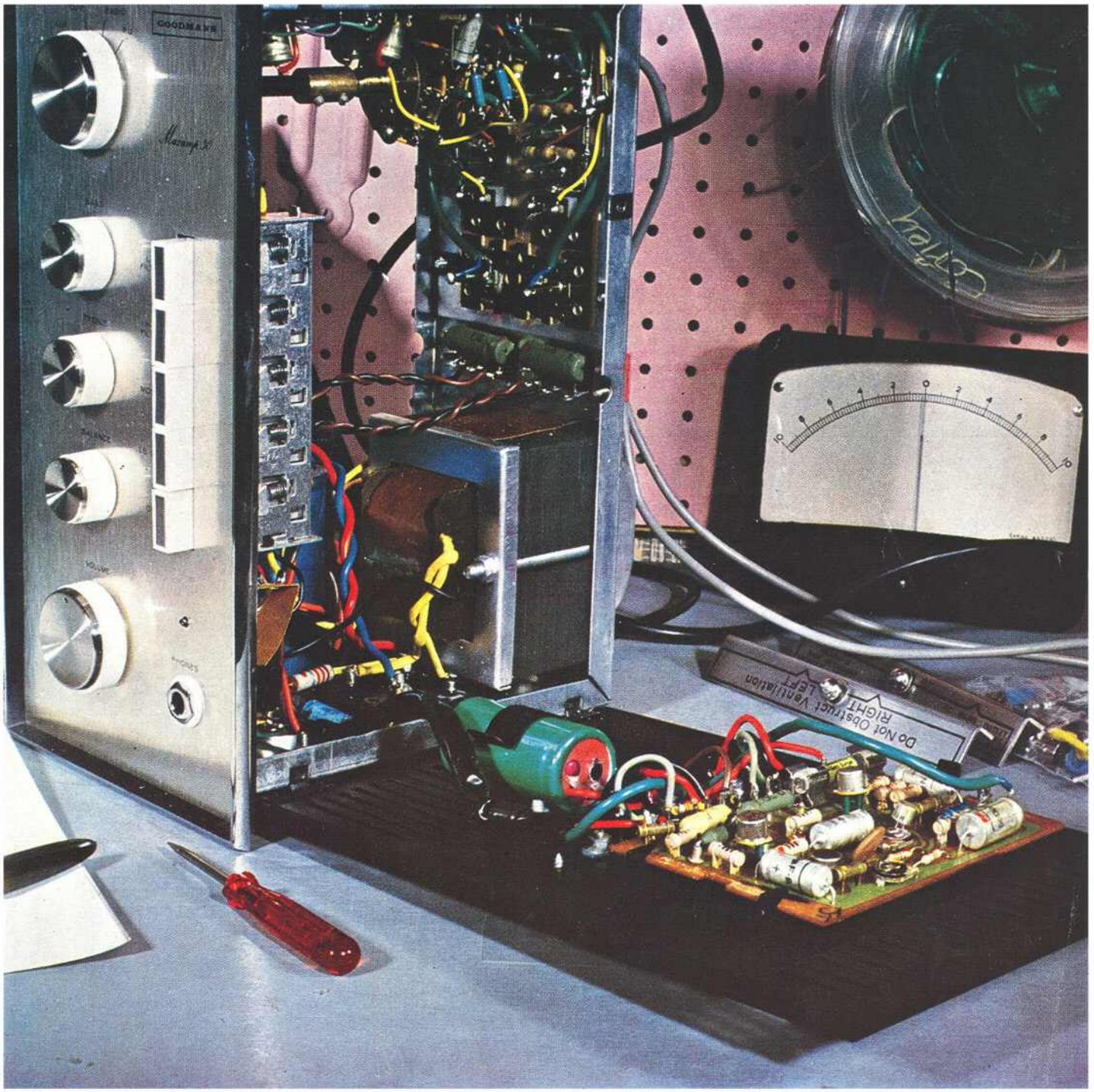
Amateur Tape Recording

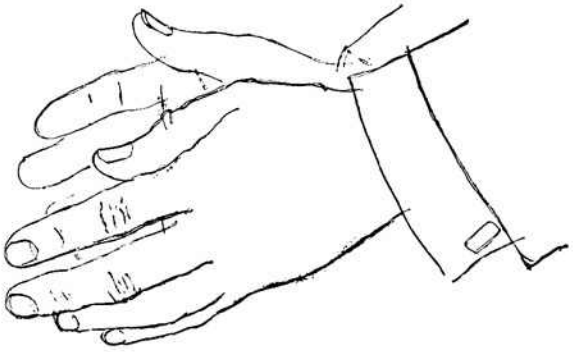
VIDEO&HI-FI

September 1966 Vol 8 No 2 2/6



NEW ATR HI-FI SUPPLEMENT BEGINS ON PAGE 29

you've got to hand it to them



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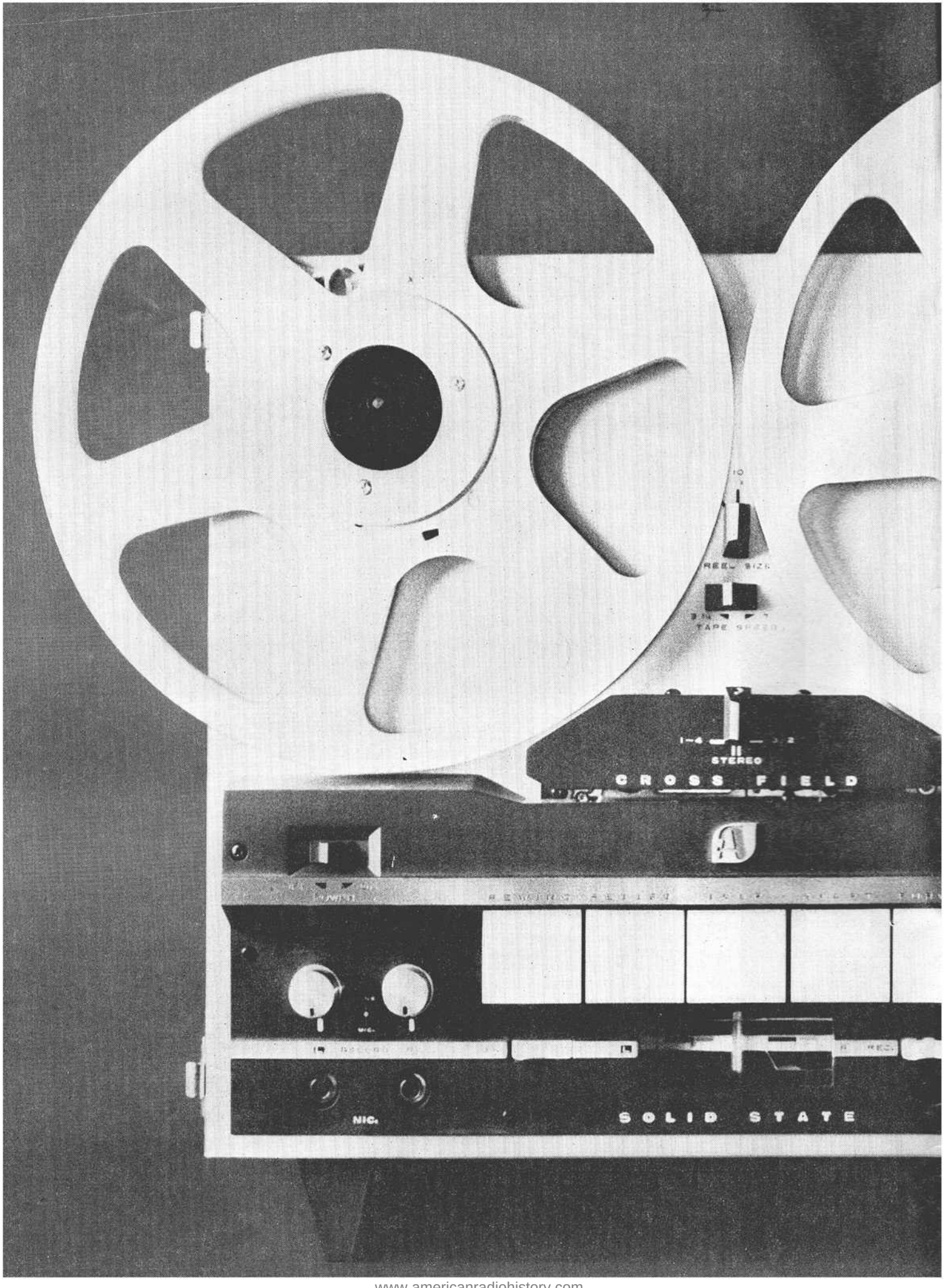

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EDITORIAL COMMENT

Stereo Broadcasting

It is perhaps fitting to this issue containing our first regular Hi-Fi Supplement that, as announced in last month's *Editorial Comment*, the BBC are now transmitting stereo radio programmes at least two or three times a day. We have all waited a long time for this moment, and although the service is available at present only in the London and South-east areas it will be extended gradually to the Midlands and the North of England. This development has, of course, resulted in an enormous demand for stereo pilot-tone FM-VHF tuners 'and stereo adaptors for existing tuners. We made detailed enquiries at the time of going to press, however, and discovered that *most manufacturers are quite unable to meet this demand.* Some, it appears, will not be ready with adaptors or indeed complete tuners with adaptors for at least two or three months. One manufacturer thought it would be six months before he could supply adaptors or tuners with adaptors. A rather sorry state of affairs, we think. Incidentally, readers should be aware of the fact that some stereo tuners and/or adaptors of American and other foreign makes may not be suitable for the decoding of the BBC stereo broadcasts. Although stereo broadcasting obviously opens up a new field for tape recording enthusiasts (yes, we know about copyright), there could be problems in recording also. Our contributor A. Lester-Rands deals with these in this issue (page 17).

High Fidelity Sound Reproduction

Hi-fi and stereo are in the main regarded as compatible since high fidelity reproduction is essential to good stereo and vice-versa. One might well say that the ultimate in sound reproduction is indeed stereo which, provided it is properly recorded or broadcast, brings the original spatial effect to the listener as well as the necessary extended frequency range so important to high quality sound reproduction. We will therefore be putting more emphasis on stereo than hitherto, and this goes for stereo tape recording as well. On the other hand, monophonic hi-fi sound recording and reproduction will still naturally take up the greater part of our tape and hi-fi editorial.

All we need now is video tape recording to complete the picture (literally perhaps) and even this is not so far away as we have been thinking—roughly 3,000 miles in fact. Sony have already released, in the USA, the first home video tape recorder which will record black and white *as well as full colour.* This comes complete with camera and retails at about $2,000. For a black and white only video recorder the price is around $995. Also on the American market is the Concord home video recorder complete with camera and screen monitor at about $1,500. Last but not least is the Sony *Videomat*, a device which records moving pictures lasting for about 30 seconds on a magnetic disc and which can be reproduced in black and white or in colour! Such a system on a low-cost home-use basis would be ideal for tapesponding, but somehow we feel this one is quite a long way off yet.

At least we now have stereo broadcasting.

FCJ

FRONT COVER

Our front cover this month shows the Goodmans Maxamp 30 all-transistor amplifier ready for the initial tests as described in the review by Gordon J. King on page 36. The Maxamp 30 is a fully integrated stereo hi-fi amplifier with some quite outstanding design features.

TAPE RECORDER SERVICING

Part X

This month Gordon J. King deals with magnetic fields and tape noise

Any magnetic field of sufficient strength coming within influencing distance of the tape will affect both the recording and the tape noise level. If we take a brand-new, perfectly virgin tape and run a bar magnet along a length of it and then run the tape through a recorder on playback at full gain, we shall hear the residual tape noise and then almost certainly a rise in noise level when the length of tape subjected to the magnetic field passes the playback head. If the tape were recorded, the signal would be deleted over that length of tape subjected to the magnetic field. This, of course, is nothing more than permanent magnet erasure; but it does show that erasure of this kind can impair the noise level of the tape itself.

The changing magnetic field provided by the erase head through whose winding signal current from the hf oscillator is passed also affects the noise level and the recording. It was shown last month that the noise added by a pure erase signal is very small and that in some instances the residual noise level of some brand-new, virgin tapes can be reduced by subjecting them to a *pure* erase field.

However, if the erase signal is badly distorted, a dc component as well as the ac (hf) signal passes through the erase head winding, and the dc component creates a static field component, like the field from a permanent magnet, thereby adding a little noise to the tape. The signal from a push-pull bias and erase oscillator is generally less distorted than that delivered by a single-stage oscillator, for which reason push-pull oscillators are featured in quality recorders. Thus, any increase in noise level relative to a recorder in which a push-pull oscillator is employed, which cannot be attributed to more common causes, should certainly lead to a check of the oscillator circuit, for electrical unbalance here, like a valve, transistor or component in one half of the circuit altering in value or characteristics, will definitely upset the waveform symmetry, which is akin to distortion.

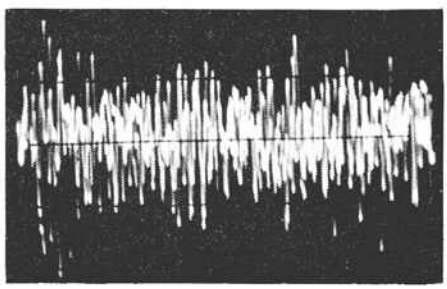


Fig. 1. Narrow band noise signal.

Tape Noise

As intimated earlier, tape noise is best discerned by running an erased tape through a machine on playback at full volume. The 'hiss', like escaping air, from the loudspeaker represents the translation of the noise signal to sound.

Noise signal is produced not only by the tape running past the playback head, but also by the random movement of electrons in components, valves and conductors of early parts of the playback circuit. When electrons in a conductor, for instance, move at random from one orbit to another of adjacent atoms, so a very, very small amount of electricity is produced. This does not mean that a conductor becomes electrically charged or is capable of producing electricity unaided. This cannot be so because the random to-and-fro movement of the electrons balance out so that zero electrical charge occurs across the conductor.

This can be seen clearly in Fig. 1. Here is an oscillogram (photograph direct from the screen of an oscilloscope) of noise signal. Examination will reveal that the average amplitude of signal peaks above the centre line is equal to the average amplitude of signal peaks below the centre line. The net result is thus zero charge across the conductor or component in which the noise signals were developed.

Nevertheless, from the point of view of a signal amplifier, noise signal 'looks' very much like ordinary audio signal and it is reproduced as a hiss from the loudspeaker. Actually, the noise signal shown in Fig. 1 was obtained from the output of a microphone transistorized amplifier. This may appear to be rather a lot of noise signal, but it is really extremely small compared with the microphone signal itself. Noise signal is sometimes looked upon as an equivalent noise signal across the input terminals of the amplifier, and since the amplifier has X dB gain, the noise signal as well as the programme signal is considered amplified in this ratio.

Thus, an amplifier with, say, a 60 dB input signal/noise ratio would imply that the equivalent noise signal voltage is some 60 dB below the programme signal voltage. 60 dB is equivalent to a ratio of 1,000 times, meaning in the above illustration that if 10 mV of input signal produced full output from the amplifier the noise signal at the output would be 1,000 times below this, which is 0·01 mV or 10 μV – a very small signal indeed. The noise display in Fig. 1 was obtained by using a great deal of 'Y' or vertical gain at the oscilloscope and no input signal at the amplifier, the noise being

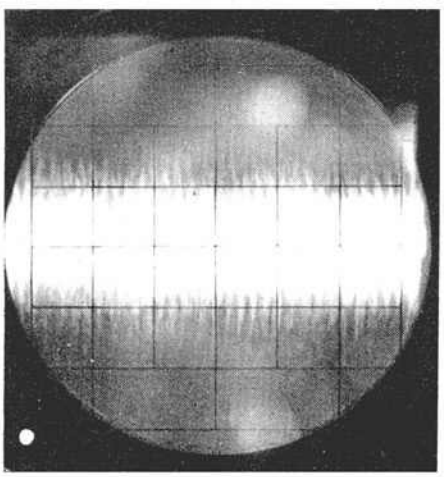


Fig. 2. Wide-band hf noise signal from alignment tape.

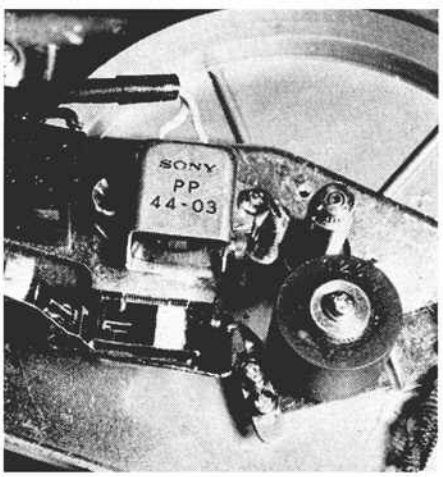


Fig. 3. Head adjustment on Sony recorder.

Fig. 4. Head adjustments on B & O 2000 recorder.

that at the output.

Tape noise, on the other hand, is produced essentially by the random fields of the particles of oxide surfacing the active side of the tape passing the playback head. Small random signals are thus developed in the head winding which, on the screen of an oscilloscope, look very much like those shown in Fig. 1.

From this, then, it will be better understood that complete and random demagnetization of the oxide particles is necessary to endow the tape with minimum background noise. If erasure leaves a definite magnetic pattern on the tape – even though not of audio – the playback head will reproduce this as unwanted background or noise.

Noise Signals

Owing to the nature of noise signals, they contain frequencies in the audio spectrum from low bass to high treble. Depending on the way that they were created, some of the higher and lower frequencies may be attenuated or missing altogether. The noise reproduction is then given a characteristic sound. For instance, tape noise (hiss) will sound different at different tape speeds, and may well sound different from noise produced in an amplifier. Noise produced by an amplifier will have characteristics according to the amplifier's bandwidth.

Noise containing all component frequencies from very low to very high values is called 'white noise'. This is a very useful noise as it can be adopted for testing amplifiers, tape recorders and loudspeaker systems. Indeed, it is possible to purchase tape records of noise, a typical one being the BASF alignment tape. The recording consists of a noise spectrum which, at a tape velocity of 3¾ ips, results in frequencies within about 5,600 c/s to 16,000 c/s. At half this velocity, the range is from 2,800 c/s to 8,000 c/s, while at 7½ ips the range is from 11,200 c/s to 16,000 c/s.

Noise Adjustment of Azimuth

True white noise, of course, would also carry frequencies going down to the bass end of the audio spectrum, but for head alignment purposes the spectrums of the BASF tape are adequate. When the tape is played the noise is heard as a definite hiss from the loudspeaker, the idea then being to apply treble boost (or turn off treble cut) and adjust the angle of the playback head until the noise is reproduced at the highest possible pitch. The azimuth angle is then correct. The use of an alignment tape of this kind makes it possible to adjust the azimuth accurately without instruments, simply by ear.

The oscillogram in Fig. 2 shows what the noise of the BASF tape looks like at the output of the playback channel. While the individual pulses either side of the centre line are not visible on this photograph, as they are in Fig. 1, they do, in fact, exist, but the oscilloscope used to display the noise was unable to respond sufficiently fast to the individual noise pulses.

The head angle or azimuth relates to the angle between the head gap and the direction of the tape, which ideally should be 90 degrees. On all pre-recorded tape records the recording will have been made with the record head at that angle. Thus, if the playback head differs from this angle, full definition of the recorded material will not be possible, resulting in loss of treble and a general impairment of the recorder's treble performance.

All tape recorders have some means for adjusting the head angle (or tilt). Fig. 3 shows the large adjusting screw on the right-hand side of the head in a Sony, while Fig. 4 shows the two heads in the B & O Model 2000 and the azimuth adjusting screws relating to these. If the machine features a common recording/playback head it follows, of course, that whatever angle the head is set to the azimuth will also be correct when tapes recorded on that machine are also played back on it. The trouble starts, though, when a tape made on a machine with an incorrect azimuth is played back on a machine whose head is in correct alignment, as established by an alignment test tape, for example.

If many tapes have already been made on a misaligned recorder, a decision must be made, before altering the head angle, whether recordings should continue to be made at the incorrect angle to allow optimum playback of the recordings already made, or whether the head angle should be adjusted to conform with international standards to facilitate tape interchange.

Now to return to noise itself for a moment. It is sometimes difficult to establish just by listening to hiss whether it is tape noise or playback channel noise. However, one can soon determine this by removing the tape, switching the machine to playback and then turning up the playback gain (volume) control to maximum. The hiss then emanating from the speaker – and there will be some, probably accompanied by a little hum on a mains-operated machine or motor sizzle on a battery-operated model – is that produced by the electronic circuits, about which little can be done. However, the hiss should not be so loud as to be heard behind a fully recorded tape being played back. If it is present under this condition at normal programme volume levels, then one would assume either that the machine is of poor design or that there is trouble in the first stage of the playback channel.

The next thing to do is to run a clean, virgin tape through the machine also on playback at full volume. The extra level of hiss (above that of the electronics as previously established) is due to the tape itself. (*A later article will suggest causes of excessive electronic section noise and ways of reducing it.*)

To conclude this article, we will finish on the note that we started; namely, the hf oscillator. If the oscillator is functioning but its hf signal output is low, the symptom will be revealed by the machine's inability fully to erase a recording of maximum level. Most of the material will be wiped from the tape unless the output is abnormally low, but a little will remain and will be heard along with the noise background when a tape erased on the machine is passed through it again on playback at full volume. The low oscillator output may also affect the recording, the bias being too low. This could give treble emphasis and distortion and tend towards tape overload at nominal recording levels. However, more about that next month.

MAPS OF SOUND

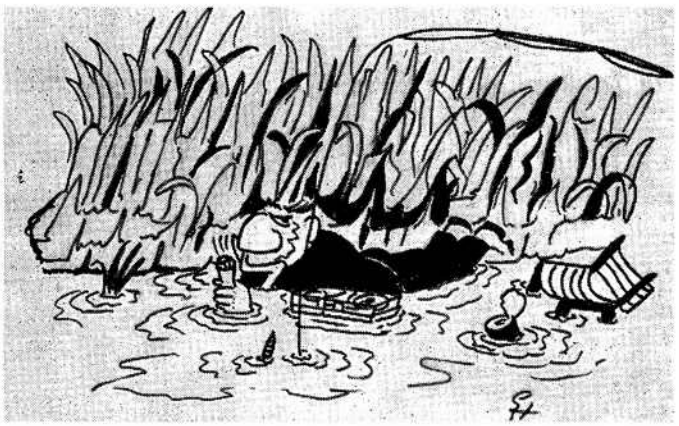
The Importance of a Script

by Graham Harris

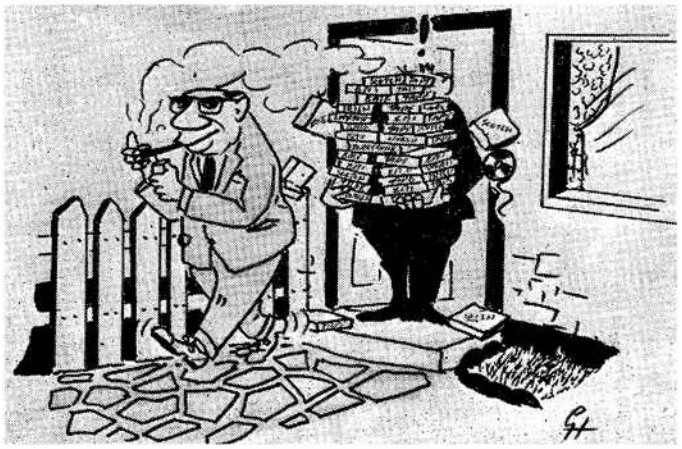
There are some people who can talk the hind leg off a donkey. In some cases this is not only sad for the donkey, but a trial for human ears!

Talking is an art. Like any form of art, it has to be cultivated and the tape-recorder has helped many public-spirited persons to perfect their rhetoric. Fortunately for the world, I don't do much public speaking. I did once deliver a talk to a gathering of literary-minded gentlefolk and recorded this *ad lib* performance. When I played it back I was, to say the least, alarmed! In spite of the polite thanks I received, there is no doubt my talk was unfit for human consumption. I had 'um'ed and 'arh'ed throughout and side tracked the main issue for ten minutes. It was a mistake. I should have known better. I should have had a script.

Of course, it depends on the subject. Most people can talk quite sanely for half an hour on what they think of income tax, but, in the main, most subjects have need of some sort of preparation. In other words, notes or a complete script. There are, indeed, some people who can talk 'off the cuff' on a given subject quite merrily until they are faced with a microphone! It is as though the microphone has a quick saturation point. Some microphones have the appearance of lidless eyes and can 'stare' the living daylights out of a speaker. To become all technical for a brief moment, 'microphonic neurosis' is a common complaint. The cure is a script! No matter how small the proposed programme is for the tape recorder, a script, in some shape or form, is essential.



. . . drinking in the atmosphere.



Just knock off a script for that lot, will you?

What is a script?

It seems like a simple question and it warrants a simple answer. A script is a piece or pieces of paper on which the material is listed in sequence, the narrative is written and the timing is planned. It is an anchor to stop irrelevant facts from creeping in and it should stop the programme sounding like an abstract piece of uncontrolled *ad lib*. It is a guide for the narrator, the technician, the producer and anyone else who may become involved in the production. It is, in short, a *map of sound*. It may be a pencilled set of notes scribbled on the back of a final demand notice or it may be done in illuminated scroll on silk woven paper, but in whichever shape it comes, it will give polish to a talk, a documentary, a magazine, that will set it above the crude amateur productions that we all have suffered at some time or another. I have even used scripts for tapesponding. Before my wife said 'I will' at the alter rail, she lived at the other end of the country. (These things happen!) We used battery tape recorders in preference to letters and even in this personal medium I constructed notes before I faced the mic. In some cases when I wanted to sound particularly suave and witty, I even wrote my dialogue before I spoke.

Solo or group?

On tape-recorded projects some people prefer to work alone. People like this, either because of choice or from necessity, will probably act with independence in spite of any advice I give and rely on spontaneous and inspired wit to cement the subject together. The more ambitious a project becomes, the more work is involved and because of the detail involved, a group venture is usually more successful. I am not an anti-individualist. Many competitions are won by solo entries, but even in these cases I imagine that some sort of script is used.

In most tape recording societies each member has a different approach to the hobby. One person's reason for having a machine will not be the same as another. I might go off into a sixth heaven at the prospect of having to interview someone on tape, whereas another person will shudder at the thought. The point is that each member's taste should be channeled into practice for the good of the group. 'They' tell me that there's something to be said for all this democratic specializing. I know it works in the tape recording societies. I am fortunate to belong to a small but active group where we have a member who can design and build electronic 'things', we have another who goes into ecstasy when editing and dubbing and another who has a fit of joy when interviewing, a photographer, another member who seems to spend a lifetime inside churches recording choirs and there's me – who writes! I don't think that we are different from any other recording group. The willing specialization is there. All that is needed is a secretary who looks for it and uses it.

Whilst the cameras click for a tape/slide show, the interviewer asks questions, the gadgets are being made and the director worries, there is the script to be prepared – the pieces of paper which help to organize the whole set-up.

Craft, art or sweat?

There are easier things in the world than dashing off a script. Anyone who has been left with a pile of tapes containing interviews and sounds and the blissful request *'Just knock off a script or something for that lot, will you, me old mate?'* will realize the truth of this! For a start it is essential that the script-writer – or shall we call ourselves 'tape-writers'? – be in at the beginning of a project. That might sound obvious, but it's not always the habit! The result is usually a long argument between script-writer and director as to what the script should be about and both parties tend to be temperamental at this point. No, it's good for all concerned in the project to be chummy from the beginning. The man who directs the session might have his faults (he usually has a lot and it seems to be an asset for directorship), but if the writer is there at the beginning he will learn to tolerate these minor irritations.

Let us assume that a short programme on local angling habits

has been scheduled. The material is at hand – that is, interviews with fishy characters, location sound noises (the lap of water, the splash of a fish, the curses of the fisherman, etc., etc.) and, if it is a tape slide show, the photographs. The writer will then need to borrow a few angling magazines from which he or she can obtain some knowledge of the sport. It's not going to help matters if the writer believes that a pike can be shoved inside a jam jar. Together with this is the 'research game'. In spite of what some people will say, research is important. I was recently asked to 'do a script' on bridges and when I explained that I should need some time in which I could read up on the history of bridges, my director (bless his stereophonic recorders) said that he didn't want the whole thing cluttered up with facts. Quite right, said I, but at the same time it was no good 'doing' a script with a load of unchecked phrases. In short the writer likes to know what he is writing about! In the case of the angling programme the tapewriter will need to find out about the local fishing scenes and a few angling terms. Armed with this knowledge, the format and timing of the programme can be considered.

