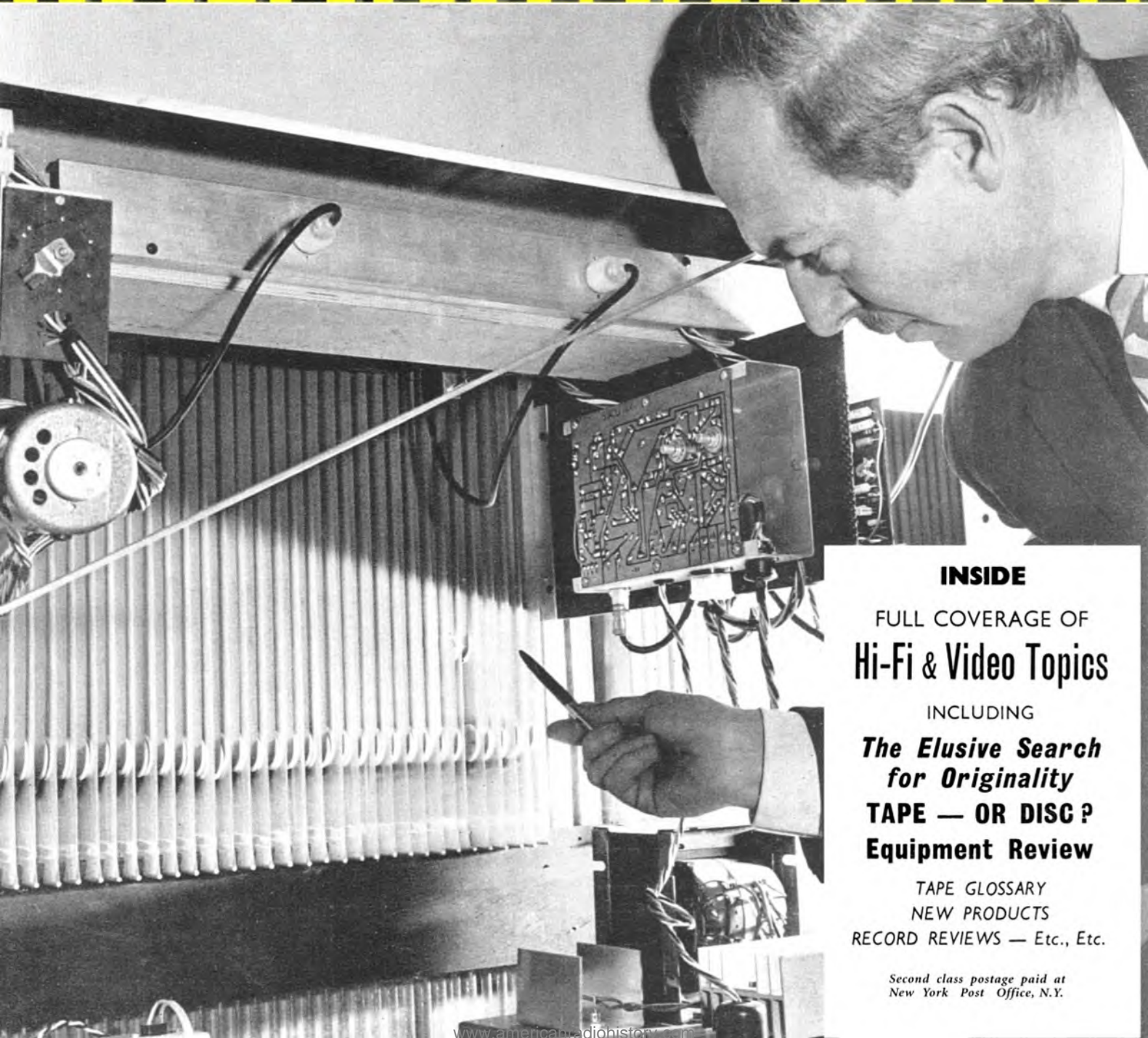


MARCH 1967

2¹/₂

TAPE

RECORDING MAGAZINE



INSIDE

FULL COVERAGE OF
Hi-Fi & Video Topics

INCLUDING

*The Elusive Search
for Originality*

TAPE — OR DISC ?

Equipment Review

TAPE GLOSSARY

NEW PRODUCTS

RECORD REVIEWS — Etc., Etc.

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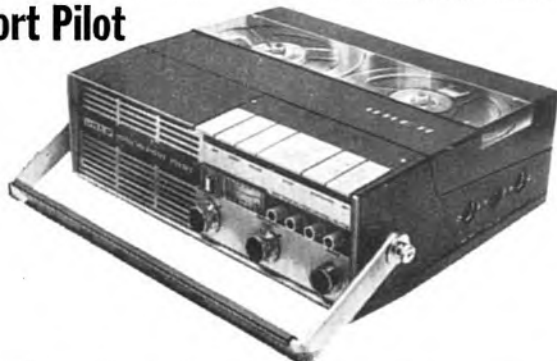
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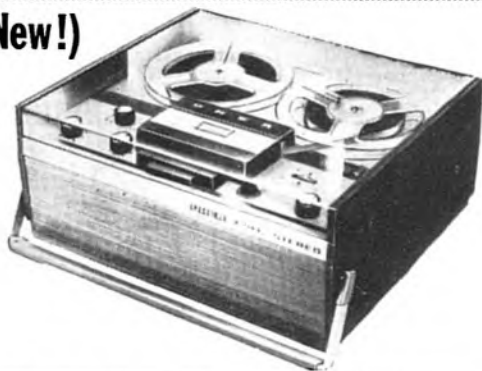
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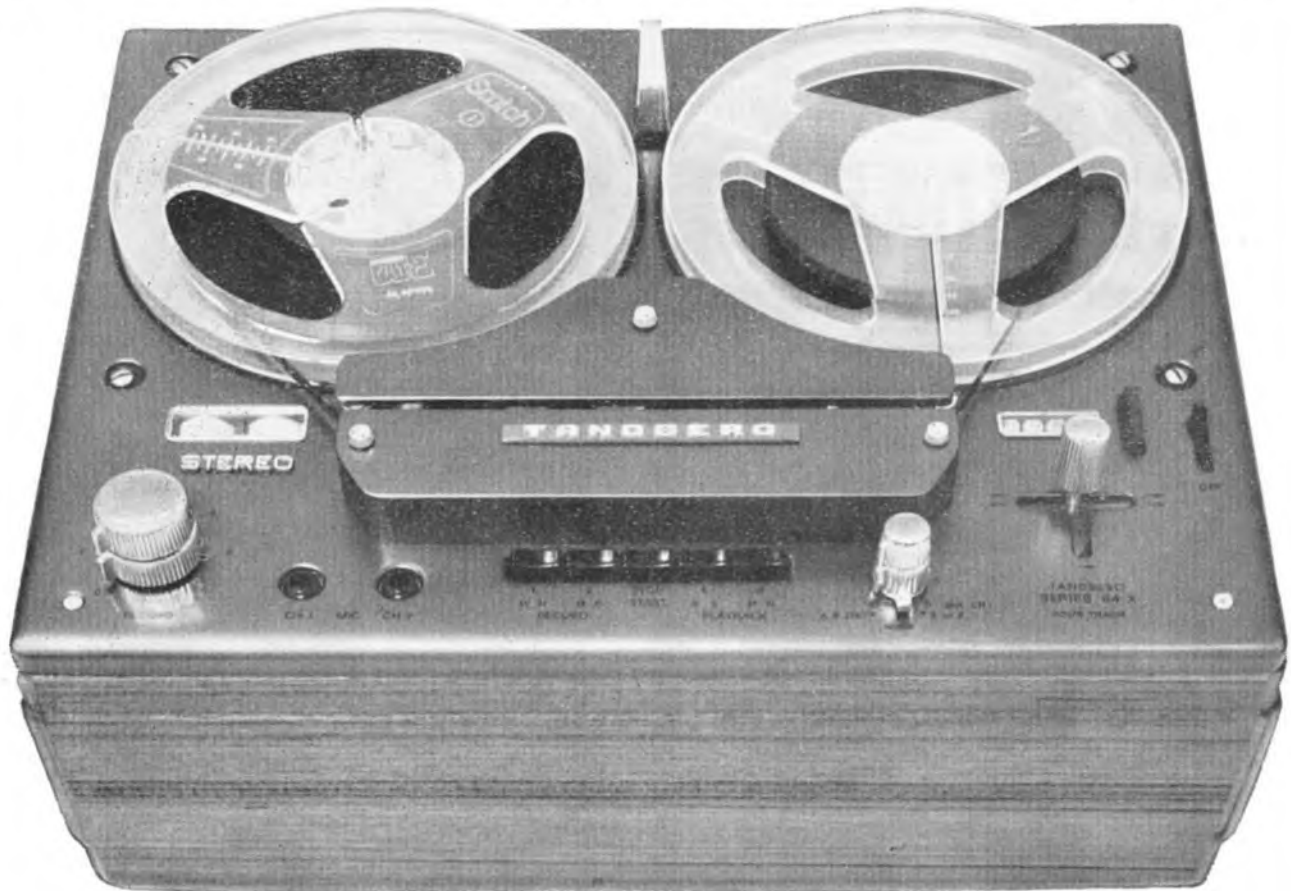
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7½" per sec: 62 dB. 3¾" per sec: 59 dB.

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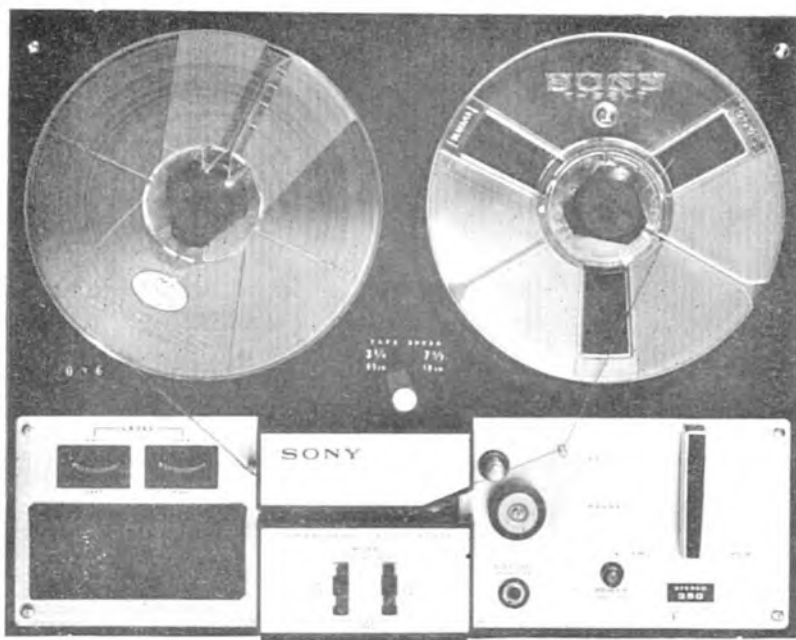
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Power requirements: 50W, 100, 110, 117, 125, 220, 240V, 50/60 c/s AC.

Reel: 7" or smaller.

Tape speed: 7½ and 3¾ ips. with automatic equalization change.

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Playback: calibrated to 0 db line output.

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1,200' tape 7½ ips. 1 hr. 2 hrs.
3¾ ips. 2 hrs. 4 hrs.
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Vol. 11

No. 3

March 1967

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COVER PHOTOGRAPH: No prizes for guessing what it is! We are looking at the rear of the Mellotron Sound Effects Console with its back covers removed. Within each one of the vertical plastic channels runs a length of magnetic tape, held in position by a spring-loaded pulley. When a key on the console is depressed the section of tape it controls begins to rise as you see happening in the picture. When the key is released the tape at once drops back again. Read about this very ingenious machine on page 89 of this issue.

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EDITORIAL

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LUDgate 9088

Managing Editor,
DENYS G. KILICK

Tape trends and tape talk

By the Editor

SIX WEEKS to this year's Audio Festival and all the indications are that we shall see another unlimited success, with the hi-fi industry in good heart and the amateurs as enthusiastic as ever. One might have thought that the economic squeeze would have played havoc with the tape and hi-fi market, but not at all. All the sales reps I encounter seem happy enough. Marginally, things are not what they might have been, but business is brisk. A glance at the advertising pages of this magazine proves the point—there are significantly more of them than there were twelve months ago.

For an increasing number of people hi-fi has now become as essential a part of home equipment as a comfortable arm-chair, and these are the sort of people—skilled professionals and technocrats, many of them—whom the squeeze has not really hurt.

And, all the time, the numbers of enthusiasts increases. I see in a recent issue or one of the "pop" home magazines a detailed "Plain Man's Guide to HiFi"—and the sort of installation envisaged for the "plain man" is something really impressive, I assure you. Standards are rising, and so is demand for quality products.

Now with bank rate coming down again, I believe the worst may be over and a brisk increase in business lies ahead for energetic manufacturers. Most of them, I hope, are deeply involved by now in thinking and planning the adjustments necessary when Britain enters the Common Market.

* * *

FOR THEIR ANNIVERSARY, Philips have constructed at Eindhoven a remarkable exhibition known as "Evoluon" and the CIMES judges and their wives were the guests of Philips on a visit there. Let it be made clear immediately that any reader visiting Holland should make a special effort to visit this permanent exhibition, which includes a great deal of special interest to sound enthusiasts.

It looks rather like a flying saucer, resting on twelve V-shaped legs. It is nearly 250 feet in diameter and the top of the structure is nearly 100 feet from the ground. Inside there are three concentric circles of balconies, the largest over 750 feet long. One goes to the top by lift and then descends, balcony by balcony.

