

FEBRUARY 1964

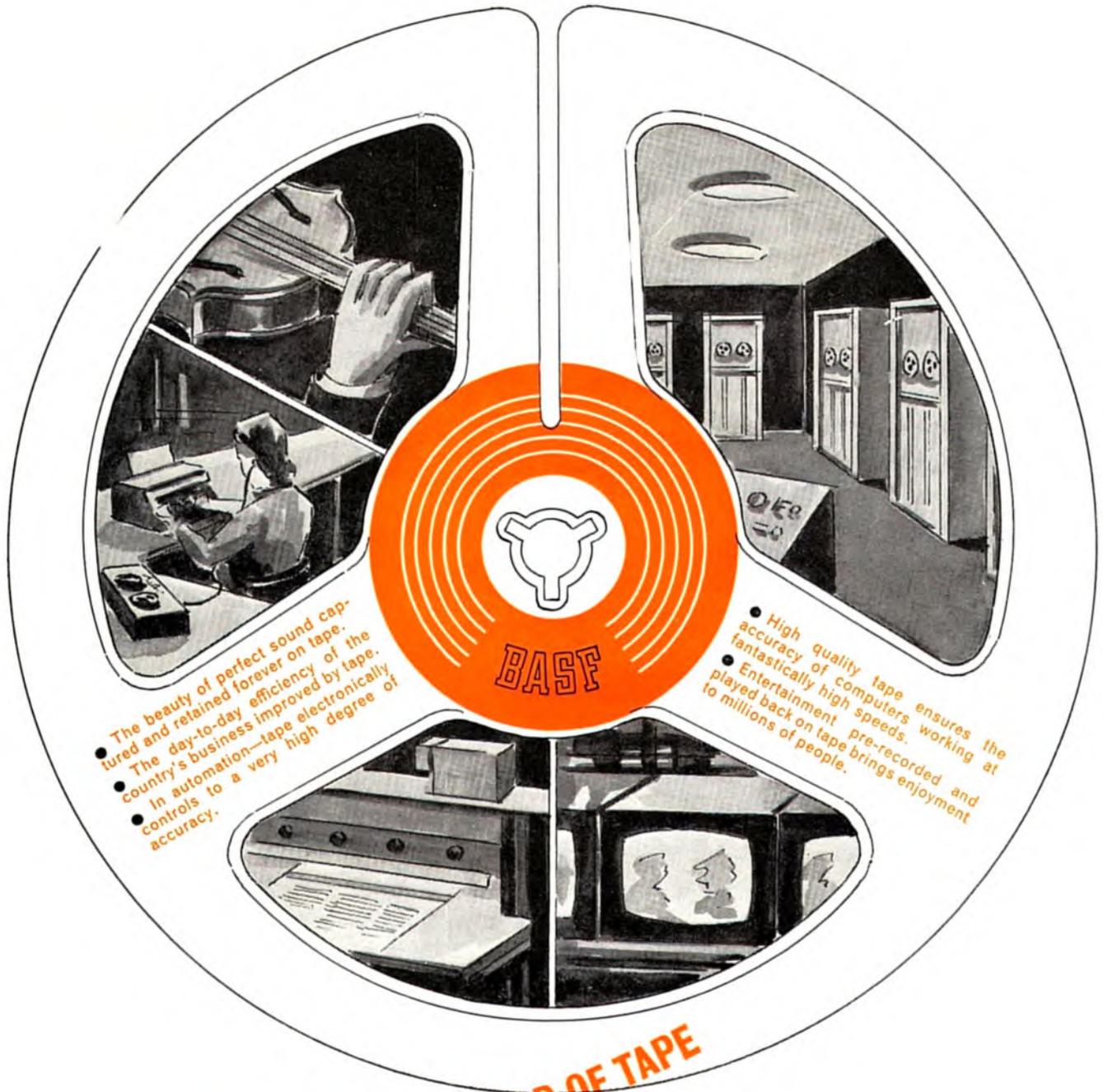
TAPE

RECORDING MAGAZINE



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- **Tape in the classroom**
- **Advice on location recording**
- **Medical uses for tape recording**
- **Producing a contest tape**
- **Microphones and their uses**
- **Reviews of tape records**
- **Do-it-yourself feature**
- **New Products**
- **Club news**



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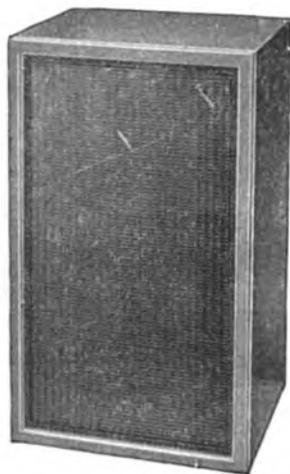
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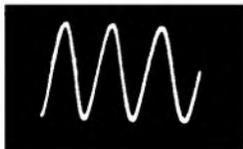
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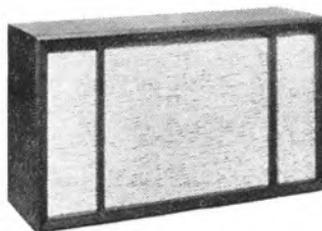
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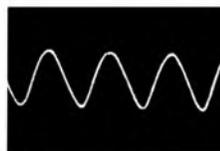
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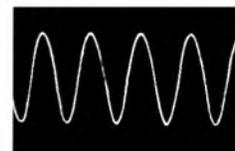


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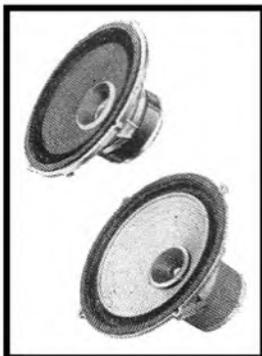


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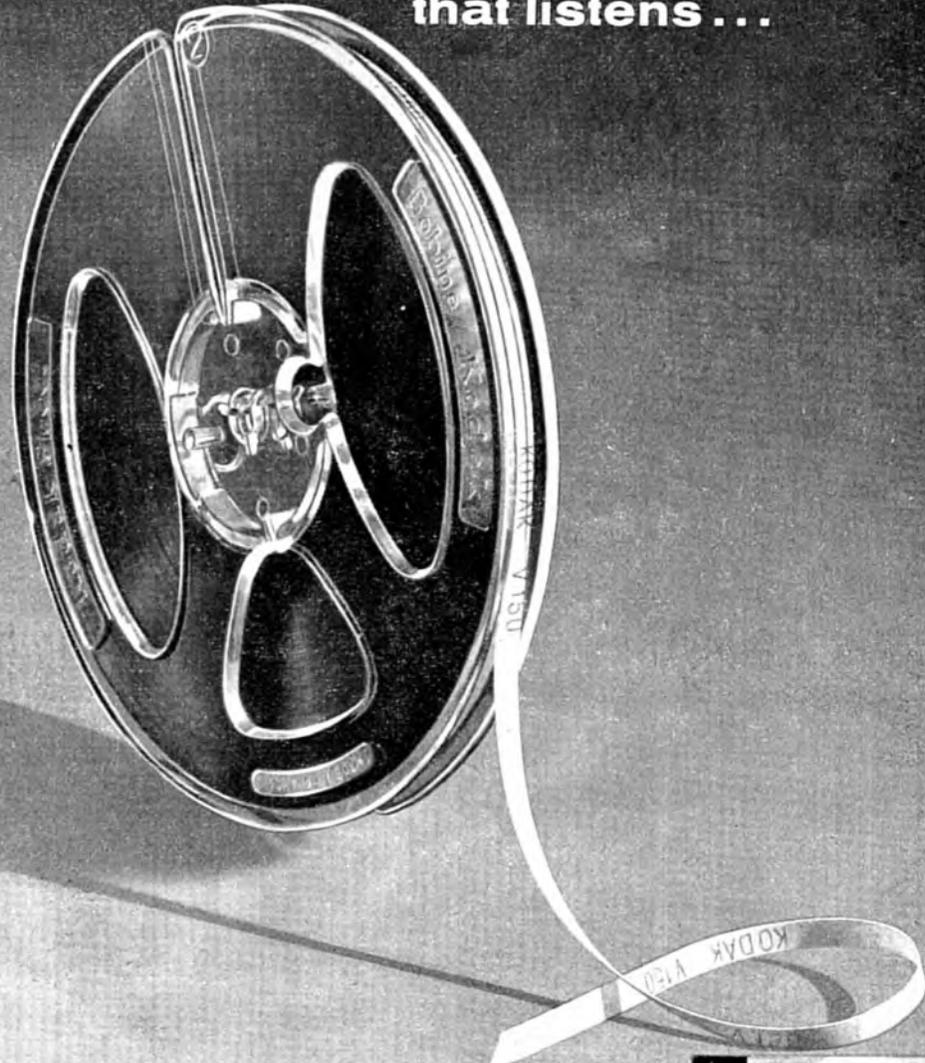
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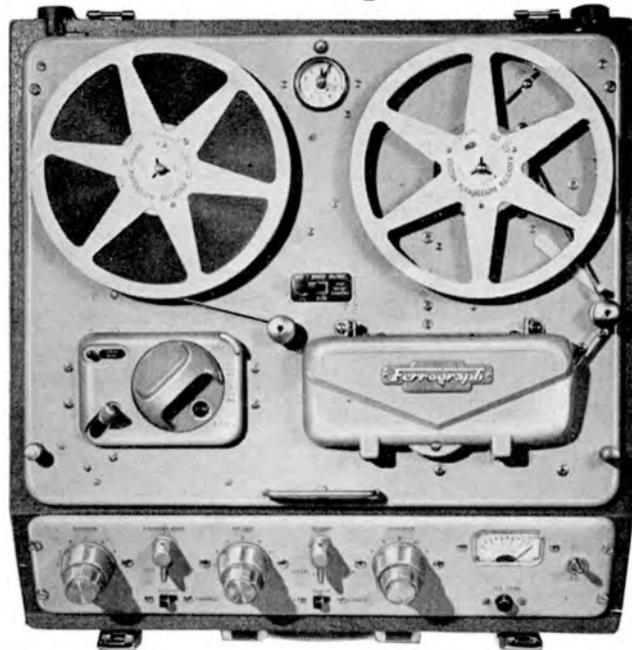
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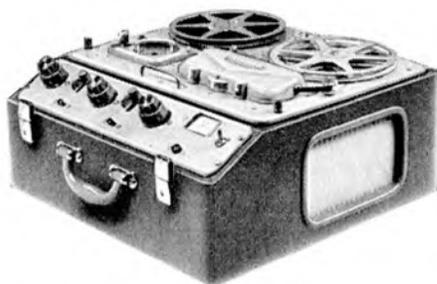
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TAPE RECORDING MAGAZINE

Vol. 8

No. 2

February 1964

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COVER PHOTOGRAPH: Harry Secombe, now appearing as Mr. Pickwick at the Saville Theatre, London, relaxes in his dressing room and records a message for the patients in Woolwich Memorial Hospital. The tape was included in the Woolwich tape club's weekly "Sound Magazine." Also seen with Harry are Stan Byfield (left), the club's secretary, and Mr. William S. Pearson, chairman of the hospital's Remembrance Association.

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EDITORIAL

ADVERTISING

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R. DOUGLAS BROWN

Advertisement Manager,
MISS PAMELA DURHAM

Assistant Editor, FRED CHANDLER

Tape trends and tape talk

By the Editor

THE MOST EXCITING developments in the tape field at the present time are in the field of video recording, but it is in the nature of things that most of the information is classified as top secret until the production and marketing departments are ready to go into action.

Norman Rutherford and Michael Turner, the two brilliant young men who developed and demonstrated the "Telcan" unit here, have been in America recently, coordinating with the giant Cinerama group, which has bought the rights to manufacture and market their equipment everywhere outside Europe and the Commonwealth.

Their demonstration of "Telcan" in New York got a good reception. And now comes the exciting news that they plan to have Telcan on sale in this country within a few months.

Meanwhile, the manufacturers of magnetic tape are hard at work to produce a tape which will improve the performance of domestic video machines.

Agfa provided the thin-base tape used for demonstrating the "Telcan" prototypes last year and the "International Sound Engineer" (an excellent new technical journal edited by Donald Aldous) reports that research has now produced a new lacquer which will help.

The problem, of course, is to produce tape that will stand up to the relatively high speed of passage past the heads without breaking or stretching and which will record the high frequencies required for picture definition.

We may assume that the major problems have already been solved.

All of the big companies are now deeply involved on work on video. One of them, I have been told, have new equipment ready to go into production at any time

which would offer highly sophisticated video recording. But the retail price might be £500—and that would limit the market considerably.

Prices, however, will come down. The same firm which developed the "Telcan" markets a closed-circuit TV camera at £60.

Now another firm has produced a "do-it-yourself" kit with which the amateur can build a transistorised closed-circuit camera. Without lens and vidicon, it costs £48.

Development of cameras is ahead of the development of video recording, but, immediately the "Telcan" or some comparable equipment is generally available, thousands of amateurs will want to embark upon the new hobby which will combine the attractions of sound recording and cine-photography.

We shall provide the fullest available service about video recording, as we have done with sound recording. For a start, we shall henceforth include in our New Products columns details of closed-circuit TV cameras and of any other video equipment which is in a price range to interest amateurs.

Tape cassettes

ANOTHER IMPORTANT development in the coming year will concern tape cassettes. I was invited recently to visit Reditune, which now supplies "packaged" musical programmes to 8,000 subscribers all over the world. The number is increasing rapidly every week.

Most of these subscribers are hotels, transport concerns, factories, shop-keepers and other firms upon whose premises the public gathers. Reditune tried to calculate recently how many people hear their taped music every day. They abandoned the effort when the total had passed fifty millions.

All programmes are recorded on quarter-inch tape in a continuous loop—a Mobius loop, so that two tracks can be used (this calls for oxide coating on both sides of the tape, of course). Ninety minutes' continuous playback is possible before the programme repeats itself.

Reditune arrange their own recording sessions, do their own copying, manufacture their own play-back units.

These are extraordinarily compact in design and have only one manual control—to adjust volume. The machine is switched on by the act of pushing the cassette into a slot provided for it.

So far Reditune has been kept busy providing a rental service of music for firms and has made no attempt to cater for the individual customer.

But the system it has developed seems to me the logical method of home music reproduction, with immense advantages over the orthodox tape recorder and over disc. I do not see how it can fail to triumph in time.

Meanwhile, I can report that Reditune is considering a new venture that would bring it into the market catering for individual music-lovers. For the moment, I am sworn to secrecy.

DR. JAN MEES, the Secretary-General of the International Federation of Sound Hunters, is coming to live in England for a couple of years and I hope that British club members will find opportunities to show him a generous welcome. No one has done more to stimulate, encourage and guide amateur recording on the Continent.

Dr. Mees is an executive employed by a big international firm and, as such, travels a great deal. During the past year he has been living in his native Holland but before that he spent two years in Sweden.

He tells me that he has recently been learning to play golf—an appropriate preparation for his stay here!

LAUGH WITH JEEVES



"I suppose you know you've completely ruined my recording of the Lesser Sprottled Cluckfinch?"

Boston sound hunters capture a 'Freedom'—on tape

By PHILIP TOWELL

WHEN we first thought of taping the Ceremony of Presentation of the Freedom of Boston to the nearby RAF Station at Coningsby, I don't think any of us realised the difficulties involved. Certainly the results were far different from those originally envisaged.

The town proposed to show their appreciation of the Royal Air Force on the twentieth anniversary of the famous "Dam Busters" raid, many of whom flew from Coningsby and other Lincolnshire bases.