It is not necessary for the tape-writer to edit the interviews, but he will have to decide on which portions to be used and fit the instructions in sequence into the script along with the available sound effects.

Words

The narrative is, of course, all important and it is this that sometimes puts people off writing scripts. It's not easy. If it were, then everyone would be earning great fortunes and winning Nobel prizes for literature all over the place.

If the tape-writer knows who is doing the narrative, then he can write, so far as he is able, for that person's tongue. Sounds technical? Not really. It's easier to write, copying someone's turn of phrase, than it is to write for an unknown reader. If the narrator is a person who likes telling funny stories then the narration should be written with this in mind. Put it another way. It's best to write the dialogue as it is spoken and not as a piece of Johnsonian rhetoric. For instance *'The early eventide's severe beauty was smitten asunder with the tintinabulation that echoed across the misty – almost spiritual meadow'* should be turned into a simpler *'The church bell struck seven.'* It's easier to read, to say and to hear. No one will thank you for trying to be super-clever.

The script can make or break a programme. If the programme is good, all the credit will go to those who can be heard on the sound track. If the programme is bad, the script-writer will receive the blunt of the attacks, and so it is up to the tape-writer to make the script easy to follow. I was once involved in a programme that was supposed to sell an idea to the general public. When I say 'involved', I mean that I was chosen to do the narration and the script was written for me. The script-writer was a professional 'Ad' man. We were doing the sound for the trailer to a main film and it lasted five minutes. The script was full of tongue and breath-twisting phrases that were supposed to grasp the viewers' attention. I can quite honestly say that if their attention was caught it was by the mistakes that I made in the reading and, of course, I blame the script-writer.

When writing for a tape/slide show it is a waste of time writing the narrative to describe the views to be seen. I'll go further and say that it's down-right criminal. Let the slides speak for themselves. To see the picture of a wooden shack in the middle of a forest and then listen to the loudspeaker saying 'This is a wooden shack in the middle of a forest' is not only superfluous, but uninspiring.

A question of balance

The narrative is the link between one slide, one sound effect or one interview and the other. The narrative should only tell the listener or viewer what is not apparent from anything else. It is up to the tape-writer to balance the voices and the sounds.

Back to the 'Local Angling Habits' programme. The narrative should be broken into two or more voices, as though it were a conversation, using male and female voices to break the monotony. The script should include all directions for dubbing of interviews and of sounds, where to fade, superimpose and cut. The tape recorder is a sound machine and the tape-writer should keep this uppermost in mind when composing the programme. Every ounce of worth should be extracted from the available sound effects and recorded interviews. These make up the meat of the story and it's the flavour that counts. Writing a script isn't just a matter of writing words for someone else to say. It is composing a story with everything that is at hand.

The layout

The tape-writer has been handed the material. This includes tapes of sundry interviews that have been carried out with local anglers, sound effects and some history of the sport. The tape-writer has probably gone along to a local session and sat on the banks of the river *drinking in the atmosphere.* The opening of the programme might look something like this on paper.

A Piece of Quiet

A 20-minute programme on local angling habits and customs written by Phylis Qwod for the production by members of the Upper-Krerting-in-the-Swamp Amateur Tape Recording Society.
Recorded 3 November 1966.

Slides	Sound Effects Interviews	Dialogue	Time
1	Scene of quiet river.		10 sec
2	Scene of trees with title.		10 sec
3	Credits.		15 sec
4	Traffic scene. *Cut in sharply with traffic sounds. Superimpose screech of brakes.*		10 sec 3 sec
5	Country scene. *Bring up slowly twittering of birds. Superimpose lap of water.*		15 sec
6	Anglers on river bank.	*Male Voice* The evening peace of an English meadow is a welcome retreat from the chaos of yelling streets.	10 sec
7	A stretch of river. *Bring in sound of reel being wound.*	Along this stretch of the River Bogg a man can sit for hours staring at the ripples on the surface of the water.	10 sec
8	Shot of Dan Myers by river.		
9	*Insert* Dan Myers' interview from 'Ah! I fished 'ere for 5 year' to '. . . I catch nowt at all'.		15 sec

It helps if each person involved with the recording of the programme has a copy of the script and there can be no excuse for anyone to complain that he or she doesn't know what's going on. The practice of using a script in sessions is another story. What matters here is the tape'writer. Having completed the script, the writer might believe that he or she can now rest on laurels. It's not, however, quite the end. The essential characteristics of a tape-writer should include *patience, tolerance, amiability, a sense of humour,* the trained ability to refrain from saying 'Go jump in the canal' and *versatility.* There is a very strong chance that the writer might be called upon read his own work. There is an even stronger chance that the script will be submitted to drastic cuts and changes.

There is also an overwhelming chance that he will be asked to write more scripts. So. It's good to feel wanted!

EXPERIMENTAL NOISE CANCELLING MICROPHONE

by B. E. Wilkinson

The 'mechanics' of the dynamic microphone are generally well understood. Pressure exerted by sound waves deflects the diaphragm, the velocity causing the magnetic element to generate an electrical output identical in frequency and proportional in amplitude to the original sound wave. In the normal instrument, the two faces of the diaphragm are isolated from one another, either by containing the mechanism and the reverse side of the diaphragm in a case, or by making the air path between the faces devious and long. If we arrange for both faces of the diaphragm to be exposed with little or no barrier between, then the characteristics of the microphone are changed. Ambient noise or sound from distant sources, is so dispersed by reflection that it approaches the instrument from all directions and reaches both faces of the diaphragm. Pressures are thus balanced, and the effect is no deflection, making the output zero. If we speak directly into and fairly close to the microphone however, the sound is not dispersed, and the greater proportion of it is applied to the front face of the diaphragm. A pressure differential exists between the faces, and there is a usable output. This is the principle of the noise-cancelling microphone, an instrument for use in noisy environments such as aircraft cabins. To the recording enthusiast, such an instrument is useful for recording conversation or interviews in locations with a particularly high ambient noise level. It should be pointed out that the background noise does not completely disappear, but is in evidence at a reduced level.

A section through the microphone is shown in Fig. 1. The principle of operation is similar to that of a standard earphone, the poles of the magnet being separated from the mild steel diaphragm by a small air gap, which (in this case) is adjustable. Deflection of the diaphragm by sound waves (and associated troughs) causes the air gap to close and widen respectively. The magnetic resistance (reluctance) due to the gap thus varies, and the magnetic field due to the magnet follows the change. The coil surrounding the poles is affected by the change of field, and an emf is induced to form the output. The noise-cancelling property is obtained by raising the magnet poles and diaphragm above the level of the case, so that a gap is formed.

Construction

The basis of the microphone is a small, but powerful 'Eclipse' magnet. This is cylindrical and measures 0·75 in diameter by 0·5 in high, with a fixing hole in the **U** formed by the poles. The magnet is available at most tool stores. A plastic bottle lid is used as a case, and accepts the magnet, with a peripheral clearance of about $\frac{1}{16}$ in, while the internal depth of the lid should not be less than the height of the magnet. No difficulty should be experienced in finding a suitable lid as there is a vast number of bottles of different sizes available, and the requirements are by no means critical. To secure the magnet in the case, a 4 BA clearance hole is drilled through the centre of the lid, and a bolt passed through the magnet. To leave space for the windings, a countersunk bolt should be used. If the lid is much deeper than the magnet, the lip should be ground down on a sheet of sandpaper laid on a flat surface.

The microphone output is taken from the unit by means of a miniature jack plug set in a hole at the circumference of the lid. A 'Radiospares' plug is available and has a parallel-sided aluminium body which is particularly suitable. The hole must be drilled carefully to avoid cracking the plastic, and then widened until the plug body forms a snug fit. For this task, I used a short length of sandpaper rolled to form a cylinder. The diaphragm is supported on three 6 BA pillars, which are set in a fibreglass annulus formed around the plastic lid and made as follows:

(*a*) Obtain two discs of Tufnol, mild steel, or similarly stiff material. The disc diameter should be at least 0·6 in greater than the plastic lid diameter.

(*b*) Drill a central hole through each plate to clear 4 BA, and bolt both to one side of the lid. Mark a point about 0·15 in from the lid circumference, and drill a 6 BA clearance hole. Remove the lid and drill the plates with two further 6 BA holes, set 120° apart. Put a small splash of paint or mark on each plate to indicate correct alignment.

(*c*) Separate the plates and stick paper (preferably waxed, but this is not vital) to the facing surfaces; make the necessary holes in the paper. Now place the plastic lid between the papered surfaces of the plates, and bolt up using a 4 BA bolt through the centres.

(*d*) Correctly line up the 6 BA holes, and pass lengths of 6 BA threaded rod ($1\frac{1}{2}$ in lengths are used in the microphone shown) through. Secure each rod to both plates using four nuts – one outside each plate and two between, and adjust until the plates are parallel. Set the jack plug midway between its adjacent lengths of threaded rod, and tighten up. The assembly should now consist of the plastic lid between the two plates, which are held in position by a 4 BA bolt at the centre and three 6 BA rods.

(*e*) Make up a fibreglass resin and paint the lid, jack plug and 6 BA rods liberally. Lay on strips of matting and layers of resin until the gap between the plates is completely filled. Be careful to avoid bubbles, and do not stop, as the resin should begin to harden in about 20 minutes. Until the fibreglass reaches the jelly stage, hold the assembly and rotate it occasionally to prevent the resin from running off. As the fibreglass hardens, place the assembly in a warm place for an hour or so.

When the fibreglass has hardened, the 6 BA nuts are removed from the periphery of each plate and the 4 BA nut and bolt are withdrawn from the centre. The plates can now be removed. The paper will have prevented a bond between resin and plate, and should tear, allowing the plates to come apart fairly easily. The microphone case is now almost complete, consisting of the plastic lid, surrounded by an annulus of fibreglass with three 6 BA projections. Grinding the annulus concentric with the lid is not difficult: although fibreglass is very strong, it can be sanded off easily using a medium grade of sandpaper. The 6 BA projections at the back of the case can now be sawn off and the back cleaned up with sandpaper.

Short lengths of plastic-covered, stranded wire are soldered to the plug contacts, which are screwed back into the body. The ends of the wire are thus now projecting into the plastic lid. Each pole of the magnet is wound with 200 turns of fine, insulated wire (taken from the primary of an old output transformer). The 4 BA bolt (with countersunk head) should be passed through the magnet and lightly secured with a nut before winding starts, and strips of gummed paper or adhesive tape wrapped around the poles to prevent chafing the initial turns. Winding must be carried out so that the wire is put on to one pole clockwise and the other anticlockwise. If the wire is wound on both poles in the same direction, the coil's emf's will be antiphased and the total output zero. I found that 200 turns was about the greatest length of wire that could be put on each pole without making the coil unmanageable, and increased the magnet diameter to a point where the assembly would only just fit in the lid. The finished coils are secured in position with glue or strips of tape, and the free ends cut off to a length of about 1 in. These are then soldered to the wire ends of the plug, the 4 BA nut is removed from the centre bolt and the magnet dropped into the lid on to washers to raise the poles about $\frac{1}{8}$ in above case level. The 4 BA nut is screwed on to the bolt at the back of the case and tightened up to hold the magnet firmly in position.

Preliminary test

The close-up photographs (Figs. 3 & 4) show the case, with magnet in position. Nuts shown on the 6 BA rods are for adjustment of the diaphragm height. Owing to the relatively small number of turns, the microphone is a low-impedance device, and while it seems to match fairly well into a base/emitter circuit, a step-up transformer is needed to feed a high-impedance input. The jack plug embedded in the fibreglass plugs into a socket on the microphone lead, which carries at the other end a plug to fit the tape recorder. To test the microphone so far, the output is connected to a recorder or an amplifier, and a piece of steel – a knife blade perhaps – is allowed to snap against the magnet poles. If the circuit is satisfactory, a 'snap' should be recorded or heard through the amplifier, and movement of the steel against the magnet will produce a scraping noise. I found that a strip of tinplate laid across the magnet will behave as a diaphragm, and a distorted speech output can be obtained. However, the idea of testing at this stage is simply to ensure that the circuit is satisfactory.

Making the diaphragm

The diaphragm is a mild steel disc, equal in diameter to that of the fibreglass annulus, and drilled with six 6 BA clearance holes. Tinplate is a good source of mild steel, and can be cut from almost any can. The most important feature of the diaphragm is flatness: if a disc is bent while being cut out, it must be discarded and a new one made. The diaphragm is clamped firmly between the front face and a ring, which in the unit shown is of Tufnol. The requirement of both ring and face plate is stiffness. Between the diaphragm and the front face there is a cardboard spacer, which ensures that the diaphragm is free. I found it

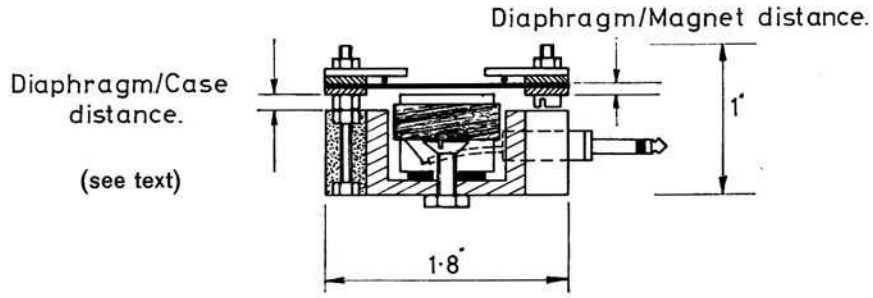


Fig. 1 Sectional view

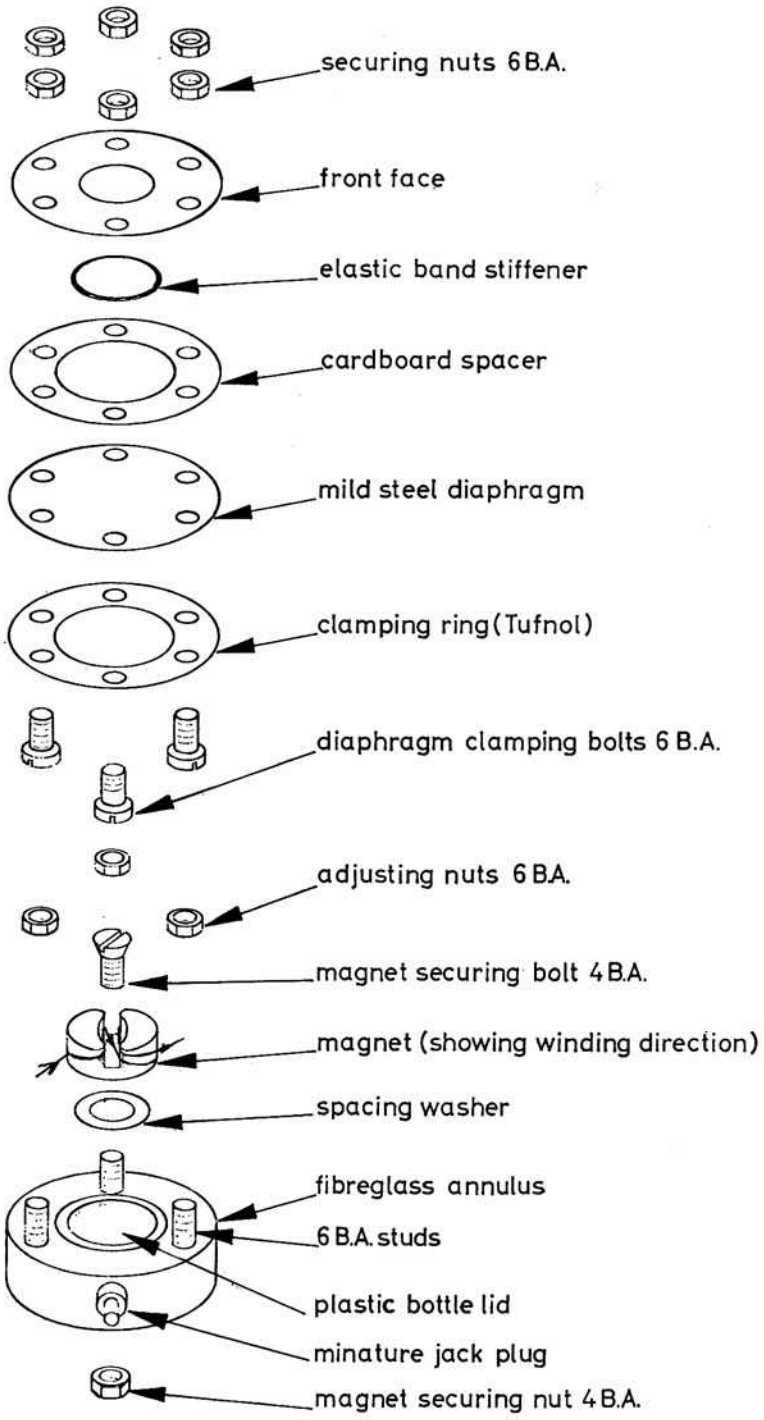


Fig. 2 Exploded view

necessary to compress a small elastic band in this cavity to stiffen the diaphragm so that resonances in the audio range are eliminated. Sound waves at the front face plate pass through a 0·5 in hole at the centre – it is tedious and pointless to try to form a pattern of small holes. The diaphragm assembly is bolted up with three 6 BA nuts and bolts, positioned in alternate holes. To fit the diaphragm to the microphone case, the 6 BA rods on the latter are passed through the remaining three holes in the former. Nuts are fitted and excessive length of rod sawn off. About $\frac{1}{8}$ in should be left to allow for adjustment of the diaphragm height.

The microphone is experimental in that performance can be altered by varying the following distances:

(*a*) diaphragm/magnet. This distance affects the output amplitude and is varied by adjustment of the nuts on the 6 BA rods.

(*b*) diaphragm/case. This distance varies the gap by which sound waves can reach the rear face of the diaphragm, and thus adjusts the noise-cancelling property. Adjustment is effected by varying the thickness of washers under the magnet, and the nuts on the 6 BA rods.

The diaphragm/magnet distance should be kept as small as possible without contact to ensure a good output, while initially a diaphragm/case distance of $\frac{1}{8}$ in is acceptable. Testing should, of course, be carried out in a noisy environment, but some idea of performance can be gauged without the need for noise. A record is made with the microphone normal to the speaker's mouth, and during the speech the instrument is rotated through a right angle so that the sound waves are then falling on both faces of the diaphragm. On replay, there should be a reduction in volume as the microphone is turned. The dimensions chosen for the instrument shown were determined mainly by the size of the magnet and the plastic lid. Earlier experiments indicated that larger cases produce undesirable resonances due to the cavities formed and the greater flexibilities of the associated diaphragms, while on the other hand very small microphones are insensitive due to the small diaphragm area.

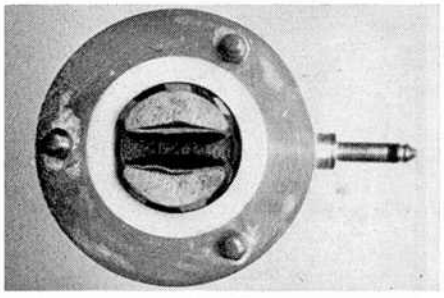


Fig. 3

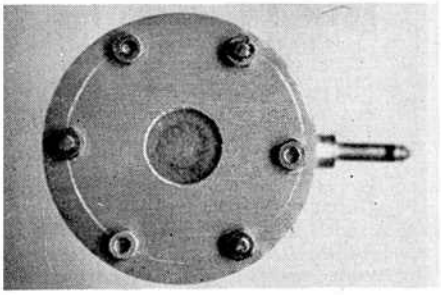


Fig. 4

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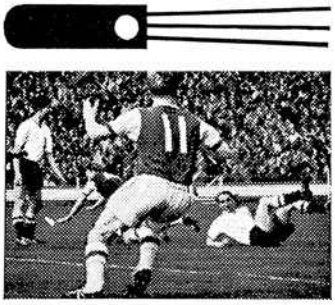

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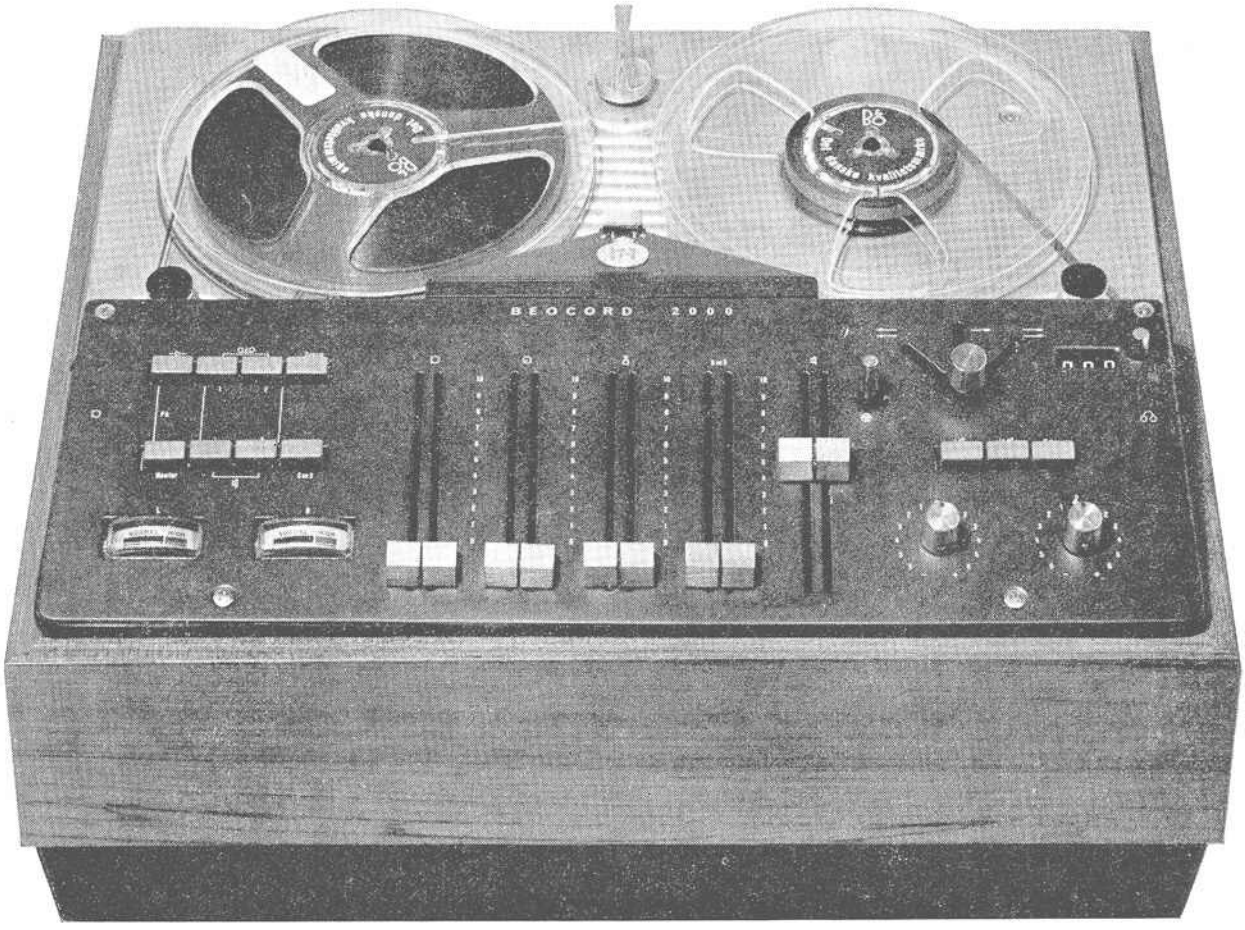

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THE THINGS YOU SAY

Each month the writers of the most interesting letters selected for publication on this page will receive a useful accessory to tape recording. Letters for this page should be addressed to *Things You Say, ATR, 9 Harrow Road, London W2.*

More about tape thieves

I note with some concern the condemnation of the British tapetalker by your correspondent Kenneth F. Williams of Australia. This is not an isolated case, and hardly a month goes by without similar complaints being aired. So much so, in fact, that Britain is fast becoming a bad risk as far as tape contacts are concerned. This is because a large number of undesirables are posing as tape pals and are being accepted in *Tape Exchange* clubs and in magazine directories in good faith, when actually all they are out for are tapes on the cheap which they have no intention of returning.

This sort of sharp practice can be defeated to a large extent by the person being invited to tape, and here Mr Williams committed two fundamental errors: first, by being the one to supply the first tape; secondly, by using 7 in tapes instead of an initial 3 in one. We at *Worldwide Tapetalk* issue precise rules and guidance to our members and we always stipulate that the person making the approach to a tape contact must always make and supply the first tape, upon being given the OK to go ahead. Never once should the approached person supply the first tape even if the would-be contact especially requests it. By following this simple rule, many hard feelings can be avoided and it will help to defeat this kind of racket.

Fortunately the vast majority of club members and readers listed in magazine directories are genuine and sincere tapespondents but, as in so many ways of life, it is the unscrupulous ones who make the news and leave a bad taste in the mouth when the word 'tapespondent' is mentioned. Now I would like to see in your columns 'the other side of the picture' where complete lives have been changed, where loneliness has been dispersed, where the road to immigration has been paved, where friendship has merged into marriage . . . in fact, I could quote scores of cases where tapespondence was the most wonderful thing that ever happened. But then, of course, it could be justifiably thought that, in my position, I was somewhat biased. Instead, let us hear from your readers about the happier side of this hobby and the change it has made in their lives.

Harrow, Middlesex **Chas. L. Towers**

The trouble is not all one-sided

Having read Mr K. F. Williams' letter about British tapespondents, I just cannot let this matter go without a few comments of my own. I am a comparative newcomer to tapesponding, although I have owned a recorder for some four years. The main function of my recorder was to make sound tracks for 8mm films, but through reading your excellent magazine I decided to try my hand at tapesponding. Over two or three months I selected two gentlemen in Australia, two in New Zealand and two in America. The two Americans answered promptly. Neither of the Australians answered, and only one of the gentlemen in New Zealand answered, and he turned out to be an Englishman who had emigrated. So you see, the trouble is not all one-sided.

Might I add that I still tapespond with the New Zealander and have five other pals, all Americans. If Mr Williams would care to have a change of heart I will tapespond with him gladly, *and will send the first tape*. All my tapes go by airmail. Good luck to your *Tape Directory*, keep the good work going; don't let a few rotten apples spoil the barrel.

Birmingham 14 **J. E. West**

Most tapespondents are honest

I feel our Australian friend, Mr K. F. Williams has been rather unfortunate in the selection of his tapespondents in this country, I would like to inform him that such unreliable and dishonest people also exist 'down under', as I had the same misfortune when sending tapes to Australia some two years ago. However, I do not condemn all Australians for the selfishness of one or two, neither would I consider the Australian flag to be flying upside down.

I respectfully suggest he considers joining one of the many excellent clubs in this country. I am sure the secretary of my own club, Mr Roger Pirie of the International Tape and Cine Society, 83 Warrens Hall Road, Dudley, Worcester, or our very esteemed Australian President, Mr Stan McMurty, 39 Reid Street, Murrumbeena, Melbourne, Australia, would be only too pleased to have him join our ranks. I can guarantee he would never lose any more tapes.

Come on Mr Williams, don't condemn the thousands of honest and reliable tapespondents in this country for the failure of only two.

St Ives, Cornwall **D. F. Palmer**

Mini-message tapes first

I was sorry to read in these columns of the tape losses by your Australian correspondent, but this 'hazard' is by no means confined to the UK. I recently had a tape from an American who said that he had nothing but praise for the promptness with which his UK contacts returned his tapes and wished he could say the same for some of those in his own country, where he had lost several tapes.

Unfortunately, it is a risk one must take in the endeavour to find new contacts. I have lost tapes both in this country and overseas but perhaps one day they will return. For first contacts I only send small mini-message tapes that I make up myself, replacing them with larger spools should the contact become established. Of course, there is the possibility of tapes getting lost in the post, although I have found the GPO very good, several tapes having been returned to me marked 'not known' or 'gone away'.

In about six years of tapesponding I have made good reliable tape friends taken from the *ATR Tape Directory* and this more than compensates for lost and 'switched' tapes. There are few hobbies that are so rewarding as tape recording. One can get out and about with a portable in the fine weather or stay in the warm when it is cold. I get a lot of pleasure from recording and during a recent long and trying illness one of my few daily high-lights was to listen for the footsteps of the postman up the drive and the hoped-for 'plonk' of a tape on the mat.

Best wishes and thanks to you and all your staff for a grand magazine.