On the way, the development of technology—and of the social and economic problems with which it has had to deal—is traced over the 75 years of Philips' history, the achievements of the present are strikingly demonstrated, and the possibilities of the future excitingly explored.

And there are many working models with which the visitor can amuse himself. "Evoluon" was a fitting climax to a memorable 1966 CIMES.



The dramatic lines of the imaginative building housing the Philips exhibition, Evoluon, at Eindhoven, Holland.

IT IS surprising how much obvious material has *not* been recorded by amateurs. A few months ago Mrs. Phyllis Copinger, British delegate to the Union Mondiale des Voix Francaises, asked through this magazine if any reader had available a recording of the Changing of the Guard at Buckingham Palace. A member of her organisation in France had made a cine film of the ceremony while visiting London and needed the sound effect for the sound track.

No one Mrs. Copinger contacted had the necessary recording, so she wrote to the Federation of British Tape Recording Clubs. They didn't have it either—but they promised to go out and get it, and they did . . . at once.

As President of the Federation it gives me immense pleasure to receive this unsolicited testimonial to the fine work which is now being done by Federation officials. I am sure that the club movement is now beginning, at last, an important and significant growth development.

* * *

I HAVE now heard more of the tape-recorded drama competition organised by the Barnet Borough Arts Council, which I hope will become a model to be followed in other towns all over the country. The rules point out that "the judges will place emphasis on the interpretation of plays in terms of the medium of sound rather than on recording quality, although both aspects will be regarded as important. The imaginative use of the medium will be the main basis of assessment."

Only residents of Barnet are eligible for this contest. They may obtain information from the Organising Secretary, 7 Chandos Avenue, London, N.20.

WHEN we want to dub a sound effect into a programme or production it's not a very difficult thing to do. All that is required is to put the effects tape on a playback machine and mix its output into the main programme channel. But suppose we wanted to handle not one sound effect but hundreds? This would present some real problems in the handling of material and cueing in at precise points in the script.

Suppose we had at our disposal a library of some thousand-odd different effects. Just imagine the time it would take to merely sort out the ones we want. This is such a difficult problem that some day someone was bound to come up with the answer. They did, and what an original answer it is.

Imagine an object not dissimilar to an electric organ. Instead of music, imagine a catalogue of more than 1,260 sound effects. Imagine being seated at this console and having the ability to produce any one of those effects by merely depressing the appropriate key. This is the function of the Mellotron sound effects console.

The ingenuity that has gone into the design of this equipment is truly incredible. Within the console are seventy magnetic tapes, each carrying three tracks. Each track is divided into six sections of recorded information. The seventy tapes are wound on to a long, rotating drum, rather in the way that the warp is loaded on to the loom in weaving. A cycling action, in the course of which the drum rotates, brings any one of the six sections of all seventy tapes into the "ready for playback" mode. Track selection is the next stage, and then finally the individual numbered key will control the desired effect.

When the key is depressed the chosen effect will be heard from the beginning, and will continue for eight seconds. If the key is released during playback, it may be immediately depressed again and the effect will at once start from the beginning once more. This might appear to be an impossibility. Fast wind is one thing—instantaneous wind is quite another!

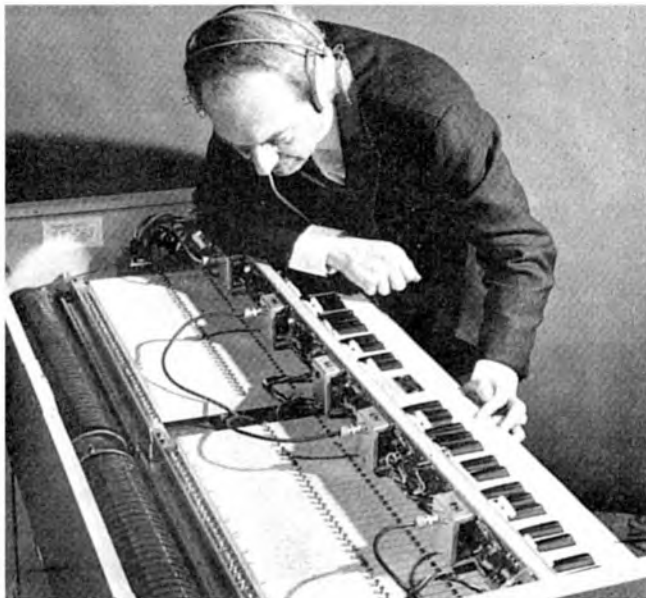
A glance at our cover photograph will show immediately how this has been achieved. The seventy tapes cascade vertically down the back of the equipment. When a playback key is depressed the individual tape carrying the effect will rise vertically as it is drawn across the playback head at the top of the mechanism. The moment the key is released the tape plummets down to its original position through the action of a specially weighted, spring-loaded, idler pulley. Like most very clever ideas it is basically extremely simple.

With additional refinements, such as built-in faders, variable speed control (± 20 per cent) and other professional facilities, the Mellotron is obviously not a toy for the amateur. Distributed overseas by Rank Audio Visual Limited, it actually costs rather more than £3,000. But then you would expect to pay a lot for a machine which uses *seventy* playback heads. Yes, there is a separate head for each of the seventy tapes.

A final nightmare thought about the Mellotron. Can you imagine what a job it

ARE YOU CLEVER ENOUGH TO WORK
OUT IDEAS FOR

ORIGINALITY IN EQUIPMENT



How does it work? A key on the Mellotron is depressed and one of the seventy tapes wound on the roller at the rear begins to move

must have been to set this equipment up in the first place? 1,200 sound effects to be sorted out and dubbed on to the special $\frac{1}{8}$ -inch, triple track tape, and then catalogued. This must surely represent one of the most involved recording tasks ever undertaken.

We all know that tape is wound on to spools. Although this arrangement has its advantages it has many disadvantages for specialist applications. Even a cassette machine is a variant of the spool principle. An original departure from this method has been developed in the Bell & Howell Language Master.

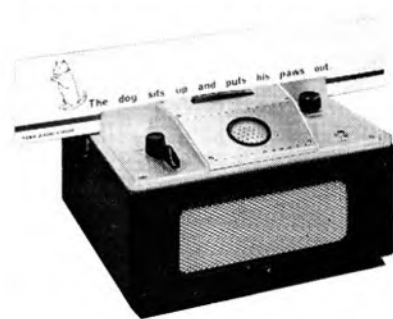
As the illustration shows, a card 17 inches long carries a ribbon of tape along its base. The idea is that young children place the card in the machine, look at the drawing and then put the machine into its playback mode. The card will actually travel through the machine, *from right to left*, and the teacher's voice will be heard pronouncing the words that remain visible above the sound channel.

The student then runs the card through the machine again, but by a simple switching arrangement is able to record his own version of the legend. This is a very ingenious and original use of the recording medium and doubtless the children who use it learn to read more quickly and less painfully than those without such advanced equipment.

But why on earth should universities want to buy this equipment? Not even the undergraduates need to learn how to read! There is another much more important use for this equipment. Cards are supplied with the ribbon of tape at the base but without either the illustration or the printed phrase. At the university sounds that need to be recorded and catalogued are recorded, one at a time, on individual cards and the relevant information about the sound is

typed on the blank space. The cards can then be numbered and filed, just like any conventional card index system.

The advantages of this method of storing short sound sequences is obvious. There is no limitation to the number of cards that may be filed: with modern filing equipment half a million or more can be stored in an automated filing cabinet. Any one card could be produced by an operator in seconds and the card could then be played back.



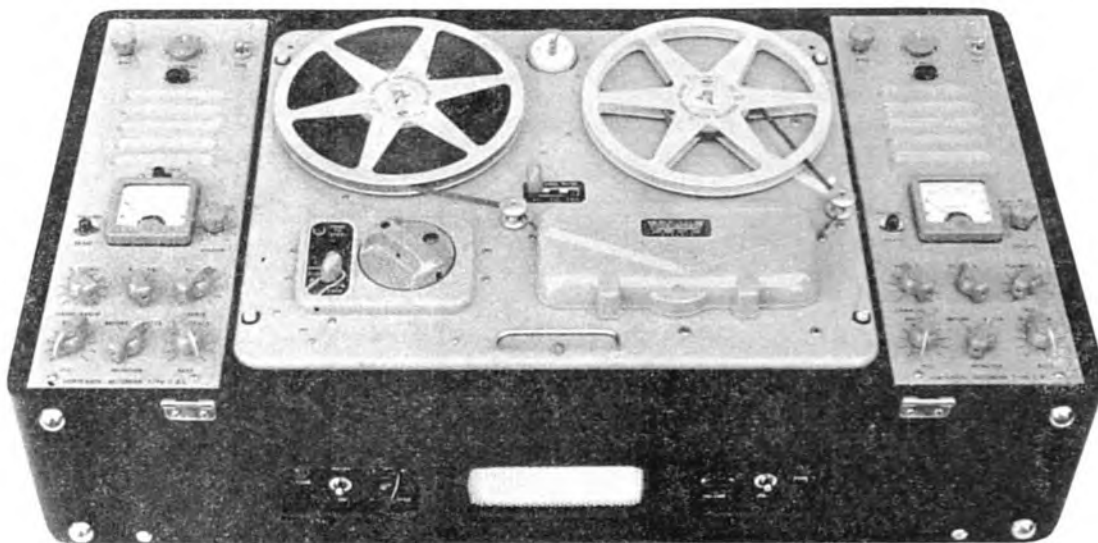
The Language Master with its card in place ready for playback

Like the Mellotron, the Bell & Howell Language Master is distributed by Rank Audio Visual Limited, but unlike the big effects console it is a very simple equipment costing less than £70.

These two examples of originality in recording equipment show what can be done by using imagination and initiative. Magnetic tape is such a new medium that the possibilities for new uses must be limitless. All that is needed is someone bright enough to think of something new—and original.

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Here is a versatile stereophonic recorder which has no equal in its price group.

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IT CAN also make a recording on one track and then transfer it to the other track while measuring and listening to it and adding one or two more signals also metered. A special PPM type meter is now used.

IT CAN repeat the process and transfer this combined signal to the first track with one or two more signals. Composers use it for this purpose. One track may have music or commentary and the other cueing signals or commentary and either may be altered without the other.

IT CAN playback stereophonically or monaurally with its own amplifiers of $3\frac{1}{2}$ watts each.

Speeds $1\frac{7}{8}/3\frac{3}{4}/7\frac{1}{2}$ i.p.s. Price **£172 0s. 0d.**

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Speeds $1\frac{7}{8}/3\frac{3}{4}/7\frac{1}{2}$ i.p.s. Price **£96 7s. 0d.**

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All tape recorders have adjustable bias controls, low impedance mic. inputs for unlimited lengths of cable, highly accurate position indicators and meters to measure recording level and bias.

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I HAVE been teaching the techniques of magnetic recording for a good many years. During that time I have tried to stress what I consider to be one of the most important attributes of any amateur recording—that of originality. Now this is something which it is impossible for me, or anyone else, to teach. All we can do is to demonstrate, by example, what we mean by originality.

The broadcasting authorities and the professional studios have to maintain the very highest quality standards. To achieve these high standards they have the advantage of superlative equipment operated by experienced and qualified engineers. Let us be quite honest—the amateur stands little chance of beating the professional in the quality stakes. I say *little* chance deliberately because there are occasions when the advanced amateur, using top grade equipment, can produce results to an equally high standard. But this opportunity occurs rarely, particularly in the recording of music. When the professional is recording a musical item he is working with professional musicians—when the amateur does the same job he is usually working with amateur musicians. Under these conditions, however good his recording might be, the amateur version will never be as good as the professional's if for no other reason than that the standard of performance will not be so high.

But in the elusive search for originality the amateur is working on the same level as the professional. When originality enters the door, quality can take a back seat. So how do we achieve originality in our recordings?

To be truthful, I just don't know. One thing I do know is that it is never derived from following rules of thumb. It comes about through the realisation of an individual's mental processes and ambition; it requires sufficient drive and enthusiasm to convert abstract thought into concrete reality.

Consider what is basically a very simple recording. We connect our tape recorder to the output of an FM tuner and record music that is being broadcast. At that moment a band is playing "El Relacario," a well-known Spanish tune.

By using a component chain, which includes amplifier and loudspeaker, of thoroughly good quality, we are able to recreate in our own home a sound which closely approximates the original. This in itself is a worthwhile and satisfying exercise. When we play back that tape we shall derive pleasure from its excellent quality. But could anyone say that this recording has originality in its own right?

Now I am going to stick out my neck and take a tilt at our friends, the hi-fi boys. The enjoyment of high quality sound reproduction, whether from tape or disc, is a most pleasant and relaxing occupation. The enthusiast is, however, in relatively the same position as the spectator at a football match. He does not participate.

In the world of tape recording we have

TAPE RECORDING TECHNIQUES

DENYS KILLICK IN SEARCH OF ORIGINALITY

an enormous advantage over those who are concerned merely with reproduction. Ours is not a passive activity because by its very nature it holds possibilities for creative—original—work.

For many years the hi-fi purist, with his long-playing gramophone record, transcription unit and magnetic cartridge has clothed himself in a mantle of superior respectability; the tape man has for too long been relegated (even if subconsciously) to an inferior position.

This attitude is no more than a reflection of similar attitudes in other creative spheres. Throughout the history of art the artist who actually paints the picture is held in less regard than the dilettante who merely looks and talks. Those who create are still tainted by the traditional indignity of the manual labour involved in their work. Even in such a new medium as recorded sound the same reactionary prejudices can be found both in print and in private conversation.

