

JULY 1968

TAPE

RECORDING MAGAZINE

2¹/₂



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Microphone Placing

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MUSIC REVIEWS

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20% OFF

**BASF—EMI—GRUNDIG—PHILIPS
SCOTCH—AGFA—KODAK**

STANDARD PLAY	LIST PRICE	OUR PRICE
5" 600'	21/-	16/10
5½" 900' } Except	28/-	22/6
7" 1,200' } Agfa	35/-	28/-

LONG PLAY	LIST PRICE	OUR PRICE
3" 210' (Not Scotch or Kodak)	9/-	7/3
3" 300' (Scotch only)	9/6	7/6
3½" 300' (Kodak only)	12/-	9/6
4" 450' (Except Kodak)	14/6	11/8
4½" 600' (BASF, Agfa only)	21/-	16/10
*5" 900'	28/-	22/6
*5½" 1,200'	35/-	28/-
*7" 1,800'	50/-	35/-
8½" 2,400' (BASF, Scotch only)	72/6	58/-
10" 3,280' (Agfa only)	85/-	68/-
10" 3,600' (BASF only)	95/-	76/-
10½" 4,200' (Agfa, BASF only)	112/-	90/-

SCOTCH DYNARANGE (L/P)	LIST PRICE	OUR PRICE
5" 900'	32/3	25/10
5½" 1,200'	40/6	32/6
7" 1,800'	57/6	46/-
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/-

Grundig Tape available only where marked with asterisk. Postage and Packing 2/-. ORDERS OVER £3 POST FREE

FERROGRAPH TAPE—20% OFF!

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/-

Post and Packing 2/-. ORDERS OVER £3 POST FREE.

ILFORD TAPE NEAR HALF PRICE

A BULK PURCHASE OF PREMIUM GRADE, TOP QUALITY, POLYESTER MAGNETIC TAPE FROM ONE OF THE WORLD'S FOREMOST EXPERTS IN FILM COATING TECHNOLOGY, WITH FULL LEADER, STOP FOIL, POLYTHENE WRAPPING, AND IN ORIGINAL MANUFACTURER'S BOXES. AVAILABLE IN LONG-PLAY BASE ONLY AT THESE BARGAIN PRICES.

	One	Three	Six
900' on 5" reel	List Price 28/-	16/6	48/-
1800' on 7" reel	List Price 50/-	32/6	95/-

Please add 2/- P. & P. ORDERS OVER £3 POST FREE

SENSATIONAL NEW HALF-PRICE OFFER!

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.

1800' on 7" reel Long Play	Normal Value	ONE	THREE	SIX
	50/-	26/-	72/-	150/-

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AMPEX TAPE 25% OFF

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)

TYPE	DESCRIPTION	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/-

Post & Packing 2/-. Orders over £3 Post Free

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

SPECIAL OFFER COMPACT CASSETTES

"MC 60"



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/-

Standard pattern to fit Philips, Stella, Elizabethan, Dansette, Sanyo, etc.

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3 for 38/3 6 for 75/- 12 for 144/-

Orders over £3 Post Free

BASF TAPE—30% Reduction

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/-

Post and Packing 2/-. ORDERS OVER £3 POST FREE.

TRIPLE PLAY TAPE—40% OFF!

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/-

Post and Packing 2/-, ORDERS OVER £3 POST FREE.

20% off all Grundig and Philips equipment.

SEND FOR LISTS OF OTHER TAPE AND HI-FI BARGAINS

K. J. ENTERPRISES, (Dept. T), 17 THE BRIDGE, WEALDSTONE, MIDDLESEX (OPPOSITE HARROW & WEALDSTONE STATION) 01-427 0395 (CLOSED P.M. SAT.) REFUND GUARANTEE

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Our New Illustrated catalogue sent entirely free on request. Britain's most specialized comprehensive range of recording tape and accessories. 20,000 reels always in stock with reductions ranging up to 50%.




The missing Link

that puts stereo tape into your Hi-Fi system!

This superb tape unit completes *your* system. You already have a power amplifier and a pair of speakers! Now add the Akai 3000D. The Akai 3000D has: ● three heads — erase, record and playback ● frequency response 30 to 22,000 Hz ± 3 db at $7\frac{1}{2}$ ips. ● Signal to noise ratio: better than 50 db. ● first class tape transport. ● two speeds $3\frac{3}{4}$ and $7\frac{1}{2}$ ips. ● Headphone monitoring (or listening) when the unit is used away from your system. Everything you've ever wanted—ever needed in a stereo tape unit for 85 gns.

AKAI

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PHOTOGRAPHIC

(A Company within the Rank Organisation)

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11 Aintree Road, Perivale, Middx.

Please send me details of the 3000D.

NAME

ADDRESS



TAPE RECORDER AND HI-FI CENTRES

EVERY LEADING MAKE AVAILABLE

- EASIEST HIRE PURCHASE TERMS
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- FINEST AFTER SALES SERVICING
- EXPERT STAFF & EXPERT ADVICE

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Every make and model of Tape Recorder and Hi-Fi Unit is available for immediate demonstration by our specialist staff who will be delighted to assist you in selecting equipment to suit your individual requirements. Only from NuSound can you benefit from all these invaluable features—the most comprehensive range of equipment on display in the country, expert staff, free technical advice, immediate demonstration of any model and the finest after sales servicing available.



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- WEST END** 82, HIGH HOLBORN, W.C.1. Tel. 01-242 7401 (200 yards Kingsway—Half-day Saturday)
- CITY** 228, BISHOPSGATE, E.C.2. Tel. 01-247 2609 (Opp. Liverpool St. Stn.—Closed Sat. Open Sun. 10-2.
- E. LONDON** 2, MARYLAND STATION, E.15. Tel. 01-543 5879 (Adjacent Maryland Point Stn.—Half-day Thursday)
- N.W. LONDON** 360, KILBURN HIGH RD, N.W.6. Tel. 01-624 1656 (Opp. Kilburn Stn.—Half-day Thursday)

TAPE AND HI-FI CENTRES

- N. LONDON** 242/4, PENTONVILLE RD., N.1. Tel. 01-837 8200 (200 yards King's Cross—Half-day Thursday)
- ILFORD/ESSEX** 85/100, ILFORD LANE, PIONEER MARKET. Tel. 01-478 2291 (200 yds. Ilford Stn.—1/2-day Thursday)
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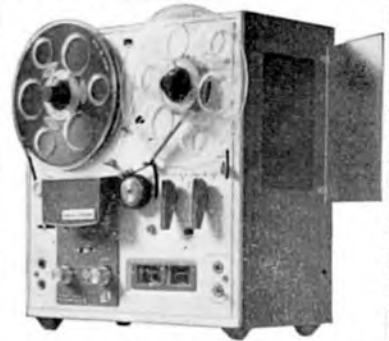
AKAI SPECIALISTS

See, hear and compare the complete range of Akai Stereo Tape Recorders. Our experienced staff are able to give expert advice and also demonstrate the many outstanding features of this wonderful range of equipment.

M9—Four track, three speed complete stereo recorder £195.35

1710W—Four track, three speed complete stereo tape recorder.

A few still left at our special pre-budget price of £89.10.0



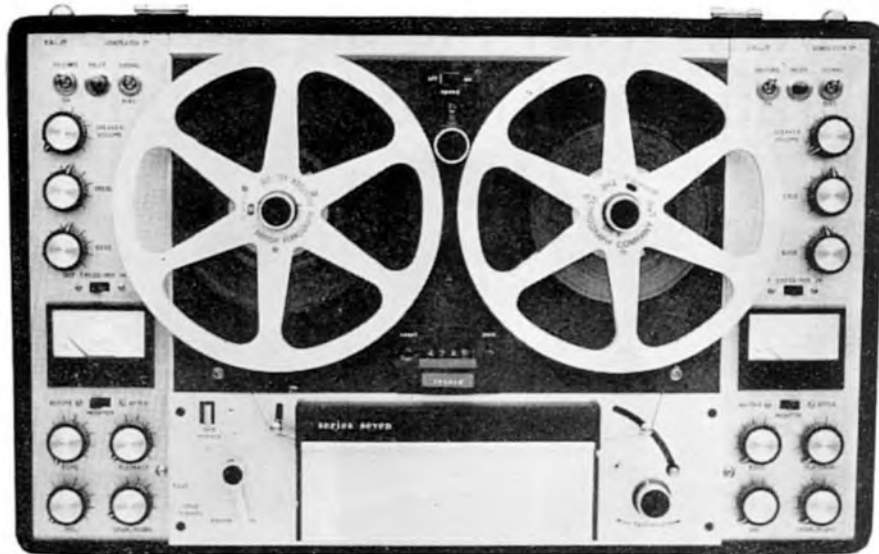
At every NuSound showroom you'll find a wonderfully comprehensive range of equipment backed by over 13 year's experience in this ever growing and highly specialised field—in which the NuSound reputation is "second to none." Four of our Centres are devoted exclusively to Tape Recorders and Accessories and the other three specialise in both High Fidelity Equipment and Tape Recorders.

Visit any Nusound Centre and you'll be certain of 100 per cent Service and Satisfaction.

BRITAIN'S LARGEST TAPE & HI-FI SPECIALISTS

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 Ω 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

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Telegrams: “Vortexion London S.W.19”

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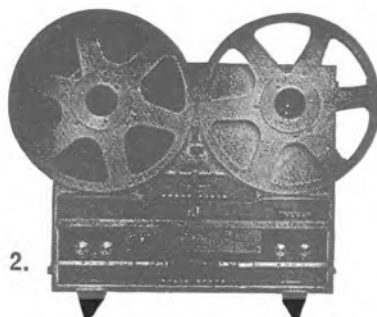
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Large stocks secured before the budget enable us to offer a uniquely large selection at Pre-Budget prices, but even our big stocks won't last for ever. **Make the most of the wide choice, come in and see for yourself now at our two showrooms, 146 Charing Cross Road (opposite Astoria) and 266-8 Upper Tooting Road.**

H.P. Terms available. Your deposit will be one third of our price, add 10 per cent to the balance and divide by 12 for monthly payments.

Overseas visitors will find our Personal Export Service really helpful. Deliveries arranged anywhere in the world.

*This
is only a selection*
**ASK FOR
LISTS !**



1. **Sony 260 Stereo Tape Recorder.** List price £116.5.2. **Our price 95 gns.**
2. **Akai X-300 Stereo Tape Recorder.** List price £263.18.3. **Our price £215.**
3. **Ampex 753 Stereo Tape Unit.** List price £117.16.8. **Our price 91 gns.**
4. **Akai X-IV Stereo Batt/Mains Tape Recorder.** List price £169.7.11. **Our price £138.**
5. **Philips 3302 Portable Cassette Recorder.** List price £31.10.0. **Our price 23 gns.**
6. **Ferrograph 631 Mono Tape Recorder.** List price £122.0.6. **Our price 95 gns.**
7. **Akai 1710W Stereo Tape Recorder.** List price £109.17.3. **Our price £89.10.0.**
8. **Tandberg Stereo 12.** List price 120 gns. **Our price 105 gns.**
9. **Telefunken 204E Stereo Tape Recorder.** List price £136.12.5. **Our price 106 gns.**

Great Britain's Largest Hi-Fi and Tape Recorder Dealers!

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● **WEST END SHOWROOMS:** 146 CHARING CROSS ROAD, LONDON, W.1. Tel.: 01-836 3365 (opposite Astoria Cinema)

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Model RD 303E. An all-transistor solid state Tape Recorder. Two speeds, twin track. Fully portable with operation from internal batteries or AC mains. Automatic or manual recording level control. Remote control switch on microphone for instant start/stop. Uses 3" reels. Utmost simplicity of control with brilliant performance—truly a miniature marvel. Dimensions: $11\frac{1}{2}'' \times 3\frac{3}{4}'' \times 7\frac{1}{2}''$. Complete with dynamic microphone, recording lead, earphone, batteries (4×Ever Ready LPU2 or equivalent), 3" reel of tape and empty spool. R.R.P. £28.17.6.

**5 YEAR
GUARANTEE**

THE SET WITH THE 5 YEAR GUARANTEE.

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Tel : SWI 3232 (5 lines)

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TR 6


Microphones

for every purpose




The DP4

Designed for general use
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The DP6

Small in size, large in performance. As a lavalier type and for panel mounting on control units etc.



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For stage and church work, P.A. use, lecture halls etc., where acoustic feedback is a serious problem.



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All microphones are manufactured in a special section of our works, under strictly controlled conditions with stringent test and inspection at every stage. Each and every microphone is individually tested both aurally and on Bruel & Kjoer visual and graphic recording test equipment for conformity to a prescribed performance.

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Integrity that you hear

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UP TO 50% OFF!

BRITAIN'S ONLY TAPE RECORDER MART

specialising in the SALE, EXCHANGE and PURCHASE of every make of high quality Tape Recorder. Brenell, Ferrograph, Ampex, B & O, etc., we have the lot!

Fantastic savings of up to 50 per cent off original list prices for Personal Callers only. Our stocks change daily—call today—well over 100 models to choose from—all guaranteed—you pay no tax on secondhand machines.

