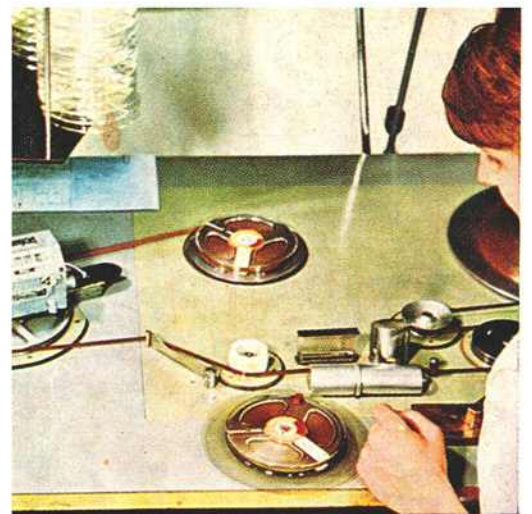
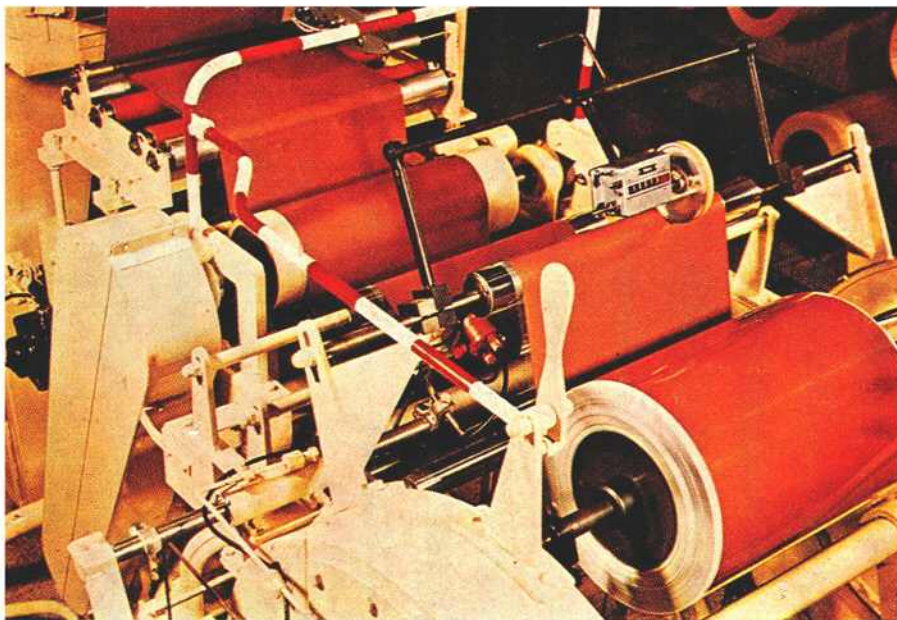
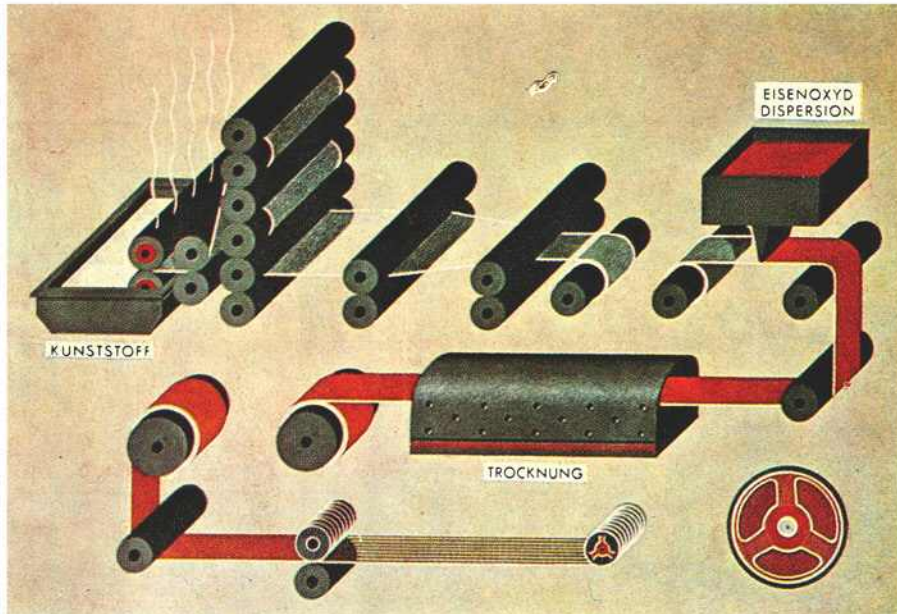


Amateur Tape Recording

VIDEO&HI-FI

November 1966 Vol 8 No 4 2/6



**THE PRODUCTION OF MAGNETIC TAPE
ATR VISITS BASF, LUDWIGSHAFEN—Page 8
FERROGRAPH 633 ON TEST—Page 26**

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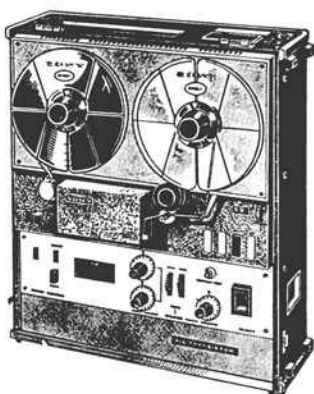
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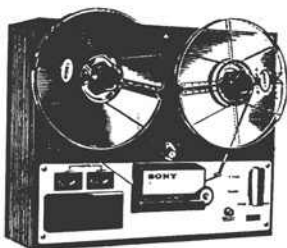


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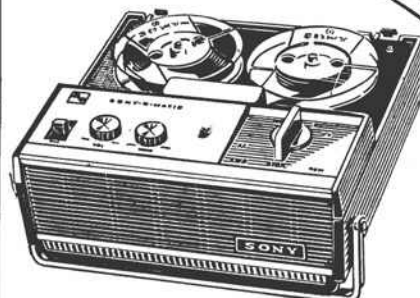


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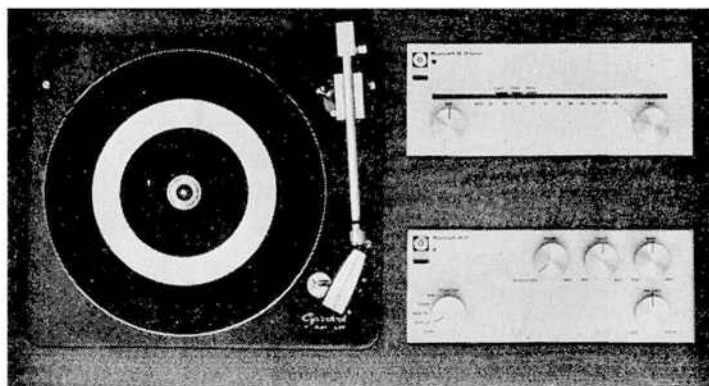
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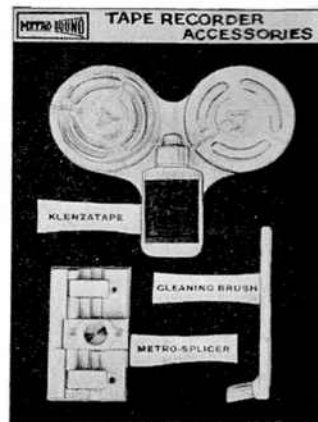
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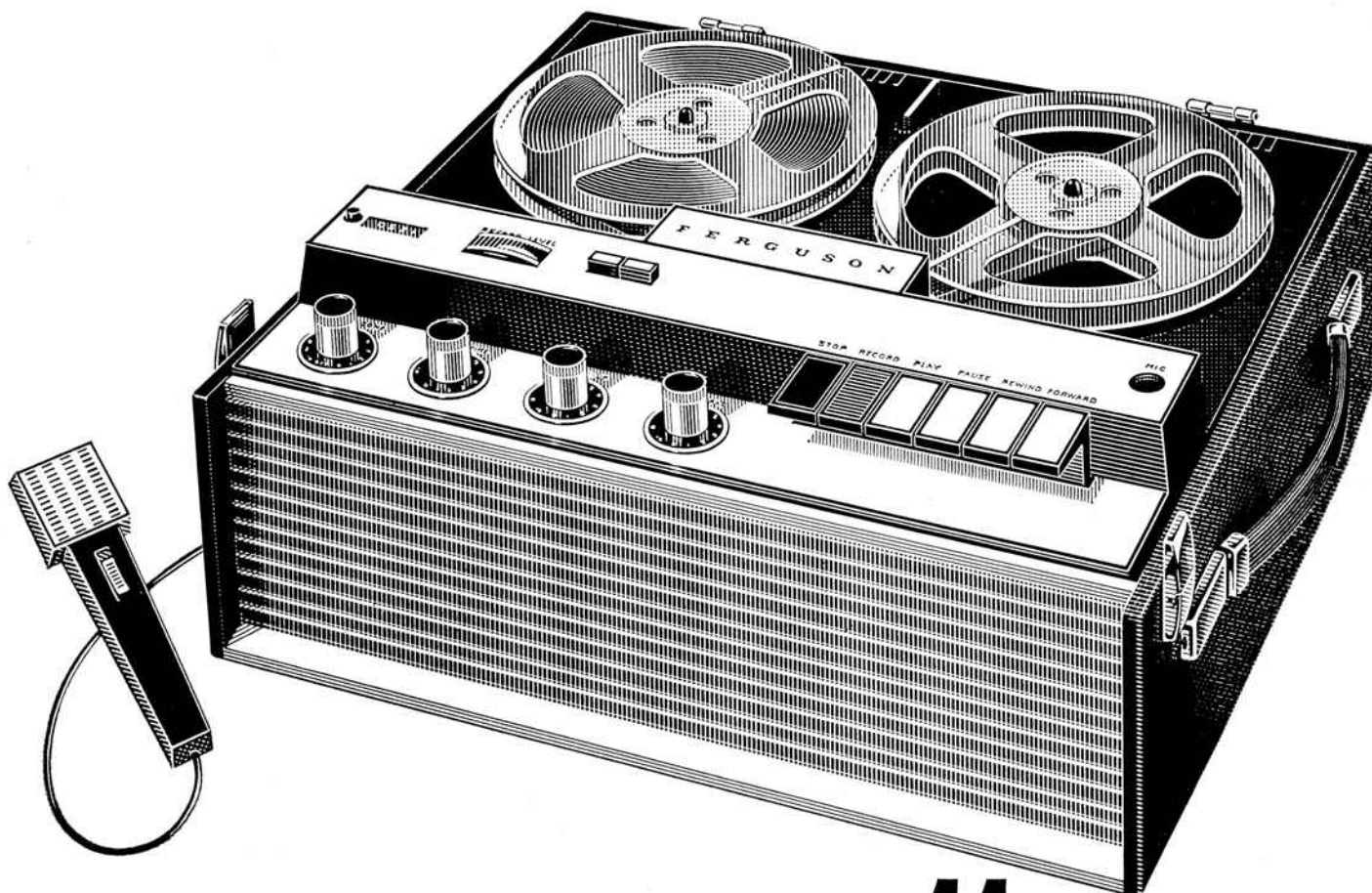
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EDITORIAL COMMENT

What is the most important electrical characteristic of a tape recorder? Frequency response, signal to noise ratio, distortion? I wonder how many would say *frequency response*? Granted, this *is* important, but not so important as many people think. It has, I would say, become something of a fad, if not a fallacy, to regard frequency response as the most important electrical characteristic of the modern tape recorder. But have you stopped to think about distortion? These days we would not be prepared to accept a hi-fi amplifier unless it could deliver full power with less than 0.5% distortion. Why, then, feed it with signals from a tape recorder which, under its best operating condition, may deliver anything up to 10% - sometimes even more - harmonic distortion. I should explain that this is the kind of distortion that makes the sound unpleasant and 'edgy' to listen to. Often some intermodulation of different signals may also be added to this due to non-linear operation during the process of record through to playback.

Now in a tape recorder harmonic distortion can be induced by the record amplifier, the actual process of recording and by the playback amplifier. One of the dangers where distortion is concerned is excessive pre-emphasis during recording, mainly to get the frequency response up to or even above 20,000c/s. Distortion can also be introduced by poorly designed pre-amplifier and power amplifier stages. By limiting the frequency response a little, which in no way reduces the hi-fi, harmonic distortion can be

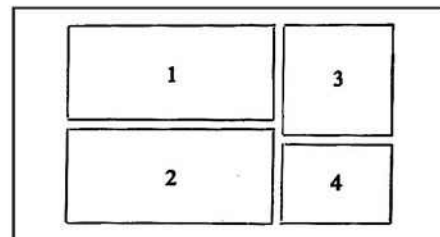
reduced quite considerably and for that matter noise also, since this too can be introduced by excessive pre-emphasis during recording. I am hoping that our technical man - Gordon King - will be able to explain these points in more detail at a later date, but I feel it is high time tape recorder manufacturers paid a little more attention to the overall distortion and noise that some of their tape recorders produce. After all, if an expensive tape recorder is to be classified as a hi-fi signal source it should produce no more distortion, hum and noise than the hi-fi amplifier system with which it is to be used.

I think something could and should also be done about the signal to noise ratio of recorders selling at over £100 with a signal to noise ratio of little better than -30dB below full recorded signal level. This applies especially to some quarter-track machines. A tape recorder with a signal to noise ratio of -56dB (half-track at 7½ ips) such as the Ferrograph 633 is exceptionally good. Even -50dB is very good, but it is interesting to note that recorders with this kind of performance do not have an excessively wide frequency response. One machine I handled recently and which cost over £150 had a frequency response extending up to 25,000c/s at 3½ ips but a signal to noise ratio of less than -30dB at its hi-fi (?) output socket. Figures for distortion also appear to vary with frequency response but a good quality tape recorder should not introduce more than 2 to 3% distortion with a signal to noise ratio of -55dB for quarter-track and -58dB

for half-track, and with a frequency response extending up to 20,000c/s at 7½ ips. So when you buy a tape recorder ask a few questions about these items and see what sort of figures are quoted. Meantime we shall be placing more emphasis on distortion and signal to noise factors when reviewing tape recorders. FCJ

FRONT COVER

ATR visits BASF



1. This picture shows in diagrammatic form the whole tape manufacturing process - compound (*kunststoff*), iron oxide dispersion, drying (*trocknung*) and slitting of the foil into tapes.
2. A foil emerges from a drying channel where its magnetic coating has been hardened.
3. An electron microscope in use, under which particles of gamma iron oxide become visible.
4. This picture shows tape running past a photoelectric sensing device which checks the coating.



TRACKING THE SECRETS OF MAGNETIC TAPE

ATR visits BASF, Ludwigshafen

Were you to drive up through Landau and Neustadt, just a little west of the river Rhine in Southern Germany, you would be in the 'Weinstrasse' (Wine Street). It is here in the many villages dotted around the countryside that some of the finest wine in Germany is produced. Of course you stop to sample some, not too much, and then head north into Ludwigshafen-am-Rhein, the twin-sister industrial town to Mannheim on the other side of the river. At Ludwigshafen and for almost as far as the eye can see along the west bank of the Rhine is the enormous factory of Badische Anilin und Soda-Fabrik AG, better known to us as BASF. The factory is virtually a city of chemistry, a huge conglomeration of buildings, railway tracks, roads and pipes. The miles of pipes especially make the whole place look like a scene from one of the Quatermass TV series. At the southern tip of the factory is sited the research centre and main laboratories, to the east, the wharves and vast stocks of coal, pyrites, phosphates and other bulk raw materials spread out for almost four miles along the Rhine banks. Only from the air or the top of their new skyscraper office block can one appreciate the real size of the BASF plant. The paved roads of the works total some 50 miles; in fact, it took an entire afternoon to tour the factory area by motor coach with only the briefest of stops to see inside some of the processing and manufacturing buildings. Chemicals of almost every kind, not to mention a thousand different smells, are produced here and the magnetic tape section, although in itself a large one, represents only a small fraction of the total area occupied by BASF. The power requirements for the whole factory amount to more than 4,000 million kWh per year, which is equivalent to that used by the city of Hamburg with a population of nearly two million. Water consumption per year is equal to about half as much as that used in the whole of Bavaria. BASF has its own hospital, its own Police Force and a small town where most of the employees live.

The Manufacture of Magnetic Tape

As in any large industrial plant, there must be security and the whole factory area is closely guarded against 'industrial spies'. Having been 'approved', my visit to the tape plant began in a small lecture room where the various pro-

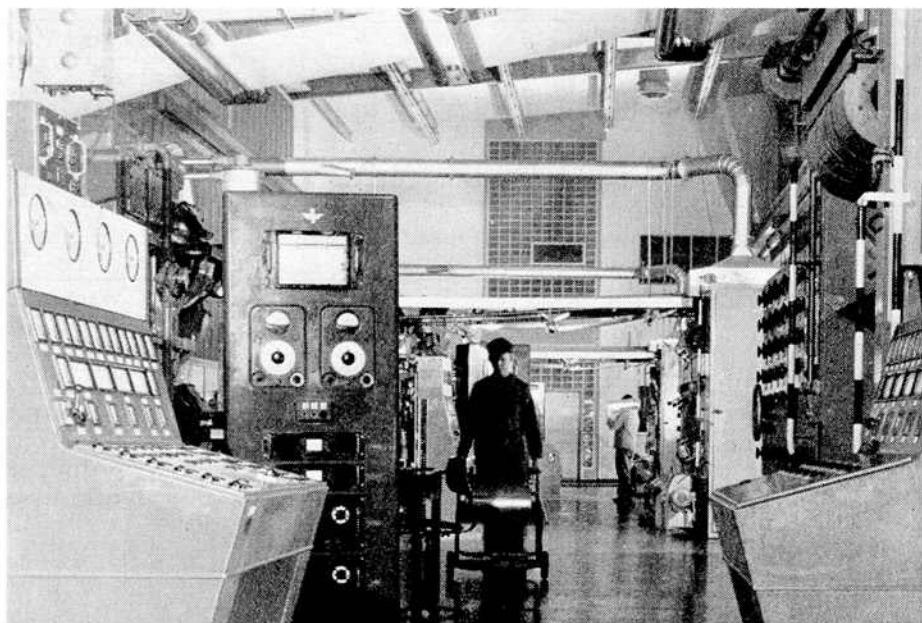


Fig. 1. In the foil factory where control is entirely automated.

cesses were outlined with a schematic diagram like that shown on the front cover. What looks simple on paper, however, is a most complicated series of processes involving the solution of a multitude of physical and technological problems.

Modern magnetic tape consists of a plastic foil and a layer of lacquer filled with an evenly dispersed magnetizable pigment. Nowadays cellulose tri-acetate, polyester or polyvinyl chloride are commonly used for the base foil. The magnetic pigment is mostly gamma iron oxide, whereas the composition of the lacquer can differ widely. The iron oxide is produced in large quantities and is first mixed with the lacquer raw materials and organic solvents in a dispersing or mixing unit. The foil can only be coated after all ingredients have reached a state of thorough dispersion. This is probably the most vital part in the manufacture of magnetic tape. The coated foil is then slit into single tapes, checked for electro-acoustic properties in the testing laboratory and finally released for spooling and packaging.

Foil Production

Now let's deal with each process in detail. First a visit to the foil production building. The *Luvitherm* foil is made of unplasticized polyvinyl chloride from which is produced a tough and durable tape base. The PVC used, one of the *vinoflex* types from BASF, is a powdery substance which undergoes several processes before the foil is obtained. The powder is first conveyed to an air-conditioned production room where the humidity of the atmosphere prevents the formation of electrostatic charges on the foil. Special air control in this part of the factory ensures that no dust particles are carried in from outside.

The thermoplastic *vinoflex* powder is then turned into a milky-white compound which is peeled from the rollers by stripping devices. A 'beater' breaks the irregular strips down into flakes and feeds them to the rigid foil 'calender' where the actual conversion to foil takes place. The whole foil production is handled by automatic machines supervised by only a few specially trained operators. The

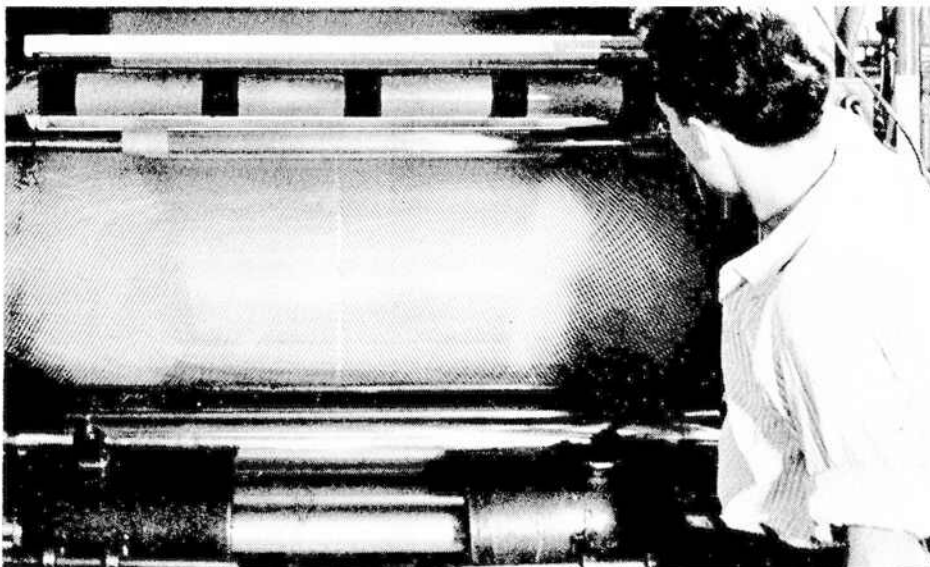


Fig. 2. The Luvitherm foil is pre-stretched, which prevents stretching later when the finished tape is used on a tape recorder.

calender is a unit with four rollers stacked one above the other, ensuring even thickness over the whole width of the foil. Once the machine has been set for the desired thickness, it is automatically held constant by a self-correcting gauge which responds to the amount of radiation absorbed by the foil. Rays from a radioactive source penetrate the foil as it leaves the calender and a detector samples the residual radiation and supplies the controlling unit with the necessary reference voltage. Great importance is attached to the apertures between the rollers since they directly influence the properties of the foil. The close tolerances required can only be held if the guidance of the rollers is extremely stable and their parallel alignment absolutely perfect. For this reason a calender must complete a trial run of 24 hours before it reaches a technically stable state. After the foil has left the calender, it moves overhead as in Fig. 1 into the *Luvitherm* unit, where the properties of the relatively brittle calender foil are improved by subjecting it to an intense heat shock. Then it passes the stretching unit shown in Fig. 2. The foil enters as a wide sheet and is transformed in all three dimensions, mainly in length which increases several times. Finally the rolls of foil are cut straight at the edges and moved to the coating rooms, protected against dust all the way. Incidentally the finished *Luvitherm* has a tensile strength of 34,140 lb per square inch which is about equivalent to the tensile strength of mild steel used for construction purposes.

Preparing the Dispersion

The coating material process runs almost parallel to the foil production. First the iron oxide which is obtained chemically in several steps must show the required magnetic properties as they greatly influence the electro-acoustic properties of the tape. The iron oxide is first tested for its suitability in a special laboratory and the hysteresis properties are checked by means of an oscilloscope as shown in Fig. 3. The gamma Fe_2O_3 produced by BASF is brown in colour and has a crystalline structure, the needle-shaped particles being especially suitable for magnetic tape. The minute needles have an average length of

0.04 thousandths of an inch and an average diameter of 0.004 thousandths of an inch and can only be made clearly visible under an electron microscope as shown in Fig. 4. Owing to their special shape, the particles can be orientated magnetically.

The dispersing process takes place in large ball mills arranged side by side and controlled by automation. The noise in this building is deafening. Inside the mills, balls of steel and porcelain assist in the fine dispersion of the contents, consisting of iron oxide, lacquer and solvents. One very important factor is the milling time, i.e. the period for which the iron oxide remains in the mills and which controls not only the homogeneity of the dispersion but is also critical with regard to damage to the minute oxide needles. On the other hand, agglomerates must be broken down in order to arrive at the fine state of dispersion required for the thin layer of the magnetic recording tape. In addition, special filters remove all impurities from the finished dispersion.

Coating the Foil

The entire building housing the coating plant is a world in itself, the so-called 'white zone' with a changing room, an air lock and a fully-automatic air conditioning system which maintains constant temperature and humidity. A separate air supply and thick glass panels shield the whole area from the outside. In the changing room the specialist employees change from their street clothes into white overalls. Before entering their respective work rooms they then have to pass an air lock, with automatically interlocked doors, where they are subjected to jets of compressed air from all sides. This is to prevent them carrying dust into the coating rooms.