So having digressed to claim superiority for us all, let us now pursue our ideal of originality and return to the example of the recording of "El Relacario." The version we have described recording is good; it approximates in quality what we might hope to obtain if we had purchased a long-playing record. In the passive occupation of listening to good quality sound we can improve further only by radical changes in equipment. Now let me describe to you the recording of a completely different version of the same subject—a version which has at least some claim to originality.

This is a recording I have frequently used for demonstration purposes. It was taken about four or five years ago in a Soho coffee bar using a Fi-Cord 1A battery portable recorder and a Reslo ribbon microphone. With the recorder over my shoulder, the mic. in one pocket and spare spools of tape in the other, I was wandering around looking for subjects to record without having any very definite object in mind. Strolling into the coffee bar, a basement below street level, I noticed a girl singing softly to a few companions at her table. Her Spanish origin was obvious—as she sang her eyes sparkled with vivacity and her long black hair was tossed from side to side with the movement of her head. Could a man with a portable do-it-yourself recording outfit ask for more?

Anyone who has attempted recording in a noisy coffee bar knows the answer. A more difficult recording location could hardly be imagined. On this trip I was actually carrying two microphones, one the more conventional, omni-directional, moving coil which might be regarded as standard

equipment for battery portable use, and the other was the figure-of-eight Reslo already mentioned. All the pundits, including myself, have said many times that the ribbon microphone should only be used under "controlled studio conditions." But originality demands the breaking of rules. So I broke the rules and used the ribbon on my Spanish vocalist, Isobel.

Firstly, I had to persuade her to move to the quietest corner of the coffee bar. Next I had to hand hold the microphone, taking special care to keep it at least 10 inches away from her face. This arrangement gave two advantages; firstly, I had the benefit of the improved quality of which the ribbon is capable; secondly, its directional properties considerably reduced the amount of ambient noise pick-up from the surrounding tables. This worked very well, giving me the soloist's voice well in the foreground with just sufficient background sound to establish the coffee bar location without it obtruding into the main recording.

One of the items she sang for me was "El Relacario." This is where we can now compare the good quality (but unoriginal) radio transcription with the only moderate quality but highly original live recording. This particular work is usually played as a military march. Isobel sang it in its original form, as a Spanish folk song. The story of the song is tragic; a beautiful girl treats the handsome bullfighter with disdain, he is mortally injured in the bullring and she repents asking his forgiveness. As Isobel sang in her untrained but completely natural voice, all her Spanish temperament and passion went into her rendering of the song. In the tragic final verse tears were rolling down her face and her breath was caught in half-heard sobs. If this recording has some tenuous claim to originality it has a more obvious claim to another equally elusive attribute—sincerity.

Isobel's version of "El Relacario" is one of my most treasured possessions. It could never have been dubbed off radio—it could not be bought as a long-playing gramophone record. It is something highly personal and highly individual, capable itself of moving the listener to tears. Its qualities are such that would not be found on any commercial recording. It is an example of originality.

If the quality of originality in this recording is analysed you will note that it has all emanated from the performer herself. But it must be remembered that without the more down-to-earth qualities of perseverance and basic technique on the part of the recordist the recording would never have been taken. Sometimes I have played back

Please turn to page 93

ON THE FRINGE

TAPE OR DISC?

ASKS DENIS GILBERT



The BSR UA 70 Transcription Turntable fitted with type C1 ceramic cartridge

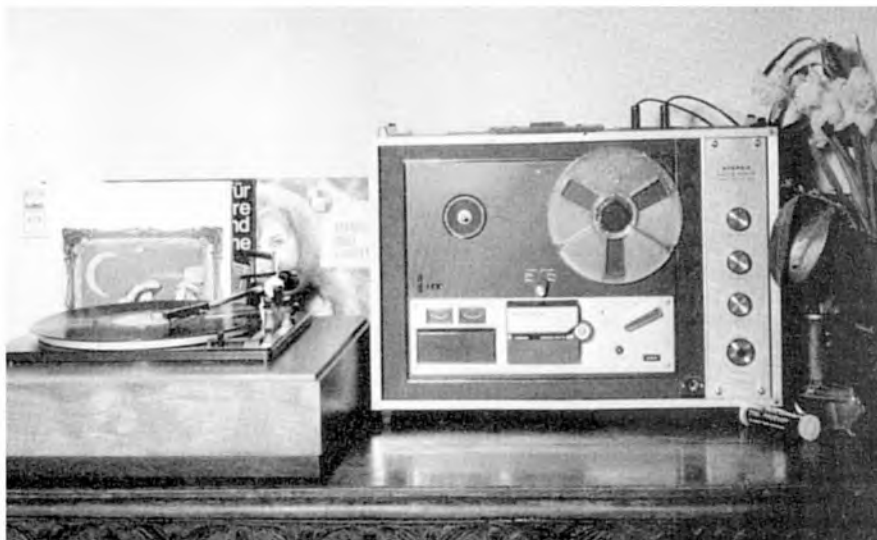
MUSIC has been reproduced mechanically for home entertainment since the late nineteenth century. For most of that time the medium has been the gramophone record, although originally of course it was the phonograph cylinder. By comparison tape is a newcomer on the scene.

Both the tape recorder and the gramophone have their own peculiar advantages and disadvantages as reproducing mechanisms. Similarly there are arguments on both sides for and against disc and tape. Unfortunately there is no short answer to the simple question, which is best?

Under normal conditions of use tape is virtually indestructible. But the recording on the tape is certainly not indestructible—by accidentally throwing the machine into the record mode an expensive recording could be completely erased. This is something that should really never happen. Recordings on tape can suffer a quality loss due to picking up stray magnetic fluxes from metal components in the sound channel. If this does occur it will be audible in the form of an increased hiss level. Tape can break; worse still it can stretch. A stretched tape is worse than a broken tape because the break can easily be repaired, whereas stretching will result in a permanent change of pitch in the sound where the elongation occurs.

One should be able to play a tape record for a limitless number of times without the tape or the recording suffering either quality loss or damage. Tapes are bulky things to store and tape records are disproportionately expensive to buy. Although a large number of titles are now becoming available in pre-recorded tape, their number is tiny compared to the vast library of items available on disc.

Because the gramophone has been in existence for so long, and because it has been accepted by everyone as the conventional means of reproducing music, we have a truly vast choice of records. Although cheaper than tape records, long-playing discs of good quality cost around 42s. each for about forty minutes programme time. This works out at a shilling a minute. Quite



The UA 70 in its operating position beside the Sony TC 260. The recorder is in the record mode with function control in the "Pause" position which cuts the motor. The Sony tone controls will adequately correct the signal from the ceramic cartridge

a number of discs are now being offered on special labels at roughly half that cost. Typical is the Pye Golden Guinea, which gives the same forty minutes for 21s. A pre-recorded tape of the same duration is likely to cost about 75s. or nearly 2s. a minute.

As compared with tape, disc has two enormous disadvantages under which it has laboured for the whole of its existence. It is the groove in the record which contains the vital sound information which is picked up by the stylus. If that stylus is applied to the record with too great a weight, or if the tip of the stylus has lost its shape, then instead of riding the groove comfortably it will plough into the fabric of the record and permanently destroy its quality. Both these things happen far more frequently than one might imagine.

To track a record at about two grammes, which is generally considered to be a fairly safe weight, it is necessary to use sophisticated equipment. Similarly, whenever the stylus is in use it is suffering some degree of wear which is gradually changing its shape. A diamond stylus is expensive but gives much more use than the cheaper sapphire. Either type can destroy the quality of a record if not in good condition.

Another snag with the gramophone is the inevitable speed difference between the inner and the outer sound grooves. As the disc is rotating at a fixed speed, 33½ rpm, the outer diameter is travelling very much faster

in inches per second relative to the stylus than the inner rings. Additionally, as the tone arm travels towards the centre of the disc it is subjected to various mechanical stresses which are not present on the edge. It is for this reason that many gramophone records betray a sharp quality loss in the reproduction of the last dozen or so grooves.

If one is investing in "canned music" should one buy tape or disc? Although disc is cheaper it has to be treated very, very carefully if one has any ambition to pass on one's collection to one's grandchildren. And the possibility is that the aforementioned grandchildren will lack our own respect and promptly mess them up. If we collect tape instead of disc the library could then be regarded as far more permanent and there is every chance that it could safely be handed on to posterity without the danger of damage.

But many of us already have collections of discs. Possibly we may even acquire more discs in the future. What can we do to ensure that they are not only played back to their best advantage, but also that they do not suffer damage? To protest gramophone records it is essential to use good equipment, and good equipment is notoriously expensive. One can pay around £40 for a transcription unit, another £25 for a tone arm and yet another £10 for a pick-up cartridge. By the time the outfit has been mounted in a cabinet you can say you

will have little change from £100—and that does not include amplifiers or speakers.

This approach to Hi-fi is all very well for the favoured few, but on behalf of all T.R.M. readers I have been looking around for a less costly alternative. Unimpressed by the long-haired fraternity who spend most of their lives bisecting .01 per cent of something or the other I have been conducting some private researches into budget Hi-fi. What is the best quality we can get for the least money? Now the owner of a good quality tape recorder is in a very privileged position because he already owns an audio amplifier. For my experiments I have been working in stereo, simply to make things a bit more difficult, but the same results would be equally true in mono.

Let me make it quite clear, I am talking about budget Hi-fi, not budget tape recorders. So I chose as an example of a good quality, medium priced, tape recorder the Sony TC260. Selling at 97 guineas, this machine has full quarter-track stereo record and play-back facilities, together with extension speaker sockets on each channel giving an output of 5 watts at 8 ohms. This is an ideal machine for the purpose because the quality of the built-in transistorised amplifiers is absolutely excellent.

Assuming ownership of this machine, or its equivalent (and there are many other recorders that would offer similar facilities) how could we set about reproducing from disc without spending a fortune and yet not ruining the records? The answer was to find a low-cost transcription unit which would enable the stylus to track the record at a reasonably light weight, and to use either a crystal or a ceramic cartridge which would give a signal suitable for feeding into the high impedance auxiliary inputs on the tape recorder. The programme could then be heard either on the two internal speakers of the TC260, or it could be fed from the extension speaker outlet to a pair of full-range reproducers.

There are probably several gramophone transcription units that would fulfil this requirement. The one I got hold of was the BSR UA 70. This is a new model that is only now being offered on the British market at the very realistic price of under £13, less cartridge. It has many advantages for the recording enthusiast.

Firstly it has a built-in "cueing" device. This comprises a small lever which actuates a mechanism to lift and lower the tone arm. The manufacturers claim that its accuracy is to within one groove. At first I found it myself to be somewhat less accurate than this, but replacement of the pick-up raising pad quickly rectified this minor fault. In all other respects it operated quite efficiently, enabling the stylus to be raised and lowered without any risk of damage to the fragile surface of the disc.

The problem of tracking at the correct weight is overcome in a delightfully simple manner. A movable weight on the end of the tone arm is adjusted to give a precise balance. The desired weight at the stylus is then achieved by merely turning a calibrated dial to the correct figure, i.e., for 3 grammes the dial is simply turned to figure 3.

As an additional feature the unit can be used as an automatic record changer, but no Hi-fi purist would dream of making use of this facility for the sake of his precious discs.

A wide range of cartridges will be accepted by the tone arm as it has standard fittings. I used the BSR ceramic type C1. This costs £2 7s, with sapphire stylus or £3 1s. 9d. with diamond. It has one great advantage because the flip-over stylus is

capable of playing all types of records, both mono and stereo.

To prepare the equipment for use it was only necessary to mount the UA 70 in a Howland West plinth (cost about £10), screw in a mains socket and fix a couple of phono sockets, one for each channel. A simple connection from the auxiliary inputs on the Sony to the two sockets on the plinth and we were in business.

The maker's specification suggests that the C1 cartridge should be tracked at weights from 2 to 6 grammes, depending upon tone arm. The ideal is to use the lightest possible weight which will keep the stylus in the groove and not distort. Too light a weight will make the stylus start groove jumping on heavily modulated passages. For these experiments I used a number of stereo discs kindly supplied by E.M.I. Limited and selected for their high quality and good stereo image. These were: E.M.I. Columbia SMC 80971—Musik für Gitarre und Violine; E.M.I. Electrola SME 73932—Querschnitt: Frau Luna, Lyristrata, Im Reiche des Indra; E.M.I. Electrola SME 83555—Traditions-Märsche; Die Volks Platte SMVP 6017—Hammond Orgel Favoriten.

It was found that even the most difficult passages—near-centre grooves heavily modulated—were tracked successfully on this equipment at a weight of 2½ grammes. This is a little greater than some people might like but in view of the cost of the equipment I regard it as absolutely excellent. For the quality checks I listened firstly to the internal speakers in the Sony and then fed the output to a brand new Jordan Watts Stereola system. Naturally the little monitoring speakers limited response, but what we got was a very cheerful sound. When we fed the output to the Stereola the quality was truly astounding.

The cost of the disc reproducing equipment used was very reasonable. A substantial saving could be made by the enthusiast who takes the trouble to make his own plinth rather than purchase one ready made. Apart from the tape recorder the most expensive item used was the high quality Stereola loudspeaker. When trying to evaluate an audio hook-up like this it is essential to use the finest speaker available; otherwise false conclusions could easily be arrived at due to distortion or colouration arising in the loudspeaker instead of in the other items of the reproducing chain.

I propose to continue these experiments, on a thoroughly down-to-earth basis, by investigating the possibilities of using low-cost speaker systems instead of the admittedly luxurious Jordan-Watts enclosure, which, by the way, costs £89 10s.

