

AUGUST 1968

2<sup>1</sup>/<sub>2</sub>

# TAPE

RECORDING MAGAZINE



## AN AUDIO-VIDEO RECORDER

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or lose—money

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*Philips Tape*  
ETC., ETC.

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*5" 900'	28/-	22/6
*5½" 1,200'	35/-	28/-
*7" 1,800'	50/-	35/-
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10" 3,600' (BASF only)	95/-	76/-
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5½" 1,200'	40/6	32/6
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8½" 2,400'	83/6	66/10

COMPACT CASSETTES	LIST PRICE	OUR PRICE
C.60	17/6	14/-
C.90	25/-	20/-
C.120	33/6	27/-

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Brand New. Fully guaranteed and in normal manufacturer's pack.	LIST PRICE	ONE	THREE	SIX
BN7 1,200' on 7" reel (Dynarange)	50/-	40/-	117/6	230/-
BN8 1,800' on 8½" reel (Dynarange)	71/-	57/-	168/-	330/-
BL7 1,800' on 7" reel (Dynarange)	70/-	56/-	165/-	324/-
BL8 2,400' on 8½" reel (Dynarange)	90/-	72/-	213/-	420/-

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A bulk purchase of top quality Recording Tape manufactured by one of the country's leading makers. A polyester based tape with superlife black coating. Polythene wrapped boxed and fully guaranteed. Available while stocks last in one size only.

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	50/-	26/-	72/-	150/-

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BRAND NEW, FULLY GUARANTEED & IN NORMAL MANUFACTURER'S PACK '500' SERIES AUDIO TAPE (MYLAR BASE)

TYPE	DESCRIPTION	LIST PRICE	ONE	THREE	SIX
541-9	900' L/P 5" reel	28/-	21/-	61/6	120/-
541-12	1,150' L/P 5½" reel	35/-	28/-	82/6	162/-
541-18	1,800' L/P 7" reel	50/-	32/6	96/-	189/-
551-12	1,200' D/P 5" reel	42/-	35/-	103/6	204/-
551-16	1,650' D/P 5½" reel	56/-	45/-	133/6	264/-
551-24	2,400' D/P 7" reel	72/6	55/-	163/6	324/-

'600' SERIES PROFESSIONAL AUDIO TAPE (MYLAR BASE)	LIST PRICE	ONE	THREE	SIX	
641-9	900' L/P 5" reel	30/6	23/-	66/6	127/6
641-18	1,800' L/P 7" reel	52/6	39/6	116/-	226/-
651-12	1,200' D/P 5" reel	46/-	34/6	101/-	197/-
651-24	2,400' D/P 7" reel	80/-	60/-	177/-	348/-

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N.B.—OTHER TYPES & SIZES AVAILABLE INCLUDING THE INEXPENSIVE "WHITE BOX" SERIES

### SPECIAL OFFER COMPACT CASSETTES

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Compact Cassettes with 60 mins. playing time. Brand new and packed in normal plastic library box—available at this exceptional price.

NORMALLY	OUR PRICE
17/6	13/-

3 for 38/3 6 for 75/- 12 for 144/-  
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A SPECIAL OFFER OF THIS FAMOUS PREMIUM GRADE TAPE Brand new, boxed, with full leader, stop foil and polythene sealed. Multiples of three 4" size can be supplied in the BASF 3 compartment plastic library cassettes at no extra cost.

Type	Description	List Price	One	Three	Six
LGS 26	600' D/P 4" reel	25/-	17/-	49/-	93/-
LGS 26	1200' D/P 5" reel	42/-	29/6	86/-	166/-
LGS 26	1800' D/P 5½" reel	55/-	38/6	112/6	219/-
LGS 26	2400' D/P 7" reel	77/6	49/6	145/6	285/-

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A large purchase from TWO world renowned manufacturers enables us to make this unique half-price offer. Brand new, fully guaranteed, premium grade Polyester Base Tape with FULL LEADER and stop foil. In original maker's boxes and polythene wrapped at these EXCEPTIONALLY LOW PRICES.

	List Price	One	Three	Six
450' on 3" reel Gevasonor	22/-	14/-	40/6	78/-
600' on 3" reel Gevasonor	27/6	17/6	51/-	99/-
900' on 4" reel Gevasonor	39/-	24/6	72/-	140/-
2400' on 5½" reel Zonal	90/-	55/6	165/-	324/-

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Well styled mains/battery tape recorder giving an undistorted output of 1.8W. Frequency range 70-8000 c/s at  $3\frac{3}{4}$  ips. 70-4000 c/s at  $1\frac{7}{8}$  ips. Two track. Automatic level control or meter control. Tone control. Push buttons for easy operation. Remote control on microphone. AC bias, DC erasing. Ext. speaker socket. Radio input socket. This compact recorder measures  $11\frac{1}{2}$ " x 8" x 4" and weighs 8 lbs. Batteries 6 x U2. The 4" elliptical speaker gives a faithful reproduction.

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**THIS EQUIPMENT  
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CENTRES**

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See, hear and compare the complete range of Sanyo Tape Recorders and Hi-Fi Equipment. Our experienced staff are able to give expert advice and also demonstrate the many outstanding features of this wonderful range.



**Model 999** (illus.)  
Solid state, 4 track,  
3 speed stereo tape  
recorder, in teak case  
£120.0.0.

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and Hi-Fi Stereo Systems  
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## to the point of perfection



**Model RD 707.** Three-speed stereophonic tape recorder, operates vertically or horizontally. Four-track monaural, twin track stereo. Instant play and record three-speed selector. Front speakers. Base, treble, cut and lift tone controls. Automatic shut-off. Two pencil-type bar microphones. Dimensions:  $24\frac{3}{4}'' \times 15\frac{3}{8}'' \times 7\frac{1}{8}''$ . Recommended Retail Price **£96.12.0.**

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GUARANTEE**

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TR 7

# PERFECTION-



Start with the new Lustraphone "Series Four" Microphones, add the new LO-NOISE Multi-Impedance Mixer, and feed into the 50 watt LO-NOISE Silicon Transistor Amplifier. Finally, connect to the finest loudspeaker you can find, and you will be a Stage Closer to Perfection.

The Multi-Impedance LO-NOISE Mixer provides inputs of 50 ohms, 300 ohms, and 2 megohms on each channel for the utmost versatility. Distortion is a negligible 0.1% and signal to noise ratio is superb at -86dB (for input of 1 mV at 300 Ohms).

Advanced, but brilliantly simple, circuitry of Lustraphone LO-NOISE Amplifiers brings you unrivalled performance and reliability. You get more of the sound you want and less of the noise you don't want.

Brief Specification of Lustraphone LO-NOISE Amplifiers:

Power Output: 15 watts RMS or 50 watt RMS (According to Model)

Frequency Response: 25Hz to 22 KHz within 1dB

Total Harmonic Distortion: Less than 0.5% at all levels up to full rated power

Signal to Noise Ratio: -120 dB

Send for free literature giving full details of Lustraphone "Series Four" Microphones, LO-NOISE Multi-Impedance Mixers and LO-NOISE Silicon Transistor Amplifiers.



## lustraphone

THE FOREMOST NAME IN MICROPHONES

Lustraphone Limited,  
Regents Park Road, London N.W.1 Tel: 01-722 8844

**Where can you get a  
STEREO TAPE RECORDER  
with this specification,  
and at these prices, but  
from HEATHKIT?**

**Kit £58** incl. P.T. P.P. 10/6

**Ready to Use £70.6** incl. P.T.

#### FOR THIS SPECIFICATION

- 1/2 track stereo or mono record and playback at 7 1/2, 3 1/2 and 1 1/2 ips
- Sound-on-sound and sound-with-sound capabilities
- Stereo record, stereo playback, mono record and playback on either channel
- 18 transistor circuit for cool, instant and dependable operation
- Moving coil record level indicator
- Digital counter with thumb-wheel zero reset
- Stereo microphone and auxiliary inputs and controls, speaker headphone and external amplifier outputs . . . front panel mounted for easy access
- Push-button controls for operational modes
- Built-in stereo power amplifier giving 4 watts rms per channel
- Two high efficiency 8 in. by 5 in. speakers
- Operates on 230V ac supply.



**The New Heathkit Stereo Tape Recorder** has built-in audio amplifiers and speakers giving you complete recording and playback facilities in one compact cabinet that's easy to carry from room to room or house to house. The kit is complete with a good quality moving coil mono microphone, 5 1/2" spool of long play (1,200 feet) magnetic tape and one spare spool.

**Versatile Recording Facilities.** The Heathkit Recorder can record "live" from microphones or from auxiliary sources such as radio tuners, records, etc., and playback . . . in 1/2 track stereo or mono at either 7 1/2, 3 1/2 or 1 1/2 ips. And you can make sound-on-sound recordings by playing back through one channel and recording through the other channel . . . stereo record and playback . . . mono record and playback on either channel.

**Other Features.** Two audio amplifiers produce 4 watts rms per channel into two high efficiency 8"x5" speakers giving high quality sound in a portable instrument. Gives startling realism to stereo reproduction . . . jacks are provided for connecting to external speakers if required. Moving coil level indicator for visual monitoring of recorded signal level. Separate inputs and controls for microphones and auxiliaries, separate outputs for speakers/headphones and external amplifiers . . . all front-panel mounted for easy access. Ganged controls for easy operation. All transistor circuitry.

**So Easy to Build . . .** the Heathkit way! Simple step-by-step instructions and large pictorial diagrams in the manual show you where every part goes . . . tell you exactly what to do . . . guide you every step of the way. No special skills or technical knowledge required. Printed circuit board construction ensures speedy and easy assembly with consistent performance.

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Please send model.....  
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# TAPER RECORDERS

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FINEST SERVICE  
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## SEE THIS EQUIPMENT

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M203—4-track stereo recording, 1½ and 3½ i.p.s., stereo playback through external amplifier or radio. Price from £88.18.8.

TELEFUNKEN 204E—4-track stereo record/replay. Few available at our special price of 95 gns. (Manufacturers list price £136. 12. 5.)



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LARGEST TAPE &  
HI-FI SPECIALISTS*

# THE TAPE RECORDER CENTRE

\*PART OF THE *NuSound* ORGANISATION

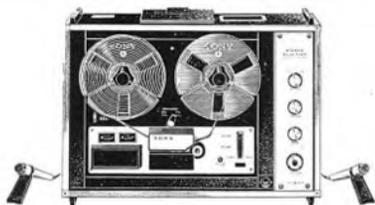


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Akai X-IV Stereo Batt/Mains Tape Recorder. List price £169.7.11

COMPLETE WITH ACCESSORIES  
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CASE EXTRA 7 gns.



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**★STAR OFFER!**



**SAVE OVER £13!**

Magnificent Philips EL 3310. Mains operated Cassette Tape Recorder, 2-track high quality slim-line model. List price £41.2.10—R.E.W.'s special price only 26 gns. or on interest free terms £9.2.0 deposit and 12 monthly payments of £1.10.4  
**BUY NOW WHILE STOCKS LAST AT THIS PRICE!**



Ferrograph 632 Stereo Tape Recorder.

**Pre-Budget price 126 gns.**

Also Pre-Budget price Model 634 at £132 gns.

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**Available at Pre-Budget Prices!**

EL3302 Cassette Portable, current price £31.10.0  
**OUR PRICE 23 gns.**

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N4304 Mains 2-Track, current price £33.2.10  
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N4408 Stereo Prof., current price £133.5.0  
**OUR PRICE 105 gns.**



Akai X-300 Stereo Tape Recorder. List price £263.18.3

**Our price 195 gns.**

# Sanyo puts you in the world class



## Introducing the new MR 939 recorder with these outstanding features

- 7 watts per channel
- 4 tracks, 3 speeds
- Sound on sound
- Sound with sound
- Built-in public address system

**Tape speeds**  
7½ ips (19 cm/sec)  
3¾ ips (9.5 cm/sec)  
1½ ips (4.8 cm/sec)  
**Wow and flutter**  
7½ ips: 0.15% R.M.S.  
3¾ ips: 0.20% R.M.S.  
1½ ips: 0.30% R.M.S.  
**Recording time**  
96 min at 7½ ips  
(Stereo 1200ft. tape)  
192 min at 3¾ ips  
(Stereo 1200ft. tape)  
384 min at 1½ ips  
(Stereo 1200ft. tape)  
**Signal-to-noise ratio**  
45 db

**Output power**  
Music power 7W x 2  
Undistorted 4W x 2

**Frequency response**  
7½ ips 20-20,000 c/s  
(30-15kc ± 3db)  
3¾ ips 30-13,000 c/s  
1½ ips 30-8,000 c/s

**Erase rate**  
65 db

**Crosstalk**  
50 db (channel-channel)  
65 db (track-track)

**Output impedance:**  
Line out: 2 Kohm

**Speaker out:** 8 ohm  
**Headphone:** 10 Kohm

**Input impedance**  
**Microphone:** 50 Kohm  
**Aux:** 100 Kohm

**Weight**  
26.3 lbs (16.5 kg)

**Accessories**  
Microphone x 2  
Recording tape 7" x 1  
Empty reel 7" x 1  
Patch cord x 2  
Reel stopper x 2  
Splicing tape x 1  
Microphone stand x 2  
**Price:** about 89 guineas

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# SANYO

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RELIABILITY IS BUILT IN

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# AKAI



## PULLIN PHOTOGRAPHIC

(A Company within The Rank Organisation)



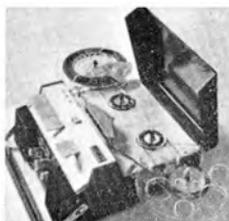
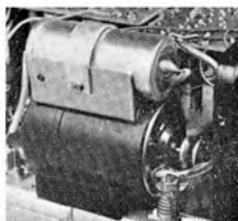
Brilliant electronic engineering and clever design make the new X·V one of the world's most advanced portable stereo tape recorders, with a signal to noise ratio better than 50 db (DC), 45 db (AC), and a response of 40-20,000 cps at 7½ ips. It is built around a new brushless D.C. micro motor which maintains constant tape speed at any of 4 selected speeds, 2 watts play-back on each channel, hi-fi automatic recording, the Cross-field Head and a built-in adaptor for AC/DC operation are a few of its special features that come in this attractive all-metal case—yet it weighs only 12.1 lbs. Send for a leaflet, or see your local AKAI Appointed Dealer.