The coating machines are mounted on a solid foundation to prevent vibration and are fed with the dispersion by a network of pipes. As in foil production, perfect parallel alignment is necessary to obtain a layer of constant thickness. First the uncoated rolls of foil are passed into the coating room through an air lock to ensure they are dust-free. To make absolutely sure of this they are cleaned again inside the coating room. The coating itself is



Fig. 3. The hysteresis loop displayed by the oscilloscope gives an indication of the electro-acoustical properties of the iron oxide used for magnetic tape.

controlled by a special device which enables an electro-magnetic assessment to be made of the amount of iron oxide deposited over a given area. Then the coated but still wet foil passes a magnet whose shoes extend across the whole width of the foil. The magnetic field is of such strength that the small iron oxide needles arrange themselves parallel to the flow of the foil. Thus the tape is given a preferred magnetic orientation which is necessary for magnetic recording. In order to harden the magnetic coating the foils are then passed through drying channels into which warm air is injected at constant temperature. The solvents which evaporate in the channel are almost completely reclaimed from the exhaust air by means of an absorber and can be re-used after condensation, purification and separation. Fig. 5 shows a foil emerging from the drying



Fig. 4. Acicular iron oxide under an electron microscope. The average length of the needles, as they are called, is 0.04 thousandths of an inch.

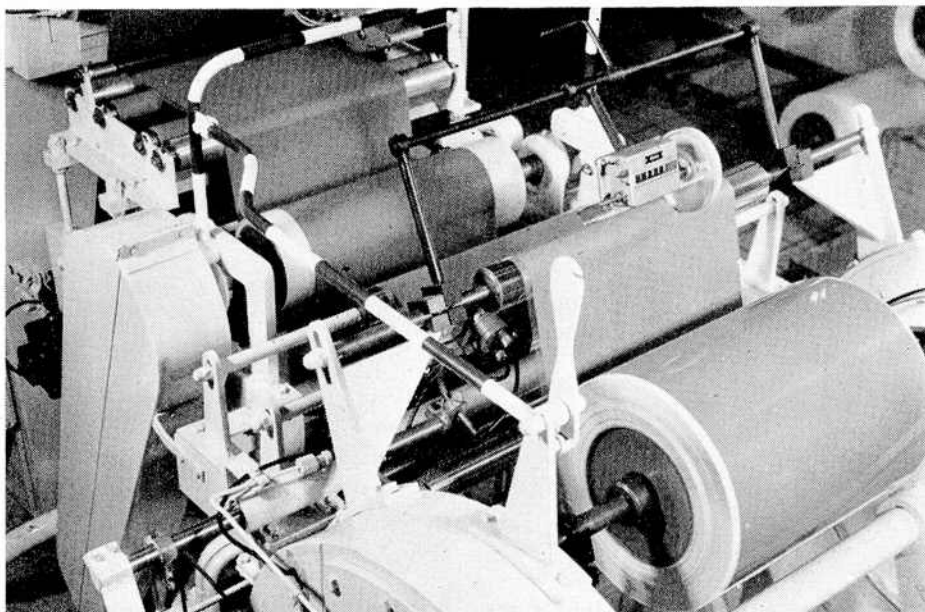


Fig. 5. This is how the coated foil emerges from the coating machine.

channel. The coating process is followed by a special surface treatment which ensures an exceptionally good physical and magnetic contact between magnetic layer and the recording or playback head. After this the coated roll of foil runs out of the 'white zone' to the slitting room. Each roll yields 40 quarter-inch wide tapes and the slitting is done by a machine with rotating interleaved upper and lower knives. The slit tapes are wound automatically on to plastic rings.

Testing

Before a roll or 'block' is released, one or more tapes are taken to the testing laboratory. Here essential electro-acoustic and mechanical data are noted and a short length of tape from each block is filed for later reference. When making the electro-acoustic measurements, a reference tape with closely defined properties is used (DIN German Industrial Standard Specification Calibration Tape) so that the properties of the recording head used in the testing machine can be taken into account and sensitivity and frequency response parameters ascertained. Further measurements cover distortion at a given degree of magnetization and the magnetic uniformity of the coating.

Every single block of tapes is tested for constant sensitivity over the entire length and even minute changes in the thickness of the coating can be detected. Special pen-recording equipment is used for these tests and two tapes can be tested simultaneously at high running speed. Momentary deviations in sensitivity which a pen-recording stylus would not be able to follow are registered electronically. Fig. 6 shows part of the testing apparatus for the measurement of electro-acoustic properties. Within practical limits all devices used for testing are 'fail-safe', as far as errors in operation and instrument readings are concerned and the same applies to the mechanical stress simulators used for elongation and shrinkage measurements. All measurements largely follow DIN recommendations but for the mechanical tests special simulators had to be developed by BASF in order to cover the extreme conditions sometimes encountered in use on tape recorders.

The Final Stages

Once the blocks have been released by the testing department the tape can be wound on the familiar double flange spools. From the large bulk reel (Fig. 7) the tape runs past a photo-electric sensing device and would be stopped automatically should there happen to be an uncoated spot, in which case the entire spool of tape would be rejected. The correct length of tape per spool is recorded on a footage counter as it runs off on to the spool. The inner end of the tape is then fitted with metallic switch foil and red leader tape. While that spool is being filled, switch foil and green leader tape is attached to the outer end of the previously filled spool, which is then sealed in a plastic bag ready for packing.



Fig. 6. A sample from every roll is subjected to stringent tests for magnetic properties and sensitivity, etc.

Tape in Use

Sound recording is, of course, not the only application for magnetic tape. Magnetic memories in computers, magnetic storage of television pictures, signal recording in spacecraft, geophysical measurements – for example in seismic exploration of oil – air traffic control and many more applications, all call for magnetic tape. To meet the ever-growing demands a new factory at Willstaett is being devoted to the production of special tapes which often necessitate different production techniques and specifications. However, when you buy a spool of BASF tape it is worth remembering that 30 years' experience of tape manufacture and research has brought this product very near to perfection. FCJ

*Title pictures from German wine catalogues.



Fig. 7. The tapes are spooled and fitted with leaders ready for packing.

FEARLESS FILING

by Mervyn Love



The tape index outlined here does not claim to be the best in the world – but it is certainly one of the easiest and cheapest to make. For those of you, who, like me, require a quick, accurate filing system with the minimum of effort in keeping it up to date, and with no complicated head scratching and cross referencing, this one is, I submit, the answer to a tape enthusiast's prayer. The materials you will require, as already implied, will cost very little – in fact no more than twenty cigarettes. In point of fact the materials for my own index were all found around the home and no expenditure whatsoever has to date been necessary.

Your first requirement will be one of those plastic or cardboard fold-over writing wallets inside which one normally finds a writing pad and envelopes, the latter being tucked neatly into a pocket in one half of the wallet. These items are favourite presents from hint-dropping maiden aunts at Christmas time, and a good 90% of you will have one knocking about the place somewhere. If not, you will have to pay a call at a local stationer's where they can be purchased for about 3s 6d.

The writing pad and envelopes are of little or no use and can be either slung, or stowed away for future use. You now have your fold-over wallet, and this is destined to become your handy, compact 'filing cabinet'. Next you will need a sheet of white card which is to be cut up into oblong index cards. Obtainable from most stationers, it will cost about 1s. Actually any piece of card will do, even the inside of a packet of cornflakes is quite serviceable if you're not fussy. Cut this into miniature postcards about 5 x 3 inches. This size can, of course, be adjusted to suit your own requirements. You will need one card for each tape you possess, whether three or thirty (or more).

Before you use your tape index it will be necessary to number your tapes clearly from one to however many you have. Spool size is unimportant and makes no difference to the filing. From personal experience I have found the best way to do this is to number the edge of the box on *all four sides*. Then, when the tapes stand upright, on a bookshelf for instance, the number can be seen whichever edge is facing outwards. Now, taking each card in turn, rule a good thick line across the top of each, about half an inch down, and write in this space on the left-hand side, the figure '1'. Write it nice and large, sparing no expense in ink. On the next card do the same and write in the figure '2', on the next '3' and so on – one card for each tape.

If you have a fair number of tapes it is best to set aside a complete evening for commencing the filing system as this may take a little time. Pack the wife off to mother-in-law and collar the dining room table. Line all your tapes up in numerical order and sit down comfortably with your pile of little white cards and a pen or pencil. Have the tape recorder plugged in ready in case you need it.

Take tape No 1, card No 1 and your pen, and write on the right-hand side, above the line and opposite the number '1' the size of the spool. Then, in the space in between, fill in the playing time

of the tape plus any details you may care to think up relevant to that tape. Below the line and top left inscribe: 'Track I, Red', green, or blue or whatever colour the leader is, and fill in what is recorded on that side.

Below this entry and about halfway down put: 'Track II, Green (or whatever) and enter what is contained on *that* side of the tape.' For four-track users continue on the second side. Simple, isn't it? A good idea is to write the *contents* details in pencil. They can then be easily erased when the tape is re-recorded. If you stubbornly insist on biro, then score through the old entry and write in the new one underneath. When a card is full simply draw up another one, with the same heading details and start afresh.

When each tape has its own card index, stack them into two or three piles, depending on the size you finally chose and tuck them into the pocket which until recently contained those ill-fated envelopes. I personally find it a good idea to keep the cards for the same sized tapes in the same pile. All the 7 inch tape cards together, all the 5 inch tape cards together and so on. Keeping the cards in numerical order serves no real purpose.

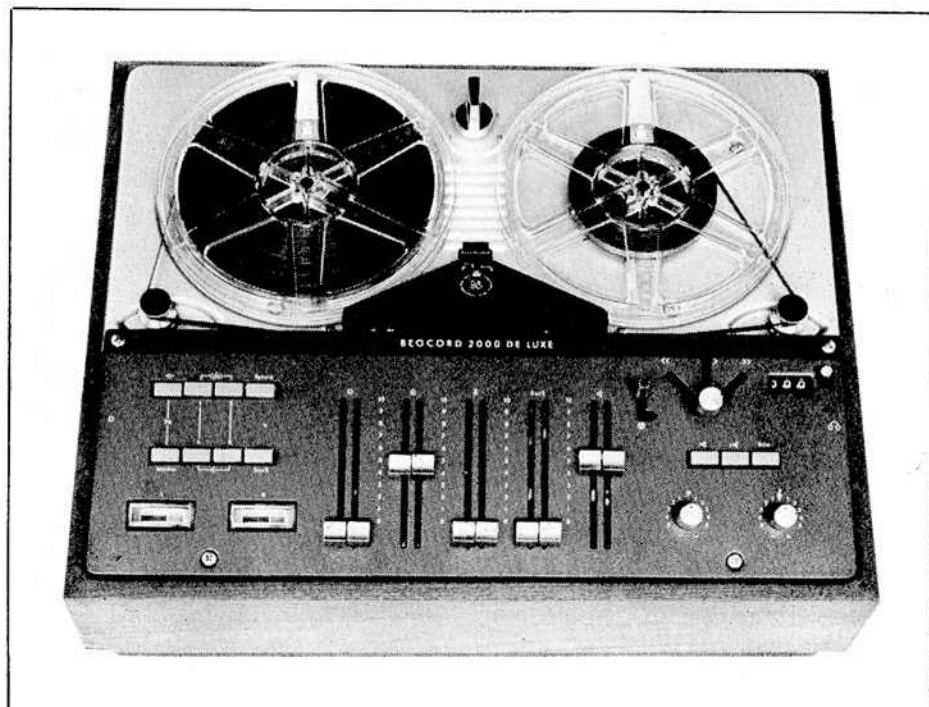
Let us now consider the system in use. There is a talk on the radio you wish to record and you can't remember which tapes have a vacant track. The talk lasts half an hour, so will fit on to a 3 inch tape at the slow speed, or a 5 inch tape at 3½ ips. Taking the 3 inch pile of cards first flick through until you come to a blank side. Failing this you may see a recording you no longer need and choose that tape. Should there be nothing in the 3 inchers, tackle the 5 inch pile. A suitable tape is found, say No. 14. It is then the work of a moment to fetch it from the bookshelf and thread it on to the recorder. I have had a tape selected, threaded and recording within three minutes of seeing a programme I wanted in the Radio Times.

On the other hand you may wish to hear, say Beethoven's Choral Symphony, which you know is recorded somewhere on one of your many tapes. It is somewhat doubtful as to whether such a mammoth work is on a 3 inch tape at 1½ ips and if you have it on a 5 inch one recorded at 3½ ips you have either a sadly uncritical ear, or a tape recorder the BBC would give almost anything to get their hands on. By dint of sheer brainwork therefore we deduce it to be on a 7 inch tape. Take up the 7 inch pile and flick through until Mr Beethoven's name meets the eye. The card says it belongs to tape No. 7. You have no reason to disbelieve it, so toddle off for tape No. 7 – and there you are.

Finally, one further suggestion is to paste one of those tape tables, which tell you how long a tape of given length will run, etc, on the inside flap of your filing wallet, together with any other items of information you may need for a quick reference. The guarantee card and instruction book for the tape recorder may also fit into the pocket behind the cards for safe keeping. Now, for those critics who may claim, for many and varied reasons, that the system cannot possibly work, I have two words, *try it!*

ON TEST - THE BEOCORD 2000K DE LUXE

by Peter Knight



Improved versatility of this model is provided by the use of *twin* fader-type controls for signal inputs and playback output. The earlier model had four faders controlling microphone, pick-up and radio input signals and playback output. These are retained on the new model, but instead of one slider for each function, there are now two. These are for separate control of the right and left stereo channels, or for the separate control of the signals up to the recording heads and from the playback heads back to the loudspeaker or signal output sockets. The new model also has an extra twin fader for controlling recording level on echo, sound-on-sound and line input.

Two-Track Model plus Four-Track Playback

Also new is that while two-track recordings can be made and played back, playback only is also possible on *four tracks*. That is to say, the machine is a fully equipped two-track model with the extra facility for playing back a four-track tape record. This is achieved by a system of head switching. Head complement is a two-track with 10 micron gap for recording, a four-track with 3 micron gap for stereo playback, a two-track with 3 micron gap for stereo playback and a two-track with two 10 micron gaps for erase. Switching between the two playback heads is handled by a push-pull switch located near the head assembly, between the tape spools – *up* for two-track and *down* for four-track.

The electronics department is composed of a number of printed circuit boards as follows: two-channel microphone preamplifier using four transistors, two-channel four-transistor radio preamplifier, two-channel four-transistor pick-up amplifier, two-channel six-transistor recording amplifier, two-channel six-transistor playback amplifier, two power

amplifiers with a total of twelve transistors, bias/erase oscillator with four transistors and a regulated power supply with four transistors. The printed circuit boards, or 'modules', are located within a robust metal frame. The preamplifiers simply plug-in and can be changed to suit the requirement.

Inputs

Signal level switches on the pick-up and radio preamplifiers allow for the application of a relatively wide range of input signal levels without the danger of overloading. The switches are accessible through holes in the bottom panel of the recorder, adjacent to the signal sockets. The radio preamplifier gives either 5mV and 47Kohms or 100mV at 100Kohms, but this amplifier section can be modified if required for a crystal microphone input of 0.5mV at 500Kohms.

The pick-up preamplifier is switchable for magnetic or piezo (crystal or ceramic) inputs, giving 2mV across 47Kohms or 40mV across 4Mohms respectively. The earlier model had a radio input of 2mV which was easily overloaded by some tuners in spite of the radio input fader control being well down. Attenuators are still needed between high-level sources and the appropriate inputs if overloading is apparent. It was found desirable on test to set the appropriate input fader to a little over half on and then adjust the source signal levels for peak recording level. The microphone input (located on the left-hand side of the control panel) has a sensitivity of 50 μ V and an impedance of 50 to 200 ohms balanced. This high sensitivity allows the use of the best quality, low output microphones. For high-level signal inputs a 'line' circuit with a sensitivity of 250mV at 50Kohms is available. This input is separately controllable by the sound-on-sound faders.

Outputs

The machine has three output systems. There are two pairs of loudspeaker sockets delivering 8 watts per channel across 4 ohms, a line output delivering 0.6V across 10Kohms and a 100 ohm headphone jack socket located on the right-hand side of the control panel, on the side opposite to the microphone input. Excepting the jack, all sockets follow the DIN standard, and each socket excepting those for the loudspeakers cater for both input and output signals on two channels.

Thus, to connect the recorder, say, to a stereo amplifier with matching DIN sockets (such as the Beomaster 1000), it is necessary only to employ a single multiconductor, DIN-plug-terminated inter-connecting cable to extract signals from the amplifier for recording, and signals from the recorder for replay through the external amplifier. This is one of the great advantages of the DIN system, but problems can arise when the partnering equipment fails to conform to DIN. It then becomes necessary to create special leads with plug ends to suit the equipment.

The main sockets are located in a cavity at the bottom of the recorder, and no problems are presented by conveying the connecting cables from these to external equipment, since the rubber feet on the recorder provide adequate clearance at the bottom – between the table or shelf.

The new model still uses the excellent Papst drive motor. This is synchronous to the frequency of the mains supply and ensures absolutely constant speed. The mechanics of the drive and speed change system determine the wow and flutter content, and this would appear to be within the maker's specification. The capstan spindle is supported at the top by a shaped, hard plastic section to avoid undue strain when pressing

against the pinch roller. On the test model this developed a very high-pitched whistle, causing resonance effects within the machine. This was akin to hf instability in an audio amplifier, but this was impossible owing to there being no internal loudspeaker. However, the problem was totally and satisfactorily cleared, and did not re-occur, by feeding in a very thin, polished plastic film between the capstan spindle and support while the capstan was rotating. This cleared the apparent very slight roughness from the support. There is certainly not any design problem here.

The machine is switched on and the speeds selected by a metal knob control between the two spools. Speeds of $7\frac{1}{2}$, $3\frac{1}{2}$ and $1\frac{7}{8}$ ips are available. The faders allow the mixing of programme signals and the signal levels in the two channels are monitored on two edge-type, moving-coil meter movements. These indicate the sum of the signals as mixed in the channels. When the machine is switched on the level meters are illuminated with a white light. When a recording is being made the light changes to red, on one or both meters, depending whether the recording is single or two-track.

The twin controls make it possible to record two entirely separate programmes simultaneously, side-by-side on the tape, turning the level of one up or down or even fading one out altogether without affecting the other. This can be useful for laboratory applications, for speech training, education and so forth. In this application, the machine can be considered as being two entirely independent recorders, but using the same tape — one track next to the other. Independent replay of the two recordings is, of course, also possible.

Sound-on-Sound

The material on one track can be transposed to the other track, making it possible to add multiple sounds to one track. This is achieved by recording the first part on track 1, rewinding and recording the second part on track 2 with the sound-on-sound button depressed. The first part is then re-recorded along with the second part on track 2. This process can be repeated within the limits of an acceptable signal/noise ratio, for as more and more parts are added, so the recorded noise increases. However, the low inherent noise of the machine makes it possible to add ten or more parts, especially at the highest tape speed, without the overall noise becoming objectional.

For automatic operation of a slide projector, the commentary is recorded on one track while pulses for operating the slide change mechanism are recorded synchronously on the other track at appropriate intervals in the commentary. Bang and Olufsen make a slide projector, 'Synchrobox', for this purpose.

Another big advantage of separate recording and playback heads is that the programme can be monitored from the tape immediately following its recording, and while the recording is in progress. In this application the recording and playback amplifiers and heads are working together. A button labelled 'monitor' brings this facility into operation when depressed, while with the button in the 'up' position, the recording signal to the head is monitored. There is virtually no quality difference between the signals going on to the tape and coming off!

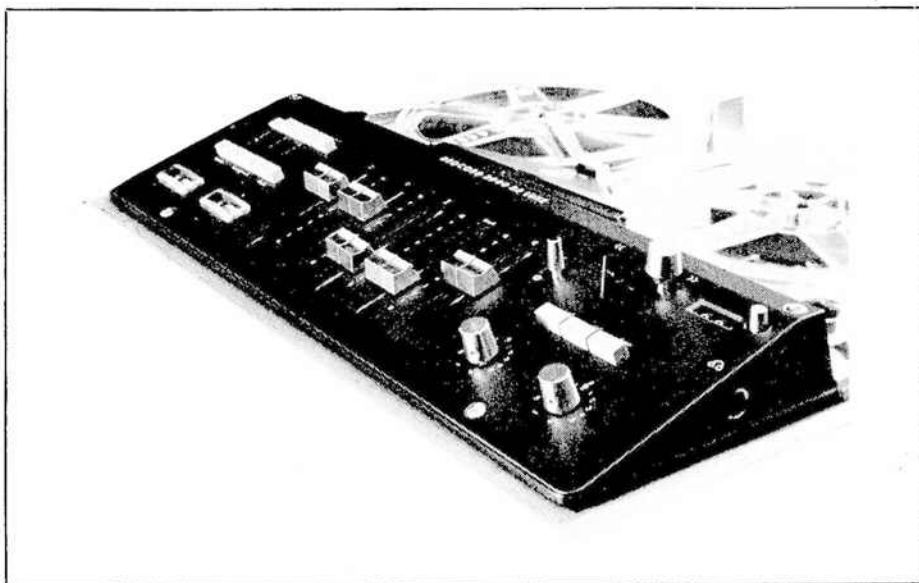


Fig. 2. Detailed view of the twin slider controls.

Separate heads and amplifiers also make it possible to introduce 'echo' to a recording. When the button marked 'echo' is depressed some of the signal picked up by the playback head is fed back to the recording head along with the main signal being recorded, but fractionally later due to the displacement of the two heads. The time period is also governed by the tape speed, of course. The echo (or reverberation) level can be controlled by the sound-on-sound sliders.

Other outstanding features of this wide range machine include its use as a hi-fi 8 x 8 watt amplifier with bass and treble tone controls and as a public address system given by the facility of being able to break into tape playback with a microphone announcement. Features of the earlier model also present in the new one include the spring-loaded tape slack absorbers and the automatic stop which operates at the end of the tape due to a foil contacting system and also on tape breakage.

The power output of the playback amplifiers was checked by setting the machine as for amplifier use, loading the loudspeaker outlets with 4 ohms and checking the power in these loads while monitoring the output

waveform with the input signal fed into the radio preamplifier. At 1,000c/s 5.7 volts rms could be measured across the loads up to amplifier clipping level, representing a little over 8 watts rms. Just below clipping level the wave distortion was barely discernible, but at a level of 5 watts could not be detected

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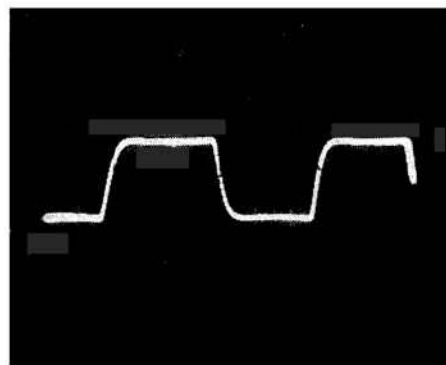


Fig. 3. Square-wave output at 2,000c/s, input to radio preamplifier and output across 4 ohm load.

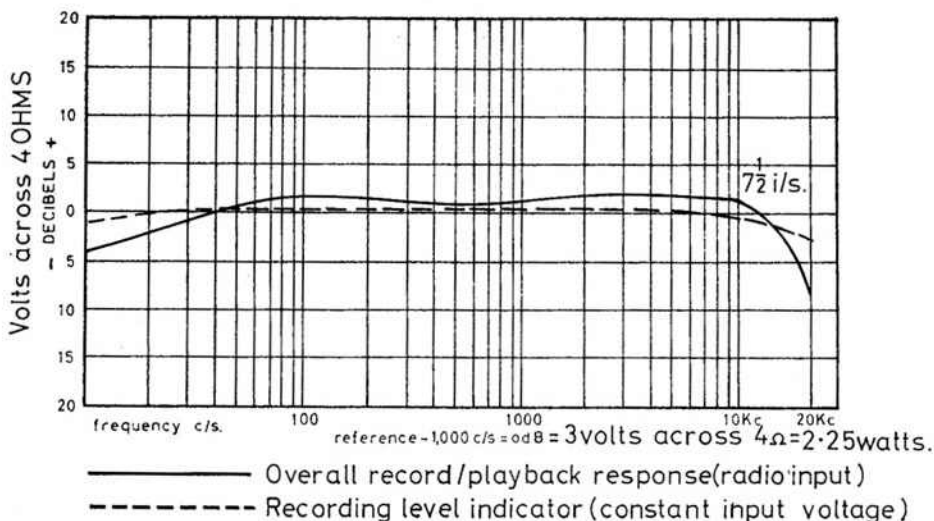
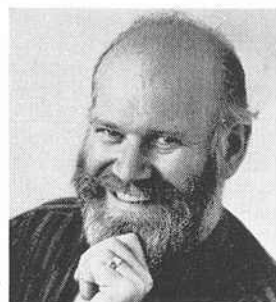


Fig. 4. Response characteristics.

TAPE RECORD REVIEWS

by Russ Allen



David Rose and his Orchestra. *MGM Stereo. STC 4004. 4-Track 7½ ips. 21 Channel Sound.*

As I promised last month, another multi-miked recording job. Again I can only say that it really is fabulous recording, for once more MGM have helped by including an orchestral seating plan and a key to the microphones used – all twenty-one of them.

