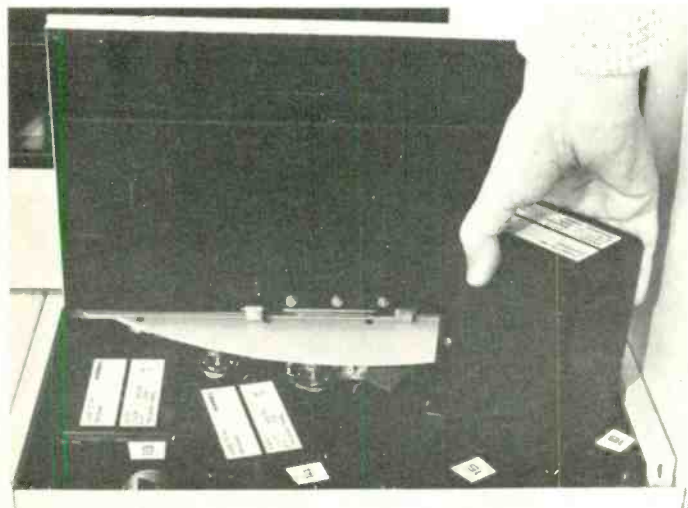
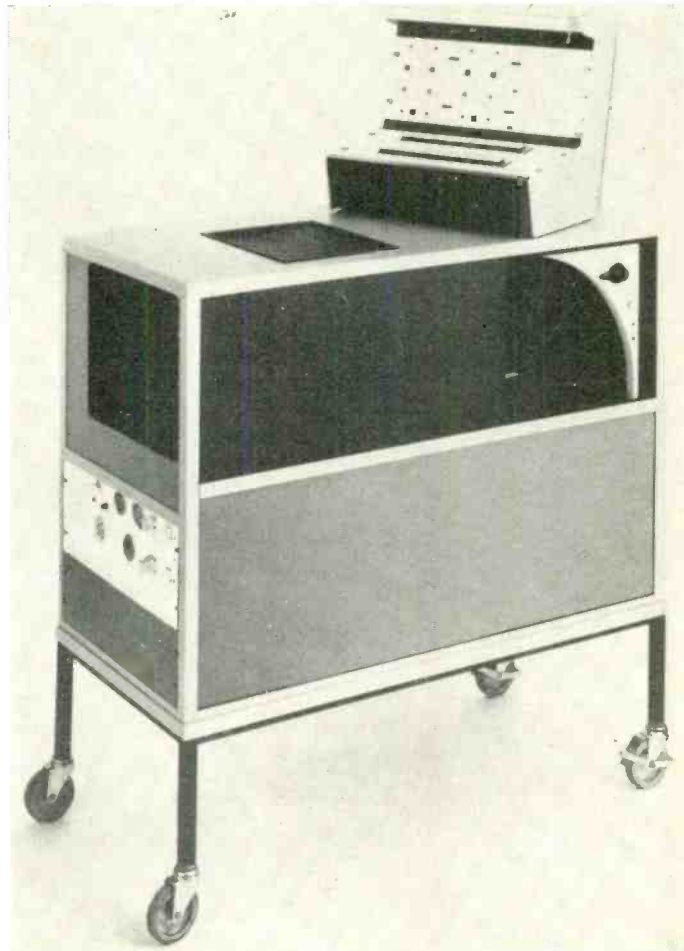
A new range of off-air/line colour and monochrome receivers and video monitors will be demonstrated by Decca Radio & Television. Off-air demodulators, field strength meters, colour bar generators and other television test instruments will also be on view.

The West Lothian based company Dynamco plan to show a complete integrated wave-form analysis system (models 7115, 7120 and 7105). Differential phase and gain, line/time linearity and chrominance/luminance crosstalk may be measured. Pushbutton selection of one, two and five line and one, two and five field YRGB displays is featured. The 7060 tv wave-form monitor offers positive odd and

continued 61



↑ Above:
Ampex VR1200S.
Right: Autocue 800.
Below: Ampex VCR-25
cassette carousel.





AKG FET C451 Series—

The most versatile condenser microphone yet?



1. **C451 - BOOM VERSION** for Studio Booms
2. **C451 - Boom Version with QUICK RELEASE ADAPTOR** suitable for hand use. **IDEAL FOR VOCALISTS**
3. Various capsules for sound recording, including "SHOT GUN" attachment
4. **New compatible mains power unit PUI0A** suitable for 9v and 48v operation

For further information on the C451, the increasingly successful BX20 Studio Reverberation Unit and the new C414 Variable Pattern FET Condenser microphone contact:

AKG EQUIPMENT LTD.

182/4 CAMPDEN HILL ROAD · KENSINGTON · LONDON · W8 7AS

Telephone 01-229 3695



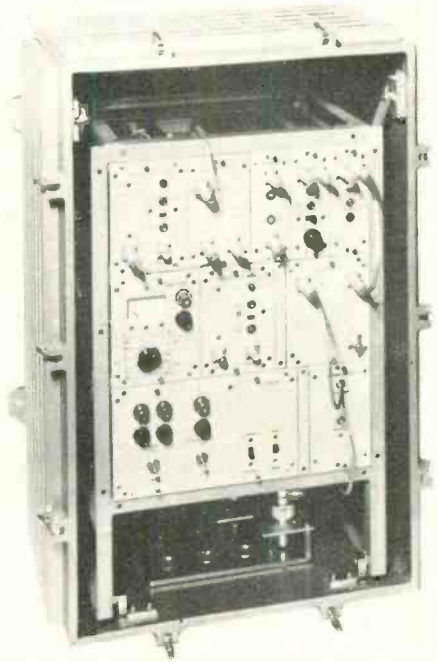
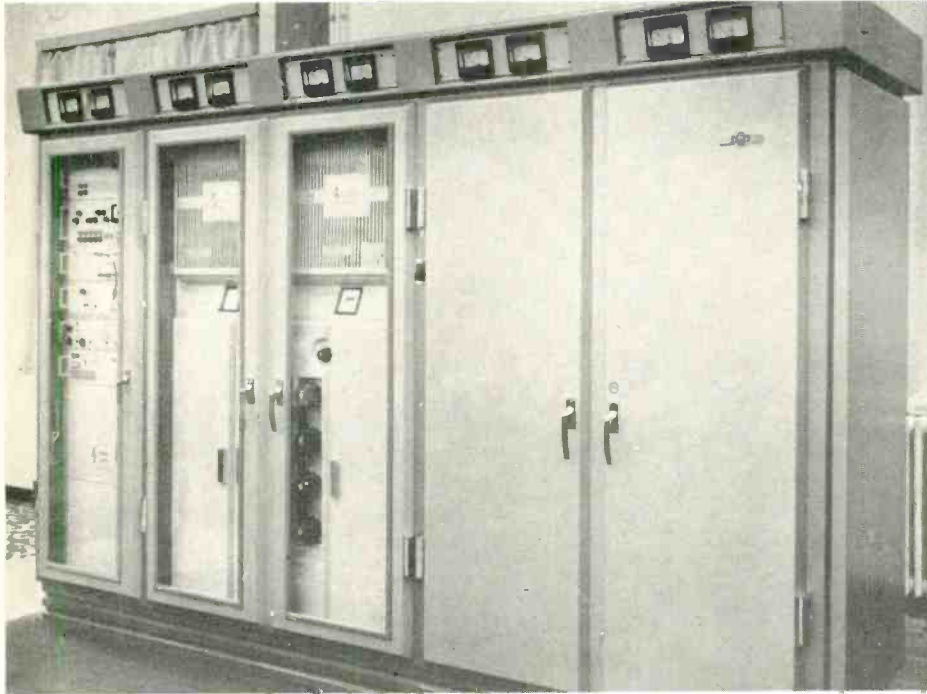
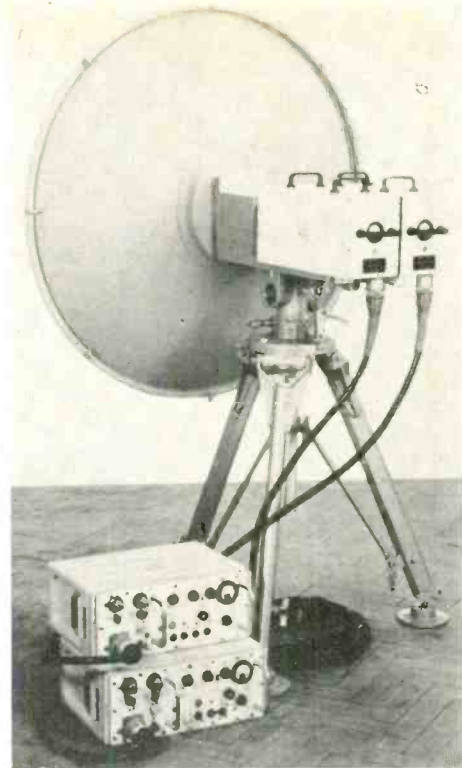
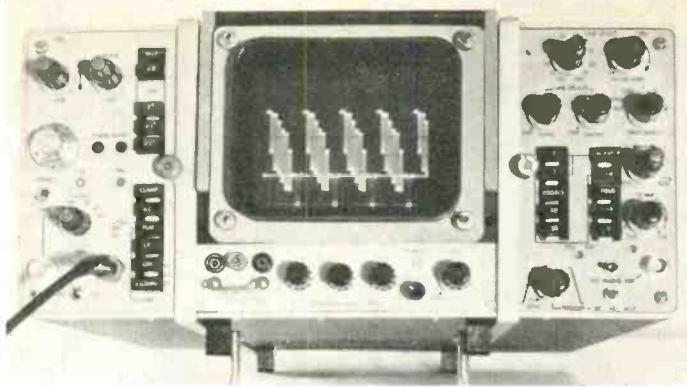
continued

Right: Dynamco 7060

Far right:
Microwave receiving
terminal.

Below: EMV 8 kW
Band 4-5 colour tv
transmitter.

Below right:
EMV 1W tv
transposer.



even field selection, same field pulse and bar overlay, and a claimed 0.1 dB chrominance/luminance gain inequality. Module 7114 is intended for 71 oscilloscopes and has 30 MHz scope facilities plus tv displays for all line standards. Dynamco will display a range of oscilloscopes including a small 15 MHz battery powered unit and 50 MHz two channel and four channel units. In addition to lighting control equipment, **Dynamic Technology** offer a series of audio and video modules including the 139 sound distribution amplifier, 145 isolation amplifier, 1009 video equalising distribution amplifier, 125 dimmer, 144 dimmer mounting bay and 203 colour error corrector.

Visitors to stand G1 will be able to see examples of tubes made for radio and tv broadcasting by **English Electric Valve**. Also on display will be cathode ray tubes made for studio applications by the M-O Valve Company with whom EEV are now associated. A colour tv monitor will show pictures produced by leddicon lead oxide pickup tubes. These pictures will come from Marconi Mk8 automatic colour cameras using EEV tubes in a studio on the Marconi Communication Systems stand. In addition to the **STUDIO SOUND**, SEPTEMBER 1972

leddicons, the static display of tv camera tubes will include vidicons, image isocons and image orthicons. Klystron amplifiers on show will be indicative of the EEV range for use in uhf tv transmitters, featuring compatibility with solid state drives, external cavity design and simple tube replacement procedure. Completing the display will be triodes and tetrodes for radio broadcasting, fixed and variable vacuum capacitors for transmitter and aerial tuning and M-O Valve monitor, projection and monoscope cathode ray tubes. The Hungarian broadcasting industry will be represented for the first time at the IBC by **Elektromechanikai Vallalat (EMV)** of Budapest. EMV commenced the development and manufacture of sound and television broadcasting equipment in 1952 and are currently producing vhf transmitters (5W to 10 kW), medium and shortwave transmitters (1W to 20 kW) and transposers. A supporting range of accessories will be exhibited on stand B10. EMV representatives will be Mrs K. Panczel, Mr V. Regenye, I. Vydareny, L. Hetenyi and A. Ecsery.

Future Film Developments, on stand B26, plan to show items from the Pearl (Sweden)

range of microphones alongside a Sait sound control desk. Future Film also handle the Triadex Muse (see page 83) and a balanced amplifier of particular value in broadcast telephone conversations. The Allotrope range of audio cables and connectors will be displayed.

The **Link Electronics** line-up for IBC 72 is a wide range of compact modular television test equipment for colour and monochrome applications. This includes the Link Camera Tube Test Channel capable of evaluating

continued 63

NOT AT THE I.B.C. . . .

but there is no need to go around in circles looking for video monitors when we are in Coventry manufacturing one of the widest ranges of video monitors currently available. Good looking equipment, well designed, well built to complement your studio, or other application. Why not come and see us here, and our 14 standard models of Monochrome monitors?

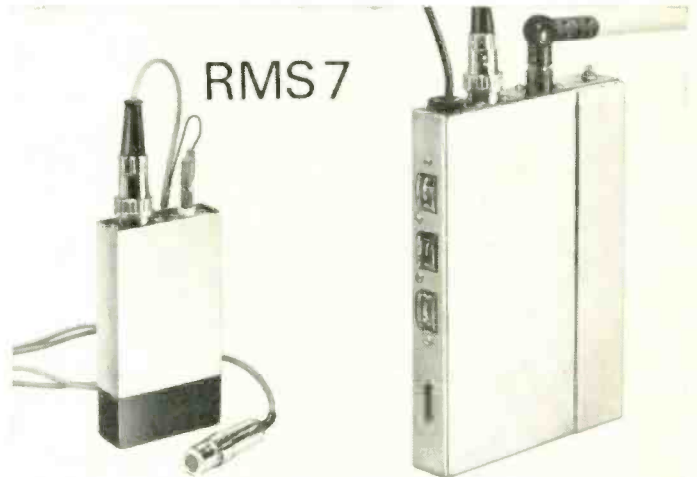
**No gimmicks, down to earth
British engineering at the right
price.**

**Contact Julian Goffe on Coventry
(0203) 89636 for further details**

Cotron
ELECTRONICS LTD

Eden Street · Coventry · CV6 5HE

new radio microphones by audio limited



Developed out of our original Audio Ltd. Radio Microphone System, we now offer for prompt delivery an improved RMS 7 system in which the newest electret capacitor microphone is used. By slightly enlarging the receiver, we have incorporated a block aerial filter to greatly reduce cross modulation interference and facilitate multi-channel operation. The receiver has battery, signal level and tuning meters, also plug-in whip aerial and output plug and lead. The transmitter is easily concealed in the pocket or about the user, and the microphone supplied is smaller than the plug used to connect it. We shall be pleased to forward full technical information on request.

COMPLETE SYSTEMS FROM £184
OTHERS FROM £115



RMS7H Hand held model

In RMS7H, microphone and transmitter are combined in a single unit. The transmitter is contained within the tubular handle which is as easy to hold and use as any conventional hand held instrument. The microphone can be cardioid or omnidirectional, and is the new electret capacitor type which offers the advantage of a condenser microphone without the problems of power supply for it. On-off switch is incorporated.

★ UHF AND HIGH POWER VERSIONS FOR USE OVERSEAS

Audio Ltd. Radio Microphone Systems as supplied to users in the U.K. conform precisely to Post Office regulations. More powerful systems and U.H.F. systems can be supplied for use overseas in compliance with locally stipulated operating conditions. Transmitters operating up to 500 MHz and with outputs up to 500m Wat 175 MHz can be supplied.

AUDIO LIMITED
26 WENDELL ROAD
LONDON W12 9RT

Telephone 01-743 1518



LOCAL RADIO

continued

comparatively short distance from town to Pebble Mill.

Because staffs are small—usually between 25 and 30, local radio is no place for the one man, one job principle. Peter Redhouse, manager of Radio London appears in his own gardening programme and Medway's station engineer, Dave Penny, produces and presents a programme about yachting. John Cordeaux of Humberside rushed off at five o'clock on the day of my visit to take over a programme in which the usual presenter couldn't appear. He had been asked to do it an hour or so before.

His enthusiasm for local radio is typical. The walls of his office are covered with photographs—souvenirs and antique pieces of sound equipment fill each shelf.

There is no reason why the two kinds of local radio should not be complementary. Each will be competing to a certain extent but why should the BBC stations worry if Radio One loses listeners to commercial stations? Local newspapers have more to fear from commercial radio than the BBC have. Many of the local newspapers have linked up with commercial radio companies to insure themselves against loss of advertisers. For this reason many newspapers, if not actively hostile to the BBC stations, ignore them but for printing programme schedules. Even these might not appear if the readers did not demand them.

Whether local radio is financed by the public or by advertising, both will be bound by the 1956 Copyright act. This restricts needle time to 75 hours a week, which the BBC has to share among all three networks. The existing stations are allowed one hour a day. There are ways round this; you can review records without including this in your allotted needle time or you can play only part of a record. The commercial stations will be no better off and will not be broadcasting as much pop music as many have suggested. There is the additional worry for the independent stations that they may not get their licence renewed at the end of each three-year period if they don't keep up a minimum standard, though this may prove to be less of a restriction than it should.

It is also clear that all the stations are and will be regional. The criticism of the BBC stations, that they were not truly local, has given way to pragmatism. In a speech on May 2 of this year Sir John Eden, the government's second Minister of Posts and Telecommunications, warned of a disposition to think of the new service primarily in terms of transmission areas. He continued: 'It is not simply the size of the area covered by the transmissions that makes a service genuinely local. It is the nature of the material broadcast, the relevance of the material to the tastes, interests and aspirations of the people who live in that particular area'. It should also be noted that the setting up of the IBA will encourage the networking of programmes.

We cannot say what commercial radio will

be like. We know what commercial television is like but, however appalling we find it, radio is not television without pictures. Nevertheless it is as silly for commercial radio to underestimate the BBC product as it is for the BBC to underestimate the common sense and integrity of those who will staff the commercial stations. For example, Jack Webster, a Canadian broadcaster, gave a talk at a commercial radio seminar in May this year in which he said that commercial radio would be 'radio that cares, radio that is totally unknown in this country'.

This statement is too harsh. Ray Beaty, for example, told me: 'I want to go for the ordinary Jack and Jill who have no means of expression in the media'. That does not indicate to me that 'radio that cares' is unknown here, and if Mr Webster is just a little out of touch with British broadcasting of whatever kind that may be because he now lives in Vancouver.

I also doubt if the British commercial radio lobby really believe him either; Mr Webster's remarks were directed, after all, at an audience invited by Beaverbrook Commercial Broadcasting. One wonders if the initials of that organisation, proudly displayed on the paper given to delegates for note-taking, are an unwitting example of the sincerest form of flattery.

**At the time of going to press we learn that, as anticipated in this article, Radio Durham will close in August and a new BBC station will open in Carlisle.*

IBC PREVIEW

continued

colour camera tubes being used in studios. A monochrome television camera, the Link 103 designed for studio and ob use, will also be shown.

