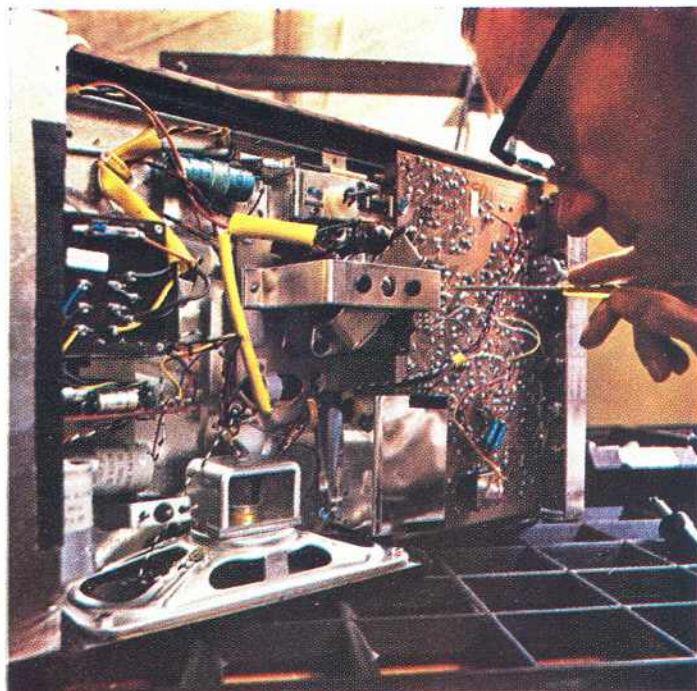


Amateur Tape Recording

VIDEO & HI-FI

August 1966 Vol 8 No 1 2/6



ATR VISITS BANG & OLUFSEN—Page 16

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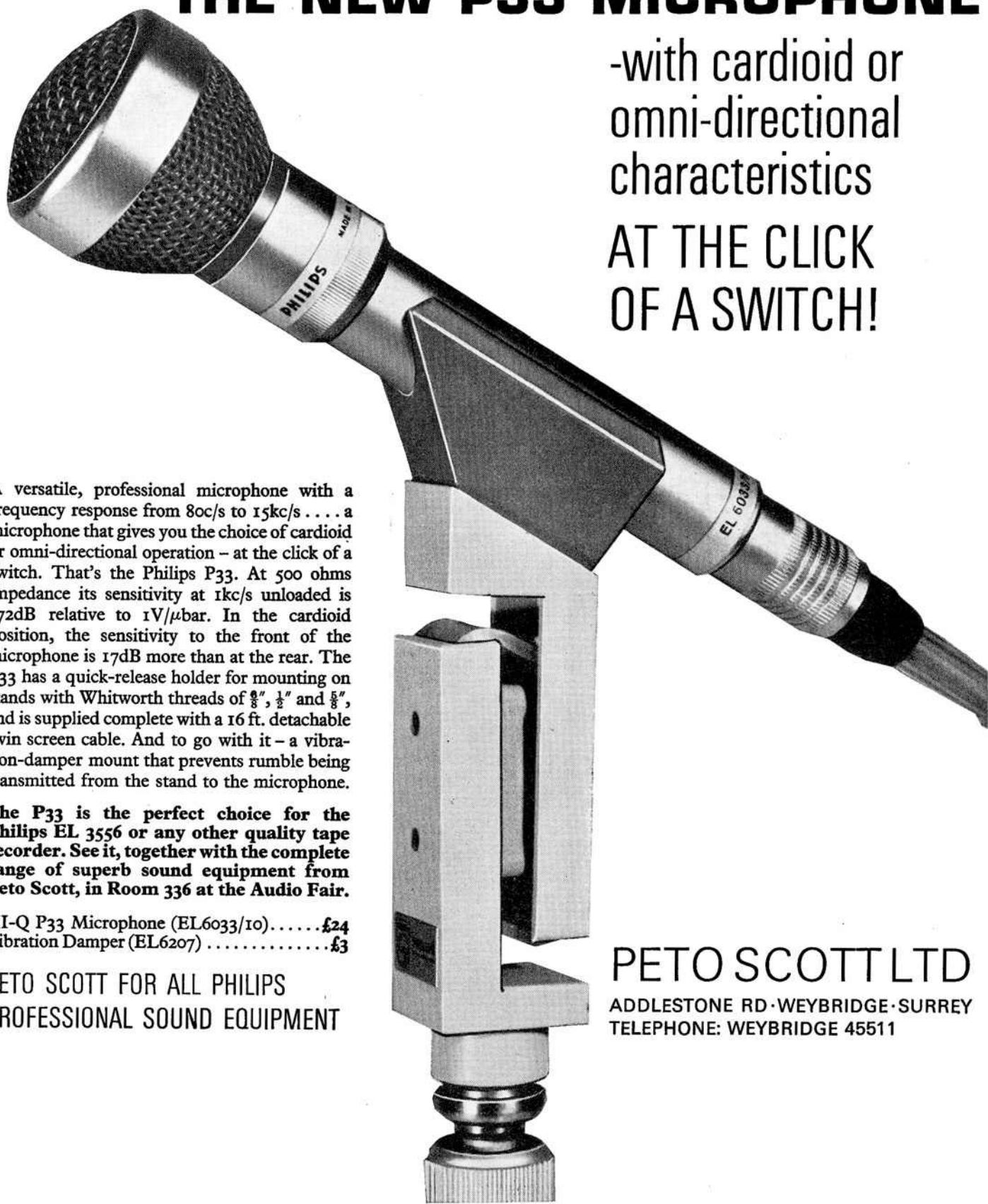
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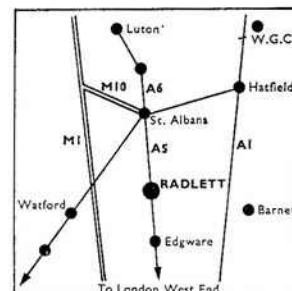
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EDITORIAL COMMENT

The letter from Kenneth F. Williams of Mona Vale, NSW, Australia, which we published in the June issue of *ATR*, has had a quite dramatic effect, for replies from *ATR* readers, many justifiably indignant, are coming in thick and fast. Mr Williams complained about British tapespondents who had not returned tapes sent to them in good faith as potential tapespondents.

Unfortunately most of these replies arrived during the final production stages of the August issue, hence my brief comment here and in *Things You Say* this month. I have, however, read all these letters with great interest and hope to publish as many as possible in September. From some it appears that British tapespondents are not the only ones who acquire extra tapes from unsuspecting but otherwise willing and honest tapespondents; nor are the Australians the only ones to have them filched. At least one lesson arises immediately from this flood of letters: take the precaution of first writing to your selected tapespondent to make sure that he or she is genuinely interested in exchanging tapes. We suggest that you then start with small message spools until you really get to know your correspondent.

Hi-Fi Supplement

From the large number of letters we constantly receive on the subject of hi-fi, it is quite clear that the great majority of *ATR* readers are just as enthusiastic about high fidelity reproduction of sound as they are about sound recording.

Commencing next month *ATR* will therefore be featuring an *extra* eight page supplement every month devoted entirely to hi-fi. The supplement will contain articles on high fidelity sound reproduction as well as test reports on amplifiers, loudspeakers, tuners and transcription units. Details of new products and reviews of outstanding disc records will also be included. The first supplement will contain a special introduction to hi-fi, a full test report on the Goodmans all transistor Maxamp 30 amplifier and a test report on Rectavox loudspeakers. Remember this supplement is *extra* to *ATR* which will continue as usual with its full quota of editorial pages on tape recording.

F.C.J.

FRONT COVER

This month our front cover pictures show various stages in the production of tape recorders at the Bang & Olufsen factory at Struer in Denmark. In the top left picture an engineer is making fine adjustments to the recording and playback heads of a Beocord 2000 De Luxe (a new tape recorder). Top right: adjusting a tape recorder's motor. Lower left: the final inspection of a 2000 De Luxe, when all electrical and mechanical functions are thoroughly tested. Lower right: completed tape recorders from the production lines, ready for the packing department. A report on *ATR*'s recent visit to the Bang & Olufsen factory appears on page 16.

AT LAST – BBC GOES STEREO

Our stereo-enthusiast readers will be pleased to learn that, at long last and starting on 30 July, the BBC will be broadcasting two or three stereophonic programmes *each day* on VHF in the Third Network. The transmissions will be on the pilot-tone system which is a fully compatible one and means that listeners who live within the service areas of the BBC transmitters and who have stereophonic receivers or adaptors for their existing VHF receivers will be able to listen to the programmes stereophonically, while other listeners using ordinary receivers will be unaffected and will hear the programmes in the normal way. The stereo transmissions will be available at first only to listeners within the service areas of the Third Network VHF transmitters at Wrotham and Dover, but it is planned to extend them to the Sutton Coldfield VHF transmitter (Midlands) in approximately twelve months and to Holme Moss (North of England) in approximately fifteen months.

The stereophonic programmes on the Third Network will be broadcast in the Music Programme and in the Third Programme and the emphasis will be mainly on music. Some of the programmes will be gramophone records and others will be live or specially recorded music programmes. It is hoped, for example, to broadcast in stereo some of the Promenade Concerts in the Third Programme during the 1966 season. All stereo programmes or stereo items within programmes will be marked by a special sign in the *Radio Times*.

LOW NOISE TAPE HEAD AMPLIFIER

This useful pre-amplifier can be coupled directly to a tape head and accordingly provides correct equalization for tape replay

Peter Knight

Many hi-fi amplifiers do not have a low-level, equalised taped head input channel. This means that they cannot, as they stand, accept signals direct from a deck tape head. If such amplifiers have a microphone input channel, the sensitivity may here be sufficient to match the low output from a tape head, but there is no equalization, and if a passive equalizer is introduced the insertion losses may severely detract from the sensitivity of this channel, thereby demanding further preamplification.

The solution to the problem lies in the use of an equalized 'booster' that can be connected between the tape head and a medium-level, non-equalized input of an audio system. Such a booster could also be used to lift and equalize the signals from a monitor head or from a winding of a four-track head to give the second channel for stereo playback. It could also act as an amplifier to allow a weak tape head playback signal to be equalized and lifted in level sufficiently to be connected, say, to the pick-up sockets of an ordinary radio set or radiogram in place of the pick-up.

The amplifier or booster to be described is of this kind. It is built upon a piece of Veroboard of sufficient size to accommodate two separate channels for stereo applications, if required, and it can be powered either from a dry battery pack or from the power supply of the parent amplifier or receiver. It differs from previous descriptions of similar amplifiers in that it is of specifically low-noise design and features the relatively new Mullard BC107 n-p-n silicon planar low-noise transistor in the first stage. This transistor has very low leakage characteristics and exhibits a high gain even when operating at collector currents down to about $10\mu\text{A}$.

The circuit, which is based on a Mullard report, 'Using the New Mullard Transistor Type BC107' and the 'Transistor High-Quality Preamplifier Mark II', Mullard Outlooks Vol 15 No 1 June 1965 and Vol 15 No 4 September 1965 respectively, employs a second stage with a Mullard

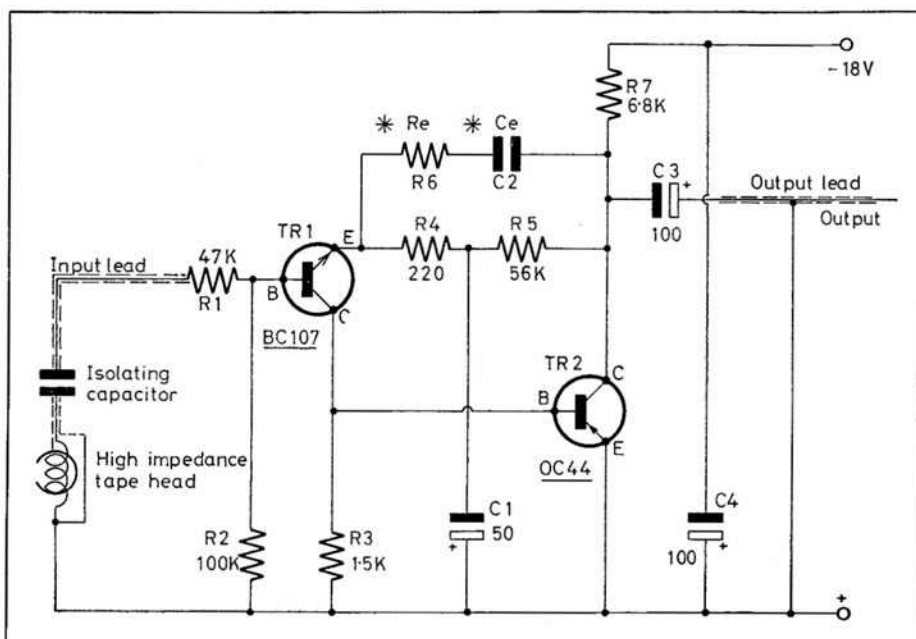


Fig. 1. Circuit diagram of amplifier (see text).

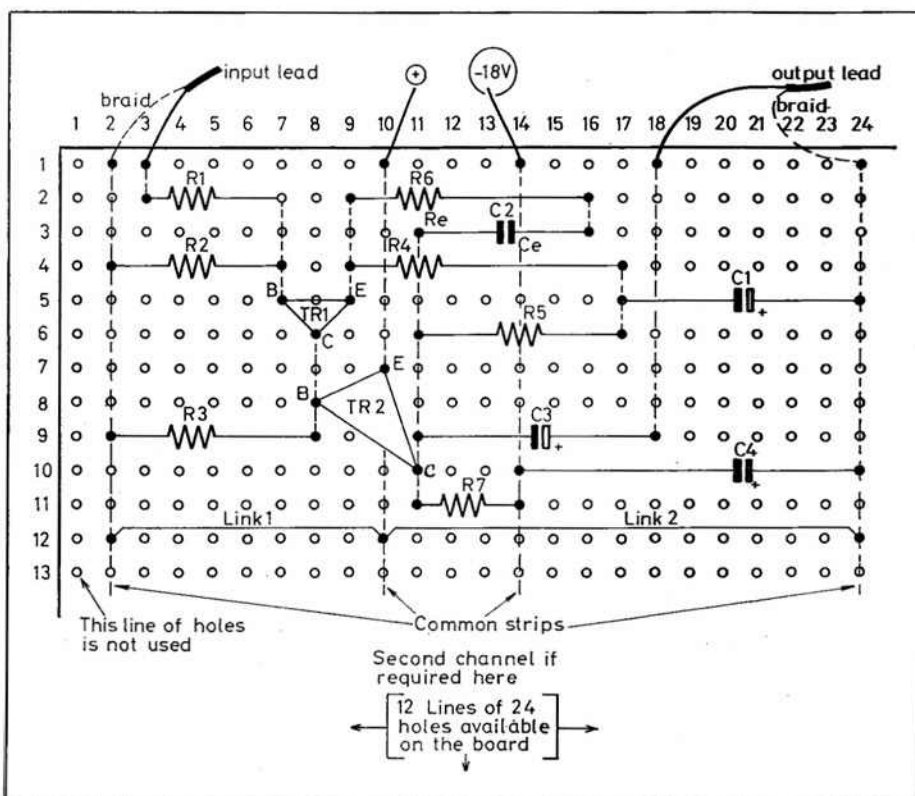


Fig. 2. Point-to-point Veroboard wiring and component mounting diagram.

Note: The lines connecting B, C and E on TR1 and TR2 are not electrical connections but serve to show the location of the two transistors and their respective base, collector and emitter contacts.

OC44. The circuit derived by the author is given in Fig 1.

Biasing

The base bias of the OC44 (TR2) is governed by the potential-divider effect given by the collector resistance of the BC107 (TR1) on one arm and by R3 on the other. This bias, of course, sets TR2 collector current, and its value is arranged to be at the 'transition' point of the base-emitter voltage-collector current characteristic. That is, at the point where the conduction of the transistor changes sharply from a low to a high value with increase in base-emitter voltage.

The value of R3 is arranged to carry the majority of TR1 collector current, so that this collector current remains substantially constant while allowing a small change in TR2 base voltage to produce a large change in base current. TR1 is biased by R2, which is a high value resistor connected direct to the base from the supply positive line. It will be appreciated, of course, that an n-p-n transistor requires a positive base voltage, while the p-n-p TR2 requires a negative base voltage.

The low leakage and resulting good thermal characteristics of the silicon make-up of TR1 allows a single resistor to be used for biasing, and its value can be high because the base current of TR1 is very low indeed, in the order of a fraction of a microampere. As already said, TR1 needs only a very low collector/emitter current to make it work, which means that the potential at the emitter of this transistor, relative to supply positive, is very low indeed – in the order of 600 mV. Actually, the emitter current of TR1 is governed by the series sum of R4 and R5 and TR2 collector voltage. Of course, TR2 takes more collector current than TR1, and this condition is achieved by R4 + R5 being of greater value than R7, TR2 collector load.

How the Circuit Works

Now let us examine the basic action of the circuit as a whole. Suppose that the input signal is swinging negatively. A fall in TR1 collector current results, thereby reducing TR2 base current and its collector current as a consequence. If for the time being we ignore the effect of C1, the fall in TR2 collector current is communicated, via R4 and R5, as negative-going signal to TR1 emitter. This is reflected effectively as a rise in TR1 base-emitter voltage, thereby increasing TR1 conduction dramatically which, in effect, is a cancellation of the initial change brought about by the negative-going input signal. Negative or degenerative feedback thus occurs, and as a consequence the stage gain is considerably impaired.

The ac negative feedback is eliminated without affecting the dc stability of the circuit by C1. This short-circuits the feedback signal and brings the gain of the

circuit up to a very high level. The elimination of the inherent feedback now permits the connection of a feedback network of any specific nature between the emitter of TR1 and the collector of TR2. In Fig 1 frequency-selective feedback is introduced for tape equalisation by Re and Ce, R6 and C2 respectively. The falling impedance of the network with increasing frequency means that the feedback rises with increasing signal frequency, thereby giving effective bass boost which is required for a tape head amplifier.

Tape Equalization

Re and Ce are chosen according to the equalization standards in terms of time-constant and turnover frequency; one, of course, being a function of the other. The old CCIR standards for a tape velocity of $7\frac{1}{2}$ ips and $3\frac{3}{4}$ ips are 100 μ S at 1.6 K and 200 μ S at 800 c/s respectively. The new standards, sometimes referred to as the DIN/CCIR standards, embrace velocities of $1\frac{7}{8}$ ips and 15 ips in addition to the two more common speeds. These for 15 ips, $7\frac{1}{2}$ ips, $3\frac{3}{4}$ ips and $1\frac{7}{8}$ ips respectively are 35 μ S/4.5 Kc/s, 70 μ S/2.3 Kc/s, 140 μ S/1.14 Kc/s and 270 μ S/570 c/s. Any of these standards can be accommodated by the amplifier simply by adjusting the values of Re and Ce to suit. For the old CCIR standards, Re/Ce can be 4.7 K/22nF for $7\frac{1}{2}$ ips and 2 K/100 nF for $3\frac{3}{4}$ ips. For the DIN/CCIR standards Re/Ca can be 3.5 K/10 nF for 15 ips, 3.5 K/22 nF for $7\frac{1}{2}$ ips, 15 K/10 nF for $3\frac{3}{4}$ ips and 6.8 K/40 nF for $1\frac{7}{8}$ ips. Incidentally while a pico-farad (pF) is 10^{-12} farads, a nano-farad (nF) is 10^{-9} farads. A time-constant in μ S (micro-seconds) can be obtained either by

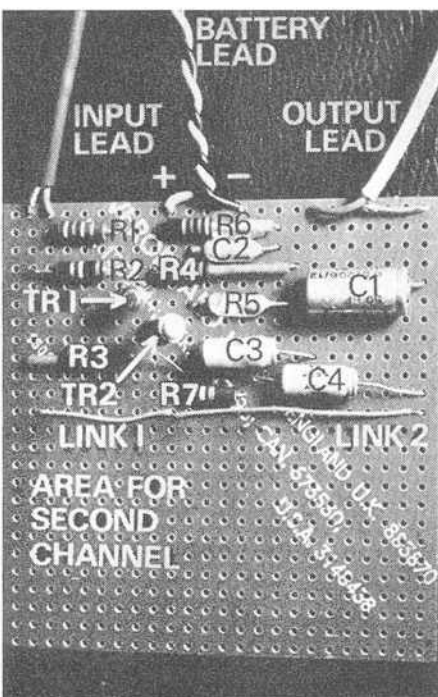


Fig. 3. Top view of the finished prototype amplifier showing the components.