Musicians will be interested in the way in which the orchestra has been set out, as it is not quite the normal set-up as I know it from British studios. Particularly odd, I think, is the fact that the two bassists have been completely separated. One is at the back and to the right of the conductor and the other, poor lonely man, is in front of the fiddles to the extreme left of the conductor. The answer is possibly that the one in front plays all the arco or bowed stuff and the one at the back sticks to playing the rhythmic pizzicato notes. My only complaint is that the tracks seem to be so short, their average length being about 2 minutes 20 seconds. There are twelve items: *Kiss of Fire, Love, Caravan, Ebbside, Misty, Flamingo*, finishing with a 4½ minute version of *All the Things You Are*.

My favourite arrangement was that of *Flamingo*, and I suspect that this was from the same pen that arranged and conducted that absolutely superb LP from Oriole's 2000 series, *Cole Porter in Percussion*, the genius being Irving Joseph. Pleasant listening, good playing, superb stereo.

Bruch - Kol Nidrei, Opus 47.

Dvorak Cello Concerto in B Minor, Opus 104.

Janos Starker, cellist, with Antal Dorati conducting the London Symphony Orchestra. *Mercury Living Presence Stereo 35mm. ST 90303. 4-Track Stereo 7½ ips.*

As a bassist I find the cello the next most fascinating instrument. They sit ahead of us in the orchestra and I have long yearned to play double bass with all the panache of a top cellist.

Janos Starker has a superb tone and the confident attack that makes him a soloist. At twenty-one he was already first cellist with the Budapest Opera. Four years later he was in America with the Metropolitan Opera and in 1953 he moved on to the Chicago Symphony. Of the two works here I find great difficulty in deciding which, if either, appeals most to my ear and really I can make no choice. Each has great moments, each presents the soloists at their best.

The 35mm recording system has done little audibly that I can notice and while the record-

ing is good, I would not say it was superlative. This is not derogatory, but when it says that this is a new recording system, etc, etc, I do expect a miracle. No miracle, but it is a fine coupling of first-rate artists.

Love Songs from South of the Border. The 50 Guitars of Tommy Garrett. *Liberty Mono TA-LBY 1302. Twin-Track 3½ ps.*

As usual, there's nowt about owt on t' box to tell you anything about anything.

Mr Garrett, one must presume, is a guitar player as it is that instrument which is featured. Where the bit about fifty of them comes in I'm not at all sure, as I can't reckon on hearing anywhere near that many. The backing is quite a large orchestra that does at times have a certain number of guitars playing, but whether they are a host of lucky sessioniers or whether it is a multi-tracked Mr Garrett I may never know. I guess that it probably is multi-tracking and there are some very fine passages of guitar duetting, tripping and quartetting. Incidentally, it is what is known in the trade as Spanish guitar, i.e. not them electric fings what the pop groups have.

As for the Love Songs from S of the B, some are familiar, *Yours, Perhaps, Time Was, La Golondrina*, and a super old memory jerker for me called *Siboney*, and if anyone cares to write and tell me whose signature tune it was and where they used to play they can have this tape. Big deal!

Actually this is quite a delightful record, very tastefully arranged, relaxed and easy on the ear. I hope nobody can tell me about *Siboney* 'cause I want to play it lots more.

The Sonny Side of Cher - Cher. *Liberty TA-LBY 3072 Twin-Track Mono.*

As the title infers, Cher is the femme half of Sonny and Cher and if you've been in doubt about which was which, Cher has the longer hair, just!

As a team I felt that they were not so gently taking the mickey out of the pop scene and at the same time making a lot of loot. On her own Cher often doesn't sing as I understand it, but intones to music sad little prose poems like *Bang, Bang* which has an extremely clever lyric. But Cher also essays to sing and tries her hand at *Old Man River*. This track on my copy had been attacked by electro-termites or something, but *The Girl from Ipanema* was OK and she sounded very good. I thought the backings were a mess, sounding like an out-of-door hurdy-gurdy. Cher also bravely has a go at *It's Not Unusual* but fails to outdo Tom Jones. She goes on to finish with *Milord* and all praise to her for not trying to ruin her

tonsils emulating the original, but it isn't a song that sounds much sung normally and anyway the awful jangly hurdy-gurdy sound was back again.

Cher can thank Harold Battiste Jr and producer Sonny Bono for not very much, because I am certain she has the potential to sound so much better with a more exciting backing and some real A & R work.

Great Ellingtonians. Volumes 1 and 2. *World Record Club TT 479/480. 2-Track Mono 3½ ips. Recorded 1960/61.*

This is a truly bumper bundle. Double rations – sixteen full tracks of three different groups of more or less Ellington alumni playing lines written by various people from the Duke himself to Britishers Stan Tracey and Kenny Graham and other non-Ellingtonians such as Quincy Jones and Tadd Dameron.

Recording is excellent, the material excellent and if you enjoy the Dukal sound then you can't afford to miss this. Regular Ellington men on the session included Harry Carney, Ray Nance, Paul Gonsalves, Booty Wood and for some reason, probably contractual, Johnny Hodges masquerading as Cue Porter.

The piano chair is mostly filled by Sir Charles Thomson. The Ellington music is in so many ways an enigma when you consider that it's been going on for over forty years and that one or two of the sidemen have been going right along, Carney particularly and Hodges too. Always it's been a great band, always doing something new and yet doing things that went out decades ago.

On these tracks away from Dukal influence the boys play a very relaxed-style jazz, at times quite unlike their normal way and yet still unmistakably Dukish.

The more I played this tape the more I liked it. So much jazz today has become taut and phrenetic that to hear people just playing is truly delightful. One point that does emerge is that Sam Woodyard, the band's regular drummer, does not swing half as much as the other two drummers on this session and I must confess I was terribly disappointed when I heard him with the band in the flesh.

Paul Gonsalves solos twice during the set on guitar and on Kenny Graham's *Swallowin' the Blues* plays a most magnificent solo which, though not a monument to technique, is one of the finest choruses of blues guitar I've ever heard.

Kenny Graham was also responsible for the loveliest number of all, *Sunday*, with some delicious Hodges alto. Thank you, World Record Club, for such a worthwhile double package and for Dennis Preston's little pamphlet.

BBRRROOOWWW

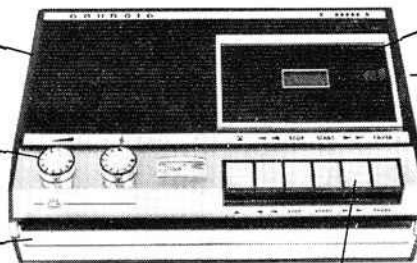


Go anywhere with the Grundig C100 – first portable cassette recorder with high performance and output power!

Twin track, single speed—the C100 can be converted to mains operation by replacing the battery compartment with a mains power pack (optional extra).

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GRUNDIG

SOUND SCENE



Fig. 1. The Uher Pilot 1000 portable with lip sync system for film sound recording.



Fig. 2. The new Van der Molen VR7 vertically operated tape recorder.

Uher Pilot 1000

From the radio show this year comes the Uher Pilot 1000 shown in Fig. 1 and which is distributed in the UK by Bosch Limited. This portable tape recorder is for professional use and is a single speed ($7\frac{1}{2}$ ips) model with a special 'lip synchronization' system for use with cinefilm cameras. We can only say at the moment that although it is a very expensive tape recorder, the official price has not yet been announced. Further details from Bosch Limited, 204 Great Portland Street, London W1.

More from the Radio Show

The Van der Molen VR7 tape recorder shown in Fig. 2 is a vertically operating machine retailing at 39 guineas and is probably the first of its kind in this price range. It is a three-speed, four-track recorder with built-in 8 inch speaker, bass and treble controls, monitoring systems etc, and includes a microphone and tapes. Further details from Van der Molen Limited, 42 Mawney Road, Romford.

Denham and Morley Releases

Three new tape recorders were shown by Denham and Morley Limited and include the ST-100 shown in Fig. 3, the SR-300



Fig. 3. The Standard SR-100 portable for Philips-type tape cassettes.

(Fig. 4) and an unusual model called the Multicorder (Fig. 5). The SR-100 is a miniaturized battery-operated transistor portable for Philips type $3\frac{1}{2}$ ips tape cassettes. It is supplied with a remote control microphone, tape and leather case and a mains converter can be supplied extra. Price to be announced. The SR-300 is a battery-operated transistor portable for two speeds, $3\frac{1}{2}$ and $7\frac{1}{2}$ ips. It takes $3\frac{1}{2}$ inch spools and is supplied with microphone and tape etc. Price not announced. The Multicorder is also a battery-operated machine and employs a new tape winding system using only one 5 inch spool. It is extremely compact and operates at $1\frac{1}{2}$ ips and $3\frac{1}{2}$ ips. It has a combined battery voltage/record level meter and retails at 49 guineas. Further details of these three recorders from Denham and Morley Limited, Chesham House, 150 Regent Street, London W1.

Sony Releases

From the Sony stand comes the TC800 (Fig. 6), a high quality mono mains/battery portable with two speeds ($1\frac{1}{2}$ and $3\frac{1}{2}$ ips) which is supplied complete with a cardioid microphone and headphones. Features are piano key operation, servo controlled drive motor and a manual/automatic recording level control system. The TC800 takes up to 5 inch diameter spools. Price £61 19s 0d.



Fig. 4. The Standard SR-300 all-transistor portable tape recorder.



Fig. 6. The new Sony TC800 battery-operated portable that will take 5 inch spools.

Also released at the Earls Court radio show was the Sony Video recorder shown in Fig. 7. It will retail at approximately 351 guineas plus 125 guineas for a camera (including lens) and tripod. This Sony video recorder employs a rotating head in conjunction with standard half inch tape which runs at $7\frac{1}{2}$ ips. The rotating scanning heads run at a controlled speed of 30 ips. During recording only one head is used but on playback both heads are employed, the second head re-scanning the recorded track so as to produce, on the screen, the appearance of a completely interlaced picture. Further details of Sony Products from Sony UK Limited, Sales Division, Mercia Road, Gloucester.

New B & O Loudspeaker

This compact pressure chamber speaker shown in Fig. 8 is ideal for mounting on small bookcase or shelf. It may be used horizontally or vertically and is fitted with separate specially designed bass and treble speakers plus crossover network with crossover fre-



Fig. 5. The new Multicorder portable with single spool loading.



Fig. 7. The Sony Video tape recorder employs half inch wide tape and a scanning record/replay head system.

quency of 4,000c/s. Power capacity 4 to 6 watts. Frequency range 60-20,000c/s ± 3 dB 85-16,000c/s. Price 13 guineas. Further details from Bang and Olufsen, UK Sales Division, Mercia Road Gloucester.

The Robuk Statesman

This new low priced tape recorder should find a ready market, for it has four speeds, $7\frac{1}{2}$, $3\frac{1}{2}$, $1\frac{1}{2}$ and $\frac{1}{8}$ ips. All functions are push-button operated and the controls are positioned at the front of the deck as shown in Fig. 9. The Robuk Statesman takes spools up to 5 inches in diameter and is supplied with a microphone and tape. Two models are available, the half-track version retailing at 29 guineas, the quarter-track at 32 guineas. Facilities include mixing, superimposing, and connections for external amplifier and/or loudspeaker. Further details from Robuk Electrical Industries Limited, 599-661 Holloway Road, London N19.

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Scotch Tape (3M) Space Promotion

In keeping with their important research role in providing communications systems for much of the space promotions, 3M are running a unique 'space picture' offer, for tape recording enthusiasts. The offer consists of three $16\frac{1}{2} \times 14\frac{1}{2}$ inch paintings of Tiros, Mariner and Polaris spacecraft, framed in contemporary style. Internationally famous artist, Oleg Stravrowsky, was exclusively commissioned by the company. The graphic, full-colour reproductions of his work are offered to purchasers of 'Scotch' magnetic tape (reel sizes 4 inch and over) at the give-away price of 7s 6d each, plus postage and special packing. Each picture – accurate in every detail – is valued at 21s but the set can be bought direct from 3M Company for only 22s 6d, postage and packing extra, accompanied by a tartan tab for each picture ordered.

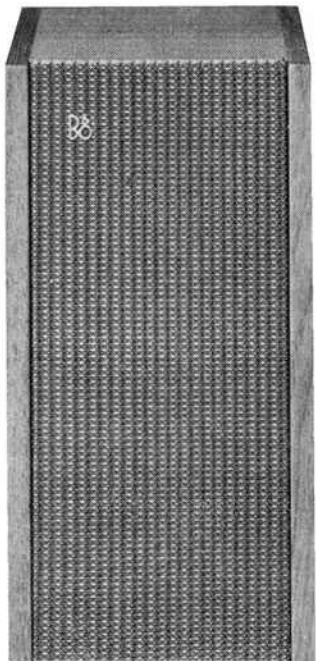


Fig. 8. A new Bang & Olufsen hi-fi loudspeaker small enough for the bookshelf.



Fig. 9. The Robuk Statesman recorder available for half- or 18 quarter-track operation and with four tape speeds.

Record it...and hear the play-back simultaneously on the **Brenell Mk5 Type M**



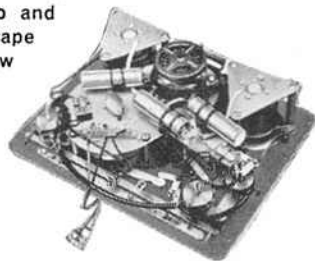
—and be sure it sounds superb!

Loudspeaker tape monitoring, enabling you to check and adjust your recording as it is being made, is only one of the assets of this outstanding recorder. All the features the discriminating recordist has come to expect from Brenell tape recorders are here—and many others, too. Four speeds (frequency response 40-20,000 c/s at 15 i.p.s.), mixing, superimposing, hinged deck, pause control, safety erase lock, $8\frac{1}{2}$ " dia. spools, etc. The price? 93 gns. For the stereo enthusiast there is the STB2, £150.

Write for illustrated leaflet ATR11.

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THE THINGS YOU SAY

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

Disc Copyrights

In the July edition of *ATR* (Things you Say), P. Overton said that he thought the licence covering the copying of discs was a good thing. I think he must be referring to this one, as the licence supplied by FBTRC doesn't cover the copying of discs, with the exception of those for hospitals and old people's homes, etc. Even then, permission has to be obtained from the recording company.

However, these licences are supplied for 10s by the Mechanical Copyright Protection Society which I think Mr Overton refers to, giving the right to copy discs (and I quote) 'in the house, in amateur tape recording and cine competitions'.

What I am bothered about (and I wonder if Mr Overton feels the same) is that if the licence gives me the right to copy discs in the home for my private use, does it also cover me for taping. This I also consider my private use, since this kind of tape only travels from one person's hand to another, and in actual fact is no worse than playing your own discs to your friends at home.

All the licence really requires is that you keep a copy of the following: titles, composers, publishers, duration of musical works, together with the make and number of any gramophone record from which the recording is taken. If the licence covers this, it is a good thing. If not, what is the purpose of taping your own records?

Swindon, Wilts

L. G. Young

Omni Loudspeaker System

I have read with much enjoyment and pleasantly little consternation Mr King's review of our *Omni MK II*.

Let me say at the outset that nothing in this letter is intended to bias the reader either for or against the reviewer or the product, for a review must be honest and off the cuff; it is intended simply as an explanation of the effects which caused some of the remarks therein.

I hope that I am fair in noticing a degree of apparent surprise (right through the article) at the bass response which is much praised in quality, and fully discussed to the perfectly true point of its changeability with siting.

If Leitz will forgive me, I admit to a Leica-like philosophy which seems to be that the basic instrument itself must be as near perfection as possible, appropriate accessories being added to make it do a particular job. We have endeavoured therefore to make the *Omni* as perfect as possible under complete anechoic conditions, for only then can a loudspeaker be 'right'. If the bass is clean in anechoic testing, then it must be as clean as it can be, subject to the effects of the listening room.

In the case of the *Omni*, more so perhaps than with any other loudspeaker system, the biggest live-room effect is that commonly called 'wall gain', which makes the size of the woofer appear a number of times larger than life so far as the air in the room is concerned, and thus to our ears too. It is an effect of reflection

somewhat similar to optics (if the walls and floor were mirrors, we would see more *Omni*s in the corner) and it commences at those frequencies where the wavelength of sound is comparable to the piston diameter, about 200c/s in the case of most big woofers.

It applies more to the *Omni* because its woofer is at the top of the backward-sloping front panel, and the woofer can thus be placed farther into a corner than it can with a conventional box-shaped enclosure when the depth of the box itself holds it out of the corner. Thus one can get a beautifully smooth bass rise below 200c/s, the steepness of the rise depending upon the proximity to a wall and, of course, upon how many walls. In itself this effect can be turned to advantage by the user, for he can decide, to a degree, just how much bass he wants, and obtain it by positioning the *Omni* accordingly.

To return to the Leica-like philosophy, accessories are gradually being developed whereby the bass response can be tailored to be as good as possible in any position (chosen for perhaps feminine reasons!) though this is fraught with problems. It should mean, eventually, that the listener can use his tone controls for other purposes than trying to correct peculiarities in loudspeakers and their environments; this, though usually the only answer, is inherently bad in my view and can only result in an inferior approximation, for the response should be correct in itself with the tone controls level. On our own Quad equipment all tone compensation is permanently cancelled.

Many thanks, Mr King, for a fair and wide-angle view of the *Omni*. You successfully prodded me into investigating very low level spurious signals around 85c/s, when a tweeter fault was discovered in one of the units which you returned. As to the shape, funny people say funny things, and we can't do it with a

square box. The average architect, incidentally, loves it as does, it seems, the Council of Industrial Design.

In closing, may I please correct a wee misprint which has crept into 'Manufacturer's Specification'? The weight is thirty-eight pounds, not twenty-eight!

Wallsend,
Northumberland

J. A. MacHarg,
The Rectavox Company.

BBC Tapes

A friend had advised me to submit some tapes to the BBC. My first one included four talks; average playing time being seven minutes. I enclosed an explanatory letter giving such times and sufficient technical data as I thought necessary. To my great surprise the tape was returned, and apparently unplayed. A duplicated reply stated that such tapes should be accompanied by scripts for each item.

I had always imagined that tapes were meant to save time and the preparation of scripts for sound radio. Of course I had read out my material from scripts, but they were in a state of correction and scribbles, so not adequate for immediate submission. Now I am faced with complete typing of the entire taped material. Maybe *ATR* should lead the way, and request the best taped letter, of so many minutes' duration, for the *Things you Say* section of the magazine.

Hollington,
St Leonards-on-Sea

E. Smith

The BBC do not normally accept tape-recorded talks or other programme material intended for broadcasting. Talks intended for broadcast should be submitted in script form, typed with double spacing between lines. A tape recording may accompany the script if the author intends giving the talk and to provide some idea of the suitability of his or her voice. In any case the actual talk would be recorded in a BBC studio if it were accepted for broadcasting. (Editor)

DON'T MISS THE DECEMBER ISSUE

Another feature-packed edition of *ATR* plus the extra Hi-Fi Section

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- ★ Test Report - Beogram 1000 Transcription Unit
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TAPE RECORDER SERVICING PART XII



This month Gordon J. King investigates a method of checking the hf signal current

Last month we considered how the recording can be affected by adjustments to the amplitude and frequency of the hf bias/erase signal. It was also shown how the oscillator frequency can be adjusted to provide maximum erase efficiency and to remove interfering harmonics from medium-frequency AM radio reception. Before we go on to discuss level adjustments and cross-field systems, however, a few more words on the subject of radio interference would not be amiss, especially now that we have stereo radio. While direct radio interference from the hf oscillator occurs essentially on AM receivers, interference can result in a round-about way on fm reception.

Taped Whistles on Mono and Stereo FM Radio

Some FM transmitters, carrying the Light and Third programmes, have their carriers modulated with a 20Kc/s signal for the purpose of remote signalling from translator stations. This supervisory signal, as it is called by the BBC, is well above audio and cannot be heard at the receiver after demodulation. Theoretically, the receiver de-emphasis circuits should reduce its level considerably.

In practice, however, a substantial signal at 20Kc/s may be present at the receiver's audio output socket, and if this signal is applied to a tape recorder it can arrive at the recording head at an even higher level, especially on machines carrying excessive treble boost for maintaining the treble response at ordinary or low tape speeds. The result is that the tape tends to be affected by this supersonic signal either by overmodulation or by overloading in the recording amplifier. This has the effect of making the supervisory signal audible, sometimes by beat-frequency processes with the bias oscillator. A whistle is thus recorded together with the programme signal on the tape, and at this stage nothing at all can be done to remove it.

Stereo transmissions carry a 19Kc/s pilot signal, along with the mono and stereo signals, for the purpose of demodulating the stereo at receivers. When such transmissions are used to record either mono or stereo, the pilot carrier can give rise to effects similar to that of the 20Kc/s supervisory signal. With a stereo receiver, an additional signal at 38Kc/s is created (the 19Kc/s signal doubled), and harmonics of this—or the fundamental signal itself—can beat with the bias signal and produce audio signals which are recorded as whistles on the tape. For example, the second-harmonic of 38Kc/s is 76Kc/s, which could beat with a 70Kc/s bias/erase oscillator to produce a 6Kc/s whistle. Another example is the third-harmonic of the 19Kc/s signal (at

57Kc/s) beating with a 60Kc/s oscillator to produce a 3Kc/s whistle.

When interference is caused by sub- or pilot carriers, there is not much point in trying to remove it by changing the hf oscillator frequency. This will simply alter the tone of the recorded whistle.

Filter Needed

The only solution lies in preventing the sub-carrier signals from getting into the recorder from the radio or tuner. This is easier said than done, because for good quality recordings, audio components up to about 13 or 14Kc/s are required, and to put a sharp dip into the response at 19Kc/s without reducing the output at 14Kc/s is not an easy task. Moreover, once the response has been caused to dip at 19Kc/s, by not less than about 36dB, it should be held down at this level, not to rise again, to avoid beat effects with higher order harmonic components.

A low-pass filter with maximum attenuation at 19Kc/s and negligible attenuation at, say, 14Kc/s is thus the requirement (see Fig. 1). A twin-T resistor-capacitor filter can be designed to give almost 40dB of attenuation at 19Kc/s and the slow fall in response up to the critical frequency can be countered by arranging a similar, but lower frequency, twin-T filter in an active feedback circuit. This technique gives degenerative feedback, causing reduced gain, at all frequencies excepting those within range of the filter, thereby resulting in a relatively sharp 'knee', as at point A in Fig. 1. To prevent the response rising again beyond the critical frequency, ordinary, passive inductor-capacitor filters can be connected at the output of the twin-T configuration.

There are less complex solutions to the problem, adopting cascaded L-C filters, and ultra-elaborate precautions may not be necessary with some combinations of tuner (or receiver) and tape recorder. However, it is worth mentioning that commercial filters for this purpose are now becoming available. So much, then, for interference whistles due to the hf oscillator. Now let us see how the level of oscillator signal can be measured and, if necessary, adjusted.

Measuring and Adjusting the Level of hf Signals

Fig. 2 shows the basic oscillator and head-feed circuits of the Grundig TK120 series. The recording bias is measured in this model in terms of hf voltage across a section of the record/playback head. Test 1 on the circuit indicates this. Here a wide-range ac voltmeter is connected as shown and the hf signal voltage noted when the machine is switched to record.

The servicing data for this machine indicates that the voltage for test 1 should be in the order 82V rms. Having checked this, the voltmeter is shifted to measure the voltage across the erase head, as in test 2. Here it is said that the reading should be in the range of 39 to 48V rms. These voltages represent the ideal average bias/erase conditions, when the oscillator frequency is about 55Kc/s. Now, as shown last month, the frequency can be adjusted by screwing an iron-dust core in or out of the oscillator coil former. This is usually attached to a threaded rod. In the circuit of Fig. 2, the oscillator drive and hence the level of the oscillator signal is also adjustable. This is the purpose of the preset control P1. The procedure, then, is first to make sure that the oscillator frequency is about right, and secondly to adjust the oscillator drive control for the correct readings across the heads. If the correct readings cannot be obtained over the range of the drive control, the oscillator frequency would probably be incorrect. If the frequency cannot be checked on instruments, the core position should be adjusted a little at a time, testing after each adjustment with the drive control to see whether the correct head voltage readings can be obtained. When the correct combination has been discovered, the oscillator frequency and signal levels to the heads will be approximately correct.

The ac voltmeter used must, of course, be capable of responding reasonably accurately at the oscillator frequency, and it should not damp (i.e. load) the head circuits unduly. Ordinary ac voltmeters designed specifically for measuring voltages at mains frequencies (50 or 60c/s) are not suitable for bias and erase signal adjustments. One is usually concerned with the hf current in the heads, but this cannot easily be measured directly. However, it can be measured indirectly by measuring the voltage developed across a

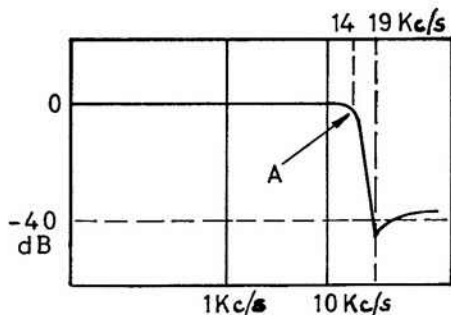


Fig. 1. A sharp slope, low-pass filter with this desirable response characteristic may be required to attenuate supersonic frequencies from the recorder without having effect on the audio signal.

resistor of known value connected in series with the record/playback head. Indeed, this method is favoured by many manufacturers.