Brighton, Sussex **D. J. Goldup**

It seems that the letter from Mr Williams in Mona Vale, Australia, has rather stirred things up among the tapesponding fraternity; Unfortunately, we haven't the space to publish all *the letters received in reply, but here are extracts from three more. We do, of course, sincerely thank all those readers who wrote expressing their views. (Editor.)*

The non-return of a tapespondent's tape is absolutely despicable. I'm sure if we shared your experience Mr Williams we should feel very sore too. Fortunately the percentage of people in this country who are dishonest is small indeed, which leaves an awful lot of decent people. I would suggest that you try again, Mr Williams, and make a contact through one of the clubs mentioned in *ATR*. This is how I got my first tapespondent. We wish you the best of luck with the two BASF tapes, a nice gesture by the Editor, and I can assure you that the Union Jack is still flying the right way up in this country. . . .

Montrose, Angus **Bill Paton**

. . . I was sorry to read about Mr Williams' misfortune in being let down by two British tapespondents. I cannot agree with his judgment that British tapespondents are wholly unreliable and dishonest since he had only had dealings with two persons who kept his tapes. Usually when tapesponding small tape reels are used, so I was surprised that he had sent large reels of tape. I have corresponded with many countries and I have occasionally been let down, but never decided that a certain country's tapespondents were completely unreliable because of one or two bad cases. . . .

Torquay, Devon. **E. Tomes**

It seems that your reader Mr Williams is a sour man and has little sense of proportion or tolerance. On the other side of the grim picture he paints there are those of us who have had little success with Australian tapespondents. In my case three of them kept the tapes I sent, one returned my tape with a recording of unpleasant and not funny jokes ending with high-pressure sales talk with the object of selling me an 8mm movie film of very doubtful propriety. The fifth does return my tapes from time to time on a five-to-one ratio against me. As those which are returned are usually diatribes against anything English, I feel that I lose very little. Nevertheless, unlike Mr Williams' silly philosophy, I do not judge all Australians as dishonest descendants of deported convicts. I have met a great number of excellent Australians and I feel sure that some of these will own a tape recorder. I don't know what age Mr Williams is, but he really ought to 'grow up'. . . .

Bedford **K. G. Dinsdale**

Now let's all simmer down and read the advice about Tapesponding by Bernard Ashfold of Worldwide Tapetalk which you will find on page 18. (Editor.)

No shady dealings!

I beg you to allow me a small space in order that I may reply to Mr Bradley – *ATR*, August – who not only implies dishonesty in my obtaining a tape from you, but hints at shady dealings with the Post Office!

I would first point out that the letter you published – *ATR*, May – was written in good faith with no thought of gaining a prize. It contained a genuine query together with the figures quoted. Does Mr Bradley imagine that I stated my own price when I sent my first tape airmail? Have you ever 'haggled' with a Post Office clerk? I was quoted 22*s* 6*d*; – I expressed concern – confessing that my name was not Rockefeller – and was simply told that if I filled in the Customs form the tape would go Parcel Post at 5*s* 6*d*. I did not understand this, but complied and left the PO with visions of my tape being flown across to Canada in an ancient machine surrounded by crates of cabbages! It arrived, so I've continued to send my tapes this way – clearly labelled. I can only assume that Mr Bradley is either an ambitious PO employee or one of the numerous busybodies lurking in our midst. If he has 'inside information', perhaps he would explain why a tape in a box wrapped in brown paper is *not* a parcel! What is it – a bunch of violets?

Dozens of my tapes have now crossed the Atlantic without loss, which says much for the Post Office and a great deal more for the kindly tolerance of the Creator who has overlooked my sins. Had Mr Bradley been in His shoes, doubtless many feet of good tape would be lying on the bed of the ocean by now.

I *will* return my pre-recorded tape if you request it, but if this reply happens to earn another – send it to John Bradley!

Ashe Warren, Hants. **M. W. Denny**

YOU CAN MAKE *PROFESSIONAL* RECORDINGS —WITH CARE

by P. T. Hobson*

Amateur musical groups in Britain often like to keep a record of their efforts, partly to be able to judge their progress, partly perhaps to offer their friends and supporters a tape recording of their work as a souvenir. To make a 'professional' recording requires a basic knowledge of microphone techniques and, although one does not have to be an audio engineer to succeed, by following some simple rules you and your musical group can have a great deal of fun and pleasure out of recording and keeping a library of your musical and other accomplishments.

The most important rule for a good recording is to get the microphone properly placed. To do this, you should know something of the type of characteristics of microphones in general. Of course, the recorder must be good, and a magnetic tape of reliable quality should be used. The mic must be placed in correct relation to the sound source and to the reverberation characteristics of the room where the recording is made. This is because the relationship between the direct and the reflected sound can seriously affect the balance of the recording.

There are two basic kinds of microphone – high impedance and low impedance. And there are three different kinds of polar or pickup patterns associated with them. Impedance means the resistance set up, in the recorder circuits, to the flow of electrical impulses from the microphone to the recorder. Most recorders used for the kind of work I am describing have high impedance mics. These are limited in use because the length of the cable to the microphone can introduce hum and reduce the treble response. Longer cables, up to 100 yards or more, can be used with low impedance microphones without affecting fidelity. But if you intend to connect a low impedance mic to a recorder designed for high impedance units you must use a suitable matching transformer.

Polar Patterns

Pick up or polar patterns are important because they enable you to control the relative volume of sound coming from different directions. The three types are *omnidirectional*, *bidirectional* and *unidirectional*. Omnidirectional mics pick up sounds from all directions with equal sensitivity (Fig. 1A). Bidirectional ones are sensitive mainly to sounds from the front and the rear (Fig. 1B). The pickup pattern of a unidirectional mic is heartshaped and it is most sensitive to sounds from the front, with decreasing sensitivity at the sides and the rear (Fig. 1C). Unidirectional mics are recommended for most recording situations because direct sound reaches them from one direction. Since reverberated sound may come from all directions, the closer the mic is to the sound source, the stronger will be the direct sound (Fig. 2). The distance of the mic from the sound source makes a difference in the blending and the definition of the sound. Definition is the quality that permits the listener to distinguish between voices or different instruments. Blending is the merger of these individual components into a whole piece of music. Sounds are better blended, but less well defined, as the mic is moved away from the source. You may have to experiment and here patience is a virtue, to find the best location for the microphone.

Arranging Groups of Voices

As amateur performers usually sing or play in less than ideal locations from an acoustical point of view, mic placement becomes a matter of trial and error. First you should record the performance and play it back to check your definition and blend. Then you should record each component separately, comparing the recording volume needle. Careful listening to the playback will enable you to regroup the components so that the volume from each is in balance.

Members of a small vocal group, for instance, should keep their heads fairly close together while being recorded so as to get a 'solid' tone. If the group is larger, it should be arranged on steps so that the various components are more or less equidistant from the microphone. Usually sopranos and contraltos are placed in the first row, tenors, baritones and bass behind them on a step. If there are three steps, sopranos should be grouped on the lowest level, contraltos and tenors next, and basses and baritones on the top step.

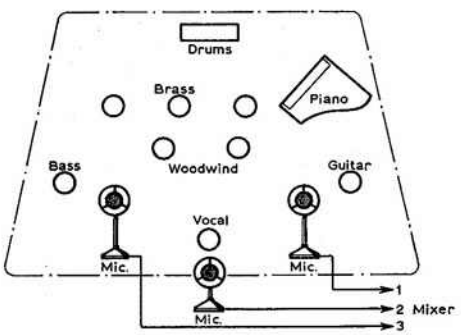


Fig. 2. Careful placement of the microphones is necessary for a group of instrumentalists.

For such groupings the mic should, if possible, be lifted on a boom so that it is approximately the same distance from all the voices. Again, you should make a test recording and then adjust either the mic or the singers to obtain the same relative volume of sound for each of the components. It is surprising how movement of only a few inches can make a noticeable change in the quality of the sound picked up. If you have a soloist, or if one section of the chorus has a particularly important part, the volume can easily be raised by having the soloist move a few inches toward the mic or by having the other voices sing more quietly.

The best way to record larger choruses or orchestras is to use two or three microphones connected to a mixer (Fig. 2). One unidirectional mic could be hung about fifteen feet high, well out into the auditorium, with another, omnidirectional mic hung at about the same height but just over the front of the group and mixed in at a lower sound level. The microphone in the auditorium does the blending, while the other one is used for definition. If two mics are not practical, then one unidirectional mic can be used. This should be suspended over the head of the conductor and it should be aimed away from the orchestra or chorus. By doing this you reduce the volume because the sound comes from the least sensitive side of the mic, but you maintain definition because it is so close to the source of the sound. You should always remember that having an audience will change the nature of the sound. The effect is the same as soft furnishing which will of its own accord absorb some of the sound and also reduce the effect of reverberation or room echo.

In the final analysis, the quality of a recording depends on the art of the recordist. Results can vary from adequate to superb in accordance with the care and patience expended. So a fine recordist uses his machine as he might a musical instrument, with imagination and with heart.

** P. T. Hobson is the Technical Manager of Magnetic Products (3M Scotch Tape), Minnesota Mining & Manufacturing Co Ltd.*

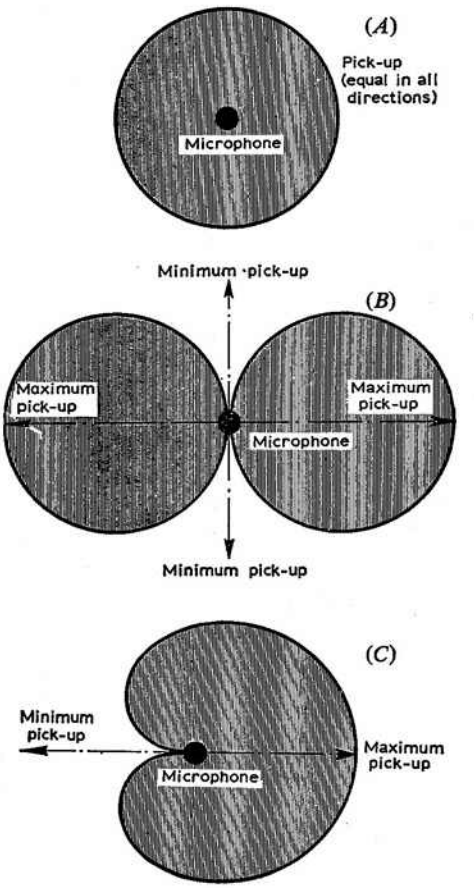
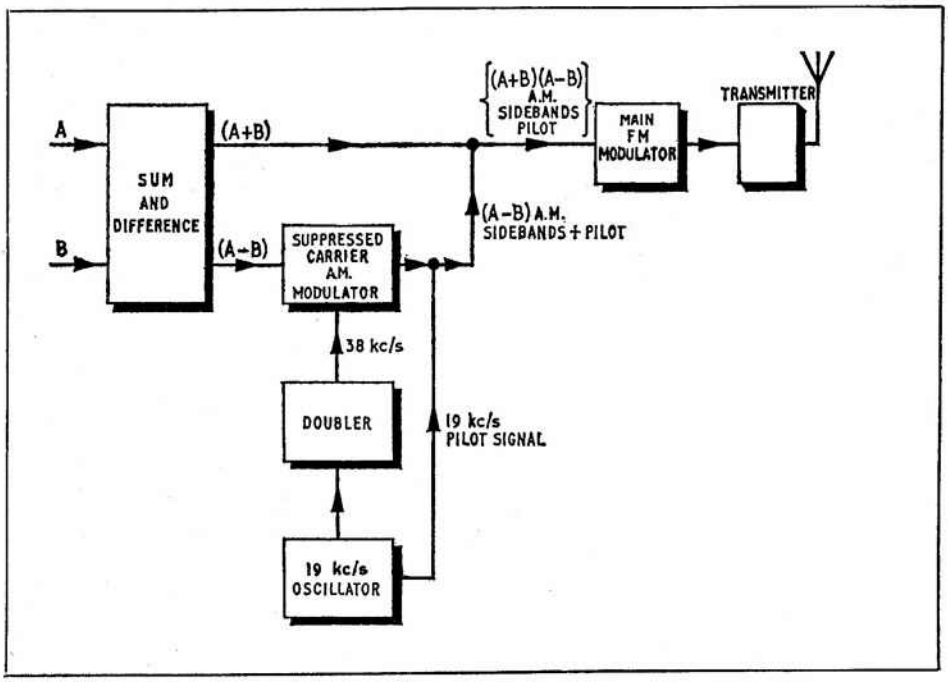


Fig. 1. Polar responses of microphones: (A) Omnidirectional, (B) Bidirectional, (C) Unidirectional (cardioid).

STEREO BROADCASTS BEGIN

By A. Lester-Rands



The GE-Zenith pilot-tone system.

Although the BBC stereophonic transmissions from the Wrotham (London and South-east) FM station began on 30 July, a little over three weeks ago, I would imagine that very few *ATR* readers are already receiving and recording them – in stereo that is. Whilst the majority of FM tuners at present in use may be 'wired for stereo', few, if any, have the necessary multiplex adaptor which separates the A and B (left and right) stereo signals ready for connection to a stereo amplifier or tape recorder. Why? Mainly through lack of foresight on the part of the manufacturers of stereo FM tuners and partly because the BBC failed to notify the manufacturers well enough in advance to enable them to get into production with adaptors and tuners complete with adaptors. A case of six of one and a half dozen of the other perhaps, but at least stereo broadcasting is established.

The Pilot-tone System

This was developed in the USA by the General Electric and Zenith companies and is a variation of an amplitude modulated sub-carrier system originally introduced by the Mullard company. In the GE-Zenith system the sub-carrier is suppressed and only the sidebands of the amplitude modulation are themselves frequency modulated on to the same carrier along with the main or sum signal. The modulation signal for the sub-carrier is, in all these systems, composed of the difference between the two channel signals so that after the receiver has extracted both the main or sum signal it must be subjected to a further sum and difference circuit in order to extract the original channel signals. If the channel signals are A and B then the system is:

$$\frac{(A+B)}{2} + \frac{(A-B)}{2} = A$$
$$\frac{(A+B)}{2} - \frac{(A-B)}{2} = B$$

In the GE-Zenith system shown in the block diagram the sub-carrier is 38 Kc/s and the pilot signal, from which the system gets its name, is radiated at 19 Kc/s, so that the receiver circuits can decode the stereophonic signals. (Reference: *Stereophonic Broadcasting* by H. Burrell-Hadden – *ATR*, August 1965.) The pilot tone system is a compatible one, i.e. listeners with monophonic tuners or receivers will receive in mono and those with tuners plus the multiplex adaptor will be able to receive in mono or stereo. There are, however, one or two problems, the foremost being an inherent reduction in signal to noise ratio. For the mono listener this may amount to 3 to 4 dB, but on stereo may be as much as 15 dB. This degradation can be reduced somewhat by employing a sensitive tuner and a really good aerial system. Most modern FM tuners have the required sensitivity so it remains that a first-class aerial is a must for good stereo reception.

Recording Problem

For normal reproduction via a stereo amplifier, the filtering of any residue 19 Kc/s pilot tone signal at the tuner output is adequate, or should be. When a stereo tuner is directly coupled to a tape recorder, however, there may arise the problem of residue 19 Kc/s pilot tone signal getting through and producing spurious audible tones by 'beating' with the bias oscillator. This applies whether recording in mono or stereo. The manufacturers of stereo tuners say they are not concerned with this and that it will be up to the manufacturers of tape recorders to incorporate suitable filters at the recording inputs or at least raise the bias oscillator frequency so that any spurious signals fall outside the audio spectrum.

It should also be known that stereo tuners by American and other foreign manufacturers may not be suitable for the proper decoding of BBC stereo broadcasts. This point should be very definitely established when buying a stereo tuner.

Finally we come to the correct connections between the stereo tuner output sockets and the stereo amplifier or a tape recorder.

Tuner manufacturers should label the output sockets correctly, i.e. *left* and *right* respectively in order that the correct channel designation can be carried on through to the two loudspeakers. The stereo reproduction should finally appear to the listener as though he were present at the original broadcast, in the studio and facing the orchestra or whatever the source of sound. The A and B channels as transmitted are *left* and *right* respectively and when connected to a tape recorder should be as follows: ***A or left-hand channel – upper track, B or right-hand channel – lower track.*** I feel that this should be clearly indicated on all stereo tape recorders and that stereo tuners and amplifiers should also be clearly marked as to which are the left and right channels at all input and output connections. Very few stereo tape recorders, stereo amplifiers or stereo tuners are marked in this way.

I hope that the BBC will transmit stereo balancing signals of some kind from time to time so that the respective channel connections can be checked and correct loudspeaker phasing carried out. Incidentally, most BBC stereo broadcasts will originate from two co-axially aligned microphones, but for some programmes, such as drama and for certain kinds of pop music, an injection system may be used, i.e. deliberate placement of a soloist or voice to the left, right or centre by means of a separate microphone.

HINTS ON TAPESPONDING

By Bernard Ashfold

In May of this year **Worldwide Tapetalk,** Great Britain's largest tape exchange club, celebrated its fifth anniversary, and, as is usual at this time, we decided to take stock of what has been happening during those first important years, and we realized that a number of queries have been raised regularly during that time, so the purpose of this artice will be to explain the art and hobby of tapesponding to those people who may be contemplating taking up this for the first time.

The obvious place to start is with the question *What is tapesponding and what does it involve?* Tapesponding is a modern way of fostering international friendships and understanding by corresponding through the medium of personal tape-recorded messages. It involves the use of imagination to think of ways in which to present a good recording, time in which to make the tape and patience to get everything right. Once a prospective member is interested, he or she wants to know if the equipment is suitable. The simple answer is that any recorder which uses standard tape, operating at a conventional speed, normally $1\frac{7}{8}$ or $3\frac{3}{4}$ ips, and which has normal tracking (that is, where the tapes pass from left to right over the recording head) can be used with success for this purpose. Care, however, must be taken when swapping tapes made on two- or four-track machines.

In order to start tapesponding one must obviously have someone to talk to. The cheapest way of finding tape pals is to examine the lists published in *ATR* and similar magazines, but a much more satisfactory method is to join one of the organizations which promote this hobby. Most of them, like WWTT, are non-profit-making and open to all. Advantages of joining one of these clubs are that for a small charge they can supply a list of prospective tape-correspondents from which there will be several suitable contacts.

WWTT publish regularly a magazine distributed to all members which helps to maintain the friendly atmosphere on which they pride themselves and also it helps to reduce the fright some people get on seeing the expensive equipment listed by some members. In fact many members turn to the magazine before ever touching the contact lists which are issued three times a year. Each list is also revised annually. Should any member still experience difficulty in making contacts, personal help is available from the head office. Other advantages are that technical advice and help is available and also a number of suppliers offer discounts on equipment and supplies.

Once contact has been established, the question of what to talk about often arises. What goes on to the tape varies from member to member and every tape is different. Amongst WWTT membership there is at the age of 16 the youngest professional recordist in the world who regularly dubs recordings he has made professionally. Another member relays short-wave broadcasts and inside information on the private radio stations. Another member conducts his tapes entirely in lyrical verse right from '*Hello*' through to '*Good-bye*'.

These perhaps are extremes, but they show that there is something in tapesponding for everyone, be they ordinary housewives who want to exchange a few recipes and gossip, or doctors and other professional men who wish to discuss problems with their opposite numbers abroad.

Also it must be borne in mind that many little things which happen daily and are perhaps taken for granted by local people may appear differently to friends from the other side of the world. Teachers are also using these exchanges to bring geography and current affairs lessons to life. Pupils are finding the fascination of listening to young people of their own age and background backing up the facts and figures their teachers have already given them.

The next problem often encountered is that of packaging the tape so that it will arrive safely. The most satisfactory method the writer has found is to use the heavy manilla clasp envelopes supplied by most printers. A $6\frac{3}{4} \times 4\frac{3}{4}$ in size will easily accommodate the usual 3 in spool and leave adequate space for stamps, customs label, etd., which can then be cancelled by the authorities without risk of damage to the reel. The writer has seen envelopes which have done round trips of over 20,000 miles and which are still in a usable condition. When addressing envelopes, it is best to print clearly to give the foreign postal sorters a chance. The sender's name and address should appear on the back of the envelope. It is also a good rule to speak both names and addresses on to the beginning of the tape. Postage by air mail is expensive and only recommended when time is short.

There is only one other point to be covered, that is the liability of the *tape-talkers* to acknowledge all letters and to return all tapes as quickly as possible. Tape exchanging is based on trust, trust that all tapes will be returned in the condition in which they were sent. In many countries recording tape is expensive and even a 3 in reel can be a heavy loss. By joining a club you are obligating yourself to answer all requests to tape even if only with a polite 'no thank you'.

To those who are interested, the membership fee of Worldwide Tapetalk is 12*s* 6*d* per annum. Full details and membership forms can be obtained from The Secretary, Charles L Towers, 35 The Gardens, Harrow, Middlesex, England.

(*The author of this article, Mr. B. Ashfold, is the press and public relations officer of Worldwide Tapetalk.*)

Note: Details of the Phonopost service can be obtained from the special supplement to the Post Office Guide. Apply to your local post office.

TAPE DIRECTORY

Particulars of Tapespondents are given in the following order: name, age, occupation, address; special interests, tastes in music; type of machine, spool sizes, speeds; area of tapesponding required.

NATAL

Daniel Coetzee, 35, police officer, PO Box 100, Dundee, Natal. Photography, cine; light classical. Philips two-track; 7 in, $3\frac{3}{4}$. Anywhere abroad.

BEDFORDSHIRE

M. L. J. Major, 20, progress chaser, 31 Bradford Road, Toddington, Nr Dunstable, Beds. 8mm photography, motor sports; jazz, some pop. Cossor, four-track; 7 in. $1\frac{7}{8}$, $3\frac{3}{4}$. Any English-speaking country.

CAMBRIDGESHIRE

J. Coles, 35, park custodian, 580 Coldhams Lane, Cherry Hinton, Cambridge, Cambs. Wild animals, photography; organ music, military bands. Philips 3552, Fidelity PM; $5\frac{1}{4}$ in, $3\frac{3}{4}$. UK, Austria.

CHESHIRE

Archie and Helda McCorkindale, 50, engineer/housewife, Bethany, 127 Borrowdale Road, Moreton, Cheshire. People, life, religion, philosophy, spiritual healing, psychical study, motoring, caravanning, astrology; all except beat and heavy classical. Stella ST 459, 7in, $\frac{15}{16}$, $1\frac{7}{8}$, $3\frac{3}{4}$, $7\frac{1}{2}$. Anywhere English-speaking.

ESSEX

Vincent Murray, 23, hospital receptionist, 1a Manor Road, Woodford Bridge, Woodford Green, Essex. Cars, cine photography, tape recording; pop, C/W, Irish showbands. Philips; $5\frac{1}{4}$ in, $3\frac{3}{4}$. Male contacts only, UK, Ireland, Australia, USA, Scotland.

HERTFORDSHIRE

Alan and Margaret Self, 30/25, engineer/housewife, 84 Musley Hill, Ware, Herts. Colour photography (35mm slides), tapesponding, do-it-yourself; all except heavy classical. Cossor CR 1604, four-track; 7 in, $1\frac{7}{8}$, $3\frac{3}{4}$. Anywhere, no need to write.

LANCASHIRE

Melvyn Beadlestone, 19, storekeeper, 2 Mather Street, Atherton, Lancs. Opera-going, movie-making, radio-listening; light classical, opera. Ferguson 3212; $5\frac{1}{4}$ in, $1\frac{7}{8}$, $3\frac{3}{4}$. Italy, America.

LONDON

R. Brian Dunkley, 39, cinema projectionist, 80 Herne Hill, London SE24. Round Robin tapes, travel, reading, photography; anything but pop and heavy classical. Civic T62, Fidelity TR7, Grundig TK100; 7 in, $1\frac{7}{8}$, $3\frac{3}{4}$, $7\frac{1}{2}$, 15. Anywhere in UK and Europe.

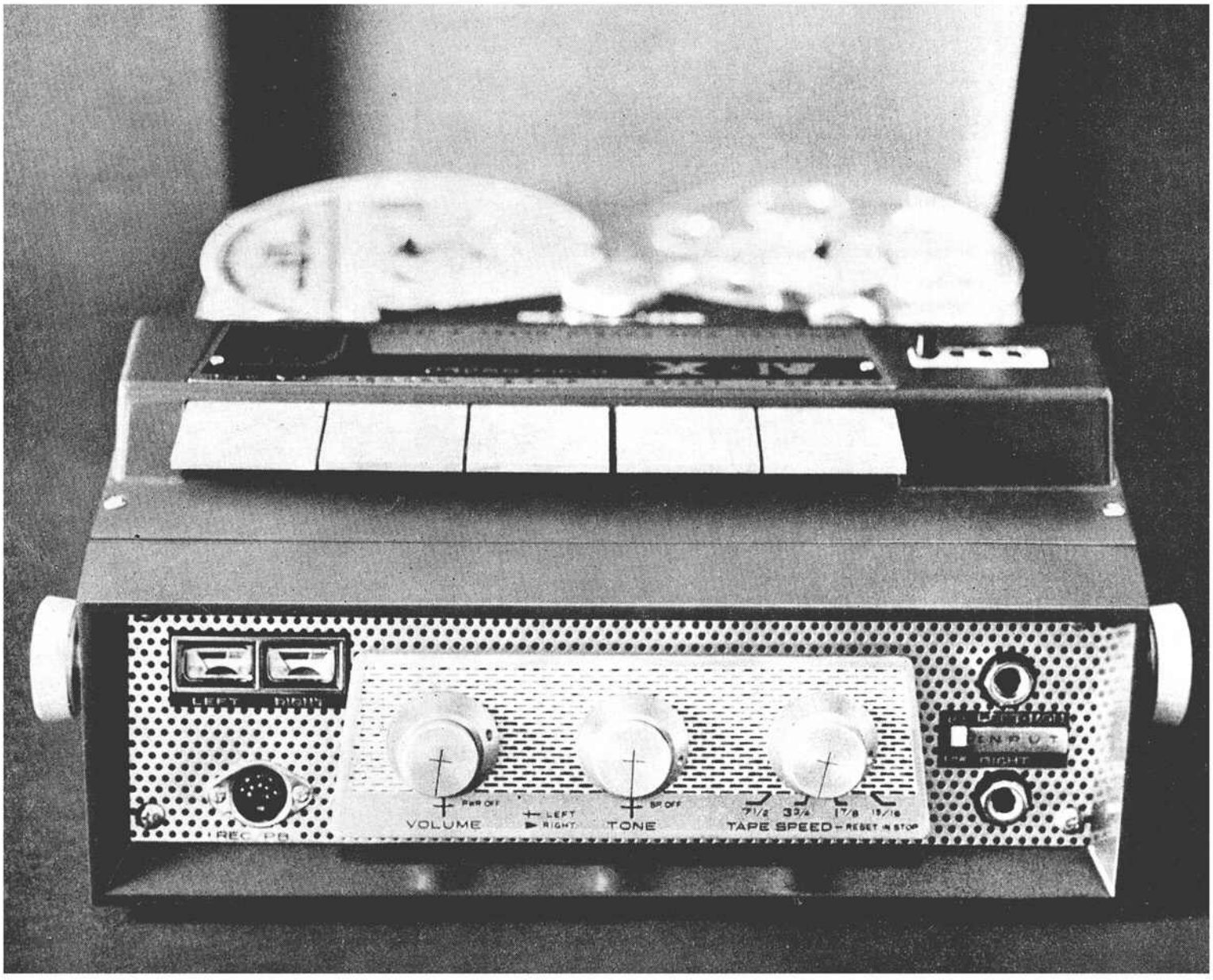
STAFFORDSHIRE

Malcolm Smith, 16, cinema projectionist, 121 Friary Crescent, Springfields, Rushall, Walsall, Staffs. Radio, television; pop. Fidelity Playmaster, four-track; $5\frac{1}{4}$ in, $3\frac{3}{4}$. America.

SUFFOLK

D. E. Weston, 21, student teacher, 13 Minden Drive, Bury St Edmunds, Suffolk. Geography, photography, children; classical, Gilbert and Sullivan. Truvox R42; 7 in, $1\frac{7}{8}$, $3\frac{3}{4}$, $7\frac{1}{2}$. As many as possible.

More Tape Directory entries appear on page 41.



Want to carry a battery stereo tape recorder with you?

Take the Akai X4 with the unique Crossfield Head

The Akai X4 weighs 12½ lbs. It has a fully rechargeable battery. It has a 5" tape reel, 4 speeds and 4 tracks, and a maximum 17 hours of recording. It will give you stereo or mono. It will give you 20,000 cps response ± 3db at a recording speed of 7½ inches per second.

So how's it done? The secret is partly in Akai's unique Crossfield Head. On conventional recording heads the bias current tends to erase the higher frequencies. On the Akai Crossfield however the bias current is fed into a separate head opposite the recording head in such a way that it can't interfere with the higher frequencies. This makes possible true high fidelity recording at much slower tape speeds than normal.