What would happen if we were to substitute a pair of £5 or £6 transducers in home made cabinets? How closely could we approach the exceptionally high quality standard of the more expensive speaker? Assuming ownership of a really top grade speaker, would there be any advantage in using a much more expensive cartridge in the tone arm other than the BSR C1? If we had a great deal of money to spend, would there be any real advantage in dispensing with the Sony TC260 altogether and substituting in its place a really top quality amplifier—alternatively could we get away with a cheaper amplifier?

All these and many more fascinating questions I am asking myself. And to find out the answers I am going to bring the various items of equipment together and write frankly on the results of my investigations. These articles will appear exclusively in forthcoming issues of *TAPE Recording Magazine*.

TECHNIQUES

Continued from page 91

this tape to a class of students without fully explaining the circumstances under which it was recorded. It's strange how many times this draws the comment: "It's all very well for you, but where on earth could we get hold of a subject like that?"

My answer, I am afraid, is that they would have to do the same as I did, go into a Soho coffee bar and literally pick her up! A very valuable tip which is entirely relevant to tape recording techniques is to do as I do and take your wife with you as your principal assistant. This helps enormously to remove any possible diffidence that might be encountered in members of the opposite sex. Dare I say it, but wives have other uses too as carriers of equipment, holders back of curious by-passers and of simply being the very necessary someone to blame for having left the right equipment at home. They usually need a certain amount of training to fulfil their duties properly, but as theirs is a long-term appointment one can anticipate reaping the benefits for the rest of one's working life.

All joking apart, I would like to say quite openly that any claim that some of my recordings might have to originality is entirely due to the help and encouragement I have always received from my wife. Better men can probably work on their own; I always find a partner to be invaluable.

This was not intended to be the story of how I took one particular recording. It is intended to be some sort of a guide and encouragement to those who seek originality. When found it is worth more than all the commercial recordings put together. It can only be found by those of us engaged in practical recording work rather than in the mere reproduction of sound recorded by others.

This kind of actuality recording is only one aspect of originality. There is perhaps more scope for imagination and initiative in the actual creation of programmes. Here the selection of material and the way in which it is blended together is of paramount importance. The recent BBC contest was a good example. All the entries were on the same theme of summer. But all those entries were very different. The first prize went to the tape that showed originality in its approach to the subject, combined with very skilful editing and mixing techniques.

Last month we discussed superimposition as one of the simplest basic techniques in programme building. At the other end of the scale we have the more advanced procedures that are only possible by the use of more sophisticated equipment. The classic example of extreme versatility in tape recorders is the Vortexion CBL, which offers facilities for almost every technique that the creative recordist is likely to wish to use. Naturally the provision of all these facilities involves the production of a fairly complex machine which one could hardly expect to be cheap. But if one accepts its specification as a "standard of versatility" there is no reason why one should not shop around to see what alternative facilities other equipment will offer at lower prices. For those who can afford it the CBL is almost a full studio equipment in itself.

In the final analysis, however, we always get back to the point where the versatility of the equipment does no more than enable the user to effectively carry out his own original ideas. However wonderful the machine, it is only an inanimate object requiring the human mind to instruct and govern it. It is that human mind which produces originality.

CROSS

TALK

By Audios

I HAD a very interesting inquiry the other day from a gentleman who was considering purchasing a top quality stereo recorder. He proposed using this in conjunction with a Radford amplifier and pair of Quad electrostatic speakers. He was very confused as to whether he should buy a quarter-track, or a half-track, machine. This is such an important question I would like to give it an airing editorially.

The fact is that quarter-track does not give quite such good quality as half-track. No one would seriously dispute this statement. But the quality difference is likely to be small; using modern, sophisticated tape that difference might be reduced still further. If I had a free choice I would vote for the half-track system every time. *But* I do not have a free choice. If I buy half-track I will find that the vast majority of the excellent pre-recorded stereo tapes are available only in four-track versions. Therefore, if anyone spends quite a lot of money on a half-track stereo recorder they must be prepared to find that their equipment is incapable of reproducing much that is best in tape records. This fact alone is sufficient to sway prospective purchasers in favour of four-track recorders.

But it is possible to get the best out of both worlds. If a half-track stereo recorder were to be fitted with an extra head—quarter-track stereo play-back only—this, with a little simple wiring and switching, would completely solve the problem. We could then record and play back half-track, taking full advantage of the improved quality, whilst using the extra head for play-back of commercial music only. One or two manufacturers are already pursuing this line. Two that immediately come into mind are Bang & Olufsen and Brennell. Ultimately all half-track stereo machines should incorporate this facility. That is something to watch for at the Audio Fair.

ALL the current talk of economic crises and squeezes seems to be having little effect on the market for quality sound equipment. I have just had a note from Charlsworths of Crewe Limited which mentions the opening of their new Hi-fi Centre, at 28, Hightown, Crewe. The premises consist of a ground floor showroom, where I am told the emphasis is on quality before price, and a well-appointed audio studio on the first floor.

One of the delightful features of the audio business is the irrepressible friendliness of those engaged in it. For instance, Charlsworths are not content to merely have good premises for the sake of their business, but they at once open the doors to enthusiasts. I am told that since the opening of the new centre regular musical evenings have been held in the studio. A local recorded music society has the use of the studio for their meetings and they would be very pleased to offer the full facilities of the studio to any local tape recorder enthusiasts who may wish to form a tape recording club.

Well now, that's a fair enough offer which I am sure originates from wholly altruistic motives. If the enthusiasts in Crewe would like to get together they have the enormous advantage of beautiful premises and outstanding facilities placed at their disposal. What an opportunity!

If Crewe enthusiasts would like to drop me a note, quoting their names and addresses, I will make out a list, have it duplicated and circulate it around all those who have written. It will then be up to you to get in touch with each other and get things moving. Don't miss this wonderful opportunity but write to me, Audios, c/o Tape Recording Magazine, 7, Fleet Street, London, E.C.4., now.

I HAVE just received a copy of the Agfa Magneton Illustrated magazine. This is available free of cost on application to Agfa-Gevaert Limited, Magnetic Tape Division, Great West Road, Brentford, Middlesex. Although it is basically an advertisement for Agfa tape, it is also a genuine magazine, very well presented, lavishly illustrated and full of interesting items. There is a delightful transcript of an interview with the Lord Mayor of Cologne being questioned by two juvenile reporters, one aged ten and the other eleven. The Lord Mayor must have been taken aback by the question, "Do you brush your teeth regularly every morning and evening?" There are stories from readers, how-to-do-it features, travel items and a host of other articles.

I have, however, queried with Agfa-Gevaert Limited a statement they make on page 15 of the magazine regarding their P.E. tape. In a subtitle they say, "Proof against over-modulation."

Is this, I wonder, a translation error? Surely they do not seriously claim that over-modulation is not possible when using P.E. tape? Instead of answering my question they have very sportingly offered to send me samples of the tape to investigate and find out the answer for myself. This I have taken them up on, and will be reporting my findings in due course.

As you probably know, the Federation of British Tape Recording Clubs publishes a "Bulletin." Their Winter number, dated December 1966, has just been received. Although a duplicated publication it is editorially now so excellent—this issue carries an important statement by Erskine Laboratories Limited on service facilities for the Fi-Cord 202A—that all clubs who are not yet members of the Federation should take immediate steps to join even if only to ensure that they receive the Bulletin regularly. Inquiries for membership should be addressed to: The Secretary, Arnold Highcazon, 101 Roseville Road, Hayes, Middlesex.

Speaking of clubs I am advised by the London Tape Recording Club that they are moving to the Marquis of Granby at Chandos Place, W.C.2, by Charing Cross Hospital. Their meetings are held on the first Thursday of each month at 8 p.m., and the next will be on March 2. Their Secretary, David Campbell, of 46 Aberdare Gardens, N.W.6, tells me that all new members as well as old friends will be welcome. David Campbell will be pleased to send full details on request.

RECENTLY the B.B.C. imposed upon home listeners some of the most dreadful transmissions it has been our misfortune to endure. I am referring, of course, to the relaying by land line of the magnificent performances of the B.B.C. Symphony Orchestra from Prague, Warsaw, Moscow and Leningrad.

Why, oh why were the recordings of these concerts not flown back home and transmitted the following day? Perhaps it was a Communist plot—or was someone putting Chairman Mao's thought into practice?

The only way in which the B.B.C. can expiate their horrible crime is to broadcast the originals again from this country so that we may share the foreign audiences' appreciation of this significant musical event. And they could also purge the genius who thought of using land lines. Perhaps they forgot to tell him that the quickest route to London from Eastern Europe is no longer by windjammer via the Cape of Good Hope.

Heaven help us if the B.B.C. Symphony Orchestra ever gets as far as Peking . . . !

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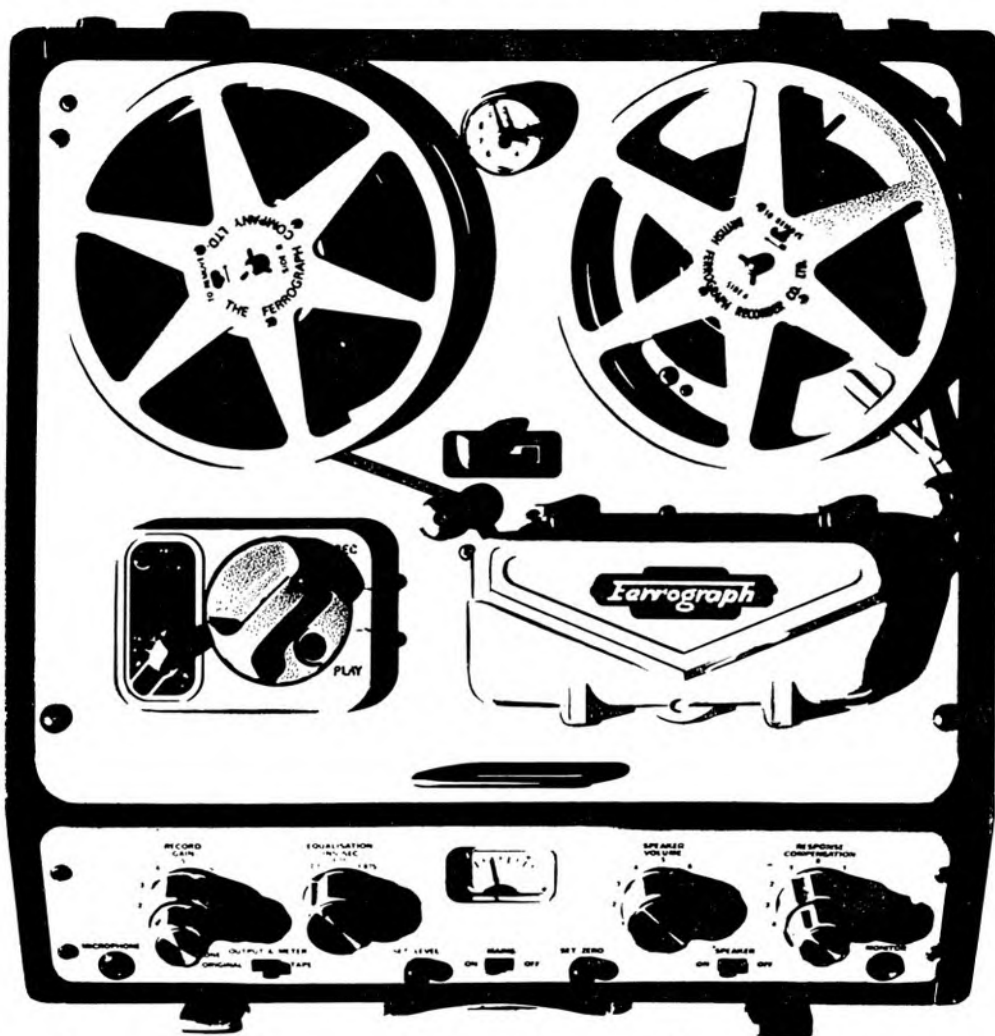
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Frankly, the Ferrograph offers more than many people want in a Tape Recorder. Its reputation, established uncompromisingly many years ago, is based on its recording fidelity, its specification written conservatively and with integrity, and its reliability sustained over long periods of use often in conditions that would knock the heart out of a lesser breed in a few months. The enduring performance of the Ferrograph is a byword within the industry.

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TM 8

TAPE RECORDING MAGAZINE

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B & O - for those who consider design and quality before price

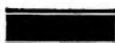


B & O—the quality angle in pickups

The B & O SP6 magnetic cartridge has been designed to provide as nearly as possible the perfect link between the gramophone record and the main amplifier. The diamond stylus is set at the B & O pioneered and now accepted standard of 15° from the vertical. It employs a symmetrical micro-cross armature for excellent stereo separation with minimum cross-talk. Push-pull design reduces harmonic distortion to a minimum. Also available with elliptical stylus (SP8). Result: A superb instrument capable of the highest fidelity.

Frequency response: 20 c/s – 20 kc/s \pm 2.5 dB. Output: 7 mv per channel at 5 cm/sec. Channel separation: better than 28 dB at 500 c/s. Stylus pressure: 1–3 gms. Compliance: 12–15 \times 10–6 cm/dyne. Moving mass: approx. 1.5 mgms. Load: 47K ohms. Mounting: standard $\frac{1}{2}$ " centres (SP6 and 8) or Plug in fitting for B & O arm (SP7 & 9). Weight: approx. 10 gms. Stylus diameter: .0007" Elliptical: .0007" \times .0002" Price: SP6 and 7 £8.8.0d. SP8 and 9 £14.14.0.

Bang & Olufsen—Danish Design—Danish Craftsmanship.