Translating hf Voltage to Current

The idea is shown in Fig. 3, where R_s is the resistor connected in series with the 'earthy' side of the head winding. A value of 1Kohms is often recommended, and the voltage developed across it should be measured with a valve or transistor voltmeter capable of responding to signals at hf oscillator frequency. In the Kolster-Brands Model WT20 recorder, for example, the suggested voltage across a $\pm 2\%$ 1Kohms resistor is 280mV for correct bias. Now, the bias current is equal to the voltage divided by the resistance across which it is measured. With the voltage in mV and the resistance in kilohms, the current will be in μA . Thus, in the case cited, the current is 280 μA or 0.280mA.

This is a relatively low bias current, though the value is considerably influenced by the impedance of the head winding and, as explained last month, by the nature of the equalization, signal/noise performance and so forth. The current is also affected by the frequency of the hf signal. The Marriott standard high impedance head (70Kohms at 50Kc/s) calls for a bias current in the range 0.6 to 1.2mA at 50Kc/s, while the medium impedance head (17.5Kohms at 50Kc/s) requires 1.2 to 2.4mA, and the low impedance counterpart (1.3Kohms at 50Kc/s) 6 to 12mA at the same oscillator frequency.

The erase current can be similarly derived, but caution is required here because a too high value load resistor interposed in circuit will itself limit the head current. The impedance of erase heads is usually substantially below that of record/playback heads, a typical value being 250 ohms at 50Kc/s. This requires a current as high as 100mA to provide a desirably high erase magnetic field for good erase.

Because the current is limited by a series resistor, therefore, and because the voltage across a low value resistor would be difficult to measure without very sensitive equipment, the voltage across the head is usually measured. Of course, from this voltage it is possible to obtain some idea of the head current, provided the head impedance at the actual oscillator frequency is known. If the impedance is, say, 250 ohms at 50Kc/s and the oscillator is delivering a signal at that frequency, amounting to 20 volts rms across the head, then the head current would be equal to the head voltage divided by the impedance, the above figures yielding a current in the order of 40mA. When the voltage is developed across a resistor, neither the head impedance nor the oscillator frequency need be taken into account.

With the K-B machine referred to earlier, the correct voltage across the resistor in series with the record/playback head is obtained simply by adjusting the core in the oscillator transformer. This tends to affect the oscillator drive as well as the frequency. As a further check, the voltage across the erase head is also measured with a valve or transistor voltmeter, this being about 17V rms. Clearly, if this frequency is far removed from the designed-for value, both the erase head voltage and the record/playback head current would differ from the values stipulated. All that has been expounded applies to both two- and four-track heads, but there is a

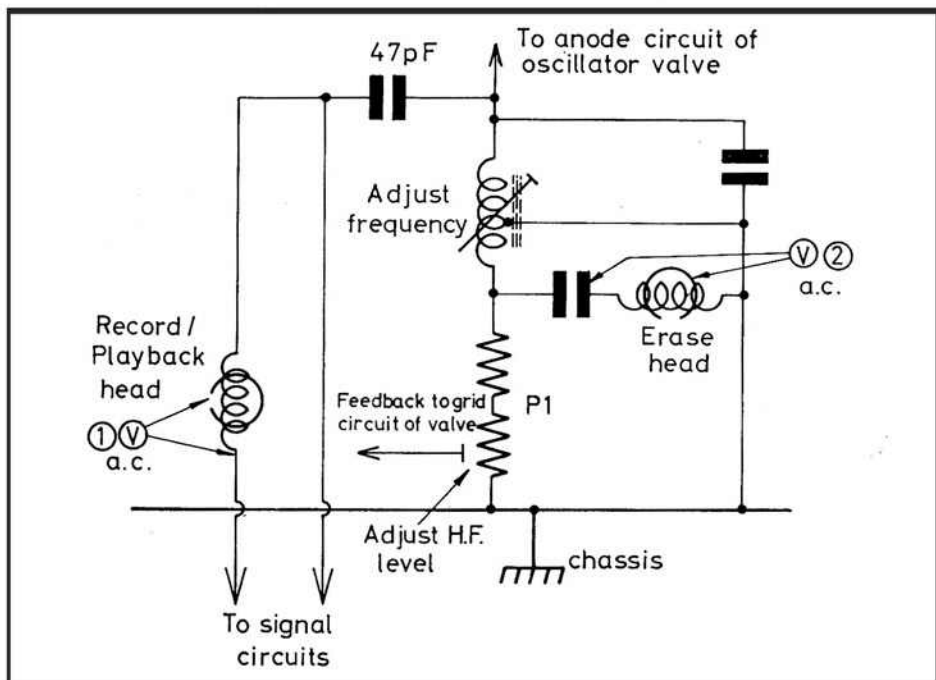


Fig. 2. Basic head feed and hf signal level adjustment. The setting-up of this circuit is explained in the text.

tendency for the head currents to be a little higher in two-track head windings. Some machines embody an arrangement for adjusting the bias current, in terms either of a preset capacitor or resistor. Such adjustments are shown in Fig. 4 at (a) and (b) respectively. The procedure here would be to adjust the oscillator frequency, first for the correct voltage across the erase head and then the bias preset for the correct current in the record/playback head. Four-track machines have two bias preset adjustments, one for each head section.

The values given in the manufacturers' service instructions or on the circuit generally represent an average bias that will work reasonably well under all conditions of recording and for all brands of tape. The enthusiast, however, is in a position to try different bias settings to find out which is best for his particular set of conditions. If the machine does not have a preset bias adjustment, but instead a fixed feed capacitor, as the 47pF capacitor in Fig. 2, the fixed

capacitor can be removed and a preset trimmer affixed in its place. This is not usually a very difficult problem, and the value of the trimmer should be about twice that of the fixed capacitor, giving a reasonable range of plus and minus adjustment. A 100pF trimmer would be used in place of the 47pF fixed capacitor in Fig. 2.

It was hoped to explore cross-field recording in this article, but this will now have to wait until next month, when we shall also look at recording current values.

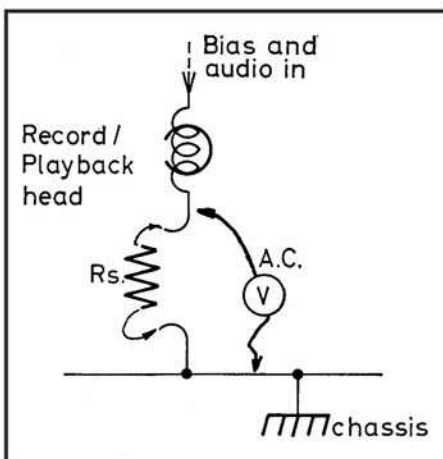


Fig. 3. Record bias can be measured in terms of voltage developed across a 1Kohms resistor which is connected in series with the 'earthy' side of the head, as shown.

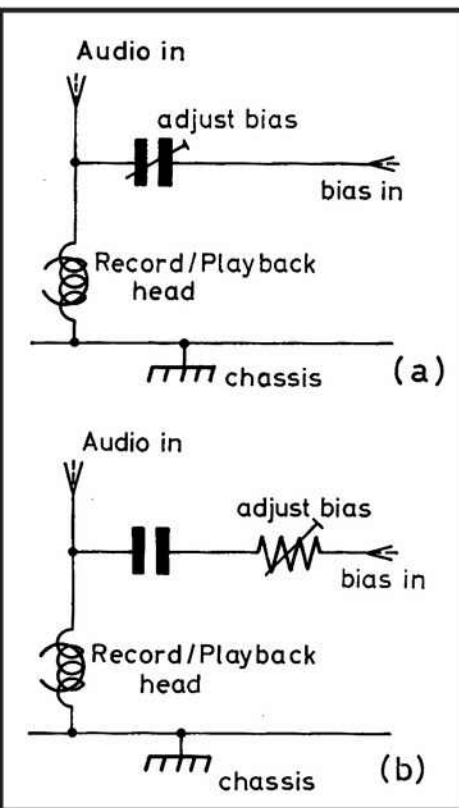
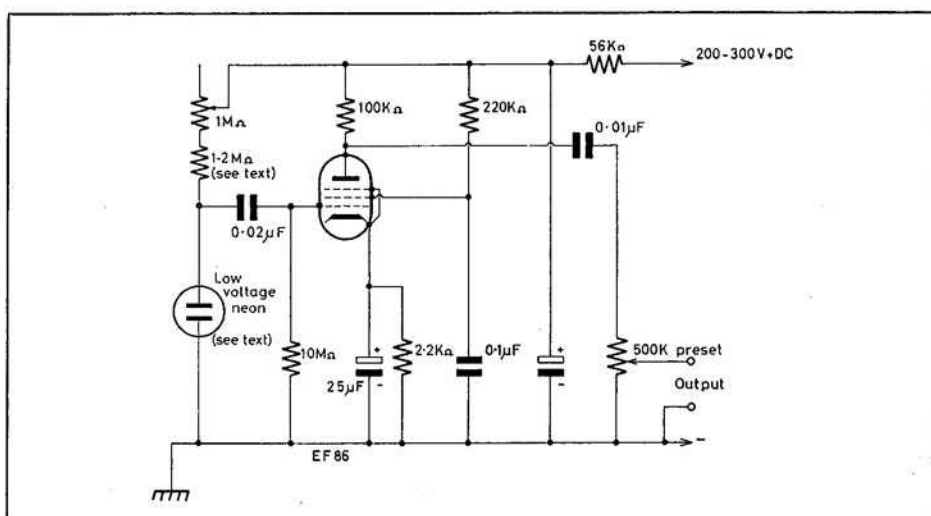


Fig. 4. Bias adjustment by a preset trimmer (a) and preset resistor (b).

NOISE GENERATOR

The so-called 'noise' generator has its uses in audio, although most of the time we try to keep down noise generated in tape recorders and amplifiers. Noise which has the sound of escaping steam is known as 'white noise' and has random frequency, phase and amplitude. It can be used for testing amplifiers and loudspeakers when suitably filtered but one of its main uses is in the azimuth alignment of tape replay heads. Here the noise is recorded on tape from a *perfectly* aligned head. The recording can then be used to align the heads of other recorders by rocking the head for maximum output which is when the 'hiss' of the noise sounds loudest. The circuit employs a high gain amplifier (EF86) and a small low voltage neon lamp. A 20 to 30V signal neon will do. A higher voltage neon could be used but this would mean altering the values of the 1Mohm variable and the 1 to 2Mohm fixed resistor in series with the neon and the ht+ rail. To obtain the requisite noise, adjust the variable for maximum loudness of the 'hiss'. The output will need to be coupled to an amplifier for this of course. It may be necessary to

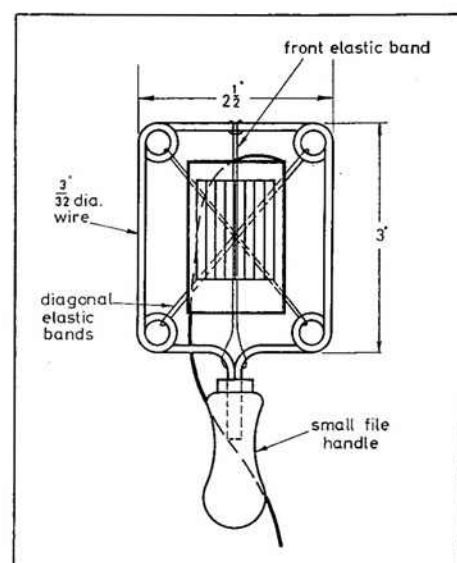


experiment with the values of the two resistors in series with the neon. The generator is useful as a noise sound source for electronic music and properly adjusted should provide

a 100mV or so of signal at the output. The amplifier must be treated as any high gain amplifier with regard to hum and must have proper screening, etc. FCJ

A USEFUL MICROPHONE HOLDER

Here is an idea for a microphone holder which calls for no alteration whatsoever to the casing and can also be carried in the pocket when not in use. It was designed for use with the Philips EL3586 recorder microphone and costs less than 1s 6d to make. A piece of wire $\frac{3}{32}$ inch in diameter is formed into a rectangle $2\frac{1}{2} \times 3$ inches with a loop in each corner and two leads about $2\frac{1}{2}$ inches long in the centre of the bottom rail. These ends are inserted into a small file handle. From a sixpenny packet of assorted elastic bands find two small ones about $1\frac{1}{4}$ inches and one about $2\frac{1}{4}$ inches unstretched. Fix the two small bands diagonally from the loops in the corners. Fix the larger band over the top rail in the centre and bring downwards in front of and under the handle and the holder is now complete and ready for use. Slip the lead plug through the top right-hand corner so that the microphone itself is in the inverted position. Lift the larger elastic band and slip the microphone under, making sure it is centrally placed over the crossed bands



beneath. This idea comes from ATR reader A. J. Link of Burton Latimer, Northants.

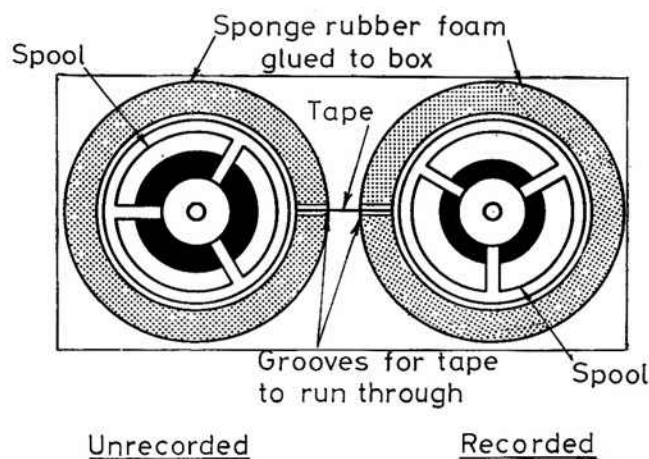
SOME HELPFUL SUGGESTIONS

SAVE YOUR BATTERIES

Those of us who use portable battery tape recorders soon find that the biggest drain on the batteries is rewinding. If the recorder is also usable on mains, one can of course use mains current and save batteries, but this is not always convenient. Most of this rewinding takes place when changing tapes for different subjects and may often mean running through half a tape or more and then resetting it at the same place when it is changed back.

I find a great saving is to use some small cardboard boxes a little deeper than a reel. Stick in some foam plastic strips, shaped round the size of a reel, with two slots for the tape to rest in as shown in the sketch. When a partially used tape is taken off the machine, it goes into one of the boxes, ready to be put on again when wanted, exactly in the right place. If a pencil note is put inside or on the lid one knows the subject of the tape and position at once.

I sometimes have up to three of these partially used tapes by me in these storage boxes and can so keep my subjects on their proper reels. There is no need to rewind at all - only a spot check via playback to make sure all is well for continuing recording.



This idea comes from ATR reader and contributor L. Tebbutt of Stamford.

CABINET SECRETS

by David Lazell

Have you ever heard a Welsh dresser giving out with four-track stereo? There seems to be a new craze for making high fidelity/tape equipment appear like something quite different—an antique ottoman, for example. It's all to do with the cabinet, my boy; naturally, by 'cabinet', I do not refer to those Parliamentary gents who spend their days talking with treble full on. Mark you, any high-fidelity fan is well advised to sit in the public gallery of the House of Commons occasionally, not so much to listen to those verbal fireworks from the floor, as to gaze around the splendid building and consider what it might be as an echo chamber. By cabinet, I mean that piece of furniture which houses the gear—you know, that elegant, veneered, acoustically-perfect chunk of timber which the children touch only at the risk of corporal punishment. For some time now, there's been a 'Back to Louis XIV' movement, with cabinets reverting to fine old style. I saw some radiograms advertised in a prominent American journal recently, pricey pieces of equipment with descriptions designed to make any music-lover rush to the store with his credit card. However, for all their undoubted quality, these radiograms looked rather like laundry baskets with wickerwork fronts, or heavily-curtained cocktail cabinets. It must have been very baffling for guests, e.g.:

Host: 'Well, what do you think of it?'
Guest: 'Er . . . well . . .'

Host: 'You'll never believe this, Fred, but I've had people in here who didn't even know what it was.'

Guest: 'Yes . . . well . . . we always keep ours in the bathroom.'

Host: 'Hey, don't sit on that chair . . . it's a cushioned stereophonic disc player with pneumatic telescopic arm!'

I'm very much in favour of this approach to graceful living. I mean, the fellow who confesses that he doesn't have his high fidelity out much because his wife doesn't like all those wires over the floor (yes, I've heard this) tends to let the side down. And I've never been able to completely understand that austere clerical gent who assured me that the best cabinet he ever found was an old ship's trunk. Maybe he meant the funnel, but he got his nautical terms mixed. Currently, I have a long, lightly-polished cabinet which, after experiment, does very well for a quiet 'kip'. I can rest full-length upon the cabinet, legs dangling over the edge, whilst having a bit of stereo Beethoven booming around my anatomy. On the whole, I'd say it's the best way of listening to music, though it's a bit of a strain when you have to get up to turn the disc over. First time I did it, I slid right off the cabinet on to the floor. (My dear wife had polished the impressive piece of furniture—said that it helped to keep the woodworm away! I'd like to meet the woodworm that could survive my stereo sessions.) The best cabinet idea I ever encountered was on my first gramophone, a creaking, spring-wound contraption with a somewhat ferocious turntable. When you released the brake, the turntable shot off like a Titan rocket. First time I used the gramophone for my new recording of Lee Lawrence, the turntable

flattened my left index finger. However, the deep red wooden cabinet had two neat little doors which, when opened, gave out the full monaural thorn-needed sound. When closed, the reproduction was naturally muted. I soon discovered that by opening and closing the door rapidly in succession, you could make any singer sound as if he were gargling. Now, I defy you to get a similar result with your modern gear! Then there was the large, heavy electric gramophone we used at the youth club, as heavy as a sideboard and with a hum as loud as a generator. We had to play loud records to drown the background noise. The youth club was situated in the middle of Welsh common-land, and, by some strange device, the authorities had laid mains electric supply only to the canteen. Thus, a long, long stretch of cable stretched from the canteen, through the corridors and meeting rooms, to the main hall where the teenagers did 'The Creep' and other diverse dances of those vanished nineteen-fifties. I carried that record-player about like Sinbad heaving that old man upon his shoulders. The cabinet resembled one of those theatre organs made in the nineteen-twenties; it was so strong that attempts to get inside the cabinet to adjust the mechanism proved quite fruitless. I came to the conclusion that it was burglar-proof. Now, in these days of crime and suchwhat, burglar-proof cabinets would obviously be an excellent idea—for example, a sudden strident stereo version of policemen's whistles, burglar alarms and dramatic excerpts from 'Dixon of Dock Green' would undoubtedly convince any intruder that it was time he mended his ways.

Some people argue that concrete would make a better material than timber for well-baffled cabinets, and I'm on the point of trying this with some blocks in the living room. The neighbours have helpfully suggested that I can brick myself up with my stereo, as far as they're concerned. I think we ought to be more ambitious about getting the right cabinets for the equipment, e.g. ex-army tanks. Truthfully, I knew a fellow who used his garage as a home for high fidelity equipment, and, as he played that famous stereo recording, bells, cannons and all, of Tchaikovsky's 1812 Overture, most people knew he was around. Between sides one and two of that disc, I managed to ask the bloke why he'd made such a momentous decision.

'Well,' he said. 'It was because of the builders.' 'You mean that they designed the garage for high fidelity?' I enquired. 'No,' he replied. 'They built the garage so close to the house we can't get a car into it. Well, you can't let a garage go to waste, can you?'

And I'll let you into another secret. Have you ever wondered why singing in the bath sounds so good? It's the baffle provided by the bath. Now, if you could only cement a 12 inch speaker into a redundant council bath, put that into an old railway engine boiler, and cover the whole with seasoned timbers, you might begin to understand how important a cabinet is. While you're thinking about it, I'm going to have a snooze on my stereo.

SOUND EFFECTS RECORDS

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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

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Side 1—Fire engines with bells Fire engine—alarm and sirens
S.S. Queen Mary siren Factory siren Telephone bell Door bell
Side 2—Clock chime Alarm clock Westminster chime Bow bells

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)
Side 2—Sibilant—white noise (pitch octave low) Sibilant—white noise (pitch octave high) Three-tone modulation Filtered tone Stridor (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 doors slam, 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 (repeat)
Side 2—City and Waterloo tube train—arriving City and Waterloo tube train—departing Footsteps (continuous) 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 Cate Figs 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

N STX/1—SOUNDS OF TORBAY, DEVON Price 7/6

(33 1/3 rpm LP 7 inch). A take-your-holiday-home record with commentary by Johnny Morris. Authentic sounds of Torbay night life, Kent Caverns, Brixham Harbour, Fishing boats, Moorland streams, etc.

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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"/>

I enclose postal order/cheque for _____ to cover the cost of record/s, plus 1s 2d post and packing for first record and 4d. for each additional record ordered.

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ATRII

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THE TAPE DIRECTORY

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

SOUTH AFRICA

Peter Robinson, 15, schoolboy, 4 Swansea Road, Parkwood, Johannesburg, Transvaal, S. Africa. Tape recording, local and regional geography, current affairs, films, science; all kinds. Sanyo Model MR-110, 5 in, 1½, 3½. Preferably someone of same age in US.

NEW ZEALAND

Noel Waters, 38, home appliance sales manager, 157 Walnut Avenue, Ashburton, New Zealand. Audio and hi-fi construction, live stereo recording, colour slides, cabinet making; all except Beatles and Beethoven. Two self-built consoles, battery portable, 7 in, 3½ but 7½ preferred. UK and USA.

RHODESIA

William, F. Kelland, 20, postal officer, PO Box 69, Gwelo, Rhodesia. Swimming, reading, cars; pop, jazz. National, 3½, 1½. Anywhere.

BRITISH FORCES

Tpr. Bill Barham, 23511683, 25, HM Forces (Army), 13 Flight, 3 Wing Army Air Corps Aden, BFPO 69. Football, cricket, cars, motor cycles; mostly pop but a little jazz. Akai STI Stereo, 7 in, 3½, 7½. USA, Japan, West Germany, UK.

Len Bithell, 24, instrument mechanic, E & I Section, RAF Gutersloh, BFPO 47, Germany. Round robins, humour; general. Philips EL3548, four-track, 7 in, 1½, 3½. Anywhere, reply guaranteed.

G-1946617 SAC Parry Graham, 20, radio mechanic, RAF, 12 RFP Rafakrotiri, BFPO 53. Motor racing, radio, travelling; R&B, pop and light classical. National R2503S, 5 in, 3½, 1½. USA, Poland, UK.

Norman Miles Judd, 23, The Royal Dragoons, BFPO 41. 34mm photography, records; blues, light classical. Sony TC200, four-track, 7 in, 3½, 7½. Anywhere, especially America.

K0686884 J. T. Moore, 22, radio fitter, Hiswa, RAF, Steamer Point, Aden, BFPO 69. Astronomy, German language; pop and classical. Akai 345 Auto, 2¼-track Stereo, 10½ in, 3½, 7½, 15. Anywhere, especially Germany. Females preferred.

BEDFORDSHIRE

David Berwick, 35, old people's attendant, 63 Ashton Road, Luton, Beds. Contacting blind people with view to operating sound magazine, collecting sound effects, especially fairground organs, documentary tapes, story telling, reading—anything of interest to blind people; classical, opera. EL3542A, four-track, EL3300 portable, Cossor 1604, four-track, 7 in, 1½, 3½, 7½. Anywhere. Blind or partially sighted people.

BERKSHIRE

Paul Tanner, 15, trainee manager, 'Roxdon', 41 Byron Road, Earley, Reading, Berks. Cars, model-making; popular and folk. Philips four-track, EL3541/15, 7 in, 3½. Australia, preferably girls of same age.

CO DURHAM

Audrey and Keith Lax, 30, housewife/postman, 'Broomhill', 19 Milton Street, Darlington, Co Durham. Motoring, gardening; light music. Defiant T12R, 5½ in, 3½. Anywhere.

CHESHIRE

Robert Thomson, 41, self-employed, 42 Birch Road, Runcorn, Cheshire. Music and anything connected with taping; all but pop. Philips Cassette, 7 in, ½, 1½, 3½, 7½. Australia, South Africa, Canada, UK.

DERBYSHIRE

Steven Buddy Kendrick, 23, O/F engineer, 54 Hawthorn Drive, Cromford, Nr Matlock, Derbyshire. Audio, radio, sound reproduction, astronomy, guitar playing; C&W. Wyndor Trident four-track, 7 in, 1½, 3½, 7½. Anywhere in UK.

DEVON

Patrick Burns, 19, meter repairer, 52 Fore Street, North Tawton, Devon. Amateur dramatics; pop, Jim Reeves. Grundig two-track, 5½ in, 3½. Anywhere English-speaking.