- plus 1 New brushless motor
- plus 2 New 7" reel adaptor
- plus 3 New automatic volume control
- plus 4 New 4 watts solid state amplifier
- plus 5 And the Cross-field Head

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The  
new  
**AKAI**  
**X·V**  
is  
**AKAI**  
**+5**

# X·V



# Get around!



## with Audac portable V.H.F. receiver units...

This VHF Receiver offers narrow or wide band operation. Its extreme portability makes it ideal for Industrial Control, Studio talk back and Radio Paging Systems. The unit is fitted into a leather carrying case and there is a choice of telescopic or strap aerial. Size 4" x 1½" x 6". Weight 15 ozs.



## ...the range of standard receiver units includes...

**RX/A and RX/AN** Two small, self contained units representing a considerable advance in VHF design. Use is made of the latest Silicon Field Effect Transistors to ensure maximum signal to noise ratio and minimum cross modulation between channels. Single channel; choice of rechargeable battery or mains operation; narrow or wide band; simultaneous operation up to five separate systems.

The whole range of receiver units is designed for use with Audac Radio-Microphone Transmitters and incorporates the same high standards of design and precision to provide long and trouble-free service

Details and literature available on request

## AUDAC RADIO MICROPHONE AND SOUND REINFORCEMENT SYSTEMS

AUDAC MARKETING COMPANY LTD/FORST WORKS/CAREY RD/  
WAREHAM/DORSET/Tel: Wareham 2245

# TAPE

RECORDING  
MAGAZINE

Incorporating TAPE RECORDING & HI-FI MAGAZINE  
and STEREO SOUND MAGAZINE

Vol. 12 No. 8 August 1968

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**COVER PHOTOGRAPH:** "Tape recording is for the family." That was what we said when we asked readers to submit their own photographs illustrating that theme. On our cover this month is one of the best entries, received from Mr. G. Dawson of John Knox Street, Glasgow. Six-year-old Raymond has just the right look of serious concentration. He is obviously in complete control of both the situation and his Truvox recorder. Sister Joyce, aged three, already handles the mike like a trouper. Tape recording is indeed for the family.

"TAPE Recording Magazine" is published on the third Wednesday in the month, by Print and Press Services Ltd., from Prestige House, 14/18 Holborn, London, E.C.1.

"TAPE Recording Magazine" is available by a postal subscription of 25s. per annum (U.S.A. \$3.75) including postage, or it can be obtained at newsagents, bookstalls and radio and music dealers. In the event of difficulty, write to the Publishers at Prestige House, 14/18 Holborn, London, E.C.1.

Back numbers, if still in print, are available, at 2s. 6d. per copy.

Address all communications

PRESTIGE HOUSE,  
14/18 HOLBORN, LONDON, E.C.1

### EDITORIAL

01-242 4742

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01-242 4851

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# Tape trends and tape talk

By Douglas Brown

JUST HOW ENTHUSIASTIC are you about your tape recording? Here is a test question. If you were setting out on a long journey in a small boat and had to consider carefully every item of equipment because of shortage of space, would you consider your recorder to be an essential?

You'd soon get fed up with recording the noise of the sea. Are you sure you'd have enough worthwhile things to say to justify carrying the machine to capture your passing thoughts?

One mariner who recently set out to emulate Rose and Chichester had a severely practical reason for recording on board; he has sold the rights to Television News, who will rendezvous with him from time to time to pick up his tapes.

But the Rev. Stephen Pakenham, from Sussex, was motivated by other things when he took part in the recent Observer trans-Atlantic race. He took a recorder with him on his ketch Rob Roy "to record his feelings" so that, when he returned home, he could use the recordings in his sermons.

\* \* \*

GOOD IDEAS are usually so basically simple that one wonders why one didn't think of them before. For example the "Bookworm." It is only a sheet of stove-enamelled steel, attractively coloured in red, blue, grey or white, but so shaped that it permits convenient storage of books, records or tapes.



The steel strip is L-shaped, but with a long horizontal stroke to the L, the end of which is sprung-coiled. Roll it back and slip in the tapes, then it retracts and holds them firmly, as on a shelf. The capacity is 32 tapes and the price 19s. 11d. post free from Empresa Company, 1, Park Lane, Wallington, Surrey.

THE CZECHS seem intent on making this year's International Recording Contest the biggest event of its kind to date. Latest information circulated shows that Prague Radio are accepting responsibility for organising the event and are contacting radio concerns in other countries to help with publicity. The Czechoslovak Press Agency and the foreign language broadcasts section of Czechoslovak Radio are also being used.

Furthermore, the organisers are contacting all recording organisations of which they know—whether or not they are members of the International Federation CIMES.

One challenge faces the British participants in the event. It is the established practice for each country taking part to contribute to the prize list. In the past British prizes have been conspicuous by their rarity; only the British Federation and *Tape Recording Magazine* have donated awards.

Are there any British manufacturers ready to respond to the appeal for prizes?

\* \* \*

NEWS-IN-BRIEF from other lands—At least two United States manufacturers are experimenting with colour video tape in cartridge form, but nothing is expected on the market for a couple of years yet. . . .

Nagra, the Swiss professional-class portable recorder is due to appear this year in a stereo version. . . .

Cartridges and cassettes are having a great boom in America, with hundreds of thousands of dollars spent on sales promotion gimmicks. . . .

\* \* \*

OUR COVER PHOTOGRAPH last month showed an attractive picture of Cilla Black at a recording session, and in our caption we named the engineer operating the mixing desk as George Martin. Unfortunately we were wrongly advised, and in fact the identity of the technician is Alan Brown. Our apologies to both Messrs. Brown and Martin for this confusion.

However, this is a most opportune moment for me to draw special attention to my namesake. Our Techniques feature this month on page 326 deals with the possibility of amateurs turning professional. Denys Killick rightly stresses the difficulties but concludes by pointing out that a few really determined people do succeed. Alan Brown is one of these. Two years ago he won the Tape of the Year Award as an amateur. Today he is a full-time professional technician working with E.M.I. There's a great future for any amateur who really can make the grade.

TRM LOOKS TO THE NOT-TOO-DISTANT FUTURE WITH THIS REPORT

ON

# AN AUDIO-VIDEO RECORDER

At first glance the illustration below appears to show the fairly standard layout of an ordinary stereo tape recorder. Closer examination will reveal the word "video" on the deck plate. This model is actually the new Akai X-500 shown for the first time at the New York Consumer Electronic Show held at the New York Hilton Hotel from the 23rd to 26th June. The designation "Roberts 1000" on the illustration is merely the American trade name and reference for this equipment.

The Akai X-500 is worthy of special note because it shows a most interesting trend in development. Design has been evolved in such a way that the same machine will operate equally well as either a video tape recorder or alternatively as a stereo audio recorder running at the usual speeds of  $7\frac{1}{2}$  and  $3\frac{3}{4}$  ips. All video recorders are capable of recording sound but this hitherto has been merely regarded as a sound track for the accompanying video information. Akai have adopted a totally different approach. They have reasoned, quite rightly, that certain facilities are common to both audio and video requirements. Why then should the user be expected to purchase two separate pieces of equipment if a single machine can do both jobs equally well?

A glance at the audio specification indicates that they have probably succeeded in this department; the figures are comparable to (or better than) those you might expect to find related to any good quality audio equipment. Wow and flutter is quoted as less than 0.05 per cent at  $7\frac{1}{2}$  ips and less than 0.08 per cent at  $3\frac{3}{4}$  ips. Frequency response is given as from 30-18,000 Hertz plus or minus 3 dB at  $3\frac{3}{4}$  ips (as good as many audio machines at  $7\frac{1}{2}$  ips) and distortion is stated to be within 1.5 per cent at 1000 Hertz. The recording system is conventional 4-track stereo/mono and three heads are provided, one each erase, record and playback. This would seem to indicate that full before and after record monitoring is possible.

When used for video a third tape speed is used,  $11\frac{1}{4}$  ips, although the actual tape itself is standard audio width  $\frac{1}{4}$  inch. With a maximum reel size of 7 inches the recording time is given as 37 minutes for a 2,130 ft reel. Resolution is given as 200 lines and the signal-to-noise ratio 40 dB.



The helical scan system is used when operating video and the deck employs four motors, one three-speed motor for capstan drive, two outer rotor motor for reel drive and one video head motor. A full range of facilities is provided including remote control and a special "sensing" tape reversal system.

When used for audio the tape is loaded at the audio recorder heads, the audio control depressed and from thence on operation is standard. When working video the tape is loaded through the video channel, the video control actuated and the machine works as a conventional VTR.

The thought behind this development is very simple and very logical. Why should one have a separate video recorder? We believe that this machine points the way towards the future development of magnetic recording.

Unfortunately it may well take some little time before such equipment is generally available in this country. At the time of writing it is not known whether or not there are any plans to distribute the X-500 in this country as well as the United States. Obviously the recent imposition of purchase tax will increase the retail price and if it is found that this is too high it would not be unreasonable for the manufacturers to by-pass the United Kingdom altogether. Who can blame them? But

these are early days as yet. As techniques improve and sales increase prices are bound to stabilise and perhaps in a few years' time a machine like the X-500 will not cost us so very much more than a conventional stereo machine costs today.

Congratulations to Akai for taking the lead in this fascinating development which holds the promise of great things to come for all recording enthusiasts.

It is not very difficult to visualise recording of the future using equipment like the Akai X-500. Such a machine could easily form the heart of a comprehensive home entertainment system permitting the reproduction of top quality sound or vision at will. With modern electronic techniques, using Integrated Circuits no larger than the head of a pin, there is no reason why all the associated equipment—tuner, amplifier, etc.—should not be housed either in a separate compact unit or even incorporated in the video/audio recorder itself.

The only "awkward" items would then be the loudspeakers, the gramophone turntable and the television screen. The trend in television screens is likely to be towards the larger picture area given by bigger tubes, although our present 23-in. or 25-in. sets do seem to be adequate for normal living conditions. Few people would welcome a television screen covering the whole of one side of their room even if that were to be technically possible.

Perhaps a breakthrough in loudspeaker design for which we have been waiting for many years will be achieved by the time the audio/video recorder is available. We all want good quality sound but few people are prepared to either pay the high prices or sacrifice the space required for genuinely full range units. If there is no such breakthrough then all this sophisticated electronic equipment is likely to do no more than produce rather dubious quality sound from a pair of small bookshelf-type enclosures. Gramophone turntables are unlikely to undergo any dramatic change. Unless, of course, they are superseded for domestic use by very small, and very efficient, cassette tape machines. All of which is to us a most encouraging prospect for the future. The only doubt—when will it all happen?

## WHEN AN AMATEUR TURNS "PRO" IT COULD BRING

## PROFIT

## —————OR LOSS!

**S**OONER or later it happens to most of us. We look at our recording equipment, we consider our experience and we begin to wonder why we shouldn't make money in the recording world. Surely someone somewhere will pay us to take a recording for them? After all, that's what the professionals do all the time. A lot of amateurs make money out of their photography; recorded sound is a newer medium—now must be the time for the lad with really bright ideas to make a killing.

That opening paragraph should be the cue to lead me on to a nice cosy editorial that will describe in precise and exact terms just how those loyal enthusiasts who have been following my *Tape Recording Techniques* series with conscientious devotion can now transmute their accumulated wisdom to pure gold. It's a lovely thought. What is it the professionals charge—is it 10 guineas an hour—perhaps it's 20 or even 50? Whatever the rate it adds up to a lovely lot of lolly. A life of opulent luxury is obviously within the reach of any who can summon the energy to raise a hand to grasp at it.

There is just one small fly in this attractive pot of ointment. A great many people publish books and articles which purport to instruct a gullible public in the gentle art of money-making. Does it never occur to the readers that if these gentlemen were to be as astute as their literature pretends then they would be practising what they preach, and making a very good thing out of it, instead of writing. Now if I knew with any degree of certainty how to make a great deal of money out of a miscellaneous collection of recording and hi-fi junk—plus a reasonable quota of experience—then I wouldn't either waste my time or spoil my chances by telling you about it. I would be far too busy doing it.

I have found it possible to make a little money out of my recording activities. In the course of these excursions I have also discovered that it is very much easier not

to make money and even easier still to make a loss.

There is one obvious expedient that will convert your equipment to ready cash. Just nip down the road to the local dealer and flog the lot. But the resulting cheque can hardly be classed as "profit." Provided the equipment is in good condition an honest dealer will probably give you something in the region of one-third to one-half of the price originally paid. Simple subtraction of the one figure from the other will give you a very neat "loss" figure to enter in your account books. Since this method of making money deprives the aspirant to fortune of both his capital equipment and self-respect it should be regarded as a temptation to be resisted as long as possible.

Two more satisfactory approaches involve talking about tape recording (hopefully referred to as "teaching" by the aspirant) and writing about tape recording. I have had what is probably more than my fair share of both of these activities. Teaching calls for a fluent tongue backed by a little knowledge. There's no more speedy way of learning your own job than by attempting to teach other people how to do it. When standing alone and isolated in front of a class of students flashes of intuitive inspiration make up for one's lack of academic learning and some sort of divine inspiration does the whole job for you. Many times I've stood outside of myself, so to speak, and listened to me giving a lecture and been astounded at the words that came out of my own mouth. Any honest lecturer will confirm that he has undergone this strange experience. Try giving talks to your local tape club. If you surprise both your colleagues and yourself with the interest you can produce you were perhaps cut out to be a lecturer.

The pay is poor, the work is hard—but it's all jolly good fun and I never regret my own five or six years spent lecturing for the L.C.C., later the G.L.C. If, on the

other hand, inspiration is lacking and the words refuse to form, then you will not need me to tell you that you've chosen the wrong approach. My best advice under these circumstances is that you should clasp your stomach with both hands, put an agonised expression on your face (which should not be in the least difficult), mumble apologies about regretting indisposition . . . abdominal pains . . . frightfully sorry . . . and escape by the quickest available route.

The advantage of writing is that one's boobs are committed in private. Unfortunately that privacy is ruthlessly torn away as soon as the piece is published. But writing is certainly one way of making money out of recording equipment and it is a fact that the audio press will always welcome new writers who show promise.

Contrary to popular misconception a good writer learns his craft only as the result of years of hard work. Needless to say that unpaid apprenticeship is never taken into account when your coveted cheque is being written. If you can dash off a couple of thousand of words in two or three hours then the rate of pay is better than for teaching; if you take a week to write the same piece of material then you are well below the breadline.

But none of these occupations really relate to "pure" tape recording. What of recording for its own sake? Are there any openings at all for the advanced amateur?