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A glossary of tape terms—part 12

BY HARRY MACK

STRAIGHT-THROUGH AMPLIFIER. Correctly, this should refer to the tape recorder amplifier with its frequency correction switched out, to give a level response curve. Very often the amplifier is then in the Playback mode, and the result is overaccentuation of the bass frequencies. Most tape recorders can be modified to give a straight-through amplifier facility by small alterations to the input switching.

STRENGTH, TENSILE. Property of the tape to withstand a breaking strain. The tensile strength of a good tape is equal to that of mild steel—more than 30,000 lbs./sq. in.—and the actual breaking strain of several pounds is far in excess of the few ounces that the correctly adjusted tape recording machine imposes.

There are other considerations, flexibility, elasticity, resistance to heat and humidity, which limit tensile strength. In particular, tape must be able to withstand stretching forces and a good deal of research has been done, and is still being done, towards the very high quality of tape at present available.

SUPERIMPOSITION. Method of adding a signal to a previous recording by switching out the erasing field. This can be done by physically removing the tape from the erase head, or pivoting the head away from the tape or by cancelling the erase power that energises the head. Fig. 1 shows a popular type of circuit.

The electrical method has disadvantages in that a common oscillator is generally employed as a bias and erase source, and bias must be maintained at the correct level. Some practice is needed to superimpose effectively as the later signal tends to swamp the previous recording by the partial erasure caused by the renewed bias. Superimposition has been superseded by multiply techniques with the increasing popularity of four-track tape recorders, but is still useful as an editing facility when *Fade Erase* is possible. In conjunction with variable bias facilities, fade erase and superimposing techniques can be successfully adapted to cine work.

SWITCHED CONTROLS. Usually refers to tone and equalising circuits that change by steps rather than with a continuous variation. The term may also be used to denote variable controls ganged with switches.

SYNCHRONISATION. Method of keeping the tape in step with accompanying film for sound commentary, effects or background. In cine work, the problem is to keep the projector speed controlled to match the tape recorder, slight changes in the visual tempo being more acceptable than

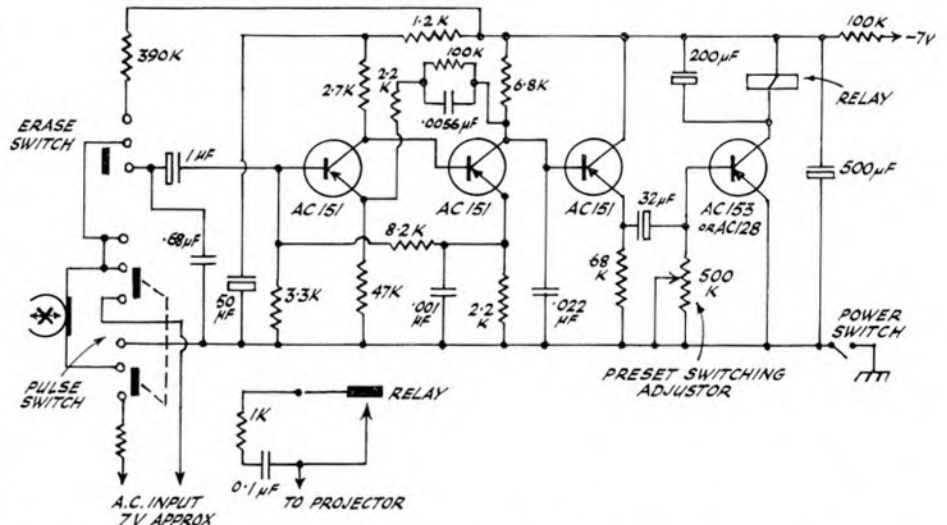


Fig. 2. The basic circuit of the Lowe Opta 416 Dia Unit for operating a slide projector

variations in tape speed which would give easily detectable changes in pitch.

There are several methods. A stroboscopic disc driven by the tape and illuminated by the projector lamp can provide the operator with a guide, the aim being to maintain a stationary strobe display. Alternatively, a recorded track of synchronising pulses can be used to control the projector.

In a typical slide projector system, the 50 Hz mains supply is used, a tapping from the mains transformer being used to power an amplifier tuned to a harmonic (third harmonic, 150 Hz), and imposing an over-saturated pulse on the tape parallel with the sound recording which is made when the programme is compiled. Then, on replay, the amplified pulses are applied to a triggering stage and employed to operate a relay which switches the slide changing mechanism. Fig. 2 shows the basic circuit of the Loewe Opta 416 "Dia" unit for operating a slide projector.

Sprocketed magnetic tape can be used on a special tape recorder unit to give a direct control. Another direct method is control of the projector speed by linkage from a spindle around which the tape is looped.

TAKE-UP. Spooling-on process (right-hand spool when normal system is used).

TAPE. The basic medium on which sound signals are recorded. Modern tape usually consists of a plastic backing material of cellulose tri-acetate, polyester or polyvinyl chloride with a layer of lacquer in which is

dispersed an even layer of magnetic pigment. The pigment is generally gamma iron oxide. The lacquer differs from maker to maker, being very often a jealously guarded trade secret. The method of bonding the lacquer to the backing is very important. Good bonding provides an even coating (no dropouts) and good resistance to physical stresses, heat and humidity. Thickness of the lacquer may be less than half-a-thousandth of an inch and the coating must be constant in density as well as thickness.

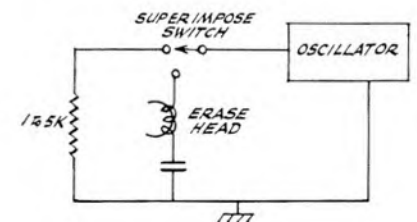


Fig. 1. Circuitry for switching out an erase head

Dispersion of the magnetic particles in the lacquer is an important part of the manufacturing process. Particles of ferrous oxide are needle-shaped of an average length of 0.04 thou', with a diameter of 0.004 thou' to allow orientation when a magnetic field is applied.

Please turn to page 101

TEST BENCH



DYNATRON STR 1

INVESTIGATED BY R. HIRST AND D. KILLICK

MANUFACTURER'S SPECIFICATION DYNATRON STR 1

Mains voltage: 195-250 volts A.C.
 Power consumption: 50 watts.
 Tape speeds: $7\frac{1}{2}$, $3\frac{3}{4}$, $1\frac{7}{8}$ ips.
 Frequency response: 50-18,000, 50-10,000, 50-6,000 Hz at $7\frac{1}{2}$, $3\frac{3}{4}$ and $1\frac{7}{8}$ ips.
 Wow and flutter: 0.15, 0.16, 0.2 per cent.
 Signal/noise: 52 dB weighted.
 Number of tracks: 4.
 Number of heads: 3: Erase/Record/Playback.
 Reels: 7 in. diameter maximum.
 Record level indicators: Two moving coil meters.
 Programme indicator: Three digit counter.
 Pause button: For instant stop/start/pause.
 Combine button: Parallels both amplifiers.
 Tone controls: Separate bass and treble push buttons.
 Track transfer: Multiplay/record/mix.
 Tape stop: Auto stop by metal foil on tape.
 Inputs: Microphone, mono or stereo 0.7 mV, 5K/ohm. Radio, mono or stereo 1-150 mV. Factory set to 15 mV. P.U. mono or stereo 150 mV, 680 K/ohm.
 Outputs: Low level, 2 x 0.5 volts; Headphones, 2 x 100-2,000 ohm; L.S. 2 x 3 watt.
 Monitor: Built in L.S. with change over switch to monitor either channel.
 P.A.: Amplifiers can be used direct from any input.
 Transistors: 16 + 4 diodes + rectifier.
 Weight: 25½ lb.
 Dimensions: 15 in. x 12¼ in. x 7 in.
 Price: 79 gns.

DYNATRON STR 1 TEST CHART

Frequency Hz	Overall Response dB			Playback Only dB	Signal/Noise Ratio dB	Distortion	Crosstalk dB
	$7\frac{1}{2}$ i.p.s.	$3\frac{3}{4}$ i.p.s.	$1\frac{7}{8}$ i.p.s.	$7\frac{1}{2}$ i.p.s.			
40					-54	3.9%	-52 dB
50	-3	-5	-6	-3	-48		
110	0	-3	-6	0	-53		
250	-1	-4	-6	-2	-55		
500	-2	-3	-5	-2	-56		
1000	0	-1	-5	0	-55		
2000	+1	0	-4	+1	-55		
4000	+3	0	-4	+2	-54		
6000	+2	0	-7	+1	-54		
8000	+1	-2		+2	-54		
10000	+1	-6		+2	-54		
12000	+1			+1	-54		
14000	+2			+1	-54		
15000	+1			0	-54		
16000	+1			0	-55		
17000	-1			-1	-55		
18000	-5			-2	-56		
Wow & Flutter	0.15%	0.17%	0.2%				

NOTES.—The Overall Response figures relate to record and playback. Playback Only relates to the reproduction of a 70 microsecond test tape at $7\frac{1}{2}$ i.p.s. (CCIR).

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

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

THE Dynatron STR 1 is a most unusual and interesting piece of equipment. Offering full quarter-track stereophonic record playback facilities, it has an audio output available via extension speaker sockets, one for each channel, together with a single, small built-in speaker for monitoring purposes. The tape transport system is a new Garrard deck operating at $1\frac{7}{8}$, $3\frac{3}{4}$ and $7\frac{1}{2}$ ips. Three heads are provided, one each erase, record and playback. Full multiplay facilities are available and the machine can also be used quarter-track monaurally or the two channels of a stereo signal can be combined.

Design has obviously been influenced

by the manufacturer's intention to produce a stereo recorder whose prime function is to form an accessory to an existing hi-fi or good quality radiogram installation. We therefore find that the mechanism is enclosed in an attractive teak cabinet without the usual lid or handle, and the cover provided is in a substantial, flexible, transparent plastic. The machine may be regarded as following the recent trend for "unit hi-fi" equipment. Not least interesting is the price of 79 gns., which is a remarkably low figure for the facilities provided.

We have set out above our own findings on technical investigation and these are shown in tabular form so they may be compared with the manufacturer's speci-

fication. For some reason the manufacturer has omitted to quote tolerances relative to frequency response. The mere ability to reproduce certain frequencies is meaningless if this is not related to the rest of the audio frequency spectrum. In the present instance the manufacturer's reticence is quite unnecessary because, as our figures show, the tolerances are exceptionally good. Readings were taken with the push-key tone controls set at minimum for bass and maximum for treble. Distortion level at 3.9 per cent is rather less good than the frequency response, but the manufacturer assures us that all machines now being despatched are modified to considerably improve the distortion level.

The signal to noise ratio is exceptionally good, apart from a noticeable deterioration at 50 cycles which indicates mains hum. Even at this frequency, however, the signal

to noise ratio of -48 dB unweighted below the peak output level may be regarded as very acceptable. The wow and flutter figures conform to the general high standard expected of modern equipment, and the cross talk level is exceptionally good.

Following the technical investigation we proceeded to carry out a number of user tests. The first point that immediately became obvious was the fact that in spite of the provision of a separate playback head there is no facility for "after record" monitoring. Monitoring is possible either through the external speaker outlets or by means of the internal speaker itself which may be switched between channels. The sound heard will, however, be the signal that is fed into the equipment, and not the playback of the tape. Although a desirable facility for live recording, after record monitoring is not so essential for purely hi-fi applications and doubtless this, coupled to the remarkably low retail price, influenced design.

We must take the manufacturer to task for permitting the treble tone control to operate in the record mode. The separate tone controls, treble and bass, are in the form of push keys giving top cut on the one hand and bass boost on the other. It is most unusual with modern equipment to find tone controls operative during record. When this does occur the tape produced will deviate seriously from the standard CCIR or NARTB recording characteristic and would require severe tonal corrections on a playback machine if it were to be reproduced correctly. With the Dynatron STR 1 it is essential that the treble control key should be in its maximum position as otherwise the recording itself will suffer top cut. Unfortunately there is a danger that this

control might be left in the wrong position accidentally, in which case poor quality recordings would inevitably result. Apart from this criticism (which is the most serious one we have to make about the Dynatron STR 1) we do feel that conventional variable tone controls are much superior to the push key cut employed here where the choice is literally between "all or nothing." When used in conjunction with other hi-fi equipment the recorder should be set for a flat response; fine tonal adjustment would be carried out by means of the controls in the main amplifier.

We could also criticise the very smooth finish to both the track selector knob, which makes it difficult to turn, and the ganged volume/record level controls which make the setting of levels rather difficult.

The Garrard deck tends to be noisier than we would have cared for and does take an unusually long time to reach full running speed at 7½ ips after the start key has been depressed. This "run in" time could result in the slurring of the opening passages of a recording. This can be obviated, however, by use of the pause control which does give an almost instantaneous start. We found that the start key on our deck was not as positive as we would have liked. It had an intermediate position where, although it felt and sounded as if the tape were being driven, the key required further pressure to actually engage the capstan.

These criticisms are really on minor points which must be considered in relation to the cost of the machine. When we came to record we were pleased to note that the two quadrant type, edge meters (one for each channel) were sensibly illuminated and readings were clearly visible. A stereo recording was taken at 7½ ips from the

new BBC multiplex transmissions using an Armstrong integrated tuner-amplifier, type 127, fitted with multiplex decoder. There was no audible interference on playback from the carrier frequency, neither was there any audible beat with the recorder oscillator. For playback the recording was reproduced by driving a pair of external speakers from the extension speaker sockets and quality was found to be wholly acceptable. By connecting the low level output provided in the combined "radio in/out" socket to a high quality amplifier we achieved very good quality indeed.