Fixed and mobile microwave communication links will be exhibited by **Microwave Associates**, whose display will include an *MAB* multichannel demodulating system and *MLV* heterodyne system. A Microwave terminal is illustrated on page 61, complete with rf head unit housing a channel filter, balanced mixer and 70 MHz if amplifier, two outputs and demodulator, the other supplying a 70 MHz signal to repeater stations or system interconnections. An if group-delay equaliser is incorporated in both units. The balanced mixer is designed to reflect radiation from the local crystal-controlled oscillator, the channel filter further reducing residual signals by up to 70 dB. Connector wiring is such that no damage results if the tx and rx cables are accidentally reversed. An adjustable cable equaliser and de-emphasis network are incorporated together with separators to extract the video, audio and communication outputs.

Among units to be displayed by **NERA** (Oslo) is a 1 kW Band Three television transmitter featuring frontal access plug-in modular construction, fault indicators, remote and unattended operation facilities, and mainly solid state (one valve) circuitry. Power amplifiers of up to 20 kW are available.

Optional plug-in stereo and SCA generator units are offered with the **NERA 15W** solid state fm broadcast transmitter.

Exhibiting at their first IBC, **Neve** propose to feature the *BCM 10/2* general purpose transportable sound mixing console. Visitors to stand F2 will be able to balance a stereo reduction from an eight track tape. A 16 channel four group tv sound console will be shown, providing for the addition of a plug-in sub mixer. Among items of related equipment will be a limiter/compressor and two power amplifier assemblies, models *15W2P* and *15W1* (detailed on pages 79 and 81).

Plymouth Polytechnic (Electrical and Electronic Engineering Department) offer courses in television engineering, department head being Mr B. R. Webster. Examples of the courses offered at Plymouth are a four year professional engineering course for tv engineers working in broadcasting; a three year television technicians' course for those seeking employment in closed circuit installations; a three year tv graphics course; regular one-week introductory courses for teachers and others interested in educational tv techniques; regular three-week courses in colour engineering for experienced tv engineers; and evening courses in audio-visual aids. The department's interests encompass broadcast vtr, telecine and laser holography.

A new compact colour monitor and series of monochrome monitors are to be exhibited by **Prowest** together with colour studio video switching and mixing equipment. Main feature will be a complete studio video mixer and effects generator, including Prowest's

recently developed Encoded Chromkey system. IBC visitors who missed **APRS 72** will see for the first time the new **Shure SM61** omnidirectional microphone, designed to minimise mechanically transmitted noise in hand-held applications. Among other *SM61* features are light weight and a breath filter. Also to be shown, the Shure range of microphone amplifiers including the Audio Level Controller, Audio Control Centre, and Broadcasting Production Master.

Video Electronics will be displaying a range of modular, integrated circuit studio vision equipment for use in both colour and monochrome Broadcast, ETV and CATV systems. Products to be shown will include the revolutionary *Tapecode* and *Cuecode* videotape editing and cueing systems, for use with any standard videotape machine.

The lecture program begins on Monday September 4 with a series of talks on management and engineering training. These are followed on Tuesday by the subject of program origination and recording. Wednesday's theme will be signal distribution and satellites while Thursday is devoted to sound broadcasting and transmitters. This includes the description of a new RTE radio centre in Dublin, the future of sound broadcasting in Europe, and the equipping of local radio stations.

Educational broadcasting, propagation and receivers will be covered on the Friday session. The provisional schedule here includes coverage of a large screen tv projector with versatile control of geometry, and integrated tv if system using a surface wave filter, and an item on the Emley Moor tv tower.

A report to the industry on the Sansui Quadrasonic System.

One test of a four-channel coding system these days is: who's using it and for what?

Today, more and more record companies are turning to the Sansui QS system.

Last year, when A&M pressed its first four-channel LP, the system that Producer Lou Adler chose was the Sansui QS system.

Today, all commercial FM stations in Japan broadcast daily four-channel material encoded by the Sansui QS system.

Pye of England and Barclay of France have announced plans to release more than 100 QS-encoded albums by this fall.

In the U.S.A., ABC, Dunhill, Audio Treasury and Command have a dozen albums on the market, all encoded by QS. Project 3 is offering 20 albums—and plans to release others soon. Alto-Fonic has supplied music tapes encoded by the QS system to an FM network of 150 stations in the U.S.

It sounds like a trend, doesn't it?

Advantages of the Sansui QS Coding System.

We hope you already know about our QS Coding System. If not, here are some of the big advantages.

1. The QS system prevents possible directional error and loss of information during encoding. It does not place limitations on the recording or the broadcast engineer's technique.

2. The QS system is the only matrix system that permits, on the decoding end, reproduction of sound both in a full circle and at the dead center of the sound field.

3. The QS system does not degrade current standards of high fidelity sound reproduction. This includes all standards pertaining to noise, distortion, dynamic range and frequency response.

4. The QS system offers dual compatibility with existing two-channel stereo equipment; it actually improves the depth and dimension of conventional two-channel sound, while affording an outstanding "synthesizer" effect.

5. The QS system avoids the use of a high frequency sub-carrier. Resultant encoded material can be effectively played back even by a speaker matrix.

And therefore the system is economical and easily popularized.

Who Decodes QS?

If you're encoding records, you better also be selling a lot of decoding hardware. Or having other companies making compatible hardware for your system.

We're selling a lot of QS hardware. Other companies are selling a lot of very similar decoding hardware fully compatible with the QS.

Including Panasonic, Toshiba, Onkyo, Hitachi, Sanyo, Mitsubishi, Kenwood, Pioneer, JVC, Toyo, Scott, Nippon Columbia, Fisher, Pilot, Dynaco, Lafayette, Electro-Voice, Marantz, Broadmoor, Utah, Ampex, Admiral, Juliette, Heath, Allied Radio Shack and others.

Our Own Hardware.

The same kind of quality that makes our QS coding system so popular also makes our decoding equipment very popular.

Today, we have eight different models on the market in a variety of price ranges. The big one is the QR-6500, a 280-watt control amplifier and AM/FM multiplex stereo tuner. There are other, smaller receivers, too. And a compact four-channel consolidator package, which updates conventional systems at minimal expense.

Get to Know Us a Little Better.

We have great faith in the Sansui Quadrasonic four-channel system. We believe it is here to stay. Not only because we keep improving it, but because many important people in the industry are sold on it.

We hope you'll take the time to get to know us better.

Frankly, we believe the Quadrasonic coding system could change all your thinking about the potential of four-channel stereo.

Frankly, we believe it could change your thinking right now.



If you'd like to learn more about what we're doing, or if you'd like some technical information, write us at

SANSUI ELECTRIC CO., LTD. 14-1, 2-chome, Izumi, Suginami-ku, Tokyo 168, Japan
SANSUI AUDIO EUROPE S.A. Diacem Bldg., Vestingstraat 53-55, 2000 Antwerp, Belgium
SANSUI ELECTRONICS CORPORATION 32-17 61st Street, Woodside, New York 11377, U.S.A.

A Peak Overload Indicator

By David Robinson

ONE of the recent significant advances in modern sound recording has been the use of multitrack recording techniques. This has been a rapid and overwhelming change. When I first described a High Quality Studio Mixer in this journal (1964) I did not think there would be a need for more than two main outputs for however many inputs. By the time I wrote about the updated version in 1970 it was mandatory in the design to include details for up to 16 outputs, for it was then clear that the majority of popular recordings would be made on eight or 16 track machines.

Now we can see that eight track was only a passing phase and 16 track is now firmly entrenched as the new standard. Apart from a few skirmishes with 24 track, it seems likely that this will remain the standard for popular recording and there are signs that classical recording techniques will follow.

While this has given great flexibility to the producer and recording engineer, it has brought a new set of problems. Proper monitoring of levels is even more important than before, for two reasons. In a two track recording, the instruments are mixed together from many microphones prior to recording, so that each is at its correct level relative to the others. With multichannel recording, each instrument is (ideally for the purpose of this discussion) on a separate track, and in each case the recording engineer tries to make all meters indicate programme. Thus the meters respond to each track and not to the mix. There is thus the situation of bass drums and flutes and harpsichords all being recorded at 0 vu or higher on their own tracks, which produces a host of new problems, mainly in the form of distortion.

Quite apart from the natural desire to keep all meters swinging, there is the added need to

use high levels so that the noise contributions of each track will be minimised when the 16 tracks are mixed. From the mathematical viewpoint, if ten tracks are mixed at equal levels to form one new track, the signal-to-noise ratio will worsen by 10 dB. This theoretical degradation is in practice more; 12-15 dB is often measured. For this reason it is essential (and standard practice) to use noise reduction equipment with multitrack recorders, whether for classical or popular material.

Secondly, both noise and distortion are seriously increased by the necessary subsequent copying. Multichannel techniques introduce several more stages of dubbing before the cutting or duplicating master tape is prepared. With a few notable companies, it was not uncommon for the second generation tape to be used for this purpose. Most companies only reached third generation. With multichannel tapes, it can be fifth or sixth quite easily, with the first coming from a 16 channel master. It is therefore most important to monitor the programme level closely on each track when recording the master. To illustrate the importance of this, I can instance the example set by one major US company which has switched from vu meters to ppm. This, as readers who appreciate the arguments which arise between the two cults will understand, is an admission indeed.

This monitoring process is an area in which many current consoles are lacking. It is not possible to watch 16 meters (particularly vus, with their rapid fall time) to see the overloads. It is often no use rehearsing carefully as, during the 'real' take, everyone gives that little bit extra and you're over the top again.

My first exposure to the problem was when I expanded the mixer to four channels for some experimental quadrasonic recordings. I soon

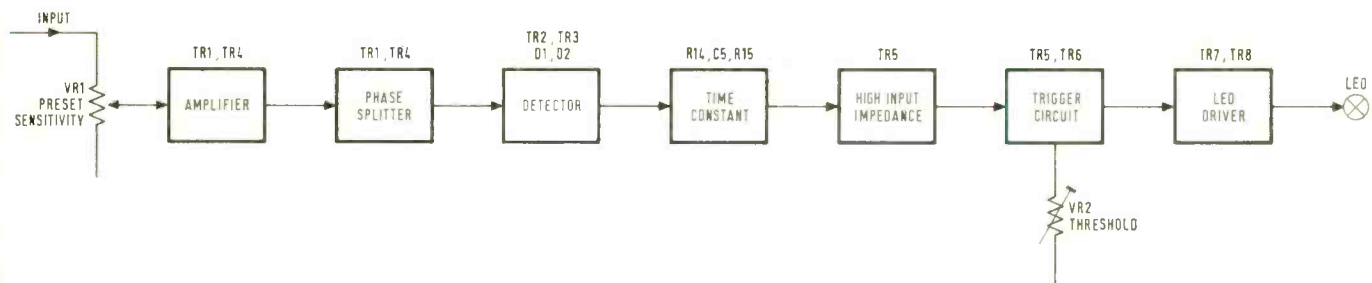
came to the conclusion that what was needed was a simple indicator which would give a clear sign of any overload. It must be small, so that several could be grouped to allow all 16 to be taken in together. The sensitivity must allow direct connection to the output of microphone amplifiers to show overload here, arising from the channel input presets being incorrectly set, or from a channel output to show overloading there. It would extend the use of the device if it could also be connected across the output of power amplifiers to show any problems in the amplifiers or speakers. The indicator must have a rapid attack time to show transients but must decay slowly to allow sufficient time to register the overload. Finally, it must be very reliable and cheap to make.

The obvious modern choice for the indicator itself is the light emitting diode, which is virtually everlasting, needs little current, and produces a bright red light with no time-constant problems. It is somewhat more expensive than a conventional bulb but each of the advantages for the led is a disadvantage for the bulb. Fig. 1 shows the block diagram of the complete unit.

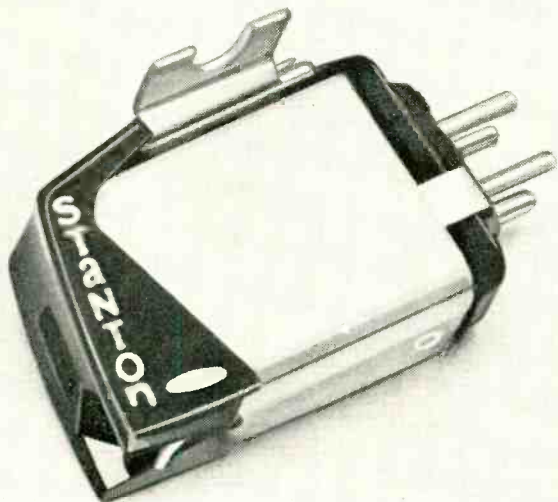
Input signals pass through a sensitivity control to an amplifier, allowing signals of as low as -10 dB (approximately 250 mV) to trigger the circuit. A phase splitter follows, ensuring that both positive and negative peaks cause the led to illuminate; an oft-quoted BBC statistic is that the two can differ by as much as 8 dB. The time-constant circuitry is arranged to be similar in attack time to a ppm, where a 3 ms tone burst registers within 4 dB of peak level; here this is translated so that if such a burst feeds the circuit at a level of 4 dB above the steady-state level which illuminates the led, it too causes the led to light. The time-constant

continued 67

FIG. 1 BLOCK DIAGRAM OF PEAK OVERLOAD DETECTOR



STANTON CARTRIDGES:



the starting point of fine hi-fi

Sound reproduction from a record can only be as good as the cartridge which tracks it: with the Stanton 681EE you ensure the best. The Stanton 681EE meets the most exacting requirements of the professional user and the discriminating enthusiast.

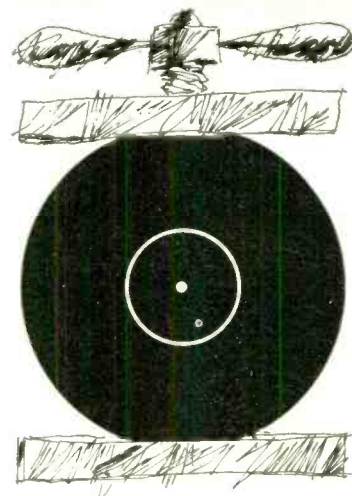
The Stanton 681 Calibration Series has an amazingly low-mass moving magnetic system which weighs only 1/5 or 1/10 of ordinary pickups. Its frequency response from 10 to 20,000 Hz is virtually a straight line.

Every 681 is guaranteed to meet the specifications within exacting limits and the most meaningful warranty possible — individual calibration test results — comes packed with each unit.

Ask for a demonstration of the Stanton 681EE at your local dealer, or write for details and specifications, plus information about the Stanton 500 Broadcast Standard Series. Trade enquiries welcome.

WILMEX LTD

Stanton Division, 24/26 Ensign Street,
London E1 Telephone: 01-949 2545



**for all Professional,
Custom, & Trade Pressings**

C. H. Rumble Ltd., Benedict Wharf, Benedict Road,
Mitcham, Surrey. Telephone: 01-648 5106

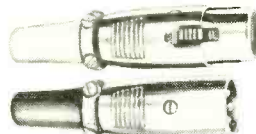
Audio Connectors

Speaking of Audio Connectors,
we have them in stock.....

Cannon, Smart & Brown and
Kings solder and crimp types
BNC, TNC, N and SMA series.

In addition, we can supply
connectors of varying types,
including Rack & Panel and
Circular in standard and
miniature configurations.

If the component you need is
not in our stock, we can
identify it and supply it quickly.



Why not telephone us now?

We'd like to demonstrate just
what PSP Service and technical
know-how can do for you.

PSP Electronics (London) Limited

Members of the Association of Public Address Engineers
228, PRESTON ROAD · WEMBLEY · MIDDLESEX
TELEPHONES: 01-904 9521 (FIVE LINES)
ITT CANNON AUTHORISED DISTRIBUTORS

continued

is determined by a resistor feeding a capacitor so that it may be altered over wide limits if desired. The decay time is longer than a ppm so that overloads of only a few dB are displayed for a reasonable time; in addition, the decay time is proportional to the amount of overload so gross overloads are certain of attention.

The resulting dc voltage is fed to a logic-trigger circuit which has no output until a threshold is passed, when it rapidly switches from one state to the other. The led, which is connected to the output of this circuit, thus switches completely on as the selected threshold point is passed. The transition occurs within 1 dB. If this trigger circuit were not used, the brightness would increase slowly making it very difficult to determine the true overload point. This part of the circuit is based on a design by Texas Instruments.

Fig. 2 shows the detailed circuit. The amplifier and phase splitter use an RCA transistor array integrated circuit. Transistors Tr1 and Tr4 from a long-tailed pair circuit whose gain is determined by the ratio of $R9/(R4 + R5)$ and $-R3/R4 + R5$. The outputs from the two collectors are thus equal if $R3 = R9$, and are out of phase with each other. The two emitters can be cross-connected additionally with a

resistor-capacitor combination to allow the use of a pre-emphasis characteristic. For example, if the indicator is used to show the possible over-deviation of an fm transmitter, then a 50 μ s characteristic can be added here. Similarly, some pre-emphasis can be used for low speed cassette master recording.

Transistors Tr2 and Tr3 are emitter-followers providing low output impedances to drive the rectifier circuit and the time constant capacitor C5. The dc voltage on C5 is therefore proportional to the ac input signal. The decay time-constant is formed by R15 and C5, together with the input impedance of the field effect transistor Tr5 which is very high and can be neglected.

There are some occasions (high power amplifiers, rf transmitters) where an indication of overloads as brief as 10 μ s may be required. This can be obtained with the circuit by shortening R14. Intermediate values will obviously give appropriately scaled attack times.

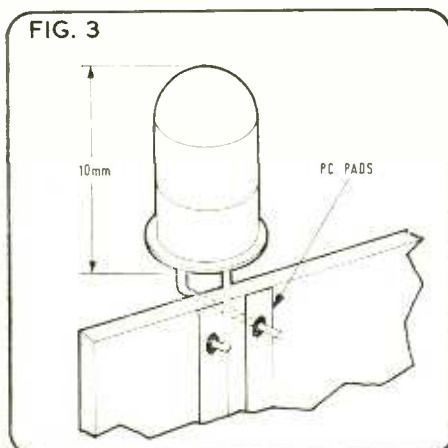
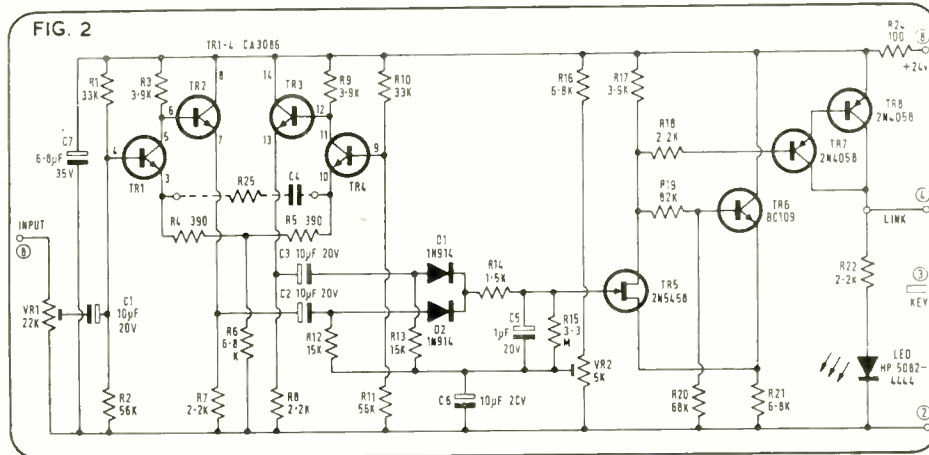
Transistors Tr5 and Tr6 are connected as a Schmitt trigger circuit using an fet for Tr5 to maintain low loading on C5. To understand the operation of the circuit, consider the initial case where the dc input to Tr5 is such that it is in the non-conducting state. Tr6 is arranged to be in the conducting state by suitable choice of R16 and R17. The emitter of Tr6 (and hence the source of Tr5) is thus at a positive potential with respect to the gate of Tr5. As the dc on C5 (and therefore on the gate of Tr5) increases,

trigger circuit and allows the use of fets with pinch-off voltages of 1V to 5V.