ESSEX

L. F. Hollis, 45, radio engineer, 6 The Maypole, Thaxted, Essex. Music, amateur radio, vintage cars; big-band jazz, popular. Home-built two-track, 7 in, 3½, 7½. Britain and South Africa.

John William Rawlings, 25, statistician, 33 Clarendon Gardens, Ilford, Essex. 35mm photography, electronics, travel; classical, electronic, light orchestral. Spectone L5L, Collaro deck with Mullard amplifiers, 7 in, 1½ to 15 inclusive. Switzerland, Australia, USA and UK.

HAMPSHIRE

A. C. Heatly Maguire, 65, dental surgeon, 1 Castle Street, Christchurch, Hants. Electronics, photography; classical, light orchestral, opera. Philips EL3534, 7 in, 4 to 7½ inclusive. Anywhere English-speaking.

HERTFORDSHIRE

Eileen D. Browne, 30, 265 Mays Lane, Barnet, Herts. Making new friends and exchanging views on varied subjects; anything but classical. Robuk four-track, 7 in, 1½, 3½, 7½. England only.

Dave Browne, 33, professional driver, 265 Mays Lane, Barnet, Herts, general; varied tastes. Robuk four-track, 7 in, 1½, 3½, 7½. UK and USA.

LONDON

Ghulam Mustafa Ahmed, 25, clerk, 53 Gloucester Drive, London N4. Mixing and editing music; Latin American, Hawaiian. Sony TC200, 7 in, 3½, 7½. Trinidad, Jamaica, France.

Ramon Blake, 32, librarian, 81 Western Avenue, Acton, London W3. Books, films, theatre, swimming, piano; all kinds. Beocord 2000 four-track, 7 in, 1½, 3½, 7½. UK, Belgium, Holland. Males preferred.

Richard A. Currie, 30, studio projectionist, 36D Lewis Trust, Warner Road, London SE5. Films, old 78 records; all kinds. Ferguson 3210, 5½ in, 3½. UK only.

Leonard John Gibson, 30, estimator, 40 Minet Avenue, Harlesden, London NW10. Sound effects, comedy and humour, country rambling, bowling, chess; all kinds excluding heavy classical and opera. Philips EL3549, EL3541/15, EL3585 four-track mono, 7 in, ½ to 7½ inclusive. Isle of Man, Channel Islands, Scilly Isles or any island contact. No letter required.

Alf Pinching, 38, messenger, 47 St. Peter's Street, Islington, London N1. 35mm photography, stereo photography; pop, light classical. Ferrograph 422U Stereo, 7 in, 3½, 7½. UK, Germany, USA, Spain.

Alan Russel, 17, student, 11 Hibbert Road, Leyton, London E17. Amateur theatre; pop, some light classical. Ferguson 3200, Optalcord 414, 5½ in, 3½. UK, USA (both sexes).

Roy Sloane, 48, civil servant, 122 Camdale Road, Plumstead, London SE18. Archery, golf; classical, traditional jazz. Grundig TK18L, 5½ in, 3½. Anywhere overseas.

E. J. Smart, 36, ambulance driver, 125 Blackwall Buildings, Fulbourne Street, London E1. Judo, reading, first-aid; classical, opera, jazz trumpet. Grundig TK18, 5½ in, 3½. Anywhere, especially US.

Melvin Tan, 21, technical clerk, 1 Blakewood Court, Anerley Park, Penge, London SE20. Sound effects, comedy; modern jazz, R&B. Grundig TK42 four-track, 7 in, 1½, 3½, 7½. UK, USA.

Mr and Mrs John E. Wilkinson, 32/30, LTB inspector/housewife, 34 Gregory Crescent, Eltham, London SE9. Stereo recording, motoring, all sports; light classical to pop. HMV four-track, Aiwa four-track stereo, 5½ in, 1½, 3½. Anywhere.

MIDDLESEX

W. F. Munro, 65, retired commercial artist, 8 Gothic Court, High Street, Harlington, Hayes, Middx. Travel and general; light music. Philips four-track EL3553, 7 in, 1½, 3½. USA, Canada.

Robert I. Cohen, 15, schoolboy, 35 St Margarets Road, Edgware, Middx. Reading, record collecting; popular, light orchestral. Philips EL3549, 7 in, ½, 1½, 3½, 7½. USA, Canada, Australia, New Zealand, France, Sweden, Israel, UK.

NOTTINGHAM

David Bradley, 27, semi-skilled fitter, 13 Penrhyn Terrace, Dane Street, Nottingham. Tropical fish, DIY, SWL; light classical, C&W, Jim Reeves, Beatles. Dansett Empress four-track, 7 in, 1½, 3½, 7½. Anywhere.

D. Desmond, 25, van salesman, 78 Dunganon Road, Clifton, Notts. Mainly taping; popular, Hawaiian. BSR Carousel, 7 in, 1½, 3½, 7½. Anywhere English-speaking.

SOMERSET

John Raoul Berthlaume, 21, lathe operator, 54 Holford Road, Bridgwater, Somerset. Hi-fi, collecting old recordings; George Formby, Everly Brothers. Tesla Sonet B3, Stella ST472 C60 Cassette, 5½ in, 1½, 3½. America, Australia, India.

Billie Cox, 38, shop assistant, 22 Baker Street, Weston-super-Mare, Somerset. Dramatics, travel, reading, charity entertainment; popular. Walters, 3½ and 5 in, 3½. Anywhere English-speaking.

SURREY

John Atkins, 83, retired engineer, 5 The Clough, West Hill, Oxted, Surrey. Story writing and publishing; light classical. Tandberg 4 and 5 in, 3½, 7½. Anywhere English-speaking.

E. G. Waters, 48, technical clerk, 28 Chatsworth Road, Croydon, Surrey. General; bands of '30s and '40s, classical. Truvox R92, 7 in, 3½, 7½. Anywhere.

WARWICKSHIRE

Andrew J. Lichnowski, 16, schoolboy, 8 Horrell Road, Shirley, Solihull, Warks. Audio and hi-fi, electronics, stamp collecting; all kinds. Elizabethan Automatic four-track, 5½ in, 3½. Anywhere, but especially USA and Commonwealth.

Robert Gordon Smith, 18, analytical chemist, 84 Victoria Road, Aston, Birmingham 6. Sciences, humour, books; all but traditional jazz. Philips EL3553, 7 in, 1½, 3½. Anywhere, especially Japan, France.

Stan Stead, 30, assistant service manager, 9 Dale Street, Leamington Spa, Warks. Motorcycling, motor sports; popular classics, big-band jazz. Fidelity Playmatic, 5½ in, 1½, 3½, 7½. England, Wales, USA.

YORKSHIRE

Brian Amos, 16, apprentice engineer, 15 Edinburgh Grove, Upper Armly, Leeds 12, Yorks. Marionettes, model railways, Spanish guitar and drum playing; pops and light classical. Elizabethan TT3, 7 in, 1½, 3½, 7½. USA.

Roland Bottomley, 39, entertainer, 2 Stewart Street, Doncaster, Yorks. Sound effects, comedy, hi-fi; jazz, C&W, no pop. Tandberg 74B, Truvox 82, 7 in, 1½, 3½, 7½. Japan, America, UK.

John C. Lewis, 22, disabled, 64 Louis Street, Springbank, Hull, E. Yorks. SWL, communications by light beam; Shadows, R&B, some light. Philips EL3541, 7 in, 3½. Sweden, Holland, Britain, Eire.

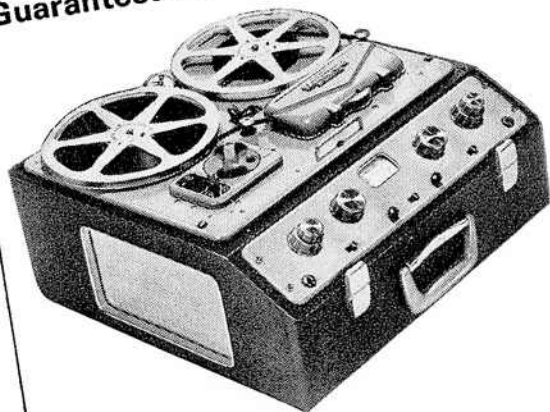
Bob Newman, 43, concierge/chauffeur, The Flat, 2 Rutland Park, Sheffield 10, Yorks. 35mm colour photography, slide-tape shows; pop and light music, shows. Ferro twin-track, 7 in, 1½, 3½, 7½. Anywhere.

continued on page 40

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MODEL 633

Guaranteed for 3 years



**An instrument for the connoisseur...
Designed to a strict specification
Built to endure**

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633— $1\frac{7}{8}$, $3\frac{3}{4}$ and $7\frac{1}{2}$ i.p.s.
633H— $3\frac{3}{4}$, $7\frac{1}{2}$ and 15 i.p.s.
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- * Comparison by "A-B" switching.
- * Switched bias control.
- * Level meter reads on both record and playback.
- * Mixing facilities with separate gain controls.
- * Modular construction to provide maximum service accessibility.
- * Separate record and replay heads.
- * Separate record and replay amplifiers.
- * Fully compensated input socket for magnetic pick-up.
- * Spot erase.
- * 3 watts undistorted output.

Model 633 120 gns.
Model 633H 125 gns.

Ferrograph
the incomparable tape recorder

The 633 is the latest addition to the Ferrograph range and is intended for the serious home recorder as well as the professional user. Each instrument is supplied with an abstract of actual performance in the form of a test certificate. Spare parts—as with all Ferrograph instruments—are guaranteed available for at least 10 years.

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- ☐ Please send me the FREE illustrated Ferrograph leaflets.
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AT6 1 _____



ON TEST THE FERROGRAPH MODEL 633

by F.C. Judd



In a recent Editorial Comment I mentioned that Ferrograph had produced a tape recorder designed for the enthusiast who is willing to pay a little extra for a versatile recorder capable of first-class performance.

The Ferrograph 633 completely fulfils this requirement. The model loaned for review has been used and tested with practically every combination of external equipment, and for very many different kinds of recording. First, however, a general description of the Model 633 which caters for three-speed operation with mono half-track recording on standard tape. The 633 version is for $7\frac{1}{2}$, $3\frac{3}{4}$ and $1\frac{7}{8}$ ips, so the first feature is a wide choice of tape speeds. (The 633H operates at 15, $7\frac{1}{2}$ and $3\frac{3}{4}$ ips.)

The 633 (and the 633H) features a three-head erase record and playback system which operates, as standard, on the upper track of the tape (Fig. 1). It also has separate record and playback amplifiers which, I was pleased to see, have low noise triode valves in the pre-amplifier stages. The 633 employs valves for all amplifier stages. Separate amplifiers and separate record and playback heads therefore provide direct monitoring of the signals being recorded (before tape) and recorded (off tape). Monitoring can be done via headphones at a monitor socket on the front panel or via the built-in loudspeaker. The recording level meter can be switched to input (to tape) or output signals (off tape) so that instantaneous comparison of signal level is also possible.

Another feature is the signal mixing facility with separate gain controls for microphone and high level inputs such as radio, another tape recorder or external mixer with a high level output. There is also a special input socket which caters for magnetic pick-ups requiring equalization.

Playback can be via the internal loudspeaker or an extension loudspeaker (socket provided), or from a high level output socket and thence through an external amplifier and speaker. The high level output, from a cathode follower, can also be used to feed another tape recorder for direct copying. An alternative output can be obtained from the 'monitor' socket, in which case the volume and tone controls (bass and treble) remain functioning. For input and output requirements the 633 is more than adequate. Microphone and monitor sockets are mounted on the front panel, other outputs and inputs being located on a small panel at the rear. All sockets are for standard jacks, which are incidentally still the most reliable form of audio plug and socket connection despite the invention of DIN and so-called phono plugs.

Controls

All main controls are on the deck or front panel, although there are various connections on a small panel at the back to cater for superimposing, spot erasing, bias level and so on. The deck employs a three-motor tape transport system and provides a fast wind or rewind (Fig. 2). Other deck features are a pause control which can be locked, a clock dial tape position indicator,

and an automatic stop which instantly cuts the drive when the tape comes to an end, or in the event of tape breakage.

Audio controls include separate microphone and high level input volume controls, equalization selector for the different tape speeds and illuminated recording level meter with zero and level adjusting controls. The 633 has a nice appearance despite the rugged construction of the deck – it is in fact typical 'Ferrograph'. For as long as I can remember, they have hardly changed the styling of their decks or the general layout. Incidentally, the instruction manual supplied with the 633, as with all Ferrograph tape recorders, is one of the most comprehensive I have ever seen and totals some 70 pages profusely and clearly illustrated, including a circuit diagram of the electronics.

Specification

This is quite detailed and we will produce the whole of it in the next issue. The 633 will operate from AC mains at 200 to 250 volts and will take up to $8\frac{1}{2}$ inch diameter spools. The frequency response for the three speeds of the 633 are given in the specification. (The response at 15 ips refers to the model 633H.) By and large the specification is a sensible one and ensures considerable flexibility in normal usage. I should, however, comment on the unusually high sensitivity of the auxiliary input (input 2) which is 45mV at 200Kohms. This is useful in some cases but with very high level signals from a mixer or another tape recorder, which can be as high as 1 volt or so, it means that the volume controls for input 2 have to be operated at around the nearly-off position. This could make gradual fading a little tricky. Mind you, if I were using the Ferrograph permanently with a mixer with a high level output, I would connect a fixed attenuator across the output of the mixer, or at input 2 on the recorder, to provide an average upper level of 75mV. On the other hand, an over-sensitive input is better than one which is under-sensitive and perhaps in this case Ferrograph wisely chose the former.

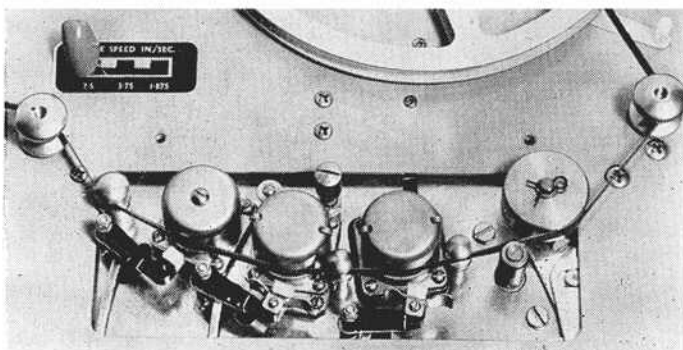


Fig. 1. The three-head erase, record and replay assembly. Provision is made for accurate azimuth align by means of the slotted control at the rear of the centre head.

There was really little need to carry out frequency response tests on the 633. Every model produced carries its own pen recorded graph of the frequency response at $7\frac{1}{2}$ ips and a special speed variation graph. Unless these graphs agree with the specification the recorder just doesn't leave the factory. This applies to other test results included in the test certificate. The one belonging to my review model is reproduced in Fig. 3, which I had photographed so that no error or alteration could occur in reproduction. The frequency response graph is reproduced in Fig. 4.

Performance

With a factory pre-test such as the 633 undergoes one expects the performance to be impeccable, which of course it is. On the other hand, one has to live with and use a tape recorder, or any comparable device, in order to fully assess its merits or shortcomings. In the case of a tape recorder it takes a little time to get used to handling its controls and really learn how to get the best from it. It is important, therefore, to ensure that a tape recorder of this kind is (a) used with comparable external equipment such as a first-class microphone, external loudspeaker, mixers and amplifiers, etc, and (b) with best quality tape and a good deal of attention to the correct matching of signal inputs and outputs. Last but not least, it is important to get recording levels right and to get accustomed to the recording level meter which, because of its damped action, could be misleading to those who are used to an instantaneous peak level meter (VU type meters) or a magic eye indicator. The instruction manual deals with this in some detail.

I found the 633 quite comfortable and easy to operate. The convenient location of the volume controls and record level meter on the sloping front panel obviate any awkwardness in manipulation of controls whilst watching the meter. The same can be said of selection of the record, replay and rewind functions from one main control on the deck.

Various functional tests included recording and playback at each of the three speeds. A rather special test, which I thought would prove the quality of this Ferrograph, was the direct connection, via input 2, of the high level output from a Lowery electronic organ. This would prove just how good the upper and lower frequency responses were. The bass pedal of the organ goes down to 32c/s and the upper register harmonics extend up to heaven knows where. However, the Ferrograph handled it very well and when the replay was made through a hi-fi amplifier and loudspeaker it was indeed difficult to tell which was the original and which was recorded.

At this point I should mention that the performance of the Ferrograph 633 must not be judged by listening to reproduction from its own loudspeaker which, although perfectly adequate for casual listening or monitoring, etc, just cannot do full justice to the excellent recording capabilities of this machine. It really deserves a good external speaker system or, better still, external amplifier and loudspeaker of the hi-fi variety.

I am satisfied that the Ferrograph 633 has come up to the standards required of a tape recorder by the serious enthusiast or, indeed, with the 15 ips model, by the professional user. Having gone to so much trouble to produce such an excellent and versatile recorder, I wonder what Ferrograph would say if I suggested that they should produce a 'full track' version of the 633H for recording speeds of 15, $7\frac{1}{2}$ and $3\frac{3}{4}$ ips. Then, as I mentioned earlier in *ATR*, one would have the best of both worlds, i.e. first-class mechanical and electrical performance plus the high signal and low noise level of full track recording. But I leave you with this final comment. For a half-track recorder the signal to noise performance of the 633 is well above average and even with the replay volume control flat out, it is difficult to hear the very slight ambient amplifier and tape noise. The bias oscillator must have a really excellent waveform.

The Ferrograph Model 633 retails at 120 gns and is manufactured by the Ferrograph Co Ltd, 84 Blackfriars Road, London SE1, who will send further details on request. (Note: the model 633H for 15, $7\frac{1}{2}$ and $3\frac{3}{4}$ ips retails at 125 gns.)

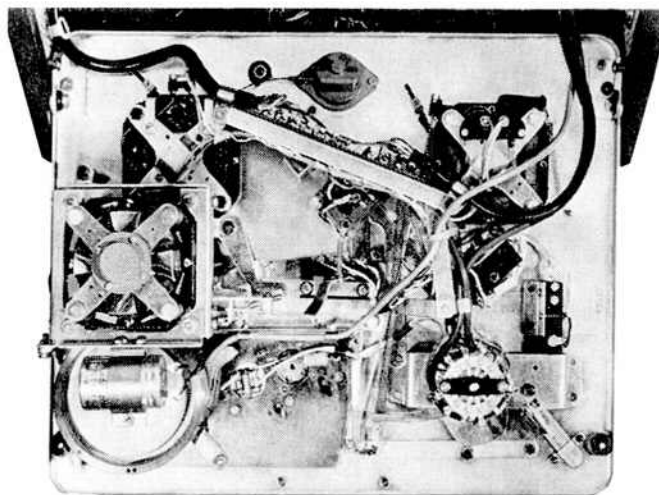


Fig. 2. The underside of the deck which employs three motors. The Ferrograph 633 has been designed for ease in servicing. The deck is hinged and can be lifted up clear to reveal the various internal units.

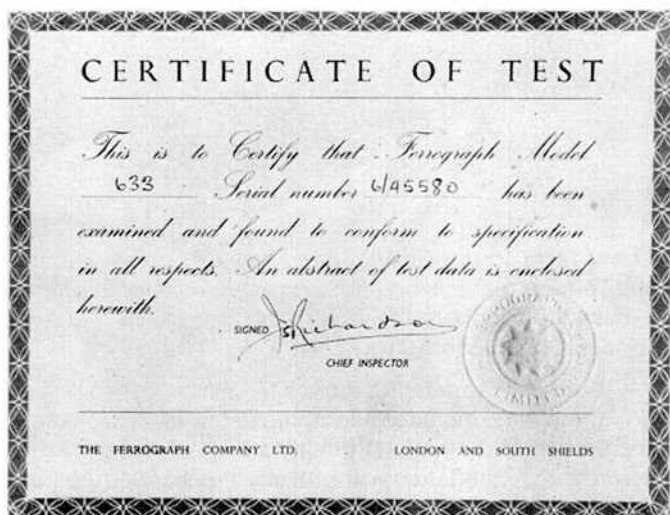


Fig. 3. The Test Certificate issued with each Ferrograph model 633 (or 633H).

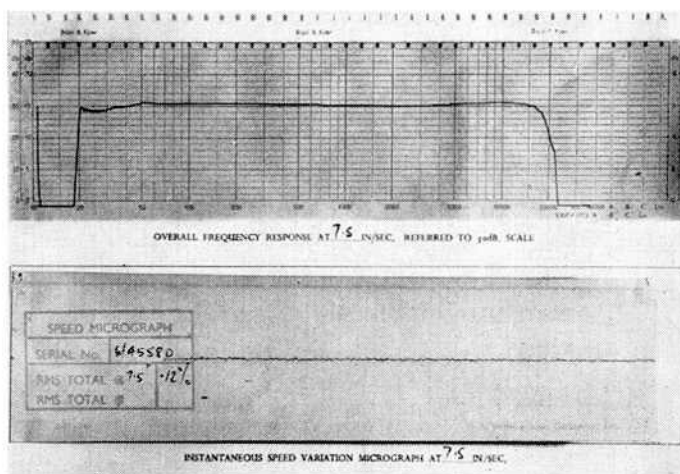
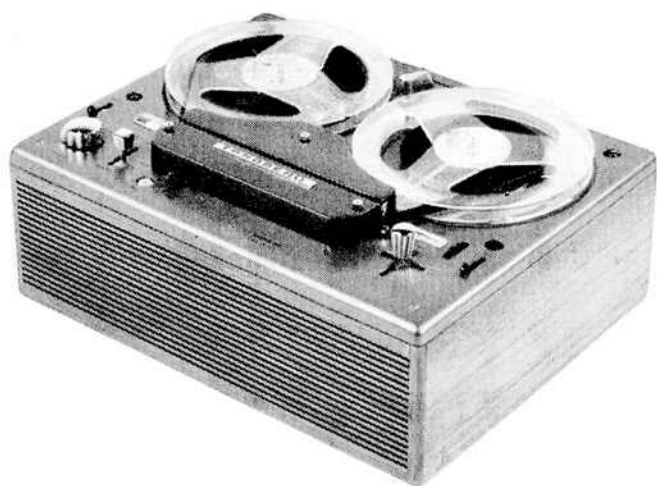


Fig. 4. Every model 633 is issued with its own pen-recorded frequency response as the one shown above which was for the model loaned for review. The lower graph is of the wow and flutter (speed variations) check.

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ATR7

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

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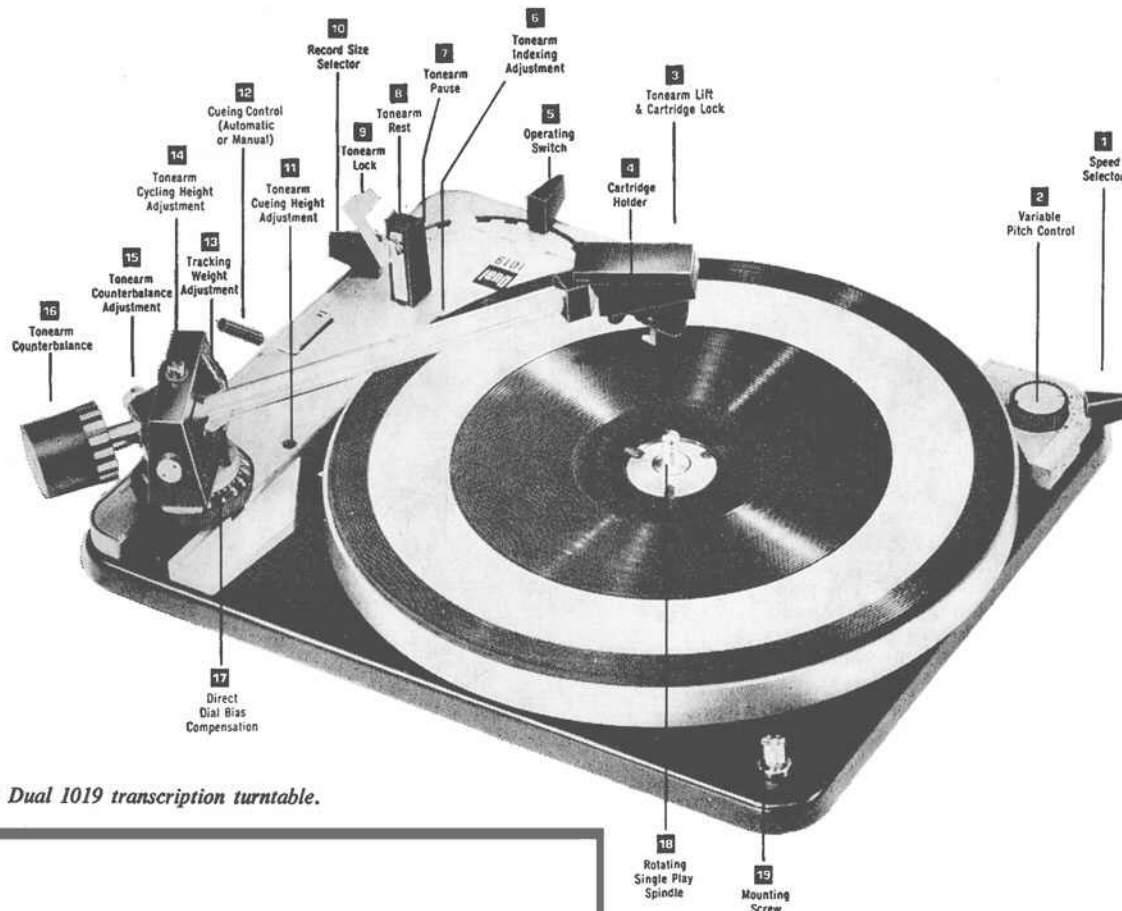


Fig. 1. The Dual 1019 transcription turntable.

