

the TAPE RECORDER

PRICE 1/6

JULY 1961
Vol. 3 No. 6

INCORPORATING "SOUND AND CINE"



IN THIS NUMBER

- Five Pages of News and Pictures
- Survey of Battery Portable Tape Recorders
- Sound and Ciné
- Tape Recorder Workbench
- Home Recording from Radio and T.V.
- Details of New Products
- Readers' Letters and Problems
- Equipment Reviewed



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the TAPE RECORDER

Editor MILES HENSLOW

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EDITORIAL

IN this column, recently, we invited readers with stereo equipment to send us details of their recorders and their set-ups, and the current and proposed jobs for such installations. We have received a most interesting number of replies to this invitation and—time and space permitting—we propose to publish some form of analysis in our next number. Passing now to another but not unrelated point, there is a brief report in our news page this month about a Federation meeting, at which it was stressed that more should be done to help the buyers of tape recorders to exploit their machines far more fully than a surprisingly large percentage seem to do.

Taking these two points together, we find on the one hand that a great number of tape recorder owners regard their instruments as the basis for a lively and adventurous hobby, whereas on the other hand a genuine, initial enthusiasm quickly wanes because there appears to be no drive, on the part of the owner, to explore. Very obviously it cannot be expected that every tape recorder owner will be converted into an electronics "boffin", just because he or she happens to have bought an unusual box of electronics; but it seems very probable that there are many people who would be keen to extract more than the initial, basic amusement from a possession of such potentialities, given only the right lead, or hint, applicable to the personality involved. We hoped to supply this form of lead when we first expanded our small news section into its present five or six page feature. We know from correspondence that we have been in some measure successful—but, it appears, not nearly as useful as we should have been.

We therefore appeal to our readers for more news, more pictures and more accounts of the interesting and perhaps unusual jobs that they have found for their recorders. Such news items are bound to find grateful readers. For our more adventurous readers we can now promise a new selection of interesting do-it-yourself features which will certainly keep them busy! For still more readers—those who fall somewhere between the bewildered and the adventurous, we think that some of these proposed features will provide some bright ideas.

JULY 1961

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COVER PICTURE

FOR many of us a visit to the dentist's chair is a visit to a torture chamber! However, it appears that some dentists realise this and are trying to make "the chair" a little more homely. In America, white noise generators are on hand in most surgeries, these allow the patient to adjust the signal to cancel out pain, and experiments are now being made in this country. The patient in the front cover picture this month is seen requesting a certain type of music that he thinks will assist him during the coming ordeal.

NEXT MONTH

AS mentioned in our first Editorial column, we plan to publish an analysis of a cross-section of the information supplied to us by readers about their stereo equipment. As also noted, we intend to offer the first of a number of "Do-it-Yourself" features—though, with two such constructional items in a still unproven state, we are not able to specify which chick, or egg, will come first. Richard Golding will write on the "Battle" between stripe and separate tapes for Cine recording. The pages of news and pictures look promising even at this early date. In fact, taking into consideration the reviews (which are scheduled to include the Sony portable and the Stella), the Workbench, New Products, Readers' letters and Home Recording features, August *Tape Recorder* looks like being a very good number.

SUBSCRIPTION RATES

The subscription rate to *The Tape Recorder* is 21/- per annum (U.S.A. \$3.00) from The Tape Recorder, 99 Mortimer Street, London, W.1. Subscription + Index, 24/- (U.S.A. \$3.25).



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HOW OTHERS USE TAPE



Mrs. Kay Ketteman and her son, Don, prepare to record a tape to their overseas friends.

TAPE RECORDERS are still rather new as standard equipment, with most families, here in America, but they are fast coming into their own and taking their rightful place in the world of entertainment. Just as we wonder how we ever got along without radio or T.V., we'll be wondering how we progressed without a tape recorder. My son, Don, holding the microphone in the picture, became interested in a tape-recorder a few years ago, for the purpose of recording T.V. shows in which I took part. I used to listen to the tape when I returned home, and could gather ideas for improvement as I heard it played back. These tapes also made permanent records of the show, and are a delight to keep as mementoes.

Then, Don decided to proceed a little further with his taping, and joined a World Tape Club. When tapes came in from different Countries, I started listening to them too, and replying to the women, exchanging ideas on a "Woman's Day in the U.S.A." as compared with a Woman's Day in other countries. We talked about fashions, foods and lectures we had attended on activities sponsored by our Clubs, child raising and so on! while Don and his friends discussed the national and political goings-on, new cars, their jobs, the intricacies of tape recorders, etc.

Inter-Country Tape Exchanges

We derive a great deal of pleasure also, from the exchange of music and folk songs, obtained from records or dubbed from radio. We have heard foreign T.V. shows, and enjoyed them immensely.

We have made many wonderful friends, too, through this medium, such as Mr. and Mrs. Lawrence J. Hill from Edinburgh, Scotland. He, being interested in photography, as is Don, sent us a group of coloured slides taken around the countryside of picturesque Scotland. He included a commentary on tape and we have shown them to many of our friends here in the States. They have enjoyed seeing the beauty of the British Isles, and listening to the comments of our delightful tape-correspondents from across the sea.

We exchange little gifts with folks from other lands, pertinent

to their particular country, newspapers, magazines and pictures. I have received letter-openers from near and far, to add to a collection of letter-openers that I have, of 300 or more.

A B.B.C. correspondent, Henry Barzilay, in Johannesburg, South Africa, has recorded jungle music and sounds, direct from native tribes, for us. Rolf Boheim from Rheinland, Western Germany has sent us some gay folk music from German bands. Olaf Swembl, of Segeltorp, Sweden, recorded some interesting Swedish "pop" concerts, while Eric Nicholson of Staffordshire, England, sent a dubbing that he made from the radio, when his wife sang in a choir in Westminster Abbey, in a programme for the Queen.

These are just a few of the interesting contacts we have made through our tape recorder. I feel that it is like a "Good Ambassador," providing, as it does, these *Personal Chats*, which lead to strong friendships, and understanding, between the peoples of the world.

K. Ketteman.

We can have Muzak wherever we go

MUZAK is a scientifically planned background music service, individually designed as a management technique for use by every kind of industrial and commercial enterprise. It is relayed to subscribers by special, high quality G.P.O. telephone lines, from a central transmission studio in Regent Street, London, with trunk lines running from London through Birmingham to Manchester.

Muzak provides a 24-hour service, requiring no attention at all from the subscriber. The Office and Industrial Services are relayed in 12½-minute programmes every half-hour, while the service for shops, restaurants, hotels and other public areas are broadcast in two 12½-minute programmes every half-hour. No programme is ever repeated.

No vocals or solo instruments are used and popular tunes less than two years old are avoided, solely because Muzak is designed to be heard—but not listened to.

£14 Million Library

The music is orchestrated and recorded to exacting specifications. Sixteen prominent musicians are employed as orchestrators, for ever feeding one hundred and fifty-nine different orchestras with new scores. The Muzak library of recordings is of unique size and significance, currently valued at £14 million.

The tape playback system used in the transmission centres is fitted with an electronic-brain mechanism which adjusts transmission according to coded instructions recorded on the tape.



(Continued on page 276)

HERE AND THERE AND

This specially designed equipment, capable of unattended eight-hour operations, makes it possible for Planned Music to give a 24-hour service through loudspeakers installed in offices and factories either completely concealed or made to blend with the existing decor. Systems of inter-communication can be linked into the installation as required.

Intensive research over the past twenty-five years by industrial psychologists has revealed that the average worker goes through a cycle of efficiency each day and normally he reaches his job in the morning, theoretically at peak efficiency. As time passes, he tires mentally. If his work is monotonous, he gets bored, his production slows, errors increase and so does his irritability. At about 10.30 a.m. the worker reaches the bottom of his slump, but in most companies he gets a tea break and his efficiency gradually picks up as he anticipates the authorised escape of the lunch hour. After the lunch he starts the second half of the day refreshed—at the top of his curve—then he repeats the same general pattern until the end of his working day!

To offset this decline in efficiency, functional music programmes are designed by Muzak as a mirror image of the efficiency curve. That is, the programme begins in the morning at a relatively low point and increases gradually in stimulus in opposition to the worker's curve.

There is no end to the work applications of Muzak—swimming pools, old folk's homes, prisons, nurseries, building sites, stock-brokers' offices, cowsheds—the Indian Minister of Agriculture recently reported to the Indian Parliament that music played in a paddy field increased the yield of the rice crop by 22 to 58 per cent. Literally dozens of farmers in this country have been reported as saying that music played to cows increased the yield of milk by a great many gallons per day.

But apart from these strange, but no less serious, occupations, Muzak serves day by day, in offices, factories, shops, hotels and restaurants in London, Birmingham and Manchester.

* * *

Radio T.V. and Tape Recorder Sales

STATISTICS for British output of Radio and Television sets are often published, but we rarely see comparable figures for abroad. However, the German Radio and Television Industry have just issued the 1960 sales figures for the Federal Republic and West Berlin and a comparison is made below with the production figures of this country. Radio and television figures for the U.K. were supplied by the British Radio Equipment Manufacturers Association.

Product	Germany	Great Britain
Radio Sets	4,675,000	1,846,000
Television Sets	2,283,000	1,817,000
Tape Recorders	685,000	approx. 240,000

Today about 1,000,000 tape recorders are used in Western Germany and it must be remembered that the tape recorder in its present form is a German development. First experiments were made in 1930, and in 1940, two engineers discovered high frequency pre-magnetisation and thereby laid the basis for the present quality of tape recorders. The largest factory in the world, producing tape recorders, is situated in southern Germany, and between 25 and 45 per cent. of its annual output is exported to more than 100 countries throughout the world.

* * *

Can any reader help?

Mr. R. A. Miller, 122 Longwood Road, Barr Common, Nr. Walsall, Staffs, would like to hear from anyone willing to lend or sell him a Grundig TK 9 instruction book.



Training has its lighter side! A representative recounts an amusing experience during the weekly training course at the City and Eastern Counties Branch of Telephone Rentals Limited.

Tape Recorders Train Salesmen

Tape recorders play a big part in the Telephone Rentals Training Scheme. Pre-recorded tapes have been prepared and are available to each branch all of which are equipped with a Grundig TK 20 tape recorder, where representatives are also able to make recordings of their own presentation and correct any faults that may creep in. If a representative is weak on any particular point he is encouraged to take the machine home with him to "rehearse" on his own. Once a week representatives meet at their respective branches for a refresher course and a discussion on any problems that may have arisen during the week. It is estimated that it takes two years to make a first-class salesman.

* * *

Change of Address

THE Tape Recorder Centre Ltd., of Harringay and High Holborn announce that the address of their Head Office is now 447 Green Lanes, London, N.4, Telephone FITZroy 2316/7/8. All correspondence should be forwarded to this address. The two Tape Recorder Centre showrooms remain at 75 Grand Parade, London, N.4, Telephone STA 1146 and 82 High Holborn, London, W.C.1, Telephone CHA 7401.

* * *

Ampex-Wilmex Agreement

WILMEX (Distributors) Ltd have announced that a trading agreement has been signed between them and Ampex (Great Britain) Ltd., for the exclusive distribution within Great Britain of Ampex pre-recorded tapes known as United Stereo Tapes. All tapes in the range are 4 track stereo at a speed of 7½ i/s only. A substantial selection has now been cleared for U.K. copyright, and negotiations are proceeding for the clearance of the majority of the remaining titles. The first release covers some forty classical recordings from the following labels: *Audio Fidelity, Concertapes, Everest, Vox and Westminster*. Distribution of United Stereo Tapes will commence within the next few weeks and initial catalogues are available from Wilmex (Distributors) Ltd., Wilmex House, 151/153 Clapham High Street, London, S.W.4.

EVERYWHERE

First Details of New Tape Deck

NEXT month, full details will be given of the Planet U.1, a high quality, hand made, tape deck. Provision is made for five heads and 7 in. spools. Other features include, a Papst motor, 4 figure digital counter, Bogen heads, and tape speeds of $7\frac{1}{2}$, $3\frac{1}{2}$ and $1\frac{1}{2}$ i/s. Cost will be in the region of £34. Later developments will include a model U.2. with $8\frac{1}{2}$ in. spools and three motors and the U.3. with $10\frac{1}{2}$ in. N.A.R.T.B. spools. Prices to be announced.

* * *

Portable Recorder Accessories

WE would like to point out to readers of this issue, which contains a survey of battery portables, the necessity of using leak-proof batteries. The extra cost involved is small compared with the risk of opening a recorder and finding the "innards" ruined by corrosion. Also on the same subject, a carrying case will help to keep the recorder new and dust free. Both of these products are advertised regularly in *Tape Recorder* and portable owners are advised to take note.

* * *

Leicester Audio and Photographic Fair

THE 4th Audio and Photographic Fair was held recently at the Co-operative Hall, Leicester. Much energetic work had been done by Mr. R. H. Willman ably assisted by Mr. D. N. Page and Mr. R. Riddlestone of the Service Department. Mr. Riddlestone had designed and constructed a most impressive new comparator which will later be used in the Co-op Electrical Department. The Audio Industry was well represented and exhibits were provided by Grundig, Brenell, Cossor, Truvox, Simon, Robuk, H.M.V., Reflectograph, Fi-Cord, Telefunken, Ferrograph, Scotch, and Lee Dulci. Leicester Co-operative Society are to be congratulated for staging such a fine exhibition.

* * *



*
NUSOUND
NUMIX
*

AS owners of new tape recorders soon realise, after purchasing a machine, the first thing that is required is a mixer. Many manufacturers have produced mixers, generally containing four inputs and one output, and depending on the circuitry the prices range from £4 to £50 or more. This again does not solve all the problems as the correct recording level for each input has to be found and this is generally done on a trial and error basis.



Dixon of Dock Green, alias Jack Warner, prepares for rehearsal with his new Grundig 4-track TK 24 tape recorder. Jack, who is also currently appearing in the popular radio series "Meet the Huggetts" is by no means new to tape recording, having owned a TK 819 for a number of years. This has now been passed on to a charity.

However, to assist owners of Ferrograph Tape Recorders with this problem the Nusound Recording Co., have produced the "Numix", a simple but efficient mixer which deals with the problem of mixing with only one control. The microphone input is fed in the usual way into input one and the lead from the extension speaker sockets of the radio or radiogram, is fed into the mixer which in turn is fed into input two of the recorder. By turning the control fully anticlockwise, recordings from the microphone are obtained. Fully clockwise records the radio. Variations in the setting of the control knob allows the volume of the microphone and radio to be mixed to the correct levels with no attention of frequency response on either channel, and by monitoring on headphones it is possible to listen to the recording. After using one of these mixers for only a short time it was found to give excellent results and is ideal for recording enthusiasts wishing to mix the output from one recorder with a commentary. With this mixer it is possible to obtain the best results with a minimum of effort.

The Numix attractively styled, in a grey polychromatic metal case measures only $5 \times 3 \times 2$ ins. and is priced at £4 7s. 6d. It is obtainable from the manufacturers, Nusound Recording Co., 35 Craven Street, Trafalgar Square, London, W.C.2. A.J.L.

* * *

Sound Underwater and in the Sun

THE underwater world is not so silent as might be supposed—a shellfish breeder claims that oysters sing and fish apparently talk. The B.B.C. has had to solve many problems to obtain sound quality from underwater and in "Sound" (Network Three) on Sunday, June 25, Sam Wheatley and John Ford will talk about these specialised and sometimes dangerous techniques.

Douglas Brown, who introduces the programme, will also talk about the problems of taking a tape recorder on holiday—not necessarily underwater!

The programme, will be repeated on Monday, July 3 (Network Three).