There are, but they don't involve any get rich quick formulae. Remember that the professional studios have a wealth of experience and equipment at their disposal. They stay in business for one reason only; because they produce top quality work at the rates that their clients can afford to pay. And none of them makes a fortune out of it. Most studios specialise in music recording and they are fully equipped with all the fancy gadgets that are essential for the production of

what is currently known as the "commercial pop sound". They would be in serious financial trouble if they had to depend exclusively upon recording classical works only. Any amateur who attempts to launch himself on a professional career by recording pops is heading straight for disaster. Lacking the facilities of the big studios his recordings will never have commercial appeal. The trouble is they will be too truthful. What the public wants today is not the sound of the instrumentalists but the sound that the latest electronic wizardry in the studio can produce—often as far removed from the original as chalk is from cheese.

No, the amateur has to look for the kind of recording work that is either too small or too troublesome for the big boys to worry about.

Recording weddings is an obvious example. No couple would dream of getting married without having a photographer in attendance, so why should they not have an audible as well as a visual record? Personally I would regard the continual recording of weddings (either by the camera or the tape recorder) as one of the most dreary and boring occupations imaginable. But it does have commercial possibilities and as such should be exploited by those who really want to make money out of their equipment. As with all commercial enterprises the quality of the end product is what counts most. No one who is not a ruthless perfectionist should attempt any class of professional work. It's downright immoral to accept money for poor workmanship. If your equipment is not of a high enough standard then hold back until it can be improved. Essential requirements would be a half-track mono or stereo recorder in the over £100 price bracket, a really good electronic mixer, at least two microphones (probably around £20 odd each) together with all the necessary stands, cables, etc., etc. Equipped with such an outfit and a good knowledge of basic recording techniques the amateur should be in a position to offer his services with some confidence.

The requirement will probably be for one or more gramophone records of the ceremony and so the recordist has not only to take the recording but also to edit the tape and arrange to have the disc cut by one of the many tape-to-disc studios that specialise in this work. Bearing in mind the necessity for really top recorded quality the recordist must not be afraid to quote a good rate for his services. If your recorded quality is not that good then you should not consider going into business in this way. The whole world of professional sound recording could very quickly fall into disrepute if a large number of thoughtless semi-professionals were running around doing poor work at cut rates.

When working out costings remember that one doesn't just calculate on the programme time alone. There is the work involved in loading equipment into the car, the cost and time in transport, setting up at the church and hanging around waiting. After recording there is the work of breaking down the equipment, loading back into the car and driving back home to base. This is followed by time spent editing, correspondence about disc cutting, postage and a hundred and one other things. If I were to be in the wedding business (which I am not) I would reckon on an absolute minimum charge of around 15 guineas with most jobs working out to between 25 and 30 guineas. And for that sort of money the client has every right to expect and to receive *quality work*.

The equipment and techniques devoted to wedding recordings can also be put to good use in the recording of all manner of other functions. I have myself recorded company and association meetings and conventions, all of which can provide a welcome source of income. Intelligibility of speech is usually the main requirement for this class of work and where the end product is merely a typewritten transcription one can get away with a recording speed of 3½ ips. Microphone positioning is critical; a mumbling speaker well off mike can be difficult or even impossible to interpret.

Commercial organisations sometimes require sound recordings for publicity or training applications. Work of this kind could be extremely remunerative but is not easy to find. The recordist must establish contact with appropriate business houses and convince them of his ability to undertake any jobs given to him in a thoroughly professional and workmanlike manner. Business men have no time to waste on inefficient or bungling amateurs.

In theory at least there should be a market for one's services in recording school orchestras and choirs, the profit being made from the sale of discs to the performers and their parents. If the students at one of your local schools have a high standard of musical proficiency it would be well worth while discussing such a proposition with the teacher in charge. The weakness of this scheme lies in the uncertainty of the number of discs that will finally be purchased. Initial enthusiasm with suggestions of an order of from 50 to 60 discs can quickly evaporate into a mere one or two purchases after the event—especially if the performance standard was not as good as had been hoped for.

Production of commercial gramophone records is a highly complex business. Not so much from the technical point of view of actually carrying out the recording but in the legal tangles of the law of

copy-right and in the specialised business of actually marketing the discs once all hazards have been overcome. As a private enterprise it could only be recommended to those with several thousand pounds capital, and iron will and a conviction that they will almost certainly lose the lot. If you try to compete with Decca, E.M.I. and the other big boys you can at least be sure of one consolation—you will have a lot of fun before you die in poverty.

Perhaps all that I have said is discouraging. Frankly it was intended to be. But of the thousands upon thousands of people who will read this editorial just one or two enthusiastic amateurs will ignore my warnings and will tread the stony path to full professionalism. Of these some will not only survive but will make a thorough success of it.

They will be the people who have the sheer guts to persevere against every discouragement and would never be put off by any mere words of mine. No other attitude could possibly lead to eventual success in this most difficult of all professions.

So long as one's recording activities are strictly amateur in every sense of the word then one is working for fun, not money. The introduction of commercial considerations can very quickly spoil the pleasure. If it is possible to make a few pounds to help to pay for equipment and expenses so much the better. But the trouble is that as soon as money begins to come in there is a very real temptation to do more and more professional work. Soon the revenue will be regarded as part of one's income. Then one day you will be asking yourself why tape recording holds no pleasure any more.

That is my profit and loss account. Even a financial profit can turn to human loss. And the chances of that profit materialising anyway are slight. Many years ago I made up my mind that the day I ceased to thrill to a recording assignment I would give the whole thing up. Perhaps I have been lucky. Today I find that I tackle recording assignments with the same enthusiasm as I did in the past. But if I found myself regarding my next job as a dreary, boring task to be undertaken only in the hope of making a little money out of it I should not hesitate to make that last irrevocable trip to the dealer that I have advocated at the beginning of this article.

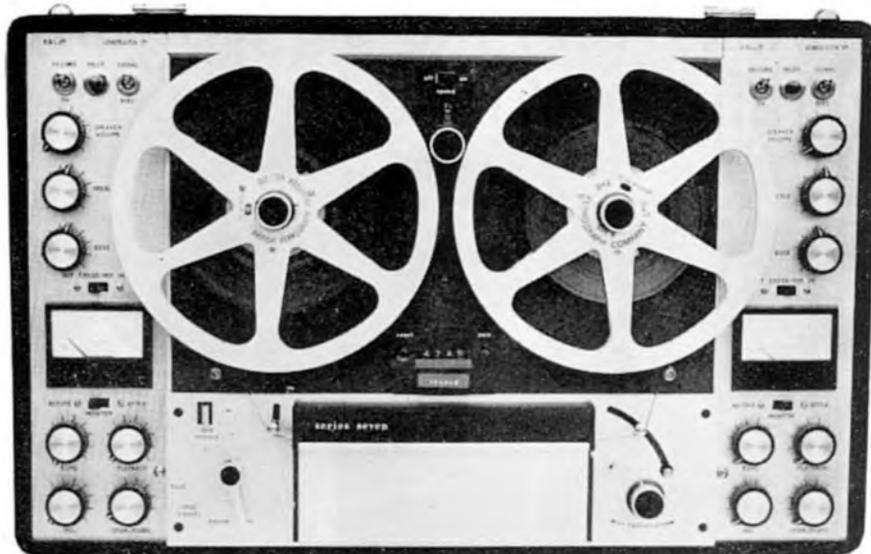
#### TEST BENCH

##### Review of Vortexion CBL/7T

The first part of our two-part review of this machine was published in our May edition with the promise that part 2 would follow as soon as possible. Production has been held up owing to supply difficulties with certain vital components, but our review will be completed just as soon as a standard production-run model is available.

# VORTEXION quality equipment

## TYPE C.B.L./7T TAPE RECORDER



Here is a versatile stereophonic recorder which has no equal in its price group.

The CBL/7T solid state version uses 8 low noise Field Effects Transistors on its twin channel Mic. P.U. and Playback inputs to give low intermodulation distortion, and the 10 watt sine wave 15 watt speech and music amplifiers each have less than 0.05% harmonic distortion and less than 0.1% intermodulation distortion at 10 watts output.

“ Before and After ” monitoring on phones and by internal or external speakers is catered for, and separate power amplifier volume controls allow the speakers to be independently controlled from the headphones. 30/50 $\Omega$  balanced line Microphone and P.U. inputs can be mixed with the other channel via a crossmix and an echo control.

All the facilities of the valve model C.B.L. are provided, plus a few extras . . . The series 7 deck has variable speed wind in either direction, solenoid operation, provision for an external switch for remote run or voice operated accessory, and still lower wow and flutter figures.

Mono and full track versions of this will also be available.

**VORTEXION LIMITED, 257-263 The Broadway, Wimbledon, S.W.19**

Telephone: 01-542 2814 & 6242/3/4

Telegrams: “Vortexion London S.W.19”

**T**HERE'S just no doubt about it, service is a problem. Tape recorders and their accessories are reasonably robust pieces of equipment but they are subject to breakdown through failure or breakdown through accidental damage.

The incidence of breakdown from either cause is probably very much less than one would expect to encounter from, say, a motorcar. As in the motoring world the mere fact that one pays top prices for "best" quality products does not guarantee immunity from breakdown. A friend of mine spent the best part of a couple of thousand pounds on his new car and it has required far more attention than my own humble Mini. We have to face the fact that no mechanical appliance is infallible and when we invest in a piece of recording equipment we must anticipate that at some stage during its lifetime it will require the services of a specialised technician to either bring the machine back to specification after a long period of use or to replace faulty components. The problem is who carries out the work, how much do they charge and how long will they take?

As with most mechanical appliances tape recorders are usually sold with some form of written guarantee. This usually defines a period of time during which the service will be carried out "free of charge." Sometimes this means that the manufacturer himself or his agent will indeed restore the equipment to proper working order without making any charge whatsoever. Other guarantees limit the liability to the replacement of faulty parts only, the customer paying labour charges. Some manufacturers refuse to accept equipment for service directly from the public but insist that it must go through the hands of the dealer first; others would much prefer to receive the appliance direct.

Now when a dealer makes a sale he also makes (or should make) a profit on the transaction. Part of that profit is supposed to cover his time and expenses carrying out minor servicing work if required during the guarantee period.

This system would work admirably if only all dealers were competent to carry out proper servicing and were also competent to judge when the correction of a particular fault is beyond either their capabilities or their facilities, and if users would only ask for service when it is genuinely needed. Any service man will tell you that a high proportion of tape recorders submitted for attention are found to have no real fault at all, the trouble being traced to incorrect use of controls, the tape being threaded with the oxide coating turned away from the heads, an accumulation of oxide dust clogging head gaps or building up on capstan and pinchwheel, incorrect wiring of mains plugs, etc., etc. The list is endless. These

# CROSS

# TALK

## By Audios

are all user failures rather than equipment failures and just because they are so prevalent some manufacturers hesitate to accept equipment for "repair" directly from the public.

That is a perfectly understandable attitude and one can sympathise with it. On the other side of the coin we have the undoubted fact that more tape recorders are sold by non-specialist dealers who do not have either the trained staff or the equipment to undertake proper servicing than by the dedicated recorder men. There have been all too many cases of machines with only minor faults suffering still further at inexperienced hands.

What is the solution? I wish I knew. The owner of a piece of equipment that has broken down requires to have it put right quickly and efficiently at reasonable cost. When the machine is first sold someone should accept responsibility and "guarantee" that this will be done. The trouble is that servicing is all too often regarded as the "bête noir" of both the manufacturer, the agent or the retailer. It's a job that causes endless trouble and never makes a profit. Too often equipment in need of repair is put on one side and not touched for weeks. Every day that passes is building up more and more resentment and frustration in the owner. What a pity we can't have a standard code of practice throughout the audio industry so that the public may be quite sure of receiving the service that they have a right to expect.

**T**HE multiplicity of uses to which recording equipment may be put continue to amaze me. A recent report refers to a series of experiments designed to establish the hearing capabilities of unborn babies.

A loudspeaker (suitably foam insulated!) is strapped to the abdomen of the expectant mother and sounds recorded on tape are delivered at high level through the abdomen wall. It is said that if the baby is normal it gets excited at the noise and kicks. Which seems to be a very reasonable reaction.

Apparently even unborn babies can become acclimatized to unwanted or objectionable noise. If the experiment is repeated at short intervals the child becomes accustomed to it and ceases to react. All of which could account for our uncomplaining acceptance of some of the nastier noises with which we are inundated nowadays.

**L**AST week-end I enjoyed a typical, if generally unpopular, British summer pastime. For some four or five hours I was walking across open country—in non-stop pouring rain.

Those in search of the sounds of nature must reconcile themselves to the need for spending a few pounds on proper waterproof equipment. The most difficult part of the body to keep dry stretches from the upper thigh to the ankle.

Far from being unpleasant, fresh rain on the face and head is most invigorating, but wet clothes around the legs are extremely unpleasant indeed. Surely a fortune awaits the man who can produce garments that will truly allow perspiration to pass out but will prevent water from getting in. Is that really too much to ask for in this age of space travel? Or perhaps it's just that insufficient people are stupid enough to go wandering around the country in pouring rain to make the project worthwhile.

*IT'S not always very easy to obtain sensible advice on the choice and use of microphones. But I have in front of me four pages of foolscap notes which start with the words: "The basis for true sound reproduction is the selection and use of the right microphone . . ."*

*Now this is the very message that my colleagues and I have been trying to put across for a very long time. And scanning through these notes it is obvious that they include a mine of information that will be extremely helpful to anyone who has the slightest interest in live recording.*

*Not only do they include information on the different types of microphones and their uses but microphone placing, impedance matching and cables are discussed as well. This invaluable document is published by Lustraphone Limited and is available to readers free of cost on application to them at St. George's Works, Regents Park Road, London, N.W.1. They don't ask for return postage but it would be a courteous gesture to enclose it. All those thirsting for microphone information are strongly recommended to write to Lustraphone asking for their "Selection and Instruction" notes. We would like to compliment this firm for producing such a worth-while little document.*

**T**HE Ferroglyph Owners' Club is rightly proud of its recent contest successes. Peter Bastin won the BBC 'On the Move' contest as well as the speech and drama section of the British Amateur contest. The Cotswold Cup for the best tape from a handicapped person was won by Roy Bannister as runner-up in the technical experiment section. Harold Wilde and George West won the Mersey Sound contest run by Radio Merseyside and the runner-up Tom Miller is also a BFOC member.

Is there another club that can match this record? By the way, the British Ferroglyph Owners' Club welcomes inquiries from prospective new members, the only qualification being the ownership of a Ferroglyph machine. Those interested should please write to the Secretary, British Ferroglyph Owners' Club, 34, Oak Street, Shaw, Oldham, Lancashire. Do please remember to enclose a stamped addressed envelope with all inquiries.