We first asked the Corporation for permission to record, and I had expected to cover only the actual formal motion moving that the Freedom be granted. This is the usual procedure for conferring the Freedom of an English Borough on a person or body, and normally takes place in the council chamber. However, in discussing arrangements with the Town Clerk, it soon became clear that the council proceedings would be rather formal and uninteresting, and (more important to us) that the acoustics of the Victorian-style council chamber would make recording hazardous as councillors would be speaking from different parts of the room.

It then became clear that the council presumed that we would be recording the military ceremony and parade in the town's Market Place, in the shadow of the famed "Boston Stump" Parish Church. This was a project of which we had little experience, and we were somewhat apprehensive of the trouble which could be caused by wind noise—and the weather forecast was none too hopeful.

I made tentative arrangements to use a room which overlooked the scene, only to find that the stands and dais would be covered, and consequently we wouldn't be able to see what was going on. The Borough Surveyor's plan of the area showed that the allocated spot behind the roped section for the public would only allow us to see part of the proceedings, and we should be in constant danger of getting the equipment damaged.

Fortunately the Superintendent of Police came to our rescue, giving instructions to his men to give us every facility. On his advice we decided to use a small trolley for the recording gear, and even small picnic seats not only for our own comfort but to stop us blocking the view of spectators!

We had already decided to record everything in stereo, bearing in mind possible public performances of the tape, and also, to be as up-to-date as possible, for archive purposes. I worked out a complete plan of campaign using the Sony 521 with one AKG D19B microphone facing the dais, and the other towards the parade. A Tandberg 64 was used with Reslo ribbons left and right of the dais, thus giving us a standby in case something should go wrong. We had thought of being completely independent of mains supplies by using a car battery and converter, until someone pointed out that the drain would be too much for one converter. So we resorted to a mains cable, praying that no one would interfere with it.

On the day, we put all the equipment in position in good time and kept some polythene sheeting handy in case it began to rain. Then Dick Parker, as assistant on location, and myself, sat ourselves down in front of the VIP's stand. An RAF officer complained that the microphone in the parade area was in the way of the Parade Commander, so we moved it to a place he suggested—where the Queen's Colour Party nearly marched into it! Both recorders were started at noon as the parade began to assemble, and by the time the Mayoral Party arrived we had got into our stride. Until then we hadn't noticed any wind noise, but a gentle breeze began to cause trouble occasionally with one microphone and I was glad we had doubled up with our equipment, especially when it came to changing reels. We had been particularly careful to site the microphones where they wouldn't pick up any-

Readers are invited to describe their own experiences recording a particular effect. Two guineas will be paid for published articles, which should not exceed 500 words.

thing from the PA system, but at one point this proved our undoing.

We had not been invited to any of the Press briefings, and so were merely working from the Souvenir Programme sold to the public. We had no idea that while the parade was marching through the streets and there was nothing doing in the Market Place, we were to hear the voice of the leader of the Vulcan bombers in the flypast *over the loudspeakers*. Consequently we had done our job so thoroughly that there wasn't a thing on the tape (one was being changed, anyway). Luckily the RAF heard of our dismay later, and provided a simulated tape using the same script. We added a slight echo with the Tandberg to make it appear stereophonic.

When it was all over, the best portions of each tape were spliced together, omitting long pauses of purely visual or military interest. A linking script was written with the invaluable help of the most comprehensive Station Orders, which identified the voices and significance of the sounds on the tape.

Bill Harrison, a friend of mine from Yorkshire, came down to speak the commentary. This wasn't as easy as I had expected, because in a 35-minute tape, either he or I would mistime an announcement and run into something of importance in the Ceremony. Eventually he recorded it monophonically (hidden under a blanket draped over a bedroom screen) in the heat of Whit Sunday with the windows closed and curtains drawn. It was then left to me to fit his narration to the "sound effects" tape, using a Telefunken tric-mixer. Alas, one machine got so hot running all day while I got everything synchronised, that it failed to erase; and when I relaxed with the thought of a perfect take (without a splice) I found to my horror that the previous attempts were still there as well.

Many more hours were required to get it right, and then some friends came in to hear the result. Imagine my chagrin when the Deputy Mayor, himself ex-RAF, pointed out an error (which had somehow slipped in without being noticed) in a very senior officer's rank. It was impossible to cut it out because the change of the background would have been noticeable. So there was nothing but to edit the recorded announcement, taking the "Vice" out of "Air Vice-Marshal" (if only all vice was as easy to cut out as that!) and re-do the whole thing.

It was only completed at 1.45 a.m. in the morning of the day it was to be presented to RAF Coningsby. If I had left it until later that day, I would have been really in the soup because a violent thunderstorm caused a power-cut. In accepting a copy of the tape, the Officer Commanding at Coningsby described it as "a unique recording" which will now be available to any other RAF Station for studying the procedure of a Freedom Ceremony. Since then a copy has also been presented to the Boston Borough archives, when it was played back in the council chamber after a splendid Mayoral reception and buffet supper in our honour.

The tape was one of the features of the local Battle of Britain celebrations in September, when it was accompanied by appropriate colour slides taken at the time. Copies have been made also for World Tapes for Education in America, and for the UK Stereo Section of World Tape Pals.

The conclusion to Freedom celebrations was provided by a "Son et Lumiere" production, which gives us food for thought, doesn't it?

TRANSISTORS IN TAPE RECORDING

THE HISTORY AND DEVELOPMENT OF TRANSISTORS WITH SPECIAL EMPHASIS ON AUDIO TRANSISTORS. SECOND PART OF A SPECIAL FEATURE BY HARRY MACK.

APPLICATIONS

SOME of the advantages and disadvantages of the transistor were discussed in the January issue. One very obvious factor that tape recorder designers were quick to exploit, is the elimination of hum, by virtue of the transistor needing no heater supply, and operating at low voltages. Several early mains machines employed a transistorised input stage.

The problems of the input stage are quite special. The limit of useful amplification is determined by the noise level—and in this context, noise includes random electron movement, as would be found in a pure resistance. But whereas this noise generation in a pure resistance is independent of frequency, the transistor at audio frequencies tends to contribute most noise at the lower end of the frequency spectrum. This noise is at a minimum when the collector current is low and the resistance of the signal source is also low (say 500 to 1,000 ohms).

Early point-contact transistors had too high a noise level to be considered useful for the amplification of audio signals below a milliwatt. Later, junction transistors with much better noise performance came along, and, with correct operating conditions, transistors gave results comparable to thermionic valves.

At this stage of development, the hum factor of valves in early stages had to be considered when assessing comparative advantages. Here, the transistor has the edge, its high gain, lack of hum and absence

of microphony outweighing the slightly higher thermal noise factor. As long ago as 1955, the circuit of Fig. 1 appeared in a Mullard Technical Communication and was described by James J. Davidson in *Audio*, October 1955.

Here, the input may be a low impedance microphone or tape head, at an optimum 200 ohms, and the output used to supply a valve amplifier at a nominal impedance of 5,000 ohms. The voltage gain of the circuit, as it stands, is in the region of 330, so that an input of $5\frac{1}{2}$ millivolts produces some 1.8 volts output (with a maximum two per cent harmonic distortion). The frequency response depends to some extent upon the impedance of the input source; with a 50 ohms input, the response is 3 dB down at 15 cps and 12,000 cps.

Although designed for 250 V supply, the circuit will operate usefully down to 100 V, and the current drain is low (about 0.7 mA from the 250 V supply). The high voltage gain is obtained by operating the transistor in much the same way as a valve, with high load from high voltage. The strictest factor is the collector-to-emitter voltage, which must be below 5 V, requiring careful stabilisation of the collector current. This is provided by the potential divider R1, R2, R3 and the emitter resistor R5, which allow both a DC and an AC feedback path. Resistor tolerances should be within five per cent (plus or minus).

In the Fig. 1 circuit, an OC70 was used, and for some years this "general purpose" transistor proved itself handy in many different guises. But later, alloy-diffused transistors, with improved audio-frequency

performance, came on to the market, and the close tolerances and critical operating conditions were reduced by employing front-end transistors in a low-voltage condition. Such a circuit was used by Philips, as in the EL3514 input circuit shown in Fig. 2, in the Elpico TR600, which employed an AC107 in very similar fashion, and in the Sony 362B, which used two transistors in the input stages.

In Fig 2, it is seen that the 200 volts of the HT rail of the valve amplifier is dropped to 20 volts by the 390k series resistor, decoupled by a 64 microfarad electrolytic. An "inverted" form of supply circuit is used, to allow chassis connection of the microphone, recording/playback head and the lower end of the 200k log. potentiometer which becomes volume control on playback and modulation control during recording.

A further variation of the transistorised input circuit is seen in Fig 3, where the internal impedance of a transistor is employed to give automatic voltage control during recording. This is the input circuit of the Fi-Cord 202. The DC collector load for TR1 is conventional, consisting of the 10k resistor, R. But the AC load is either the volume control, a 10k potentiometer, or, when the control is fully anti-clockwise, the impedance of the TR2, which varies inversely with the amplitude of the recorded signal. During playback, TR2 is out of circuit.

Output stage configuration is, of course, well-known. But whereas the principles of employing a valve power amplifier as an oscillator during recording permits a

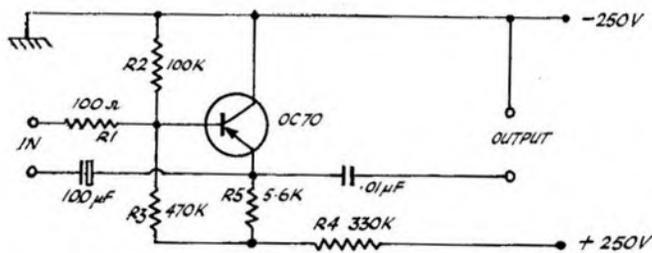
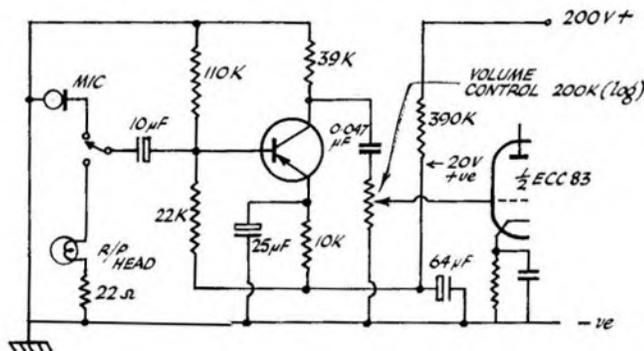


Fig. 1. Circuit incorporating an OC70 "general purpose" transistor. Fig. 2 (right). This circuit employs alloy-diffused transistors.



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Dramatape miscellany

By PERSPECTIVE

DID you know that dramatape technique can apply to all recording? A journey on a foot-plate, for example, may seem remote from drama-studio requirements. But you have an advantage if you give this actuality a *dramatic* structure.

First, we hear the train departing into the distance; then we "cut" to the foot-plate and hear a section of commentary; then we "cut" to the arrival-platform to yet another commentator. He interviews (say) a waiting passenger and then passes us back to the foot-plate . . . and so on.

The impression we receive is something like a radio play. And this structure has to be planned at a preliminary conference. A team of some four or five recordists need briefing by the producer-in-charge. One chap might record from the departure-platform; another two might be aboard the train; the fourth might be handling the arrival. Yet another might be waiting on some little country bridge. . . .

The end-product is the result of cross-cutting and mixing all these tapes—building them into a framework of time. The illusion that the recordists are in "radio" communication is a most useful convention. (Although they don't necessarily record on the same day.) You can even utilise genuine conversation, cutting on selected phrases and post-fading into a new location—a trick borrowed yet again from dramatape.

"Fake!" I hear someone protest. "It's not reality. . . ."

But do you agree with this charge? A creative technique is needed to bring any actuality to life: whether it's a party, wedding, coach-tour or boat-trip. You can't put every single moment of time on record. All you can do is to assemble selected bits. This is exactly what Walthamstow Recording Society have done in *Changeover*, a local-railway documentary.

It doesn't follow the pattern I've suggested; instead, the producers have arranged a neat sequence of interviews, commentary and background-sound. Each item is exactly the right length; and the transitions between them first-rate. Now this evokes "atmosphere" just as much as a drama-structure. It's simply a different form. Yet it would be exciting to hear this group handling a drama-structure in the next documentary.

Their natural instinct for dramatape is already obvious in Mrs. Manning's play *The Strong Call*.

The play gives us a storm-swept country road, a darkened church, sinister organ-music . . . and the group seize on these ingredients with enthusiasm. The acting in the opening scene wasn't completely convincing, but it soon quickened as the play settled down.

The vicar was well-portrayed and his "entrance" (expressed in wispy strains on the organ) very dramatic. Overall tempo indicated the group's ready grasp of atmosphere. That's why I hope they'll explore this dimension again—and combine dramatic elements with their existing documentary skill.

MAGAZINES-IN-SOUND

These, too, are similar to dramatape production, calling for a sense of structure, continuity and transition. Several clubs have kindly responded with tapes for discussion; and offered friendly information. This is useful in planning future points for this column, please don't feel ignored if they're not covered immediately.

J. B. Cartmell's monthly *Concord* (good title) illustrates an essential quality: that of a wide range of *well-contrasted* topics. But the continuity needs better time—to a split second. I also suggest that only *one* announcer is used for linking the items.

The technical quality of most copy-tapes was poor (as only Mr. Cartmell admits). I insist on giving a dirty black for this—despite

readers' courtesy in lending their tapes! My excuse: making copies is surely an integral part of magazine-tape production? The master-tape should be compiled with copying in mind. Copying on average equipment is always detrimental to quality. Your nicest transitions (i.e., fades and mixes) can "go all tinny" when copied. Simple in-and-out fades, therefore, are preferable to deep cross-fades on the master-tape.

Always copy from 7½ ips originals if you can. But record any "straightforward" takes (e.g. continuity) on as many separate recorders as possible. You can then splice these originals into the general copy. Not enough recorders? Then re-perform your take for the number of copies needed.

DRAMATAPE WITH A DIFFERENCE

I'm now deep in producing recordings for Sweden's *Folkuniversitetet*. But there's a noticeable paradox about the scripts. As one of the new actors exclaimed at rehearsal: "This isn't radio dialogue at all. It's written for the stage!"

The reason: these dramatapes are intended for re-enactment in the classroom. The students listen while practising visible action.

Now, does your club record sound-effects for theatrical societies? If so, why not persuade the actors to try stage-dialogue on the tape? As with Swedes, it will benefit their final re-enactment. And it will certainly challenge your knowledge of perspective. You'll very likely be asked to arrange a regular dramatape session!

Two-minute tape sketch by David Haines

ALTHOUGH these sketches are set in a drama context, they are offered as simple exercises in recording. Don't take them too seriously. They are merely typical of extracts from any "cabaret" tape, played at parties.

You can easily make similar "dramatapes" from any anecdote that amuses you; but the acting should always be stylised and light-hearted. Changes in acoustic (corridor, bedroom) can be achieved very simply: stop the tape and shift the microphone to a previously-tested location about the house (e.g., empty landing, large wardrobe, larder).

AT A FOREIGN HOTEL

We hear a girl's footsteps approaching down a large, carpeted corridor [*i.e., live acoustic*]. A service-trolley is being pushed with a slight rattle of crockery. It stops [*i.e., at close-microphone*]. A door is gently knocked.

GIRL: (*cheerfully, German accent*) Good morning, English Sir! Your breakfast has arrived . . . with tea-pot as instructed.