This machine will doubtless be used for the reproduction of tape records and so we proceeded to play back a selection of E.M.I. pre-recorded tapes. As might be expected from the quoted figures for playback response, the sound quality was better than one should legitimately expect from such a comprehensive piece of equipment that has obviously been designed and built to a very reasonable price, and the background noise was almost nonexistent. We did not evaluate from the internal speaker as this is only intended to perform a monitoring function.

Our conclusions on the STR 1 are that the manufacturer has achieved what he set out to do—to produce the best obtainable quality within a price bracket that should be well within the reach of most people. As such it offers extremely good value for money and should be seriously considered by all who are thinking of adding tape to an existing set-up. Alternatively it could form the nucleus of a full stereo installation in view of the very wise provision of audio output on the two external speakers sockets. Of smart, modern appearance, it will also look well in any living room.

GLOSSARY Continued from page 99

Standard width of magnetic tape for domestic use is a quarter-inch, with tolerance limits given in BSS 1568 as 0.246 ± 0.022 in. Cassettes have demanded the use of narrower tapes, generally half the above, and industrial use requires tapes of an inch width or more. Video tape recording is demanding new standards and there are systems employing ¼-inch, ½-inch and one-inch tape already in use.

Tape thickness (of normal domestic tape) can be standardised in four grades, as shown in the table, where the differing lengths for similar sized spools can be seen. As an example, Long-Play tape may have a coating of a half-thou' thickness on a base of one thou', while Double-Play has a base half as thick, and Triple Play has a coating of reduced thickness. Given the length of tape and the speed of the transport, (in feet length and in./sec. speed), the following formula can be used to calculate playing time per track.

$$P \text{ (playing time in minutes)} = \frac{\text{Length (feet)} \times 12}{\text{Speed (in./sec.)} \times 60}$$

Tape lengths are standardised in multiples of 300 ft., with one or two intermediate lengths, such as 850 ft. (standard 5½ in. spool) and 1,750 ft. (standard 8¼ in. spool).

Materials used for the base also divide classes of tape, earlier materials such as paper and acetate now having given way to PVC and polyester (Mylar). The latter is more flexible and will stretch before it breaks. It is also able to withstand changes in temperature and humidity to a greater degree than previous materials and is used for long playing tapes.

Tape Length (feet)	Playing time required	Reel sizes available in inches and grades of tape			
		Standard play	Long-play	Double-play	Triple-play
150	8m	3	—	—	—
175	9m 20s	3½	—	—	—
225	12m	—	3	—	—
300	16m	4	—	—	—
450	24m	—	4	—	—
600	32m	5	4½	4	3½
850	45m 20s	5¾	5	—	—
900	48m	5¾	5	4½	4
1200	64m	7	5¾	5	4½
1700	90m 40s	—	—	5¾	5
1800	96m	8½	7	5¾	5
2400	2h 8m	10	8½	7	5¾
3600	3h 12m	—	10	8¾	7
4600	4h 5m	—	—	10	—

TABLE OF TAPE LENGTHS with playing times for recording speed of 3½ips. Double all times for 1½ips, halve for 7½ips.

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Tape records reviewed

POPULAR BEETHOVEN

BEETHOVEN. Symphony No. 4, B flat major, Op. 60, and Symphony No. 5, C minor, Op. 67. Berlin Philharmonic Orchestra conducted by Herbert von Karajan. Ampex (DGA 8803), four-track, stereo, 7½ ips, 75s.

Beethoven's Fifth must surely be one of the most well known and most easily recognised works in the entire musical repertoire. Its opening bars were used by the BBC as an introduction to broadcasts to occupied countries. It is the "Victory Vee" motif from which the symphony derived its nickname of "Destiny."

The Fourth may be less familiar to many. To those it will probably come as a pleasant surprise. A canvas of boldly sweeping strokes that could only have been produced from a master's hand, this work has moods and ideas in profusion.

The performance of the Berlin Philharmonic under Herbert von Karajan is, naturally, authoritative and confident. The recording engineer is named on the box, as well he deserves to be. This album, only the third I have yet heard in the new Ampex series, is another excellent example of the entente cordiale between Deutsche Grammophon and the Ampex Corporation. Their avowed intent is to offer the very best quality in both programme content and actual sound. For this reason I am told all their issues will be at 7½ ips. This is a policy that I personally applaud.

No lover of classical music should be without Beethoven's Fourth and Fifth Symphonies. Those that lack them can invest in this album with every confidence—I am quite sure they will enjoy listening to them every bit as much as I did.

VIVID BRASS DELICATE HARP

A WAGNER PROGRAM. Otto Klemperer conducting The Philharmonia Orchestra. Angel (ZS 35947) four-track, stereo, 7½ ips, 75s.

We have an unusual collection of Wagnerian excerpts in this album. The items on side one are all taken from *Der Ring Des Nibelungen* and are, *Das Rheingold—Entrance of the Gods into Valhalla*, *Die Walküre—Ride of the Valkyries*, *Siegfried—Forest Murmurs* and *Götterdämmerung—Siegfried's Rhine Journey*. Side two gives us the *Prelude to Act 3*, *Tannhäuser* and concludes with the *Prelude to Act 1, Parsifal*.

There must surely have been more written about Wagnerian opera than any other subject in the musical world. In literature we have a comparable mass of comment, criticism and analysis devoted to Shakespeare's Hamlet. Why, then, do the pub-

lishers not include one word of explanation with this otherwise very excellent recording?

I have no wish to add to the comment, criticism and analysis of the heroic epics out of which Wagner created his masterpieces. Familiar to the least musical amongst us, the Ride of the Valkyries for instance is pure descriptive music, easily understood without the need for any deeper appreciation. But by contrast the prelude to Parsifal needs an explanation of the meaning and masterly integration of the various motives from which it is constructed. Once these are understood the real meaning of the music transcends mere melodic enjoyment and the listener finds himself transported into a new world of profound beauty.

Most people who had a few 78 rpm gramophone records probably included amongst that number at least one Wagnerian item. Many of these discs, alas, were destined to be reproduced by tinny-sounding gramophones. Today, thanks to modern methods, we can at last enjoy the full beauty and depth of the original orchestral sound—when the makers of commercial tapes or discs don't lose it somewhere down the line. Let me now say unequivocally that the quality we have in this album is amongst the best I have heard from either tape or disc. As a result nothing is lost from the dramatic orchestration—the trumpets are as vivid and brassy as only trumpets can be; nothing is lost from the delicate tones of the harps.

Otto Klemperer's interpretation is what we might expect—exemplary. I can only conclude by saying that this album lacks absolutely nothing—except a printed sheet of explanation which would have cost the publishers only a few coppers. But if you buy it, and I hope you will because it's excellent value for money, I do earnestly suggest that you should buy one of the many short explanations of Wagnerian opera that are available.

REVEL IN THE SOUND

RUSSIAN ORCHESTRAL MASTERPIECES. Georges Prêtre conducting the Royal Philharmonic Orchestra. Angel (ZS 35951) four-track, stereo, 7½ ips, 75s.

With an all-embracing title such as this album carries we might expect to find almost anything on the tape. What we do find on one side is *Borodin's Polovtsian Dances from Prince Igor* and *Moussorgsky's A Night on Bald Mountain*. Odd, but I was always under the impression that the mountain was bare, not bald. This variant of the title inclines one to think comically of hair restorer. On side two we have *Rimsky-Korsakov's Capriccio Espagnol* and *Borodin's In the Steppes of Central Asia*. A pleasant enough choice of items certainly, but I cannot help feeling that some licence has been taken with the word "masterpieces." Never mind, this selection has obviously been published for no other reason than the sheer unashamed enjoyment of the listener. So the first question I have to ask myself is, how much did I enjoy it?

Repetition is monotonous. But I must say again that E.M.I. have given us some really excellent quality sound in this recording. In reviewing these tapes I take great care to use what I consider to be top

quality equipment. It is on the basis of the sound this produces that my judgments are made. The Polovtsian Dances are so familiar (hackneyed?) that something outstanding is required to draw special attention to them. Given the right playback machine and the right loudspeaker this version is guaranteed to make one sit and listen. If volume levels are not critically adjusted it might also bring protesting neighbours knocking on the front door! May I be excused for saying, "to blazes with the music, let's revel in the sound." This is not so much a collection of masterpieces of Russian composition as a single masterpiece of recording technique. What we need is more tape records to this very high standard. If we demand them loudly enough and long enough perhaps E.M.I. will give them to us.

I see I've said nothing about the other items on the tape. One of the first records I bought as a very young man was Mousorgsky's Night on a Bare Mountain. I can almost, but not quite, forgive its translation into baldness. But I do know how thrilled I would have been if that original disc of mine had given me one-tenth of the quality that has been achieved in this version. The items on side two are perhaps less well known but certainly not less enjoyable.

The situation in the tape record world is now such that the discriminating can seriously consider collecting music on tape rather than on disc. Even those who are interested in simply acquiring records that will give a pleasant sound can hardly go wrong with this month's offering.

CALLAS— LACKING WHAT?

MARIA CALLAS IN PARIS. Great Arias from French Opera Vol. 2. The Paris Conservatoire Orchestra conducted by Georges Prêtre. Angel (ZS 36147) four-track, stereo, 7½ ips, 75s.

Maria Callas has a great following of ardent admirers. Rightly so because she is surely one of the great masters of the operatic art. Apart from the natural beauty and breadth of her voice Callas is a superb actress, an attribute that some other prima donnas sadly lack. Perhaps that is why I found this collection disappointing.

A sheet in the box gives, considerably, both the original words of each aria and their English translation together with brief notes explaining their position in the context. We are also told that this album was recorded in the Salle Wagram, Paris, on May 2 and 7, 1963.

Is this what is wrong? Callas, taken outside the dramatic action of the various operas, has been made to stand and perform this collection of arias out of context. As a result we have what to me is a concert performance. This, from an actress of Callas's calibre, is bound to be disappointing.

Even more disappointing is the voice quality. Somehow the recording engineers have achieved an almost metallic intonation that I find hard to understand. The opening aria has a "grammophonic" colouration, with the soloist lacking presence. Careful listening a number of times has confirmed my original impression that there is an improvement as the recording progresses, particularly on side two.

The quality of the orchestral accompaniment leaves little to be desired. What, then, has happened to the soloist? Perhaps the Callas voice is a "difficult" one to record. Perhaps I expected too much. At all events there is no doubt that the great Callas voice does shine through in spite of any dastardly acts the engineers might have perpetrated.

I am quite sure that the great retinue of Callas admirers will be eager to add this recording to their collection; I am equally sure that others less besotted will continue to exist quite happily without it. The album includes *Gluck: Iphigénie en Tauride—O malheureuse Iphigénie!*; *Berlioz: La Damnation de Faust—D'amour l'ardente flamme*; *Bizet: The Pearl Fishers—Me voilà seule . . . Comme autrefois*; *Massenet. Manon—Je ne suis que faiblesse . . . Adieu, notre petite table, on side one, and Massenet: Manon—Suis-je gentille ainsi? . . . Je marche sur tous les chemins*; *Massenet: Werther—Werther! Qui m'aurait dit . . . Des cris joyeux (Air des lettres)*; *Gounod: Faust—Il était un Roi de Thulé (Ballad of King of Thule) . . . O Dieu! que de bijoux . . . Ah! je ris (Jewel Song), on side two.*

ALMOST AN EPIC

HANDEL—SOLOMON. Sir Thomas Beecham conducting the Royal Philharmonic Orchestra with the Beecham Choral Society. Two Volumes WRC TCM 82 and TCM 83) ½-track mono. 29s. 6d. each.

These two volumes comprise a version of Solomon edited by Sir Thomas Beecham. The work has been re-arranged to give greater prominence to the soloists. Handel is so renowned for his great choral works that previous editions had tended to overshadow the solo parts. In this version the soloists are allowed full range and we may enjoy the lyricism of some of Handel's finest writing.

Although an oratorio, Solomon is not essentially a sacred work. The oratorio tells the story of Solomon's great love for his wife and her love for him. Nicaule, Queen of Sheba, visits Solomon, is entertained by him with music, and departs. The choruses are truly Handelian in the grand manner; but the work itself is an expression of romanticism not usually associated with the composer. What could be more delicate than the Queen's love song to her husband, "With thee th'unsheltered moor I'd tread"? And as they retire the chorus sings "May no rash intruder disturb their soft hours."

The sheer power of writing leaves one overawed. The work has been likened to a collection of Michael Angelo frescoes; such a description is not very far wrong.

In the present recording the part of Solomon is sung by John Cameron. Of the four soloists his voice makes most impression on the listener. One must restrain the impulse to smile cynically at one of his lines, "Gold now is common on our happy shores".

Unfortunately, the recording of the choral section leaves much to be desired. The human voice, when singing in concert, is capable of far more beauty than we are allowed to appreciate in this recording. This is a pity, because had recorded quality been better the two volumes could have been something of an epic. As it is I found the muddiness of the sound fatiguing, and it detracted considerably from what would otherwise have been the grandeur of a great work.

CONWAY THE URBANE

POP-A-CONWAY. Russ Conway. Columbia (TA-SX 6104), half-track, mono, 3¼ ips, 35s.

The famous piano of Russ Conway tinkles its way through a mixed bag of the most familiar pops. Tinkles is the right word, because the engineers have succeeded in endowing the piano with a very light, airy quality which blends happily with the accompaniment. Russ's fingers flash away, mostly at the top end, to give a typically Conway performance. One can just imagine him, as urbane as ever, rising from the piano with a deprecating smile on his face. "All this," he seems to say, "is so simple and so effortless." Perhaps it is for Conway.