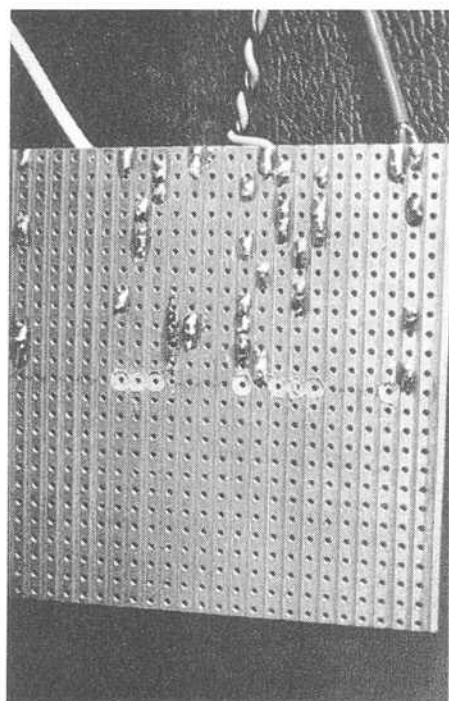


Fig. 4. Underside view of the Veroboard circuit, showing the soldering and the breaks in the copper strips.

multiplying the equalizing RC network component values in megohms and pico-farads or in kilohms and nano-farads, for those who like to know how it is done! There are a million pico-farads to one micro-farad and a million micro-farads to one farad. There are a thousand-million nano-farads to one farad and a thousand nano-farads to one micro-farad. Thus, there are a thousand pico-farads to one nano-farad. This, for instance, makes a 22 nF capacitor equal to 22,000 pF or 0.022 μ F. It is just as well to get to know about these basic sub-multiples in audio and tape recording work.

So much then, for the equalizing aspect of the amplifier. There is really little else to bother about. In the circuit is shown a capacitor in series with the head. This serves to isolate dc from the head winding and for a high impedance head the value can be about 4 μ F, the negative end going to R1 if an electrolytic is used. The author found that this capacitor was more conveniently located near the head in his equipment, but it can be mounted on the circuit board if required.

The values used for R4, R5 and R7 determine to some extent the output signal voltage obtainable from the amplifier and are related to the supply voltage. The components in the circuit allow the amplifier to be worked up to about 25 volts and good results have been obtained with a pair of 9-volt PP4 batteries connected in series (giving 18 volts). Incidentally R4 contributes little in terms of resistance to R5, but being unbypassed subjects TR1 to inherent negative feedback and thus adds to the high value of

input impedance of the stage.

The amplifier can deliver in excess of 150 mV of equalized and very low distortion signal, which is usually adequate to drive a medium-level audio channel. Full main amplifier drive can generally be obtained from a tape head signal as low as 2.5 mV when derived from the booster. The signal/noise ratio at this high sensitivity (excluding hum that may be picked up by poor construction or misplacement of mains-carrying components and equipment) is in the order of 200 times (i.e., 46 dB). The amplifier will cater for almost all high and medium impedance tape heads. *To keep the noise level as the very lowest possible, all resistors should be high stability 1/4-watt or 1/2-watt type.*

Construction

A piece of $3\frac{1}{2}$ in. \times $3\frac{1}{2}$ in Veroboard has sufficient space to accommodate two of the amplifiers (for stereo applications) with a line of holes serving as a demarcation between the two sections. Such a piece of board, which is of standard 'constructor's' size has 24 holes along one side corresponding to the number of printed copper strips, and 25 holes along the other side. Each amplifier takes no more than an area of 24×12 holes, leaving one line of 12 holes between the two amplifier circuits as already mentioned.

Fig 2 shows the exact location of the components of one channel as looking at the component side of the board. The broken lines reveal how the printed copper strips of the Veroboard form the 'circuit' and connect the components together in accordance with Fig 1. To isolate the two amplifiers, the metal strips are purposely broken along line No 13, excepting those which are common to both sections on lines 2, 10, 14 and 24. The lines of conducting strips corresponding to lines of holes not employed in the circuit need not be broken along line No 13, though in some cases it may be advisable to cut even these to minimise feedback and channel interaction troubles.

Fig 3 shows the top of the actual prototype amplifier with the components identified. There is only one amplifier channel here, but note the room available on the board for a second channel if needed now or in the future. Fig 4 shows the underside of the board, indicating how the printed copper strips are severed along line No 13 to isolate one amplifier from the other. Incidentally, a special Veroboard copper strip cutting tool is readily available to facilitate this operation.

Mains Operation

It is possible to operate the amplifier from an ordinary mains-derived ht supply, and one way – and a good one – of doing this is by using a Zener diode. This sort of diode is biased in reverse conduction

characteristics. A high reverse current then flows, called the 'Zener current'. This produces a voltage across the diode, called the 'Zener voltage' and this voltage which holds substantially constant irrespective of Zener current, serves as the amplifier powering voltage.

Fig 5 shows a suitable circuit. Here 250 volts rms is picked up from the secondary of the mains transformer (as may be present, say, in a small amplifier or tape recorder). This is fed to the 'cathode' of a small silicon ht rectifier. Rs feeds the negative current to the Zener diode, and the value of Rs is chosen to pass about 25 mA while dropping 223 volts. Thus, the Zener diode and the amplifier together pass approximately 25 mA.

The amplifier (per channel) accounts for about 5 mA, meaning that the Zener diode passes about 20 mA of reverse or Zener current. This gives 27 volts negative at the 'anode' of the Zener diode, which is fed to the amplifier through a 1.3 k $\frac{1}{4}$ -watt resistor. This cuts about 7 volts off the supply when one amplifier is powered, thus delivering about 20 volts to the amplifier proper. When two channels are so energized, the value of this resistor should be reduced, but the other components need not be altered. Note that Rs is a hefty component. This needs to be approaching the 10-watt

rating because it has to drop quite a lot of voltage at 25 mA. The Zener need not be rated higher than about 1 to 1½ watts. The 1.5-watt Mullard 2Z27C 'Zeners' at about 27 volts and is thus quite suitable. The silicon rectifier can be a Radiospares 51A for 250 volts rms. This supplies far more current than ever required (about 500 mA!), but it fits the voltage requirements nicely. Two 250 μ F 50 V working electrolytics are used for smoothing. It is unlikely that hum will cause trouble, as C4 in the amplifier proper aids with the smoothing, but if it should the 250 μ F components can be raised to 500 or even 1000 μ F.

The amplifier has a medium output impedance which will match fairly well into most amplifier inputs of medium sensitivity. However, if a higher output impedance is called for a resistor of the required value can be connected in series with C3 and the output lead.

Acknowledgements

The author wishes to acknowledge the use of basic Mullard circuits adopting the BC107 transistor. He also wishes to thank Mullard Limited and Brian Whale of Mullard Public Relations Department for permission to use extracts from these circuits. Thanks also go to Vero Electronics Limited for assistance regarding the Veroboard circuit used in this project.

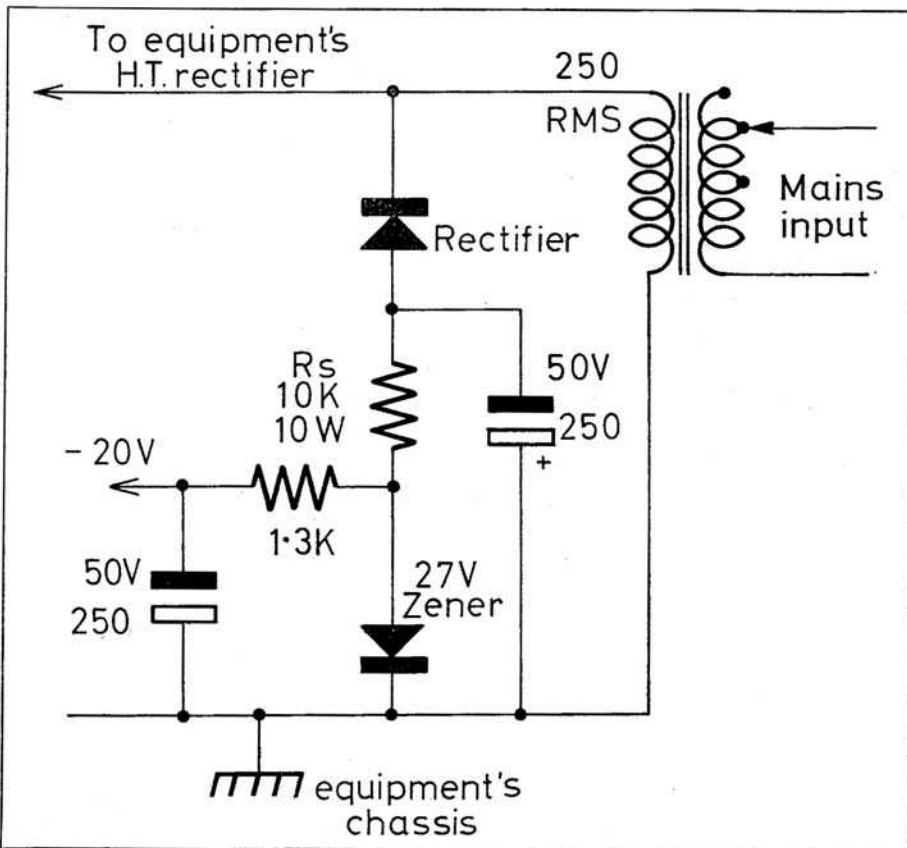


Fig. 5. This circuit reveals a way of powering the booster from the parent mains-operated equipment by tapping off an ac supply from the secondary of the mains transformer. A Zener diode is used for stabilization and to provide a low impedance power source. This technique is feasible only when one side of the secondary winding is in direct connection with the equipment's ht negative line or chassis.

MULTI-TRACK MUSIC RECORDING

By F. C. Judd

Sometime ago in ATR I outlined the possibilities of multi-track recording with the guitar or electronic organ plus a rhythm backing from a tape loop. Quite a few readers have asked for a little more detail concerning multi-track recording techniques, for example, best order in which to dub the different parts, are there any problems regarding musical pitch when using two different tape recorders, how to achieve the best possible quality and lowest noise levels through successive re-recording and so on. There is the question of musical arrangement too and tonal effects both of which can make or mar an otherwise good recording.

A tape recorder which features track-to-track re-recording is not necessarily ideal for multi-track recording and may in fact have certain drawbacks, particularly if the recorder happens to be a quarter-track machine. The first problem here is signal to noise ratio and unless the recorder is a very good one, with low noise amplifiers and a very clean bias oscillator waveform, noise level and distortion may make itself well and truly audible after two or three re-recordings. Secondly some so called multi-track tape recorders may not have suitable facilities for monitoring and balancing the mixture of recorded signals and those to be recorded. Tone or frequency response compensation may not be possible and this is something which is highly desirable if not essential in multi-track recording. Perhaps the best way of proving your track-to-track recorder is to make a recording from a high quality music source such as an fm radio tuner or at least live music via the microphone. Make two recordings the second one separated from the first by a few feet of blank tape.

The second one is your check recording. Now copy the first recording onto the other track and then back again to the original track which means it will have been copied twice. Now run the tape through and compare the twice copied recording with the original (second) recording and see how much the copied version has been changed in quality and whether or not the noise level has increased. You could take the test to four re-recordings but unless the recorder has an exceptional performance you will no doubt find that the quality has suffered very considerably.

However, you can be assured that there will be no problems with pitch difference between the recordings and the musical instrument being used. The most important factor is *balance* between the various



Fig. 1. The Philicorda organ with a home-constructed pedal bass unit (see text).

recordings. The foundation rhythms should be recorded first and this can be drum rhythm recorded live or from another recording or from a tape loop. It should be recorded at full level and then transferred at a slightly lower level to the second recording, together with the chord foundation from whatever musical instrument is being used. The level of the chord recording should be at maximum. We now have two recordings on one track each balanced with respect to the other. I should point out that correct balance may not be achieved at first and that it may be necessary to do the recording several times in order to find the best settings for con-



Fig. 2. The Brenell tape deck which has removable capstans and can be adapted for other than standard tape speeds of $7\frac{1}{2}$, $3\frac{3}{4}$, $1\frac{7}{8}$ ips, etc.

trols and recording levels. The loss of quality through re-recording will of course determine the number of recordings possible. A total of four would be worth trying consisting of foundation rhythm, foundation chords, bass and melody. This would be about the limit with a quarter or half-track recorder having conventional multi-track facilities. Note that musical instruments such as the piano which will have to be recorded via a microphone are unlikely to go to four recordings unless the microphone is a very high grade one and the room acoustics are good. Electrical instruments such as the guitar and electronic organ are of course ideal since they can be connected directly to the recorder. When a microphone has to be used recordings would be better if limited to say, piano plus piano (duets) piano plus voice or another musical instrument or acoustical guitar, plus voice plus bass (from the low register guitar strings) and so on.

Multi-track with two tape recorders

Well so much for the possibilities with the average multi-track recorder although some machines will provide tape echo but this should be used sparingly or at least artistically. The ideal system for multi-track recording is to use two separate recorders, each having high level signal inputs and outputs. It is useless trying to copy from one recorder to another by 9

taking an output from the external speaker socket of one and connecting this to the microphone socket of the other.

With this system it is essential that the recording made on one machine is also played back on that machine and fed from there into the second recorder. No two tape recorders ever run at exactly the same speed. There is usually just the slightest difference which in terms of musical pitch can mean a large fraction of a semitone. If the two tape recorders are quarter-track machines then the comments about signal to noise and loss of quality etc. still apply. Half-track recorders are better, full-track better still, but perhaps best of all a combination of stereo half-track and full-track. However, full-track recorders are rarely used by amateurs although few realise that the signal to noise of full-track recording is far better.

An even more ambitious system would be two half-track stereo tape units and two stereo high fidelity amplifiers plus high level mixing. This is the system I use in my own studio for multi-track electronic organ and guitar recording. Perhaps a detailed description of the actual making of a recording would better illustrate the possibilities which no doubt many tape clubs could put into operation by pooling members equipment. (Perhaps I had better disclose the fact that this article is based largely on a lecture I gave to the Walthamstow Tape Club).

Equipment? Well this has been featured in ATR often enough (see November 1965 front cover of ATR) but mainly I use a Tandberg Model 62 half-track stereo tape record/replay unit, a Telefunken M24 full-track recorder and a Brenell tape deck with nine different sized capstans which allow for 27 different speeds (Fig. 2). The Brenell is used mainly for playing the foundation rhythms from tape loops or recorded percussion. The small variations in replay speed allow for different tempos. The Brenell deck which has a full-track replay head is also used for replaying the final recording, if necessary at a slightly faster speed, onto the Telefunken M24 on which the master recording is made. Coupled with the recorders are a four channel mixer and two stereo hi-fi amplifiers, each capable of twenty watts output and each coupled to appropriate loudspeakers for monitoring etc.

Now the actual making of a recording. The recent resurrection of an old favourite *Bye Bye Blues* by one of the big record companies triggered off an idea for a multi-recording of this tune with rhythm background, electric guitar and a Philicorda electronic organ, plus many electronic and tape effects introduced during the recording. The Philicorda normally has no pedal bass range so one was actually built for it as shown in Fig. 1. The musical arrangement

(rhythm) organ (bass) organ (background chords) organ (melody). The drum rhythm was taken from a special recording of various three times 32 bar rhythms. So this constituted a sound track already recorded. The first stage in the exercise was the actual musical arrangement on paper (music sheet) and this is quite important for unless you know exactly where you are at any point in the complete arrangement multi-track recording is nearly impossible. For instance certain parts of the arrangement were not recorded until the third or fourth stage of dubbing. The complete piece was arranged for a four bar introduction, one chorus in A flat, one in B flat and a final 16 bar part of the main theme in D flat, each section being coupled by a one bar modulation to the new key.

The drum part was first copied from the Brenell onto one track of the Tandberg, together with guitar backing (chords) on the other track, both at full recording level and with treble boost. The drum track was replayed via a Grampian reverberation unit to provide acoustic uplift. This was necessary in view of the fact that these two parts were eventually dubbed no less than four times more through to the finished recording. The two tracks from the Tandberg were then replayed, still as separate tracks, through a hi-fi stereo pre-amplifier (for tone correction and balance) and then mixed for level ready for recording with the first organ chord parts. This recording was made on the M24 at full-track. The electronic organ and the two rhythm tracks were each simultaneously played through monitoring amplifiers and loudspeakers. The combined full-track recording was then checked for balance

and was in fact recorded several times before this was satisfactory. This is where the advantage of separate recorders comes in for none of the individual recordings need be erased as would be the case with a single track to track recorder.

The combined full-track recording was then transferred via a correcting pre-amp onto one track of the Tandberg the second organ part being recorded onto the other track. This again made it possible to balance the two recordings when these were ready for transfer to the M24 along with the third organ part. The fourth organ part was then recorded with the four parts so far completed, again splitting the signals onto the two separate tracks of the Tandberg. Finally these were balanced and recorded back on the M24 with the fifth and last organ part, making a total of six musical parts.

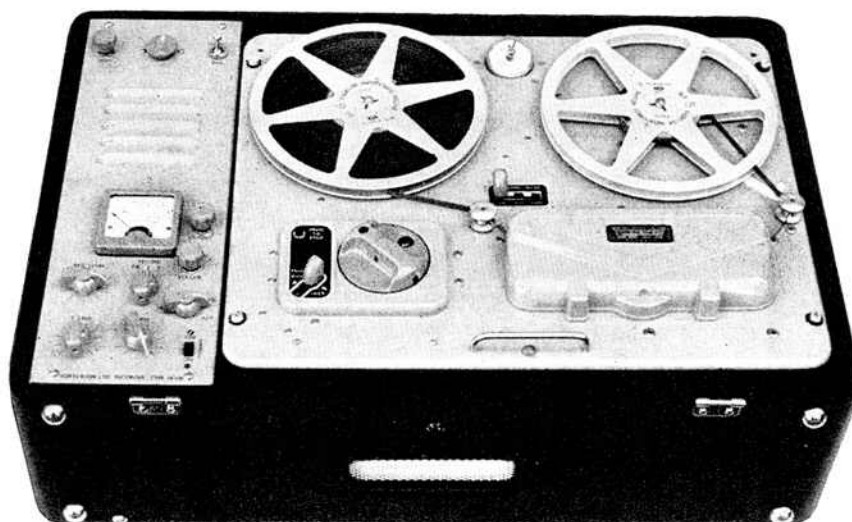
Well, you will say, this is fine if you have all the equipment for doing it, but even so and with only a single track-to-track recorder arrangements as nearly as ambitious as this can be achieved. There is the possibility of pooling equipment too which many clubs might do. I should also mention that multi-track does not have to be confined to music. Ever tried recording a whole play where you do all the voices and dub in the effects? With a tape deck like the Brenell and various sized capstans, small changes in speed and therefore in voice pitch can be achieved thus making ones voice sound completely different (not the Donald Duck effect of replaying at double speed). Those who have Brenell machines or tape decks will be interested to know that Brenell will turn out different sized capstans for a modest charge.



Fig. 3. One organ that doesn't need a microphone for recording! The Philicorda electronic organ will plug straight into a tape recorder. (Photo by courtesy of Philips Electrical.)

Vortexion **quality equipment**

TYPE W.V.B. TAPE RECORDER



The **Vortexion W.V.B.** is a high quality monaural machine with "Before and After" monitoring. The recording inputs are a high sensitivity socket for moving coil or ribbon microphone and a high impedance socket for radio, etc., either of which can be selected by a switch. Superimposing and echo work can be done, and the playback has reserve gain for abnormal requirements. This model cannot be converted for stereo playback, but it is a thoroughly reliable machine for the engineer specialising on monaural work.

Speeds $1\frac{7}{8}/3\frac{3}{4}/7\frac{1}{2}$ i.p.s. Price: £115 10 0
Speeds $3\frac{3}{4}/7\frac{1}{2}/15$ i.p.s. Price: £128 0 0

The **Vortexion W.V.A.** is a monaural machine which has a performance equal in sound quality to the other models. It possesses all the features of the W.V.B. except for "Before and After" monitoring, Dubbing and Echoes. The recording being made can be heard on the internal loudspeaker, as in the W.V.B. and C.B.L. The controls are uncomplicated.

Speeds $1\frac{7}{8}/3\frac{3}{4}/7\frac{1}{2}$ i.p.s. Price: £96 7 0
Speeds $3\frac{3}{4}/7\frac{1}{2}/15$ i.p.s. Price: £107 3 0

The **Vortexion C.B.L.** is a versatile stereophonic recorder which has no equal in its price group.

IT CAN record monaurally or stereophonically with its own mixed inputs from Gram., Radio or other sources and from high grade low impedance balanced line microphones. With good microphones, etc., the result is a suitable master for disc manufacturers. "Before and After" monitoring is provided together with adjustable metered bias for perfection.

IT CAN also make a recording on one track and then transfer it to the other track while measuring and listening to it and adding one or two more signals also metered.