TYPICAL BARGAINS

ALL WITH 3 MONTHS WRITTEN GUARANTEE
(Note: M=Mono, S=Stereo, BP=Battery Portable, 4=4 track, 2=2 track)

PHILIPS EL3301 (BP/M/2)	...	OUR PRICE ONLY 18 gns.
GRUNDIG TK20 (M/2)	...	OUR PRICE ONLY 22 gns.
PHILIPS EL3549 (M/4)	...	OUR PRICE ONLY 29 gns.
GRUNDIG TK400 (M/4)	...	OUR PRICE ONLY 29 gns.
AKAI M69 (M/2)	...	OUR PRICE ONLY 32 gns.
GRUNDIG TK30 (M/2)	...	OUR PRICE ONLY 32 gns.
REPS R10/2 (M/2)	...	OUR PRICE ONLY 33 gns.
GRUNDIG TK41 (M/4)	...	OUR PRICE ONLY 39 gns.
TELEFUNKEN 300 (BP/M/2)	...	OUR PRICE ONLY 39 gns.
WYNDSOR VANGUARD (M/4)	...	OUR PRICE ONLY 39 gns.
TELEFUNKEN 85KL (M/2)	...	OUR PRICE ONLY 42 gns.
GRUNDIG TK6 (BP/M/2)	...	OUR PRICE ONLY 45 gns.
PHILIPS EL3536 (S/4)	...	OUR PRICE ONLY 49 gns.
SONY TC200 (S/4)	...	OUR PRICE ONLY 55 gns.

NOTE:—THESE ARE NOW EVEN BETTER VALUE AS YOU PAY NO TAX ON SECONDHAND RECORDERS.

FERROGRAPH 4AN (M/2)	...	OUR PRICE ONLY 59 gns.
VORTEXION WVA/4 (M/2)	...	OUR PRICE ONLY 59 gns.
BRENELL MK5 III (M/2)	...	OUR PRICE ONLY 59 gns.
AKAI I700 (S/4)	...	OUR PRICE ONLY 59 gns.
SANYO 929 (S/4)	...	OUR PRICE ONLY 59 gns.
PHILIPS EL3534 (S/4)	...	OUR PRICE ONLY 59 gns.
AKAI M6 (S/4)	...	OUR PRICE ONLY 65 gns.
FERROGRAPH SAN (M/2)	...	OUR PRICE ONLY 69 gns.
BRENELL MK5M II (M/2)	...	OUR PRICE ONLY 69 gns.
UHER 4000 (BP/M/2)	...	OUR PRICE ONLY 69 gns.
AKAI M7 (S/4)	...	OUR PRICE ONLY 72 gns.
TANDBERG 64 (S/4)	...	OUR PRICE ONLY 75 gns.
VORTEXION WVB (M/2)	...	OUR PRICE ONLY 79 gns.
VORTEXION WVB/5 (M/2)	...	OUR PRICE ONLY 79 gns.
B & O STEREOMASTER (S/2)	...	OUR PRICE ONLY 82 gns.
AKAI M8 (S/4)	...	OUR PRICE ONLY 85 gns.
SONY 777 (M/4)	...	OUR PRICE ONLY 89 gns.
AMPEX 1100 (S/4)	...	OUR PRICE ONLY 95 gns.
B & O 200 (S/4)	...	OUR PRICE ONLY 105 gns.

PERSONAL CALLERS ONLY

NEW TAPE RECORDERS

We also stock every make and model of New Tape Recorder plus a complete range of accessories.

Part of the NuSound Organisation

THE
**TAPE
RECORDER
MART**

242/4 PENTONVILLE ROAD, LONDON, N.1

(200 YDS. KINGS CROSS)

TERminus 8200

(HALF DAY THURSDAY)

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

Recommended Retail Price £110 0 0

SANYO

RELIABILITY IS BUILT IN

See Sanyo at any authorised dealer. For further information write to: J. W. Cowley, Sales Manager, Electronic Equipment Division, Marubeni-Iida Co. Ltd., 164 Clapham Park Road, London, S.W.4.

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. P.P. 10/6

FOR THIS SPECIFICATION

• $\frac{1}{2}$ track stereo or mono record and playback at $7\frac{1}{2}$, $3\frac{1}{2}$ and $1\frac{1}{2}$ 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, $5\frac{1}{2}$ " spool of long play (1,200 feet) magnetic tape and one spare spool. Cabinet finished in Black Rexine with Grey panel.

Versatile Recording Facilities. The Heathkit Recorder can record "live" from microphones or from auxiliary sources such as radio tuners, records, etc., and playback . . . in $\frac{1}{2}$ track stereo or mono at either $7\frac{1}{2}$, $3\frac{1}{2}$ or $1\frac{1}{2}$ 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.

See Britain's Finest Range
of Hi-Fi · RADIO · TAPE
in the latest FREE Catalogue

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Please send my FREE BRITISH HEATHKIT Catalogue

Please send model.....

Enclosed is £ s d plus postage

Name

Address

Prices and specifications subject to change without prior notice.

ILIFFE BOOKS

STEREO HANDBOOK

by G. W. SCHANZ

A Philips Paperback (No. 15)

In recent years stereophony has found a continuously expanding field of application and is now always considered in close relation to methods of recording, reproducing and transmitting sound. It is therefore essential that those involved professionally or otherwise should gain an understanding of the subject. Although there is no shortage of literature dealing with this matter, the present paperback on stereophony is intended only to give a brief survey, to facilitate understanding and, last but not least, to give useful directions for the appropriate testing of stereo reproduction equipment. This book has been designed expressly to give an explanation of the most important principles to a circle of readers consisting mainly of technicians and stereo enthusiasts.

135 pp., illustrated, 16s. net, 8d. postage

ILIFFE BOOKS LTD.

42 RUSSELL SQUARE, LONDON, W.C.1

FERROGRAPH—WEARITE TAPE RECORDERS

A fortunate release from the Ministry of Supply enables us to offer these PROFESSIONAL models at under half price. Specification includes some units with four speeds. All units are sold with a written guarantee and are in excellent condition.

PRICE: £65 CARRIAGE PAID

Massey-P.E.A.T., Nettlebridge, Oakhill, nr. Bath

Telephone: Oakhill 418



To ALL OWNERS of
Tape Recorders!
YOU SAVE MONEY AND
PREVENT IMPORTS



High-grade Magnetic Recording Tape. Polyester and PVC. Specially coated. Sensitive. Clear and durable. Appreciated by discerning people.

STORED AT CORRECT TEMPERATURES.

Dear Sir,
Thank you for your service to us members of the Tape World.
S.T. Beds.

	3"	5"	5½"	7"
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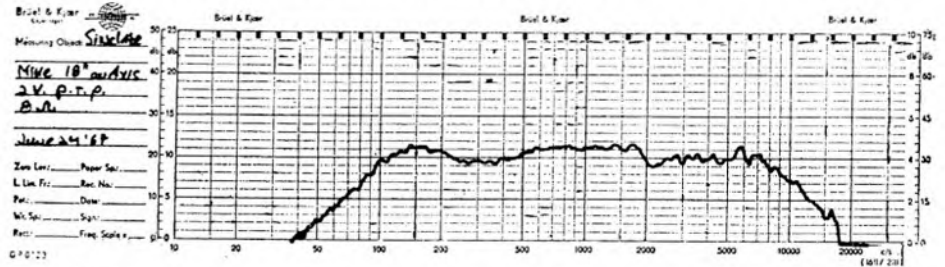
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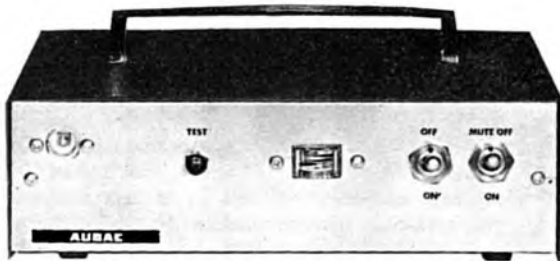
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Incorporating TAPE RECORDING & HI-FI MAGAZINE and STEREO SOUND MAGAZINE

Vol. 12

No. 7

July 1968

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FRONT COVER PHOTOGRAPH: No prizes for naming the lady. Of course it's Cilla Black. She recently went to the recording studio to record the title song from her first feature film, "Work is a Four Letter Word." The imposing E.M.I. mixing desk, typical of the equipment used for this class of work, is being operated by George Martin. George is responsible for the production of the disc which will shortly be issued under the Parlophone label.

"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.

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EDITORIAL

01-242 4742

Publisher,
R. DOUGLAS BROWN

ADVERTISING

01-242 4851

Advertisement Manager, VIVIANNE GOODING

Tape trends and tape talk

By Douglas Brown

IF THE 1968 Audio Fair in London suggested that there was not a great deal excitingly new in the offing, there is good reason to reassess the situation now. The German industry last month showed its new range of tape recording equipment at the Hanover Fair and it added up to a picture of an aggressive new marketing drive with many new or redesigned products that are bound to capture the public imagination.

I was not able to get to the Hanover Fair myself, but I was in Germany a fortnight later, talking to audio experts who had spent a lot of time there and who were able to pass on to me literature about the new products.

Let us start, then, with a glance at the latest video recording developments. There are now five Continental firms offering domestic or semi-professional video equipment. At the top end of the scale is the Philips machine which has been available for some little time now and which costs approximately £700: its standard of performance is very high.

Coming down the scale, Grundig have now shown a model which caters for the semi-professional market, costing rather less. Cheaper again, at something like £400 in Germany, is equipment developed by Loewe Opta, then a model by Blaupunkt, and finally a revolutionary development by Telefunken.

The Telefunken recorder uses one-inch tape and a moving head, provides 2 x 45 minutes playing time, and plays back through an ordinary domestic TV set. The price has not yet been announced in Germany; most people seem to think it will be about £200; one report I heard was that it might be nearer £100 (but that seems incredible).

It is evidently going to be some time before we may hope to settle down to agreed standards for video equipment. The Loewe Opta machine, like the Telefunken, uses one-inch tape, but the Blaupunkt model uses half-inch tape. On the other hand, the Blaupunkt operates at 7½ ips, whereas the Loewe Opta has a non-standard speed of 15.22 cm/sec—about 6 ips. The Blaupunkt provides for 2 x 30 minutes playing time and the Loewe Opta for 2 x 50 minutes.

* * *

THE OTHER INTERESTING piece of video recording news heard during the past month comes from Japan, via the United States. Sony have now publicly announced a "magnetic film camera," with a built-in microphone—battery operated, so that it can be used anywhere.

This, of course, is the ultimate in video development and the thing which, if it evolves satisfactorily and

economically, will really challenge the orthodox photographic industry.

* * *

NOW A LOOK at sound recording developments. Telefunken have marketed a new recorder with automatic place-finding facilities. Once you have catalogued your recordings, and obtained an index reading for the start of each one, you can dial the appropriate reading, press the fast forward button and the recorder will set itself up for the particular recording you want.

* * *

TELEFUNKEN AND PHILIPS have both produced complete new ranges on the Continent. Two trends emerge from these and other manufacturers. One is a big development of semi-professional machines. The Philips Pro 12, for example, priced at about £200 in Germany, has much of the look of hitherto much more expensive studio models

The second trend is towards battery-operated cassette recorders which also incorporate radio receivers. And many of these are deliberately designed to get at "the carriage trade"—the motorists.

Another interesting Philips product is the Cassettephone 2200, which has just been launched in Germany, Holland and Italy to catch the teenage market. It is a playback-only machine and, to give improved quality, the speaker occupies almost half the total bulk of the machine. There are only three controls: play/stop, forward wind and volume.

The price? Well, the Continental price may not be relevant, so I will not quote it. But, without doubt, when this model hits the British market it will set a price standard that, until now, no one has dreamt possible.

* * *

IN CASE any reader feels, after reading the above, that the Continent is setting too hot a place for Britain, a reminder that other countries enjoyed a head start in tape recording development.

Over here the tape recording clubs are celebrating their tenth anniversaries—this magazine was established in February 1957.

In Paris M. Jean Thevenot has just been feted by the French radio on the completion of 20 years of his programme "Aux Quatre Vents," which caters for recording amateurs. The Swiss association of recording amateurs will be celebrating its 20th anniversary in 1970.

For relative beginners, perhaps we're not doing too badly!

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THE FINE ART OF ELECTRONIC MUSIC



Fig. 1. Paul Griffin, winner of the 1967 British Amateur Recording Contest technical recording class, who was also awarded the Tape of the Year trophy for his fine multi-track guitar recordings

By F. C. Judd



Fig. 2. Ten years of multi-track recording! Our author and his wife with the home-built equipment he designed specially for creative work. Much of this gear is still in use today

BEFORE embarking on the recording techniques and the musical aspect of electronic music and sound effects, I have a few comments to make regarding facilities for multi-recording as at present available on most modern tape recorders. This subject was also dealt with recently in a contemporary magazine, but some of the observations may have been misleading.

First of all, those stereo tape recorders without an extra replay head, and these are twin track machines with a combined record/replay head only, are not suitable for serious multi-tracking. Some of these recorders have an arrangement for picking up the signals from either of the tracks so that material can be recorded on the remaining track in synchronism. With such machines signals cannot normally be re-recorded from one track to another. Twin track recorders with

separate replay heads usually have a system which enables one to re-record from one track to another, but this often requires the use of an external mixer as described in my recent articles. This applies particularly in cases where one is using electronic musical instruments with a high level output.

My suggestion to manufacturers who would like to produce a really versatile recorder for multi-tracking, is to incorporate high level signal mixing facilities that will simultaneously accept (a) the output from the replay head pre-amplifier of either channel and (b) the direct output from electronic musical instruments and/or the output from an external mixer with its own high level signal and microphone channels. This is in addition to microphone mixing which some recorders do have.

The 1967 BATR Contest

The "Tape of the Year" award in the 1967 BATR Contest was won by a multi-track recording, which of course, was top of its own category (technical recording). The winner, Paul Griffin of Wycombe in Buckinghamshire, entered an excellent multi-track guitar recording of "Lover", and old popular tune by Richard Rogers and one greatly favoured by Les Paul and other professional multi-track artistes. Paul Griffin's recording deserves special mention here in view of the quite modest equipment installed in his garage. The car resides outside! As can be seen from the illustration (Fig: 1) he uses two tape recorders of domestic class and a few auxiliary items, some of which are home built.