She opens door, pushing trolley. We are now in the bedroom [*i.e., dead acoustic*]. She shuts door and steps to window [*i.e., steps to distant-microphone*].

GIRL: I will open curtains for you, English Sir! (*curtains slide open*) [*re-establish live acoustic*]. Ow, yes!—what a wonderful view of our glorified mountains . . . [*returning to close microphone*]. On behalf of the management, I welcome you

to a truly enjoyable holiday on this your first morning.

GUEST: (*waking slowly, politely*) Oh, thank you so much. . . .

GIRL: (*screaming suddenly*) Aaah! Your face! Your face!

GUEST: Why, what's the matter?

GIRL: You have got horns!

GUEST: Horns?

GIRL: (*hysterically*) The twisted horns of a beast—they are grown from your forehead. And you have a long green tail! It is curling out from beneath the blankets—in a most sinister manner.

GUEST: Well, don't panic—there's a rational explanation. It's just that I'm simply not human until I've had my morning cup of tea.

Fade out on a cup of tea being slowly stirred and sipped—with delicate relish. . . .

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SPECIAL ASSIGNMENT

Recording at the Festival Hall

By DENYS G. KILLICK

NONE of the Special Assignments I have undertaken on your behalf threw me into such a frenzy of activity as a letter I received from the London County Council. Briefly, this was a request to record a concert to be given in the Festival Hall in a week's time. Would I be interested?

The thrill and excitement of the big occasion is infectious. The glamour inevitably associated with the Hall itself, thoughts of the famous orchestras and great instrumentalists who have per-

formed there went straight to my head and left me slightly bemused at the prospect. But this was no way to approach such a problem. It can only be satisfactorily tackled by reducing it to a series of cold, technical expediencies every one of which is dependent on the nature and circumstances of the performance. This data, the information about "what is going to happen" is vital; without it there can be no planning, no organization.

Having agreed, only too eagerly, to under-

take the assignment I was even more bemused when I saw the list of works to be performed. There were no fewer than nine items every one of which involved a complete change of artists and platform arrangement, ranging from full orchestra to small ensembles, from massed choir with organ to solo vocalist; somewhere down the list was a brass band.

"Fools rush in . . ." I thought to myself sadly as I considered the staggering complexity of such an operation.

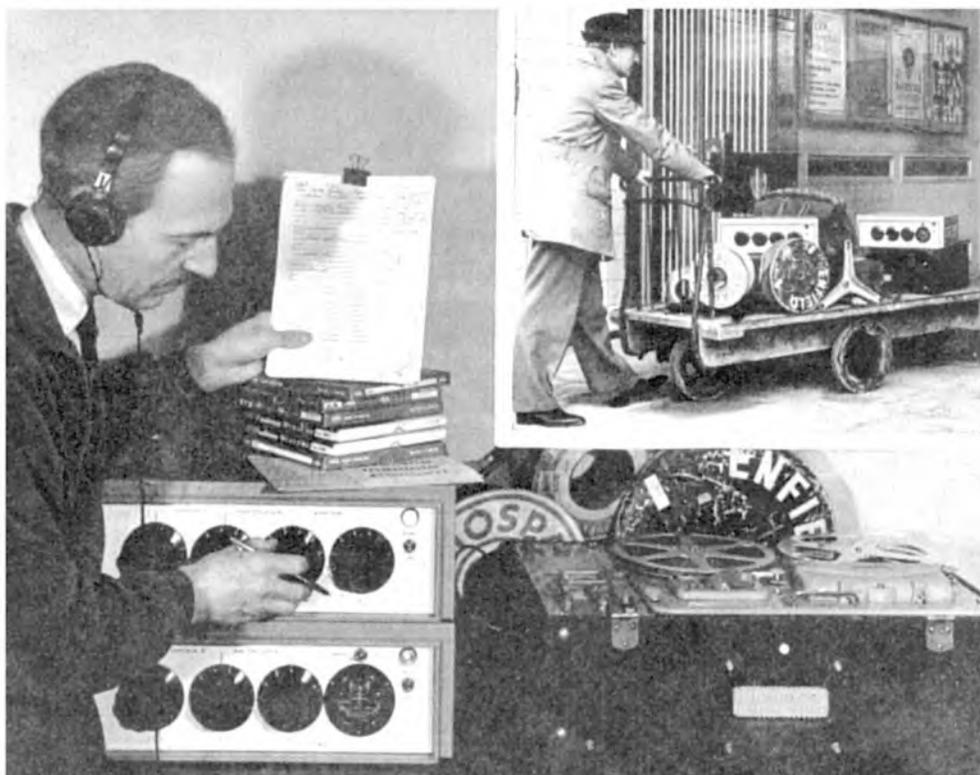
The success or failure of such an enterprise was obviously going to depend upon planning. From the moment the public performance started I should have to know precisely where each microphone would have to be positioned in relation to the performers and at what levels to start recording. I should also have to know exactly what changes to make in the platform arrangements (in full view of the public, of course!) to accommodate the next item. Lastly, but equally important, my assistants would have to know without any doubt which items were to be recorded on which tapes so they could make the necessary changes on the machine while I was rearranging microphones in the brief pause between items as one group of performers left the stage and before the next came on.

These problems are not specific to this particular concert; they are general to all events of this kind whether given in a vast auditorium in the centre of London or in the village hall. In fact, such a varied programme is just the sort of thing the amateur is likely to be asked to record. So much of what I'm going to say here will relate to the preliminary arrangements upon which the quality of the final recording depends.

First of all there must be a quick think about the availability of equipment. How many microphones? What length of cables? Have we enough microphone stands? Will the mixer accept all the microphones to be used? Where will the recording equipment itself be positioned in the hall? Can the performance be monitored without interference? If we're to be tucked away out of sight and sound, which is very much to be preferred, how shall we know what's happening on stage? What mains power supply is available, and where? The answers to these questions and a dozen more reduce a frightening prospect to more manageable proportions.

An early visit to the hall is essential. I spent most of the next Saturday morning discussing the recording with the engineers at the Festival Hall. It was finally decided to station all the equipment in the "wings" just off stage behind a pair of sound-proof doors. The power supply was convenient and cable runs even to the far side of the stage would not be too long. From the adjacent stage steward's cubicle it was possible to get a view of the auditorium through a small glass panel. All very satisfactory. I would like to add that the Festival Hall staff were at all times most helpful. I needed all the help I could get.

The only other information obtainable was a list of approximate timings which showed that most of the items were scheduled to run for about ten minutes, the shortest eight and a half, the longest twelve. Unfortunately the only description accompanying these details were the cryptic notes, "orchestral," "choral," without identifying the individual items to which they referred. On the basis of this wholly inadequate programme data all the preparations had to be made.



Left: The author checks his recording levels. (Insert: A trolley "saved an enormous amount of hard, manual work.")

The heart of the recording system would be the Vortexion Model B recorder running at 15 ips. Why use such a fast tape speed? As the programme comprised a number of comparatively short items they could be fitted quite comfortably on to separate spools of tape and the faster speed does have the advantage of allowing a certain latitude in the registering of heavy peaks. Apart from which the original tape would have to be used as a master from which dubbings would be taken and so the improved signal-to-noise ratio would be desirable.

If only slower speeds had been available then I should have compromised by using whatever was the fastest. To record on too slow a speed at such an event is to court disaster as peak levels are likely to be unknown quantities and we need all the latitude we can get.

Microphone, cable and mixing arrangements are bound to be modified according to the equipment available. I decided to use two mixers, one four-way feeding into a three-way mixer with peak programme meter. The p.p.m. on the second mixer was not essential but it's a great convenience to have all the controls in the same plane. This meter was carefully calibrated with the meter on the recorder and a fixed level was determined on the machine, that point being marked on the gain control with red china-graph pencil.

So far so good, but next to consider was the tape available and how each item related to the playing time. Like most people I don't have an endless supply of tape at my disposal, so it wasn't easy, and I ended up by selecting two seven-inch reels of double play Audiotape, each to be recorded track one only, two seven-inch, long-play C.B.S. tapes together with a single 8½-inch Scotch long-play for the rehearsal. Although from the timing information the tapes selected would nicely cover all that was to take place with a minute or two to spare on every reel I took a couple of extra spools of C.B.S. long-play just in case. In the event nearly every item over-ran, the concert ended thirty-five minutes late and every tape had been used.

Greatly reassured by the completion of so much preliminary work I began to wonder how much actual assistance would be needed. Rehearsals would be going on all day in the hall, so I'd arranged to get there as early as possible in the morning and stay there for the whole of that day. Too many helpers would be an embarrassment—two, I decided, would be ideal. My wife (ever willing!) became my number one, and a friend who could spend both the afternoon and evening with us became the second.

But how to co-ordinate all the complex information that would be required so we

Readers suggest the recording assignment and, if they wish, the equipment to be used. Killick does the job and reports on the problems encountered and the way they were solved. Let him have your suggestions for his next assignment.

should all three know exactly what had to be done at any given moment? To accomplish this we used a batch of "studio sheets." About fifty of these were prepared, one sheet for each item in triplicate, with spares for the rehearsal. These were clipped, in sets, on to pieces of millboard and they provided the key to the entire programme.

These notes ensured that fullest possible information is given, even down to the bias setting for every spool of tape. This is quite easy to determine, by the way, if a metered variable bias is available on your equipment. A signal of fixed frequency and amplitude is fed in to the machine at peak level and recorded on the sample of tape to be tested whilst the bias is increased from a point below the expected level to a point above. The tape is then played back and a note is made of the bias setting that was operating at the point where playback output just begins to fall off. Twenty per cent is added to this figure and the result is the optimum bias level for that spool.

The total playing time entered in the appropriate space was actual playing time, not approximate. In other words the tapes were carefully checked for length—there was to be no running off the end. Every spool was numbered in red china-graph, the playing time and bias setting noted on the plastic reel in the same way. Nothing was left to chance.

It now only remained to check all the equipment, so a complete hook-up was rigged at home. With amateur gear this is very necessary to ensure that none of the microphone lines is going to induce hum in the final recording because of a faulty soldered joint. A feeling of anti-climax followed. There was nothing more to do until the day itself.

The Monday of the concert did not start well. The heavens opened and rain flooded down. After all that preparation I'd neglected to check on one important item. For the very first time in nearly three years the car wouldn't start—flat battery and no handle. It was raining even more heavily as I was pushed unceremoniously down the road until the engine condescended to fire.

At the hall it was a relief to find that all our equipment could be loaded on to a trolley and taken up to the auditorium by lift. This saved an enormous amount of hard, manual work. A rehearsal had already begun when we arrived so no time could be lost. We at once began to run out our

lines and prepare for what was to be the first of many trial-recordings.

Having so little knowledge of the character of the various works to be performed I'd allowed for using up to seven microphones; actually only five were needed. These were two Reslo ribbons, one a figure-of-eight and the other rear damped, a Film Industries figure-of-eight and two S.T.C. moving coil cardioids kindly loaned to me by the Festival Hall authorities. Let me hasten to report that the ribbons, all in the around £10 price brackets, compared very favourably indeed with the much more expensive S.T.C. models. Not, mind you, that I don't have ambitions. . . .

What can I say about the actual microphone arrangement? There's not space to go into very great detail. The technique used was to cover sections of each group of performers with separate microphones, bringing the microphones in fairly close to the sound sources and then balancing to achieve a pleasing and acceptable sound structure in the recording. Levels are set for the more delicate and elusive instrumental sounds first and the more strident, penetrating sounds faded in to suit. All the information about relative positions and levels was carefully noted on the sheet for the item, and we were ready for the next rehearsal. So the day went on.

The hall was packed when the conductor walked on to the stage. As the applause rang out we started recording. This is the supreme moment; the thrill of the first sounds from the "after record" monitor speaker. My heart never fails to miss a beat as I listen anxiously for those first notes. As they rang out, clear and true, all the worry and frustration of the day vanished in a sense of achievement.

Most of the recording we did that night was wholly successful. Only one item was spoiled, and in that a solo vocalist didn't stand in the agreed position but moved off to the dead side of a cardioid microphone to sing her aria. Against this one can do nothing but fume impatiently. Bringing up the level is useless because you are recording only the reflected sound as it bounces off walls and ceiling.

Some of the items had a very wide dynamic range with grave danger of distortion on the peaks. However, apart from a couple of very minor imperfections in one of the choral works we succeeded in avoiding these pitfalls.

I personally learned a great many lessons from this enterprise, but the most important is the absolute necessity for all the preparatory work carried out, and the intention of this article is to help those of you who have to plan such an operation to carry it out successfully. As for me, I have some very good recordings I'm going to listen to again.

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MICROPHONES

Their types and uses—part 3

By J. A. MOIR

A RIBBON microphone is almost the simplest possible type of sound operated voltage generator, a single conductor moving in a magnetic field. The conductor is a strip of extremely thin aluminium foil wide enough and light enough to be vibrated directly by the moving molecules of air that are the sound wave. Thus, no separate diaphragm is necessary. Movement of the foil strip in the magnetic field provided by a large permanent magnet generates small signal voltages having a waveform substantially identical to that of the sound wave. The construction of a typical ribbon microphone is made plain by the illustration of Fig. 1 (STC.4038 with cover removed).

Microphones of this type are distinguished from all others by the "figure-of-eight" shape of their polar diagram, well illustrated by Fig. 2. This is the basic result of their mode of operation. A sound wave approaching the foil strip "diaphragm" from either the front or the rear produces the maximum movement and therefore the maximum signal voltage. The same sound wave approaching the ribbon strip from

either side encounters the foil strip diaphragm "edge on" and therefore produces no movement and not output voltage.

A moment's consideration will show that a figure-of-eight polar diagram achieved in this way is fundamentally independent of frequency, at least up to those high frequencies where the dimension of the ribbon are about the same as a wavelength. Other types of microphone can be made to have a similar polar diagram but this is only achieved by a complicated group of acoustic phase shifting networks and the performance is then dependent upon the frequency of the sound wave.

What are the advantages of a polar diagram having this particular shape and one that is independent of frequency? To understand this it is necessary to refer back to an earlier section in this series of articles. In brief, the two-eared human hearing system has the capacity to ignore the generally reverberant sound reflected from all the room walls and, indeed, it is able to reject any sounds that it does not wish to hear.

An ideal microphone would have the same polar diagram as the human hearing system and the resultant ability to hear only that sound which it wished to hear, but this has not yet been proved possible. Any microphone having a restricted polar diagram will have advantages, for this allows the sensitive face of the microphone to be pointed at the desired sound, but it is particularly important that the shape of polar diagram should not change with frequency. A unit having a polar diagram that changes appreciably with frequency results in sound of second rate quality because the direct and reverberant sounds are received with different effective frequency response curves.

The best ribbon microphones have a polar diagram that varies little over the frequency range, a point illustrated by Fig. 2, but this requires great skill in the design of the field magnet system if it is not to distort the shape of the sound field at high frequencies. Skill in design needs to be supported by adequate measuring facilities and as both skill and measuring facilities cost money, the cheaper examples of ribbon microphone are unlikely to have the same performance as the more expensive versions, although they may still represent very good value for money.

The basic single ribbon microphone has two equally sensitive lobes in front and rear (see Fig. 2) and two points of substantially zero sensitivity on the sides but for many purposes a single sensitive lobe would have greater advantages. This requirement is not easy to satisfy but it can be managed.

