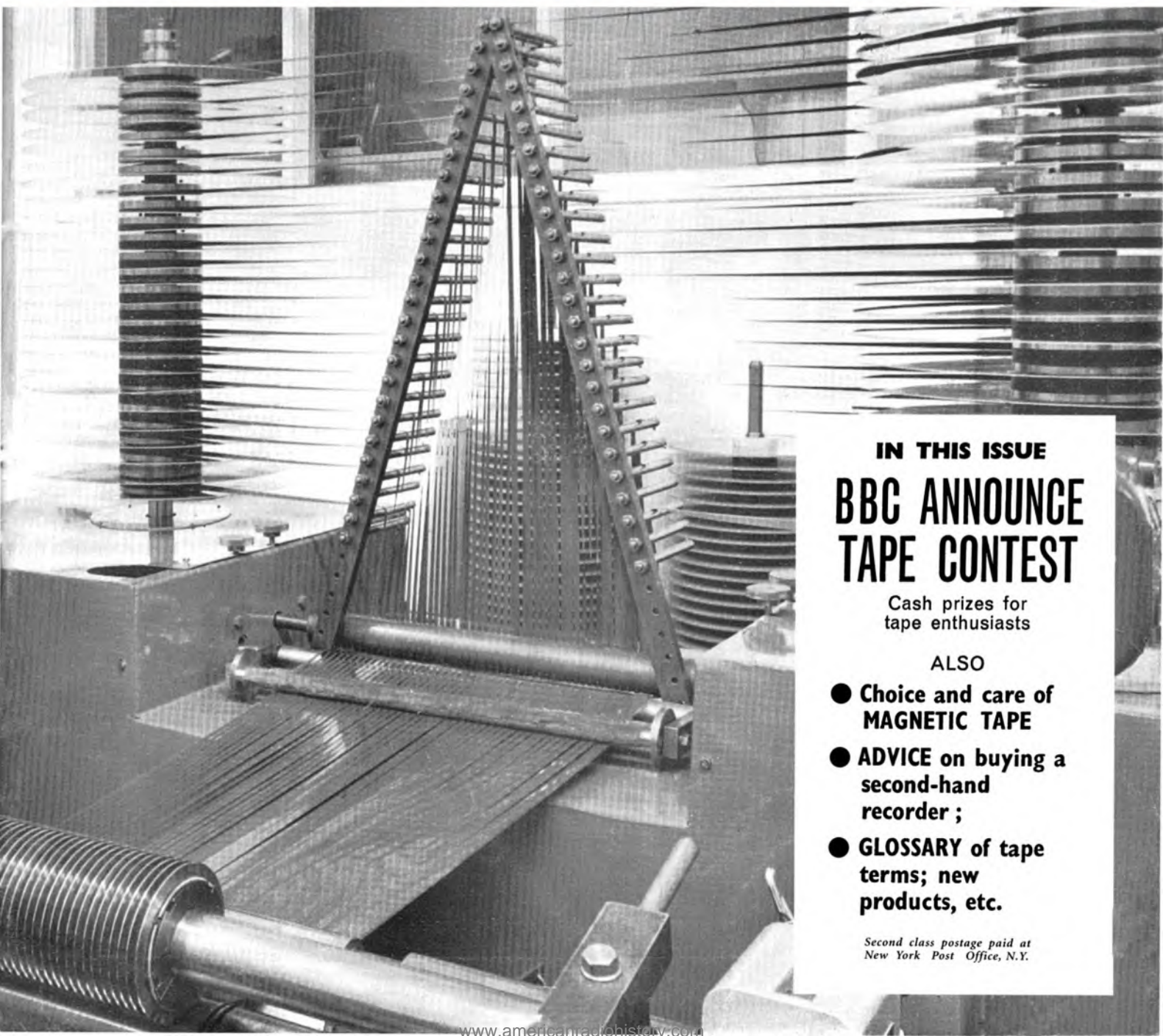


TAPE

RECORDING MAGAZINE

JULY 1966

2½



IN THIS ISSUE

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tape enthusiasts

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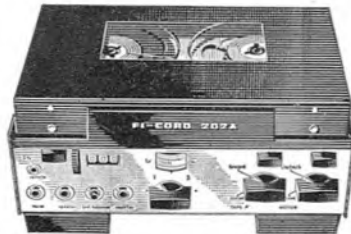
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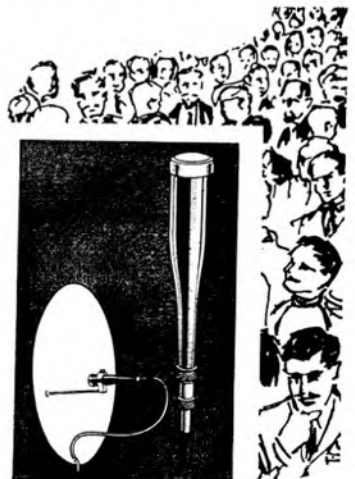
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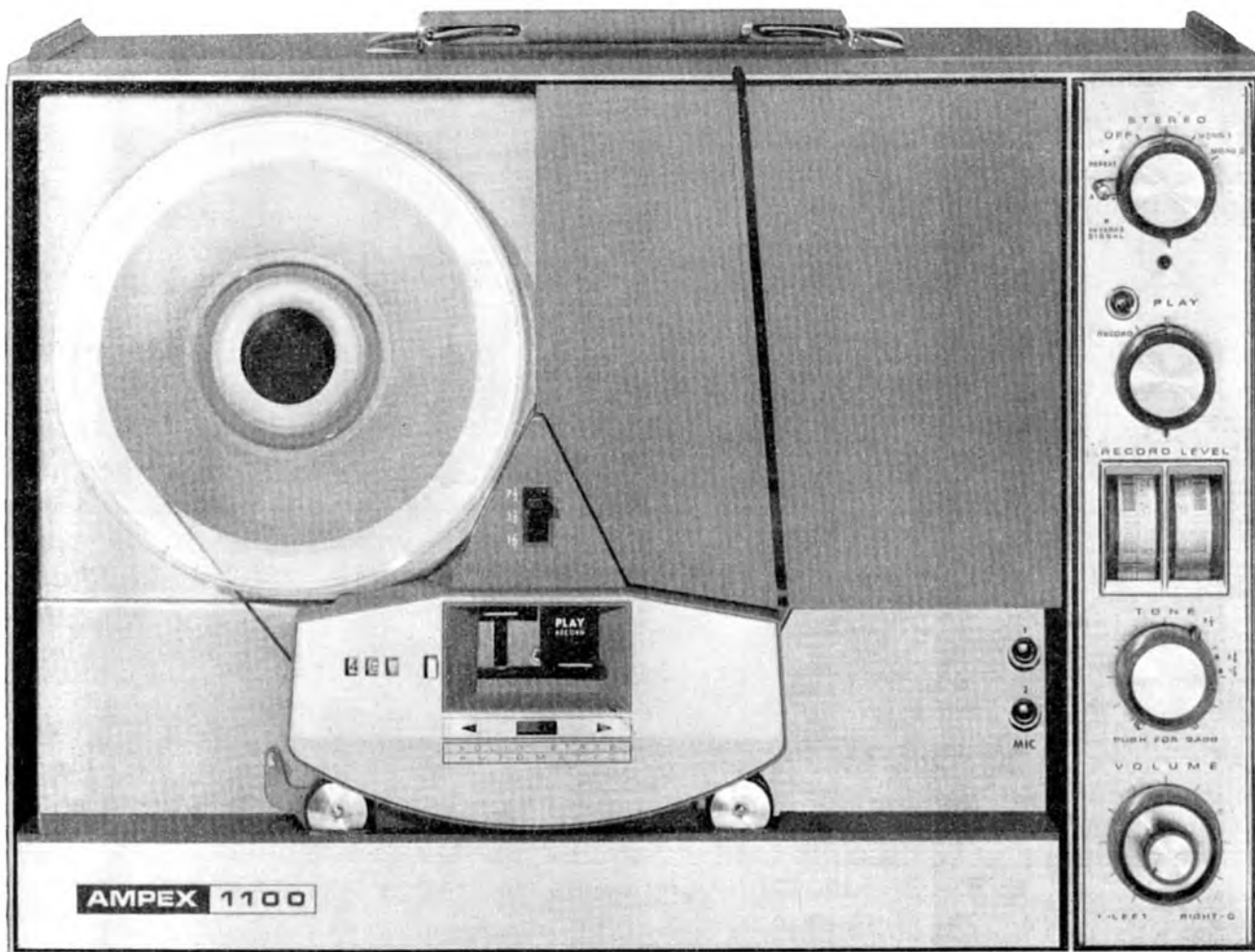
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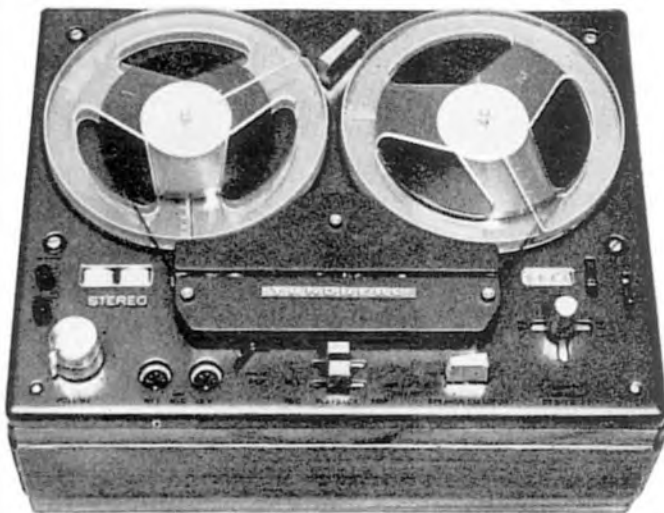
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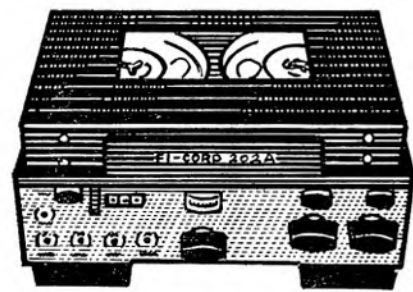
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TAPE

RECORDING
MAGAZINE

Vol. 10

No. 7

July 1966

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COVER PHOTOGRAPH: Our geometric design illustration this month is provided by the tape-slitting process in the manufacture of recording tape. Taken at Ilford's factory, the photograph shows the rotary knives, bottom left, slitting the tape into quarter-inch widths, before it is wound on to large spools to left and right of the photograph. Further information about tape is given in the article "Choice and care of magnetic tape" on page 240 of this issue.

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EDITORIAL

ADVERTISING

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Tape trends and tape talk

By the Editor

THE BBC is organising its own amateur tape recording contest. North Region, at Manchester, has published an invitation to listeners who are recorder owners to submit tapes not exceeding eight minutes duration on the theme of "Summer". Tapes must be recorded at not less than $3\frac{1}{2}$ ips and must be submitted not later than September 30. Detailed rules appear on the facing page.

I feel honoured to have been invited to join Timothy Eckersley, Assistant Head of Central Programme Operations (Recording) BBC, and David Scase, Director of Productions from Liverpool Playhouse on the judging panel.

The BBC decision is a most exciting development. I have long been convinced that the BBC has it in its power to do more to stimulate amateur recording activity than almost everyone else put together. Now we shall see!

The new contest has been in the planning stage for quite a while: in part, at least, it has developed from the International Recording Contest in London last October, in which the BBC played a valuable role; but Colin Shaw, Assistant Head of Programmes in Manchester, had been working on the idea before that.

It seems to me a very good idea to start this experiment in the north. If it succeeds, I have no doubt the BBC will be ready to develop the contest more boldly later on.

The new contest is in no sense a rival of the well-established British Amateur Tape Recording Contest, which was established by this magazine ten years ago (it is interesting that the theme chosen by the BBC is exactly that of the original *Tape Recording Magazine* contest).

Tim Eckersley and I both serve as a link between the two contests and, as Vice-Chairman of the committee which now organises the BATRC, I have been able to keep it fully informed of the BBC's intentions. It can

be taken for granted that the two events, and their organisers, will enjoy a healthy relationship.

* * *

NOW THE FIRST videotape exchange between amateurs has taken place—between Shin Tanaka, of Kobe, Japan, and John and Maxine Ramsey, of Dallas, USA. The tape originated at the American end and was sent back with its new recording to complete the two-way exchange. That was on March 17 and the American magazine, *Tape Topics*, announces it as probably the first two-way exchange of personal video tapes.

World Tapes for Education, the pioneer among the American-based tape pals organisations, now announces that it is preparing to form a new section for members with video recorders.

WTE is also discussing the possibility of a Language Study Section to cater for members who are serious students.

Another reminder of the value of tape in this respect comes from Britain's Institute of Directors, which has now stepped up the activities of its Languages Centre. This was established in November 1963, using tape equipment and the now familiar language laboratory techniques. More than 1,100 directors and executives have now taken these courses, which achieve colloquial fluency in as little as three to four weeks with only half-day attendance. There are now courses five days a week.

The video recorder, of course, is going to revolutionise teaching techniques further. Philips have just demonstrated in several Continental cities the use of video for musical training. Musicians were shown giving lessons to young students. One of them, Herman Krebbers, explained: "What a pity that this unique educational medium did not exist before. It is of the greatest importance to show pupils exactly what they have done wrong. There are things you can tell them a dozen times without your being understood. Here, with the video recorder, they can see themselves face to face. It is very different from the mirror in which the image disappears with the motion. No, here the faults are 'called back'. Now it is possible to give pupils a clear indication of imperfections in behaviour and technique."

There will be many other subjects than music where the video recorder may be expected to initiate new teaching methods.

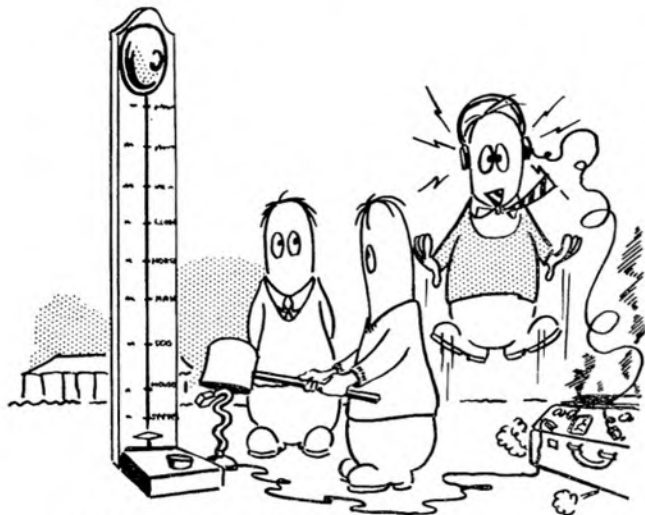
* * *

THE FEDERATION of British Tape Recording Clubs have done me the honour of electing me as their first President. I have followed the fortunes of the Federation from its foundation and I feel that it is today making the best progress it has ever achieved, thanks to the enlargement of the team of honorary officials and the recruitment of some highly-talented enthusiasts.

Now the Federation is offering useful services to its affiliated clubs and individual members (who now provide most of its income). There is a splendid tape-to-disc service, music appreciation tapes are available; there are plans for a language tuition service, and, of course, the Federation is now responsible for the library of winning tapes in the British and International Recording Contests.

An effort is being made to induce all clubs in Britain to register with the Federation, without obligation. My ambition is to see, during my term as President, a well-integrated national club movement ensuring the maximum co-operation between clubs and individual enthusiasts everywhere.

LAUGH WITH JEEVES



"I think the general idea was to record you hitting the peg, not the microphone!"

FURTHER opportunity for enthusiasts to collect cash for their recording technique and to have their tapes broadcast is provided with the announcement of a new tape recording contest.

The BBC North Region are organising the competition which is to have "Summer" as its theme. Listeners are being invited to submit tapes not exceeding eight minutes duration for the contest which is designed to find evidence of the imaginative use of the tape recorder.

Three prizes will be awarded. The First Prize for the sender of the best tape—which should be a combination of words and sounds—will be £25. There will be a second prize of £10, and an additional prize of £10 which will be awarded to the best entry from a competitor residing in the North of England. Eligible for this latter prize are enthusiasts in the counties of Cheshire, Cumberland, Derbyshire, Durham, Lancashire, Lincolnshire, Northumberland, Nottinghamshire, Westmorland, Yorkshire and the Isle of Man.

The theme of "Summer" can be interpreted broadly to cover a great many different subjects, demonstrating character and atmosphere. It was felt to be ideal for such a contest opening up a great range of possibilities for the modern lightweight recorder. The successful competitor is likely to be someone who fully exploits this range.

Although the rules and conditions have been kept to a minimum, there are one or two that should be highlighted. Especial attention is drawn to Rule 6 which expressly forbids the use of any copyright material, and the elimination of any quarter-track and slow speed recordings (Rule 2). The BBC are specifically interested in encouraging quality recordings and current policy necessitates the inclusion of these particular points.