There were quite a large number of multi-track entries for the '67 contest,

Please turn to page 293

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Continued from page 291

including a unique multi-organ recording by a blind tape enthusiast, Mr. R. Bannister, and some multi-musical instrument recordings in which all the instruments were played by one person. Flashback—(Fig. 2) equipment used by the writer for multi-recording some 10 years ago, all of which, including the tape deck, was home constructed!

Electronic Music

In order to appreciate electronic music it is necessary to listen to it. Some like it, some don't. A number of records are at present available and details of these will be given later. The origin of electronic music goes back many years, in fact to the invention of the thermionic valve which engineers soon discovered could be made to oscillate at audio frequencies and these oscillations could be reproduced via loudspeakers. In 1921 a concert was given in the Paris Theatre de Champs Elysées by an Italian, Luigi Russolo, with the aid of electrical sound generating and reproducing equipment.

Really serious research and considerable work in the field of electronic music was begun by Karlheinz Stockhausen, a composer with the Cologne Studio of Electronic Music. Composers such as Henk Badings in the original Philips Studio in Eindhoven and Luciano Berio in the Milan Studio of Italian Radio have also contributed much to its development.

Studios for electronic music are now in operation all over the world and yet very little material seems to be available on gramophone records compared to the enormous output from many composers. The answer was given to me by the Philips recording studios at Baarn, in Holland. There is simply insufficient demand for this kind of music. Perhaps not surprising in view of the dubious "avant guard" warblings that certain other record companies have issued.

Fig. 3. In the original Philips studio for electronic music at Eindhoven. Dick Raaymaker, electronic music award winner (centre) with Henk Badings (right), the Dutch composer of "Cain and Abel," electronic music for a ballet



Unfortunately for potential listeners, over enthusiastic composers who saw tremendous possibilities in "electronics" and tape recording as media for new music came up with vast numbers of compositions based on twelve tone techniques and even material without related pitch, scale or harmony. To untrained ears much of his music (?) sounds merely like a series of pulses of noise and tones of indefinite pitch and timbre.

A few composers have, however, produced electronic music much more closely related to conventional music and based on the tempered musical scale, its related keys, pitch and harmony. They have done what should have been obvious in the first place, and that was to apply the new tonal possibilities offered by electronics and magnetic recording techniques to the kind of music we are already accustomed to.

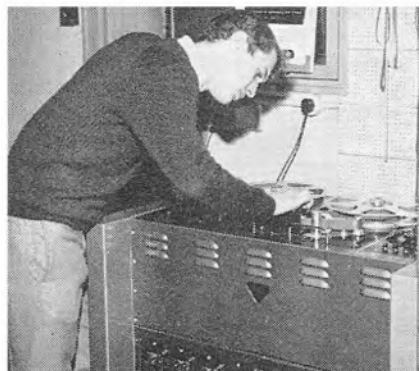


Fig. 4. A special Leever-Rich eight-track recorder used in the BBC Radiophonic Workshop. It uses tape one inch wide

Here two composers come to mind and one of these I have had the pleasure of meeting. This is Tom Dissavelt, A Dutch composer who has produced many fine examples of electronic music with rhythms, melody and harmony, plus completely new tonal effects made possible by electronics and recording. The other is Dick Raaymakers, a Dutch electronics and recording engineer, formerly employed in the old Philips Electronic Music Studio in Eindhoven (Fig. 3). (This studio is now at the University of Utrecht). Raaymakers' music has gained some high awards and his work, together with some of Tom Dissavelt's, can be heard in "The Fascinating World of Electronic Music" (Philips records).

Equipment for Electronic Music

The tape recording enthusiast with a knowledge of music and multi-track techniques (Fig. 4) will find that the combination of electronics and tape offers some highly interesting and creative possibilities. I should, I think, make it quite clear at this point that electronic music does not preclude the use of keyboard electronic musical instruments. In

fact most of the European studios I have visited all have keyboard sound systems of one kind or another, but more of this later.

Let us then consider setting up for electronic music and for those not so musically minded for electronic sounds and effects and creative work with tape. The real essential is a twin track recorder with re-recording facilities (see earlier paragraphs of this article), or two mono recorders. A three or four channel mixer with at least two high level inputs (see previous article in June issue of *Tape*) is also an essential item. Next we require at least one audio sine tone generator, covering the audio frequency spectrum, although a sine/square wave generator would be better. I will be providing an excellent transistorised circuit for a stable sine wave generator later on.

A ring modulator is useful for special effects and a circuit and details for using the device will also be given later. Finally a small keyboard instrument (a single note tempered scale organ with a number of 'voices') is necessary if one is to produce melodic composition in tempered scale. Such a device can be home constructed and requires only a 24 to 32 note piano keyboard plus some simple transistor circuitry. The alternative is a commercial version of these single note devices such as those made by Vox Limited.

Briefly, what exactly can be composed by the amateur in terms of real music? What must we regard as merely special musical backgrounds with an "electronic sound" or even just as electronic sound effects? The dividing line is very thin, for one can quickly reach a point where it becomes difficult to differentiate between the two categories. Those with a knowledge of composition would be able to apply that knowledge and produce work which could quite legitimately be classified as music, their work would or could be based on the conventional rules relating rhythm, pitch, scale and harmony. One can of course produce a random series of sounds that might be called "electronic music" but which has no real musical value, except as background to plays or films. Lower in the scale are "sound effects", the kind of thing one hears in television features about space travel and other productions of a futuristic nature, or even Alfred Hitchcock type presentations such as "Psycho." However, the field is quite large and there is plenty or room for experiment by everyone.

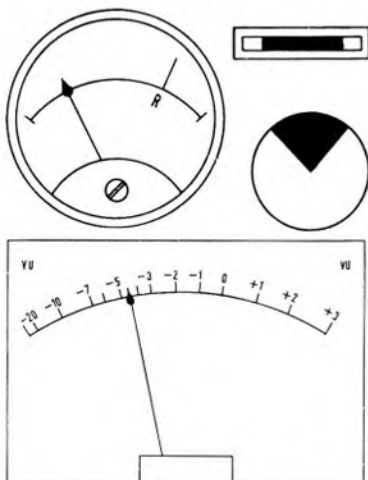
Next month I will start dealing with tape techniques including the making of looped tape rhythms and their application to special effects or to more conventional forms of music. A simple transistor circuit for a sine wave tone generator will also be included for those who are keen on the construction of equipment that can be used for electronic sounds and music.

WE established working drills for "live" and non-microphone recording in the previous article of this series. Still on operational matters, I'd now like to suggest that you pay special attention to monitoring—that is the continuous checking by ear and eye of everything that is going on to the tape.

Some relaxation is allowable during straightforward dubbing or transferring from tape, disc or radio. Let's assume that you want to record the given item "as is," with no changes in volume or quality (which pre-supposes that you are happy that the dynamic range of the original—between the loudest and quietest passages—is suitable or practicable for your purpose). Then the only problem is to select the correct initial setting of the volume controls. Professionals make this job easy for each other, when exchanging recordings for copying, by recording a short band of tone at the beginning of the tape at some agreed reference level. If this level is the peak permissible level, for example, then all the operator needs to do is set his controls so that the tone causes his recording meter to read maximum—and he is ready to record.

In the home studio, however, material may be received at all sorts of levels for copying. You can soon get used to the settings required for recording from your own equipment—radio tuner, record player and your own tapes. For unknown tapes you may have to do a dummy run, adjusting the volume until you are satisfied that the loudest passages just peak up to maximum. You should then be able to cope with a dynamic range between this peak level and the level at which the signal becomes lost in background noise

Fig. 2. Different kinds of level indicators, showing two shapes of "magic eye," peak programme meter and VU meter



Professional methods for practical amateurs in . . . Part Six: Monitoring By John Borwick

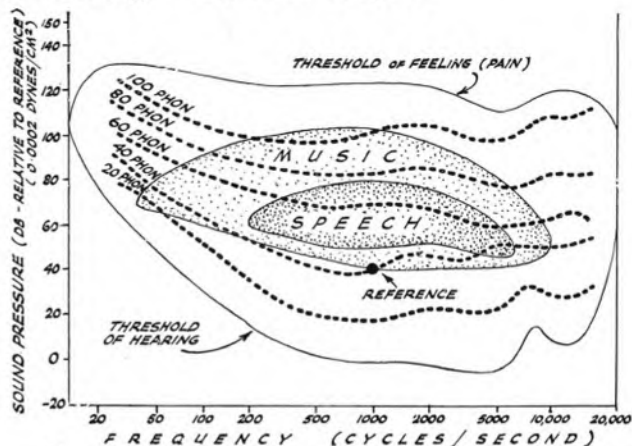


Fig. 1. A composite diagram showing the range of human hearing, from the lower to the upper limits. At both the extreme limits "hearing" becomes "feeling." The shaded portions show the comparatively small range of intensity and frequency covered by both speech and music compared with the capability of the human ear. Heavier dotted lines show the "equal loudness" contours, which demonstrate the difference in sound pressure needed to give an equal subjective response at the ear at different frequencies. All points along each line are of equal loudness

of about 40 dB upwards, depending on the quality of your recorder.

For speech recordings this is easy enough. As Fig. 1 shows, the dynamic range of speech sounds is only about 30 dB and the fairly regular peaks on each stressed syllable can soon be lined up on a meter or magic eye. With music, however, a total range of up to about 70 dB is possible (see Fig. 1 again) and you may need to play through lots of the music to satisfy yourself that your setting will accommodate the loudest peaks without overload.

This done, you can then usually rerecord with impunity because most recordings will have been manually controlled at source and BBC broadcasts, for example, are kept to within a relatively narrow range of 30-40 dB.

However, you may decide to introduce some manual compression of the dynamic range, perhaps because the inherent noise level in your equipment is not as low as you would like, or you are making a tape for a specific purpose such as Public Address. Then it is essential to have a visual check as well as monitoring by ear. Aural monitoring is best for judging quality and balance and such things as the relative loudness of speech and music: but the ear is a poor judge of peak levels. This is mainly because human hearing is so frequency-dependent. As you will see from the steep rise at the bass end of the equal loudness lines in Fig. 1, a bass note which sounds quiet to the ear may in fact be at a high intensity level—as shown on a level indicator.

THE HOME STUDIO

Fig. 2 shows several types of level indicator. Magic eyes are not liked by professionals, but can give quite satisfactory results. The peak programme meter (PPM) is used by the BBC and others and features a very rapid rise time with delayed fall-back for easy reading of peaks. A usual scaling is 4 dB per division over the range -24 to +4 dB. The volume unit (VU) meter is corrected to follow the volume of sounds as perceived by the ear and may be calibrated in decibels, percentage modulation or both. Fig. 3 shows the VU meter fitted on Truvox Series 100 machines.

Live recordings

When it comes to live recording, the correct monitoring and control of signal levels becomes of first importance. All the above remarks apply plus the additional factor that unrehearsed incidents may force you to adjust the level at split-second's notice. Except for these surprises, however, the aim should be to make such adjustments as are necessary as imperceptible as possible.

Professional methods for practical amateurs in . . .

THE HOME STUDIO

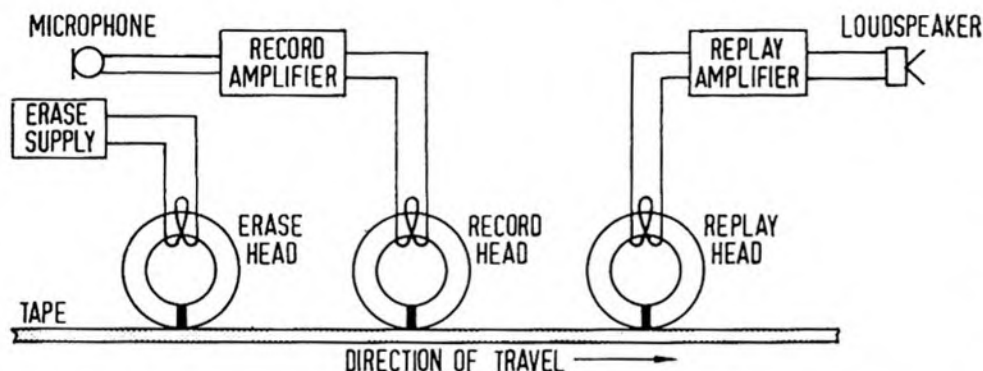


Fig. 4. Tape machines with separate replay heads and amplifiers permit the monitoring of signals a split second after recording

The real art of controlling programme volume is to *anticipate* the loud or soft passages by gradually creeping the control down or up beforehand so that the "difficult" passage, when it comes, is safely contained within your acceptable dynamic range, with its contribution to the musical expression preserved. Seize every opportunity to practice this artistic control and, if you can read music, borrow a copy of the score so that you can be on the look-out for extra loud or soft passages. If your musicians rehearse the music beforehand, then you can monitor the rehearsal and pencil your control fader settings on the score.

Monitoring by ear

So far I have been stressing the need for careful monitoring and control of the signal level (and a great many amateur tapes fall down either through overload distortion or, at the other end of the scale, high noise level due to under-recording).

But the major purpose of monitoring is to check the sound quality—and this we must do by ear. Pretty obviously too, we should use as good an amplifier/loudspeaker as possible (two for stereo) and train our ears to be hyper-sensitive. Leaving over the subject of loudspeakers to next month, there are several points to make on the principles of quality checking.

Purely from the engineering viewpoint, you will be listening for technical blemishes such as distortion, resonances, lack of bass or treble, wow and flutter, hum, tape hiss, intermittent connections, interference . . . shall I go on?

Strangely enough it needs training, or long practice, before your ears are able to pick out these faults objectively and diagnose the likely cause. But acquiring keen ears is as vital to the home studio engineer as a keen nose is to a wine taster.