So it adds up to this. The Akai X4 is a true portable. Yet within its slim lines and for its modest price of 131 gns., it gives you recording of a quality and versatility you'd normally expect only from much larger equipment. For further details simply mail the coupon to us.

To Pullin Photographic Dept A.T.R.9.
11Aintree Road Perivale Middlesex
Please send me details of the Akai X4

name_____

address_____

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AKAI PULLIN PHOTOGRAPHIC

SOUND SCENE

Professional Recorder

We occasionally receive enquiries about professional-class tape recorders which are of course very expensive. Two new models by Akai which were released recently may well be of interest to those of our readers who would like a fully fledged studio recorder.

One we would probably all like to possess is the Akai PT5011 professional full-track recorder shown in Fig.3, but before you get too interested we'd better quote the price, namely £600 or rather *from* £600 as the brochure quotes. The PT5011 has three separate heads, erase, record and replay, and three separate drive motors. It runs at 15 and 7½ ips and takes 10½ in NAB spools. Here are the main points from the specification:

Heads	Recording head: Full-track, low impedance 45 ohms at 90 kc. Playback head: Full-track, high impedance 2,500 ohms at 1 kc. Erase head: Full-track erase, low impedance 500 ohms at 90 kc.
Motors	Hysteresis synchronous two-speed motor for capstan drive. Two six-pole induction motors for tape supply, fast forward and rewind operations.
Tape width	¼ inch.
Recording	Full-track recording.
Tape speed	7½ ips and 15 ips.
Frequency response	30 to 18,000 cps ± 2 dB at 15 ips. 40 to 12,000 cps ± 2 dB at 7½ ips.
Wow and flutter	Less than 0·10% rms at 15 ips. Less than 0·15% rms at 7½ ips.
Distortion	Within 2% for all tape speeds.
Signal to noise ratio	Better than 55 dB at all speeds.
Equalization	NARTB or CCIR.
Input impedance	Microphone 600 ohms. Line { 600 ohms. / 10 K.ohms.
Input level	Microphone −70 dBm. Line −20 dBm.
Line output impedance	600 ohms.
Line output level	+4 dBm.
Reel	10½ in or 7½ in. reels of NAB, DIN, IEC.
Fast forward and rewind	About 90 seconds for 2,400 ft.
Monitoring	High impedance headphone jack provided.
Safety interlock	Interlock mechanism provided to guard against accidental operation of erase head.
VU meter	VU meter for recording level, output level, AC level and bias level.

It is interesting to compare this specification with that of a typical high quality domestic tape recorder, particularly the frequency response at 7½ ips, namely 40 to 12,000 c/s.

Fig. 1. The Akai X300 our-track tape recorder.

Why, you may well ask, does a professional tape recorder have an upper frequency response limit of 12,000 c/s when many domestic class recorders have a frequency response extending to 20,000 c/s? The answer is somewhat involved, but takes into account such things as noise level in the upper frequency range, low distortion and a guarantee of the recorder maintaining its high frequency performance far longer than a domestic class tape recorder. In most domestic tape recorders the quite unnecessarily extended high frequency response is only obtained at the expense of quality loss, i.e., distortion and/or excessive noise level. It is usually achieved by high recording amplifier gain at the upper frequencies and by the use of narrow gap record/replay heads which can very soon wear, resulting in a loss of hf response in any case.

Professional or semi-professional?

The second recorder, classed as professional and shown in Fig.1, is the Akai model X 300 which sells at £199 10*s* 0*d* and is a four-track mono/stereo machine. Like the PT5011, it features the Akai crossfield head system.

However, we think this particular recorder should be tagged semi-professional as also the Akai X 355 which sells at just over £250 and is also a four-track (on ¼ in tape) model. The X 355 also records mono or stereo. Further details of these recorders can be obtained from Pullin Photographic Ltd, 11 Aintree Road, Perivale, Greenford, Middlesex.

Get a Tiger in your Tape Recorder!

. . . or rather a cheetah. Derek Worman, an *ATR* reader from Johannesburg, South Africa, sent us the photograph (Fig.4) of himself encouraging the cheetah to say a few words about tigers. Petrol manufacturers should note that cheetahs are much faster than tigers anyway. Derek Worman has promised us a story about this particular cheetah and about tape recording activity in South Africa.

New Moving Coil Microphone

The LEM DH 80 shown in Fig.5 is a dynamic moving coil microphone designed for general purposes. It is a small lightweight microphone with excellent characteristics for recording, since the frequency response can be modified for music or close speech. A built-in transformer caters for either high or low impedance input microphone sockets. Technical features are as follows:

Directivity	Omnidirectional.
Sensitivity	50 ohm type – 0·085 mv for 1 Bar (−82 dB). 200 ohm type – 0·16 mv for 1 Bar (−76 dB). 80K ohm type – 2·4 mv for 1 bar (−52 dB).
Frequency response	Music setting: low impedance 70–14,000 cps ± 4 dB. Music setting: high impedance 70–10,000 cps ± 4 dB. Speech setting: low frequency drop below 200 cps.
Dimensions	Length 2⅜ in. Diameter 1⅜ in.
Output	Through shielded cable (approx. 2 yards).

The LEM DH80 microphone can be used with a desk stand or as a hand-held microphone or clipped to a coat lapel. The sole agents in the

UK are D. A. Lyons Ltd, 32 Grenville Court, Dulwich, London SE19. The DH80 (50 ohm model) retails at £6 10*s* 0*d* and the DH80 high or 200 ohm model at £8 7*s* 6*d*.

Two More Sanyo Recorders

The first one is the Sanyo MR 225 *Blueboy* portable which is quite low priced at £16 16*s* 0*d* and is shown in Fig.6. It is a two-track recorder, capstan driven and designed for portability. It has a single operating speed of 1⅞ ips and employs eight transistors. Frequency response is 200 to 3,000 c/s, which makes it rather more suitable for speech recording only, such as tapesponding, etc. The second model is the MR 701 *Brigadier* (Fig.2) which is a two-speed mains model retailing at £40 19*s* 0*d*. This one features an automatic recording level system and two-track recording. Frequency response is again rather limited, being 100 to 8,000 c/s at 3¾ ips and 100 to 4,000 c/s at 1⅞ ips. It also employs a dc erase system which suggests the possibility of high tape noise level. Further details from Sanyo Sales & Service, 23 Savage Gardens, Trinity Square, London EC3.

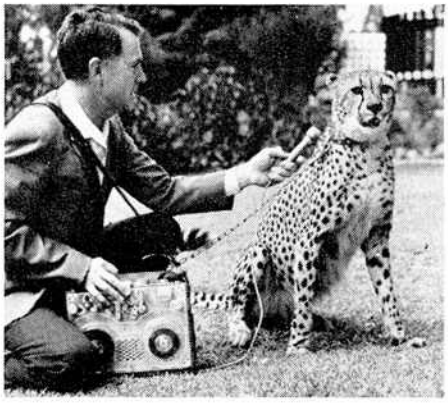


Fig. 4. ATR *reader Derek Worman of Johannesburg interviews a cheetah!*

Fig. 5. The LEM DH80 microphone which has a two-way frequency response.

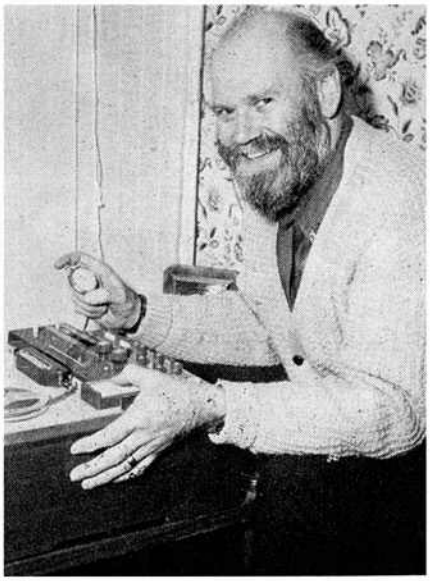
Fig. 2. The Sanyo MR 701 Brigadier, *a new mains tape recorder with automatic record control.*

Fig. 6. The Sanyo MR225 Blueboy *portable tape recorder.*

Fig. 3 (above). The Akai PT5011 professional studio tape recorder.

Fig. 7 (right). The Akai stereo/mono studio recorder Model X355.

TAPE REVIEWS



by Russ Allen

This month — André Previn, José Motos, The Animals, Stravinsky and Mozart

André Previn, The Previn Scene. *MGM STC* 3908 *Hi-Fi Track Stereo, 7½ ips. Manufactured by Ampex. Imported by EMI.*

A year or two back I spent a very delightful afternoon at the Savoy Hotel with André Previn and his wife. We just sat and talked and I could happily have gone on listening to him for hours more. He has great charm, modesty and appeared as interested in me as I in him. How could I fail to like a man like that? Previn's music is to me every bit as interesting. He came on the scene as a jazz man, he still is, but he has also blossomed as a composer of film music, has recorded with symphony orchestras, and must be one of the most successful young men around light music today.

This particular tape is jazz-slanted, though some of them are backed by vast banks of David Rose strings. Four of the 12 tracks are with small jazz groups featuring such notables as bassist Red Mitchell, drummer Shelly Manne, trumpeter Blue Mitchell, etc.

Because Previn is such an established man in the fields of TV, film and classical, he is often dismissed by jazz critics who probably feel that you can't be so polished and still play jazz. Hogwash, I say, and for all I know everything he plays is written out beforehand. One thing I do know, quite a few vaunted jazz players seem to trot out the same chorus over and over again. So far as Previn goes, he sounds superb to me and what he plays, be it written or improvised, swings, sounds original and a hell of a sight more interesting than some of the lesser known pianists who manage to get rave reviews from popular press.

For massed schmaltz strings, *Little Girl Blue* is treated with oozles of them and in similar vein on track two *Young and Tender*, Previn can wring much pathos from his keyboard; 'he fair makes it cry.' Also string-full but very excitingly beaty is *Blue Holiday* which zings along.

Altogether an excellent tape – well produced, packaged, recorded and of course played by André Previn and Co, to whom many thanks.

Stravinsky conducts Stravinsky/The Firebird. *The complete ballet in the original* 1910 *Orchestration with the Columbia Symphony Orchestra. Columbia MS* 6328. *Four-track Stereo, 7½ ips.*

Recorded, it says, in honour of the composer's 80th birthday, meaning it was recorded in 1962, Igor having first seen the light of day near St. Petersburg in 1882.

Only a few nights before writing this I had the pleasure of watching the TV film of Stravinsky visiting his old haunts and talking to US schools and I found him entrancing. I would dearly love to meet him.

Firebird was composed around about 1910 for a Diaghilev ballet. Of the performance I can say nothing but 'Viva Igor.' While composers are not necessarily the best conductors, I don't think such a criticism can be levelled at this maestro.

Recording is splendid and Columbia have included an intensely interesting leaflet written by Stravinsky full of intriguing and humerous anecdotes as, for instance, when he recalls the first night of *Firebird* in Paris and Diaghilev had the idea that real horses should march on stage. *The poor animals did enter on cue all right but they began to neigh and whinny and one of them, a better critic than an actor, left a malodorous calling card.*

Stravinsky is not for those who require smooth easy-to-ignore background music, nor is he easily assimilated. It is meaty, sometimes sad, sometimes mad, exciting stuff full of grand crashing percussive crescendos. If you don't know his work, be assured you'll not be bored. Stupendous!

José Motos, Viva Flamenco! *World Record Club TT* 326. *Two-track Mono, 3¾* ips. Finger-style acoustic guitar playing is so much cleverer, so much more interesting and so much more beautiful than the electronic gyrations of the pop guitarist. There is not really a true comparison – they're not of the same culture. I'm not condemning the pop plague (far from it, as I can also enjoy that cult), but the sound produced by José Motos is like comparing the latest Rolls Continental to a bicycle. They both get you there but in such a vastly different way. Me? I prefer a Rolls and José.

He is a master guitarist and my wife tells me that he is as well known in Spain as Segovia. His playing has much fire and though the performance is not always flawless it has all the thrills and zest one expects from a set that's labelled *Viva Flamenco.*

Recording is first class and it is an exhilarating tape.

Anita Sings Jazz. *Anita O'Day with Oscar Peterson, piano; Herb Ellis, guitar; Ray Brown, bass; Milt Holland, drums. World Record Club TT* 244. *Two-track Mono, 3¾ ips.*

Miss O'Day has the distinction of being possibly the greatest white female jazz singer. More, she is a human instrument. A frighteningly efficient vocal technician who can distort lyrics, time and tune to the point where lesser musicians fill with fear and trembling that she will never make it back but, dammit, she always does.

This recording must be quite a few years old but doesn't suffer because of that. The redoubtable Peterson and group do a sterling backing job and even get to contribute the odd solo half chorus. If ever you saw that 'shot off the cuff' jazz film *Jazz on a Summer's Day* then you will remember that Miss O'Day featured muchly and delightfully.

As with most jazz singers, she sticks to the standard pops of yesteryear. *S'wonderful* taken at a cracking pace, *Tenderly, Old Devil Moon, Love Me or Leave Me, Stella by Starlight,* etc., and quite the loveliest both instrumentally and vocally, mainly because Anita appears more aware of the lyrics' import, *I've Got the World on a String,* and so on to finish with an Anita-twisted *Bewitched.*

The title tells the story: Anita Sings Jazz.

The Most of the Animals. *Columbia TA-SX* 6035. *Two-track Mono, 7½ ips.*

Eric Burdon, the Animals singer, is quite the best British R & B man still working with a group or at least he was when this was written, but will almost certainly be out on his own by the time this is published. He is extraordinarily good and the entire quintet backs up and responds with splendid rapport.

Some of these numbers are stupendous; particularly I liked the heart cry *Don't let me be misunderstood,* words of which are so much an everyday problem, and Burdon sings as if it were his very own worry. In fact, Burdon sings all his numbers as if he were personally involved and the group build up the excitement behind him so that each track (with the exception of a couple of irritating fades) builds up a grand climax. For me the Animals are one of the best sets in the country and certainly knock the Stones for six, with Burdon outsinging the over-publicized Jagger every time.

Instrumentally they're interesting too with some good guitar work, a very adequate organist, and it's probably him who turns out some good barrelhouse piano on *Mess Around.*

Yes, I believe you could call me an Animal fan. For those who like R & B style pop this is a must.

Eine Kleine Nachtmusik. *Bruno Walter conducting the Columbia Symphony Orchestra. Columbia Four-track Stereo, 7½ ips, MQ* 543.

Wolfgang Amadeus Mozart wrote the title music in 1787 as a four-movement suite for string quarter or string orchestra.

Considering his short life span (born 1756, died 1791), his output was prodigious. He started writing short pieces at the age of six and his first full opera at the age of 14 – *Mithridates, King of Pontus.* His field was seemingly limitless, operas, over forty symphonies, concertos, string serenades, quartets, quintets, sonatas for piano and violin, church music, masses, lieder, duets, arias, etc.

Despite his brilliance and the success of his operas, he gained little monetary reward and at his death went to a pauper's grave. Bruno Walter, who died about four years ago in California, was an ardent promoter of Mozart's works and conducts them with true sympathy. Apart from the Nacht Musik, there are recorded here the overtures to the *Impressario, Cosé Fan Tutte, Marriage of Figaro, Magic Flute* and in contrast the *Masonic Funeral Music.* Recording and packaging are of the high standard we expect from American Columbia, and there is also an odd little pamphlet called *Bruno discusses Mozart with Arnold Michaelis*; quite interesting in itself but having little to do with the contents of the album. I liked it very much indeed. Mozart and beautifully treated!

ARE YOU COVERED ?

John Gaselee points out some of the advantages of proper insurance for your tape recorder and accessories.

By Insurance, we mean

It is well worth insuring a tape recorder so that, whether it is lost, stolen or dropped, it is fully covered, and you will receive the money from the insurance company to buy a replacement. Usually anything kept in a house is covered under what is known as a householder's **comprehensive** policy, but the chances are that you will need wider insurance cover than this. Although this policy will cover a recorder against fire, burglary and various other risks, you will not be paid a claim if it is stolen from a car or a train, nor if you drop it accidentally and find that it will be very expensive to have it repaired.

What you will need is an **all risks** policy. Don't be confused by the name. In fact, it will *not* cover every single eventuality. For instance, it is not a form of maintenance contract (which includes breakdown from any cause) which you may have for a television set. This means that you will not be able to claim from the insurance company for mechanical or electrical breakdown. In other words, if the recorder merely *goes wrong*, the chances are that your insurance company will not pay. If, however, it has been damaged by some accidental means, you will be able to claim.

Under some policies, tape recorders are covered only whilst in a club, hotel or other premises, or whilst in transit. This means that if you are recording anything in the open air, you may find that there is no insurance cover in force. This is a point which you should check in advance. If you will be using the recorder a great deal out of doors, it may not be worth while to have a policy with this restriction in it. Otherwise, if it is only on odd occasions that you will be recording out of doors, probably the best arrangement is to advise the insurance company in advance and to ask them specially to cover the tape recorder. They may be quite agreeable to co-operate in this way.

As it is really only *accidental* loss or damage which is covered, you will not be paid for repairs or replacements which are necessary due to wear and tear or gradual deterioration. Nor will there be any cover when you take the recorder to be cleaned or repaired – so find out the conditions on which the dealer accepts it, and see that he is responsible for any loss while the recorder is in his hands. Generally speaking, you may find that the breakage of valves and/or filaments is not covered. Nor are other glass parts usually insured – unless the apparatus containing them is damaged at the same time. This is reasonable enough.

Incidentally, as in any insurance policy, detention or confiscation by the Customs is excluded. Otherwise the insurance company would be aiding and abetting you for smuggling! Of the other important exclusions, the one which you are most likely to meet excludes theft from an unattended vehicle. This, however, is not quite so bad as it sounds. For claims *will* be paid if the theft is from a car of the fully enclosed saloon type – provided all the doors, windows and windscreen were closed and the car was *locked* at the time. This is an important point to remember.

If this sounds like a list of disasters which are not covered by a policy, at least it means that practically every other kind of loss or damage will be paid for by the insurance company – provided you take proper care of the recorder. If you are *too* careless, the company could turn down the claim. Probably you will have to complete a proposal form before the insurance is in force. On this form you will have to give your name and address, and details of the recorder and other equipment which is to be insured with it. These details, by the way, can be a great help in trying to trace it if it should be lost or stolen when it is insured.

What will it cost?

How much will the insurance cost? Not all companies charge the same rates, but you may find that, for a recorder worth £100, the cost is 25*s* a year – which is reasonable enough. It will, of course, be cheaper for recorders worth less than £100. Don't, however, be misled into thinking that, if you insure your recorder and equipment for a particular sum, automatically that amount will be paid in the event of loss. Only the value at the time will be paid. The insured amount is only the *maximum* figure which will be paid. So there is no point in wasting premium by insuring for more than a realistic figure.

Here are some 'case histories' of claims:

One recorder was stolen from the back of a car in a public car park while the owner was having a meal at a nearby hotel. All the doors and windows were closed and locked, and so the claim was paid. The thief had spotted the recorder in the back of the car, and had made his entry by forcing down a window. Insurers would *prefer* one to leave a recorder in the boot, where it cannot be seen, provided it is locked.

During the cold weather, the ceiling of a house suddenly fell in on the recorder – and a few repairs were necessary. The cost of the repairs was borne by the 'all risks' policy.

While on loan to a friend a recorder was stolen from the friend's house. Unfortunately, the friend's policy did not cover it, but it was insured under the owner's 'all risks' policy.

Finally a claim which was not settled: A recorder was stored for some time in a damp atmosphere, and needed overhauling before it could be used again. That, say insurers, comes under the category of gradual deterioration, and is not covered.

J.G.

'My tape recorder is insured. Are you?'

'I 'opes you got that there tape recorder insured, Laddie.'

tape club news

I doubt if there can be any club members who have not heard of the BBC North Region Tape Recording contest. If there are, they haven't been reading *ATR*! But I wonder how many have got their entries under way. With just about a month to go till the closing date, club members who want to enter should put their thinking caps on now and get under way if they have not already done so. This competition is open to all recording enthusiasts from all parts of the country, but naturally enough there is a special prize for the best entry coming from within the BBC's North Region reception area.

For a long time now the audio enthusiasts have been campaigning for a programme of their own on the radio again. If this North Region contest is a success, it could well pave the way not only for a contest with nation-wide coverage, but also for the reintroduction of a radio programme about recording. So there are more reasons than one why a large number of entries is essential for this contest, and it is the clubs who must provide the lead. I know for a fact that many club members who make excellent tapes just do not enter them for national competitions, although they may do so for club contests. As the theme of the competition is 'Summer', why can't all clubs hold their individual club contests to comply with the rules of the BBC contest on this subject, the best two or three entries in each case to be entered for the competition.

Club secretaries and/or programme organizers who want to refresh their memories can refer back to the July issue of *ATR*, page 31, for rules and other details. Meanwhile, I will be looking forward to hearing that the winning tape has come from a club in the *ATR* league. **K.C.**

Audio Star

First club newsletter out of the bag this month is entitled 'Audio Star', but which club it comes from, whoever sent it forgot to say; although I do know that this club meets in the Seven Kings library and has as secretary Dave Bolton. However, Dave, club secretary for the past six years, is relinquishing this job at the club's AGM this month. Also resigning from the committee, because of pressure of work, is Treasurer Alan Forrester, and both these vacancies will be filled at the AGM.

Club members have recently competed in a club quiz championship 1966, the four finalists this year being Messrs Tipper, Faulkner, Budd and Bolton, and the final championship programme was a quiz devised by John Albury. Sound tracks for slides and films have taken up a considerable amount of club time, and included among the items has been the club's competition, 'The Story of the Tower of London'.

BTRAC

Perhaps the oddest situation in the history of the Birmingham TRAC occurred at a recent meeting, when not one single tape recorder was to be found in the club room. This unusual situation was due to an unavoidable breakdown of transport arrangements. In place of the proposed programme, a discussion group was organized by Chairman Terry Morris. Terry drew up a list of subjects, and each member drew a number from a hat and spoke on the subject with the corresponding number on the list. Discussions somehow got away from the subject of recording, but it was felt that by encouraging members to hold forth on the various subjects under discussion, this would facilitate communication with others outside the club, increase fluency of speech, and reduce embarrassment, all of which should help the more reticent members in their recording activities.

Deficit of machines on this occasion was more than compensated at other meetings. Secretary Alan Bird demonstrated his Beocord 2000 recorder, coupled to his Garrard 4HF transcription deck. He was able to monitor the signal into the recorder and the signal off the tape by the mere pressing of a button, and quality at all speeds showed little difference, even to the keen ears of blind member Eric Sheer. Laurie Watson, BTRAC vice-chairman, played back a tape entitled 'The Guns of the Isle of Man'. This amusing tape was the work of three youngsters – David Bell (17) and John Haynes (18), who wrote the script and between them played all the characters, and Paul Simms (21), who edited the material and introduced suitable music and effects. The result was a 30-minute humorous sound programme of excellent quality comparable with many a BBC programme.

But perhaps the most fascinating evening of all was provided by guest speaker Mr Alfred W. Croton, who brought along an original Edison cylinder phonograph and a small selection of his large collection of Edison's famous Amberol cylindrical records. The reproduction of the records was of a particularly fine standard considering that some of the recordings were made as far back as 1912.

Brighton

Members of the Brighton TRC have set up a special production team to demonstrate the work of the club. Recently the team, complete with equipment, descended upon the Southwick community centre to demonstrate equipment to the Albany Production Film Unit, who were surprised at the mass of equipment produced. This included six recorders, a large multi-channel mixer, a stereo amplifier, two slide projectors, two Goodman's speakers, together with the inevitable range of microphones and yards of cable. In the near future the situation will be reversed, when members of the Albany group visit Brighton to demonstrate their films and filming equipment.

'Sound Link', an idea of the Dartford TRS, now includes an item from Brighton prepared by five members and containing recordings of a choir, bird song, Lewes bonfire festivities, and Brighton's 'Petticoat Lane'.

Sound effects of a play by the Brighton Youth Theatre are being prepared. Three recorders are being used for this, and they will be controlled on the two presentation nights by two club members. Membership has now increased to a total of 18, which includes two lady members, the first to brave the club for more than four years.

Coventry

The latest edition of the Coventry TRC's quarterly sound magazine includes the second part of the group's history 'Know your Club', together with a number of tape tips and humorous articles. Also featured is an article by Stan Day, club committee member, on the making of a tape slide show using colour.

A directory of members, including addresses and equipment, has been compiled.

Derby

Recent meetings of the Derby TRC have included a treasure hunt night. In these civilized days the hunt was, of course, carried out by car, each vehicle having a driver and two hunters. The winning car was driven by Mr A. Stanway, his hunters being his son Martin and Nick Potter. A summer outing to Llandudno, complete with portables, was also enjoyed by members. Meetings have included the usual programme features 'All Your Own' – this time presented by Mr H. Barton – and the monthly quiz presented by Miss E. Hassal and won jointly by Mrs V. Barlow and Mr A. Jeffries, and also 'This and That', a news programme by Mr A. Stanway.

Doncaster

A packed month for the Doncaster and District TRC began with a demonstration by vice-chairman George Swan of a Bang & Olufsen recorder. This demonstration was much appreciated by all members, but I am told that everybody entering the demonstration room was first frisked for screwdrivers!

The first of four outside recording sessions was at Wilsik Hall traction engine rally, but, British weather being what it is, windshields were a must. The second outside session was in search of birds (feathered), and ended up at a large lake packed with fish. After falling over many fishermen and generally disturbing the fish, all the members managed to find suitable spots for recording the bird songs, but – the British countryside being what it is – a nearby railway line ran right beside the lake, with a horribly regular two-minute train service. Nothing daunted, a third attempt was made at outside recording, this time at one of the local woods (sandal beet). Here some good recordings were made, but one member, Mr Ralph Broom, was bitten so badly by gnats that he subsequently spent two days off work in bed. Finally, at the fourth outdoor attempt members' efforts were rewarded with success. At a traction engine rally excellent recordings were made of all six steam organs.

Back in the club room, chairman Eric Kibblewhite demonstrated his new Revox, and a Rotherham member presented a slide show. Following the latter, the club has now started its own project of making a one-hour sound track of the sights of London, to be matched with a set of slides provided by a committee member. This project is expected to take at least six weeks.

Ferrograph Owners

At the AGM of the British Ferrograph Owners' Club, unexpected but nevertheless very welcome guests were Mr Richard Margochis and his wife, who dropped in for a chat. After the formalities of the meeting were over Mr Margochis demonstrated his modified Fi-cord 1a and described his methods of recording. Mr Metcalf, the new sales manager for the Ferrograph Company, was also presented, and introduced his theories and intentions to boost sales and, incidentally, club membership. A demonstration tape was made up for the company by George West and Leon Tipler, which will be used in future demonstrations throughout the country.

It is with deep regret that the club announces the tragic death of member Stan Claughton. It has been proposed that a competition cup in his memory shall be awarded for the best tape of the year, as a fitting tribute to a keen member.

The new tape listing has now been circulated among members, and it is interesting to note that more than 50% of the membership is included in the club's Round Robins.

ITACS

This year's winner of the International Tape and Cine Society's Reel Award for the member who was giving the best support to the club magazine *Tape and Cine Reel* over the past twelve months has been won jointly by three members. The three joint winners, who can each choose between a reel of 8mm film or a 5 in reel of LP tape, are Gerry Boarer, Alec Mollison and Skip Shipman. The number of contributors to *Tape and Cine Reel* is on the increase, so competition should be even stiffer next year. The club's annual get-together, which takes place this month in London, will coincide with the making of the Society's film, *The Little Grey Spool*, but for those members who are unable to attend, arrangements have been made to play back recordings of messages, etc., to those able to be there. *Cine Reel's* section on sound tips this month concerns the various types of microphone commonly in use, their characteristics and applications. The information for this came from Fred Wood; Alec Mollison continues his series on Super 8 films, and Doug Palmer discusses pre-amplifiers.

Leeds

The main news from the Leeds and District TRC this month is a change of meeting time and place. The new club room is at Mencap House, 142 Chapeltown Road, Leeds 7, and meetings will now be fortnightly on Tuesdays at 8 pm. This sudden change was effected very speedily, for on the day the offer of the new room was received, members Mike Plant and Bill Rowe made a quick visit to inspect the premises and

reported back to members at the club meeting later the same evening. The proposition was put to members, and the whole thing was fixed in a matter of hours.

The last of the meetings in the old club room included a competition evening, during which play-back of members' three-minute tapes, entitled 'Dawn Chorus', took place. However, this had not meant many sleepless nights for most members, as they had done things the easy way, employing time switches and remote control units while the keen recordists were fast asleep in bed. However, the winning entry from John Newton was made on a Philips battery portable whilst on holiday on a farm, and the time was about 4.45 am.