THE JUDGES

The judges selected to hear the entries are:—

Timothy Eckersley, Assistant Head of Central Programme Operations (Recording), BBC.

David Scase, Director of Productions from Liverpool Playhouse; and

Douglas Brown, Editor of *TAPE Recording Magazine* and President of the Federation of British Tape Recording Clubs.

Their decision is to be final, and the BBC cannot enter into correspondence with competitors.

CONDITIONS

1. Competitors must be individuals or groups of individuals not engaged in sound recording as a profession. They may reside in any part of Great Britain.
2. Entries must not exceed eight minutes, although any competitor may submit up to three separate recordings. Recordings should be made on quarter-inch tape at a speed of 3½ ips or more, full

B.B.C. ANNOUNCE TAPE CONTEST

Editor of *TAPE*
joins judging panel
for 'words and sounds'
national tape competition

1st. Prize £25
2nd. Prize £10
Regional Prize £10

or half track. (Where half-track is used, the second track should be clean.)

3. The judges will look for imagination in the composition of the tape as well as for technical quality. Extreme technical skill, unaccompanied by imaginative effort, is unlikely to succeed.
4. At the start of each tape, competitors should record their names and addresses, the sub-title (if any) of the recording, and the duration of the recording.
5. Whilst every possible care will be taken of the recordings while they are in the possession of the BBC, the BBC cannot accept liability for any loss or damage sustained by the recordings. Competitors requiring acknowledgement of their entries' safe arrival should attach a stamped addressed postcard.
6. Material whose copyright is not owned by the competitor must not be submitted.
7. In addition to the prize money described above, the BBC will pay an appropriate fee for any recording which it broadcasts other than in a programme, at a date to be announced later, discussing the competition and announcing the results. The BBC does not, however, bind itself to broadcast any of the entries either in whole or in part.

Entries must reach the BBC not later than **September 30**, and be despatched to:—

BBC North Region Tape Recording Competition,
Broadcasting House,
Piccadilly,
Manchester.

Tapes will be returned as soon after judging as possible.



Astronaut John Glenn (left) and Fred Chandler of "TAPE"

TAPE AND AMERICA'S FIRST ORBITING ASTRONAUT

THE vital part magnetic recording tape plays in space research was acknowledged by astronaut John Glenn when he met leading science correspondents at a luncheon given by the 3M Company in London recently.

Colonel Glenn, America's first man to orbit the earth, told Fred Chandler of *TAPE Recording Magazine* (seen with the astronaut left) that he appreciated the importance of an instantaneous, accurate and permanent recording system. It was not possible he said, speaking as one with first-hand knowledge, to record everything during a spaceflight, yet it was vital that the information be recorded for later analysis.

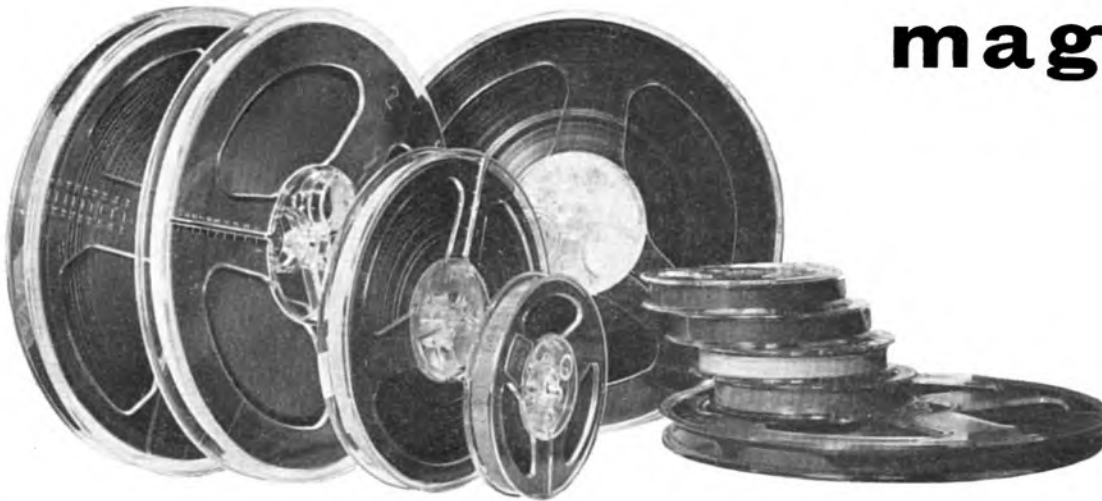
Earlier he had heard Dr. Matthew H. Miller, Chairman of 3M Research Ltd. of Harlow, describe the use of tape as an integral part of orbiting space units referring specifically to the use of Scotch tape for Mariner IV, the Mars exploration vehicle, and for Britain's own UK3 satellite due for launching next year.*

As a memento of his trip to London, Colonel Glenn received from Dr. Miller, a volume of Sir Winston Churchill's speeches recorded on Scotch tape.

(*Scotch tape carried in pioneer satellite flights": *TAPE Recording Magazine*, July 1959.)

The choice and care of magnetic tape

by L. Reid



THE newcomer to tape recording soon encounters things which puzzle him, and all too often the dealer who supplies his first machine can offer no advice beyond some elementary instruction in operating the recorder. This unsatisfactory state of affairs may sometimes be, and all too often is, due to unqualified staff. But even an experienced salesman often forgets that things which seem too obvious to need explanation may bewilder someone who is taking his first steps into the world of sound.

Not so long ago I heard a complaint from such a person to the effect that he could find very little guidance with regard to choosing the right sort of tape. This article is an attempt to remedy matters in this respect.

All too often the tyro who buys a reel of tape for some particular purpose finds that he has been sold something unsuitable because he himself was not very clear as to his exact needs. It is not enough merely to ask the shop to supply a new reel of tape for a tape recorder, or even to ask for "a five-inch reel of tape." Reasons for this will, I hope, become clear during the course of this article.

There is some excuse for confusion in the mind of a beginner who not only finds himself confronted by the products of many different manufacturers, but also has to decide between tapes made from acetate, PVC, Polyester or Mylar, in various lengths. Instead of finding one standard grade of tape suitable for all purposes, the beginner is offered a variety, for the introduction of thinner Polyester tapes has made available the range of extended play tapes. These are sold under such labels as Long Play, Double Play, Triple Play . . . and more recently . . . Quadruple Play! This simply means that by making the tape thinner the manufacturer has been able to accommodate more and more tape on the same size of reel, giving, as the description implies, increased playing time.

Reel sizes

For this reason it is not sufficient to ask for a certain size of reel, one must also specify the grade of tape required. This will be determined by the length of the item it is intended to record.

The standard reel sizes range from 3 to 8½ inches in diameter. These, in conjunction with the various tape grades give tape lengths which vary from 150 to 3,600 ft. The maximum reel size which you can use will, of course, be determined by the maximum size which your machine will accommodate. Many popular models only allow for reels up to 5½ inches, with some portable machines using much smaller sizes as their maximum.

While all this may seem very complicated at first glance it is possible, once a few basic facts have been grasped, to classify tapes in such a way that it becomes quite a simple matter to make the right choice. In fact for handy reference all the essentials can be

set out in the form of a chart (see **Table**) from which you can see at a glance how long any particular tape will play, or conversely, what tape length you need to give the required recording time.

The underlying principle of such a classification is that at a given recording speed a definite length of tape will pass the Record/Playback head in a specified time; if any two of these facts are known it is easy to discover the third.

Standard lengths

Considerable economy is possible by making use of the most suitable length of tape for each recording. This avoids those long blanks at the end of a tape which are so hard to fill exactly.

Recording tape is available in the following standard lengths: 450 ft., 600 ft., 850/900 ft., 1,200 ft., 1,800 ft., 2,400 ft. and 3,600 ft. These are, it will be noticed, in multiples of 300 ft., making playing time easy to calculate (as each 300 ft. extra tape adds approximately 16 minutes playing time at a speed of 3½ ips. Shorter lengths are available on the small three-inch reels used for tape exchanges.

Now it is obvious that as the tape length increases so must the reel become larger in order to hold it, hence the range of reel sizes which were introduced when there was only one standard grade of recording tape. The introduction of the thin long playing tapes have, of course, revolutionised the position by making more tape available on smaller reels. This explains why your friend's five-inch reel may play so much longer than the one you bought last time!

Longer playing time can be obtained either by ordering a *larger reel of the same grade* of tape, or alternatively, if your machine will not accept a bigger reel size by specifying the appropriate grade of extended-play tape.

Standard tape, in the less expensive ranges, is usually made from a material called acetate (I will come back to this later), which is thicker and stiffer than the other grades: better quality standard tape usually has a PVC base. Standard-play tape, in the lengths already mentioned, is usually supplied on reel sizes as follows: 300 ft. (4-inch reel), 600 ft. (5-inch), 900 ft. (5½-inch), 1,200 ft. (7-inch) and 1,800 ft. (8½-inch). A few manufacturers also provide intermediate lengths of tape: 850 ft. (5½-inch) and 1,750 ft. (8½-inch).

The advent of polyester (Mylar) as a base, made possible the development of thinner and more flexible tapes giving longer playing time and other advantages. These tapes greatly extended the amount of tape that can be wound on a standard size of reel.

For example, a seven-inch reel which formerly held a maximum of 1,200 ft. standard-play tape could now accommodate 1,800 ft. of long-play tape giving fifty per cent more playing time. By using still thinner tapes, the same seven-inch reel can hold 2,400 ft. of double-play tape, or 3,600 ft. of triple-play tape thus increasing the playing time by two or three times that of the original reel. Such tapes are particularly invaluable in cases, such as battery-operated portable recorders, where only a small size reel can be accommodated and where playing time was formerly very restricted on this account.

Converting the above tape lengths into actual playing times may make the benefits even more clear. Assuming the popular playing speed of $3\frac{1}{2}$ ips, the playing time available for each track of the relative tapes on a seven-inch spool would be 64 minutes (1,200 ft. SP), 96 minutes (1,800 ft., LP), 2 hours 8 minutes (2,400 ft., DP) and 3 hours 12 minutes (3,600 ft., TP). In the same way, the five-inch reel which some battery recorders use can be extended from 32 minutes per track with 600 ft. of standard-play tape to 96 minutes per track using 1,800 ft. of triple-play tape—a decided advantage.

As everything depends so much on tape length, it is perhaps best to order tapes by length rather than by reel size. The length is normally marked on the box, and the most suitable length for any possible programme can be found from the accompanying table.

Although it is possible, by making use of the various grades of tape, to obtain the same tape length on a variety of reel sizes (1,800 ft.: seven-inch LP or $5\frac{1}{4}$ -inch DP), there is no advantage in having too many assorted sizes. Your library will look neater if the same tape lengths are always on the same reel size, and this will also simplify indexing. (A suitable indexing system was described in my earlier article in *TAPE*, dated November 1964.)

I find that long-play tapes are of most value on the smaller reels for my battery portable machine, and on seven-inch reels to obtain the maximum recording time on my mains recorders. Short items, such as sound effects, are best stored on three- and four-inch reels as this avoids excessive fast winding in order to find a spot effect. While maintaining a uniform reel size in this way variations in playing time are obtained by using long-play tapes for longer effects or those recorded at a higher speed, and standard tape for shorter items and slower speeds.

Reference has already been made to the standard lengths in which tape is supplied. These are usually quite accurate, but occasionally variations may be found and it is therefore a wise precaution before making an important recording to run the tape through the machine at the required recording speed and check the actual playing time, which can then be marked on the reel.

(Continued on page 245)

Tape Length (feet)	Playing time required	Reel sizes available and grades of tape			
		Standard play	Long-play	Double-play	Triple-play
150	8m	3	—	—	—
175	9m 20s	$3\frac{1}{2}$	—	—	—
225	12m	—	3	—	—
300	16m	4	—	—	—
450	24m	—	4	—	—
600	32m	5	$4\frac{1}{2}$	4	$3\frac{1}{2}$
850	45m 20s	$5\frac{3}{4}$	5	—	—
900	48m	$5\frac{3}{4}$	5	$4\frac{1}{2}$	4
1200	64m	7	$5\frac{3}{4}$	5	$4\frac{1}{2}$
1700	90m 40s	—	—	$5\frac{3}{4}$	5
1800	96m	$8\frac{1}{2}$	7	$5\frac{3}{4}$	5
2400	2h 8m	10	$8\frac{1}{2}$	7	$5\frac{3}{4}$
3600	3h 12m	—	10	$8\frac{3}{4}$	7
4600	4h 5m	—	—	10	—

TABLE OF TAPE LENGTHS with playing times for recording speed of $3\frac{1}{2}$ ips. Double all times for $1\frac{1}{2}$ ips, halve for $7\frac{1}{2}$ ips.

SOME TIPS ON HANDLING TAPE

By P. T. HOBSON

Technical Manager
3M Magnetic Products

QUALITY magnetic tape will last indefinitely. This fact provides a unique situation for the amateur recording enthusiast who alone can claim that the basic tool of his hobby has maximum longevity.

The artist's brush and paints, the cameraman's films, the motorist's fuel; all will eventually be used up or will wear out. None can be repeatedly used without loss of performance; but such is the claim regarding the use of tape.

Its manufacture is highly specialised. From the production of the correct size and shape of magnetic oxide, preparation of the oxide "paint" and its coating to the base material and slitting to standard tape widths, the procedure entails rigid control methods.

Many of the stages involve incredibly stringent standards of cleanliness to ensure that the coated surface is completely free from foreign particles; the manufacturing operatives being subject to standards usually only associated with the handling of nuclear material.

Once the finished product has been tested and boxed, its life is completely in the hands of the user. And this is the deciding factor for optimum performance. To allow tapes to perform at their best, there are some common sense rules to keep in mind in handling them. These rules are more important for the professional and very sophisticated applications like aerospace and computer work, but they can be applied even to amateurs.

Great care is taken during the initial spooling stage to ensure that the tape is not distorted, rippled or warped at the edges. Such defects mean poor frequency response as a result of poor tape tracking. Damaged tape does not maintain correct contact with the recording heads. The first point then is to always ensure

that your tape is wound carefully and correctly. Attention to tape guides and the recording channel, plus avoiding the use of warped spools is the answer here.

To make interchange of tape easier, care should be taken to ensure that the head gaps on all recorders are aligned exactly perpendicular to the tape. Intimate contact between the tape and the head gap must be maintained. Loss of contact due to specks of dust, splicing adhesive that gets caught on the recording or playback head, scratches on the head surface or foreign matter on the tape, however small it may be, has an immediate effect on high frequency output.

Storing tape in its original box keeps it protected from dust and from physical damage to edges. Normally cleaning tape is not necessary but if there is excessive dust on the tape the reel can be vacuumed and the tape cleaned by wiping it with a lint-free, dry cloth while rewinding. However, prevention is better than cure and tape handling should be kept to an absolute minimum.

Although re-lubrication of magnetic tapes will keep them smooth and reduce the amount of oxide wear-off, this is unnecessary with some tapes such as our own Scotch brand, because they have a built-in dry silicone lubrication that lasts as long as the tape. Occasional use of recording tapes, or simply rewinding them improves their resistant to ageing in prolonged storage. But, if there is a need to store tapes for an unusually long period, use a polyester-backed tape. This has more resistance to temperature changes, and far more resistance to humidity changes than acetate tapes.

Tape should be stored at room temperature (between 60-80 degrees Fahrenheit) and relative humidity should be between 40 and 60 per cent. If acetate tapes become brittle through storage in especially hot dry conditions, they can usually be returned to good enough condition for playback by simply storing them for 24 hours in normal conditions. A simple way to restore moisture is to leave a lightly moistened sponge or blotter with a reel of tape in a closed container for a day. But take care not to let the moisture touch the tape directly. A tape exposed to extremes of cold should be allowed to return to room temperature before being played.

Finally, occasional cleaning of the recording head, capstan, tape guides and other parts of the recorder will help to ensure long life and minimum wear. Ethyl alcohol or a similar cleaning agent can be used, but it is advisable to check the operating manual for your own machine.

The above points are all good tips for taking care of tape, but the starting point is the tape itself. Make sure the tape you use is of high quality: the rest will more or less take care of itself.

B. E. WILKINSON advises on what to look for
and how to make a thorough examination when.

buying a second-hand tape recorder

THERE are several reasons for wanting to buy a second-hand tape recorder. Two machines are essential if one is to edit tapes without cutting, and the cost of two new recorders is prohibitive to the majority of us. Then, of course, where tape recording is the secondary aspect of an interest—photography with sound, the expense of a new recorder may not be justified.

Where then does one find a good, second-hand recorder? Many dealers will be able to find you one, if you specifically ask for it, and although you may pay a little more than if you bought it privately, you can expect a machine which has been overhauled and should give no trouble. The advertisement columns of local newspapers usually devote space to radios, television sets and tape recorders, if you wish to buy one privately, and, of course, there is always the occasional machine offered in the classified advertisement section of this magazine.

Now, when you have located a recorder that you consider might be suitable, you will want to examine it and hear it. A reasonable examination will take more than a few minutes, so do not be hurried. On the other hand, I think one should be wary of the tempting offer to "take it away and try it." When buying from a dealer, this may be all right, but you might find yourself in an embarrassing position if a machine you were testing, developed a fault in your own home.