At the same time as you are monitoring for technical quality, you must also act as producer or impresario—unless a colleague is fulfilling these functions. Using a different kind of listening acuity, you should try to detect artistic faults in the performance, stilted reading, bad timing, incorrect balance between performers or parts of the programme, untidy fading or mixing, poor acoustics, editing faults, etc. If this list seems endless, then at least it emphasises the special care in planning and subsequent monitoring that must go into any recording in which the home studio strives to approach professional standards.

Visual and aural monitoring *can* be performed on the signal entering the tape recorder. But there are clear advantages in monitoring the signal actually recorded on the tape. This is possible only on machines having the set-up illustrated in Fig. 4, namely separate record and replay heads and amplifiers. By switching the monitoring meter and loudspeaker(s) to the replay chain, you are checking the quality of the signal off-tape a fraction of a second after it was recorded.



Fig. 3. VU meter and monitor switch on the Truvox recorder

I personally consider this feature to be an absolute must. It is the only way in which you have a real guarantee that everything is safely on the tape—a valuable feature if you are recording expensive artists or once-only performances. If you look again at Fig. 3 you will see that there is a slide-switch on the Truvox machine in question to give immediate comparison between the incoming and off-tape quality. I'll have more to say about this next month and there will also be some hints on choosing and using loudspeakers.

MORE ABOUT MICROPHONE PLACING

IT is quite clear from recent readers' letters that there is still a great deal of misunderstanding about the techniques of microphone placing. A number of letters complain that we do not give specific information on precisely *how* to undertake particular recordings. Editorial references to the similarity between photography as an amateur interest and recorded sound—references which, by the way, also stressed the fundamentally dissimilar aspects of the two processes—have drawn the comment that tape recording will never be as popular as photography simply because *TAPE Recording Magazine* does not offer the amateur the same detailed and precise “how-to-do-it” instructions as are frequently given in the photographic press.

A little thought will soon demonstrate the impossibility of dealing with recorded sound in the language of photography. Negative material in a camera is exposed to light under precisely controlled and measured conditions. After taking a reading with his light meter the photographer sets his lens aperture and shutter speed to permit a precisely calculated amount of light to fall on the sensitive face of the film. In terms of light transmission the magic formula “1/125th at f8” means exactly the same thing regardless of make or type of camera or lens.

When dealing with sound we sadly lack either the precision or the stability of camera systems. Certainly one can measure sound with a sound level meter in much the same way as a photographer uses his light meter. But good light meters are relatively inexpensive accessories whereas sound level meters are disproportionately costly. Even if we were all to own and use sound level meters they would be useless unless all microphones were to have a standard sensitivity and all gain controls on tape recorders were to function in exactly the same way over the same range of sound intensities. Such a state of affairs is obviously impossible.

However if we were to imagine a theoretical standardisation applying generally to all equipment, attempts to work by meter and formulae would be doomed to failure. The human mind is required to assess the *character* of a sound, to decide upon the *balance* of the individual components that go to make up the complex

sound and to form opinions about the *acoustic effect* of the building in which the recording is being taken. These are the real problems with which the recording engineer has to grapple, and the solutions he evolves may well be different for every single recording job he undertakes.

There is only one way to learn how to place microphones. Go out and do it. Whatever any of the so-called “experts” might have to say on this subject is irrelevant in specific terms to any one recording job. Faced with any given recording requirement the engineer will place his microphones as he thinks best in the light of his experience. From that point on he will work by trial and error. The greater his experience the less will be the error and the fewer will be the trials. But he didn't learn how to do it from any book or magazine.

One can always be quite certain that the answer must be there. Somewhere in front of your sound source is a spot likely to give better results than anywhere else. Broadly speaking all areas “too far away” from the source of the sound will give poor results because the microphone will pick up too much reflected sound—sound bounced back from walls, ceilings and even from the floor. So it's reasonably safe to start off with the microphone placed well up in front of (“close to”) the sound producing agent. What does “close” mean? With a solo instrument such as a violin it might mean anything from 1 to 4 feet away. Close to a church organ probably means at least 20 feet away from the row of pipes; close to a full symphony orchestra probably means at least 30 feet from the front row of performers. When recording the spoken word “close” probably means about 10 inches from the face.

All the time we must bear in mind the “character” of the sound—in the case of an orchestra this would be represented by the combined effect of the total number of performers, the manner in which they are seated, the way in which they perform and of course the actual work they are playing. Then there are the effects of room acoustics to which I would add a possible break-through of noise interference from outside traffic, aircraft, etc. If a rule could be formulated it would apply only to one particular orchestra

performing one particular work in one particular hall. Any significant change in the circumstances of the recording would require the engineer to at least consider modifying his microphone arrangement.

A recent recording assignment of my own is a good example of how one should work. I was called upon to record an organ recital to be given in a church that I had never before visited. To be precise the building was a chapel and it had two galleries, one above the other, running along the two sides and the back. The organ console was on the front wall at a height level with the lower of the two galleries. Above and around it ranged the ranks of pipes. An unusual arrangement that I had never before encountered in quite this way. The problem—where to place the microphones?

Balconies or galleries are always dangerous obstructions. They tend to trap sound beneath their horizontal surfaces producing unpleasant reverberation and lack of top. In this case I decided to place the microphone stand on the lower of the two galleries and to use an extended boom arm to get the microphone head as far out over the edge of the gallery as possible. The distance from organ pipes to microphone was about one-third of the length of the building.

Back in the monitoring room I was quite pleased with the results as the organist extemporised with a few chords and scales. The signal was clean and there seemed to be plenty of it. Reverberation was about right and there was no break-through of outside traffic noise.

One of the main items to be recorded was the famous Bach Toccata and Fugue in D Minor. Now I knew exactly how the opening phrases of the Toccata *should* sound. Crisp and brilliant, the organ notes should have an immediate dramatic impact. To my disappointment the sound from the monitoring speakers was distant and woolly, devoid of brilliance or attack. In spite of promising results from earlier tests the microphone position was wrong.

Hurriedly interrupting the performer, the microphone assembly was carefully moved ten or twelve feet nearer to the sound source. We tried again. What a difference! Now the sound had just the character that was required; with realistic presence the organ notes peeled out to thrill the listeners in the monitoring room. This was the result we wanted.

A change of repertoire could—and did—require further alterations in microphone positioning. Very light delicate works required even greater reduction in the sound to microphone distance; a dramatically heavy composition needed a slightly more distant microphone position.

In two or three months' time I shall be recording a recital of choral items in the same building. The microphone position that was found to be about right for the organ would be the worst possible for the choir. Everything will be different. And until I get the choir arranged on their platform and can form some opinion about the character of the sound they produce I have absolutely no idea where my first trial microphone placings will be.

Surely this is what makes live recordings so interesting? Success depends almost entirely upon personal judgment. Just as an automatic camera will produce average negatives of little merit so automation in sound recording can only produce an average sound that is as far removed from real sound recording as the family snapshot is from the 20 x 16 exhibition print.

One reader even complained that the recent original article by Basil Dawson entitled "Give a Dog a Bone" described *how* he slung his microphone over high beams and pillars but did not describe *why*. There are a number of advantages in hoisting a microphone up to a height in a tall building. Not only does it increase the distance between the microphone and an unwanted sound source (the audience) but it increases the effective angle of acceptance which would otherwise be obstructed by the floor at lower level. There are many reasons for hoisting a microphone up whenever it is possible; the very best is the one that I am sure Basil Dawson would have given had he been asked—simply to find out what would happen!

Sometimes I envy the photographer. Not only can he deal with his exposure in precise and accurate mathematical terms but he can prove his point by publishing the picture he has taken. We have to speak in abstract terms about "quality" and "high fidelity" and the limitations of the medium prevent us from publishing our results for public inspection. But we do try very hard to get the message across. And that message is for the enthusiast to work out his own answers himself rather than to rely upon printed instruction. The only guide is experience, and experience is acquired through continual experiment. And the fascinating aspect of sound recording is that there is not the slightest reason why your results should not be as good as—indeed better than—mine or anyone else's. But those results are going to be influenced far more by what you *do* than what you *read*.

Let me quote yet another example which occurred only yesterday. I was required to record a small choir performing a number of contemporary sacred compositions, some of which were to have

organ accompaniment. The church where the recording was to take place proved to be on one of the busiest main roads in West London. It was Roman Catholic and instead of the usual Church of England choir and organ arrangement there was a choir loft high up at the far end of the church and this also served to house both the organ console and the pipes. The acoustic was exceptionally lively and the requirement was to produce a stereo recording. At the last moment I was told there would be solo vocalists in some of the items. Such were the problems—what were the solutions?

The biggest snag was outside traffic noise. Although obvious precautions such as keeping windows and doors closed and using a directional microphone will help to reduce unwanted traffic sounds they cannot be totally eliminated in this way. The problem can only be overcome by either recording at an hour when the traffic is at its lightest or alternatively by finding another recording location. In fact we did find another church. Situated in a peaceful cul-de-sac within a few yards of the river not a single internal combustion engine could be heard. Unfortunately it also happened to be directly beneath the main flight path to Heathrow Airport and so about every three minutes we heard the unmistakable roar of jet engines breaking through the silence. Back to church number one and the buses, cars and motorcycles.

To dodge the traffic we decided to start late in the evening and continue as far as necessary into the night. Even with this arrangement outside noises proved to be a problem which was only partly overcome by wasting a great deal of time on retakes.

What about the choir perched in their loft? The choir-master proudly informed me that he had a couple of wires strung across the church roof and these could be used for hoisting up microphones. The choir were used to singing in the loft and it was obvious that they had not even considered any other arrangement.

Now if I had agreed and had hoisted microphones up on the wires provided there would have been a complete loss of control over the critical sound-source-to-microphone distance. A directional microphone *must* be accurately sited on its target; the angle of a stereo pair *must* be accurately aligned. One only has to imagine this pair of microphones dangling on a transverse wire about sixty feet up in the air to realise how impossible such an arrangement would be.

Gently but firmly the choir were told that the recording could only take place if they were prepared to perform at ground level. With good natured regret they proceeded to group themselves around their conductor at the foot of the

chancel steps. Even this arrangement was not satisfactory. A semi-circular formation is very convenient for the choir but impossible for the recording engineer; the voices at the two open ends are singing across, instead of into, the microphones. A little more shuffling around and we at last arrived at a sensible straight line formation in three ranks with the conductor a few feet down the central aisle and my microphone stand holding the stereo pair about eight feet behind him.

A distinction has to be drawn between musical and technical balance. A few trial runs revealed far too much power from the baritones and a little weakness from the sopranos. A good choir will easily correct internal balances of this kind as soon as their conductor is aware of them. Trial recordings revealed a rather woolly sound due to the over-bright acoustic. This was vastly improved by adopting a slightly closer microphone position, remembering to realign the pair of heads to suit the new angle subtended by the line of the choir. So far so good—until it was realised that the conductor intended to sing some short solo phrases himself. Everything stopped whilst it was pointed out to him that he would have to change his position and turn to face the microphones at such times. The position he finally adopted for his solo parts was excellent, giving a nice firm central image. When members of the choir had to sing solo they merely stepped forward and took up this position.

The only thing that now worried me was the organ with its pipes two-thirds of the way up the rear wall at the opposite end of the church and *behind* the cardioid microphones. Here luck was with us, probably due to both the height of the pipes and the brilliance of the acoustic. Since the organ was doing no more than providing an accompaniment it was important to keep it well down below the level of the voices. And that is precisely what this "back to the sound source" position of the microphones actually gave us. From the point of view of the organ the microphone position was completely and absolutely wrong. No-one should ever attempt to record an organ in this way. But in this church and for this purpose it just could not be improved upon.

I have dealt with this episode at some length because it does demonstrate so clearly the impossibility of applying any given set of rules to every recording occasion. Perhaps the arrangements I finally adopted were not the best. One thing I am sure of—if I had agreed to record the choir in their loft at a time of day when the traffic was heavy in the main road outside then we should have simply wasted our time. As it is the recording is not at all bad, but perhaps you could have done better. Why not try?

As time passes the trade begins to recover from the initial shock of the purchase tax bombshell that exploded in March. Not that the position is yet by any means clear. Local officers of Customs and Excise play an important part in the machinery of purchase tax. The local officer is the man responsible for discussing the application of the law to particular manufacturers' products. In performing this duty they have made some very strange decisions based upon what one can only call "personal" interpretations of the regulations.

When the bureaucrat, ignorant of the finer complexities of a specialised industry, imposes irrational conditions on normal business activities he inevitably creates chaos and confusion. Throughout its history purchase tax has been notorious for its weird and wonderful anomalies. Everyone can call to mind instances of products which are subject to purchase tax when sold in one particular form and yet if slightly modified, made in a different size or marketed under a slightly different description, are classified as "tax free." I wonder how much of the nation's productive effort is squandered in working out tax evasions of this sort?

Whilst no one would dispute the wisdom of achieving—or trying to achieve—national economic stability there is certainly no universal agreement on the best means that should be adopted to bring it about. There is a very natural and very human tendency to approve measures that do not affect one's own pocket and to condemn roundly any tax that reduces one's own personal spending power. Every responsible citizen knows (he's been told often enough) that the simple answer to the whole problem lies in productivity. If we all worked harder, made a greater effort and so produced more without receiving a proportionate increase in reward we should magically transform bankruptcy to solvency, deficit to credit.

As an economic simpleton I sometimes try to picture this financial Utopia. The factories produce consumer durables in a relentlessly expanding stream. To maintain the rate of growth that is constantly demanded the long suffering producers must make more and more and more as each year goes by. In a few years' time with warehouses filled the national production of frying pans, paperclips and electric light bulbs would surely overflow to clog the roads, the railways and the canals. As the nation slips gently out of sight beneath an ever deepening sea of manufactured rubbish we should all be so exhausted as not to notice its passing.