In the S.T.C. Type 4033A unit, a small moving coil microphone is added just below the ribbon unit, the output voltage being combined with that of the ribbon in such a way that it cancels the voltage from the ribbon section when the sound wave arrives from the rear and adds to the voltage generated by the ribbon when the sound wave arrives from the front. This sounds easy but in fact only one commercial unit (the STC.4033-A, Fig. 3) remains in production and in widespread use in professional studios.

The R.C.A. Varacoustic ribbon microphone achieves the same single lobed result by a more sophisticated approach. Any single ribbon design has a figure-of-eight polar diagram because both sides of the ribbon are exposed to the sound wave. If sound is prevented from reaching one side, the polar diagram reverts to that characteristic of any of the simple diaphragm types, a circular polar diagram at low frequencies and a single forward facing lobe at high frequencies. The addition of a "closable" opening to the rear of the ribbon allows the performance to vary all the way from the simple figure-of-eight where the sound is given full access to both sides of the ribbon, to a near single lobe where the rear opening is nearly closed.

All ribbon microphones are essentially low impedance devices for it is impossible

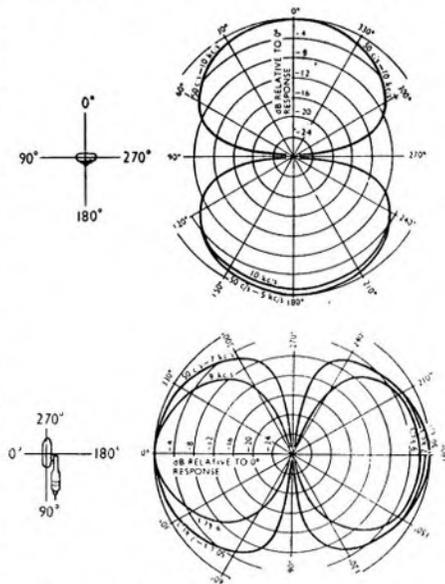


Fig. 2. Polar diagrams of a "figure-of-eight" microphone. The horizontal plane (top) and the vertical plane.

to make a couple of inches of aluminium foil have a high resistance, nor would it have any advantage if it could be done. In fact, the ribbon resistance is too low to allow it to be connected directly to any external microphone circuit except through a transformer and all the commercial units include this inside the microphone housing. The internal transformer can be used to raise the output impedance to any desired value, but 25, 250 and 500 ohms are standard values. Microphones having this impedance can be used at distances of several hundred yards from the amplifier with very little loss in efficiency.

CONDENSER MICROPHONES

The majority of the professional recording studios prefer to use condenser microphones for indoor work, for they give a "clean" kind of sound quality that it is difficult to achieve with any other type.



Fig. 1. The STC4038 ribbon microphone which has a "figure-of-eight" polar diagram.

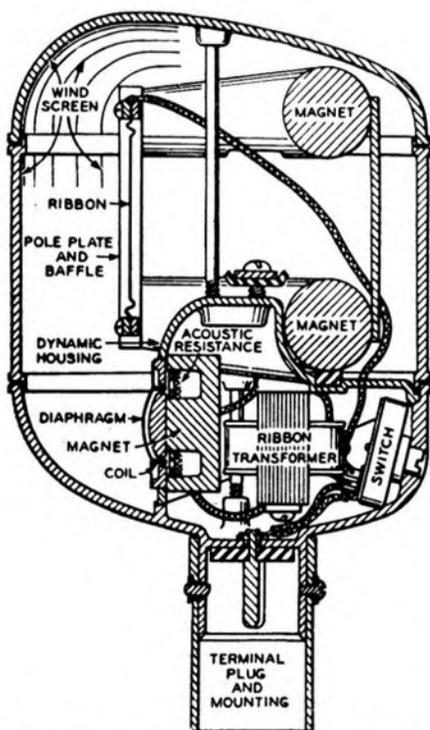


Fig. 3. The STC 4033-A a combined moving coil and ribbon microphone.

Not only is the distortion exceptionally low but they have a wide and very smooth frequency response and a polar diagram that is well maintained over the whole frequency range. The diaphragm is the only moving part and as this is well damped, the transient response is particularly good. As might be expected, the price is rather high, some of the stereophonic versions costing £250-£400 for the microphone and its power supply.

In principle, the condenser microphone is a very simple device (see Fig. 4) being merely a thin, flexible foil diaphragm exposed to the sound wave and mounted adjacent to a solid backplate. A separate power supply maintains a well-smoothed D.C. supply of above 200 volts across the diaphragm/backplate gap, through a resistor which may be as high as some hundreds of megohms.

When a sound wave sets the diaphragm in motion, it varies the spacing between the diaphragm and solid backplate and this causes the capacitance to vary. The high series resistance in the H.T. supply circuit holds the electrostatic charge on the diaphragm constant and thus, as the capacitance varies, the voltage across the diaphragm/backplate capacitance varies. This variation is the desired signal voltage. Condenser microphones can be con-

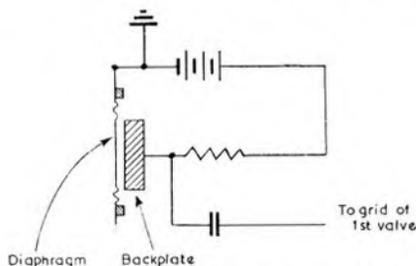


Fig. 4. Circuit diagram of a condenser microphone.

structed to give almost any shape of polar diagram required and, as an added advantage, the shape of the polar diagram can be remotely controlled by a single potentiometer. This allows the polar diagram to be narrowed to pick up a single singer, or broadened to include a group of instrumentalists. A typical unit of this type is shown in Fig. 5 (AKG C12) but this sort of instrument may cost £350.

The sensitivity of the condenser microphone expressed in millivolts/bar is of the same order as that of a good moving coil microphone but as the signal voltage is developed across a very high resistance (hundreds of megohms), it requires a special valve circuit to change the load impedance from megohms to hundreds of ohms. This valve and circuit must be mounted immediately adjacent to the actual microphone capsule, something of an operational nuisance. Largely because of this requirement, condenser microphones are unlikely to find much application in the domestic tape recorder field, though they have an outstanding performance.

HIGHLY DIRECTIONAL MICROPHONES

For many specialised purposes, it is advantageous to use a microphone having highly directional characteristics, a device rather like a searchlight (in reverse) that produces a signal only when the source of sound is directly on the axis of the microphone.

Typical uses for such a highly directional microphone are the pick-up of speech, when the microphone cannot be located near the artiste, or for collecting bird songs. These feathered artistes are rarely so cooperative that they will come and sit in front of a microphone and thus the would-be recorder must have a microphone that ignores everything but the desired bird. Directivity of the order achieved by any of

L USTRAPHONE LTD. have asked us to point out that the VR65/NS microphone reviewed in our December issue is an "identical twins" version of their Model VR64 ribbon microphone which retails at 7½ guineas, complete with swivel mounting and table base.

In connection with this same article, we apologise for the misprint which gave the price of the Beyer M.119 microphone as £16 10s. 1d. In fact this unit retails at £15 15s.

the usual directional microphones is quite inadequate for the purpose but it can be achieved, though not without some resultant disadvantages.

The simplest solution is to mount a standard type of (preferably) single lobed microphone at the focal point of a parabolic reflector. This collects the sound arriving along the axis of the reflector and focuses it all on to the microphone, while sounds approaching the parabola, but off its axis, are substantially ignored. Apparently a simple solution to the problem but in practice one that is of little value except for the collection of bird calls. An efficient reflector must be many wavelengths in diameter, an easy thing to achieve for sounds above say 4,000 cps where the wavelength is less than three inches, but rather a problem at 100 cps where the wavelength is about 11 ft.

The collector of recordings of bird noises is fortunate in that the majority of bird song is predominantly in the frequency band above 2,000 cps where a two-foot diameter parabola is reasonably effective. Though they have been used for the recording of speech and music, parabolic reflectors even as large as five feet in diameter are



Fig. 5. The AKG C12 condenser microphone is designed to give almost any shape of polar diagram.

not really satisfactory and though they have often been tried, they have invariably been discarded.

An alternative form of highly directional microphone is the tubular type made by Electro-Voice (Fig. 6) and sold in this country by K.E.F. Electronics. The actual microphone capsule is of conventional moving coil construction but it is mounted on the end of a long tube having a number of openings at carefully calculated intervals along the side of the tube.

Sound energy in a wave approaching from the side, reaches the microphone capsule through the hole at the end of the tube but also through the holes in the side of the tube. A careful choice of the size, shape and position of the side holes results in cancellation of the sound pressure at the microphone capsule when a wave approaches from the side. A sound wave approaching along the axis of the tube only suffers little loss and thus the microphone has a highly



Fig. 6. The Electro-Voice 642, a highly directional moving coil microphone.

directional characteristic, adequate to allow pick-up of the call of a bird or the words of a speaker two hundred feet away

There are some obvious disadvantages sound quality is not of the very best and the high directivity necessitates the use of a simple optical sight to keep the microphone trained on the speaker but the device solves the remote pick-up problem in a more satisfactory way than any alternative device

TO BE CONTINUED

In the New Year Honours List two O.B.E.s were awarded "for services to doctors throughout the world by providing them with tape recordings of speeches and lectures by leading surgeons and physicians." The recipients were Drs. John and Valerie Graves who thus become the first persons to be honoured as a result of the tape medium. They tell their story in the article below.

The tapes that do not grumble!

IN the last few years a number of libraries on tape have been organised and the idea is becoming popular. Our library of tapes (and also discs) is unusual, for it is for doctors only, and the tapes are of talks on medical subjects to keep them up to date.

This library started in a very small way in 1957, when we made some recordings at medical meetings for friends who could not come. It is often very difficult for busy G.P.s to get to these meetings, and we soon found that a lot of doctors wanted to borrow our tapes.

The early recordings were very bad, as anyone who has ever tried to make recordings in noisy public halls will understand. We soon learned that it was better to ask speakers to make recordings for us privately, at their own homes or at ours.

We soon acquired a wide experience of the difficulties involved in recording this kind of talk—the speaker who "dries up," who speaks too quickly, who jingles money in his pocket or thumps the table—all these are natural hazards! But our speakers have been wonderfully patient with us and have given up precious spare time to help us.

The tapes have many uses besides the original one of keeping isolated doctors up to date. They are in demand by small medical societies and discussion groups who can't always get good speakers—the secretary of one such society said: "At least your tapes don't grumble if it's a foggy night and hardly anyone turns up!" Recordings by famous and busy speakers enable them to be heard by far more people than would otherwise be possible.

Tapes are used for teaching, too, and recordings of sounds such as heart sounds can be very useful for students. Few students nowadays, for instance ever hear a full-blown whooping-cough—and thank goodness they don't!—but they ought to be able to recognise it. We like to use visual illustrations, too, when we can—slides, diagrams or photographs.

Our listeners often find the talks a good

starting-point for discussion, and they can record comments and send them back to us.

We prefer to do the actual recording ourselves, as it is less disturbing for speakers unused to microphone technique, and we can make sure that all the points we want have been covered, and encourage the occasional speaker who "dries up."

Sometimes a tremendous amount of cutting and editing has to be done, which would be impossible without medical knowledge.

The equipment we use? Of course the Ferrograph has long been our standby, and we have a Vortexion recorder and mixer for meetings, a Fi-Cord, a very old M.S.S. for editing, and two skeleton Brenells for copying. After many experiments with microphones we have found that really good moving-coil microphones such as the STC 4037 suit us best.

Recently the work has been transformed by the addition of a Nagra to the family. This incredible machine makes no mistakes, needs no mains and so has removed all our problems of hum and peculiar plugs and voltages. It is also genuinely portable, which is appreciated when one has lugged a Ferrograph with all its impedimenta down a million steps into countless hospitals and consulting-rooms. The Nagra's "automatic record" cuts out most problems of volume control, another bugbear in the past.

The library, which started as a hobby, is now quite a flourishing concern and we send out several thousand tapes a year to all parts of the world. We have had to employ staff, design suitable boxes and become mines of information about postal regulations regarding unheard-of corners of the world. This is not a commercial enterprise—the College of General Practitioners has a grant to cover expenses, but we make no profits and in any case we are both busily engaged in our own jobs. At the beginning our correspondents were all our friends—they are too numerous now for us to know them all, but we still correspond on tape and letter with a great many of them.

An unexpected result is that our family now have a wonderful collection of foreign stamps! Our own ambition is one day to travel round the world and see where all our tapes have been.

Exchanging tapes with schools abroad

By ALLAN COOPER

WHEN considering the planning of class tapes for exchange with schools abroad, it is soon apparent that one or two marathon listenings of an hour or so may dampen children's enthusiasm for the wide world.

The good pupils listen attentively, somewhat hopefully, in anticipation that something more interesting may turn up in a minute or two; the bad ones, quite likely, have long given up, and twist and turn to find renewed interest in the structure of the beamed school roof, or in the picture of the young Raleigh that may be as old as the building. The answer lies possibly in magazine-type tapes and accompanying drawings, diagrams and maps.

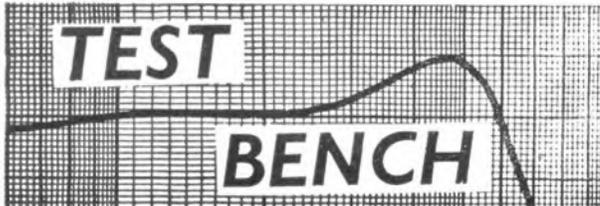
The advantage of producing magazine-type tapes is their adaptability to short periods of listening that fit easily into lesson periods, allowing for immediate follow-up and associated written work. Secondly, they do not make overlong demands on children's attention; and in the making they benefit from careful editing that is necessary in view of restricted time allowances, thus all padding is pruned out.

An accompanying index of feature titles and their approximate duration will save the recipients much trouble in working out a suitable schedule of listening.

The features are of varying length and may be the products of individual contributors, groups, or of the whole class. For example, an individual may report on some event he has witnessed. This news report with the personal touch can make an otherwise ordinary news item come alive with the benefit of first-hand experience. I once had an opportunity of producing a report following my attendance at the funeral and memorial services of the late 9th Earl of Shaftesbury. Being able to record my impressions immediately after the event, I was able to include, as a background, part of an hour-long peal of muffled bells which provided a fitting accompaniment.

Group contributions may take the form of discussions, at best extempore, on such subjects as spare-time activities; of ways of helping at home; or of the description of bus or car journeys to town. The last-named are greatly improved if a set of small sketch maps is sent with the tape—enough for each

(Continued on page 69)



SPECIALIST 1200

By John Aldred

DYNATRON have established themselves over the past 35 years as manufacturers of high quality radio and sound equipment, consequently their Specialist 1200 tape recorder is a quality machine in the top price bracket. It is based on the well known Reflectograph tape deck, recording at 7½ and 3¾ ips, and has a hand-built amplifier system with a professional specification.

Black Vynide with chrome trimmings covers the plywood case, and the recorder top plate is finished in a black enamel. All the control knobs are hand machined dural, with the necessary scales engraved on their skirts.

The tape deck, amplifiers, loudspeaker, and connecting sockets are all mounted on a single steel framework. Thus the cabinet can be discarded if necessary, and the complete machine installed as part of a recording installation or hi-fi set-up.

The main facilities built-in to the Specialist include a three-way mixing panel, variable bias control, tape or direct monitoring comparator switch, echo control, auto stop, and a variable speed rewind or wind on. Recordings are standard half-track, with no provision for stereo replay, multi-play, or parallel track replay.