Quite a lot of information can be gained from a fairly superficial look at the recorder. Look for signs of rough treatment—deep scratches, etc., on the case. Some wear must, of course, be expected, but anyone who takes reasonable care of his recorder will avoid treatment likely to damage the case. Try to compare the condition of the exterior with some small area of case material tucked away—under the lid perhaps. You will be able to judge in this way, whether the outer case has faded much. This is a good indication of age, though the process could be accelerated by exposure to sunlight. In this case, however, areas not usually visible (underneath), will be less faded.

The tape deck

With the lid removed, the deck may be examined. Look at the tape reels. Are they in good condition, or are they scratched, or chipped and yellowed with age? Now lift them off and examine the spigots of the reel platforms. If they are of metal, they will perhaps reveal nothing, but plastic spigots tend to show signs of wear if the recorder has been used a great deal. Much changing of reels roughens the thin blades of the spigots. Where a rotary function switch is fitted, an arc of worn paint or deck around the circumference is an indication of a fair amount of use.

The same applies to volume controls—tone controls, generally speaking, do not get so much wear. Keep an eye open for the screws by which the deck is secured to the case. An unhealthy sign, is screw heads that have been mutilated. The damage may



LOEWE OPTA

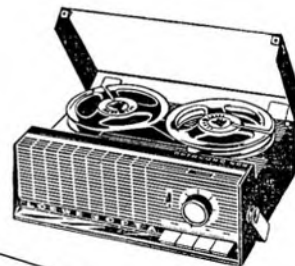
Hi-Fi Tape Recorders

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Single Speed $3\frac{3}{4}$ i.p.s. Twin Track. For use
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THE LATEST OPTACORD 416

OPTACORD 416

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volume controls, 2 speeds $3\frac{3}{4}$ i.p.s. and $1\frac{7}{8}$ i.p.s. Twin Track. **51** GNS.

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71/73 GT. PORTLAND ST., LONDON, W.1
Telephone: MUSEum 2901/5

B. E. WILKINSON advises on what to look for and how to make a thorough examination when.

buying a second-hand tape recorder

have been caused by frequent dismantling of the recorder, or it may be due to careless attempts to open it using the wrong tools. In either case, the sign is not a good one.

While it would be unreasonable to expect to examine the "works" of the recorder, it is usually fairly easy to expose the head and capstan assembly, and no objection could be raised to this. A small accumulation of oxide powder and dust is permissible around the heads, but substantial quantities indicate that maintenance is rare.

Examination of the record/replay head(s) may be difficult visually, but if possible, try to get a fingernail on the surface and feel for a ridge, particularly near the top of the head. As the tape is drawn across the head, tension tends to make it curl and the tape edge will wear a groove, so that ultimately, the surface of the head in contact with the tape will become slightly curved. If the groove worn is barely perceptible, the head will not be worn much and the reproduction will probably not have deteriorated. A deep groove, however, indicates the passage of a great deal of tape, and head wear resulting in a falling off of the high frequency response. The erase head is not so important, because the gap is not critical and head wear here has no effect on performance.

While looking in the head area, examine any screw heads for damage and disturbance of sealing paint. Where a condition is set at manufacture, relevant screw heads may be sealed with a splash of paint. This is intended to prevent movement, but also gives an indication when an adjustment has been made. It is a good policy to examine the head assembly with the recorder running. Here, you are looking for a bent capstan or an eccentric pinch wheel. If the recorder has ever been left with the function switch set to record or replay, the spring pressure of the capstan against the pinch wheel tyre may have worn a flat on the latter. Try to rock the capstan to feel for excessive side play in the bearings. Finally, examine the tape guides. One must expect some wear, which will take the form of flats, but a considerable reduction in diameter will indicate a corresponding amount of use.

Tape transport

If all seems well, turn your attention to the reels. Running the recorder in record or replay, momentarily stop the take-up reel so that a few inches of slack tape are driven out by the capstan. Now observe how the take-up reel responds to the slack when released. If it picks up instantly, then the clutch would appear to be in good working order. If however, the reel hesitates and then slowly winds up the slack, the clutch may be worn and is producing insufficient torque. Loose or uneven piling of the tape on to the take-up reel is an indication of this. Now wind all the tape on to the take-up reel using the fast forward function, and then fast rewind it. I have found this to be a good guide to age and condition, as the rewind function tends to become sluggish and slow as belts stretch and friction drives wear. Observe if the supply reel maintains a fairly constant speed throughout the rewind process. When the supply reel is almost full, stop the recorder, and then try to start the rewind again. This is the worst condition from which to start rewinding because the mechanical advantage of a nearly full reel taking tape from a nearly empty one, is low; the response of the drive will give a good idea of the state internally. When the tape is running fast, check the effect of stopping it in both directions. Each reel platform is fitted with a brake, which is adjusted at manufacture to stop the reels very rapidly. If they grind slowly to a halt, or appear to be unbraked, one can suspect some wear at the brake pads, and the need for adjustment. Further indication of faulty braking, is tape cascading across the deck, or being stopped rapidly by one brake only, so that it stretches.

Electronics

Electrically, the recorder must be judged almost entirely on its performance, as, even if you could see the circuitry, the probability is that little could be judged from it. So the first operation is to make a record. Try recording at all the available tape speeds, as quality always improves with speed and to make a reliable assess-

ment of the recorder, you will want to know how it behaves in all functions. Don't speak too loudly into the microphone—keep it at first a foot or so from your mouth, and adjust the gain until the magic eye (or level meter) is a little short of the maximum mark. Now, move back, possibly to the other side of the room, continuing to speak as you move. Replay the tape.

If you have heard your voice before, you will be able to judge if the recording is a faithful one. But pay particular attention to clarity. The speech should be sharp without being harsh, and it should not be woolly (a sure sign of an ageing machine). Now try turning up the gain. There should be plenty in hand, particularly during the part of the record when you were quite close to the microphone. Note what happened when you withdrew from the microphone. Is the system sensitive enough to record satisfactorily from across the room? Turn the tone control from one extreme to the other. With plenty of treble, there will be a tendency for harshness, but there should not be an excess of background hiss. At the other end of the swing, the reproduction should lose its high frequency content, but it should not sound woolly, and while a slight hum is permissible, really noticeable mains hum should not be present.

While speech is a quick and simple method of checking the quality of reproduction, music is better, especially for assessing the performance of the transport and for judging the machine's response to transient signals. The ear is very sensitive to changes of frequency and when replaying sustained treble tones, very slight deviations are readily perceptible; the system should be free of noticeable frequency variation. When a piano key is struck, or a guitar string is deflected, the amplitude of the resulting note, builds up very rapidly. Sounds of this type are known as transients, and music of a transient nature is particularly useful in checking the recorder's response. You cannot do better than, than to record piano music, if this is possible.

Try turning the volume control from minimum to maximum with the function control set to replay. Any "crackling" of the reproduction is due to an accumulation of dirt on the track of the volume potentiometer. This fault usually occurs only after much use, so it is reasonable to expect to find it in an old, or much-used machine. Tone controls rarely give this trouble, due to less adjustment. Distortion, if any is present, could be due to lack of recording bias, while a lack of volume could be due to too much recording bias. The bias system is part of the erase system, the high frequency currents for each function being derived from the same oscillator. To check the oscillator performance, make a record with more modulation than usual—i.e., make a heavy recording, and with either the microphone disconnected, or the gain set to zero. Replay the tape with a high gain and check that the recording has been satisfactorily erased.

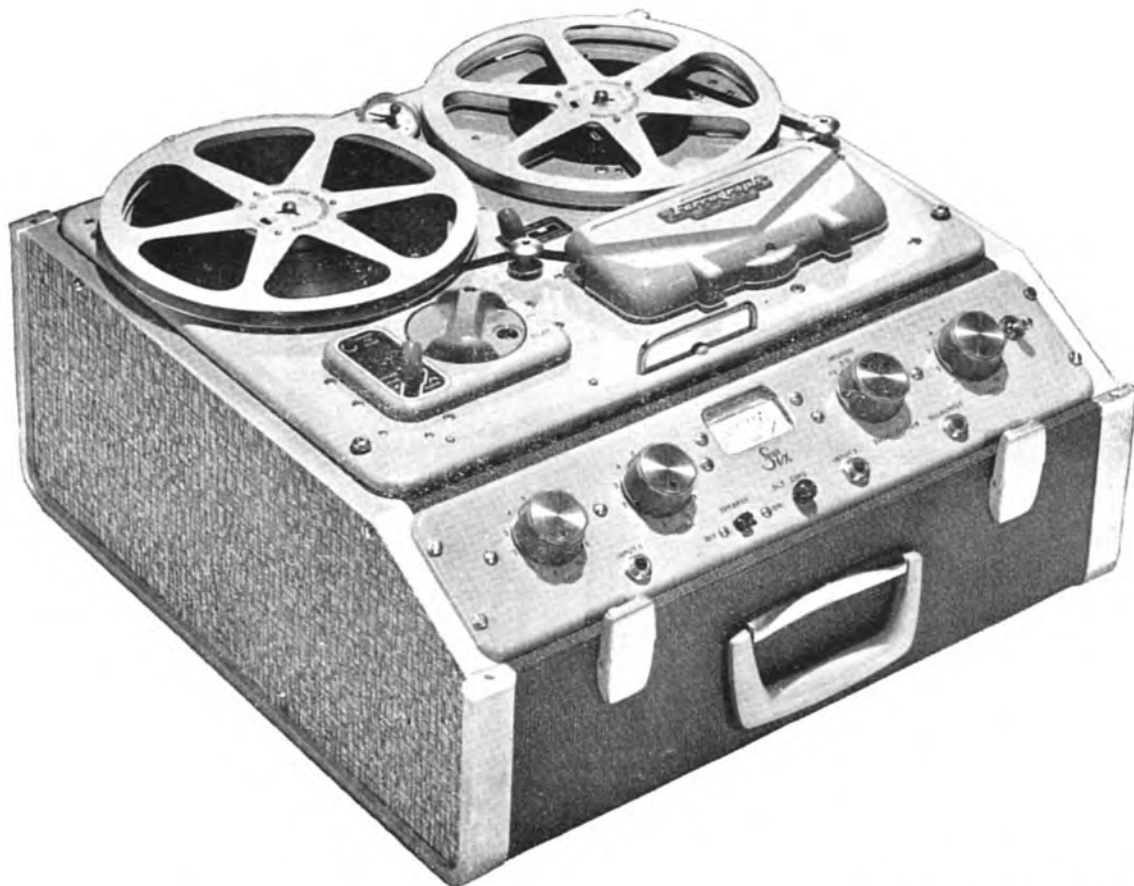
Accessories

Of possible accessories, there must be a microphone (you would be unable to carry out the above checks otherwise), and it is as well to examine this carefully. See that the microphone does not show signs of having been dropped or generally mistreated, and check that the lead is not kinked. It may well be easy enough to replace a microphone lead, but "more than usual" wear and tear indicates that insufficient care has been taken of the instrument, and thus the recorder has also probably been neglected.

Most of the points mentioned are applicable to battery portables, although these machines are perhaps more susceptible to the effects of misuse. To start with, the portable is smaller and more compact, so that the mechanism is lighter and more delicate. One would expect such a machine to have been carried about a fair amount, since the recording potential is virtually unlimited with independence of the mains supply. The exterior case then, should be examined carefully for distortion or damage.

The use of dry batteries means that the power available to drive the tape transport system is limited. Spring tension at the capstan

(Continued on page 245)



Ferroglyph Model 631 Tape Recorder

Ferroglyph

built in a tradition of excellence

For many years Ferroglyph have unofficially extended the warranty on all Recorders from one to three years. This is because the design and construction of a Ferroglyph are such as to provide years of trouble-free operation. Because the components of a Ferroglyph are tailored to the job – most of them are made in the Ferroglyph factory from raw material to finished product. When you buy Ferroglyph you buy British through and through. And that means consistent high quality.

Complete and post this coupon for an illustrated brochure. Or, we will send you the comprehensive 64-page Ferroglyph Manual handsomely bound at the price of £1, refundable when you buy your Ferroglyph.

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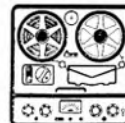
*Delete as applicable.

Name _____

Address _____

TM3

Ferroglyph



the incomparable tape recorder

Choice and care of magnetic tape

(Continued from page 241)

This is much more satisfactory than watching a tape run out a few minutes before the end of some special event which cannot be repeated! Incidentally, to guard against any hitch, such as a programme taking longer than expected, it is safer to use a slightly longer tape than seems necessary. The programme can always be copied on to a shorter tape later if required.

Base materials

Earlier I referred to the fact that besides being classified in grades (LP, DP, etc.) tapes are also described as being acetate, PVC, etc., which refers to the material from which the base is made. The base is the actual plastic ribbon, constituting the tape, on which is sprayed a microscopic film of iron oxide. This very thin film of oxide is the active part of the tape which stores the recording. With modern production methods (which have been described in *TAPE*) the well-known tape manufacturers can obtain an amazingly uniform performance from their products. This is more than can be said for some of the very cheap tapes on sale; although there are several excellent brands of cheap tape.

We are not concerned here with the chemical composition of the various tape bases, but the physical characteristics can have an effect on our recordings and it is well to understand what the differences are.

Standard-play acetate tape, at one time the only kind available, tends to become brittle with age. But, being thicker and stiffer than other grades they do not stretch like some of the thin varieties. The extra stiffness, however, tends to make them spring away from the record/playback head and this may lead to less intimate contact which could be troublesome with four-track working. A PVC-based standard tape is to be preferred for many purposes as this is more flexible.

Long-play tapes are made from polyester (sometimes described under the name of Mylar). This produces quite a limp tape of great thinness and flexibility, and leads to a very close contact with the record/playback head and less trouble from "fall-outs." ("Fall-out" is the term used to describe the drop in volume due to a flaw in the tape coating. The effect of such a flaw can be exaggerated by a stiff tape.) In spite of their extreme thinness these tapes are surprisingly strong; they stretch rather than break cleanly like the acetate variety. Because of this stretching, which will of course ruin any recording on the tape, such tapes can be damaged by rough handling or by brakes which act too fiercely. Even when brakes are properly adjusted they can be thrown off balance if the take-up reel is not of the same size and weight as the supply reel, and the resultant snatch can stretch and "chew up" a tape beyond repair. The only remedy then is to cut out the damaged portion and splice the ends—using a proper splicer, of course.

Sometimes when a tape has not been too badly damaged, but merely crumpled and creased, it can be smoothed between the fingers in the same way that a "curl" is taken out of a sheet of paper. If the tape is then wound firmly, by braking the supply reel lightly with the finger while fast winding, and the tape left overnight the damage will often iron itself out and not show up in the recording.

Performance

So much for the base material. The recording characteristics of most good tapes are very similar, although slight variations may appear between different makes owing to differing oxide formulations. Compensation can be made for this on recorders which have adjustable bias, but with most recorders this facility is not available. The makers therefore set the bias to give optimum results with the brand of tape which they supply with the machine. This explains why performance may not be equally good with all tapes—it is not the tape which is at fault. The easiest way to compare different brands of tape is to splice a few yards of each into one continuous tape, carefully noting which is which, and then recording along the whole length. On playback any difference will become very obvious and it will be easy to choose the brands which best suit your machine. For this test choose a piece of music which maintains a more or less constant volume throughout rather than something with violent contrasts. Include some of

the cheaper tapes which are advertised regularly in this magazine and you may find, as I did, that certain brands suit your machine and give as good results as the original tape, although they cost so much less.

Tape is expensive, and even if you buy mostly the cheaper brands to which I refer, you may get a shock if you tot up the cash value of an extensive tape library. So it is well to take proper care of your tapes.

Tape should always be kept under cover when not in use; it tends to "dry out" in a warm atmosphere, and dust does it no good at all. Apart from mechanical damage to the tape due to deck projections or rough handling, there is the less obvious damage to the recording, which can be caused by magnetic fields. Keep tape well away from magnets (such as are used in loudspeakers) and from all electrical apparatus, otherwise you may find that your precious recording has been mysteriously erased!

Another form of magnetic damage is known as "print-through." When reels of tape have been stored for long periods without being disturbed there is the possibility of interaction between the tape layers causing one layer to "print through" on to the next. The result is a noisy background to the recording, or even a ghost recording in the background. It is therefore advisable to bring out these long-term recordings now and again and run them through on fast wind to disturb the tape layers. Tapes can also be made noisy if the tape recorder heads become magnetised, and it is sound policy before playing any of your prized recordings to de-magnetise the heads first. The small outlay for a de-magnetiser is money well spent.

SECOND-HAND RECORDER

(Continued from page 243)

and pinch wheel, and other parts of the drive cannot be too severe, so that any stiffening in the drive may result in slipping and consequent wow and flutter. When running the recorder, turn the gain to zero and listen closely to the mechanical noise. What you are listening for, are mechanical "clicks" of a once-per-rev nature. If the speed is variable, change it and observe if the rate of any such noise changes proportionately. The noise may be due to an irregularity in the drive, caused by jamming at some point.

