

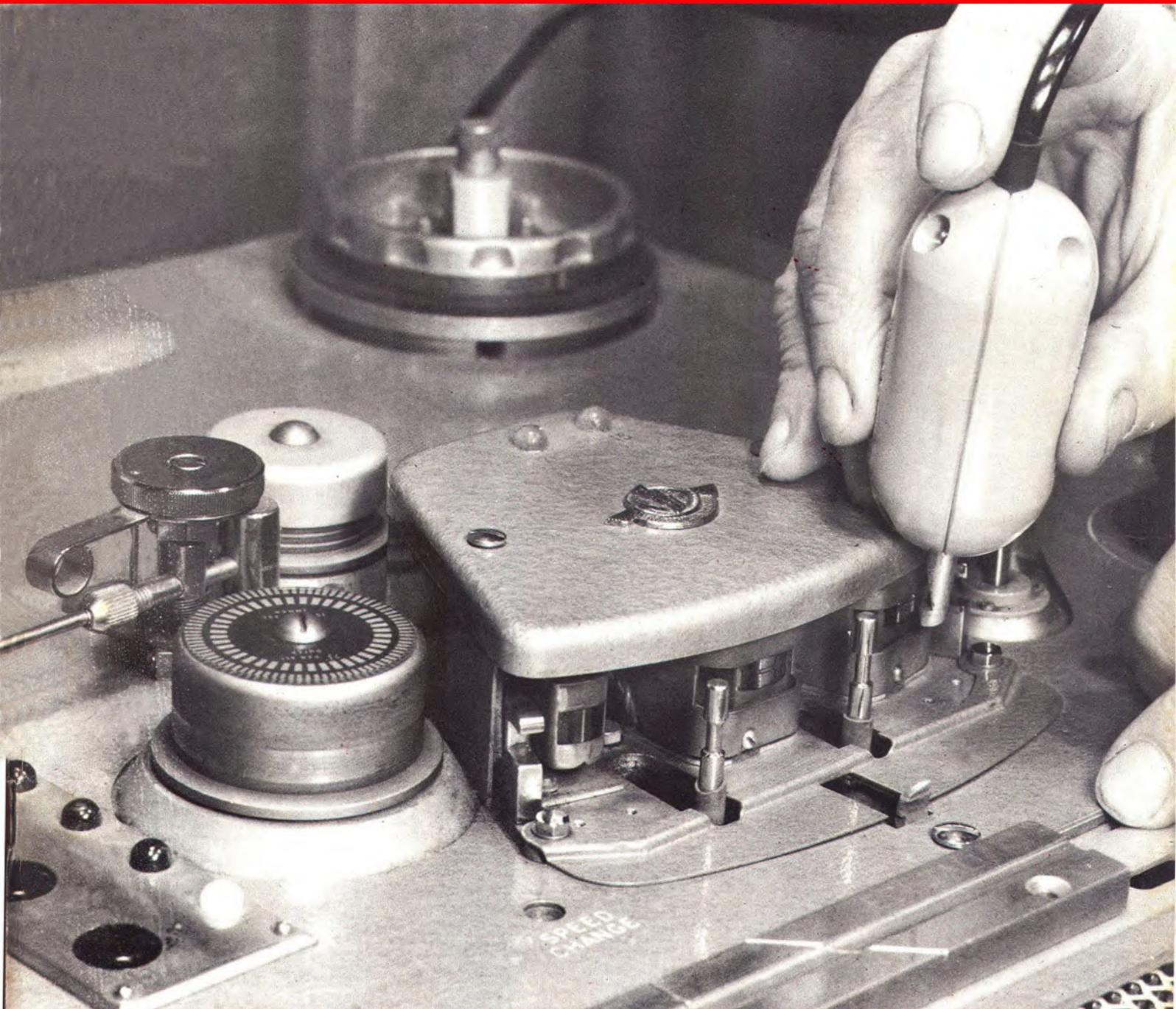
— INCORPORATING —
"SOUND AND CINE"

tape recorder

MARCH 1964

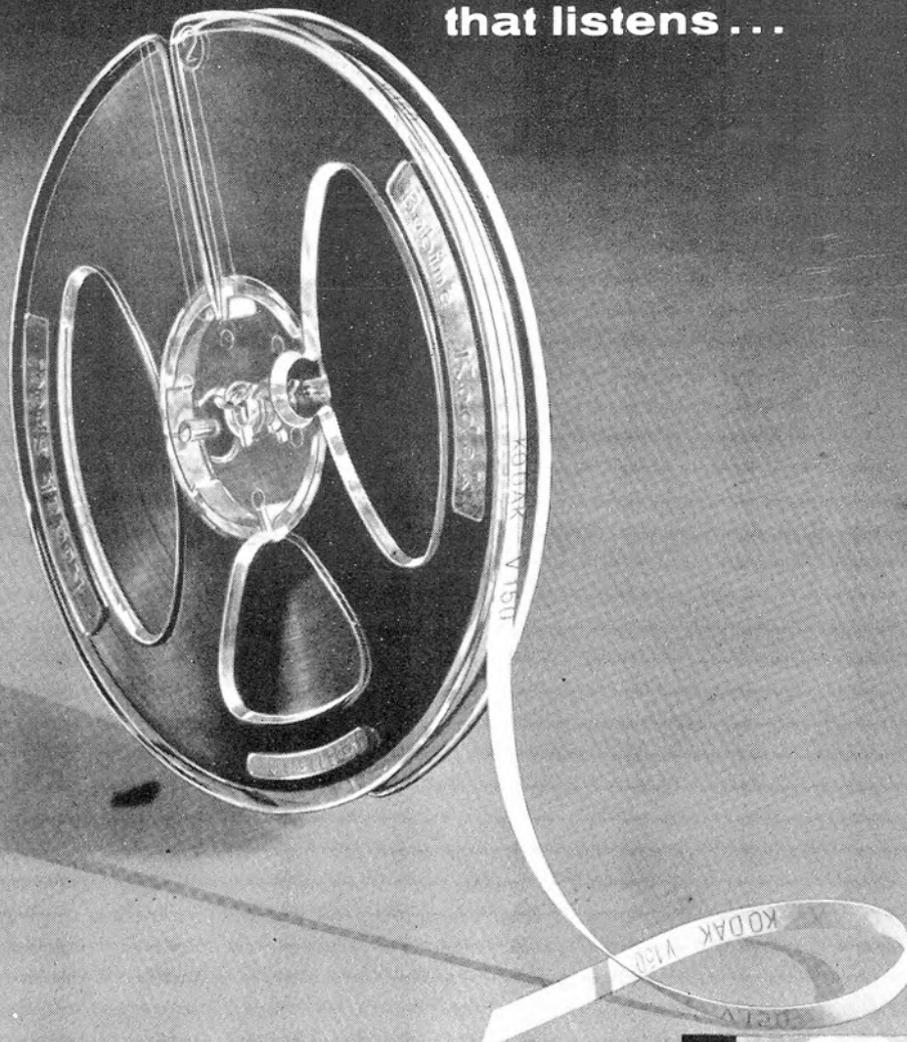
vol. 6 No. 2

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- TAPE RECORDER SERVICE - TELEFUNKEN MAGNETOPHON 85

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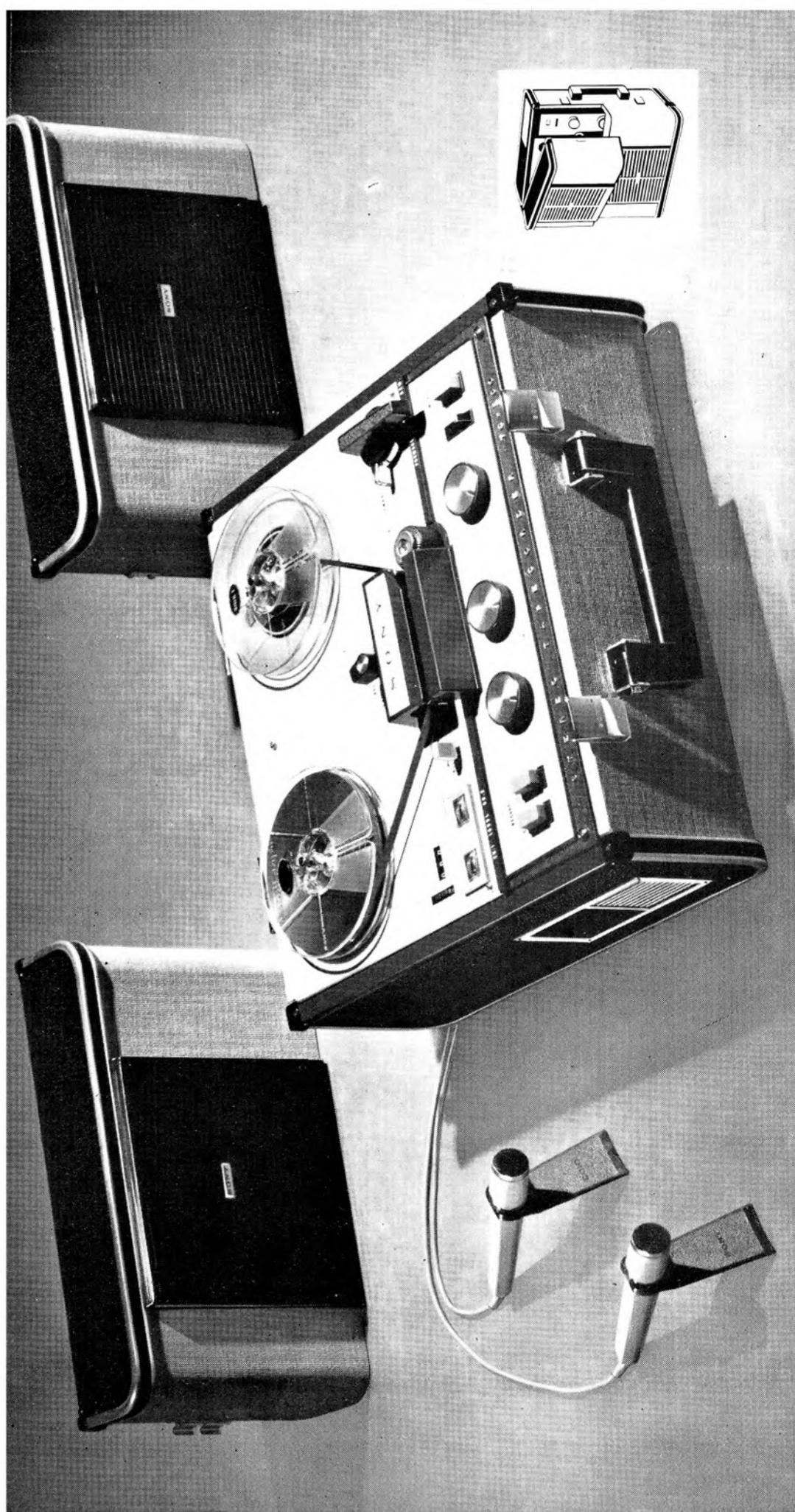
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54 Tchaikovsky's last and greatest symphony, is here given a splendidly moving rendering by the Sinfonia of London conducted by Muir Mathieson. Also in stereo.



58 The fabulous dynamic Duke Ellington himself in eight great numbers including Stomping at the Savoy, In the Mood and Honeysuckle Rose.



14 Tchaikovsky Symphony No. 5. Sir Malcolm Sargent and LSO combine to give this famous symphony a dramatic and colourful rendering. Also in stereo.



25 Ian Wallace, Joyce Blair and chorus. Some Enchanted Evening, I'm In Love With a Wonderful Guy and all the unforgettable songs from this great musical. Also in stereo.



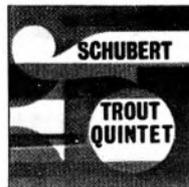
74 Superb Sarah Vaughan in ten great numbers. If I Loved You, Saturday, It's Delovely, You'll find me There, etc. Every one a hit.



76 Unforgettable Art Tatum in person plays Tenderly, Body and Soul, Without a Song, Begin the Beguine. 12 superb numbers from the greatest-ever jazz pianist.



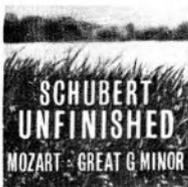
11 Dvorak Symphony No. 5. From the New World. Leopold Ludwig conducts the London Symphony Orchestra in a dramatic and moving performance. Also in stereo.



69 The exquisite playing of the Virtuoso Ensemble matches the beauty of Schubert's celebrated Trout Quintet, which contains some of his most famous melodies. Also in stereo.



66 Lily of Laguna, Milord, Come Prima, Dance Everyone Dance, and 14 more played in characteristic manner by the Les Baxter Orchestra.



44 Leopold Ludwig and LSO combine brilliantly in an exciting 'double' two of the world's greatest symphonies receive vivid new interpretations. Also in stereo.



72 The magnificent Platters bring you Sixteen Tons, My Dream, Mystery of You, You'll Never Know, One in a Million. 10 superb numbers. Also in stereo.



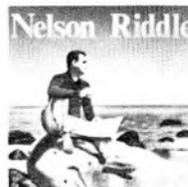
34 Stardust, How High the Moon, Nearness of You, Round Midnight, King David eight numbers by the vibraphone genius, Lionel Hampton. Also in stereo.



85 Beethoven's Emperor Concerto. A virtuoso performance by Yuri Boukoff with L'Orchestre des Concerts de Colonne under Pierre Dervaux. Also in stereo.



53 These two suites, containing some of Bizet's most thrilling music are given magnificent performances by the Sinfonia of London under Muir Mathieson. Also in stereo.



71 The smooth sound of the Nelson Riddle Orchestra in Touch of Your Lips, Body and Soul, The Tender Touch, As you Desire Me—11 favourites in all.



2 Grieg Piano Concerto. Alexander Jenner in an electrifying performance with the Bavarian State Radio Orchestra conducted by Odd Gruner-Hegge.



1 Tchaikovsky Swan Lake. John Hollingsworth conducts the Sinfonia of London in a great performance of this well-loved ballet music. Also in stereo.



70 The Archduke Trio. Beethoven's inspiring masterpiece here receives a truly outstanding performance from the Lovelidge - Martin - Hooton Trio.



45 Crazy Rhythm, Bijou, I cover the Waterfront, Northwest Passage, Blowin' Up a Storm, etc. The master clarinetist plays 12 numbers in great style. Also in stereo.



32 Star cast and orchestra stage all the famous songs: Getting to Know You, Hello Young Lovers, I Whistle a Happy Tune, Shall We Dance, etc. Also in stereo.



77 In the Mood, Hugel-Call Rag, Chattanooga Choo-Choo, Serenade in Blue. 9 original tracks by the immortal Glenn Miller and his band.



49 Beethoven Fidelio Overture, Brahms St. Anthony variations, Mendelssohn Hebrides Overture, Wagner Siegfried Idyll. Superb interpretations. Also in stereo.



31 Rimsky-Korsakov Scherezade. Sir Eugene Goossens conducts the LSO in a breathtaking performance of this rich and exotic masterpiece. Also in stereo.



65 Our Love is Here to Stay, The Nearness of You, Gully, and nine more great hits, all with America's top vocal group, the fabulous Four Freshmen.



91 Barbara Leigh with all-star cast and orchestra sing It's Never Too Late, I Could Be Happy With You, We Said We Wouldn't Look Back. 12 in all. Also in stereo. Tape.



63 Cuban Carnival, Yesterdays, Blues in My Heart, and eight more great numbers played by George Shearing with vocals by Dakota Staton.



6 Kismet. Full cast production. Brand new arrangements. Star artists sing Stranger in Paradise, Baubles, Bangles & Beads. This is my Beloved, etc. Tape.



81 Some of Chopin's loveliest melodies magnificently played by world-famous pianist Fou Ts'ong—The Four Ballades, Nocturne in F Sharp Major, etc.



18 Gershwin's Rhapsody in Blue and American in Paris. Pittsburgh Symphony Orchestra conducted by William Steinberg. Jesus Maria Sanroma, piano. Also in stereo.

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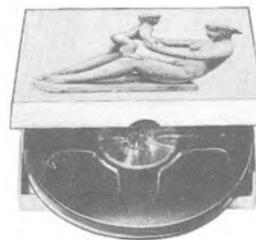
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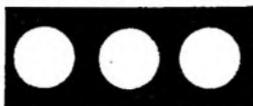
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Please send me, without obligation, on 7-day free trial, the three selections indicated. (Your 3 selections must be either all tape or all disc.) If satisfied, I will pay you 30/- plus 3/- postage, packing and insurance. Only at that stage may you enrol me as a full member of World Record Club, entitled to all the benefits described. My only obligation as a member would be to agree to purchase 4 more top quality 3½ ips tapes over the next year at the special club price of 29/- each (or 12" LPs at 26/6) plus a small charge for post and packing. If I am not completely satisfied with my 3 selections, I will return them to you within 7 days, in good condition, and owe you nothing.