The recorded quality is really excellent; this is a very happy little album that goes with a swing and will be enjoyed by almost everyone. The items on track one are *Hi-Lili Hi-Lo, Elusive Butterfly, Tears, Things, A World Of Our Own, All My Loving, The More I See You and Spanish Flea*. On track two we have *Everyone's Gone To The Moon, One Of Those Songs, Second Hand Rose, Strangers In The Night, Promises, I'll Never Find Another You, Happiness and It's Not Unusual*. Not only is this a list of some of our most popular numbers of the last few years, but it's no coincidence that they all happen to be rattling good tunes. Excellent value for money.

HONEST ENJOYMENT

ROBERT AND ELIZABETH with John Clements, June Bronhill and Keith Michell. HMV (TA-CLP 1820), half-track, mono, 3¼ ips, 35s.

The new musical based on the Barretts of Wimpole Street has been a great success in London, and by the time this appears in print it will have gone on tour in the provinces. Ron Grainer's music has produced some charming tunes with which most of us are already familiar. The best of these are to be found in this H.M.V. album.

June Bronhill's performance is particularly impressive and she is not let down by the recorded quality which is exceptionally good. John Clements sings (if that is the right word) "I'm the Master here" with all the verve of the most likeable unlikeable character one can imagine. This and many other numbers will be welcomed as reminders of a very pleasant evening by the vast number of people who have seen the show, whilst others might well recognise songs that they didn't realise came from Robert and Elizabeth. Musicals are good, clean, honest fun with lots of enjoyment and pleasure packed into them. And that is precisely what this tape is.

I've just broken off from writing this review to listen to the tape once again. May I repeat, the quality is really excellent and the fun is effervescent. An album of this kind contains sufficient variety to sustain the listener's interest right the way through. Of the tapes I have played this month I think most people would vote for Robert and Elizabeth.

The tapes reviewed this month are issued by the following companies:
 "Amplex": Amplex Great Britain Ltd., Acre Road, Reading, Berks.
 "Angel": "Columbia": "H.M.V.": E.M.I. Records Ltd., 20, Manchester Square, London, W.1.
 "W.R.C.": World Record Club, Box 11, Parkbridge House, The Little Green, Richmond, Surrey.

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THE latest variant of the Uher Report battery-operated portable is the new 1000 Report Pilot, a machine specially produced for synchronizing sound and cine film as well as for reporting under professional conditions. The machine has a facility for recording a synchronizing pulse on the tape when it is used in conjunction with a suitably equipped cine camera. This is the method exclusively used by film studios to achieve synchronization between sound and vision which is so very difficult to achieve in any other way.



Superficially similar in size and weight to the better known Uher portable, it has special features which include a switchable rumble filter, pilot tone test, battery test, before and after record monitor, stroboscopic tape speed control, built in monitoring loud speaker and switchable equalisation for CCIR and NARTB.

Operating at a single speed of 7½ ips, the Pilot records full track and is powered either by five 1.5 volt cells, a dry accumulator, a car battery (6-24 volt) or 110-250 AC with mains unit which also charges the accumulator. Frequency response is quoted as from 20 to 20,000 Hz and the signal to noise ratio better than 54 dB on NARTB or 52 dB CCIR. For convenience of operation the machine has a remote stop/start facility. The cost is yet to be announced.

Bosch Limited, 205 Great Portland Street, London, W.1.

**EIGHT
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A NEW and revolutionary recorded music system known as Stereo 8 has been announced by R. C. A. Victor jointly with Motorola Incorporated. R. C. A. Victor have been responsible for the development of the Stereo 8 tape cartridge system in America and Motorola are American manufacturers of sound reproducing equipment and car radio instru-



The basis of the system is the Stereo 8 cartridge where four complete stereo programmes may be recorded on each tape. This is roughly the equivalent of two 12 in. stereo records or about eighty minutes of programme time.

Although not limited to use in motorcars the equipment has been designed with this application in mind. R. C. A. Victor themselves have produced more than two million tape cartridges and they have more than four hundred titles in their stereo 8 catalogue. It is intended that the equipment shall be used as a "tape player," not recorder. The mechanism will not be offered by retail but will be made available to manufacturers of recording equipment and motorcar radios.

Motorola Inc., 4901 West Grand Avenue, Franklin Park, Illinois. R. C. A. Victor, 155 East 42th Street, New York.

**SHERATON
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THE supposition that Thomas Sheraton (1751-1806) was a fashionable maker of furniture is legendary. He was never a furniture maker nor had he a workshop of his own. He was a drawing master and designer who supplemented his income by his exertions as an author.



Sheraton was the most powerful source of inspiration behind the furniture of the end of the eighteenth century. "Sheraton style" is typified by the elegant mahogany and satinwood inlaid painted furniture based on Sheraton's designs published in 1794 in "The Cabinetmaker and Upholsterer's Drawing-Book" and some later works.

The inspiration of Sheraton can be clearly seen in this new equipment cabinet from Design Furniture Limited. It is mahogany serpentine fronted, containing two false drawers in the frieze. The cupboard below is enclosed by a pair of doors veneered with mahogany curls and the whole is inlaid with boxwood lines and rests on splayed bracketed feet. The intention of the manufacturers is to bestow in their own factory at Banbury the same love and care as was lavished by the eighteenth century craftsmen.



The cabinet will comfortably accommodate a transcription unit or tape deck with amplifiers and tuners. It stands 36 in. high (including four-inch legs), is 39½ in. wide and 20½ in. deep. The removable motor board is 36 in. x 16½ in., fixed 6½ in. deep from the lid. The vertical control panel is 34½ in. wide and 9 9/16th in. deep below which there is ample space to accommodate amplifiers and tuners. The recommended retail price is 105 guineas.

Design Furniture Limited, Calthorpe Manor, Banbury, Oxon.

GADGETS FROM METRO-SOUND

WELL known for their useful accessories, the Metro-Sound Manufacturing Co. Ltd. introduce three new items of low cost but great interest. The Metro-Sound spirit-level is for use on turntables and for all levelling needs. It is a button-type spirit-level that can be mounted permanently into any desired position by the fixing screws supplied.

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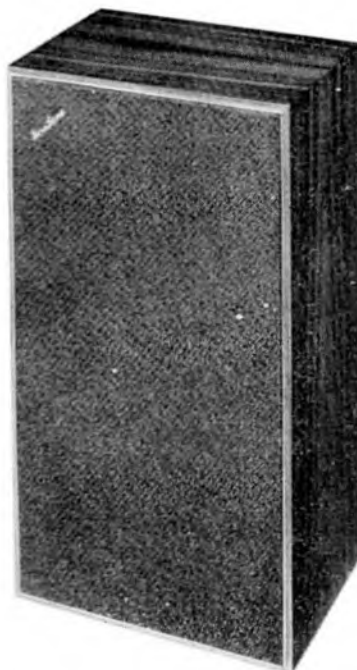
All Metro-Sound products are presented in attractive "bubble packs" complete with instructions, and prices are: Metro-Sound spirit-level 6s., Metro-scale stylus balance 7s. 1d. including purchase tax, Metro-Sound lubrication kit 6s.

Metro-Sound Manufacturing Co. Ltd, Bridge Works, Wallace Road, London, N.1.

FANE'S LATEST IONOFANE LOUDSPEAKER

FANE ACOUSTICS Limited announce a new full range loudspeaker assembly using their ionic high frequency unit, the Ionofane. This is their model No. 604 and is housed in a teak veneered cabinet measuring 31 in. x 17 in. x 12 in. The Ionofane is mounted in a well ventilated compartment at the top of the cabinet below which is a new 12 in. unit in a sealed enclosure.

The 12 in. unit has a two-inch voice coil with a 17,000 gauss magnet and a conventional type cone to which Fane give a special treatment which, they claim, results in a true piston action throughout the middle frequencies without break-up or colouration and yet a level response is said to be maintained up to 5 kHz. This permits a cross-over at 3½ kHz to the Ionofane without the need of a separate mid-range unit.



Response measurements, with a microphone at one metre from the front, show the response to be 80 decibels relative to .0002 dynes per square centimetre for an input of 4 volts RMS, within 2 dB from 50 to above 22,000 Hz. Further, a very good wave form is claimed down to 40 Hz. The manufacturers state that from listening tests to good stereo records in a normal domestic living room the resultant sound quality makes it easier than ever to forget the loudspeakers altogether.

The new model 604 is available through normal trade channels or directly from the manufacturer at a cost of 49 guineas.

Fane Acoustics Limited, Bailey, Yorkshire.

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Suddenly, it's fantastically easy to play music - anywhere. And to record sound. Because Philips Cassette Recorders are so simple that you can use them with your eyes shut! Their tape comes loaded in special cassettes that just snap in for instant use. And you get superb pre-recorded music on fabulous new Musicassettes - in a wide range of titles. You have three Philips Cassette Recorders to choose from.

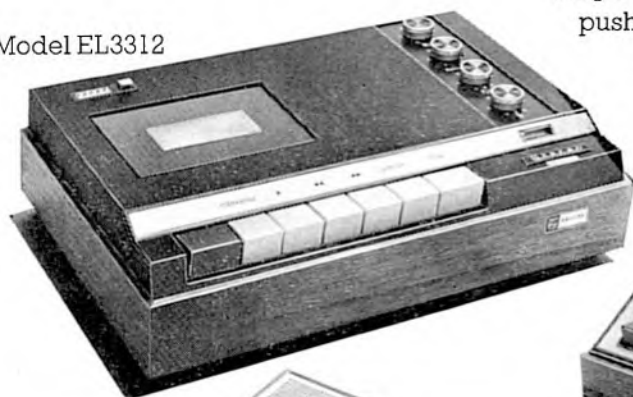
Model EL3301T is a 27 gm play-anywhere battery portable that travels in a carrying case, has simple controls including a remote stop/start switch, and can even be mounted in your car. The 35 gm Mains/Mono Model EL3310 has a teak-finished cabinet, exclusive hinged 'Sound Mirror', Automatic Recording Control

for perfect recordings, and push-button cassette ejection.

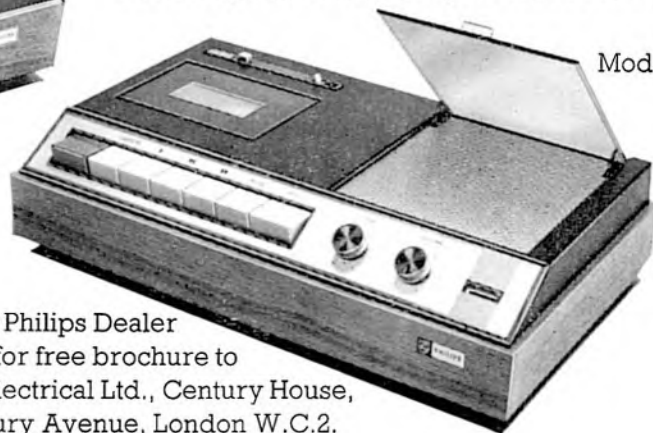
Model EL3312 is a superb

Mains/Stereo recorder at 48 gns, with two Hi-Fi speakers extra at 10 gns plus 3/1 P.T. surcharge each. All prices cover many useful accessories.

Model EL3312



Model EL3301T



Model EL3310

See your Philips Dealer or write for free brochure to Philips Electrical Ltd., Century House, Shaftesbury Avenue, London W.C.2.



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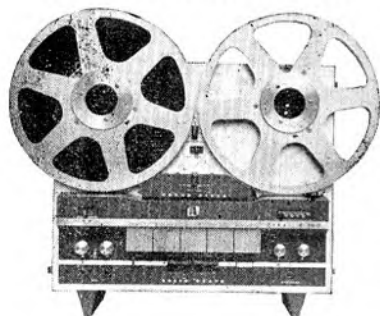
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AKAI X300

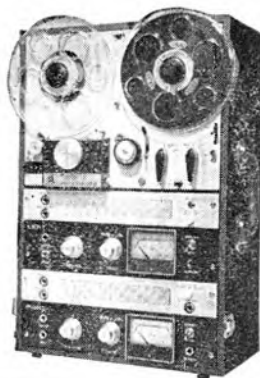
A studio type 3-speed, 4-track, stereo / mono recorder of professional quality. Fully solid state, 20 watts per channel amplifier; Crossfield heads; 10 1/2 in. reels; keyboard controls, and many other features.

Interest - free terms. 190 gns. Deposit £66.10.0. 12 monthly payments of £11.1.8.

AKAI M8

High quality, 4-speed, 4-track stereo/mono recorder featuring Crossfield head, Vertical or horizontal operation. 4 hours stereo recording on 1,200ft. standard tape. 2 stereo fill-in speakers. Sound-on-sound. 6 watts per channel.

Interest-free terms. 136 gns. Deposit £52.16.0. 12 monthly payments of £7.10.0.



AKAI 1710

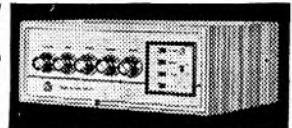
A completely self-contained, 3-speed, 4-track stereo/mono recorder. Two 7in. x 5in. built-in speakers, 3 watts per channel. Attractive styling and AKAI precision finish. Takes up to 7in. reels.

Interest-free terms. 79 gns. Deposit £27.19.0. 12 monthly payments of £4.11.8.

18 gns. SAVED!!!

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Type	List Price	Our Price
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5 1/2 in. L.P. 1,200ft. ...	£1.15.0	21/11
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3in. Std. 150ft. ...	7.9.	4/6

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Tape Recorder

This de luxe tape recorder features a

unique

automatic recording

level control; twin track recording

at 3 1/2 i.p.s. Complete with all accessories and fully

List 41 gns. guaranteed.

ONLY 30 GNS.