The reduction from motor speed to tape speed is considerable, and to achieve it, the small motor shaft sometimes drives a rubber-tyred wheel by spring-loaded contact. Under normal conditions, the drive is positive enough, but if a supply reel jams, the motor may not be man enough to pull it free, so that the motor shaft spins against the rubber tyre. In a few seconds, there is a groove sufficient to ruin the performance. Unusual? Perhaps, but I have come across two recorders where this happened, because the end of the tape at the hub of the supply reel was secured too tightly in the slot made for it. The drive could not pull it free at the end of the record and was damaged as a result.

Examine the battery compartment, as irremovable corrosion can result from batteries that have leaked. Mains hum you will not expect to hear at replay, but the DC motor incorporated may generate a similar form of interference. A slight motor noise may be permissible, but it should not be loud enough to interfere with the recording. Sometimes when the batteries are removed, a good view of the mechanism is afforded. Look for stretched belts, and black powder deposits from worn friction drives. Dirty oil on bearings is usually a sign of much use.

A word or two is perhaps indicated on the subject of spares. Electrically one component is as suitable as another (except in the case of special volume controls with two potentiometers and a switch perhaps, on the same component), and an electrical fault can be remedied easily enough. If a mechanical part fails, a spare may be indicated, and there could be difficulty in obtaining a replacement. One should therefore avoid machines of lesser-known makes, and particularly, fairly inexpensive imported models, where (presumably) no spares service exists.

Clearly then, one can get a fair idea of a recorder's condition, by looking for certain points in the appearance and performance. But how does one decide where the line between buying and not buying, lies? This would depend on the nature and number of faults observed.

Some of the faults discussed are serious individually and the cost of repair might be prohibitive (if spares were available)—a bent capstan for example. But where the majority of faults could easily be corrected—perhaps by an overhaul, it might well then become a question of price. This would have to be balanced against the usual price asked for a machine of that particular type and age, and account taken of any extras that might be "thrown in." Anyone not specifically planning to buy another recorder might well include his collection of tapes. Tape is not a cheap item, and even a couple of reels is a worthwhile saving.

OUR article last month was a general introduction to "Tape Recording Techniques." We considered some simple notions of sound and learned something of the history of disc and tape recording. But what is a tape recorder and what makes it work?

By convention, when we refer to a tape recorder, we mean a piece of equipment capable of both recording and reproducing sound. However, it's as well to bear in mind that there are some specialised instruments which record but do not playback, whilst others playback but do not record. Such equipment with its limited usefulness is more often found today in professional or technical applications than the domestic market.

The diagram in Fig. 1 shows in simplified form the essential components in any record/playback chain. We shall be dealing with each of these more specifically later on, but meanwhile these are briefly the microphone, amplifier (and oscillator), erase and record heads, magnetic tape and loudspeaker.

The microphone, whose job it is to convert the mechanical vibrations of sound into electrical impulses, passes these very feeble signals to the amplifier. There the pulses are amplified or magnified until they are strong enough to be passed to the coils around the record head. This head consists of a number of plates or laminations, stacked together on top of each other like a pile of pennies.

The tape itself travels from left to right, the magazine, or feed spool being always on the left, the empty or take-up spool on the right. The tape is dragged at a fixed speed past the erase, record and playback heads by the capstan and pinch-wheel, two vital components. In the playback function an existing signal registered on the tape is picked up by the playback head and the weak impulses pass to the playback amplifier, the final stage of which drives a loudspeaker from which sound will be heard.

* * *

The diagram shows a common arrangement where a single head is used for record and playback with a single amplifier circuit catering for both functions. Fig. 2 however shows separate heads for record and playback and such a machine would be provided with separate record and playback amplifiers. There are certain advantages in such an arrangement and we will discuss these at a later date.

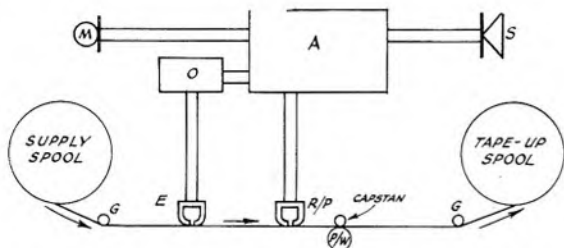


Fig. 1. The essential components in a record/playback chain. M, microphone; A, record/playback amplifier; O, oscillator; E, erase head; R/P, record/playback head; C, capstan; P/W, pinch-wheel; G, tape guides; and S, loudspeaker.

Fig. 1 shows the erase head linked to an oscillator which provides the current to erase any signal on the tape prior to recording a programme. If an oscillator were not present it would be impossible to erase an existing recording and the quality of new recordings would be very poor. The oscillator also produces the "bias" current for the record head, but does not function when the machine is in the play-back condition.

This chain of parts is essential in any tape-record/playback equipment, although naturally the individual processes are rather more complex than as stated here. For the sake of simplicity we can, both in theory and in practice, divide the equipment into two quite separate parts; the mechanical and the electronic. This month we shall concentrate on the mechanical side of a recorder.

The mechanical part comprises the motors, cogs and driving wheels, whose sole job is to control the movement of the tape—in other words the tape deck.

If you went into a shop and bought a tape deck you would be handed a piece of hardware; no valves, no electronics. Usually the price would include the necessary heads.

TAPE RECORDING TECHNIQUES

CONTINUING his new series on the fundamental principles of tape recording, DENYS KILLICK describes the function and design of a tape recorder with particular emphasis on the importance of precision in tape transport systems,

Most people take it for granted that the mass of valves and electronic components perform miracles, quite forgetting that in its own way the deck is at least as important. Yet its job is simple—to maintain a fixed speed of the tape past the heads and to keep the tape tidily wound on its spools. We have seen (Fig. 1) that the tape passes between the capstan and pinchwheel: these are the two members that control its speed past the heads. In effect they work on the principle of the mangle—the capstan revolves at a fixed, steady speed whilst the pinchwheel (a very expressive name) squeezes up against it and "mangles" the tape through. To afford the necessary traction either the pinchwheel or the capstan is usually neoprene faced to give a "rubber tyre" effect which helps to grip the tape.

All well-designed decks have a built-in safety mechanism which prevents the capstan and pinchwheel remaining in contact under pressure when they are not in motion. This is very necessary because if they were in contact whilst stationary a "flat" would be liable to be caused in the relatively soft neoprene. The result of this flat would be to fractionally change the speed of the tape at this point on each revolution. This speed variation would be heard as a change of pitch in the playback of the recording. It is necessary to check your equipment to see if the capstan and pinchwheel fly apart when the machine is stopped or if the electric current should suddenly fail. If they do not part automatically take care to manually separate them every time the machine is stopped.

The design of tape transport systems is rather more complicated than might be immediately obvious. Since the speed of the tape must be constant as it passes the heads it follows that the two spools will rotate at different and constantly changing speeds. A take-up spool will be empty at the beginning of a run and will therefore rotate relatively quickly: its speed being reduced as the number of turns of tape builds up and increases the effective diameter. Similarly the magazine spool will rotate slowly when fully loaded but its speed will increase as more and more tape is drawn off and its effective diameter is proportionately reduced.

Additionally it is necessary to ensure correct movement of the tape whenever the "run" function is engaged regardless of the amount of tape on either side. When the tape is in motion it must be possible to stop it at any desired point without its overspilling or being subjected to undue tension. Quite apart from these functions provision must also be made for the tape to travel rapidly (fast-wind) in either direction.

* * *

In the early days of tape recording, when neither the tape itself nor the design of the deck were as advanced as they are today, life could be very exciting. It was by no means unusual for the tape to either break or spill itself in a muddled heap on the floor as soon as the stop button was depressed. During the fast wind action, the spool might literally take off from the deck and fly across the room leaving a twisted, tangled thread of tape miserably in its trail. Today things are much better ordered and such events should never happen.

To assist in lining up tape accurately to and from the heads it passes a series of guides. As it is necessary to maintain an even and intimate contact between the heads and the tape "pressure pads," little squares of felt on sprung arms, apply gentle pressure from the rear. Both the tape guides and the pressure pads serve another very important purpose by smoothing out any small irregularities in speed due to minor inefficiencies in the mechanics of the deck.

There are three ways of applying the necessary tractive forces on the deck. A single motor can be used for all the functions; two motors can be employed—one for the capstan and the other for the drive to the spools; or three motors might be used, one for the capstan and one for each spool. Fig. 2 shows the British-made Ferrograph Series 4 three-motor deck (Fig. 3 illustrates its underside) and in these photographs the three motors can be clearly seen.

There has been much discussion on which is the better design, but the principle is less important than the quality achieved using any system. In fact one can only say that a well-designed and well-made deck is always better than an inferior one. When listening to

TAPE RECORDING TECHNIQUES

the playback of a recording no one is going to care tuppence whether the tape is being driven by one motor or three—the only thing that really matters is the end product, that is, the quality of the recording.

It is worth noting that apart from the drive to the capstan all the other mechanical functions of the tape deck are designed solely to keep the tape neatly and tidily on its spools. In theory, and indeed in practice if you care to try the experiment, the machine will function quite satisfactorily without using either spool at all. Just put a pile of loose tape on the table to the left of the machine, thread it through the sound channel and select the "record" or "play-back" mode. The tape will pass through quite happily and form another pile on the right.

The paramount need for precision in a tape transport system can only be met by using relatively powerful motors and applying the best engineering principles in manufacture. On reflection its not difficult to realise why good battery portable machines are not cheap. It is a bit much to expect a few torch cells to provide the necessary power. Precision engineering is always more costly when components are drastically reduced in size and weight.

* * *

The truly perfect piece of mechanical apparatus has yet to be made. The search for it is the medieval quest of perpetual motion—alas, it didn't exist for them and neither does it for us. All kinds of mechanical losses occur in any tape transport system and fortunately they don't worry us greatly *unless they affect the speed of the tape.*

Why is this so important? Because variations in speed may be heard as variations in the pitch of the recording. We've already mentioned this in connection with an accidental "flat" appearing on either the capstan or the pinchwheel. Though not directly caused by the mechanism itself (it can only appear as a result of misuse) this would be classed as a *mechanical* fault. Perhaps the capstan bearings are worn allowing lateral movement as it revolves; a drive belt is worn or greasy; or a brake pad is rubbing on the inside of a brake drum. All these things are actual faults, quite easily remedied, but each will impose its variation in speed and therefore in pitch in the recording. This kind of variation is known, expressively as *wow*.

To check your machine for the presence of wow, record and play back a piece of slow piano music. The long, sustained notes should sound pure and true. If there is a tremolo effect, or if it

sounds as though the pianist is off-key, that is likely to be wow. The slower the speed at which this music is recorded and played back, the more stringent the test.

If you carry out this test and find your machine is satisfactory, this does *not* mean it is free from wow. Because of the impossibility of achieving engineering perfection it will always be present to some degree, even if we pay thousands of pounds for the most costly professional equipment.

Having said all these frightening things about wow it must be understood that in a great many cases it doesn't matter at all. The old quotation, "What the ear doesn't hear the heart doesn't grieve over" was never more true than when applied to recording techniques. We can, most of us, tell the difference from one musical note to another. A half tone is also fairly easy to distinguish. But when we get to small fractions of a tone it becomes more and more difficult—even a quarter tone is inaudible to a great many ears. So as long as our wow content is kept well below the limits of human hearing it doesn't matter.

* * *

Most manufacturers specify the wow content to be expected from their equipment, and this is usually shown as a percentage. The deck illustrated in Figs. 2 and 3 had a quoted wow figure of less than 0.2 per cent. After some three years heavy use the wow on this deck was measured again and found to be just over 0.3 per cent, but I still couldn't hear it. Routine maintenance, as a matter of interest, brought the figure down to about 0.16 per cent. As manufacturers are always striving to improve their designs we would expect to see better figures for newer models. The figure quoted for the newest Series 6 deck, is less than 0.16 per cent.

These figures indicate what should be expected from a well-made, well-designed deck in the semi-professional class. Bear them in mind and compare other manufacturers' specifications. Remember, moving parts tend to wear; wear produces speed inequalities. A badly made deck might have quite good figures when new, but after the three years' use referred to above the story might be very different.

Another speed variation is known as "flutter." Again this is an expressive term referring to a relatively high speed variation in pitch, sometimes heard in speech as a "bubbling" effect. For specification purposes the total of both wow and flutter is usually added together because they are really one and the same thing. The maximum permissible level of wow and flutter has been quoted as 0.5 per cent, although by today's standards this would be regarded as a rather poor performance. Whatever the value quoted it will inevitably tend to increase with use, but why worry so long as you can't hear it?

Wow and flutter can easily be measured in the laboratory; it has to be really bad to be heard in the drawing room. But when it is heard it sounds horrible.

Yet another kind of speed variation is related to "long term speed stability." If our measuring instruments are accurate enough we shall find that our 7½ ips is not precisely 7½ inches per second at all, but will vary slightly above or below that figure. Again tiny differences in overall speed are immaterial. Show me the man who can say, "That tape is not being played back at 7.5 ips, but 7.49 ips." A figure of 0.5 per cent is very acceptable for long term speed stability because the difference in pitch will be quite inaudible.

(Continued on page 252)

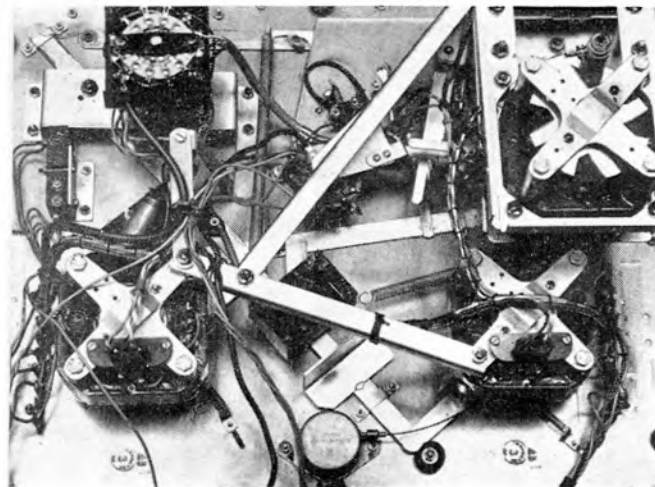
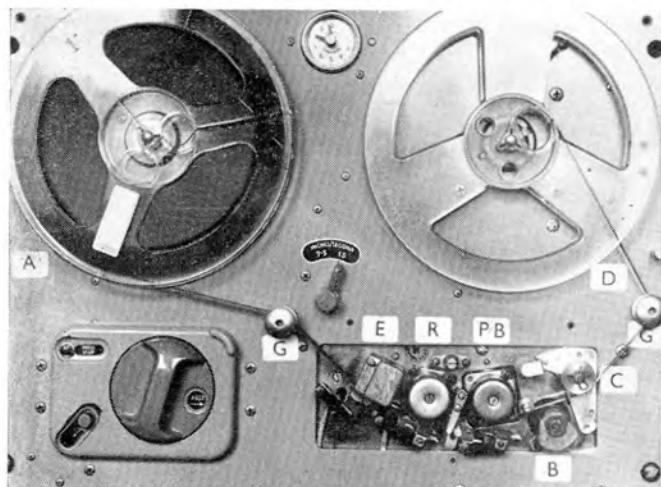


Fig. 2 (left): Top view of Ferrograph tape deck showing A, supply spool; B, capstan; C, pinch-wheel; D, take-up spool; E, erase head; R, record head; P/B, tape guides. Fig. 3 (right) is a view of the deck from below showing the three motors at bottom left, bottom right and top right.

BATTERY-OPERATED TAPE AMPLIFIER

A RELIABLE, ECONOMICAL AND COMPARATIVELY SIMPLE UNIT FOR THE DO-IT-YOURSELF ENTHUSIAST

DURING the past few years nearly all approaches to a portable, quality tape recorder have proved to be expensive and rather more difficult to construct than would normally be undertaken by any other than the experienced amateur.

This article describes a reliable, economical and comparatively simple battery tape amplifier and oscillator circuit, which in its simplicity does not detract from a fine quality of reproduction.

It features the "DC coupled pair" configuration with its attendant temperature stability factor. Seven Germanium transistors are used in the recorder proper, with a further transistor added in an optional Meter Indicating circuit. It will operate from a nine-volt supply and can deliver up to nearly one watt into an eight-ohm speaker. A standard tone control is included in the replay position and the Volume control is common to record and replay.

The amplifier terminates in a complementary symmetry class B output stage with clip-on type heat sinks. This type of output

stage uses very little current in its quiescent condition thus greatly increasing battery life.

HEADS

For test purposes the amplifier was fitted to a Garrard battery tape deck, the record replay head being a Marriott type R/RP33A having an inductance of 110 m/H at 1,000 cps. The erase head is one of the modern types of self-oscillating heads thus dispensing with the need for an oscillator coil and the like. The type number is Marriott R/EC23.