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TAPE RECORDER

Editor - - - - - MILES HENSLOW
 Editorial Offices - - - - 99 Mortimer Street, London, W.1
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EDITORIAL

IS price maintenance good or bad? This is a question that several millions of people will have been discussing since the Government's deliberations last January. Before then, as a fairly safe guess, 50 per cent of these people never bothered about it. We discuss it here, and in the counterpart of this column in *Hi-Fi News*, because its abolition could have a special significance in a market where relatively complicated equipment is concerned.

In an attempt to answer our own opening question, *is it good or bad?*, we must admit that we find it difficult to separate the main issue from its many and complex side-issues; and we have little doubt that any attempt on the part of any Government to resolve the problems with complete integrity will be attended by the most painful hair-splitting and hair-tearing worries. Basically, of course, there can only be one broad answer in a truly competitive structure; namely, that there is no reason why any product should not be sold for any price that its makers or distributors care to ask. But that is where we leave the basic question. What is far more important for the customer—and he (or she) is the person who is supposed to expect the benefits of abolition—is that these benefits would be real and not diluted or undermined. To give only one example, and in the form of a question, would widespread price-cutting result in a new evil of still greater quality-cutting at the manufacturing end, in order to enable Brand X to show the same profits as Brand A? And that is where we leave the whole question, as a general issue, for journals better suited to deal with such matters. Our own concern is that of fixed prices—or otherwise—in the electronics world.

We have made much of "after-sales-service" in our two magazines. We have always recommended that our readers should buy their equipment from dealers who are prepared and fully qualified to service and repair them. On the "hi-fi" side of things we record the recent instance of a reader who bought a complete and expensive set-up which refused to work at all, as purchased. The dealer who sold it would not attend to it and, quite understandably, no other dealer would do so without payment. On the tape recorder side of things (only a week ago as we write this column) a reader asked our advice. He had bought a recorder at considerably less than "list price", rather than buy through a dealer, and found that it had a fault. He did not want to pay anything to have it fixed, but he felt that this new machine should at least work. Quite right—and very bad luck. But had both these readers dealt with shops which undertake to look after their customers and their purchases, neither would have had cause to complain.

SUBSCRIPTION RATES

The Subscription rate to *The Tape Recorder* is 30s. per annum (within the British Isles) and 32s. 6d. per annum overseas (U.S.A. \$4.50). This includes a free copy of the annual index. The same rates apply to *Hi-Fi News*.

The Tape Recorder, 99 Mortimer Street, London, W.1



MARCH - - - - - 1964
 VOL. 6 - - - - - NO. 2

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It costs money to equip and staff a service and repair department; and when a dealer with a reputation to guard feels that he wants to give good service, he must make enough profit from his business to meet these overheads. The wise customer *must* realise this and think ahead when he buys. If a free-for-all, competitive trading spree results from the abolition of price maintenance, and if we see the same tape recorder, or amplifier, or television set in three different windows in the same street, with three prices, the important question to ask before deciding how little or how much to pay should surely be: "What is this really going to cost me?" Dealer A may well say, "I wrap it up and it's all yours". Dealer B may say, "I will service it and keep it in order for you, free, for 18 months". Dealer C may offer alternatives, as for example, "At £30 it's all yours. At £32 10s. it is still my headache for 18 months".

We all know the maker's guarantee which undertakes to replace faulty parts but not to pay for their fitting, etc. A fan bracket on a car would thus be replaced by the makers at 30s. while the owner forked out £10 for repairs to the radiator which it punctured. In a free-for-all market, Dealer A might well request a signature on a form, clearing him of any liability outside that in the maker's guarantee. Dealer B might equally well offer a form, this time with his own signature, declaring his liabilities and his intentions to honour them.

In a sentence, abolition of fixed prices would almost certainly benefit the buyer of everyday purchases, but it could react the other way for customers who sought to gain by its attractions, without due thought for the morrow.

COVER NOTE

THIS month, again, we feature the deck of the EMI TR90—probably one of the most popular and reliable professional tape recorders so far made. Many hundreds of them are in use all over the world, by broadcasting companies, film studios and disc manufacturers. This editorial photo shows the Ferrograph de-fluxer being used for a routine de-gaussing of the tape heads. We apologise for our omission to thank the BBC for the photo on our February cover.

AUDIO FAIR EXHIBITORS

	Booth	Room	Lounge	Office	Trade Name
Richard Allan Radio Ltd.	39	120	—	—	ALLAN
Akai Electrical Co. Ltd.	47	412	—	—	AKAI
Ampex Great Britain Ltd.	17	247	—	—	AMPEX
Akustische und Kine-Gerate G.m.b.H.	46	204	—	240	AKG
Armstrong Audio Ltd.	19	404	—	441	ARMSTRONG
Agfa Ltd.	2	114	—	124	AGFA
Amateur Tape Recording Magazine	34	—	—	—	AMATEUR TAPE REC. MAG.
The Acoustical Mfg. Co. Ltd.	58	422	—	423	C UAD
B.A.S.F. Chemicals Ltd.	22	320	—	326	B.A.S.F.
Boosey & Hawkes	56	420	—	—	JORDAN-WATTS
Brenell Engineering Co. Ltd.	28	342	—	341	BRENELL
Braun Electric International	9	214	—	216	BRAUN
S. G. Brown Ltd.	27	421	—	426	BROWN
Butoba Schwarzwald	68	234	—	241	BUTOBA
Beyer Electrotechnische Fabrik	36	415	—	—	BEYER
Clarke & Smith Manufacturing Ltd.	24	321	—	324	CLARKE & SMITH
Chapman Ultrasonics Ltd.	70	448	—	462	CHAPMAN
Clairtone Sound Corp. of Canada	7	215	—	—	CLAIRTONE
A. R. Sugden & Co. Ltd.	25	242	—	243	CONNOSSEUR
The Decca Record Co. Ltd.	65	236	—	—	DECCA
Decca Radio & T.V. Co. Ltd.	66	235	—	205	DECCA
Design Furniture Ltd.	59	117	—	—	DESIGN FURNITURE
E.M.I. Tape Ltd.	63	322	—	323	E.M.I.
Elcom (Northampton) Ltd.	60	213	—	—	ELCOM
Electroimpex of Hungary	61	113	—	—	QUALITON
Fane Acoustics Ltd.	19a	221	—	—	FANE
Fi-Cord International Ltd.	37	414	—	416	FI-CORD
The Ferrograph Co. Ltd.	67	337	—	339	FERROGRAPH
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G.K.D. Ltd.	45	319	—	—	G.K.D.
The Goldring Mfg. Co. Ltd.	20	118	—	123	GOLDRING
Garrard Engineering Co. Ltd.	29	145	—	162	GARRARD
General Gramophone Publications	—	—	244	—	THE GRAMOPHONE
Gavaert Photo-Production N.V.	6	—	—	—	GEVAERT
Goodmans Industries Ltd.	31	347	—	363	GOODMANS
Grundig (G.B.) Ltd.	35	147	—	148	GRUNDIG
Hansom Books Ltd.	1	—	—	—	RECORDS & RECORDING
Hanover Press Ltd.	—	—	344	—	AUDIO RECORD REVIEW
Miles Henslow Publications Ltd.	72	—	—	—	HI-FI NEWS TAPE RECORDER
Iliffe Electrical Publications Ltd.	1	—	—	—	WIRELESS & ELECTRICAL TRADER WIRELESS WORLD
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Kodak Ltd.	49	312	—	327	KODAK
K.E.F. Electronics Ltd.	38	212	—	224	KEF
Kelly Acoustics Ltd.	—	—	232, 233	—	KELLY
Loewe-Opta A.G.	10	413	—	—	LOEWE-OPTA
J. B. Lansing Sound Inc.	21	112	—	—	LANSING
The Lowther Mfg. Co. Ltd.	12	411	—	409	LOWTHER
The Long Playing Record Library	—	—	153	—	L/P RECORD LIBRARY
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Luxor Industri Aktiebolag	30	218	—	228	LUXOR
Minnesota Mining & Mfg. Co.	35	349	—	—	SCOTCH
M.S.S. Recording Co. Ltd.	51	217	—	—	M.S.S.
Metrosound Ltd.	4a	335	—	—	METRO-SOUND
Mullard Ltd.	50	211	—	209	MULLARD
Ortofon A/S	2a	336	—	—	ORTOFON
Philips Electrical Ltd.	54	111	—	109	PHILIPS
Peto Scott Electrical Instruments Ltd.	—	—	152	—	PETO SCOTT
Pye Ltd.	13	318	—	325	PYE
Pioneer Electronic Corp.	16	314	—	—	PIONEER
Planet Projects Ltd.	57	418	—	425	PLANET
Rola-Celestion Ltd.	8	149	—	150	CELESTION
Radford Electronics Ltd.	11	417	—	424	RADFORD
Record Housing	52	302	—	301	RECORD HOUSING
Reslosound Ltd.	71	—	—	—	RESLOSOUND
Rogers Developments Ltd.	43	449	—	450	ROGERS
Revox-Studer	15	315	—	316	REVOX
Shure Electronics Ltd.	48	249	—	251, 250	SHURE

The OKI FT 2020

THE OKI FT 2020 is the first full-size recorder to be introduced by the OKI Electrical Industry of Japan. Nevertheless, it is perhaps the most fascinating machine ever to "come out of the East". The fact that the company manufacture telephone and industrial radio equipment, as well as computers and radar apparatus, may well be responsible for their perfectionist approach to tape recording.

The FT 2020 incorporates 47 transistors and 26 diodes, some of which are employed as switching devices, with the result that the "piano-key" controls which operate the tape-transport functions, glide into action without the force so often required on contemporary machines. This is not unusual, but the ingenious part of the FT 2020 is that no relays or solenoids are used in any section of the machine. These have been replaced by *flip-flops* (one shot multi and diode gates). The switching system is completely foolproof and "running up the keyboard" or depressing "chords" causes the machine to stop altogether until the user "regains his sanity".

The recording system is $\frac{1}{4}$ -track stereo, and separate record and playback heads permit off-the-tape monitoring and echo. Facilities for inter-track transcription ("sound on sound"), make the machine even more versatile. The manufacturers state the wow and flutter figures to be 0.15% and 0.25% at 7½ and 3¾ i/s respectively, but an American review recently reported obtaining figures of 0.035% at the faster speed.

A claimed frequency response of 30 c/s to 20 Kc/s at 7½ i/s, and 30 c/s to 15 Kc/s at 3¾ i/s, both ± 3 dB, with a distortion figure of 1%, and a signal/noise ratio of 50 dB—should satisfy even the most critical hi-fi fan. The maximum output power is 10W per channel.

Three inputs are provided for each channel: radio, 250 K; auxiliary, 500 K; and microphone, 10 K. The two Vu-meters are designed to withstand a ten-times overload.

We understand that the FT 2020 may become available in Britain during 1964 but do not have any information as to its price. **Manufacturer: OKI Electric Ltd., 10 Shiba Kotohira-Cho, Minato-Ku, Tokyo.**

New Address

THE distributors of the *Microkit* condenser microphone (reviewed in our December issue) have moved to: 4 Manchester Street, London, W.1. (Telephone: HUNter 2353).

Grundig Centre at Norwich

NORWICH T.V. and Electrical Limited, Grundig dealers in Norwich, have announced plans to convert one of their two branches into a store specialising in Grundig equipment.

The new centre will be based on the décor of Grundig's London showrooms at Orchard Street, W.1.

Philips Appoint New Sales Manager

PHILIPS Electrical Limited have appointed a new General Sales Manager, Ronald H. Pengally, to succeed A. L. Sutherland, who is now the company's commercial director.

Mr. Pengally's former position, as Director of Cossor Radio and Television Ltd., has been taken over by David Holmes, who has been with the company for twelve years.

WORLD OF TAPE



BSRA Discuss Tape Quality

MAGNETIC tape was the subject of a BSRA meeting last January, which began with a lecture on specifications and performance, by Graham Balmain, of MSS Recording Company. After an examination of tape parameters, it was explained that several facts given in advertisements were of little interest to the domestic user. In particular, changes in sensitivity of several dB, over 30 seconds of music, were found to be inaudible to an audience during one of the demonstrations.

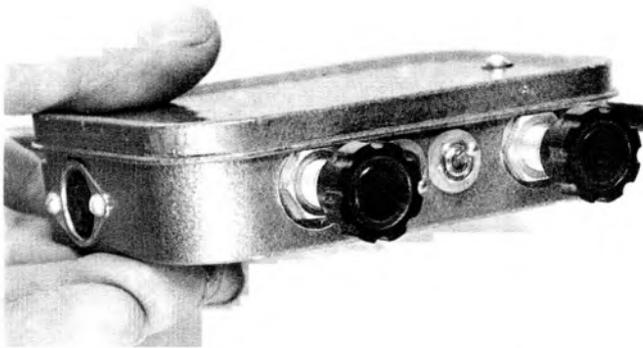
Mr. Balmain was joined later by P. T. Hobson (3M's), R. J. Munday (EMI Tape Ltd.), F. Livingstone Hogg (Livingstone Laboratories) and R. L. West (Northern Polytechnic), to discuss questions on recording, submitted by BSRA members. The panel were all agreed that there is no "ideal tape" and users should experiment with various brands and stick to the one that gives best results on their machine.

... given away with every TK6

IN order to boost sales for their new battery portable recorder, the TK6, Grundig announced that they are giving away a tape record with every machine sold. The tape contains twelve EMI recordings, giving 40 minutes playing time at 3¾ i/s. Popular, traditional jazz, light and classical music make the tape suitable for all tastes. **Manufacturer: Grundig (Great Britain) Ltd., 40 Newlands Park, Sydenham, London, S.E.26.**

Standard Telephones & Cables Ltd.	..	..	..	..	3	—	—	—	S.T.C.
S.M.E. Ltd.	..	..	..	..	44	—	—	—	S.M.E.
Sherwood Electronic Laboratories	..	..	..	..	42	122	—	—	SHERWOOD
Stuzzi Radiotechnischer Betrieb	..	..	..	..	14	115	—	116	STUZZI
Sony Corporation of Tokyo	..	..	..	..	73	311	—	309	SONY
Tannoy Products Ltd.	..	..	..	..	23	447	—	446, 463	TANNOY
Tandbergs Radiofabrikk A/S	..	..	..	..	69	248	—	262	TANDBERG
Tape Recording Magazine	..	..	..	..	—	—	346	—	TAPE RECORDING MAGAZINE
Trio Corporation of Japan	..	..	..	..	62	121	—	—	TRIO
Truvox Ltd.	..	..	..	..	41	442	—	—	TRUVOX
Telefunken G.m.b.H.	..	..	..	..	5	402	—	401	TELEFUNKEN
Thorens S.A.	..	..	..	..	3a	—	—	—	THORENS
Vitavox Ltd.	..	..	..	..	18	348	—	362	VITAVOX
Vortexion Ltd.	..	..	..	..	74	202	—	201	VORTEXION
Whiteley Electrical Radio Co.	..	..	..	..	26	304	—	305	WHITELEY
K. H. Williams & Co. Ltd.	..	..	..	..	—	—	246	—	WILLIMAN
The Wilson Stereo Library Ltd.	..	..	..	..	—	—	155	—	WILSON STEREO LIBRARY
Wharfedale Wireless Works Ltd.	..	..	..	..	53	222	—	223	WHARFEDALE
Worden Audio Developments Ltd.	..	..	..	..	—	—	313	—	WORDEN
Zonal Film Ltd.	..	..	..	..	40	—	—	—	ZONAL

A MICROPHONE AND MONITOR AMPLIFIER



A SHORT while ago I wanted to record bird songs on a tape recorder, but found that even when using a parabolic reflector to direct sound into a microphone the output was insufficient to load the tape recorder fully. The need for a single stage pre-amplifier was apparent. At the same time I felt that it would be an excellent idea to monitor the microphone output so that I would be able to determine when the reflector was correctly directed, and when I wished to record. An additional three-stage amplifier was therefore incorporated to drive a pair of headphones; a block diagram of the complete unit is shown in fig. 1.

The Microphone Pre-Amplifier

The single-stage microphone pre-amplifier is shown in fig. 2. This is a conventional common-emitter stage, except for the method of gain

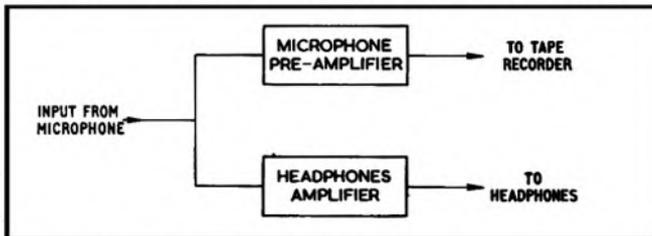


Fig. 1: A block diagram of the complete unit.

Fig. 4: The circuit of the headphones amplifier.