INTEREST FREE TERMS

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£11 SAVED!! on the KEF DUETTE

Mk.II de luxe, Listed at £39.10.0

ONLY £28.10.0

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DUETTE Standard, as above but with grille front in coffee fleck vynair. Listed at

£35.0.0. **ONLY £24.10.0.** INTEREST FREE TERMS. £8.10.0 deposit and 12

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EXCLUSIVE OFFER!

The Famous **HITACHI BELSONA** Tape Recorder List 42 gns.

ONLY 24 1/2 gns.

Semi-professional machine at barely half list price. Half-track mono, 2 tape speeds 3 1/2, 7 1/2 i.p.s. Freq. response 50-12,000 c.p.s. at 7 1/2 i.p.s. Save over £18! INTEREST FREE TERMS, £8.11.6. deposit; 12 monthly payments of £1.8.7. carr., pack. & ins. 19/6.

Sensational - £44 off!

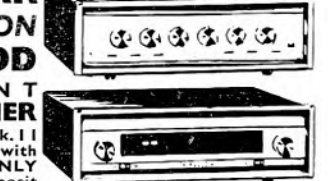
*superb **AKAI-N4** PORTABLE RECORDER

This extremely versatile transistorised 4-track tape recorder complete with all accessories.

Only slightly shop-soiled. Fully guaranteed and unrepeatable.

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MODEL S.5500 Mk.II 35 watts per channel r.m.s. Complete with Case. List Price £70. OUR PRICE ONLY £45. INTEREST FREE TERMS. £15 deposit and 12 monthly payments of £2.10.0.

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*Akai X-300	190 gns.
*Akai 910	62 gns.
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Akai 355 Stereo	239 gns.
*Beocord 2000	119 gns.
*Beocord 2000 de luxe	135 gns.
*Beocord 1500	89 gns.
*Beocord 1500 de luxe	105 gns.
*Beocord 1000	69 gns.
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*Brenell Mk. 5 M Series 3	93 gns.
*Brenell Mk. V Series 3	74 gns.
Elizabethan LZ32	32 gns.
Elizabethan LZ34	34 gns.
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Ferguson 3222	35 gns.
Ferguson 3216	49 gns.
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*Ferroglyph 631	95 gns.
*Ferroglyph 632 Stereo	126 gns.
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Grundig TK14L	37 gns.
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Philips 3553	36 gns.
Philips 3552	24 gns.
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Sony 600	127 gns.

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Telefunken 203	69 gns.
Telefunken 201	44 gns.
Telefunken 200	39 gns.
*Telefunken 85 de luxe	83 gns.
*Telefunken 204 Stereo	106 gns.
*Truvox PD102	93 gns.
*Truvox PD104 Stereo	89 gns.
Truvox R102	76 gns.
Truvox R104	79 gns.
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*Uher Hi-Fi Special	129 gns.
*Uher 724L	75 gns.
*Vortexion WVA, 3 speed	£96.7.0
*Vortexion WVB, 3 speed	£115.10.0
*Vortexion CBL Stereo	£172.0.0
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Coscor 1621	26 gns.
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Loewe Opta 408	39 gns.
Loewe Opta 416	51 gns.
Loewe Opta Cassette	39½ gns.
Philips EL3301	26 gns.
Philips 3586	27 gns.
Philips 3586	27 gns.
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Sanyo Batt./Mains	36 gns.
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Telefunken 300	49 gns.
Telefunken 301 4 Tr.	54 gns.
Uher 4000L	103 gns.

*Microphone extra

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... and NO EXTRA FOR CREDIT TERMS

- ★ Minimum Deposit
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Prices subject to alteration as announced by manufacturers

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Uher 4000, with cell	18 gns.
Telefunken 300, with cell	£15.17.0

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Hammond Condenser M100	29 gns.
AKG D14S	£10.0.0
AKG D119	£20.10.0
AKG D19C	£17.10.0
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Grampian Ribbon	£11.10.0
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Philips Preamp	£6.10.0
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Also in stock: microphones by ACOS, BEYER, FILM INDUSTRIES, TELEFUNKEN, etc.

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Breaks the price barrier in transistor Amplifier Cost.

Incorporates all the essential features for good quality reproduction from gramophone records, radio and other sources.

Features: 16 transistor, 4 diode circuit. Good frequency response. 3 watts rms (15Ω) each channel. 6-position selector switch. Easy printed circuit board construction. Compact, slimline styling. Choice of 2-way installation. Measures 3½" h. x 13" w. x 8" deep. Build it in your own cabinet or choose the elegant walnut veneered cabinet for free standing use (optional extra). Most attractive styling with gold/brown perspex front panel and matching knobs.

TS-23 AMPLIFIER KIT £17.15.0.

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WALNUT VENEERED CABINET 91-509 £2.

When used with either model SSU-1 Speaker System Kit £11.17.6 (legs 14/6 extra) or AVON Speaker System Total price Kit £13.16 incl. P.T. and suitable player unit forms a modern, compact free standing Audio System.

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The challenge to our acoustic engineers was to design a speaker with minimum size consistent with first-class reproduction. This is the speaker that will meet the needs of those requiring a compact unit of exceptional quality. Ideal for use in any good Hi-fi system. Special 2-speaker system. Good frequency response. Fully finished cabinet. Compact size, only 7½" x 13½" x 8½" deep.

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Elegantly designed to match the stereo amplifier, Model AA-22U. Range 88-108 Mc/s.

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TRANSISTOR FM TUNER

TOTAL PRICE KIT (STEREO) TFM-IS £24.18.0 incl. P.T.

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**OPTACORD 450 THE UNIVERSAL TAPE
RECORDER FOR BATTERY/MAINS OPERATION
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- New compact-magazine-system bans tape threading (Philips type).
- Unlimited reproduction possibilities with self-made recordings or commercially available pre-recorded tapes.
- Ready for recordings per microphone supplied with the set, as well as from the radio-receiver, record player or any other tape recorder.

Other features include:

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**AKAI SS-55
Stereo Speakers (2)**

8 inch Woofer and 2½ inch Horn Tweeter in each enclosure
Impedance 8 ohms
Capacity 5 watts
Frequency Range 60 to 15,000 c.p.s.
Dimensions: 20 inches wide x 16½ inches high x 10½ inches deep
Brand new in maker's cartons complete with two connecting leads

List Price £44.6.5
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**AKAI 44S
4-Track Stereo/Mono**

1 Built-in Speaker
3 Speeds 7½, 3¾ and 1¾ i.p.s. (15 i.p.s. optional extra 16/6)
6 Watts Stereo Output
Auto Shut-off
2 VU Meters
7" Spool Capacity
New, slightly shop-soiled Complete with 1 Mono Dynamic Microphone, 5" Demonstration Tape, Instructions and maker's 12 months' Guarantee.

Originally listed at 93 Gns.
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Deposit £20.13.0 and 12 monthly payments of £3.8.10

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Mains/Batt. Portable
4-Track Stereo/Mono**

4 Speeds 7½, 3¾, 1¾ and 15/16ths i.p.s. Crossfield Head
Frequency response 40-20,000 cps at 7½ i.p.s.
Spool Size 5"
New, slightly shop-soiled Complete with 2 Dynamic microphones. A.C. Adapter and Automatic charger. Rechargeable battery, 5" Demonstration Tape, Connecting Leads, instructions and maker's 12 months' guarantee.

List price 131 Gns.
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★ MAINS 4-TRACK	Deposit		12 Monthly Payments		Cash Price
	£	s. d.	£	s. d.	Gns.
Fidelity Playtime ...	9	9 0	1	11 6	27
Ferguson 3222 ...	12	5 0	2	0 10	35
Grundig TK140 ...	13	6 0	2	4 4	38
Philips EL3558 ...	14	14 0	2	9 0	42
Ferguson 3224 ...	15	8 0	2	11 4	44
Wyndors Vanguard ...	20	13 0	3	8 10	59
Philips EL3556 ...	21	14 0	3	12 4	62

★ MAINS 2-TRACK	Deposit		12 Monthly Payments		Cash Price
	£	s. d.	£	s. d.	Gns.
Ferguson 3220 ...	8	15 0	1	9 2	25
Grundig TK120 ...	10	6 6	1	14 5	29½
Tandberg 823 ...	18	18 0	3	3 0	54
Brenell Mk. 5/3 ...	25	18 0	4	6 4	74
Brenell Mk. 5/3 'M' ...	32	11 0	5	8 6	93
Ferrograph 631 ...	33	5 0	5	10 10	95
Ferrograph 633 Connoisseur	42	0 0	7	0 0	120

★ STEREO/MONO	Deposit		12 Monthly Payments		Cash Price
	£	s. d.	£	s. d.	Gns.
Philips EL3312 ...	16	16 0	2	16 0	48
Sony TC250A ...	19	19 0	3	6 6	57
Philips EL3555 ...	26	5 0	4	7 6	75
Akai I710 ...	27	13 0	4	12 2	79
Sony TC260 ...	33	19 0	5	13 2	97
Tandberg Series 12 ...	36	15 0	6	2 6	105
Truvox PD104 ...	36	15 0	6	2 6	105
Beocord 1500 ...	36	15 0	6	2 6	105
Beocord 2000K De Luxe	43	15 0	7	5 10	125
Revov 736 ...	44	9 0	7	8 2	127
Beocord 2000T De Luxe	45	3 0	7	10 6	129
Akai X-350 ...	66	10 0	11	1 8	190
Akai X355 ...	83	6 4	13	17 9	239

★ BATTERY	Deposit		12 Monthly Payments		Cash Price
	£	s. d.	£	s. d.	Gns.
Philips EL 3301 ...	9	9 0	1	11 6	27
Telefunken 301 4-T ...	18	18 0	3	3 0	54
Akai X-4 Stereo ...	34	13 0	5	15 6	99
Uher 4000L ...	36	1 0	6	0 2	103

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Specially designed to use with the DP4, in order to cut down wind noise is the Wind-shield — as illustrated here.



There is also the "Grampian" Parabolic Reflector. Where it is not possible to place a microphone close to the source of sound such as when making recordings of bird songs, weddings, car and train noises etc. the Parabolic Reflector has been proved over and over again to be of enormous value.



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1200' on 7" reel. Normally 35/-. OUR PRICE 19/6. P. & P. 1/6d.
Three reels for 55/6, Six reels for 105/- post free. Boxed add 1/- per reel.

GRUNDIG TAPE 40% Off

Brand new, fully guaranteed, Premium Grade Magnetic Tape. Complete with the specially designed Grundig Plastic Tape Storage Cassette (Except 7" size which is in Manufacturers' Cardboard Boxes). Full leader and stop foil at both ends, and suitable or use with all makes of tape-recorder.

DON'T MISS THIS RARE OPPORTUNITY. SEND NOW!

TYPE	DESCRIPTION	LIST PRICE	ONE	THREE	SIX
GL18	1800' L/P 7" reel	50/-	29/6	86/-	165/-
GL15	1200' L/P 5½" reel	35/-	22/6	65/-	125/-
GS15	900' S/P 5½" reel	28/-	17/-	49/-	93/-

Post and Packing 1/6d. for single reels. OTHERWISE POST FREE!

ILFORD TAPE NEAR HALF PRICE

A bulk purchase of premium grade, top quality POLYESTER MAGNETIC TAPE from one of the world's foremost experts in film coating technology. With FULL LEADER stop foil, Polythene wrapping, and in original manufacturer's boxes. Available in long-play base only at these BARGAIN PRICES!

	ONE	THREE	SIX
900' on 5" reel. List price 28/-	16/6	48/-	90/-
1800' on 7" reel. List price 50/-	28/6	84/-	160/-

Please add 1/6 p. & p. for single reels. OTHERWISE POST FREE!

TRIPLE PLAY TAPE—HALF PRICE!

A large purchase from a famous world renowned manufacturer enables us to make this unique half-price offer. Brand new, fully guaranteed, premium grade Polyester Base Tape with FULL LEADER and stop foil. In original maker's boxes and polythene wrapped at these EXCEPTIONALLY LOW PRICES!

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450' on 3" reel	22/-	12/-	35/-	66/-
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900' on 4" reel	39/-	20/6	60/-	117/-
1800' on 5" reel	66/-	34/-	101/-	198/-
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SCOTCH MAGNETIC TAPE AT NEARLY HALF-PRICE!

Over 3,000 REELS of top quality MAGNETIC TAPE, double coated, SCOTCH made to the best possible specification and intended for the electronic industry. This type of tape is rarely, if ever, offered for domestic consumption and is unobtainable elsewhere.

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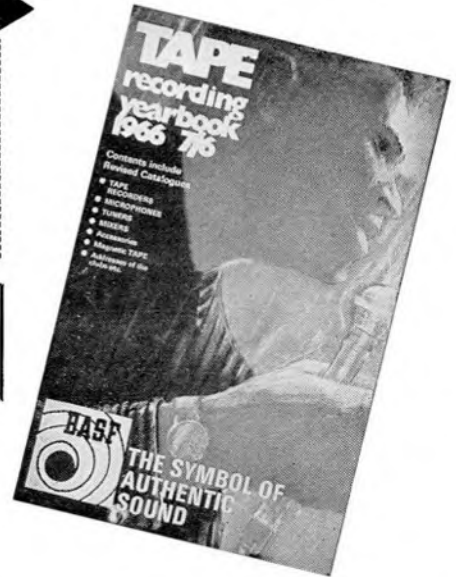
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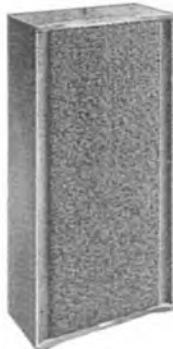
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