Full test data is included here and no further instruction is necessary in order to complete the amplifier. The circuitry also describes a stabilised power supply unit should the constructor wish to conserve batteries when in use indoors. This amplifier is primarily intended as a quality recording device with the suggestion that the replay feature is run in conjunction with the external supply unit. This will enable the user to take advantage of the full available power output without the heavy continual drain on the internal supplies. An earphone may be used to check the recording whilst in the field.

Fig. 1. Main amplifier circuit.

COMPONENT LIST

RESISTORS

R1	220 K	1/4 watt carbon 10 per cent
R2	15 K	1/4 watt carbon 10 per cent
R3	4.7 K	1/4 watt carbon 10 per cent
R4	680	1/4 watt carbon 10 per cent
R5	10 K	1/4 watt carbon 10 per cent
R6	1 K	1/4 watt carbon 10 per cent
R7	270	1/4 watt carbon 10 per cent
R8	100	1/4 watt carbon 10 per cent
R9	1 K	1/4 watt carbon 10 per cent
R10	22 K	1/4 watt carbon 10 per cent
R11	47	1/4 watt carbon 10 per cent
R12	680	1/4 watt carbon 10 per cent
R13	100	1/4 watt carbon 10 per cent
R14	6.8 K	1/4 watt carbon 10 per cent
R15	470	1/4 watt carbon 10 per cent
R16	4.7	1/4 watt carbon 10 per cent
R17	22 K	1/4 watt carbon 10 per cent
R18	27 K	1/4 watt carbon 10 per cent
R19	120	1/4 watt carbon 10 per cent
R20	47	1/4 watt carbon 10 per cent

CONDENSERS

C1	40uf/2.5V	C426 AR/A40
C2	0.22uf	C280/220K
C3	0.3uf	
C4	64uf/10V	C426 AR/D64
C5	40uf/2.5V	C426 AR/A40
C6	200uf/6.4V	C426 AR/C200
C7	50uf/6.4V	C426 AR/C50
C8	150pf	Radiospares ± 5 per cent ceramic

C9	33pf	Radiospares ± 5 per cent ceramic
C10	0.3uf	
C11	1uf/40V	C426 AS/G1
S1	6 pole 2 way wafer switch (2 wafers of three pole 2 way)	
VR1	1 K linear carbon	
VR3	100 K linear carbon pre-set	
VR2	1 K Log law carbon	
Speakers	of 8 Ohms impedance	
M1	1 millimeter	

TRANSISTORS

TR1	NKT 677	} Matched at 50 mA HFE
TR2	NKT 677	
TR3	NKT 129	
TR4	NKT 262	
TR5	NKT 261	
TR6	NKT 713	
TR7	NKT 262	
TR8	NKT 129	
Record/Replay Head: Marriott Type R/RP/33A		
Erase Head: Marriott Type R/REC/23		

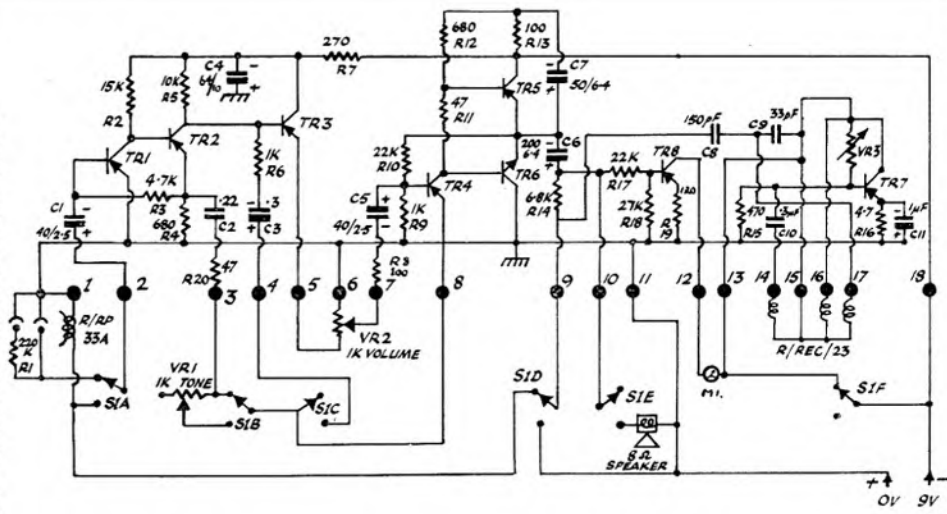


Fig. 4. Power Supply Unit.

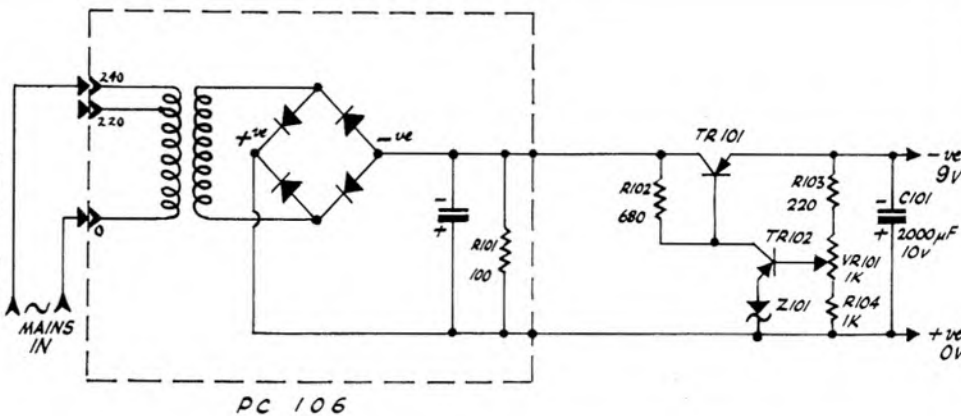
COMPONENT LIST

RESISTORS

- R101 100 Ohm 5 watts
- R102 680 ½ watt 10 per cent carbon
- R103 220 ½ watt 10 per cent carbon
- R104 1 K ½ watt 10 per cent carbon
- Z101 5.6V Zener Diode
- C101 2000uf/10V C431 BR/D2000
- VR101 1 K preset linear carbon pot

TRANSISTORS

- TR101 NKT 451
- TR102 NKT 272
- PC106



CIRCUIT DESCRIPTION (Fig. 1)

Record. With the function switch S1 in the record position, TR1, TR2 and TR3 act as a directly coupled low input impedance pre-amplifier, the emitter follower putting very little load on TR2 collector thus taking advantage of the voltage gain available in this stage. C3 and R6 are open circuited by S1 in the record position and take no part in the recording process.

The input of TR1 is designed to take any low impedance microphone in the order of 1 K ohm or less which has an output of something greater than 1 mV.

VR1 is the volume control which feeds the signal into the base of TR4. TR4, 5 and 6 form a directly coupled self temperature compensating amplifier, providing the record head with the necessary audio current via R14.

C2 and R5 form a treble lift network required to feed a constant current through the head in the frequency range specified. R14 is calculated to stop the low output impedance of TR5 and TR6 shunting the high frequency recording bias thus not allowing the correct HF recording current to flow through the head and to maintain a relatively constant current through the head.

Oscillator. TR7 acting as the oscillator uses the coils of the erase head as the inductive element. This circuit oscillates at approximately 40,000 cps and provides erase bias and recording bias. This may be adjusted by VR3. The DC supply to the oscillator is switched by the function switch S1.F.

Playback. In the playback position of the function switch S1 the replay head is connected to the base of TR1, and input impedance being in the order of 100 ohms. C3 and R3 turn the amplifier over at 400 cps so that the bass response remains substantially flat to 50 cps. C2 and VR1 now form a treble tone connection network which can be adjusted at either speed for listening preference.

The compensated replay output is fed via VR2 into a directly coupled class B complementary symmetry output configuration which will drive a 10 ohm speaker with up to a watt of output power which is more than sufficient for any normal listening requirement.

Approximately 10 dB of negative feedback is applied over the last three transistors consequently linearising the frequency response and maintaining a very low degree of distortion. This feedback also adequately compensates for AC and DC transistor spreads dispensing with any setting-up procedure.

SETTING UP PROCEDURE (Main Amplifier)

Switch to record position and measuring with a valve voltmeter, adjust VR3 so that 15 Volts RMS is present at the junction of C8 and R14, or approximately 45 Volts peak to peak measured on an oscilloscope.

This is the only adjustment required. VR3 must be set at maximum resistance before switching on.

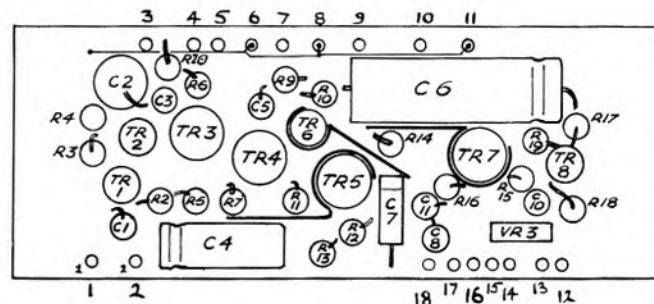
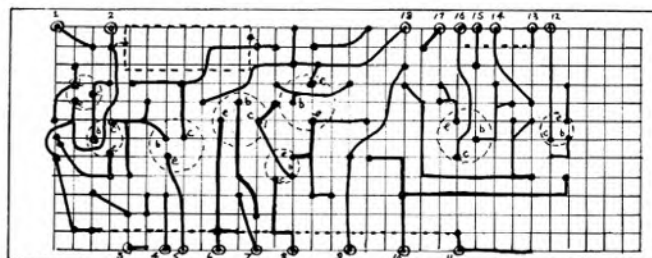


Fig. 2 (above): Physical top layout of main amplifier with Fig. 3 (below): Underside layout.



CONSTRUCTIONAL

The recorder was housed in an aluminium box 12 x 8 x 8 inches with an output to an external speaker. However, any material or size would do, as the speaker could be contained in the same box, if the need for extreme portability is not essential.

MAIN AMPLIFIER

The physical top layout is shown in Fig. 2 and the underside in Fig. 3. The board used was a veroboard type with an 0.1 grid. Care should be taken to ensure that there are no short circuits on the underside wiring. All the points were terminated in Ariel Pressing pins and sockets for ease of assembly, and ordinary Yaxley wafers were purchased at one of the many component shops.

The layout wiring should closely follow the diagrams as under extreme conditions instability may take place.

Rather than drill holes in the tape deck all mounting was made to the enclosure itself thus keeping the motor and flywheel assembly free from drilling swarf.

Care should be taken to see that the speaker leads are not shorted together otherwise damage to the output transistors will ensue.

LEVEL INDICATOR

TR8 in conjunction with M1 forms the metering circuit which enables the record level to be adjusted to quite an accurate degree. Again negative feedback automatically adjusts the circuit against transistor spreads. M1 is a one millimeter movement reading 0.8 mA for peak recording level. The circuit has been so arranged that any zero adjustment has been obviated.

POWER SUPPLY (optional) Fig. 4

For simplicity a basic power supply unit type PC106 was obtained from Newmarket Transistors Ltd. This is termed as a sagging supply, which means that the output voltage decreases as more current is drawn. In magnetic recording this is an undesirable feature, though for many other applications quite satisfactory.

In order to stabilise the voltage to a reasonable degree, two transistors in a feedback configuration were used with a zener diode as the reference. The output resistor R101 was changed to a 100 ohm one watt resistor and the output voltage at point A was adjusted by VR4 for 9.1 V. At full load this voltage dropped to 9.0 V thus quite adequately maintaining the supply voltage.

PHONO PLUG/SOCKET. Type of connector with single pin and shields, as illustrated. Some Phono sockets have shorting contacts, which ensure that the insertion of the plug applies the signal, and removal shunts the input (or output, in the case of an earphone socket).

PLAYBACK. Reproduction of recorded signals. Alternatively termed "Replay."

PLUGS/SOCKETS. A wide variety of connectors has come into use, and there is little standardisation. One company, Tape Recorder Maintenance Ltd., which specialises in aids for the tape recording enthusiast, has a list as long as a street directory of varying linkages of plugs, sockets and cables.

There are many more than can be discussed in a glossary of this nature, but for the benefit of readers who have raised specific points, the illustrations of Figs. 1 to 5 show the principal jack plugs and socket types in use.

Fig. 3 is a view of the normal jack plug, known as the GPO type, and perhaps the most robust and trustworthy connector in use. The tip screws, or is riveted, to a rod running through, and insulated from the barrel, terminated in the shorter connector. The barrel, of

SERVICE BUREAU

A glossary of tape terms—part 6

BY HARRY MACK

the plain, two-pole type is connected to the outer casing, which screws to the main body or is held by a grub screw. Other types have an insulated outer casing. All types should have an inner sleeve of insulation which protects the outer from stray whiskers of wire, etc.

Three-pole jacks are widely used for balanced line connection. These have a tip and a ring just behind the tip, insulated from each other, and from the barrel. The type of socket used with this plug is illustrated in Fig. 4, with the actual spring blade contacts shown in the inset. The method of use, generally, is to provide a shorted connection, with the inserted plug connect-

ing to the spring blade *B* when inserted, thus breaking the short-circuit and completing the necessary connection to the required circuit. The purpose is seen plainly in microphone inputs, where a shorted jack will maintain quiescent conditions until the jack plug is inserted.

The type of plug and socket illustrated in Fig. 5 is widely used for the earphone connectors of transistor radios, and some tape recorders. Here, the short-circuit serves a different purpose and may be used to isolate the loudspeaker or parallel the inserted connection.

A very popular type of socket which has found much favour with continental manufacturers is the DIN, of which there are

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Grundig TK23L ...	12 17 3	3 4 4	49
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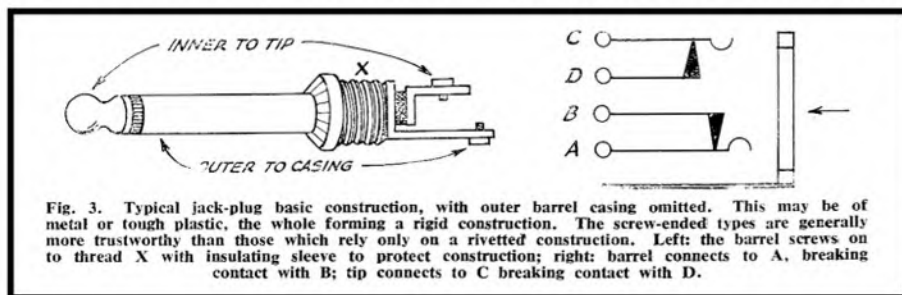
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again several versions. Three-pin and five-pin types are most widely used, with the pins connected as shown in Fig. 6 for Recording, Playback and stereo purposes. There are individual variations, however, and the pin sequence should never be taken for granted. It may be regrettable that standardisation is as far away as 1984, but a few moments with a soldering iron, and a couple of components from the spares box, usually makes any type of interconnection a feasible proposition.

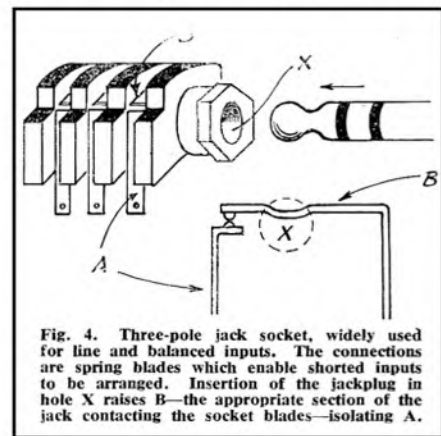
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POLAR DIAGRAM. Curve of signal strength against distance and direction, plotted to show differences of signal pick-up with position of source with, for example, a microphone. A typical polar diagram for a crystal microphone would be circular, for a moving-coil microphone, cardioid, or heart-shaped, and for a ribbon microphone, figure-of-eight. These polar diagrams are modified by the construction



of the microphone, and sometimes variable by the microphone housing adjustment. (See also *Microphones*.)

Polar diagrams can also be plotted for loudspeakers, showing output at given distances and positions, with constant power. But as loudspeakers depend for their



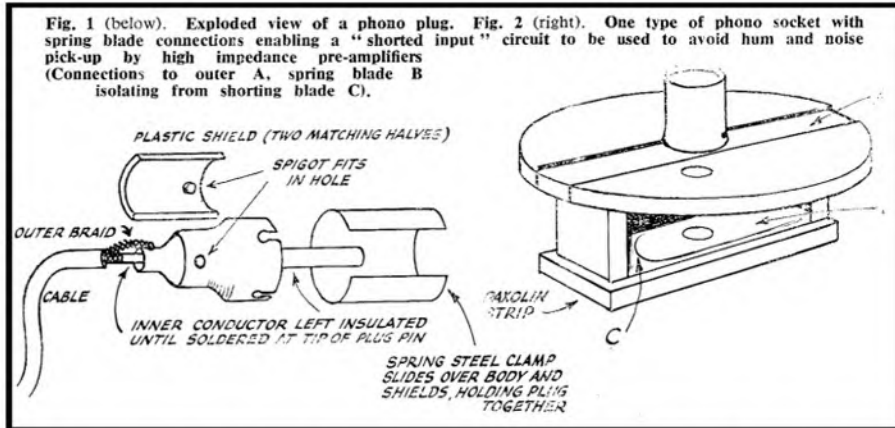
efficiency and effect as much on the enclosure and surroundings, such diagrams are of little use, except to the designer.