NEWS AND PICTURES FROM

THE Liverpool Central Tape Recording Society has recently obtained new premises which will soon be available to members six nights per week, and daytimes if required. The premises are the sole property of the society and equipment etc. may be stored there permanently. At the society's formal meetings Mr. Williams has given two further parts in his six-part talk on tape recording. This series is aimed at the beginner to tape recording, who wants to know how a tape recorder works. Future activities arranged include visits from E.M.I. Ltd. Wilmex (Distributors) Ltd., and other firms. More details can be obtained from *A. Evans 13 Clapham Road, Anfield, Liverpool, 4.*

ANOTHER invitation from the B.B.C. was accepted by the Bristol Tape Recording Club who were able to be present in the Control Room during the actual broadcast of a programme. The information gained during the broadcast (which was Orchestral) and the following tour of the studio with emphasis on microphone placing and programme monitoring was another step in the instruction of club members. To assist the club with the production of programmes, a member Mr. R. F. Beaton was sent on a course at the Rose Bruford Training College. Anyone interested in joining the club is invited to attend two meetings before becoming a member, which the committee are convinced they will do! Details and dates of meetings can be obtained from *M. Hollier, 27 Dean Lane, Southville, Bristol, 3.*

THE Northampton Tape and Ciné Club has decided to hold a Rally of Tape Clubs, in Northampton on October 3rd, 1961 and extends the invitation to all clubs in the Midlands area. It is proposed to hold this Rally each year, and at the moment the response in the area has been greater than expected, so the number of tickets has been limited to six to each club. The evening is open to cine tape or hi-fi members of any club. Tickets are available from *J. Harrison, 36 Spring Gardens, Northampton.*

MR. Frank Inman, a member of the Friern Barnet and District Tape Recording Club has undertaken to give a series of lectures once a month on tape recorders and recording. They have, so far, had two interesting and instructive lectures which have been of benefit to all members.

On a visit to the Eastbourne Tape Recording Club on May 8th members spent an enjoyable and interesting day, views and ideas were readily exchanged. Mr. J. Fulton has kindly presented the club with a Cup and Mr. Neal a Plaque, which will be competed for annually by members for the best tape of up to 5 minutes duration. A panel of outside judges will select the two best tapes at their Christmas Party. New members are invited to attend any club night, details of times etc. are available from *A. Andrews, 13 Hartland Road, Friern Barnet.*

THANKS to the Walthamstow and District Tape Recording Society, patients who might otherwise have missed the Borough's Carnival procession altogether were brought a sound picture of the event by the Society over the internal broadcasting system. Overlooking the Carnival procession route were two commentators, Society Secretary Mr. K. Perks and Miss V. Burnett who, using three microphones two for commentary and one for effects, kept up a lively descriptive narrative. The comments were passed through a mixer to a recorder operated by Mr. M. Dudley, Press Officer of the Walthamstow Group, who produced and directed the programme. As soon as track one of a three-inch reel was completed, it was rushed by a runner down to the basement and amplified for playback to the patients on their headphones. After the commentary, a tape recorded on a

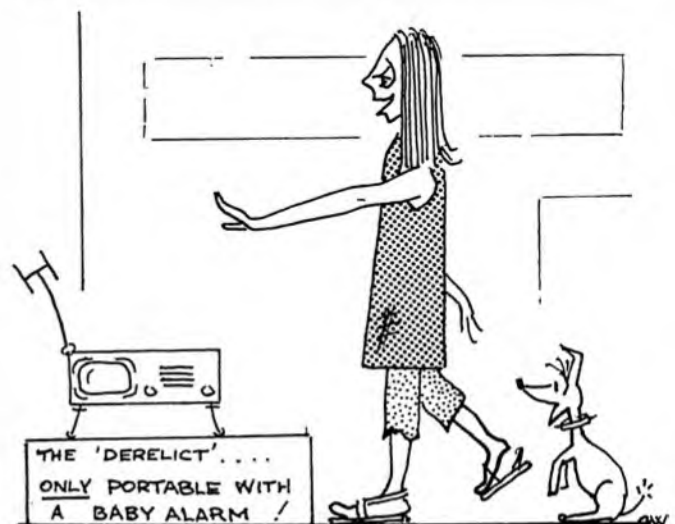
battery portable taken at the Town Hall earlier in the afternoon was played, the roving reporter introducing Carnival Queen Linda Hughes and her two Maids of Honour. The Mayor of Walthamstow Alderman Baldwin also passed his best wishes to patients in a brief message. Membership enquiries should be addressed to *K. Perks, 9 Third Avenue, Walthamstow, London, E.17.*

FROM the other side of the world comes a report of the New Zealand Tape Recording Club giving details of activities during the past few months. Up to the present time 122 members have joined, this does not include 15 overseas members from England and America. Meetings are held on the second Monday of every month in Auckland and at a recent meeting a demonstration was given of the M.R.I. tape recorder which is produced by a local firm Mowatt Radio Industries. At the next meeting, a technician from a local Radio Station will give a lecture on dubbing and tape splicing techniques. Any person interested in contacting this club should contact either the Dominion secretary *K. M. Tuxford, P.O. Box 7060, Auckland, W.1.* or the Auckland Branch Secretary, *M. S. Wardle, 39 Norwood Road, Bayswater, Auckland, N.3, New Zealand.*

A VERY comprehensive club magazine has arrived in this office from the Indiana Recording Club entitled "Tape Squeal". It contained the following report. "The first successful contact with a foreign tape club has been made—The Bristol Tape Recording Club. They have enthusiastically agreed to 'associate' with IRC, and we are forwarding them our membership roster and a copy of theirs should arrive soon. The original contact was made by Don Hilton who contacted Neil MacDonald of Bristol. A tape was returned and played to the club, and each of the members present said a few words."

Many interesting tips can be picked up from tape clubs in other countries, the latest trend in recording techniques can be studied. Why not try it?

ON May 3rd, members of the Cambridge Amateur Tape Recording Society recorded a tape to the Clacton Club, and at the following meeting, Mr. Alan Stableford, Secretary of the



"CRA-ZY"

CLUBS

Whether this is a junior tape recording club or not we cannot tell, but it shows the interest that is taken whenever portable tape recorders are produced. These young children are seen here recording their voices for the first time on a Butoba portable recorder in Africa. A few adults appear to be interested, but who isn't when they see a tape recorder for the first time?



Federation of British Tape Recording Clubs, described the foundation and work of the Federation, and played some of the winning tapes of the 1960 International Contest. The society is now fully affiliated to the Federation, and will be sending two representatives to their Second Annual Congress in June. Membership has risen now to 26, with a further dozen prospective members and four honorary members. Thanks to a letter received from an interested recordist Mr. E. Vaughan, at Melbourn (about 10 miles from Cambridge), it seems that the society may be opening a branch centred at the Melbourn Village College. If this idea is successful, it is hoped that more branches will be formed at the various other colleges in Cambridgeshire. Meetings are held every Wednesday evening at the Mitre Club-rooms, Bridge Street, Cambridge, details can be obtained from *M. E. Renshaw, 6 St. Vincent's Close, Girton, Cambridge.*

AT their meeting on May 18th, the **Cotswold Tape Recording Society** welcomed Mr. Mortimer, chief development engineer, and Mr. Spark, tape sales' manager, of the famous Swindon firm of Garrard, who gave a demonstration of tape and disc reproduction, using instruments manufactured by their firm. The first demonstration was of the tape-deck, the special feature of which is that it incorporates a tape-magazine which obviates the necessity for threading the tape, and also protects it from dust and damage. The speed stability of this deck is remarkable, and convincing reproduction of stereo and mono tapes was given, using a Jason stereo amplifier and Goodmans' speakers. The new tape-cue'ng device was also shown; this is a clock-type indicator which is attached to the take-up spool. Mr. Spark rewound the tape, and told us that at 1.32 precisely on the clock, the word "Margie" should be heard; it was, loud and clear. This kind of precision on a place-indicator is extremely difficult to obtain. Mr. Mortimer then took over, and demonstrated disc-stereo, using the latest Garrard transcription motor and playing-arm, which makes provision for automatic if desired, and also a new type of ceramic cartridge developed by this firm. The records gave great pleasure, and showed clearly the excellent of the play-back equipment

The visit was not without incident for Mr. Mortimer and Mr. Spark, as they were involved in a car crash after setting out, and delayed for well over an hour. Members were very grateful to them for coming on despite this unpleasant shock; and certainly neither they, nor their equipment showed any effects from the bump. Further details from *P. Turner, Cave Cottage, Oakridge Lynch, Stroud, Glos.*

THE theme for the 2nd Congress of the Federation of British Tape Recording Clubs held at the Russell Hotel, London, on Saturday 10th June, was "The Art of Sound". The principal speaker was Mr. Timothy Eckersley, Assistant Head of Central Programme Operations (Recording) BBC, who following in the footsteps of his famous relative, Capt. P. P. Eckersley gave an enlightening talk, interspersed with demonstrations of records from the B.B.C. archive library. A recording made in 1897 of Miss Emily Myers relating her story of how she spent the day watching the Diamond Jubilee of Queen Victoria, opened the lecture.

Sound effects and bird songs were played and strange as it may seem, it was admitted that the B.B.C. did not have a good recording of a Tawny Owl.

However, after this meeting, it is certain that this will be put right. Summing up Mr. Eckersley stated the amateur had a big advantage over the B.B.C. in collecting rare sounds and "on the spot" recordings. Visitors to the meeting showed their appreciation of the talk, which was well produced with a fine selection of recordings, reproduced on equipment loaned by Stagesound Ltd.

Mr. Douglas Brown, Editor of *Tape Recording Fortnightly*, then addressed the meeting, speaking on the subject "The Amateur during the past year". He pointed out that although the number of clubs throughout the country was now in the 120 region, during the past year the increase has been small, in comparison with other years. This was caused, possibly, by the fact that fewer people were buying recorders in the early part of last year, due to the credit restrictions. Mr. Brown went on to say that the market was still unsettled and that the problems of recording standards should be settled by the manufacturers themselves. At present a person thinking of purchasing a recorder has this to settle (1) 7½ and 3½ or 3¼ and 1½ i/s?; (2) two or four track?; (3) cassettes or spools?; (4) mono or stereo?; (5) jack plug or 3-pin plug? and so on. On the subject of club meetings he thought that the manufacturers sending representatives throughout the country were doing a fine job, but the obvious answer is to record lectures on tape and distribute them to every club.

Following this talk was a short discussion when members of the audience were invited to ask questions. Various subjects were discussed including Pre-recorded tapes, Copyright, standardisation, and club activities. Questions were answered by Mr. T. Eckersley, Mr. Hans Spring (Grundig), Mr. T. Saunders and Mr. J. Anderson (E.M.I. Ltd). Mr. K. Peters, Mr. D. Brown and Mr. A. Lovell. The meeting was then closed by the Secretary and Chairman of the Federation, Mr. A. Stableford, who must be congratulated on organising such an efficient Congress.

hi fi

FOR BEGINNERS

by John Borwick

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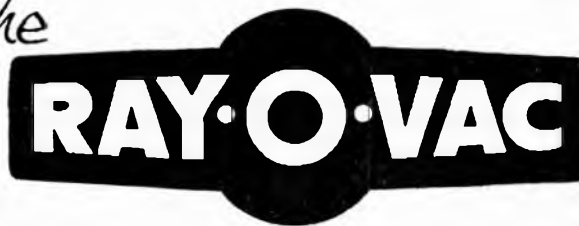
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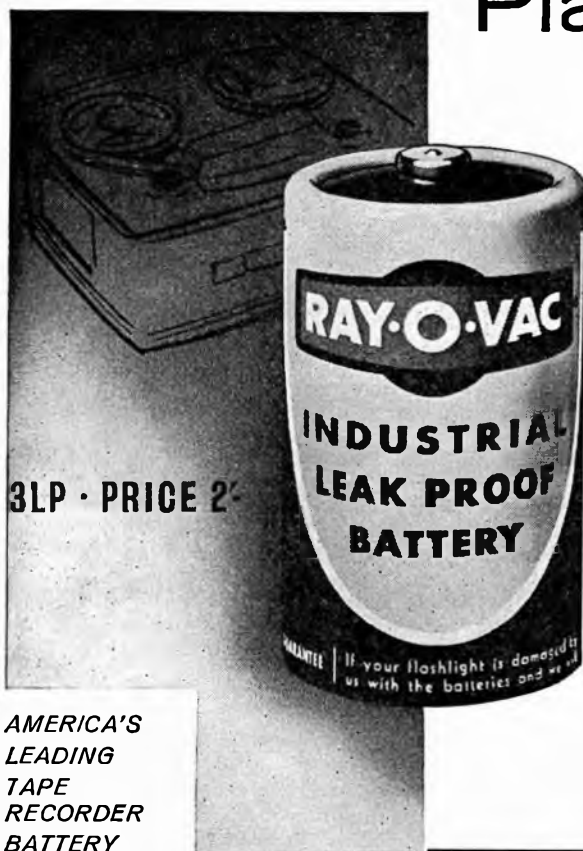


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By John Borwick

HOME RECORDING

PART 3 Radio & T.V. Recording

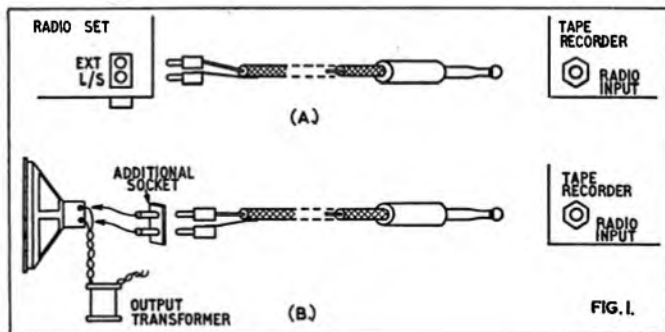
THIS series caters exclusively for the individual newcomer to tape recording who wants to get the maximum fun and usefulness from his machine without joining a club or swallowing a technical dictionary. We first outlined the kind of trial recordings (May issue) that help you to explore the capabilities of your recorder and discover the best settings of the controls. Secondly (June issue) we extended our field of activity by lengthening mains and microphone leads to record out of doors.

Radio Recording

Now we turn to another source of interesting material, the recording of radio and television programmes, gramophone records and telephone conversations. It is not surprising that radio recording should be so universally popular. The programmes range over every conceivable type of musical, dramatic or hobbyist interest. In any given week, therefore, everyone can find something to put on tape and thereby increase his enjoyment of radio and recorder alike. In terms of technical quality, particularly if you use a good VHF/FM receiver, the results will often exceed those obtained by microphone. There are very serious legal and copyright restrictions, of course, and although these are of first importance, we outline them at the end of this article.

Fortunately the technical aspects of radio recording are simple enough. Don't try to oversimplify things, however, by just dangling your microphone in front of the radio. All loudspeakers radiate sounds in a directional way, and this together with the reflections from the walls, etc. gives you an unbalanced recording. Also, the microphone picks up any other sounds in the room or outside. The family are soon going to get fed up tiptoeing about the house every time the microphone is "on".

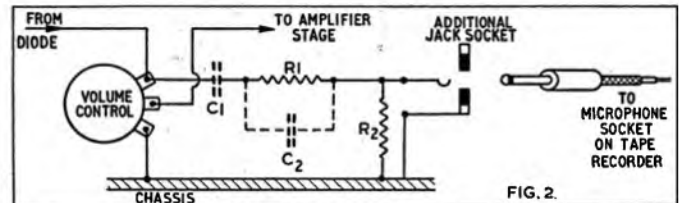
It is much better to take an electric feed from the radio, better for quality, and better for domestic quiet. The easiest



way to arrange this kind of connection is to take a parallel lead from the loudspeaker and plug into the "Radio" input on your recorder. Two variations of this are shown in the diagrams (fig. 1). The first applies to the vast majority of sets where there is a pair of one-pin sockets labelled "External Loudspeaker". Your connecting cable should be long enough to reach the recorder and be fitted with one-pin plugs at one

end and a jack plug at the other to suit the recorder. A screened cable is best, that is one having a signal wire in the centre and a covering of metal braid, but ordinary twin flex works very well. The necessary jack plug may have been supplied with your machine, or even a complete screened cable. But if not, you can get a plug from the shop where you bought the machine—and also useful help and advice on how to connect everything up if your recorder is non-standard.

The second illustration, (fig. 1b) shows you what to do if the radio has no external loudspeaker sockets. You solder or clip the ends of the lead on to the wires terminating on the loud-



speaker itself, i.e. on the speaker side of the output transformer. Fastening sockets to a convenient point on the back-board or cabinet of the radio is a good idea—though it could be omitted. It makes the installation more flexible, since you can plug in as required and tidy the recording lead out of sight at other times.