The construction of the unit is straightforward. As with most of these published circuits, there is a printed circuit available which is complementary to the others. The led can be mounted at one end of the board for applications where it is desired to group many boards together (fig. 3). Two positions are provided, one of which raises the led above the edge of the board to allow it to protrude through a panel. Alternatively, the led can be mounted externally, remote from the board, which allows the packing density of multiple indicators to be very high. Finally, the same circuit can be used with an incandescent lamp, and there are types available for board or remote mounting. The circuit for this is shown in fig. 4.

Setting up is straightforward too. It is easiest if a high impedance dc meter is available. With no signal input, turn the potentiometer RV2 to a minimum and check the dc voltages present in the circuit. These should conform within 2V to the values shown in the circuit diagram. Next transfer the dc meter to the gate of Tr5. Gradually increase the voltage by turning RV2 until the led operates. Then reduce RV2 until it goes out; the control must be moved very slowly to avoid errors introduced by the time-constant RV2/C6. Note the voltage and then adjust RV2 to give a gate voltage of 1.5V below that voltage at which the led went out.

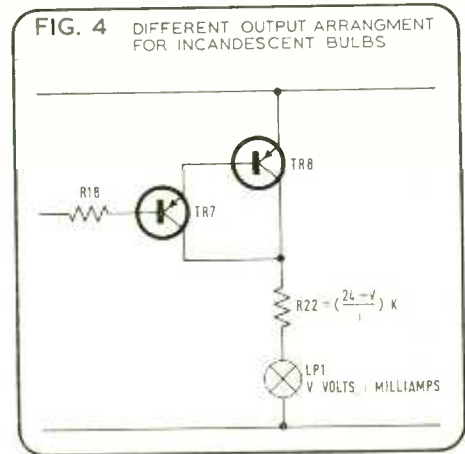
continued 71



there comes a point at which Tr5 starts to conduct. More current flows in R16, lowering the base drive to Tr6 which in turn conducts less. Hence the potential on Tr6 emitter drops, increasing the gate-source voltage of Tr5 which conducts harder. The process is self-accelerating and the circuit rapidly changes state. Similar reasoning can be applied to falling gate voltages.

The change in drain voltage is used to switch the two transistors Tr7/Tr8. The led is connected into the collector circuit.

The pinch-off voltage of field effect transistors varies considerably, especially in the cheaper varieties. To achieve consistent results, some compensation for this effect must be incorporated into the design. RV2 sets the dc voltage on the gate in the absence of signal to be about 1.5V below the operating point of the Schmitt

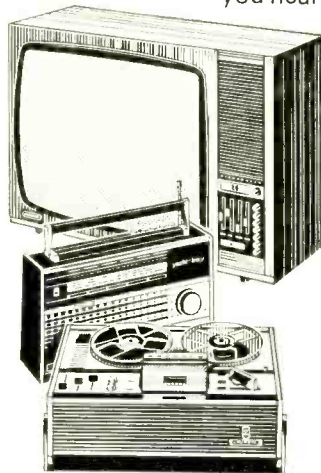


Sounds too good to lose



If anything is worth recording it's worth recording well. And that means getting a Grundig to do the job properly. A precision-built reel-to-reel tape recorder with a moving-coil microphone designed and made to hear as clearly as you do. A machine with a recording head precision-engineered to make sure every sound is recorded exactly as it comes in. A machine with a strong steel chassis to protect all

that superb circuitry. Slider controls, like the ones you see on big studio consoles, for extra precision in setting. And for playback, a full-sized loudspeaker to make sure you hear exactly what you recorded with nothing missing! In short, a tape recorder designed by perfectionists, built with precision, rigorously tested, right for you, for life. Worth while? Just lean back and listen.



GRUNDIG

The difference is incredible

Mini Minimising Print-through

By Michael Gerzon

SOME RECENT results (see reference) by E. D. Daniel and D. L. A. Tjaden on tape print-through have an important practical consequence to users of audio tape and to designers of tape mechanisms who wish to avoid print-through.

For many years there have been arguments about whether tape should be stored 'oxide in' (i.e. with the tape oxide coating facing the reel hub) or 'oxide out'. Most people who have come across this have been faintly sceptical of the claim that 'oxide out' tape storage reduces print-through but many people who have tried it have found that indeed it seems to work.

At last the above mentioned research has provided the true answer. For the least objectionable print-through, tape should be stored oxide in (as usual) on the take-up spool but oxide out on the feed spool. It is clear that those who claimed that oxide out storage gave less print-through store their tapes on the feed spool.

An oversimplified account of what happens is as follows (see the reference for fuller details): when a signal is recorded, the magnetisation of the tape causes external magnetic fields to appear symmetrically on either side of the tape coating. These fields cut across the coating of adjacent layers of tape, generally in a diagonal direction. Print-through causes these adjacent layers to become magnetised by the fields both laterally (i.e. in the direction of motion of the tape) and perpendicularly (i.e. across the thickness of the oxide coating). The external fields caused in turn by these lateral and perpendicular magnetisations of an adjacent layer add up on one side of its tape coating, and subtract on the other (see fig. 1). The print-through effect is symmetrically disposed about the coating of the layer which causes the print-through. The print-through will therefore have an 'additive' effect on, say, the head side of the coating of the adjacent layer on one side and on the base side of the coating of the adjacent layer of the other side.

The net effect is that the playback head sees more print-through on one adjacent layer than on the other. True, the print-through is really the same on both adjacent layers but, whereas the stronger additive print-through is seen by the head on one, it disappears harmlessly through the tape base away from the playback

head on the other. Thus either the pre-echo will be stronger than the post-echo, or vice-versa.

Which echo will be worst in any particular case? A good rule of thumb is that a layer of tape will cause worse echoes on adjacent layers by print-through through its base than by print-through onto tape on its coating side (see fig. 2). For obvious musical reasons, a pre-echo is much more annoying than a post-echo. Thus the tape should always be wound so that its oxide coating side points towards the music recorded earlier, as print-through from the coating side is least severe. This means: wind the tape oxide in on the take-up spool, and oxide out on the feed spool.

Thus, for any long-term storage of recorded tape, it is a good idea to store it oxide in and

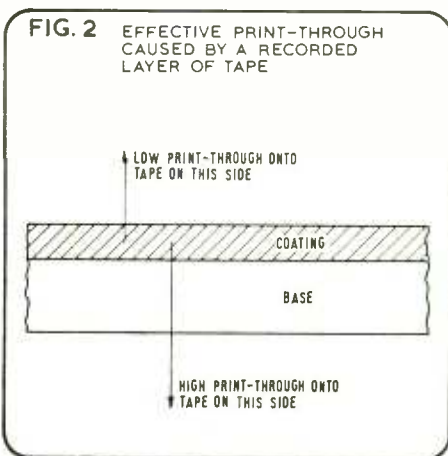
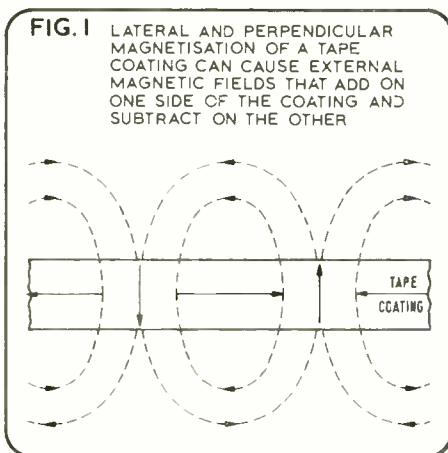
tail-end out (i.e. on the take-up spool). This procedure is in fact already widely used in the industry and it is worthwhile here pointing out the other overwhelming advantages of this mode of tape storage. Not only is the basic print-through less annoying, but the effect of print-through is reduced in two further ways. First, tape winding always occurs before replay rather than after, and it is well-known that fast winding helps to reduce print-through. Second, in a partly filled recording tape, the recorded portions will normally be stored with a smaller radius than the unrecorded portions. This means that any echo occurs sooner after the music, which at a tape speed of 38 cm/s can cause an appreciable reduction in its annoyance value.

A further advantage of storage on the take-up spool is that, after a complete playback, the tape will be stored neatly wound, instead of with the rough wind often encountered with storage after fast rewind on the feed spool. Neat wind is not merely an aesthetic requirement. It renders the tape almost immune from handling damage to the tape edges, and prevents the edges of isolated layers of tape from being badly deformed or curled during storage. Neat wind also allows badly deformed tape (which suffer from severe drop-out) to smooth itself out gradually by means of the gentle pressure of adjacent tape layers. This often causes a marked reduction in drop-out during subsequent playbacks or recordings. This ability to prevent and cure tape deformations (other than stretching) is most effective with long play tape, less so with standard play. Neat wind also prevents dust and atmospheric contamination from covering the exposed oxide of poorly wound layers.

There are some lessons to be drawn in understanding how pre and post-echo differ. Never leave recorded tapes oxide-in on the feed spool for long periods, especially in warm conditions. Similarly, never leave recorded tape oxide-out on the take-up spool longer than necessary. If independent recordings are made on different tracks of a tape (e.g. half track mono or quarter track stereo) wherever possible make both in the same direction so that the same mode of storage will minimise print-through on both. This is particularly important on archive material and, if it is not possible to switch to the unused track(s) on the record head of a standard machine, the expedient can be adopted of using one track at a time of a two track stereo machine for half track mono, or two tracks at a time of a four channel machine for quarter track stereo.

It is worth looking at the possibility of storing the tape oxide out on the feed spool and oxide in on the take-up spool. On conven-

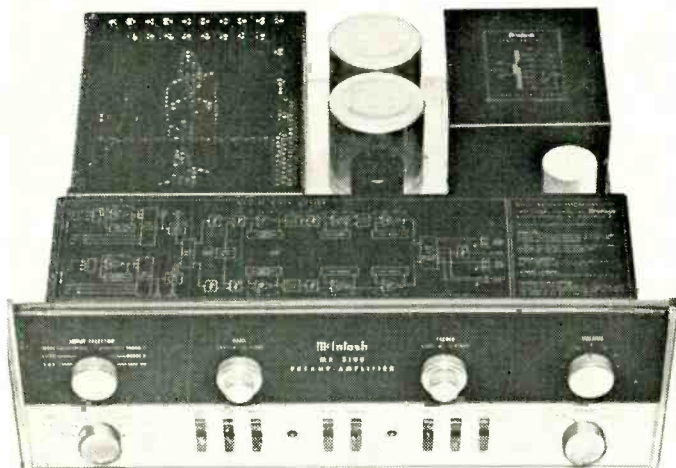
continued 71



Reference

Eric D. Daniel, 'Tape Noise in Audio Recording', *Journal of the Audio Engineering Society*, Vol. 20 pages 92 to 99 (especially 97 and 98), March 1972

McINTOSH IS HERE!



McIntosh MA5100 integrated amplifier.

With nearly all products, there is one make that stands head and shoulders above others, revered and coveted by everyone. In hi-fi, the name is McIntosh from America.

In these days of production rush and economy, the McIntosh policy of "assured performance" makes it significantly different from the rest. Every McIntosh unit - *every one* - is tested to be equal to or better than the superb published specification. At McIntosh,

more time means more care and protection for you. You will hear music as never before! McIntosh innovations in solid state electronics allow you to hear new beauty and subtle passages that until now have been clouded by lower reproduction standards. McIntosh is very expensive - outstanding performance cannot be bought at a standard price.

Listen to McIntosh at your nearest franchise dealer, or write for details and specifications.

WILMEX LTD

Import Division, 24/26 Ensign Street, London E1 8JD
Telephone: 01-949 2545

Grampian

POWER MODULES OF ULTIMATE RELIABILITY AND COOLEST RUNNING

Equipment engineered to the highest technical specification and setting a new standard for the reliability requirement of Professional and Rental use.

Write for the complete specification of the Series 7 Power amplifiers used, to I.E.C. 268.3.

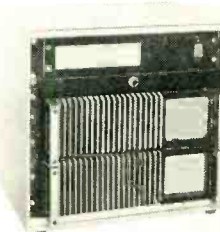
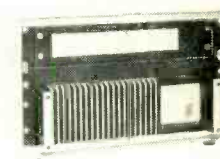
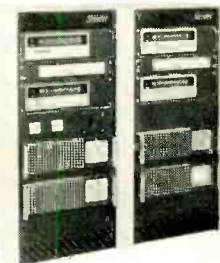
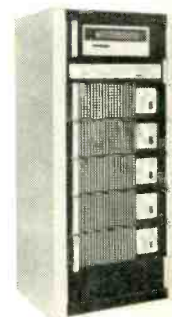
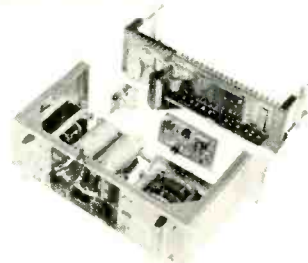
*The Solid State Power amplifiers used in the installations illustrated are distinguished by the following features:

- * 50 and 100 watts **continuous** sinusoidal output into reactive loads having phase shift up to 35° make these Power Amplifiers suitable for many industrial applications in addition to use in Audio Systems.
- * A new technique of assembly using flexible printed wiring, interchangeable modules and providing access from the front.
- * The most complete protection systems available.
- * Die-cast machined front panel heat-sink. No separation of forced cooling needed for stacking on racks. In an ambient temperature of 20°C the front panel does not exceed normal human body temperature under continuous speech and music drive to full rated output.

The input and control circuits used are distinguished by the following features:

- * Extensive use of monolithic integrated circuits.
- * Use of Tantalum capacitors in signal coupling circuits throughout.
- * Solid state control of signal priority and channel selection.
- * Modular construction permits great flexibility in the design of specific systems.

Grampian manufacture all types of amplifying equipment, whether solid state or valve and for operation from AC supplies and battery. Everything for the complete installation is manufactured, thereby assuring you of long term service. Microphone and loudspeakers of all types together with necessary accessories, Reverberation and Ambiphonic Units, all made by a British company of forty years' experience.



Grampian

SOUND EQUIPMENT

GRAMPIAN REPRODUCERS LTD

HANWORTH TRADING ESTATE,
FELTHAM, MIDDLESEX.

Telephone: 01-894 9141.

MINIMISING PRINT-THROUGH

continued

tional ('oxide in') tape machines, this means putting a 180° twist in the tape between the feed spool and the head block. This is only practical if there is room for such a twist on the thickest tape likely to be used when the feed spool is full. Some machines do not have enough room for a twist, or can manage it only with long play tape. One must beware of those machines that cause the feed spool to 'swallow' twists when fast rewinding. Certainly avoid trying to fast-rewind with a twist when the tape is slack. DIN hubs or plates are out when a twist is used, as are spools with a very wide open space between spokes. To prevent mishaps it is normally better to use a twist that tends to make the tape rise off the reel, rather than one in the opposite direction that tends to cause it to fall.

Occasionally it has been found that when a twist is used with very full reels on some machines drop-out and wow-and-flutter can occur, especially with standard play tape. Despite all these possible snags, though, a 180° tape twist after the feed spool is practical on many good 6.25 mm tape machines. It is doubtful, however, if a twist will ever work with, say, a 50 mm machine. Also, it is clearly difficult to edit tape with a twist, especially if one tries to avoid touching (and hence contaminating) the oxide surface.

Another way of getting oxide out on the feed spool and oxide in on the take-up spool is to use a tape deck whose feed-spool motor is wired up to apply rewind and playback tension in an anticlockwise direction, as in

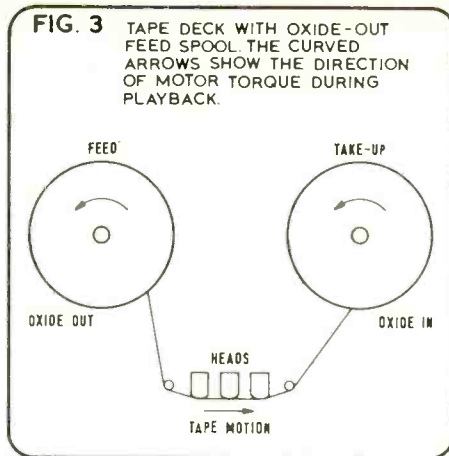


fig. 3. This is an ideal arrangement on a suitably designed deck, except that some tapes already recorded may be stored oxide in on the feed spool, as may new unrecorded tape. Clearly there will not be time to rewind unrecorded tapes during a recording session, and we are thus stuck with the ever-recurring problem of compatibility. The two methods of storage are incompatible on machines on which tape twists cannot be used. The problem ceases within an individual organisation if all the storage is on the take-up spool, and if the manufacturer supplies new tape oxide-out. As a desperate expedient, the tea-boy (or his equivalent) could rewind new recording tape to oxide out as it arrives. Even so, inter-studio problems may still arise unless take-up spool storage is always adhered to.

One dangerous solution to these problems is to have the feed spool switchable to either

direction. What an ideal way absent-mindedly to ruin precious mastertapes! Readers of this journal are well placed to try and think out their own solutions to this dilemma—if indeed it is a dilemma. Many will take the probably reasonable attitude that, as a recorded tape will only be on feed spools for short periods, print-through won't have time to set in, so oxide in will be satisfactory on the feed spool. Fine—but don't leave recorded tape on the feed spool during hot weekends.

Is the difference in print-through between the two modes of tape storage worth worrying about anyway? The difference between pre and post-echoes can be several dB and most people who have tried it find the difference clearly audible. One might argue that with Dolby and good tape it doesn't matter but this is clearly a matter of personal tolerance to faults. It is in any case good engineering practice to avoid a defect in the first place rather than to attempt to cure it after it has struck. Clearly, all archive material, and all material such as electronic music whose existence depends on tape, should be stored either tail-end-out and oxide in or tail-end-in and oxide out, preferably the former.

One last point. Once an idea gets into the heads of those in the audio world it tends to hang on and on and on, long after its *raison d'être* has disappeared. So it is necessary to point out that the difference in levels between pre and post-echo is caused by the ability of present day tape to be magnetised perpendicular to its surface. If in future a tape (perhaps a CrO₂ type) should come into use which does not have this ability then the difference will disappear, and whether oxide in or oxide out tape storage is used will then no longer matter. But it certainly does matter with present-day tapes.