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

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

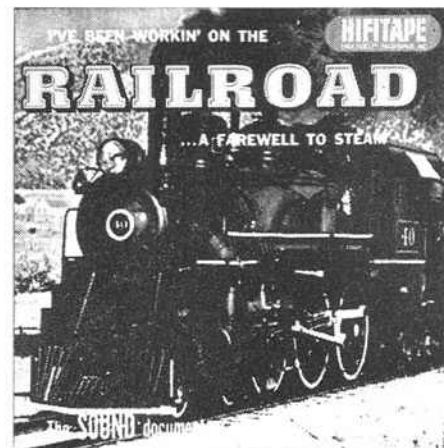
Speeds $1\frac{7}{8}/3\frac{3}{4}/7\frac{1}{2}$ i.p.s. Price: £172 0 0
Speeds $3\frac{3}{4}/7\frac{1}{2}/15$ i.p.s. Price: £180 0 0

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

VORTEXION LIMITED, 257-263 The Broadway, Wimbledon S.W.19

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MUSIC TAPES

THEIR PAST AND FUTURE

Twelve years ago the idea of commercial tape records in this country was hardly more than a dream and when they did come into existence they were in a form that was already out of date in the USA. It is hard for us to realise that mono tapes were virtually abandoned by 1957 and 2-track stereo became a curio by 1961. However, to judge by the progress made by this one-time back room industry, it is fair to say that before long it will have gone a long way towards catching up with its American cousins.

The trade, as a whole, has been slow to recognise the potential of this market and thus, in the early days producers were forced to go direct to the public either with a 'Club' or mail order business. Unfortunately for the trade, mail order is well entrenched and just a few firms hold the lion's share of the market. There are, however, many fields of activity in which we lag behind lamentably, partly due to the fact that recorder manufacturers show little or no interest in the possibilities for, or problems of pre-recorded tape. Thus there is no standardisation of speeds, tracks, or any serious and general attempt to standardise on equalisation techniques. It is largely for this reason that a tape which sounds good on one machine will sound out of balance on another. It is fortunate for our American friends that they have never been bedevilled with 2-track or 4-track mono and 2-track or 4-track stereo all at the same time. Admittedly they are now busy in the realms of 4-track and 8-track stereo, and engaged with speeds of $3\frac{3}{4}$ and $1\frac{1}{2}$ ips in addition to their more or less standard speed of $7\frac{1}{2}$ ips.

Some of us in the industry believe that the things so far accomplished are only a

A. Campbell Gifford has been connected with the sound recording industry for more years than he cares to remember, both in this country and overseas, and is at present Managing Director of two companies engaged in the production and importing of pre-recorded music tapes. (Editor)

preface to a more exciting story yet to unfold before us during the next few years. Tape, we believe, will in one form or another be as widely accepted as a home entertainment medium as the disc record is today. Whether it will finally replace the gramophone record is very doubtful, but it will gather along with it as the years go by, an ever increasing volume of devotees.

Until recently in the USA reel to reel and cassette pre-recorded tapes have been

the cinderella of the recorded sound industry but latest developments have created a resurgence of interest by several of the major companies, some of whom have returned to the market after being out of it for several years. Some have set up their own duplicating plant rather than enter into licencing arrangements with the giant Ampex organisation which produces the bulk of the world's pre-recorded tapes. (See photograph below.)



An Ampex high-speed tape duplicator.

Here in this country we have EMI and World Record Club with a huge catalogue of 3½ ips mono material. Only recently EMI introduced some of its American associates' lines such as Capitol and Angel in 7½ and 3½ ips 4-track stereo. All this, alongside the current availability of most of the Ampex range not controlled by EMI associated companies, plus another fourteen or so labels outside the Ampex range, all offered by Transatlantic Music Tapes, brings just about all there is available in the USA to our door. Unfortunately, with heavy duties the prices are not sufficiently competitive to discs to represent any real competition in that direction.

We, like the USA, will finally have to produce 3½ ips 4-track stereo tapes for the same price as discs and to make things even more acceptable, produce tapes which carry the music content equivalent to two full LP records. However, this cannot be achieved without improved duplicating techniques, and the ability of all 4-track stereo machines to accept 7 inch spools.

The pre-recorded tape industry in this country, at its best, is still in a pretty primitive state so far as duplicating gear is concerned. One has only to compare it with the huge Ampex organisation which is capable of producing in excess of 3000 finished tapes a day, all 4-track with the four tracks being duplicated simultaneously at 120 ips. In this country a duplicating speed of 30 ips is considered high, and some even produce their best work at speed to speed, or at best, one speed up. It is doubtful if the total weekly output of the trade in this country could match two days' output from the Ampex Hackensack plant alone.

Qualitywise we suffer too. Most makes on offer suffer from various forms of distortion, over-recording, heavy tape noise and sometimes excessive drop-out as a result of faulty tape stock. Our packaging hardly compares with that of the USA manufacturers. Their large hub spools, which go a long way to help in the reduction of wow and flutter, are unfortunately not very popular with users in this country. One firm has to re-wind a large proportion of its USA imports onto standard 5 inch spools in order to meet the demands of its market here. Some music tapes appear on 3 inch and 4 inch spools in mono, yet ideally the 5 inch spool with the 3 inch hub is the best for all, producer and customer alike, better still the 7 inch spool with the 4 inch hub. Several makers declare the *brand* of tape upon which they are duplicating. This can be a mixed blessing for the tape manufacturer, who can sometimes be blamed for a duplicating fault even when the virgin tape was perfectly good.

Many users are very keen on printed leaders at either end of the tape. So far as this writer is aware EMI are the only major producers in the world who provide

this luxury which is not even found on their very expensive lines imported from the USA. The production and labour cost of handling this end of the business must be quite high in proportion to the rest of the operation. In the end I think we shall settle for a label on the reel which will quote artists, titles and running time. It must be understood however, that all the faults are not on the side of the tape producer. Instances have occurred with regularity where customers' machines have been seriously out of alignment, heads so magnetized that they have imparted a not inconsiderable hiss onto the returned tape. Tapes have been returned half erased, stretched, broken and repaired with bits of cello tape. Sections of radio programmes have been recorded over, the track below has been recorded on the top track as a result of pressing the wrong button at the right time, or a complete copy has foolishly been made on a different brand of tape and the copy hopelessly returned as a reject. Some folks will try anything.

However we look at it, there is no doubt that tape has several advantages over disc, and one cannot deny that disc has advantages over tape. The quickness with which it is possible to pick out a selected number or segment of music is

but one. However, tape, properly handled has an indefinite life and unlike the gramophone record does not start to deteriorate after the first few playings. Discs are vulnerable to dust, careless handling and the ravages of a mishandled or worn stylus. At the worst you can break tape, and acetate is repairable. Its effective life, in and out of use is approaching that of indestructibility. The writer has tapes that were made in 1957. They have travelled the length of tropical Africa, been stored in a garage where the temperature rose to 120° at mid-day and down to 30° and below at night. Later they were stored in this country in a shed during the terrible winter of 1962, but they are still as perfect as the day they were made; the levels are the same and there is not a trace of print through.

It is to be hoped that the expansion of the USA market will find reflection here and that we shall see more and more of the leading labels becoming available at prices which will attract not just the wealthy enthusiast but the owner of a moderately priced machine as well. Let us look forward to the double play tapes that will bring us two LPs at a time. Who knows, 1966 may be the turning point of this unpredictable pre-recorded tape business. A.C.G.

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CASTLE, 7" 45 rpm records, approximate playing time 10 minutes. Each contains selection of sound effects in separate tracks. Complete with sleeve and paper inner jacket. Sleeve includes description of each sound effect and playing time in seconds

A ABX/1—BELLS AND SIRENS Price 7/6

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S.S. Queen Mary siren Factory siren Telephone bell Door bell
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B AFX/1—WILD ANIMALS Price 7/6

Side 1—Male and female lions Gibbons Chimpanzees Bell bird
Rattlesnake Baboon Viper Emperor geese Fish eagles Mountain lion (puma) Kookaburra (laughing jackass)
Side 2—Elephants Mississippi alligator Indian tiger Sea lions
Male lion In the jungle (a background of typical sounds)

C BGX/1—BACKGROUND SOUND EFFECTS Price 7/6

Side 1—Sea (breakers) Wind (howling—erie) Thunder (light rain)
Side 2—Rain (heavy shower) Factory sounds (industrial) Traffic (busy street)

D EFX/1—ELECTRONIC SOUNDS AND MUSIC Price 7/6

Side 1—Space ship—take off Space vehicle—imaginary take-off
Space vehicle—imaginary landing Ring modulation—tonal Modulated tone glide (descending) Modulated tone glide (ascending)
Sibilant—white noise (pitch octave low)
Side 2—Sibilant—white noise (pitch) Sibilant—white noise (pitch octave high) Three-tone vibration Filtered tone Slidder (tonal) Ring modulation and sibilant

E EFX/2—ELECTRONIC THEMES AND MUSIC CONCRETE Price 7/6

Side 1—Delta F Study in Sine-tones
Side 2—Sound object Montage

F HMX/1—HAUNTED HOUSE, MYSTERY SOUNDS AND MUSIC Price 7/6

Side 1—Thunderstorm Mysterioso Electronic Music
Side 2—Spooks Intruder Creaks Fright Dungeon Ghosts Ghouls Maniac laughter

G MFX/1—AUTHENTIC HIGH-FIDELITY SOUND EFFECTS Price 7/6

Side 1—Lion roaring Twin piston aircraft landing Building and debris falling Road drills and compressor Ship's siren Steam train leaving station Small steam loco and whistle Cell door, keys and locks
Side 2—Police car and bell, chase Police launch and siren Steam goods train and whistle Car door alarm, and starter Storm at sea, thunder, wind and gulls Tube train, stop, doors and start

H MFX/2—AUTHENTIC HIGH-FIDELITY SOUND EFFECTS Price 7/6

Side 1—American police car with siren—arriving American police car with siren—departing American police car escort with sirens—passing American police motor-cycle patrol with siren—stopping Applause (hand clapping) Orchestra tuning up Car crash Glass breaking (repeated)

Side 2—City and Waterloo tube train—arriving City and Waterloo tube train—departing Footsteps (continuous track) In subway (mixed) In narrow streets (female) On pavement (mixed) Running in street (female) Running in street (male) Up and down (wooden stairs) Workmen hammering and sawing

I MPX/1—MILITARY PARADE AND WARFARE SOUNDS Price 7/6

Side 1—March past—Guards and crowd sounds, etc. Royal Salute—Parade commands and National Anthem Drums and pipes—with parade commands
Side 2—Aircraft—low level attack (bombs, machine-gun fire, aircraft) Artillery—tanks—rifle fire, etc.

J TFX/1—AUTHENTIC BRITISH TRAIN SOUNDS Price 7/6

Side 1—Train departure—main line Train arrival—main line Express train passing—with whistle Fast goods train passing—with whistle Express train passing Small tank loco—passing
Side 2—Local passenger—arrive and depart Fast goods train—passing Central London tube train—arrive and depart Train over points and crossing Slow goods train passing—with whistle

K MFX/3—HORSES Price 7/6

(10 effects) Trotting Walking Jumping Composite recording of foxhounds, calls, horns, etc. Cows Cats Pigs Blacksmith's shop

L LFX/1—SOUNDS OF LONDON Price 7/6

Guards, Bow Bells, River, Markets etc., etc., with linking commentary. Ideal for cine films and colour slides

M RSX/1—ROAD SAFETY Price 7/6

With Jack Warner (Dixon of Dock Green) and Coco (Bertram Mills Circus) Documentary with sound

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<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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ON TEST

THE SONY-O-MATIC TC 135

Reviewed by Peter Knight

This is a mains-operated tape recorder in the 'popular' price range. It is suitable for the less-serious creative activities, for tapesponding and for the newcomer to tape who wishes to try his hand before investing in a more exotic model. One of its attributes is simplicity of operation. The use of one of the automatic recording level control circuits makes the recording level control and the level indicator redundant. Over-recording and tape saturation are rendered impossible by the arrangement which automatically pulls down the gain of the recording amplifier when the input signal exceeds a pre-determined level.

Auto Recording Level

This idea is not new, of course, and it is found in other makes and models. There is a Philips model, for instance, which has a switch allowing the selection of either 'auto' or manual recording level control. On the face of it, it would seem that this mode of auto control would tend to act rather like 'volume compression' and thus destroy the dynamic range of the recording. Indeed, similar circuits are used for just this purpose!

The secret of auto recording level control (called 'automatic gain control'—agc for short) however, lies in the ability of the circuit to respond rapidly to the overload signal and then take a relatively long time to recover so that the rate of increase in gain is not perceived. Should the circuit come back immediately to normal gain after an overload, the effect would be volume compression.

The TC135 employs three valves and a solid-state rectifier for ht. The first valve is a high-gain pentode, type 6AU6, and this is followed by a type 6AV6 double-diode triode valve, the diodes in which serve as the signal rectifier for the agc system. The output valve on playback—which also seconds as bias and erase oscillator—is a 6M-P17, capable of delivering about 1½ watts of audio to the speaker.

The machine is contained in an attractive plastic case with a sloping loudspeaker front, the carrying handle being a part of the moulding, as shown in Fig 1. There is also a plastic lid which fits over the spools,

as shown in Fig 2 and for carrying or storage a plastic-faced canvas case with zip fastening is also supplied with the machine. The dimensions of the machine proper are 11 in by 9½ in (depth) by 5½ in (height) and the weight without accessories is about 7½ lbs. The only electronic control is for playback volume and mains on/off edge mounted at the side of the speaker grill. This lights up when the machine is switched on.

The deck function switch on the top of the machine can be seen in Figs. 1 and 2. This gives rewinds, pause and playback. For record it is necessary to depress the red button on the opposite side of the top panel while activating the function switch. That takes care of the control! The machine can take up to 5 inch spools and can be arranged to run at either 3½ ips or 1½ ips. For the slower velocity a bush needs to be removed from the tape capstan. There is no speed switching as such. Anyway, it is likely that the slower speed

would only be used for low quality speech or dictation work.

Hf Erase

At 3½ ips the frequency range is specified as 100 to 7000 c/s. It is somewhat below this, of course, at the slow speed. Two-track heads are employed and hf erase is utilised as distinct from permanent magnet which is sometimes expected on the less costly recorders. The internal speaker serves quite well for the frequency range and size of the cabinet. It is a 3½ inch permanent magnet type with an 8-ohm speech coil. The electronics are built upon a small circuit board and chassis assembly, as can be seen in Fig 3. Complete mains isolation is provided by a double-wound mains transformer and tapings are available for use on 110, 120, 220 and 240-volt mains supplies. Internal modifications in wiring are required to change from 50 c/s to 60 c/s mains frequency. A change is also required of the motor pulley.

There are two input channels, a low-level



Fig. 1 Front view of the TC 135 with top cover removed.

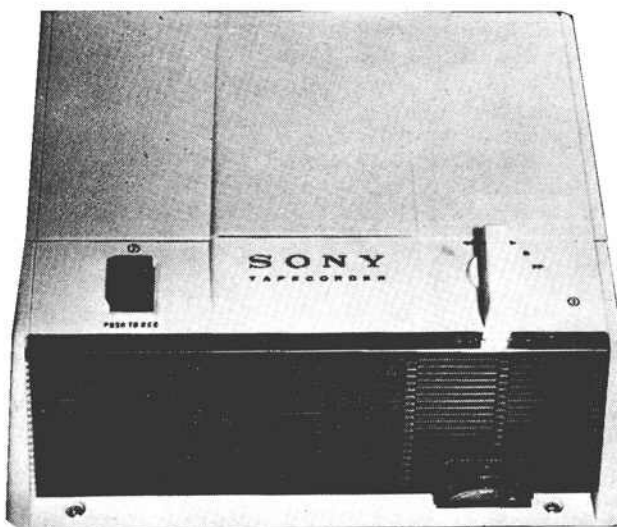


Fig. 2. Top view of the Sony TC 135 with deck cover in position.

one for the microphone, a high impedance dynamic unit being supplied with the machine (this can be neatly tucked away in a small cupboard at the base of the machine) and a high-level auxiliary input. This latter has an input impedance in the order of 0.5M ohms and is on the same circuit as the microphone, but is fed via a resistive attenuator. No sensitivity figures are given in the instruction booklet, but it would seem that the microphone channel can be fully loaded with a signal of about -45dB, which is about 200 times below 0.775V, which is about 4mV. The auxiliary input calls for -10dB (with 0dB = 0.775V), which is about 250mV. However, in practice smaller levels appear to load the recording amplifier quite well, probably due to the gain reserve related to the agc circuits.

The machine also has a monitor or signal output socket which in the *record* position delivers about -25dB (approximately 40mV) and in the *playback* position delivers about -12dB (a little under 200 mV). Both of these outputs are across 100k load. Small jack sockets (as distinct from DIN sockets) are located on the left-hand side of the cabinet for the inputs and output. There is no position for an extension loudspeaker, but this would hardly be worthwhile since the playback output stage is not designed to do justice to much more than the small internal speaker. For improved quality playback the signal at the monitor socket can be fed to the input of a hi-fi amplifier system, but even then due consideration must be taken of the frequency limitations of this class of machine. The tape deck mechanics are remarkably good for a machine in this price range. Fig 4 shows the top of deck mechanics, which is the view with the top plate of the machine removed. The large flywheel is clearly visible here and this has the tape capstan as its spindle. Belt coupling is used to the spools. The machine is ventilated by a fan on the protruding spindle at the rear of the motor housing, as seen in Fig 3. This operates in a small extension at the

bottom of the cabinet and when working this area must be kept clear otherwise internal overheating of the recorder may occur.

On Test

The machine was tested on all services. For ordinary record and playback using the microphone supplied reasonably good results are possible having in mind the frequency range of the electronics and the small size of the speaker. A small amount of internal reverberation was in evidence on the test specimen, but this was by no means disconcerting. At full output on play-back, however, particularly from a tape somewhat under recorded, a fairly high level of hum was present from the loudspeaker. This, it seemed, was induced into the playback head from the mains supply circuits. Tapes made with the recorder and played back on another machine were reasonably free from hum. Some improvement was possible by very careful adjustment to the 'hum dinger' control which is present in the heater circuit, but even then at full playback volume on very soft passages a trace of background hum could be heard.

At reproduction levels in the order of 500 mW from a tape of normal recording depth, needing the playback volume control a little under half advanced, the hum was by no means troublesome, and this is probably how the machine would be used 90 per cent of the time. The recording agc circuit works really well on this machine. By subjecting the supplied microphone to excessive sound pressures it was impossible to run the tape into saturation. It was still impossible to over-record from the tape point of view by injecting quite large level signals into the auxiliary input. There came a time, however by increasing the signal level when bad distortion was recorded; but this was more likely to be caused by overloading of the first stage rather than tape saturation. Of course, while agc circuits control the level of signal current in the recording head and tend to keep this below the level

corresponding to tape saturation, too much input signal produces a large control bias at the signal rectifier circuit, and this being applied to the first stage valve—which is the gain-controlled valve—can aggravate non-linear problems here. Nevertheless, under normal and expected signal level limits, the auto control is highly successful and well worth while on this type of machine.

There is adequate signal at the monitor output socket on playback to permit dubbing onto another tape, via a second machine. The signal level allows the use of a passive equalising circuit, should this be necessary, while still leaving sufficient for the second recorder. There is also plenty of signal to drive a larger and better playback amplifier but a good bass response here can result in hum from the recorder becoming noticeable. The low frequency response of the machine itself is restricted at 100 c/s.

The 'pause' position on the deck function switch represents a good, workable proposition and for the price of £29 8s. 0d, including the dynamic microphone, a 3 inch tape and a 3 inch empty spool, motor pulley for speed change and head cleaning ribbons, the machine is quite good value for money. The machine can be left running for long periods of time without excessive temperature rise and it requires no qualifications to operate.

Manufacturers Specifications

Mains requirements: 110, 120, 220 or 240V 50 c/s (60 c/s adaptation) 55 watts.

Speeds: 3 $\frac{1}{2}$ ips and 1 $\frac{1}{2}$ ips by removing capstan bush.

Track: Two—standard recording direction.

Bias Frequency: Approximately 35000 c/s.

Frequency Response: 100 to 7000 c/s at 3 $\frac{1}{2}$ ips.

Power Output Playback: 1.5 watts.

Input: High impedance microphone; high impedance auxiliary.

Output: Monitor at 100k ohms.

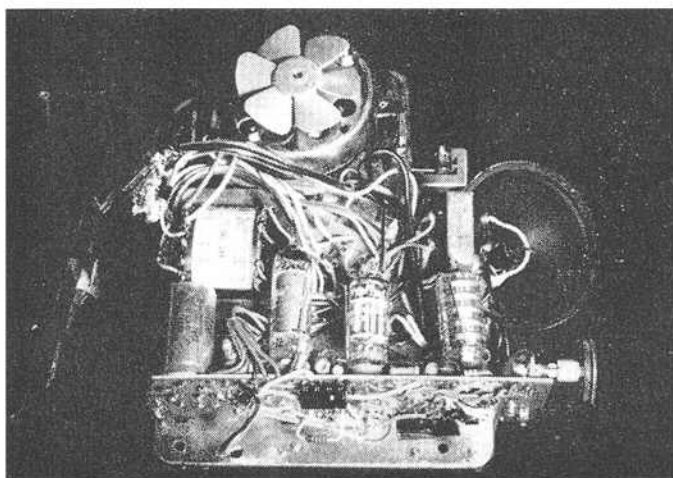


Fig. 3. Amplifier and deck assembly.