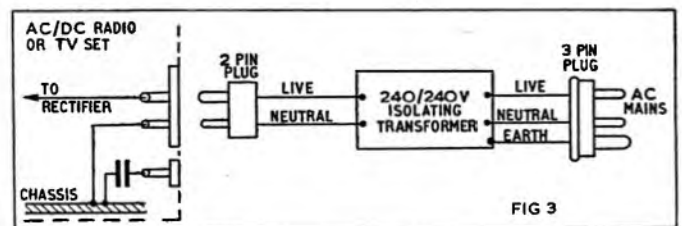
Recording from the loudspeaker of your radio, as just described, is only one of the methods available. If you are able to tackle a little electric wiring—or get someone else to do it for you—there are advantages in recording from an earlier part of the circuit. You see the signal feeding the loudspeaker is unnecessarily powerful for our purpose. Amplifying it to speaker level has meant the introduction of distortion—except in the very best receivers—and we will normally throw away some of this level at the input to the recorder.

All this is avoided by making what is called a "diode" connection. It consists of wiring our recording lead to the outer two tags on the volume control of the radio (see fig. 2). For safety's sake, and so that plugging into the recorder does not interfere with the radio performance, the extra components are recommended as follows: $R_1 = 1.2$ Megohms resistor, $R_2 = 50-100,000$ ohms resistor, $C_1 = 0.025$ microfarads capacitor (required only if there is DC on the volume control), $C_2 = 35$ picofarads capacitor (required only if cable exceeds 10 feet in length). An incidental advantage of this method of connection is that the recording level is independent of the volume control on the radio. It is therefore predictable in advance, and you can listen at any volume you like during the recording, or turn the speaker down altogether, without affecting the feed to the recorder.

Safety First!

Perhaps you own an AC/DC radio, also known as "universal". These are much less suitable than the standard AC sets for connecting to a recorder. In fact they are downright dangerous. This is because the metal chassis, to which one side of the recording lead would normally be connected, is "live". At best this can produce a loud hum at the frequency of the 50 c/s mains supply. At worst it can feed a high voltage along the cable, dangerous alike to you and to your tape recorder.

AC/DC sets can be isolated to make them safe for recording (see fig. 3), but this is definitely not a job for the uninitiated. If you must record from an AC/DC receiver, get your dealer



to wire an isolating transformer into the mains lead and fix an insulated output socket well away from the chassis. Better still, use an AC-only set if there's one in the house. It's safer.



A commentator records her impressions after an underwater exploration. Even when submerged she could describe the scene into a special microphone let into her face-mask.

BBC PHOTOGRAPH

Emitape goes down with BBC diver

Interviews in unusual or noisy situations often contain superfluous material. The BBC find Emitape perfect for editing and cutting. 'Dead' material can be eliminated, interviews kept lively and to the point.

Emitape, consistent and dependable: the obvious choice for a broadcasting organisation famed for its technical excellence. Year in, year out, the BBC send thousands of 'packaged programmes' to radio stations everywhere, spanning the world—on Emitape.



When Emitape returns from the studios to the BBC Central Maintenance Unit, it is re-serviced, passing through this 'washing machine'. A giant electromagnet finally wipes off any signals remaining on the tape.

Emitape used by the BBC 9 times out of 10



EMITAPE DIVISION, E.M.I. SALES AND SERVICE LTD, HAYES, MIDDLESEX

Or why not buy a tuner unit which you can leave permanently hooked up to the recorder? Then you can use the tape machine's amplifier and loudspeaker for radio listening; and when a programme comes along that you want to record, everything is already connected. A very wide range of tuners exist, from simple crystal or transistor radio jacks costing a pound or two to high fidelity units at up to £30. Only you can decide which of these is for you, but do ask for a demonstration before buying—through your own recorder if possible.

The sound circuits in a television set, at least from the volume control through to the loudspeaker, are just the same as the equivalent stages in a radio. But be warned that making external connections of any kind to a television receiver can be very dangerous. In the first place, the metal chassis may be live as in an AC/DC radio, and in addition the loudspeaker tags themselves may carry a very high voltage. If you want to record from TV, then, give the job to a qualified dealer who can install a safe recording outlet.

The Recording Drill

Once you have rigged up the proper connecting lead for radio or television recording, you ought to practice a bit until you are sufficiently drilled to produce technically perfect recordings at a moment's notice. The programme you specially want to record has a habit of suddenly being announced when you are up to the elbows in the washing up. Knowing the right things to push or pull to start the tape running isn't enough. You want the item to begin smoothly, either at full volume or with a gentle fade in; you want to know the right volume setting without having to feel for it; and you don't want to wipe off a valuable recording—or part of one—through not setting up the tape properly beforehand.

Assuming that a programme you want to record is fairly imminent, you should attend to the following:

(a) switch mains on to the radio and recorder at least 5 minutes before zero hour. You don't want the receiver drifting off tune during the recording, and this may happen if you allow insufficient time for warming up.

(b) check that the connecting lead is properly inserted, and tune accurately to the required station. A number of cases have been reported of tape enthusiasts recording "The Archers" on a Monday evening in mistake for "Sound", the programme devoted to tape topics broadcast on Network Three at round about the same time.

(c) lace up a fresh tape, or wind to a clear space of sufficient length on an existing tape.

(d) if you have allowed enough time before the programme is due, carry out a pre-recording test. Some machines permit you to switch to "Record", check the level indicator readings and monitor the input signal without running the tape. Failing this, it may be worth recording a few seconds of a previous programme, winding back and checking its quality. Then you can be sure everything is in good working order.

Recording Level

At zero hour all you have to do is start recording. This is always supposing you know the correct volume setting. Using the 'diode' connection, this is always independent of the loudspeaker volume, as we have said, and should always be about the same. Recording from the speaker, too, should give you a predictable level if you listen at a fairly consistent volume. Luckily, a professional studio engineer is regulating the programme level at source, so you have no adjusting of levels to bother with once you begin. All the same, the beginnings and ends need watching. For example, some recorders put a distinct 'plop' on the tape when you stop and start, and you may find that you can avoid this by operating the stop/start only when the volume is faded right down. Alternatively, if your machine has a "Pause" button, smoother operation may result from using it. This control is obviously helpful if you are cutting out announcements in a music programme or recording short items.

Connecting up to a radiogram allows you to record from radio or gramophone discs without further effort. However, with a record player unit you will have to adopt the same procedure as for radio connection. Taking a lead from the loudspeaker is identical to the procedure already described, and so is the need to isolate an AC/DC unit from the mains supply to which your recorder is linked.

Corresponding to the "diode" connection in a radio, it is possible to bypass all or part of the electronics in a record player too. To do this you wire up to the volume control exactly as in a radio. And if no volume control is fitted, as happens in the case of record-playing desks which are intended for reproduction through the "Gram" sockets on a radio receiver, it is the output lead itself which you must connect to the recorder "Radio" socket. The pickup in such a player unit is invariably a high output crystal type and will operate direct into the radio/pickup input of your tape recorder. The lead should be screened, the sort normally supplied, and should be as short as possible.

Telephone Adaptors

Yet another source of useful recordings is the telephone. Of course what we want to record is not simply the local end of the conversation—this we could do quite easily through our microphone—but both voices equally balanced. The way to do this is to place a pickup coil of wire close to the base of the telephone so that the magnetic field set up by the incoming and outgoing speech currents links with the coil. This will induce a tiny current in the coil which can be amplified and recorded through the microphone input on your recorder.

You can make your own telephone recording coil—a reader's design was published in *The Tape Recorder* May, 1959—but a number of commercial adaptors exist costing about 25s. The early types consisted of a flat disc which you placed under the telephone. Current adaptors usually have a rubber suction cap whereby you actually attach the unit to the instrument. Pickup is stronger from some parts of the telephone base than others, so experiment a bit to find the best position.

Recording from the telephone can be useful in a business sense, to store messages or dictation; and it helps with family long distance calls which can be played over or even sent through the post to absent friends. At the same time, just as you can listen to radio programmes without actually recording, it is often handy to connect up the adaptor and 'broadcast' telephone conversations to other people in the room.

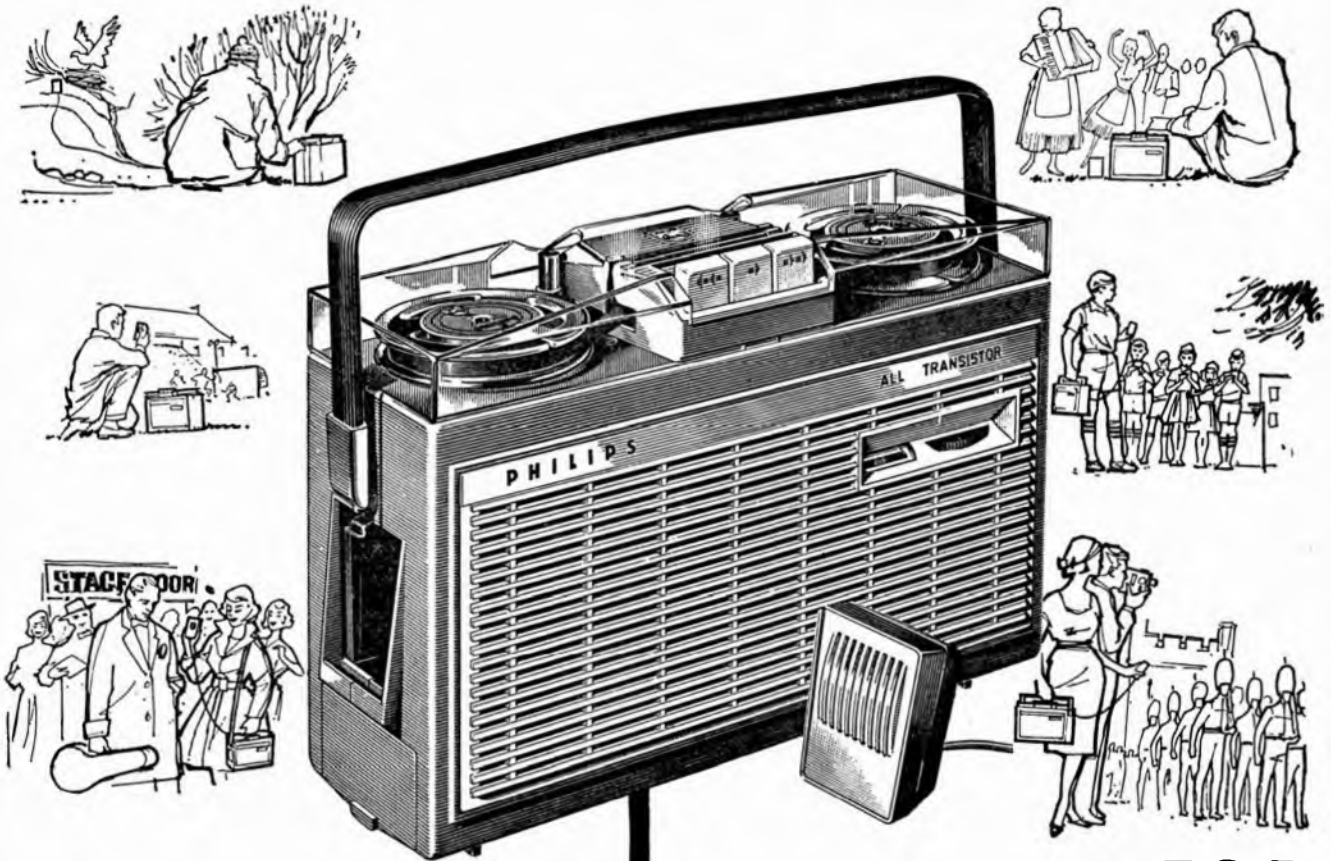
Keeping Within the Law

You must be aware that copyright restrictions apply to the tape recording of broadcasts and gramophone records. The subject has received a great deal of publicity and a notice which you should learn by heart is printed in the *Radio Times* from time to time headed "Copyright and Performers' Rights". It is necessary for you to respect the rights of (a) the B.B.C. and other broadcasting concerns, (b) the gramophone companies, (c) actors, speakers and musical performers, (d) the owners of copyright in musical and literary material.

These rights are set out in the relevant Acts, including the Copyright Act, 1956 and the Dramatic and Musical Performers Protection Act, 1958. In the case of performers and copyright owners, recording and reproduction may take place only for private and domestic use; otherwise prior permission must be obtained. But where gramophone records are concerned, either directly or from a broadcast, recording is an infringement of copyright whether for private purposes or otherwise. So you have been warned.

You should take a responsible attitude to other kinds of recording too, of course. It would be a mistake to record a telephone conversation if you had any reason to suppose the participants would object. The same goes for interviews, or recording in restaurants, churches, etc. Always make a point of finding out who has the authority to grant or refuse permission for you to record, and get a definite go ahead.

Tape recording goes mobile!



PHILIPS

ALL-TRANSISTOR BATTERY TAPE RECORDER

The portable recorder with the lifelike sound. At last you can capture any sound you want — from a military band to a bird in a tree, from touch-line commentaries to folk singing — play it over whenever you like. For this brilliant new Philips Battery Tape Recorder goes wherever you go; records or plays anywhere, any time — even while being carried; recreates each living moment with vivid reality. Light, easy to operate, completely independent of mains electricity, this is the tape recorder for you. See it at your dealer's, today!

- Fully transistorised for economical battery operation and true-to-life reproduction.
- Easy to carry — weighs only 8 lbs.
- Gives up to 20 hours' recording on six small, inexpensive batteries.
- Plays or records while being carried. Transparent plastic lid protects reels.
- Simple, error-proof controls. Accidental erasure is impossible.
- Dual indicator shows battery power and volume. Warns when batteries need replacing.
- Sensitive microphone fits in slide recess for quick-action use.
- Maximum playing time: 2 x 60 minutes at tape speed of 1½" per second.

24 GNS.
Excluding batteries. Optional extra: carrying case and strap 45/- complete.
 Made in Holland

Another wonderful product from PHILIPS — the friend of the family

Philips Electrical Ltd., Century House, Shaftesbury Avenue, London, W.C.2
 (ST 109)

A survey of battery portables

ALTHOUGH the point has not yet been reached where battery operated portable tape recorders are as frequently seen as cameras, the last year has seen a great increase in their popularity. Recording the sounds of a holiday, or the actual words and inflections of a business or sales interview, helps to recall events accurately, and often dramatically.

The size, shape and weight of battery recorders vary considerably. They are almost all transistorised nowadays, but still range from tiny 9 in. x 4 in., 4½ lb. pocket miniatures to 20 in. x 14 in. x 1 in., 20 lb. "studios in a box". There is always a carrying handle, sometimes convertible to a shoulder strap, and a number of models may be had in special hold-all carriers. It is then worth checking that the controls are readily accessible during transit.

Most machines employ standard torch cells which you can buy anywhere, though battery life varies very much according to the power consumption of the motor used. There are exceptions, however, notably the Fi-Cord Mark 1A, which are fitted with rechargeable accumulator-type batteries. Sometimes there is provision for running the recorder from an external DC supply such as a car battery, to conserve the internal batteries. Mains converters, permitting operation from ordinary AC mains are available as extras in a few cases.

The most popular running speed is 3½ i/s, though 1½ i/s and 7½ i/s are also used. The maximum duration of non-stop recording is restricted on some of the smaller machines where only the small 3-inch diameter spool can be accommodated. With standard tape, this gives a playing time per track of 4 min. 40 sec., 9 min. 20 sec., and 18 min. 40 sec. at 7½, 3½ and 1½ i/s respectively. These times are multiplied by 1½ and 2 if the thinner Long Play or Double Play tapes are used.

BUTOBA MT5. Tape Speed: 3½ and 1½ i/s. Maximum size of spool: 5 in. Battery Complement: eight 1.5 U2 cells or similar. Battery Life: 20 to 40 hours. Frequency Response: 50 to 13,000 c/s at 3½ i/s, 60 to 5,000 c/s at 1½ i/s. Signal to Noise Ratio: 40 dB. Output Power: 100 mV into 200 ohms. Loudspeaker: 7 x 4 in. elliptical at 1.2 watts. Level Indicator: magic eye. Position Indicator: clock type. Miscellaneous: fast forward and rewind, straight through amplifier, tone control. Dimensions: 12 x 9½ x 6 in. Weight: 12 lbs. including batteries. Price: £72 9s. including tape. Accessories available: microphone £7 7s., mains convertor £11 11s., plastic carrying case £3 17s. 6d., pigskin leather carrying case £7 7s.