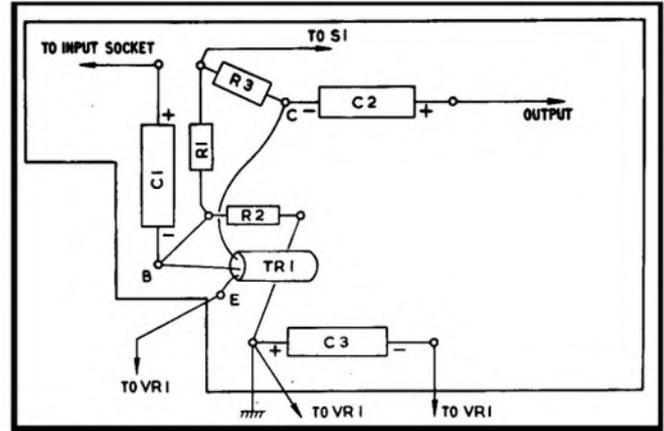
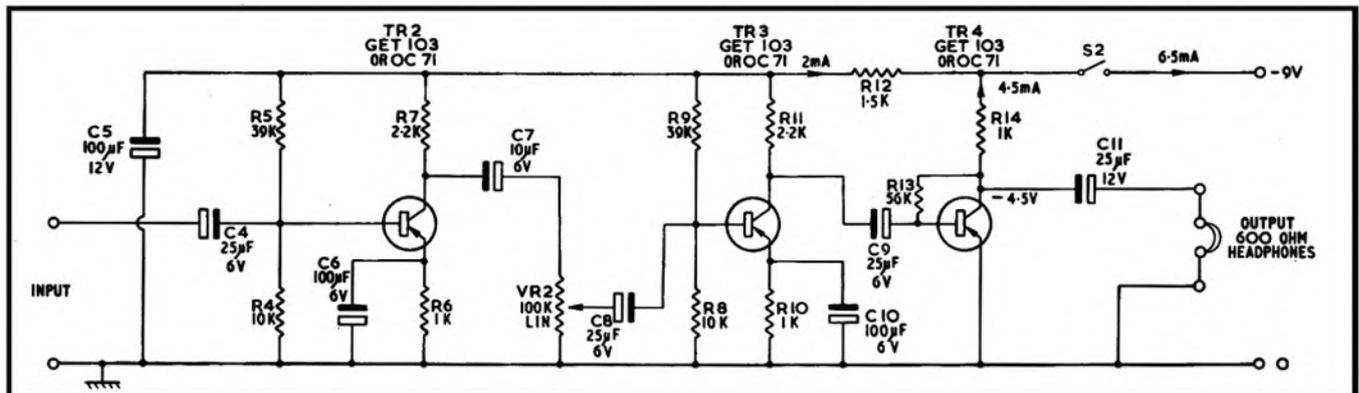


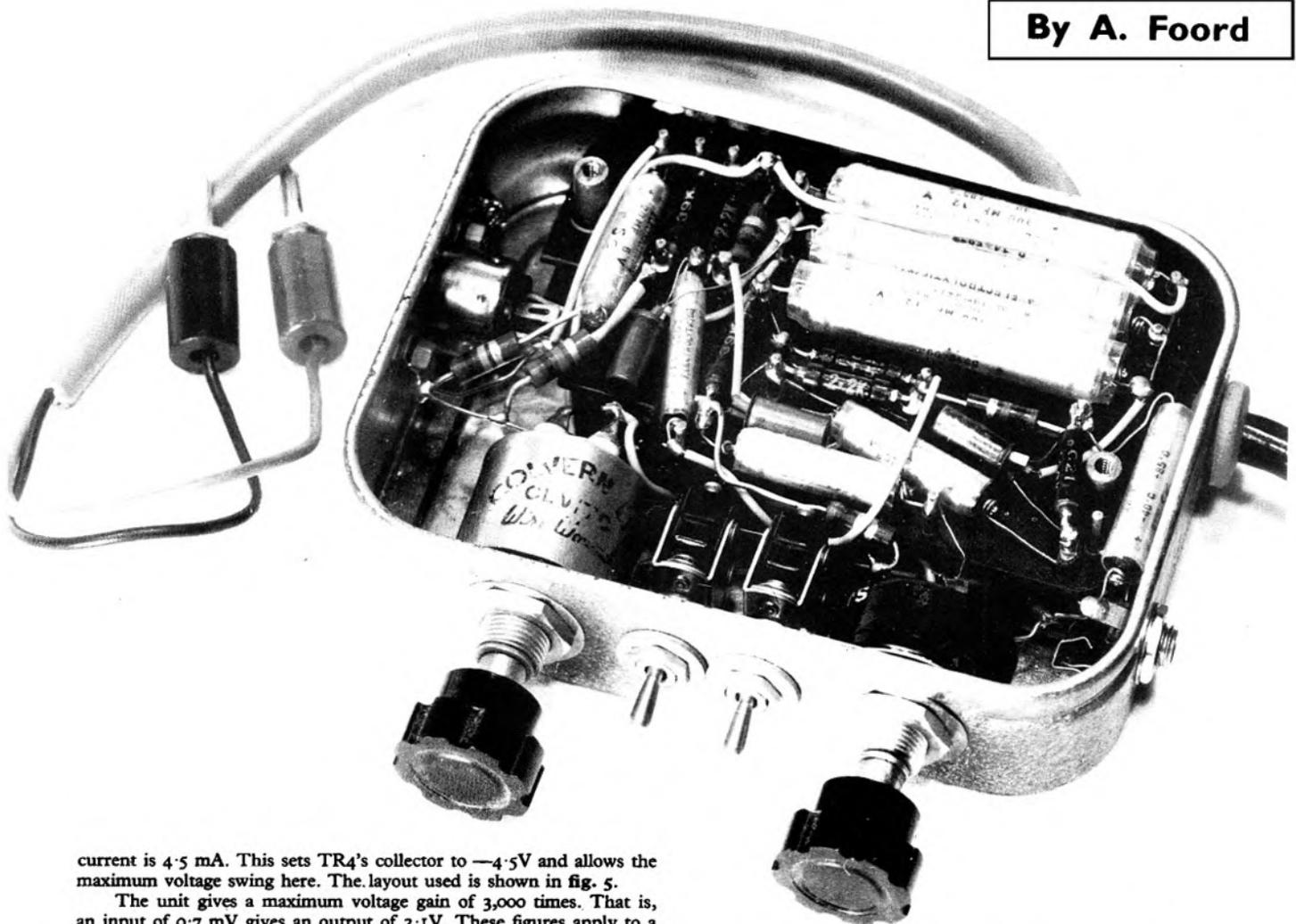
Fig. 3: The layout of the microphone pre-amplifier.

control used. This deserves some explanation. When VR1 is adjusted so that C3 is connected directly to the emitter of TR1 the circuit operates as a normal common-emitter stage. When C3 is connected to the earthy end of VR1, there is an appreciable amount of negative feedback applied to the stage, since VR1 is common to both the input and the output circuits. VR1 thus gives control over gain. In practice, although a linear potentiometer is used for VR1, the effect of the control is approximately the same as a normal control of the logarithmic type. The construction of the pre-amplifier will depend greatly on the actual components used by the constructor, but fig. 3 shows my own layout, and is given as a guide.

The maximum voltage gain is 18 times (this is given with C3 connected to the emitter end of VR1). The minimum gain cannot be reduced to zero, but this is not a disadvantage since the pre-amplifier is only used to boost a weak signal and will therefore not be used at a gain of less than one. These figures apply to a 600 ohm source-impedance and a 600 ohm load. This section of the unit consumes 1 mA.

The Headphone Amplifier

The circuit of the headphone amplifier is shown in fig. 4. Again, this is a standard arrangement except for the volume control circuit. Here a linear control is used, but the heavy loading presented by the next stage ensures that the control is virtually logarithmic in effect. The output stage TR4 requires some comment. R13 gives some negative feedback at audio frequencies, and also sets the bias current. The value given for R13 should be adjusted, if necessary, until TR4's collector



current is 4.5 mA. This sets TR4's collector to $-4.5V$ and allows the maximum voltage swing here. The layout used is shown in fig. 5.

The unit gives a maximum voltage gain of 3,000 times. That is, an input of 0.7 mV gives an output of 2.1V. These figures apply to a source-impedance of 600 ohms and a load of 600 ohms. Although headphones of approximately 600 ohms are recommended, the unit will fully load headphones of a wide variety of impedances.

The current consumed by the headphone amplifier section of the unit is 6.5 mA. This is split up in the following manner: TR2 and TR3 each consume 1 mA, while TR4 consumes 4.5 mA.

Constructed in Two Layers

The layout of the complete unit is shown in fig. 6. The unit was built into a two-ounce tobacco tin, in two layers, one above the other.

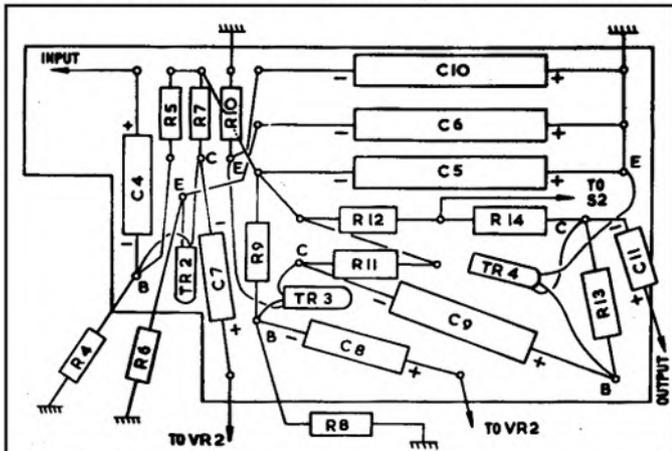


Fig. 5: The layout of the headphones amplifier.

One Paxolin tagboard held the microphone pre-amplifier while another held the headphone amplifier. The complete unit consumed 7.5 mA at 9V. Although it was designed for use with a microphone of 600 ohms impedance, it will work satisfactorily from microphones of any impedance less than about 3 K. The microphone pre-amplifier will feed into any load greater than about 500 ohms. The gain will be slightly greater for loads higher than the quoted 600 ohms; the pre-amplifier is thus suitable for most tape recorders, including those designed for high-impedance inputs. The advantage in using a microphone pre-

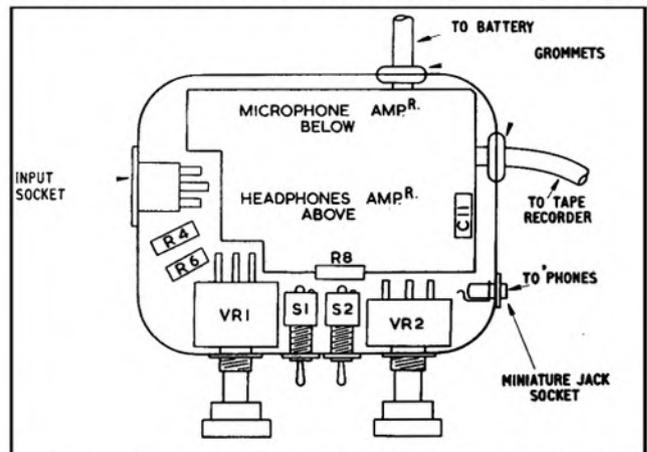


Fig. 6: General layout of the complete unit. (Continued overleaf)

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A MICROPHONE AND MONITOR AMPLIFIER

amplifier with a low impedance is that it allows long leads to be used between the microphone/pre-amplifier and the tape recorder.

Note: All resistors in the following lists may be either ¼W or ½W.

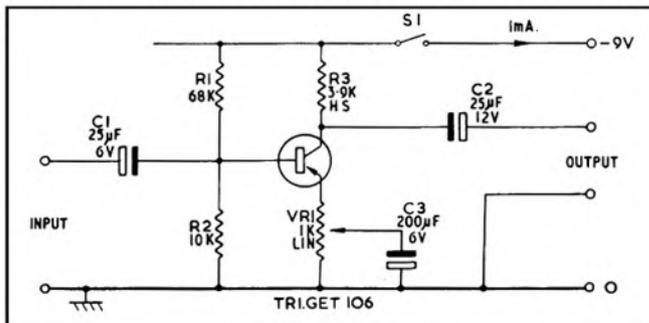


Fig. 2: The circuit of the microphone pre-amplifier.

Components Specifications for Microphone Pre-Amplifier.

Resistors: R1, 68 K; R2, 10 K; R3, 3.9 K 10% High Stability.
Capacitors: C1, 25 mF, 6V; C2, 25 mF, 12V; C3, 200 mF, 6V.
Other components: VR1, 1 K linear potentiometer; S1, On/off switch.
Transistor: TR1, GET 106.

Component Specifications for Headphones Amplifier.

Resistors: R4, 10 K; R5, 39 K; R6, 1 K; R7, 2.2 K; R8, 10 K; R9, 39 K; R10, 1 K; R11, 2.2 K; R12, 1.5 K; R13, 56 K; R14, 1 K.
Capacitors: C4, 25 mF, 6V; C5, 100 mF 12V; C6, 100 mF, 6V; C7, 10 mF, 6V; C8, 25 mF, 6V; C9, 25 mF, 6V; C10, 100 mF, 6V; C11, 25 mF, 12V.
Transistors: TR2, GET 103 or OC71; TR3, GET 103 or OC71; TR4, GET 103 or OC72.

Other components: VR2, 100 K linear potentiometer; S2, On/off switch; Headphones, approximately 600 ohms impedance; Miniature jack plug and socket; 9V battery; Input socket.

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TAPE RECORDS REVIEWED

WE have six tapes again this month, chosen to cover a wide range of musical tastes. Modern "pops", jazz, classical "pops", some unusual Handel, and arrangements of English folk songs make up the list, five mono at $3\frac{3}{4}$ i/s and one $7\frac{1}{2}$ i/s stereo.

Popular musicians come and go, and though the Beatles are all the rage today, only a couple of years ago the Shadows were at the top. To be fair, though, the Beatles are at their most popular as a vocal group, whereas the Shadows excelled instrumentally. Some of their instrumental skill is shown to great effect on a tape called, simply, *The Shadows* (Columbia TA-33SX 1374). This carries 14 popular pieces played in the inimitable Shadow fashion, which seems to make the most of this sort of electric-guitar/percussion combination. The recording is clear and fresh, and though one or two vocal pieces are included we feel that the level of entertainment is much higher when mouths are closed and hands are working. The Shadows' style is appropriately sentimental in places and their rhythms and turns of instrumental phrase are quite infectious at times.

* * *

Another popular musician who is always stylish and engaging—this time in the jazz field—is Lionel Hampton, who is supported by 15 fellow jazz-men on *Hampton Hits*, a selection of eight arrangements recorded at public performances and issued on WRC TTP152. Hampton sticks to his beloved vibraphone through most of this tape, though once he goes to the piano.

The atmosphere of a public jazz event comes over very well on this tape, particularly at the beginning of *How High the Moon*, where Lionel's musical wit and his reaction to (and involvement of) the audience is well caught. Hampton is clearly a great jazz musician who always produces beguiling sounds whatever the style of the piece he is playing. The recording of the other players is a little dim, but the vibraphone always rings out like a perfect bell.

* * *

More jazz, but in a different modern idiom, is found on *Saga* STG 8046. This is called *Lucky Thompson Jazz Session*, with Thompson himself on tenor sax, Jimmy Hamilton (clarinet), Billy Taylor (piano), Oscar Pettiford (bass) and Osie Johnson (drums). This is a group of very skilled performers doing their technical utmost with five extended pieces, but it is hard to feel that any of it is anything more than very inconsequential. Though Thompson is the key figure—and he is good—the contributions of drums and bass are rather effective in a restrained sort of way. Clearly a tape for fans.

* * *

Fans of a different sort will enjoy listening to Tchaikovsky's *1812 Overture* in stereo ($\frac{1}{4}$ -track) on Crown ST131 (available from Teletape). This features the Hamburg Philharmonic Orchestra under Karl Jergens, and included for good measure is the *Warsaw Concerto*. The *1812* opens beautifully, though the promise of the opening is not quite fulfilled in the middle sections; however, the performance is generally satisfactory and leads to a good rousing climax. In addition to a shift

to the left, needed because of a deliberately recorded imbalance (Heaven knows why they do this in the States), the bass and extreme treble need cutting when the tape is reproduced on wide-range equipment, and such gear shows up a few other recording limitations. But on small portable stereo machines with detachable speakers the recorded balance seems to make up for the replay limitations, so perhaps the recording was made with these in mind.

Richard Addinsell's *Warsaw Concerto* (composed for the film "Dangerous Moonlight"), receives a rather dim performance—but then it is rather dim music when heard detached by so many years from its wartime associations. The pianist is not named.

* * *

Handel's *Royal Fireworks Music* was composed for a public occasion in 1749, and at the request of the King it was scored for wind and percussion only as befitted an outdoor event. However, the version usually heard, includes string parts, so it is interesting to have a performance using approximately the same instrumental forces as at the first playing. The Jean-Francois Paillard Ensemble provide this on WRC TT270, and very "military" it sounds, with powerful trumpets and percussion.