**A** LOT of people write to me and I have an idea that one or two have been having me on. One reader says he has just recorded a cuckoo. Is it a record? But he goes on to say that the call was definitely Oo-cuck. . !

**I** FINISHED up last month by strongly advocating the off-tape method of monitoring. Of course I realise that many of the tape machines on the amateur market do not cater for this. It would be fairly easy to attach an extra head and a transistor pre-amplifier on a Meccano bracket. But this do-it-yourself approach is probably best used for providing a basic check signal. To give a real guide to the quality of the recorded signal, the monitoring circuit has to be as good as the main programme circuit and should ideally permit switching of the meter as well as the audible chain.

The makers of hi-fi amplifiers have now got the message and are tending to incorporate a "tape monitor" switch. This allows you to switch the power amplifier and loudspeakers for listening to either the signal going to the tape machine or the off-tape signal—without affecting the amplifier's "tape out" chain.

Mind you, there are minor snags in off-tape monitoring of live recordings. If you are monitoring in an adjacent room to the artistes, for example, and they can hear your loudspeakers even faintly through the wall (or via doors and windows) they will find the *delayed* interference more off-putting than if it were synchronised with their voices. Also, you may find the split-second delay enough to throw out your timing when cueing between live artistes and pre-recorded inserts.

Needless to say, this delay is less at the higher tape speeds. Thus, for a spacing of  $1\frac{7}{8}$  inches between record and monitor heads, the delay would be 1 second at  $1\frac{2}{3}$ ,  $\frac{1}{2}$  second at  $3\frac{3}{4}$ ,  $\frac{1}{4}$  second at  $7\frac{1}{2}$  and  $\frac{1}{8}$  second at 15 ips.

### Monitoring geography

I mentioned possible leakage of sound between listening-room and studio. For this and other reasons it is worth giving some thought to the room layout. With the tape machine, mixer, gramophone turntable, etc., conveniently arranged for operation at table-top height, try to position the loudspeaker (two for stereo) for optimum listening. (I am assuming here that you are using a separate, high quality loudspeaker. The speaker built into your tape recorder is simply not good enough—you would really do better to monitor on a decent pair of headphones.)

The best listening distance from the loudspeaker is from about five to ten feet. A shorter distance is needed in poor room acoustics but has the disadvantage that the loudspeaker directivity makes the ear's position critical. Figure 1 shows a typical plot of sound intensities in the plane surrounding a loudspeaker. At 100 Hz, the sound is more or less equally radiated in all directions. But at 1,000 Hz, and still more at 10,000 Hz, the energy becomes concentrated in a beam along the

GOOD LISTENING IS THE KEY TO GOOD RECORDING

SAYS JOHN BORWICK IN

# THE HOME STUDIO

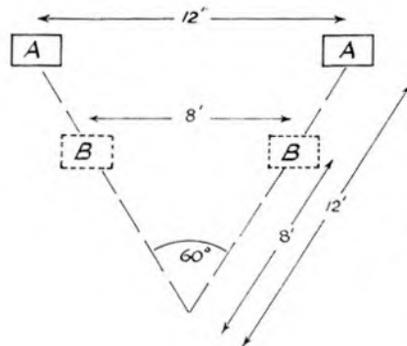


Fig. 2. Stereo loudspeaker pairs AA and BB subtend the same  $60^\circ$  angle and so will produce the same stereo spread at the distances shown. The further away the listener sits the greater must be the speaker separation.

axis. The amount of treble one hears is therefore conditioned by one's position relative to the axis.

As for angle, it is best to listen slightly off axis where it is less critical, but I like to be able to move my ear directly on to the axis for occasional checks on treble. In fact I often stick my head close up to the loudspeaker to check things like background noise, tape hiss, etc.

The best listening volume for monitoring the sound quality is undoubtedly the same as that used by an average listener. In practice, however, most professionals and I suspect most amateurs prefer to monitor at an abnormally high volume. This is perfectly understandable, since so much is at stake during a recording, but it does mean that the average listener will hear less actual bass and treble than the recordist did. A good solution, though it may be a counsel of perfection, is to monitor briefly at a "domestic" volume when making decisions about the microphone position, bass filtering, etc., and then wind up the volume when actually recording.

When recording in stereo, it again makes sense to imitate the listeners' (domestic) situation. Make your loudspeakers subtend an angle of about  $60^\circ$  (see Fig. 2) which is the same thing as spacing them by the same distance as you are from each. In the diagram, for

example, if you monitor eight feet away from speakers B, eight feet apart, you will hear the same effective width of stereo stage as a listener 12 feet away from speakers A spaced 12 feet apart.

### The choice of loudspeaker

A loudspeaker is a loudspeaker is a loudspeaker, as Gertrude Stein might have said. And any good loudspeaker should be satisfactory for monitoring. The main thing to avoid, quite clearly, is any idiosyncrasy in the response which you may try to counteract in the microphone balance by frequency correction. Then the tape quality would be *wrong* when the speaker sounded *right*.

The type of loudspeaker is relatively unimportant. The Quad Electrostatic has many advocates and it is still the only full-range model to use this principle on the UK market. All other loudspeakers use the traditional moving-coil principle, though some combine an electrostatic, ribbon or ionic high frequency unit

# THE HOME STUDIO

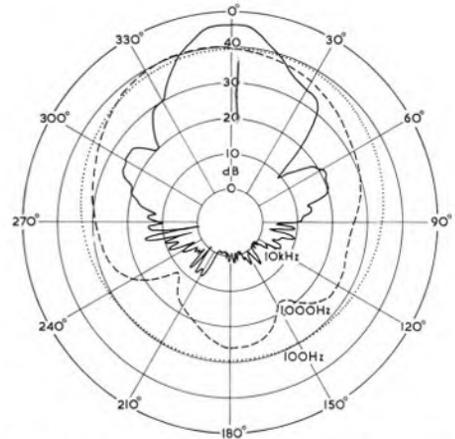


Fig. 1. This diagram shows the polar response of a typical loudspeaker. It will be noted that the high frequencies tend to be concentrated along the axis. Since it is the higher frequency range that conveys a sense of direction to the listener—particularly important in stereo—it follows that both direction and quality will be impaired if the listener is too far off axis.

(tweeter) with a moving-coil bass unit (woofer).

Cabinet types include *infinite baffle* (a totally closed box which absorbs the out-of-phase wave from the back of the cone), *bass reflex* (a box with a port hole whose dimensions tune with the enclosed volume of air to produce a phase reversal, so that the port wave reinforces the cone frontal wave) and *horn loaded* (in which the sound emerges from a flared tunnel). I have listed these three types in ascending order of size. Infinite baffle enclosures can be quite small, given the right sort of drive unit, and are currently favoured because of the need to accommodate two speakers for stereo. Bass reflex cabinets used to be the most popular with hi-fi enthusiasts and are still an excellent choice where space permits.

If you are choosing ready-made loudspeakers, you will find an almost bewildering selection available. My advice is to visit a specialist shop where you can hear a number of models in your price

range and let your ears be your guide.

## Do-it-yourself loudspeakers

There is a great deal to be said for building your own speaker cabinets. First, you will save money, and secondly you will be able to tailor the enclosure to fit your exact requirements.

Two quite different requirements, for instance, are illustrated in Figs. 3 and 4, both using the bass reflex principle.

The first (Fig. 3) is designed to fit into an ideal position for a fixed home studio installation. It is sloping downwards so that, when fixed say five feet above floor level, it will be well angled into the whole room and over the top of any obstructions. The second (Fig. 4) is unashamedly made for rugged transportability and will help you to obtain speedy and consistent results on recording jobs away from the studio.

No special knowledge is needed to construct loudspeaker cabinets other than the ability to cut panels of plywood, chipboard

or blockboard (or get your timber merchant to cut them for you) and make simple glued and screwed butt joints. All the leading makers of speaker drive units freely supply drawings of suitable cabinets—usually rectangular, or triangular for corner mounting. But, provided you make the internal volume the same, you can alter the shape as you like. My Fig. 3 has the recommended internal volume to suit the Celestion CX 1012 or 2015 12 inch coaxial drive units, i.e., 4,640 cubic inches with a 4 x 4 x 6 inch port. It could easily be scaled to suit other drive units. Figure 4 is a straight pinch from Goodmans' design for their Axiette 8 or Twin-axiette 8 units, i.e., 3,000 cubic inches internal volume and 4 x 7 x 6 inch port. I have added extra strengthening battens and suggested a "battleship" finish to withstand mobile conditions.

Next month I shall discuss mixers and mixing.

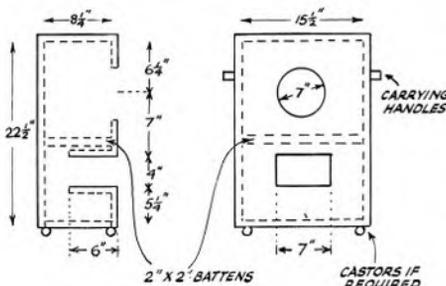


Fig. 4. A design for a portable monitoring loudspeaker based on the Goodmans Axiette 8 drive unit. Note the strengthening battens; use paint or Formica finish to give the hard wear needed for working in the field. Total building cost around £3 plus the drive unit. (Axiette 8 price £6 19s. 7d.)

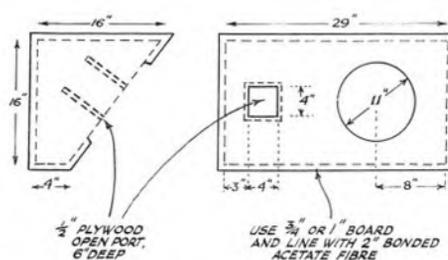


Fig. 3. This design for a wall-mounted monitoring loudspeaker is based on Celestion 12-inch drive units. Total building cost of the cabinet work should be about £5 plus the cost of the transducer. (Celestion 2012 price £18 18s.)

**T**APE recording techniques, as applied to electronic music and special sound effects are best tabulated, for in this way one may see almost at a glance how many there are and that any group could be applied simultaneously. These are as follows, although the list has been kept within the bounds of tape recorders and other equipment likely to be used by the amateur.

### Recording Techniques

1. Normal recording and/or replay at a given speed.
2. Replay at speeds faster or slower than the recording speed.
3. Replay in reverse (possible with full-track and most stereo recorders).
4. Recording with tape head feed-back (echo).

To these basic recording techniques can be added:

1. Dubbing from track-to-track or recorder to recorder.
2. Mixing of one or more recordings and other signals.
3. Tape Loops.

The above can be combined in various ways; for example a recording made at  $3\frac{3}{4}$  ips is replayed at  $7\frac{1}{2}$  ips via a mixer. Signals from a tape loop on another machine are also fed into the mixer. The output from the mixer is taken to a recorder and the combined signals are recorded and echoed via tape head feedback. This recording is now replayed in reverse on one recorder and copied with echo on another machine. When replayed in the reverse direction i.e., in the original sense, the recording will be one octave higher in pitch with echoes before and after the signals. One can go on *ad infinitum* providing the necessary equipment is available. I cannot deny the fact that really ambitious electronic sounds and music compositions do require two, or even three tape recorders, or possibly two tape recorders and a replay deck, plus a multi-channel mixer and other items.

"Electronic treatments" and sound sources also warrant separate listing and again are limited only by equipment. These are as follows:—

### Sound sources

1. Audio signal generators—sine and square-wave.
2. Audio tone records and/or tapes (test records and tapes).
3. Noise generator (a circuit for a white noise generator given in this article).
4. Noise signals (White noise test tapes are suitable if no generator is available).
5. Sounds via a microphone (everyday sounds, percussion sounds and sounds from musical instruments, etc.).
6. Electronic Musical Instruments: Electronic organs and guitars.

## EQUIPMENT AND CIRCUITS FOR TACKLING

# THE FINE ART OF ELECTRONIC MUSIC

Described by Fred Judd

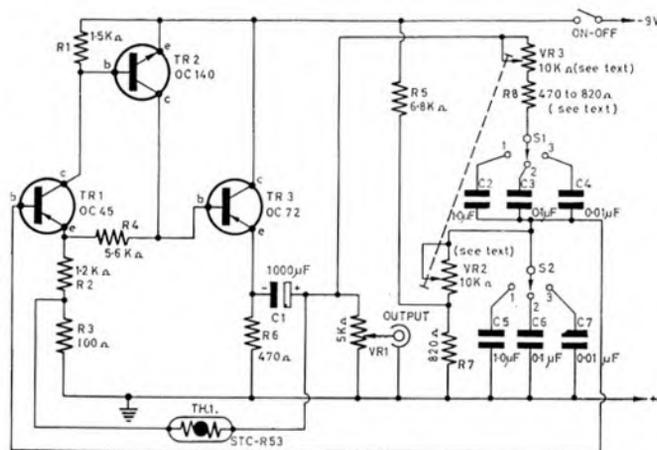


Fig. 1. Circuit for a transistorised audio range sine-wave generator (reproduced from "Circuits for Audio and Tape Recording" by F. C. Judd)

7. Electronic keyboard instruments of special design: i.e. audio oscillators or signal generators connected via a keyboard.

8. Electronic Rhythm Systems: Provide continuous common rhythms of typical percussion i.e. drums, cymbals etc.

### Electronic Treatment

1. Attack and Decay: Sounds can be provided with specific attack and decay via special circuits.
2. Wave Shaping: Sounds can be given a different waveform i.e., a new timbre.
3. Electrical Filtering: Elimination of specific fundamentals and/or harmonics, thus providing new tonal quality.

4. Modulation: Modulation of one sound by another by means of special circuits such as a ring modulator.

5. Reverberation: By means of echo chambers, plate or line reverberation systems and magnetic tape.

Practically all of the recording techniques, electronic treatments and the sound sources listed in the foregoing are within reach of the amateur. Possible exceptions are plate and echo chamber reverberation and electrical filtering. Electronic keyboard instruments and electronic rhythm units are expensive but simplified designs could be built by those

with some knowledge of electronic circuitry. I will be dealing with basic circuits for such instruments in later articles.

The most valuable items of equipment to electronic sounds and music enthusiasts are the audio signal generator and the noise generator. The audio generator needs little description except that commercially made generators normally provide a sine or square-wave output. A square-wave output is desirable but not essential as a sine-wave can be squared and modified in other ways by a simple over-driven amplifier; another circuit I will deal with later.

### Circuit for a sine-wave generator

The circuit given in Fig. 1 will produce almost a pure tone i.e., the percentage of harmonic content is extremely low and the output is sinusoidal. The frequency range is far greater than ever likely to be required for electronic music, in fact the generator is accurate enough and the frequency range sufficient for audio test purposes. The output voltage is also constant.