● Distributed by: **Denham & Morley Ltd.**, Denmore House, 175 Cleveland Street, London, W.1.

CLARION Mk. 1. Tape Speed: 3½ i/s. Maximum size of spool: 3 in. Battery Complement: four 1.5 volt Leak-proof U2 type. Battery Life: 50 hours. Frequency Response: 200 to 6,000 c/s. Output Power: 20 mW approximately. Loudspeaker: 3 in. Miscellaneous: fast forward and rewind, straight through amplifier. Dimensions: 9½ x 5 x 3½ in. Weight: 5 lbs. Price: £19 19s., including tape and microphone. Accessories available: mains convertor £4 4s., twinset amplifier/loudspeaker carrying case £8 8s.

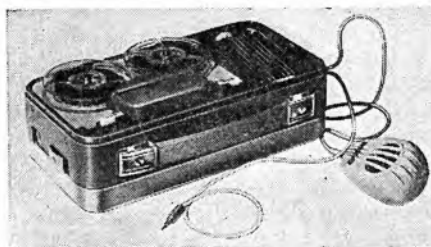
● Manufactured by: **GBC Electronic Industries Ltd.**, 121/123 Edgware Road, Marble Arch, London, W.2.

E.M.I. RE 321. Tape Speed: 7½ i/s. Maximum size of spool: 5 in. Battery Complement: eight 1.5 volt cells or rechargeable units of equivalent size. Battery Life: 3 hours (approximately). Frequency Response: 50 to 10,000 c/s ± 3 dB. Signal to Noise Ratio: 44 dB. Wow and Flutter: < 0.25%. Output Power: 70 mW. Loudspeaker: 2½ in. Level Indicator: Meter type. Miscellaneous: full track recording and playback. Dimensions: 14½ x 6½ x 8 in. Weight: 17½ lbs. Price: £124. Accessories available: Canvas Cover. Stethophone headset.

● Manufactured by: **The Gramophone Company Ltd.**, Hayes Middlesex.



**BUTOBA
MT5
PRICE
£72 9s.**



**CLARION
MARK 1
PRICE
£19 19s.**



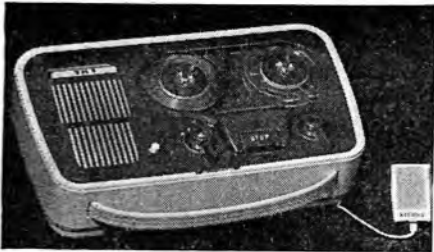
**E.M.I.
RE 321
PRICE
£124**



**FI-CORD
Mk 1A
PRICE
£61 19s.**

FI-CORD Mk. 1A. Tape Speed: 7½ and 1½ i/s. Maximum size of spool: 3½ in. Battery Complement: four 2 volt rechargeable batteries. Battery Life: 1½ to 2 hours at 7½ i/s, 3 to 3½ hours at 1½ i/s. Frequency Response: 50 to 12,000 c/s ± 3 dB at 7½ i/s. Signal to Noise Ratio: 35 dB. Wow and Flutter: 0.4%. Level Indicator: magic eye. Miscellaneous: remote control via motor switch on microphone, output socket from playback head. Dimensions:

a survey of

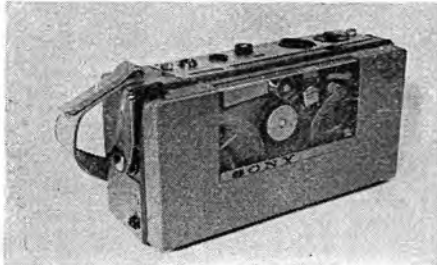


**GRUNDIG
TK1
PRICE
£30 9s.**

9½ × 5 × 2¼ in. Weight 4½ lbs. Price: £61 19s., including tape, batteries and microphone, or £69 6s. with Gramplan DP4 microphone. Accessories available: battery charger.

● Manufactured by: **Fi-Cord Ltd.**, 40a Dover Street, London, W.1.

**SONY
EM-1
PRICE
£262 10s.**



FI-CORD 101. Tape Speed: 1½ i/s. Maximum size of spool: 3 in. Battery Complement: two Mallory ZM9. Battery Life: 20 hours. Position Indicator: accurate counter. Miscellaneous: automatic volume control, fast forward and rewind. Dimensions: 6¼ × 3¼ × 1½ in. Weight: 1 lb. 11oz. Price: £55 13s. Accessories available: stethophone earphones, electronic foot pedal, transcribing amplifier, etc.

● Manufactured by: **Fi-Cord Ltd.**, 40a Dover Street, London, W.1.

GRUNDIG CUB. Tape Speed: 3¼ i/s average. Maximum size of spool: 3 in. Battery Complement: four 1.5 volt Mono cells or equivalent, one 3 volt. Battery Life: 10 to 15 hours. Frequency Response: 150 to 15,000 c/s. Signal to Noise Ratio: 40 dB. Output Power: 100 mW approximately. Loudspeaker: 3.5 ohms elliptical. Miscellaneous: fast forward and rewind. Dimensions: 11 × 6¼ × 3½ in. Weight: 5½ lbs. with batteries. Price: £27 6s. including tape, microphone and extra cable. Accessories available: mains convertor.

● Manufactured by: **Grundig (Great Britain) Ltd.**, 39/41 New Oxford Street, London, W.C.1.

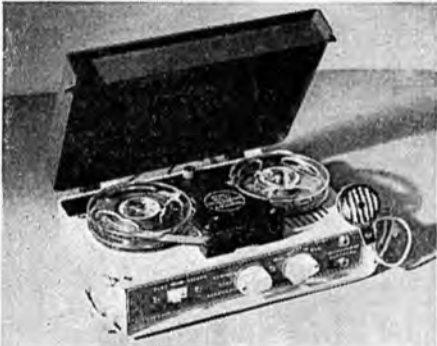


**NAGRA
IIB
PRICE
£293**

GRUNDIG TK1. Tape Speed: 3¼ i/s. Maximum size of spool: 3 in. Battery Complement: four 1.5 volt Mono cells type 3 LP, two 1.5 volt Monocells type 1 LP. Battery Life: 20 hours. Frequency Response: 80 to 8,000 c/s ± 3 dB. Signal to Noise Ratio: 40 dB. Output Power: 250 mW. Loudspeaker: 5 ohms, 4 in. Bias: 40 Kc/s. Level Indicator: magic eye. Miscellaneous: fast wind back, straight through amplifier. Dimensions: 11¼ × 7 × 4½ in. Weight: 8 lbs. with batteries. Price: £30 9s. including microphone, tape and two extra leads. Accessories available: mains convertor £7 7s.

● Manufactured by: **Grundig (Great Britain) Ltd.**, 39/41 New Oxford Street, London, W.C.1.

**APOLEC
PRICE
£15 15s.**



MINIVOX C. Tape Speed: 3¼ and 1½ i/s. Maximum size of spool: 3 in. Battery Complement: one AD42, two BI23. Battery Life: 100 hours. Frequency Response: up to 8,000 c/s. Output Power: 600 mW. Loudspeaker: 5 in. Level Indicator: magic eye. Miscellaneous: fast forward and rewind, mixing and superimposing. Dimensions: 10¼ × 10¼ × 5½ in. Weight: 10 lbs. Price: £31 10s. including tape, microphone and extra lead.

● Manufactured by: **Challen Instrument Company**, 4 Stratford Place, Oxford Street, London, W.1.

MINIVOX B. Similar to above, but tape speed 1½ i/s only.

MOHAWK MIDGETAPE 400. Tape Speed: 1½ i/s. Special Tape Cartridge. Battery Complement: Mercury cell type T50. Battery Life: 50 hours. Frequency Response: 150 to 5,000 c/s. Signal to Noise Ratio: 42 dB. Dimensions: 8½ × 3¾ × 1¼ in. Weight: 3 lbs. Price: £129 10s. including microphone, speaker and battery.

● Manufactured by: **Thomas A. Edison Ltd.**, Victoria House, Southampton Row, London, W.C.1.

MOHAWK MIDGETAPE 500. Tape Speed: 3¼ i/s. Single Battery. Frequency Response: 50 to 10,000 c/s. Signal to Noise Ratio: 42 dB. Wow and Flutter: 0.4%. Dimensions: 8½ × 3¾ × 1¼ in. Weight: 3 lbs. Price: on application. Address as above.

NAGRA IIB. Tape Speed: 15, 7½ and 3¼ i/s. Maximum size of spool: 7 in. Battery Complement: twelve 1.5 volt cells or alkaline accumulators. Battery Life: 20 hours, or 70 hours, on accumulators. Frequency Response: 30 to 15,000 c/s ± 1 dB at 15 i/s, 30 to 12,000 c/s ± 1.5 dB at 7½ i/s, 50 to 7,000 c/s ± 3 dB at 3¼ i/s. Signal to Noise Ratio: 51 dB at 7½ i/s. Wow and Flutter: 0.2% at



**STEELMAN
PRICE
£57 15s.**

battery portables

7½ i/s. Level Indicator: Meter type. Miscellaneous: fast forward and rewind, mixing on three inputs etc. Dimensions: 8¼ × 12½ × 4¼ in. Weight: 15½ lbs. (approximately). Price: £293.

● Distributed by: **Livingston Laboratories Ltd.**, 31 Camden Road, London, N.W.1.

SONY EM-1. Tape Speed: 7½ i/s. Maximum size of spool: 5 in. Battery Complement: 6 U3 cells. Frequency Response: 100 to 5,000 c/s ± 5 dB. Signal to Noise Ratio: 50 dB. Level Indicator: Meter type. Miscellaneous: clockwork motor, bias and battery motor. Dimensions: 13 × 4½ × 6¼ in. Weight: 13 lbs. Price: £262 10s.

● Distributed by: **Tellux Limited**, 44 Brunel Road, London, W.3.

STEELMAN. Tape Speed: 3¼ and 1⅞ i/s. Maximum size of spool: 3 in. Battery Complement: thirteen 1.5 volt cells. Battery Life: 50 hours (motor), 300 hours (amplifier). Frequency Response: 150 to 7,500 c/s. Level Indicator: magic eye. Miscellaneous: fast forward and wind back. Dimensions: 9¼ × 6¼ × 2⅞ in. Weight: 6½ lbs. less batteries. Price: £57 15s.

● Manufactured by: **Steelman Phonograph & Radio Company**; distributed by: **Telec Tronic Ltd.**, 46/47 Frith Street, London, W.1.

STUZZI MAGNETTE. Tape Speed: 3¼ and 1⅞ i/s. Maximum size of spool: 4 in. Battery Complement: four 4.5 volt cells. Battery Life: 30 to 100 hours. Frequency Response: 40 to 9,000 c/s at 3¼ i/s, 80 to 4,500 c/s at 1⅞ i/s. Signal to Noise Ratio: 45 dB. Wow and Flutter: 0.25% at 3¼ i/s. Output Power: 400 mW. Level Indicator: magic eye. Position Indicator: 3-digit. Miscellaneous: fast forward and rewind, straight through amplifier. Dimensions: 11 × 8 × 4½ in. Weight: 8 lbs. Price: £61 19s. including tape and microphone. Accessories available: plastic ever ready case, telephone adaptor, stethoset, earphones. 7½ i/s version available.

● Distributed by **Recording Devices**, 44 Southern Row, London, W.10.

TRAV-LER. Tape Speed: 3¼ i/s. Maximum size of spool: 3 in. Battery Complement: three Vidormax T 6009 or equivalent. Battery Life: 100 hours. Frequency Response: 100 to 6,000 c/s ± 3 dB. Signal to Noise Ratio - 42 dB. Wow and Flutter: 0.4%. Output Power: 400 mW. Loudspeaker: 7 × 4 in. elliptical. Level Indicator: magic eye. Miscellaneous: fast forward and rewind, straight through amplifier. Dimensions: 10 × 8 × 5 in. Weight: 9 lbs. with batteries. Price: £26 with microphone and tape.

● Manufactured by: **Casian Ltd.**, 37 Grafton House, Golden Square, London, W.1.

TRAV-LER PROFESSIONAL. Specification and price on application to above.

WALTER METROPOLITAN. Tape Speed: 3¼ i/s. Maximum size of spool: 5¼ in. Battery Complement: three Ever-Ready PP9. Frequency Response: 50 to 9,000 c/s. Signal to Noise Ratio: 40 dB. Output Power: 2 watts. Loudspeaker: 7 × 4 in. elliptical. Level Indicator: magic eye. Miscellaneous: also mains operated, fast forward and rewind, straight through amplifier, mixing and superimposing. Dimensions: 14 × 13¼ × 5¼ in. Weight: 17½ lbs. less batteries. Price: £57 15s. with tape and microphone.

● Manufactured by: **Walter Instruments Ltd.**, Garth Road, Morden, Surrey.

PHILIPS EL 3585 Tape Speed 1⅞ i/s. Maximum Size of Spool: 3 in. Battery Complement: six 1.5 volt cells. Battery Life: 20 hours. Frequency Response: 120 to 5,500 c/s ± 3 dB. Wow and Flutter: less than 0.5%. Signal to Noise Ratio: -40 dB. Loudspeaker: 4 in. Output Power: 250 mW. Miscellaneous: 4 inch spools can be fitted if cover is removed, fast rewind and wind, modulation level and battery meter. Dimensions: 10½ × 3¼ × 7½ in. Weight: 8 lb. Price: £25 4s. including microphone and tape. Carrying case and strap extra.

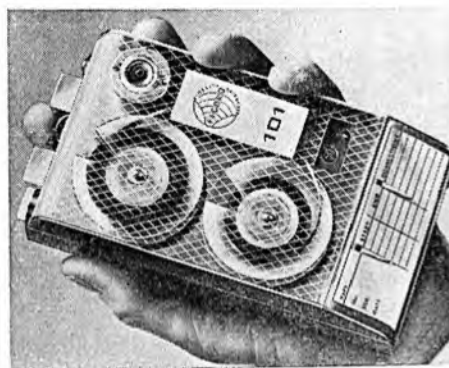
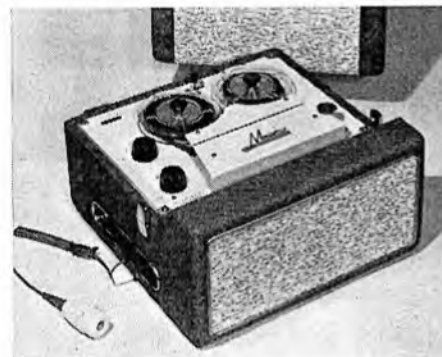
● Manufacturers: **Philips Electrical Ltd.**, Century House, Shaftesbury Avenue, London, W.C.2.

**DOKORDER
PT 4H
PRICE
£39 10s.**



**STUZZI
MAGNETTE
PRICE
£61 19s.**

**MINIVOX
MODEL C
PRICE
£31 10s.**



**FI-CORD
101
PRICE
£55 13s.**

**PHILIPS
EL 3585
PRICE
£25 4s.**



**THE IDEAL MAGNETIC
RECORDER FOR TV
"REMOTES"**



Self-contained, portable battery or mains operation—can be interlocked with any professional film camera.



LEEVERS-RICH EQUIPMENT LTD.
319B, TRINITY ROAD, LONDON, S.W.18

**The right microphone
makes a good recorder—
better**



The Grampian DP4 is a moderately priced sensitive reliable microphone developed to meet the requirements of the "Quality-minded" recordist seeking better performance from his equipment.

With a uniform frequency response from 50 c/s to 15,000 c/s the DP4 will satisfy the most exacting user. The DP4 is equally suitable for Public Address, Broadcasting, Call Systems etc.

Output levels

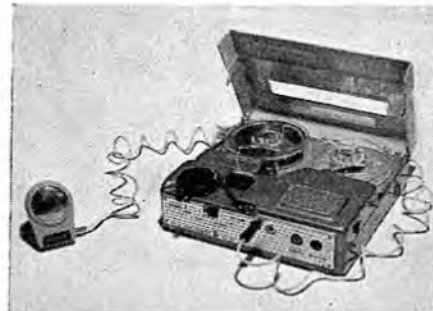
DP4/L low impedance—25 ohms 86 dB below 1 volt/dyne/CM². DP4/M medium impedance—600 ohms 70 dB below 1 volt/dyne CM². DP4/H high impedance—50,000 ohms 52 dB below 1 volt/dyne CM².