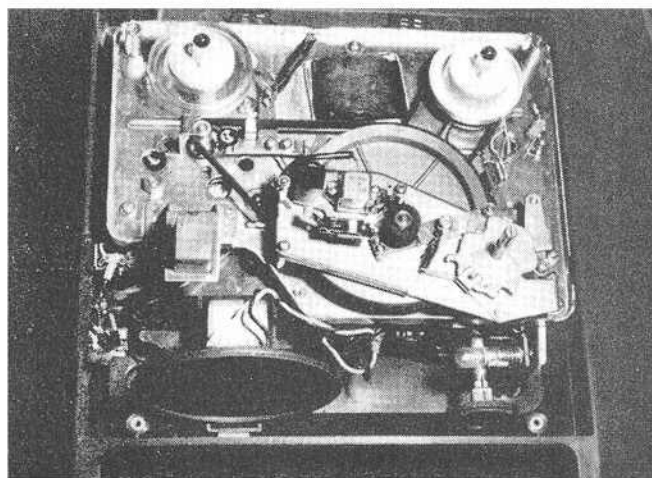


Fig. 4. View of deck mechanism with cover plate removed.

TAPE RECORDERS IN THE MAKING

Top-quality components, good design and precision performance are important features in all Bang & Olufsen tape recorders and hi-fi equipment. E. McKeown reports on his recent visit to the B & O factory in Denmark



Many of us still tend to think of the Danes as a nation mainly concerned with agriculture and dairy farming – certainly we import plenty of butter and bacon from them – but the present rate of industrial expansion in Denmark is quite dramatic. For example out of a total employable population of two million, over 400,000 people now work in the various manufacturing organizations throughout the country and this is about 100,000 more than ten years ago. During the same period the annual value of Denmark's industrial production rose from £700 million to £1,500 million.

I recently visited a Danish manufacturing firm whose name and products are well known in the United Kingdom. Bang and Olufsen, who design and manufacture tape recorders, hi-fi equipment, radio and television sets, are proud of the quality of their products. My tour of their main factory at Struer, in Jutland, convinced me that their pride is more than justified. In 1925, when radio was still in its infancy, this Company was formed with very limited capital by two enthusiastic young engineers, Peter Bang and Svend Olufsen, who had known each other during their student days. Together they started producing radio receivers in rather primitive surroundings – in a garret at Quinstrup Manor just south of Struer. The growth of the Company since those early days is a fine reflection of the diligence and dedication of these two pioneers. From the start they always insisted upon the highest possible quality in materials and workmanship

and they soon became the leaders of the then very young radio industry in matters of invention and design.

Expansion is now in full swing at Bang & Olufsen. In 1960 they employed 700 people; by 1964 this figure had risen to 1,000; now the Company employs over 2,000 workers and its factories occupy more than 380,000 square feet. B & O produce over 900 major units and about 1,000 stereo pick-ups every day. Approximately 45% of their production is exported.

Instrumentation and assembly

There is a very comprehensive instrument department at Struer, the core of which is B & O's own transmitting centre comprising thirty different TV, AM and FM transmitters, all equipped with automatic control circuits to ensure that at all times absolutely accurate signals reach the assembly operators and test engineers. The distribution of these signals throughout the factory calls for over 16 miles of coaxial cable! The Company designs and makes virtually all its own test equipment, a selection of which is shown in a photograph overleaf. The assembly lines and test benches are exceptionally well-planned to achieve maximum productivity with the minimum of physical exertion – an important point for operators doing repetitive work for hours at a stretch. Coils are wound, circuit boards printed, transformers made, capacitors and resistors soldered in, motors assembled, etc. The various sub-assemblies are then brought together with the casing of the tape



Top Left: *An electro-plating bath ensures that all metal component parts are corrosion-proof.*

Lower Left: *One of the many assembly and unit-soldering lines.*

Top Right: *Part of the main Bang & Olufsen factory at Struer.*

Centre Right: *A completed radio tuner undergoes a circuit alignment and performance check.*

Lower Right: *Final testing bays where azimuth alignment and frequency response checks ensure that all B & O tape recorders come up to specification.*

recorder on to a conveyor system. Here, step by step, the recorders take shape and begin to look more like your machine and mine when we've taken the cover off.

Quality Control

While all these operations are in progress, a remarkable department called quite simply 'Quality Control' is also hard at work. QC has a staff of sixty-one highly qualified and specially trained technicians. Their Chief, Mr Rudolf Jensen, explained to me that they had to ensure that every component, sub-assembly and finished product conformed to the strict specifications laid down for them. For example the dimensions of most of the mechanical parts of B & O tape recorders are subject to limits of $\pm .0001$ in. There are over 30,000 different components produced by B & O themselves and their sub-contractors, and QC check the quality of every batch. One single item not meeting these high standards will result in a whole batch being rejected.

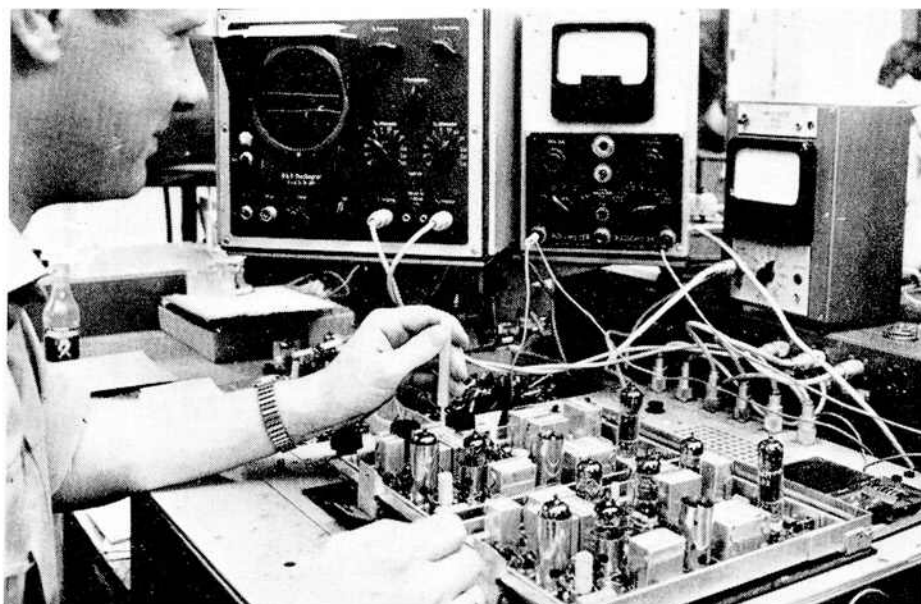
Mr Jensen's department has supreme authority in their quest for perfection. Disruption of the production flow is a serious hazard for any manufacturer but at Bang & Olufsen quality is considered so important that QC are empowered to halt production in any part of the factory *without notice* if they find that any faulty components have slipped through their inspection net. Fortunately such events are very rare indeed.

'Quality Control' technicians constantly take sub-assemblies and completed tape recorders from the production lines at random for thorough inspection and testing. The recorders are also subjected to rigorous user trials as an additional assurance of trouble-free service to the people who eventually buy them.

Anechoic Chamber

Another interesting feature at Struer is the anechoic chamber which B & O have built. It is one of the few to be found in Europe outside the universities and research institutes. The Company's technicians use this room for a large number of electro-acoustic measurements, e.g. on loudspeakers and microphones. In the course of building this anechoic chamber, the walls, ceiling and floor were lined with $\frac{3}{4}$ in chipboard, then about 2,000 rockwool wedges were glued to these surfaces and a false floor - a grating - was installed. Each wedge is 32 in long, 8 in square at its base and weighs about 2 lb 12 oz. The measurement of the reflective quality of the wedges was made by the staff of the Technical College at Aarhus in Denmark, using the tube method. The entire cross section of one end of a tube five metres in length was filled with wedges and a loudspeaker was placed at the other end. A microphone, placed in the tube, was movable by remote control from outside. The speaker was connected to an audio oscillator. Maximum and minimum sound pressures in the tube were found by moving

continued overleaf





TAPE RECORDERS IN THE MAKING

continued

the microphone, these being P_{max} and P_{min} respectively. The reflection coefficient, R , was calculated as a percentage where

$$R = \frac{1 - n}{1 + n} \times 100 \text{ where } n = \frac{P_{min}}{P_{max}}$$

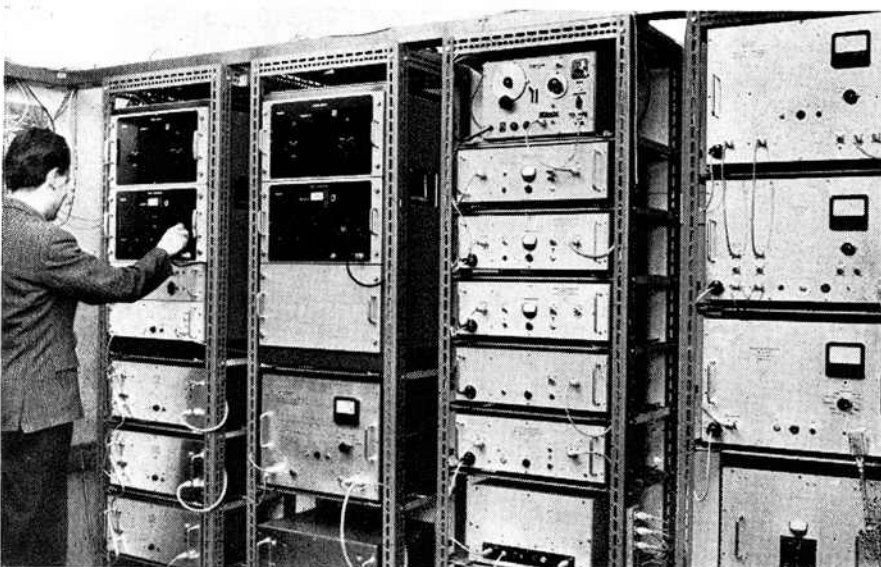
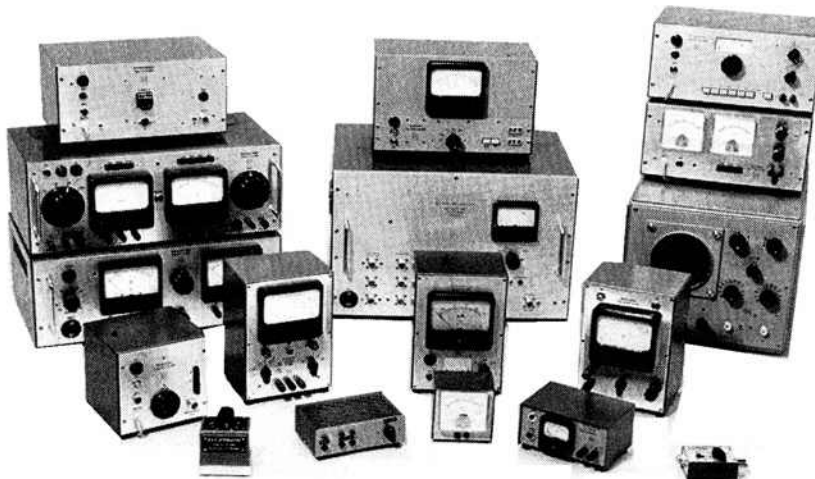
The engineer in charge demonstrated the effectiveness of the anechoic chamber by firing a starter's pistol. It sounded rather like a child's cap-gun. We stepped out into the corridor and he squeezed the trigger again; the explosion was almost deafening!

New tape recorder

By the time this report is published a new B & O tape recorder should be taking its bow in the UK. I was able to see and hear this machine – the Beocord 2000 De Luxe – at Struer and was very favourably impressed by its performance. It is a fully transistorized stereo recorder whose specification, particularly in relation to speeds, wow and flutter, measure up to international standards for studio machines. It has a built-in 4-channel mixer with twin faders for both monaural and stereo recordings, providing individual control and mixing of mic, gram, radio and line input signals. The amplifier system is a unique combination of seven easily replaceable all-transistor amplifier units. Separate record and playback heads with individual amplifiers permit monitoring of both the input signal and the recording. Frequency response figures claimed by the manufacturer:

- (a) At $7\frac{1}{2}$ ips: 30–20,000 c/s (± 2 dB 40–16,000 c/s)
- (b) At $3\frac{3}{4}$ ips: 30–16,000 c/s (± 2 dB 40–12,000 c/s)
- (c) At $1\frac{1}{8}$ ips: 50–8,000 c/s (± 2 dB 50–6,000 c/s)

Some of the other features of the versatile 2000 De Luxe are: two illuminated VU



Top Left: An acoustics engineer explains the structure of the B & O anechoic chamber where microphone and loudspeaker performance measurements are carried out.

Centre Left: Some of the laboratory test instruments used for precision performance measurements on prototype equipment.

Lower Left: B & O's own transmitting room from which accurately known test signals are piped throughout the factory.

Top Right: The new Beocord 2000 de luxe tape recorder which will shortly be reviewed in ATR.

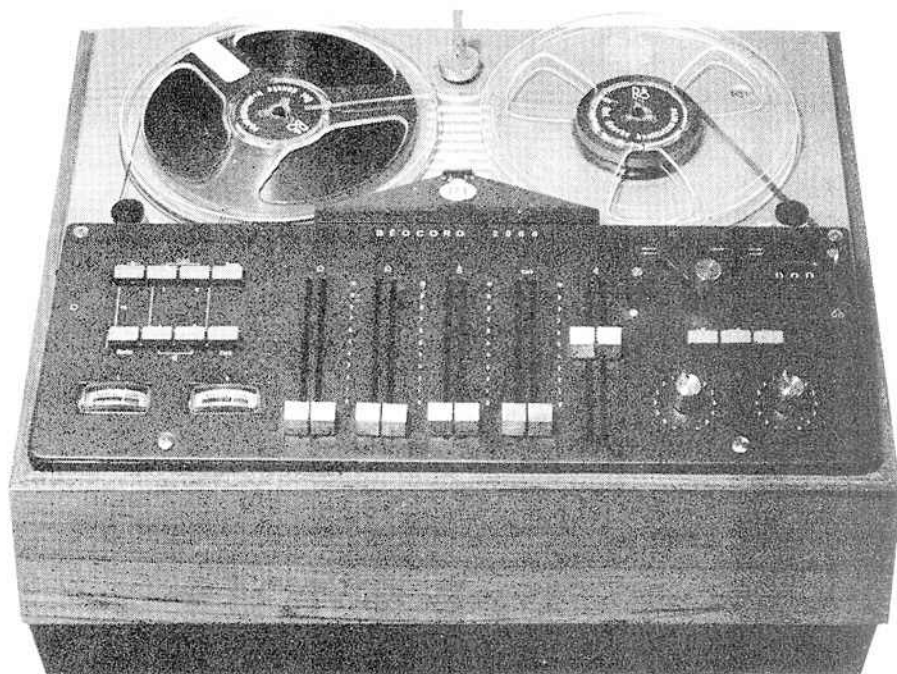
meters; a special safety circuit to prevent damage from electrical overloading; built-in splicer; two-track recording but – unusual departure – this machine will playback both two-track and four-track tapes; fast forward and fast rewind; slack tape absorbers to ensure really smooth starting and stopping at all speeds; pause control; tape counter; individual bass and treble controls duplicated for stereo; telephone pick-up jack; echo facilities.

This is intended only as a brief look at this new tape recorder. *ATR* will very shortly be putting this machine through its paces and reporting in much greater detail on its performance and its wide range of extra facilities.

Pick-ups

Bang & Olufsen is also famous for its stereo pick-ups. Eight years ago Mr Rørbaek Madsen, their Chief Engineer, set to work on the problem of playing the first stereo gramophone records, then being manufactured experimentally. Working with one of these records he designed a stereo pick-up which was so successful that it has been marketed ever since then in virtually the same form. The pick-up factory, one of the largest in Europe, is housed in a former school building in a rural area of Jutland where the quiet and peaceful surroundings are a perfect background for the concentration and precision required in this particular type of work.

My visit to Bang & Olufsen was a most



interesting and enjoyable experience. I wish I could have taken all *ATR* readers along with me! I met many of the Company's designers, engineers, fitters and machine operators and was much impressed by their skill and knowledge. Three very lasting impressions which I brought home with me were the friendly one-big-family atmosphere which extended from the

managing director right through to the newly joined apprentice; the impeccable cleanliness of the whole factory – even the heavy machine shops had wooden floors, spotlessly clean; and the utter pre-occupation at all levels with quality of workmanship and materials.

Bang & Olufsen is a very successful organization – and it certainly deserves to be.

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BIG GAME HUNTING WITH A '202'

For a second time Bob Danvers-Walker has been on a big-game-hunting Safari in East Africa to gather recordings for a BBC programme. In this exclusive *ATR* report he writes about some of the sounds he recorded whilst on a leopard hunt in the wildest region of Uganda



After only 6½ hours' flying time from Gatwick by a BUA VC 10, Bob Danvers-Walker was on the monsoon-rain-wetted tarmac of Entebbe Airport. The General Manager of Uganda Wildlife and the UWD Safari car were there to meet him. Bob indicates that he means business with his Fi-Cord 202a.

Gathering and recording the sound ingredients of a programme is the most interesting and exciting part of an assignment, writing and fashioning the resultant tapes into a composite script is the arduous part but hearing the finished production on the air the most rewarding.

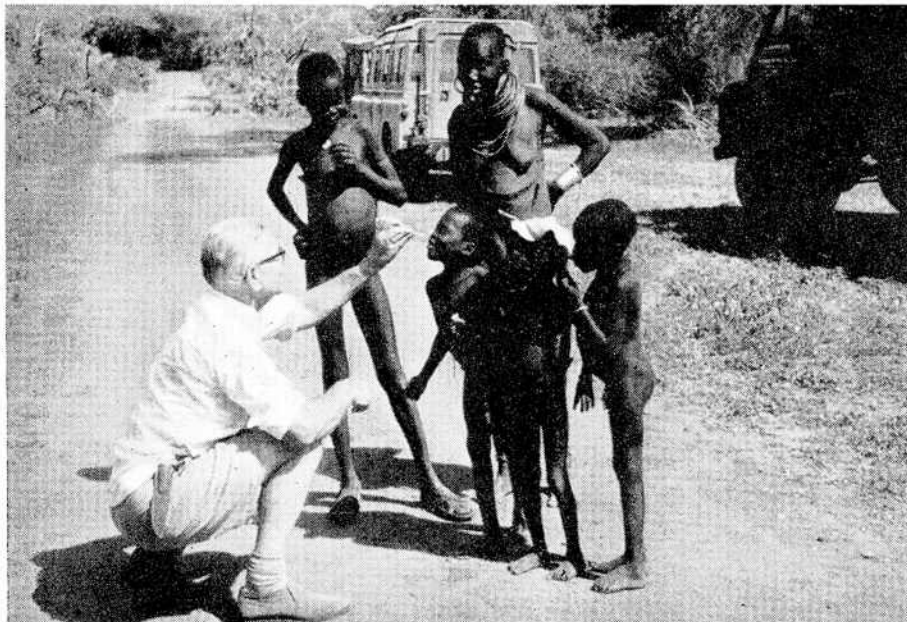
Within days of my return from three weeks in the African bush I was deep in phase two of the operation. The purpose of my being on a big game hunt was to construct a programme I had suggested to the BBC dealing with the professional hunters and how money brought in to the East African Game Department through controlled hunting is being used to help in the work of wild life conservation. Paradoxically, it is by licensing wealthy sportsmen (client hunters) to gather trophy on hunting (and photographic) safaris that the herds of that country's unique species are preserved. The main erosive factors depleting the rarer animals are poaching and loss of habitat through agricultural expansion. Selective culling by Game Wardens is another means whereby balances may be maintained and disease kept under control. These are the elements which gave me the idea of making a programme which I call *Kill and Let Live*.