A PEAK OVERLOAD INDICATOR

continued

Next apply a 1 kHz audio input, with the dc meter still connected. With RV1 fully up, the led will light at an input in the region of -10 dB. Gradually back off the input until the lamp just goes out, and remove the dc meter. If the lamp comes on and stays on, then the meter had been loading the circuit and RV2 may be reduced slightly until the light is extinguished again. The circuit is now correctly aligned for the dc conditions appropriate to the particular fet used for Tr5.

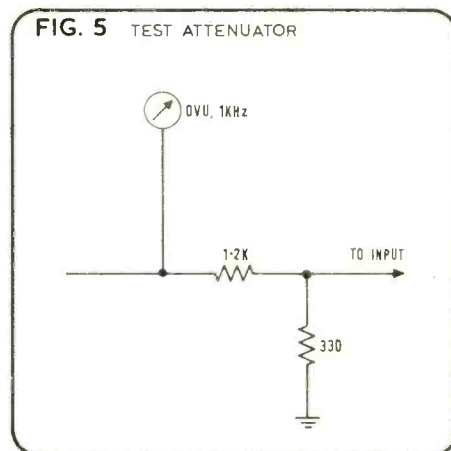
Second method

There is a second method of setting up without a dc meter, provided some method of ac measurement is to hand, either a meter or an oscilloscope. With RV1 set at maximum, feed a signal of -10 dB into the input. Fig. 5 shows an attenuator suitable for use with a vu metered signal. Adjust the dc potentiometer RV2 slowly upwards until the led fires. Check that it goes out on removing the ac input signal; this checks the operation of the amplifier and rectifier stages.

The final adjustment is to set the input potentiometer for the correct sensitivity for the particular application. This can be done by

reference to a programme meter already in use. It is suggested that a level of +6 vu or 2 dB above nominal peak (ppm 6) be used. Alternative methods are to use an oscilloscope or distortion meter to link the display with an acceptable distortion reading, or even to use your ears.

The circuit should provide a reliable accurate indication of peak overloads in an audio channel and allows the indications for a multi-



channel set-up to be grouped very close together. Not the least important, it is very cheap to build with readily available components.

Component Suppliers

Integrated circuit: RCA 3086

Electronic Components Supplies (Windsor) Ltd, Thames Avenue, Windsor, Berkshire.

38p each (+ 33p post and packing for any number).

Tantalum Capacitors (Union Carbide types):

C1, C2, C3, C5: 10 μF, 20V (Code K10E20). Price 14.6p.

C6: 1 μF, 20V (K1E20). Price 14.6p.

C7: 6.8 μF, 35V (K6R8E35). Price 14.6p.

Celdis Ltd, 37-39 Loverock Road, Battle Farm Trading Estate, Reading, Berkshire.

Prices include postage, but £1 minimum order charge.

Led: Hewlett Packard 5082-4444. Price 50p inc p&p.

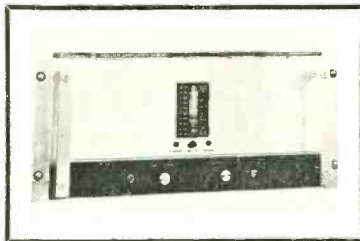
Hewlett Packard Ltd, 224 Bath Road, Slough, Buckinghamshire.

Pcb: Ref 225 from the author, c/o Link House. Price 40p inc postage.

change up to Crown International!

Crown International power amplifiers are available in various power sizes, but all share the fabulous Crown reputation for performance, and reliability as well as the 3-year warranty on all parts and labour. The same amplifiers used by groups such as Moody Blues, Fairport Convention, and Ten Years After are also selected by the Min. of Defence, The Post Office, and the C.E.G.B.—namely the DC300.

M600
£730



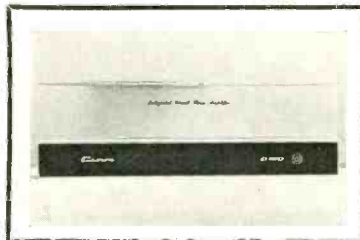
The M600 is new. It offers 1,000 watts RMS into a 4 ohms load with less than 0.1% THD at this level. Hook two together and you have 2,000 watts RMS into 8 ohms. It comes complete with two-speed cooling fan, comprehensive load protection, and a plug-in system for the front end. With the ability to slave 8 M600 units together, it becomes ideal for finally getting high quality sound at outdoor festivals.

DC300
£360



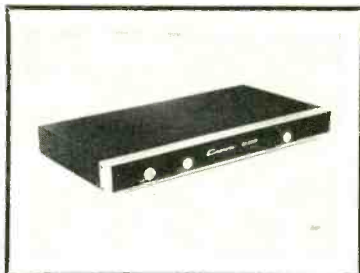
Recognised as the world's best power amplifier, and long used by such discriminating customers as Island Records, Led Zepelin, Jethro Tull, and many others. Each of the two channels can provide up to 340 watts RMS into 4 ohms, and being virtually indestructible, is very popular for hire companies.

D150
£199



With 150 watts RMS from each of its two channels, or 330 watts RMS into 8 ohms as a mono amp., the D150 is equally suitable for P.As or studio monitor applications. Sound Techniques Studios have long used the D150. Fairport Convention use it for Foldback. (DC300s for their main P.A.) The D150 will, of course, outperform all other brands of power amplifier.

D60
£97



The Slimline D60 again is a two-channel amplifier offering up to 60 watts RMS into 4 ohms from each channel, or over 100 watts into 8 ohms as a mono. amp. It is ideal for Disco and Club use, as well as for P.A. and domestic applications. It offers DC300 quality in a package only 1 3/4" thin.

More and more people are changing up to Crown International, having realised that any other choice is a compromise. Eventually, you will change to Crown, so why not make it now, and join the Elite. Full details of these fine amplifiers from sole agents:

MACINNES LABORATORIES LIMITED
STONHAM, STOWMARKET, IP14 5LB
TEL. STONHAM 486

Survey: Power Amplifiers

ACOUSTICAL

Acoustical Manufacturing Company Ltd,
Huntingdon.
Tel: 0480 2561/2

Quad 50E

Power response: -1 dB at 30 Hz and 20 kHz ref to maximum output.

Distortion: 40 Hz <0.35%; 1 kHz <0.1%; 10 kHz <1% any level up to maximum output.

Output source impedance: 0.5 ohms in series with 25 μ H for 5.5 ohm connection. Others in direct proportion.

Hum and noise: Better than 80 dB referred to full output.

Frequency response: Unbalanced input: -1 dB 30 Hz and 20 kHz ref 1 kHz; 600 ohm bridging: -2 dB 30 Hz and 20 kHz ref 1 kHz.

Input level: 0.5V for full output, balanced or unbalanced. Preset adjustment for higher levels.

Input impedance: Unbalanced: 14-50 K Ω depending on preset gain; 600 ohm bridging: 14 K Ω in parallel with 50H.

Stability: Unconditionally stable with any load.

Weight: 11.3 Kg with 600 ohm bridging transformer.

Dimensions: 120 x 159 x 324 mm.

APOLLO

Apollo Electronics, 96 Mill Lane, West Hampstead, London NW6.
Tel: 01-794 8326

PA.10 Plug-in monitor module.

Frequency response (+0.5 dB): 20 Hz to 20 kHz.

Input impedance: 47 K Ω unbalanced.

Input sensitivity: 0 dBm (770 mV rms).

Maximum input level: +19 dBm (7V rms).

Output source impedance: 0.2 ohms unbalanced.

Terminating impedance: 8 ohms.

Maximum power output: 12W (8 ohm load).

Total harmonic distortion: (10W into 8 ohm load): 85 dB.

Operating voltage: 32V AC.

Current consumption: 600 mA approx.

Dimensions of front panel: 190 x 45 mm.

Depth (including mating connector): 142 mm.

Weight: 630 gm.

Connector: 16 way DIL plug with gold-plated contacts.

AREAC

Areac Ltd, Summit Gardens, Halesowen, Worcs.
Tel: 021 550-2868

Model 100

80W rms stereo amplifier with master gain on each channel. Input equaliser modules available.

STUDIO SOUND, SEPTEMBER 1972

AUDIX

Audix BB, Stansted, Essex.
Tel: Stansted (027971) 3132/3437

There are seven amplifiers in the *Studio* series; the 1x15, 1x30, 1x80, 2x15, 2x30, and two versions of the 2x80, one with crossover at the input. These are 15, 30 and 80W amplifiers suitable for rack mounting or as free standing units and are designed and manufactured by Audix for recording and broadcast applications. All the amplifiers are unconditionally stable and contain protection circuitry to overcome conditions such as mismatch and short circuit. All active components with the exception of the output transistors are located on a plug in printed circuit board thus ensuring that any servicing is reduced to changing cards. In the case of the 30 and 80W amplifiers the rear panel is fabricated from a massive cast alloy heatsink thus ensuring that the amplifier can operate with a minimum of ventilation in high ambient temperatures. Each amplifier is fitted to an engraved, natural anodised, extruded aluminium front panel. Each frame can house either one or two amplifiers and can be supplied with input transformers, common connectors, etc., as required. To cater for modern monitoring systems the twin amplifiers incorporate adjustable filter networks fitted to the input to enable separate amplifiers to drive high and low frequency loudspeakers independently.

Specification:

Sensitivity: 200 mV for max output.

Noise: 95 dB below maximum output.

Power bandwidth: 5 Hz to 35 kHz at rated output into 8 ohms.

Frequency response: 20 Hz to 20 kHz ± 0 -0.5 dB at full power.

Distortion: 0.05 per cent at 1 kHz, 0.2 at 10 kHz from 200 mW to max power.

Power supply: 110 to 120V or 210 to 250V ac, 50/60 Hz.

CHYMES

Chymes Audio Electronics, 320 Barkham Road, Wokingham, Berks.
Tel: Wokingham 1970

Stereo units with power ratings of 200 and 400W rms in the two basic versions available. Multiples of these may be assembled into rack/cabinet mounts to special order. The power bandwidth extends to more than 25 kHz at maximum power output. Built-in load line limiting included together with open circuit protection. High stability with resistive or reactive loads together with reactive load fault protection. Input impedance is 18 K Ω and full load is developed into 4 ohms. Total harmonic distortion



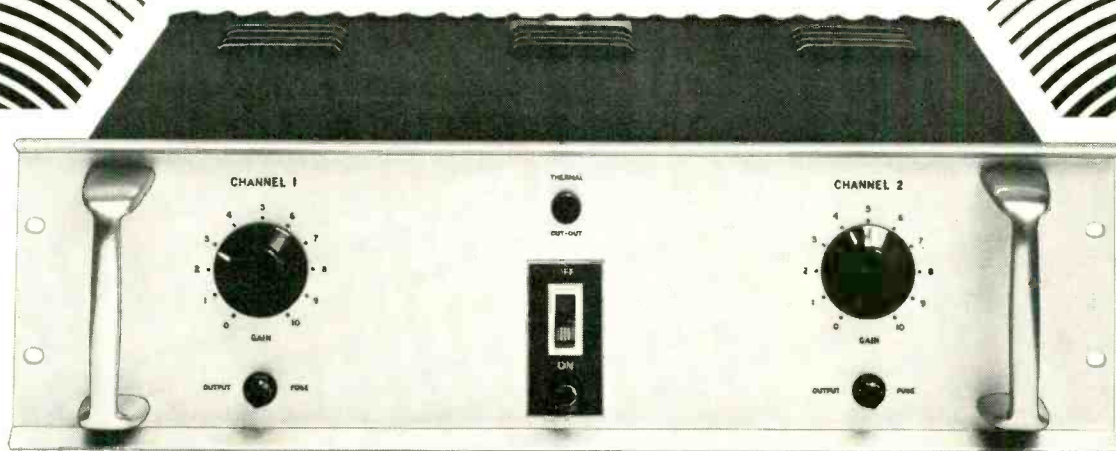
Above: Quad 303 and 50E power amplifiers. The 303 stereo (top) is designed to complement the 33 control unit and supplies 45W per channel into 8 ohms.

continued 75

audix

SOUND SYSTEMS AND ELECTRONICS

MONITOR



AMPLIFIERS

Three new amplifiers at 15, 30 and 80 watts (r.m.s.) suitable for rack mounting or free standing are now available for broadcast and recording studio monitoring. These units now supersede the well tried Studio 80 and represent a further improvement in the latest techniques of semi-conductor circuit designs. Stringent quality control and exhaustive test procedures combined with protection circuitry ensure continuous trouble free operation.

Typical Performance:-

Power Bandwidth:- 5Hz to 40KHz at rated output.
Frequency Response:- +0-0.5dB 20Hz to 20KHz at rated output.
Total Distortion:- 0.05% at 1KHz; 200mW to rated output.
Noise:- -100dB.

audix

MANUFACTURERS OF
SOUND SYSTEMS AND
ELECTRONICS

AUDIX BB LIMITED
STANSTED · ESSEX
TELEPHONE: STANSTED 3132/3437 (STD 027-971)

POWER AMPLIFIERS

continued

is typically 0.4% at maximum output and signal-to-noise ratio is typically +78 dB. Metal cabinets are available together with a variety of input modules including a comprehensive discotheque mixer at additional cost. The chassis versions of these units cost £79 for the 200W and £147 for the 400W.

C.B. ELECTRONICS

C.B. Electronics Ltd, 23 Halford Road, London SW6.

Tel: 385 4774

CB200

1 x 200W into 8 ohms or 2 x 100W into 4 ohms.

CB400

4 x 100W into 4 ohms.

2 x 200W into 8 ohms.

Power bandwidth: 20 Hz to 60 kHz.

Input sensitivity: -10 dBm.

Hum and noise: Better than 90 dBm below maximum output power.

Distortion: less than 0.1% at all levels.

General description: These amplifiers are designed to meet the demand for high quality, high powered audio amplifiers. The units are enclosed in slim-line anodised aluminium cases which are standard 480 mm rack mounting.

Dimensions: CB200: 88 x 430 x 347 mm.

CB400: 132 x 430 x 347 mm.

All inputs and outputs are via Cannon connectors.

Price: CB200: £160. CB400: £220.

CROWN INTERNATIONAL

Agent: Macinnes Laboratories Ltd, Stonham, Stowmarket, Suffolk IP14 5LB.

Tel: Stonham 486

PC 300

Frequency response: ± 0.1 dB, zero to -20 kHz at 1W into 8 ohms, zero to 100 kHz ± 6 dB.

Power response: ± 1 dB, zero to 20 kHz at 150W rms into 8 ohms.

Power at clip point: typically 190W rms into 8 ohms, 340W rms into 4 ohms per channel.

Total output (IHF): typically 420W rms into 8 ohms, 800W rms into 4 ohms

IM. Distortion: Less than 0.1% from 0.01W to 150W rms into 8 ohms; typically below 0.05% max 0.05% (60 Hz to 7 kHz).

Damping factor: Greater than 200 (zero to 1 kHz into 8 ohms at 150W rms).

Hum and Noise (20 Hz to 20 kHz): 100 dB below 150W rms output (unweighted, typical 110 dB).

Slewing rate: 8V per μs (maximum value of the first derivative of the output signal).

Load impedance: 4 ohms or greater. Stable with all speaker loads. Stable with all capacitors less than 1μF, and all capacitors if isolated by 1 ohm.

Input sensitivity: 1.75V ± 2% for 150W into 8 ohms (26 dB gain, ± 0.1 dB).

Input impedance: Nominal 100 kΩ (10 kΩ at full gain).

Overall protection: All main supplies and line voltage are independently fused. Thermal switches in ac line protect against over-heating caused by insufficient ventilation. Four spare fuses for main supplies are stored on the inside of front-panel fuse access door. Controlled-slewed-rate voltage amplifiers protect overall amplifier against rf burnouts. Input overload protection is furnished by internal resistance at inputs of amp.

Power supply: 1 kw transformer with heavily-heat-

sunked high-current diodes and massive computer-grade filter capacitors storing over 48 joules of energy. Total of four regulated supplies (2 per channel) for complete isolation and stability.

Power requirements: Requires 50 to 400 Hz ac with adjustable taps for 117, 125, 234, 250V ± 10% operation. Draws 40W or less on idle, 500W at 300W output into 8 ohms per channel.

Heat sinking: Black-anodized heat sinks, thermally joined with chassis.

Controls: Heavy-duty independent input level controls are on front panel. Power switch, with adjacent pilot light is on front panel. Non-interacting balance controls are mounted behind screwdriver access holes which are behind front-panel access door. Slide switches mounted on sides allow two modes of V-1 limiting, one being for high-hysteresis loads.

Finish: Bright-anodized brushed-aluminium front-panel with black-anodized front extrusion, access door, and chassis.

Price: £360

D-150

Power output: not less than 75W rms per channel into 8 ohms (both channels operating) 20 Hz to 20 kHz at rated distortion. Typically 100W rms per channel into 8 ohms, 140W rms per channel into 4 ohms.

Power bandwidth: ± 1 dB, 5 Hz to 20 kHz at 75W rms per channel into 8 ohms.

Frequency response: ± 1 dB 20 Hz to 20 kHz at 1W into 8 ohms.

Hum and noise: 110 dB below 75W rms output.

Damping factor: Greater than 200 from zero to 1 kHz into 8 ohms.

Load impedance: 4 to 16 ohms (complete stability with any load).

Input: nominal 25 kΩ, screwdriver adjust on rear; input sensitivity 1.2V for full output.

Circuit: Unique wideband, stable design utilizing linear ic (dual op-amp). Total equivalent of 40 transistors, 24 diodes, and four rectifier-diodes.

Protection: Amplifier is short and mismatch and open-circuit-proof.

Power supply: Two capacitors with energy storage exceeding 20 joules. Total of two regulated supplies for complete isolation and stability. No fuses except AC power-line.

Price: £199

D-60

Frequency response: ± 0.1 dB, 20 Hz to 20 kHz at 1W into 8 ohms, ± 1, 2 dB.

Power response: ± 1 dB, 5 Hz to 30 kHz at 30W both channels (rms into 8 ohms).

Power at clip point: Typically 41W rms into 8 ohms, 64W rms into 4 ohms.

Total harmonic distortion: Below .05% at 30W into 8 ohms.

Damping factor: Greater than 200 (zero to 1 kHz into 8 ohms).

Hum and noise: 106 dB below 30W rms output unweighted band; limited 20 Hz to 20 kHz typically 115 dB).

Slewing rate: 6V per μs.

Load impedance: 4 ohms or greater. Stable with all speaker loads.

Input sensitivity: .775V ± 2% for 30W into 8 ohms.

Input impedance: 25 kΩ.

DC output offset: 10mV or less.

Load protection: Short, mismatch and open-circuit proof.

Overall protection: The line voltage is fused. Controlled-slewing rate voltage amplifiers protect overall amplifier against rf burnouts. Input overload protection is furnished by internal resistance at inputs of amp.

Power supply: Computer-grade filter capacitors with a special design low profile transformer. Two regulated supplies for complete isolation and stability.

Power requirements: 50 to 400 Hz ac on 120V or 240V ± 10%. Draws 15W or less on idle, 120W at 60W output into 8 ohms.

Heat sinking: The entire amplifier is used as a heat sink. Front panel extrusion acts as a heat sink along with the chassis covers.

Controls: Two input level controls on front panel with power switch and pilot light.