Grampian DP 4

Retail Price—DP4/L complete with connector and 18 ft. screened lead £7/11/-.
(Medium or High Impedance models £1 extra).

A complete range of stands, swivel holders, etc. is available also. A matching unit (Type G7) can be supplied for adapting the microphone for a recorder having a different input impedance, or when a long lead is required. Retail Price £3/5/-. Write or telephone for illustrated literature.

GRAMPIAN REPRODUCERS LIMITED Hanworth Trading Estate, Feltham, Middx. Feltham 2657



**TRANSCORDER
TR 100
PRICE
£40 19s.**

TRANSCORDER TR 100. Tape Speed: 3½ and 1½ i/s. Maximum spool size: 3 in. Battery complement: six 1.5 volt penlight cells, one 9 volt cell. Battery Life: 20 hours. Frequency Response: 150 to 7,000c/s. Level Indicator: Meter. Loudspeaker: 2 in. Miscellaneous: Power rewind. Dimensions: 7 × 7 × 1½ in. Weight: 4 lb. Price: £40 19s. Accessories available: mains adaptor, remote control, microphone, 12 volt adaptor.

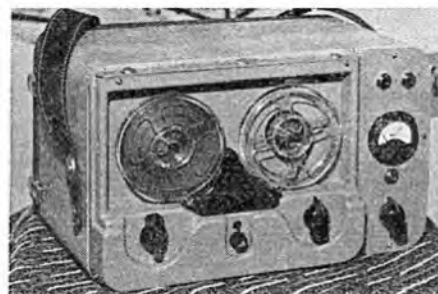
● Distributed by: **Cine Accessories (Brighton) Ltd.**, 15 Bond Street, Brighton.



**METROPOLITAN
PRICE
£57 15s.**

APOLEC. Tape Speed: 3½ i/s (approx.). Maximum spool size: 3 in. Battery Complement: two 1.5 volt penlight cells. Battery Life: 100 hours (approx.). Frequency Response: 250-5,000 c/s. Loudspeaker: 2 × 3 in. Miscellaneous: Rewind. Dimensions: 8½ × 6 × 2½ in. Weight: 2½ lb. Price: £15 15s. including microphone, monitoring earpiece, tape and batteries.

● Distributed by: **Finex (Overseas) Ltd.**, 7 West End Lane, London, N.W.6.



**CASIAN
PROFESSIONAL
PRICE
£85**

DOKORDER PT 4H. Tape Speed: 3½ and 1½ i/s. Maximum size of spool: 3 in. Battery Complement: five 1.5 volt penlight cells. Battery Life: 3 hours. Frequency Response: 200 to 5,000 c/s at 3½ i/s. Wow and Flutter: 1.2%. Loudspeaker: 2½ in., 8 ohms. Output power: 100 mW. Miscellaneous: hand rewind. Dimensions: 7¼ × 3½ × 2¼ in. Weight 2½ lb. Price: £39 10s. including microphone, tape, earphone, splicing tape and polishing cloth. Accessories available: 240 volt mains adaptor, remote control cable, leather case and extension lead.

● Distributed by **Samuel Lewis (City) Ltd.**, 200a Upper Thames Street, London, E.C.4.

* * *
The Metropolitan and Grundig "Cub" are now out of production but may still be obtainable from dealers.

... tape recorder workbench

Practical suggestions for the tape handyman

by A. Bartlett Still

No. 24—FITTING DIFFERENT HEADS

JUDGING by the number of letters on the subject over the last month or two, there must be quite a number of tape recorder owners who have been toying with the idea of fitting different heads to their machines. There seem to be two reasons behind this—for improving performance, and for changing from two to four track working. At the risk of being labelled as a conservative, (in the non-political sense) let me make it plain that I am not in favour of four-track working, since it generally represents a severely retrograde step in performance standards. Hence my stipulating two reasons for changing heads on an existing machine, one cannot expect them to be combined. However, not everyone will agree with me, and in some cases the extra tape economy may well be valid, so, having had my say, let us consider what is involved.

Make no mistake, this is not something that is as simple as changing a valve. Both mechanical and electrical problems arise, such as cannot easily be solved without proper aids. I have fitted

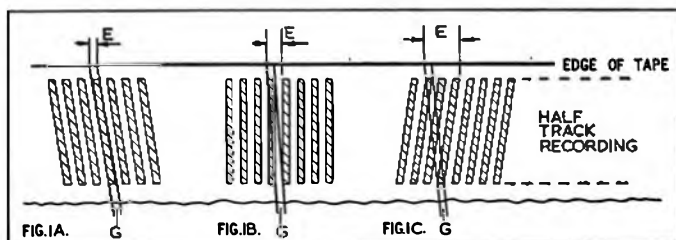


Fig. 1. The most serious result of misalignment of record/playback head is loss of high frequencies since the effective gap width is increased.

three heads, Erase, Record and Replay, on to a commercial deck originally designed for two of a completely different type, with comparative success. However, the alignment and correct adjustment was carried out with the aid of a frequency test tape, a frequency generator and a valve voltmeter.

Azimuth Adjustment

The mechanical problems of the actual head replacement will be encountered first, but presumably if the change is being seriously considered at all, confidence exists in the ability to carry out the necessary fitting. What may not be realised is that complete head adjustment facilities must be provided, in order that correct azimuth adjustment and tracking can be realised. I am reprinting some diagrams from earlier articles, and the first shows the sort of discrimination of high frequency signals that can be expected from a poorly aligned head. In the first

instance it is assumed to be replaying a signal of its own recording when the difference is not very pronounced. The second and third illustration show, respectively, the relative increase of gap length when replaying a standard tape and a tape recorded on a machine that is out by an equal amount in the opposite direction. The second (fig. 2) illustrates two typical ways in which head adjustment can be provided.

Correct tracking of the record and erase heads is equally important for efficient working, particularly if "crosstracking"

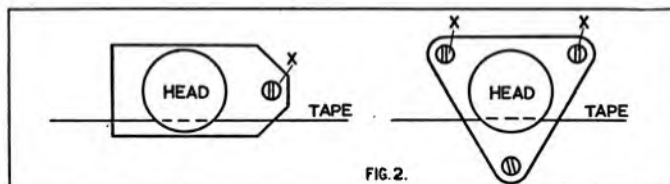


Fig. 2. Two types of head mounting which permit azimuth adjustment are shown here. The bolts X are spring-loaded, and raising and lowering is achieved by small turns with a screwdriver.

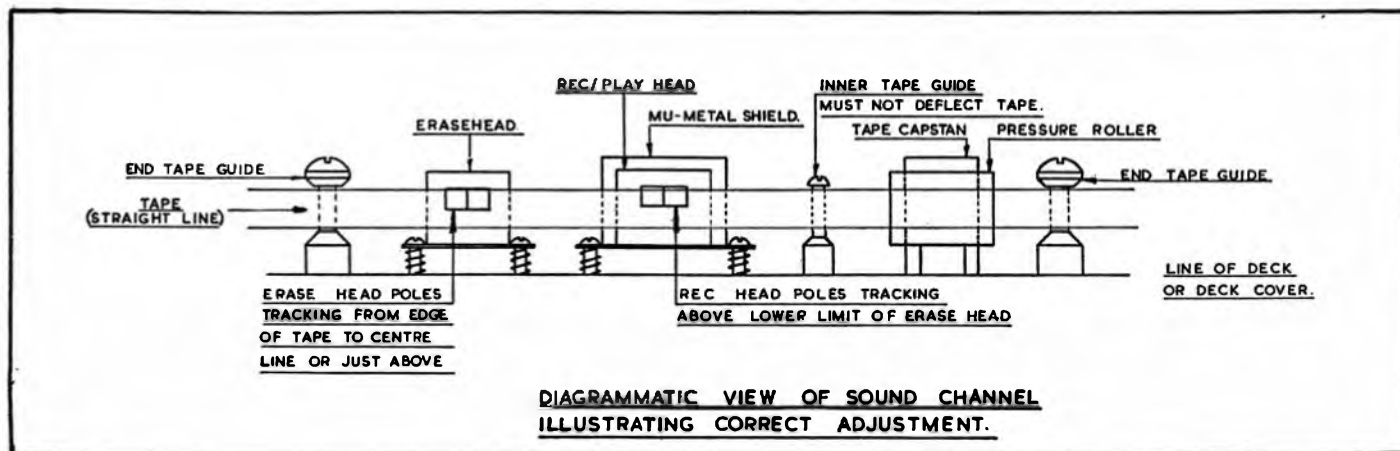
is to be avoided. The path of the tape through the sound channel for correct tracking is shown in fig. 3, and in order to achieve this either the heads or the tape guides should be adjustable vertically. Although there may not be such adjustment at the moment, remember that the relative vertical heights of the new and old heads may not be the same.

Electrical Effects

So much for the actual mechanics of such a change: Now, what are the electrical effects? If, as is most likely, a head with a finer gap is to be fitted, the record characteristic of the amplifier will have to be altered to suit before any real advantage can be obtained. In fact, the frequency response may deteriorate from the original if the first design anywhere approached maximum performance. Equally, the inductance and self-capacity of the new head will probably be different, requiring an adjustment of the replay response at the high frequency end.

I must now come to the most important of the electrical factors of the sort of change we are considering. No two types of record/replay head have similar bias requirements, and to change the head, without making the necessary change of bias, will give results far worse than changing the brand of tape. Again the maximum effect occurs at the high frequency end of the response curve, the final figure shows a typical effect, which is the point at which, presumably, improvement is expected.

There may well be other effects, good or bad, but I think the foregoing picture, which I have admittedly looked at with a



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T/R.

TAPE RECORDER WORKBENCH—(continued)

pessimistic eye, will serve to show that one would be unwise to tamper with an existing design unless possessing the knowledge and tools to enable you to better it. The knowledge may well exist, and can certainly be acquired, but the necessary instruments to obtain any advantage in electrical performance are few and far between.

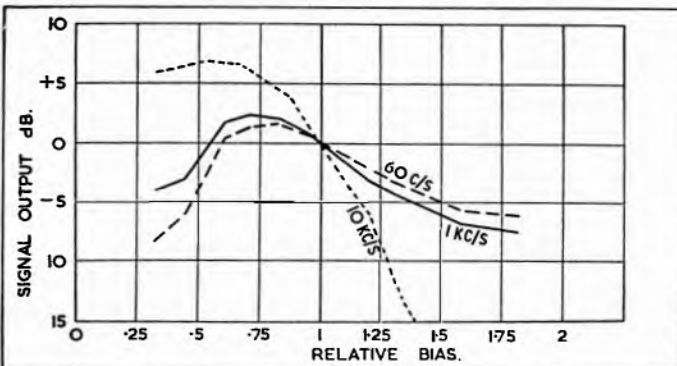


Fig. 4. Shows the erasure effect of the HF bias three "spot" frequencies, recorded at the same input level, indicate a more marked effect on higher frequencies than on low.

I usually try to give advice and encouragement to readers who wish to improve the performance of their machines, but I make no apologies for taking the opposite view in this instance. My advice can be summed up in very few words: "If in doubt, don't!"

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see page 303

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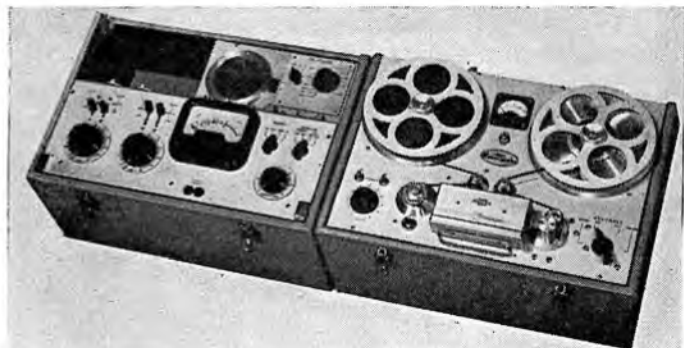
by Richard Golding

IN the dizzy heights of lip-sync film recording many Industrial Film Units and sponsored amateurs prefer to use the patent interlock system for tape-film known as the Leavers Rich Synchronpulse. This system employs a once-per-frame contact from the camera drive to switch on a 1,000 cycle audio oscillator and to record a continuous timing signal or tone pulse on the tape, simultaneously with, and adjacent to the speech track. One pulse for every frame of picture. The resultant magnetic recording therefore consists of a speech track alongside which runs a series of carrier pulses. These pulses bear the same relationship to the sound track that the frame lines bear to the picture image on the developed film.

Since the control track is physically part of the recording, it provides a means whereby the sound can always be replayed at a speed to correspond with the projection of the picture. Further, the synchronising is in no way affected by the speed at which the tape was recorded, or by any slippage or tape stretch that may occur.

The recorded tape is used only as a means for storing the sound before re-recording on to optical or mag/stripe. Sync is maintained during the re-recording session by having another once-per-frame contact on the recorder, which sets off a time-base of a cathode ray oscilloscope. The visible pulse is kept stationary in the centre of the timebase by manual vernier adjustment of the speed of the special tape deck being used. In practice this manual method proves adequate, as we discovered when watching the Leavers Rich transfer of our track on the latest L.C.C. film "Learning For Leisure."

This film, produced by Alfred Upton, film tutor of Goldsmiths College, London, is a review of the many facilities offered by London Evening Institutes. For the dialogue and music inserts it was found necessary to hire a Synchronpulse unit and have Leavers Rich effect the final transfer to optical in their own studio. A notable feature of the system is that the camera speed does not have to be accurately 24 fps, but a departure of 5% from true 24 fps will result in audible change



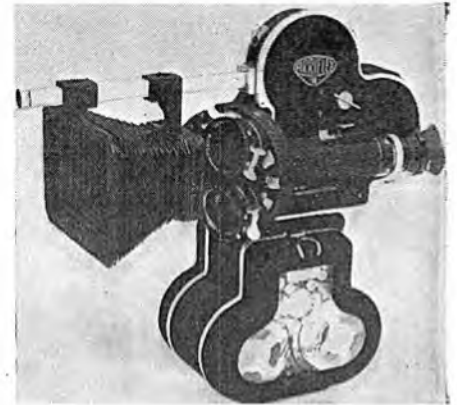
of sound pitch on playback at the correct speed. One or two of our earlier music takes suffered from our using the Bolex on spring drive, the departure occurring when the spring ran down. The lesson learned being that for long takes a motor should be used to safeguard against loss of camera speed. With a battery operated camera and a battery operated recorder as well the Synchronpulse offers one of the best and most portable sync sound recording systems.

Hire charges about £8 per day for the recording unit. Transfer to 16 mm optical film 6.8d. per foot; to mag/stripe or fully coated 16 mm filmstock 4.75d. per foot. Details from: Leavers Rich Equipment Ltd., 78b Hampstead Road, London, N.W.1.

Blesma

The sponsored film on the work of the British Limbless Ex-Servicemen's Association directed by Leslie Morris of the Grasshopper Group used a special pulse unit devised by Keith Raven and other members of University College, London, for its few dialogue inserts.

The transfer to magnetic stripe was effected by Raven himself on a B. & H. 640 projector from a variable speed Reflectograph tape recorder which was controlled manually to a strobe and



For the serious 16 mm worker who likes to be mobile, Magnasync of Hollywood have introduced the Nomad magnetic recorder. The unit is driven from the camera motor by a flexible drive and the twin track recording permits background

effects to be added later to the speech track. Here the unit is shown fixed in its normal operating position under an Arriflex.

a neon lamp fitted to the projector. For those of you who wish to make up such a transfer unit there are still some variable speed Reflectographs on the market despite the makers having finally discontinued the production of this model, relying now on a synchronous motor which gives smoother transport but only fixed speeds. Chitnis, however, are importing a professional variable speed deck retailing for about £125.

Double Heading

Keith Raven does a considerable amount of double heading and considers the 640 ideal for the job. The advantage of double heading is that by running separate sound and picture on the same machine various sounds can be allowed to be recorded and adjusted until the synchronisation is right. The 640 is fairly easy to adapt and the extra sound films can be edge or full stripe or one of the fully coated films from Gevaert, Kodak, EMI or Zonal.