On this same tape are performances of Handel's *Double Concerto No. 27 in B flat major*, and the *Oboe Concerto No. 10 in G minor* (with Pierre Pierlot, oboe). Strings return to their rightful place in these two works, the first of which employs a string orchestra and two wind groups, and the second using the oboe against a string background.

It is very interesting to hear what this French group makes of Handel's music, especially as it has achieved some fame in France for this sort of thing. On the whole we feel that the Handelian tradition is better perpetuated by English players, as much of the music's natural lilt seems to be missed by the Paillard Ensemble—but we may be right off the mark as other critics have reacted differently. This WRC tape was received very recently and it included the little printed programme-note insert for which we appealed a couple of months ago; we now learn that all WRC tapes will include these in future. This is a step towards the proper presentation of tape records which we welcome most heartily.

* * *

Also with comprehensive notes is our last tape, *English Folk Songs*, arrangements by Ralph Vaughan Williams on WRC TCM46. RVW was a great collector of folk songs, and in the early years of the century he noted down many as sung by the last survivors of an earlier age. About a dozen settings for various soloists or chorus are included, together with six studies for viola and piano based on English folk songs. Performances are by the Purcell Singers under Imogen Holst, with Rosamond Strode (soprano), Patrick Shuldham Shaw (baritone), Jean Stewart (viola) and Daphne Ibbott (piano).

There is much of great beauty on this tape, and after listening to these lovely old tunes one begins to grasp something of the rich musical background from which Vaughan Williams received inspiration for much of his symphonic music. Beneath those flowing pastoral slow movements is an undercurrent of ancient tradition.

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MA-5

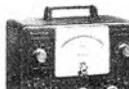
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RSW-1



UXR-1



GL-58



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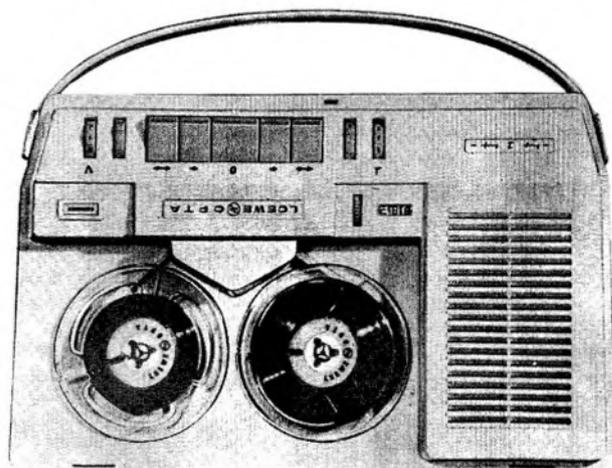
The Eumig S2 cine camera

JUST about this time of the year there is a spate of letters from readers asking for suggestions on suitable cine equipment for use on holiday. Some readers have problems concerning choice of equipment for filming underwater, others seek guidance on the Zoom-lens versus Combination-lenses question, and others pose special recording-on-location and lip-sync problems. Most of the letters, however, have one thing in common: they are concerned with how to avoid unnecessary expense.

One reader, certainly with this last point in mind, quite recently wrote to say that he was prepared to spend up to £60 for an all-purpose system to take on a Spanish holiday. The equipment must include a reliable, easy-to-use cine camera, and a portable tape recorder capable of recording all the sounds necessary for a small travelogue. He wanted the best combination possible within the limits of the sum, but, *he also wanted to be able to use the portable recorder as a playback unit on projection of the film.* The provision that the recorder must also be used for playback purposes complicated the issue for me but, nevertheless, I tried to find an answer.

Quite obviously, the very cheap recorder with rim-drive, was completely out of the question. This type of machine relies on the take-up spool to pull the tape past the heads; the tape speed therefore increases as the effective diameter of the spool is enlarged. The ordinary transistorised battery portable costing around £25 would not do either, for synchronisation with projection really needs a static mains recorder. I therefore investigated the battery/mains portable recorder position, deciding, eventually, on two models. These were the *Optacord 414* and the *Q-Cord R.119K*, both of which would work perfectly well with a loop coupler on mains supply and would provide good sync. The *Optacord* was the more versatile of the two but it was priced at £49 7s., without microphone, and therefore left precious little over for the purchase of the cine camera. It was, furthermore, a little bulky and heavy (9 lbs. in weight) to be carried about together with the cine camera and other items of equipment. The dimensions of the *Q-Cord* were still not minute (9 x 4 x 10 ins.) but were distinctly manageable, and its weight was 3 lbs. less than the *Optacord*. The price, with microphone, tape and batteries, was £34 13s., leaving just over £25 for the camera. At least, there was now a workable basis for the system. (I was not going to try to include the price of a loop coupler in this; if this reader was going to borrow a projector, he could jolly well borrow one with a coupler built in.)

The first requirement of a battery/mains recorder is that there must be a constant tape speed on battery operation so that tapes recorded in this fashion can be played back normally on mains operation. The *Q-Cord* measures up to this all right, for the use of a quite large diameter capstan keeps wow and flutter better than 0.5%. It also has a high dynamic range and a wide range of tone control. Frequency response is 60 c/s-10 Kc/s. There is one speed— $3\frac{3}{4}$ i/s—International double-track—and the recording time is one hour for each track. This does give the



The Optacord 414 portable tape recorder

advantage of recording on one track only and being able to edit this track for mains synchronisation. Extra features include: connections for dynamic microphone, radio, phone, earphones and external loud-speaker. The *Q-Cord*, therefore, looks ready-made for our proposed system.

Now, how about the camera? Well, there are a number of cheap electric-eye models on the market and some of these have electric-drive as well. With a battery-operated tape recorder an electrically-operated camera would be an asset, firstly for convenience of working, and secondly because there would be no slowing down of picture at the end of the wind as with the spring-wound sort. Thus, both units would have every chance to keep a constant speed during all the various runs.

Of the cheaper camera models, the *Vernon 18/28* looks a reasonable buy at 18 gns., and this would leave a few pounds over for accessories. I do not know this camera, however, so cannot recommend it. I could simply say that it exists, but the whole question still intrigues me and demands further thought.

Last year, an artist friend of mine, who knows nothing about photography, and flaunts the fact, was looking for an inexpensive and completely fool-proof 8 mm. Zoom camera—"Something that will do everything by itself with no effort from me". At that time I was testing the, then new, *Eumig S3*. This seemed the obvious choice for my friend; he bought one and has remained delighted with it ever since. "It's marvellous", he said, "but there are still some things that, even now I don't quite understand about it. For instance, what are those two little holes in front of?"

Everything seemed to fall into place at that moment. Of course, the answer to our reader's problem was the Eumig synchronised start system.

(Continued overleaf)

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SOUND AND CINE—continued

The Eumig T5 transistorised portable tape recorder costs £25 10s. (microphone £4 15s. extra) and has been designed primarily for cine work. It can be connected by a synchronising cable to any Eumig S2, S3, C5 or C6 cine-camera, and is small enough (6 x 4 x 2 ins.), and light enough (2 lbs.) to be carried over the shoulder. When the camera button is pressed, both camera and recorder start off together. Thereafter, synchronisation depends on the ability of each unit to retain a constant speed. As each of the camera models is powered by battery-drive (one set of batteries running ten films) they should run fairly true. The T5 recorder uses an electronic speed control so the speed of this unit should hold fairly constant as well. Furthermore, the T5 is provided with a control for *varying the speed of the playback*, enabling one to slow down or to speed up when dubbing to a static mains type recorder.

Originally, I think it was planned that this recorder should be used directly with a projector for playback purposes, and starting switches for the Eumig projectors are still supplied with the T5. Indeed, with the provision of the variable playback speed control, an extra amplifier and a speaker, this is a possibility that should not be overlooked. Nevertheless, the small spools provide only ten minutes recording time at 3 1/2 i/s, on each of the two tracks, which would make editing difficult.

The Eumig System

The merit of the synchronised-start system, I feel, lies more with the cable sockets, "the two little holes in the front", than with the small recorder. These sockets connect with a pair of contacts in the camera which close when the camera bar is pressed and open again when the bar is released. This allows the system to be used not only with the T5, but with virtually any transistorised tape recorder. It is, after all, only a circuit which is made when the camera button is pressed and broken when the button is released. As for using a Eumig with the Q-Cord, it would be wise to contact the agent, C. Braddock Ltd., 266 Waterloo Road, Blackpool, Lancs., to find out if there would be any serious obstacle to making a small modification to the Q-Cord start switching mechanism.

The cheapest of the Eumig cameras is the S2 at £27 18s. which is extremely good value. Fully automatic exposure control is used, with *f*-numbers visible in the viewfinder. The photo-cell needs no battery to energise it and it is slanted slightly to avoid picking up too much sky area which could give a false reading. The emulsion speed of the film in use is set on a dial above the lens which reads off in APEX numbers 2-3-4-5. These can be calculated very simply and quickly in ASA or DIN numbers, from the conversion scale on the bottom of the camera. Once a film is found that suits the user, this dial need never be altered.

The electric motor, powered by four 1.5V. penlight cells, is of the permanent-magnet type and runs at single speed only—16 fps. As with most other inexpensive battery-driven cameras, there is no provision for single frame shooting. I do not regard this as a disadvantage for, certainly, the addition of such a facility would complicate the release mechanism of the electric-drive, and raise the price.

The lens is an *f*/1.8 Eumigon fixed-focus and the depth of field is adequate to give a sharp picture at all working distances beyond 5 ft., unless wide apertures are being used.

For the lone worker who also has to cope with a recording machine, this is an ideal camera. Once the film is loaded and the emulsion speed has been set, there is nothing to do except point the camera and press the button, and, if the synchronising cable is linked up to the tape recorder, then the recorder may well look after itself.

The Final Solution

So it seems that we have a reasonable number of suggestions to make to our friend after all, and these are: (1) The Q-Cord portable tape recorder and the Vernon 18/28 cine camera. Price, £53 11s.; (2) The Eumig T5 recorder and the Eumig S2 camera. Price, with microphone, £58 3s.; (3) The Tru-Cord and the Eumig S2. Price, £62 11s.

With the point made that these were only suggestions rather than a complete review of the situation, the possibilities were posted off to him.

A few days later the reply came in. "Thank you for your nice long letter and for all the trouble you have taken over my problem. The fact is that I have now decided to give up the idea of filming in Spain and I am thinking of buying a canoe with the money . . ."

The Next Spool



I HAVE been reminded that I wrote an article in the September issue (Vol. 5: No. 8) called *The First Spool*, which was a summary of do's and don'ts and advice for better recording. I was asked to follow this up with more practical suggestions on the line, paving the way, in general terms, for a completely new series of articles which begins in the April number (next month). This series, I should mention, is being contributed by Gordon J. King, and the articles—twelve have been planned so far—are designed to take the reader stage by stage along the road, from ordinary everyday recording, to standards of quality which are well within the reach of anyone with the necessary enthusiasm and patience. It is a well planned series of articles which I look forward to seeing in print in this magazine; and so, having let no official cats out of the editorial bag that were not meant to escape, let me get on with my own specified job of writing *the next spool*, so concluding what I began six months ago.

Use the Slots

I am flattered to learn from quite a few readers that the notes in my first article made sense, and that considerably better recordings had resulted from following them. I hope that these additional suggestions will prove to be as useful. Beginning with something which seems almost stale news. I have been amazed, watching various people threading-up tape, to notice how few of them realise the usefulness of the 45-degree slots on the inside hubs of the spools.

The customary practice seems to be to hold the leader or the tape flat against the hub, and then to turn the spool until friction and pressure take over from entangled fingers! At first, until one gets accustomed to doing it the right way, it takes a little more effort to slip the leader, or the tape end into the slot; but this method definitely removes one of the most unnecessary causes of wow—the creation of a small lump on the circumference of the tape as it spools—a lump which builds the tape into an ellipse.

Piano or Bell

This brings me straight to another very useful point. Wow and flutter are not always noticeable as such, straight away, particularly to an untrained ear, but both help to degrade the overall sound quality in various ways. The simplest test is to record a sustained piano note and to play it back; but for those who do not possess a piano there is an excellent substitute—the note of a handbell. Provided that the note is of a definite pitch, and not too high, and with a long after-ring, a recording and playback will show up speed irregularities very clearly. The ear is specially sensitive to changes in pitch in notes which do not undergo short-term changes in nature.

One of the best ways of improving one's standards of recording is to get away from the ordinary things—for which the ear makes too many automatic allowances anyway—and to record the slightly unusual. The exercise, apart from its usefulness, has a very high interest value, as will soon be appreciated; and it also introduces the element of control which can be of great help all along the line. Starting with relatively simple sounds—for example the dripping of a tap, or a jug being filled with water—notice how easy it is to produce results which would be quite difficult to recognise; and experiment until the reproduced sound is realistic enough to be all but indistinguishable from the original. Some sounds, it will be found, are almost impossible to capture and reproduce with realism at this stage, despite the care and patience taken, but to say more on the subject would be to step over on to some of the territory to be covered by Gordon King at a later date.

Purely as an experiment, and for the entertainment value of it, try going from the normal to the odd! For example, the microphone amongst the mechanism of a kitchen clock, or against the throat of a purring cat, can produce some most unlikely sounds. And, talking of throats, when passing a Government Surplus Disposal shop, look for a "throat mike".

For clean speech recording, now that we are within reasonable distance of spring and warmer weather, try taking the microphone out of doors, into the open, but not into the wind. Notice the startling freshness of speech when it is recorded without over-reverberant room

acoustics. With this valuable warning of the degrading effects of "average" indoor conditions, endeavour to improve the indoor set-up until it begins to approach the quality of the outdoor example. This is a hard exercise, but one well worth the effort involved. From it can come a dozen-and-one useful tactics that may improve almost every ordinary recording in the future. There can obviously be no fixed rules for improving individual room acoustics because we all clutter up our rooms in so many different ways! But for those who have not already tried the experiment, it can be most revealing to record the same sounds or speech in different rooms—and even in different places of the same room—without altering the controls. Often a small cloth behind the microphone will produce startling changes and a piece of woven material on a wall can completely alter the bad acoustics of a room.

Checking the Magic Eye

Passing on to a slightly more complicated subject, owners of recorders which embody a magic eye type of level indicator, often find it difficult to fix the point at which the eye-closure corresponds with the onset of distortion. In fact it is often thought that it is impossible to check this without some form of test equipment, such as oscilloscopes, or signal generators. However it is quite possible to do this, approximately, by using the BBC tuning signal which is broadcast before the start of a programme, and at the end of broadcasting. This signal is a fairly pure sine-wave.

Record this tuning signal and note the magic eye settings as you increase the volume level in steps (leaving the controls of the radio receiver steady). A "Chinagraph" pencil, finely sharpened, can be used to mark the glass or plastic cover of the eye. The steps can be noted on paper, as made, for counting later. Then, on playback, when a small percentage of distortion is present it can be recognised by an additional edginess or buzzing sound. This is an induced harmonic. The volume level at which this change is just audible should coincide with magic eye closure. If it does, all is well and good. If it does not, then a repetition of the experiment with finer steps, will make it possible to mark the "eye" at the overload point.

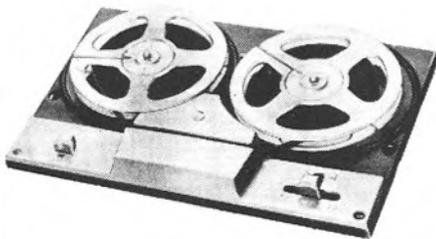
Unwanted Background

To conclude on a different note, one of the most irritating contributory factors to unsatisfactory recordings is that of unwanted background noises. In a way this is akin to forms of trouble experienced by amateur photographers in the early stages of progress. The eye is so accustomed to all the everyday man-made things that it sees, that momentarily, when the photographer concentrates upon a picture he intends to record, it overlooks the unwanted, interfering object. But the recorded picture shows it up immediately and for ever as a distraction because concentration is no longer in charge. So it is, when making a sound recording, with the ear, hard at work concentrating on what is wanted.

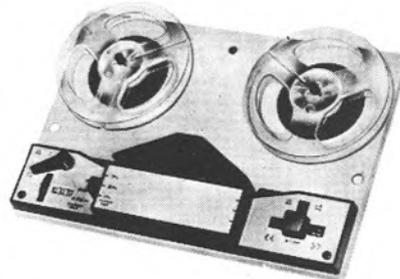
Only on playback do the unwanted sounds hit out like sledge-hammer blows! There are, obviously, techniques for excluding or minimising unwanted background noise, and some of them involve the use of special microphones; but the starting point is the job of training the ears to listen for what is unwanted while concentrating upon the important job in hand. Proof of the truth of this "deafness" can be found by listening to the coughing and audience noise when playing back a recording of a live concert. How much of it was noticed while the recording was being made?

by: rafe seabrook

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MONARCH WORKS, OLD HILL, STAFFS

Readers' Problems

★ Readers who encounter snags, or who run into trouble with their tape recording equipment, are invited to write to this editorial office for advice, marking the envelopes "Readers' Problems—Tape". Replies will either be sent direct by post, or published in this column if the subject is of general interest. However, we must emphasise that this advisory service cannot include requests for information about manufacturers' products when such information is obviously obtainable from the makers themselves. It is also essential to keep the queries reasonably short and to the point, and to limit them to one specific subject if at all possible. And, please, in no circumstances confuse such letters with references to other matters which have to be dealt with by other departments in our office.