TAPE DECK

The Reflectograph deck is assembled on a thick dural plate and contains three



motors. A large synchronous hysteresis motor by Papst give a direct drive to the capstan, which is in fact the top of the

motor shaft. The two speeds are obtained by altering the number of poles on this motor, thus eliminating the need for any mechanical links or belts.

The tape heads, erase, record, and monitor, are open to view. This makes for easy tape threading, editing, or cueing. The capstan is set slightly back from the line of heads, and one has to carefully guide the tape between the capstan and the rubber pinch wheel. The spool hubs allow the use of up to 8¼-inch diameter spools, held securely in position by large screw-on hub caps.

There are six controls for the tape transport mechanism. MOTORS SWITCH—selects recording speed. A centre "off" position permits the amplifier only to be used for purposes other than recording. TAPE FUNCTION LEVER—controls tape movement forwards, or fast wind on. It is held in the "run" position by a solenoid in the main h.t. supply. A small neon light indicates when the amplifier has warmed up. STARTING BRAKE—prevents tape snatch. STOP BUTTON—used when recording or playing back. FAST WIND CONTROL—provides variable speeds in both directions.

The auto stop is triggered by the usual strip of leader foil, but is arranged not to operate on the beginning of a reel. A tape position indicator, which is of the clock face variety, is also provided.

AMPLIFIERS

Conventional construction has been adopted for the separate record and replay amplifiers, with every component hand soldered to tag strips and earth bars. Although not so neat and tidy as a printed circuit, it does give one a chance to carry out running repairs when necessary. All

TAPE DECKS—HI-FI EQUIPMENT—MICS—RADIOS—SPEAKER SYSTEMS

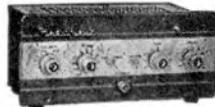


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TA-IC £6.15.0. TA-IM £19.18.0. TA-IS £25.10.0.



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HI-FI STEREO 6 W AMPLIFIER Model S-33
Only 0.3% distortion at 2½ w/chl. £13.7.6 kit
Send for details of other models.

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HI-FI FM TUNER Model FM-4U
Available in two units. Tuning unit (FMT-4U) £2.15.0 incl. P.T.). I.F.-amplifier (FMA-4U £13.3.0.) Printed circuit for I.F. Amplifier and Ratio detector own built-in power supply, 7 valves. Tuning range, 88-108 Mc/s.
Total Price £15.18.0 kit



FM TUNER

HI-FI AM/FM TUNER. Model AFM-I
Also available in two units as above: Tuning heart (AFM-TI £4.13.6 incl. P.T.) and I.F. amplifier (AFM-AI £21.16.6.).
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T.2

DAYSTROM LTD.

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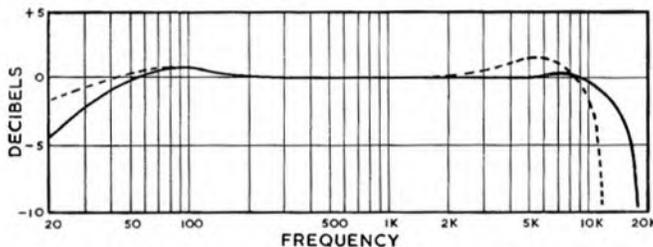
valves are located along the front of the recorder frame, and replacement is a simple matter once the case has been removed.

The mains transformer is located at the rear of the case to minimise hum, and the valve heaters in the initial stages of the playback amplifier are fed with DC. The Specialist is therefore completely hum-free, and has a good signal-to-noise ratio (better than -50 dB).

The main control panel appears rather forboding at first sight. The required amplifier condition is first selected by buttons marked record, play, superimpose, and interlock. The last named activates the erase head, recording bias and volume indicator, and is pressed simultaneously with the record or superimpose buttons. When the play button is pressed, all other buttons are released automatically. Coloured signal lamps show at a glance the condition of the amplifier.

The top row of controls comprise (L to R) monitor volume, bass, treble and bias. The last named gradually raises the recording bias from zero to normal when superimposing, so that additional sound can be recorded without "clicks."

A variety of input sockets, which accept standard tip and sleeve plugs, are located



Overall frequency response of specialist.

7 1/2 ips —————
3 1/2 ips - - - - -

along the front edge. The front line of controls comprise a three-way mixer, each control being fed from either of two inputs: mixer A—radio or echo, mixer B—radio or high impedance microphone, mixer C—high or low impedance microphone. Two other sockets provide headphone monitoring and a low level output, whilst a rear panel contains low level input and output sockets, also extension loudspeaker (15 ohms).

The radio sockets can be used for pick-ups and tape recorders, although a signal of only 0.25v. is required for maximum recording level. The volume indicator is a peak reading instrument with an "edge-wise" scale numbered one to ten, eight to ten coloured red to show overloading. A tape/direct comparator switch is nearby, also a balancing control so that an equal volume from both is fed into the monitor amplifier.

The internal loudspeaker is a Goodmans 10 x 7 inch elliptical, which gives a very pleasing quality. It is automatically muted when a plug is inserted in the extension loudspeaker socket.

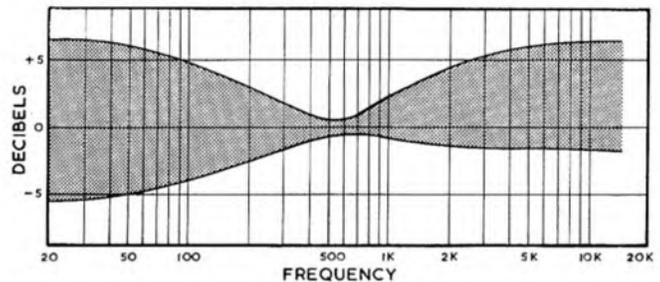
ECHO SWITCH

The Echo switch enables a signal from the tape replay head to be fed back into the recording amplifier via mixer A. Providing the mixer is not advanced too far, the result is reverberation at 7 1/2 ips. At 3 1/2 ips, the result is just a plain echo. Reverberation can also be added to previously recorded material by using the superimpose facility.

PERFORMANCE

The overall frequency response of the Specialist closely follows the C.C.I.R. standard, and consequently may appear to be lacking in extreme h.f. when compared with other recorders. But this is a case of quality before quantity and the response

The range of frequency correction available in the replay and monitor amplifiers, using the bass and treble controls.



curve is absolutely flat over the useful working range of 50 to 12,000 cycles. The treble response is clean and free from all forms of distortion, which is due to a very efficient push-pull bias oscillator.

Tests are carried out with various signal sources, including an F.M. tuner, gramophone pick-up and various types of microphone. The built-in microphone transformer, permitting direct connection of ribbon and moving coil types, does not introduce any hum. Wow and flutter tests produced most encouraging results, being slightly better than the quoted figure of 0.2 per cent r.m.s. at 7 1/2 ips. The signal-to-noise ratio

sion before the pinch wheel engages with the capstan, so there is little chance of tape spill. When the stop button is pressed, brakes are applied to both spool hubs.

COMMENTS

The Dynatron Specialist is obviously designed as a portable, since it has a carrying handle; but its weight of 58 lb., not 45 lb. as quoted, demands a strong pair of hands! It goes without saying that it should be handled with care, which is probably why the 27-page instruction book suggests that you install the recorder in a piece of furniture.

The built-in mixer is far more flexible than appears at first sight. Up to five different sound sources may be connected to the various sockets, although due to the absence of selector switches, any sound source not in use should have its plug withdrawn half-way. Pushing the plug home disconnects the neighbouring socket.

Only the record head is fitted with a felt pressure pad, which proved adequate during tests. In addition, metal guide pins fall into place when the recorder is running to increase the wrap around each head. Sound can be heard during the rewind or wind on process, so that track location during editing is a simple matter. The tape is only held lightly against the head, so there is no head wear during winding.

My main criticism is the position of the bias control, which must always be turned fully clockwise during recording. It is too easily knocked accidentally and cannot be switched out of circuit. My other criticism is the price, which seems to me to be rather high for a machine offering purely mono facilities. But followers of the name of Dynatron will not be disappointed in the performance of their latest product, especially when compiling competition or feature tapes.

matched the manufacturer's figure of approximately -50 dB.

The internal loudspeaker offers a perfectly satisfactory guide to sound quality whilst monitoring a recording, but the full tonal range of the Specialist only becomes apparent over an external loudspeaker. The headphone monitoring socket provides ample volume and it is worthwhile investing in a pair of high quality moving coil headphones.

The Reflectograph deck is very robust and full recording speed is achieved in only one tenth of a second (due to the continuously running capstan motor). The take-up spool receives a very positive ten-



Manufacturer's Specifications

Operating Voltage: 200 to 250 AC.

Power required: 100 watts.

Tape Deck: Reflectograph.

Max. spool size: 8 1/2-inch.

Tape Speeds: 7 1/2 and 3 1/2 ips.

Wow and Flutter: Better than 0.2 per cent at 7 1/2 ips.

Signal-to-noise ratio: Approx. 50 dB.

Frequency Response: 50-13,000 cps at 7 1/2 ips, 45-7,500 cps at 3 1/2 ips.

Amplifier inputs: Radio (0.25v. at 300 Kohms) and (0.25v. at 500 Kohms). Microphone: Two inputs (6 mV. at 1 megohm); and one (0.1 mV. at 60 ohms).

Amplifier outputs: Three watts at 15 ohms, 150 mV. at medium impedance.

Valve line-up: 1-EF86, 3-ECC83, 1-ECC82, 1-6BR8, 1-EL84, 1-EF91, 1-EX80.

Loudspeaker: 10 x 7 inch elliptical.

Dimensions: 20 1/2 x 18 1/2 x 10 1/2 inches.

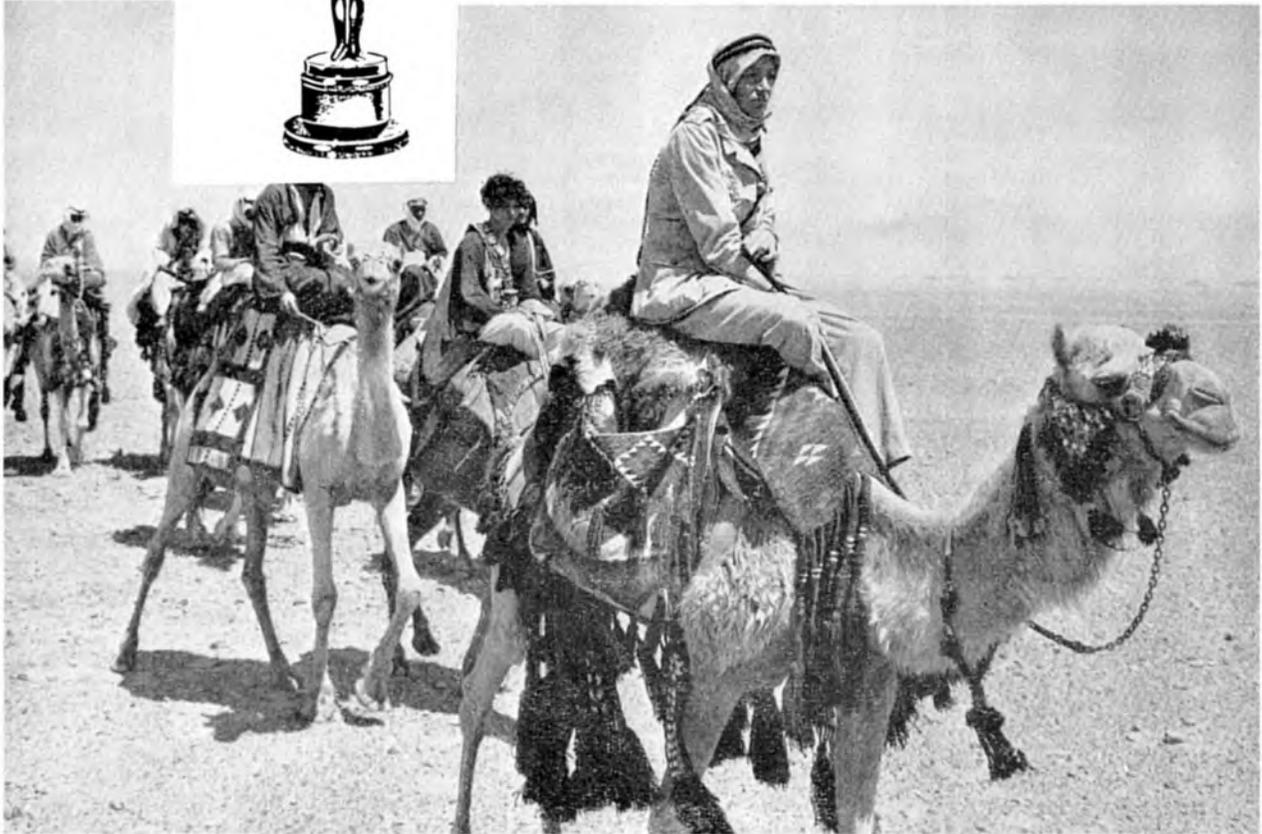
Weight: 45 lbs.

Price: £145 19s.

Manufacturers: Dynatron Radio Ltd., Maidenhead, Berkshire.



"Lawrence of Arabia" recorded on Zonastripe and Zonafilm magnetic tracks awarded 'Oscar' for Best Sound 1963.



THE TAPE WITH THE OSCAR-WINNING RECORDING QUALITY

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A full range of Zonatape recording accessories includes, printed leader and timing tapes supplied in 5 colours, splicing tapes and metal stop foil.

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Telcan will be on sale in the spring

THE three young inventors of the £62 home television tape recorder, recently returned from America with the news that Telcan will be on sale in Britain in the spring.

The three partners in the Nottingham Electronic Valve Company at East Bridgeford, Michael Turner (30), Norman Rutherford (30), and Brian North (29), have formed a company in America to manufacture the Telcan units.

They have so far received orders for about 100,000 recorders, the first in the field at this cheap price. Picture quality, which was criticised during the first showing in London last August, was admitted by Mr. North to be not as good as studio telerecordings, but it was improving all the time. Picture and sound are recorded on the same tape, and each eleven-inch spool gives 44 minutes recording time. Telcan operates on the four-track system using the upper two separately for vision and sound channels. As a sound recorder it has tape speeds of $7\frac{1}{2}$ and $3\frac{1}{2}$ ips and for video 120 and 60 ips.

The three young inventors travelled to America to reach agreement with the giant Cinerama organisation of America who wanted to sell the equipment. Mr. North said they had decided to go to America first because American competitors would have copied the invention anyway as soon as it was marketed in England. "The principles involved are original but not complicated,

and the Americans would soon have been trying to find ways round the patents."

He is also reported as saying that the Americans were sceptical at first about picture quality but he was sure they were now convinced. When used in conjunction with the firm's £60 closed circuit camera for home movies it had created a great impression.

Tape recorders

V. shorthand writers

TAPE recording experiments in the courts are being extended. Following experiments in the Divorce Courts, a division of the Treasury is to use a system designed by E.M.I. Electronics Ltd.

Six microphones were positioned in the court in front of the Judge, clerk, witnesses, defendant, foreman of the jury and counsel, so that all the proceedings are recorded. The aim is to see whether tape recorders are more able than shorthand writers to deal with the cross-examinations, interruptions and exchanges between counsel. During the experiment shorthand writers remained responsible for providing official transcripts.

The experiment, started on December 10, was to last about a month.

The Ministry of Transport are also to extend experiments with tape recorders. For three months they will be relied upon entirely to record the proceedings at one of the metropolitan traffic area courts at Soho Square. It is the first time they have been used without the check of shorthand writers.