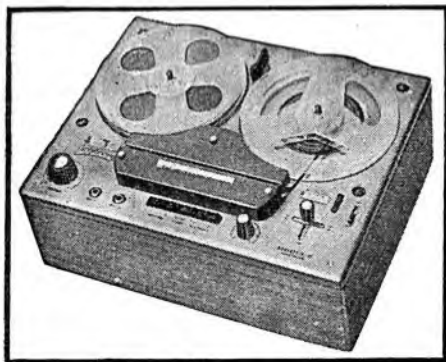
In threading, the sound film should be placed on the rear take-up arm, and the belt disconnected. The sound film is then taken in under the lamp housing and over the upper of the two sprockets beneath the gate, then through the sound head in the normal manner, over the lower sprocket and finally out through the projector door into a felt lined bin. The picture film is laced normally through the gate but, missing the first sprocket, is fed out, preferably over a pad, through the projection port to drop into the same bin. The projector must be stopped before the ends run through together and end up in a tangle. This double heading procedure can be used for post-synching sessions to record short lengths of dialogue where the actors speak their words in time to the screened lip movements. For this it is advisable to divide the film into short lengths for continuous running, together with loops of striped film of exactly the same length. Longer loops will have to be supported by some external roller system. A word of warning here. Post-synching is difficult and can be discouraging, especially to the artists, so make sure that you have mastered the procedure thoroughly before you inflict it on your cast.

On professional film locations direct dialogue recordings are made when-ever possible, these are usually guide tracks for later post-synching sessions in the studio. There are reasons for this—it is difficult to keep a balance between dialogue and effects

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at the time of shooting—unwanted noises invariably creep in on location work. It is sometimes impossible for the advanced worker to make such a guide track but he can make notes of the actual words spoken and use these as a framework for a guide track. So that starting cue marks can be made it is useful to splice some frames of clear film into the picture loop. Additional cue marks can be made along the film with a China-graph pencil, but generally the loop should be kept as short as possible covering one sentence at a time.

If the stripe projector is switched on in the recording position, then directly the actor has succeeded in matching his words to the picture the projector can be switched over to playback and the result checked. The artistic success of inserting short lengths of lip-synching depends on how they match the rest of the track. This is important. Projector noise must be eliminated. Background noise must be in its right proportion. Room echo must be cut down. Double heading is not easy and one pair of hands is never enough, but the results entirely justify the trouble taken.

Double Heading Extra

Designed primarily for small Industrial film units but available to the advanced worker is the Rank 1840 Twin Take Up Unit for use with B & H 16mm projectors. This unit has its own motor drive and accommodates spools up to 2,000ft. capacity. Separate motors are used for each spool and are independently driven. Although not normally on sale to the general public orders can be taken through your dealer.

8mm Lip-Synching

On this gauge the revolutionary Fairchild 8 mm recording camera is the answer to lip-sync and costs with 12.5 mm lens, microphone, headset, battery and charging cable—£182 0s. 0d. Sound and action is synchronised automatically in the camera on film which is pre-stripped. The unit is electrically driven, the motor being charged by rechargeable nickel-cadmium cells.

The separation between sound and picture is 52 frames, as



against the normal 56 on most British and Continental machines. There is, I understand, international discussion going on at the moment with standardisation in view, and the U.S. is confident that 52 frames will eventually be accepted. The Fairchild projector, however, has provision to adjust the loop so that 56 frame films can run in perfect sync.

Sound shooting is simple but it is essential to plan the shots for editing to minimise the amount of film that must be cut and discarded, for each time that film is thrown into the editing bin, stripe goes with it. Unless two seconds of silence are allowed at the start of each shot the sound track will suffer



"Sorry we've no clapper-board sir . . . would you mind gnashing your teeth."

every time a cut is made, as there is an overlap of $7\frac{1}{2}$ " of stripe over picture. Critical editing of sound can be effected on the projector by using a slower running speed or by removing the film from the sprockets and manually running the film back and forwards over the soundhead until the precise area is located.

The filmstock is pre-stripped Ansco, packed in 50 ft. double run rolls for a recording total of 100 ft. Exposure index—12ASA for interiors and 10ASA with 85B filter for exterior work. The approved processing station is *Colour Centre Cine, Farnham Royal, Slough, Bucks.* Other filmstock can be pre-stripped by an independent laboratory so that film availability is no real problem. A 16-page booklet is issued with each camera.

Sunshine on Sea

Most holiday films improve with a clever commentary and I have just seen one that is quite definitely saved by a witty and apt soundtrack. It is a professionally made film for the Southend Corporation and presents the pier, the Kursaal, a water ballet and many other attractions in a competent and carefully photographed manner. The commentary is spoken by Johnny Morris and it is obvious that he wrote it himself after studying the series of picture postcard cameos that the producer shot over several months and edited together in an attempt to find an overall shape. It is 22 minutes in length, 16 mm colour, on free loan from Southend Corporation and worth borrowing.

Letraset

I am impressed by the new "Instant" lettering produced by *Letraset*. The letters are sharply defined on the backs of transparent polythene sheets and are arranged in the font system giving more of the letters in most frequent use. I made some titles up in about the sixth of the time I used to take for the old type *Letraset*, finding them much easier to align, just pressing the letters on my artwork by rubbing them with a soft lead pencil through the transparent sheet.

As there is no playing around with screen, brush and water, I feel that the price of 7s. 6d. per sheet is not too high. Added to this is the point that the finished work can be made to look most professional with almost no effort.

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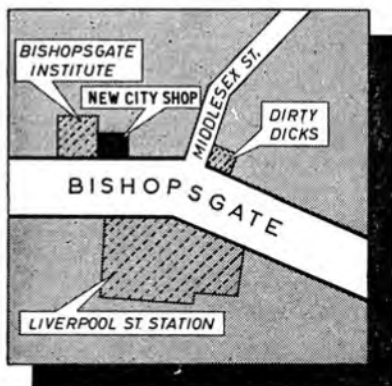
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our readers write

. . . about the 89% rejects again

From:—Charles W. Aitken (Secretary), Dundee Tape Recording Club, 59 Strathmartine Road, Dundee, Angus.

*Dear Sir:—*Having read your correspondence re The University Recording Company and their rejection system (for 89 per cent rejection is surely a system!) I feel that the other side of the picture should be shown. The figures which the company shows us are impressive, but I cannot believe that nine out of every ten components or items of equipment merit rejection, no matter how stringent the tests are. If, however, the company is right in their findings, then I can only suggest that we members of the Dundee Tape Recording Club must have been very lucky in our choice of equipment, or else the "wee folk" are looking after us!

I do not deny that we have found new equipment to have faults from time to time. We have even had cases of major faults in one or two cases. But most of the faults, (and they have not been many) are usually of a minor character and have been easily remedied. Indeed, many minor faults in tape recorders could easily, and should easily have been remedied by the retailers themselves prior to selling the machines. But far too many machines are taken out of the box and placed in the shop window along with a price ticket, without even elementary checks being carried out.

No matter how efficient the inspection system is in any factory, faults will continue to occur so long as the construction, assembly and inspection are carried out by human beings. I expect if the human race were given a test as thorough as the one used by the University Recording Company, we should find the rejection percentage much higher than 89 per cent!

On behalf of myself and club members, I have had much correspondence with manufacturers. I have always found them most helpful, prompt with replies, and technical advice freely given. Recently one manufacturer went so far as to advise me against the purchase of a piece of equipment as they felt it would not give reasonable results with my existing equipment, and they returned my cheque which I had sent with my order!

With nearly forty members in our club at present, I think only two are experiencing trouble with new equipment. Obviously the 89 per cent system does not apply in Scotland. Or do the University Recording Company have a check point at the border?

In my own case I have had a Brenell Mark II for nearly six years, a Challen Minivox for over one year, a simple mixer unit, a BSR turntable, several microphones and a VHF radio set. None of this equipment was faulty on arrival. And apart from fitting one take-up motor to my Brenell after several thousands of hours work, I have no trouble whatsoever with any of the items listed. Two months ago I bought a tape deck at a bargain price (new) through a trade magazine. I wired it up, plugged it in, and have used it fairly often since then without any trouble. Perhaps I'm just lucky!

Yours sincerely,

* * *

. . . about shoddy goods

From:—R. Strudwick, 891 Uxbridge Road, Hillingdon Heath, Middx.

*Dear Sir:—*I feel impelled by the two letters in your May issue, concerning shoddy goods and service, to write and give my views. Indeed I have a feeling that I shall not be the only reader to do this.

Being a member of a tape club, it does not surprise me in the least that 70% of the club members use recording machines which are made abroad. The other 30% experienced something wrong with each machine purchased, with the only exception of those whose equipment was home-built. The pity of this state of affairs is that there isn't much the individual can do. The so-called guarantee seems to provide more protection for manufacturer than customer, and it is treading on ice to name the maker concerned.

In my own case, I bought a machine which has given no trouble at all except that it produces excessive background hiss

the supply reel spindle is eccentric, the motor, a synchronous type, gives twice as much flutter as the spec. demands, and the replay amplifier has ceased to function on numerous occasions. When I approached the manufacturers, they claimed that different measuring techniques had accounted for the deviation from spec. So I sent it back for servicing, and it returned in the same state as it went.

Obviously one cannot continually buy and sell expensive gear, otherwise I should be rid of my machine. But one can learn from experience, and one piece of advice I should give to any readers who are going to buy a machine is, look in the classified adverts column of a magazine such as this, and get an idea of the products continually being advertised for exchange. Also, try to avoid those companies whose products are regularly restyled or redesigned. Join a tape club before you buy a machine, and judge for yourselves which are popular with members and which are reliable.

Yours faithfully,

* * *

. . . about coloured leader tape

From:—Albert Chapman, 31 Dulwich Village, London, S.E.21.

*Dear Sir:—*Colour coding of tape is desirable but not red trailers. When fast winding, it is necessary to know instantly when the trailer is reached. Red is especially unsuitable because it is too near the colour of the tape. Flashing colours are needed.

Yours faithfully,

* * *

. . . about black magic

From:—J. M. Bowman, P.O. Box 10296, Johannesburg.

*Dear Sir:—*Having recently acquired a tape recorder I would like to have some information on the best packing methods for tape exchanges, together with information on customs regulations etc. It sounds an excellent idea—and would be a boon to my friends as my writing is not too legible.

The seeming excitement whenever tape recorders are used in conjunction with 8 mm cine or 35 mm slides slightly amazes me. It is not at all rare at our cine evenings, in fact one may almost say the film without a taped soundtrack is unusual. At the last evening meeting a 35 mm colour slide set was shown which not only had a taped commentary with music, but the slides were automatically changed by means of inaudible "blips" on the tape. To a beginner in the tape recording field like myself, that seemed almost like black magic!. Nevertheless I thoroughly enjoyed it.

Yours faithfully,

* * *

. . . about tape in Argentina

From:—D. H. N. Craig, c/o Swift, Maipù 88, Buenos Aires, Argentina.

*Dear Sir:—*I realise that by residing in Argentina I am not really entitled to take part in the questionnaire set out in your March editorial; nevertheless I thought you might be interested and in any case, no harm can come of it. My answers are given on the enclosed sheet.

Although I've been a reader of *Tape Recorder* for some time and from it gleaned useful hints and information, I have as yet to see correspondence from any other subscriber in this country. You may therefore be interested to have a very general résumé of the tape recorder situation here; but don't think I'm setting myself up as a professional authority on the subject.

All recorders are imported, none made locally. Philips and Gelo are the most-sold makes, followed by Grundig and Sony. Unfortunately British recorders are in the minority although some Truvox, Elizabethan and Brenell Mk V decks are occasionally seen. American recorders are in the same position as the British—i.e. few. Of all of these, almost none are stereo.

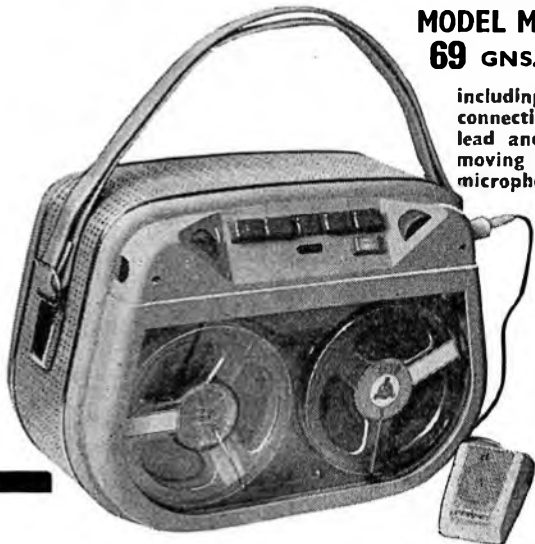
The surface has scarcely been scratched for using recorders to provide music in the home through hi-fi equipment but this is

Here is one expert's opinion of *

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* Mr. John Borwick, Technical Editor of a leading tape recording magazine.

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- High sensitivity level—no lack of gain with this machine.
- Very low background noise level—lower than on many mains machines, 40dB.
- Playback through radio or amplifier, with or without recorder's speaker operating.
- "Buy-anywhere" normal flashlight U2 batteries—not special radio-type batteries. Life up to 40 hours with standard cells.
- $5"$ reels of tape can be used, giving 4 hours, with d.p. tape on $1\frac{1}{2}$ r.p.s.
- Interchangeable Mains converter for home use or use with car battery.
- Prompt service facilities.
- Designed and engineered by an old-established firm which for years has produced precision clocks and watches, then clockwork tape recorders, and now, for the last five years, all-battery recorders. This valuable experience has culminated in the unique Butoba MT5.

Full details of the machine and accessories from sole importers:

DENHAM & MORLEY LTD.,
Denmore House, 173-175 Cleveland Street,
London, W-1 Tel. EUSon 3656-7

READERS' LETTERS—(continued)

not surprising as there are comparatively few of the latter either; furthermore there are no locally-made amplifiers or radios with flat outputs to recorders resulting in people finding it awkward to make their own, satisfactory, recording off records or radio. As if this wasn't enough, no pre-recorded tapes are available on the market.

Many small Gelosos are used to record conferences, lectures and for dictation by doctors, lawyers, students. Many night-clubs use recorders instead of record players but this is merely to facilitate working—they do not usually hire orchestras.

Generally speaking, Grundig are the only consoles imported with recorders already incorporated (usually the TM-60).

Locally-manufactured loudspeakers, mostly of 15 Ohm impedance and of fair quality, are available mostly being specified for use in Karlson enclosures.

Prices of recorders are high due to Import Duties. Examples, equivalent in £ are: Philips EL 3536 £254; EL 3541 £116; Grundig 1K-60 £292; TK-35 £135; TK-24 £145; Geloso 258 £100. An average monthly wage can be considered around £60. Many recorders are brought in for re-selling by returned travellers, at prices about 25% lower.

Tapes of most makes, sizes and lengths are readily available; price indications 1,200ft. STD £2 16s., 1,800ft. LP £3 5s. and 2,400ft. DP £5 16s. Accessories are almost unobtainable and splicing is done with scissors and splicing tape.

FM transmissions on 96.5 and 99.1 m/cs are made only by the Government's station (equivalent to the BBC) and only experimentally, so far poor in quality. AM is also poor as there are about 13 commercial broadcasters on the MW and another dozen or so are easily picked up from nearby Uruguay, causing overlaps.

All in all, we are in a pretty backward situation with little prospects of improvement. Yours faithfully.

... about electric shock

From:—E. A. Waddon, 13 Blake Road, West Bridgford, Notts.

Dear Sir:—As an electrical engineer responsible for the safety of personnel, I was horrified to read the article on Home Recording by John Borwick in this month's *Tape Recorder*. Does not Mr. Borwick know that 240 volt A.C. can kill? And that some dozens of fatalities occur a year, caused by electrocution, a large proportion of which are due to faulty or wrongly connected leads? Mr. Borwick states that "the principal worry is safety from electrical short circuits". Sir, short circuits are taken care of by the normal house fuse or cut out, but nothing will take care of a bad shock or electrocution, should a person make contact with anything alive. Not one word of warning is given about 240v on wet grass, etc.

The extension lead shown in fig. 1, is the correct method if properly carried out, but a more lethal arrangement than fig. 2, is difficult to imagine—a two pin plug and what looks like a metal lampholder, in inexperienced hands out of doors—I shudder.