Bill Rowe and Chris Eagle, whom I understand are known in the club as the Tandberg Twins, had a very interesting live recording session with a group called the David Bates Quartet. The group consists of lead and bass guitars, piano and drums, and all members read music and do their own arrangements; as well as playing dance music in any tempo, they also played modern and set hymn tunes used in church services. Bill and Chris again featured in a gathering at Bill's home to record the Yorkshire Federation Newsletter. At the end of this session Bill's machine packed up, but luckily Chris was able to diagnose microswitch trouble. This led to a very odd occurrence: the receipt of a get-well card addressed to Bill Rowe's tape recorder!

PA facilities and background music for a local fete were provided by Mike Plant, John Newton, Bill Rowe, Chris Eagle, and 'Ron'. Bill and John also assisted with outside games of skittles, hoop-la and electric disc, and helped the organizers raise £500 for the Chapel Allerton Hospital.

Leicester

Loudspeakers formed the focal part of a recent meeting of the Leicester TRC. Members brought along their many and varied types of speaker, ranging from Peter MacFarlane's speaker mounted on a baffle board to Sid Marnoch's paralline. The latter caused many comments, and it was noticed that many members stayed behind for a surreptitious inspection after the meeting was over. Each member described his speaker and the reasons that prompted him either to buy or build that particular type, and each was then compared with the others by playing the same piece of music through each speaker.

Another recent meeting was held in the local St Mary's Church by kind permission of the vicar, and gave the club members an opportunity to record a Hammond electric organ. The church choir very sportingly rendered several anthems to provide a varied programme and a good exercise in recording techniques to overcome the difficulties of church acoustics.

Club chairman Howard Dutson and his wife Margaret, who is also a committee member, were hosts to the club at a recent coffee evening held in their home. This provided an opportunity for a completely informal and very enjoyable get-together.

London

The McManus Cup of the London TRC has been won this year by Ron Tucker, with a choral recording, and second place was awarded to Mike Avel. Play-back of the winning tapes was made on the Sony 521 belonging to member Barry Mitchell.

This meeting was followed by a talk on microphone presentation, in which Doug Morris gave some hints on interviewing, announcing, and associated arts before a microphone. Future meetings are to include 'The History of Electronic Music', which is part two of 'Radiophonics and Electronic Music' by Barry Mitchell, and, of course, the club's AGM.

Montrose

Four members of the Montrose and District TC appeared briefly on BBC television while making a recording of part of the Montrose Festival week. This is the first time that members have been able to tape material during the actual festival, and several performances were recorded in three different halls, in addition to taping the Service of Dedication. Two members are now engaged in editing the material for future use.

Club members are showing a distinct leaning towards educational work; the club's first Open Day was held recently under the auspices of 'World Tapes for Education'. Other educational work has included rendering assistance to one of the smaller schools in the production of a tape for Grampian Television.

Exploratory talks on the possibilities of compiling an extensive documentary tape on Montrose are now taking place within the club, and any material on hand is being sifted and edited for possible use.

Individual efforts by club members have been many and varied. Mrs Trefor Jones has been busy making tapes for the blind in conjunction with the world-wide tape club. Mrs Paton has again been busy in connection with her teaching, organizing the programming of a new language laboratory to ensure more efficient use of the equipment. Mr McAlpine, assisted by Mr Murray and Mr Hardie, has been very busy finalizing the recordings of sound effects for the Kaims Players. The recent closure of a local train service, marked by the departure of a gaily decorated steam engine pulling an overflowing long passenger train carrying the Provost and other local personalities dressed in old-fashioned clothes, was recorded by Mr Paton, and the recording is to be accompanied by colour slides. Mr and Mrs Murray have been on nature rambles with their portable to record the sounds of the countryside.

North London

Visits to manufacturers and demonstrations at the club room have proved extremely popular with members of the North London Tape and Hi-Fi Club. The club, of course, does have the added advantage of being situated within easy reach of a number of manufacturers, and has had demonstrations of Grundig, Truvox, Philips, Akai and Brenell equipment, among others. 21 members thoroughly enjoyed their visit to the Brenell factory, when they were escorted around by Director Mr J. W. Raine. Members were shown how various components were made and thoroughly tested before being incorporated in a machine, and recorders were seen in various stages of manufacture. The visit was rounded off by a demonstration which included many interesting recordings sent in by Brenell owners, one of which had been multi-tracked at least twenty times.

Another meeting was spent in comparing various pre-recorded tapes, both mono and stereo, 2- and 4-track, that are available on the market. The very varied selection, ranging from Holst's Planets Suite to Jazz from Benny Goodman, was critically listened to by club members. Keith Parker ended the evening with a talk on the bad buys he has made at various times of pre-recorded tapes which included unwanted noise and even in some instances bad cases of drop-out.

Five club members who were escorted round the Royal Mint by Mr D. W. Greenhaulgh were privileged in being allowed to record Mr Greenhaulgh's commentary.

Reading

At the beginning of the season Reading Cine and Tape Recording Society decided to introduce a 'Member of the Year' trophy to encourage all members to take a more active part in club life. One point was awarded to each member for any contribution made to club nights, and in any of the major fields of tape, slide or film up to 10 points could be awarded, according to merit. The first winner of the trophy was Derek Holt, and a very popular win it was too, for Derek has been runner-up in almost every competition the club has held during the past two seasons. As Programme Secretary, he is one of the hardest worked members of the Society's committee, as he also edits the club magazine *Trailer*.

The present season was rounded off with a meeting entitled 'Photo Fair', and during the recess members have been working hard on the annual exercise, which this year is to make a tape, a tape and slide show or a film, which must include part of a chosen piece of music and two selected sound effects.

Much of the programme for the new season which opens later this month has already been defined, and includes a demonstration of Ampex equipment as well as the usual Ladies' Night and Grosvenor Cup Competition.

Rugby

The eighth AGM of the Rugby TRS was held recently, at which John Bannister was elected President in succession to Len Stephens. John, who is a sales manager with Benn Radio Ltd, has been a member of the society since 1958, when he was elected Chairman. He has already been President once before, from March 1959 until June 1963, when he was elected to the Management Committee, on which he has served ever since. As reported last month, Mike Brown has retired after eight years' service as Secretary and has been succeeded by Mrs Janet Clarke of 11 Craven Road, Rugby, who has been a committee member since October 1962. The five other committee members elected were Gordon Routh, Len Stephens, Mike Brown, Jack Willis and Bill Long.

Guest speakers at a recent meeting were Mr A. G. Craske and Mr D. Logan, of the 3M Company. Two cine films were shown dealing with the growth of the company and with the manufacture and marketing of Scotch tape. A number of questions were put to the guests from time to time and they accepted a preliminary invitation to visit the club for a third time at some future date. The quiz tape in this programme was provided by Ernie and Jean Crane, and was won by John Bannister, who knocked out current quiz expert Gordon Routh on the tie-breaker.

Tapesponding continues between the club and Joyce Lawson in New Zealand, the Palmerston North Club, also in New Zealand, the Newcastle Club, and with polio victim Anne Armstrong of Newbury. Winner of the club's winter tape recording competition, the theme of which was 'A Day in the Home', was Bill Long, who is now awarded the Terry Davis Trophy. The subject of the society's summer competition is 'Gambling'.

Five completely new members have been enrolled since the AGM, bringing the total to 71, and, in addition, the Management Committee has made honorary members of the landlord of the Central Hotel, Mr B. A. R. Satchell, and his wife.

South Devon

Members of the South London TRC have been particularly lucky recently. Club Chairman Don Aldous recently returned from a business trip to Strurer and Copenhagen, including a visit to the Bang & Olufsen factory (as reported by *ATR* staff last month). Naturally he was able to give fellow club members a first-hand report of the audio developments in Scandinavia.

Biggest stroke of luck came to the club's Hon. Treasurer, who can now be seen driving a Rover 2000. No, he did not abscond with club funds, but won the car in a national competition. He is one member who now has no excuse for not bringing his recording equipment to club meetings!

Ken Ward, the club's most distant member (geographically speaking), whose home is in Aldershot, is back in Torquay for the summer season playing with Nat Temple's orchestra in a local ballroom, and as drummer he can also be heard with the orchestra in the Dick Emery shows on BBC radio.

At a recent club meeting teams of members left with portable recorders in search of twelve sounds on a list prepared by Shirley Furneaux. No one managed to obtain all of them, but W. A. Ford, Mr and Mrs C. E. Holt, E. A. Tomes and T. Saunders all managed to collect eight of the twelve. At another meeting four members of the Torbay Amateur Cine Society showed some of their sound film productions and described how they set about making a sound track. This included a demonstration of a method devised by Cine Society member Keith Whitehouse for producing lip synchronization.

Southend

At the recent AGM of the Southend Teenagers Recording Society the previous committee was re-elected, with the addition of Ian Fagelson and Ray Butler as joint hospital programme associates.

During one of the weekly meetings a talk was given on the basic principles of recording for the benefit of new members. A very amusing quiz tape was also presented, where members had to identify the items that were used to make tape sound effects.

Terry Mendoza and Viv Fisher added to the club's rapidly growing tape library with yet another recording of a fair organ, this time an Atlas Organette owned by a local antique collector.

Continued on page 40

ON TEST

THE UHER 22 HI-FI SPECIAL

by Peter Knight

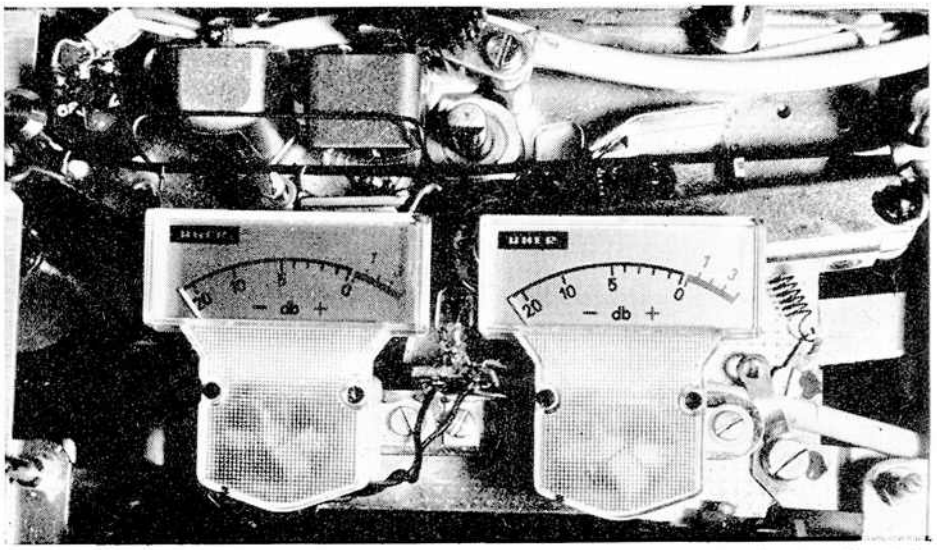


Fig. 1. View of head and capstan section with top cover removed, showing the twin recording level meters.

The Uher 22 Hi-Fi Special is from the range of recorders handled by Bosch Ltd of Great Portland Street, London W1. It is, in fact, one of the most expensive home models of the range. At 129 *gns.*, it may not be within the immediate grasp of all wishful thinkers within our clan, but to those whose demands are exacting from the viewpoints of both good engineering and good audio – and with a pocket to match them-it is certainly a machine worth looking into. It is designed specifically for use with an existing hi-fi set up and has no power amplifiers or inbuilt speakers. For quality playback its output signal needs to be conveyed to an unequalized, medium- high-level input of a hi-fi amplifier system-using the system's speakers. The machine, however, has all the virtues required to create good recordings at tape velocities of 3¾ ips and 7½ ips. The *Hi-Fi 22* model is two-track, but there is a four-track model, known as the *Hi-Fi 24*.

The heads and electronics provide twin-channel stereo operation. The heads of the *Hi-Fi 22* have dual windings and cores to provide for the two tracks. Thus, the deck has three heads in all – recording, playback and erase. These are clearly visible in Fig. 1, which shows the tape transport and head arrangements and also the two recording level meters. The playback head (that nearest the capstan) can be adjusted for azimuth by means of the small control knob seen at the top centre of the photograph. This knob protrudes through a hole in the head assembly plastic covering and is thus always available for adjustment by the user.

Azimuth adjustment (ie, head tilt) is made for the best treble response when playing a pre-recorded tape (tape record) or special test tape, such as white noise. The idea is to delete any angle between the line of the gap of the recording head, when the tape record was being made, and the line of the gap of the playback head. Of course, zero angle exists when the same head is employed for both recording and playing back, irrespective of the azimuth setting, but the Hi-Fi 22 uses separate heads. Hence the desirability of an accessible azimuth adjusting control.

Solid-state electronics

Solid-state electronics are used throughout. The recording channel is completely separate from the playback channel in each of the two stereo channels. This adds up to quite a few transistors, while lending itself to extremely versatile operation. Each recording channel has five transistors, the final being fed to the recording head from the emitter at low impedance and each playback channel has a similar number of transistors, again, the final delivering signal from its emitter.

There are two transistors in the recording level metering circuits, two in the hf oscillators and one in the power supply, along with Zener diodes, for voltage regulation. This sums up to a grand total of 25 transistors. The electronics are built upon boards, and Fig. 2 shows a section of the electronics and reveals how the transistors are accommodated. Note the small preset potentiometers on the boards for circuit adjustment.

A fully-isolated mains transformer connects the mains supply to both the drive motor and the transistor supply bridge rectifier. Fuses protect the circuits both sides of the transformer. A substantial drive motor is heavily damped by a flywheel, and the one motor serves all operations. This can be seen towards the bottom left in Fig. 3, which is a photograph of the underside of the machine with the bottom cover removed.

Friction drives and belts couple the motor to the various items of mechanics at the top of the deck as selected by press-buttons and a slider type of control below them operates the fast rewinds in the direction the control is pushed from centre. Fig. 4 shows the drive arrangements, while Fig. 5 gives an impression of the top of the machine, showing the press-button controls directly below the recording level meters.

Fig. 5 also shows the function switch on the right, the digital counter above it, the tape speed selector on the left and the six control knobs at the bottom. From left to right, these controls serve as monitor level, programme selector (pick-up, radio, etc. or microphone), straight monitoring (this is a press-button, record action (a button again) and track one and two level controls.

Other features include an auto end of tape stop, which is triggered by the stop foil at the end of the tape, and a playback equalization selector, which allows the selection of the desired playback equalization. This has three positions, giving NAB, CCIR1 and CCIR2, and is effective only at 7½ ips. Thus, the old and the new CCIR time-constants are catered for.

Inputs and outputs

Nine DIN sockets at the rear of the machine give the inputs and outputs, and the instructional manual details various ways that these may be connected to a diversity of external equipment. The *minimum* average input for full recording level is 2·5 mV and the *maximum* 300 mV (both at 1,000 c/s) across 47 K. The maximum playback output from a fully recorded tape is 1·5 V across 7·5 K. The microphone inputs record fully from 150 µV to 15 mV across 5 M (note that low impedance microphones can be connected direct to this input). A high-level input (for radio signal, etc.) is also available, catering for well in excess of 300 mV, while still operational down to 50 mV, the impedance here being 1·2 K. It is interesting to note that this input will handle signals up to 7·5 Volts! The headphone sockets have a source of 470 ohms and they deliver up to 1·5 V of audio.

There is also a socket for accepting a foot-operated remote-control device, allowing the

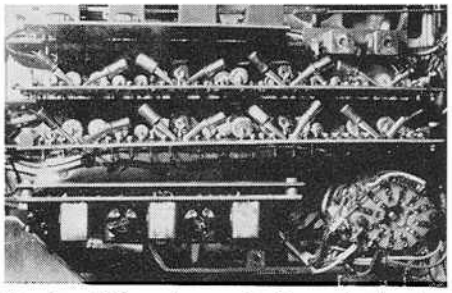


Fig. 2. Side view of the electronics, showing transistors board-mounted.

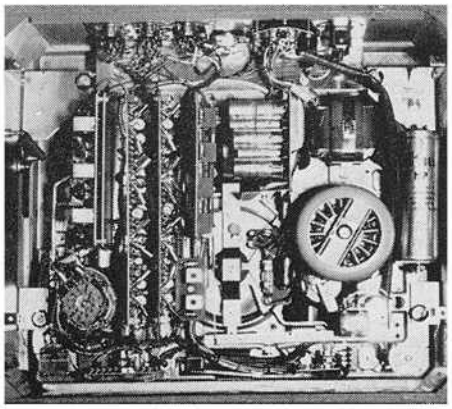


Fig. 3. Underside view of machine showing motor on right-hand side.

tape feed to be stopped and started as required at a distance from the actual machine. Alternatively, a remote-control microphone switch can be employed. An extremely useful attribute of the machine is that the programme signal actually going into the recording head can be monitored, while at the press of a button (monitor button) the signal will change to that actually recorded on the tape, via the playback head. Immediate comparison is thus possible between the signal being recorded and the signal actually recorded.

Multiplay recordings are possible on the machine, there being two such positions on the function selector switch. Thus, it is possible, aided with monitor 'phones, to make recordings one upon another without having to resort to a second machine.

Guaranteed Specifications

Each machine is issued with a certified frequency response curve before it leaves the factory, based on 7½ ips. This shows the responses of both channels from 20 to 20,000 c/s. The curve on the writer's sample machine was well within 1 dB from 80 to 20,000 c/s, the response dropping by only about 1·5 dB from 35 to 60 c/s, otherwise extending right down to 20 c/s within the 1 dB variation! This is incredibly good, of course, but it should be remembered that there are no power amplifier stages on playback.

Spot tests over the frequency range overall were performed by the writer using a Heathkit sine/square wave generator, monitored amplitude-wise on an oscilloscope, and a Taylor valve voltmeter to measure the playback output level at the spot test frequencies. The results obtained were substantially in agreement with those of the original frequency response curve.

The makers also supply a test certificate obtained relative to DIN standards, and the performance of the machine to these standards, as specified, is guaranteed (see the specifications at the end of this report). The frequency performance of the amplifiers can be readily appreciated from the square-wave oscillogram in Fig 6. This is an untouched trace of a 2,000 c/s signal applied at the front-end of the record amplifier and picked up from the monitor socket and fed to the oscilloscope Y-input (Y-bandwidth 15 Mc/s). The trace shows hardly any rounding and very little tilt, and at 2,000 c/s this certainly proves that the amplifiers are letting through all the frequencies!

The machine is simple to operate, and to keep dust out of the deck it is supplied with a transparent plastic lid. Its connections and inter-connections allow its use with any hi-fi outfit as a programme source, while its versatility makes it a relatively easy matter to tape any other programme signal that the hi-fi outfit is able to provide.

While the mechanics cannot be described as noisy, the writer's sample did appear to produce a wee bit more noise than one may expect from a machine of such high class. The noise level was not by any means disturbing, but quieter machines do exist. Electronic noise is very low, as also is the maximum distortion characteristics of the amplifiers.

The Hi-Fi 22 is, indeed, a machine that would enhance a high-quality hi-fi set-up that is yet lacking a tape source and recording system. Its dimensions are not so large that useful space will be occupied. It calls for an area of about 13 in × 13½ in and its overall height is little more than 7 in but space above will be needed to lift the lid and get to the deck.

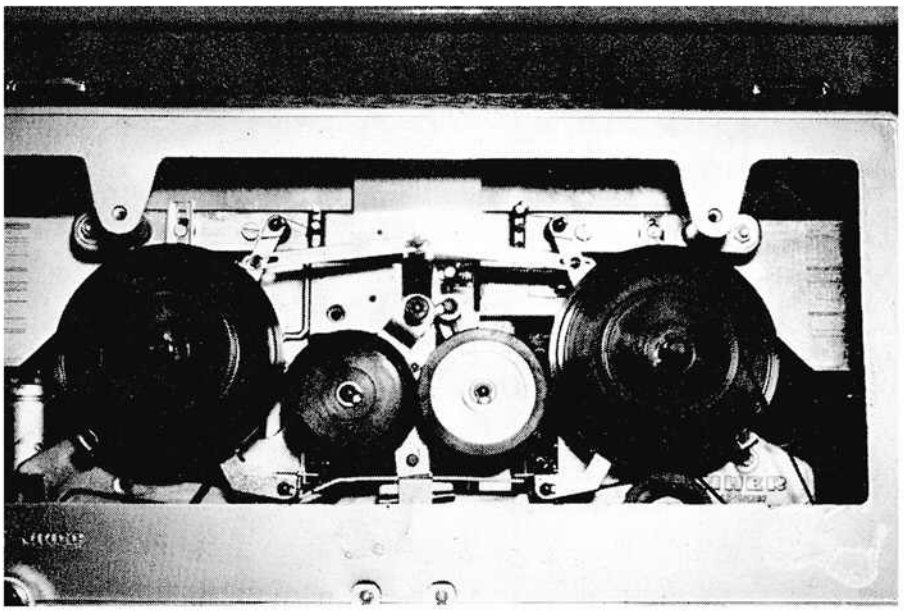


Fig. 4. The spool drives and belts.

Fig. 5. Top view of the recorder with plastic cover removed.

Specification Guaranteed by the Makers

Frequency response: As per the characteristics supplied at 7½ ips (see text), 3¾ ips 20 to 15,000 c/s. *Wow and flutter:* ±0·1% (max ±0·08% rms) at 7½ ips and ±0·15% (max 0·11% rms) at 3¾ ips. *Deviation of average speed from nominal speed:* ±0·2% at 7½ ips. *Dynamic range:* 56 dB at 7½ ips and 50 dB at 3¾ ips (60 dB and 54 dB max respectively). *Channel separation:* Mono 65 dB, Stereo 55 dB. *Distortion* (for signal of maximum intensity): record amplifier 0·15%, playback amplifier 0·15% (both at 1,000 c/s).

(Further enquiries regarding the Uher 22 Hi-Fi Special from Bosch Ltd at the address quoted.)

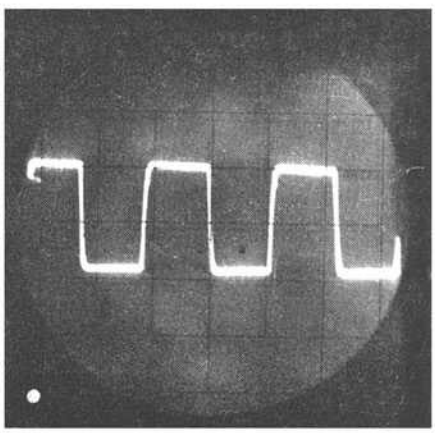


Fig. 6. Square-wave through amplifier at 2,000 c/s.

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HIGH FIDELITY AMPLIFIER

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MAXAMP 30 is a fully transistorised stereophonic High Fidelity Amplifier using Silicon Transistors throughout. It is precision engineered and fullest use is made of printed circuits. It will deliver continuously up to 15 watts of power on each channel and it looks as good as it is. Its polished wood cabinet with 'Danish Silver' scratchgrain control panel blends with any decor. £49. 10.0d.

PERFORMANCE SPECIFICATION

Power Output
30 watts r.m.s. maximum (15 watts per channel) into an 8 ohm load.
20 watts r.m.s. maximum (10 watts per channel) into a 4 or 15 ohm load.

Total Harmonic Distortion
Less than 0·4% for 15 watts per channel into an 8 ohm load at 1,000 c/s.

Frequency Response
20 c/s to 20 Kc/s ± ½db.

Inputs
Pick up: monophonic or stereophonic; RIAA characteristic.
Sensitivity (a) 3·5mV, input impedance 47k ohms
(b) 50 mV, input impedance 100k ohms

Radio Tuner: monophonic or stereophonic; flat characteristic.
Sensitivity 100mV, input impedance 100k ohms.

Tape: monophonic or stereophonic; flat characteristic.
Sensitivity 150mV, input impedance 100k ohms.

Auxiliary: monophonic or stereophonic; for low output microphones, tape heads, etc., flat characteristic.
Sensitivity 3mV, input impedance 50k ohms.

Outputs
Loudspeakers: 4-8-15 ohms.
Tape: High level signal for tape recording.

Hum and Noise
With reference to 15 Watts, volume control at maximum, all inputs —55db overall. Main section of amplifier only —80db with input shorted.

Crosstalk
With input selector in any position, with unused channel input open circuit, better than —40db with reference to 10 watts into 8 ohms on the active channel.

Supply
Adjustable for 105-120-200-220-240 volts A.C., 40-60 c/s.

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INTRODUCTION TO HI-FI

by F. C. Judd

The Editor explains the basic requirements for high-fidelity sound

Although much has been written about high-fidelity sound reproduction, it has usually been of a more technical nature. In this introduction, therefore, I will attempt to cover the basic principles and requirements, especially the requirements, in terms which I trust will not offend our more technically minded readers, but instead will be more readily understood by those who would like to venture into the higher realms of sound reproduction. This, of course, without having to worry too much about technical terms like 'decibels', 'harmonic distortion' and 'intermodulation', etc., and abbreviations such as RIAA, CCIR and the like, which may have to be included.

In the simplest possible terms, therefore, *high fidelity*, nearly always abbreviated to 'hi-fi', means a faithful recreation of the original sound – the 'sound', of course, stemming from the original live performance, be it music, voice or any other sound. Remember, however, that the 'sound' can only come to your ears via a microphone and subsequently a radio broadcast, tape recording and/or disc record. The final link in this chain is the amplifier and loudspeaker through which the 'sound' will be reproduced in the home.

Common 'sound' or signal sources are therefore radio, tape or disc which bring the sound into the home as it were and cannot be reproduced without a radio tuner, a tape recorder a record transcription unit and pick-up, respectively, plus, of course, a hi-fi amplifier and its associated loudspeakers. Although the amplifier is considered the most important unit, for nothing can be reproduced without it, the loudspeaker is equally important, for nothing can be reproduced without that either.

Since we have to start somewhere, perhaps it should be with the amplifier which is normally divided into two sections, the first being the pre-amplifier which selects, corrects and pre-amplifies all the 'sound' or signal sources ready for the power amplifier which, as its name indicates, further amplifies the sound signal this time with sufficient power to drive the loudspeaker. It should be made clear that the pre-amplifier and power amplifier may be two completely separate units or they may be integrated into one unit. For the purpose of explanation they may be regarded as separate units in view of their quite different functions.

The Power Amplifier

Power amplifiers are generally classified according to the power they provide which may range from three to four watts up to twenty watts or more (Fig. 1) and which determine to some extent the ultimate loudness of the reproduced signals. For example, a violin playing softly may require only one-tenth of a watt, whereas a large orchestra may call for the full power of the amplifier. This is known as the 'dynamic range' which a high quality amplifier must cater for *without distortion*. So we must first consider what maximum power will be required. For the average living room most experts agree on a maximum of ten watts; on the other hand, a power of five watts could be sufficient for quiet armchair listening. There is, of course, little point in having a power amplifier capable of covering the dynamic or loudness range for the life-size reproduction of a large orchestra in which case something like eighty to one hundred watts of power would be needed! One should consider hi-fi reproduction as a model of the original sound faithfully reproduced and pleasing to the listener.

Frequency Range

The frequency range, or the range of 'pitch' of natural hearing, is about 25 to 15,000 cycles per second, although in young persons this may extend as high as 20,000 c/s. If natural reproduction is to be achieved the power amplifier must be capable of providing the same output power over a frequency range of at least 25 to 25,000 c/s, otherwise one would find that very high and very low notes were either missing or of insufficient strength. For critical listening, using the best loudspeakers and programme sources, a frequency range of 20 to 20,000 c/s is preferable with an extension of the high frequency range to at least 30,000 c/s. so that transient sounds, cymbals, snare drums and similar sharp sounds, etc., are properly reproduced. The pick-up, tape recorder or radio tuner and the pre-amplifier must also reproduce over a similarly wide range of frequencies, otherwise the high quality amplifier and loudspeaker would be wasted.

Signal Level and Noise

It is also highly important that hum and noise produced in either the programme source or the amplifier are both low enough to be inaudible during even the quietest parts of a programme. This characteristic is known as the 'signal to noise' ratio and refers to the ratio of wanted signals to unwanted sounds or noise. The ratio of loudness from the threshold of natural hearing to a maximum loudness known as the threshold of pain, i.e. from very quiet to very loud, is about 1,000,000 to 1 but in a hi-fi system this ratio may be nearer to 100,000 to 1. This ratio is usually, given in decibels; hence you may find a specification quoting 'radio – 50 dB, pick-up and tape – 45 dB' and so on. The reference here, however is to the ratio of unwanted noise like hum or valve noise, to a pre-determined power output usually the maximum the amplifier will deliver without distortion.