If the experiment is successful tape recorders will probably be installed in all

traffic area courts, which hear applications for road service licences. Results of the Ministry's earlier experiments with shorthand writers and tape recorders working side by side showed that tape recorders were technically efficient and provided "a material saving" in cost over the shorthand writer. Counsel and witnesses appear in these cases, and when transcripts were compared they were found to be "as good as each other."

The *Police Review*, weekly journal of the British police, recently compared the written word to tape recordings. It pointed out that the written word can never reproduce inflexions, the calmness, heat, hesitancy, or shiftness of a denial. The shorthand writers' claim, that they always manage to pick out the voices that matter most—and what they are saying—when two or three people are speaking at the same time, is answered succinctly with "but recording engineers can do this too."

One very interesting point that arose concerns the use of a tape recorder in Court. At present there is no law to prevent anyone taking a recorder into court and furnishing himself with a record of the proceedings. Section 41 of the Criminal Justice Act, 1925, which prohibits photographing and restricts sketching in court, has no relevance to tape recording. Turning such a person out would be no more justifiable, legally, than turning out an old lady with a long ear-trumpet, writes the *Police Review* correspondent.

Grundig provide TV treat for contest winners

A VISIT to the ATV Studios at Birmingham was the treat arranged by Grundig for the thirty-four pupils of the Stimpson Avenue County Primary School, Northampton who took part in making the winning tape, "A meditation on the Crucifixion," in the Schools' Section of the 1963 British Amateur Tape Recording Contest.



The children were taken by coach to the studios to see the "Lunch-Box" programme compered by Noele Gordon, seen with the children above, who publicly presented the Grundig Shield to Jennifer Le Mesurier and Christopher Willis, as a permanent memento of the School's success in the contest.

Mr. Harry Walding, a master at the school, who submitted the winning entry for the second year running had received the Grundig Cup from Miss Jo Douglas at a special function earlier in the year.

After the performance the children were given lunch in Birmingham before returning to Northampton laden with toys and sweets.

Exchanging tapes with schools abroad

(Continued from page 65)

member of the class at the receiving end. Or, to save postage, one exceptionally clear copy may be sent for use in an opaque projector or epidiascope. In fact, projected illustrations are useful in nearly all features; even the words of a song in which the participation of the listeners is sought.

The inclusion of some *individual* written work has two advantages. First, the receiving class has something tangible to hold and see; and second, the sender benefits from a period of solid preparation that eliminates the possibility of the tape being mere transitory talk and entertainment.

Local legends make suitable group productions, especially if they are dramatised. These can include ghost stories, former communities and their varying domestic ways, from the Stone Age to a Victorian Sunday; and the questioning of a local personality like the parson, policeman or paper-boy. These are all within the capabilities of even junior children.

A skilful interview by the class teacher can yield treasures of inestimable worth. From Africa, for instance, came the recollections of an aged man who trekked with ox-wagons northwards from the Cape. An Arizona teacher brought to life the dull textbook descriptions of a desert environment. His tape included a fascinating description of the attempts of the cactus wren to build six or seven nests as decoys to confuse marauding creatures.

Habitually shy boys and girls can be encouraged to participate by reading from their diaries of their home affairs. In this way little gems of description may arise. For instance, one may learn how Mrs. X gives Mother a home "perm"; the rich rewards are made known of gathering wild mushrooms and selling them in town; or maybe the gamekeeper's son has collected plover's eggs for Lord Y. Lastly, there may be a vividly painful narrative of the night a pet dog came home injured, and of how no one heard it at the door except the brave little ten-year-old who dressed and came downstairs to give first-aid.

One tape a term is usually sufficient if this vital mode of learning is not to be worn out by over familiarity. The anticipation of a tape from afar should be seized and well worked up by the teacher, in order to build up a keen interest and useful background for what is to come.

If the result is a disappointment then let it be taken in the stride and be made an object of intensive criticism from the young "connoisseurs." Perhaps the microphone was too far off; the enunciation may have been weak; the subject matter may have been unsuitable or text-bookish; or it could have been simply the product of uninspired planning. Whatever the case may be, then "let us go to it, and show them how really to do a good job!"

People young and old never tire of teaching others when they feel they know better!

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ALAN EDWARD

BEEBY

RUBY MURRAY and her husband, Bernard Burgess were talking to me the other day about their hi-fi interests. Both are keen record-collectors, and have stereo installed in their new home: a charming, old-world cottage in a small Northamptonshire village. "I like selections from all the big stage and screen musicals," Ruby told me. And Bernard? "Oh, I go mainly for the vocal-group type of recording. You know—the Hi-Lo's and the Freshmen. Anything in that line." Naturally, perhaps, since Bernard began his own stage career back in 1953 as a member of a close-harmony group called the Mell-o-Macs, later to achieve outstanding popularity as The Four Jones Boys. It was while the team were appearing in Blackpool that Bernard and Ruby met and married.

I asked whether they ever used tape at all in their work. "Yes, we do," said Ruby. "We find it invaluable when rehearsing and preparing new material, particularly when my pianist isn't readily available. I simply get him to pre-record any new numbers I happen to be working on, and there you are!" They have a tape recorder each: a Grundig TK12 mains model and a transistorised portable.

"Why don't you two make a record together sometime?" I suggested. "After all, you double-up on stage and TV—so why not on disc?" "We'd love to," replied Bernard. "It's just a question of finding the right material." And if a suitable number turned up? "We'd do it," they said. Which set me thinking. . . .

Are there any budding song-writers, I wonder, among TAPE readers? If so, why not have a go? A cheerful "you-and-me" duet with simple, catchy tune and lyrics. I'll pass on all suitable submissions. Words and music, together with a taped version of the song, plus return-postage, please, direct to me at 88, Clare Street, Northampton.

"O.A.P.'S DEPARTMENT": TAPE reader, Wilfred Imison is nearly seventy, and for the past 2½ years has devoted much of his spare time to writing and producing his own original tape recordings. "I find it's an excellent medium for helping to keep my brain alert and my speaking-voice lively in my days of retirement," he tells me.

Wilfred has a friend—a widower, like himself—who lives just down the road. They've had an arrangement for years whereby, each Tuesday morning on his way to the station at 6 a.m., Wilfred's friend calls to collect a pile of magazines from the letter-box, leaving in return some periodicals of his own.

Last year, when his friend's birthday fell on a Tuesday, Wilfred had a brainwave. He made up a short tape of musical birthday-greetings, and placed an extension loud-speaker behind the letter-box. Then, shortly before 5.45 a.m., he positioned himself behind a crack in the curtains, waiting for his friend to appear as usual. It was a bitterly-cold morning with frost and snow lying thick everywhere, and soon Wilfred heard the familiar footsteps crunching along

the drive up to the front door. He switched on the tape. . . .

Wilfred's friend's wife was, at that time, lying dangerously ill, and it was evident that she had not long to live. "Just another day," he'd told himself as he left the house that morning. "Just another day. The same routine. It's my birthday—but who cares?" He was to find out that someone did.

This is a true story. It isn't that the idea itself was clever or original; it's probably been worked dozens of time before. It isn't smart, witty or sophisticated either. It isn't meant to be. But it's nice—don't you think? Like Wilfred says: "Making people laugh or smile is, to me, a job well worth doing."

Anyone else know of any other "Good Turns on Tape"?

S.G. of Manchester writes: "Unknown to two people who were talking together at my home recently, I made a tape recording of their conversation. Now one of them has turned extremely nasty, and is demanding that I hand the tape over to him. If I don't, he says, he'll start legal proceedings against me. Can he, in fact, do this?"

The term "legal proceedings" is, I think, over-dramatising the issue slightly. Nevertheless, this reader has quite clearly put himself in the wrong by an intrusion into what was, after all, a private exchange between two people—even though it did take place in his own home. The aggrieved person could, if he felt so inclined, instruct a solicitor to issue a formal request on his behalf that reasonably adequate steps be taken to ensure that the recording in question remained private. In other words, that the tape (and, of course, any copies) be erased.

I've said it before, and I'll keep on saying it: Hidden microphones and cameras never have been my idea of creative amusement. What on earth anyone can see in such childish tricks I simply cannot imagine.

WOULD you take kindly to the idea of a live hand-grenade with a rusty pin lying in a cupboard at your home? How about letting your kids muck about with an unexploded bomb? Just thought I'd ask.

A neighbour called round recently with a tape recorder, together with the explanation that it had: "... fallen off the table, and now it won't light up." (Can never understand, incidentally, why so many people use that expression, as though "lighting-up" were the only function a mechanically-sound machine was required to fulfil!) Her husband, it seemed, had had a go at it; so had the two youngsters. But no response. She wondered if I could help.

The machine was in an indescribably-filthy condition. Two small valves were rolling about loose inside, in company with a selection of screws, washers, pieces of snapped cable and what looked suspiciously like a chunk of a broken mains-switch.

Wonder how many more such death-traps there are lying around?

When writing to manufacturers for information about new products please mention that you saw it in TAPE Recording Magazine.

Crystal microphones and long leads

By M. J. PITCHER

THE idea that extremely short leads are essential for crystal microphones has been put forward in the pages of this magazine, and elsewhere, with such frequency as to have become generally accepted. The origin of this fallacy is no doubt shrouded in mystery, and the purpose of this short article is to do a little gentle de-bunking.

Many tape recording enthusiasts remain tethered to their machines by a crystal microphone and its short cable. Most will also hold the view that this particular type of instrument is necessarily of inferior quality and yearn for, and hope to possess, a ribbon, or moving coil, type. The reasons for this preference are, usually, that if recordings of high quality are required a more expensive microphone is believed to do a better job, and long leads require the use of a low impedance microphone.

In my opinion the Acos 39/1 stick microphone is capable of giving extremely good quality recordings and is in a very different class to the cheap crystal types supplied with some recorders. These latter are nearly bad enough to put would-be recordists right off recording for good and no doubt account for the bad name given to this type. The 39/1 is available at three guineas, or for less than £2 in certain quarters, and, working into a sufficiently high impedance, gives results that are as pleasing as other types at three times the price.

All crystal microphones are essentially capacitive, with the result that any attempt to alter the impedance by means of a transformer produces unsatisfactory results. It is not unknown that efforts in

this direction can give good reception of the BBC Home or Light Programmes, or both. In any case the system may well resonate within the audio range, with weird and wonderful distortion as a result.

An "equivalent circuit" is shown in Fig. 1. The capacity of the microphone is represented by $C1$ and that of the lead by $C2$. The voltage generated by the crystal is divided between these two capacities so that when $C2$ is small, with a short lead, the voltage supplied to the valve is high. When a long lead is used, and $C2$ is large, the voltage is proportionately less at the valve. The division is independent of frequency and would lead one to suppose that if a suitably screened lead is used, its length would not matter, provided that there is enough gain in hand at the amplifier to take care of the loss in signal.

The result of using a 39/1 microphone with a long lead is shown in Fig. 2. The cable chosen was Radiospares "Hygrade" co-axial television cable. Co-axial plugs and sockets were fitted to ensure complete screening. I have used lengths

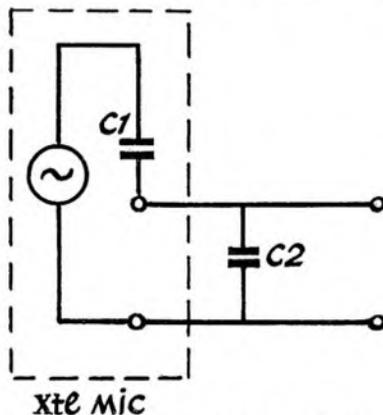


Fig. 1. An "equivalent" circuit

up to forty feet with no noticeable ill-effects. There was a slight loss in volume, with this length of cable, which was easily corrected by advancing the volume control slightly. For the test a ninety yard length of this cable was fitted. The response of the microphone was first taken with the two-yard-long lead with which it is supplied and this response was taken as a datum, the test figures being corrected to give a straight line.

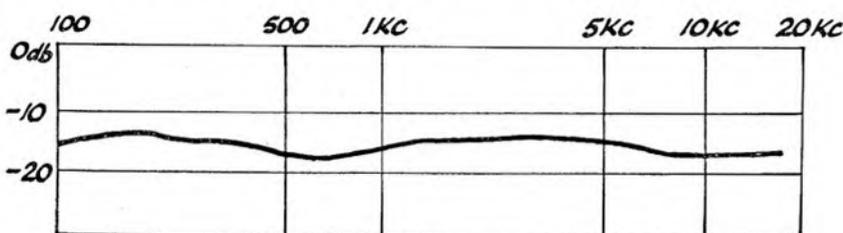


Fig. 2. The result using an Acos 39/1 microphone with a long lead.

The same correction was applied at each test frequency when the very long lead was in circuit. It will be obvious that nothing untoward happens as the frequency increases. There is a consistent decrease in signal, which amounts to a loss in power of about 6 dB per 100 ft., right up to, and beyond, 17,000 cps.

Readers who possess a high quality crystal microphone need have no hesitation in extending the length of the lead, in the manner suggested. Co-axial cable is a relatively inexpensive, and first class, alternative to a low impedance microphone, and will greatly extend one's range of recording activities.

LETTER TO THE EDITOR

—from Africa

WE recall the recent correspondence in your columns on the subject of the after-sales services offered by retailers of tape recorders and accessories.

We think the following example shows a degree of trouble taken which would be difficult to beat. Our tape recorders are, respectively, a Butoba MT5 and a Philips EL3542 (which, of course, here "in the bush" is run from car batteries via an AC/DC converter). The Butoba developed trouble in the switch-bank, and the Philips a variation in speed. Living as we do some 125 and 265 miles of dirt road from the nearest so-called "experts" in Kampala (and having very little faith in their expertise in any case!) we decided that the advice of a real expert must be sought.

We two, with our third tape-recorder—and two bottles of wine—then set to, and produced a message-tape to Mr. Douglas Francis of Streatham, in which we described our troubles in detail—and some hilarity—and requested succour.

Having played the tape back, we fully expected to get a rude answer and some caustic comments on the apparent habits of jungle dwellers in Darkest Africa. To our great surprise, within a fortnight we received not only a most friendly taped message giving explicit description, in careful stages of the dismantling and repairs required, but also the requisite spare parts and service manuals. We had no difficulty in setting everything to rights by following the instructions—this, of course, called for further celebrations.

The last thing we want to do is to involve Mr. Francis in a world-wide taped message repair service. We, of course, felt that our circumstances astride the Equator were unusual and called for unusual remedies. But we do feel (especially as the tape recorders were both purchased here in Uganda) that the service given to us by this dealer shows an unusual degree of helpful interest and expert knowledge which could well be emulated by other firms.

Once more we are now happily recording everything within hearing range, from the contented digestive rumbles of elephants through the girlish giggles of laughing hyenas to the masculine roar of lion hunting between our tents.

MISS J. A. NEVILLE-KAYE.

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Mbarara, Uganda, East Africa.



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MAGNEGRAPH

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Tape records reviewed

This tape has life, colour and teamwork

CLASSICS



By Edward Greenfield

LEHAR. The Merry Widow—Selection. Sadlers Wells Opera Company and Orchestra conducted by William Reid. HMV (TA-CLP 1226), 3½ ips, mono. 35s.

"The Merry Widow" was the first of Sadlers Wells' highly successful essays in popular operetta, and it remains the most satisfying production of all. For one thing the music is consistently interesting at every level. Not even Johann Strauss had quite so many memorable tunes in one operetta as Lehar provided here—*A highly respectable wife, I'm going to Maxim's, the Vilja* song, the *March Septet, the Pavilion Duet, the Waltz* and so much else. This selection provides all the most attractive numbers and in addition gives a sense of the dramatic action developing, which is more than most operatic selections do.