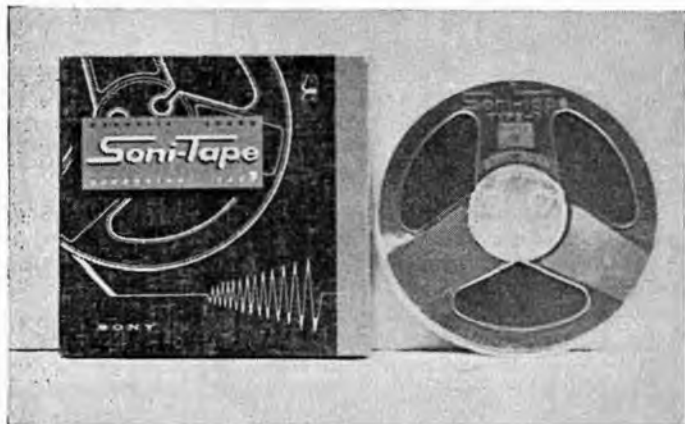
I can only suggest and pray that you will publish a warning that, if a recorder *must* be taken out of doors, the system shown in fig. 1 is used, constructed by a qualified engineer, and that the method in fig. 2 is withdrawn completely. Such an arrangement should not be used in any account. I also pray that the warning will be seen by all those recording enthusiasts who will be tempted to gamble with death in the manner described by Mr. Borwick. Yours faithfully.

Footnote: In fairness to the author of the article, he did specifically state. "Do use heavy or medium duty cable, covered with rubber or thick plastic, and don't let it or the recorder stand in wet grass, etc." Nevertheless, we are ashamed that we allowed such a recommendation to creep into the *Tape Recorder* without our usual warning about **danger from electric shocks**. Regular readers of this paper will know our feelings on this point. So, if only for the valuable advice it carries, we publish Mr. Waddon's letter in full. The following figures, supplied to us by The Royal Society for the Prevention of Accidents, further emphasises the need for care. Fatal Accidents 1960—Electrical Accidents in all forms 134 (49 domestic premises—85 industrial premises) 1959—141 accidents. Editor

TAPE, RECORDERS & ACCESSORIES

FIRST DETAILS OF NEW PRODUCTS

● We remind our readers that notices of equipment listed and illustrated in this monthly feature are in no sense reviews. When figures, specifications and diagrams are published, these data are extractions from manufacturers' lists. When samples of this equipment are submitted for test, they are passed to our technical contributors, whose reports are published in a separate section.



SONY of Japan, manufacturers of mains and battery tape recorders are now exporting *Sontape* to this country. This is supplied packed in polythene envelopes and attractive boxes in the following sizes: 3 in. (200 ft.) 6s., 5 in. (600 ft.) 16s., 5½ in. (850 ft.) £1 2s. and 7 in. (1,200 ft.) £1 8s. These tapes are available from the U.K. Distributors, **Tellux Ltd., 44 Brunel Road, London, W.3.**

Two New W.A.L. Products

WELLINGTON Acoustic Laboratories Ltd., makers of tape recording accessories, have recently added two new products to their range—the *Hi-Gain* and the *D-Mag*. The *Hi-Gain* is a battery operated, transistorised pre-amplifier, with built-in tape equalisation which can be coupled direct to the playback head of a tape deck. This allows the deck to be used for dubbing, tape monitoring, and adding stereo to existing mono machines. Current consumption is claimed to be 1.6mA which is calculated to give 1,000 hours continuous operation. Two inputs are provided; low impedance not greater than 2,500 ohms, high impedance 25,000 ohms. The size is 6½ × 2½ × ½ in., weight 18 ozs., price complete with battery, leads and plugs £7 16s.

The second new product, the *D-Mag*, also provides several facilities for the price of a single instrument. It can be used for which allows the operator to pinpoint and erase the unwanted sounds on striped film and recording tape. A concentrated field is set up in the very small gap between the tips of the probe which allows the operator to pinpoint and erase the unwanted sound. The *D-Mag* measures 2 in. square by 1 in. deep and the probe extends 3 in. The weight is 9½ ozs., price £2 10s. and both of these items can be obtained from dealers. **Manufacturers, Wellington Acoustic Laboratories Ltd., Farnham, Surrey.**

WITH reference to the enquiry regarding mixer impedances (*Tape Recorder—June 1961—Page 251*), **Standard Telephones and Cables Ltd.**, inform us that they can supply a transformer with an impedance ratio 30—1,000 ohms. It is of toroidal construction and was originally designed for incorporation in their 4032 Hand Microphone when this instrument was required for use with a *Fi-Cord* Tape Recorder (Input Impedance 1,000 ohms).

The charge for these transformers is £2. 5s. each. The reference number is CAV-4200-34. The address is **Standard Telephones and Cables Ltd., Hide Place Works, Esterbrooke Street, Victoria, London, S.W.1.**

Pocket-sized Portable

A NEW transistorised portable tape recorder, small enough to fit into a coat pocket or handbag, has been introduced by G.B.C. Electronic Industries. Known as the *Clarion 88*, this new machine weighs only 3 lbs, complete with batteries and measures 7½ × 4½ × 1½ in. Features include, push button controls governed speed of 1½ i/s, and a safety interlock button to prevent accidental erasing. The pocket *Clarion* takes 3-inch spools. It will run for approximately 30 hours on three U11 and three U12 batteries, a mains converter is available which enables the machine to be used from the mains supply. Special adaptors are provided so that the small spools can be played back on other machines. The price of the new *Clarion 88* is £40 19s., leaflets can be obtained from the distributors **G.B.C. Electronic Industries Ltd., 121 Edgware Road, London, W.1.**

RENDAR PLUGS AND SOCKETS



IN last month's article "Home Recording" a suggestion was made for lengthening a microphone lead using a film storage can fitted with jack plug and socket. A more professional way of making this joint is by using screened cable connectors. One Company manufacturing such a connector is **Rendar Instruments**, who produce a full range of jack plugs and sockets, screened and un-screened. Screw Locking devices can be supplied if required. Water, Dust and Twist-proof connectors are available and illustrated leaflets can be obtained from the Manufacturers, **Rendar Instruments Ltd., Victoria Road, Burgess Hill, Sussex.**

Four New Dynamic Microphones

FOUR Kent Dynamic Microphones have been introduced in this country by **Selmer**. They are the D.M. 10; D.M. 17; D.M. 20 and the D.M. 21. The D.M. 21 is suitable for hand use or fitted to a neck halter which is available as an extra. Characteristics are non-directional and high impedance, sensitivity 75 dB and the price is £5 5s. complete with 20 ft. of cable. The D.M. 10 can be used with a table or floor stand or as a hand microphone, and is omni-directional. Sensitivity is 70 dB, rating, high impedance. Price £6 6s. The D.M. 17 is a tilting floor stand microphone with side fittings and non-directional characteristics. Sensitivity is quoted as 71 dB. Price £5 5s. Finally the D.M. 20 is the most suitable for public address work or recording equipment, and can be fitted to any floor stand. Frequency Response claimed is 70 to 10,000 c/s ± 5 dB. It is supplied with 20 ft. of detachable cable and the price is £8 8s. Floor stands and accessories are available, and further details may be obtained from **H. Selmer, 114-116 Charing Cross Road, London, W.C.2.**

EQUIPMENT REVIEWED

REFLECTOGRAPH MODEL A TWO-TRACK RECORDER



Manufacturer's Specification

Power requirements: 200—250v. **Consumption:** 100 watts. **Inputs:** mic., not less than 100K ohm. **Radio:** not less than 10K ohm. **Output:** 3 watts. **Frequency Response:** $7\frac{1}{2}$ i/s, 50 to 10,000 c/s., $3\frac{1}{2}$ i/s, 45 to 7,500 c/s, both ± 2 dB; **Signal to Noise ratio:** better than 45 dB (unweighted including hum). **Erase and Bias Frequency:** 63 Kc/s. **Wow and Flutter:** 0.2% RMS at $7\frac{1}{2}$ i/s. **Position Indicator:** Clock type. **Record level:** Meter indicator. **Spool Size:** up to $8\frac{1}{2}$ in. **Automatic Stop:** When metallised leaders are used. **Motors:** Direct Drive synchronous capstan motor, two Garrard side motors. **Amplifiers:** Separate record and playback. **Valve Complement:** 1 EF86, 2 6BR8, 1 ECC82, 1 ECC83, 1 EL84, 1 6AM5, 1 EZ80. **Dimensions:** 20 × 16 × 10 in. **Weight** 50 lbs. **Price:** £115 10s. **Manufacturers, Multimusic Ltd. Mayland Avenue, Hemel Hempstead, Hertfordshire.**

REFLECTOGRAPH tape recorders have a reputation for performance above the average, and for this reason they appeal to the enthusiast and semi-professional user rather than those who are merely interested in recording "pop" music from radio. There has been some delay between the first advertisement for their new machine and its general availability, and this seems to have whetted the appetite of many readers for news of the machine.

Two models of the *Reflectograph* are available, the "A" model being a standard two-track recorder while the "B" model has $\frac{1}{4}$ track heads, required to play four-track tapes. A two-track recorder was submitted for review but, as the tape drive mechanism and amplifiers are identical, it is reasonable to expect that the "B" model will differ only in that the signal/noise ratio will be lower by 2-4 dB than in the "A" model.

As will be seen from the photograph, the new *Reflectograph* is unconventional in appearance, for there is no carrying case, or indeed handles of any kind. A two-tone case is available as an optional extra. It is clearly intended for semi-permanent installation rather than for taking from party to party to listen up the proceedings. Lifting is not troublesome, the weight being only 50 lbs., while the two recesses in the ends provide convenient holds. The dimensions are 20 × 16 × 9 in. The shape and construction make it easy to build the machine into existing furniture though the three input and output jack sockets located in the wooden ends require three or four extra inches on the width if the jack plugs are to be withdrawn with the machine *in situ*.

No cover is provided for the deck and thus it is likely to collect dust unless mounted in a drawer or on slides in a cabinet. Knobs with recessed heads and the grooves along the top and bottom of the control panel are ideal dust collectors, while the panel and skirts on the control knobs, though attractive in appearance, tend to pick up finger marks and may lose their pristine appearance after a few months' use. Despite this criticism, it is certainly one of the most attractively styled tape recorders on the market.

Construction is another unconventional aspect of the *Reflectograph*. All the "works" are mounted on cast aluminium deck

frame and sheet metal chassis clamped between two wooden end cheeks which form the "legs" on which the machine stands. A large 10 × 7 in. speaker is mounted in one end. Access for simple service is particularly easy, for removal of four screws in the front panel enables valves to be changed; while removal of the bottom panel provides access to almost all the "electronics". The theme of easy access is continued on the top deck, the tape run being completely open, though some protection against dust getting on to the heads is given by an overhanging cover. Spools up to $8\frac{1}{2}$ in. diameter can be accommodated.

Controls

Editing is facilitated by a clock type footage counter, more troublesome to read than one of the digital type, but not likely to introduce slight flicker on the digit's change. The visibility would be enhanced by inclining the dial slightly. Spools of up to $8\frac{1}{2}$ in. diameter can be accommodated.

A "lever" control is employed for the tape motion, three positions of the control giving "off", "record/replay" and "fast wind", the direction of fast wind being governed by a separate knob which also allows the rewind speed to be controlled. This is an excellent facility for it allows the tape to be run up slowly to a really high speed for winding or rewinding, and yet allows it to be brought gradually to a standstill without imposing high stresses on the tape due to a fierce but efficient braking system. It is also invaluable when searching for a particular word while editing a tape. As the rewind speed is under the control of the operator it is difficult to be specific, but 1,200 ft. of tape can be rewound in 50 seconds without great difficulty. A separate, red push button is provided to trip the lever control to bring the tape to a standstill from the "play" position, though this stop button is inoperative on rewind.

Two other knobs select either of the two speeds, $7\frac{1}{2}$ and $3\frac{1}{2}$ i/s, and operate the mains switch. The mains switch and speed selector control are electrically interlocked with the lever control to ensure that it returns to the *off* position when the mains circuit is open. This is a very necessary precaution, for three motors are employed and the capstan motor has sufficient stored energy to wind a lot of tape on the floor if the capstan is left in contact with the spooling motors de-energised.

Recording Meter

Four skirted knobs along the front panel provide control of *bass* and *treble*, *replay volume* and *record volume*; all the knobs are scaled, though it was noted that none of the controls would rotate through the angle indicated by the scale. An edgewise meter, set on the right-hand side, indicates recording level. Meters are expensive and not usually fitted to domestic recorders, but they have the great advantage of allowing the recording level to be set or re-set with precision. In this respect they are an absolute "must" to the professional user.

A knob on the left side of the panel selects *record* or *replay*, a mechanical interlock preventing the inadvertent use of *record*, while a companion knob on the right side allows the internal replay amplifier to be connected to the incoming signal or to the recorded signal on the tape. Separate erase, record and replay heads are fitted, so it is possible to monitor the signal recorded on the tape while a flick of the switch allows the incoming and recorded signal to be compared. These are invaluable facilities for the professional recording engineer.

Jack sockets for microphone and radio inputs, a 15 ohm. output and a *hi-fi output* from the pre-amplifier of about 500 millivolts are fitted to the sides and rear of the machine.

Objective Measurements

Fig. 1 shows that the replay response at the speaker terminals extends to well beyond 10 Kc/s., the limit of the E.M.I. SRT.13 test tape used for the measurements. At the low frequency end

of the range there is a loss of about 6 dB at 40 c/s, but this can easily be corrected by the tone controls.

The replay response measured at the pre-amplifier output socket was impressively smooth, being flat within about ± 1 dB between 40 c/s and 10 Kc/s. This is about the tolerances of the SRT.13 test tape and it thus represents the limits of

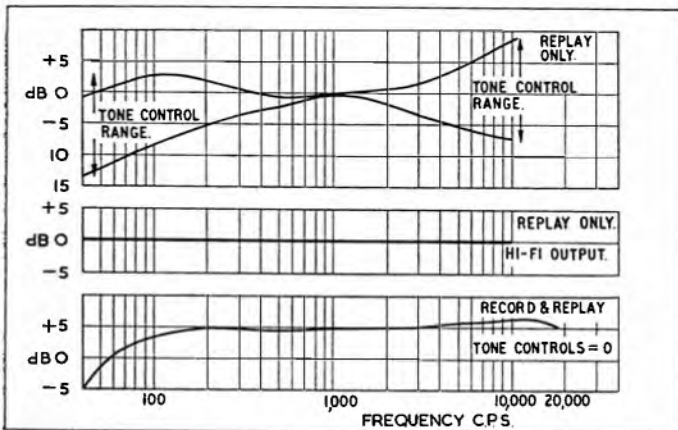
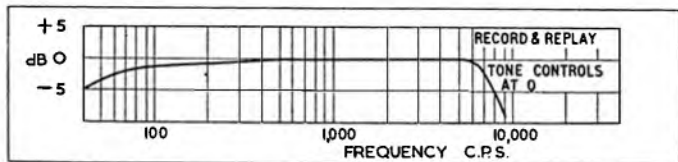


Fig. 1. (Top) Replay response at the speaker terminals using the EMI SRT.13 test tape. (Middle) Replay response at the pre-amplifier socket. (Bottom) Record and replay response at 7½ i/s.

accuracy of the tests. It was noted that insertion of the jack into the pre-amp socket disconnected the internal speaker and amplifier. There are occasions when it would be advantageous to have the internal speaker running at a low level to monitor the tape being played, so it may be worth modifying the socket connections to leave the internal amplifiers in circuit when the pre-amp output is in use.

The descriptive literature suggests that the output voltage of this socket is 150 mV but in the particular machine tested it was nearer 500 mV from the standard SRT.13 test tape. The waveform was unusually clean at the low end of the range, a region where the average domestic tape recorder does not score as a result of using a small output transformer.

The record and replay response at the two speeds is shown and it will be seen that the response is substantially flat to at least 16 Kc/s at a tape speed of 7½ in./sec. and to about



Record and replay response using test tape at 3¼ i/s.

8 Kc/s at the lower tape speed. Mr. Cunningham-Sands the designer of the Reflectograph obviously believes that further extension of the frequency range is inadequate compensation for the harmonic distortion that results at the top end of the frequency range. There is an increasing amount of support among serious workers for this point of view.