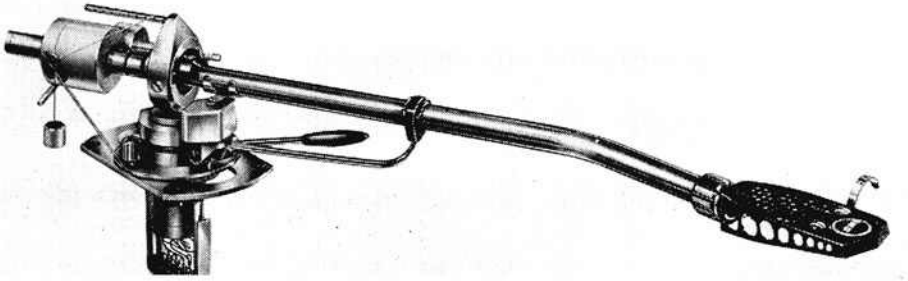


Fig. 4. An SME precision pick-up arm complete with cartridge shell.

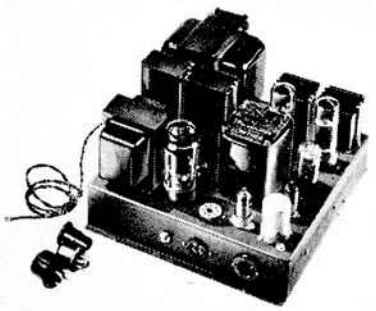


Fig. 1. The Lowther LL26 Mk.1 power amplifier.

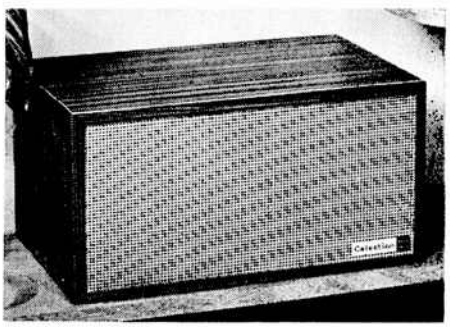


Fig. 3. A neat 'bookshelf' loudspeaker by Celestion.

The Pre-Amplifier

The pre-amplifier is virtually the 'telephone exchange' for all signal sources whether they be from radio, tape or disc or even microphone. It is provided with a main volume control, tone correction controls, signal selector switch or buttons, special internal frequency correction circuits for direct tape-head signals and gramophone pick-ups, etc. Controls are usually included for reducing whistles on radio signals and turntable rumble from record transcription units.

Intelligently used, the pre-amplifier can be made to greatly enhance or correct the frequency characteristics of particular programme sources but it cannot remove unwanted noise present on a signal. The pre-amplifier is the most used and therefore the more conspicuous part of a hi-fi system and is usually specially finished to match modern decor or hi-fi furniture (Fig. 2).

The Loudspeaker

As the final link in the hi-fi chain a poor loudspeaker can destroy all that has been accomplished in the programme sources, the pre-amplifier and the power amplifier. High-fidelity loudspeakers need not, however, be a complicated assembly of 'woofers', 'tweeters' and 'crossover networks'. A single high quality loudspeaker in a properly designed cabinet can produce just as much hi-fi as the large assemblies using two or more speaker units. Generally speaking, a single unit speaker system like that shown in Fig. 3 is adequate for low power amplifiers or as an external speaker to a tape recorder, many of which now incorporate a high quality output stage.

For greater power outputs large and more complex speaker systems become desirable and since the bulk of the power generated by the amplifier is due to the low-pitched musical instruments, such as tympani, bass drum, etc., a large bass speaker (woofer) can be used to handle it. At the higher frequencies the work imposed on the loudspeaker cone is considerably less and a smaller speaker may therefore be used. To prevent the low frequency signals from reaching the high frequency speaker (tweeter), a device known as a 'crossover network' is used which separates the low frequency from the high frequency signals. The mutiple speaker system can be taken a stage further by using a third speaker for the mid-range frequencies, in which case a special crossover network is used to separate the low, middle and high frequency signals.

Signal Sources

Now we deal with the signal or programme sources of which there are three, or four if we include the microphone, especially when it is used for recording. In view of the fact that many of our readers will already have a tape recorder and this can be an excellent hi-fi signal source, we will deal with this first. Generally speaking, a tape recorder will not cater for hi-fi by itself because of the limitations imposed by a small loudspeaker, although there are now appearing on the market a few tape recorders with quite large power outputs which need only a comparable *external* loudspeaker for the deliverance of really high fidelity reproduction. On the other hand, the quality of reproduction is there on the tape and most tape recorders have a special socket for connection to a hi-fi pre-amplifier. The alternative for those who wish to play only pre-recorded tapes is the tape transcription unit which is really a tape deck with suitable replay heads that can be connected *directly* to any pre-amplifier which caters for this. It is important to ascertain this from the dealer or manufacturer. Almost all pre-amplifiers will, of course, accept signals from a tape recorder or tape record/replay unit external amp. socket.

The Record Transcription Unit

There is not a great deal to be said about record transcription units except to warn readers *not to buy a cheap so-called transcription unit or one of the automatic variety which bang the records down, one on top of the other.* This does not do the records any good nor the stylus of the pick-up either. A good transcription unit has a heavy dynamically balanced turntable and will run at constant speed without fluctuation. The fluctuation found in some of the cheaper record players is known as 'wow', i.e. rhythmic variation in speed which can cause a quite distressing audible change of pitch particularly on sustained notes. Another undesirable effect to be found in poor transcription units is 'turntable rumble' caused by motor and other vibrations being transmitted via the turntable to the pick-up. A demonstration of this item of equipment by the dealer is essential.

Pick-ups, which include the pick-up arm and the cartridge, can also be a source of poor quality reproduction and indeed excessive record wear, unless they comply to a quite rigid specification. A really good pick-up (with arm), like that shown in Fig. 4, is therefore necessarily expensive. One can pay up to £30 to £40 for the pick-up arm plus up to £20 or so for a first-class cartridge with a diamond stylus.

The Radio Tuner

A radio tuner will, of course, provide continuous programme material which costs nothing but the annual outlay for the wireless licence. A tuner might therefore be considered as the first choice of programme source as opposed to the otherwise popular tape recorder or disc transcription unit. There are two kinds of broadcast transmissions that can be utilized and these are known as AM (amplitude modulation) and FM (frequency modulation). Both systems are used by the BBC but the newer FM system was designed to provide the highest possible quality and the lowest level of interference. There are now FM stations all over the country and in the London and South East the BBC are now broadcasting in stereo via a compatible system that enables the listener to receive in stereo or mono as desired. A typical and neatly designed AM/FM tuner by Chapman is shown in Fig. 5. This is an integrated tuner which covers the short, medium and long-wave AM transmissions from the BBC and foreign stations as well as FM broadcasts. Tuners for the vhf-FM broadcasts only are, of course, also available and probably the most popular.

Stereophonic Sound

Stereophonic sound might well be regarded as the ultimate in sound reproduction for it can provide, in addition to high quality, a spatial atmosphere that is only experienced when hearing the original 'live' performance. In other words, stereo creates for the listener the same spatial effect that would be experienced when seated in front of, say, a large orchestra, spread out across a wide angle. It does not necessarily mean 'exact' placement of individual orchestral instruments as many pre-suppose.

The electrical requirements for the signal sources, amplifiers and loudspeakers are of course similar to those for monophonic (over a single loudspeaker) reproduction. The main difference is that each signal channel must be duplicated right from the microphone. (We shall be featuring stereophonic techniques and reproduction in the October issue of *ATR.*)

Stereo pre-amplifiers may be separate or integrated with the power amplifiers and contain coupled or 'ganged' controls for each channel. This allows a common setting on tone or volume controls, etc., to be made on both channels simultaneously. Stereo amplifiers can of course also be used monophonically, i.e. combined to form a single channel, so one really gets the best of both worlds – from stereo amplifiers at least. Hitherto stereo has been rather taking a back seat but now that the BBC are broadcasting two or three programmes a day in stereo there will undoubtedly be a great revival of interest and equally a demand for stereo equipment. Stereo radio offers considerable scope for those with stereo tape recorders too.

In Conclusion

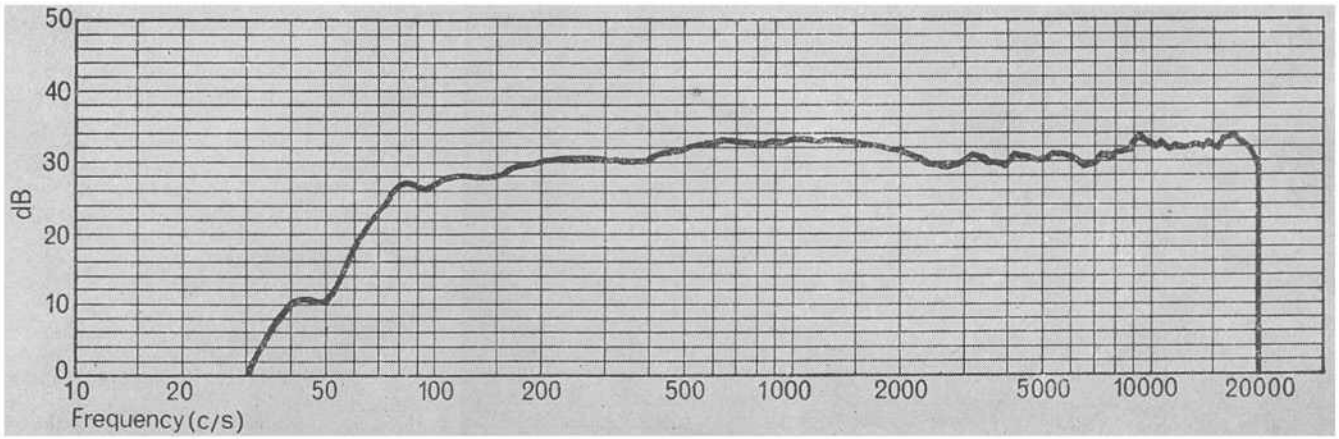
Remember that high fidelity need not be expensive if you choose your equipment carefully and build up a system gradually. Guidance from our future hi-fi supplements will help here, but it is vitally essential that you have equipment well and truly demonstrated by the dealer before you purchase. Avoid cheap equipment so often labelled 'hi-fi' and if in doubt about its quality or performance write to the Editor of the *ATR Hi-Fi Supplement.* A reliable specialist dealer will also honestly advise on the best and right kind of equipment to buy and whether it will match with any other items you may already have.

Fig. 5. The Chapman Mk.2 AM/FM tuner.

Fig. 2. The Rogers Cadet Mk.3 integrated stereo amplifier.

Don't buy a speaker

unless you have this Sonotone Challenge Chart with you—



This is the performance of the Solent, a new speaker by Sonotone, costing only £18 in a modern stylish veneered cabinet. You can easily pay £10 more for speakers which barely equal the performance of the Solent. Clip out this chart. Use it as your yardstick of value when you're shopping for speakers.

Hi-fi connoisseurs have long been familiar with Sonotone, as engineers of fine pick-up cartridges. Now this respected company has produced its own speaker. It's already the sensation of the Audio World. Read the facts. They may revise your thinking about what you should pay for a good quality speaker.

The problem with buying a speaker is knowing where to stop on price! Unless you are a sheepdog or an orchestra leader you may end up with refinements so acute you will rarely be able to appreciate them.

For some years Sonotone have been looking into the question of speakers and have set out to offer three important things:—

Three Achievements

1). High enough performance to satisfy 99% of enthusiasts.

2). A unit of a suitable size to fit on a bookshelf.

3). A sensibly priced speaker.

It wasn't easy—but now Sonotone have achieved all three objects. But claims alone are not enough! Sonotone offer proof!

We don't thihk you will find a speaker that delivers so much commonsense value. And the ones that deliver this standard of performance will invariably cost you up to £10 more.

Why not write for more information to:—

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Technical Ceramics Limited, New Lane, Havant, Hants.

A member of Plessey Components Group.

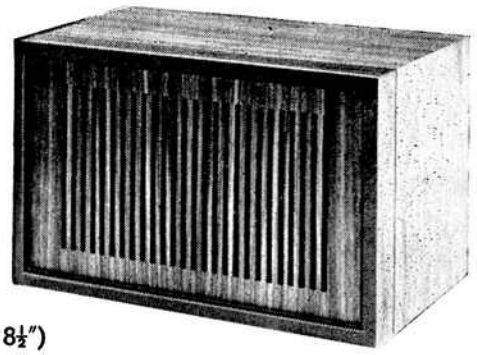
Attention all addicts

So far we've talked about the logic of this new speaker.
Now for the technical details:
Woofer: 6½", 10,000 gauss, 1" pole.
Free Air resonance: 50 c/s.
Tweeter: 3⅜"—acoustically loaded (i.e. custom made to the actual cabinet).
Frequency Response: 40 c/s—20 kc/s.
Sensitivity: 98 dB at 12 w. (microphone 6ft).
Power Handling: 12 w programme level.
Impedance: 8 ohm system suitable for 8-15 ohm valve or transistor amplifiers.

Drive units coupled with the cross over network have resulted in an outstanding and unusually smooth response. Due to the special design of the bass unit suspensions, linear restoring force against cone movement is ensured. This, coupled with a high degree of damping ensures a bass response free from resonances and other tonal colouration. The use of highly absorbent organic fibre to line the cabinet ensures a clean middle and upper response.

NEW!

Sonotone Solent £18



(14" × 9" × 8½")

TEST REPORT

THE RECTAVOX OMNI MK II LOUDSPEAKERS

by Gordon J. King

Listening to a pair of these speakers in stereo formation, it is truly difficult to realize that the sound is emanating from a couple of cabinets each of about one cubic foot in volume. The *Omni* differs essentially from the usual run of small speakers in that the only parallel surfaces of the enclosure are the two sides. This is physical, of course. It differs in technical ways, too. The face of the enclosure – which would normally be the front – is inclined by about 45 degrees towards the ceiling, while a small section of the cabinet beneath the face has a complementary inclination which, relative to the bottom, puts all surfaces, excepting the sides, out of parallel. The basic design of the enclosure is shown in Fig. 1, where dimensions A, B, C, D and E are 24½, 11⅛, 18¾, 8½ and 13½ inches respectively.

The enclosure is extremely well made in heavy plywood which is veneered as required in teak, mahogany or walnut to match the cabinets of the rest of one's hi-fi equipment. The face is nicely edged with satin-chrome brass, the net result being a speaker system of considerable substance, weighing about 40 lb, even though of unusual shape. It can be stood on its normal base (dimension D) or on almost any of its sides to match both room décor and acoustics. Standing on dimension D, its face is towards the ceiling. In this configuration, for instance, the treble is somewhat reflected and diffused by the ceiling. The speaker can be arranged to look into or out of a corner of the room, it can be stood normally along one wall or it can be mounted or stood on a shelf in the corner or along a wall as might be dictated by the room itself and/or the reproduction.

The non-parallel sides discourage standing waves within the enclosure, while the different shapes of the sides produce different modes of vibration or resonance, the overall result of which is towards a smoothness of output which is not so easily obtained by the more conventional cabinet design over a wide audio spectrum.

The Mk I Omni featured a rather small port in the front panel, too small, it has been claimed, to serve towards the lower bass response its main purpose probably being to damp the system at the low bass end. The writer has had no experience of this early model, but the Mk II uses a real tuned port which certainly extends the bass end of the spectrum. In conjunction with the internal enclosure dimensions, the port helps to produce an output at the low-frequency end which is remarkably smooth and pleasant to listen to and which extends right down to 30 c/s.

Original designs

The idea behind the original Mk I port was to produce harmonics missing from the reproduced fundamental frequencies without exciting the primary resonances of the listening room. To some extent it would appear that this idea succeeded (as indicated by test reports of the Mk I system), but the more down-to-earth approach of the Mk II system has much to commend it. The port is 3 inches in diameter, and this is tuned by a tube 12 inches in length extending from it into the depths of the cabinet.

It may be thought that a true reflex cabinet of the dimensions given earlier is virtually impossible. Indeed, there are problems to such a design, but these have been resolved by an enthusiast's approach to the problem – for make no mistake about it, Mr MacHarg, the designer of the Omni, is a very knowledgeable enthusiast turned manufacturer. He knows what he wants – what his fellow enthusiasts want – and how to achieve it!

The effective increase in length of the port compensates for the relatively small volume of the enclosure. Normally, the port dimension is related to the enclosure volume, and it would need a small port to correspond to a small volume. However, the tube extension has the same effect (from the acoustic loading aspect of the volume of air in the enclosure) as making the port smaller, while maintaining an air movement equivalent to that of a larger port.

This philosophy is interrelated to the cabinet design proper coupled with the units, but this is not the time to venture into the complications of enclosure design. Sufficient to say that Mr MacHarg has certainly succeeded in obtaining big reflex cabinet sound from a small enclosure. It is interesting to note, also, that a fair-sized roll of Luxan is used in the cabinet of the Mk II system. This tends to absorb the final traces of standing waves, while applying acoustical resistance to the reflex action.

KEF Units

So far nothing has been said of the speaker units employed within the cabinet. These, in fact, consist of a KEF B139 bass unit and a KEF T15 tweeter which operate very well with the enclosure described. The units are coupled via a four-element half-section KEF crossover network, crossing at 1,000 c/s. These are well-known and proven factors in the equation, about which little needs to be said in this report.

Since the tweeter is of totally enclosed design, this itself is unaffected by the make-up of the cabinet, it being the cabinet, of course, that is wholly responsible for the bass performance of the system. It is said that at low input levels the Omni behaves as an infinite baffle speaker (i.e. a speaker in a fully enclosed and sealed box – with no port or reflex action). However, once the reflex action has been incited, the effect is sustained down to frequencies lower than those required to start it. In practice, this means that low-level signals are lifted a little (which is not an undesirable effect), while signals of higher level flatten the response and give bass extension when the reflex action takes place.

Two standard Omni speakers were tested subjectively on a number of programme signals through various valve and solid-state amplifiers of well-known makes and designs, first in stereo set-up and then one at a time on mono signals, followed by paired application on two-channel amplifiers mono-fed. Stereo results were really good with the speakers located one in each corner at the far end of a room measuring about 20 ft by 14 ft by 8 ft in height. The stereo effect was similar with the speakers looking both in and out of the corners, but the treble was more prominent with the face of the speakers looking at 45 degrees towards the ceiling. With the speakers looking into the corners, the corners acted as high- and middle-frequency diffusers, giving a considerable spread to the sound and enhancing the stereo width, but for the best results several degrees of treble boost were required on the amplifier.

Either way round the bass was a wee bit exaggerated, but this was soon cured by appropriate adjustment to the amplifier's bass control. After all, this is what the tone controls are for. A word more about the bass response. This was by no means obtrusive, nor synthetic and appeared to be neither coloured nor box-like which, looking at the size of the enclosures, was rather surprising.

Clean Middle

Another surprising factor was the pure treble (of course, given by the excellence of the KEF T15) and the very clean middle range. Transition around 1,000 c/s was extremely smooth, and the action of the tuned port, leading from infinite baffle action at low-level towards pure reflex at higher levels, was clearly demonstrated. The speakers were then taken from the corners and placed either side of the far-end wall with the faces looking out. Stereo was as good as before, but the bass appeared to be down and needed lifting a little for the best effect. With the high frequencies impinging upon the ceiling (as per the basic design), an effect of spaciousness was created without killing the stereo image. Indeed, the author found this position the best one for his room acoustics (though probably not so aesthetically, for it is felt that the speakers *look* best in corners).

An attempt was made to operate the speakers towards the top of one of the narrow walls, but this could only be a temporary arrangement as the domestic powers-that-be vetoed the permanent fitting of wall shelves or brackets! Anyway, the results that were obtained by this configuration appeared to be below those obtained with the speakers at floor level.

Mono signals fed simultaneously to the two speakers in the various positions described gave all-embracing sound devoid of the hole-in-the-wall symptom. Middle-frequency harmonics or bass frequency-doubling gave no trouble at the levels applied to the speakers, but when the speakers were swept with an audio generator very low-level spurious signals around the 850 c/s mark were detected, but no trouble from this effect was experienced on actual programme signals. The generator signal was fed to the input of the amplifier, the output remaining matched to the speakers. One could not be absolutely sure as to the origin of the spurious sounds, but it could have been something to do with the port tube.

Fed in this way at low frequencies, however, the bass was pure and extremely high powers could be applied without any show of distress either by the B139 or its enclosure. Without a doubt, the bass unit loads extremely well down to the lowest frequencies in which we have an interest. Bass seems to

emanate from all round the enclosure, whether in a corner or out, which is really incredible for a speaker system of such small size adopting the reflex principle.

Full Power Test

Finally, the speakers were run at full power (15 watts each) after first making sure that the neighbourhood was clear of known dislikers of loud sounds. The performance was certainly close to what would be appraised for speakers of much larger size. A sure test for an unknown speaker system is to employ it for a number of weeks under domestic conditions and arrange so that the known hi-fi speaker can be switched on as required at any time to give a quick comparison. This set-up was, in fact, utilized. A stereo amplifier and radio tuner constituted the associated equipment, and comparison tests were facilitated by the stereo balance control on the amplifier turning off one channel completely in favour of the other when fully advanced. The known speaker was thus connected to one channel output and the Omni to the other, both channels being fed with the same programme signal.

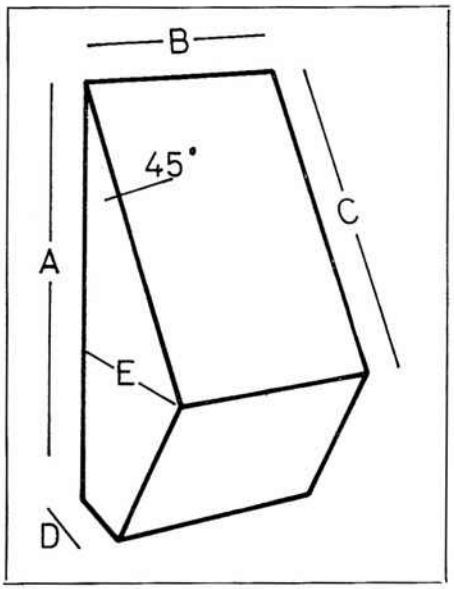
For normal listening the balance control was turned to energize the Omni, but for a quick comparison with the known speaker the balance control only had to be turned its full range to mute the Omni and bring on the known speaker. Thus, music and speech of all kinds could be compared, and at all times the Omni came out with full marks. It could be listened to for very long periods without signs of fatigue, which proves that it is a speaker that one can live with. Working one alone, however, the results fall somewhat short of two speakers working together, but a lot depends on how the single speaker is positioned and located in the listening room. Corner location was found best for just a single speaker in the author's case – that is, with the front looking out of the corner.

Reaction to the shape of the speaker differs considerably between people. Most like the shape, while few just cannot tolerate it, calling it a 'seat gone wrong', 'shoe-shop rack' and so forth. People without knowledge of hi-fi and speakers had no idea what it was. Some thought that it was a kind of contemporary ornament of no functional purpose, others thought it had some purpose, but could not define it; but all were happy to hear it perform.

Full marks to Jim MacHarg for such an original speaker and for the development into the Mk II version. It seems certain that we shall be hearing more about the Rectavox team in the field of loudspeaker design in the future.

Manufacturer's Specification

Weight: 28 lb. *Bass unit:* KEF B139 with flux density 10,500 oersted and total flux 137,000 maxwells. *Tweeter:* KEF T15 with flux density 12,000 oersted and total flux 43,000 maxwells. *Crossover:* 1,000 c/s with four-element half-section by KEF. *Overall frequency response:* 30-20,000 c/s. *Fundamental resonance:* 50 c/s. *Nominal impedance:* 15 ohms. *Power handling:* 15 W rms, 30 W peak (USA). *Price:* £39 10*s* 0*d*. *Makers:* The Rectavox Company, Central Buildings, Wallsend, Northumberland, from whom detailed information can be obtained.



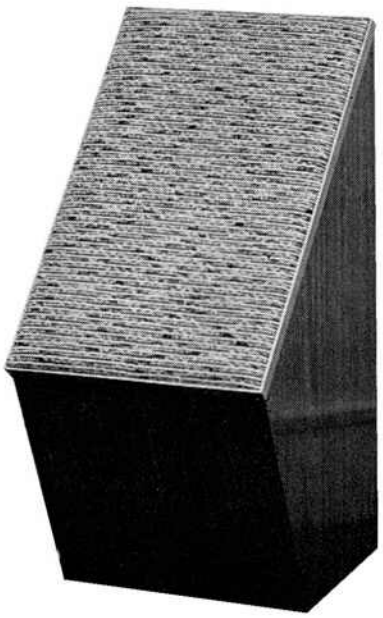
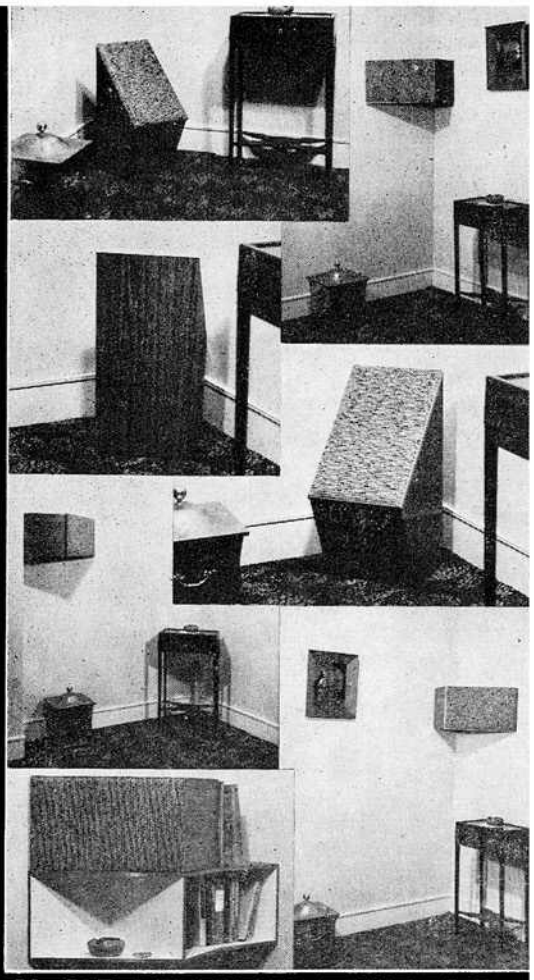


Fig. 2 (*above*). *The Omni corner located.*

Fig. 1 (*left*). *Basic pattern of design* (*see text*)

VARIATIONS



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There are various reasons of course; for instance, electrostatic units just can't be made like that, horns are difficult to fold, columns are inherently longer one way than another, and so on.

Then there is the OMNI, which has its own special reasons for not being "a square".

Firstly, any flat surface directly behind and parallel to the cone causes "standing waves" which are a product of reflection from such a surface, and result in narrow troughs at harmonically related frequencies, usually in the upper mid-frequency range.

Even tightly packed absorbent material does not obviate these entirely in the short distances found in small enclosures, and it creates other problems, too: the OMNI has no surface in this position, and these annoying standing waves are just not there to need absorbing.

Secondly, parallel surfaces allow air resonances to build up between them, resulting in peaks, again harmonically related, and again in the precious mid-range; the OMNI only has one pair of such surfaces, the sides. At the top the massive bass driver separates them; lower down the reflex tunnel and generous damping material are in the way.

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AUDIOVIEW TAKES A LOOK AT Hi-Fi AMPLIFIERS

On deciding to take up hi-fi, whether for the sheer pleasure of listening to high-quality reproduction or indeed as a hobby with an interesting technical challenge, one is faced with the question of what kind of equipment to buy, what price to pay for items that can really be classified as hi-fi and, moreover, finally integrated into one complete system.

Let us suppose we have a good quality tape recorder and wish to start off with a suitable amplifier and loudspeaker. Later a radio tuner and perhaps a record transcription unit can be added. The amplifier is the most important link in the hi-fi chain and will normally consist of a pre-amplifier like the Quad unit shown in *Fig. 1a* and its associated power amplifier as in *Fig. 1b*. Now a hi-fi amplifier is of no use unless it has an equally hi-fi loudspeaker to match (two in the case of stereo), so the amplifier and loudspeaker(s) together will represent the initial and largest single outlay. The choice should therefore be very carefully considered (see **Introduction to Hi-Fi**, page 29).

However, there are very few amplifiers, tuners, tape recorders, transcription units and loudspeakers, even of different makes, which cannot be interconnected into one system. On the other hand, one might wish to consider a partly integrated system which could save a little on the budget. For example, the Armstrong Audio Model 227M shown in *Fig. 2* is an integrated amplifier and tuner and therefore provides three items, i.e., pre-amplifier, power amplifier and AM/FM tuner, requiring only a loudspeaker to complete the system. There is also a stereo version of this unit which can be adapted for the BBC stereo radio broadcasts now going out on the London and Southeast FM transmitters to the extent of two or three programmes a day.