Price: £97

DJ

DJ Electronics (Hackney) Ltd, 122 Balls Pond Road, London N1.

Tel: 254 5779 and 254 4861

DJ100

A metal cabinet unit which delivers 100W into 8 ohms.

Price: £49.50

Discmaster

Similar to the above unit but with a wooden cabinet and an emitter follower output.

Price: £59.50

Both units have the following specification:

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

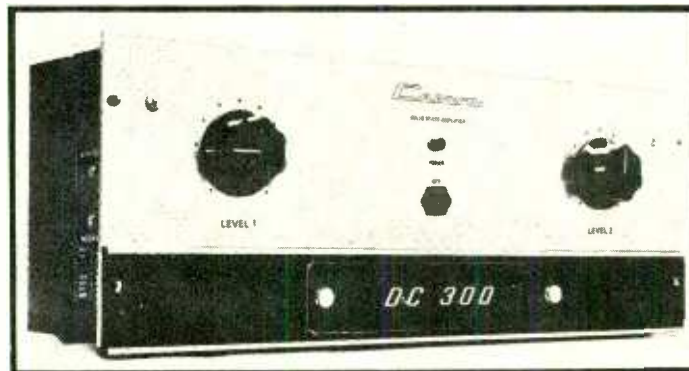
Input sensitivity: 700 mV at 20 kΩ.

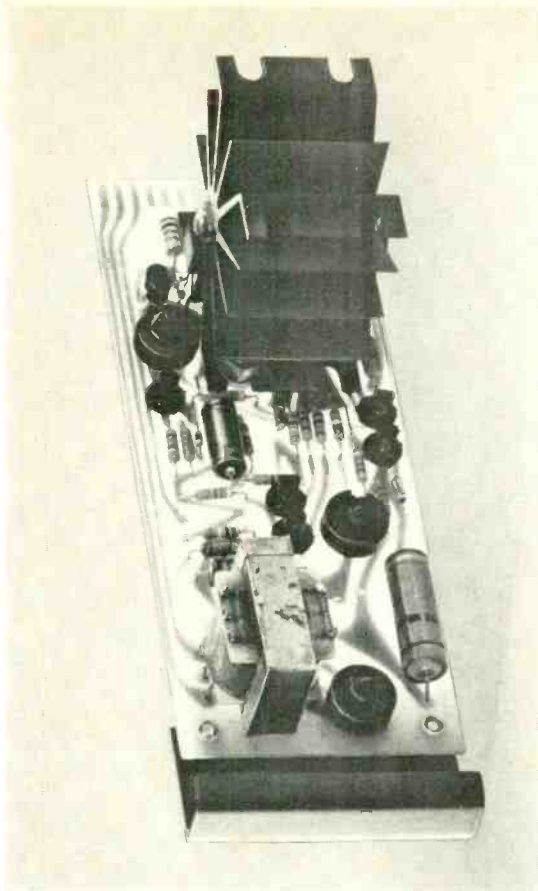
Power output: 100W.

Distortion: less than 1 per cent at 70W.

continued 77

Crown DC300





Modular Power Amplifiers: Electrosonic ES 1253 Double Power and ES 1254 Quadraphonic Power Amplifiers offer unique output capability coupled with laboratory standard performance. These features are essential for professional high quality sound reproduction and are achieved with solid-state fully complementary DC coupled circuitry.

The unique Electrosonic Combined Output technique enables a pair of amplifier channels to be used together for a mono output of 60 Watts r.m.s; singly the channels will give stereo outputs of 30 Watts r.m.s. each or (with the ES 1254) four channel outputs in excess of 20 Watts r.m.s. each.

Printed circuit based plug-in amplifiers (as illustrated), featuring specially designed heatsink and gold-plated edge connectors, are employed for reliability, efficiency, stability of operation and the highest standard of reproduction.

Ask Electrosonic about custom-designed audio systems: our range is suitable for the simplest system up to a complete professional theatre sound installation.



ELECTROSONIC

Electrosonic Limited Electronic Control and Audio Systems
47 Old Woolwich Road London SE10
Phone: 01-858 4784/5/6 Cables: Multiplex London SE10

**THE TPA 100D IS THE MOST ADVANCED
200W POWER AMPLIFIER MADE IN EUROPE**
Most professional recording and broadcasting
studios in the U.K. use TPA series amplifiers.



CLIENTS USING TPA SERIES AMPLIFIERS INCLUDE:

BBC Radio & T.V. ■ ATV Network Ltd ■ Thames T.V. Ltd ■ I.T.N. Ltd ■ RCA Ltd ■
De Lane Lea Processes Ltd ■ Electricity Research Council ■ Marconi Broadcasting Co Ltd ■
Ministry of Technology ■ Cavendish Laboratory ■ British Scientific Instrument Research Centre.

HH ELECTRONIC MILTON CAMBRIDGE TEL 0223 65945

POWER AMPLIFIERS

continued

GRAMPIAN

Grampian Reproducers Ltd, The Hanworth Trading Estate, Feltham, Middlesex TW13 6EJ. Tel: 894 9141

SERIES 7

Power unit: double wound mains transformer with electrostatic screen. Silicon bridge rectifier giving positive and negative supplies with smoothing by long life electrolytic capacitors.

Amplifier: Quasi-complimentary, class 5 configuration using four 115W single diffused silicon n-p-n output transistors. Direct coupled circuit using ac and dc negative feedback. Input and output transformers external to feedback loops.

Protection circuits: drive crippling circuits compare voltage and current of output transistors with programmed limits. Zener diode input voltage limiter. Anti-surge fuses in supply and low voltage circuits. Thermal cut-out on output transistor heatsink.

Semiconductors: Silicon bridge rectifier. 11 silicon diodes, Two silicon zener diodes, 11 silicon transistors.

Rated source impedance: 600 ohms.

Input impedance: 10 k Ω (for bridging 600 ohm line).

Rated source EMF: 1V rms.

Minimum source EMF for rated output: 0.8V rms with output control at maximum.

Protection: Circuit is protected against transient over-voltage up to 250V.

Rated output voltage: 100V rms.

Rated output power: 100W (50W version available). **Stability:** unconditionally stable with open circuit or any passive load. (BS 3860: 1965).

Effective frequency range: 100 Hz to 10 kHz -1 dB; 50 Hz to 15 kHz -3 dB, with rated input signal.

Total harmonic distortion: less than 0.5% at rated output at 1 kHz.

Signal-to-noise ratio: greater than 70 dB including hum.

Output control: rotary potentiometer in input circuit to adjust output from rated value to zero.

Supply switch: self illuminated rocker type.

Operating Temperature range: 0 to 50 C.

Dimensions: 483 x 133.3 x 320 mm.

Weight: 18 kg.

H H ELECTRONIC

H H Electronic, Industrial Site, Cambridge Road, Milton, Cambridge CB4 4AZ. Tel: 0223 65945

TPA 25D & TPA 25D-M

Maximum power output: 30W rms into 15 ohms; 45W rms into 7.5 ohms; 75W rms into 4 ohms.

Power frequency response: ± 0.2 dB 20 Hz to 20 kHz into 15 ohms ± 0.3 dB 20 Hz to 20 kHz into 7.5 ohms (full output in both cases).

Total harmonic distortion: Less than 0.1%, 20 Hz to 20 kHz at 25W into 7.5 or 15 ohm loads; 0.01% at 25W into 15 ohms at 1 kHz; 0.03% at 45W into 7.5 ohms at 1 kHz.

Input sensitivity: 0.5V for full output down to 100mV for full output (to customer requirement).

Input impedance: 15 k Ω gain control maximum.

Signal-to-noise ratio: -100 dB ref full output into 15 ohms (20 Hz to 20 kHz)—rack mounting version. Bench standing version and plug-in module -80 dB ref as above.

Damping factor: 200 with 15 ohm load; 100 with 7.5 ohm load



Protection: Proof against short circuit and open circuit operation.

Slewing-rate: Not less than 10V per μ s.

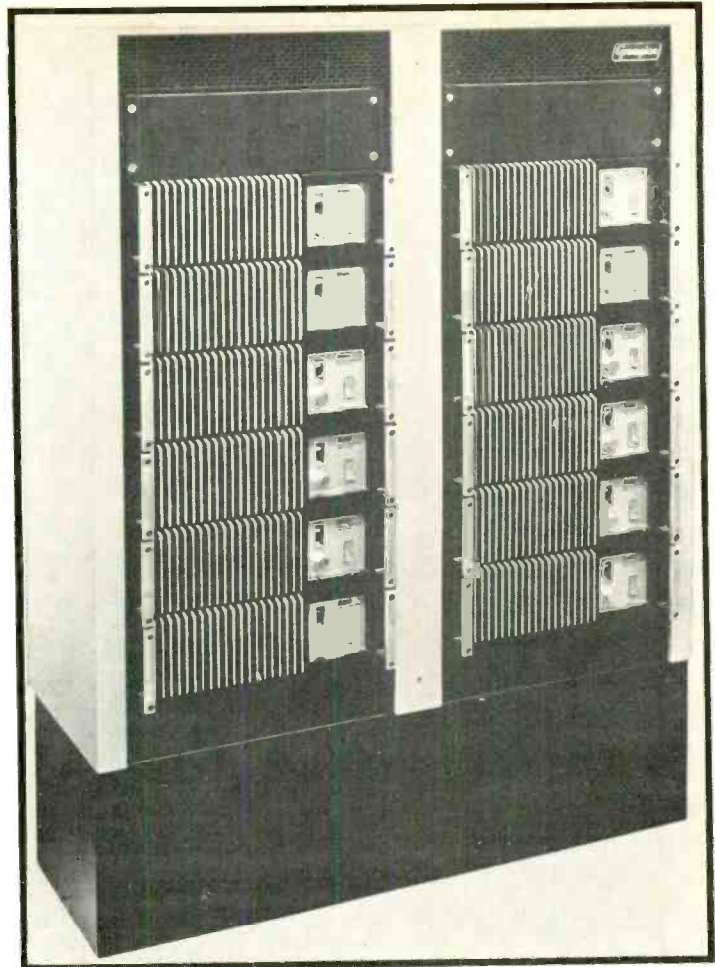
Operating temperature: $+50$ C without forced ventilation.

Price: £34 basic (25D-M: £38).

TPA 50D

Maximum power output: 60W rms into 15 ohms; 80W rms into 7.5 ohms; 100W rms into 4 ohms.

Power frequency response: ± 0.1 dB 20 Hz to 20 kHz into 15 ohms at full output; ± 0.2 dB 20 Hz to 20 kHz into 7.5 ohms at full output.



Right: Bank of Grampian Series 7 units.

Below: HH Electronic TPA 25-M.

Total harmonic distortion: Less than 0.1%, 20 Hz to 20 kHz at 50W into 7.5 or 15 ohms load; 0.01% at 50W into 15 ohms at 1 kHz; 0.03% at 80W into 7.5 ohms at 1 kHz.

Input sensitivity: 0.6V for full output down to 100mV for full output to customer requirement.

Input impedance: 15 k Ω , gain control maximum.

Signal-to-noise ratio: -100 dB ref full output into 15 ohms (20 Hz to 20 kHz).

Damping factor: 200 with 15 ohm load; 100 with 7.5 ohms load.

Protection: Proof against short-circuit and open circuit operation

Slewing-rate: Not less than 10V per μ s.

Operating temperature: $+50^{\circ}$ C without forced ventilation.

Dimensions: 483 x 89 x 305 mm (rack); 439 x 89 x 305 mm (bench).

Weight: 9 kg approximately.

Price: £53

TPA 100D

Maximum power output: 200W rms into 4 ohms; 120W rms into 7.5 ohms; 100W rms into 15 ohms.

Power frequency response: Reference 100W output at 1 kHz; 8 or 15 ohms load; Level $+0$, -0.5 dB, 5 Hz to 20 kHz.

Frequency response: Reference 1W output at 1 kHz 8 or 15 ohms load -0.5 dB at 5 Hz, -0.5 dB at 20 kHz.

Total harmonic distortion: Less than 0.2% at any level up to 100W into 7.5 to 15 ohms, 20 Hz to 20 kHz. Typically 0.05% at 1 kHz.

Take a QUAD 50E Amplifier (a good start for any installation)

plug it into your monitor system and it bridges 600Ω lines to drive your speakers.

Take that same amplifier and, without changing it in any way, plug it into another installation to deliver 50 watts into 100 volt line * from a 0.5 volt unbalanced source. This versatility and its attendant easing of stocking and maintenance problems is one reason why large organisations use the Quad 50E.

** or indeed any other impedance from 5 to 250 ohms.*



Other advantages appropriate to users of all sizes include:

Excellent power and frequency response (—1 dB).

Low distortion (0.1% at 1 kHz at all power levels).

Low background (better than 83 dB referred to full output).

Pre-set level control adjustable from front panel.

Unconditionally stable with any load.

Proof against misuse including open or short circuited output.

Small size (4 $\frac{3}{4}$ " x 6 $\frac{1}{4}$ " x 12 $\frac{3}{4}$ ")—
(120 mm x 159 mm x 324 mm).

QUAD
for the closest
approach to
the original sound

Send for details to Dept. SS3 ACOUSTICAL MANUFACTURING CO. LTD., Huntingdon, Hunts. Tel: (0480) 52561

POWER AMPLIFIERS

continued

Input sensitivity: 0.775V or 0.250V for 100W into 15 ohms at 1 kHz.

Input impedance: 10 k Ω \pm 10% at maximum gain.

Signal-to-noise ratio: -100 dB reference 100W into 15 ohms at full gain, 600 ohm source impedance.

Damping factor: 200 with 15 ohm load; 100 with 7.5 ohm load.

Protection: The amplifier will tolerate output short circuit and open circuit operation.

Operating temperature range: -25 C to 50 C.

Dimensions: 483 x 89 x 305 mm (rack).

439 x 89 x 305 mm (bench).

Price: £79

MARANTZ

Agent: Pysier-Britex (Swift) Ltd, Fircroft Way, Edenbridge, Kent.

Tel: 0732-71 2434

250

Total rms continuous power (both channels driven, at rated distortion, 20 Hz to 20 kHz): 250W into 8 ohms (125W per channel).

Total harmonic distortion: At or below rated power, 20 Hz to 20 kHz, less than 0.1%.

Intermodulation distortion: At or below rated power for any combination of two frequencies 20 Hz to 20 kHz, less than 0.1%.

Frequency response: 1W: \pm 5 dB, 2 Hz to 100 kHz; \pm 0.1 dB 20 Hz to 20 kHz.

Total noise: Better than 106 dB below rated power into 8 Ω .

Input sensitivity: 1.35V for rated power.

Input impedance: 100k Ω .

Damping factor: Greater than 100 at 8 Ω .

Semiconductor complement: 11 transistors; 18 diodes.

Optional accessories: WC-2 walnut cabinet; RA-1 rack adaptor.

Price: £329

500

Power output (total rms continuous power, both channels driven at or below rated distortion, 20 Hz to 20 kHz): 1 kW into 4 ohms (500W/channel).

Total harmonic distortion (at or below rated output 20 Hz to 20 kHz): less than 0.1%.

Input sensitivity: 1.75V for rated power.

Input impedance: 100 k Ω .

Number of semiconductors: 54 transistors, 11 diodes.

Power requirements: 120V ac, 2000W, 60 Hz, 220V optional on special order.

Price: £1,000

32

Power output: 120W rms continuous into 4 or 8 ohms 60W rms continuous into 16 ohms (60W rms continuous per channel, both channels driven into 8 ohms, 20 Hz to 20 kHz at less than 0.15% intermodulation and harmonic distortion).

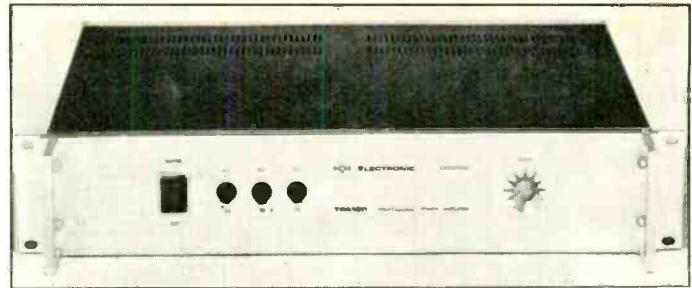
Comparable total music power (IHF): 180W into 8 ohms.

Price: £199

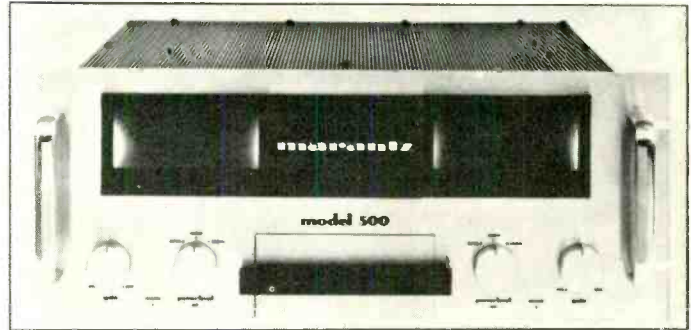
Crown D60 power amplifier.



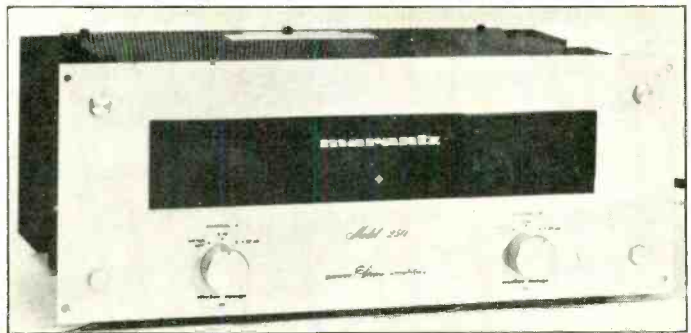
STUDIO SOUND, SEPTEMBER 1972



HH Electronic
TPA 100.



Marantz Model 500,
incorporating
vu meters.



Marantz Model 250
also incorporating
vu meters.

NEVE

Rupert Neve and Company, Cambridge House, Melbourn, Royston, Herts.

Tel: Royston (0763) 60776

15W 2P

Comprises two 15W power amplifiers and a separate 24V power supply mounted in an 8.8 cm high frame suitable for a 483 mm rack or as a free standing unit. Construction is modular to allow individual units to be removed from the front of the rack. The power supply has enough output to operate the Neve PSM range of portable mixing consoles or the BCM10j2.

Performance:

Input: 10 k Ω bridging, balanced, floating.

Sensitivity: variable with preset from -8 to +6 dBm at 10W into 8 ohms.

Output: 20W max into 8 ohms.

Frequency response: 20 Hz to 20 kHz \pm 0.5 dB at 15W.

Distortion: 0.1 per cent max over 20 Hz to 20 kHz at 15W output into 8 ohms.

Noise: less than -90 dB referred to maximum output.

Crosstalk: better than -70dB between amps.

Power supply: 24V at 3A, short circuit and overload protected.

continued 81

SOMETHING NEW!