The great merit of the Sadlers Wells production is its life, colour and teamwork, and the inclusion of a high proportion of the ensembles (as well as the obvious solos and duets) allows these qualities to come over splendidly on this recording. In Vienna of course it is no new thing for such an operetta to be sung by opera stars, and judged by the standards of, say, Elisabeth Schwarzkopf the widow in this production, June Bronhill, lacks the last degree of refinement. She sings very sweetly, but does not project the lady's true dignity which makes such a fascinating contrast with her sense of fun.

Thomas Round makes a highly engaging hero, though his tone becomes a little gritty in the more sustained lyrical numbers. Marion Lowe, as she did on the stage, makes a charming Valencienne, younger and more vivacious than some who have played the part. William McAlpine's superb tenor adds greatly to the attractiveness of her lover's music. The rest of the cast includes such fine character singers as Denis Dowling and Howell Glynn, but it is essentially the teamwork, the sense that everyone knows the piece thoroughly from repeated stage performances, that makes the whole effect even more impressive than its individual parts.



I doubt if the March septet has ever been recorded with so much sense of fun as here, with the cries of "Women!" ranging through the whole gamut of male emotion. The recording is atmospheric in H.M.V.'s best manner with the words almost always very clear—an important point.

WEILL. The Threepenny Opera—Nine Songs. MONNOT. Irma la Douce—Five Songs. Mike Sammes Singers, the New World Show Orchestra conducted by Alan Braden. WRC (TT 253), 3½ ips, mono. 29s.

It is not easy to translate the peculiarly German world of Kurt Weill into that of the English musical. It is not made very much easier by the fact that the "Threepenny Opera" is set in London and in fact is based on an English original, Gay's "Beggar's Opera." Understandably instead of the snarling style with which Brecht and Weill represented the decadence of inter-war Berlin, the performers here provide a cockney-sparrow cheerfulness. It misses the sense of decadence—perhaps as well though Brecht and Weill fans might complain—and provides something much more rugged and surprisingly English-sounding. Kurt Weill's sharp jazz rhythms begin to remind one of the red-nosed world of the music-hall despite the authentically sharp and brassy orchestration.

It is the same with the adaptation of "Irma la Douce," a show which attempted to do for Paris what Brecht and Weill had done for Berlin. Here there is less excuse for cockney-sparrow lustiness and a number like *Our language of Love* really should have a more languishing Parisian style than Mary Preston and Grahame Laver give it. But the liveliness, the good ensemble and the bright recording make it attractive all the same. A good coupling.

OSCAR STRAUS. The Chocolate Soldier. FRIML. *Firefly*. Stephanie Voss, Laurie Payne, The Linden Singers. WRC (TT 210), 3½ ips, mono. 29s.

Nowadays we generally hear these operettas in amateur performances which for all their breezy enthusiasm do not often let us appreciate just how attractive the pieces are. "The Chocolate Soldier" was adapted without permission from Shaw's "Arms and the Man" and it is doubtful whether the dramatist had he known about it in time would have authorised his satirical play being turned into a sweet sentimental entertainment which roughly approximates to the kind of romance he was originally guying.

Friml's "Firefly" depends far more on the success of one number, the *Donkey Serenade*, and even in amateur societies it is done less frequently. It is good to hear on this tape four of the other numbers as well.

Stephanie Voss is an excellent singer by any count, one who has always shone brilliantly when persuaded to take on more serious material. Her singing here is clear, sweet accurate and always beautifully characterised. Laurie Payne is an excellent foil and the unnamed orchestra under its



unnamed conductor acquits itself very well. The recording is appropriately bright with the voices balanced well forward of the orchestra.

POPULAR **A musical precis for Cliff Richard**



By Fred Chandler

CLIFF'S HIT ALBUM. Cliff Richard with The Shadows, the Drifters, and Norrie Paramor and his Orchestra. Columbia (TA-33SX 1512), 3½ ips, mono. 35s.

This tape traces Cliff Richard's pop singing history during the past four years. Many of his most successful recordings are included, beginning with his first chart-making record *Move it*. The Drifters, later to change their name to The Shadows and to make their name as an independent group, provide the backing to this number. To follow is *Living Doll*, by Lionel Bart, Cliff's first great hit. He sang this in his first film, "Serious Charge," and it is my own favourite on this reel. The great difference of style between the languid guitar playing of the Drifters, and the later backings of the Shadows is most noticeable here.

Shadow's fans will also welcome this tape for their ten numbers, which include *A voice in the wilderness*, from "Expresso Bongo," *Fall in love with you*, and *Please don't tease*.

Cliff's first musical film, "The Young Ones," provides two of the tunes: the title number and *When the girl in your arms is the girl in your heart*. Norrie Paramor's orchestra makes an appearance here, and the mellow mood throughout the tape is accentuated. For *The Young Ones*, Norrie is joined by The Shadows. The tape livens up on this gay number, and again for *Do you want to dance*, backed by the Shadows.

Fourteen tunes in all, and a must for all Cliff's fans.

FROM ACKER WITH LOVE. Mr. Acker Bilk and the Leon Young String Chorale. Columbia (TA-33SX 1568), 3½ ips, mono. 35s.

Acker Bilk's wistful clarinet introduces his newest tape with *Moonlight Tango*. The tango flavour is provided mainly by the orchestral accompaniment, with Acker strolling into the melody in his usual casual manner.

Still typically unhurried is his version of *Diamantina*, with a rumba rhythm, and

The Missouri Waltz, sedate and evocative of evenings on the veranda after cotton picking is done.

Another traditional tune is the sea-shanty *Shenandoah*, before Mr. Bilk starts swinging with a lively *Tangerine*.

Although without vocals on this occasion, Acker's fans will find this tape welcome for their more leisurely moments. I found it ideal for the "end-of-the-party" mood.

MORE COLE ESPANOL. Nat King Cole with music conducted by Ralph Carmichael. Capitol (TA-W-1749), 3½ ips, mono. 35s.

The master goes Spanish again in this tape, recorded in Mexico City. The velvety voice is as sure as ever, although the language provided some uneasy moments.

There are some catchy feet-tapping numbers, including the opening tune *La Feria de las flores* wherein the heel-flashing, finger-snapping *senoritas* can be vividly imagined. *Las Chiapanecas* (While there's music there's romance) is another heel-clicking number, with characteristic hand-clapping supplied by an un-named chorus. Then there is *Aqui se habla en "Amor"* (Love is spoken here), a catchy cha-cha.

The ever-popular *Vaya con Dios*, complete with xylophone accompaniment, concludes the first half of the tape, which has twelve numbers.

The second track begins with a melancholy *La Golondrina* (The Swallow), but Cole breaks away from that mood then, with his arrangement of the familiar *A Media Luz*; even more so with his version of *Guadalajara*.

Another old favourite *You belong to my heart*, or "Solamente una vez" as sung here, is pleasing in Spanish, and the tape is concluded with a cha-cha, *Piel Canela*.

BIG BAND BOSSA NOVA. Stan Getz arranged and conducted by Gary McFarland. Verve (TA-CLP 9024), 3½ ips, mono. 35s.

Stan Getz first popularised the Bossa Nova, and on this tape his typical body-swaying rhythms provide ideal music for dancing and listening.

The recording, first issued on disc in 1962, includes eight numbers, none of which are oldies—to me at least; all are fun and light-hearted. That is, except *Melancholico* (Melancholy), which is not surprising.

Bossa Nova seems to be more suited for the latter part of the evening, and at such times there are very few "big bands" performing. A small group would have been sufficient for the dancers the music is designed to accommodate, and I waited in vain for proof of the necessity of the "big band" title.

The tapes reviewed this month are issued by the following companies:

"HMV," "Columbia," "Verve," "Capitol"; E.M.I. Records Ltd., 20, Manchester Square, London, W.1.

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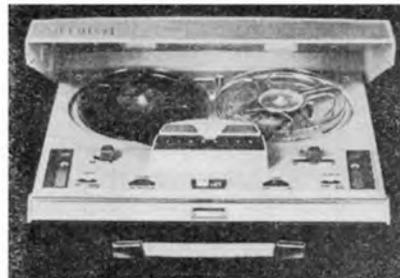
FIDELITY RADIO INCREASE THEIR RANGE

THREE recent introductions by Fidelity Radio are their Playmaster range of recorders. First is the two-track single speed recorder incorporating the B.S.R. deck selling at twenty guineas. Among the features are accommodation for up to 5½-inch spools, providing a playing time of 45 minutes per track using standard-play tape at 3½ ips; microphone, radio, and gramophone inputs safety erase lock; and an optional tape position indicator (two guineas extra). The four-track version (illustrated below) with the rev. counter included, will sell at 23 guineas, including crystal microphone with 8 ft. of cable.

Technical specifications include a quoted frequency response of 60-8,000 cps; signal-to-noise ratio is given as 50dB; and wow and flutter as better than 0.25 per cent RMS.

The built-in 8 x 3 inch loudspeaker provides an output of three watts, and power consumption is estimated at 60 watts. Three valves, ECC83, EL84, and EM87 are included in the circuitry.

They have also introduced the Playmaster-Major. This is a four-track recorder, having tape speeds of 7½, 3½, and 1½ ips. Accommodation is available for up to seven-inch reels, providing a playing time of 64 minutes per track using standard-play tape at 3½ ips. It incorporates the new B.S.R. TR10 deck, and additional facilities include mixing, super-imposition, and stereo playback with an additional amplifier. Separate bass and treble controls are included, and the Major

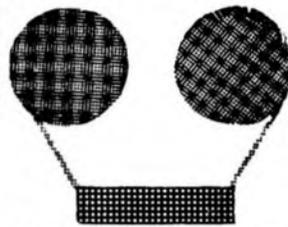


has also a moving-coil type meter recording level indicator. It costs 35 guineas including microphone, tape and recording leads.

Fidelity Radio Limited, 11-13, Blechynden Street, London, W.11.

NEW JAPANESE MODEL BY DENHAM AND MORLEY

A NEW battery or mains operated portable tape recorder is announced by Denham and Morley Ltd. The recorder is the Japanese-manufactured Unicorder SR-F61RT, in next column, a two-track double-speed machine operating at 3½ and 1½ ips.



Measuring 8 x 6½ x 3 inches, and weighing 6 lb., it has a mains transformer built in. The maximum spool size is 3½ inches, providing a playing time of 32 minutes per track at the slower speed.

Two 2½-inch speakers are incorporated, and the power output is rated at 300mW (8-10 ohms). The mains supply required is 100, 117, or 225 volts, 50 or 60 cycles.

Other features include fast forward and rewind facilities; combined battery state/meter recording level indicators; sockets for



foot-operated remote control; earphone/external loudspeaker sockets; and remote control, moving coil microphone (220-600 ohms).

Complete with leather carrying case, mains lead, radio leads, monitoring earphone, and microphone case, it costs 36 guineas. An additional accessory is a foot-operated remote control lead.

Denham and Morley Limited, Denmore House, 173-175, Cleveland Street, London, W.1.

COPYRIGHT-FREE FX DISCS BY E.M.I. RECORDS

TWENTY 45 rpm seven-inch records make up a new series of HMV sound effects. The effects range from dawn choruses of birds, a train crash or workmen hammering, to thunderstorms and jet aircraft. Each effect is contained on a separate band on the record for ease of selection of the desired sound required, and timings for each item are given on the record label.

One important point made by E.M.I. is that these recordings, 7s. inc. P.T. for each disc, may be re-recorded for private purposes or by amateur film societies, and may also be used without licence fee for public performance by private individuals and by amateur dramatic societies. Professional bodies have to obtain the necessary licences.

All the discs have the prefix 7FX before the numbers which run from 1-20. The titles of the discs are Air Raid on London and Air Raid Effects (7FX1); then in numerical order are cars; church bells; dogs; horses; sea effects; rain and ships; thunderstorm; trains; winds; birds; street noises and applause; aeroplanes; demolition, glass crashes and hammering; spaceships and ghosts; baby and children and cheering

crowds; telephone bell and footsteps and marching; gun and pistol shots; fire; farm-yard effects; and tree felling, jungle noises, and murmuring.



E.M.I. also have available the latest catalogue of the titles in their popular music repertoire. The leaflet, illustrated left, contains details of the performers and titles for some 170 tapes recorded two-track at 3½ ips. Most of these have been reviewed in our regular tape record feature, and the titles range from the Beatles' *Please, Please Me*, through *At the Drop of a Hat*, to the soundtrack of *Mutiny on the Bounty*. The leaflet is available free from Dept T.

E.M.I. Records Limited, 20, Manchester Square, London W.1.

AMPEX ANNOUNCE NEW STEREO RECORDERS

A COMPLETE new line of high-quality stereo tape recorders, including four different models for home, industry and education has been announced by Ampex.

The new F-44 series of four-track stereo recorders incorporates major advances over the 1200 series which it replaces. The 1200 series, introduced in 1961, is the largest selling line of audio recorders in Ampex history.

As a unique new service feature, an individual performance record is retained at the Ampex factory for each F-44 and this is made available to the purchaser. The record includes frequency response, signal-to-noise ratio, wow and flutter measurements, crosstalk rejection, and is initialed by the Ampex engineer making the measurements. The customer receives this performance record when he sends in his completed warranty card, and thus knows precisely what performance to expect from his F-44.

Other features of the new series include a new specifically-designed hysteresis-synchronous motor providing quiet operation through a dynamically balanced rotor and fan. Under normal conditions the motor never needs re-oiling. Separate record level meters for each channel; multiple generation sound-on-sound; a special pre-set shut-off control; separate bass and treble controls; and a one-year warranty on parts are other features. Two of the new models, the F-4450 and F-4452 are unmounted; the F-4460 and F-4470 are portable units; and the 2044 is a portable self-contained unit.

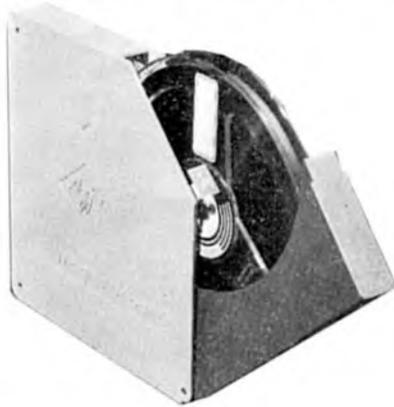
Specifications and details of prices are available from the manufacturers.

Ampex Great Britain Limited, 72, Berkeley Avenue, Reading, Berkshire.

AGFA INTRODUCE TAPE LIBRARY CASSETTES

AGFA have introduced a library cassette which will provide permanent, dust-free and low-cost storage at a fraction of the

price of ordinary tape boxes. The Agfa library cassette, illustrated below, is made of two-tone grey "Novodur," a warp-free and shatter-proof plastic, and is designed with a hinged spool holder for easy insertion and removal of spools. When joined by the simple process of pressing firmly together, the cassettes become a self-supporting book-shelf array. Individual cassettes can be unclipped and re-arranged as necessary. A



programme card is provided with every cassette.

They will be available with Agfa long-play, double-play and triple-play tapes (5, 5½, and 7-inch spool sizes) at an extra cost of 2s. 6d.

Agfa Limited, Deer Park Road, Wimbledon Factory Estate, London S.W.19.