There are, of course, integrated amplifiers consisting of the pre-amplifier and power amplifier like the Rogers HG88 Mk 3 in *Fig. 3*. This will cater for tape, radio and pick-up and has all the refinements of a good amplifier system, namely tone controls, stereo balance (in the case of stereo models), filters and instant selection of any signal source. It will deliver 15 watts per channel, which is a good average power output for comfortable listening, but nevertheless realistic reproduction. It is one of the more expensive of its kind, but well worth it if you want the best.

On the other side of the window we have something less expensive for those who want a good performance but are prepared to, or like to, build their own equipment. This is the Daystrom Heathkit all-transistor integrated stereo amplifier shown in *Fig. 4*, which will provide 20 watts output per channel and caters for tape, radio and pick-up. It also has, as do most amplifiers, an output for feeding signals into a tape recorder for recording. Prominently displayed in the centre of the window – the most expensive items usually are – the Rogers Master Mk 2 stereo outfit consisting of pre-amplifier and power-amplifier. These two units form one of the finest amplifiers on the market with an electrical performance to match. The Master Mk 2 caters for microphone, disc, tape and radio, mono or stereo and has additional inputs and outputs for tape recording and monitoring, etc. It features push-button selection of signal inputs and provides some 35 watts power output per channel. The tape inputs cater for direct connection from a tape head with CCIR equalization and all input levels can be pre-set for accurate matching. The Rogers Mk 2 amplifier system is shown in *Figs. 5a* and *b* – pre-amplifier and power amplifier respectively.

At the lower end of the price bracket, and still a good hi-fi buy, is the Symphony 10 + 10-watt integrated stereo unit which at 20 guineas is good value for it caters for radio, tape and pick-up and includes filters as well as tone controls and switched signal selection. Like all genuinely hi-fi amplifiers, it has a frequency response of 20–20,000 c/s ± 1 dB and harmonic distortion at less than 0·5%. It also has a neat appearance, as can be seen from *Fig. 6*.

Our look through the shop window has, of course revealed only a cross-section of the many makes and types of amplifiers now on the market. The next step is to go into the shop and ask for demonstrations, not only of the amplifier of your choice but also of suitable matching loudspeakers which we will take a look at next month. Meantime, don't get the idea that hi-fi means a clutter of odd chunks of electronics all over the bookshelf or the corner table. It can be neatly stowed away in an attractive hi-fi cabinet like those made by Record Housing Ltd. (address below).

Prices of the Amplifiers mentioned

Quad 22 control unit (pre-amp) (*Fig. 1a*), £25. Quad 2 power amplifier (*Fig. 1b*), £25. Further details from Quad Acoustical Manufacturing Co, Huntingdon, Hunts. Armstrong Audio 227M integrated amplifier tuner (*Fig.* 2), £35 15s. 0d. Further details from Armstrong Audio Ltd, Wartlers Road, London N7. Rogers HG88 Mk 3 integrated stereo amplifier (*Fig. 3*), £46 10*s* 0d. Further details from Rogers Developments Ltd, 4/14 Barmeston Road, London SE6.

Daystrom-Heathkit integrated stereo amplifier (*Fig. 4*). Kit including cabinet, £41 15*s* 0*d*. Further details from Daystrom Ltd, Gloucester, Glos. Rogers Master Mk 2 stereo system – pre-amplifier and power amplifier (*Figs. 5a and 5b*). Prices: master stereo control unit (pre-amplifier), £35, Master 2 power amplifier, £50. Further details: Rogers Developments Ltd. (as above).

The Symphony 10 + 10 stereo amplifier (*Fig. 6*), 20 guineas. Further details from Symphony Amplifiers Ltd., 16 Kings College Road, London NW3.

Prices and details of hi-fi cabinets may be obtained from Record Housing Ltd,, Brook Road, London N22.

Fig. 1a

Fig. 1b

Fig. 2

Fig. 3

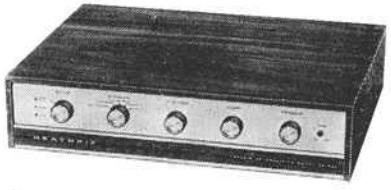

Fig. 4

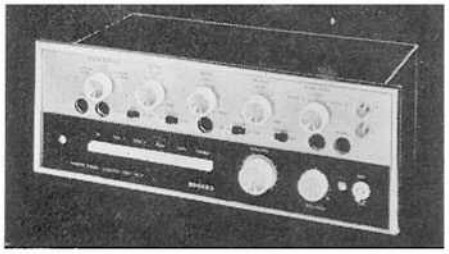

Fig. 5

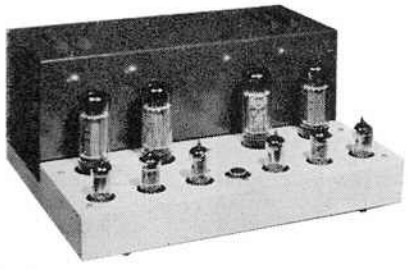

Fig. 6

Fig. 7

TEST REPORT THE GOODMANS MAXAMP 30

by Gordon J. King

An audio prophet of the *valve era*, gazing into his crystal ball and proclaiming that in a few years time 30 watts of high quality audio would be nicely tucked into a volume measuring only $10\frac{1}{2}$ in × $5\frac{1}{2}$ in × $7\frac{1}{4}$ in, would have been a sure candidate or the audioman's 'nut house'. Mutterings about alpha, beta, silicon p-n-p devices and 30 watts without valves would have put him into the 'burning at the stake' class!

This, nevertheless, is 'with it' audio of today. The Goodmans backroom boys got hold of the shell of their acclaimed Maxim, full-range hi-fi speaker system and into this built their Maxamp 30. Not quite this way; they made the Maxamp within a substantial and rigid metal framework-come-chassis and it is this integrated form that fits snugly into the Maxim shell, quickly removed by releasing a couple of bolts and clamp plates at the rear. This makes it possible to employ the Maxamp as a component of an integrated hi-fi set-up, the wooden shell then not being used, of course.

The Maxamp is a two-channel stereo amplifier, each channel delivering a maximum of 15 watts into an 8-ohm load. The front panel features five control knobs, five press buttons, a jack for headphones and a small pilot light which shows when the amplifier is switched on.

Knobs and Buttons

The top knob works a four-position programme signal selector switch, giving *auxiliary, tape, radio* and *pick-up*. The bottom matching knob is for *volume*, the middle one for *treble*, and the other two for *bass* and *stereo balance*.

From top to bottom, the press buttons give *lf filter, hf filter, mono, speaker out* and *on/off*. The filters come on when the appropriate buttons are depressed, the speaker cuts *out* when its button is depressed and when the *mono* button is depressed a single-channel signal applied to a left-hand input drives both channels simultaneously, thereby allowing a mono signal to produce a total of 30 watts in two speakers.

The phone's jack socket is connected on two circuits (for the right- and left-hand channels) to the output stages proper, via 100-ohm resistors as signal limiters, and when the speaker is switched out there is no proper load across the output stage, but this does not appear to cause any harm, which only goes to show that while transistor amplifiers can get into trouble with a short-circuit across a speaker, unlike their valve counterparts, they are not unduly affected by an open-circuit.

Two Pick-up Inputs

In addition to the speaker terminals, at the rear of the amplifier are five phono type signal input sockets and one signal output socket for each channel. There are two pick-up inputs, both equalizated to RIAA, one for dynamic pick-ups at 3·5 mV sensitivity across 47 K, and the other mainly for piezo pick-ups at 50 mV sensitivity across 100 K. The radio input has a 100 mV sensitivity across 100 K, the auxiliary input a 3 mV sensitivity across 50 K and the tape input a 150 mV sensitivity across 100 K. The amplifier is thus able to cater for almost any input signal apart from, perhaps, a signal straight from a tape head.

The output sockets give about 100 mV of signal (as applied to the amplifier) from the output of the pre-amplifier stages. This should be connected across an input impedance (say, input of tape recorder) of not less than 30 K. When the dynamic pick-up socket is utilized, the piezo socket is automatically muted. The speaker wires are connected to convenient terminals on a 6-way barrier strip. There are three terminals for each channel, a common terminal, one suitable for 3–5-ohm speakers and the other for 8–15-ohm speakers. Also at the rear is a mains outlet for energizing or tuner or turntable under the control of the amplifier's on/off switch. The amplifier can be adjusted to suit nominal mains voltages of 105, 120, 200, 220 and 240 ac 50–60 c/s. Fuse protection is employed both in the ac and dc circuits.

The circuits are built upon well-designed printed boards, there being a detachable board assembly at each side of the main chassis carrying the right- and left-hand power amplifier circuits. The pre-amplifier and tone control circuits are built into the main chassis assembly. In spite of the remarkably small volume accommodating the complete amplifier, the components are very accessible once the side plates have been hinged back. Servicing, therefore, should not present much of a problem. (See front cover).

Goodman's quality control would appear to be excellent and very good soldered connections were present in the test amplifier. It would seem, however, that a little dry-joint trouble might have existed in the test amplifier, as some of the soldered connections had obviously been re-checked with a soldering iron subsequent to normal assembly and a few odd bits of solder fell out of the chassis assembly when the side plates were removed. Anyway, this proves that the amplifiers are well checked for soldering faults before leaving the factory.

About the Circuit

Each power amplifier section contains five transistors. The output pair are in class B push-pull and these are driven by a pair in complementary mode (ie, one p-n-p and one n-p-n), in front of which are two n-p-n stages. Direct coupling is employed throughout with temperature compensated stabilizing and heavy overall negative feedback from the output circuit to the emitter circuit of the first transistor.

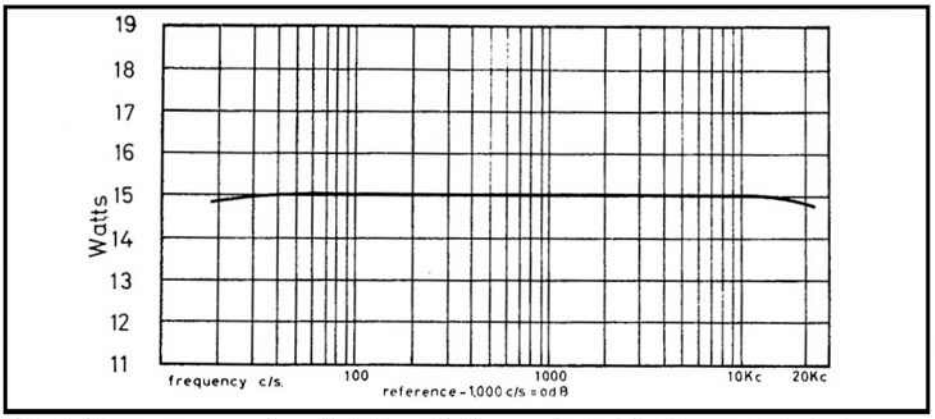

Fig. 1. *Power response characteristics with tone controls flat, filters out, both channels operating simultaneously and power across 8-ohm load.*

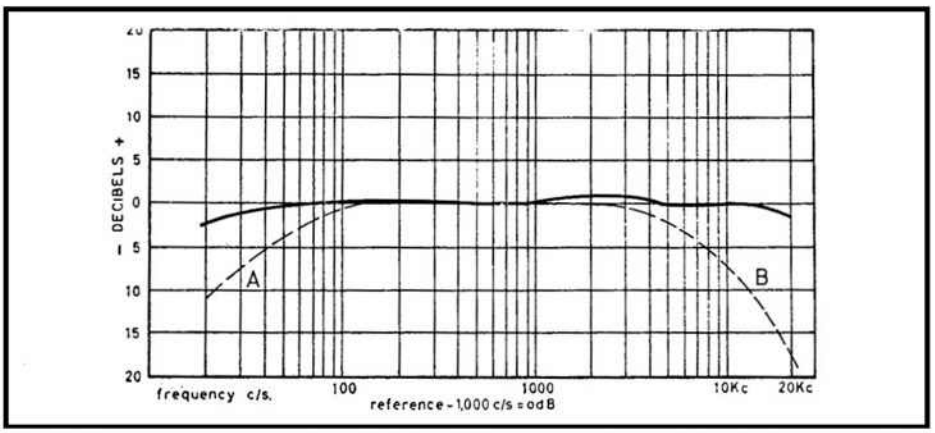

Fig. 2. *Frequency response characteristic. Taken across 8 ohms at 0·5 W, tone controls flat and filters out. (A) shows the effect of lf filter and (B) the effect of hf filter.*

Fig. 3. *Overall appearance of the amplifier in case.*

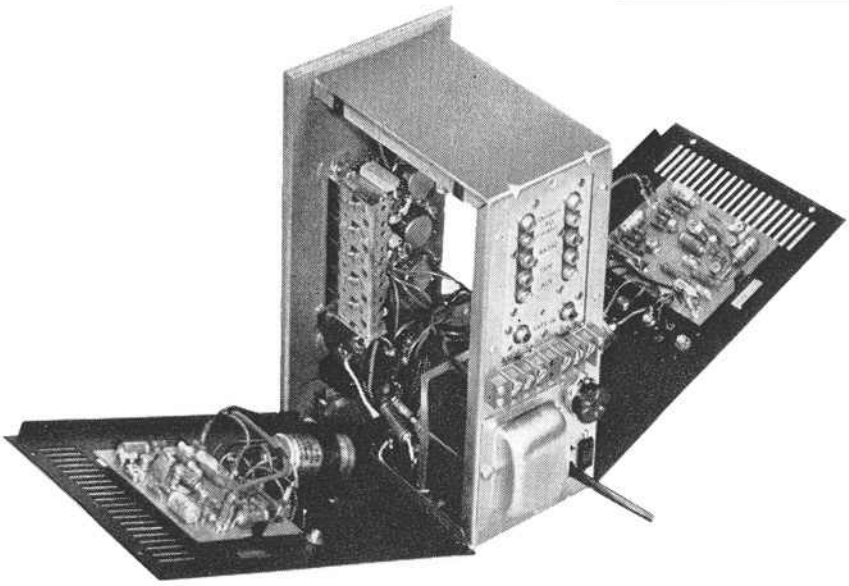

Fig. 4. *Showing the amplifier de-boxed and with the power amplifier side sections hinged down.*

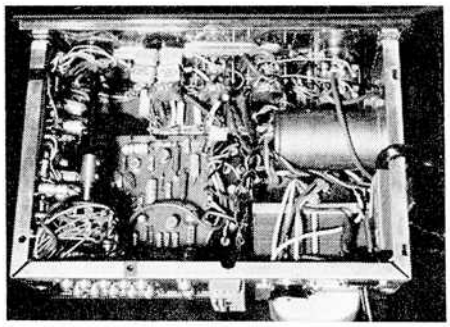

Fig. 5. *Inside of amplifier with one side removed.*

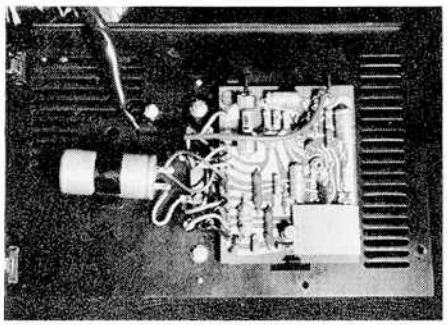

Fig. 6. *Close-up of one channel power amplifier section.*

There is no output transformer, the speakers being fed from the output transistors through 1,000 µF electrolytic capacitors. Preset resistors are fitted to allow optimum balance of the biasing after a servicing operation or transistor replacement, and the output transistors are protected by 1 A fuses. Each pre-amplifier section contains three n-p-n transistors, and into the base of the first transistor the selected programme signal is fed. Negative feedback is applied from the collector of the second transistor to the emitter of the first and this is frequency-selective in the pick-up position in a manner to provide the correct RIAA equalization characteristics. In the other three input positions the feedback is linear by the use of a resistor instead of resistor-capacitor combinations which give the pick-up time-constants. The value of the feedback resistor determines the input sensitivity on the particular programme channel selected.

The third pre-amplifier transistor receives the selected programme signal (equalized or otherwise) through a Baxandall negative feedback type tone control system, the feedback being associated with this third transistor. From the output of the tone control stage, the signal is applied to the power amplifier section, via the hf and lf filters if they are switched in. The lf filter, giving a high-pass characteristic, simply switches a 0·22 µF capacitor into the signal circuit between the pre-amplifier and the main power amplifier section, while the hf filter switch, giving a low-pass characteristic, introduces a series inductor and a parallel capacitor at the signal coupling.

The balance control works in conjunction with the circuit of the volume control, and a feature of the former—due to the circuit technique adopted—completely mutes one channel when it is turned fully in favour of the other channel. This is quite useful in practice.

All Silicon

Of course, the controls of the two channels are ganged, and a total of eighteen transistors makes up the amplifier as a whole. An important point here is that all the transistors are of the silicon variety. Until recently, the majority of transistors in domestic service were germanium type. These work very well of course but the latest silicon devices have the edge on germanium ones. Silicon transistors combine a number of distinct advantages, including low leakage current, relative freedom from thermal runaway, low bottoming voltage, higher collector voltage rating, higher permissible junction temperatures and the maintenance of good gain at very low temperatures. These attributes go towards less circuit complications and greater reliability over a wide range of operating temperatures. Silicon amplifiers are also less likely to be troubled by breakdown due to heavy peak and transient voltages and currents.

The power end of the amplifier consists of a substantial fully isolated mains transformer with tapped mains primary and a secondary that feeds straight into a bridge rectifier. The reservoir capacitor across the dc output side of the rectifier is valued at 2,500 µF, and the main smoothing is accomplished by a 1·2 K resistor in conjunction with a 64 µF electrolytic capacitor. These heavy chunks of capacitance endow the power supply with a very long time-constant, giving good regulation without Zener diodes, transistors or other aids and, of course, eliminate completely all traces of ripple voltage from the supply line.

Power Tests

It was found that the main dc supply voltage fell by only 5 volts (about 8%) when both amplifiers were fully driven simultaneously and delivering a 30-watt 1 Kc/s sine-wave signal between them across 8-ohm loads. This was felt to be very good indeed, for this sort of thing is far more than ordinary programme signals would ever impose. On full-power music, the voltage variation was barely visible, except on sustained organ music.

Indeed, the amplifier is designed to have a rms rating of *output power* (not music power, but full-blooded power!). The speaker terminals were loaded with 8-ohm wire-wound resistors, the balance set midway, the tone controls flat and the volume control half on and filters out, then the voltage across

continued overleaf

TEST REPORT—
GOODMANS MAXAMP 30

continued from page 37

the loads was monitored on a calibrated, wideband oscilloscope with an increasing amplitude 1,000 c/s sine wave signal applied to the flat input. At 15 watts per channel the distortion was within specification and the output could be wound up to almost 19 watts per channel before symmetrical clipping of the waveform occurred. This is a lot of sine wave power, adequate for pretty well all domestic environments.

A power response test was then performed relative to 15 watts at 1,000 c/s and the accompanying characteristic shows the result of this test. It is virtually a straight line! And 15 watts of power was available over the entire spectrum. Indeed, it was possible to hold the power at all frequencies by swinging the generator over the whole band.

This characteristic applies with the tone controls flat, the filters out and with both channels operating simultaneously with 8-ohm loads.

Frequency Tests

The other characteristic was taken with a decibel meter relative to 0·5 watt into a 10-ohm load. This shows a flat frequency response (as would be expected, of course) from 20 to 20,000 c/s. The little variation could have been caused by the setting of the tone controls deviating very slightly from flat. The dotted lines show at A the effect of the lf or high-pass filter and at B the hf or low-pass filter. The lf filter is down to about —13 dB at 20 c/s and the hf filter down to about —16 dB at 20,000 c/s.

The tone controls on the sample were electrically flat with the bass about 7 degrees advanced and the treble about 10 degrees retarded. Treble cut was found to be 12 dB and lift 14 dB, while approximately 12 dB of cut and lift occurred at the bass control limits. The two channels balanced powerwise with the balance control about 10 degrees advanced (from the vertical position), and when the control was turned fully in favour of one channel, the response of that channel increased by 2 dB, the response of the other channel falling to zero response. The noise output power was approximately three-million times below 15 watts on each channel with the selected input open-circuit and the gain control at maximum. This is a remarkably good signal/noise performance and speaks well of the low-noise input circuitry, aided by the silicon transistors which can be run at low emitter currents to ease noise, and the ripple-free power supply.

Hum power in the output was above that of noise though, but only in the input of greatest sensitivity and this fell with the input shorted. The lack of hum pick-up from the power system so closely enclosed with the signal circuits is undoubtedly due in part to the magnetic screening of the power unit.

Square Wave Performance

The accompanying oscillograms show how very well the amplifier handles square waves. The 120 c/s waveform signifies a good lf response and the 2,000 c/s waveform a nicely extended top without overshoot or ringing. At 10,000 c/s, of course, one can expect rounding at the leading and trailing corners, for it must be remembered that the odd-harmonics must extend towards the eleventh to maintain perfectly square corners, and this is a mighty high frequency when the repetition frequency is 10,000 c/s.

In conclusion, it should be said that at 15 and 4 ohms, the output power drops to 10 watts per channel, but even so this is still generally more than adequate for the majority of domestic installations; 20 watts in all on a two-speaker mono system as well as 20 watts stereo is still a lot of power.

The instructions say that a tape *head* can be used on the auxiliary input. This is not really true in spite of the 3 mV sensitivity here because a tape head alone gives an output rising at 6 dB/octave, and equalization is demanded to compensate for this. The amplifier does not provide this kind of equalization. However, the amplifier would accept a tape deck signal from an equalized head amplifier or the signal from the *monitor* or high-level output socket, and this is probably what the instructions mean.

There is also a question here about compensation for ceramic pick-ups. The instructions imply that correct compensation will occur by loading a ceramic pick-up across a 100 K RIAA equalized input. This is not the case with all ceramic pick-ups of the type that may be used with the amplifier. The Decca Deram, for instance, needs a loading network of greater complexity than this when fed into an RIAA equalized input! This, of course, is not a serious matter, for a matching pad can easily be connected between the pick-up and the input to suit the pick-up. There is certainly plenty of sensitivity in the amplifier to allow this.

One minor point is that there is no control knob calibration. Some may not consider this important. Perhaps they are right, but calibration does help to reset to a specific piece of music or type of record.

The new-generation Goodmans Maxamp 30 can be thoroughly recommended as a sound piece of audio engineering, and it lives up well to the quality name of Goodmans. It has arrived at just about the right time and will most certainly set a standard in the field of transistor hi-fi audio amplifiers. My congratulations go to the Goodmans team responsible for its creation.

Manufacturer's Performance Specification

Power output: 30 W rms maximum (15 W per channel) into 8-ohm load. 20 W rms maximum (10 W per channel) into 4 or 15-ohm load. *Total harmonic distortion:* Less than 0·4% for 15 W per channel into 8-ohm load at 1,000 c/s. *Frequency response:* 20 to 20,000 c/s $\pm\frac{1}{2}$ dB. *Hum and noise:* With reference to 15 W, volume control at maximum, all inputs —55 dB overall. Main section of amplifier only —80 dB with input shorted. *Crosstalk:* With input selector in any position, with unused channel input open-circuit, better than —40 dB with reference to 10 W into 8 ohms on the active channel. *Bass control:* Boost or cut to 12 dB at 50 c/s. *Treble control:* Boost or cut to 12 dB at 10,000 c/s. *LF filter:* 10 dB cut at 20 c/s, ultimate rate 12 dB/octave. *HF filter:* Cut of 16 dB at 20,000 c/s, turnover 8,000 c/s, ultimate rate 12 dB/octave. *Price:* £49 10*s.* 0*d.*

Further details from Goodmans Industries Ltd., Axiom Works, Wembley, Middlesex, or your local hi-fi dealer.

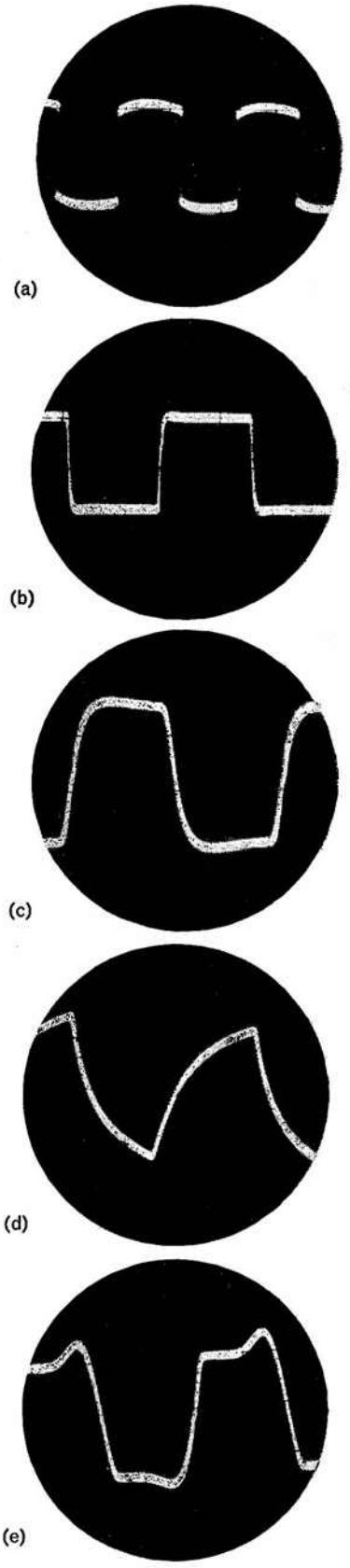

Fig. 7. *Square wave performance. (a) 120 c/s test, (b) 2,000 c/s and (c) 10,000 c/s test, all with tone controls flat and filters out and signal to 'flat' input. (d) 2,000 c/s square wave signal to equalized input, showing RIAA compensation effect and (e) 2,000 c/s square wave, showing the effect of the hf filter.*

ON TEST

Here is a full list of the test reports on tape recorders and other equipment that have appeared in issues of *ATR* which are still available from the publishers. These issues may be ordered (price 3*s* each, post paid) by using the coupon below.

Akai 44 S stereo tape recorder	*August 65*
Akai X 4 stereo portable tape recorder	*October 65*
Armstrong 224 FM tuner and stereo decoder	*June 65*
Beocord 2000 T stereo tape recorder	*February 66*
Carol Cinesound film/tape synchronizer	*March 66*
Eumig Phonomatic projector for synchronizing with a tape recorder	*March 66*
Goodmans' Magnum K loudspeaker	*April 66*
Grampian Reverberation Unit	*May 66*
Grundig TK 23 A automatic tape recorder	*March 65*
Philips EL 3301 cassette tape recorder	*December 65*
Pye Achoic Stereo hi-fi system	*January 66*
Pye HFS 30 T hi-fi stereo amplifier	*September 65*
Saba TK 230 S 4-track stereo recorder	*April 65*
Scott 200B amplifier	*July 65*
Sony TC-250 A stereo record/replay unit	*March 66*
Sony-O-Matic TC-135	*August 66*
Sony-O-Matic TC-900 portable tape recorder	*June 66*
Tandberg Model 9 tape recorder	*February 65*
Telefunken 201 tape recorder	*June 66*
Topsonic converter – silent projector to stripe-sound unit	*March 66*
Truvox R 102 tape recorder	*November 65*
Uher 724-L stereo tape recorder	*July 66*
Wyndsor Vanguard tape recorder	*May 66*

There are full test reports in every issue of *ATR*. Keep up to date with the latest equipment this easy way. Place a regular order for *ATR* by using the subscription coupon on page 45.

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Hi-Fi *DISC* CORNER

Each month we hope to review records which have a particular interest, for example historical or revival recordings, discs of outstanding stereo or high fidelity, special orchestral works and documentaries such as the collection of Sir Winston Churchill's speeches released some months ago and the recently issued *Voice of Richard Dimbleby* included in this, our first *Disc Corner.*

The Voice of Richard Dimbleby, MFP 1087 (mono)
This is an **EMI** *Music for Pleasure* LP record, the proceeds of which are being donated to the Richard Dimbleby Cancer Research Fund. The various extracts from some of his most famous radio and television broadcasts are introduced by Wynford Vaughan Thomas. There are in all 27 of these and they include his first broadcast, a bomber raid over Germany during the war, the Belsen concentration camp, Dimbleby in Hitler's study, VE day in London, a Panorama broadcast in which he takes a telemetry transistor radio transmitter pill, the funeral of John F. Kennedy, the first live TV broadcast from America and the funeral of Sir Winston Churchill, to mention just a few. One of the highlights of the record, which will be of great interest to would-be 'tape' interviewers, is Richard Dimbleby talking about his own interviewing techniques. The quality of the recording is excellent and collectors of documentaries and historical records will find this one worth adding to their collection.