The day after my arrival in Kampala I

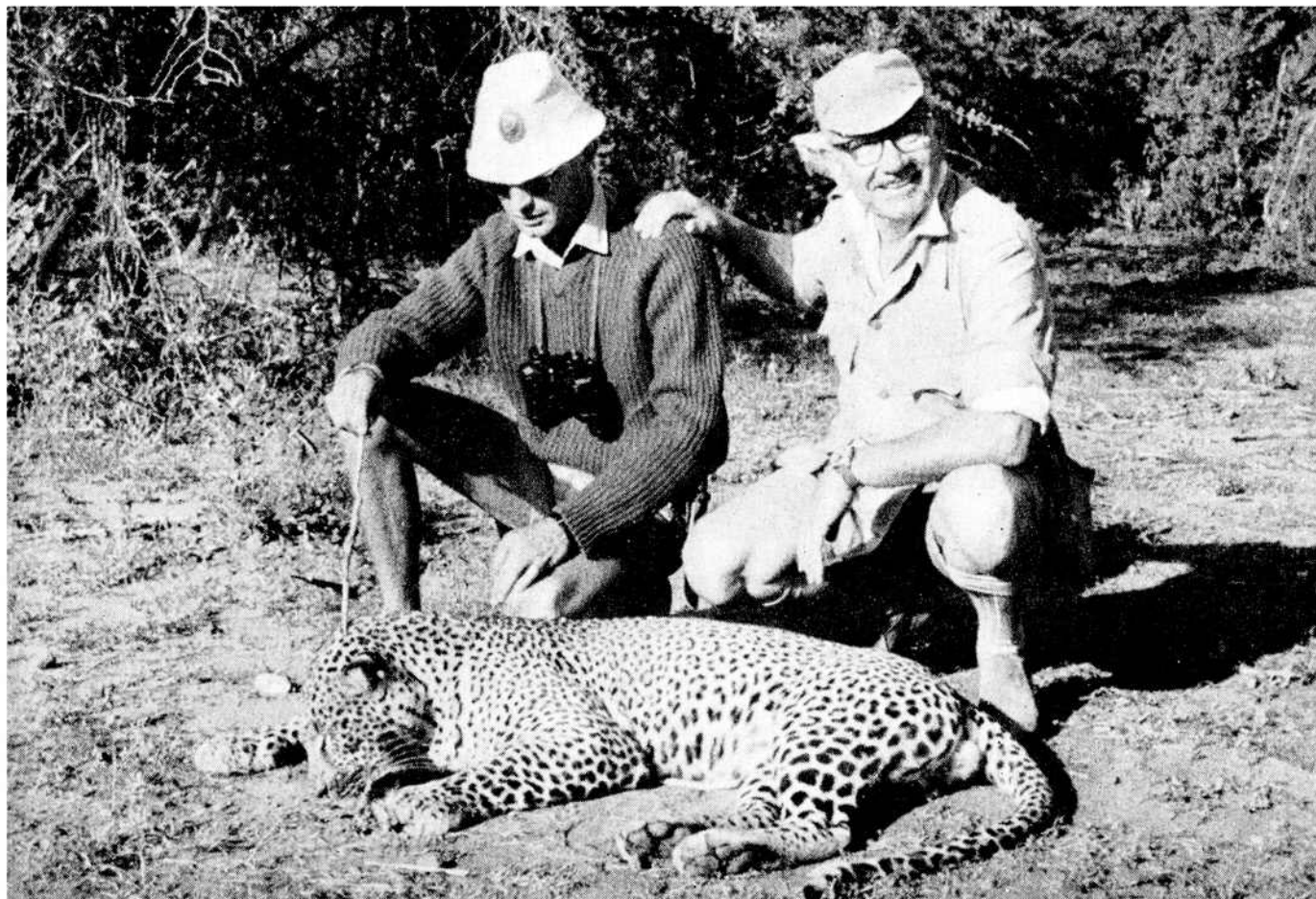
was driven 400 miles to join a leopard-hunting safari operating in the most primitive region of Uganda, the Karamoja. This spectacular area is some 175 miles South of the Sudan. It is inhabited by the Karamojong, Jie, Dodoth and part of the Suk tribes who have so far steadfastly resisted *civilisation*. They are a cattle-raising people, by and large, counting their wealth in the number of humped cattle they own. They rarely kill one for food, however hungry they may be. That's their capital and a hundred beasts will buy a wife. They live principally on a diet of blood, milk and meat—the wild meats of the bush. The men are mostly without clothes; a loose-flowing cape draped from the shoulder is formal attire, while the women's 'dress' is basically a small bead-studded apron and masses of metal hoops and beads worn as necklaces. Animal-hide skirts are also frequently worn. There is much cattle raiding and inter-tribal fighting is still very much the order of the day. On two successive days while I was there twenty-two men were killed in a raid by cattle rustlers.

Many of the 'Jong' would stray into our camp tempted by the prospect of getting some meat from the hunter's excursions. They came from a village about a mile from our tents which were pitched in the Katakekele region. I found them to be shy upon acquaintance but after a few days, during which I tempted the little kiddies with biscuits and boiled sweets, they became quite friendly. I will venture to say that I have the only recording of a Karamojong tribal song and dance performed in celebration of a feast. One night as I lay half asleep in my tent I heard, far away in the distance, the Jong clapping, stamping and chanting. I always had my Fi-Cord 202 loaded and ready to hand with the Beyer M66 directional microphone on a tripod beside the open tent flap. When a hyena starts up in the middle of the night you have to be trigger-happy to catch his howl. Lions on the hunt will also be heard during the night.

Getting out of bed I walked away from the camp into the bush a short distance to be clear of the chatter from the camp boys and, putting the volume control at full boost, tried to pull in the distant sound of the Jong whooping it up. It was there all right on the tape but not usable. The nearby insect sounds were amplified far too heavily. It was not until several days later that the Jong were set off spontaneously into their song and dance. Several women, children and old men had come in to our camp. Where there are white men with high velocity rifles, there'll be meat. They were right, we had shot a leopard. While waiting for the dead beast to be skinned they hung around for the share-out of the carcase. Imitating the rhythm I had heard during the night I got one or two copying me and in no time at all some thirty or so meat-happy Jong were howling and dancing and clapping their



Near Camp Katikekele, Karamojong children have been won over with bits of biscuit. Timid by nature, it took days of patient persuasion before they would venture near. Bob made a hat out of a large leaf and a feather for the little boy in the middle.



A seven-foot leopard fell to the rifle of professional hunter Robin Hurt, seen here with Bob immediately after the early-morning kill.

hands in their tribal dance. The high leap they execute is not unlike that done by the Masai warriors.

Among the many splendid tapes I brought back I consider the dawn chorus of bird calls to be among the best in expressing the true atmosphere of the bush. There were hornbill, turtle doves, weaver birds, kingfishers, waterbottle birds, kite, brilliant blue, scarlet and yellow starlings and a dozen other ornately plumaged birds singing their hearts out. One interesting bird is the clapper lark which beats its wings together on the down drop after soaring aloft. This is a mating display which sounds like a football supporters rattle. And the Go-away bird. He pipes up about the time a leopard is in the vicinity. As the leopard is a night feeder he is hunted near sunset or early morning. The hind quarters of a zebra, a topi or even a wild dog (a mangy, verminous brute like a cross between a hyena and a wolf) are lodged as bait in the forked branches of a tree, sufficiently foliated to keep it safe against vultures. A hide is built of brush wood some 40 to 50 yards away with an uninterrupted view of the bait. The hunter must be prepared to sit for two or three hours on end without making the slightest movement or sound. His rifle must be poised in the firing position, resting in a forked stick ready for firing. I spent two

days working on a plan to record a leopard kill. I had even to consider the faint click of the tape switch. A leopard will scare at the slightest sound. And he's the quickest thing on four legs. The sound I have is so dramatic that the strike of the bullet a fraction of a second after the rifle shot can be detected.

I made excursions away from the leopard haunts in the Moroto Mountains travelling into the Matheniko Plain with the hunters to stalk lesser kudu, topi and oryx. Here also were herds of zebra, giraffe and hartebeest – to name a few. I was to learn a lot about animals and their ways from the professional hunters I was with. Particularly so when I heard the noise the zebra make; they bark like dogs. And the alarm note from a herd of cow elephants with their calves – a rumbling, deep-chested roar as though a pride of lions were giving voice. The lion itself is a ventriloquist. He can cast his echoing, growling roar from any quarter of the compass. He stands still and roars. Startled game scatter, and he roars again from what seems to them a different direction; they change course, not knowing which way to flee because the noise comes from anywhere. The trap is set and they blunder into the king of beasts. He makes his meal and the vultures gather.

The most amusing sound I brought back

is surely the grunting and bellowing of hippos in their wallows. Pink nostrils, eyelids and ear tips peep from water level. From a dozen or more half submerged cows and bulls, sharing with the crocodiles the waters of the White Nile, there come the evening noises from these huge creatures, the third bulkiest land animal in the world. It weighs up to three tons, is five feet high at the shoulder and fourteen feet long. Jets of vapour shoot into the air like a submarine blowing its tanks and Kiboko (in Swahili) surfaces. Yawning hugely he then submerges to a chorus of groans and booming grunts. These are the big sounds of the bush. There are the little ones too. Like the shrill whistle from the whistling thorn or stunted Acacia trees and bushes as wind blows through their masses of two-inch long thorns; a shrub which forms the basis of a lion-proof stockade round native villages. Then there's the bell note coming from frogs in a bog and the mini-screams of fruit bats hanging clustered in their thousands from eucalyptus gum trees. This is a dawn operation as they fly in in their thousands out of the pink-tinted Eastern sky to hang upside down like bunches of inverted cats with wings – and as big. A slightly pathetic sound is the 'tweet, tweet' of the tiny dik dik antelope, no bigger than a hare, as it leaps about in the bush by night.

B. D.-W. 21

TAPE RECORDER SERVICING

Part IX

of the series

by Gordon J. King

Last month attention was given to the type of recorder in which the playback output valve changes its function to that of erase and tape bias oscillator when the machine is switched to the *record* position. At this juncture it should be mentioned that the amount of noise signal on a recorded tape is influenced by the purity of the hf (hf – high frequency) bias signal waveform. Optimum signal/noise ratio is secured in this respect when the

waveform is a pure sine wave.

The oscillogram in Fig 1 shows a fair representation of a sine wave and hence the nature of the signal produced by the hf oscillator. Actually, this waveform was obtained from the monitor head of a domestic type tape recorder from a 2000 c/s sine wave signal previously recorded on the tape. The rather thick line of the trace is due in part to over-exposure of the photograph and to the presence of noise on the signal. More will be said about noise later.

To get back to the signal/noise aspect relative to the hf signal, the purer the waveform, the better the signal/noise ratio. This applies to both the erase signal and the bias signal. If the erase signal deviates from a pure sine wave, the tape is erased all right, but the harmonics of the waveform (resulting from the distorted signal) are themselves actually recorded on the tape and result in a relatively high background noise.

Tape Noise

A rough idea of how much noise the erase oscillator is adding to a tape can be gleaned first by running a brand new virgin tape (unrecorded) through a machine at full playback gain, listening to the tape noise, and then comparing this noise level with that obtained from the

tape after it has been run through the same machine in the *record* position with the recording level control at zero and with all programme inputs removed. One may be surprised at the substantial (in some cases) rise in noise level between a virgin tape and one subjected to erasure by way of the recorder itself. A distinct alteration in noise level is often discerned by running a few seconds of new tape through the machine in the *record* position (and at zero recording level, etc, as detailed above) when on *Playback* the noise level will be heard to decrease immediately the tape passes from the machine-erased section into the virgin section.

While the distortion level of the hf signal produced by a relatively inexpensive machine – in which, for instance, the playback output valve doubles as the oscillator valve – is reasonably low, distortion is, nevertheless, present. Thus, some recorded tape noise is bound to exist, but this may not be particularly important owing to the fact that the signal/noise performance of the early amplifier stages of this kind of machine is likely to mask the tape noise anyway! Purity of hf signal waveform becomes progressively more important with machines designed for high quality recording, such as studio recorders. The early amplifier stages of this comparatively expensive type of machine are carefully designed for extremely low noise generation, thereby making it particularly important to avoid the erase and tape bias from adding noise.

The design of the hf oscillator thus demands careful attention, and rarely is it possible to switch the playback output valve to produce the oscillatory signal. Instead, a separate bias/erase oscillator stage is adopted. This may employ a single valve or a push-pull oscillator circuit may be used. The latter has the advantage of a purer waveform owing to the push-pull operation cancelling out some forms of distortion. A very symmetrical hf signal waveform is needed to maintain a low level of noise. An asymmetrical waveform (which means that one half cycle of the waveform differs in some way from the other half cycle) gives rise to a dc component resulting from the amplitude difference between the two half cycles of waveform and is responsible for the recording of tape noise.

Push-Pull Oscillator

Various examples of single-ended oscillators have already been given in this series, and an example of a push-pull oscillator is depicted in Fig. 2. This is

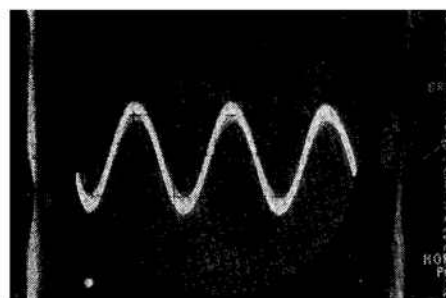


Fig. 1. Oscillogram of a sine wave signal. This is at 2,000 c/s as taken from the output of the playback amplifier from a tape previously recorded from a sine wave generator.

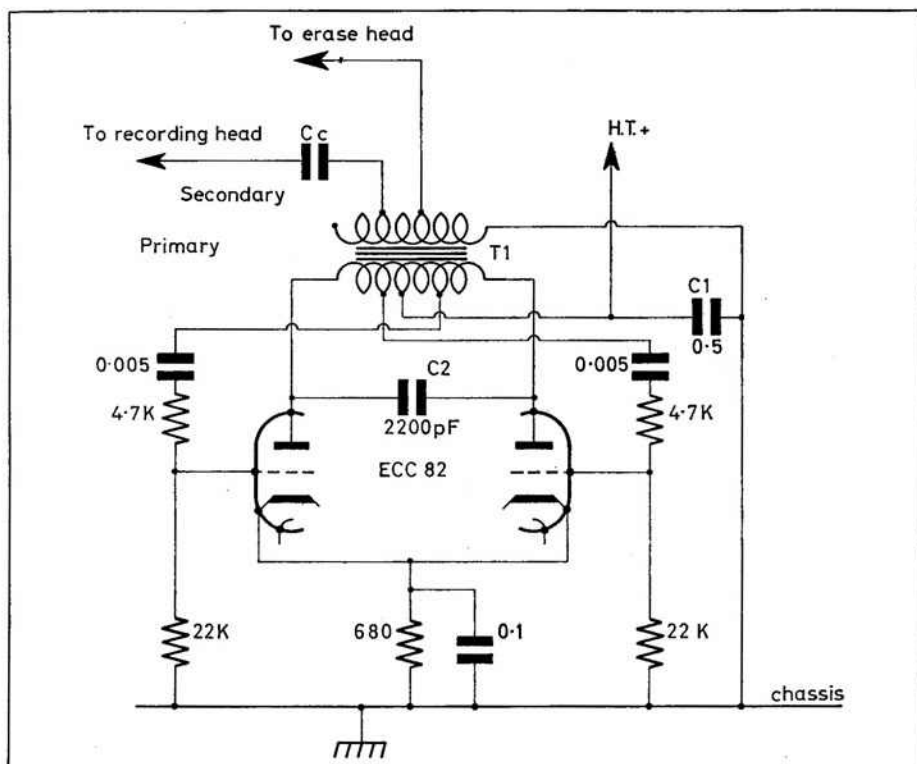


Fig. 2. A push-pull oscillator taken from the Mullard tape pre-amplifier. It is fully described in the text.

from the Mullard tape preamplifier a single, double-triode valve being used. The main feedback component is the transformer T1. This has windings on both its primary and secondary windings. The primary winding is really the feedback winding proper, the secondary being used to feed out the oscillatory signal to the heads at the correct amplitude and impedance.

Complete symmetry of circuit is attained by the centre tap of T1 primary being at earthy potential signal-wise (through C1) and by the components being balanced either side of the circuit. In effect, the primary of T1 can be considered as an auto-transformer. Thus, we have coupling from the anode winding of one half back to the grid of the other valve whose anode is in the other half of the winding. This is done cross-wise to produce the push-pull effect and to secure the necessary feedback required to sustain oscillation. The frequency of oscillation is determined by the inductance across the primary winding of T1 and by the value of capacitance (C2) shunting it. The transformer is endowed with low-loss properties by the nature of its core which, in the Mullard design, is Ferroxcube, this being a pot-core type.

Correct conditions for feedback are achieved by the capacitive-resistive couplings from the primary winding taps back to the valve grids. The values of these components (and the grid resistors to chassis) are selected to give the correct amount of feedback for the oscillator frequency and to ensure minimum waveform distortion. A good balance of the circuit component-wise goes towards purity of waveform.

Severe deviation from balance (such as may happen due to change in value or characteristic of a component or valve section), while probably not muting the oscillatory signal, may well give rise to undue waveform distortion and, possibly, reduced signal amplitude, thereby causing a rise in overall noise on the recorded tape. Reduced bias amplitude could also affect the recording sensitivity, frequency response and any distortion characteristics of the circuit. The best way of extracting a signal from a push-pull oscillator is by way of a separate winding on the oscillator transformer. This

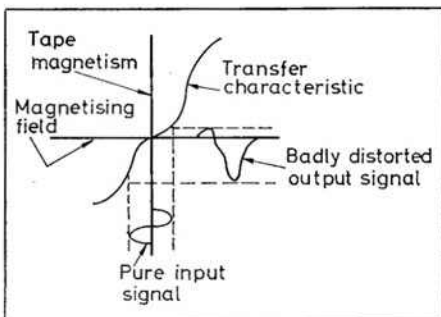


Fig. 3. Here is shown how the non-linear transfer characteristic could result in bad distortion of the recorded signal.

method has the advantage of ease of matching to the impedance of the erase head, and if the winding is tapped it allows the use of almost any head.

In Fig 2 it will be seen that one end of the secondary winding is connected direct to the chassis and that taps are available to feed the erase head and the recording (or recording/playback) head. For adequate tape erase considerable oscillatory power is needed to feed the erase head and this is attained by making sure of a good impedance match between the secondary winding and the head winding. Far less hf signal power is required for tape bias, and the usual technique is to feed the signal to the recording head through a capacitor, this being Cc in the circuit. The value of this capacitor is adjusted to suit the type of recording/playback head employed. If the value is too low, there will be insufficient bias, while excessive bias will result if the value is too high. As already mentioned in past articles, the recording current is usually fed to the recording head through some kind of filter (often a parallel-T network) to prevent the hf tape bias from getting into the recording output stage.

Erase and Bias Function

Before we go on to examine the effects resulting from alteration of hf signal amplitude and frequency in the recording and erase heads, let us briefly glimpse at the theory behind the hf erase and biasing principle. It is well known, of course, that the oxide on a tape magnetises to the pattern of the signals being recorded. Now, erasure simply implies demagnetisation of the tape oxide. Any magnetized metal can be demagnetized to some degree by subjecting it to an opposing magnetic field. Just how easily it is demagnetized and how much demagnetizing field is required for the operation are governed by the *coercivity* of the material, this being a measure of the material's resistance to demagnetization.

Early design tape recorders (and some relatively inexpensive battery models of current design) use a permanent magnet erase head. This effectively clears the tape of signal but leaves some residual magnetism (remanence) on the tape which adds noise to the recorded signal, as we have seen. Most domestic recorders and all quality models adopt the hf method of erase, whereby the oscillator signal is coupled to the erase head. Thus, as the tape passes the gap in the head it is subjected to a rapidly alternating magnetic field, the strength of which increases as any point on the tape approaches the gap and decreases as it leaves the gap.

The amplitude of the magnetic field is such that the tape is saturated (this means that it cannot accept any further magnetism) on each half cycle and, assuming that the waveform is symmetri-

cal (as already defined), the tape will be completely demagnetised and no remanence will remain. It is because a field strength sufficient to result in tape saturation is required that the erase head needs to be supplied with substantial hf power. If the power is not adequate to bring the tape into saturation, traces of the previous signal will remain on the tape and the noise level will be high. Some erase heads are tuned to the oscillator frequency as a means of absorbing a greater signal power.

How about tape biasing, then? This is necessary because the transfer of the tape signal from across the gap of the recording head on to the tape is distorted. Such a transfer characteristic is shown in Fig 3. Due to the kink in the characteristic a pure input signal will resolve as a badly distorted output signal, as is revealed. This is combated by the use of hf bias, the effect being that the recording signal is superimposed upon a signal of very much higher frequency (this is the bias signal, of course). The influence that the bias signal has on the transfer process is clearly shown in Fig. 4. It will be seen that the bias signal swing virtually puts the transfer action on linear parts of the characteristic, bypassing the non-linear centre section of the characteristic.