Fortunately there is little chance that this frightful state of affairs will ever come about. If instead we have to endure the absurdities and the irritations of purchase tax then one must admit that it is the lesser of the two evils. The general opinion

CROSS

TALK

By Audios

around the trade is that although sales of tape recorders have dropped during the last few weeks this was only to be expected as a natural consequence of the "pre-budget buying spree." The sales that are being made in spite of purchase tax indicate the strong probability of a very healthy recovery by next autumn.

Music on tape suffered a very much harder blow. The thoughtlessly pernicious tax rate of 50 per cent—from nil—is going to take a lot of swallowing. The advantages of tape over disc as a medium for reproducing music are so great that many people will still consider the extra expense worthwhile. What is more worrying is the danger that manufacturers will limit their repertoire just at the time when their catalogues were beginning to expand. And all this confusion has been caused in order to raise a revenue so paltry that it cannot be worth the cost of its collection.

On the professional front involved discussions and negotiations are proceeding. It was *TAPE Recording Magazine* that first drew attention to the iniquity of taxing professional equipment and also to the effect the repercussions of such an act would have over the entire field of audio reproduction. Had the chancellor's original proposals been implemented to the full then the general decline in audio standards throughout the entire country would have caused more indignation than could ever be aroused by the mere imposition of tax on the purchase of domestic equipment. It is earnestly hoped that as a result of present talks it will be agreed that the tools of the professional recording industry are to be exempted from purchase tax.

My personal beat-the-budget effort was singularly short-lived. What could be easier than to save money and improve one's health by walking back and forth to work instead of using public transport? For just one day I pounded sixteen miles of hard London pavements. I now know what would be easier—almost anything!

READERS living within reach of the RAF, Mildenhall, Suffolk (approximately 20 miles north-east of Cambridge off the main A11 route), are asked to make a special note of Sunday, 30th June. This is the occasion of the annual international mobile rally of the Amateur Radio Mobile Society.

The trade show is open from 10 o'clock in the morning to 6 o'clock in the evening and is free of charge to visitors. Sections will be devoted to hi-fi enthusiasts and radio transmitting and receiving stations will be contacting both local and world-wide amateurs throughout the day. An incongruous note—beauty counsellors will demonstrate! They will have a hard job to improve yours truly but they are welcome to try.

Seriously, my own contacts with the Amateur Radio Mobile Society have been most pleasant. They are all fascinating people with a fascinating hobby. Visitors to this rally are assured of a truly memorable experience—even discounting the services of the beauticians. Very strongly recommended.

* * *

THE commencement of Fred Judd's series on electronic music is an appropriate moment to draw attention to the absolute lack of facilities for such work in this country. If you, as a private individual, wanted to experiment in this medium there is not a single studio in the United Kingdom that would be open to you. On the Continent and in the United States of America things are very different. Not only do a large number of studios exist but many of them are state subsidised. But in the UK—nothing. Perhaps if you were a very distinguished composer you might persuade some private establishment to permit you to use their facilities. If you wanted to carry out serious research or study the best thing you could do would be to go abroad.

This country has always been notoriously niggardly in its support for the arts so it is hardly surprising that electronic music should be totally ignored. By contrast the official interest displayed in France, Germany and America leaves our potential workers in this field feeling frustrated and disappointed. It will not be surprising if future developments of significance originate from overseas. One does get rather tired of reading about this country "lagging behind" but it has never been further behind than it is in the study of electronic music.

* * *

UNDER the title "History and Tape" the Musicraft Hi-fi Centre of Hounslow, Middlesex gave a tape demonstration last month. Produced and conducted by their Mr. Dave Wiseman the show included a number of historic sounds. The audience were thrilled to hear the recorded voice of Florence Nightingale but Dave assures me that the hit of the evening was a tape of Mrs. Wiseman playing a Hammond organ at a public house. Backing was provided by a local pop group and the recording technique involved the use of five microphones, echo and multi-tracking. Apparently the evening was so successful that Dave Wiseman had to agree to give a repeat performance a week later.

More demonstrations are being planned by this firm and interested readers who are accessible to the Hounslow area are invited to contact the Musicraft Hi-fi Centre at 63 High Street, Hounslow, Middlesex.

* * *

ONE American publication has a delightful habit of publishing an April-the-first leg-pull. This year one of their crazier items is headed: "Hippies now turning on with Tape". This feature suggests that the San Francisco narcotic squad has discovered that the latest craze is for going "on a trip" via a brew of acetate tape tea. According to the hippies the only danger is to the teeth—the iron oxide particles cause an unpleasant coating of rust to build up . . . !



NATURE NOTES

FOR JULY

BY RICHARD MARGOSCHIS

PEOPLE who are keen on making natural history recordings become interested in the subject in one of two ways. They are either experienced recordists who see it as a challenge to their capabilities, or they are naturalists who have been studying nature for many years, probably from a childhood interest in birdwatching, and have now realised the possibilities of making their own recordings. So far as the recordist is concerned it is perhaps one of the most difficult branches of sound recording, for he can never completely control the conditions under which he is working. It is by no means limited to birdsong, as I hope to show in the future, and is a relatively new incentive to explore the countryside.

With a little thought you will realise that the two approaches are poles apart. The naturalist will know how to approach, watch and identify his subject but in the process might forget to switch on the recorder; on the other hand the recordist might easily record a bird's song but makes a wrong identification or even have no idea what species it is. This is not hypothetical; I have known a naturalist to forget that he had a recorder with him, and I have played to an ornithologist what I believed to be the song of a tree creeper only to be told that it was a nuthatch! The latter was the result of the tree creeper being visible and not audible and the nuthatch audible but not visible. Since those days practice, the only way, has improved my capabilities but I frequently still run into identification difficulty because I am principally an amateur recordist.

The obvious conclusion to be drawn is that the ideal person must be both an expert recordist and an expert naturalist. Such people certainly do exist but they are not nearly so common as recordists and naturalists. It is not essential to be expert in both these arts, so the next logical step is some sort of alliance to provide a means for each to learn more of the side in which he is least experienced.

As the result of a competition run by the BBC Natural History Unit a few amateurs gathered at Woodchester Park Field Centre and enjoyed a week-end practising and talking about recording wildlife sounds. It is doubtful if more than one was an experienced naturalist-recordist, and the majority were there because they were primarily naturalists. From this very small beginning we founded the Wildlife Sound Recording Society with an initial membership of less than 25. I am pleased that we have very good backing from the Natural History Unit and following a recent broadcast our membership has been considerably increased, again mainly by naturalists.

There is a strong possibility that week-end courses on natural history recording might be run at Woodchester Park Field Centre in Gloucestershire at a very reasonable fee. It is necessary, however, to have some idea of the demand for such a venture, so if you are interested in either a week-end or the new society, why not get in touch with me for further details.

As I write these notes the first of the swallows are arriving in Britain after their long journey across the equator; before the end of July their broods will be hatched. Though the bird is often seen perched on telegraph wires or buildings it is more commonly found on the wing as it feeds over water and open country, its pleasant chattering song being delivered both from perch and wing. The bird is very gregarious and, particularly around migration time, great flocks can be found roosting in reed beds; before they go down in the evening and as they rise at dawn the sound of their continuous twittering rises and falls as the flock swirls about above the reeds.

Also in the swallow family are the martins—house and sand. Their habits and song are similar to the swallow but the song of the sand martin is perhaps not so well developed and is almost invariably delivered on the wing. Swallows and house martins are found nesting in and around buildings whilst the sand martin, as its name suggests, prefers sandy banks and gravel pits.



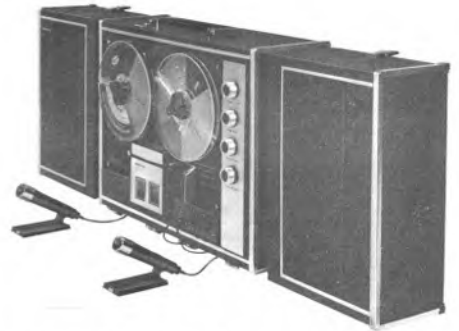
TELEFUNKEN

Listen to as many portable recorders as you can. Compare. This is the one that stands out.

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TEST BENCH



SANYO MR-939

INVESTIGATED BY R. HIRST AND D. KILLICK

MANUFACTURER'S SPECIFICATION

Sanyo MR 939

Recording System: AC bias, $\frac{1}{2}$ track.
 Erasing System: AC erase.
 Tape Speeds: $7\frac{1}{2}$, $3\frac{3}{4}$ and $1\frac{7}{8}$ ips.
 Wow and Flutter: 0.15 per cent at $7\frac{1}{2}$ ips; 0.20 per cent RMS at $3\frac{3}{4}$ ips; 0.30 per cent RMS at $1\frac{7}{8}$ ips.
 Forward and Rewind Time: Up to two minutes, 1,200 ft. tape.
 Level Indication: VU meter x 2.
 Output Power: Music Power 7W x 2, Undistorted 4W x 2.
 Frequency Response: At $7\frac{1}{2}$ ips 20 to 20,000 Hz (30 to 15,000 \pm 3 dB); at $3\frac{3}{4}$ ips 20 to 13,000 Hz; at $1\frac{7}{8}$ ips 30 to 8,000 Hz.
 Signal/Noise Ratio: 45 dB.
 Erase Rate: 65 dB.
 Crosstalk: 65 dB track-to-track, 50 dB channel-to-channel.
 Output Impedance: Line out, 2 Kohm; Speaker out, 8 ohm; Headphone, 10 Kohm.
 Input Impedance: Microphone, 50 Kohm; Aux. 100 Kohm.
 Record/Play DIN Socket: Input 10 Kohm; Output 2 Kohm.
 Monitor: Headphones or Speakers.
 Microphones: Dynamic.
 Speakers: 4-inch free edge permanent dynamic, 8 ohm.
 Power Source: AC, 117V, 125V, 220V, 240V 50-60 Hz.
 Power Consumption: 50W.
 Dimensions: $18\frac{1}{2}$ inches wide x 6 inches deep x $13\frac{3}{4}$ inches high, plus speaker enclosures 9 inches wide x 5 inches deep x $13\frac{3}{4}$ inches high.
 Weight: 36.3 lb.
 Accessories: Microphone x 2, Recording tape 7 inches x 1, Empty Reel 7 inches x 1, Patch Cord x 2, Reel Stopper x 2, Splicing Tape x 1, Microphone Stands x 2.
 Price: £89 18s. 10d. plus £20 1s. 2d. purchase tax.
 Distributors: Marubeni-Iida Ltd., 164, Clapham Park Road, London, S.W.4.

SANYO MR-939 TEST CHART

Frequency Hz	Overall Response dB		Playback Only dB	Signal/Noise Ratio dB	Distortion	Crosstalk	
	$7\frac{1}{2}$ i.p.s.	$3\frac{3}{4}$ i.p.s.	$7\frac{1}{2}$ i.p.s.			Tk/Tk	Chl/Chl
30.....	-2.8	-6.0	-1.8	52	2.2%	68	46
40.....	-2.0	-4.0	-1.5				
50.....	-0.5	-2.8	0				
60.....	+1.0	-0.5	+0.5				
100.....	+2.2	+1.4	+1.0				
250.....	+3.0	+1.5	+1.8				
500.....	+2.3	+1.2	+1.2				
1000.....	0	0	0				
2000.....	0	-0.8	-0.5				
4000.....	+0.5	-1.2	-1.0				
6000.....	0	-1.5	-1.0				
8000.....	-0.8	-2.3	-1.5				
10000.....	-1.2	-3.8	-1.0				
12000.....	-2.4	-7.0	-0.5				
14000.....	-2.8		-0.5				
16000.....	-3.6		-2.0				
18000.....	-5.0		-3.5				
20000.....	-7.3		-7.0				
22000.....	-12.0		-10.0				
Wow and Flutter	0.12%	0.19%					

NOTES.—The Overall Response figures relate to record and playback. Playback only relates to the reproduction of a 50 microsecond test tape at $7\frac{1}{2}$ i.p.s. (N.A.B.).

For Signal-to-Noise Ratio the tape was recorded at peak level and then the input signal was removed from the record amplifier. By reference to the signal level recorded and the resultant tape noise, the noise voltage was read off, with the tape still in motion (see text for further information). Distortion is quoted against a 1,000 Hz signal recorded the correct maximum level as indicated by the manufacturers, and the figure is an R.M.S. value. Crosstalk is quoted for track-to-track and channel-to-channel.

Wow and Flutter is also R.M.S., the test frequency being 3,000 Hz. Test equipment used includes: Bruel and Kjaer Signal Generator, B & K Frequency Analyser Type 2107, B & K Level Recorder Type 2305, Marconi Distortion Factor Analyser and Gaumont-Kaylee Wow and Flutter Meter.

THE name of Sanyo has long been known in this country for a diverse and popular range of low-cost electronic equipment, specialising particularly in transistorised radios. The vast works in Japan, however, produce on a much broader front covering the entire field of electronics at all levels of price and quality. Recently Sanyo domestic high fidelity equipment has been introduced into the UK bringing to us tuners, amplifiers, "compacts" and of course tape

recorders, all of which display characteristic ingenuity of design and in many cases highly original styling. It was therefore with a great deal of interest that we prepared to examine the Sanyo MR-939 4-track stereo mains tape recorder.