"SIX INPUT 100 STEREO" AMPLIFIER



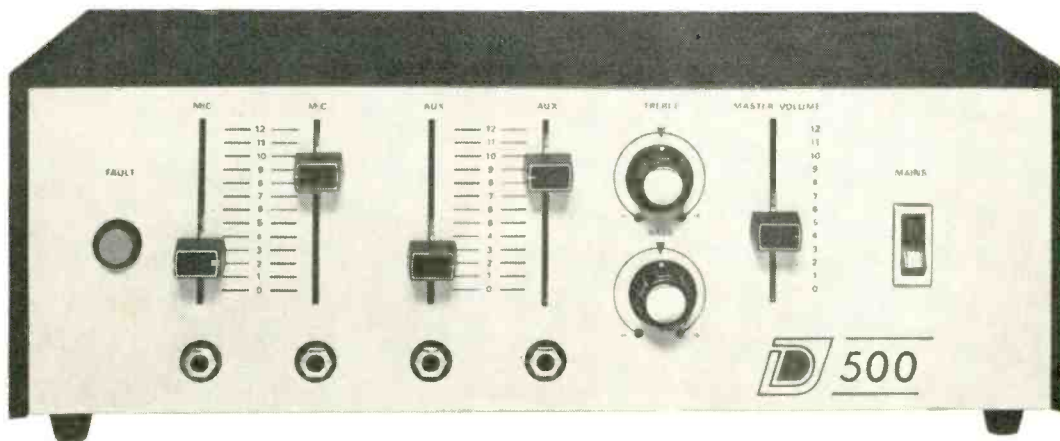
- ★ All modular construction 19in rack, 3 unit high
- ★ Interchangeable plug-in inputs (gold plated contacts)
- ★ All important pre-set gain (40 dBs variation) accessible from front
- ★ Pan (stereo width) control on each input
- ★ High signal level 'op amp' mixer, with separate Bass and Treble controls for music inputs
- ★ 80 watt R.M.S. modular stereo power amplifier with transistorised short circuit protection
- ★ Circuits designed and produced to professional standards



AREAC Ltd, Summit Gardens, Halesowen, Worcs

021-550 2868

NEW D.J. RANGE OF HIGH QUALITY P.A. AMPLIFIERS



D.J. 500

50 watts R.M.S. output

D.J. 700

70 watts R.M.S. output

D.J. 1000

100 watts R.M.S. output

Features

- ⊗ Exclusive "Fail Safe" Electronic Protection Circuit
- ⊗ Fault condition warning lamp
- ⊗ Built-in Bass boost below 30Hz
- ⊗ 4 channel Mixer with slider controls
- ⊗ Emitter follower Slave Amp output
- ⊗ Fibre Glass P.C. Boards

For full details of this range and all D.J. products, please write to the manufacturers:

D. J. ELECTRONICS (HACKNEY) LIMITED, 122 BALLS POND ROAD, LONDON, N.1

Telephone: 01-254 5779 and 4861

POWER AMPLIFIERS

continued

Power supply noise: better than -75 dBm at 1.5A and -65 dBm at 3A.

Mains input: 110 to 240V at 50/60 Hz.

15W4

Comprises four 15W amps and a power supply built into an 8.8 cm high frame suitable for mounting in a 483 mm rack or as a free standing unit. The construction is modular to allow individual units to be removed from the front of the rack.

Performance:

Input: 10 k Ω bridging, balanced and floating.

Sensitivity: variable by preset from -8 to $+6$ dBm at 10W into 8 ohms.

Output: 20W max (music power) into 8 ohms.

Frequency response: 20 Hz to 20 kHz at 15W, ± 0.5 dB.

Distortion: 0.1 per cent max from 20 Hz to 20 kHz.

Noise: less than -90 dB referred to the maximum output.

Crosstalk: better than -70 dB between amps.

ORANGE

Orange Musical Industries Ltd, 3 & 4 New Compton Street, London WC2.

Tel: 836 7811

Valve 50

Power output: 50 W rms.

Frequency range: 30 Hz to 20 kHz.

Distortion: 1% at 50W.

Input level: .775V for 50W output.

Input impedance: 10 k Ω bridging balanced.

Valve line up: Two ECC83, two EL34.

Price: £85.

Transistor 80

Power output: 80W.

Frequency response: 20 Hz to 30 kHz ± 5 dB.

Output impedance: 4 ohms.

Price: £95.

Valve 100

Power output: 75 to 100W rms.

Frequency range: 30 Hz to 20 kHz.

Distortion: 1% at 50W

Hum and noise: Better than -85 dB.

Input level: .775V for 100W output.

Input impedance: 10 k Ω bridging balanced or 250 k Ω unbalanced.

Valve line up: Two ECC83, four EL34.

Price: £165

'Killerwatt' Transistor 1000

Power output: 2 x 500W rms into 3 ohms.

Frequency response: 30 Hz to 20 kHz ± 5 dB.

Input level: .775V for full output.

Input impedance: 5 k Ω unbalanced.

Output into 15 ohms: 100W per channel.

Full protection circuits; fan cooled.

Price: £650

PYE TVT

Pye TVT Ltd, PO Box 41, Coldhams Lane, Cambridge, CB1 3JU.

Tel: 0223 45115

4067

Frequency response (relative to 1 kHz): Between $+0.2$ dB and -1.0 dB from 30 Hz to 15 kHz.

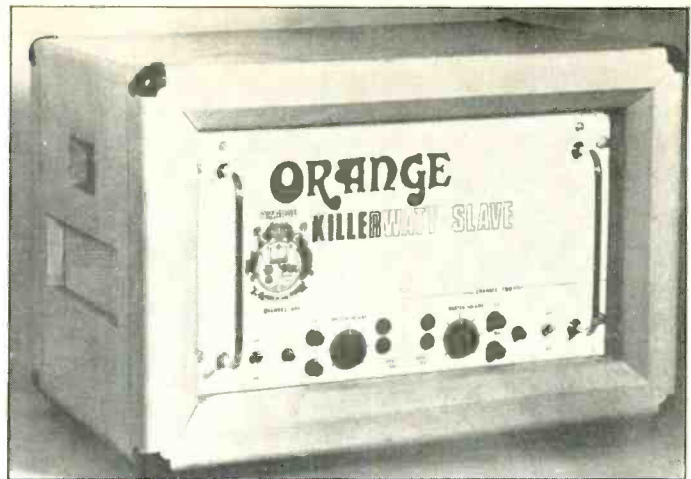
Gain: 25W output for $+4$ dBm input.

Input impedance: Greater than 10 k Ω at 60 Hz, 1 kHz and 8 kHz.

Supply requirements: 86 VA at 25W output, 32 VA under quiescent conditions.

Power supply: Adjustable over the ranges 100 to 125V and 200 to 250V ac, 47 to 70 Hz.

STUDIO SOUND, SEPTEMBER 1972



Orange Killerwatt
1000W amplifier.

Input isolation: Greater than 50 dB.

Noise: more than 90 dB below full output.

Distortion (15 ohms or 25 ohms load): less than 2% at 25W, 8 kHz.

Overall dimensions: 14.3 cm, 14.3 cm, Depth: 23.4 cm*

*including handle and mating plug.

Finish: Silver Anodised.

Weight: 6.15 kg.

5710

Input impedance: 10 k Ω balanced.

Input isolation: 50 dB.

Gain: 48 dB.

Noise level: 51 dBm.

Frequency response: 60 Hz to 8 kHz $+0 -1$ dB; 30 Hz to 15 kHz $+0 -2$ dB.

Distortion: 1% for 2W into 15 ohm load measured at 100 Hz, 1 kHz and 8 kHz.

Output level: 2W for -31 dBm input.

Output load: 15 ohms.

Supply requirements: $+24$ dc at 240 mA for 2W output.

Overall dimensions: 128 x 560 x 217 mm.

Weight: 880 gm.

Connector: 11-way ISEP.

Temperature range: -10 to 55° C.

Finish: Polychromatic silver.

RODEC

Agent: Allotrope Limited, 5B Thame Industrial Estate, Thame, Oxfordshire.

Tel: 437 1892/3

1572

Rms power output (both channels at 4 ohms): 60 + 60W; both channels at 8 ohms = 50 + 50W; both channels at 16 ohms = 30 + 30W.

Harmonic distortion: 40 Hz to 12.5 kHz = less than 1% at rated output. Intermodulation = less than 0.5% at rated output -3 dB.

Power bandwidth: -0.5 dB = 32 Hz to 23.5 kHz; -1 dB = 20 Hz to 30 kHz; at 50 + 50W rms.

Input: 0.77V/27 K asymm.

Channel separation: 66 dB.

Signal to noise: better than 90 dB.

Max ambient temp: 35° C for free air flow.

Securities: automatic electronic overload clipping below 3 ohms; four 2 A slow blow fuses on printed wiring; one 1A slow blow fuse in mains circuit.

Semiconductor complement: 18 transistors eight signal diodes, four rectifier diodes.

Dimensions: Front panel = 483 x 133 mm.

Weight: 8.7 kg.

Price: £100.

SPECTRA SONICS

Spectra Sonics, 770 Wall Avenue, Ogdon, Utah 84004, U.S.A.

Model 700

Continuous power output: 60W rms.

Power response: dc to 20 kHz ± 1 dB into 8 ohms at full output.

Total harmonic distortion: 0.01% at full output.

Signal-to-noise: 100 dB below 30W.

SUGDEN

J. E. Sugden and Company, Carr Street, Cleckheaton, Yorkshire, BD19 5LA.

Tel: Cleckheaton (09762) 2501

Studio power amplifier to be introduced shortly.

TRIAD

Trident Audio Developments Ltd, Trident House, 17 St Anne's Court, Wardour Street, London W1.

Tel: 734 9901/4

Provisional details only

Shortly introducing a range of power amplifiers designed for studio monitoring and similar purposes. Housed in slim rack-mounting cases, they will offer power ratings from 70 to 150W.

ELECTROSONIC (late entry)

Electrosonic Ltd, 47 Old Woolwich Road, London SE10

Tel: 01-858 4784/5/6

ES1251: 100W rms into 8 ohms 0 dBm balanced input.

ES1252: 100W at 100V line, 0 dBm balanced input.

ES1253: Stereo 30+30W rms into 8 ohms. 0 dBm balanced input.

ES1254: Quadraphonic 4 x 20W into 8 ohms. 0dBm balanced input.

Power response: 20 Hz to 50 kHz within 1 dB.

Input Impedance: 10 k Ω balanced.

Hum and noise: -88.5 dB below rated output into an eight ohm load.

Distortion: Less than 0.1 per cent at any power and frequency below rated output.

Stability: unconditionally stable for any load including an electrostatic loudspeaker.



**Finding out
is fun at the**

DO IT YOURSELF EXHIBITION

Here's an exciting exhibition for all the family. Even if you're a complete beginner, you'll find something of interest. And the expert will find hours of inspiration.

Help to make 'The largest marquetry mural in the World'. See how the Do it yourself Couple of the Year turned two condemned

cottages into an £8000 home. There are lots of helpful hints on how to improve your home. 250 exhibitors showing the latest in do-it-yourself equipment. Plus a large International Craftwork Exhibition.

So come along to Olympia. And find out how much fun improving your home can be.

OLYMPIA AUG 25-SEPT 9

Empire Hall 10am-9pm (Closed Sundays)

Admission Adults 25p Children 15p

20TH INTERNATIONAL HANDICRAFTS AND DO IT YOURSELF EXHIBITION. SPONSORED BY DO IT YOURSELF MAGAZINE.

It's fun finding out about DIY.

Triadex Muse Electronic Music Synthesiser

THE *Muse*, says the manufacturer's blurb, is a computer. It composes and plays music, instantly. Limitlessly. The *Muse* is the invention of two MIT professors that harness the most advanced computer technology for the purpose of putting notes together in interesting ways. In other words, of creating musical compositions. There are more than 14 trillion potential note combinations inside the *Muse*. That's what makes it so intriguing. It's almost impossible to exhaust its potential. Unquote.

Unlike the electronic music synthesisers previously discussed in these pages, the *Muse* can be switched on and played without any initial study of the working principles. Try that on a vc synthesiser and the ensuing silence refers you back to the instruction book.

This unit synthesises music as distinct from sound. The output is a rectangular wave, variable in pitch and rate of pitch step but fixed in tone. It composes a melody line which is governed in complexity by the settings of eight 40-position switches and simultaneously presents it at a volume, tempo and basic pitch governed by four linear slide controls. No musical knowledge is required of the operator; the *Muse* justifies its existence in allowing totally non-musical people to compose concordant and original tunes.

Occupying the table space of a small typewriter, the *Muse* presents a sloping fascia, silver-finished with blue and grey calibrations and black controls. An internal loudspeaker is mounted to the top left. Below this is a power off/on and 'start' control. At any stage in one's musings, pressing 'start' reverts a performance to its beginning. Right of this switch are volume, tempo, pitch and fine pitch sliders, plus a second three-position switch labelled 'auto/hold/step'. In the 'auto' state, a composition proceeds at a rate dependent on the tempo setting. At 'hold', the performance is frozen on whichever note had been reached. Pressing 'step' produces one pulse—one more step along the melody line—followed by another pulse when the control is returned to its rest position at 'hold'.

The eight switches governing the initial structure and proceeding development of Muse compositions can be seen in the photo. To the right are two strips of light emitting diodes, one above the other. Eight leds occupy the column from calibration 'on' down to C6. These show through blue Perspex. Below these, adjacent to B1...31 are a further 31 leds behind green. The visible size of each led is about 5 wide x 4 mm with 1½ mm vertical spacing.

The eight switches are grouped into four 'interval' and four 'theme' controls, the former governing pitch and the latter basically controlling the duration of each note. With all eight

controls at 'off', the Muse will produce a constant tone, for our purposes the *doh*. All eight are in an off plane in that none is in the (on) plane of an illuminated diode. With the 'auto/hold/step' control at 'hold' and the 'off/on/start' pressed to 'start', only two diodes are illuminated—those against calibration 'on' and 'C½'. And we're getting very tired of this *doh*. So we push the farthest left interval switch one step downward to 'on'. Immediately the *doh* rises a second to *re*. Push it a further step down and, at C½ (nothing to do with a musical C) it remains at *re*. Switching from 'hold' to 'auto', the C½ diode now flashes on and off at a speed determined by the tempo slider. The switch at C½ is thus oscillating from an on to an off state, producing a continuous *doh re* cycle.

Triadex have chosen to label the four Interval switches A, B, C and D, from left to right respectively—again nothing to do with alphabetical music notation. Switch A gave us *re*. Switch B, standing alone in an on plane, produces a third above *doh*. In the plane of a flashing diode, therefore, we obtain a *doh mi* cycle. Switch C given the same treatment produces a fifth interval, *doh so*, while switch D produces a full octave rise: *doh doh*¹. The base *doh* can be silenced by pushing a separate switch (bottom right) from 'normal' to 'rest'. Instead of, for example, *doh so doh so*, we would have *rest so rest so*.

Supposing now we place switches A and B together in the horizontal plane of an on diode? Individually they contributed *doh* and *re*, together they produce *fa*. Switches C and A together contribute *la*, C and B produce *te*, and with D on the higher *doh* we have a complete octave. An additional octave can be obtained by combining in any on plane AD, BD, ABD, CD, ACD, BCD and ABC, which may look strangely familiar.

A backward guide to binary

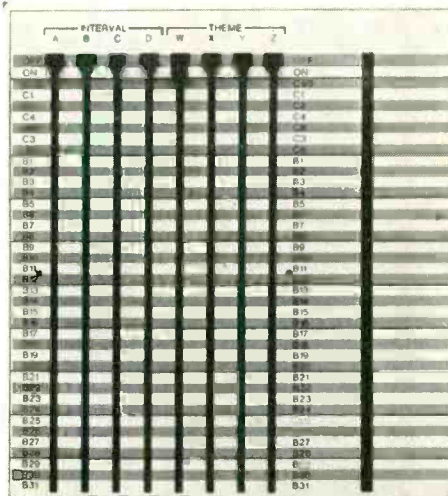
It is a convention, among arithmeticians, to think backwards. Thus 0000 is the binary zero, 0001=1, 0010=2, 0011=3, 0100=4, and so on. To understand the *Muse* fully, and you don't *have* to understand it, you must turn

backwards binary backwards, two backwards making a forwards. Thus 1000=1, 0100=2, 1100=3, 0010=4, 1010=5, 0110=6, 1110=7, 0001=8, and so on. In *Muse* language, 0000=*doh*, A000=*re*, 0B00=*mi*, AB00=*fa*, 00C0=*so*, A0C0=*la*, 0BC0=*te* and ABC0=*doh*¹. 000D is also *doh*¹ which seems to be cheating slightly but it's all in the aid of an extra octave.

And a vertical guide

When the auto/hold/step control is at 'auto', C½ is not the only diode to flash. The diodes against C1, C2, C4 and C8 also flash and, as their calibrations suggest, these too follow a binary law. C½ behaves as a binary half, C3 illuminates when the lamps have reached 1100 (C1 and C2 on, C4 and C8 off) but cuts out at 0110 replaced by C6. C3 lights again when 1001 registers 9 (6+3). This count, from zero to 15, continues endlessly, whether triggered by the tempo pulse or by operating the 'tep' switch, and may at any instant be reverted to zero by pressing 'start'.

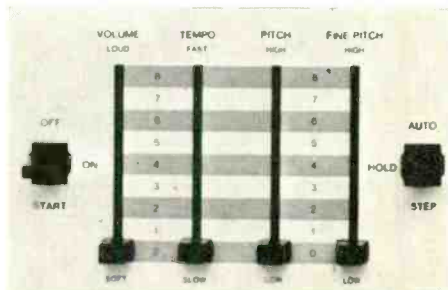
continued over



MANUFACTURERS' SPECIFICATION

Electronic music generator producing melody line permutations. Fixed output waveform suitable for external treatment. Five octaves range. Internal loudspeaker. Controls comprise volume, tempo, pitch, fine pitch, four 'interval' and four 'theme' selectors. Provision for connection of keyboard and second Muse. Price: £250. AGENT: Allotrope Ltd, 90 Wardour Street, London W1V 3LE.

Photo: see page 32.



continued

This combination of binary interval selectors and binary led activation results in a two-octave rising scale being produced when the interval switches are set at A:C1, B:C2, C:C3 and D:C4. Resetting to A:C₂, B:C1, C:C2 and D:C3 has the predictable effect of doubling the effective tempo. The addition of intervals does not require two more interval switches to occupy the same horizontal *on* plane. They will add in pitch whenever both are in the plane of an illuminated diode. A variety of quite pleasing melodies, though very short, can be set up by placing the interval switches within the seven C settings alone. It is impossible to find a setting which offends the ear, the *Muse* being essentially diatonic.

The green diodes from B1 down to B31 are controlled by the theme switches W, X, Y and Z. The basic rule here is *even=on, odd=off*. If an even number of theme switches are in any one state—all on unlit planes, all on lit planes, or two lit and two unlit, then all the B diodes will light, doing so progressively from B1 down to B31. Given this rule, which is simple enough, it is possible to calculate the kind of melody—its exact structure and duration—produced by any combination of *Muse* switch settings. Given superhuman patience, you could forget about the *Muse* and merely use the foregoing as a code for future compositions.