AUDIOVIEW TAKES A LOOK AT TRANSCRIPTION UNITS

If you take a close look at Fig. 1, the photograph of a Dual 1019 transcription turntable, you will get some idea of the precision engineering that goes into a unit of this kind and of the facilities that should be incorporated in all well-designed transcription turntables and their associated pick-ups. This month we take a look at some of the best record transcription units on the market. Why only the best, you may say? The answer is quite simple—only the best will do justice to your records and because there are few, if any, cheap transcription units that could be classified as hi-fi. All turntable units, pick-up arms and cartridges that comply with an acceptable specification for hi-fi are precision-made devices and consequently fairly expensive. For instance the

turntable itself must be heavy yet carefully balanced in order to prevent speed variation. The drive motor and turntable bearings also receive special attention to prevent vibration (motor and turntable rumble) from reaching the pick-up arm and cartridge. The pick-up arm must also be very accurately balanced in order to prevent wear on the records and various kinds of distortion. The record turntable, the pick-up arm and the cartridge are normally regarded as three separate items and although some manufacturers can provide a complete outfit like the Goldring Lenco GL70 with L70 pick-up arm (Fig. 2) some make only turntables and some only arms with or without cartridges. This means that quite a few combinations of turn-

table, arm and cartridge are possible. Your hi-fi dealer or the makers of the various units will always advise on this, for example a turntable manufacturer will be able to recommend a suitable pick-up arm and cartridge.

Goldring-Lenco

The GL70 turntable shown in Fig. 2 is supplied with the pick-up arm. As the owner of one of these units your reporter can recommend the Pickering cartridge which the Goldring Manufacturing Company Limited can supply. The GL70 turntable has, like most transcription units, a choice of four speeds, namely 78, 45, 33½ and 16 rpm which are normally selected by a preset click-in control. However, small

continued overleaf 29



Fig. 2. The Goldring-Lenco GL70 turntable with L70 arm.



Fig. 3. The Goldring G99 transcription unit.

continued from previous page

variations in speed change are possible in order to play a music record in concert pitch. Many turntables have this particular facility which is very useful for those who like to play a musical instrument with a record. It is a great pity that such a facility cannot be incorporated in tape recorders.

The Goldring G99 is a transcription unit specially designed for those who require a high quality unit but wish to use a pick-up arm of their own choice. This unit is shown in Fig. 3 and has an infinitely variable speed range of 15 to 18 rpm and 30 to 80 rpm. The speed control is, however, calibrated for 78, 45, 33½ and 16 rpm. Like the GL70 it is available for 200 to 250V 50c/s mains operation and employs a four pole constant velocity motor. Earlier I mentioned heavy turntables. The GL70 and G99 turntables weigh 8 lb and are turned from non-magnetic metal. The GL70 turntable costs £29 18s 0d and the L70 pick-up arm £8 10s 11d. The G99 turntable costs £21 19s 5d. Goldring also produce an integrated hi-fi turntable complete with pick-up arm for £11 11s 0d. This is the G66/M2M which is fitted with a mono cartridge. There are also stereo versions of this.

Beogram 1000

Many transcription units are without cabinets or a plinth of some kind but are designed for installation in a cabinet and are supplied with templates, etc, for cutting out the turntable mounting board. Some, like the Beogram 1000 shown in Fig. 4, are mounted on a plinth which, like a lot of hi-fi equipment these days, could be installed on a wide bookshelf. The Beogram 1000, which incidentally will be reviewed in the next issue of *ATR*, is an integrated unit complete with pick-up arm and cartridge. It has a plexiglass dust cover, a vernier speed selector, a built-in hydraulic pick-up lift and is normally fitted with a B & O magnetic stereo cartridge type SP7. There is also another version known as the Beogram 1000VF which has a built-in pre-amplifier. By and large the Beogram 1000 is not expensive at 34 guineas, and is definitely hi-fi.

Pick-up Arms

This look at record transcription units would not be complete without a brief look at pick-up arms as well. There are many features to a pick-up arm as shown in Fig. 5 which we have reproduced from one of the Goldring brochures. This gives some idea of the complexity of a modern hi-fi pick-up arm, all of which is necessary to ensure extremely accurate balance.



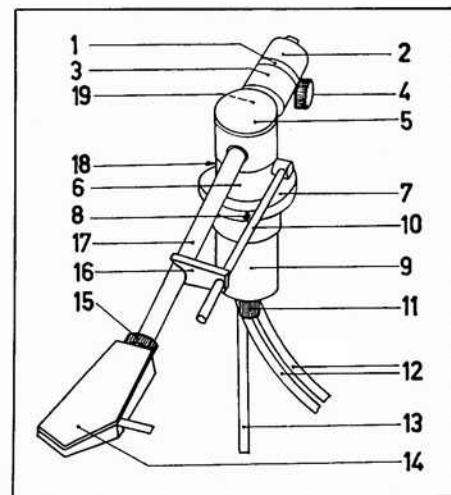
Fig. 4. The Beogram 1000 transcription unit complete with pick-up.

The actual Goldring pick-up arm to which the diagram refers is shown in Fig. 6. It is the Goldring P77 which retails at £29 18s 6d and which will accommodate most of the popular mono or stereo cartridges. This particular pick-up arm can be statically balanced out in all planes and has a hydraulically damped

positioning and lowering device. Also from the Goldring list comes the G65 transcription arm shown in Fig. 7. This could be accommodated on various other makes of turntable units or on any of the Goldring models. It retails at £7 6s 6d and will take most makes of mono or stereo cartridges.

Fig. 5. Details of the Goldring P77 pick-up arm:

1. Counterbalance weight.
2. Rear adjustment ring.
3. Front adjustment ring.
4. Knurled adjustment knob.
5. Calibrated stylus pressure adjustment.
6. Pedestal spindle.
7. Pedestal base.
8. Clamping screw.
9. Screening can.
10. Lowering arm.
11. Securing screw for screening can.
12. Pick-up lead.
13. Earth lead.
14. Plug-in shell.
15. Plug-in shell securing nut.
16. Rest clip.
17. Pick-up arm tube.
18. Scale for height adjustment.
19. Stop screw.



SME Series 2 Arms

We shall be reviewing one of these SME precision arms very shortly. Two models are made, the 3009 and 3012 with pivot-to-stylus distances of 9 and 12 inches respectively (Fig. 8). The most popular is the 3009 because it can be accommodated in a small space. It is also lighter and for this reason is sometimes preferred to a very high compliance cartridge. Provision is made for balancing in almost every direction and for tracking adjustment etc, and a hydraulic raising and lowering device is included. As with most precision hi-fi pick-up arms the SME models will take practically all types and makes of cartridges with half-inch fixing centres.

Bang and Olufsen

From Bang and Olufsen we have chosen the model ST/L shown in Fig. 9. This is statically balanced by a specially designed counterweight so that it will remain in a state of neutral equilibrium if the spring under the arm is removed, i.e. balanced in all directions. It also has compensation for the ingoing force (skating effect) and the stylus pressure can be adjusted to between one and four grams. It retails at 7 guineas and is supplied complete with cartridge.

In the course of the coming months we shall be dealing in greater detail with record transcription units, pick-up arms and cartridges and will be reviewing leading makes. Meantime it is worth remembering that a poorly balanced pick-up arm can cause damage to your records, aside from creating various forms of distortion. A poor turntable can introduce unwanted vibrational noise which can be transmitted via the pick-up to the amplifier and loudspeaker. It can also introduce distressing speed variation effects known as wow and flutter. As always, we strongly advise adequate demonstration before purchasing. After all these things are fairly expensive.

AMENDMENT

In *Audioview* of the September issue, page 35, the illustrations for the Rogers Master Mk 2 Stereo power amplifier and the Symphony integrated stereo unit were incorrectly numbered as Fig. 6 and Fig. 7 respectively. These should read Fig. 5b and Fig. 6. The price for the Symphony amplifier was also incorrectly given as 20 gns. It is, in fact, 25 gns.

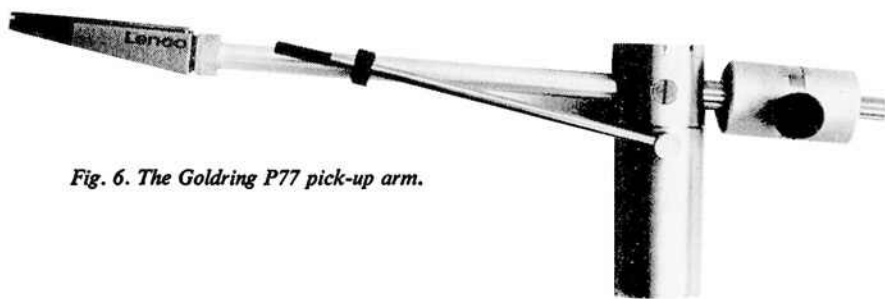


Fig. 6. The Goldring P77 pick-up arm.

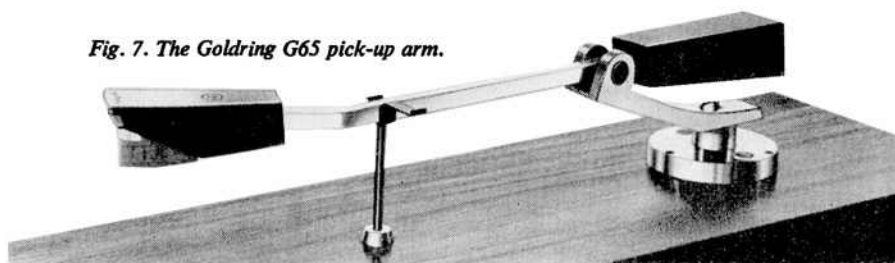


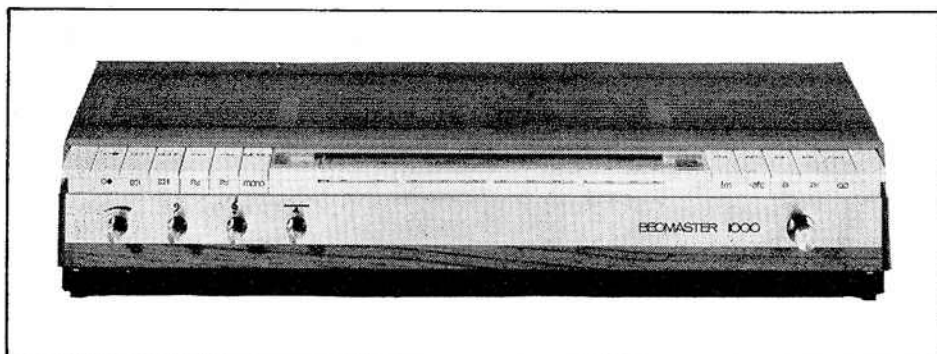
Fig. 7. The Goldring G65 pick-up arm.



Fig. 8. The SME precision pick-up arm.



Fig. 9. The Bang & Olufsen pick-up arm.



TEST REPORT THE BEOMASTER MODEL 1000

by Peter Knight

There is a growing interest in integrated tuner-amplifier systems having facilities for connecting external programme signals from tape recorder, record player and microphone and delivering a suitable signal for recording. The Beomaster is such a unit. Moreover, it is a highly sophisticated solid-state stereo amplifier, delivering 15 watts from each channel, coupled with a remarkably efficient FM tuner complete with stereo decoder suitable for immediate use (without extras) on the BBC's new stereo radio programmes.

The Beomaster is also very nice to look at, and sounds as good as it looks. It is styled rather like a plinth, having an overall height of only 3½ in. It is 10 inches deep and 19½ inches long and can never be obtrusive no matter where it is placed.

The unpolished light-wood shell fits the aesthetics of any domestic environment and the book-like dimensions allow the unit to be fitted into a space of very restricted height, provided a reasonable margin is available at the top for ventilation. Ventilation slots exist at the top of the wooden shell, so it is not possible to use the unit strictly as a plinth, as the ventilation would then be impaired. This is not to imply that the unit runs hot. Indeed, the reverse is true; only a very small rise in temperature was observed after many hours of continuous running.

The switched controls are all push-key operated, and their function can be seen both from the top and the front, the latter being necessary should the top of the unit be hidden by the nature of the housing. The radio tuning can also be seen from the front as well as the top. The tuner embraces the whole of Band 2 over the range of 88 to 108Kc/s. A large, clearly calibrated scale simplifies tuning and accuracy is ensured by a centre-reading tuning indicator which actually indicates ratio detector balance. Once tuned, any possibility of frequency drift is avoided by a very effective automatic frequency correction circuit, employing a capacitance diode in the oscillator circuit which is biased from a plus or minus tuning error voltage developed in the ratio detector. This is brought into operation by a press-key.

The tuner section also embodies a stereo

decoder, and when the 19Kc/s pilot signal of a stereo transmission is tuned in, a green indicator bearing the word 'stereo' is illuminated at the left-hand side of the tuning scale. This same indicator also illuminates when the amplifier section is switched to stereo. The amplifier section will accept both high- and low-level pick-up signals to CCIR, the latter via a low-noise built-in amplifier module, and low-level signals from a tape recorder (20mV) but tape equalization is not provided. The tape socket (DIN) also delivers recording signals at a level of about 250mV.

There are two sets of right- and left-hand speaker outlets which can be used together or separately and selected by two press-keys. To realize the full power output, the connected loudspeakers have to represent a load of not much more than about 3 ohms to each outlet.

Press-keys and Control Knobs

Press-keys also bring in, as required, treble and bass filters (low-pass and high-pass respectively). Thus, including the on/off press-keys, there is a total of eleven, giving speaker sets one and two, bass and treble filters, mono/stereo (in the former position – key down – the two amplifier channels are paralleled), FM radio, afc, pick-ups high and low level and tape. In addition, there are five front control knobs – volume, bass, treble, stereo balance and radio tuning. The various inputs and outputs are located at the rear, these being DIN sockets exclusively. The power output transistors are adequately heat-sunk on a large metal surface beneath a metal grill underneath the cabinet. Fig. 1 gives a fair impression of the appearance of the instrument.

The radio section has seven transistors, including two vhf types in the tuner proper, and two semiconductor diodes in the ratio detector. The stereo decoder circuit has five transistors and five semiconductor diodes. The low-level pick-up amplifier has four transistors, two in each channel, and each power amplifier section has eight transistors (total sixteen) and finally three transistors are employed with a bridge rectifier and Zener diode in the regulated power supply.

The stereo decoder and pick-up amplifier are built upon separate printed circuit boards or modules, and, if required, the pick-up amplifier can be substituted for a gain-corrected two-channel microphone amplifier. Sockets are mounted on the main printed circuit board to accommodate plugs from the decoder and amplifier modules, and if the decoder is not required the socket is loaded with a plug carrying a resistor and capacitor to provide the correct de-emphasis. This de-emphasis is otherwise provided on the right and left channels from the stereo decoder.

It should be noted, however, that ordinary mono FM radio transmissions can be received even with the stereo decoder in position. When a stereo transmission is received the green light mentioned earlier illuminates, but remains extinguished on mono transmissions.

Power Output and Square-waves

A power test of the amplifier was undertaken by injecting a pure sine wave signal into the tape input socket from a 500Kohms source, by loading the speaker outlets with 3 ohm resistors and by connecting an audio valve voltmeter across the loads along with a wideband oscilloscope to monitor the waveform. Power output at all frequencies within the audio passband was sustained at about 16.3 watts rms to waveform clipping level (i.e. 7V rms across 3 ohms) and clipping was symmetrical, showing good output stage design.

Square-wave performance was next examined, but with the signal input at the tape socket derived from a 500Kohms source severe treble loss was evidenced by rounding of a 1,000c/s square-wave. A frequency response test proved this with a progressive roll-off at about 5,000c/s. This was corrected, however, by applying the signal direct from the signal generator at lower impedance and Fig. 2 shows at (a) the square-wave output at 1,000 c/s and at (b) at 100Kc/s. The low-frequency test here shows a little phase-shift, but the shape of the output display was considerably influenced by the setting of the volume control, which is frequency-compensated (really a loudness control).

The 1,000c/s square-wave output signifies a good treble response under this condition of input loading. The square-wave was retained still at 2,000c/s, indicating a good response up to at least 20,000c/s, but a very small amount of ringing then appeared. Not sufficient to cause trouble, however, and not discernible in listening tests. The square-wave displays were taken after very carefully setting the tone controls from optimum flatness at 1,000c/s. A series of square-wave tests were made at various settings of the volume control, aiming for the best flatness, as indicated by the oscilloscope traces, by adjusting the tone controls. The results were as follows: volume fully advanced, bass control centre and treble retarded about 30 degrees. Volume 50% advanced, bass retarded by about 45 degrees and treble retarded by about 10 degrees. Volume about 25% advanced, bass then retarded by about 45 degrees and treble retarded by about 20 degrees.

Frequency Response

With the volume control fully advanced and the tone controls adjusted to give the best flatness as indicated by the display of a 1,000 c/s output square-wave, a frequency response test was performed with the same basic set-up as for the power tests. The input, however, was

adjusted for an output of 1V rms across a 3 ohm speaker load. The curve in Fig. 3 shows the results of this test. The response, in fact, is perfectly flat within 1dB from 50c/s to 20,000c/s. The small fall at 20,000c/s could have been due to the setting of the bass control, but it was not considered worthwhile running a further test at a different bass control setting owing to the excellence of the response shown in Fig. 3. Both channels were very closely matched to this response.

As previously intimated, the power output was sustained over this range, but the power falls pretty steeply if the amplifier is loaded much above 3 to 5 ohms. At 15 ohms, for instance, the power was found to be down to a maximum of 4.5 watts, and was about 7 watts maximum at 8 ohms loading. Here, then, is shown the great importance of loudspeaker matching on transistor amplifiers. A pair of 15 ohm speakers in parallel prevent the amplifier from yielding its full power, and it seems rather a shame to employ a matching transformer when the amplifier itself is devoid of such a component. A solution lies in the use of extra low impedance speakers. The Bang & Olufsen range has a matching impedance of 3.5 to 5 ohms.

A great advantage, however, is that the power delivered by the amplifier is true rms power. This is contributed by the very well-regulated power supply and by the large mass of metal draining the heat away from the power transistors. The maximum music power per channel is 20 watts. The bass and treble controls and filters had specifications very close to those indicated by the maker (see under specifications).

Radio Section Tests

The radio section was tested in conjunction with the amplifier at full output. The speaker outlets were loaded to 3 ohms across a watt-meter and a vhf FM (modulation 1,000c/s) was applied to the aerial socket from a 75 ohm source. The level of vhf signal was measured on a signal strength meter before being applied to the aerial socket, and the curve in Fig. 4 shows the really excellent performance of the radio in terms of limiting and sensitivity. Solid limiting commenced a little above 20 μ V (and this is a very weak signal) and full power output of the amplifier section was obtained with the volume control about 75% advanced. Full power output could be obtained with an input below 20 μ V and, indeed, a signal which would not register on the signal strength meter produced a usable output! No distress was

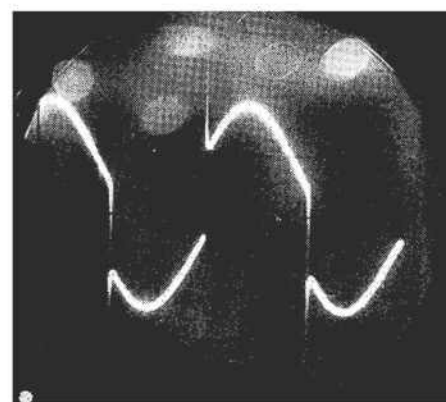
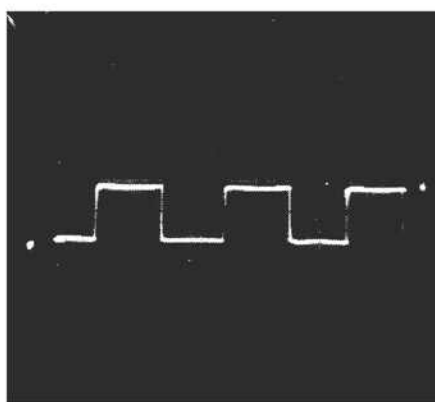


Fig. 2. (a) Square-wave output at 1,000c/s and (b) at 100c/s.

observed by turning the input signal up to 50mV and the modulation signal suffered no distortion at the output.

External modulation from an audio generator was then applied to the vhf FM generator, and this test proved the excellent overall response of the FM tuner section and ratio detector. At a modulation frequency of 19Kc/s, the stereo indicator lit up, as was expected; but as this just about started to light up with the modulation approaching 20Kc/s, it is possible that the 20Kc/s supervisory signal on the vhf signal from some of the BBC's transmitters (on mono) may cause a stereo indication!

The 19Kc/s signal (equivalent to a stereo pilot carrier) was about 16dB down relative to 10Kc/s at the tape recorder output. This could be important later when stereo recordings are made from a stereo transmission, for the pilot carrier and/or its harmonics can beat with the bias oscillator in some recorders and result in the recording of a whistle, superimposed on the programme signal. Background noise and hum could barely be heard and was found to be about 46dB below 15 watts.

The unit was run for long periods under domestic conditions in conjunction with a record player and tape recorder (B & O Beogram 100 and the new 2000K De Luxe, both the subject of test reports this month) and was very much liked by all who heard it. The pleasing appearance was very highly praised. One little problem is the nature of the control knobs. Their settings cannot be clearly defined and they are not calibrated in any way.

Even working with a pair of 7.5 ohm speakers it was found that the output power was adequate for a room measuring about 20 x 12 x 9 feet. For really serious listening, it was found that the tone controls had to be readjusted after adjusting the loudness control. Thus, different settings of bass and treble were required to match changes in output.

One would certainly have to seek for a long time to find a 15 + 15 watt amplified stereo radio system of much better performance than that of the Beomaster 1000. For the enthusiast and serious listener whose desire is for something neat, with self-contained stereo radio integrated with a true hi-fi 15 + 15 watt true-power solid-state amplifier, then the Beomaster 1000 is well worth investigating.

Maker's Specification

Radio frequency range: 88 to 108Mc/s. **Power Input:** 110/250V ac (80 watts). **Power output:** 15W rms each channel (20W music power). **Stereo Separation:** Better than 34dB. **Frequency Response:** 30 to 20,000c/s. \pm 3dB. **Bass Control:** + 10dB to - 14dB at 80c/s. **Treble Control:** \pm 12dB at 10Kc/s. **Scratch Filter:** 4dB at 7Kc/s and - 14dB at 20Kc/s. **Rumble Filter:** - 2dB at 80c/s and - 16dB at 20c/s. **Pick-up Sensitivities:** (One) 250mV and (Two) 7mV into 47Kohms (CCIR). **Tape Recorder Output:** 250mV. **Tape Recorder Input:** 20mV. **Loudspeakers:** 3 to 5 ohms (two pairs). **Stereo Indicator:** Green light for stereo FM. **Tuning Indicator:** Radiator with mid-scale zero. **Hum Level and Noise:** 45dB below 15W.

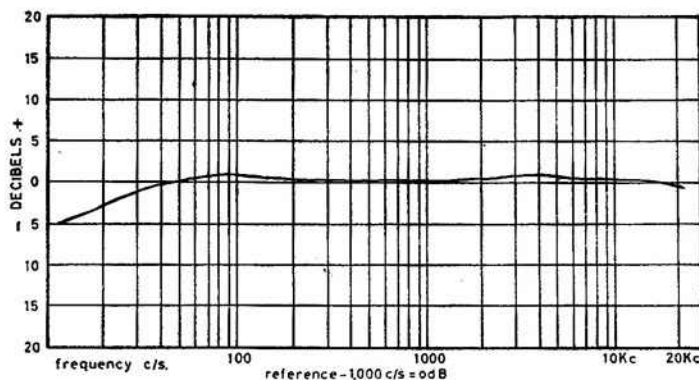


Fig. 3. Overall frequency response.