Leaving physical presentation for the moment we will first deal with the usual laboratory investigation, the results of which are set out in tabular form. The handbook does not give any indication of the equalisation characteristic but it was soon established that the replay curve

coincides very closely with the NAB standard. It will be particularly noted that the specification claims a frequency response at $7\frac{1}{2}$ ips of from 30 to 15,000 Hz plus or minus 3 dB (the figures 20 to 20,000 Hz without naming measurement tolerances are valueless, and anyway they do not say if this is a replay only or an overall record/playback response) whereas the greatest deviation we could establish from the NAB calibration tape within the specified bandwidth was no more than 1.8 dB. Our measurements for overall response

do indicate a tolerance of plus or minus 3 dB, but these will naturally be influenced by the properties of the tape used in the test recording. We were sorry to find that the instruction book gives no guidance about the tape for which bias has been set—we used Agfa PE31. The same comments apply to the overall response at $3\frac{3}{4}$ ips which falls rather sharply at the extreme ends of the range. Although this is a 3-speed equipment we did not seriously investigate conditions at $1\frac{7}{8}$ ips since when the two faster speeds are provided we regarded this extra facility as a “bonus” which should be used only for limited purposes where extended programme operation and intelligibility are the only requirements.

Short-term speed stability is of the greatest importance in all tape recorders. Our readings of 0.12 per cent at $7\frac{1}{2}$ ips and 0.19 per cent at $3\frac{3}{4}$ ips may be regarded as extremely good indeed. As a matter of interest we recorded a 1 kHz tone and listened carefully to the playback. Wow and Flutter figures can often be misleading—the only thing that really matters is the amount of audible variation in pitch and it is not at all unusual to find that a strong beat is present in the reproduction of a pure tone despite low readings on the Wow and Flutter meter. This beat content is always present to a greater or lesser extent, but in the tape reproduced on the Sanyo it was less evident than on some equipments of the fully professional studio type.

The claimed signal-to-noise ratio of 45 dB did not lead us to anticipate anything outstanding in this respect. To be honest, a noise level of only 45 dB below peak programme is not very good by today's standards. One invariably finds that 50 Hz mains hum is responsible for the relatively poor performance of some domestic machines as compared to the very much more expensive professional equipments. It is for this reason that we quote signal-to-noise ratio against the 50 Hz line in our tables since it is at this point that maximum noise is present. Although we have continued this practice in the present review it really does not strictly apply because the 50 Hz content was 10 dB below the level over the full bandwidth of 30 to 15,000 Hz. In other words the mains hum content is 62 dB below maximum signal level output. In practical terms hum is sensibly absent altogether, and the only unwanted noise is in the form of high frequency hiss plus transistor noise.

Readers may wonder why crosstalk is quoted in the specification for both track-to-track and channel-to-channel separation. The reason becomes apparent when one remembers that the two stereo channels are reproduced from alternate tracks; breakthrough between these will do no more than slightly change the stereo image. Adjacent tracks, however, contain unrelated programme material and breakthrough here could be most objectionable. Our investigation showed track-to-track crosstalk at 1 kHz to be less than 68 dB below peak signal and channel-to-channel crosstalk less than 46 dB.

It is our practise to take distortion measurements at the line-out sockets thus bypassing the final audio output stages and loud speakers where these are present. In our opinion this is the only accurate method of assessing the basic technical performance of equipments. Our established figure of 2.2 per cent is again outstandingly good, but this was queried during practical tests

when a subjective impression of very much greater distortion appeared to contradict our laboratory findings.

All too frequently the recording of a steady tone bears little relationship to practical work. The character of speech and music is completely different, because it is usually made up of a series of short, high-level bursts of sound—transient peaks. We therefore proceeded to recheck our distortion figures, but this time instead of applying a steady 1 kHz tone we arranged for interruptions via an electronic gate at a rate of 100 times per second to simulate what the record head would “see” in reality. It was now found that the input gain had to be increased by 4 dB as compared to the uninterrupted tone to bring the needle in the VU meter up to the indicated peak position.

What does all this mean? Our conclusion is very simply this. When short bursts of sound are applied the mechanical damping within the VU meter itself may prevent it from giving a true reading and this error may in the present case be as much as 4 dB. Now if the recorded signal is only 3 dB above true peak then the distortion content in the MR-939 will deteriorate rapidly from its excellent 2.2 per cent to a poor 8 per cent. The danger of this situation is obvious. Under laboratory conditions working with steady tones all is well, but as soon as we deal with transients the meter reading will be comfortably below peak level when in fact the record amplifier is on the verge of overload. This could easily cause trouble which could be completely avoided by regarding the minus 3 dB mark on the meter scale as representing peak level. When the equipment is operated in this way the danger is entirely removed, so our advice is to slightly under-record by reference to the built-in meters.

Having spent so much time on the laboratory section we must now turn quickly to practical user comments. Styled mainly in black and silver the case (which by the way is fitted with a very sensible and solid carrying handle) is some 11 inches deep which makes a rather unwieldy boxlike construction. On releasing the pair of catches to raise the lid the reason is immediately obvious. It is not a lid at all but a pair of completely separate speaker enclosures each measuring 9 inches wide by 5 inches deep by $13\frac{1}{4}$ inches high.

At the rear of each speaker is a storage compartment the contents of which comprise two cardioid microphones complete with table stands, two “patch cords” (leads fitted with phono plugs at one end and crocodile clips at the other), two rubber reel stoppers for use in vertical operation, and a spool of splicing tape. We must add that the review machine was also supplied with a three-pin 5-amp plug in one of these compartments but as this is not listed as a standard accessory it may have been a courtesy gesture on the part of the distributors. The speaker leads, about ten ft. in length and fitted with miniature jack plugs at the remote end, are permanent fixtures and can be tucked into the storage compartment when not in use.

There are several criticisms we must make about the general layout of the main deck and control panel. Although the tape follows a simple path through the sound channel the only part of the head cover that can be removed is the rear section. This pulls off very easily to give reasonable access for head cleaning, but as will be seen from the illustration the level meters are integrated into a fixture which effectively prevents access to the front of the heads for any other purpose. Accurate editing in the con-

ventional manner is therefore unnecessarily difficult.

Another small point is the speed change lever situated immediately to the left of the sound channel; when in the $7\frac{1}{2}$ ips position it looks at first glance just like a tape guide and one has to consciously restrain the natural impulse to pass the tape around it when loading. The meters themselves are internally lit which is very helpful, but they are both small and in our opinion the decay time is too short. Rapid violent movement of a small needle is very difficult to follow.

A hinged plastic lid at the bottom left-hand corner conceals a pair of record gain controls and record function keys. Why do these vital elements have to be hidden away beneath a panel of flimsy plastic? It is almost as if the manufacturers were ashamed to admit that their equipment had a record facility at all! We suspect that this layout has been influenced by the requirements of the American market where most tape recorders are used for playback only. One unfortunate result of this absurd concealment is that the record gain control knobs are far too small for either easy, accurate or convenient use. The record keys themselves are very sturdy and can arouse no criticism.

Tape transport modes are selected by a massive lever type rotary switch on the right of the sound channel. The positions are marked for rewind, stop, play, pause and forward. This function control is extremely positive in action and inspires confidence in the user. The only fault found was the lack of a positive safety lock in the stop position; as a result it is possible by careless use to come out of rewind straight through stop and into play, which naturally causes tape spillage. There is not the slightest need for the user to ever make this mistake and we achieved this result only by deliberately misusing the control.

Two microphone input sockets, one for each channel, are positioned just below the function control with mains on/off to their right and a stereo headphone monitoring socket to their left. A further control panel is mounted along the full right-hand side of the deck plate and this carries four large rotary controls, the upper pair for tone and the lower for playback volume.

Recessed panels at the sides give speaker-out on the right together with sound-on-sound switch and voltage selector; on the left are four phono sockets, one pair line-in and the other line-out, together with a five-pin DIN socket offering the usual combined record/playback facilities as an alternative to the phono connections. Another concealed compartment is located on the underside of the machine and this houses the mains cable. We were amused to note that this three-core mains lead is of a much heavier grade than is really required (the laboratory sarcastically commented that our Japanese friends must have thought that we were supplying the national grid!). Actually this cable is so heavy that it is almost impossible to force it back into its storage compartment, the cover of which tends to dangerously bulge in protest. Our more evil-minded colleagues enjoyed some quite unwarranted hilarity at the sight of our antics as we endeavoured to ram this lead back into its compartment.

For first user tests we reproduced some pre-recorded tapes of known quality, listening first to the speakers provided then feeding from line-out to a main amplifier driving a pair of large full-range loud speakers. As a third test we monitored via a stereo headset from the monitor output socket on the main deck panel.

Continued overleaf

Continued from page 301

One cannot expect the small stereo speakers provided to give true high fidelity. What they did give was a pleasant, acceptable sound, more than adequate volume—with complete absence of hum as previously indicated—and good stereo separation when properly placed. The measured output at the speaker socket was four watts RMS per channel—miniature jacks—Ugh! The two tone controls merely provided top cut; a bass boost would have been more useful in balancing tonal quality from such small enclosures. But taken all round they performed very well indeed—much, much better than the more conventional built-in loud speakers provided in the majority of tape recorders. The output at the line-out socket is at fixed level unaffected by either volume or tone controls and is visually indicated on the two level meters. When fed to good quality speaker equipment via a main amplifier the quality was as good as our technical investigation indicates. Slow piano music did not reveal the slightest trace of wow or flutter at 7½ ips and the only possible criticism was the slightly obtrusive level of hiss which could easily be corrected by applying a little top cut at the amplifier. Once again hum was absent.

Recordings were taken on the MR-939 using for sound sources 15 ips master tapes, a VHF radio tuner and the microphones supplied. In the first two cases recorded quality was very satisfactory, but live recordings were of course influenced by the properties of the two microphones. These instruments are highly directional thus making them eminently suitable for stereo work, but in terms of absolute quality one cannot expect very much from what must obviously

be low-cost appliances. However, they were little different to other proprietary microphones of similar type selling at around £5 or £6 each.

In summarising our conclusions we can say that the Sanyo MR-939 is the most complete and compact stereophonic record playback unit we have come across with a performance well within its manufacturer's specification and a standard of construction that would indicate the probability of a long and useful working life. We have made many criticisms in this review but they all relate to superficial items rather than basic efficiency. There is always room for improvement on all manner of trivial details—for instance it would be more convenient if the speaker leads had been fitted with a plug and socket at the speaker end so that they were completely detachable—but such minor points are of little real consequence.

We would recommend this machine to any reader who wishes to purchase a complete stereophonic record/playback unit which includes separate loud speakers (although these will fall short of accepted high fidelity standard). The man who already owns loud speakers or amplifiers would be well advised to investigate alternative models in the Sanyo range since if he were to purchase the MR-939 he would be duplicating some of his existing facilities unnecessarily.

Bearing in mind our reservation on the indication of peak levels as shown by the meters, the careful user should obtain a great deal of pleasure and enjoyment from this machine and he will acquire a collection of recordings of a quality standard high enough to stand the test of time throughout the years to come.

MUSIC ON TAPE

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

VIVA BOSSA NOVA! Laurindo Almeida and the Bossa Nova All Stars. Capitol ZB 1759 4-track stereo 7½ ips. 102s. 5d. including purchase tax.

An album of good quality sound devoted to the Bossa Nova Rhythm. The treatment by Laurindo Almeida is inclined to be noisy; the sound is not only good but there is a great deal of it.

The items comprise *Naked City Theme, Lazy River, Ramblin' Rose, Maria, Petite Fleur, Teach me Tonight, Lollipops and Roses, Moon River, Desafinado, Mr. Lucky, One Note Samba* and *Theme from Route 66*.

The leader plays both the guitar and the cavaquinho, which the sleeve explains is a Brazilian instrument similar to a ukulele. I can accept that definition without reservation—to me it sounded exactly like a ukulele.

None of the items are of noteworthy merit but all have been arranged and are performed with professional polish. After a time the rhythm tends to become monotonous and the sound overbearing. But this is entirely a matter of taste and others may disagree. Mainly useful as background music the collection does not warrant special attention by way of either criticism or praise. A good buy for those who like this kind of thing.

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Truvox R102 or R104 Mono
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Ultra 6212 Mono 4 Tr. 3 sp.
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*Wyndor Vanguard 3sp.4Tr.M

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TWO SPEAKER SYSTEMS FROM WHARFEDALE DENTON & SUPER LINTON

By Denys Killick

MANUFACTURER'S SPECIFICATION Super Linton



Size: 19 inches x 10 inches x 10 inches.
Impedance: 4 to 8 ohms.
Watts Input: 15 watts maximum.
Response: 40 to 17,000 Hz.
8-inch Unit: 40 to 1,750 Hz.
Pressure Unit: 1,750 to 17,000 Hz.
Type of Loading: Acoustic Suspension.
Finish: Oiled Teak or Polished Walnut.
Cubic Capacity: .75 cu. ft.
Suitable for use with transistorised or valve amplifiers.
Price: £41 4s. per pair incl. P.T.
Manufacturers: Rank Wharfedale Ltd.,
Idle, Bradford, Yorks.

Denton



Size: 9½ inches x 15 inches x 8¾ inches.
Impedance: 4 to 8 ohms.
Watts Input: 15 watts maximum.
Response: 65 to 17,000 Hz.
8-inch Unit: 65 to 1,750 Hz. Paper cone
10,000 oersteds.
Pressure Unit: 1,750 to 17,000 Hz. Plastic
dome 10,500 oersteds.
Type of Loading: Acoustic Suspension.
Finish: Oiled Teak or Polished Walnut.
Cubic Capacity: .45 cu. ft.
Suitable for use with transistorised or valve
amplifiers.
Price: £32 10s. 6d. per pair incl. P.T.
Manufacturers: Rank Wharfedale Ltd.,
Idle, Bradford, Yorks.

THANKS to the courtesy of Rank Wharfedale Ltd. I have been able to carry out some interesting comparative tests between their Denton and Super Linton enclosures, two speaker systems at the lower end of the price list. They differ mainly in their cubic capacity; Denton is .45 cubic feet, Super Linton .75 cubic feet, and the larger is fitted with a more powerful eight inch bass/mid range unit. Both are supplied boxed in pairs and are said to be "matched" for stereo reproduction.