Some early machines used a form of dc bias. This introduced a constant value of magnetism on the tape, upon which the recording signal was superimposed. The effect was then that the upper linear half of the transfer characteristic was used, away from the severely non-linear middle bit. This was applied by running a small

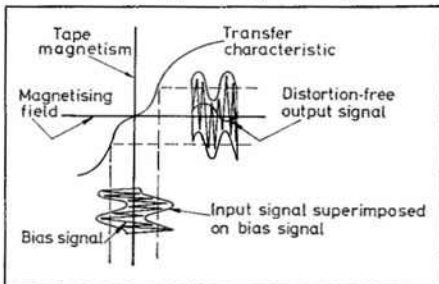


Fig. 4. By the use of a hf tape bias upon which the recording signal is superimposed, the non-linear middle section of the transfer characteristic is effectively bypassed (see text).

direct-current through the recording head, along with the recording signal. A big disadvantage of this system is that the signal swing is limited to the linear section of one half only of the transfer characteristic. And, of course, the tape establishes a fixed value of magnetism during the recording process, and this itself impairs the signal/noise performance, as we have already seen.

Next month we shall look at the effects of bias signal amplitude and frequency on the recording, and see how these can be adjusted for the best results.

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.

The Future—Full-track recording

In the June issue of ATR under the above heading you suggest for real recording a manufacturer ought to produce a full-track 7½ ips recorder.

I agree of course that such a machine should produce high quality sound tracks but what about tape cost? I am a keen music lover of classical music and use a Philips EL3549 four track recorder, playing back via a hi-fi stereogram. This outfit enables me to record long symphonic works and complete operas via radio or records at a reasonable price and at a quality which is the equal of any vhf BBC transmission via good speakers. Recordings thus made give me pleasure in listening to the music and also enable me to really study the works or portions thereof being played. I simply could not afford to buy the vast quantities of tape which would be required in order to make 7½ ips full-track recordings.

From a music lover's point of view therefore, I personally would like to see a machine turned out of first class mechanical and electronic quality and built to stand prolonged periods of use day in and day out, minus all gadgets. A simple record/playback outfit only and as a compromise, better than 7½ ips full-track and multi-speed quarter-track, what about 3½ ips at half-track?

With the present trend in making better quality tapes and in the case of some recorders, offering a better frequency response at a reasonably flat level too, at 3½ ips such a machine for the music lover would offer quality sound at a reasonable price in recording costs.

Southport, Lancs. **S. Edwin Benn**

Phonopost

Mr M W Denny asked in April ATR 'why the jubilation?' (Meaning about the new Phonopost). Because Phonopost is on average half the cost of air mail letter post by which, according to GPO regulations, tape recordings of a current and personal nature must be sent. (Phonopost is a concession to this rule of course).

Mr Denny has been using the air mail parcel service for this, but he shouldn't have done it. There is no Phonopost service to Canada at the present moment, so he should pay 1s 3d per half-ounce letter rate. Countries which do accept Phonopost (at 6d 7d or 8d per half-ounce) are listed in the Air Mail leaflet issued by the GPO on 1st February last.

I was going to suggest that Mr Denny ought to return his pre-recorded music tape, but since he now should consider

24 putting 20s worth of stamps on his half-

pound tapes to Canada, perhaps it would be kinder to let him keep it.

Wallington, Surrey

John Bradley

Angry Buzzing

It seems that the letter from Mr Kenneth Williams (Mona Vale, NSW, Australia) complaining about dishonest(?) British tapespondents, which we published in the June ATR *Things You Say* columns, has stirred up a hornet's nest.

We would like at least to acknowledge letters on this subject from Chas. H. Towers of *World Wide Tape Talk*, from Mr Tomes of Torquay (two letters), Mr D. F. Palmer of St Ives, Cornwall, Mr Bill Paton and many other indignant British tapespondents. We will publish as many of these letters as possible in the September issue of ATR.

(Editor)

Cartoonist complimented

I must say that the cartoon illustrating my story *Devil's Kitchen* (June issue) was magnificent! How unfortunate that the cartoonist's name was not shown prominently. Several colleagues wrongly came to conclusion that I had drawn it - how I wish I could! Please, in all issues let the cartoonist's name be prominent, adjacent to or included on the drawing.

Thank you for another good, interesting issue. *The Professionals* was much appreciated and I look forward to future BDW features as promised.

Sunderland, Co Durham

W. Duffy

The cartoon which illustrated Mr Duffy's article was drawn by Peter Borland who also created the similar amusing drawings in our March and May issues. (Editor.)

Four months to repair a tape recorder

I had a similar experience to C. J. Street with my tape recorder, which was a Grundig TK1. In less than 13 months it went back to the dealer's four times; the first three times it was the playback that failed and the fourth time both playback and the internal battery circuit were out of action. This machine was taken to the dealer in November 1965. I heard nothing until the end of December and on further enquiries they informed me that it had gone back to the manufacturer. I made more enquiries in January 1966 and received an estimate of about £3 for repairs. This I endorsed and then heard no more from the dealer.

Eventually I wrote to Grundig and they informed me that they did not get my machine till the end of December 1965,

and that they were waiting for the authorization from the dealer to proceed with repairs. A telephone call to Grundig in February revealed that they were still waiting to hear from the dealer. Then I wrote explaining how many times the machine had been in for overhaul and Grundig told me that this was the first time they had had the machine and that the earlier repairs must have been done by the dealer. At last in March 1966 I received a letter informing me that the machine had been despatched to the dealer, and I got it home about the last week in March. So my advice is, where possible send your tape recorders back to the manufacturers or find a dealer who specialises in tape recorder repairs.

Elm Park, Essex **W. H. Long, MT Inst**

From a Happy Reader

I wish to thank you, even at this late stage for printing my name and address, etc. in the *Tape Directory* way back last January. As a result of that I got over twenty letters from people interested in the same things as I myself am interested in and having selected the six nearest to my ideal choice I wrote to all the remainder expressing regret. I have now established a regular relationship with each of the original six and wish to thank you for bringing about such a happy state of affairs through the columns of the popular ATR.

Santry, Dublin

J. P. Logue

Tape Club talent

I read with interest Mr Richard Margoschis's letter on tape recording clubs and whilst a speakers panel is a good idea I feel more clubs should make use of their own members talents as indeed we do. Through the *Yorkshire Federation of Tape Recording Clubs* visits between member clubs and competitions are arranged. A recent instance was when the *Doncaster Club* got an engineer from the BBC in Leeds to give them a talk on tape recording. All the clubs in the federation and round about were invited and a nice time was had by all present. Through a monthly newsletter we get to know what the other clubs are up to both in and out of the clubroom; thus ideas from other clubs are then used in our programme. May I suggest that clubs in the same area get together more, I know some already do, then you can provide a larger audience for a special demonstration or talk as well as meeting face to face voices you may have only heard on tape. The pooling of knowledge is another reason for clubs meeting other clubs even if only on tape.

Leeds Tape Recording Club

W. Rowe

TAPE LABELLING

by Alex Sparrow

Have you ever searched frantically for a blank space on a tape, with time breathing down your neck? Or tried to find that tit-bit tucked away on a spare reel of tape, when you were not sure which one it was on?

Labelling each spool with the exact position of every item on the tape makes life much easier. It also saves covering the box with notes, and then having to use the rev-counter, which is never very accurate. Self-adhesive labels are best, such as the $1\frac{1}{2}$ in by $\frac{1}{4}$ in variety sold for photograph album labelling. You will need one-and-a-half labels per track (fig. 1). A mapping pen may be necessary if you want very much detail written on. If you have a machine which requires the reel to be turned over for half the playing time, the items on those tracks will be labelled on the side which will be on top while they are playing. As soon as a recording is finished, draw an arc on the label where the unused tape comes to, and write in the space between arcs the title of the item. If required, fuller details can be kept in a note-book separately.

The position of the beginning and end of each recording can now be found to within half a minute of playing time. To cut this down still further, the exact position can be indicated by those $\frac{1}{4}$ in round adhesive labels sold for cine films. These can be stuck on to the shiny side of the tape, but must not be allowed to overlap the edges (fig. 2). A different colour can be used for each track.

The main criticism of some language courses on tape has been the difficulty of finding any particular lesson. Labelling in this way makes each lesson easy to find. Many precious minutes will be saved by these methods, and your friends will be so relieved that they no longer have to sit in boredom while you push knobs and play little bits and keep saying, 'I'm sure it's on this tape somewhere!'

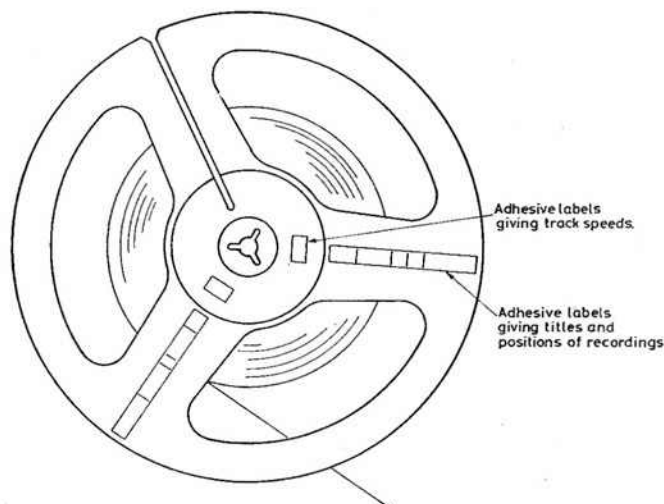


Fig. 1

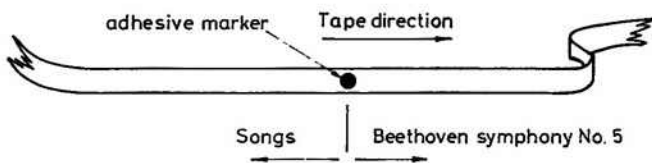
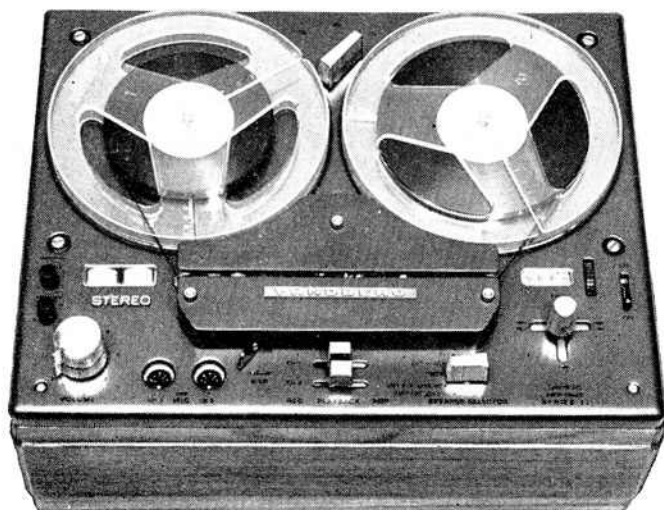


Fig. 2

Tandberg announce the new 3 speed, 4 track, totally transistorised series 12 stereo record & playback Hi-Fi system



- ★ 20 WATTS OUTPUT (10 watts per channel) makes additional Hi-Fi unnecessary.
- ★ BASS & TREBLE Tone Controls.
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- ★ INTERNAL SPEAKERS, etc. etc.

Tandberg

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(BLOCK LETTERS PLEASE)

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ATR2

SOUND SCENE



Above. Spaceman John H. Glenn has a word with ATR Editor F. C. Judd who is using for the first time on a series of field trials a Uher 4000 L Report portable tape recorder.

Left. The Uher 4000 L Report on trial again, this time in a helicopter.

The Formation of the British Acoustical Society

The rapid growth of interest and discovery in the various branches of acoustics in Britain has led to the setting up of a number of separate societies and sub-groups, often with overlapping areas of interest. It has been felt for some years that this diversification and duplication of effort has not provided ideal conditions for the development of the subject as a whole, in spite of the very successful activities of the Acoustics Groups of the Institute of Physics and Physical Society and the Society of Acoustic Technology, the two main societies concerned. A committee was therefore set up in 1963 by the Royal Society to explore the possibility of forming a British Acoustical Society. This committee, under the Chairmanship of Sir Gordon Sutherland, which was representative of all the acoustical and allied interests in the country, pledged itself to support the new society and in due course became its provisional council. The Chairman is Dr A J King and the Vice Chairman is Professor E J Richards who are respectively the Chairman of the Acoustics Group of the Institute of Physics and Physical Society and the President of the Society of Acoustic Technology.

The Society's interests will embrace all aspects of sound, hearing and vibration, including ultrasonic activities such as the detection of flaws in solids and of shoals of fish in the sea. Such currently important problems as the noise of aircraft and traffic, industrial noise, noise in dwellings and the design of better public and concert halls will be studied with due regard to intelligibility and musical aspects. The Society will also actively sponsor the furthering of teaching and research in acoustics.

Society meetings will be held in the Physics Department, Imperial College Prince Consort Road South Kensington London SW7. Enquiries should be directed to Dr R W B Stephens at this same address.

Tapeman meets Spaceman (Fig.1)

On a goodwill mission to the UK, John H Glenn Jr, first American to make an orbital space flight recently attended a press luncheon held by 3 M (Scotch Tape) at the Savoy Hotel in London. He spoke among other things, of the vital part played by magnetic tape in space flight programming and in recording communication between ground and space vehicle.

ATR editor F C Judd met and spoke with Colonel Glenn and recorded the short interview with a Uher 4000L portable. This was in fact a first assignment with the Uher 4000L in what will amount to extensive field trials being carried out by the editor and by Bob Danvers-Walker, ATR's tape and travel contributor. John H Glenn now a NASA consultant was the first American to make an orbital space flight in February 1962. He completed three orbits of the earth in the Friendship 7 spacecraft reaching a maximum altitude of 162 miles in a flight which lasted nearly five hours.

Another Uher 4000L Test

John Garnett of the Bosch organization puts the Uher 4000 Report L tape recorder through its paces in the testing conditions of noise and vibration inside a helicopter (Fig.2).

The Brantly B2B helicopter of David M Kay and Associates Limited flew from its base at Westland London Heliport. The recording made during flight was entirely satisfactory.

The 4000L has several special features which make it tremendously versatile; it operates off the electric mains, a car battery, a 5-monocell battery or a storage battery. Its four tape speeds mean that it can be adapted to any given recording situation and its reliability and high performance give it the ability to perform under a vast range of climatic conditions.

Debenham Appointment

Debenham Electrical and Radio Distribution Company Limited announce the appointment of Mr P J Moger as their technical and service manager. Based at their Eastbrook Road premises he will be responsible for both Bang and Olufsen and Sony service. Previously Mr Moger was Service Manager for Grundig (UK) Ltd.

Cine-corder Distribution

REW (Earlsfield) Limited of 266-268 Upper Tooting Road London SW17 have acquired the sole distribution rights of the Cine-corder tape recorder and will continue to market this product to radio, electrical and photographic dealers. All enquiries for spares and accessories and perforated tape should now be made to REW at the above address.

The Law and your tape recorder

... is the title of a very informative little booklet price 3s 6d from Print and Press Ser-

vices Limited 7 Tudor Street London EC4. It deals with the somewhat controversial subject of copyright and attempts to unravel some of the legal tangles in which any tape recording enthusiast might land himself all too easily. The booklet deals, without resort to technical law jargon, with every aspect of copyright in eleven separate sections viz: The right to privacy, Trespass, Copyright in lectures, The BBC, Recordings of another's works etc. etc. A booklet which every tape recorder owner should read.

Travels with a Nikon

The Pullin lecture service which is operated by Pullin Photographic Limited a company within the Rank Organization has announced a new series of six slide lectures under the title *Travels with a Nikon*. These lectures, consisting of seventy-two slides each with a taped commentary, cover some unusual parts of the world which are not normally the subject of slide lectures. The lectures have been prepared by Surgeon Lieutenant-Commander Richard Cleave RN using Nikon equipment exclusively in the course of his travels as a Naval doctor. Clubs wishing to show these lectures should have available a good quality 35 mm slide projector with four suitable magazines holding thirty-six slides each and a tape recorder with an operating speed of 3½ ips. The recorded tapes are 'keyed' with an audible signal and a typescript of the lecture commentary is enclosed with each lecture pack.

The lectures are supplied on loan free of charge, packed in a strong wooden box containing two complete lectures, each consisting of seventy-two slides, a tape and a typewritten commentary. Although supplied free it is necessary for the club concerned to pay the return postage. The two lectures supplied run for a total of ninety minutes and a short break between the two is suggested. Details of the lectures are as follows:

Lecture A - Ceylon. A Pilgrimage to Adam's Peak

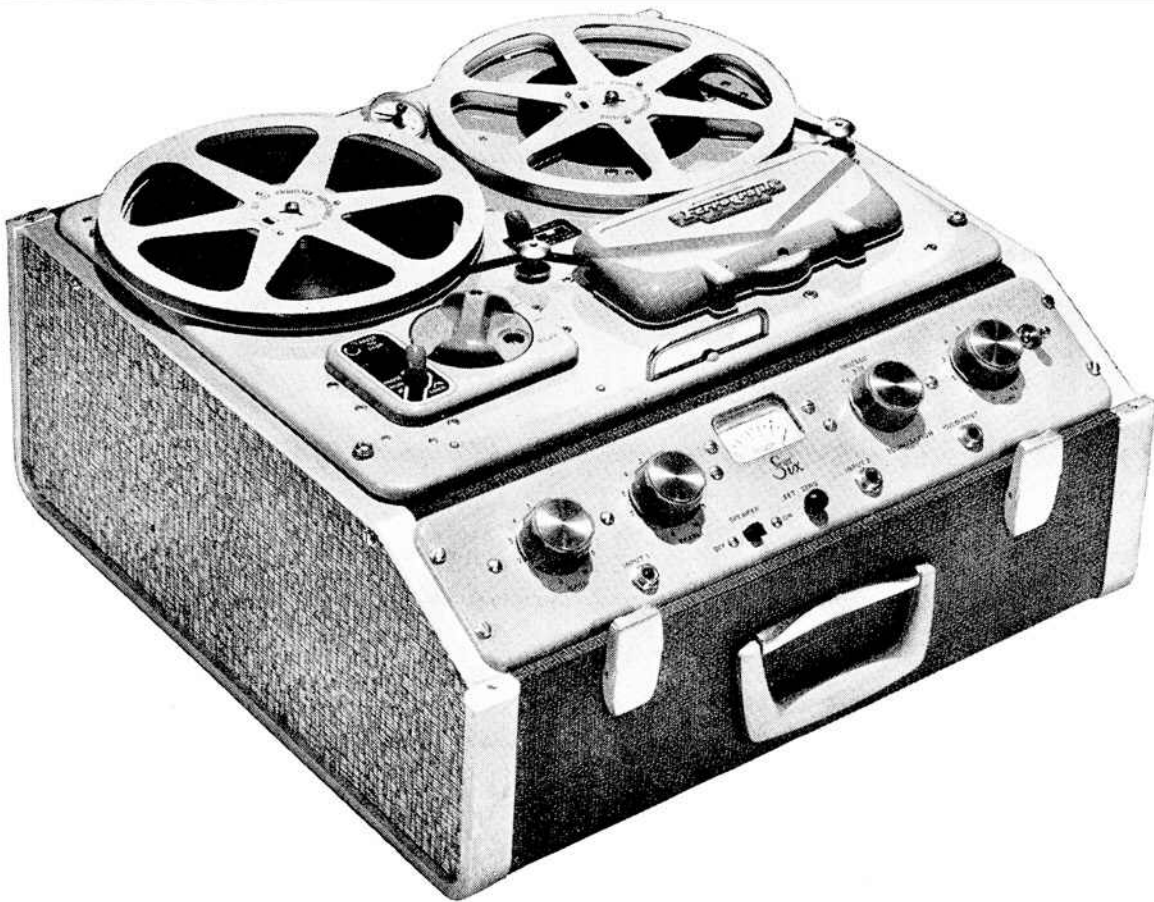
Lecture B - The Near East. Crusading Castles

Lecture C - Nepal. A Trek to Mount Everest

Lecture D - Turkey. The Greek Cities of Ionia

Lecture E - Borneo. A visit to the Dyaks

Lecture F - Afghanistan, India and Ceylon. Early Buddhist Art.



Ferrograph Model 631 Tape Recorder

Ferrograph

built in a tradition of excellence

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

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

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*Please send me the Ferrograph Manual ☐ Mono ☐ Stereo

(I enclose Cheque/Postal Order for £1)

*Delete as applicable.

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AT4

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AUDIOVIEW

NEW PRODUCTS

Uher 4000 Report-L Field Trials (Fig.1)

From time to time we shall be featuring the Uher 4000 Report-L portable tape recorder in articles by Bob Danvers-Walker, who will be using the Uher during his various BBC and other travel assignments. A second model will also be reviewed shortly in *ATR* and will be field tested under various conditions by the Editor. First tests have showed the Uher 4000L to be reliable and capable of making an excellent recording. It has four tape speeds $7\frac{1}{2}$, $3\frac{3}{4}$, $1\frac{1}{8}$ and $\frac{1}{4}$ ips and operates from 5 U2 cells or a rechargeable accumulator or from a mains power unit.