It operates from a 9-volt battery and is basically a phase shift oscillator in Wien bridge form. The components of the bridge are VR3, R8, C4, C7, VR2 and R7. The remainder of the bridge

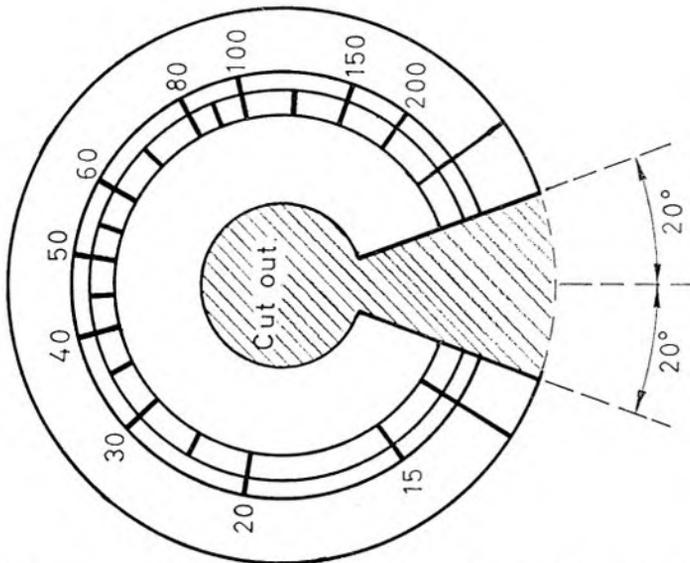


Fig. 2. Calibration of the audio generator. This dial is reproduced here full size and could be cut out and used with reasonable accuracy (from "Circuits for Audio and Tape Recording" by F. C. Judd)

network capacitors are C2, C3, C5 and C6 which are switched by S1 and S2. The bridge also includes the internal base resistance of TR1 together with the emitter resistors R2 and R3 associated with TR1. To maintain oscillation the components of the bridge are so arranged that the inherent phase shift of the transistors is added to the phase shift produced by the components of the bridge.

The gauged wire wound potentiometers, VR2 and VR3 adjust the frequency of oscillation to within the ranges set by S1 and S2. The thermistor, which is an STC type R35, acts as an amplitude control and ensures constant output voltage. It compensates for changes in supply voltage and operating temperature.

The frequency range of the generator is approximately 15 to 20,000 Hz obtained in three ranges by S1 and S2 as follows:— Range 1:15 to 200 Hz, Range 2:150 to 2,000 Hz. Range 3:1,500 to 20,000 Hz. The output voltage is continuously variable via VR1 from approximately 50mV to 1 volt rms. The external load should not be less than 10,000 ohms, i.e., it should be high impedance. The special gauged potentiometer is a Colvern type 5018/15F, 10,000 ohms per section and may be obtained from Colvern Limited of Romford, Essex. The S.T.C. Thermistor type R53 may be obtained from Electroniques (S.T.C.) Limited, Edinburgh Way, Harlow, Essex. The calibration dial given in Fig: 2 is reproduced full size and can be cut out and used with reasonable accuracy.

The components list is as follows:—

#### Transistors

- TR1 Mullard OC45
- TR2 Mullard OC140
- TR3 Mullard OC72

(the circuit will not operate with other types of transistor).

VR2 and VR3 (see preceding text) 10,000 ohm per section wire wound.

#### Resistors (all ¼ watt 10 per cent)

- |               |                                  |
|---------------|----------------------------------|
| R1 1.5 K.ohms | R5 6.8 K.ohms                    |
| R2 1.2 K.ohms | R6 470 ohms                      |
| R3 100 ohms   | R7 820 ohms                      |
| R4 6.8 K.ohms | R8 680 ohms (see following text) |

#### Capacitors

- C1 1,000µFd 12V wkg.
- C2 C5 1µFd (paper type) 150v wkg.
- C3 C6 0.1µFd (paper type) 150v wkg.
- C4 C7 0.01µFd (paper type) 150v wkg.

#### Other Components

- VR1 5 K.ohms
  - S1, S2 two pole 3-way wafer switch
  - Thermistor S.T.C. R53 (see preceding text).
- The signal generator must of course be housed in a metal box. My version of this generator was constructed to fit a box approximately 6×5×3 inches including the 9v battery.

The frequency range controls (S1, S2 and VR2 and VR3) should be wired so that clockwise rotation increases frequency. The resistor R8 (nominal 680 ohms) may require some adjustment to provide accurate calibration against the frequency scale given in Fig: 2.

#### Simple White Noise Generator

This circuit will produce white noise i.e., noise signals covering the audio spectrum which are produced with random amplitude, phase and frequency. This noise sounds like the hiss of escaping steam and is much used in electronic music. When noise of this kind is recorded with a given "attack" and "decay" a sound very much like that produced by striking a large cymbal can be obtained.

The noise generator circuit is given in Fig: 3 and consists of a high gain amplifier valve (EF86) with a diode shunted between anode and grid. The noise is produced by current flowing through the diode to the grid of the valve. The output from the generator is only a few milli-volts so that it must be connected via a high gain, high impedance input to the tape recorder or mixer i.e. a microphone input. An alternative source of white noise is the B.A.S.F. white noise test tape obtainable from B.A.S.F. (UK) Limited, 5a, Gillespie Road, London, N.5. This tape is normally intended for tape head alignment but the noise from it can be used as described above.

May I remind readers that a circuit for a signal mixer and one very suitable for electronic sounds and music recording was given in the June issue of "Tape Magazine".

Next month I will be dealing with more simple circuits and will go on with recording techniques such as rhythm loops, stereo panning, and the employment of specific sounds for musique concrète, etc.

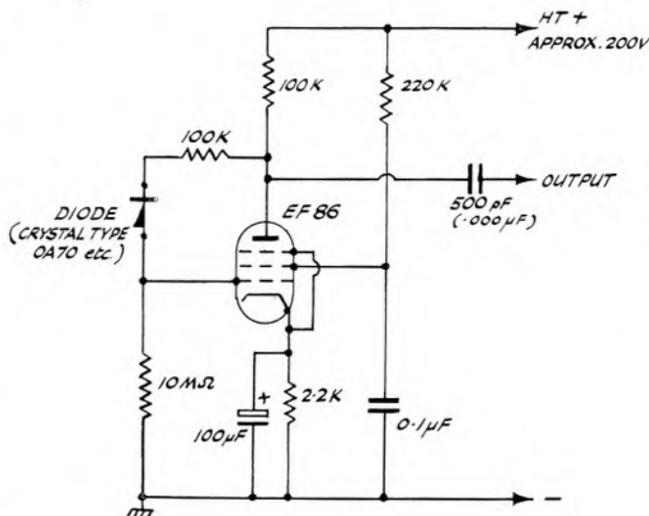


Fig. 3. A simple circuit for a white noise generator for home construction. White noise is an important component in "manufactured" music and sound effects



# NATURE NOTES

## FOR AUGUST

BY RICHARD MARGOSCHIS

**A** MONTH of tired and rather bedraggled birds. This is probably a reasonable way to describe August from an ornithological point of view, but because of this one should not get the idea that it is a month lacking in interest. There are sounds to be recorded in the countryside throughout the year.

Parent birds have had a pretty hectic time during the last three months, building a nest and rearing a brood; probably two. In many cases the young are still dependent upon their parents for food and protection, and this is the main reason why an audible change has taken place. The cock bird no longer has time to sit and sing while his hen hatches; instead, both birds are gathering food and carrying it to their chicks, making dozens of journeys a day.

This might appear a simple enough job at first, but once the fledgelings have left the nest there is the additional task of keeping in contact with them; so we hear the special contact calls made by both adult and young. Quite recently I went into a yard where I knew a robin had four young. As soon as I entered I knew the birds had left the nest for the whole place rang with "chirps" which were echoed back from the buildings; it made a remarkable quartet.

In addition to these calls there are the alarm calls made by the adult to warn the young of some danger lurking nearby, and on less frequent occasions you might be lucky enough to hear calls of encouragement. I remember sitting by my favourite pond one evening in late August last year, watching a swallow flying in small circles over the water as it collected insects for food; it was chattering all the time. Suddenly I realised that every time it passed a certain spot it seemed to give an extra special sort of call. The reason for this became apparent when, after moving my position slightly, I spotted four baby swallows lined up on a branch. Soon one took to the air, then another, until eventually I saw all four flying around after mother—or father—I don't know which!

I suppose you could say that I was lucky to be in the right place at the right time. That, no doubt, is true, but it is just as true to say that the amount of luck I have is directly proportional to the amount of time I spend watching and listening.

Having become familiar to the song of a particular species it is fascinating and worthwhile to follow on with a study of the calls. Of necessity it is a long-term project requiring hours of patient observation.

The blackbird might be a good choice to start with for it is fairly common with us all the year. The most familiar call is probably the one which starts with a sharp "chack," is repeated more quickly as the bird becomes more alarmed, rises almost to a scream and tails off as the bird flies away.

There is the "pink-pink" call the pitch of which seems to change according to the circumstances under which it is used. It can be heard in the evening as the birds are going to roost and sometimes appears to be quite a contented sound, but if the bird becomes alarmed, up goes the pitch and frequency. Quite often at this time of day a number of blackbirds will each produce this noise as they "mob" an owl—the noise is terrific and the owl is lucky if he can get a hoot in sideways.

The anxiety call is a very high pitched squeal which can sometimes contain an occasional stutter. When this is first heard it is often difficult to locate its source and when the bird is found it might be seen to be in a skulking position with its bill partly open to emit the sound.

The other day, again at the pool, I heard the low "cluck" of a blackbird, it was being emitted without any hurry or flurry as I watched this beautiful cock bird work his way along the top of a fence. Running along the bottom of the fence, perfectly silently, I saw the stoat that he was stalking; that bird's call is now on tape.

Perhaps I am not such a spartan as our friend "Audios," for I prefer our small touring caravan to his tent. Of course, I entirely

agree with what he had to say about the elements and the wide open spaces in the June issue of *TAPE*, and his writings were fresh in my mind as my wife and I enjoyed ten days of lovely weather with the caravan parked in the middle of a field in a rugged valley in North Wales. The back of my car was full of recording equipment and we were able to get on tape a number of sounds which will add to our library of natural history recordings. I hope to write about some of these experiences in future issues.

I was also very interested in what "Audios" had to say in that issue about noise nuisances. The Noise Abatement Act of 1960 causes a noise which is a nuisance to be made a "Statutory Nuisance" within the meaning of the Public Health Act, 1936. Any three persons aggrieved by the nuisance may take private action under the Act but it is more general that such nuisances are dealt with by the local Council who have duties under this legislation. If you are troubled with a noise which you consider to be a nuisance the person to contact is your local Public Health Inspector at the Council Offices; he will be able to give you expert advice and have the necessary equipment. I know, because this is part of my professional work and you would be surprised at some of the complaints I have to deal with.

Ambient noise is one of the greatest hazards of natural history recording; you just do not want it on your tape but there is very little you can do to control it. But take heart; on July 1 Britain became the first country in the world to have roadside noise checks on vehicles. As from that date the level of noise from existing cars must not exceed 87 dB A, and from April 1 1970, new cars tested at full throttle must not exceed 84 dB A. These tests will be carried out under specified conditions by the police. The levels might, at first, appear rather high, but it is a step in the right direction and it is to be hoped that in due course they will be lowered.

The Regulations have been made by the Ministry of Transport and I hope that the Ministry of Housing and Local Government will follow this lead in an attack on industrial noise, such as mechanical diggers and pneumatic road drills. Excessive noise is now regarded as a definite health hazard; any reduction will certainly help the patience of the outdoor recordist.

Finally a stop press item. Next month I hope to be able to announce details of the first Natural History Recording Contest. It will be sponsored by one of the large tape manufacturers and The Wildlife Recording Society will play an important part in the organising and judging.

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4"	300'	3/9	450'	5/-	600'	8/3	900'	12/6
5"	600'	8/3	900'	9/9	1200'	15/3	1800'	22/6
5½"	900'	10/-	1200'	12/3	1800'	19/3	2400'	28/6
7"	1200'	12/3	1800'	17/3	2400'	21/9	3600'	38/6

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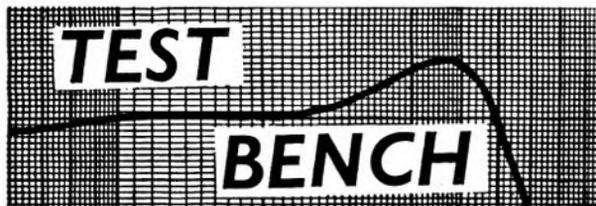
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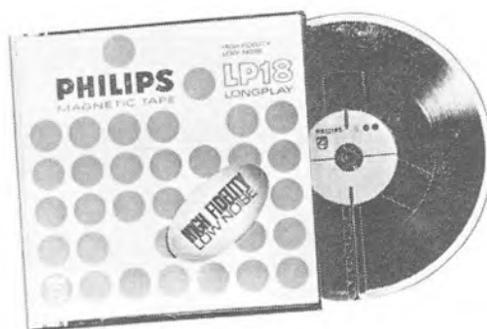
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# PHILIPS HIGH FIDELITY LOW-NOISE TAPE



INVESTIGATED BY R. HIRST AND D. KILLICK

**T**HE proper evaluation of recording tape presents the reviewer with a number of very difficult problems. Not least of these lies in the inescapable fact that the practical performance of any magnetic tape depends not upon the properties of the tape alone but on its relationship with the machine on which it is being used. It is for this reason that tape recorder manufacturers usually recommend a particular brand or type of tape for use on their machines, the inference being that the bias current at the record head has been specially set to suit the requirements of that kind of tape. Whilst it is strongly recommended that the user should follow this advice one should not slavishly conform and ignore other products, particularly when, as in the case of Philips High Fidelity Low-Noise tape, the new material is the result of recent research and development.

During the last year or two a number of so-called "low-noise" tapes have appeared on the market and it is highly probable that some of these might offer advantages—but the only way in which the reviewer could be specific would be to carry out his tests on *your* particular machine or a similar model. This is, of course, quite impracticable. What we have done therefore is to undertake a laboratory investigation under conditions approaching the ideal as nearly as possible. In order to do this a special piece of equipment with a signal-to-noise ratio of better than 74 dB was specially designed by one of your reviewers, Robert Hirst. This machine operates  $\frac{1}{2}$ -track at a single speed of  $7\frac{1}{2}$  ips. Following this we proceeded with the usual practical user tests and from the combined report it is hoped that readers will form an opinion as to the basic qualities of the product.