Before discussing my observations I would like to remind readers that our speaker reviews are always *subjective*; they represent a personal opinion and as such are not to be regarded as definitive. The best test for any speaker is to hear it, in your own home, under normal listening conditions and to form a personal opinion of your own by comparison with other models. None will give "perfect" reproduction, and any manufacturer who makes such a claim for his product is guilty of gross exaggeration—because he knows full well it can't be true.

Now the advertising brochure for the Denton (the smallest!) *does* state, quite clearly, "perfect reproduction." Come, come! Apart from the fact that, because of its size, it must be the *least* perfect of this manufacturer's range, it stands to reason that anyone who managed to evolve "perfection" would have no need to produce larger, and more costly, models! Let us at least be realistic and admit that any loud speaker is a (more-or-less) poor substitute for live sound. By imposing its own character on the sounds it produces it makes a mockery of both equipment specifications and hi-fi enthusiasts who lie awake at night worrying because someone told them their gear is 1 dB down at 18 kHz. The end product of any hi-fi installation is the sound heard, and that sound will be influenced far more by the loudspeaker (*plus room acoustics*) than any other factor.

These are general remarks, and they apply to all loud speakers, not just to the two Wharfedale models under examination. Having worked off my irritation at reading that absurd claim on the Denton leaflet we can now take a look at the exteriors of the enclosures. Both are similarly styled, with the Super Linton standing some five inches higher than the Denton. In both cases the manufacturer's name

plate, a large "W" with the word "Wharfedale" below, is provided with a rotating fixing so that it can be turned right-way-up for vertical or horizontal use. A small detail, but it reveals thought on someone's part.

Finish to the cabinet work is described as "hand-laid" veneer, and having seen this process carried out in Wharfedale's own joinery shops at Bradford (see *Tape Recording Magazine*, June 1967) I can confirm the truth of this. It is also claimed that the veneer of each pair is precisely matched for grain pattern. The only way to achieve this is to use the same sheet of veneer for both boxes and then to ensure that they are "paired" all the way through the assembly lines. Which is just what they do at Bradford, and is one reason why they are sold in boxed pairs. Certainly the ones I have match exactly, although it would never be noticed when they are spaced out as a stereo pair. . . !

The front covering is of the usual sound-transparent material, held in place by a very neatly finished and fixed contrasting beading. Overall appearance is conventional in every way, but it does display a high standard of workmanship. Turn to the back and things are not quite so good. Both enclosures have roughly cut, ill-fitting back panels glued permanently in place. Provided the air-tight seal is absolute it doesn't really matter what the rear looks like, but as the panel is made of some kind of chip-board this will tend to break up on removal. A more serious criticism—the marking of the phasing of the connectors (screw and washer type to accept bare wires) is by a silly red paper spot "stuck" on the rear panel. I have drawn attention to the word "stuck" because this minute piece of gummed paper (or whatever it is) will very quickly unstick itself and so leave the enclosure without any phasing indication at all. Why not a touch of red paint on one terminal? So easy and so permanent.

In both cases the drive units are eight inch bass/mid range together with high frequency pressure operating from 1,750 to 17,000 Hz. The quoted response figures are 65 to 17,000 Hz for the Denton and 40 to 17,000 Hz for the Super Linton. Both are provided with cross-over networks and the usual coils of wadding for damping.

Tests with a signal generator showed an identical top response for both enclosures with very little audible signal present above 15,000 Hz. At the lower end the Super Linton definitely outperforms its smaller brother despite the fact that there is minimal output below 40 Hz. Cut-off on the Denton is not sharp at 65 Hz, but falls away steeply retaining audibility at 40 Hz. One might imagine that mains hum could be eliminated by using a speaker with a restricted response such as the Denton has, but in fact such evasion

won't work. You'll have to find a proper cure for hum troubles, not rely on the speaker filtering it out.

Loud speaker specifications are always misleading. If we were to accept the figures literally we could expect an identical sound from both enclosures, but with a slightly extended bass from the larger. Nothing could be further from the truth.

The differences between the two are much more profound.

One effect of increasing enclosure size is to enlarge the sounds produced (I have deliberately used the word "produce" rather than "reproduce"—the sounds issuing from any speaker are original productions in their own right!) with what I can only call greater "solidity." They are more "real." A comparison between the Super Linton and the Denton reveals just such an increase in reality, due to the greater apparent depth of the sound. Similarly the Denton requires just a little more power than the Super Linton to produce the same subjective listening level.

Nowhere does the law of diminishing returns operate more relentlessly than in high fidelity. There is not an enormous difference in either cost or size between the Denton and the Super Linton. But the increase in quality is considerable—quite out of proportion. To improve just a little

on the Super Linton we should have to advance cost and size considerably—and the improvement would be disproportionately small.

Since they both use identical HF pressure units the directional properties are similar. As so often happens with "bookshelf" enclosures a marked loss of top occurred when placed on a thick carpet on the floor but this recovered as soon as they were put on supports two or three feet high. Small speakers are not intended to be used at floor level. Driven by a Wharfedale System 20 amplifier cone break-up occurred at a point way up far above domestic listening level—it was touch and go whether the neighbours knocked first.

There's nothing like a good organ recording to show up deficiencies in the lower end. Taking some 15 ips masters of organ recordings and listening by comparative switching the losses in the lower register on the Denton were immediately obvious. At the same time the increased reality of the Super Linton—due to smoother, more solid middle tones—was equally apparent. Listening to instrumental tapes, both solo and ensemble, confirmed this impression. Voice reproduction was fully acceptable on both.

In case I should have damned the Denton with faint praise, let me hasten to add that at no time did it produce any sounds that could be classified as in any way unpleasant. To the contrary, it gives very pleasant, smooth listening. It's not what it does give that one objects to, but what it doesn't. And for a loud speaker that is praise indeed! In view of its deficiencies I could recommend it only for those who require an enclosure to occupy the very minimum of space and are not too concerned about the height of their fidelity. For such there is probably no better answer than the Denton.

What is highly significant is the considerable improvement that has been achieved in the Super Linton; an improvement that costs little in either money or space. Results here are so good that one would have to spend a great deal more to achieve any further quality increase.

To sum up—both are excellent enclosures of their own kind, offering clean and pleasant listening. To my ear the Super Linton is the better buy because it offers that much more quality. On the other hand the Denton is never objectionable and may well suit many people. As so often happens in the speaker world, you pay your money and takes your choice.

MUSICASSETTE

REVIEWS

POURCEL TODAY. Frank Pourcel and his orchestra. EMI TC-SCX 6200 54s. 6d. including purchase tax.

We recently reviewed Pourcel pour Vous (EMI HMV MCV 16004), a French cassette from the imported division of EMI Ltd. The album we are now considering is British, recorded in stereo and less costly. Recording is equally as good as the Continental issue—and that was very good indeed—and *Puppet on a String*, one of the most brilliant of the French items, is repeated for us here.

The programme also includes: *San Francisco, Aranjuez Mon Amour, The World we Knew, Casino Royal, Le Neon, The Last Waltz, Une Larme aux Nuages, Somethin' Stupid, You Only Live Twice, Live for Life and A Man and a Woman.*

I like the Frank Pourcel sound, and this cassette version offers excellent quality and entertainment. One is not surprised to read in the sleeve notes that Frank is deeply interested in the techniques of sound reproduction. That explains why the instrumental textures are so sharp and clean—he knows what he is doing and obviously refuses to compromise. There's a moral here for some of our British ensembles. Strongly recommended.

SHADES OF HAWAII. The Waikiki Islanders. EMI TC-SCX 6189, 54s. 6d. including purchase tax.

A collection of favourites transported, transposed and transmuted into the magical idiom of the Hawaiian style. My knowledge of botany is certainly shaky but even I raised an eyebrow on finding Edelweiss transplanted to the South Seas.

Seriously, the recording is good, the performance competent and the whole a most pleasing collection. Titles include: *Moon River, The Breeze and I, Lace covered Window, Strangers in the Night, Sleep Walk, This is my Song, Somewhere My Love, The Shadow of your Smile, Stranger on the Shore, Edelweiss, Pearly Shells, More and Moon-glow.*

Hardly world-shattering in their originality, but perhaps more enjoyable than the endless pseudo-genuine music of the Pacific. As pure escapism the charm of the Islands must take some beating. I found myself playing this album several times and enjoying it more on each occasion. A good buy.

DIANA ROSS AND THE SUPREMES, Greatest Hits. Tamla Motown TC-STML 11063, 54s. 6d. including purchase tax.

Diana has a small, pleasing voice which in this album is too often overwhelmed by the backing. First impressions are of excellent recorded quality, but distortion on some of the low frequency content is soon apparent to modify that opinion.

Titles are: *Stop! In the name of love, Nothing but heartaches, When the lovelight starts shining thru' his eyes, My world is empty without you, Where did our love go, Love is like an itching in my heart, You can't hurry love, I hear a symphony, Reflections, Back in my arms again, You keep me hanging on, Whisper you love me boy, The happening, Love is here and now you're gone, Come, see about me and Baby love.*

An emotional mixture which, if taken in too large doses, is liable to induce dire consequences in the less strong minded listener. But Diana is a real charmer—the minx!—against whom the poor male critic is powerless. And when she sings I don't seem to

notice the few rather nasty noises down in the lower register.

MANFRED MANN, Up the Junction. Fontana CFP 4206, 54s. 6d. including purchase tax.

Created for the film "Up the Junction" this music is intended to reflect the life and times of the youngsters of London. Since the sleeve notes are exclusively devoted to explaining how well this aim has been achieved I wonder if perhaps as an old fogey I am so far out of touch with "the scene" as to find no point of contact. Because I didn't.

The album comprises: *Up The Junction, Belgravia, Walking round, Love theme, Just for me, Sheila's dance, Sing songs of love, Wailing horn and I need your love.*

Do they, I wonder, need the pictures on the screen to drive their message home? They certainly need something. I am inclined to believe in the sincerity of these numbers; what I doubt is their ability to stand up on their own as pure musical entertainment.

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

WILD HONEY. The Beach Boys. Capitol TA-T 2859. 47s. 9 $\frac{1}{2}$ d. including purchase tax.

Let me say right away that EMI, in this particular case, have given us value for money. By this, I mean that they haven't pursued their all-too-frequent policy of having an irritatingly long run-off of empty tape at the ends of each side.

Maybe this is thanks to the Beach Boys themselves, for their last track on side two, *Mama says*, is a real short filler. It might have been deliberately made to save EMI embarrassment. Only it wasn't.

The Beach Boys are as usual impeccable. What's more, on this tape they're *different*. We've had one or two tapes of the Beach Boys released lately that have consisted of old material . . . and though the tapes were really great, they weren't up to the moment.

On this one, the group goes through a varied repertoire, rather removed from the "surfing" stuff from days of Yore. (Say—can anyone tell me who "Yore" was? He must've been quite a guy!)

Recording is good here, and very clear. The Beach Boys prove their versatility by taking, for example, the Stevie Wonder hit, *I Was Made to Love Her*—which they perform (albeit without much originality) superbly.

Tracks are: *Wild Honey, Aren't You Glad?, I Was Made to Love Her, Country Air, A Thing or Two, Darlin', I'd Love Just Once to See You, Here Comes the Night, Let the Wind Blow, How She Boogalooed It, and Mama Says.*

I wonder what "Boogaloo" means. It's beginning to crop up on rather a lot of pop records. . . .

MOVE. The Move. Regal Zonophone TA-LRZ 1002. 47s. 9½d. including purchase tax.

This is one of the best collections of the Move's material released, and I'm sure that the tape (carrying the same sleeve pattern as the original long-playing disc) will enjoy the same popularity.

The Move is an original group. Its constant search for originality mirrors its name, for in fact, two of the gentlemen who performed on these numbers have already, by the time of writing, moved away to pastures new.

The Move like to startle. Bear in mind that quickly-quelled publicity campaign of theirs involving a postcard of Harold Wilson. However, there is nothing actually startling on this tape. It is just good, down-to-earth pop performed extremely professionally, with well-balanced recording, a splendid orchestral accompaniment where necessary (Tony Visconti . . . a name to conjure with these days) and the lyrics clearly sung.

There are jokes on the tape, I'm sure of it. They must be "in" jokes, because personally I can't see the fun of them. "*Zing Went the Strings*" is a prime example . . . it's ludicrously horrible!

I'd recommend the tape to fans of the Move (obviously) and to parents who want to kid their kids that they're in touch. Mainly because I feel the parents could take the performance without pain. Incidentally, Roy Wood, the quietest, most shy, yet zaniest member of the group, humour-wise, wrote most of the songs on this tape. I know it's not really his fault, but it's a pity he didn't have just one of his songs spread out a bit. There's an awful lot of waste tape at the end of side two. . . .

The tracks are: *Yellow Rainbow, Kilroy Was Here, The Lemon Tree, Weekend, Walk Upon the Water, Flowers in the Rain, Hey Grandma, Useless Information, Zing Went the Strings of My Heart, The Girl Outside, Fire Brigade, Mist on a Monday Morning, and Cherry Blossom Clinic.*

FOUR TOPS LIVE! The Four Tops. Tamla Motown TA-TML 11041. 47s. 9½d. including purchase tax.

One may spend an awful lot of money going to cabaret nightclubs . . . eating,

drinking, dancing . . . listening to what the floor-show has to offer. In these days, when the loyal and true Briton has to watch the strings of his purse in case his devalued sterling becomes light enough to float out through the opening, I can think of no better substitute for a night on the tiles than a neatly home-cooked meal, a bottle of cheap wine, and this tape in the background.

The Four Tops are well recognised in today's pop world. They spin frequently on the dee-jay shows, and turn out a beautifully consistent string of professional-sounding hits. But now we have them live.