In practice, the theme section behaves in the following ways. All four theme switches at off (top row), since they are an even number, cause all the B diodes to turn on. Any interval switches in their plane will therefore cause an appropriate rise in pitch. If any two switches are moved together to one lower setting, on or off, their effect will still be to hold the B diodes on since the theme switches are still in an even condition. However, if one theme switch is pulled down to, say, C1, a more elaborate situation arises. When C1 is *off*, all four theme switches are in the same condition and the first B diode illuminates. On the next pulse, C1 is *on* so the theme switches are no longer in an even state. Remembering the rule that odd-state theme switches = off lamps, B1 is extinguished. The *on* state formerly at B1 is trans-

ferred to B2, which illuminates. At the next pulse, C1 reverts to off, causing B1 to come *on* again. And so it goes on until the entire B section contains a waspish column of alternating light, no light, light. Setting theme W at C2 (X, Y and Z remaining at the top *off* plane) produces a longer cycle of two on, two off, two on. C4 by the same rule (having a longer 'beat') produces a four on, four off chain. Whether at a C or B setting, one theme switch will produce on/off blocks the length of the adjacent number. A switch at B31 generates blocks of maximum duration, 31 pulses on, 31 off.

It doesn't need much patience to predict the kind of melody these blocks will produce, remembering that the interval switches behave the same way in green as in blue planes. But try predicting the effect of interacting two, three or four theme switches in the blue and/or green sections. The resultant melodies become so complex that it is sometimes difficult to see when they have recycled. Many of the more complex compositions are too mechanical for my taste but one must not be excessively greedy. Musability grows on you, if you let it, so that finding an attractive composition among that '14 trillion' possibilities becomes less of a random quest. The ability to see the 'theme' formation becomes increasingly useful when trying to impose melodies on the *Muse*. If the 14 trillion possibilities include any man-made efforts, they have yet to be found.

So who wants a *Muse*? Triadex describe it as a new way to get actively involved in your own entertainment. As an ideas machine in a music studio, it has possible applications. From a direct performance viewpoint, there are slight problems. My own experiments with multi-tracked polyphony were defied by variations in tape speed. A good musician might be able to compensate for these by adjusting the tempo; a wealthy one by locking together several *Muses*. More fruitful results could be expected from coupling a *Muse* to a vc synthesiser, when it would act as a form of sequencer.

Uses might be found in music teaching and also in arithmetic since it offers a very human way of demonstrating binary. For myself, I would like to see Triadex produce a more elaborate *Muse* which could be keyboard programmed with the melody I choose, rather than it chooses. To the machine, this artist would then leave the more difficult task of composing variations. **David Kirk**

continued

record voices for tests for the film *Little Prince*. Paul McCartney came in to do a track and an overdub for a single by Richard Hughson and Paul Lington produced one or two jug bands and a single by Walter Mitty called *Caroline*.

A 12-piece Indian line-up came in to do music and an album for the film 'Siddhartha'. The film was produced by Conrad Rooks from the book by Hermann Hesse. Ralph McTell also came in to some film work.

Chess Records used the studio to do an Afro-Rock album. David Foster, who wrote 'Time and Place' and 'Sweet Dreams' with John Anderson, came in to do a solo album, helped out by Tony Kay. Salena Jones made a lp at Dean Street produced by John Schroeder.

At the Wembley studios of De Lane Lea a Richard Kerr session was produced and engineered by Martin Birch, who also engineered a session for Silverhead. Flaming Groovies and Hard Stuff also came in and Christopher Neil was produced by Mickie Most.

Indigo Studios in Manchester have had their busiest month yet. Dave Kent-Watson engineered sessions for Tate enterprises, of ex-RSC actor Michael Tate singing arrangements of his own poetry, and for Bob Stewart, who used session men to record his own music for a new tv series. Paul Curtis and the Union Express roared in to lay down some tracks produced by Paul and engineered by Bob Auger. Other customers included Tri-Star Airbus, the Ramblers, and a new group, Googgenheim, consisting of Paul McDowell, Chris Pye and Jules Burns, who recorded an lp.

Tv's Alan Browning brought folk singer Ronnie Copas up to the studio from Penzance to tape his own material and John Paul Jones laid tracks for his latest single.

Greenlow Commercial, Radio 70's and agencies Phillips Publicity and Royds Manchester used the studio regularly, and Indigo's mobile work during the month included a concert in Sheffield Cathedral by the British Youth Choir and Orchestra. The concert, which included works by Britten, Handel and Haydn, will be issued on an lp.

SYNTHESISER?

Build your own using Dewtron Professional Modules: Voltage-control system, man-size patching facility, Discount offers on quantity.

VOLTAGE-CONTROLLED OSCILLATOR. New VC0-2 gives SINE, SQUARE and TRIANGULAR symmetrical outputs simultaneously. Supplied singly or MATCHED and TRACKED! 1v/Octave. All modules obtainable separately, including VC filters, VC amps, Keyboards, contacts, envelope shapers, sample/hold/envelope circuit, VC phaser, white noise etc.

OTHER MANUFACTURERS USE Dewtron Professional Modules in their equipment . . . that's sound reasoning!

Full catalogue 15p from:

D.E.W. LTD.

254 RINGWOOD ROAD, FERNDOWN, DORSET

Classified Advertisements

Advertisements for this section must be pre-paid. The rate is 6p per word, minimum 60p. Box Nos. 20p extra. Semi-display £3.00 per inch. Copy and remittance for advertisements in **OCTOBER 1972** issue must reach these offices by **18th AUGUST 1972** addressed to: The Advertisement Manager, **Studio Sound**, Link House, Dingwall Avenue, Croydon CR9 2TA.

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

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

APPOINTMENTS VACANT

★ Qualified and Trainee Maintenance Engineers required for London Recording Studios. Telephone: 01-229 2345.

★ **ASSISTANT MAINTENANCE ENGINEER** Required by the CENTRAL OFFICE OF INFORMATION for their Radio Division. Candidates should have had wide experience in maintenance of professional tape recording and studio equipment. Theoretical knowledge to City and Guild Intermediate level would be an advantage as would experience in sound recording. Salary according to experience and qualifications on a range £1530-£1965 per annum. Five-day week of 41 hours (inclusive of meal breaks). 20 days paid annual leave. Please send postcard for application form to Manager (PE/290083/VY), Department of Employment, Professional and Executive Register, Atlantic House, Farringdon Street, London EC4. Closing date for completed forms 31 August, 1972.

STUDIO FACILITIES

YOUR TAPES TO DISC

Records made to order—7in from £1.50, 12in from £4.00. 4-day postal service. Vinyl pressings, photo sleeves, labels. Tax free for schools, choirs, etc. We cut records for many Recording Studios, Record Companies, etc and use the same equipment for you:—

3 NEUMANN DISC CUTTING LATHES including auto stereo system, Philips and Telefunken professional studio tape machines with Ferrite playback heads. DOLBY A301 system. 200W Radford amps into Lockwood monitor speakers. Teletrox and Ortofon Limiters. Revox domestic T/R. Send SAE for photo leaflet.

DEROY STUDIOS

Hawk Street, CARNFORTH, Lancs. Tel. 2273

★ **County Recording Service.** Stereo and Mono masters, 12" vinyl pressings.

★ **Coastal Music Studios Ltd.** All tape to disc services. Commercial pressings and masters by quotation. Please send for brochure to: 1 Royal Terrace, Lowestoft.

mjb recording and transcription service

Vinyl pressings and acetate demodiscs. Limiting, compression and equalisation facilities; high undistorted cutting levels with feedback cutter heads. Booklet available.

ST. MICHAEL'S, SHINFIELD ROAD, SHINFIELD GREEN, READING, BERKS. Reading (0734) 84487 Member A.P.R.S.

STUDIO FACILITIES Contd

"Rumblecure"

Disc Jockey of Studio Turntables using quality cart-ridges, with correct full range monitoring speakers, invite the same problems as better class Hi-Fi, where structure-borne vibration introduces 'distortion' at the crucial signal stage. Our Plinths solve these problems and bring a 'new era' to record reproduction. Demonstrations at: "Rumblecure", 15 Irving Street, Leicester Square, London WC2. (Wed., Thurs., Fri., Sat., noon to 8 pm.) Above renowned 'Paramount Grill'.

★ **County Recording Service.** 7" vinyl discs pressed on our own plant.

★ **Graham Clark Records.** Tape to disc pressings. 124A Station Road, Addlestone, Weybridge, Surrey. Tel. Weybridge 43367.

COMPACT CASSETTES PROFESSIONAL HIGH-SPEED DUPLICATION

Dolby B—compression and equalisation available—competitive prices on small runs—full productions undertaken—music and language specialists.

Contact Chris Sands

AUDIO EDUCATION COMPANY
01-723 6635

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

★ **County Recording Service.** Stereo and Mono discs from your tape.

EDEN STUDIOS LTD

QUALITY recording, tape to disc and pressing services, all at very sensible rates. Please write or phone for leaflet.

11 EDEN STREET, KINGSTON, SURREY
01-546 5577

Member Assoc. of Professional Recording Studios

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

★ **County Recording Service.** Top quality, reasonable price, quick delivery. Tel. Bracknell 4935. London Road, Binfield, Bracknell, Berks RG12 5BS.

ROGER SQUIRE DJ STUDIOS

Our specialist studio is available for recording DJ programmes, audition tapes, sound commercials, and jingles. Can we help you?

01-722 8111

FOR SALE—TRADE

ADVENT CASSETTE UNIT

THE NEW MODEL 201 WITH WOLLENSAK
DECK AND DOLBY 'B'

Normally unobtainable in U.K. A special import arrangement has provided us with a very limited number of these world famous machines 240v 50 cycles. Every serious enthusiast will know the quality and specification offered and by normal standards they could be expected to cost in excess of £200—by direct sale our price is £165.

All brand new, just landed, and with full guarantee.

Orders will be dealt with in strict rotation.
C.W.O. or call (by appointment only please)

D. B. ASSOCIATES

75 Marlow Road, London, S.E.20

★ **Professional tape only 45p.** 1200ft. Agfa on hubs no joins (p. & p. one box 25p, each additional box 10p). We handle 99% of all s/h professional recording equipment. Send for list. Jackson Studios Rickmansworth, Herts.

RAC MIXERS

We build mixers to your exact requirements using our range of printed circuit modules at reasonable prices, e.g. 6 input stereo mixers with tone and pan controls from £100. Please ask for a quote. Or if you wish build it yourself, using our modules—send for details.

RUGBY AUTOMATION CONSULTANTS
220 Alwyn Road, Rugby. 0788-810367

★ **If quality matters** consult first our 105-page illustrated Hi-fi catalogue with technical specifications (60p). Members enjoy unbiased advisory service, preferential terms, Membership (40p) p.a. Our associates also manufacture records from your own tapes or record the Master at our studios (Steinway Grand). Bulk terms for choirs, fund-raising, slim-discs. Please specify requirements. Audio Supply Association, 18 Blenheim Road, London, W.4. Tel. 01-995 1661.

★ **Professional heavy duty slave 100 watt power amplifiers**—suitable for all types of public address and discotheque systems—£84.50. Wayne Industries, 23 Ripley Road, Worthing, Sussex.

★ **Lancashire.** Tandberg, Ferrograph Tape Recorders, etc. Plus over 10,000 high fidelity systems. After-sales service. Holdings, Photo-Audio Centre, 39-41 Mincing Lane, Blackburn BBA 2AF. Tel. 59595/6.

★ **Tame those dB's . . .** Plug in professional quality FET compressor module £15.50. For the 'slick operator' . . . 'Voice over' module £15.50. S.A.E. details. Cathedral Sound SS, "Fourways," Morris Lane, Halsall, Lancs., L39 8SX.

★ **Complete 805 Outfit** including case. Normal price £250. Special offer £180. Sennheiser MD112 Microphone, new and boxed. Normal price £44 special offer £32. J. J. Francis (Wood Green) Ltd., 123 Alexandra Road, Hornsey, London, N.8. Tel. 01-888 1662.

FOR SALE—TRADE Contd

SOWTER TRANSFORMERS
 for all purposes in
SOUND RECORDING AND REPRODUCING EQUIPMENT
 We are suppliers to many well-known companies, studios and broadcasting authorities and were established in 1941. Early deliveries. Competitive prices. Large or small quantities. Let us quote
E. A. SOWTER LTD.
Transformer Manufacturers and Designers
7 Dedham Place, Fore Street, Ipswich IP4 1JP
 Telephone 0473 52794

FOR SALE—PRIVATE

★Beyer M160 double ribbon microphones+ Fi-Cord S/U transformer £28.00. Tel. 0279 4420 (Bishops Stortford) after 8.00 p.m.
 ★FOR SALE. Quantity of E.M.I. 10½s. NAB Spools, some boxed. Phone 01-428 1198.

WANTED

★ Lee Electronics. The Tape Recorder and Hi-Fi Specialists wish to purchase good quality Tape and Hi-Fi equipment for cash. 400 Edgware Road, W.2. Phone PAD 5521.
 ★ Highest possible cash prices for Revox, Ferrograph, Brenell, Vortexion, Tandberg, Akai, B. & O., Sanyo, Sony, Uher. 9.30-5.00. Tel. 01-242 7401.
 ★ Complete Recording Studios purchased for cash. Also all types of Professional Recorders and associated equipment. J. J. Francis (Wood Green) Ltd., 123 Alexandra Road, Hornsey, London, N.8. Tel. 01-888 1662.
 ★ Nagras (all models) and assorted equipment required immediately for cash settlement. Tel. 01-888 1662.
 ★Four channel recorder wanted; Ampex or similar. Box 638 (London).

MISCELLANEOUS

★ Repairs. Our modern service department equipped with the latest test equipment including a wow and flutter meter and multiplex stereo signal generator is able to repair hi-fi and tape recording equipment to manufacturer's standards. Telesonic Ltd., 92 Tottenham Court Road, London, W.1. Tel. 01-636 8177.
 ★ Tape and Cassette Recorder Repairs by Specialists. The Tape Recorder Centre, 82 High Holborn, London, W.C.1.
 ★ Ladders. 24½ft. £9.80, carr. 80p. Leaflet. Callers welcome (Dept. SOS), Home Sales, Baldwin Road, Stourport, Worcs. Phone 02-993 2574 5222. Order c.o.d. Ansafone installed 5222.

INDEX TO ADVERTISERS

Acoustical Manufacturing Co. Ltd.	78	Hollick & Taylor	32
Acoustico Enterprises Ltd.	9	International Handicrafts and Do it Yourself Exhibition	82
Action Video Ltd.	42	Leevers-Rich Equipment Ltd.	38
A.K.G. Equipment Ltd.	60	Lennard Developments Ltd.	16
Alice (Stancoil) Ltd.	24	Macinnes Labs. Ltd.	72
Allen & Heath Ltd.	27	Magnetic Tapes Ltd.	8
Allotrope Ltd.	32	Millbank Electronics Group	48
Areac Ltd.	80	Minnesota Mining & Mfg. Co. Ltd.	6, 7
Audionics	20	Monks, Keith, Audio Ltd.	4
Audio Ltd.	62	M.S.R. Electronics Ltd.	9
Audio Design Recording Ltd.	10, 42	Neve, Rupert, & Co. Ltd.	29
Audix, B. B., Ltd.	74	Penny & Giles Ltd.	22
Avcom Systems Ltd.	12	Philips Electrical Ltd.	18
A.V. Distributors (London) Ltd.	88	PSP Electronics (London) Ltd.	66
Bauch, F. W. O., Ltd.	32, 56	Pye TVT Ltd.	58
Beyer Dynamic (G.B.) Ltd.	54	Radford Laboratory Inst. Ltd.	15
Bias Electronics Ltd.	12	R.A.F. Appeal	12
Brenell Engineering Co. Ltd.	14	Revox	23
Calder Recordings Ltd.	19	Richardson, J., Electronics Ltd.	19
Cave, F.	87	Rogers, Developments Ltd.	8
Chadaere Electronics Ltd.	4	Rola Celestion Ltd.	2
Chymes Audio Electronics (C.A.V.D.) Ltd.	20	Rumble, C. H., Ltd.	66
Cotron Electronics Ltd.	62	Rycote	16
C.T.H. Electronics	34	Sansui Electric Co. Ltd.	31, 64
D.E.W. Ltd.	84	Shibaden (UK) Ltd.	21
D.J. Electronics (Hackney) Ltd.	80	Sound Audio Electronic & Video Techniques	10
Eagle International	11	Sound Techniques Ltd.	40
Electrocraft Inst. Ltd.	50	Spectra Sonics	5
Electrosonic Ltd.	76	Starman Tapes	16
Feldon Audio Ltd.	21	Sugden, J. E., & Co. Ltd.	10
Francis, J. J. (Wood Green), Ltd.	13	T. B. Technical Ltd.	10
Francis of Streatham	20	Telcon Metals Ltd.	27
Fraser-Peacock Associates Ltd.	14, 22	T.R.D. Ltd.	16
Future Film Developments Ltd.	44	Trident Audio Developments Division	46
Grampian Reproducers Ltd.	70	Turner, Ernest, Electrical Inst. Ltd.	15
Grundig (G.B.) Ltd.	68	Walker, N.	8
Gulion Europe Ltd.	17	Wilmex Ltd.	66, 70
Helios Electronics	36		
H.H. Electronic Ltd.	76		

KEEP IN TOUCH WITH STUDIO SOUND

25p

Place a regular order with your Newsagent or take advantage of a POST FREE Annual Subscription.

See page 20 for details of subscription rates.

Lowest prices. Widest choice. UP TO 40% OFF makers Rec Price

Low Deposit Credit Barclaycards Paybonds Full Guarantees

HI-FI EQUIPMENT, AUDIO, TAPE & CASSETTE RECORDERS, RADIO, TV SEND S.A.E FOR LATEST LIST

ARMSTRONG

UNBEATABLE PRICES!
Top quality equipment

521 Stereo amplifier, 25 Watts RMS per channel output, 2 PU, radio and input for tape, Bass, treble and loudness controls—rumble filter, Frequency response 40Hz-40KHz - +1dB.



REC. £59.00 CASH £44.95
SEE LISTS IN THIS ADVERT.

NEW! TELETON 2300 TUNER AMP

This brand new stereo Tuner Amplifier is the latest addition to the well known Teleton range of high quality Hi-Fi and Audio units. LOOK AT THESE FEATURES! AM/FM Stereo radio reception with built-in decoder and switchable AFC, Volume, bass & treble and balance controls. Big 8 W RMS output, connections for Record deck and tape recorder. All this in a really beautifully styled and constructed cabinet, with satin silver and black fascia. REC PRICE £55.00
CASH PRICE ONLY £32.50

Available as a complete Stereo system from as little as £56.94. ASK FOR FULL DETAILS!