But we cannot stress too strongly that results achieved by individual users are likely to vary due to a number of factors other than the obvious one of bias current setting. The efficiency of the tape transport system, pressure pads, contour and surface of the heads themselves will all exert an influence on final sound quality. We would therefore suggest that after studying this review readers should conduct their own investigation by splicing lengths of this brand of tape together with lengths of the kind normally used, recording over both, and then assessing the practical differences in sound quality achieved. When one does not have either an array of measuring instruments or facilities for adjusting bias currents such a practical and simple trial offers the best basis for forming opinions on the advantages, if any, achieved through making a change in the brand of tape used.

Even for review purposes it is essential to offer some standard of comparison. A series of measurements relating to a single brand of tape would tell us nothing unless those figures are related to the results achieved from similar tests on other different kinds of tape. We have therefore used Philips ordinary long-play tape as a "control," and quote our findings in terms of the differences between that and the new High Fidelity Low-Noise tape.

To simulate normal operation both tapes were recorded to produce an output on replay containing 5 per cent harmonic distortion with the fundamental frequency at 1 kHz. Bias was set for optimum output at 1 kHz. It was found that the High Fidelity Low-Noise tape required 4 per cent more bias and 5 per cent more audio signal than the ordinary long-play tape to produce identical replay charac-

teristics. To simulate low level operations the audio signal was reduced by 20 dB and the same test applied again. The High Fidelity Low-Noise tape still required 4 per cent more bias but the audio signal was now at the same level for both tapes. In practical terms we could say that the difference in bias requirements is so small that it could be ignored for all but the most critical applications but the newer tape is marginally more sensitive at reduced level of applied signals.

A similar test at 20 dB below the 5 per cent distortion level (with bias set for optimum output) was carried out with the signal frequency increased to 10 kHz. The performance of the two tapes was almost identical, the Low-Noise tape giving an output 1 dB higher than the other indicating a very marginal improvement in upper response.

One of the important properties of any recording tape is its reaction to gross overload. When recording live one is constantly meeting difficult peaks that tend to kick the needle over the danger mark on the record level indicator. Provided the record amplifier in the machine is not so overloaded that it distorts itself, then the amount of actual audible distortion heard on replay will depend entirely on the characteristics of the tape. To check this condition our audio signal was increased to the point where harmonic distortion was raised to 10 per cent on playback. As the equipment used employed a 3-head system this was monitored during the recording process. The frequency of the recorded sound was 1 kHz and bias was set for optimum output at 5 per cent distortion. It was found that the amplitude of the input signal had to be marginally increased to produce 10 per cent distortion when recording High Fidelity Low-Noise

as opposed to the other tape. From this we may deduce that the newer tape handles overload slightly better than the other and thus gives the recordist a greater margin of safety when working under difficult conditions.

Figures for overall frequency response have not been published in tabular form. The only statement we can make is that within the bandwidth 40 Hz to 20kHz the response achieved from both tapes was to all intents and purposes identical when they were recorded under similar conditions on our test rig. As this ran at  $7\frac{1}{2}$  ips  $\frac{1}{2}$ -track we left slower speed checks to the user investigation.

The very name "low-noise" indicates that one of the features of the tape should be an improvement in the signal-to-noise ratio. Unfortunately it is only too easy to confuse inherent tape noise with the noise generated by the electronic equipment that must be used to carry out the tests. This was one of the reasons that it was felt necessary to design our special piece of equipment. Working within the bandwidth 300 Hz to 3 kHz the signal-to-noise ratio of the test gear is better than 74 dB and therefore no measurable noise increase is introduced in the tape measurements. The bias oscillator operates at 50 kHz and the output employs a very symmetrical push pull circuit which is an ideal condition for low noise working.

After setting the bias for both grades of tape to produce optimum output at 1 kHz the input signal was removed and the noise content of the recorded tape was examined at 1 kHz within the stated bandwidth of 300 Hz to 3kHz. Referring back to our first test of the series in which we simulated normal operation it was found that the Low-Noise tape offered an improvement of 2 dB in signal-to-noise ratio as compared to the other. This might be regarded as only a small improvement but in fact differences in level of 2 dB are quite audible and since we regard signal-to-noise ratio as one of the most important factors governing overall recorded quality (in some respects much more important than frequency response) an improvement of 2 dB would be well worth achieving.

Tensile strength of recording tape is most important. All tapes are subject to mechanical stresses and strains during recording, and perhaps more severely during fastwind. If recorded tape stretches the listener will hear a drop in pitch at the point of elongation. In many ways it is better for a tape to actually break rather than stretch; a break can be repaired without affecting recorded quality but such a tape would be bound to be more brittle than elastic. A brittle tape will offer a maximum of mechanical resistance and will therefore tend to skate across the surface of the heads rather than wrap itself around them. To achieve a smooth

response to the upper limits of the audio spectrum it is essential that the tape should have intimate contact with the heads and so for this requirement a more resilient tape is likely to give better results. This particularly applies when working at slow tape speeds and using narrow tracks. We found the Low-Noise High Fidelity tape to be slightly more resilient than the other but not so much as to create a possible danger from undesirable stretch. Although the difference was slight it could represent a major advantage on some of the modern narrow track slow speed machines.

Print-through is a phenomena that often causes a great deal of trouble. It occurs when the signal from a heavily recorded passage imposes its "magnetic shadow" on the layers of tape wound immediately above and below it on the spool. It is most noticeable when a particularly loud sound is preceded by silence. It will be heard as a "ghost" at low level in what should be the silent part of the tape. Once print-through has been recorded there is little one can do to remove it, although partial erasure at high speed has been recommended in extreme cases. All makes of tape are liable to print-through to a greater or lesser degree; if it is held back below the level of audibility then it need not concern us at all. Storage conditions affect print-through which will tend to increase as the temperature rises. This is one reason why we do not like too much free heat on the main deck plate of a tape recorder because by warming up the tape it will provide exactly those conditions where print-through is liable to be at its worst.

Both kinds of Philips tapes were fully modulated with a tone at 1 kHz and were stored for seven days at a temperature of 50 degrees Centigrade. The "silent" sections of the tape were then played back and the existing signal was found to be 58 dB below peak. A 1 kHz filter was employed but some of the components in the measurement must obviously constitute inherent noise. All of which means just one thing—that the print-through was quite inaudible in both cases.

When we erase a tape we expect the original recording to disappear. If either the tape is unduly resistant to erasure or the erase system on the machine is inefficient we shall be left with a "ghost" of the original recording. There was no measurable difference between the two kinds of Philips tape in the erase tests we undertook which in both cases resulted in a sensibly silent tape.

Summarising our laboratory investigation we can say that we have been examining two different tapes which both display remarkably good characteristics. At the points where they differ the advantage is always, as one might expect, with the

newer High Fidelity Low-Noise tape. The manufacture of modern recording tape is a highly sophisticated process and one would not expect to encounter dramatic differences. Nevertheless even the small advantages enumerated by us are significant enough to warrant the use of the newer tape.

Turning now to the practical investigation we firstly find that both spools of tape are packed in plastic library-type containers displaying similar contemporary designs on the front cover. One has to look very carefully to see which is which. The container holding the newer tape has the words High Fidelity Low-Noise printed in rather small type at the top right-hand corner of the front but nowhere else. The two tapes are however quite different in appearance, the ordinary long play being of the usual brown colour whereas the Low-Noise tape is a rich black. Whilst the library containers are an excellent means of storing tape we must point out that although the design is exceptionally good there is not the slightest indication as to how the box can be opened. It took one of your reviewers two minutes to discover that hand must be placed on the spine with the fingers at the back and then pressure on the cut-out back panel will swivel the holder outwards provided the other hand has a firm grip on the upper and outer lower edges. Dead easy—when you know how!

In user tests we were looking for differences in overall frequency response, improvement in noise level, resistance to oxide shear and drop-out, all of which were particularly related to slow tape speeds and narrow tracks.

As might be expected from the technical findings there was little practical difference observed between the two tapes. A very slightly better frequency response was noted from the Low-Noise tape (probably due to its better wrap-around) together with a just perceptible improvement in background noise. In neither did we experience the slightest trouble with either drop-out or oxide shearing. Both of these can be very troublesome faults when they occur; accumulations of loose oxide very quickly clog up the heads and degrade both recording and playback quality, whilst drop-out—a momentary hesitation in the recorded signal caused either by inefficient tape transport or by inequalities in the oxide coating on the tape—can completely spoil one's enjoyment.

Opinions on comparative results were only achieved by splicing together lengths of each kind of tape to form a composite spool and then noting immediate differences as the splices passed the playback head. The casual listener would probably detect no sensible difference between

*Continued overleaf*

recordings made on separate spools of the two kinds of tape. To this we must add the qualification, when recorded under the same conditions, that is to say on an Akai 3000-D and a Tandberg 64X.

Since much of the art of tape recording lies in the consistent achievement of better recorded quality it is wise for the enthusiast to take full advantage of even small improvements, particularly when they can be achieved by the simple expedient of merely changing tape. And by the way, the new High Fidelity Low-Noise tape costs no more than the ordinary long play tape. Remember that a small improvement in quality achieved in this way is a positive entry on the credit side; if similar small improvements were to be achieved in, say, the electronics and microphone they would together add up to a very significant overall gain. Apart from which every recordist should always use the kind of tape which gives him best results with his equipment. The products are there—the choice is yours.

**Manufacturer:** Philips Electric Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

**Price:** Various prices for different sized reels; for example a 7-inch spool (1,800 feet) in plastic "library type" container costs 50s. plus 1s. 7d. purchase tax. Other spool sizes pro rata.

## ACCESSORY REVIEWS

BY

DENYS KILLICK

**Metro-Sound Professional Tape Editing Kit, price 27s., tax free.**

**Metro-Sound Tape Recorder (Mechanical) Maintenance Kit, price 36s. plus 7s. 8d. purchase tax.**

**Metro-Sound Manufacturing Co. Ltd., 35/37, Queensland Road, London, N.7.**

A NUMBER of firms market "editing kits" of different kinds. Most of them include some means of cutting the tape at the conventional 45° and 90° angles, a spool of splicing tape and a collection of coloured leader tapes, often together with a length of metallic stop foil. They tend to differ mainly in the manner of presentation and also in the design of the actual splicing appliance included. In my opinion they all suffer from one common failing—they tend to give far too small a quantity of each of the component materials.

The Metro-Sound Kit comes in the



form of a plastic box complete with screws for fixing the base permanently to a work-table, or as an alternative a set of four plastic legs that clip into the screw holes to give a firm non-scratch base for use on domestic furniture. This last item is a very thoughtful and ingenious little extra that has not been noted in other kits.

Three small reels of different coloured leader tape together with a similar sized spool of metal foil are housed in plastic drums that clip by pressure on to the base plate. Each drum has a slot which enables the individual tape to be led out of its drum. These drums are mounted in two pairs and since they are inter-

Continued overleaf

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\*Ferrograph Mono 2 Track  
\*Ferrograph 2/4 Stereo  
Fidelity Studio 2 or 4 Tr. M.  
\*Grundig TK245 S/M pre-amp  
\*Grundig TK340 Stereo  
Grundig TK140 4 Tr. M 3 1/2  
Grundig TK120 2 Tr. M 3 1/2  
Grundig TK145 Auto 4 Tr. M  
Philips Cassette 3312 Stereo  
Philips 3575 St. 3 sp. 4 Track  
Philips 4306 2 sp. 4 Tr. Auto M.  
Philips 4305 4 Tr. 2 sp. Mono  
\*Philips 4408 Pro. 3 sp. 4 Tr. St.  
\*Revox 77 Stereo Transistor  
Sanyo 800 4 Tr. St. Pre-amp Dk

Sanyo 929 4 Tr. 2 sp. St.  
Sanyo 939 4 Tr. 2 sp. St.  
\*Sanyo 999 3 sp. 4 Tr. St.  
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\*Sanyo 800 3 sp. 4 Tr. St.  
PA/Deck  
Stella 463 Mono 4 Tr. 2 sp.  
Stella Mains/Batt. Cassette  
\*Tandberg Ser. 6X St. PA & DK

\*Tandberg Ser. 12 St. 3 sp. 2/4T  
\*Tandberg 915 Mono 3 sp. 2/4T  
Telefunken 200 Mono  
\*Telefunken 204 St. 4 Tr. 2 sp.  
Telefunken 203 Ser. 50 M2/4 Tr.  
Telefunken 201 Mono 4 Tr.  
Truvox 50 Series M 3 sp.  
Truvox R102 or R104 Mono  
\*Truvox PDI02 or PDI04 St.  
Ultra 6212 Mono 4 Tr. 3 sp.  
\*Vortexion WVA 3 sp. 2 Tr. M  
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locking any number of separate drums could be clipped up together. If the height exceeds two, however, the transparent plastic cover will be obstructed and will not be able to be used.

In the centre of the base plate is a slot into which clips vertically a small spool of  $\frac{1}{4}$ -inch splicing tape. Unfortunately the flanges at the sides of the spool are rather deep and to accommodate tape it must of course be only a little more than a quarter of an inch wide at the centre. In use splicing tape has a nasty habit of "losing" its raw edge in just the same way as transparent plastic tapes sold by the stationers. The problem then is to find the end. When the finger is obstructed by the sides of the reel, as in this case, it becomes almost impossible. If the end of the splicing tape is allowed to stick itself down it has to be located and eased up with the blade of a screwdriver. Splicing tape should always be sold in reels devoid of any obstruction at the edges.

The splicing tool itself is one of the simplest and very best kind. It comprises a simple metal block with a central groove and two guide cuts, one at 45° the other at 90°. The cutting implement is an ordinary single-edged razor blade.

The splicing tool interested me considerably. It is very much smaller and lighter than another well-known model of the same basic design. A little investigation showed it was held into place on the plastic base plate by a length of what appeared to be double coated oxide plaster—the sort of thing sold by the chemist but with both sides sticky.

I do a very great deal of splicing and editing (which is probably why I react violently to the very small quantities of material included in these made-up kits) and I am firmly of the opinion that the correct place for the splicing tool is on the tape recorder itself. It should be fixed firmly and securely as close to the sound channel as possible. It took less than two minutes to gently remove the Metro-Sound splicer together with adhesive plaster from the kit and to install them both on the main deck plate of one of my machines. The whole thing worked like a dream. The plaster gives an excellent solid fixing on the smooth surface of the deck without any trouble at all. It is a method of fixing as good as drilling and screwing without any of the trouble and possible complications.

So with the splicer installed in its rightful place and the plastic feet clipped into the base of the splicer kit with the end of each leader tape peeping through the slots in the plastic drums the whole thing was ready for use.