MORE TAPE RECORDS BY ESOTERIC PRODUCTIONS

A NEW series of Recotape tape record titles are announced by Esoteric Productions. Included in the new range of tapes, mono only, at 3½ ips are a chairside concert (RML 7001); Music for dining and dancing (RML 7002); Music for a lazy evening (RML 7003); An evening with Tchaikovsky (RML 7004); Fireside Music festival (RML 7005); Music for a winter night (RML 7006); An evening in Vienna (RML 7007) and An evening at the ballet (RML 7008). These will sell at 69s. 6d. each.

Other titles in the new releases are Lenny takes the States (RML 220, price 30s. at 3½ ips, and 42s. 6d. at 7½ ips); and Sibelius Six Humoresques for violin and orchestra (RML 221, price 27s. 6d. at 3½ ips, and 40s. at 7½ ips). Two-track stereo versions of the Sibelius tape costs 35s. at 3½ ips, and four-track stereo versions cost 32s. 6d. at 3½ ips, and 45s. at 7½ ips.

The tapes provide over seventy minutes music on each five-inch reel.

Esoteric Productions Limited, 22, Coastal Chambers, Buckingham Palace Road, London, S.W.1.

CHANGE OF ADDRESS

CHATEAU PRODUCTIONS, distributors of the Microkit condenser microphones, announce a change of address. Their new premises are at 4, Manchester Street, London, W.1. (HUNter 2353).

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News from the Clubs

BIRCHINGTON

A new club is to be formed in Birchington, Kent. Charles A. Brown, the instigator, has already played a large part in the formation of two clubs in Kent and Middlesex.

Interested readers are invited to contact Mr. Brown at "Studio One," Woodlands Avenue, Birchington, Kent.

BOSTON

The Boston Soundhunters continued in an active mood following their success in the British Amateur Tape Recording Contest last year. (Their secretary writes about the production of their award-winning tape on page 55 of this issue.)

In November, the members welcomed Mr. Denis Affleck, twice winner in the B.A.T.R.C. "Technical Experiment" section, who spoke about the tapes he has produced. A competition on editing which followed his talk, and for which members had to conduct a mock interview with a radio celebrity, was not too successful. Further practical sessions are now proposed. At the end of the month an international pianist permitted members to record one of his concerts, and the inauguration ceremony of the Blackfriars Theatre was also taped.

December saw members recording a local performance of the "Messiah," and a taped cabaret show was provided for a motor club party. During this month, also, the secretary recorded the "Lincolnshire Past, Present and Future" conference which was opened in Lincoln's Theatre Royal by John Betjeman. The last meeting of the year was devoted to accessories and mixers, and saw chairman Ken Healey demonstrating his home-constructed bulk eraser and head demagnetiser. Afterwards, members visited the secretary's home to see his recently-installed equipment which seemed to have every conceivable accessory.

Earlier activities of this club included the presentation of a tape and slide show for the local Battle of Britain week. Their contribution was the first public performance of their tape "Freedom of the Borough to R.A.F. Coningsby." A requested repeat performance was given at the Camp. The September tuition class was devoted to microphone technique and outdoor recording. This was followed at the next meeting by a programme of tape records selected by members.

In October, the members organised their second hi-fi show, this time called "Sounds Superb." The club then

enjoyed an outing to London where they were the guests of Mr. George Tughan of Teletape, the Marble Arch tape record dealers. They were regaled with a demonstration of the Bang & Olufsen Stereomaster tape recorder and the new range of Truvox machines.

Secretary: Philip Towell, 107, Spilsby Road, Boston, Lincolnshire.

BRITWELL

November proved to be a sit back and watch month for the members of the Britwell club. Among the programmes held were two film shows. First of these was presented by Sir Anthony Myers, whose programme included films on the countries he has visited. This was supported by a tape/slide show compiled mainly by Syd Hall, entitled "A town called London Airport."

Their second November meeting saw representatives from Agta visiting the club to lecture on the manufacture of tape and its uses. During the month members learned that their tape illustrating the activities of a social centre, made on behalf of a local community association, had been awarded second prize in a contest organised by the National Federation of Community Associations.

Earlier, members were entertained to a demonstration of microphones presented by Lustraphone Ltd. The evening's emphasis was on stereo, and members also saw the Lustraphone radio-microphone in action. Later in October a marionette show was given by R. J. Jessman.

September saw the first showing of a slide show, *The Continental Holiday*, compiled by members. The show included the first stereo demonstration held for the members. This was arranged by P. Dawson-Smith with his stereo recorder.

Secretary: B. J. Jackson, 1, St. Paul's Avenue, Slough, Buckinghamshire.

DERBY

Among the fortnightly programmes arranged for the members of the Derby club have been a talk and demonstration on "How a recorder works" by Mr. Burton; an appreciation of classical music, by Mr. Stanway, in which he demonstrated the various instruments of an orchestra, and members' own tapes with titles including "Their holiday memories" and "Their most embarrassing moment."

"All your own" programmes were provided by Mr. Nicholls, Mr. E. Flecknoe, and the monthly quiz by Mr. Bramble.

Secretary: Miss E. Hassall, 52, Richmond Road, Derby, Derbyshire.

F.B.T.R.C.

The latest edition of the quarterly bulletin issued by the Federation of

British Tape Recording Clubs was recently issued.

Among the contents is an editorial plea for greater support from the individual clubs and regional groups, and requests for suggestions and comments concerning the work of the Federation.

Other articles include reviews of the tapes entered in the 1963 British Amateur Tape Recording Contest, which the Federation Committee help to judge; a note about the Tape Library; address changes for member clubs; and an offer concerning his B.A.T.R.C. prize-winning tape "Somervell's Magnificat," by Philip Towell.

The bulletin also includes details of the Federation committee for 1963-4 and a membership application form.

We have received various comments regarding the Federation, and wish to point out again for those doubting Thomas' that this organisation is formed by members of the tape clubs spread throughout the country; the committee is elected by representatives of the member clubs; and they are UNPAID. Why not bring up the subject of membership for your club at the next meeting? Or even better, write to the secretary for a copy of the bulletin and present it at the next meeting.

Secretary: E. Roger Aslin, 1007a, Finchley Road, London, N.W.11.

HULL

One of the most recent meetings of the Hull tape club included a visit by Mr. Sealey-Clarke of Planet Projects Ltd, who had presented a demonstration of his company's Planet tape decks. His visit was one of four he made to the north of England when he called on the clubs in Leeds, for a combined meeting with the Huddersfield society, Middlesbrough, and Doncaster.

Earlier, members of the Hull club organised an open day to demonstrate some of their activities. Displays included sections on hospital broadcasting, home maintenance of machines, tape exchanges, the history of tape recording, and home construction. Secretary Ken Fulstow described the event as a method of obtaining publicity for their hospital broadcasting service and to gain more members.

Visitors to the exhibition were shown practical demonstration of disc-jockey shows.

Secretary: Ken Fulstow, 17, Lowfield Road, anlabay, Hull, East Yorkshire.

LONDON

A visit to BBC studios in London was arranged for members of the London tape recording club at the beginning of December. The trip was to hear Mr. Dennis Morgan of the BBC's Training Staff lecture on the production of "Spot Sound Effects."

Assisted by a charming young lady filling in at short notice, he gave a most enlightening demonstration which included a most realistic episode of a prowler entering a house, climbing the stairs, exploring an empty room, and leaving the house again. All the effects made by one person's feet and a dummy door.

Other effects demonstrated included creaking doors, windows, telephones, and pouring from a bottle. Mr. Morgan's lecture concluded with an extract from one of the Goons' shows. This illustrated a 45-second continuous effect performed live. During their visit the club members also saw gramophone effects being cued in. One groove from a 78 rpm twelve-inch disc was selected, the needle dropped, and the programme faded in within a second. Two members recorded the

lecture using a Nagra IIIb battery portable.

Lined up for members at the February meeting will be a demonstration presented by the Ferrograph Recorder Co. A special invitation is extended to any Ferrograph owner who wishes to be present. The meeting will commence at 8 p.m., on Thursday, February 13, at the Marquis of Granby, Chandos Street, off Trafalgar Square.

Secretary: Douglas J. Morris, 80, Tangier Road, Richmond, Surrey.

POLICE ASSOCIATION (TAPE SECTION)

News of a tape group formed within the International Police Association is received, the secretary Les Silcock.

Open to membership for the police forces throughout the world, the group has been in formation for six months. In May this year the Association are holding their Triennial Congress Meeting at Blackpool's Winter Gardens. Among the many activities will be a demonstration by BASF of their Tape Mailing system and a demonstration for members of the tape group.

Secretary: Les Silcock, 42, Greenwood Road, Sheffield 9, Yorkshire.

RUGBY

An audience of approximately forty persons attended the Rugby headquarters on December 5 for a talk/demonstration presented by Mr. A. C. Griffiths, Recording Manager of the World Record Club.

Mr. Griffiths explained the working of the club, and presented examples of recent and forthcoming releases, using his own equipment based upon a Ferrograph Series 5 tape deck mounted on a mobile trolley. He spoke about past recording sessions, going into detailed examination of recording technique. He also recalled his post-war recording sessions in Vienna when he worked with Elisabeth Schwarzkopf and Herbert von Karajan.

Four members of the Nottingham tape club attended his show, including the secretary Keith Fricker.

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

SOUTHALL

A new secretary is announced for the Southall tape society. Arnold Highcazon is the new official, and his address is 101, Roseville Road, Hayes, Middlesex.

STOCKPORT

News of another new club is received from Stockport. Among the early activities have been visits from the representatives of B.A.S.F. Chemicals and Minnesota Mining & Manufacturing Co. Ltd.; and various miscellaneous meetings to establish the possibilities of the members.

The secretary makes an appeal to overseas enthusiasts who are willing to establish a tape exchange with the club members.

Secretary: John W. Makers, 124, Buckingham Road, Heaton Moor, Stockport, Cheshire.

WORLDWIDE TAPETALK

Some two hundred sound effects, listed under collective titles of railways, birds, animals, frogs and toads, space, and location recordings are available for members of the Worldwide Tapetalk organisation.

The list appears in the fourth edition of their quarterly journal *Sound Advice*. Among the space listings are crew entering space-ship; countdown signal and rocket fire, radio to flight control, radar viewer signalling meteorites, magnetic storm, entering planet's atmosphere, ship landing, and creatures on planet.

More down to earth are the railway effects which include interior and exterior recordings of many types of trains, plus station announcements, American railroad sounds, and even a mountain rack rail effect.

Secretary: Charles L. Towers, 35, The Gardens, Harrow, Middlesex.



Left: The London Tape Recording Club visited their "adopted" children at one of Dr. Barnardo's homes just before Christmas, to present gifts collected by the members. Our photograph shows the president, Ken Blake, front left, and beside him chairman Ron Tucker, with some of their "hosts."



RESLO 'BROADCASTING'

Miniature Ribbon Microphone-Type
VRT

This microphone is a "special" version of the famous Reslo type RB and has been developed to meet the very high standards insisted upon by the various broadcasting authorities, including the B.B.C. The ribbon element is mounted in the front shell (the label side) and the internal protective screens have been reduced to the minimum. A high quality 300 ohm or 30-50 ohm (nominal) line transformer is fitted, which allows long microphone lines without appreciable losses. These microphones are particularly recommended for use in pairs for stereo recording.

SPECIFICATIONS

- Models Available:** VRT/L for 30-50 ohms impedance. VRT/M for 300 ohms impedance.
- Frequency Response:** Smoothly maintained over the range 40 c/s. 40 c/s response -2 dB. 16 Kc/s response +2 dB referred to the level at 1,000 c/s.
- Sensitivity:** 81 dB below 1 Volt/dyne/cm². (300 ohms impedance).
- Polar Response:** Nominal figure of 8. No acoustic damping incorporated.
- Dimensions:** From top of frame to swivel screw-2 3/8" (66.7 mm.) approx. T base swivel screw to the plug connector-2 1/2" (63.5 mm.) approx.
- Weight:** 9 oz.
- Finish:** Satin chrome overall.
- Construction:** Head tilting-mounted as Reslo RB series with 45 degree movement from vertical in rear direction only, on 'T' (tubular) base which includes Reslo T.C. socket connector.
- Connecting Cable:** Each microphone is supplied with 6 yards screened and twisted P.V.C. cable (red and black) grey sheathed

Write for illustrated literature:

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3" 150'	7/6	Acetate	4" 300'	10/6	Acetate	3" 150'	5/3	
4" 300'	13/6	4" 300'	9/-	5" 600'	21/-	5" 600'	18/-	
5" 600'	21/-	5" 600'	18/-	5 1/2" 900'	28/-	5 1/2" 900'	24/6	
5 1/2" 900'	28/-	5 1/2" 850'	24/6	7" 1200'	35/-	7" 1200'	30/-	
7" 1200'	35/-	7" 1200'	30/-					
Long Play		Standard Play		Long Play		Standard Play		
3" 210'	9/-	Polyester	3" 210'	9/-	PVC	3" 150'	5/9	
4" 450'	14/6	5" 600'	20/-	4" 450'	14/6	4" 300'	10/6	
5" 900'	28/-	5 1/2" 850'	26/6	5" 900'	28/-	5" 600'	21/-	
5 1/2" 1200'	35/-	7" 1200'	32/6	5 1/2" 1200'	35/-	5 1/2" 900'	28/-	
7" 1800'	50/-	Long Play		7" 1800'	50/-	7" 1200'	35/-	
Double Play		Double Play		Double Play		Long Play		
3" 300'	14/-	3" 300'	9/6	3" 300'	14/-	3" 225'	9/-	
4" 600'	25/-	4" 450'	13/6	4" 600'	25/-	4" 450'	14/6	
5" 1200'	42/-	5" 900'	26/6	5" 1200'	42/-	5" 900'	28/-	
5 1/2" 1800'	55/-	5 1/2" 1200'	32/6	5 1/2" 1800'	55/6	5 1/2" 1200'	35/-	
7" 2400'	77/6	7" 1800'	44/6	7" 2400'	77/6	7" 1800'	50/-	
Triple Play		Double Play		Triple Play		Double Play		
3" 450'	22/-	Tensilised Polyester	3" 400'	15/6	3" 300'	13/6	3" 300'	13/6
4" 900'	39/-	4" 600'	22/6	4" 900'	39/-	4" 600'	25/-	
5" 1800'	66/-	5" 1200'	41/-	5" 1800'	66/-	5" 1200'	45/-	
5 1/2" 2400'	90/-	5 1/2" 1800'	51/6	5 1/2" 2400'	90/-	5 1/2" 1800'	57/6	
7" 3600'	115/-	7" 2400'	72/6	7" 3600'	115/-	7" 2400'	80/-	

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- REPS. R.10 2-Track ... 59 gns.
- SIMON S.P. 5 ... 93 gns.
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SPECIFICATION—Coverage: 87-108 M/cs.

Sensitivity: 1.5 µV for 20 db quieting.

Output: 0-2 volts variable to match any amplifier or tape recorder.

Stages: R.F. Stage, Two IF Amplifiers, Limiter Stage and Foster Seeley Discriminator.

223 AM-FM TUNER (illustrated)

Identical in performance to the 224 above but with the addition of the Medium waveband.

Price: £28.15.0

SPECIFICATION—FM Band—as the 224 above.

AM Band—

Coverage: 180-600 metres.

Sensitivity: 5 µV for 20 db quieting.

Automatic

Variable selectivity: 2 to 8 K/cs depending on signal strength.

Filter: Built in Heterodyne rejection filter.

The new 224 FM Tuner and 223 AM-FM Tuner are designed to provide outstanding facilities and performance with any tape recorder or amplifier.



Optional cases of teak and vinyl-hide are available for all models.

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