* * *

POLYESTER. Base material for much modern tape. For more detailed description, see *Tape*.

* * *

POST-ECHO.—When tape has been been too tightly spooled there is a possibility of recorded sounds from a previous or subsequent turn being imposed on the magnetised track. Over-tight spooling is a common cause of pre- and post-echo. The effect is particularly noticeable at the start

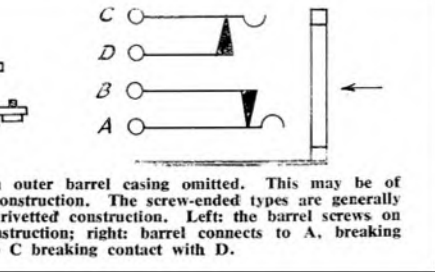


of a quiet passage. There is no cure, once the effect has been produced. Correct tape storage, spooling and the method of record-

better machines, separate pre-amplifiers are employed to handle the very small head signals, and also, where appropriate, to amplify the input signals to the level acceptable to the main amplifier.

In hi-fi parlance, a pre-amplifier is often a separate piece of equipment, designed to accept the various inputs, mix and equalise them and feed a standard output to a power amplifier. Thus, a pre-amplifier can be a comprehensive item, with its own power supply, switching for various speeds and equalisation curves. Alternatively, the term may be used to indicate the first stage of a circuit only.

* * *



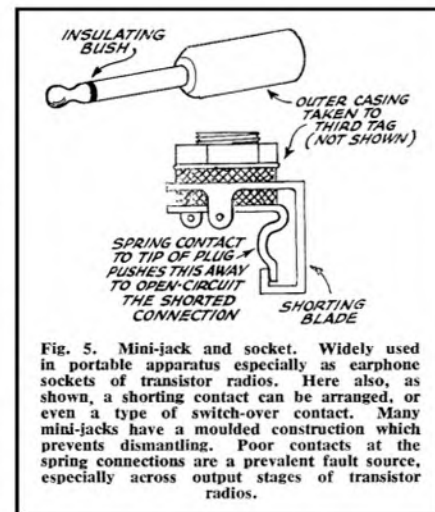
ing, i.e., avoiding over-modulation, is the only method of preventing this annoying effect.

* * *

PRINT-THROUGH.—(See above.) When tape is tightly spooled, and stored under adverse climatic conditions, the magnetism, especially on heavily modulated passages, affects adjacent turns of a spool of tape. The effect is to induce an echo by partial modulation of the "clean" portion of tape. Although a very real problem in earlier days, this effect is less troublesome with modern tape, and should be non-existent with correct storage.

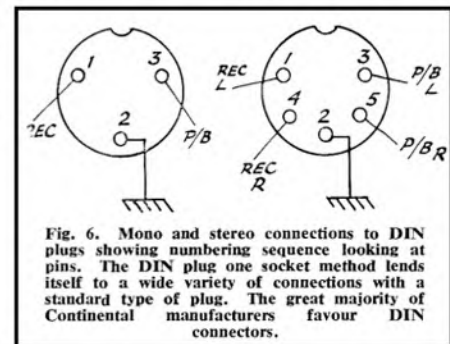
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PRE-AMPLIFIER.—The input section of a tape recorder or its associated amplifier. This section is especially designed to handle small signals and to eliminate noise. In the



PRE-EMPHASIS.—The principle of tape recording, which has already been described, requires a signal to be fed to the recording head to produce a change in magnetic flux. The magnetic curve is non-linear, and to compensate for inevitable losses, in both the head and the tape, a certain amount of "shaping" of the applied signal must take place. (This, in addition to the necessary bias.) The recording amplifier thus contains circuitry which boosts the treble and the lower end of the bass to make up for these losses, and such a method is termed pre-emphasis.

It should be remembered that the principle of standardisation is to produce a recorded signal on the tape which can be played back on any other machine—in a



word, which is compatible. High frequency boost helps maintain an adequate signal-to-noise ratio, and bass boost assists in the reduction of hum pick-up, which may be evident if additional boost is required to compensate for the lack of bass during Replay. Much depends on the type of machine—many cheaper models employ little or no pre-emphasis, relying entirely on the Replay equalisation to compensate for the head and tape losses.

(TO BE CONTINUED)

THERE are snags about being a columnist. Not the least of these is the dread of being wrong, perhaps even hopelessly wrong. Worse still is the fear of being publicly shown to be wrong. The mere thought of such an exposure will send even the most strident of our critics groping blindly for the tranquilizers with shaking hand. Beads of perspiration on the forehead, temperature a hundred and four, further outlook utterly without hope.

As you might guess, I have been caught out, or rather I am in the process of being caught out. It's not quite as bad as it might have been—but it was a near thing. It all started at the Audio Fair and it was about one of the new AKG microphones, the D 109. This is a miniature moving coil, omni-directional, intended to be used with a lavalier attachment. This is in the form of a clip with a perlon cord; when assembled the microphone is suspended on the cord which is slipped around the neck.

When the clip stands about $\frac{1}{4}$ inch proud of the microphone grille, it acts as a Helmholtz Resonator and boosts the high frequencies to compensate for losses absorbed by the user's personal clothing. As the maker says, ideal for television or stage applications. However, I couldn't see very much use for such a microphone so far as the recording amateur is concerned, and I didn't hesitate to say so. I might have felt the urge to strike my subject on the head with a microphone occasionally, but I've very rarely had the need to hang it around his neck.

To cut a long story short, I've been playing around with a D 109 for the last few days and as a result I've completely changed my opinion. It's the smallest, neatest little microphone I've had in my hand for many a day. About three inches long it's a real miniature and would be ideal (without the lavalier clip which is completely removable) for any application where an omni-directional moving coil is called for; this would include outdoor interviewing where the 200 ohm impedance would be suitable for many transistorised, battery portables. The quality is so good it could also be pressed into service as a "studio" microphone when necessary. As it's not designed for this purpose the makers don't market a stand attachment. However, a couple of heavy rubber rings around the body would hold it

CROSS

TALK

By Audios

securely in a stirrup type holder which could then be mounted on a stand. And lastly we could attach the lavalier clip and use it as a neck-slung mike (if ever the occasion *should* arise!)

So you see why I'm worried about saying the wrong thing. My first opinion was that this was very limited in its usefulness. Investigation shows that this particular microphone, and probably others of different makes, is one of the most versatile instruments I've come across. The price of the D 109 is £11 which is a sensible enough level to make it a very good buy indeed. As amateurs we all have to make what money we spend go as far as possible. One way is to buy one microphone that will do several jobs equally well. As a type the lavalier has been neglected by a lot of us—it could be worth bearing in mind.

* * *

THE history of magnetic recording in this country is so short that a piece of equipment made twelve or more years ago is already something of an antique. I was fascinated when I came across one such the other day. A friend of mine had been given a recorder, but he was mystified when the donor told him, "Its all complete. You'll find the handle to wind it up in the box."

Handle? Winding up? There was a handle all right, and a clockwork motor. It turned out to be an old Boosey & Hawkes clockwork portable, recording full track. The mechanism runs as sweetly as the day it was made. This model was one of the first truly portable machines and might be regarded as the forerunner of the modern midgets. With a little attention on the electronics it will doubtless function again as well as new—it's already playing back satisfactorily. As a matter of interest, does any reader have a similar machine in working order? There might be scope here for a "Veterans Club." So if you have an "old groaner" drop me a line but only if it's a really old one.

* * *

IF recording were simple it would hold little interest for most of us. The mere dubbing from radio is simple, and therefore

uninteresting. But when recording live anything can happen—and more often than not it does.

A week or two ago I was recording a choral work in the chapel of one of the larger London hospitals. The equipment was housed happily in the vestry and the choir was covered with three microphones carefully positioned between the two rows of choir stalls. Every detail had been thought of, even to running a cue light from the vestry to the conductor's rostrum as it was a long work and would have to be recorded on three separate tapes. The light signalled when we were ready to proceed after changing tapes in the breaks in the performance.

Monitoring was "after record" and the signal came through well, with a good balance between soloists and choir. A routine job, rather dull after the first few minutes. But then I heard a squeak from the monitor. It sounded like tape squeak and as it was after record it must have registered on the tape. It was very brief, and soon disappeared, only to reappear shortly afterwards. Throughout the recording this squeaking came and went, sometimes so loud as to nearly drown the choir. You can imagine my feelings, especially as frantic checks refused to reveal the source.

In fact the equipment was picking up the "bleeps" from the hospital communications systems and the recording was completely ruined. Nothing could be done about it at all—except request a repeat performance at a different location. Moral, when recording beware bleepers!

* * *

AS a contrast to recording sacred music I was working recently with a pop group. By chance an elderly lady happened also to be present. As a comment on the group she was overheard to remark, "They are exaggerated in neither their dress nor their performance," which, when you think about it, was a sincere compliment in this age to exaggeration. She appreciated the play-back of the recording, too. Many young people tend to overlook the interest that a very much older generation might show in their work. There are a lot of organisations catering for the welfare of old folk and there should be opportunity to help by providing recordings or even talking about recorders. Why not make some inquiries locally?

* * *

ILIKE to end my little piece with a wisecrack. This month I can think of nothing funnier than the statement made with honest sincerity by the Postmaster General, Mr. Wedgwood Benn, on an Independent Television programme. Said Mr. Benn, "...and I can assure you that the days of the pirate radios are numbered..." Since then at least one more station has opened up.

TAPE TECHNIQUES

(Continued from page 247)

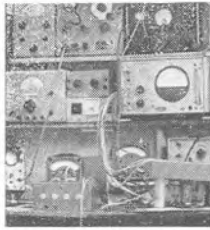
However, it will show in the total time taken to play back a given recording. The figure of 0.5 per cent means thirty seconds in 100 minutes, and there are occasions when thirty seconds can be a very, very long time, but for normal purposes it passes quite unnoticed.

So much for the deck itself. The money we spend on a tape deck purchases above all—speed stability. The more we pay the finer should be the tolerances, the smoother its operation and the greater its reliability. Costs may vary from a few pounds for the cheapest domestic model to many hundreds of pounds for a professional deck designed to operate continuously for very long periods and yet still maintain its mechanical efficiency and reliability.

The electronics are the non-mechanical components that enable us to pass the sound impulses to the head when recording, and off from

the tape to the speaker during playback. Just as we look for speed stability from the transport system, we look for other attributes from the electronics. Great importance is necessarily attached to a good signal-to-noise ratio, freedom from distortion, a flat frequency response, a wide frequency range, and flexibility of controls.

There is a great deal of misunderstanding over the significance of a wide frequency response. There is a mistaken impression that the wider the quoted frequency range of a recorder the better will be the quality of the sound. Unfortunately this has been encouraged in the past by certain manufacturers who hope to persuade the public to buy their products by quoting what are virtually impossible figures. A study of specification sheets for equipment over a wide price range can often be revealing. It might be seen that a machine costing, say, £45, has a very much better frequency response than another costing two or three times that price. Obviously there must be a fallacy somewhere. There is indeed, and just what it is we will discuss in next month's article.



TRUVOX R42

By H. Burrell Hadden

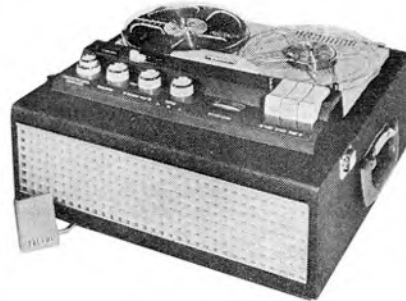
THE Truvox R42 is a portable, mains operated, fully transistorised tape recorder of compact design. It incorporates the latest Magnavox type 363 tape deck, giving three-speed operation with a maximum reel size of seven inches in diameter. The equipment is attractively housed in a wooden case finished in grey simulated leathercloth, and the dimensions are 16½ x 14 x 18 inches. The weight is 22 lb. The external design is pleasing and the finish is good.

The main controls of the tape transport are three piano type keys, situated on the right-hand side of the machine, and these are; fast rewind, start, and fast forward. Each key has two positions. Pressing the front end of the key gives the facility desired, and pressing the rear of the key switches it off. Associated with the start key is the record switch, one of five rotary controls to the left of the control panel. When the record function is required this switch, which is spring loaded in the "play" position, is turned before depressing the start key. The machine automatically reverts to play when the tape is stopped, giving the usual protection against accidental erasure. The fast wind and rewind were even, and the rewind time for 1,200 ft. of tape was 2 minutes 7 seconds.

The amplifier controls are simple, consisting firstly of two concentrically mounted gain controls, which give mixing facilities for microphone and radio or gramophone inputs on record. The microphone gain control acts as volume control on playback. Next to these is the playback tone control, which doubles as a monitor level control whilst recording. It is thus possible to use the amplifier and loudspeaker to monitor the input to the recorder whenever there is no danger of howl-round to the microphone. Next to this is the record switch already referred to, and then the

selector for the three tape speeds of 7½, 3½, and 1½ ips. The only other control is the pause lever, adjacent to the main operating keys. A three-figure digital tape position indicator is provided, and a meter is used for record level indication. This is marked with a black area in which the recording is satisfactory, and a red area which must be avoided if distortion is not to occur.

All the input and output sockets are grouped conveniently on a small panel to the rear of the machine, on the left-hand side. Also on this rear edge is a compart-



ment for the storage of microphone and mains lead. The sockets, of which there are four, are all of the miniature phono type. Unfortunately no standard in/out DIN socket is provided. The four sockets are all coloured differently for easy identification, and from top to bottom they are; microphone input, radio input, monitor output to an external amplifier, and external loudspeaker.

Inserting a plug in the external loudspeaker socket automatically mutes the internal loudspeaker. One slight disadvantage should be noted in this respect. The socket for the feed to an external amplifier is connected after the volume control, so this control is operative, and the internal loudspeaker and amplifier are also connected. There would thus seem to be no way of muting the internal loudspeaker unless a plug is inserted in the external loudspeaker socket, preferably with a dummy loudspeaker load. This output impedance is 15 ohms. The output impedance at the monitor output is 10K ohms, and the output level up to one volt. At the input sockets, the impedance of the microphone socket is 25K ohms and the sensitivity high

at 50 mV; that at the radio socket is 100K ohms and the sensitivity 100 mV.

The amplifier design is very comprehensive featuring eleven transistors, the two power supplies being provided by two bridge rectifier assemblies. Full equalisation to the new CCIR standards is provided at all three speeds. Access to the interior is by removing the two plastic deck covers, after which the whole assembly, apart from the loudspeaker, can be removed from the cabinet in one piece. The amplifier is built on one printed circuit panel, and servicing, should it be necessary, would be a simple matter. The power amplifier is transformerless, and delivers three watts into the 8 x 5 inch elliptical loudspeaker. The machine sent for review was biased for BASF tape, and a reel of this make was included. I understand future machines will be set up for use with EMI tape.

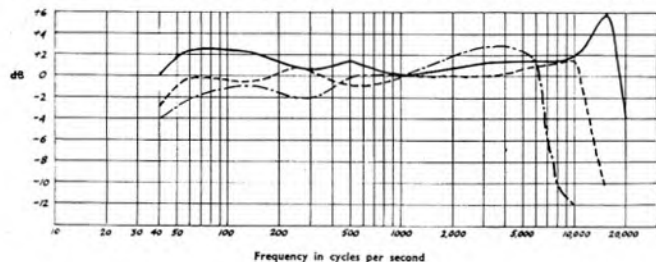
The machine was given the usual electrical and practical tests. Recording from the microphone and radio inputs produced very good results indeed, with excellent frequency response from all three speeds. Wow and flutter were negligible at all except the slowest speed, and background noise was low. Incidentally, the background noise from the microphone channel is sufficient to be heard when recording on the radio channel unless the microphone gain control is turned to zero. On measurement, the excellent frequency response was well confirmed, as the accompanying response curves show. These are well within the makers specification, except for the rise at 15,000 cps at 7½ ips. This rise is on the right side, however, and does not seem to cause any undue distress on reproduction. The response at 1½ ips. was exceptionally good. It is a pity that the measured signal-to-noise ratio (unweighted) did not quite make the specification at 38 dB. The troublesome noise seemed to be at very low frequency, and again this was not at all troublesome on reproduction.

Supplied with the record is a small dynamic microphone, and recording lead for the radio input. The instruction manual is clear and easy to follow, and the review machine was sent complete with a circuit diagram. I can thoroughly recommend this machine as a good buy at 44 guineas.