The name "Professional" Tape Edit-

ing Kit presumably originates from the fact that the splicing appliance is indeed of a professional type. In other words it is one of the best one can buy and is of a similar kind to that used in all the professional recording studios. This and the novel method of fixing I can recommend unreservedly. The other items are highly suitable for someone who is only doing a small amount of editing work; others will prefer to buy their leader tape in larger quantities. And if you should be driven mad by the end of the splicing tape disappearing between the vertical sides of the spool don't say you haven't been warned!

The Metro-Sound Tape Recorder (Mechanical) Maintenance Kit contains the following assortment of accessories: Klenzatape Set, Tape Deck Brush, Tape Strobe, Lubricating Kit and Cleaning Buds. The whole is packed neatly into a divided cardboard container.



There is little need to refer in detail to the Klenzatape Set since this well-known accessory is widely used and approved by both owners and manufacturers. It comprises three items: a bottle of special fluid, a spool of fabric tape and an empty spool. In use the fabric is moistened with the fluid, then run through the sound channel in the same way as ordinary tape. In its passage it cleans heads, tape guides and all other points of contact. Since it does not require any special access to the heads it is ideal for use in those machines where the head assemblies are shrouded in fixed head covers, but it also carries out the vital cleaning task very efficiently and safely on any machine. The cleaning brush, long stiff nylon bristles on a very substantial white plastic handle, is invaluable for getting dirt and dust out of odd corners as are the Cleaning Buds, a packet of flexible composition sticks with a neat swab of wadding at either end.

The Lubricating Kit comprises two small bottles of lubricant together with a miniature container of grease. It must be emphasised that the lubricants are

intended for use on the mechanical parts beneath the deck plate. On no account should any grease or lubricant be applied to the capstan, pinchwheel or any other parts in the path of the tape. If the slightest trace of grease contaminates the tape it will slip and produce the most appalling wow. Similarly, if friction drives are used beneath the deck plate they must be kept rigorously free from all traces of grease. The types of lubricant provided are ROB (the colourless fluid) a main spindle oil that can also be used for solenoids and mechanical linkage, etc., type ROG (an amber fluid) for oil retaining type bearings, and grease for general application for mechanical parts where grease is recommended. Great caution is recommended in the use of these lubricants since many tape recorders embody self-lubricating bearings that require no attention at all.

Perhaps the most interesting accessory included in the kit is the Tape Strobe. This strobe is in the form of a plastic wheel freely rotating on an offset handle. The upper and lower surfaces of the wheel are marked with the usual strobe markings and the appliance is used by pressing lightly against the moving tape and viewing the strobe marks under 50 Hz mains electric light. The purpose is, of course, to check on the accuracy of the tape speed, and when this is correct the appropriate strobe marks should appear to be stationary.

The basic principle of this little gadget is extremely good but there are of course certain snags that must arise in practice. Before using the strobe make sure to use only small sized magazine and take-up spools on the machine. If the tape recorder is equipped with 7-inch diameter spools it will probably be found that there is insufficient length of unobstructed moving tape to position the strobe correctly; at least that is what I discovered with the three machines on which I used it. The next problem is to hold the strobe steady so that its revolving wheel is accurately driven by the moving tape. Too little pressure and the tape will slip causing the strobe to revolve too slowly, too great pressure and there will be too much resistance to permit free movement. This is a very delicate adjustment that is bound to be more or less rough and ready using a hand-held tool of this kind.

I have found that even where a strobe disc is mounted on the top of a capstan spindle changes of tape speed can be achieved by making fractional adjustments in the capstan/pinchwheel pressure. In such cases variations in pitch up to plus or minus nearly half a tone can be produced without showing any varia-

*Continued overleaf*

*Accessory Reviews*—from page 339  
 tion at all on the strobe. Since the Metro-Sound strobe investigates actual tape speed rather than capstan speed it should in theory be more reliable. However, allowance must be made for this critical tape/strobe pressure discussed above. When this is correct the appliance will accurately evaluate all standard tape speeds from 3 $\frac{3}{4}$  to 30 ips.

Most of the items included in this kit can be purchased separately in the popular polythene sealed packages. A snag with this style of presentation is that the package is invariably destroyed when the contents are removed. By purchasing in kit form one has a comprehensive range of accessories packed in a neat and permanent container that will always keep them tidy. Modern tape recorders require

a minimum of mechanical maintenance apart from regular and frequent cleaning of the heads to remove surplus oxide. This kit provides just about all one is likely to require and will last for years. As such it is a most useful accessory and, as a hint, would make a most useful present for any recording enthusiast who is not yet fortunate enough to own these items.

# MUSICASSETTE

## REVIEWS

### CROISIÈRE DANS LES ÎLES GRECQUES. Riviera B 421018. 68s. 3 $\frac{1}{2}$ d. including purchase tax.

Modern, typically Greek, sound—sharp as a knife and as clear as a bell. Not so very different to the sound that has brought unbelievable trouble to certain nationals of its country of origin. If that is incomprehensible to you, then it's equally mysterious to me. Politics and the arts have never yet mixed throughout the course of history, but sometimes the effect is the opposite to the objective of the repressive government. Which leads me naturally to the current vogue for Greek music and the fact that this cassette is an import—from France.

The sixteen numbers include: *Baktse-Tsifiki, Prépare ton lit, La lune se ballade, Perdu, Danse karsilamas, Un tour sur la lune, La patronne, L'Aigle sans ailes, Maître Antoine, Nuit sans lune, L'aube en mineur, Eteins la lumière, Danse Hassapico, Cinq et six dix, Tes cheveux noirs* and (et?) *Le marché aux citrons*.

Recorded quality could hardly be better and the whole thing goes with a real swing. In spite of the French titles all the numbers are Greek compositions, including several by Théodorakis. Like all Continental imports it is, of course, mono (reproduces as double mono on a stereo player). Recommended.

### THAT HAMMOND SOUND, Howard Blake. EMI TC-SCX 6072. 54s. 6d. including purchase tax.

A dangerous title, this. Try shifting the emphasis from word to word and you'll find the phrase adopts new subtleties of meaning, all of which could legitimately be expressed by listeners depending on their personal likes and dislikes.

The offering includes: *Alfie, Bluesette, Moon River, Oasis, More, Gypsy in my soul, Till there was you, Someday one day, Scorpio, Meditation, Perdido* and *Recado*. Some of these numbers are renderings of the Hammond "naked," others are clad in a respectable covering of Vibes, Xylophone, Piano, Marimba, Celeste, Guitar, etc.

Sleeve notes refer to the latest recording techniques, but these are lost on the Hammond itself which doesn't lend itself gracefully to electronic gimmickry. To my ear the organ sadly needs the astringent quality of percussive instruments to liven up the proceedings. Either you like the Hammond sound—in which case you may buy it with confidence—or you don't. And if you don't you'll refer to this cassette as *that* Hammond sound.

## MUSIC ON TAPE 7 $\frac{1}{2}$ ips STEREO

*Equipment used for review tapes: Amplifiers—Quad valved and Wharfedale transistorised. Loudspeakers—Celestion and Jordan-Watts. Tape Recorders—Akai 3000 D and Tandberg 64X.*

### BRAHMS. Symphony No. 3 in F major Opus 90, Symphony No. 4 in E minor Opus 98 and Variations on a Theme of Joseph Haydn Opus 56a. Berlin Philharmonic Orchestra conducted by Herbert von Karajan. Ampex DGK 8927 4-track stereo 163s. 6d. including purchase tax.

On this one spool we have two great Brahms symphonies, together with the Variations on a theme by Joseph Haydn as a filler. Add to this the performance of the Berlin Philharmonic, the genius of Karajan and the recorded quality of D.G.G./Ampex and the result can hardly be less than epic.

We have previously reviewed the first two Brahms symphonies (April '68) and the approval then expressed can be extended to the present album without reservation. Thank goodness this fine music is offered at 7 $\frac{1}{2}$  ips. One can really sit back and lose oneself in the magnificence of the performance of this great orchestra. The sleeve

### WOUT STEENHUIS MEETS THE KONTIKIS. EMI TC-SCX 6191. 54s. 6d. including purchase tax.

Our sleeve note writer has taken considerable pains to refer to the romantic image of Hawaii as propagated by travel agents and the cinema. Most of us have little opportunity to dispute the veracity of either the highly glossed representation of these Polynesian Islands or indeed the accuracy of what we are led to believe is their music.

The album now being considered is undoubtedly in the Hawaiian idiom but it is doubtful if any stronger claim could be made for it.

On Side 1 we have: *Analani-E, Blue Horizon, Beyond the Rainbow, Tuki-tuki, Sarina, Drifting and Dreaming and Kontiki Hula*. Side 2 gives us: *On Treasure Island, Nina Bobo, Catamaran, Farewell Lei-lani-, White Sails and Moonglow*.

After the outstandingly good quality of some of the musicassettes reviewed this month one cannot help feeling a little disappointed with the sound of this album. It does lack that extra touch of brilliance that would lift it up out of the "average" into the "special" category. Steenhuis performs with his usual virtuosity, manfully doing his best with what I do feel to be a somewhat trivial programme. Without him the collection would have been a flop—with him it will probably do something for some listeners.

notes rightly point out that one of the features of the Third is its ceaseless contrasts of tone colours the true characters of which are faithfully preserved for us in this recording.

Now we have to live with the heavy burden of purchase tax on tape records the prospective purchaser is bound to look at the price and shudder. Is it worth it? Many will swallow hard and pay up. They know that works of art are of greater value than mere coin of the realm, and for them the aesthetic pleasure derived from their purchase justifies the expense.

If such are your feelings, then take care to invest wisely. Mistakes are costly. Even at its grossly inflated price this Brahms album still represents grand value for money. What wouldn't the gramophone addict give to get the whole of the Fourth on one side of a record so it could be heard without turning over in the middle? Plus a disc that is near indestructible? Plus a system without the vagaries of cartridge, stylus and arm? But this, in effect, is what we are paying for when we hand over the—impertinent—price that the shops are obliged to charge. And we can do nothing about it at all. Nothing.

Things could, I suppose, be worse. Just how is not clear but perhaps readers with sufficiently macabre minds could devise some more fiendish situation. I shall do no more than fume with impotent frustration and continue—when I can—to invest in tape.

## 3 $\frac{3}{4}$ ips Mono Tapes

### GOLDEN HITS—15 HITS OF PAT BOONE. Pat Boone. DOT TA-LPD 504. 47s. 9 $\frac{1}{2}$ d. including purchase tax.

This is a must for Pat Boone addicts, and I fancy will be welcome as a replacement for any of those old seventy-eights that may have been smashed over the years.

This selection covers Pat's best hits over the period 1957-1962. The classics that you'll recognise easily from the list at the end of this review.

If recording techniques have advanced over the past ten years, there's no real sign of it here. By that I mean that the recordings here are fresh, undated, and clear as crystal throughout.

There's really nothing more to say. Everyone knows these songs . . . if you like Pat Boone, then this is for you.

The tracks: *Love Letters In The Sand, Friendly Persuasion, Moody River, I Almost Lost My Mind, Why Baby Why, Anastasia, Don't Forbid Me, April Love, Speedy Gonzales, It's Too Soon To Know, A Wonderful Time Up There, With The Wind And Rain In Your Hair, Sugar Moon, Twixt Twelve And Twenty, There's A Gold Mine In The Sky*.

## MORE MUSIC ON TAPE

**SHER-OO.** Cilla Black. Parlophone TA-PMC 7041. 47s. 9½d. including purchase tax.

Another absolute winner from E.M.I.! I know there are some people who can't bear Cilla's voice, but personally I'm crazy about it. I'm also crazy about the really varied selection of numbers on this tape, the splendid recording itself, and the feeling of relief when the music begins on side one! Crazy comment? Not at all. For some reason there is a disturbing amount of unrecorded tape at the very beginning . . . and it gives rise to the immediately horrifying thought that by some ghastly mistake, you've been sold a blank spool!

Happily, the producers of this tape have included one number—the very final one—that shows off Cilla's sense of humour. It's a very amusing number, and makes a perfectly "up beat" ending to a splendid performance. Best tracks? It's difficult, because they're all good. I'd say *Take Me In Your Arms . . .*, *Something's Gotten Hold . . .* and *Step Inside Love*.

The complete picture: *What The World Needs Now Is Love*, *Suddenly You Love Me*, *Th's Is The First Time*, *Follow The Path Of The Stars*, *Misty Roses*, *Take Me In Your Arms And Love Me*, *Yo Yo*, *Something's Gotten Hold Of My Heart*, *Step Inside Love*, *A Man And A Woman*, *I Couldn't Take My Eyes Off You*, *Follow Me*.

**THE LATE LATE SHOW.** Matt Monro. Capitol TA-T 2919. 47s. 9½d. including purchase tax.

E.M.I. are pushing a lot of Matt Monro on tape . . . and this one is probably the best yet. Everything is superbly recorded, and although the overall tendency is towards the slow, romantic ballad, the tracks are neatly varied . . . being taken from sessions involving no less than five different musical directors.

The number I like best is *Maria*—which might almost have been tailor-made for Matt's voice. I'm not particularly a Monro fan, for all my praise. But I shall certainly be spinning this tape in those late evenings when I want everything to be smooth, sentimental and soothing.

Matt sings: *If She Should Come To You*, *When I Fall In Love*, *Maria*, *Hello Young Lovers*, *September Song*, *Time After Time*, *This Is All I Ask*, *I've Grown Accustomed To Her Face*, *Days of Wine And Roses*, *The Shadow Of Your Smile*, *Autumn Leaves*, *The Party's Over*.

**PROCOL HARUM.** Regal Zonophone TA-LRX 1001. 47s. 9½d. including purchase tax.

Regal Zonophone! Ah, what memories the name of this particular label conjures up! Forgive a reviewer with a taste for jazz, who has combed junk-shop after junk-shop for records on the old red and green pre-war labels for items of exceptional interest by bands who recorded for this company.

Alas—this tape by the Procol Harum is therefore a double disappointment to me. Firstly, because the first issued single disc by the PH was to my mind something rather good. Remember it? *A Whiter Shade of Pale*, with that organ rendering of *Air On A G-String*. Oh yes, I know that it was actually

performed by two people at the keyboard . . . or so we in the pop world were told . . . but nevertheless, the disc was extremely pleasant.

Well, this tape—produced by Denny Cordell—falls short. Not only does it let down the initial (disc) impact made by the Procol Harum, but it also damages the re-emergence (for me) of the Regal Zonophone label.