Djangology MFP 1054 (mono)
The name of Django Rheinhardt may not mean much to the younger generation, but to jazz lovers and particularly jazz guitar fans of more mature years Django Rheinhardt was the finest jazz guitarist the world has ever known. This collection of Rheinhardt's recordings, however, does not quite do justice to him, except perhaps as a composer in his own right. In fact, most of the ten pieces are of his own composition and although he plays in all of them his brilliant style is somewhat swamped by what appears to be a typical American brass backing of the pre-war and immediate post-war film musical era. However, in *Limehouse Blues, Sweet Sue* and *Black Eyes* on side 1 the virtuosity of Rheinhardt and the famous Maccaferri guitar is really there. The sleeve gives a good deal of information regarding Django Rheinhardt and the personnel in the various groups accompanying him. Recording quality is very good, considering that most of the tracks were made between 1939 and 1945. This is also an EMI *Music for Pleasure* record.

A.L.R.

tape club news

continued from page 25

Tape Link
Tape Link is a recently formed club which, besides supplying all the normal activities, i.e. round robins, club magazine, sound bank, tapesponding lists, etc., for members, is also producing a sound magazine for the blind. Secretary is Ken Proctor of 8 Sandringham Street, Scarborough, Yorks, who tells me that the club requires many more members so that it can provide a more ambitious programme and a better service to blind people. Any ideas and offers of help will be most welcome, as will, of course, the names and addresses of blind people with tape recorders who would benefit from tape contact.

Thornton Heath
A recent playback of a 1963 sound programme dealing with the work of the BBC Radiophonics Workshop has fired the members of the Thornton Heath TRC with the idea of tape loop and rhythm work, and three club nights have been devoted to this with some first-class results. Some of the tapes produced have been entered for the BATRC. Club member Alan Brown recently received from the Duke of Edinburgh in person the gold medal he won in the Duke of Edinburgh's Gold Medal Award scheme, in which Alan chose as his subject sound recording. Alan has also been particularly busy with other club members, providing music and PA for a number of church fetes and garden parties.
Monthly contests continue to go well, and assistance to outside individuals also continues Most common cry from outsiders is that their recorder won't work, and the most common causes of failure are found to be fluff on the recording heads, broken microphone cables, or even a lack of knowledge of how to put the machine into the record function. As a result of their experiences in this field, club members increasingly feel that manufacturers should give much closer attention to the presentation of instruction books, as some of the ones currently going out with machines are regarded by audio beginners as so much Chinese!

Uxbridge
A number of changes have taken place in the committee of the Uxbridge and District TRC. Mr Reg Bonney has been succeeded as secretary by Mr Roy W. Barnett of 25 Livingstone Road, Southall, Middlesex. New Public Relations officer is Mr Dennis Hughes, of 19 Maygoods Green, Cowley, Middlesex. Members recorded their thanks to the retiring committee members. I am told the club will be undergoing a face-lift in the coming season. Among projects in hand are the production of tapes and tape slide shows for Old People's clubs and institutions in the Uxbridge area, as well as the production of a stereo demonstration tape.

Walthamstow
Outdoor events have been the highlight of the programme of the Walthamstow and District TRS. Once again the members of the society made very successful recordings of the Walthamstow Carnival, including interviews with the Mayor and the Carnival Queen. Excellent commentary was provided by Peter Dowsett and Maurice Dudley, and the completed programme was played back to the Connaught Hospital patients almost immediately.
Social secretary Joan Watson was congratulated by all club members on her excellent arrangements for the society's outing to Hythe. Recordings were made whilst travelling on the miniature railway at great discomfort to all concerned, and at great risk to life and limb members also got their microphones out at the top of Dungeness lighthouse. On the journey home songs written and sung by Ken Perks and Ted Cheeseman were recorded for posterity by Noel Britton. Two documentaries – a serious one from Maurice and a humorous one from Ken – have also been produced on the outing.
ATR Editor Fred Judd was the society's guest of honour at a recent meeting, when he gave a lecture on the subject of multi-track recording. At a later meeting Jack Watson gave a lecture on the subject of sound effects.
The society has for some time had a pass for 20 persons to visit the docks for a recording session, but following the recent seamen's strike the members are wisely biding their time before using them.

West Middlesex
A change from the usual 'bring and buy' evening was provided by the West Middlesex TRC when they held a 'bring and mend' evening. All members having troubles with their recording equipment brought the offending items along, and at least three recorder owners went away rejoicing. Club meetings are held at the Feltham Recreation Centre on Thursdays at 7.30 p.m.

World Tape Pals
The UK branch of this world-wide organization for encouraging tape exchanges recently held its AGM in Sutton Coldfield. This was attended by 25 members from many parts of the country, and included members of the blind section. An excellent tape slide show was presented by Kenneth Duke, who had also prepared a world map showing the many places to which his show had been circulated. He also displayed a number of picture postcards he had received from some of his tape pals.
A far-flung club such as this finds it difficult for members to get together, so it was with great pleasure that the club was able to organize its first special open day in Scotland. This was held in conjunction with the Montrose TRC – see above.
Enquiries regarding membership of the club should be addressed to C. F. Goodall, 96 Fulwell Road, Teddington, Mddx.

Téip-Gael
This is a new club for those interested in Gaelic, and has been formed by Terence Birkett (Dr Traolach De Burca for those who understand Gaelic). All enthusiasts are welcome, and complete mastery of the language is not essential. Speakers of Scottish Gaelic will also be welcome, provided they can speak a little slower than usual to make the slight differences in the two dialects more readily understood.
Full information can be obtained from Terence Birkett at Naomh Martin, Bothar Droichead Atha, Baile Atha Fhirdia, Co. Lut, Eire.

TAPE DIRECTORY

Particulars of Tapespondents are given in the following order: name, age occupation, address; special interests, tastes in music; type of machine, spool sizes, speeds; area of tapesponding required.

SOUTH AFRICA

P, Wehner. 38, scales fitter, 134 Haig Road, Durban, S. Africa. 8mm sound film, building recording and playback equipment, recording sound effects, reading; light and background music. Philips twin-track, 5 in, 7 in, 1⅞, 3¾, 7½, and Sierra Cartridge portable. Anywhere.
Daniel Coetzee. 35, policeman, PO Box 100, Dundee, Natal, S Africa. Photography, hi-fi; light classical. Philips EL 3541, 7 in, 3¾. Anywhere abroad.

BRITISH FORCES

414 Pte Fry, W. S., 21, RAMC, No 2MMR team, att BMH Rinteln, BFPO 29. Stamps, tropical fish, hiking, boats; all types of music. Philips RK 66 (EL 3534 A/224 A), all spool sizes, 3⅜, 1⅞, 3¾, 7. Anywhere (both sexes, preferably 15–25 years old.)
Pte Hicks, E. R., 29, soldier, 37 Company RAMC, BMH Dhekelia, BFPO 53. General; classical, military bands. Telefunken 104, 5¾ in, 3¾. Anywhere.
23874966 L/Cpl Tidd, Dennis, 22, technical control clerk, 74 AC Wksp REME, BFPO 69. Literature, music, current affairs; light classical, pop. Grundig TK 47, 7 in, 1⅞, 3¾, 7½. Anyone, anywhere (English-speaking).

CAMBRIDGESHIRE

John E. Coles, 35, park-keeper/custodian, 580 Coldhams Lane, Cherry Hinton, Cambridge. SW radio, wild animals, tape recording organ music; organ music. Philips portable EL 3586, Wyndsor two-track, 5¾ in, 1⅞, 3¾, 7½. Holland, UK; letter not needed.

CORNWALL

Douglas Brown, 19, 12 Quay Street, St Ives, Cornwall. Singing, dancing, helping people, youth fellowship; hymns and psalms. Philips, 7 in, 1⅞, 3¾. Scotland.

ESSEX

Christopher Peter Murray, 13½, schoolboy, 4 Glen Avenue, Colchester, Essex. SWL, electronics, tape recording, animals; classical, some pop. Fuji-Cherry FT 104 A, 3 in 3¾. Anywhere French- or English-speaking.

HUNTINGDONSHIRE

Max Wooldridge, 28, Royal Air Force, 15 Belle Isle, Brampton, Hunts. Photography, maps, scouting; all types. AKAI M5, four-track, 7 in, 3¾, 7½; Fi-Cord 202, two-track, 4 in, 3¾, 7½. Queensland, East Coast.

KENT

David F. Bird, 26, jewellers' assistant, 92 Gardiner Street, Gillingham, Kent. Electronic organ, photography, gardening, general interests; standards, pop, classical. Grundig TK 8, Unicorder two-track, 7 in, 1⅞, 3¾, 7½. UK, Germany (male contacts preferred).
Michael Smith, 15, schoolboy, 27 Rough Common Road, Canterbury, Kent. Ten-pin bowling, cinema, tape recording; folk, pop, Beatles, light classical. Robuk RK 4, two-track, 7 in, 1⅞, 3¾, 7½. Anywhere English-speaking, preferably girls.

LANCASHIRE

John C. Pitfield, 13, schoolboy, 5 The Dell, Upholland, Nr Wigan, Lancs. Photography, cycling, tape recording, cars; pop, folk, light classical, electronic music. Elizabethan, two-track, 3 in, 5¾ in, 3¾. Great Britain, France, anywhere English-speaking; no need to write.
Alan Shenton, 24, butcher, 64 Gaskell Street, Newon Heath, Manchester 10, Lancs. Dancing reading, radio electronics; all kinds. Ferrograph, 8¾ in, 1⅞, 3¾, 7½. Young lady about same age in Norway, Sweden, Germany, Holland.

LONDON

T. Harlow, 30, clerical worker, 7 Nutbrook Street, London SE15. 8mm, fishing, nature study, rambling, camping; classical, pop. Grundig TK 18, 12 in, 3¾. 5¾. London and country.
Gordon James, 25, night telephonist, 37a Gloucester Street, Victoria, London SW1. Driving, amateur theatre, 8mm cine, sound effects, model railways; light, classical. Cossor, four-track stereo, 7 in, 1⅞, 3¾. Anywhere.
Kenneth Michaels. 39, packer/folder, 287 Navarino Mansions, Dalston Lane, Hackney, London E8. Photography, tape recording; ballads, pop. Grundig TK 46, stereo/mono, 5¾ in, 3¾, 7½. Anywhere in England.
Michael J. Riley, 26, salesman (hat trade), 39 Alexandra Street, New Cross, London SE14. Cycling, youth hostelling, travel, church work, chit-chat; most music. Marconi, two-track, 7 in, 1⅞, 3¾, 7½. Anywhere English-speaking.
E. G. Waters, 47, Maisonette 4, 218 Portland Road, London SE25. Tape recording; music of the 1940s, Glenn Miller, Ted Heath. Stern/Mullard, 7 in, 1⅞, 3¾, 7½. Anywhere.

NORTHAMPTONSHIRE

Derek J. Barber, 25, press telegraphist, 19 West Oval, Kings Heath, Northampton. Current affairs, association football, general interests, old churches; folk, R&B, pop. Ferguson 3210, 5¾ in, 3¾. Anywhere English-speaking.

STAFFORDSHIRE

Ismail Ravat, 26, telecommunications technician, 27 Camden Street, Walsall, Staffordshire. Sound movement and adj. technology; classical, oriental, Indian. Cossor CR 1670, ¼ Stereo, 5¾ in, 1⅞, 3¾. India, South Africa, USA.

SUSSEX

Roy Bannister, 43, piano tuner-musician, 43 North Farm Road, Lancing, Sussex. Music, sport, hi-fi, outdoors recording, general interests; all types except pop. Vortexion, Ferrograph, Butoba, 7 in, 3¾, 7½. Great Britain only (please send tape mono only).
Chris Morris, 14½, schoolboy, 34 Long Close, Pound Hill, Crawley, Sussex. Music, tape recording; Beatles, pop, light entertainment. Fidelity Playmaster four-track, 5 in, 3¾. USA, Canada, British Isles.
Ernest Smith, 52, clerical, 78 Oxford Road, Hollington, St Leonards-on-Sea, Sussex. Spiritualism, astral projection, writing, science fiction, young people, photography, travel, stamps; almost all music. Stella ST 459 four-track, 7 in, 3⅜, 1⅞, 3¾, 7½. Scandinavia, Iceland (Reykjavik) (English-speaking).
Stephen A. Smith, 17, student, 26 Willowbed Drive, Chichester, Sussex. Reproduction of sound from tape and records; blues, modern jazz, pop, light classical. TD 10 Deck, Mullard Pre-Amp; 7 in, 1⅞, 3¾, 7½, USA, Canada.
Keith Upton, 20, apprentice aircraft engineer, 47 Kingsley Road, Brighton 5, Sussex. Motor-cycling, ballroom dancing, painting, photography, tape recording, reading; all types of music. Elizabethan Major four-track, 7 in, 1⅞, 3¾, 7½, Optacord two-track, 4½ in, 3¾. Anywhere, females preferred.

WARWICKSHIRE

Patricia Hawkins, 22, state registered nurse, Nurses Home, Birmingham Accident Hospital, Birmingham. Medical research, sports (especially swimming), photography, music; classical, light opera, pop. Fidelity four-track, 5¾ in, 3¾. Continental, Near Eastern, North Africa.
Ralph Leech, 33, operating theatre attendant, 4 Wake Green Road, Moseley, Birmingham 13, Warwicks. Travel, music, general topics; Dixie jazz, light music. Philips EL 3541; 7 in, 3¾. USA, Canada, Europe.
Jeffrey Link, 19, BBC technical operator, 14 Lightwoods Hill, Smethwick, Birmingham 41. Records, tape recording, painting; pop, big band, orchestral, film music. Ferrograph/3AN, 8¾ in, 3¾, 7½. Great Britain
Frank H. Platt, 62, schoolmaster, High Street, Stoke-Golding, Nuneaton, Warks. Literature, poetry, discussions, tape recording, general knowledge; classical (no pop please). Elizabethan LZ 29 four-track, 7 in, 1⅞, 3¾, 7½. Anywhere English-speaking, both sexes.
William McReynolds, 35, machine operator, 2/122 Kyrwicks Lane, Sparkbrook, Birmingham 11. Car and motor-cycle racing, scrambling; C & W, folk. Ferrograph 631, 8¾ in, 1⅞, 3¾, 7½. Anywhere English-speaking.
John West, 35, sales supervisor, 64 Westfield Road, Birmingham 14. 8mm cine, travel, outdoor life, languages; all kinds. Robuk RK 4, 7 in, 1⅞, 3¾, 7½. Anywhere.

WORCESTERSHIRE

Peter Yates, 16, student, 16 Maple Avenue, Tolladine, Worcester. Radio, politics, cricket, satire, anything *avante-garde*; anything, especially jazz. Stella ST 459, 7 in, 3⅜, 1⅞, 3¾, 7½. Anywhere English-speaking, especially Australia, America, Britain (females preferred).

YORKSHIRE

K. Broomfield, 44, experimental officer, 8 Southlands Drive, Nunthorpe, Nr Middlesbrough, Yorks. Photography, building techniques, humorous songs, science; pop, light classical. Philips EL 3541 and EL 3300, 7 in, 3¾. Anywhere, preferably Sweden and USA.
John C. Lewis, 22, disabled, 11 Beeton Street, Holderness Road, Hull, Yorks. SWL, reading, electronics in general; Shadows, rock and roll. Philips EL3541, four-track; 7 in. 3¾. Britain, USA, Sweden.
Edwin Hoyle, 56, draughtsman, 31 Newlands, Farsley, Pudsey, Yorks. Travel, building, 8mm cine; light music. Clarion, 3 in, 3¾. Anywhere English-speaking.
Tom Smith, 40, refiner, 10 Glendale Estate, Morley, Leeds, Yorks. 8mm, DIY, stereo, humour, tape recording; electronic music, light. Grundig TK 46, Telefunken, 7 in, 1⅞, 3¾, 7½. Anywhere.

NORTHERN IRELAND

Michael Brown, 21, student teacher, 137 Sandown Road, Knock, Belfast 5, N Ireland. Photography, French, people, places; light classical, folk, pop, Philips EL 3553, 7 in, 1⅞, 3¾. Anywhere English- or French-speaking.
Ronald McMorris, 20, baker, 38 Chapel Road, Waterside, Londonderry, N Ireland. Collecting country and western records; country and western. Ferguson 3210, 5¾ in, 3¾. USA, Canada (no need to write).

SCOTLAND

Jack Docherty, 22, graphic designer, 63 Underwood Road Paisley, Scotland. Film music, especially Max Steiner Elizabethan four-track, 5¾ in, 3¾. Britain only.
Ian S. Gloag, 34, newspaper despatcher, 3 Baffin Street, Dundee. Motoring, travel, DIY; all music except opera. Simon SP2, Collaro two-track, 7 in, 1⅞, 3¾, 7½. Anywhere.
Ron Hetherington, 28, Insurance, 105 Parkhead Loan, Edinburgh 11, Scotland. Photography, shortwave radio; no classical or pop. Ferguson two track; 5¾ in. 3¾. North, Central, South America, any island, not UK.
J. Stuart Kemp, 16, draper's assistant, Willowdale, Willow Road, Kirkwall, Orkney, Scotland. General knowledge, mags, maps, aircraft; pop, Reeves, Shadows. Ultra 6204, 5¾ in 1⅞, 3¾. Anywhere, especially New Zealand (South Island).
Colin Leslie, 17, bricklayer, 11 Murdoch Terrace, Edinburgh 11. Pop, light classical. Stella ST 459, four-track, 7 in, 3⅜, 1⅞, 3¾, 7½. Anywhere English-speaking.
Fiona Lockie, 32, nursery school assistant, 4 Maryfield Place, Bonnyrig, Midlothian, Scotland. 35mm colour photography, stamps, travel, places of historical interest, reading; folk, show, light classical. Philips Cossoir four-track, 7 in, 3¾. Holland, Norway, Germany, Spain, Ireland, Scotland.
James West, 16, telephone engineer, 16 Penders Lane Falkirk, Scotland. Every form of radio, tape recording; light classical, folk, blues, most pop. Grundig TK 30, Wyndsor two-track, 7 in, 1⅞, 3¾, 7½. Anywhere.
Andrew Wilson, 18, advertising assistant, 1 Melgund Terrace, Edinburgh 7. Photography; modern jazz. Philips, 5 in, 3¾. USA.

WALES

Andrzei Bereza, 15, schoolboy, Penley Hall, Nr Wrexham, Denbigh, North Wales. Electronics, 8mm cine; pop, Beatles. Walter, 5 in, 3¾. America, Canada, Australia (Polish-speaking).
Colin Beynon, 22, electronic engineer, 20 Victoria Square, Penarth, Glamorgan. Tapesponding, small cars; pop, light classical. Philips EL 3527 and 3504, 5 in, 3¾. Anywhere.
Garry Jones, 15½, apprentice to radio engineers, 5 Rosser Street, Wainfelin, Pontypool, Monmouthshire. Reading, photography; pop. Philips, 7 in, 1⅞, 3¾. Anywhere English-speaking.

CLUBS

Gainsborough Youth Club, 16–20, c/o 220 Kingston Road, New Malden, Surrey, All sorts; R&B, rock and roll Philips, 5¾ in, 3¾. Anywhere abroad.

SCHOOLS

Dollar Academy Tape Recording Club, Braelangewell, Blairingone, By Dollar, Clackmannanshire Scotland. Brenell Mark 5, two-track, Ferrograph two-track Philips portable two-track, 1⅞, 3¾, 7½, 15.

ARE YOU SITTING COMFORTABLY?— THEN GET THIS TAPED!

by J. L. Jackson

Anyone for a trip back to school? Can you imagine the change which has come over lessons, even during the past four or five years, because of the introduction of tape recorders into schools? In actual fact, there is very little because the machine is still something of a new-fangled contraption to some of the more hard-bitten (by pupils, in some cases) teachers. However, for more and more teachers a spool of tape is becoming a new instrument for penetrating 'wooden heads'.

Fortunately, children accept 'machines' more easily than their teachers, but for the first few lessons with a tape recorder any questions addressed to the class may be expected to elicit replies such as: *'Please sir, what does them two round 'fings on top go round for?'* or *'Does them new recordin' whatsits always smoke like that, sir?*

These childish obstacles (otherwise known as perishing nuisances) can, of course, be overcome by gas or the usual means of an introductory lesson during which the 'machine' is explained in simple terms: 'Here we have the tape... this passes from the left-hand spool to the take-up spool, but in so doing it passes the erase and recording heads, a signal being applied to the latter when a recording is required. The signal can, of course, be monitored....'

The seven-year-old child of today takes this in without any trouble, but thirteen-year-olds are usually more susceptible to a sound quiz in which they listen to a noise on tape and then write down what they think is making it. In the first lesson the noise is quite often teacher screaming whilst trying to extricate his finger from between the pinch wheel and the capstan, but the recorded sound usually filters through to the discriminating ear. Bathroom sounds are very useful for this type of quiz. The association of soap and water no doubt!

When a recording is to be made of class activity it is often necessary to first record the class 'sitting quietly'. The resulting 'noise' and scraping of chairs, etc., is quite surprising even to the pupils. After listening to themselves interviewing fellow class-mates, the participants usually resolve either never to let another word pass their lips or (the inevitable) never to *stop* another word passing their lips.

Educational radio programmes are becoming increasingly popular and the tape recorder now allows every class to listen to that which only one class could listen to previously. This perhaps explains why the 'tape recorder' is a naughty word in most schools, at least to the pupils. For a school without a pianist, the music lessons which come over the air several times a week are a blessing, but imagine telling a couple of million children to sing song number six and then not hearing one of them as they miss every other note! For the large music department in a secondary school which may have a sizeable band or orchestra, tape loops of tuning-notes for the instruments can be very useful and time-saving – until the piano goes out of pitch with the loops!

Social activities come well within the scope of the school tape recorder or what is left of it after being used for the sound effects in the school plays! It is far more economical on pupils to record the screams of one child falling from the back of the stage than to throw one off nightly.

Back in the music department, the teacher may easily find difficulty in describing the sound of some of the more unusual instruments. There cannot be so many schools that have (or want) an eighteenth-century pianforte, double bassoon or bass triangle (also known as the miniature gong) but with a little care and a lot of luck these can be brought into the classroom. Any ordinary bassoon or triangle recorded at 7½ ips and then played back at 3¾ ips will produce a sound approximating to those of the latter instruments. For the former, more or less, the reverse procedure is used. Record at 3¾ ips a piano being played at half the proper speed of the music, one octave lower than written and then play back the recording at 7½ ips. Hey presto! A modern eighteenth-century pianoforte.

School sports day, the day when every schoolboy (or girl for that matter) worth his salt loses himself amongst a sea of faces and suddenly finds that he has gone deaf! All you require, dear teacher, is a dozen loudspeakers, three miles of wire, a tape recorder and an amplifier with about 200 watts output! With the speakers spread liberally over the sports field you now sit on top of the pavilion with microphone in hand and binoculars ready to spot the shirkers and bawl them out. As a side line, announcements can also be made!

A similar method, although slightly more complex, has been used in schools to enable the headmaster to speak to every class without leaving his room. Every pupil in the building hits the ceiling as the Tannoy booms out: *'Will the following boys please come to my room immediately...'* Then follows an unusual multiple sound effect like that of carpets being beaten!

Bearing in mind the numerous activities *not* mentioned above, as well as those listed, perhaps you can now decide whether a joy-ride back to school is acceptable or not; however, don't expect *me* to offer encouragement—**I'm teaching!** J.L.J.

CUT HERE

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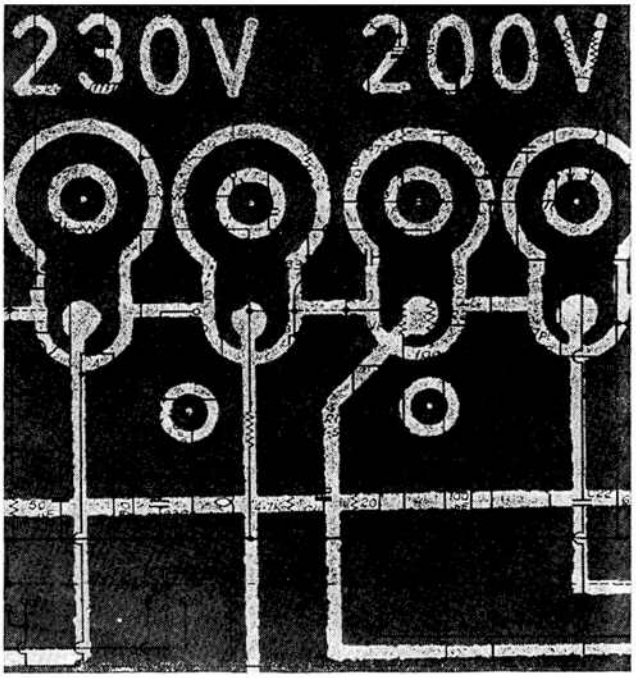

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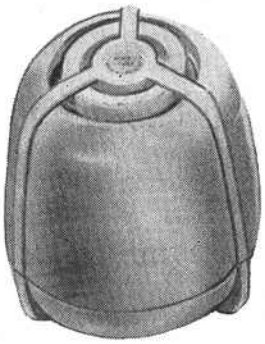

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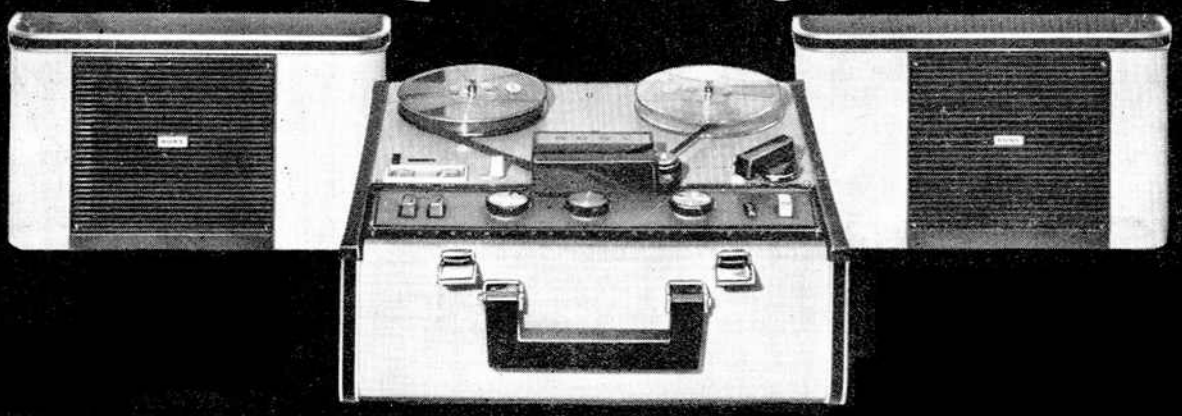

The compact TC200 stereophonic tape recorder

FEATURES ■ **Complete 4 track stereophonic and monophonic tape recording system** ■ **Compact and light weight** ■ **2 full range balanced satellite speaker systems** ■ **Public address** ■ **Sound-on-sound recording** ■ **Variable tone control** ■ **2 VU meters** ■ **Instant stop, individual track selection** ■ **Individual level controls on each channel** ■ **2 SONY F-96 dynamic microphones with other accessories** ■ **Price 72 gns.**

SPECIFICATIONS

Power requirements	100, 110, 117, 125, 220, 240 volts 70 watts, 50/60 c/s
Tape speeds	Instantaneous selection 3¾ ips or 7½ ips
Frequency Response	50-14,000 cps at 7½ ips ±3dB 50-10,000 cps at 3¾ ips
Signal-to-Noise Ratio (per channel)	46 dB
Wow and Flutter	Less than 0.19% at 7½ ips Less than 0.25% at 3¾ ips
Erase Head	In-line quarter track
Record/Playback Head	In-line quarter track
Bias Frequency	Approx. 55 Kc/s
Level Indication	Two Level Meters
Level Controls	Individual Controls on each channel for playback and record
Tone control	1 Tone Control for treble boost or roll-off operates both channels simultaneously
Editing Facilities	Instant Stop Lever, Automatic Tape Lifters, Fast Forward and Rewind, Manual Cueing and Digital Tape Counter
Reels	7" or smaller
Outputs	8 ohm Speaker outputs or high impedance line outputs selectable by switch (2)
Inputs	Low impedance Microphone inputs (2) High Impedance Auxiliary inputs (2)
Power Output	Max. 1.5 watts
Tube Complement	6267 (2). 30MP23 (3)
Transistor	2SD64 (2)
Diodes	1T22G (2), 1S125 (1)
Weight	Approx. 27 lbs.
Dimensions	15" W x 8 11/16" H x 15 7/8" D

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