Fig. 1. Snap! Bob Danvers-Walker and *ATR* Editor F. C. Judd try a double interview with Mr B. L. Muller of Bosch Ltd, UK distributors of Uher tape recorders.

New Philips Tape Cassette

In response to numerous requests from users of the Philips cassette tape recorder, Philips have now introduced a new cassette with quadruple play tape. Playing time has been increased to 45 minutes on each of the two tracks and hence the new cassette will have the code number C90. The price of the new cassette is £1 7s 6d while the original C60 cassette will continue to be marketed at 19s 6d. Both cassettes are being distributed in the new perspex containers with an index card for the tape contents.

New Portables from Dansette

The Dansette magazine tape recorder, Model JTR 909 (Fig.2) uses the Philips cartridges. The machine works from 4×1.5 volt torch batteries, is fitted with piano key controls, has a stop/start control on the microphone and a very sensitive dynamic speaker. Weighing only 3 lb it is no larger and certainly no more awkward to carry than a small portable radio. The magazine tape recorder is packed in an attractive gift box and retails at 26 guineas complete with cartridge and batteries. Slightly less expensive—at 22 guineas—and not very much bigger is the Dansette *Executive* tape recorder Model JTR 93 (Fig.3) which is a compact mains/battery twin track tape recorder using conventional $3\frac{1}{2}$ inch spools. Features include a pencil type microphone which fits neatly into the recorder carrying handle; two speeds— $3\frac{3}{4}$ and $1\frac{1}{8}$ ips; a 3 inch diameter speaker operating

from an output of 800mW; and an automatic recording level control.

Further details obtainable from Dansette Products Limited, Dansette House, Honeyport Lane, Stanmore, Middlesex.

New Stereo Recorder from Grundig

A new fully stereophonic four track tape recorder has just been announced by Grundig (Great Britain) Limited. The TK340, a 3 speed four track machine shown in Fig 4 is a new and improved version of the TK46 with all the outstanding features of the earlier machine—separate erase, recording and playback heads, separate recording and playback amplifiers, facilities for multiple synchronisation, monitoring via tape and the introduction of echoes and remote control. It has a press button position indicator, tape cleaner, recording input selector, temporary stop key and is designed to take 7 inch spools.

The TK340 is fully transistorised and features separate bass and treble controls. It has a combined output of 16 watts and two built in loudspeakers. Facilities are provided for the connection of stereo loudspeakers to extend the separation of the two sound channels. The TK340 is supplied with a spool of tape, a multi purpose stereo record/playback lead and six spare tape cleaning felts. The price is 145 guineas.

An alternative model, the TS350 hi-fi unit with an identical specification, is available in a natural walnut case with a thick polished perspex lid and fold away handle. The price is 149 guineas. Details from Grundig dealers or Grundig (GB) Limited, Newlands Park, London SE 26.

New Akai portable

The Akai X-PK1 miniature portable shown in Fig 5 will be available in August and will sell at 28 guineas. It features the Akai crossfield head system of recording and has two speeds $1\frac{1}{8}$ and $\frac{1}{4}$ ips.

Recording is standard half track and the frequency response at $1\frac{1}{8}$ ips is 100 to 9000 c/s ± 3 dB. The X-PK1 operates from four 1.5 volt UM2 cells and measures only $9\frac{1}{2} \times 4\frac{3}{4}$ in $\times 2\frac{1}{2}$ in. Details available from Pullin Photographic Limited, Ellis House, 11 Aintree Road, Perivale, Middlesex.

New Wharfedale Speaker

For some years Wharfedale have designed their larger enclosures to have a much wider radiation angle than is possible with conventional systems employing forward facing units. The big advantage of doing this is the elimination of the 'point source' effect where the listener is conscious of the sound beam from the loudspeaker.

The Teesdale system employs a special arrangement of wide angle reflectors, together with a controlled amount of back radiation to achieve the required dispersion in the middle and upper registers. The bass chamber is slightly less than three cubic feet and houses a special 15 in bass unit with a roll suspension, giving clean reproduction down to 25 c/s. The upper chamber contains a 5 inch mid range and a 3 inch tweeter unit both with high performance magnets giving great sensitivity and excellent transient response.

Type of Loading—Acoustic suspension.

Number of units—Three, mid and treble facing upwards with wide angle dispersion arrangements and bass unit forward facing.

Crossover frequencies—500 c/s and 3000 c/s.

Frequency range covered—25 c/s to 20000 c/s.

Balance Controls—separate mid range and treble controls for any desired setting.

Impedance—suitable for 15 ohms output.
Power handling capacity—20 watts rms, 40 watts peak.

Finishes—Teak, mahogany or walnut veneers £52 10s 0d. Rosewood veneer £55.

Further details from Rank Wharfedale Limited, Idle, Bradford, Yorks.



Fig. 2. The Dansette JTR 909 magazine portable tape recorder with cassette loading.

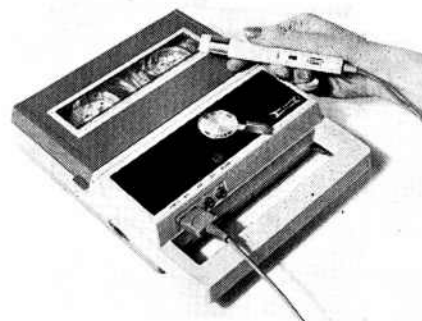


Fig. 3. The Dansette model JTR 93 'Executive' portable tape recorder.



Fig. 4. The new Grundig TK 340 stereo tape recorder.

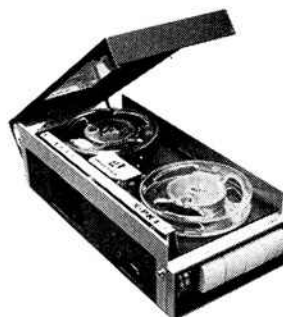


Fig. 5. The Akai X-PK1 pocket portable tape recorder.

TELEFUNKEN



The 200 range was impressive enough Now the 204 E makes it outstanding!

Elegant modern styling. Superb sound reproduction. That's what you get with every recorder in the 200 range. Telefunken invented tape recording and PAL colour TV system. When we talk about high fidelity we mean it.

M 204 E It's got everything. Four tracks, stereophonic record and playback, with sound to fill the largest room from a fantastic output of 6 watts per channel. Operates either vertically or horizontally. Fully transistorised, separate level controls and VU meters for each channel. Complete with reel of tape, audio lead and empty reel. Price 106 gns.

and the same goes for these Telefunken recorders



M 401 Cassette Loading Recorder

Clip in the cassette and press a button for instant recording or play back. No fiddling around threading tapes. Nothing to impair sound reproduction. The cassette conforms to the system adopted by most tape recorder manufacturers on the continent. No sparking to create interference. Negligible wow and flutter. Half-track for monaural recording and playback. Complete with moving coil microphone, audio lead and one DC 90 tape cassette. Price 46 gns.

M 300 A twin track tape recorder that actually records while moving around. Fitted with a revolutionary twin fly-wheel tape drive mechanism that guarantees constant running speed and distortion-free reproduction. Battery and/or mains powered. Complete with TD 7 microphone, 5" LP tape, spare spool, audio lead. Price 49 gns. Also the four track M 301 at 54 gns.



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ONE TRACK MIND-

FOUR TRACK RECORDERS

An *ATR* reader,
Mike Howell, speaks
his mind on the pro-
blem of getting the
right kind of
tape recorder

'It depends what you want, of course' – I saw the words in my mind's eye time and time again – and the pleasing thing was that I did. Having been the owner of five or six tape recorders during the past few years, I knew just what I wanted and I thought I knew where I could find the desired article.

Dealers and manufacturers have now started a line of sale which, by any standards, is unconventional, to say the least. I doubt if I would have actually bought a recorder on this occasion had it not been for the fact that my second model, a small but reliable twin-track machine, had gone wrong last August. By October my dealer advised that a new motor was the only solution to the problem and, on my changing colour with great rapidity, he went on to say that there was no need to worry about expense as this would be covered by the guarantee. The weeks of waiting turned into months. Each time I 'phoned the tape shop I received a charming variation on a theme that, as the model was a new one, there were no spare motors. On two occasions the theme varied to the extent of the firm actually having sent a couple of motors – both, sad to say, nearer to $1\frac{1}{2}$ ips than to $3\frac{3}{4}$ ips – the normal running speed of the machine. Then when I made yet another 'phone call to the shop I was graced with the same old story, apart from the fact that, on this occasion, there was a promise 'most definitely' that the machine would be ready by next week. This assurance had been increasing in strength each week, and on each occasion I had replaced the 'phone feeling unpleasantly warm in both mind and body. It was too much to swallow on this occasion, and I asked how much they would give me for the model. A favourable reply was received and I felt pleased to think that I would have a replacement for the twin-track very soon.

I required a good two-track recorder which would accommodate 7 in spools and which incorporated at least two running speeds, one of them being for $7\frac{1}{2}$ ips. My dealer then promptly tried to interest me in machines in the £50 – £60 bracket. First he demonstrated a tape recorder which he favoured himself, a machine often used by professionals; it has a fine reputation for reliability and is not mass produced. The first snag which came to light about this teak-cabinet gem was that it did not include a $7\frac{1}{2}$ ips speed. 'Well,' said the assistant, 'you don't want to worry about not having $7\frac{1}{2}$ ips facilities. The $3\frac{3}{4}$ speed is the best I've heard – it's easily as good as the $7\frac{1}{2}$ speed on most machines.' Perhaps it was. The specification showed the statement to be true, but, even so, it wouldn't do justice to

existing $7\frac{1}{2}$ ips recordings. The machine was very nice indeed, and the matter was almost settled when I learned that a similar model with a $7\frac{1}{2}$ ips speed could be obtained for a further ten guineas. I asked how long it would take to acquire the recorder, and after a rather nasty pause I suggested that a week would be a reasonable length of time. This wasn't taken very kindly either! The machine which I had just seen, and was now being hurriedly put back into the window, had taken three months to come from the factory! I abandoned the idea, but thought they must be very good if delivery took three months from the date of ordering.

I then became interested in a recorder being sold at a good reduction. This had two speeds but no $7\frac{1}{2}$ and could take a $5\frac{1}{2}$ in spool. The only one item of my specification which wasn't fulfilled was the track width, but this machine could hardly be considered, for as soon as the music started I realized immediately that the recorder was running slow. It probably needed a new motor but my dealer seemed oblivious of this fact.

I must at this point give due credit to the manufacturer of a three-speed tape recorder which sells at thirty-six guineas. I had used a four-track model of this machine while at college and I had been served faithfully. I would willingly have purchased his twin-track version were it not for the fact that the main object of the new machine was for copying purposes and this one hissed like a snake. Still wondering if something else of similar quality could be obtained for a moderate price, I asked about a three-speed machine which had been recommended by the Consumers' Association. At one time the prospect was bright, for this recorder had more facilities than the above-mentioned snake machine.

There was, for example, a bass and treble control which was supposed to enhance the response. This might have been so, but when the volume was increased, there was a gradual decline in the quality of the recording. I was advised not to buy this: the manufacturer had recently gone bankrupt, spare parts were not easy to come by, and besides, there wasn't a twin-track version in stock.

After inspecting a few more tape recorders, the game had almost got into a stalemate position. It was obvious by now that my ideal tape recorder at a reasonable price was a mere dream and a compromise was the only only alternative to abandoning the idea completely. There were machines of two-track denomination manufactured by a firm of such good repute that half the money you spent in

buying their product was for the famous name they carried. There were those machines which came near to the specified standard, but which my dealer said he was not prepared to sell me because they would present no end of trouble. Worse than this, there were recorders which might have suited admirably but they were only made in four-track versions. Everything seemed to be *quarter track only* and I just could not accept the inevitable conclusion.

I tried to convince myself that the price-range had altered vastly since the purchase of my last tape recorder. I again toyed with the idea of buying the twin-track model I had seen originally, but such musings only added to the storm of confusion now going on in my mind. These 'professional' machines seem to have almost the same number of snags as the domestic recorder. Being a person without the advantage of sight, a monitoring system is rather important in my recording activities and I had always thought that the same applied to the professional recordist. Not so with this model. Instead of having a tone control, there was a switch which merely increased or decreased the bass response. Also when the machine was switched to *play* or *record*, there was a most annoying and extremely lengthy run-up wow (I thought that had gone out with the early battery recorder) although my dealer assured me that use of the temporary stop would solve this problem very satisfactorily. If this is an example of how the professional has to wait before he can record at the correct speed, then I must confess that I have been under a delusion about his work and the quality of equipment available to him. I listened to the machine again and quickly realized that the sound was by no means inspiring. I could still vaguely remember the hard fact that professional machines only incorporated a monitoring speaker. 'Yes,' said my dealer, 'it sounds really good through a big amplifier.' The thought scared me through and through. I had almost forgotten what the word 'amplifier' meant, but I said that I would buy one when I had found a satisfactory recorder.

A fine tape recorder was delivered to my house that evening. It does everything I require and performs extremely well... *but it's a four-track job*. I am now saving hard for a good twin-track machine, but I doubt if I'll find one on the better side of £80, so if any manufacturer had been lulled into a sympathetic attitude and has in his catalogues a good twin-track recorder, I would be delighted to give it a trial, *but please do not send anything without a tone control or I'll blow my top!*

ATR postal bookshop

A selection of audio handbooks and guides readily available to you through Haymarket Press Ltd. (All prices include postage and packing.)

- | | | | |
|----|---|-------------------|------|
| 1 | Dramatage Guide
(Focal Press Ltd) | by H. Woodman | 9/- |
| 4 | The Loudspeaker Guide
(Focal Press Ltd) | by J. Borwick | 9/- |
| 5 | Magnetic Sound
(Focal Press Ltd) | by J. Chittock | 14/- |
| 6 | The Microphone Guide
(Focal Press Ltd) | by J. Borwick | 9/- |
| 7 | The Tape Editing Guide
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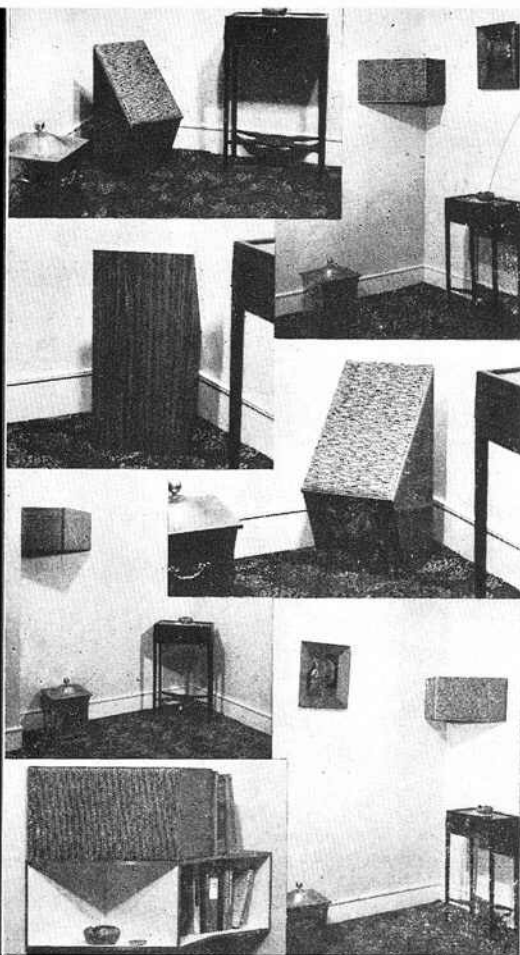
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TAPE REVIEWS

by Russ Allen

Especially for those readers who have complained that they can't get any good jazz on tape, Music Tapes Inc have sent me four very fine examples, two of them being by jazz tenorist Eddie Harris.

Jazz for Breakfast at Tiffany's. *MVJ 3027 4 Track 7½ ips.* A couple of months ago when reviewing a small jazz group, I think it was either the MJQ or Oscar Peterson Trio (or both), I said how I would have liked to have heard them in stereo. Now just to prove how right my thinking was, along come these with superb stereo sound and spread and really much more exciting than mono. As seems to be the case with most imported American tapes these days the recording quality is absolutely tip top. *Breakfast at T's* has some very exciting tracks. Harris is a full sounding modern tenor sax man and his rhythm section does a really swinging job. The personnel is, I regret not listed and while I could make guesses at some of them, the only one I'll stick my neck out for is bassist Leroy Vinnegar and if it isn't him then I'll eat my resin. Naturally, *Moon River* is included and there is quite a bit of Latin slanted rhythm with *Latin Golightly*, *Loose Caboose*, *Something for Cat*, and that way or otherwise it is all great.

Mighty Like a Rose Eddie Harris. *Music Tapes. 4 Track 7½ ips. MVJ 3025.*

This package has all the sleeve notes you might need and lists the participants as Harris – tenor, Joe Diorio – guitar, William Yancy – bass, Willie Pickens – piano, Harold Jones – drums. This set is quite different in character from the Tiffany's album. Perhaps because of the change of rhythm section, I don't know, but it is more moody, less extrovert. To say it is inferior or better will be a matter for personal taste. There is so much that's good in both. Recording again is first class although the breadth of the stereo is less marked due probably to the siting of the musicians but it's still good. There is no vibraphonist on this set which is a pity if you like the instrument and a blessing if you don't. Personally I like both albumsequal well. Both are highly enjoyable bits of jazz, in fact, the first real jazz I've heard in stereo. An experience I trust will be repeated at very frequent intervals and jazz fans among my readers will agree.

Gene Norman presents Lionel Hampton and the Just Jazz All Stars. *Music Tapes. 4 Track Stereo 7½ ips. MGN 15.*

32 Hampton – vibes, drums and piano. Charlie

Shavers – trumpet, Willie Smith – alto, Corky Corcaran – tenor, Milt Buckner – piano, Slam Stewart – bass, Jackie Mills – drums (or Lee Young).

Side One which was supposed to be *Perdido* turned out to be *Kaba's Blues* which is in fact the first track on side two which would only confuse people who didn't know the tune. The most interesting point about this set is that it was recorded before the days of stereo. However, be that as it may, the jazz concert atmosphere is magically caught and all the stars are their most extrovert best, and if you like your jazz early forties vintage and decidedly wild then this is for you. I have heard all these tracks before and know them pretty well. Certainly the recording is better on this than when I've heard it previously and my only criticism is that Hampton's vocal hallmark, a sort of sheeplike grunt of exhortation, has been well and truly recorded and I find it somewhat wearying.

The masterpiece is certainly *Flying Home* based on a twelve bar blues sequence with the entire company on stage and blowing like crazy. Highly delectable period stuff and in some ways that old riff blowing behind the soloists really worked them up to a frenzy. It's a practice that's died out as jazz has progressed and the Count Basie band who may even have started it, but certainly popularized, are just about the only group that still do it. It made me a little sad to hear Charlie Shavers who last time I saw him with Ella at a Jazz at the Phil' show, played so badly and so sadly, that I'd almost forgotten that he could be so sensational. His stratospheric blowing here was a wow. As near as I can make out Hampton does a vibes solo on *That's My Desire*, in *Central Avenue Breakdown* both the piano and drum solos. *Hamps Boogie* was of course the leader's solo piano. Most of the other tracks he mostly sticks to the vibes. Groovey!

Hip Soul. Shirley Scott. *Music Tapes. MP 7205. 4 Track Stereo 7½ ips.*

Scott – Hammond Organ, Stan Turner – tenor, Herb Lewis – bass, Roy Brooks – drums. Funny but I'd almost forgotten the existence of this *hip soul* and yet she was one of the first to swing Hammond.

Dear old Carlo Kramer of the late Esquire records issued a lot of her LP's and I used always to refuse to review them. Perhaps I'm mellowing but I have to admit that Miss Scott almost makes me forget that strangled plumb sound. She really does play a tremendously good style and swings like mad. Lewis and Brooks help to keep things moving along and Stan Turner plays some very fine hard tenor, sounding extremely like another Stan, a certain Mr Turrentine. Could it be he?

Whoever it is they combine to make this a jazzfully exciting set and one of the best is *Out of this World* (in more ways than one) with its tempo and rhythm changes all working up to a superb example of Turrentine's bitingly original tenor. Miss Scott's following solo doesn't quite match up in brilliance but she tries hard and the excitement doesn't drop. A mighty satisfying record and certainly the first time I've raved about a Hammond organ player. Fred Judd please note!

(Noted Russ – I now have a copy, not quite my style but a good recording. F C J.)