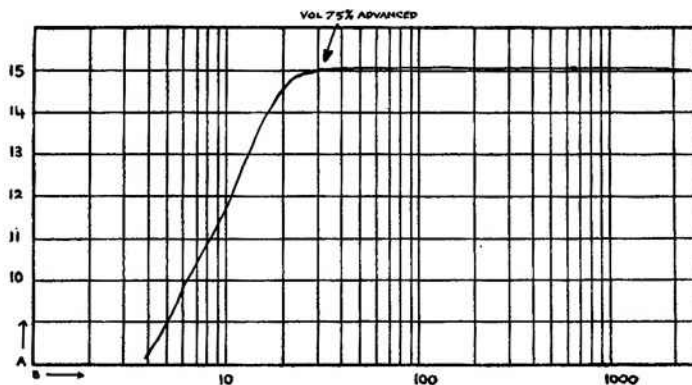
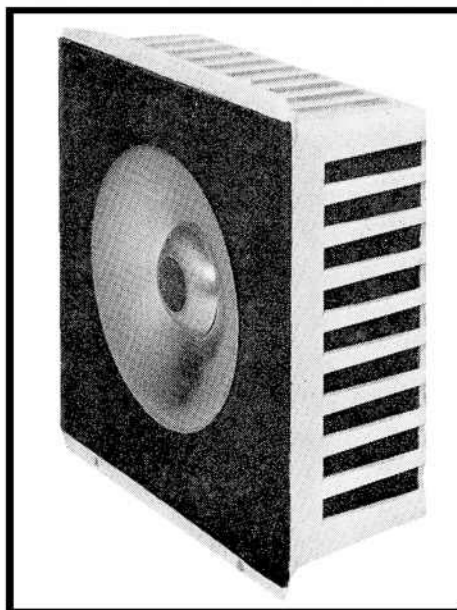


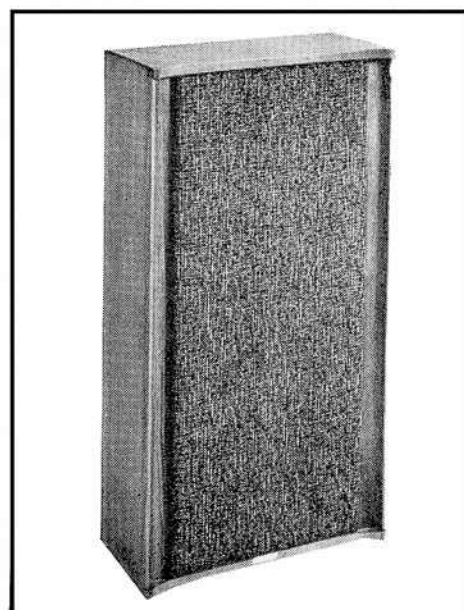
Fig. 4. Response of FM tuner limiting action
A—Output across 3 ohms (watts).
B—Signal input vhf with 1000c/s modulation (micro-volts).

HI-FI FROM YOUR TAPE RECORDER

by Leslie E. Watts



For those who would like to build an external loudspeaker, the Jordan-Watts module unit is supplied with diagrams and dimensions for a suitable enclosure.



The Jordan-Watts loudspeaker and enclosure has a frequency response covering 40-20,000c/s and will handle 12 watts. It is available for 3 to 5 and 7½ to 16 ohm outputs.

The loudspeakers fitted in recorders usually serve their purpose quite well—that is for monitoring and on-the-spot playback facilities, but in order to hear *all* the recording and to keep the distortion level down to the minimum, external high-fidelity loudspeakers, able to span the entire range of audible frequencies, are used.

The Hi-Fi Loudspeaker

Without adequate bass, reproduced music is vitiated and loses much of its substance, whilst absence of the upper frequencies and therefore those harmonics, deprives the music of its tone. Only a high-fidelity loudspeaker can release the full potential of a good recording and provide lifelike sound reproduction from the tape. Why is this so? A high-fidelity loudspeaker is a combination of drive unit(s) and enclosure, designed as an integrated system, to provide sound at an acceptable low distortion level, and having for a given electrical input a sound level variation usually within ± 5 decibels over a wide frequency range and up to its rated power handling capacity. It must cause the lowest possible drop in the quality of the sound being reproduced and it must add virtually none of its own noise, so that the resultant sound is almost indistinguishable from the original, or in the meaning of the phrase, maintains the highest fidelity.

At each stage of recording and reproducing sound, some loss must inevitably occur, and even by the relatively short route offered by a tape recorder there are several stages: namely the microphone, input amplifier, recording head, tape, pick-up head, output amplifier, loudspeaker, plus any mechanical influences such as variations in tape movement past the heads. The quality of the final sound can never be better than that permitted by the poorest link in the chain, and very often for the reasons stated above this component is the loudspeaker. It is the purpose and endeavour of high-fidelity components to keep all those losses down to the absolute minimum, and each must be as near perfect as can be.

The final stage, that of accurately transducing electrical energy into sound energy, requires a

loudspeaker possessing many virtues. The magnet must be powerful in order that voice coil movement may be precisely controlled and brought to rest almost instantly after each electrical impulse. The voice coil suspension system acts as a spring and tends to continue mechanical oscillation after each impulse. If no means were used to arrest or damp this unwanted movement there would be hangover from each impulse extending to subsequent pulses, with consequent distortion of the reproduced sound. The degree of electro-magnetic damping available depends on the flux strength and depth of the magnetic field in which the coil moves, in relation to the mass of the moving system.

The heavier the moving system, including the cone, the greater is the electro-magnetic force or flux needed to damp its movement, and therefore the lighter the system the more efficient is the same damping. Efficient damping is essential to good transient response; that is to say the ability of the loudspeaker to respond instantly to each energy pulse, change of frequency, or intensity, so that clear separation of each contributory sound is distinguishable in the whole. Good transient response gives crispness and attack to the reproduced sound and contributes much to its natural quality and to reducing fatigue during listening.

The whole complex movement of the voice coil must be transmitted to the cone with minimal loss by a means rigid and strong enough to withstand the forces and pressures involved yet light enough not to absorb much energy. The cone or diaphragm must be able to convert any single pulse or a simultaneous multiplicity of frequencies into intelligible sound, again with the minimum of modulation or hangover from one pulse to the next that would distort the sound. At lower frequencies the entire cone moves as a piston to create the larger, more widely spaced, pressure waves in the air, but as the frequency rises the cone movement reduces, until only part of the cone is vibrating. In practice several degrees of movement are usually superimposed on the cone at the same time and since each mode is causing its own outward travelling ripple in

the cone, careful damping of the cone edge energy is required to prevent inward travelling ripples or backwaves creating distortion. The cone edge damping device must also allow free excursion of the cone at maximum amplitude, be airtight, keep the movement axial, and be non-resonant, i.e. not add anything to the sound radiated by the cone.

The Enclosure

Most loudspeaker units are of little use by themselves, and, like a tuning fork or violin string, require a sound box of some sort to make them effective. The main purpose of a loudspeaker box is to prevent the sound waves that are radiated from the front of the cone being cancelled by those radiated by the back of the cone which are, of course, in opposite phase. There are many methods in use, including the closed box or infinite baffle which stifles the back radiation; the reflex enclosure which adds reversed phase back radiation to the forward radiation at low frequencies and the exponential horn. Reflex enclosure systems are widely used because of greater efficiency than closed box infinite baffles, although for large diameter loudspeakers they are somewhat cumbersome.

High-fidelity loudspeakers are usually more efficient than the normal lightweight loudspeakers built into tape recorders and thus will provide more sound per watt of amplifier output. Nevertheless, because more power is required to operate a loudspeaker at low frequencies, some small built-in amplifiers would not have enough power, before overloading distortion occurs, to drive a high-fidelity loudspeaker, and in such circumstances a power amplifier would be desirable. Indeed it is common practice in many domestic high-fidelity installations to have programme sources from a tape deck, a pick-up and an FM tuner, fed through a preamplifier to the power amplifier. Whether or not an external amplifier is desirable depends on the sound volume required, but in almost every case the connection of a high-fidelity loudspeaker to a tape recorder will add immensely to quality and enjoyment of one's recordings.

TEST REPORT KOSS MODEL SP-3X STEREO PHONES

by Peter Knight

Hi-Fi

Moulded in a hard dark-brown coloured plastic and containing moving-coil inserts, these light-weight (15-ounce) headphones can be worn for long periods without any form of distress to the wearer. Intimate acoustic coupling between the ears and the cones is achieved by soft, sponge foam rubber cushions surrounding the fronts of the ear pieces and additional comfort is given by a similar rubber head cushion.

Each ear piece is adjustable along a wire frame to suit the wearer's physical features and each ear piece is also adjustable over an angle of about 25 degrees. The ear pieces are supported from the main cushioned head moulding by gold-coloured wire frames, and although there is no actual adjustment here, the pressure of the ear pieces on the ears can be optimized by adjusting the bends in the wire frame close to the head moulding. This simple adjustment works extremely well in practice and it takes only a few minutes to secure the most comfortable fitting.

Only a single, thin, flexible cable emerges from the left-hand ear piece for connection to the amplifier, the two inserts being connected inside the left ear piece to the four conductors of the cable. Thus, although there are two conductors to each ear piece insert, there are only three connections at the jack-plug which terminates the cable, one conductor, of course, being common to both inserts.

Although this technique will work with the majority of valve amplifiers and with some transistor amplifiers, certain transistor models do not function properly when a common connection is made between the two output circuits. Indeed, by making such a common connection in some equipment a section of the circuit can be short-circuited, including the phase reversal switch or centre speaker

channel circuit featured in some amplifiers. This problem is appreciated by the manufacturer and, where required, they are prepared to give advice.

The headphones are supplied with a small coupling unit containing a pair of resistors, a tag-panel and a jack-socket. This unit allows the headphones to be connected to the speaker output terminals of amplifiers to secure the best signal/noise ratio, but it does not act as a matching device or output load. Additional loading may be required on each channel of a valve amplifier. The jack-plug is suitable for the stereo headphones socket of the majority of amplifiers, including the latest transistor versions, without the need for the coupling unit.

The headphones were tested on a large number of stereo programmes from tape and disc. Extremely good results were obtained. Some listeners, not having heard stereo through 'phones before, were in fact converted from speakers to 'phones! There is certainly a very personal feeling when listening to good quality stereo material through 'phones capable of doing it justice.

The headphones were tested with a sweep sine-wave signal from 20 to 20,000c/s, and at the level of signal used for the test, audio started to make itself felt at about 20c/s. The author could hear up to about 14,000c/s, while the author's son indicated that sounds were still being emitted up to about 16,000c/s. Even at full input from the test source (about 5 volts across 4 ohms - a little over 6 watts) there was no sign of distress or overloading at any frequency. Certainly a nice pair of medium-priced headphones capable of good reproduction and devoid of wearing fatigue.

Maker's Specification

Frequency Response: 10 to 15,000c/s. Imped-



ance: 4 ohms but can be used with systems having 8 or 16 ohm outputs. Sensitivity: 1V at 400c/s applied to driver will develop 127dB of sound pressure relative to 0.0002 dynes/cm². Maximum Input: 10 watts per channel or 60 watts per channel of normal music signal. Distortion: Less than 1% at maximum output of 143dB SPL. Cord: 8ft four-conductor, attached to three conductor 'phone plug (commons joined). Colour: Dark brown, with beige ear and head cushions. Weight: 15 ounces (shipping, under 2lb). Price: £9 18s 0d. Further details from Audioson Ltd, York House, Empire Way, Wembley, Middlesex.

ON TEST—THE BEOCORD 2000K DE LUXE

continued from page 13

on an oscilloscope. Based on 1,000c/s square-wave, the tone controls appeared to be level with bass at dead centre and treble retarded by about 1.5 degrees.

The square-wave performance at 2,000c/s (representing a passband up to about 20,000 c/s) is shown in the oscillogram in Fig. 3. The small amount of rounding at the leading corners is reasonable at 2,000c/s. A constant level sine-wave signal was then fed into the radio preamplifier with the machine recording at 7½ ips and with the level meter showing a recording level of about 6dB below peak

level. Over the audio spectrum there was hardly any change in the reading of the level meter, the actual response being shown in Fig. 4 by the broken-line curve.

Recordings were made of the input signal at a large number of spot frequencies and the tape so processed was then played back and the rms voltage change, relative to 3 volts across 4 ohms at 1,000c/s (representing about 2.25 watts of rms power), plotted to give the full-line curve in Fig. 4. This overall performance is very good indeed and is well up to professional standards.

Here, then, is a machine with professional specifications designed for the serious amateur and professional user, and one of the currently most versatile machines available.

Manufacturer's Specifications

Fast Winds: Approximately 170S with 1,800ft tape. Power Output: 2 times 8 watts. Distortion: Harmonic less than 1% at 5 watts per channel. Erase and Bias Frequency: 100Kc/s. Frequency Response: At 7½ ips 30 to 20,000c/s (±2dB: 40 to 16,000c/s); at 3½ ips 30 to 16,000c/s (±2dB: 40 to 12,000c/s); at 1½ ips 50 to 8,000c/s (±2dB: 50 to 6,000c/s). Signal/Noise Ratio: Better than 55dB at 7½ ips. Crosstalk: Better than 45dB at 1,000c/s. Wow and Flutter: Peak-to-peak values 0.2% 0.3% and 0.5% at speeds of 7½, 3½ and 1½ ips respectively. Tape Speed Variation: Less than 1%. Price: 135 gns. Portable (Luggage) version 139 gns.

HEADPHONE LISTENING

by Peter Knight

It may be desirable to read this article in conjunction with the Koss Stereophone Review, for there is more to headphone listening than may be suspected



Unlike early-style phones, the latest hi-fi kind need audio power, rather than voltage, to work them properly. Most early headphones and those used for communications are generally high impedance and relatively low quality while those for hi-fi listening are low impedance, with miniature moving-coil inserts, like small loudspeakers acoustically loaded to the ear pieces.

Hi-fi 'phones are designed to handle fairly high audio powers without distress and they can, in fact, be connected direct to the speaker sockets of hi-fi amplifiers. Indeed, for best results they call for a fair power input, and for this reason fail to work very well from voltage sources, such as the monitor socket of an amplifier or tape recorder.

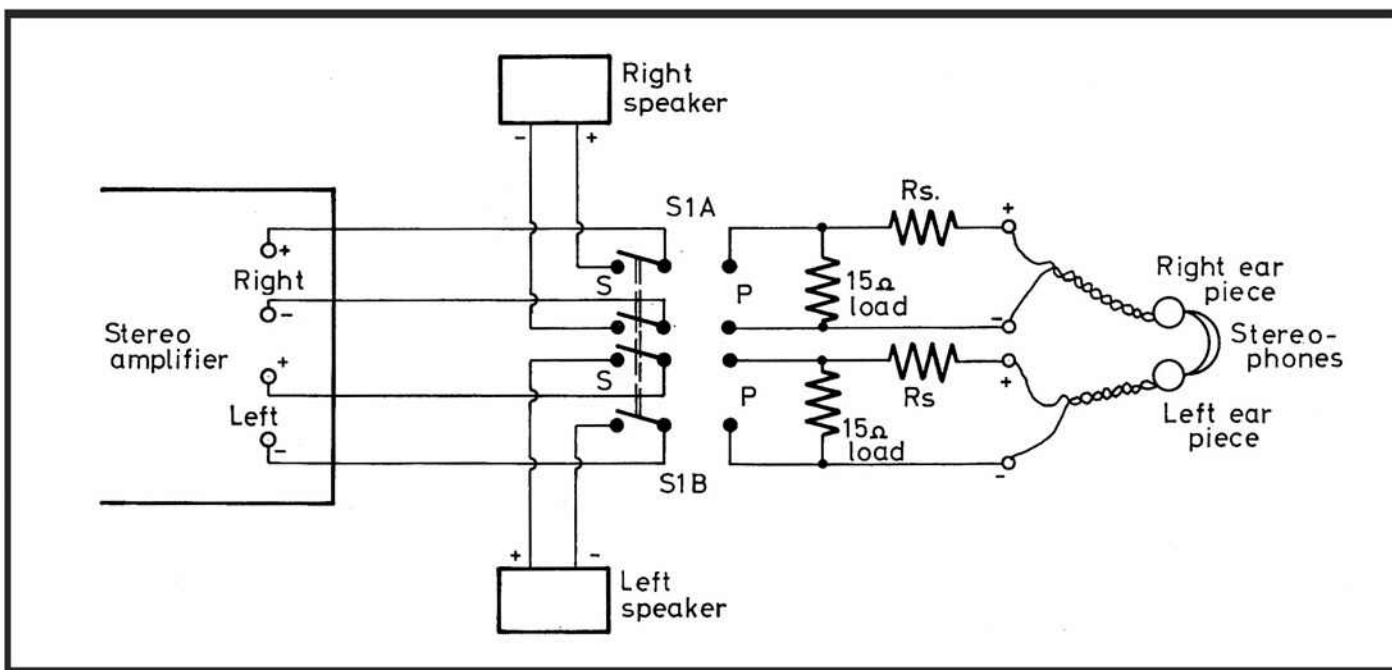
Some amplifiers and recorders, however, have a special 'phones jack socket fitted, which is usually connected to the power amplifier, through resistors. The reason for the resistors is, not for matching, but for ensuring the best signal/noise ratio, for a low volume control setting may be necessary for comfortable listening when the 'phones are connected direct to the speaker terminals. This means that low-level background noises produced normally by the power amplifier, though not heard from loudspeakers, are emphasized by the intimacy of the 'phones themselves to the listener and by the fact that the signal level is low in the power amplifier due to the retarded volume control setting.

A solution is to introduce attenuation between the amplifier

output and the 'phones and bring the output back by advancing the volume control setting, thereby masking the power amplifier noise by the increased level of signal at the same time. This works well and requires resistors of about 100 ohms in each channel, depending on the impedance of the 'phones. Valve power amplifiers can suffer if driven towards maximum output power without a correct value load, and the load given by the phones in series with 100 ohms is far removed from a nominal 15 ohms. The speakers could be connected with the 'phones, but personal listening may be required. In this event, artificial loads have to be switched across the speaker terminals, of value equal to the amplifier output impedance and rating in watts to match the full amplifier power.

Fig. 1 shows how such a switched system can be arranged on a stereo amplifier. Here two ganged double-pole changeover switches are used, and in the speaker (S) position, the outputs are fed direct to the left and right speakers in the normal way. In the 'phones (P) position the amplifier outputs are applied across 15 ohm loads, and then through resistors R_s to the 'phones. The series resistors R_s are adjusted for the best signal/noise ratio, as already explained.

Valve amplifiers with transformers can often cater for speaker and headphone circuits with a common cable. For example the two negatives of the right and left channels (speakers or 'phones) can be made common to a single conductor. But this



36 Fig. 1. A stereo speaker/headphones changeover system for valve amplifiers requiring speaker outputs correctly loaded.

cannot always be done with transformerless transistor amplifiers for fear of shorting feedback or phase reversing circuits. However, transistor amplifiers are not affected, even at full drive, when working without speaker loads. They are, though, greatly troubled by the speaker or 'phone lines being shorted, but valve amplifiers are not. For a transistor amplifier set-up, therefore, the circuit in Fig. 1 can be used without the load resistors, but the series resistors R_s will still be needed.

Most stereo headphones have three-contact jack-plug terminated cables, meaning that one contact of the jack is common to both channels, even, as with the Koss Stereophones, a four-conductor cable is used. Should channel isolation be demanded therefore, the jack plug would have to be removed and the two pairs of isolated conductors brought out to two separate plugs or a single special plug, depending on the exact requirements. The problem of retaining a common conductor on the two channels of a transistor amplifier, if required, can be resolved by the use of an isolating transformer, such as the Wharfedale SM1, wired as shown in Fig. 2.

Headphone listening is theoretically the ideal stereo arrangement where the original left-hand sound source is brought exclusively to the listener's left ear and the other to his right ear. This really represents the binaural system, in which one channel is completely isolated from the other at the listener's ears. Nevertheless, the stereo effect is very marked by its use. However, some headphone listeners prefer to synthesize the loud-speaker effect, and they do this by blending a proportion of the inputs to the ear pieces by a *blend control*, as shown in Fig. 3.

1966 BRITISH AMATEUR TAPE RECORDING CONTEST RESULTS

The judging of this year's contest evoked high praise of 20-year-old Alan Brown of Thornton Heath TR Club who won the 'Tape of the Year' Award with his excellent recording of the witches' cavern scene from *Macbeth*. He used natural and electronic sound effects and spoke all the parts himself, using a variety of capstan rollers to alter the pitch of his voice.

The judges considered that the standard attained by novices and advanced amateurs was generally high this year, but felt that groups, including schools, had not improved upon previous years. They also expressed disappointment at the greater number of straight musical recordings and felt that story and presentation were overlooked in many entries.

Here are the results:

Tape of the Year

Excerpt from 'Macbeth'. The witches' cavern scene, with the competitor portraying the characters. Entered by A. Brown of Mitcham, Surrey, who wins the *Emtape Challenge Cup*, donated by EMI Tape Ltd, and a £100 prize.

Novice Amateurs

Grandfather's Chronoclassm. A humorous musical tape with the traditional tune - *My Grandfather's Clock*. Entered by K. McKenzie of Sunderland, Co Durham, who wins the **first prize** - the *Scotch Trophy*, donated by Minnesota Mining & Manufacturing Co Ltd, and a £10 prize plus £15 worth of magnetic tape.

Dreams of Northumbria. A folk song especially composed for this contest. Entered by C. Blair of Sunderland, Co Durham, who wins the **second prize** - the *Agfa Cup*, donated by Agfa Ltd, and £10 worth of magnetic tape.

Trains. A stereophonic recording of train movements. Entered by E. Fitzgerald of Hawick, Scotland, who wins the **third prize** - the *Acos Cup*, donated by Cosmocord Ltd.

Advanced Amateurs

Breeze and I. A musical performance by the competitor using multi-tracking techniques. Entered by P. Griffin of High Wycombe, Bucks, who wins the **first prize** - the *Phillips Shield*, donated by Philips Electrical Ltd, and a £10 prize plus £15 worth of magnetic tape.

Negro Spirituals. Stereophonic performance of a medley of well-known spirituals. Entered by J. Shuttleworth of London SE9, who wins the **second prize** - the *Kodak Shield*, donated by Kodak Ltd, and £10 worth of magnetic tape.

Sarabande and Finale. Stereophonic recording of an amateur string orchestra in a work by Corelli. Entered by W. P. Copinger of Kilmarnock, Scotland, who wins the **third prize** - the *Irish Trophy*, donated by Elstone Electronics Ltd.

Groups

The Making of a Mass. A dramatized account of the stereophonic recording of a choral mass. Entered by R. Partridge for Oxford University Tape Recording Society, who win the **first prize** - the *Amphlett Shield*, donated by the Federation of British Tape Recording Clubs, and a prize of £10 plus £15 worth of magnetic tape.

Tutti. Stereophonic recording of a humorous choral version of a nursery rhyme. Entered by G. Furneaux for the South Devon Tape Recording Club, who win the **second prize** - the *BASF Shield*, donated by BASF United Kingdom Ltd, and £10 worth of magnetic tape.

The Bus Run. A feature tape of a coach outing by Class 1S2 of St Peter's RC Secondary School, Aberdeen, who win **third prize** - the *Mastertape Trophy*, donated by Mastertape (Magnetic) Ltd.

In addition to the awards and prizes, the winner of the 'Tape of the Year' and the winners of the first prize in each of the sections will be given a free trip to London to receive their prizes. The prize-giving will take place at the Criterion Hotel, London, on Friday, 4 November.

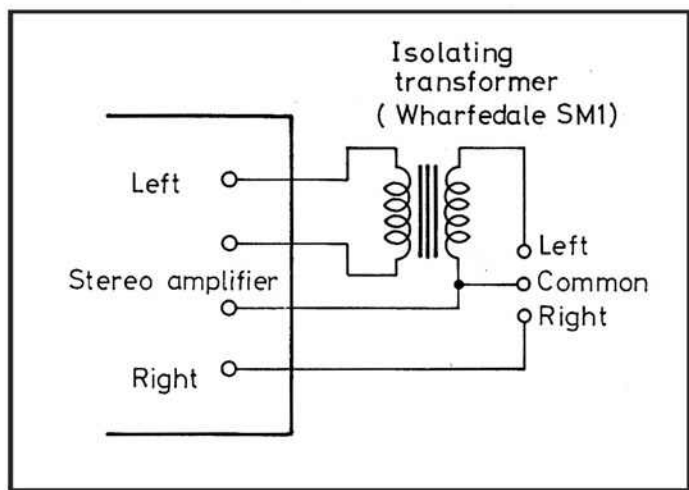


Fig. 2. The use of a transformer for providing dc isolation of the two amplifier outputs to a 'phones input with a common circuit.

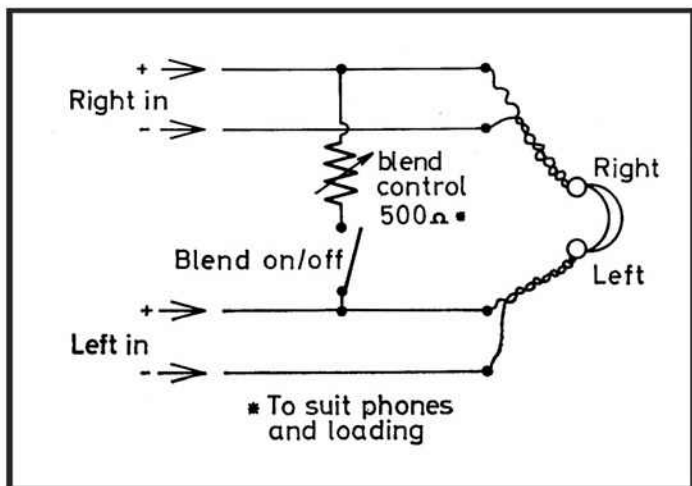


Fig. 3. Basic blend control.