Pre-Amp for a Portable

Dear Sir, I am contemplating building a portable tape recorder using the Garrard tape deck, but have been unable to obtain a suitable pre-amp circuit diagram for this. Could you please inform me if any such circuit is available with switched equalisation for $1\frac{1}{3}$ and $3\frac{1}{3}$ i/s.

Yours faithfully, R. D. M. Bramhall.

A very suitable design is that published in the Mullard Publication "Circuits for Audio Amplifiers", which should be obtainable from any good bookshop. Since the publication of this book, there has also been a modification sheet, giving switching and equalisation networks for $3\frac{1}{3}$ and $1\frac{1}{3}$ i/s. This is designed around the EF86 and has three-speed switching—you would, of course, dispense with the higher speed of $7\frac{1}{2}$ i/s by leaving the switch tags blank (or perhaps utilising them for an additional function, such as straight-through amplifier).

Another circuit, this time of a complete three-valve amplifier, with three-speed switching and equalisation, was published in September 1960. You should ask for a reprint of Mullard's "3W Tape Amplifier Circuit for Modern Tape Decks". This is a well-proven circuit, having been used, with small variations, on many commercial machines.

We do not think you will get much help in this respect from Messrs. Garrard. They will provide information on their own products but are understandably reluctant to advise on the circuits or designs of other makers.

* * *

Background Hum

Dear Sir, For the past three years I have used a Philips three-speed EL 3542 recorder and have been quite satisfied with the reproduction from its internal speaker. However, in an attempt to improve reproduction I have tried using an 8 in. Axiette loudspeaker in a cabinet constructed to Goodmans' design, the speaker being fed from the extension socket via a Wharfedale matching transformer. Whilst the reproduction of this system is generally better than before, a pronounced hum is noticeable in the background. I should be grateful if you could suggest how this might be eliminated.

Yours faithfully, L. R. J., Grosford.

The problem of hum on the Philips EL3542 which shows up when a Goodmans' Axiette is connected could have two possible causes. It is likely that you have a fault on the tape recorder which is masked by the restricted range of the built-in speaker, but which shows up on the wider-range (and smoother response) Axiette. First, it is necessary to know whether a pre-recorded tape shows hum. This is where a test tape is extremely handy. Next, we must ascertain whether the recordings are themselves having hum imposed on them.

If the hum is on the recordings, and shows up when replayed on another machine, you must look to your input stages, the microphone input connections, and, in particular, the connections and contacts of the switch slider selecting Record or Play to the EF86 input. If the hum is present with a pre-recorded tape, we must next check whether the output stage is in order, whether the smoothing is correct, and if the decoupling of the previous stages is correct. Note whether hum is present with no tape replaying, or with no input to a "clean" tape.

The final possibility is that your Axiette has a peak at the lower end of the spectrum, or that the cabinet is affecting the smoothness of the response. Check this by using the loudspeaker in conjunction with other equipment.

* * *

A Ringing Flywheel

Dear Sir, My Elizabethan FT1 tape recorder (BSR deck) emits a ringing sound when running free, and on recording, and playback. The microphone tends to pick up the sound, making it quite audible on play-

back. On fast-wind and rewind the sound disappears. It appears to be coming from the flywheel, possibly from its bottom bearing. Is the bearing running dry? Does it need lubricating or packing with grease? If so, how do I go about it?

Yours faithfully,

The ringing noise you are experiencing with your Elizabethan FT1 tape recorder is more likely to emanate from the motor than the flywheel, provided the latter is correctly mounted. It is unlikely that the bottom bearing, even when fairly dry, would give this symptom.

The bottom bearing of the flywheel, incidentally, does not need packing with grease. These are oilite bearings, with a phosphor bronze bearing bush and a felt washer that retains light oil. To get at the bottom bearing for lubrication purposes is simple enough, provided you remove the deck completely. There is an end-plate, and a cover rim held by three screws, but the best method is to remove the capstan from the top without slackening the bearing support position. Take off the top covers, unsolder the head leads (and carefully note the relative positions of the leads); remove the two self-tapping screws at the edges of the head plate and the two 4BA screws at the rear, and ease off the plate. The clutch belt lies above the flywheel; take care not to get oil on this.

Having said this much, we hasten to add that the most likely cause is the rotor section of the motor rubbing slightly. Clearance is quite small and there is a self-aligning action due to centrifugal force. Thus, when the motor is at a standstill the armature may feel fairly loose, but this is normal. To prove, ease the idler away slightly (disengaging the flywheel drive), and note whether the noise persists. If it does, check the long bolts that secure the laminations and make sure they are tight. Then note that the bottom bearing plate is secure. Again, only light or medium oil is needed to lubricate.

* * *

Incomplete Erasure

Dear Sir, I recently purchased a Sound Slimline tape recorder to which I added an extra r/p head for echo effects, etc. Since this arrangement has been in operation, there has been a tendency for the machine only to partially erase previous recordings. I wondered if my modification could be causing this fault, and if so, what can be done to correct it. Also, when recording from the microphone, I have noticed a lack of volume on playback. I am always most careful to set the modulation level according to the "magic-eye" indicator.

Yours faithfully, J. A. B., Kendal.

It is doubtful whether the addition of an "echo effect" head would impair erasure, unless you had so connected it as to damp the scillator. More likely is a coincidental amplifier fault. Most usual cause of the fault is an erratic contact of the variable resistor used to control bias setting. This component is adjacent to the oscillator coil. The slider is fitted to the body of the skeleton potentiometer by bent flanges, which also provide contact. These become loose. The control has to be dismantled, and the flanges of the slider pressed gently outwards to renew the tension. If this is not the fault, check also the two 0.005 mfd capacitors by substitution. These are also adjacent to the oscillator coil, one of them connecting to the potentiometer discussed above. (Note that some Marks had 0.003 mfd components in this latter position, and an increase to 0.005 is in order.)

The lack of volume on playback, if recently noticed, could simply be falling emission of the ECL82 valve, but the setting of the recording level with the magic eye is only applicable when the reference setting is made for optimum conditions. The eye is only an indication, and several factors will affect the illuminated leaf closure. If the weakness is only apparent on microphone, and recording is full strength with radio or gram input, we would suggest the crystal capsule of your microphone is faulty. This is by no means uncommon.

(Continued on page 79)

DO YOU KNOW HOW TO SOLDER?

GOOD soldering is the very heart of good electronic construction.

It is probably true to say that half the faults which develop with electronic equipment are caused by bad or "dry joints"—and it only needs one bad joint at a vital point to stop a piece of equipment working. When this happens—and a joint often goes "bad" suddenly—it may take several hours to locate the fault. If it happens during construction it can cause even more headaches, because it is usually easier to find a fault in something that has been working than to pin down a trouble point in an unknown quantity. There is no need to say more about the unpleasant side of the affair. If the importance of good soldering is realised to the full, and never forgotten, the home constructor will defeat half his troubles before they arise. Now for the more interesting side of things.

Good soldering is easy. In fact it is so easy that once the trick is mastered, it is almost impossible to make a bad joint without deliberately trying to do so! This is why this part of the series is published first. Most beginners, being only human, unpack a kit of parts as soon as they get time, clear the table and start right away, building up trouble and disappointment. If, instead (whether they intend to become constructors or not) they will take the trouble to spend a couple of evenings with wire, soldering iron and solder, they will learn something extremely valuable. And, like riding a bicycle, swimming or boiling an egg, soldering is something which is never forgotten once mastered! Moreover there is nothing difficult about it. It is dead easy.

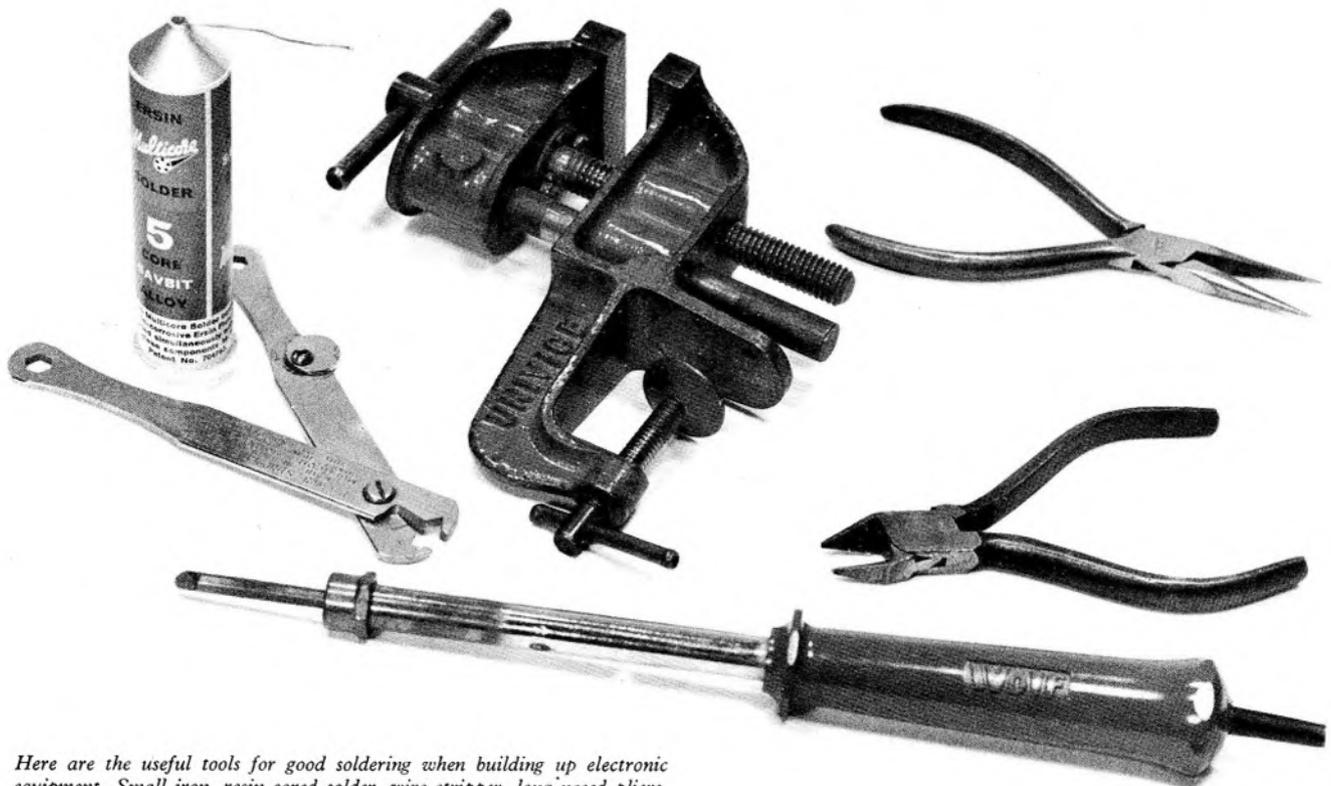
The essentials for soldering (good or bad) are 1. an iron; 2. some solder. The requirements for **good** soldering *under all conditions*, are: 1. an iron which gets hot enough but not too hot—and the ideal is a 25W iron with a small bit; 2. a reel or roll of some good cored-solder;

● Thousands of enthusiasts are building electronic equipment from kits to-day. Hundreds of them have learned the taste of defeat which comes when the last joint is made, when the last nut is screwed home, when the unit is switched on... and when nothing happens. In at least fifty per cent. of the failures, bad soldering is the cause. These three pages of pictures and words may save much unnecessary disappointment.

3. a small vice for holding work when three hands seem essential; 4. a stand (home made if you like) for resting the iron when not in use, so that it will stay at the right temperature; 5. a pair of long-nosed pliers; and 6. a pair of side-cutters. All these items are illustrated in fig. 1.

The secrets for good soldering are few and simple; and here it should be noted that women and children can solder as well as men, and often better if they have more patience. The first secret is *correct heat*. The second, *cleanliness*. The third, a *firm, deft touch*. The fourth, *correct application*. The fifth, *timing*. That is all.

Now for some elaborations on the above. Never use a big, hot iron for a delicate job; and, equally important, never try to solder big areas of metal with a small iron. Today, with the increasing use of transistors and small components which can easily be overheated, it is particularly important to ensure that the heat does not spread to areas where it is not wanted. To understand this you have only to hold a 3 in. length of wire in your fingers, and apply the soldering iron to the other end, in order to see how quickly you have to drop the wire! At the other extreme you need only try to solder a piece of thin wire to a really thick brass bolt with a small iron to understand how the available heat dissipates to



Here are the useful tools for good soldering when building up electronic equipment. Small iron, resin-cored solder, wire stripper, long-nosed pliers, side cutters, vice.

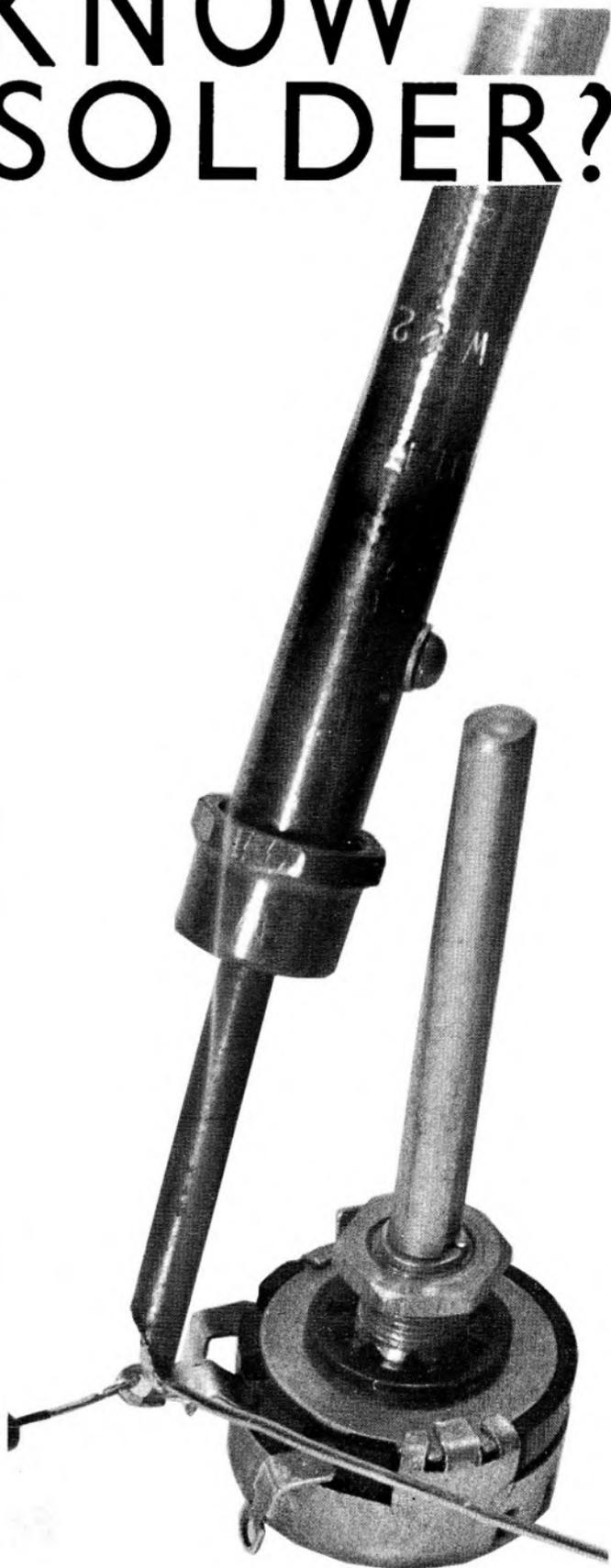
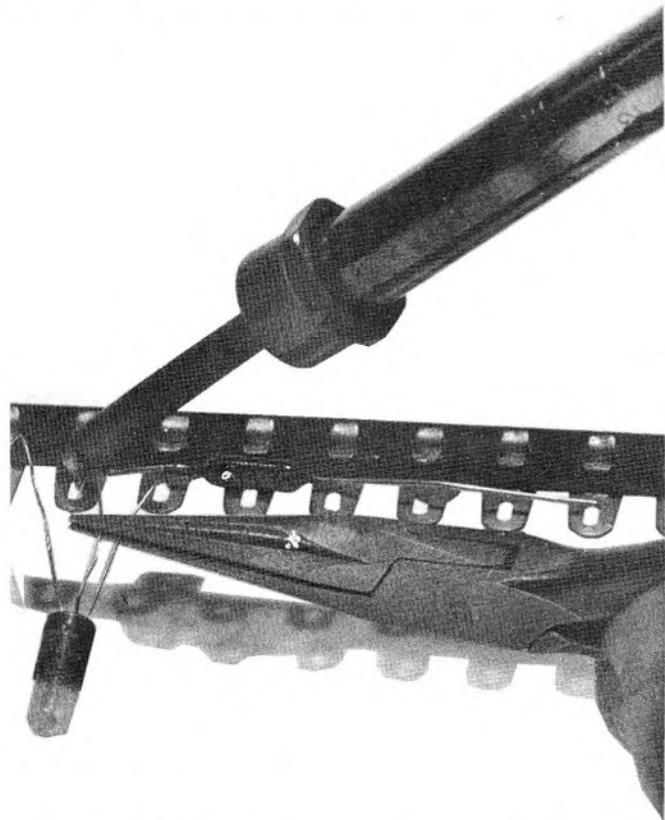
DO YOU KNOW HOW TO SOLDER?

where it is not wanted, leaving insufficient heat to do the job properly.