BIG SAVINGS EMI SPEAKER KITS

SPEAKER KITS (e)

150.....£2.60	850.....£4.60
250.....£3.80	215.....£23.65
350.....£7.00	315.....£35.95
450.....£3.40	750.....£16.80
650.....£7.00	

ENCLOSURE KITS (f)

150 per pair.....£14.10
215.....£17.65
250 per pair.....£10.25
315.....£26.95
350.....£12.35
450 per pair.....£15.00
650 per pair.....£14.10
850 per pair.....£17.35
750.....£17.65

COMPLETE SPEAKER/ENCLOSURE KITS (g)

150 per pair.....£18.00
215.....£38.40
250 per pair.....£19.70
315.....£58.00
350.....£18.20
450 per pair.....£20.40
650 per pair.....£30.25
850 per pair.....£32.00
750.....£32.00

LUX 1220

P&C 100p

100 Watts RMS of smooth pure sound from this superb quality, high performing unit. Separate bass and treble controls for each channel, with 3 cut-off levels for each. Tape monitor switch and a host of other top features and facilities in this highly attractive unit.
REC. PRICE £124.50
CASH PRICE £74

RICHMOND 38

SUPERB QUALITY SPEAKERS

Size: 18" x 11" x 8"
10 Watts power handling. Fine veneered enclosures.
ONLY £9.47 EACH.

Packing & Carriage Codes

a.....12p	d.....50p	e.....125p
b.....25p	e.....75p	h.....175p
c.....40p	f.....100p	x.....250p

A Complete STEREO SYSTEM

Famous Teleton CR101, multiplex, Stereo Tuner amplifier, AM/FM plus FM Stereo, with Automatic Frequency control which locks on to stations preventing drift. Input sockets for Tape Recorder and Record Deck plus separate volume controls for each channel and Tone Control. Stereo broadcast indicator beacon. This superb unit, complete with Garrard auto-record changer with 4 speeds and fitted with stereo cartridge. Complete with Teak finish base & transparent cover, and a pair of quality veneered Stereo speakers, not to be confused with other smaller, low performance speakers!

MUST BE WORTH OVER £52.00



P&C £1.50 CASH PRICE £39.95

AMPLIFIERS

c Alpha F212.....£30.20
d Alpha F200.....£25.60
d Alpha FA300.....£31.95
d Alpha FA400.....£37.20
c Alpha DB5 Dolby Unit.....£47.25
d Amstrad IC2000.....£29.95
d Amstrad 8000 Mk2.....£14.95
d Amstrad 521.....£44.95

Cambridge prices on application

d Duette SA616.....£16.50
d Duette SA400.....£26.50
d Duette SA500.....£32.95
d F'graph F307 Mk2.....£48.95
d Leak Delta 30.....£48.25
d Leak Delta 70.....£58.75
d Lux SO1220.....£49.50
d Lux SO1777.....£74.50
d Metrosound ST20E.....£26.95
d Metrosound ST60.....£49.95
d Pioneer SA950.....£33.95
d Pioneer SA600.....£71.70
d Pioneer SA700.....£78.40
d Pioneer SR202 Reverb.....£40.85
d Pioneer SA800.....£95.90
d Pioneer SA900.....£107.05
d Pioneer SA1000.....£118.25
f Quad 303/33.....£92.95

Revox prices on application

d Rogers R'brook Mk2 C.....£44.40
d Rogers R'brook Mk2.....£40.40
e Rogers R'bourne Case.....£55.60
e Rogers R'bourne.....£51.60
d Rota 2200.....£24.95
d Rota 1500.....£17.95
d Rota R3100.....£33.95
d Rota RA210A.....£24.95
d Rota RA610.....£53.25

Sansui prices on application

d Sinclair 2000 Mk2.....£24.25
d Sinclair 3000.....£33.50
d Sinclair Neoteric 60.....£45.50
d Sugden A21.....£55.25
d Teleton SAQ206B.....£19.95
d Teleton SAQ307.....£19.95
d Teleton GA202.....£27.95
d Wharfedale Luton.....£44.95

TUNERS

d Alpha FT 150 AM/FM.....£38.70
d Armstrong 523 AM/FM.....£40.75
a Armstrong 524 FM.....£31.70
d Armstrong 148.....£7.95
d Leak Delta FM.....£56.75
d Leak Delta AM/FM.....£67.50
d Pioneer TX500A.....£58.60
d Pioneer TX600.....£80.90
d Pioneer TX700.....£99.25
d Quad FM Mk3.....£68.88
d Quad AM3 European.....£40.85
d Quad AM3 Overseas.....£40.85

Revox prices on application

e Rogers R'bourne FM C.....£53.75
e Rogers R'bourne FM.....£49.75
e Rogers R'brook FM C.....£41.20
d Rota RT320.....£43.95

Sansui prices on application

d Sinclair 2000.....£35.25
d Sinclair 3000.....£35.25
d Sinclair Project 60.....£20.50

8 TRACK STEREO

d Akai CR80.....£88.50
d BSR TD85.....£17.95
d Hanimec 5000 (car).....£24.95
d Hanimec 5020 (car).....£25.95
d Metrosound Mk3.....£36.95
d Teleton ST1801.....£42.95
d Teleton STP800.....£39.95
d Lear Jet P550.....£41.95
d Lear Jet P560.....£52.95
d Lear Jet L277 (Car).....£45.50
d Lear Jet L431 (Car).....£27.75

GRUNDIG C200SL Cassette Recorder.

Rec price £37.55
CASH £26.95

Tape & Cassettes HUGE SAVINGS

AGFA LN		REELS PAC FREE		SCOTCH Dynarange	
5 1/2" LP	£1.50	5 1/2" LP	£1.24	5 1/2" SP	84
7 1/2" LP	£2.10	5 1/2" LP	£1.43	7 1/2" SP	£1.13
5 1/2" DP	£2.10	5 1/2" LP	£2.04	7 1/2" SP	£1.42
7 1/2" DP	£2.65	8 1/2" LP	£2.68	5 1/2" LP	£1.11
7 1/2" TP	£3.75	10 1/2" LP	£4.52	7 1/2" LP	£1.40
10 1/2" LP	£4.35	5 1/2" DP	£1.42	8 1/2" LP	£2.73
		5 1/2" DP	£2.04	10 1/2" LP	£4.11
		7 1/2" DP	£2.50	5 1/2" DP	£1.56
		7 1/2" TP	£2.50	5 1/2" DP	£2.06
		7 1/2" TP	£3.12	7 1/2" DP	£2.90

PHILIPS BASF EMI AGFA SCOTCH

C60	45p	45p	45p	40p	40p	P&C 3-6 10p or more 15p
C90	60p	60p	60p	55p	60p	
C120	90p	90p	90p	70p	80p	

SPECIAL OFFER! Audio Magnetics Quality Cassettes.
C60.....30p C90.....40p C120.....50p

CASSETTE TAPES AT TOP DISCOUNT PRICES! (Minimum 3)

COMPARE THESE PRICES! TURNTABLES

TUNER AMPLIFIERS

g Akai AA8500.....£160.95
g Akai AA6600.....£111.50
g Akai AA6300.....£100.75
f Akai AA6200.....£74.50
e Alpha R200.....£58.25
e Alpha R500.....£65.75
e Alpha R150.....£49.90
e Alpha FA3000.....£74.50
e Alpha FA4000.....£82.40
e Armstrong 525.....£69.70
e Armstrong 526.....£79.40
e Duette SAT 260X.....£63.70
e Duette SAT 460X.....£83.50
e Duette SAT 4370X.....£41.75
d Duette SAT 555T.....£52.75
e Goodman's Module 80.....£73.80
e Goodman's One Ten.....£108.75
Leak Delta 75.....£125.50
f Pioneer SX440.....£84.70
f Pioneer LX440.....£103.50
f Pioneer SX770.....£112.20
f Pioneer SX990.....£147.25
f Rota RX150.....£54.95
f Rota RX200.....£64.95
e Rota RX440.....£82.50
e Rota 130.....£49.95
f Rogers R'brook Case.....£90.45
f Rogers R'brook Chassis.....£82.90

Sansui prices on application

e Tandberg TR200 MPX.....£83.90
e Tandberg TR200.....£74.55
d Teleton CR101.....£17.25
d Teleton F2300.....£32.50
d Teleton TF550.....£58.95
d Teleton TF550.....£60.75

SPECIAL OFFER!
Wharfedale 100.1 Tuner-Amp
REC. £135.00 CASH £89.50

CARTRIDGES

a Acos GP91.....£1.50
a Acos GP96.....£2.00
a Acos GP96.....£2.50
a Acos GP101.....£2.75
a ADC 10E Mk2.....£25.00
a ADC 10E Mk2.....£19.95
a ADC 26.....£48.95
a ADC 27.....£48.95
a Audio Technica AT166.....£4.95
a Audio Technica AT21.....£3.25
a Audio Technica AT55.....£9.25
a Commsour SCU1.....£4.75
a Decca Deram.....£4.15
a Empire 1000/EX.....£47.75
a Empire 999 VEX.....£34.00
a Empire 999 TEX.....£19.85
a Empire 999 SEX.....£16.05
a Empire 999 EX.....£12.60
a Empire 999 X.....£9.80
a Empire 90E EX.....£7.55
a Empire 909 X.....£6.35
a Goldring G800 Super.....£18.80
a Goldring G800E.....£8.95
a Goldring G800.....£5.50
a Goldring G800.....£3.85
a Goldring CS91E.....£6.25
a Goldring G800 Super.....£14.00
a Ortofon M15E.....£24.55
a Ortofon MF15E.....£20.45
a Sonotone 9TA H/C.....£1.75
a Shure M34.....£4.12
a Shure M42 5 or 7.....£5.50
a Shure M44E.....£5.75
a Shure M55E.....£6.50
a Shure M75/6 Type 2.....£7.70
a Shure M75E Type 2.....£10.95
a Shure V15 Type 2.....£26.95

F.C.AVE HI-FI TOP DISCOUNTS

OUR 4 STORES ARE LOCATED FOR YOUR CONVENIENT SHOPPING

WEST END 21 Old Compton St W1 01-437 9359
KINGSTON 5 Bridge St Sy 01-948 1448
RICHMOND 27 Eden St Sy 01-546 7848
ROMFORD 86 South St ROMFORD 20218

AKA SUPERB VALUE Tape & Cassette RECORDERS!



1720L three speed, 4 track stereo recorder. Frequency response 40-15 KHz. Full 6 W RMS output, input mixing facility.
REC. PRICE £87.36 P&C 100p
CASH £62.50

SPEAKERS

e Alpha HT20.....£24.55
e Alpha HT7.....£18.75
e Alpha HT10.....£50.95
e Alpha HT16.....£10.40
e Alpha HT17.....£12.90
g Akai CSS8.....£9.87
f Akai SW155.....£48.95
e AR 4X Teak/Walnut.....£38.50
e AR 4X Pine.....£32.85
e AR 6 Oilie! Teak.....£57.50
f AR 2AX R'wood/Pine.....£78.95
d B&W DM1 Tk/Wint/Rsw.....£31.95
f B&W DM3 Teak/Wint.....£44.95
f B&W DM3 Red/White.....£57.50
f B&W Series 70.....£115.95

Cambridge prices on application

g Celestion Ditton44.....£41.95
d Celestion Ditton 120.....£21.75
d Celestion Ditton 25.....£43.50
g Celestion Ditton 15.....£30.95
g Celestion Ditton 66.....£83.95
e Contract 40.....£4.47
e Contract 8.....£8.97
f Ferrograph S1.....£80.75
e Goodman's Mezzo 3.....£24.95
g Goodman's Magnum.....£32.50
e Goodman's Havant.....£22.45
g Goodman's Minister.....£19.95
h Goodman's Magister.....£45.95
g Goodman's Dimensions B.....£50.70
g J B LANSING.....£72.00
a Ker Chorale Tk/Whit.....£27.50
d Ker Celeste.....£23.95
d Ker Cresta.....£20.15
e Ker Concerto Mk1/Whit.....£33.95
f Ker Concerto Mk3 Tk.....£47.95
f Ker Concerto Mk3 Wht.....£53.00
f Ker Cresta Tk/Whit/Wint.....£21.95
f Ker Cresta Tk/Whit/Wint.....£18.50
d Keith Monks Et1.....£14.25
e Keleton K N800.....£11.90
f Keleton KN1100.....£15.25
e Keleton KN4000.....£6.45
e Keleton KN500.....£7.95
f Keleton KN1000.....£13.75
f Leak Mini Sandwich.....£18.95
e Leak 200.....£20.50
e Leak 300.....£26.80
f Leak 600.....£34.50
f Leak 150.....£18.20
f Leak 250.....£22.95
f Quad Electrostatic.....£60.75

Richmond Mk1 Same Units & Performance as

f Ker Cresta.....£17.50
e Richmond 350S.....£16.50
e Richmond 350S.....£19.95
e Richmond 450.....£13.50
e Richmond 38.....£9.45
f Tannoy 12" Chatsworth.....£48.50
f Tannoy 1111Z Mk2.....£33.95
f Tannoy 15" Lancaster.....£57.95
f Tannoy 15" GRF Rect.....£104.50
e Wharfedale Denton 2.....£14.50
e Wharfedale Denton 3.....£18.25
f Wharfedale T12.....£24.80
f Wharfedale Dovedale 3.....£31.50
e Wharfedale Melton.....£24.50

QUAD

FOR THE CLOSEST APPROACH TO THE ORIGINAL SOUND
QUAD 303/33 Stereo Amplifier
REC. £106.00 CASH £92.95
To Personal shoppers only

SUPER PORTABLE TV BARGAINS!

TELETON TH14 12" Portable Battery/Mains. REC. £80.19
CASH PRICE £52.95

CROWN 9" DUAL STANDARD Model 305 Portable REC. £70.95 CASH PRICE £35.95

FANTASTIC OFFER! LEAK 200 & 300 SPKRS.

THESE SUPERB SPEAKERS ARE SUPERIOR TO THE 150 AND 250 HAVING EXTRA HIGH FREQUENCY UNITS!
LOOK AT THE SAVING.....

Rec Price	CASH PRICE
Leak 200.....£30.19	£20.50
Leak 300.....£39.33	£26.90

All prices subject to change without notice. E & O.E.

SONY & SANSUI SPECIALIST

Send S.A.E for latest lists!

ROTEL rx400



AM/FM Stereo tuner amplifier
40 W rms output. Response 15.50KHz
Superb design—beautifully finished.
REC. £112.79 CASH £82.50

GARRARD BARGAIN OFFERS!



d Garrard Trans. 401 Dk.....£27.00
d Garrard Zero 100A.....£23.50
d Garrard Zero 100S.....£38.75
d Garrard SL95B.....£36.50
d Garrard SL 72B.....£23.95
d Garrard AP76.....£19.50
d Garrard SL65B.....£15.95
d Garrard 2025TC Auto.....£8.50
d Garrard SP25 Mk3 S.P.....£9.95
c Garrard 2000/9TA/BC.....£14.50
d Garrard 3500/KS40A.....£13.95
d Garrard SP25 Mk3 B.....£15.95
d Garrard SP25 Mk3 B/C.....£16.95
d Garrard AP76 White.....£19.50

QUAD



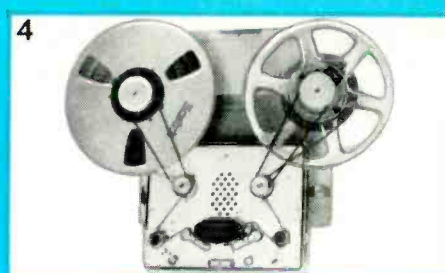
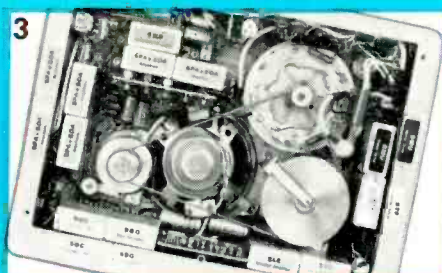
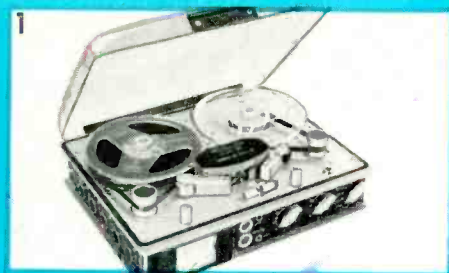
FOR THE CLOSEST APPROACH TO THE ORIGINAL SOUND
QUAD 303/33 Stereo Amplifier
REC. £106.00 CASH £92.95
To Personal shoppers only

FANTASTIC OFFER! LEAK 200 & 300 SPKRS.

THESE SUPERB SPEAKERS ARE SUPERIOR TO THE 150 AND 250 HAVING EXTRA HIGH FREQUENCY UNITS!
LOOK AT THE SAVING.....

Rec Price	CASH PRICE
Leak 200.....£30.19	£20.50
Leak 300.....£39.33	£26.90

All prices subject to change without notice. E & O.E.



STELLAVOX

Quality and Reliability for the Professional Sound Recordist

The new Stellavox SP7 is one of the most versatile and all-embracing systems for magnetic recording. Weighing less than 8lb the machine is of a revolutionary design supported by a system of unique accessories. This Swiss-made precision tool is used throughout the world by the leading sound recordists and scientists, a record of technical excellence stretching back to 20 years, with service to match.

1. Recorder

Weighing less than 8lb, measuring 3 x 8 1/2 x 10 1/2 in, tape speeds 3 1/2 to 30 ips, or fully variable, 20 Hz to 20 kHz (±) 2 dB at 7 1/2 ips, wow and flutter (±) 0.12% DIN weighted, automatic record mode, starting time 0.1 seconds, rechargeable Ni-Cads or AA size dry cells, built-in condenser mike powering, built-in monitor speaker. Available with optional quartz crystal pilot tone generator and pilot amplifier.

2. Interchangeable heads

The sound head assembly is easily interchangeable. As the heads are

changed the machine becomes mono or stereo. Heads can be supplied for any operating mode, e.g.:

Mono—1/2 or full track. Mono—full track with neo-pilot. Stereo—1/2 or 1/4 track. Stereo—1/2 track with synchrotone pilot or cue track. Stereo—0.75 mm guard band with flutter filter. Special heads to order.

3. The heart of the Stellavox SP7 is its unique and versatile servo motor, strobe lines on the motor are coupled to photo electric sensing elements which are integrated with the motor. All amplifiers are plug-in, pre-set encapsulations for easy servicing.

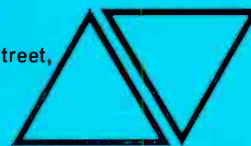
4. Reel Attachment

This accessory allows for the use of 10 1/2" NAB or 12" plastic reels; this is particularly useful for studio work at high recording speeds. The attachment can be fitted in a matter of seconds.

5. Mixer

The Stellavox AMI Mixer is the same size as the recorder and weighs 7lb. The AMI has five channels with symmetrical inputs 0.1 mV to 200 mV/200 ohms for condenser or dynamic microphones, line input up to 8V/10K ohms, bass cut, presence lift, bass and treble controls and pan pots. Stereo outputs 1.55V/200 ohms optional 4.4V/600 ohms balance.

**A.V. Distributors
(London) Ltd**
26 Park Rd., Baker Street,
London, NW1 4SH



Tel. 01-935 8161