Handel's Messiah. The London Philharmonic Choir with the London Philharmonic Orchestra conducted by Walter Susskind. Choirmaster Frederick Jackson. April Cantelo – soprano, Helen Watts – contralto, Wilfred Brown – tenor, Roger Stalman – bass. George Malcolm –

Harpsichord, Harold Darke – organ. *Audio Spectrum AST 315. 4 Track Stereo 7½ ips.*

As the sleeve says – complete selections from the greatest oratorio ever written. A monumental work composed in just three and a half weeks between 22 August and 14 September 1741. This recording was made in the Church of St Magdalene, Paddington, London. Although like many popular works it has been done to death by both professionals and amateurs it has such beauty that it may always be heard again with pleasure and especially when performed by such stalwarts as the London Phil' company. Superbly played and sung the recording is excellent, full of warmth and capturing the subtle nuance of harpsichord and orchestra. There just isn't room to list all the items included but to whet your appetite there is *Behold the Lamb of God, For Unto Us a Child is Born, And the Glory of the Lord, Hallelujah* etc. Beautiful.

Holst – The Planets. The Vienna Philharmonic Orchestra with the Vienna State Opera Chorus conducted by Herbert Von Karajan. *London LCL 80097. 4 Track 7½ ips.*

Gustav Theodore Holst despite his foreign sounding name was born in Cheltenham in 1874. He came from a musical family and started his professional career as a village church organist. The Planets Suite he finished writing in 1915. Each of the seven movements has as its theme a different planet. Commencing with a fiery warlike *Mars the Bringer of War* full of the tumult of violence, it is frightening in its intensity and assaults the ears with its fury. Following and in complete contrast *Venus, the Bringer of Peace*, is just that, calm and tender with a gentle beauty that soothes the Martian shattered nerves. *Mercury, the Winged Messenger* comes on like the wind. An exciting gossamer breeze that breaks into momentary flurries. *Jupiter, the Bringer of Jollity* has an almost Eric Coates quality when it's bustling and gay but there is a sad maestoso mid section. *Saturn, the Bringer of Old Age* is again frighteningly descriptive. The doleful, tolling, plodding intro fills one with a feeling of dread and loneliness which gradually becomes instead firm and pridefilled to move with the majesty of old age, aware of approaching doom but with head held high, walking on.

Uranus, the Magician suggests a Disneylike scene of little Orientals, hands tucked into sleeves tottering on and off a vast stage, setting the scene for the dramas to follow. Uranus it would seem is a magician who does more than just the usual sleight of hand. At times the suspense is unbearable only to be broken by the comic arrival of another Oriental assistant.

Neptune, the Mystic conjures up a picture of a dead flat tract of uninhabited country shrouded in drifting mists. It is eerie and becomes even more so when the choir singing wordless sounds joins in eventually taking the work to it's close, fading gradually away.

This recording, an import from America, is an Ampex production and it has extremely good quality in every respect ie the recording, stereo, sleeve notes and packaging.

In fact, all the tapes I've reviewed this month have been first class in every way and if only this standard could be maintained by all manufacturers, then the 'pre-rec' tape buyers' lot would be an extremely happy one and I would feel a lot happier too, for I really do hate criticising recording and tape quality knowing full well all the trouble that has to be taken to produce even a lousy result.

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tape club news

Many of you will be wondering what has happened to the *ATR* League Tables in recent months. No need to worry, they have not been forgotten. As you may have noticed, Club News has often over-run its normal quota of two pages, and we felt that you would rather have as much news as possible during the busy months and catch up on the League Tables during the summer months, when club reports are less frequent. So you will notice that we are including this month the League Tables for May and June as the first instalment. Summer holidays always mean a slowing down of club activities, both at inland clubs and those in coastal resorts, with the inland members usually finding their way to the coast and the coastal members finding themselves too busy coping with visitors! However, I am sure many a club member will have included his recorder as a most important item of luggage, and doubtless we shall hear all about the holiday tapes when the new recording season gets under way again next month. **KC**

Coventry

Attendance at recent meetings has been very high, and a number of new members have been enrolled. Members' Equipment Night brought a really marvellous display of recorders and ancillary equipment, much of the latter being home-made. Outstanding was a remote-control box for a slide projector made by Roy Reynolds, a 10-watt transistorised amplifier and pre-amp and a transistorized voltmeter measuring up to 150,000 ohms by Harry Elcock. Miss N. Yeomans demonstrated her Stella and Fi-Cord 1a, and Mrs Woodier her new Phillips EL-3553. Also demonstrated were a Sony stereo by Lou Jones, Tandberg stereo by Ken Preston, and Reflectograph model B by Bob Tucker. Club secretary Cyril Stanley gave a demonstration using a parabolic reflector.

The meeting immediately following this centred around sound effects and humour on tape – a kind of meeting which Coventry members heartily recommend to other clubs. Some of the effects were quite hilarious! From a more serious angle, Arthur Ayres gave an interesting talk on his home-built AM ground-to-air transmitter which was accompanied by a tape of an imaginary conversation between the pilot of an aircraft and the control tower officer.

The recent musical evening held at the home of Stan Day was again well attended, and the lecture 'Language of the Birds' given at a local gallery has led to the possible engagement of a speaker from the BBC Natural

History Unit to address a Club meeting.

Derby

The latest edition of the Derby Club's 'All Your Own' programme was presented by Mrs Vicky Barlow. The evening was very well attended, particularly as Mrs Barlow had received extensive coverage in the previous day's 'Derby Evening Telegraph' for her work in recording song lyrics. Already one of the lyrics she has written has been set to a tune by composer Ronald Binge, and she is hoping to enter another song for the BATR Contest. The latest monthly quiz, again on general knowledge, was set by F. Shaw, and proved to be a tough one. The eventual winner was A. Stanway. It was then the winner's turn to present his programme, in which he showed members home-made equipment for finding particular effects on non-copyright discs without having to play right through the recording. A live play has been recorded as an exercise in mic placing with members of the drama section playing the parts.

In a reply to a tape from the Hove Tape Recording group, club members explained how they managed to produce a programme four months ahead and stick to it. They couldn't cope in any other way.

Leeds

The holiday period has had its usual quietening effect (in more ways than one?) on the Leeds and District TRC. But although attendances may not have been at peak, the programme has still been lively.

Slide expert Ron Crossley showed his slides of the Lake District accompanied by a sound track played back on a Ferrograph into a Lowther corner acoustic speaker.

Ron also achieved automatic slide change by recording a bleep onto the soundtrack tape and feeding it via a Phillips attachment to the projector. The usual 'Any Questions' session was chaired by Mike Plant and a wide variety of questions were answered by club members nominated to do so by the Chairman. This way everybody present was able to take part. Tapesponding with other clubs continues, and the production of the Club's contribution to the Yorkshire Federation Newsletter was handled by secretary Bill Rowe.

Leicester

Still catering for the beginners among its members, the Leicester TRC spent an evening examining tuners and amplifiers. Getting right down to basics, the performance of these items was discussed and then demonstrated. Some of the amplifiers used were home-made from kits, and among the tuners AM radio was discussed from the recording point of view, and a tuner was demonstrated to show the vast difference in recording quality.

One club member and four of his friends recently entertained the club in a local museum art gallery. The five formed a wind quintet, playing such things as old English hornpipes, giving members an opportunity to practise recording technique in the handling of solos, duets, etc., on different instruments.

So many members had seized this opportunity for a lesson in microphone placing, and had covered between them so many points with numerous microphones that it became highly dangerous for anyone to move during the session, as the floor was a maze of cables – even knee high, I am told!

London

Following his visit to the London TRC as a guest speaker, Barry Mitchell has now been enrolled as a new club member. Three other new members have also been enrolled, and between them the four newcomers bring to the club a Sony 521, a Grundig TK23L, a Brenell Mk5S, a Truvox R104, and a Telefunken 301. Richard Keene has again visited the club and has played back a further instalment of his production 'The History of Stereo'.

North London

The printed edition of the 'North London Tape and Hi-Fi' Club's magazine is now three years old, and is regularly on display in 14 libraries in the Enfield area – certainly an excellent publicity effort, particularly as the magazine is extremely well produced.

A novel way of gaining members came to light following a draw on behalf of the Enfield Microphone. Lucky winner Mr A. Webb is now a club member.

Another newcomer to the club, Dave Dicker of Edmonton, has demonstrated his method of compiling electronic music with the aid of an IBM computer. Even the words of the songs, which came over very clearly, were formed electronically.

Outside visits have included a trip to the New Circle Tape Club, the annual outing and a trip to record the AGM of a local Ratepayers' Association. Visitors to the club have included members of the Cheshunt and District Radio Club.

Norwich

Most notable among the recent meetings of the Norwich TRS was a visit from the BBC's East Anglian correspondent, Tony Scase. He gave a most interesting talk on interviewing to an audience which included members of the Great Yarmouth TRS. Mr Scase described some of the people he has met and the individual recording techniques employed, using recorded examples as illustrations. The committees of the Norwich and Great Yarmouth clubs met recently and arranged several joint meetings, including a quiz, tape contest, lectures and a dinner/social evening.

A request has come to the club from an Australian tapespondent for recording of church bells. The church in NSW to which the tapespondent belongs has only a small single bell, but a system of loudspeakers has been erected through which bells can be 'rung' over the countryside. However, recordings available in Australia do not meet requirements and so recordings of bells at a local church in Norwich are being sent to Australia. Another tape will shortly be going to Dallas, Texas, via a gentleman in Plymouth, and here the item of interest is the village of Redenhall in South Norfolk.

Park

Until the Park TRC is more strongly established and has a little more money in the kitty it is proving difficult to obtain speakers from distant parts, as the club quite rightly feels obliged to pay a speaker's expenses and cannot at present afford to do so. However, they are fortunate in having Mr Conn Ryan as a comparatively near neighbour and he has already visited the club for a very memorable discussion and demonstration. Meanwhile a balanced programme of technical and beginners' material is planned, with many discussions and demonstrations by club members,

combined with as many practical sessions and outdoor recordings as possible. Efforts are being concentrated on the BTR Contest, and it is hoped that a large number of individual entries can be raised, as well as a joint club entry. Recent events have included a talk and practical exercise on 'Speech and the microphone', given by club Chairman Doug Morris, and a sound effects session at which the basics of club SFX library were outlined.

Rugby

After eight years as secretary of the Rugby TRS, Mike Brown has now found it necessary to retire. Naturally all club members are very sorry to see him relinquish this post, but of course Mike will still be seen regularly at club meetings as he remains a committee member. Assistant Secretary Tom Reader is to continue in his present post, but is unable to take over the full job of secretary. The new secretary is Mrs J. B. Clarke.

Continuing their research work into the local Percival Guildhouse, its beginnings and developments, its present situation and its future, John Bannister and Bill Long have visited Harlow New Town to interview the first warden of the Guildhouse, Mr Sewell Harris, who was appointed in 1925. The present warden, Michael Dawson, BA, who is a member of the society, is giving members every facility and is co-operating in the work in every way possible. The club has yet another association with the Guildhouse in that John Brown, one of the club's vice-presidents, has also been a warden, and he too will be interviewed for the feature tape.

Two car loads of members have visited the Birmingham TRAC, including Bill Long, Len Stephens, Michael Martin, Ian Drinkwater, Janet Clarke, Mr and Mrs Tom Reader, and Michael Brown. At the rendezvous in Birmingham they met not only their hosts but members of the South Birmingham TPC and the South Birmingham Cine club. Resulting discussions between the four groups proved very enjoyable.

Southend Teenagers

Members of the Southend Teenagers Recording Society have been very busy preparing for their main project for the year – a full sound coverage of the 1966 Southend Carnival. Club members now contribute regularly a three-quarter hour variety programme to a local hospital broadcasting service. Other activities have included a visit to Southend Airport, the climax of which was a long climb up the control tower – clutching portables, of course. Four members, including new club photographer Tony Green, were allowed a hair-raising recording session within a few yards of the main runway.

Oddest request has come from the owner of a 100-year old autoglockenpolyphon, who has invited members to visit him and make recordings of this unusual instrument.

South Reach

The tape group of the South Reach Youth Centre has now taken a new name – Radio Erith. This was adopted when the Erith hospital authorities handed over a room in the old out-patients block so that the group, which has been operating a hospital programme for three years, could set up a permanent studio for the production of future shows. The London Borough of Bexley's 'Education Week' has meant a very active time for the tape group. Two exhibition stands and materials had to be produced first at the centre,

and during the week nearly 100 members of the general public attended, and many questions about the group and its activities were answered. The following Saturday saw the group exhibiting with the Amateur Radio section at a combined youth service display held at Bexley Heath. By combining with the radio group, tape group members were able to help by recording all incoming radio calls for future reference.

The mobile section with portables has been very active with recordings of interviews made by group secretary Denis Burridge at the Tower of London, and Tom Butler, Chairman, had made interviews at the start of the Margate to Maidstone walk organized by the Kent Association of Boys' Clubs. Interviews were also recorded with young people participating in the London Union of Youth Clubs' Ten-pin bowling finals at Acton. Copies of these recordings have been included in the hospital programme as well as in tapes being sent to the groups' many taperspondents.

Thornton Heath

Members of the Thornton Heath TRC are also finding meetings rather less densely populated than usual as a result of the temporary holiday migration. However, the weekly meeting at the Wilton Arms is always maintained and something of interest takes place each week.

A number of scripts have been duplicated, and dummy runs of dramatic tapes are being made several times in an evening. Each version is subsequently torn apart and an improved version made, and this process continues until all members are reasonably satisfied both with acting performance and recording quality. Ulterior motive behind these intensive practices is a win in one of the various contests now announced. The club committee is still persevering with the unfortunate Croydon General Hospital programme, and hope that, almost in spite of authorities, they can continue this part of their social service. By contrast the Mayday Hospital programme is still running excellently after a number of years.

Club member Ian Wood, who married and emigrated to New Zealand back in 1962, has suddenly returned and is once more an active member of the club. This made the long-standing committee members realise just how quickly time has flown!

Nearly every member of the THTRC has at least one portable, and location recordings were planned well in advance for the whole of the summer period.

West Middlesex

Following the eighth AGM of the West Middlesex TRC, Dennis Marks has been elected secretary, and H. E. Saunders is the new Chairman. Preparation of the Club's bulletin is now in the hands of the new Chairman. Demonstrations from visiting companies have included one of the range of Akai recorders and one by Mr Ken Smith of Truvox. In return members have paid a visit to the Truvox works, and a number of members have also visited the

Polegate Steam Engine Rally. Ten tapes were entered for the annual Chairman's Trophy contest, and judges for this included club president Angus McKenzie and Ken Smith. Club meetings are held on the second and fourth Thursday in each month at the Feltham Assembly Rooms, Hounslow Road, Feltham, Middlesex, from 7.30 to 10 p.m.

BOOK REVIEW

Tape Recorder Servicing Manual by H W Hellyer. 336 pages. Price 63s. Published by George Newnes Limited, London WC2.

Although this mammoth work consists primarily of a large collection of circuits and mechanical diagrams of domestic and semi-professional tape recorders reproduced from manufacturers literature and servicing instructions, there is a liberal sprinkling of useful practical data derived from the personal experience of the author himself, acquired from his day-to-day work as a practising service technician.

An introduction of 14 pages, dealing with fundamental theory and basic circuit techniques, starts the book off on its grand total of 336 pages of text, circuits and diagrams.

Such a pity that a work of this magnitude, into which much effort and energy has obviously been effectively applied, cannot easily be kept right up-to-date by the yearly publication of supplements dealing with the very latest models as they come along; for let there be no mistake about it, this sort of book most certainly has great potential value to the service technician whose job it is also to deal with the specialisation of tape recorders. Makers' servicing literature is not always readily available to all – and, indeed, sometimes not available to any! But it is possible, of course, that the publishers have something like this in mind, after the style of their *Radio and Television Servicing* volumes. If they have, then Mr Hellyer is certainly the right man to compile, add-to and edit such a project.

While this present volume will soon leave behind the latest models and techniques, it will, nevertheless, live for a very long time as a first class book of reference, for let it not be forgotten that the demands of servicing usually rise steeply with time.

Moreover, the book is ideal for the enthusiast and student wishing to make a study of the ins and outs of tape recorder mechanics and circuits without having to plough through mountains of service sheets and manuals. I know one thing, and that is my copy will become well thumbed over the years.

Of recent years Mr Hellyer has become well known for his nicely penned articles dealing with the mechanics of tape recorders – how they operate and methods of adjustment, etc. – and these will be found in trade as well as in the enthusiast's magazines.

Full marks must certainly be recorded for Mr Hellyer's contribution to the field of technical literature, for the way that he has compiled this present work and for the considerable extra value that he has given to manufacturer's data by the inclusion of his own experiences – even if, as Mr Hellyer himself says, these started life first on the backs of old envelopes and in the margins of service manuals.

Let us hope that this is to be the first of a series of books in this context by this author. Certainly a book to be recommended to all servicing people and to students of tape recorder techniques. G.J.K.

TOP TEN FOR MAY

1. Coventry
2. Brighton
3. Furness
4. Thornton Heath
5. Doncaster
6. Rugby
7. Merseyside
8. South Devon
9. Radio Scotland
10. Derby

TOP TEN FOR JUNE

1. Bournemouth
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3. Thornton Heath
4. Brighton
5. Friern Barnet
6. Montrose
7. Leeds
8. South Devon
9. Coventry
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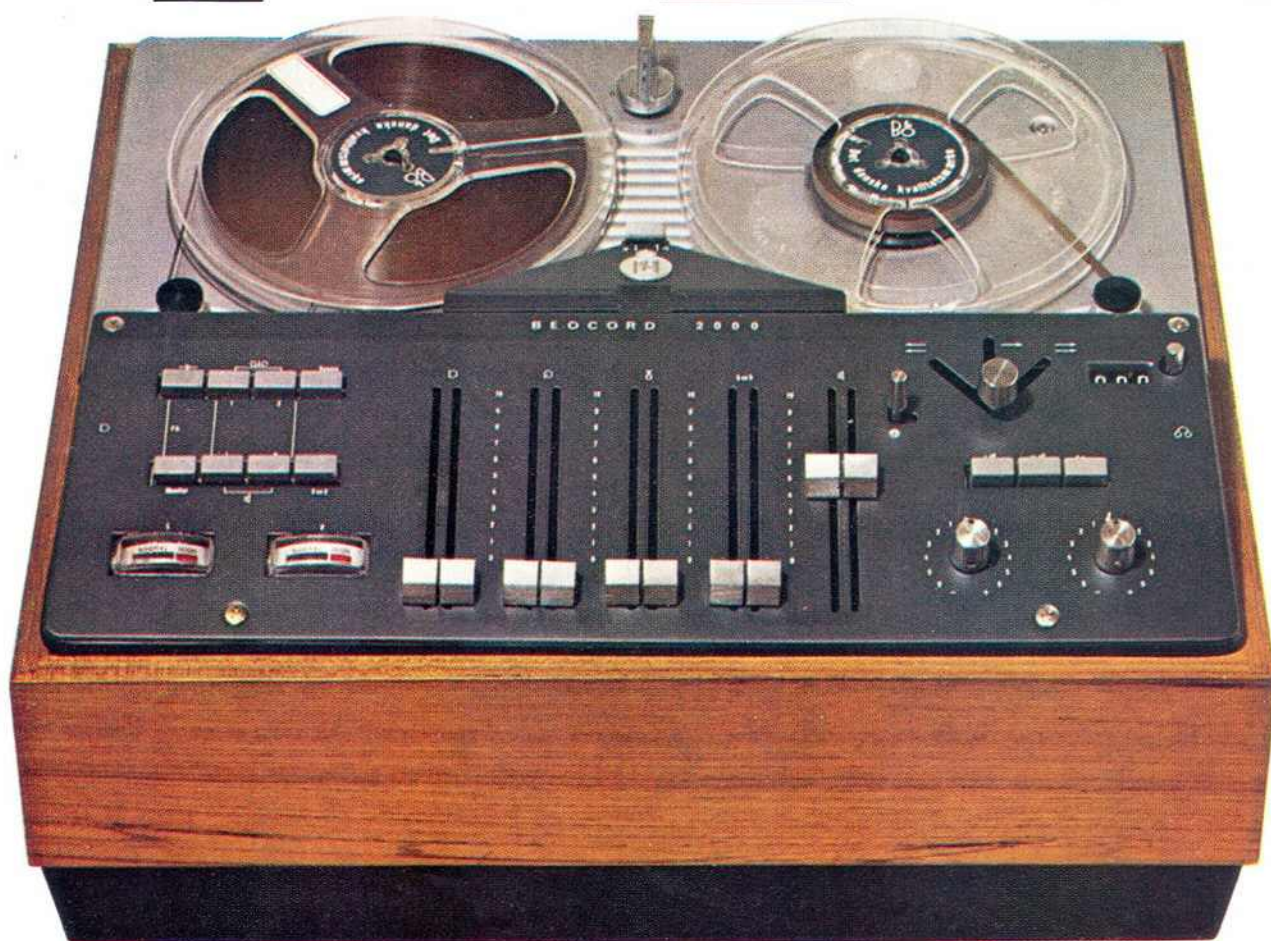
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