Never use any of the soldering fluxes, solutions or spirits for electronic work, in any circumstances, ever. Redundancy in grammar, maybe, in that sentence, but *how* important the point! Use one of the specially developed, cored solders, notably *Ersin Savbit*, manufactured by Multicore Solders Ltd. This has the flux inbuilt, so that it is applied automatically to the joint at the right time and in the correct quantity as the job is done. *Savbit* also has the great advantage of keeping the bit of the soldering iron clean and free from pitting.

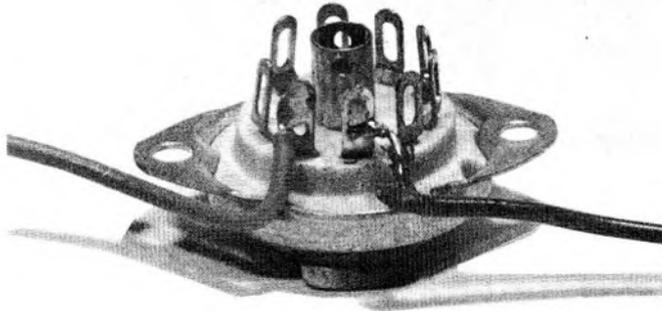
Cleanliness is all-important. You want to make a permanent metal-to-metal contact. You do *not* want to join a layer of dirt to a film of grease. Therefore, prepare each joint before soldering. Run the wire end through the jaws of the side cutters to clean away any "mildew" or film. When applying the solder, remember that a good physical contact should be made between the two parts (wires) to be joined. If the joint is likely to be called upon to stand up to strain, then crimp the wire round the tag, so that the solder merely has to ensure good electrical contact.

The solder and the flux are required at the actual point of contact, and they should be there at the correct moment. Only the absolute expert can deposit them there exactly, one hundred times out of one hundred, by transferring them via the hot iron. Therefore the ideally correct drill is 1. to place the two items together, 2. to apply the tip of the hot iron to the point where they meet, 3. to apply the end of the cored-solder wire to that same point about one-and-a-half seconds later, 4. to wait, motionless, for about one second while the solder



Transistors and very small components need special care. They **must not** be over-heated, or they will be damaged or destroyed. To prevent this happening, use what is called a "heat shunt".

DO YOU KNOW HOW TO SOLDER?



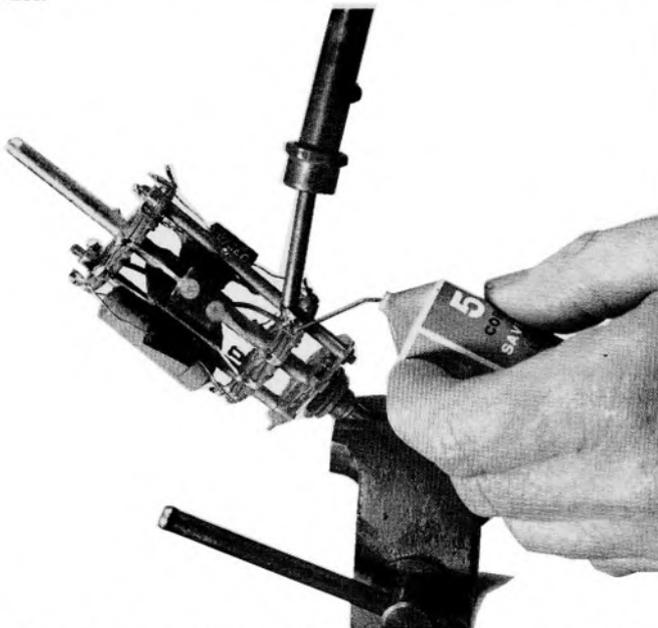
When soldering plastic-covered wire, or wire with sleeving, remember that too much heat will fry and distort these materials.

flows, 5. to remove iron and solder wire simultaneously and, *most important*, 6. hold the two parts *absolutely motionless* for perhaps three seconds until the solder is seen to "freeze". Blow on it if you like, to hasten the process, but don't on any account move.

The "freezing" of the solder will soon give the worker an accurate guide to the goodness or otherwise of the joint. If it freezes smoothly and evenly, all is well; if it dries roughly and with minute pinholes, apply the iron again for a second or so, as before. *Movement* at the time of cooling will almost inevitably cause a bad joint.

Now that is absolutely all that need be said about the basic art of soldering. There are, of course, many tricks and aids which workers will adopt to suit themselves and their particular needs, but each to his own. For example, if an absolutely firm joint is to be ensured first time at a most inaccessible valve-holder tag, one trick is to make a tiny hook on the wire end (having scraped it clean) and to stretch the wire gently to some firm part of the chassis, anchoring it by a couple of turns. Then both hands are left free to apply iron and solder—and the wire *cannot* move

The use of a small vice for most wiring will save hours of time and ensure good soldering, for the simple reason that it leaves both hands free.



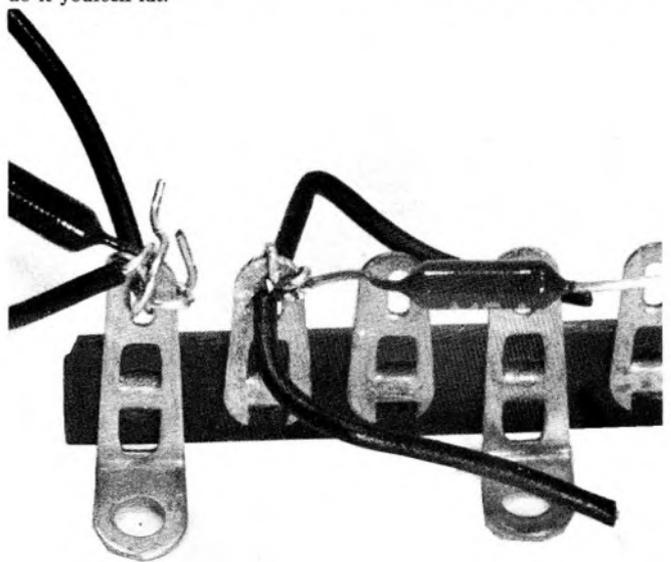
The use of a small vice provides the constructor with the equivalent of a third hand. Other tricks, such as crimping wires on to tags, can save the need for a fourth hand!

Most wiring in constructional kits calls for soldered joints at tag strips or fixed components, a potentiometer – condensers. In many cases, because these components are planned to act as junction points to simplify wiring, there will be two or three wires to solder at each point. The technique is to fix each wire neatly in position (having cleaned its end), so that when all are in place they will be sensibly spaced—not heaped and bunched one on top of each other—ready for one soldering operation. Then, with the iron and solder held against the centre point, apply the solder to that point until it flows outward on to all contact points.

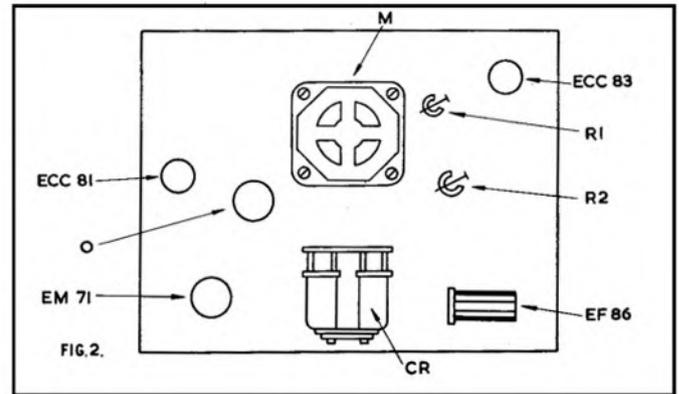
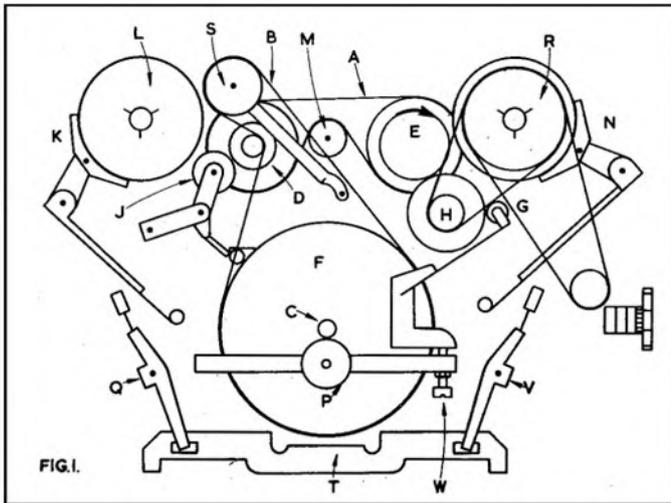
Use just enough solder to allow a thin but adequate flow. No more. Don't be over-generous, so that it runs into a great, all-embracing silver blob.

Transistors and very small components need special care. They **must not** be over-heated, or they will be damaged or destroyed. To prevent this happening, use what is called a "heat shunt". In simple terms (remembering how quickly the heat travels up a wire to burn the fingers) this means putting a barrier between the hot wire and the component. This can be done by gripping the wire with a pair of pliers *between* the transistor and the point where the hot iron will touch. The large lump of metal (the pliers) will absorb the heat, and stop it travelling on in the form of an overdose. Repeat the hot fingers experiment to prove it, only this time with the pliers half way along the wire. What the fingers don't feel the transistor won't suffer! If you have not enough hands for pliers, iron, solder and work, take a really thick piece of wire, or strip of lead, and clamp it round the wire—anything to entice the heat away before it can travel to where it can do harm. This is really important—particularly at first, before becoming so expert that you can judge everything accurately, so that the iron is only in contact with the work for the exact and absolute minimum time necessary.

With all the foregoing in mind, and with the soldering essentials written down on the shopping list, visit your local dealer and buy half a dozen resistors and small condensers of different type, a couple of tag strips, a valve-holder, a potentiometer and any other components that he can suggest. Tell him what they are for, and he will probably let you have some rejects. They will only cost a few shillings. Then buy a few yards of thin, tinned-copper wire and some sleeving. With this assortment of bits and pieces you will have almost everything you need for useful soldering practice; and by the time that you have soldered them a dozen times and (equally important, as you will later find during actual construction) unsoldered them without frying them, you should be sufficiently proficient and confident to tackle your first do-it-yourself kit.



Finally . . . don't do this . . . but this!



AS I was saying last month, several readers have told us that after an initial flirtation with the 75, in the early days of tape enthusiasm, they have graduated to the more ambitious models. Just as a motorist is a fan of a particular model, working his way through the range from the second-hand "banger" to the gleaming status symbol that he cannot quite afford, so it seems the *Telefunken* owner progresses.

This may be why there are a fair number of Telefunken machines available at reasonable prices; and also why, in the perverse nature of things, there are invariably no operating instructions or service data. So, without more ado, more information on the Telefunken range in general, and the *Model 85* in particular. It differs in many respects from the 75, 75-15 and 76, which were briefly dealt with last month. More important than this, however, is the difference between versions of the 85 itself.

There were three principal marks; the 85T, 85K and 85KL. The first was a table model, intended to be used in conjunction with a radio receiver; the second, a portable with an ECL82 pentode section output stage feeding two loudspeakers, and giving 3W output when loaded correctly with 4.5 ohms; and the third, Model KL, had a push-pull output stage, consisting of a pair of EL95 valves driven by an ECC83, double triode. There were again two inbuilt loudspeakers, giving 5W output. On both output units there is a switch for "killing" the audio output. This is incorporated with the volume control—that is, the main volume control, not the recording level control, which, rather confusingly, also controls playback gain—the purpose being to provide level response for earphone listening, the 'phone signal being taken off prior to the ordinary volume control.

On the table model, single-ended output, this switch removes HT from the primary of the output transformers; but in the push-pull version, a 1/4A fuse is used in this position, and the isolating switch is in the common return of the grid circuits.

The Erase Current

Another point of difference is the oscillator, which on the three models of the 85 range, is an ECC81 double-triode, used solely for that purpose. Its circuit is common to both table and portable models, and has a superimposition switch which substitutes a 470 ohm resistor for the erase head. Note that a separate winding on the oscillator transformer is used for recording bias, and a 15-45 pF variable capacitor fitted in series with this section of the winding allows independent adjustment. The erase head is fed via a 0.1 mfd capacitor from the other section of the secondary. The oscillator circuit is powered from the 300V tapping on the HT line, as are both output stages (note also, that the output stage have their own auxiliary smoothing circuits, and as is common to many Continental machines, quite high value—50 mfd— electrolytic capacitors are employed).

While on the subject of the power supply, it is worth noting that the heaters of the pre-amplifier valves are fed from a rectified 25V supply, via a winding on the mains transformer. The heaters are in series, and are thus DC powered, to reduce hum. This obviates the familiar balance control, but makes it very necessary to check the exact voltage and current conditions in this auxiliary circuit. Complications crop up when any faults develop in the two relay circuits—the capstan idler and the autostop, or in the remote control jack, which is effectively across the switch operated by the "quickstop" button. Both the LT and the HT rectifiers are flat metal type, bridge-connected. A separate winding on the mains transformer fitted to the models with push-pull output feeds the valves of the output stage with a 6 1/2V AC supply. On these machines, overall consumption is about 55W, against the 40W of the single-ended models.

Tappings on the mains transformer primary, as well as selecting the correct operating voltage, apply three separate AC voltages to the single motor. This is a basic 183V design, with higher and lower operating voltage applied for specific purposes. During record and playback, the motor is under-run, receiving 110V by the auxiliary phase capacitor. For fast-winding, forward and reverse, a 220V supply is applied. For this reason, the machine should never be left switched to either of these functions for longer than is necessary.

Automatic Motor Cut-Out

If inadvertent misuse results in over-heating, or if a mechanical fault such as a binding main bearing places an overload on the motor, the machine will come to a halt. Now then, disappointed users, there is a catch. A thermal switch in the motor itself cuts out with over-heating. But it is self-setting—all you have to do is sit back patiently for half an hour or so, and the switch resets as the motor cools. More than one "faulty motor" has been diagnosed because of this safety device! If, after waiting sufficient time, there is still no sign of the motor restarting when switched on, check the auxiliary phase capacitor, and when replacing always use a good high-voltage component. One point worth noting, when inspecting a strange machine, is the value of this capacitor. Models intended for Continental use (60 c/s) had a 0.7 mfd capacitor instead of the 1 mfd used for 50 c/s supply.

Principle electrical adjustments on this machine can be carried out with the aid of a test tape, 100% modulated at 1, 10, and 12 Kc/s, and if possible, with a similar band at 80 to 100 c/s. The 1 Kc/s band is used as reference level, playback output being measured with valve-voltmeter or a good AC meter at the extension loudspeaker socket or the earphone jack. Recommended value for 100% modulated tape input at 1 Kc/s is 1V at the output, but all adjustments can be made by measuring the output carefully at the reference frequency, regardless of actual value, then calculating difference levels. The left-hand azimuth screw should first be adjusted for maximum at the reference frequency, then re-adjusted at the upper frequency of 12 Kc/s for maximum. Actual voltage output should then be 20 dB down. Check at 80 c/s and

TAPE RECORDER SERVICE



10 Kc/s and note that the output is also 20 dB down, with a tolerance of ± 3 dB.

Measuring the Frequency Response

To check the overall frequency response, first switch to $3\frac{1}{2}$ i/s and record two bands of 100 c/s and 14 Kc/s at equal input level. Actual input voltage to the PU input should be about $\frac{1}{2}$ of operating level, which is 26 dB down, or about 8 mV. With recording level turned fully up, two bands should be recorded, at the reference frequency and at the upper frequency. When played back, these should not differ in output by more than 3 dB. It may be necessary to adjust the bias trimmer a small amount. Do not over-adjust to compensate for treble loss, which may be the result of a fault. The ultimate effect will be distortion, difficult to trace without adequate test gear, but giving an unmistakable harshness to recordings. The bias trimmer is situated behind the heads on the upper mounting plate—too temptingly accessible, in the opinion of some engineers! Turning it clockwise decreases treble response, and vice-versa.