MANUFACTURERS SPECIFICATION

- Speeds: 7½, 3½, 1½ ips.
- Maximum spool size: Seven inches.
- Winding time: Two minutes for 1,200 ft.
- Frequency response: 40—15,000 ± 3dB at 7½ ips, 40—10,000 cps ± 3 dB at 3½ ips, and 40—5,000 cps ± 3 dB at 1½ ips.
- Hum and noise: Better than 42 dB.
- Signal-to-noise ratio: Better than 46dB.
- Wow and flutter: Better than 0.15, 0.25 and 0.35 per cent at 7½, 3½, 1½ ips. respectively.
- Inputs: Microphone (50 microvolts at 25 K ohms), radio pick-up (100 mV at 100 K ohms).
- Power output: Three watts into 15 ohms.
- Loudspeaker: 8 x 5 inch hyperbolic cone.
- External Amplifier output: Across 10 K ohms variable up to one volt.
- Operating voltage: Dual 100-120 V and 200—250 V, AC 50 cycles (60 cycles to special order).
- Power consumption: 75 watts.
- Transistors: Eleven plus two rectifiers.
- Dimensions: 16½ x 14 x 8 inches.
- Weight: 22 lb.
- Price: 44 guineas.

Manufacturers: Truvox Limited, Neasden Lane, London, N.W.10.



Record/replay frequency response of Truvox R42
 7½ ips —————;
 3½ ips - - - - -;
 1½ ips - . - . - .

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**Tape records
reviewed**

CLASSICS



By **Edward
Greenfield**

**A special
tape
for
young
listeners**

**BRITTEN. Young Person's Guide to the
Orchestra. DOHNANYI. Variations
on a Nursery Theme. Victor Aller
(piano) with the Concert Arts Symphony
Orchestra conducted by Felix Slatkin.
WRC (TT 506), 29s. 6d.**

It was an excellent idea to couple two sets of variations written with young listeners specially in mind. For anyone eager to interest children in serious music, this is as good a tape as you could find, and the enjoyment for older listeners is by no means trivial.

Britten first wrote his Young Person's Guide for an instrumental film, which first went through the different sections of the orchestra and then provided individual variations for the separate instruments. Not only does Britten give each instrument a part specially designed to bring out the distinctive qualities, the result hangs together extraordinarily well as a set of variations quite apart from the teaching purpose for which it was designed, and nowadays you will often see it listed in programmes as Variations and Fugue on a Theme of Purcell. Moments specially to look out for include the variation for percussion near the beginning where the tune is played on the timpani to show how precisely pitched such drums are. The final fugue is a real riot, working up to a marvellous climax when Purcell's very grand theme returns magnificently.

Where Britten chose a very little-known theme for his variations, the Hungarian Dohnanyi approached the problem of interesting young people the other way round. He took what is perhaps the most popular of nursery-tunes, one which we know as "Baa, baa, black sheep," and used it for a dazzling display for piano and orchestra, of marches, Viennese waltzes and other colourful ideas. Like the Britten variations it ends with an elaborate fugue, showing that fugues need not be heavy and intellectual.

The late Felix Slatkin was perhaps the most brilliant musician to have worked consistently in the film world of Hollywood, and it is sad that he died so early. The Concert Arts Symphony Orchestra was formed of musicians who worked in the film studios too, among the most accomplished—and highly paid—in America. Both performances are brilliant, and the Capitol-made recording has the right sort of edge for these works.

**BRUCKNER. Symphony No. 8 in C minor.
Munich Philharmonic Orchestra con-
ducted by Hans Knappertsbusch. WRC
(TCM 71-2), 59s.**

Even among Bruckner's massive symphonies, No. 8 in C minor stands out for the sheer size of the achievement, and when the final symphony, No. 9, remained incomplete at Bruckner's death, it is reasonable enough to regard it as the culmination of the whole cycle. He himself said he regarded it as his greatest symphony, but as he was a man who notoriously deferred to other people's opinions (particularly when revising his own works) we must not take this as a dogmatic statement.

The wonder is that for all the size Bruckner's concepts are amazingly simple and apparently straightforward. Each theme unrolls itself with a sense of inevitability, and maybe it is this quality of untroubled spaciousness that has made Bruckner appeal more and more to the concert-going public, which not long ago used to reject him (wrongly) as long-winded and boring.

The late Hans Knappertsbusch was best known for his work as a conductor of Wagner at Bayreuth and other opera houses throughout the world, and particularly for his interpretation of the last Wagner opera, "Parsifal," a work from which Bruckner derived much inspiration, for its measured paragraphs chimed with his own character and sympathies. So here Knappertsbusch gives a ripe, expansive performance, that for the most part is very convincing. The orchestra is not so virtuoso a body as one would ideally ask for, and in the rustic-sounding scherzo the result is rather ragged, but the important thing is the conductor's warmth and sympathy. Recording fair though not as clear as it might be. It is a pity two spools had to be used instead of a double tape on a single spool as in Mahler No. 2 reviewed last month.

**An ideal
tape
for
your
parties**

POPULAR



By **Don
Wedge**

**BEACH BOYS' PARTY! The Beach Boys.
Capitol (TA-T 2398), 3½ ips, mono, 35s.**

The Beach Boys are to American teenagers what the Beatles are to Britain's. Both groups are musical adventurers. Both have fanatical followings. Both thrive on excitement.

The Beach Boys have not, as yet, won anything like the following here that the Beatles gained in America. But this spring saw their first real success in the British charts with "Sloop John B".

There could now be a great awakening of British interest in the group and this LP is a fine example of their range of work. The party element is provided by studio dancers and informal comments by members of the group between the numbers.

This makes the record ideal for discotheque-type parties. The audience noises interfere with listening pleasure although the group itself has much to offer. Its inventive vocal harmonies show a desire to avoid

undue conformity and lead to great excitement.

Their links with the Beatles are further forged by using three Lennon-McCartney songs. They also go folksy with Bob Dylan's *The Times They Are A-Changin'*, but are at their best with exciting versions of American teen dances such as *Hully Gully* and *Alley Oop*.

* * *

TEARS OF HAPPINESS. Ken Dodd, with the orchestras of Geoff Love, Brian Fahey and Tony Osborne. Columbia (TA-33SX 1793), 3½ ips, mono, 35s.

Last year belonged to Ken Dodd. He was rightly hailed as a music hall genius. And for a vaudeville comic he is a good singer.

That is qualified praise admittedly but Dodd's big 1965 hit, "Tears", was probably the biggest selling single of the year. Why quarrel with success?

The title song of this album is not his big hit but it is in a similar vein as are the rest of the songs—sentimental, syrupy . . . and sensational box-office.

His comedy is at times inspired. But his singing is a lower range of his talents. If only it matched those of the accompanying orchestras.

* * *

P. J. PROBY IN TOWN. P. J. Proby, with orchestras conducted by Johnnie Spence, Norman Smith, Johnny Scott and Les Reed. Liberty (TA-LBY 1291), 3½ ips, mono, 35s.

The box of this record shows Proby with hair swept back, wearing a dark suit, white shirt and gold cuff links. A different man indeed from the one whose trousers slip on stage!

When he made this record Proby was switching from his attempt at gaining teen idolatry to trying for a maturer cabaret audience.

Just as he seems to adopt so many personal roles, his voice has a fantastic range and he tackles so many singing styles that it is hard to put him in any category.

Nearly all the songs on this LP are from stage shows. *Maria* was released as a single as an example of the dramatic intensity of which he is so capable.

But Proby is an acquired taste. His classy versions of *People* and *It Ain't Necessarily So* suit my palate, but at times he overdoes things and makes tough listening.

BRIEFLY

Herb Alpert's Tijuana Brass brought a refreshingly different flavour to the hit parade with their "Spanish Flea" success. I had looked forward to *Sounds Tijuana* (Stateside: TA-SL 10176, 35s.), for further examples of acceptable novelty. It is there, but the effect is disappointingly small after the strong impact of Alpert's big hit.

Films and stage musicals have provided most of the standard songs which lead to endless recordings. *Sixteen Hits From Stage And Screen* (Columbia: TA-33SX 1795, 35s.) is a collection of some of E.M.I.'s best orchestral and choral talent (Tony Osborne, Eddie Calvert, Norrie Paramor, Geoff Love and Cliff Adams) in a repackaged collection which makes wonderful background music. Hawaiian music should not stand still

The tapes reviewed this month are issued by the following companies:
"Capitol," "Columbia," "Liberty," "MGM" and "Stateside"; E.M.I. Records Ltd., 20, Manchester Square, London, W.1.
"W.R.C.": World Record Club, Box 11, Parkbridge House, The Little Green, Richmond, Surrey.

any more than other styles. In *Return To Paradise* (Liberty: TA-LBY 1289, 35s.), Tommy Garrett's Fifty Guitars evoke the music of the swaying palms, inject a few hippy guitar features but somehow lose the crisp, clean, coolness one expects to hear under the Hawaiian label.

Though Hollywood Garrett's base is nearer to Hawaii than London, there is a more authentic flavour about the British-made *Paradise Island*. (Columbia: TA 33 SX 6024 35s.) which features Dutch guitarist Wout Steenhuis providing his own multi-tracked accompaniment. This is the one I am repeatedly playing.

Mickie Most no longer produces the Animal's records but in *The Most Of The Animals* (Columbia: TA-33SX 6035, 35s.) is a compilation of his best work with the group. The finest British pop exponents of soul music, the Animals have an admirable raw quality. Their first hit, *House Of The Rising Sun*, and one of their most recent, *We've Gotta Get Out Of This Place* are included.

I never thought a Lena Horne record would disappoint. But *The Horne Of Plenty* (WRC: TT 512, 29s. 6d.) certainly does. There are only ten songs. The first track is merely a recital accompanied only by piano and rarely using the orchestra that is present. Every jewel needs a good setting. Lena Horne is no exception and it is made even more plain by the second track which has some wonderful accompaniment.

Background music is, I suspect the kind most needed by tape record buyers. Trumpets can be very harsh and demanding. That is not the case with an Eddie Calvert re-issue, *The Golden Trumpet* (WRC: TT 485, 29s. 6d.) which makes fine easy listening. Just how mellow Calvert can be is well illustrated with *I'm Getting Sentimental Over You*.

More conventional background music is *Secret Songs For Young Lovers* (WRC: TT 471, 29s. 6d.). It features the sparkling piano of Andre Previn and the lush strings of David Rose. All the titles involve youth or young love to justify the name of the record.

Less easy on the ear is some heavy-handed latin piano by Pepe Jaramillo on *Pepe On The Continent* (Columbia: TA-33 SX 6036, 35s.).

Michael Holliday's similarity to Bing Crosby will always stand out in the memory of a charming man. Crosby was his idol and it was no surprise that most of the songs on *Holliday Mixture* (WRC: TT-508, 29s. 6d.) were associated with the American star. Michael Holliday had his place in the pop world and was liked by so many. It is nice to hear him on record again.

That Holliday was no copy of Bing Crosby is well illustrated on *The Great Country Hits* (Capitol: TA-T 2346, 35s.). Bing Crosby has recorded country-and-western songs before, but this is his first album. The songs are well-known ones like *Jealous Heart* and *Wabash Cannon Ball*. Many of them suit Crosby's warm, cuddly styles. With him, even sad songs become happy.

More genuine country-and-western—the present Nashville version—comes from Hank Williams, Jr., on *Ballads Of The Hills And Plains* (MGM: TA-MGM-C-8003, 35s.). The first Hank Williams was one of the country music greats. His son, on this showing, is going to rival him in the Hall of Fame that the Nashville music industry is opening. This is a beautifully made record for which producer Jim Vienneau must take a lot of credit. There is useful assistance, too, from the Jordanaires.

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NEW PRODUCTS

LATEST STEREO MODEL FROM GRUNDIG

A FOUR-TRACK three-speed transistorised stereo tape recorder is the latest addition to the Grundig range.

The new model, illustrated right, is the TK340 a new and improved version of the TK46. Featuring a wide range of features including separate record and playback heads and amplifiers, facilities for multiple superimpositions, tape monitoring and echo, it operates at $7\frac{1}{2}$, $3\frac{3}{4}$, and $1\frac{1}{2}$ ips.

The quoted frequency range is 40-18,000 cps at $7\frac{1}{2}$ ips, 40-15,000 at $3\frac{3}{4}$ ips, and 40-10,000 at $1\frac{1}{2}$ ips, signal-to-noise given as better than 52 dB at the top two speeds and 47 dB at $1\frac{1}{2}$ ips. Wow and flutter is rated as less than 0.1, 0.12 and 0.2 per cent respectively.

Accommodation is available for seven inch reels, providing a playing time of 64 minutes per track using standard-play tape (12000 ft.) at $3\frac{3}{4}$ ips.

Other features include four digit rev. counter with zero reset button, separate bass and treble controls, neon recording level indicator, pause control, and two built-in loudspeakers providing a power output of 8 watts per channel.

Inputs are provided for microphones (2mV/1.5 M ohms), pick-up (100mV/1 M ohms and diode (22mV/22 K ohms). Outputs are provided for two extension loudspeakers (5 ohms). The circuitry includes six valves (two EF 86, two ECC 81, an EL 95 and an EM 84) and fourteen transistors (two BSY 76, two AC 127, two AC 152 and four AD 150). Power supply is from 110-250 volts AC, 50 cycles.

Measuring 21 x 16 x $8\frac{1}{2}$ inches, and weighing 37 lbs., the TK 340 is sleekly finished in charcoal and ivory with silver escutcheons. The price is 145 guineas.

An alternative model, the TS 340, is available in a walnut case with a perspex lid and fold-away handle for 149 guineas.

Grundig (Great Britain) Limited, 40, Newlands Park, Sydenham, London, S.E. 26.

AKAI INTRODUCE 3 - SPEED BATTERY RECORDER

SEEN at the recent Audio Fair was Akai's X-PK1 battery-operated tape recorder. The new unit, which will retail at 28 guineas, incorporates the ultra-slow speed of 15/16 ips together with the more usual $1\frac{1}{2}$ ips.

Quoted frequency response is 100-9,000 cps \pm 3 dB at $1\frac{1}{2}$ ips, and 100-5,000 cps at 15/16 ips; wow and flutter is given as less than 0.6 per cent at the top speed; and signal-to-noise ratio as better than 35 dB. Accommodation is available for a $3\frac{1}{4}$ -inch spool, providing a playing time of 26 minutes per track using standard-play tape at $1\frac{1}{2}$ ips.



Among the features are the unique Akai Crossfield head, push-button controls for record, stop, play and fast rewind, meter recording level indicator which doubles as battery life indicator on playback, and thumb-wheel volume and gain control. Sockets are provided for external amplifier and extension loudspeaker.

The power output is rated as 85 mW from the transistorised amplifier incorporating three 2SB171, two 2SB172, a 2SB475D and one diode. Power is supplied from four $1\frac{1}{2}$ -volt cells (UM-2).

Housed in a solid metallic case, the X-PK1 measures $9\frac{1}{2}$ x $4\frac{1}{2}$ x $2\frac{1}{2}$ inches, and weighs only $3\frac{1}{4}$ lb. The price includes dynamic microphone, spool of tape, spare spool, batteries, plus wrist-band for carrying the recorder.

Pullin Photographic, Ellis House, 11, Aintree Road, Perivale, Greenford, Middlesex.

DANSETTE ANNOUNCE THEIR CASSETTE MODEL

TWO battery-operated tape recorders have been introduced by Dansette. First of the models is the JTR 909, illustrated below, a 26-guinea recorder featuring the Philips $\frac{1}{2}$ -inch wide tape cartridge.

With a tape speed of $1\frac{1}{2}$ ips, it provides a playing time of thirty minutes for each of its two tracks. The recorder operates from four $1\frac{1}{2}$ volt U11 torch batteries, featuring piano key controls, a meter re-



cording level indicator, 2½ inch loudspeaker unit handling the power output of 40 mW, and an AC mains adaptor.

It measures 8 x 5½ x 2¼ inches and weighs only 3 lb. Included in the price is a dynamic microphone with remote control stop/start switch.

Second new model is the JTR 93, illustrated below a two-speed recorder operating at 3½ and 1½ ips. Accommodation is available for 3 inch reels, providing a playing time of 13 minutes for each of its two tracks using standard-play tape at 3½ ips.

Among the features are automatic recording level control, and a power output



of 800 mW through the built-in three-inch round loudspeaker. Included in the price of 22 guineas is a stick microphone featuring a remote control stop/start switch.

Power is supplied by four HP 2 cells for 110-125 and 220-240 volts, AC mains. Measuring 10 3/16 x 8¼ x 2½ inches it weighs 5 lb.

Dansette Products Limited, Dansette House, Honeypot Lane, Stanmore, Middlesex.

FI-CORD'S FIRST CONDENSER MICROPHONE UNIT

FI-CORD are claiming sales success for their condenser microphone, the FC 1200 illustrated below.

With a quoted frequency range of 30-20,000 cps, the microphone is usually supplied with capsule having a cardioid polar pattern with a front to back response difference better than 20 dB over this range. An alternative omni-directional capsule can be provided and easily fitted by the user.

The FC 1200 is 6 7/16 inches long and one-inch in diameter. It weighs 10 ounces. Included in the price of £98 are windshield, stand clamp, connecting leads and power



supply unit for the microphone head amplifier.

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

CONSOLE MODEL BY STEREOSOUND

LATEST model to be introduced by Stereosound Productions is the Carousel RT5, a three-speed half-track recorder operating at 7½, 3½ and 1½ ips.