Let me say at once that the balance on this tape is not good. Neither are the lyrics—especially of the singers backing their leader—clear. But I feel that this effect is intentional. The whole impression one gets is of sitting at a ringside table, say at one of the ubiquitous Playboy Clubs. It's a true cabaret tape, and as such succeeds immensely. Even the audience chatter and applause is there after each number (*merited* applause, incidentally) and in itself it is beautifully refreshing after the dubbed-in applause we usually get on these so-called live tapes. Well, this is live, in every sense of the word, and I can only recommend the tape to those who can afford the necessary candles for a discreet dinner-dance at home!

The selection consists of *Introduction, It's the Same Old Song, It's Not Unusual, Baby I need your Loving, Reach Out I'll be There, I'll Turn to Stone, San Francisco, You Can't Hurry Love, Ask the Lonely, Climb ev'ry Mountain, The Girl from Ipanema, If I Had a Hammer, I Can't Help Myself, I Like Everything About You.*

SUPREMES A GO GO. The Supremes. Tamla Motown TA-TML 11039. 47s. 9½d. including purchase tax.

The Tamla Motown label seems to be synonymous with quality. You'll find Britain's top disc-jockeys raving their heads off about the consistent professionalism of the artistes appearing on this label.

Diana Ross and The Supremes are no exception . . . but frankly, I find this particular tape just a little disappointing.

Tamla Motown (yes, the term is used as a mark of particular style) is possibly beginning to pall a little. It may be for that reason that I have to say that the recording is blurry and overloaded, rather than just admit that it's in the correct Tamla Motown style. Can we be having too much of a good thing?

The Supremes work through a miscellany of songs, and on three of them at least come croppers (in my humble opinion). For instance, we most of us formed either a chuffy liking or a violent dislike for Nancy Sinatra's first big one—*These Boots Are Made For Walkin'*. Well, the Supremes tackle it, and their rendering is as wishy-washy as a pair of worn-out wellingtons. Similarly, *Money* and *Hang On Sloopy*. Please Diana Ross and your Supremes . . . stick to your own material. There's no need to take a crack at other people's hits.

I would only recommend this tape to ardent followers of the Supremes. Mere admirers of them, like myself, stay clear!

Tracks: *Love Is Like An Itching In My Heart, This Old Heart Of Mine, You Can't Hurry Love, Shake Me Wake Me, Baby I Need Your Loving, These Boots Are Made For Walkin', I Can't Help Myself, Get Ready, Put Yourself In My Place, Money (That's What I Want), Come And Get These Memories, Hang On Sloopy.*

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NEW PRODUCTS

MIXER FOR THE NAGRA

CARSTON Electronics Limited of Watford, recently appointed sole UK agents for Sela of Stockholm, announce the release of a new four channel portable mixer Model 2880.

Designed particularly for location recording with high quality tape recorders, the mixer can be powered direct from a mains or battery operated Nagra, or from its own separate Model 2811 power supply available as an optional extra.

The four balanced transformer microphone inputs are said to be able to accept outputs over a wide range of levels from either dynamic or condenser microphones with impedances from 50 to 200 ohms. Two outputs, one at 500 ohms for the recorder and the other at 10 ohms for programme lines, provide up to 1.5 and 3.0 volts respectively.



Frequency response is claimed to be within 0.5 dB from 40-16,000 Hertz, 5 dB down at 20,000 Hertz and extended usefully to 32,000 Hertz. Distortion is given as less than 0.1 per cent at normal programme level and better than 0.2 per cent at maximum output. Designed to be carried easily by hand the Sela mixer weighs 12 lb. and costs £225.

Carston Electronics Limited, Electra House, Wigganhall Road, Watford, Hertfordshire.

FI-CORD CONDENSER MIKES

CONDENSER microphones have long been acknowledged as top for quality—unfortunately they have also been relatively costly. Now a new range from Fi-Cord International Limited offer no fewer than 10 models at prices ranging from £20 2s. 2d. to £55 15s. (the essential power packs are extra in each case).

The simplest instrument is FC600 at £20 2s. 2d., a condenser microphone for general use with a $\frac{3}{4}$ in. diameter omnidirectional capsule and a claimed frequency response of from 40-15,000 Hertz. A suitable mains power unit reference FC621 costs £9 13s. or the FC 611 battery power unit £6 19s. 6d.

Model FC1200 is a condenser microphone for studio use giving balanced output from a 1 in. diameter cardioid capsule with 20 dB minimum front to rear discrimination. Supplied complete with windshield and provision for capsule extensions, etc., the FC1200 with quoted frequency response of from 30-18,000 Hertz costs £40 15s. and the mains power unit is an additional £19 6s.



A full range of accessories and windshields are also available.

Fi-Cord International, Charlwoods Road, East Grinstead, Sussex.

AUDIO TEST GEAR

SPECIFICALLY designed for the audio engineer, the Si 453 AF oscillator from J. E. Sugden & Co. Limited is the third item in their series of new audio test instruments.

Frequency coverage is from 13 to 30,000 Hertz in six overlapping ranges. A calibrated attenuator gives outputs of 1.0 mV, 10 mV, 0.1 V, 1.0 V and 2.0 V RMS and there is also a fine infinitely variable attenuator. An additional feature is an output conforming to the BS 1928 fine groove recording characteristic (RIAA) enabling direct checks of equalising characteristics to be made. Output impedance is low and the oscillator is capable of driving into 600 ohms. Output is claimed to be constant over the full output range to better than 0.2 dB and since power is by batteries hum on the output is eliminated. Harmonic distortion is given as less than .05 per cent and typically better than .025 per cent.



Styled to match the Si 451 millivolt meter and the Si 452 distortion measuring unit the oscillator measures 10 x 5 x 7 inches with a weight of 11 lb. Cost is £35 carriage paid delivery from stock.

J. E. Sugden & Company Limited, Bradford Road, Cleckheaton, Yorkshire.

TWO NEW CASSETTE MACHINES

TWO new Standard compact cassette recorders are announced by Denham & Morley Limited.

Model SR107 has an AC bias recording system, facilities for extension speakers, provision for mains converter and remote control operation for recording and playback.

It has six transistors, one diode, one varistor and the output is 600 milliwatts. It has a power supply of four U2 batteries and provision for use by mains with mains converter. The size is $8\frac{1}{2}$ x $4\frac{1}{2}$ x $2\frac{1}{2}$ inches and the recommended retail price is 27 guineas which includes £4 19s. 9d. purchase tax.



Model SR101 is described as a "luxury version." It comes complete with leather case and has push button operation for all controls. Facilities include fast forward and rewind, recording level meter, extension speaker socket and remote control recording and playback. The SR101 may be used on mains via a mains converter.

The output is 600 milliwatts and the circuitry includes seven transistors, two diodes and one varistor and a 2½-inch loudspeaker. It runs on four U2 batteries and weighs 3½ lb. complete. Size is 7½ x 5½ x 2½ inches and the recommended retail selling price complete with leather case is 38 guineas including £7 0s. 6d. purchase tax.

Denham & Morley (Overseas) Limited, Denmore House, 173/175, Cleveland Street, London, W.1.

MULTIPLE SWITCHING UNITS

AUDIO adaptor units comprise a range of indispensable accessories for all tape recorder owners. No fewer than twelve different models are available to cover the widest possible diversity of applications.

As an example the AAU-2 provides switching between two pairs of speakers and one pair of stereo headphones to one stereo amplifier or tape recorder which can be either switched singly or simultaneously. The cost is £3 19s. 6d.

Model AAU-4 provides stereo record/replay connections between two stereo or mono tape recorders to one stereo amplifier. One recorder can be permanently installed in the cabinet with the amplifier connected via the rear sockets. The other can be used externally and can be connected to the front socket as required. The cost of the AAU-4 is £4 7s. 6d. but alternative versions are available fitted with five-pin DIN audio leads (AAU-4Q) or (AAU-4M) modified for use with ampli-



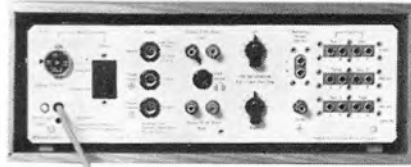
fiers incorporating tape monitor circuitry.

The latest of these ingenious accessories is designated AAU-TV and it is said to provide a ready means of connecting external equipment to a television set with complete safety. The three-way switch is marked TV L/S on, TV L/S off-EXT. on and TV L/S on plus EXT. Cost of the AAU-TV is 7 guineas.

Villacosta, Portsmouth Road, Ripley, Surrey.

RADFORD SOLID STATE

A NEW generation of solid state stereo amplifiers is announced by the Radford Marketing Division. Known as the SCA30 this amplifier features a complementary symmetry output stage eliminating crossover distortion and the "transistor" sound sometimes associated with solid state circuitry. Power output is rated at a minimum of 30 watts RMS per channel into any impedance from 3.5 to 15 ohms.



The output terminals may be left open-circuited or short-circuited for extended periods with no ill effects whatsoever—similarly the amplifier may be driven with a low frequency continuous sine wave without damage.

Specification refers to less than 0.1 per cent distortion (30 watts RMS into any reactive load) and input facilities for disc equalisation to RIAA characteristics at 3 mV sensitivity, tuner, tape monitor and two auxiliary inputs all flat at 250 mV and an additional auxiliary input, also flat, at 3 mV. Overall size in aformosia cabinet is 16½ x 5 x 14½ inches, the weight is 25 lb. and the recommended retail price is £106 including cabinet.

Radford Marketing Division, Eastbrook Road, Gloucester.

TUNER AND PORTABLE

THE increasing interest in stereo radio reception is being met by Highgate Acoustics with the release of the F211 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 28 guineas including £3 17s. 9d. purchase tax but excluding the surcharge of 7s. 9d.

Another line also released by Highgate Acoustics is the TA10 transistor radio selling at 33 guineas including £4 11s. 6d. purchase tax but excluding surcharge of 9s. 2d.



The TA10 follows the contemporary trend towards more substantial transistor portables with full VHF facilities and acceptable sound quality.

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

PHILIPS Pro 12

Apologies to readers and to Philips for errors that crept into our New Products' announcement last month. Dimensions should have read 20½ inches wide (not 2½ inches!) and Signal/Noise at 3¼ ips -52 dB (not -22 dB).

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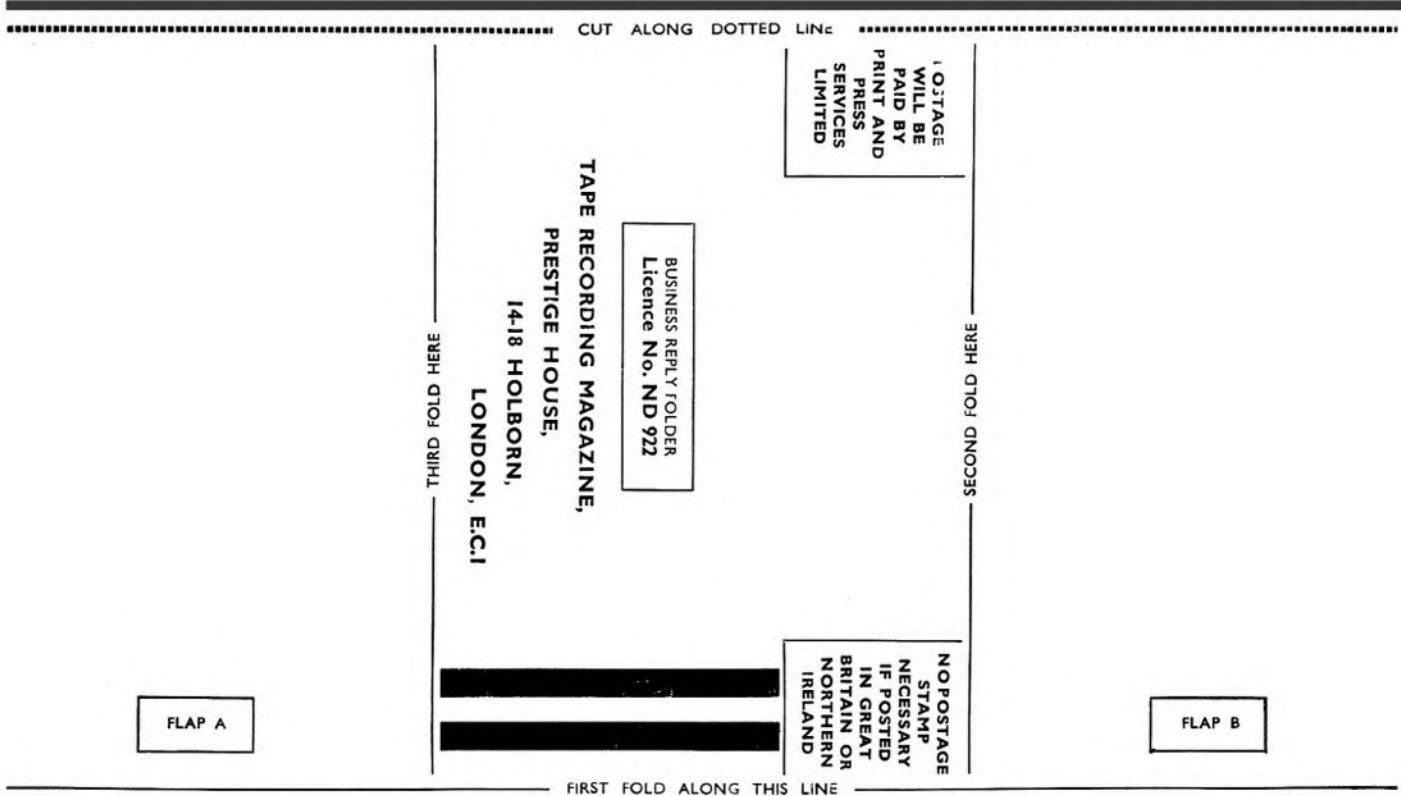
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