At $7\frac{1}{2}$ i/s a similar adjustment can be made, but in this case we have another trimmer, R2 in fig. 2, which is a rough diagram of the bottom view of the machine. This is an equalisation adjustment, and turning it clockwise increases the treble response.

Magic-Eye Adjustments

After making these adjustments, the modulation level can be checked, and the magic-eye closure set. If a 1 Kc/s tone is recorded with an input level of about 150 mV, then played back, the output should be about equal to that from the normal operating level of the test tape, i.e. 20 dB down on the reference level. Re-record and adjust R1 until the magic-eye just closes.

The mechanical arrangements of the 85 are quite different. A diagram of the basic drive mechanism is given in fig. 1, with the usual apology. Briefly, the motor, a two-pole asynchronous type with its pulley indicated at M, drives the two idlers, D and E, via a flat belt, A. The idlers have different diameter steps (2:1 ratio), and speed selection is quite different from any mechanism we have discussed before. In the $3\frac{1}{2}$ i/s position, the drive is as shown in the diagram, with the speed change idler S bearing another belt B so that it partially wraps the upper diameter of the left idler D and drives the flywheel F. Speed change involves a lateral slide movement, a bracket with two claws, omitted from the diagram which is cluttered enough already.

Sliding this bracket to the right carries the pulley S on its pivot arm to such a position that the belt B engages the larger diameter of the idler E. A direction arrow is drawn on this idler; working out the drive we see that the belts move in the same direction as the bracket pivots over. There is a possibility of belt slip after a period, and some adjustment is possible by lengthening the arm that supports S.

A screw and elongated hole are provided. Actual belt tension should be between 0.9 and 1.3 lb.

When Record or Play is selected, the relay CR in fig. 2 closes, engages P with the capstan spindle C. The same action pushes the crossbar forward, causing H to engage with the right idler E. The belt on H drives the right spool carrier R via a small nylon diameter step, giving a slip action. The amount of this slip, and therefore the take-up torque, can be adjusted by the setting of screw W. There are one or two points to watch: first, make sure the stretch arm G does not foul the mounting post of the head plate; if necessary, bend the arm slightly, for a clearance of at least ten thou. in the playback position. Also, when adjusting, note that the clearance between the spring blade and its mounting plate should be about a millimetre (40 thou.). Do not confuse this adjustment with the setting screw for the pressure pulley, which is the right-hand screw of the inner bracket (not shown).

The motor drive belt has no direct adjustment, but there is some play in the motor mounting, allowing small adjustment to be made for wear and tear.

Fast winding, forward and reverse, is effected by lateral movement of the bracket T. There are two pivoted bearing brackets affixed, with the idlers D and E mounted on them. Appropriate movement does three things: the idler is engaged with the turntable, giving fast wind, the brakes are released by the pivotal action of Q or V, and the electrical switching is made by a tongue and cam. Note the placement of the electrical switch, with a further adjustment of screws and elongated holes. Time can cause a slackening here, with some curious intermittent faults.

Note that the braking is arranged in such a way that the winding-off turntable is always slightly braked. Check that the throw of Q or V is sufficient to disengage the brake from the inner hub of the turntable, and adjust the eccentric bush at the pivot point of the brake block to give a positive re-engagement, remembering that the braking force is dependent on the direction of rotation, by virtue of the wedge shape of the brake blocks. The control pin of the brake rod should just touch the tape from the outer diameter of a full spool to the nearer tape guide. Check this before making final adjustments.

SUBSCRIPTION RATES

The Subscription rate to *The Tape Recorder* is 30s. per annum (within the British Isles) and 32s. 6d. per annum overseas (U.S.A. \$4.50). This includes a free copy of the annual index. The same rates apply to *Hi-Fi News*.

The Tape Recorder, 99 Mortimer Street, London, W.1

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twin probes with a concentrated demagnetising field in the 1/8" gap between the arms. Pistol grip, A.C. mains. Professionally designed for professional recording engineers. £2.10.0.

Pre-amplifiers

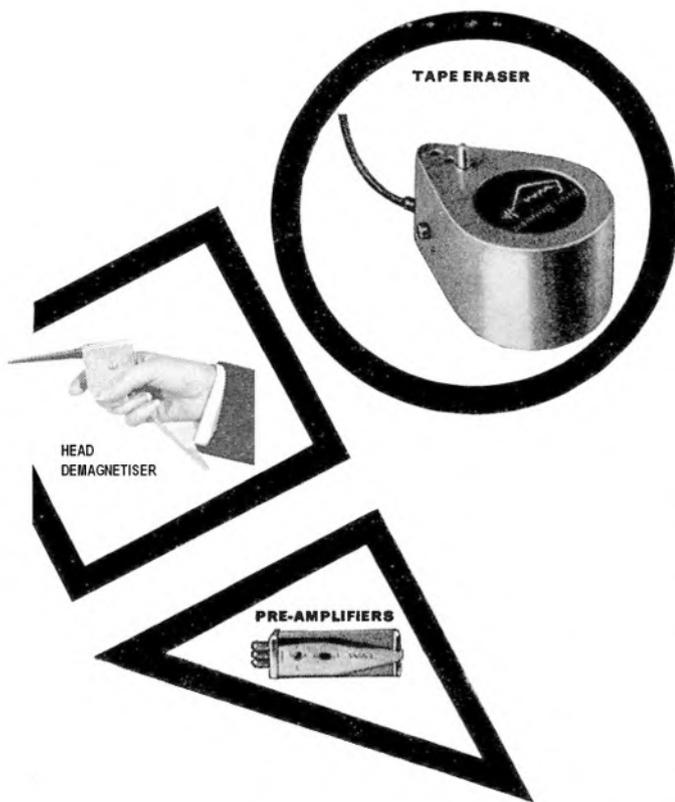
WAL pre-amps are made for every purpose. Fully transistorised, battery-operated, give high gain, completely hum-free. Laboratory built and fully tested. Professionally designed for professional recording eng-

ineers. Ask for details of WAL-GAIN Mono £5.10.0, STEREO WAL-GAIN £7.10.0, and the superb WAL HI-GAIN with built-in switched equalisation for monitoring, dubbing etc. etc. £7.16.0.



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TAPE, RECORDERS & ACCESSORIES

FIRST DETAILS OF NEW PRODUCTS

EMI Series E Tape Heads

A NEW range of precision magnetic heads, the *Emidata Series E*, has been introduced by EMI Electronics Limited. They are designed for multi-track instrumentation and data processing systems, and are said to be a considerable improvement on the previous S range of tape heads, with a higher order of accuracy azimuth and gap alignment. They are interchangeable with the Series S.

A frequency response of up to 100 Kc/s is claimed, and provision is made against possible tape weave, by making the recording width of each track greater than the playback width. All IRIG and SBAC track configurations are available, permitting up to 33 tracks on 1 in. wide tape. The heads are supplied wired to miniature Cannon plugs. **Manufacturer: EMI Electronics Ltd., Hayes, Middlesex.**

* * *

Ultra 6202

THE second model produced by Ultra since their entry into the tape market in November 1962, the 6202 uses a *Thorn* tape deck, giving wow and flutter figures of 0.2% at 3 $\frac{3}{4}$ i/s. With a maximum spool size of 5 $\frac{1}{2}$ ins., the $\frac{1}{4}$ -track recorder has two speeds—3 $\frac{3}{4}$ and 1 $\frac{1}{8}$ i/s, with a frequency range from 60 c/s to 10 Kc/s and 6 Kc/s respectively.

Among several interesting features there is a pause control located on the microphone, and an automatic stop. Three inputs are provided, for microphone (1.5 mV into 10 M), radio (1.5 mV into 22 K), and pickup (75 mV into 1 M). Also three outputs, 500 mV into 22 K, 3W at 3 ohms (for external loudspeaker), and a power socket for low-voltage transistor accessories.

Measuring 12 $\frac{1}{2}$ x 14 x 7 ins., the machine weighs 19 lbs. and retails at £34 13s. **Manufacturer: Ultra Radio and Television Ltd., Television House, Eastcote, Ruislip, Middlesex.**

* * *

Three Elizabethans for Export

THREE new recorders, aptly named the *U.S.1*, *U.S.2*, and *U.S.3*, have been announced by *Elizabethan*, intended for export to the United States. The former is equipped with speeds of 3 $\frac{3}{4}$ and 7 $\frac{1}{2}$ i/s, while the *U.S.2* and *3* also offer 1 $\frac{1}{8}$ i/s.

The *U.S.3* is a complete $\frac{1}{4}$ -track stereo recorder with a claimed speed accuracy of 0.05%. It has a frequency range of 40 c/s to 16 Kc/s at the faster speed and incorporates separate bass and treble controls. The amplifiers provide 8W per channel to two 8 x 5 in. speakers, which can be separated by up to 8 ft. if required.

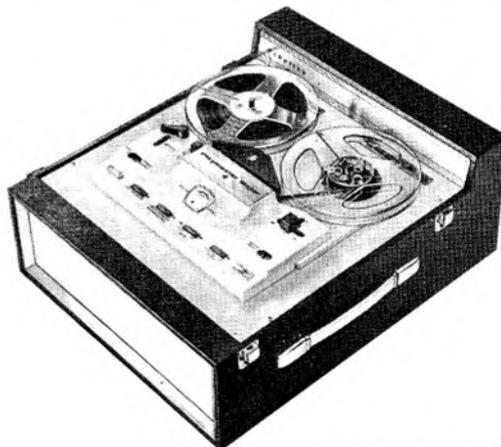
The dimensions of the *U.S.3* are 25 x 13 x 8 in., and the weight 36 lb. **Manufacturer: Elizabethan (Tape Recorders) Ltd., Bridge Close, Oldchurch Road, Romford, Essex.**

* * *

Fidelity Playmaster Major

THE *Playmaster Major* is the outcome of a completely new approach to the problems of design. It has an impressive outward appearance and is finished in grey leathercloth and chrome. The $\frac{1}{4}$ -track machine has a specified frequency range of 60 c/s to 15 Kc/s at 7 $\frac{1}{2}$ i/s, 60 c/s to 10 Kc/s at 3 $\frac{3}{4}$, and 60 c/s to 7 Kc/s at 1 $\frac{1}{8}$. Wow and flutter figures are 0.15%, 0.25%, and 0.35% respectively. Signal-to-noise ratio is 50 dB down at 1 Kc/s, erase damping 70 dB down at 1 Kc/s. A 9 x 5 in. forward-facing elliptical speaker, of 5 ohms impedance, is incorporated, but this can be muted for replacement with external speakers of the same impedance. Recording level is indicated on a Vu-meter, and there are facilities for internal mixing of a 60 mV and 2 mV signal, the latter being for use with the high-impedance microphone supplied. Playback of stereo tapes is possible, with the provision of an extra amplifier, the head output being 2 mV at 1 Kc/s.

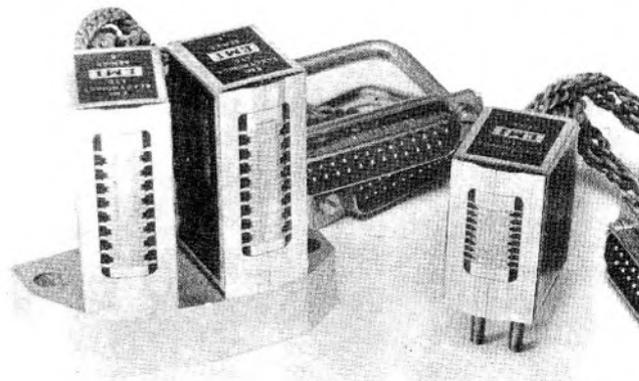
The *Playmaster* retails at £36 15s.; we look forward to having one for review in the near future. **Manufacturer: Fidelity Radio Ltd., 11/13 Blechynden Street, London, W.11.**



FIDELITY PLAYMASTER MAJOR



ULTRA 6202



EMI SERIES E TAPE HEADS



for the connoisseur

IRISH

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'IRISH', 'FERROSHEEN' and 'Signature Binding' are registered trade marks of Orradio Industries Inc., Opelika, Alabama.

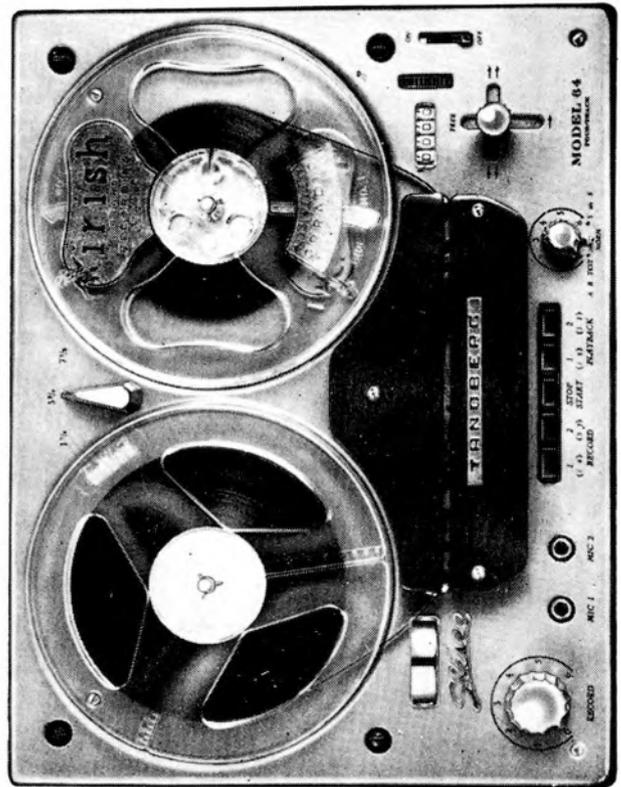
The universally acknowledged leader—that's the Tandberg Series 6 stereo tape deck. Three speeds, three heads, four amplifiers. Four-track and two-track models. High and low level mixer inputs and cathode follower outputs. 'On and off the tape' monitoring. Sound-on-sound simultaneous record and playback. Fully professional performance in every respect, beautifully made—unsurpassed precision engineering—strictly for the connoisseur.

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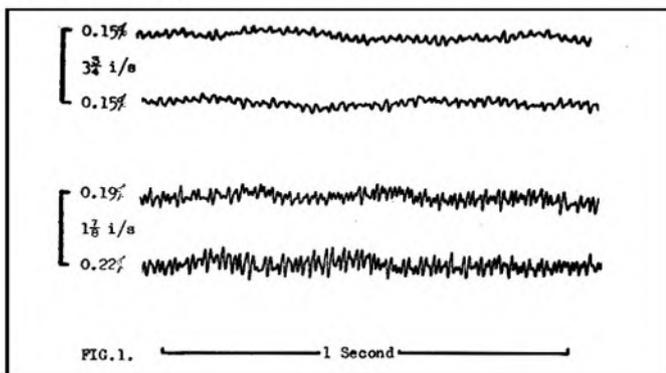
EQUIPMENT REVIEWED



**COSSOR
CR 1604**

Manufacturer's Specification: Recording Sense: $\frac{1}{4}$ -track. Tape speeds: $3\frac{3}{4}$ and $1\frac{7}{8}$ i/s. Mains voltages: (Adjustable), 110, 127, and 200-250V AC 50 c/s. (Can be adapted for 60 c/s.) Facilities: "Stereo" output socket, for reproduction of pre-recorded stereo tapes in conjunction with EL 3587 pre-amplifier. "Duo-play" and "Multi-play" also possible with this amplifier. Parallel-playback. Mixing of low and high-level inputs. Can be used as straight-through amplifier. **Spool capacity:** Up to 7 ins. **Frequency response:** $1\frac{7}{8}$ i/s: 60 c/s to 10 Kc/s ± 3 dB, $3\frac{3}{4}$ i/s: 60 c/s to 13 Kc/s ± 3 dB. **Fast wind:** 1,800 ft. in three minutes. **Power consumption:** 50W. **Signal-to-noise ratio:** better than 40 dB. **Inputs:** (1) diode 20 K, 3 mV; (2) gram. 500 K, 150 mV; (3) microphone, 1 K, 1 mV. **Outputs:** (1) diode, 20 K, 1V; (2) Loud-speaker, 3-7 ohms, 2.2W; (3) headphones, 1.5 K, 200 mV; (4) stereo, 300 ohms, 0.4 mV at 1 Kc/s. **Dimensions:** $14\frac{1}{2} \times 14\frac{1}{2} \times 7\frac{1}{4}$ ins. **Weight:** 18 lbs. "Tropicalised". **Price:** £40 19s. **Manufacturer:** Cossor Radio and Television Limited, 233 Tottenham Court Road, London, W.1.

THIS machine uses a hybrid circuit with transistors for all low-level stages and with a 3W pentode for the output stage, thus making the best of both worlds: low hum and noise in all recording and playback circuits and more power output than can easily be obtained from transistors. The valve output stage remains in circuit when recording, so that monitoring at full level is possible whilst recording from radio or gramophone, and at reduced level—to avoid acoustic "howl back"—when recording from microphone. The centre volume control sets playback and monitoring level only. Separate controls for radio/gramophone and microphone are provided so that these signals can be mixed while recording. The right-hand microphone control becomes the tone control on playback.