Incorporating the BSR TD10 tape deck, the RT5 (illustrated below) has accommodation for seven-inch spools, providing a



playing time of 64 minutes per track using standard-play tape (1200 ft.) at 3½ ips. The quoted frequency range is 60-10,000 cps.

Among the features are magic eye recording level indicator, facilities for monitoring, combined tone control, three digit rev. counter and safety erase switch to prevent accidental erasure.

The RT5 is housed in a polished teak veneer cabinet measuring 23½ x 21½ x 13½ inches, and has ample storage space for tapes, microphone (optional extra) and a plug-in radio tuner (optional extra, nine guineas). The price is 34 guineas.

Stereosound Productions Limited, Capital Works, 12-14 Wakefield Road, Brighouse, Yorkshire.

QUADRUPLE-PLAY TAPE FOR PHILIPS' CASSETTE

PHILIPS announce the introduction of a new cassette with quadruple-play tape. With the playing time increased to 45 minutes on each of the two tracks, the new cassette will be designated C90.

The price of the new unit is 27s. 6d., while the original C60 will continue to be marketed at 19s. 6d.

Both cassettes are now available in perspex containers with an index card for the tape contents, and with storage racks for up to six cassettes for a tape library.

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Sections on its uses in business, education and pleasure, how it works, etc.
2. **Alternating Current and Acoustics.** Edited by Edgar J. Black (1964). 116 pages, 86 illustrations. **10s. 6d.**
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21. **Practical Hi-Fi Handbook** by Gordon J. King. 224 pages. **25s.**
A guide to choice, installation and servicing of equipment, for dealer, engineer, and amateur enthusiast.
22. **Practical Stereophony** by H. Burrell Hadden (1964). 159 pages. **37s. 6d.**
The author, an instructor at the BBC, has been actively engaged for many years in research in this field, as a result the book is mainly directed towards those who make this art their profession, but there is much for the amateur enthusiast.
35. **Tape Recording Yearbook 1965.** **7s. 6d.**
The 1965 edition contains all the well-known facts and figures of earlier editions, revised to date, as well as important contents vital to all interested in this field. Compiled by the staff of "TAPE Recording Magazine" this Yearbook is a must.

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News from the Clubs

IPSWICH

Manufacturers' demonstrations have been high on the list of activities for members of the Ipswich tape society. Mr. A. J. Fround of Decca Records started the ball rolling on January 20 when he presented his lecture on the post-war development of the record industry. Illustrations for his talk included extracts from *Iolanthe*, plus recordings of the London Symphony and Vienna Philharmonic Orchestras together with some unusual African music.

On February 3 Frank Parrington of BASF Chemicals made a return visit to the club to talk and demonstrate tape/slide synchronisation and present the ever-popular film *The Magic Tape*.

It was Cosmocord's turn a month later when Mr. A. W. Nash presented a talk, demonstration and film of various Acos products including microphones and pick-ups. The final manufacturers' visit was by Mullard who were scheduled to meet the club on March 31, and present some of their films.

Members themselves have not been entirely inactive. Russell Burgess and Harry Dix presented a range of recordings covering several decades and on March 17 having heard a tape from the Glasgow enthusiasts members recorded a reply. Contributions by members included extracts from programmes made during visits to a local newspaper office, fire station, scout group review, together with musical items, including jazz and organ arrangements.

READING

Derek Holt, runner-up in almost every competition organised by the Reading tape and cine society, has been awarded the "Member of the Year" trophy for being the most active member in the club. Editor of the club's magazine *Trailer*, he is also programme secretary and is currently preparing the programme for next season.

The latest reported meeting of the club was a "Photo Fair" to round off the present season. During the recess, members will be working hard on the annual exercise which this year is to make a tape, a tape/slide show, or a film which must include part of a chosen piece of music and two selected sound effects.

At the May 9 meeting founder member Mr. T. H. Pettit announced his resignation as Chairman, but expressed the hope that he would be able to find time to continue attending as an ordinary member.

At the previous meeting vice-chairman James Helder lectured the club on "Making a film soundtrack." His ambitious talk covered the artistic and technical problems involved. His talk included a short demonstration piece of a fairly "neutral" opening scene from one of his films. By changing the musical track he showed how it could be made to seem like the opening of a comedy sequence, emotional drama or a spine-chilling thriller. Correct use of sound effects was covered before he reviewed the relative merits of wild tape, synchronised tape and striping methods, illustrating each process in turn.

Secretary: Mrs. Rita Noyes, 4, Froxfield Avenue, Reading, Berkshire.

RICHMOND

Concentration on documentary-type feature programmes for the members of the eight-month-old Park tape club at Richmond. Following location recording on the occasion of the University Boat Race members heard Mr. Con Ryan, a senior producer at the Central Office of Information, talk about interviewing and documentary production. Their April 18 meeting was to have been a practical evening making a documentary programme, followed on May 2 by a members' tape

time and discussion on their group entry in the British Amateur Tape Recording Contest.

Further local recording was scheduled for May 7 when Highland Games, part of the Scottish Festival in London, were being held at Richmond Athletic Grounds.

Secretary: John Tibble, 29, Meadlands Drive, Petersham, Surrey.

RUGBY

The latest meeting of the Rugby tape club was attended by eight members of Dallington Camera Club in Northampton who acted as judges for the Rugby winter tape contest.

Tapes had been submitted by Keith Fisher (the trophy holder), John Armsby, Len Stephens, Michael Martin and Bill Long, and it was to Bill Long that Dallington awarded top marks. He now holds the Terry Davis trophy for 12 months. The evening was concluded with a half-hour programme of slides presented by Mr. Sharpe. The tape members are to return the visit later this year to judge the camera enthusiasts' slide competition.

Their June 2 meeting saw members

welcoming representatives from the 3M Company to show two films on the manufacture of their Scotch magnetic recording tape.

A programme dealing with tape and cine synchronisation was presented by Mr. T. Gilbert of the Birmingham club when he attended a Rugby meeting at the beginning of April. A short film on the Norfolk Broads was followed by a demonstration of recording the commentary for accurate synchronisation before Mr. Gilbert introduced his main film with multi-channel stereo soundtrack, of a holiday touring Austria and Italy.

Further involvement in cine programmes followed when some Rugby members travelled to the Birmingham club to join the South Birmingham club members for an evening of films. This was followed on May 19 with a return visit by Richard Margoschis who spoke of his work as a Public Health Inspector with regard to noise control.

Future programmes are to include their AGM on June 16; a visit by local hi-fi dealer W. M. Tyson; and a talk on photography by John F. Hughes, a local freelance photographer.

Secretary: Michael Brown, 219, Clifton Road, Rugby, Warwickshire.

BARROW

Scripts of short playlets and sketches suitable for tape recording are urgently wanted by members of the Furness Soundtrack Club in Barrow. Local library sources have dried up and all the members have now tried their hand at scripting their own sketches which are required for a local Blind Social Club. The members produce a monthly 45-minute magazine programme on tape and would appreciate the loan of scripts from other clubs. Even library book titles would be welcome.

Two husband and wife teams are also regularly providing a weekly 45-minute programme for the local Resident Home for the Blind, and script and stories would also be welcomed for this.

The club members recently welcomed members of the Millom tape club for a rare get-together of north-west tape enthusiasts.

Secretary: Mrs. Jane Rayner, 123, Abbey Road, Barrow-in-Furness, Lancashire.

FERROGRAPH OWNERS

A change of address is announced for the secretary of the British Ferrograph Owners' Club. Bob Littler's new address is given below.

The club also announce the availability of their home construction kits, details of which have already been given in their magazine *Ferro*. Latest edition of this journal includes a history of the Ferrograph Co. by Mr. R. W. Merrick and constructional articles by Fred Kempton.

Ferrosound, the club's monthly magazine on tape, has recently completed its rounds, and is being received with great enthusiasm.

Secretary: R. D. Littler, 19, Redhall Gardens, Leeds 17, Yorkshire.

GLASGOW

Plans for a Scottish Tape Convention are being made by members of the Tape Section of the Radio Club of Scotland.

To be held on October 2, their proposed annual event will be located at Perth felt to be the most suitable venue in central Scotland. The whole venture is being sponsored by the tape members with a Glasgow tape and hi-fi dealer providing the equipment. The programme is to include a demonstration of the latest tape and hi-fi equipment and tape/slide and tape and cine shows.

Admission is to be by ticket only, price one guinea. This charge includes a first-rate Dinner after the shows. Interested persons are invited to contact the secretary.

Recent activities of the club have included tape exchanges with the clubs in Brighton and Coventry, a demonstration of linking film and taped commentary by John Anderson, and a loudspeaker test by Frank Watson. The club's monthly sound magazine *Tape Time* is now being compered on a rota system to provide greater variety. Connoisseurs may be interested in possible location recordings made when the members visited the oldest brewery in Scotland, Traquair House, near Inverleithen in Peebleshire.

Secretary: John Wood, 62, Kingarth Street, Glasgow, S.2.

TAPE EXCHANGES

Tape recorder owners who wish to contact others with similar interests, to exchange news and views by tape are invited to fill in and return the form below giving their name, age, address, special hobby or interest for this free service.

Details given here also include speeds to be used, spool size, name of recorder, and special area to be contacted.

Lawman, Thomas E. (21). Highfield Villa, Tye Green Village, Harlow, Essex. Photography, philately, motor sport. 7½, 3¼, 1½, 15/16 ips. 7-inch spool. Stella ST459, four-track. UK, Europe, Iceland.

Linaere, Terry (47). 59, South Road, Waterloo, Liverpool 22, Lancashire. Cinema and theatre organ music. 3½ ips. 5½-inch spool. Philips EL3552. England, Holland, USA.

Macpherson, Cluny (40). 62, Anderson Avenue, Aberdeen, Scotland. Travel, most music. 3½ ips. 5½-inch spool. Grundig TK14. UK, Europe.

Massey, Albert F. (53). 125, Makin Street, Walton, Liverpool 4, Lancashire. Psychological study, religion, light music. 3½ ips. 5½-inch spool. Stella, four-track. Grundig TK5. UK only.

Matthews, G. A. (20). 2, Lancing Road, Feltham, Middlesex. Travel, films, most music. 7½, 3¼, 1½ ips. 5½-inch spool. USA, Canada only.

McArthur, Vincent (24). 2a, Fairbridge Street, Middlesbrough, Yorkshire. Swimming, reading, TV. 7½, 3¼, 1½ ips. 7-inch spool. Elizabethan Princess, Hawaii, New Zealand, USA.

Milne, John (31). 9, Chaucer Avenue, The Straits, Sedgley, Staffordshire. Hi-fi, motoring, all music. 7½,

3¼, 1½, 15/16 ips. 7-inch spool. Philips EL3549, four-track. UK, USA, Australia, Hong Kong.

Mitchell, Brian (20). 1, Fairway Crescent, Newton, Nottingham. Cars, humour, books, most music. 3½ ips. 5½-inch spool. Grundig TK18. USA, Australia, South Africa, New Zealand.

O'Reilly, T. J. (39). 50, Maendy Wood Rise, West Pontnewydd, Cwmbran, Monmouthshire. Photography, drama, most music. 7½, 3¼, 1½, 15/16 ips. 7-inch spool. Philips EL3549, four-track. UK only.

Parry, Frank (29). 434, Southport Road, Bootle, Lancashire. Current affairs, politics, most music. 1½ ips. 4-inch spool. Philips EL3586, battery portable. UK, USA, Europe.

OVERSEAS READERS

Minarik, Vladimir (22). Hlinsko Poste Restante, OKR Chrudim, Czechoslovakia. 3¼, 1½ ips. 5-inch spool. Sonet Duo.

Mustafa, Ghafor (23). 67, Ilang Ismail, Mersing, Johore, Malaysia. Reading, chess, music. 3½, 1½ ips. 3-inch spool. Sony-O-matic recorder. English and Malay spoken.

Scerri, Emanuel (32). 5, St. Joseph's Flats, Testaferrata Street, Msida, Malta, G.C. 3½ ips. 7-inch spool. Two Philips EL3541. Europe and S. America.

Smith, Edward J. L. (37). 7, Chiltern Park, Hugon Road, Claremont, Cape, South Africa. Photography, reading, jazz music. 7½, 3¼, 1½ ips. Grundig, Philips and Truvox recorders.

Wrangham, Brian (24). 33, Mason Terrace, Ottawa 1, Ontario, Canada. Live recording, hi-fi and stereo, humour. 7½, 3¼, 1½, 15/16 ips. 7-inch spool. Grundig TK46 and Sony 262, both four-track, Uher 4000S. UK only.

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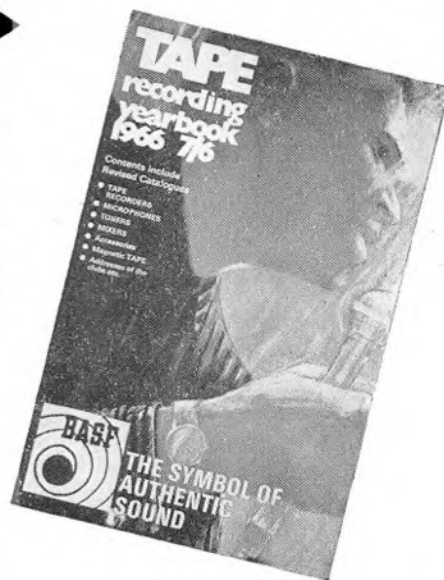
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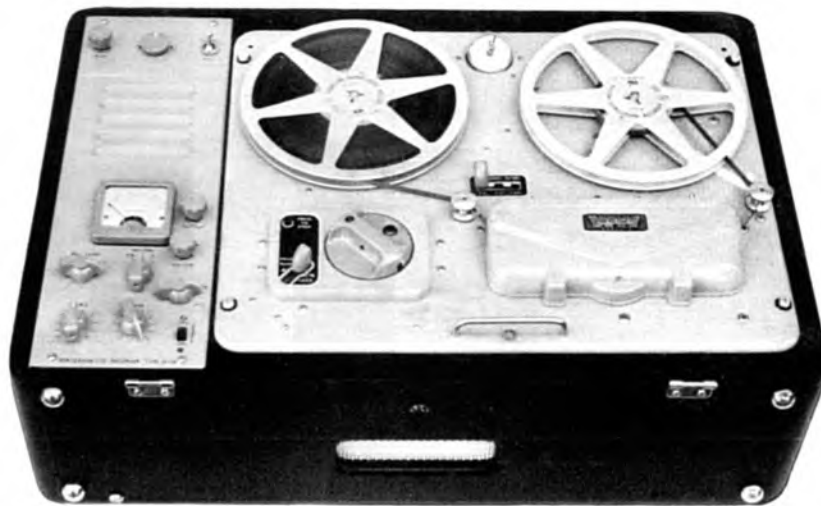
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TYPE W.V.B. TAPE RECORDER

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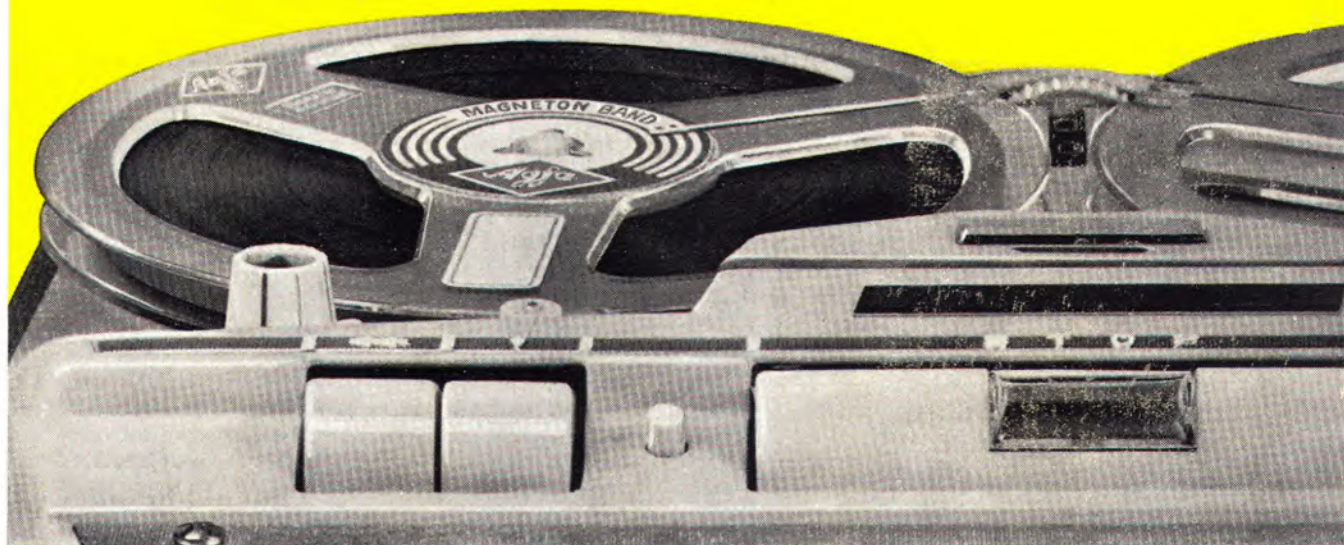
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