I wouldn't actually fault the recording. It's very clear, and you can hear everything that's sung. But it's the words of the songs that actually get under my skin. I know that modern pop songs are not written to be understood, but the stuff on this tape seems to me to be singularly "far out." It's so incomprehensible as to smack of exhibitionism. I would say the whole tape is consciously done "for effect." That is why I don't like it.

Try it, by all means . . . it's such an individual offering that you'll adore it or hate it. But if you do spend the necessary in order to pop it over your spindle, don't blame me if you find its content beyond you. A glance at the titles might give you a clue as to what it's like . . .

*Conquistador*, *She Wandered Through The Garden Fence*, *Something Following Me*, *Mabel*, *Cerdes (Outside The Gates Of)*, *A Christmas Camel*, *Kaleidoscope*, *Salad Days*, *(Are Here Again)*, *Good Captain Clack* and *Repent Walpurgis*.

**LOVE LOVES TO LOVE LULU.** Lulu. Columbia TA-SX 6201. 47s. 9½d. including purchase tax.

I would say this was a good tape, but for one thing . . .

But first, let's take the content itself. Lulu is a doll-like Scots girl who has made her impression on the pop scene as a lively young lass with a good voice and a good repertoire of songs. And this tape fully exploits the extent of her repertoire, to give us a pleasant selection of what is Lulu's best . . .

You like Lulu? So buy this tape. You've heard most of the tracks on radio, for sure. *Love Loves To Love*, *Love*, for example. A nice, beaty rendering that brings out her talents better than the slower items on this particular strip of acetate. I would say that the recording balance on some of the slower tracks tends to drown Lulu's voice orchestrally, but the whole is very nicely representative of this girl's style and delivery.

My niggle? It's purely that I think EMI are twisting us on this. The first side comes to an end after the fifth song. And there is one hellishly long expanse of empty tape running blithely off the machine, upon which the company could easily have put one more track . . . if not, indeed, two short ones.

I think this is a swindle, and I don't mind saying so. A tape is a certain length . . . why can't they fill it? Maybe the original disc LP from which this particular item was taken only had the five tracks on its "A" side . . . okay. On records, you can get away with that. A record starts and ends, and nobody's likely to be standing over the record player watching the stylus move across the disc. But here, the immense wastage of tape is distinctly visible at the end of the performance. So wake up, EMI . . . pad it out a bit. It's bad marketing to leave a chunk of empty tape at the end. You tell them, Lulu . . . it can't be doing your sales any good!

Track One begins with *To Sir With Love*, follows with *Morning Dew*, *You and I*, *Ratter* and *Day Tripper*, Track Two; *Love Loves to Love*, *Love*, *To Love Somebody*, *The Boat That I Row*, *Let's Pretend*, *Take Me In Your Arms And Love Me*, and *Best Of Both Worlds*.

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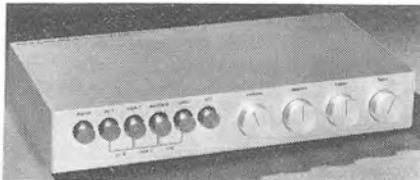
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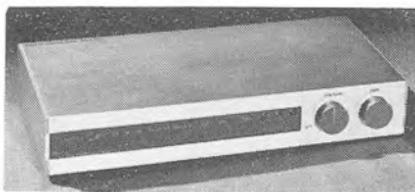
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**O**RIGINAL styling is a feature of the Sinclair System 2000 range of high fidelity products. The 35-watt integrated stereo amplifier is said to provide sufficient output power for all but the largest domestic installations and incorporates every feature likely to be required.



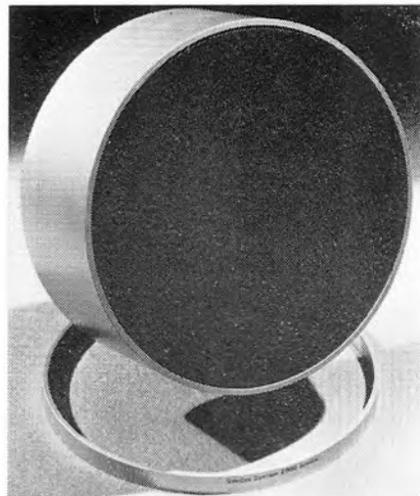
Output is said to be 35 watts RMS total music power with a loading of 3 to 15 ohms. Total harmonic distortion is given as less than 0.5 per cent at 1 kHz with a frequency response of from 15 to 30,000 Hertz plus or minus 1 dB at 1 watt. Size is 12 x 6 x 2 inches and the recommended price is 29 guineas.

The System 2000 FM tuner is claimed to represent a considerable advance in tuner design. Features include inter-station noise suppression, electronic tuning indicator, electronic fine tune, A.F.C. and a pulse-counting discriminator. The latter feature is claimed to provide far better linearity and freedom from distortion than the ratio and Foster-Seeley discriminators used in many other tuners.



An unusual feature of the System 2000 tuner is the facility for remote tuning. A socket on the back allows a tuning control which is basically a variable resistor to be plugged in. This may have a lead of any length so that the tuner can be operated from any remote position. Alternatively a switched tuning facility may be added and a module for this will shortly be available. The equipment is available as a mono only unit or as a complete stereo/mono tuner. The mono version can be converted to stereo/mono by the addition of a plug-in module. The tuner switches to stereo operation automatically when a stereo signal is received and the presence of a stereo signal is indicated by a neon bulb. Size is 12 x 6 x 2 inches and prices are: mono only 25 guineas, stereo/mono 29 guineas and plug-in stereo decoder 4 guineas.

To complement this range of equipment the System 2000 loudspeaker is unique in its styling.



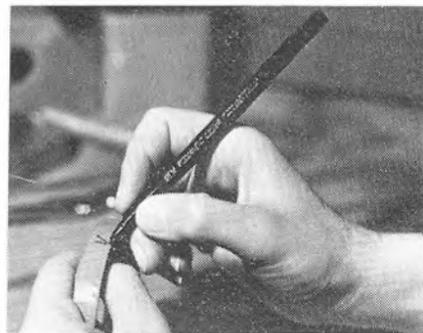
The specification quotes a frequency response of from 50 to 15,000 Hertz plus or minus 2 dB and 50 to 18,000 Hertz plus or minus 5 dB. Power handling capacity is said to be 10 watts continuous—20 watts music power. Impedance is 8 ohms at 1 kHz and construction is of solid aluminium.

The size of the System 2000 loudspeaker is 10½ x 8½ x 8½ inches and the price 12 guineas.

Sinclair Radionics Limited, 22, Newmarket Road, Cambridge.

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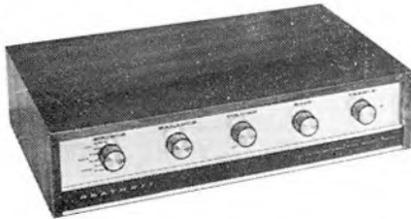


It is claimed to give good permanent marks on light coloured porous surfaces such as wood, cardboard or cloth and good light fast weatherproof and scuff resistant marks on light coloured non-porous surfaces such as paint, plastics and metals. The "Gem" permanent writer is available in black, red, blue and green and costs 1s. 11d.

Venus Easterbrook Limited, King's Lynn, Norfolk.

## HEATHKIT CLAIM "COOL POWERFUL SOUND"

OUTSTANDING hi-fi performance at lowest possible cost is claimed for the new Heathkit transistor 12 + 12 watt Stereo Amplifier, Model TSA-12. The circuit includes 17 transistors and employs 6 diodes for "cool, powerful sound."



The attractive, low silhouette styling harmonises with both modern and traditional decor and matches the well-known Heathkit slimline tuners, Models TFM-1 and AFM-2. Prices are: In kit form £30 10s., factory-assembled £38, walnut veneered cabinet £2 5s. extra, mounting trim and brackets £1 18s. extra. Full details of this and other models are obtainable from:

Daystrom Limited, Gloucester.

## HOT IRONS AND WHERE TO PUT THEM

WHAT does one do with a hot soldering iron? Weller Electric Limited offer a solution.



Their new range of simple, safe bench holders are designed for both industrial and domestic type soldering irons. Prices range from 16s. each and in addition to the holder and base each kit includes a sponge for the easy cleaning of the soldering iron tip. It is claimed that correct use of the sponge will prolong tip life.

Weller Electric Limited, Redkirk Way, Horsham, Sussex.

## NEW TUNER AND PORTABLE RADIO

THE increasing interest in stereo radio reception is being met by Highgate Acoustics with the release of the F 211 FM



stereo tuner. Operating on the FM range, 87 to 108 MHz, its stereo decoder is built up on the modular system. Employing three aerial tuned circuits and four IF band filters the equipment is neatly styled in either teak or Brazilian rosewood and costs 31 guineas including £5 9s. 9d. purchase tax plus £7 7s. for the stereo decoder.

Another line also released by Highgate Acoustics is the TA 10 transistor radio selling at 36 guineas including £6 7s. 6d. purchase tax.



The TA 10 follows the contemporary trend towards more substantial transistor portables with full VHF facilities and acceptable sound quality.

This announcement has been repeated from last month but now includes revised prices following purchase tax changes.

Highgate Acoustics, 184/188 Great Portland Street, London, W.1.

## TRADE ANNOUNCEMENTS

A new comprehensive catalogue of Eagle products is now available. The many interesting new items it lists include stereo tuner/amplifiers, test instruments, microphones, headsets and a host of component items suitable for manufacturers or the home constructor. This catalogue is available price 5s. on application to the Publicity Department, 32A Coptic Street, London, W.C.1.

The recommended retail price of the Bib quarter-inch recording tape splicer is being reduced immediately from 23s. 10d. to 19s. 6d. This welcome reduction is said to be due to H.M. Customs and Excise having decided (after three months!) that the splicer is not subject to purchase tax. The instrument is now available in its new style which has a non-slip base and is packed in polythene complete with instructions.

Four of the most recent additions to the Garrard range of record playing units have been accepted for inclusion in the Design Index of the Council of Industrial Design. They are Models SL95 and SL75, two of the automatic transcription turntables from the recently announced SL series, Model AP75, a high quality single record player, and the stylish Model 2025TC, a moderately priced auto turntable.

An agreement has been signed between Decca Educational Service (a division of the Decca Group) and Van der Molen Limited (a wholly British company) which ensures wide educational distribution of the range of Van der Molen tape recorders. All the Van der Molen machines are suitable for educational use and in addition Van der Molen Limited will undertake development for Decca Educational Service to produce special tape recording and ancillary equipment for education use.

Concert Recording offer to pay all incoming Customs, post office and tax charges on their pre-recorded tapes. Orders without remittance should be sent to P.O. Box 2,

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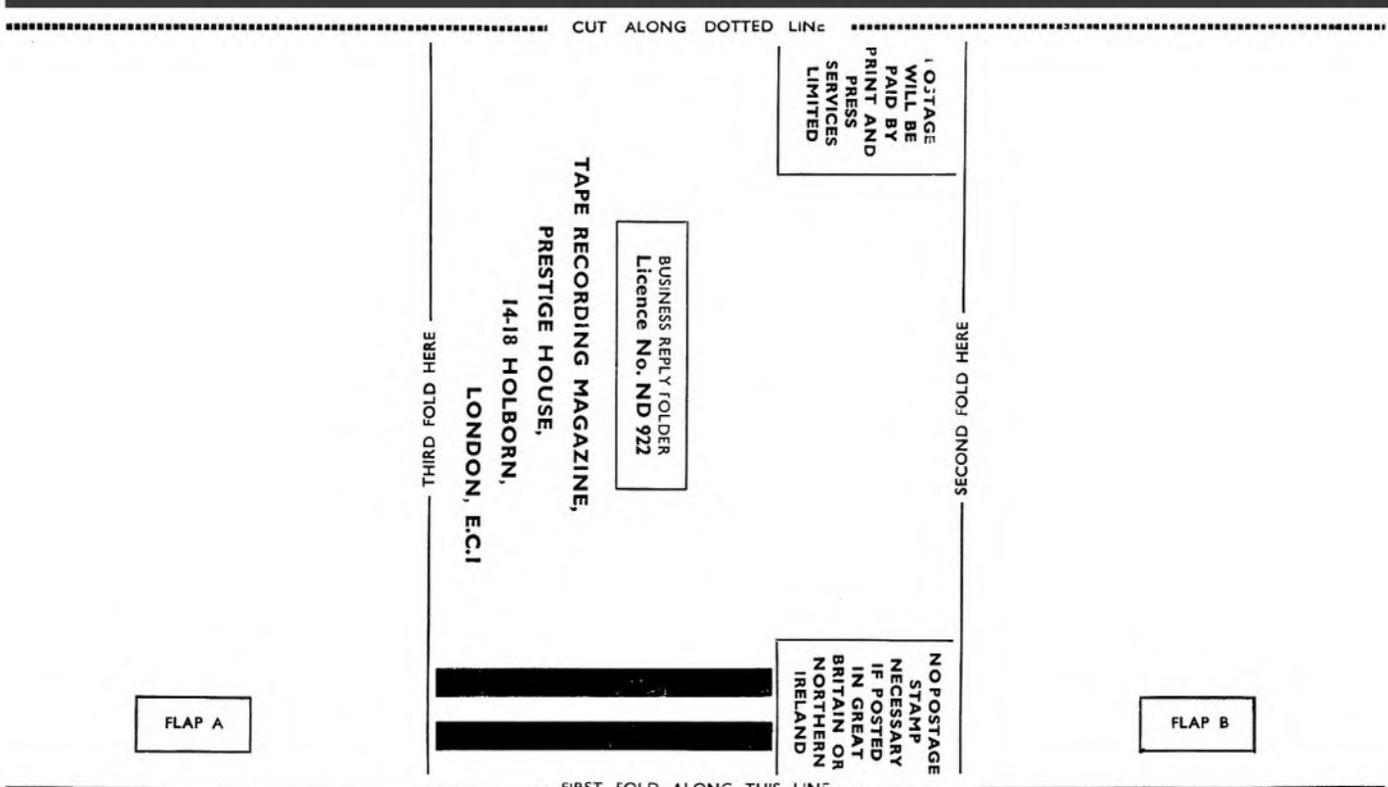
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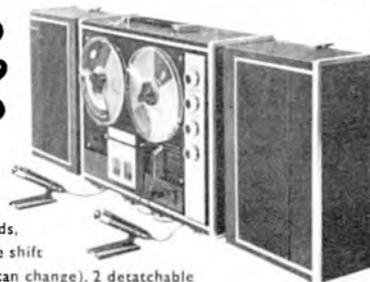
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