Signal/Noise Ratio

This is outstandingly good, no doubt to the use of D.C. heating for the critical valves and very careful layout of the wiring to the grid and heater circuits. The values obtained are shown in table 1. Incidentally it was noted that the substitution of

Table 1—Signal/Noise Ratio

Speed	Weighted	Unweighted
7½ i/s	56 dB	51 dB
3¼ i/s	60 dB	51 dB

Table 2—Wow and Flutter

7½ i/s	Replay only	.09%
	Record and replay	.12%
3¼ i/s	Record and replay	.15%

virgin tape for the fully modulated but wiped-on-the-machine tape improved the signal/noise ratio by only 2 dB, a very considerable tribute to the efficiency of the erase head and its push-pull drive oscillator.

It will be noted that the signal/noise ratio obtained at the lower tape speed approaches 60 dB: a very good result but due in part to the restricted upper frequency range found when checking frequency response.

Wow and Flutter

Table 2 records the values measured at the two speeds. The "record only" figures were taken using a tape recorded on an E.M.I. BTR2 professional machine having a total wow and flutter of only about .04% and thus the first figures in table 2 represent the performance that would be obtained when the Reflectograph was used to play professionally recorded tapes. During the measurements of wow and flutter it was noted that the values fluctuated a great deal less than is usual with domestic machines.

Acoustic Noise

The sound level with the capstan motor running was 34 dB, and this increased to around 36 dB when the tape transport was in operation. This sound level is not likely to arouse comment when the machine is run in an average living room but might do so when it is used in an unusually quiet room.

General Comment

The Reflectograph is in the high price bracket and as with any quality product one always wonders whether the extra cost is justified. Let us look at what we get for the extra money. A typical tape recorder usually uses about five valves (counting twin triodes as two). The Reflectograph uses a dozen, necessitated by such desirable features as the separate replay head and amplifier and the push-pull bias and erase oscillator. D.C. heating for the critical valves results in an exceptionally good signal/noise ratio but the cost of the extra rectifier and smoothing capacitor generally results in it being excluded from the average tape recorder. Provision of a meter to monitor the recording level is expensive but essential for serious work. Low values of wow and flutter demand selective assembly or precision mechanical work, both being expensive solutions to the problem of obtaining uniform motion of the tape.

On the debit side, the absence of separate mixing controls for radio and microphone input and the absence of a "pause" control will be missed.

Summary

A month's use of the Reflectograph revealed no troubles of any kind. I liked the separate control of rewind speed and the ease in editing which it gives, but the user has to remember that the stop button only functions on play and record but not on rewind. The tape function lever control engaged forward motion of the tape half-way across the gate so that it had to be moved smartly into the rewind position or the tape may move off in the wrong direction. It is a matter of personal opinion but I sense a public preference for push button control, a view that also appears to be penetrating the professional field.

The large internal speaker gives unusually good reproduction, but the necessity of keeping any tape recorder portable limits the size of the enclosure and hence the quality of reproduction. All the response curves, but particularly that obtained at the pre-amp socket, are unusually smooth; and this in conjunction with the low values of wow and flutter result in a smoothness in quality that is rarely evident in the average domestic tape recorder.

The handbook that accompanies the machine is well worthy of comment for its unusual completeness. Circuit and complete details of all components are included, a particularly valuable feature for an owner living abroad and thus out of immediate contact with spare parts. Undoubtedly a tape recorder with an all-round performance much above the average. Definitely a machine for the semi-professional user, and not intended as a birthday present for your daughter, whatever your income bracket.

J. Moir.

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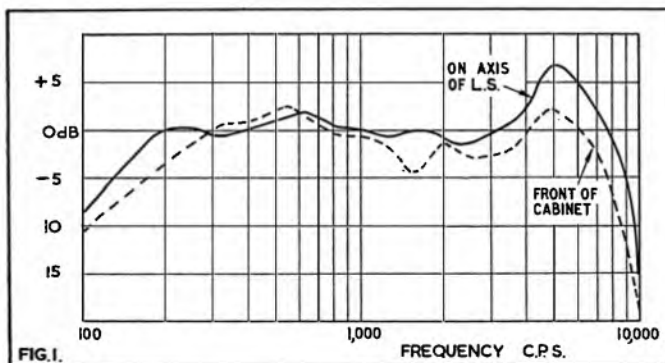


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Technical Specification:—Tape speeds: $7\frac{1}{2}$ i/s, $3\frac{3}{4}$ i/s and $1\frac{7}{8}$ i/s. Twin track, Automatic amplifier correction at all speeds. 7 inch spools. Recording sense: top track left to right (International standard). Rewind and forward speed: 1,200 ft. in less than 1 minute. Magic eye recording level indicator. Mains voltage: A.C. only 200-250v. 50 c/s. Consumption: approx. 95 watts. Valves: ECC83, ECL82, EL84, EZ80 and EM84. Three motors. Pause control. Superimpose control. Tape counter. Separate mixing controls for mic. and gram. Separate monitor gain control. Separate on-off switch. Separate tone control. Frequency response: $7\frac{1}{2}$ i/s, 60 to 14,000 c/s, $3\frac{3}{4}$ i/s, 60 to 7,000 c/s, $1\frac{7}{8}$ i/s, 60 to 3,500 c/s. S/N ratio better than 40 dB. Total wow and flutter: Better than 2% at $7\frac{1}{2}$ i/s, and better than 3% at $3\frac{3}{4}$ i/s. Power output: 2.5 watts. Price: 36 Gns. Mfg. by Robuk Electrical Industries Ltd. 559/561 Holloway Road, London, N.19.

The above specification is ambitious for a machine in this price range, and it meets the specification in almost every respect. Styling is very original, and the sound quality is so different from the average portable recorder that it must be mentioned first, to explain the rather unusual response curves shown later. In fact I am going to reverse my usual review sequence completely, and start with the subjective testing. My first impression, on switching to replay after a music recording session, was of a rather glittering, high note response, reminiscent of the quality on a modern 'pop' record. There was no need to sit on the axis of the speaker for adequate top response, it was there all around, suggesting a multitude of high frequency 'tweeters'—but inspection revealed only one small 7 in. by 4 in. speaker on one side of the case. The effect is produced by quite deliberate 'doctoring' or 'faking' of the amplifier frequency response to suit the characteristics of the loudspeaker and cabinet used in this recorder. The word 'faking' is not meant in any derogatory sense; the world famous Ampex Corporation market a special combined amplifier and loudspeaker where the response of the amplifier has been made complimentary to that of the speaker and cabinet so that the overall response is level.

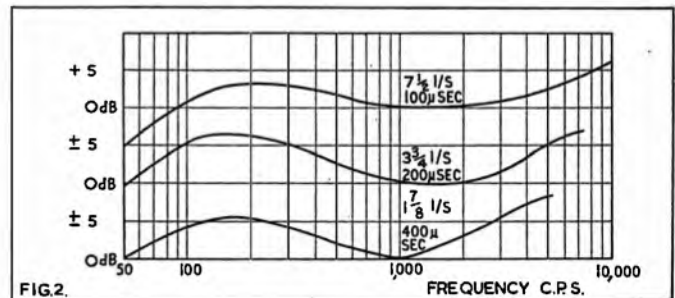
Acoustic Response: My first test was to thread up a White Noise test tape and measure the output from the loudspeaker with a calibrated microphone. Fig. 1, solid curve, shows the response on



the axis of the speaker, and the dotted curve the response one foot away from the front of the cabinet, i.e. at 90 degrees from the axis of the speaker. It will be seen that the sound output is constant within plus or minus 4 dB over the range 200 c/s to 8,000 c/s over a wide angle. It seems best to face the speaker into a corner, or onto a wall, to distribute the high note response as widely as possible.

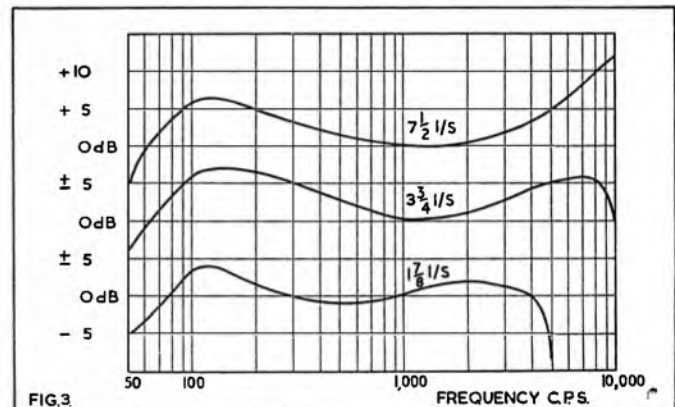
Replay only Response: Test tapes with surface induction characteristics of 100, 200 and 400 microseconds were played at tape speeds of $7\frac{1}{2}$, $3\frac{3}{4}$ and $1\frac{7}{8}$ i/s respectively, and the responses are indicated in Fig. 2. It will be seen that the bass and top responses are both raised relative to the mid frequency response. Listening tests on pre-recorded tapes show adequate top response and sufficient bass response, having regard to the limitations of the small speaker enclosure, to ensure musical balance.

Record-Play Responses: The record-play responses of Fig. 3 show that at the commonly used speed of $3\frac{3}{4}$ i/s the recorded response is almost identical to that of the test tape. At $7\frac{1}{2}$ i/s rather more top response is recorded and the tone control has to be used to restore the balance. The recorded $1\frac{7}{8}$ i/s response does not correspond to any particular time constant, but there is no agreement



about a standardised recording characteristic for this speed, and, so long as the combined record-play response is satisfactory, all is well! Speech quality is excellent at this speed.

A check was made that the recorder would record a level 12 dB above test tape level without distress, and it passed this test with flying colours. The magic eye beams just closed at 13 dB above test tape level. On a peaky microphone, or at the lowest speed, it is better to under-record slightly, due to the extreme top pre-empha-



sis, but on radio recording, or recording with a wider range level response microphone, the level can be fully maintained.

Signal Noise Ratio: The combined noise and hum content was 26 dB below test tape level, or 38 dB below peak recording level. The hum and hiss are both exaggerated somewhat, because of the concave frequency response, but this shows up more in the objective measurements than in actual listening tests. Proper earthing of the Green mains lead is most important on this machine to reduce mains hum to the minimum; indeed it is so essential that I would suggest that the manufacturers investigate the possibility of a foil electrostatic screen around the inside of the cabinet.

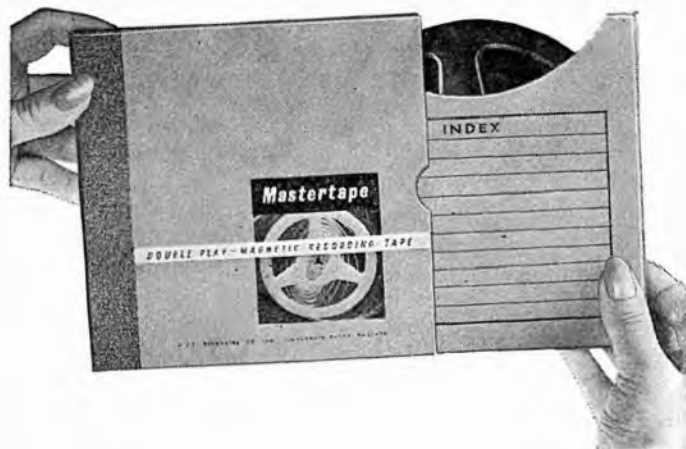
Power Output: Waveform distortion was evident above 2.3v r.m.s. across a 3 ohm load. This corresponds to a power output of 1.8 watts. The maximum undistorted acoustic output at one foot from the speaker fret was 107 phons.

Wow and Flutter: Fig. 4 illustrates the "fluttergrams" or pen recordings obtained from a wow and flutter bridge, and indicates that the specification limits are met in this machine. All show a slight pulsating torque flutter at 100 c/s from the four pole capstan motor, together with a 23 c/s motor rotation frequency flutter due to a slightly eccentric stepped pulley or bent motor shaft.

(Continued on page 302)

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EQUIPMENT REVIEWED—(continued)

The smoothing effect of the flywheel is reduced at the lower speeds and the 23 c/s 'gargle' is quite evident on $1\frac{1}{2}$ i/s music recordings. At $3\frac{1}{2}$ i/s the flutter could be heard on a pure tone but was not objectionable on most music recordings.

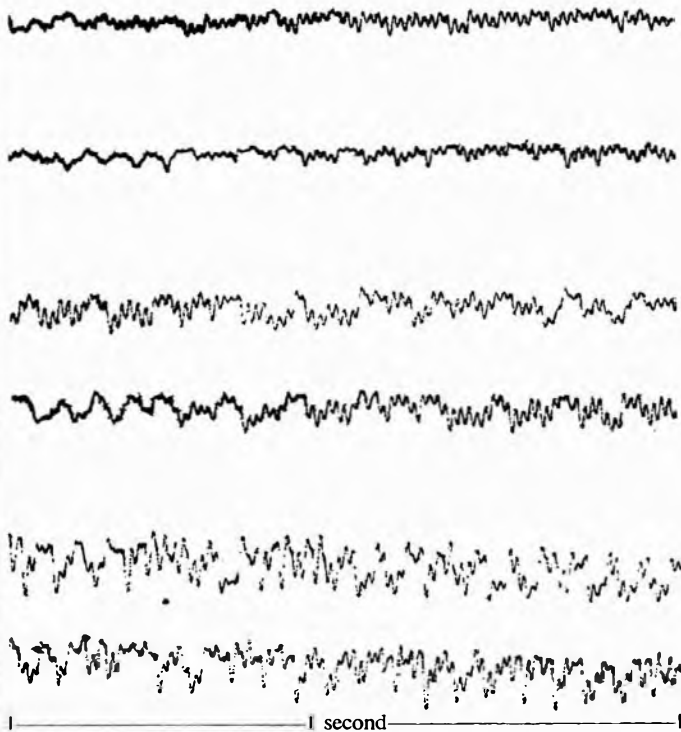


Fig. 4. The Robuk RK.3 fluttergrams (top) $1\frac{1}{2}$ i/s. 0.15% (middle) $3\frac{1}{2}$ i/s. 0.25% (bottom) $1\frac{7}{8}$ i/s. 0.4%

Comment: The designer and manufacturer are to be congratulated on breaking new ground in the small, relatively cheap, table-top recorder class of instrument. There is always the risk of the extended response showing up imperfections in amplifier design or tape transport mechanism. As some wise man once said, "the wider you open a door the more dirt blows in". It is a sad fact that a wide top response emphasises the deleterious effect of inter-modulation, whether it be caused by wow and flutter, amplifier non-linearity, pentode distortion, low bias or over recording—hence the popularity of the top cut tone control. So far as my rather ageing ears can tell, this machine has skated round most of these pitfalls and it has more virtues than faults. So my verdict is try it and see what *you* think!

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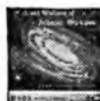
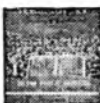
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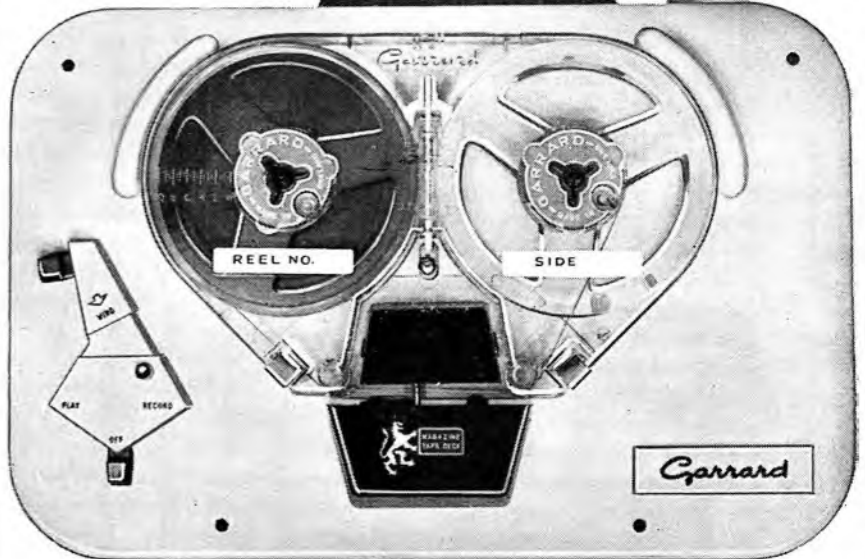
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