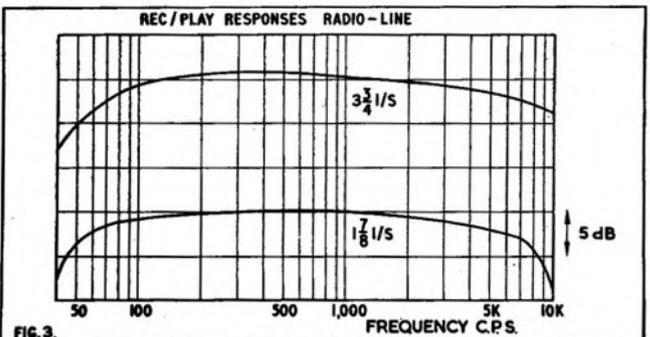
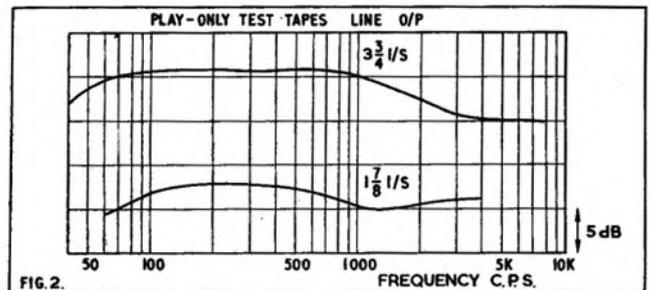
The loudspeaker faces upwards so that the operator is on the axis for really critical listening when setting the controls or playing back a recording. This placement of the speaker also provides a more favourable baffle area and avoids the mid-frequency "boxiness" so common in compact table model recorders.

Wow and Flutter

The drive to the flywheel is by a simple round cross-section belt, with a very elegant speed change "switch" which moves the belt from one pulley diameter to the other on the motor shaft.

The "fluttergrams" of fig. 1 show that wow and flutter provide almost equal contributions to the total speed imperfections shown in the pen recordings. Wow, due to capstan or flywheel eccentricity, is just perceptible at 2 c/s at $3\frac{3}{4}$ i/s and 1 c/s at $1\frac{7}{8}$ i/s.

The high frequency flutter is a mixture of 100 c/s pulsating torque as the motor armature moves from pole to pole, and 50 c/s which is the motor spindle rotation frequency. At the higher speed the smoothing effect of the flywheel is at a maximum so that the 100 c/s flutter is lost



and only a very small amount of 50 c/s is left. At the lower speed all three effects can be observed. Despite this, the music quality on $1\frac{7}{8}$ i/s is as good as anything I have heard on very much more expensive and elaborate machines.

Play-only Tests

Fig. 2 shows the play-only responses from test tapes recorded to surface induction characteristics of 200 and 400 micro-seconds respectively. Both show the mid frequency step which indicates that the playback equalisation is to the Continental 100 and 200 micro-second time constants.

System noise and hum, with no tape running, was extremely low at 35 dB below test-tape level or 47 dB below theoretical peak recording level.

Record-play Tests

Oscillator tones were fed to the radio/gramophone input and the playback level measured at the radio or diode line output. These responses for the two speeds are shown in fig. 3.

The responses of the top and bottom tracks were so nearly identical that it was not worth plotting them separately.

Peak recording level at 12 dB above test-tape level was recorded with the magic-eye beams just touching with negligible waveform

(Continued on page 77)



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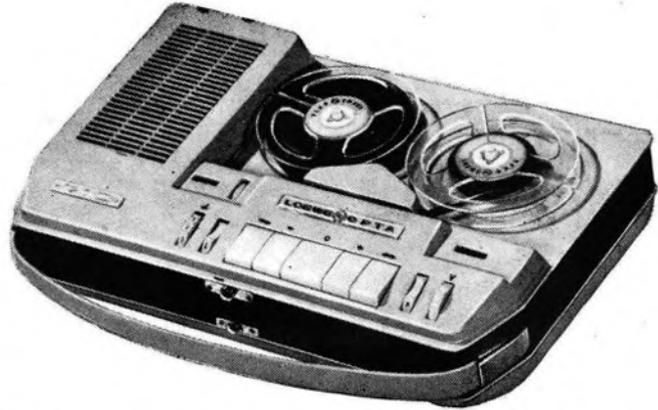
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Brenell 5/2	7 5 0	5 8 8	69
Truvox 92	7 5 0	5 8 8	69
Reps R10	6 4 0	4 12 11	59
Telefunken 95	6 4 0	4 12 11	59
Grundig TK18	4 2 0	3 1 5	39
Grundig TK14	3 13 6	2 15 2	35
Wyndson Trident	3 10 0	2 11 11	33
Ferguson 3200	2 16 6	2 0 10	26

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Grundig TK23	4 15 0	3 10 10	45
Philips EL3541/H	4 12 0	3 5 10	42
Elizabethan LZ29	4 0 0	2 19 10	38
Philips EL3541	3 15 8	2 16 9	36
Fidelity Major de Luxe	3 13 6	2 15 2	35
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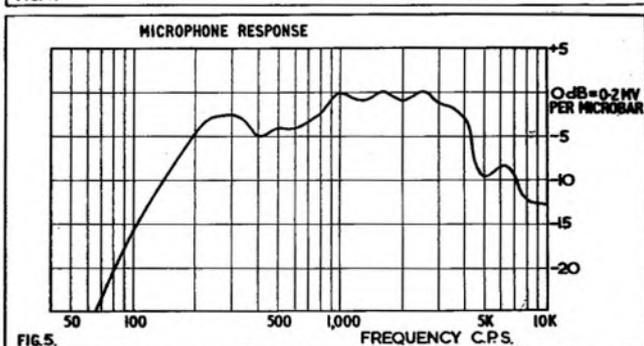
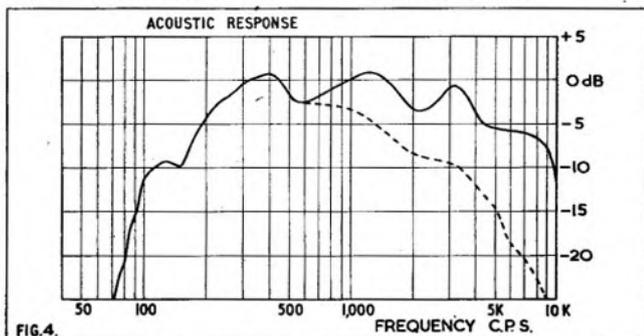
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EQUIPMENT REVIEWED — continued

distortion. Recorded noise, due to bias and erase, was 43 dB below peak recording level. Bulk erased tape noise was 45 dB below peak, showing that bias and erase noise was at a very low level. At this point I did notice that, as the microphone control doubles as a playback tone control, there is a tendency to leave this control fully advanced for maximum top response which leaves the microphone channel wide open when recording from radio. Such a procedure will add 3 to 4 dB of hiss to any radio or record recordings. One way of avoiding this mistake is to leave the microphone plugged in, when the ear-splitting screech on switching to record will soon remind you to turn the control to zero while recording from radio or gramophone.

Acoustic Response

One-third octave bands of filtered white-noise were recorded at $3\frac{1}{2}$ i/s and the sound output of the speaker measured on axis by a calibrated microphone during replay. The resultant electro-acoustic response is shown by fig. 4. The solid curve is with the tone control fully advanced, and the dotted curve shows the effect of maximum top cut. The slight fall in response at high frequencies, even with the tone control at maximum, is compensated to some extent by the fact that the natural listening position is on the axis of the speaker.



Microphone Response

The microphone response was measured in a white-noise sound field to give the response shown in fig. 5. The response would sound thin and lacking in bass on a really wide-range sound system, but reference to fig. 4 above will show that it matches the acoustic response of the recorder very closely, and further extension of the response would not be very noticeable. Speech quality is crisp and clean and the cut in bass response covers up a number of room effects which would be obvious on a wider range instrument.

Comment

"Top of the class" for this little machine. In its class, as a medium priced domestic recorder, I cannot fault it.

Its electrical response on both speeds is smooth and well balanced. The signal/noise ratio is excellent. Mechanical noise is low. Controls are well placed and simple to operate. Sound quality is "big" and open due to the well placed efficient speaker and output stage. The built-in mixer and parallel mixing of the two tracks, together with the added facilities provided by making the output of second head available for stereo playback or cross recording from track to track (via EL3787 pre-amp), makes this a recorder for the cine or documentary tape enthusiast as well as for the most non-technical member of the family.

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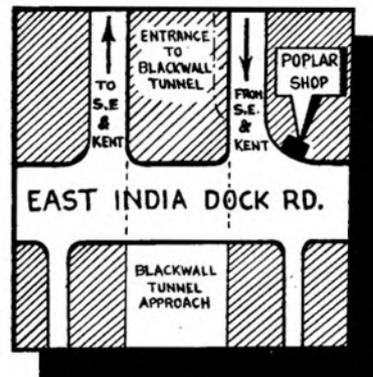
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Readers' Problems

Fitting a Remote Switch

Dear Sir, I own a Philips EL3585 battery portable tape recorder to which I wish to add remote-control facilities. Could I break into the battery circuit as a means of controlling the tape-transport?

Yours faithfully, W. F., Falkirk.

Your problem, remote control facilities for the Philips EL3585, should present you little difficulty, providing you only require to stop and start the machine in the one function. Changeover from Record to Play or vice versa, or to fast wind in either direction, needs mechanical alteration as well as switching. However, you must already have thought of that.

This is the one case where remote control switching is simple and effective—where a transistorised supply is used, and battery-driven motor. Your suggestion of breaking the battery supply is quite feasible—it only remains to ask, "where?" As the batteries insert by sliding on one another, I would suggest that the simplest way, to save dismantling, is an insulated sandwich. This can be made quite thin, with foil gummed to laminate, and cut to shape to sit between two cells. Connect the leads to your switch, but keeping these two leads quite isolated from any other, and as far from mains-carrying equipment as possible.

Dubbing Problems

Dear Sir, I would be very pleased if you would advise on the following queries. I have a Butoba MT5 twin-track recorder which I use mainly for bird recording. This is a transistor machine with an input of 100 K, 200 mV. I also have a ¼-track Philips EL3541 with a valve line-up of one EF86, ECC83, ECL82, EM84, and EZ80 respectively. When copying from the Philips to the Butoba (dubbing Butoba-recorded originals), an attenuator is employed as the two machines are unmatched. It is possible, I feel, that a better undistorted output might be obtained by taking a signal from one of the Philips valves. If you agree, would you specify what valve should be tapped and from what terminals?

The overall playback response from the ¼-track machine is surprisingly good but I have discovered a speed variation between the two recorders. The Philips, on test, is running at approximately 3.64 i/s instead of 3½. Could you advise how to adjust this as I cannot find any means of doing this short of altering the mains voltage setting, i.e. lowering it to make the machine run faster, and this doesn't seem very prudent.

The remaining problem is one of background hiss, which is increased on the dubbed tape, despite the liberal use of a head de-gasser, and a general clean-up of the heads. You may be able to suggest a simple filter circuit which will reduce or eliminate this noise.

Yours faithfully, N. E. L., Newton Abbot.

The mismatch you speak of when coupling the Philips EL3541 to the Butoba MT5 should not be necessary if you feed the high impedance output of the Philips to the radio input of the Butoba. The Butoba radio input requires 200 mV fully to modulate the tape, with an input impedance of 100 K. The high impedance output of the Philips from the PU socket gives 1.5V from a fully modulated tape, from 50 K. This is, of course, too much, and would need the replay gain turned down quite a lot. I should imagine that the signal-to-noise ratio for bird-call material is extremely important, and so you may need your attenuator between the Philips and Butoba. But a 2:1 step-down would be quite suitable, and quite opposite to mismatching, would, in fact, bring the matching conditions nearer.

Speed variation cannot be overcome in this instance by changing voltage tapping. The motor is more responsive to frequency change and is widely tolerant of voltage differences. You would need to change the capstan, which would appear to be slightly undersize, but the trouble could equally well be loss of belt tension, and the spring tension roller should be checked.

THESE RECORDERS ARE "HOT"

ROBUK Electrical Industries announce yet another theft of a consignment of tape recorders, this time from a lorry in Derby. The serial numbers are as follows: 48067, 48076, 48222, 48180, 48057, 48039, 48203, 48065, 48117, 48075, 48212, 48170, 48290, 48275, 48078, 48018, 48010, 48052, 48130, 48172, 48064, 48079, 48179, 48083, 48178, 48152, 48096, 48174, 48164, 48105, 48168, 48087, 48176, 48107, 48183, 48053, 48083. All these machines were new RK4 models. Also stolen were two used recorders, an RK4 48316, and RK3 33094. The police and the company will welcome news from any person who is offered an item from the above list.

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From: G. Ravenscroft, Hon. Secretary, The Listening Library Limited.

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Although the machine is quite straightforward, those who operate it are, because of their disabilities, often rather lacking in confidence when they first handle it. They need someone to explain patiently when the machine arrives, and particularly someone who can call in during the first week-or-two to iron out any difficulties that may have occurred, and give reassurance that all is going well.

Would individuals or groups, anywhere in Britain, who could perform such a service please get in touch with the Founder of the Listening Library, Mrs. Norma Skemp, 31 Queen Anne's Gate, London, S.W.1.

Yours faithfully.

* * *

. . . about tapes for the blind

From: J. W. Crockett, Hemel Hempstead Round Table, 25 Bennetts Gate, Bennetts End, Hemel Hempstead, Hertfordshire. Dear Sir, We should like to thank you for publishing our appeal for assistance from readers, in *Our Readers Write*, last December. The number of replies to our request was overwhelming, and I am pleased to tell you that we have been able to contact local enthusiasts who are keen to help.

We are one of several organisations which, in turn, entertain members of the local Blind Association, and through our letter we have made contact with a blind recording enthusiast who keeps a library of tapes that are of particular interest to blind people. We now have the advantage of being able to call on a large selection of his tapes, in return for which our organisation will be recording technical books for blind students, to add to the library.

Yours faithfully.

* * *

. . . about tape letters

From: Charles L. Towers, Secretary, Worldwide Tapetalk, 35 The Gardens, West Harrow, Middlesex.

Dear Sir, I cannot let Rafe Seabrook's comments, in his article "Tape Memoranda" (February issue), go by unheeded. When he remarks that the practice of recording and posting "tape-letters" is a disease, he hastens to add that he has probably invited the wrath of many interested people. No doubt Mr. Seabrook is quite sincere in all he says, but I half suspect that he makes some of his bitter attack on tape-sponding in the hope that he may excite a certain amount of controversy. In which case he has succeeded!

Continued on page 83



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our readers write . . .

Your contributor fails to appreciate that the great thing about this fascinating hobby is that it is a *creative* hobby, and the fun lies, not so much in receiving, as in the making of tape letters. Let me be the first to agree that many tapes are (to use his own words) "spools of utter nonsense". They may contain a lot of dubbed music of inferior quality with very little speech and original thought added, but even so they may have provided a lot of amusement to the maker, and it shows that he, or she, is at least attempting to be creative, rather than sitting in front of a television or radio night after night.

A person who dabbles in canvas and paint may produce a horrible mess that would send a shudder through his best friend, but nevertheless satisfaction has been achieved in the execution of the "masterpiece". This can be said of most hobbies, it is not so much the finished results which matter, but rather the personal sense of fulfilment in utilising mind and fingers, and I can assure Mr. Seabrook that many people who are exchanging terrible tape-letters with each other know quite well that their efforts are far from perfect, but it is the best they can do with perhaps limited resources and lack of professional "know-how" that I am quite sure Mr. Seabrook possesses. The point is that these people are having a whale of a time swapping these sort of tapes, and it must be granted that with each tape letter they make they are bound to improve.

It is a great pity that Rafe Seabrook has had such uninvited tapes inflicted upon his disturbed ears, but really the remedy is very simple for him and others who can find neither time nor tolerance to be bothered with them . . . on their recorders is a little knob marked *Fast Forward*. Why do they not use it? Or are they afraid they may miss something after all!

Yours Faithfully,

CLASSIFIED ADVERTISEMENTS

No responsibility will be accepted by the editor, the publishers, or the printers of "The Tape Recorder" for the quality of any goods offered, bought, or exchanged through the medium of these columns, or for any failure in payment, etc., though the greatest care will be taken to ensure that only bona fide advertisements are accepted.

Advertisements for this section must be pre-paid and accompanied by a postal order, money order, or cheque. The rate is 6d. per word with a minimum charge of 7s. 6d. Box numbers may be used for an extra charge of 1s. 6d. The trade rate is 9d. per word, plus 2s. for a box number, conditions on application. Send replies to box numbers, c/o "The Tape Recorder", 99 Mortimer Street, London, W.1.

Advertisements for the April issue must arrive not later than March 3rd.

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Continued on page 85

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RECORDER CENTRES See Page 78

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