Mood Music Records available from ATR

Please allow two weeks for delivery

These records are high quality 12 inch LPs (33 $\frac{1}{3}$ rpm). Each contains a wide selection of opening and closing music, mood and theme music and sound effects highly suitable for tape, slide and cinefilm sound tracks. Each record sleeve gives full details of recordings and timings and an instruction leaflet is included.

MM1 Cine Mood Music 24 tracks include openings, closings, themes and effects, grand, prelude, tragic, drama, comedy, holiday, nautical, Christmas, suspense, etc. Airport, jets, fireworks, train, sea, etc. Price £2 9s. 6d.

MM2 Sound for a Picture 25 tracks include openings, closings, themes and effects. Grand, dramatic, gentle, finale, happy, party, holiday travel, parade, circus, playtime, etc. Effects: sea, train, jet, baby, crowd, traffic, etc. Price £2 9s. 6d.

MM3 Custom Music for 8mm 38 tracks include openings, closings, themes and effects. Ceremonial, mellow, finale, movie finale, holiday, travel, continental, birthday, wedding, pageantry, etc. Effects: crowd, dog, baby, seaside, thunderstorm, etc. Price £2 9s. 6d.

To: Haymarket Press Ltd., 9 Harrow Road, London, W.2.
Please send me the following records [indicate with a tick in the appropriate square(s)]:

MM1

MM2

MM3

I enclose postal order/cheque/cash for £.....for 1, 2, 3 records, plus 2s. post and packing for each record ordered.

NAME

ADDRESS

Please allow two weeks for delivery.

ATR11

Note: Each record ordered is posted separately in its own packing.

PLEASE WRITE YOUR ADDRESS CLEARLY IN BLOCK LETTERS

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ATR TAPE DIRECTORY SERVICE

If you wish to be included in the Tape Directory, fill in this form and send it in. Your particulars will be published as soon as possible.

To: The Tape Directory, ATR, Haymarket Press Ltd,
9 Harrow Road, London W2.

I would like you to include the following particulars in the Tape Directory, and agree to acknowledge all replies I receive in response to my entry. (USE BLOCK LETTERS)

Name

Age..... Occupation.....

Address

Special interests.....

Tastes in music

Tape recorder used

Maximum spool size..... Speeds.....

38 Countries you wish to contact



A Winner

The DP4 microphone is another winner—by performance alone it has achieved world wide acclaim. It is used regularly by P.A. engineers, broadcasting and television companies, film studios, etc., as well as by many professional and amateur tape recordists. Its winning qualities have been designed and produced by Grampian—specialists for over thirty years in the field of sound equipment. We shall be pleased to send you full technical details of the DP4 and other microphones, together with descriptions of various accessories.

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



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



Grampian Reproducers Ltd.,
Hanworth Trading Estate, Feltham, Middlesex.

Brand	Levels relative to Kodak P.200 tape			Absolute measurement levels		
	Low frequency sensitivity	High frequency sensitivity	Output at 2% distortion	H/F response at 12,000 c/s against a 400 c/s reference	Erase level	Modulation noise
Kodak P.200 Tape	0	0	0	+ 7.1	77.5	55
Brand 'A'	- 3.5	- 5.1	- 3.8	+ 5.5	75	52
Brand 'B'	- 0.3	- 5.0	- 2.3	+ 2.4	74	55
Brand 'C'	- 1.0	- 5.7	- 1.7	+ 2.4	74	54.5
Brand 'D'	- 2.8	- 10.9	- 3.5	- 1	72.5	55
Brand 'E'	- 1.9	- 4.7	- 5.0	+ 4.3	76	51.5
Brand 'F'	- 0.5	- 5.0	- 2.9	+ 2.6	78	54.5
Brand 'G'	- 2.3	- 4.8	- 3.0	+ 4.6	75.5	55
Brand 'H'	- 3.8	- 7.5	- 1.7	+ 3.4	72.5	55

See how Kodak P.200 Tape compares with other leading brands

Random samples of premium-quality Double Play Magnetic tapes on sale in Britain have recently been tested and compared.

The results demonstrate clearly that Kodak P.200 Tape is the *only* tape to provide both a better high-frequency response and a higher output level *without sacrificing other characteristics*. The advantages of this unique combination of features are obvious—whatever your recording need.

Study the chart above carefully, then try Kodak Tape on your own recorder and hear the improvement for yourself.

Kodak Tapes—Standard, Long, Double, Triple and Quadruple Play—are available through Kodak Photo Dealers everywhere.

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ADDRESS.....

Kodak sound recording tapes... the best tapes in the world

RECORDING IN A CHURCH— OR HUNT THE KEY

By
John Lawrence Jackson

First buy a car! Transporting the dead weight of tape recording equipment is not the type of joke that is easily appreciated. My first recording attempts in church with one of the cheaper and lighter recorders were simple to attain but made terrible listening. However, when I eventually changed jobs (voluntarily) and pennies came rolling in a little faster, I bought a Brenell Mk 5'M' tape recorder and the recordings became at least bearable.

The first major experience I had of recording came one Christmas when the school attached to the local parish church arranged a carol service and wanted a recording of it. Transporting the recorder proved to be something of a problem, or so my friend told me as she put it down outside the church! Positioning the microphone (an omnidirectional Foster DF-3 moving coil) was the next task which a short lead did not make any easier. An extension lead was out of the question as my bank account had not recovered sufficiently from the pulverizing blow it received when I bought the tape recorder. Eventually, I tied the mic to a pillar facing the chancel. This pillar proved very useful, for when the school choir sang their carols and anthems it cut out many of the bronchial coughs, etc., from the congregation.

Be Prepared

A friend, who is also a tape recording fanatic, bought a similar machine to my own,

and so we have started a tape recording service (if you will excuse the pun) for church weddings. Our first attempts were not exactly professional but at least they provided valuable experience. The first lesson to be learned was *be prepared* — for anything.

On the morning of the first wedding we recorded, I transported approximately 3 cwt of equipment (possibly a slight exaggeration, but only slight) into the church two hours before the ceremony was due to begin. It should have been three hours! To position the first microphone I had to climb a ladder. For the second I could only visualize its new extension lead in position, as my fanatical friend was frantically searching all the likely shops in Leeds trying to buy it. When at last she crawled in, with only 15 minutes to go, I had to put a jack plug on the new lead and then test both the microphone and a brand-new mixing unit.

By this time, wedding guests were arriving and I had to slip out quietly with the 20 ft ladder, stifling a scream as part of it fell on my foot. Luckily, the service went well and the recording (at 7½ ips) produced a good copy at 3½ ips. I say lucky because later in the afternoon, after another wedding, the organ broke down in the middle of the Wedding March! One point for any prospective wedding-recorders: make sure the bride and groom want a recording of the ceremony; I once felt something of a fool when I rolled up with a tape as a surprise for the newly married couple and they did not own a tape recorder!

Hunt the Key

Being an organist, I naturally take pleasure in taping organs, even though they produce sounds that are among the most difficult to record. However, transporting heavy equipment and buying expensive microphones is sometimes only half the battle. Quite recently, while I was on holiday with my portable tape recorder, an organist friend went with me to a large church to play and

record the splendid organ there. The vicar readily granted us permission to enter the organ loft, but reaching it was not quite so easy. Just inside the door of the church was a mains switch which had to be thrown to supply current to the organ-motor circuit. Quite a simple chore, you may think, but wait for the next step. Under the organ loft was a quite innocent-looking piano, but it holds a secret which is apparently sometimes — in fact most times — difficult to discover, namely a key! Inside the lid was a small felt key-holder. Unfortunately, the key was of the large metal variety and it inevitably fell out. We only found it after removing the front panels of the instrument and delving into its dusty interior.

Armed with the key, we managed to gain entry through two doors (something like a bank vault) into the vestries; but where now? Inside the third cupboard along, four hooks from the left, was the second key which opened the loft gate. Up the steps and along the narrow catwalk; we were there at last, but not quite. The end panel of the organ casing opened with a little persuasion (safe-breaking experience would have helped) and inside, on a ledge, were the keys to the organ console. When the appropriate switches had been found to make the organ operative the instrument was ready to be played.

However, there were still problems to come, for the architecture of the building makes it one extra-large echo chamber. Half-way down the centre aisle two distinct organs could be heard. Eventually, in the corner farthest away from the organ I found a reasonable place to record.

The occasion was really quite enjoyable, but two things tended to spoil it. First, the loft gate would not re-lock and so we had to ruin the security system by leaving it open; and, secondly, my recordings were over-modulated!

Needless to say, I intend to try again, this time, however, with the Brenell. Now I only have one question to ask — where on earth can I play in?

TAPE DIRECTORY

continued from page 24

AUSTRALIA

Bert Beattie, 50, 26 Molesworth Street, Coburg-Victoria, Australia. People, customs, world affairs; guarantees chatty, lively, light-hearted tape. Philips two-track, 7 in, 3½, 7½. Anywhere English-speaking.

Caroline Davey, 21, stenographer, 194 Raglan Street, Mosman, NSW, Australia. Guitars, surfing, bushwalking; folk music and most kinds. Sony TC500A four-track stereo, 7 in, 3½, 7½. England, Scotland, USA.

Peter Foster, 25, steward, Merchant Navy, 2 Kenton Avenue, Oaklands Park, Nr Adelaide, South Australia. Photography, music, taping; all kinds. Revox F36 Stereo, 10 in, 3½, 7½. Anywhere. Robert Illidge, 20, clerk, civil service, 7 Catherine Street, Mortdale, NSW, Australia. 8mm photography, politics, hi-fi, foreign customs, swimming; classical. Tandberg 64 Stereo, 7 in, 1½, 3½, 7½. All countries.

I. R. Park, 30, electrical mechanic, 46 Darlington Street, Clearview, South Australia. Electronics, movie photography; modern and light classical, sound effects. Philips Model ER1500 twin-track, 1½, 3½, 7½. Switzerland, France, Scotland, Canada (English-speaking).

Marcus H. G. Pillifant, 22, clerk, 6 Carlow Street, Salisbury Downs, South Australia. Script writing, comedy; pops, light classical, continental

music and unusual recordings. Philips EL3542/A, four-track, 7 in, 1½, 3½, 7½. Switzerland, Germany, Norway, South Africa, USA (English-speaking).

Robert M. Pillifant, 30, branch manager, 589 Beryl Street, Broken Hill, NSW, Australia. Water skiing, modern radio presentation, photography; modern and light classical, pop, sound effects. Philips Model EL3515, four-track, 7 in, 3½. France, Holland, Japan, Sweden, United Kingdom (English-speaking).

Murray B. Knight, 48, finance company manager, 12 Lural Avenue, Linden Park, Tasmare, Adelaide, South Australia. Stereo recording, photography, sport, travel; shows and film musicals. Grundig TK46 Stereo, 7 in, 1½, 3½, 7½. America.

Eric Kenneth Wagstaff, 43, carpenter and joiner, 15 Price Street, Merrylands, NSW, Australia. Methodist Couple's Clubs, square dancing, camping; C&W. Elizabethan 200 two-track, 5½ in, 3½, 1½. Anywhere English-speaking.

NORTHERN IRELAND

J. A. Wilson, 36, teacher, Waringfield, Moira Lurgan, Co Armagh, Northern Ireland. Cine and still colour photography, dancing, foreign languages, motoring; C&W, comedy. Brenell 1200, 1½, 3½, 7½, 15. USA, Canada, Switzerland, Germany, France, Canary Islands.

David A. Hart, 19, lab assistant, 'Brookholme', 85 Station Road, Greenisland, Belfast, Northern Ireland. Dx-TV, cricket; light classical, instrumental, pop. Truvox R42, 7 in, 1½, 3½, 7½. Australia, New Zealand, Canada, USA, Pacific.

James Patrick Lavery, 17, student, 3 Beechlands Malone Road, Belfast, Northern Ireland. English literature (especially modernist school), skin diving; jazz, pop, a little classical. Ultra four-track 6204, 5½ in, 1½, 3½. Anywhere.

Alastair Smyth, 19, student, 'Strathleven', Toome Road, Ballymena, Co Antrim, Northern Ireland. Travel, geology, stereo, swimming and entertainment world; most, but especially C&W. Philips EL3541 four-track, Sobell two-track, 3 in, 3½. Anywhere.

SCOTLAND

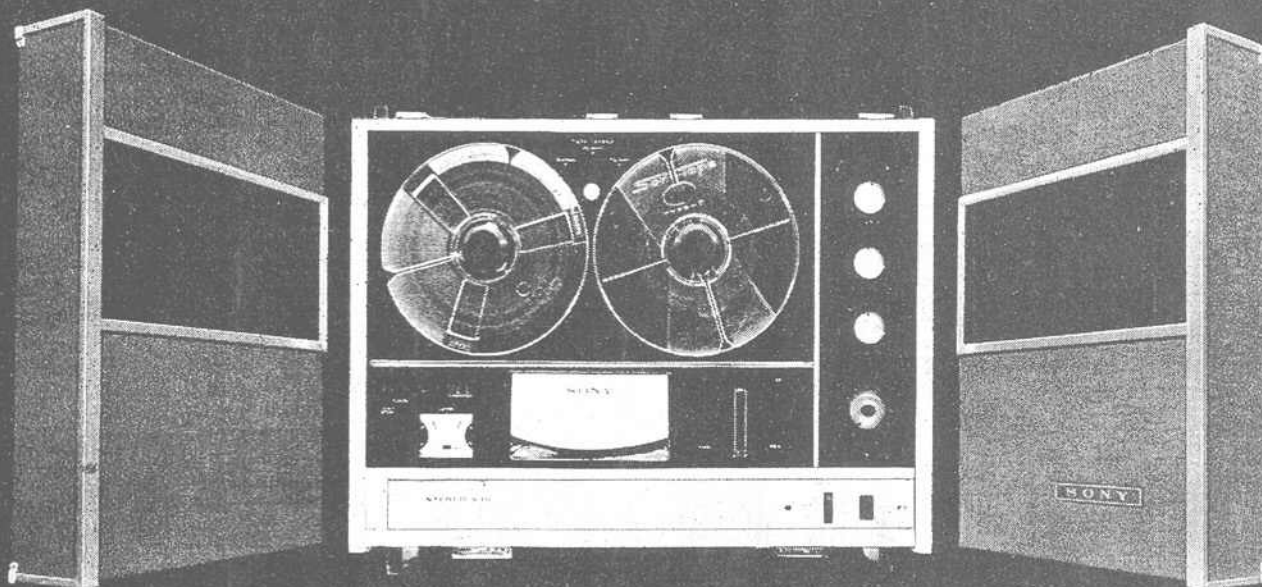
Brian L. Beatson, 24, mechanical engineering student, 199 Yokermill Road, Glasgow W3, Scotland. 8mm cine, sync. sound tracks, astronomy, church work; all except pop and modern jazz. Cossor CR 1604, 7 in, 1½, 3½. Canada, US, Australia, anywhere English-speaking excluding Britain. Male only. No letters required.

Gerrard Grannum, 21, hospital porter, 109 Broughton Road, Edinburgh 7, Scotland. Photography, stamp collecting, reading, wine making; light classical, humorous, pop. Fidelity Playmaster-4, 5½ in, 3½. Anywhere.

Thomas R. Laurensen, 18, student, 3 Grant Street, Nairn, Scotland. Physics, electronics; pop and folk. Stella ST458, 7 in, 1½, 3½. UK, Continent. Females preferred.

Colin M. Malcolm, 27, computer programmer, 2303 Dumbarton Road, Glasgow W4. Philosophy, religion; classical violin music. Brenell, 8½ in, 1½, 3½, 7½, 15. UK only.

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MODEL TC530—FEATURES ■ 4-track stereophonic and monophonic recording and playback ■ Quadradial (4-way) speaker system ■ High precision all silicon solid state circuit ■ Vertical or horizontal operation ■ "Retractomatic" pinch roller for easiest tape threading ■ 3-speed, full 7" reel capacity ■ Tape position indicator ■ Instantaneous pause control ■ Two illuminated, calibrated VU meters ■ Automatic "Sentinel" tape stop ■ Stereo headset jack. Price 120 Gns.

SPECIFICATIONS:

Power requirements: 100–125V and 220–240V AC. 50/60 c/s 65 watts.
Tape speed: $7\frac{1}{2}$ ips., $3\frac{3}{4}$ ips. and $1\frac{7}{8}$ ips. instantaneous switching.
Reels: 7" diameter or smaller.
Recording system: 4-track stereophonic or monophonic.
Frequency response: 30–20,000 cps at $7\frac{1}{2}$ ips. (± 3 dB 50–15,000 cps. at $7\frac{1}{2}$ ips.) 30–13,000 cps. at $3\frac{3}{4}$ ips. 30–10,000 cps. at $1\frac{7}{8}$ ips.
Wow and flutter: Less than 0.17% at $7\frac{1}{2}$ ips. Less than 0.3% at $3\frac{3}{4}$ ips. Less than 0.4% at $1\frac{7}{8}$ ips.
Power output: 5W R.M.S. per channel.
Signal-to-noise ratio: Better than 48 dB (at peak record level).
Harmonic distortion: Less than 3% at 0 dB line output.
Level indication: Calibrated VU meter x 2.
Tone controls: Separate controls for bass and treble.
Inputs: Low impedance microphone inputs: transistorised (will accommodate any microphone from 250 ohm to 1K ohm impedance).

Inputs (cont.):

Outputs:

High impedance Sensitivity—72 dB (0.19mV) 100k ohms) Auxiliary: Sensitivity—22 dB (0.06V).
Line outputs: 0 dB (0.775V), load impedance 100k ohms.
Speaker outputs: 2 x 8 ohm.
Binaural monitor output: will accommodate stereo headset Model DR-3C (10k ohm impedance).

Dimensions:

Weight:

Accessories:

$19\frac{1}{8}$ " wide x $9\frac{1}{8}$ " high x $15\frac{7}{8}$ " deep.
41 lbs. 10 ozs.

Stereo recorded 5" tape, 7" reel. Two SONY dynamic microphones (F-96). Integrated record replay connector type RK-46 60c/s Motor pulley. Reel cap. Head cleaning ribbon. Splicing Tape.

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tape club news

BARROW

The first AGM in the history of the Barrow Soundtrack Club was held recently. So much work was awaiting the joint secretaries, Brian and Jane Rayner, that duties were divided into four parts and new officers elected to carry them out. New general secretary is Ron Duxbury of 42 Walton Lane, Barrow. Brian Rayner is now Hospital Liaison Officer, while his wife Jane is the new Public Relations Officer. Fourth member of the new secretariat is Leslie Richardson, who takes over supervision of tapes played to clubs and the local Home for the Blind, as he is now Outside Broadcasts Officer. New Chairman is Jim Irwin, Treasurer is Bernice Knight, and John Duxbury (brother to Ron) takes over as Librarian.

One of the recent weekly meetings had to be abandoned in favour of a good turn-out and autumn-clean of the studio, which was littered with bits of snipped-off tape left from the latest project, a 40 minute documentary which concerned the Furness Mystery Plays. Many of the club's meetings have been devoted to the recording and editing of this work.

BTRAC

The Tape Recorder and Hymnopaedia was the title of a most interesting and instructive talk and demonstration given by BTRAC member Wil Jackson. In case you are wondering about that odd word, it is all about sleep learning. The methods and the automatic time switching were expertly explained to an interested audience who were far from asleep in spite of the subject. Some of the club's boffins were able to assist blonde member Mary Cliff, who was having difficulty dubbing from a Stellaphone ST458 to a Philips EL3541. In less than no time the trouble had been sorted out; the correct connections had been made between each machine and perfect dubbings were obtained. A grateful Mary entertained her helpers for the rest of the evening with some of her pre-recorded tapes.

Are you good at expressing yourself? was the theme of a word game played by members, in which each player was given a word and asked to explain its meaning and use the word in a sentence. The variety of words submitted to members by Chairman Terry Morris caused great interest and will undoubtedly help those who manage to remember them in any future tapesponding. Terry also entertained members with some fine stereo recordings on all subjects, and Dave Taylor presented a programme of stereo music. Alan Bird also presented an excellent programme, this time in mono.

BOSTON SOUNDHUNTERS

At the recent AGM of the Boston Soundhunters, Ken Healey was re-elected Chairman, with Walter Franklin and Philip Towell retaining the

posts of Treasurer and Secretary respectively. Philip also became Soundhunter of the Year as he was leading at the penultimate competition, after which the points table mysteriously disappeared. To teach the secretary a lesson he wasn't awarded a cup (they felt he had won too many anyway!). At the AGM it was revealed that the club is in a healthy financial position, and can now boast luxuriously appointed meeting rooms fully equipped for recording and play-back. Two club members were among those highly commended for their entries in the BATR contest. Much controversy was created by the completed feature tape *Kirton 1965 - a sound portrait of a Lincolnshire village*. The Parish Council at first refused even to hear it, but later it became the climax of a village festival of a week's activities. It was received with great acclaim by a packed Town Hall, with nearly as many standing as sitting, to hear it played at a special ceremony. Future club activities include a visit to the Nottingham Photo and Hi-Fi Centre, and *Sounds Sensational*, a demonstration of high quality sound reproduction. The new address of the secretary is Studio 92, Fishtoft Road, Boston, Lincs.

BRIGHTON

Another club which held its AGM recently was the Brighton TRC, and a new and larger committee was elected. The 'old faithfuls' (Ralph Vivian, Keith Upton and Louis Goldberg) fill the posts of Chairman, Secretary and Treasurer respectively. This club, too, reports a much better financial situation and a considerable increase in the amount of club equipment.

Many members have been out on location, recording at such places as the Farnborough Air Show, the Isle of Man TT Races and the National Speed Trials held in Brighton itself. An interesting tape featuring the North Shore branch, with most members speaking on the tape, was received from the New Zealand Tape Recording Club. Most of these were British immigrants, some even former inhabitants of Brighton.

DERBY

The fourth club this month with an AGM is Derby, and again this club recorded an excellent financial year. Retiring Chairman Dennis Land mentioned the welcome influx of new members and some of the newer activities featured at club meetings. The highlight of the year, he said, was the wonderful show members had given at the recent rally of the Derby Amateur Radio Society. New officials elected were Chairman Ernest Flecknoe, Secretary Miss E. Hassall, Treasurer Derek Hill (re-elected), Vice-Chairman Dennis Land, with Beryl Gapp, Malcolm Nichols, Nicholas Potter, Alfred Stanway, Mrs V. Bramble and Douglas Flecknoe completing the committee. 'Any Other Business' on the agenda included a discussion on what to do with the club's wealth (passed to the committee!) and a suggestion that small groups of members be formed, each producing its own tape independently with the ultimate winner going on to the national contest. A decision was made to hold the club's own 'Open Day and Exhibition' for the first time this coming year.

The latest monthly competition had as its subject *Things ain't what they used to be*, and members submitted their 3 minute entries to be judged by the rest of the club. As always, points were awarded for entertainment value and technique, earning first place for Alf Stanway, with Beryl Gapp second and Derek Hill third.

DONCASTER

The past month has been very busy for the Doncaster and District TRC, and it got off to a good start with a visit to a professional recording studio. Following this, the club provided a public address system for the British Legion at Sprotburo, and threw in one engine driver for the miniature railway for good measure! A demonstration of a

Telefunken stereo machine and a discussion of the club's latest tapesponding venture with a New Zealand club completed the following meeting. The month closed with a session of listening to tapes submitted by members, before the club's technical adviser, Mr Broome, copied them on to a master tape.

FRIERN BARNET

Prior to a short recess in the club's annual programme, the Friern Barnet club held a most interesting sound hunt in which members in pairs were sent chasing around their area of North London to record certain difficult sounds. The trail finally led all the competitors to a local restaurant where a pleasant supper had been organized. Afterwards came the real difficulty in trying to decide the winner. The most enterprising tape was one which required the recordist to climb into the driving compartment of a diesel train and interview the motorman *en route* to the next station where his partner was ready to pick him up. The winner got his five points for a diesel siren! The club's first engagement after the recess was a visit to the BBC transmitter at Brookman's Park. This was a most enjoyable and instructive visit; members were shown around the station by the courteous staff who had been detailed to meet them. For this they extended a special thanks to the BBC.

ITACS

A recent issue of *Tape and Cine Reel* includes a round robin report from Jack Spooner detailing the number of miles covered by ten round robins organized by members. Although figures have not been received for two of the ten, mileages for the others (based, incidentally, on straight lines) total in two instances 32,750 miles. Another had travelled 30,000 miles, others 24,000 and 20,000. They are now aiming to see which of the round robins will be the first to cover a million miles. *Mixers* was the title of Fred Wood's article in the sound tips section, and the final plans were being arranged for the club's annual get-together.

IPSWICH

Ipswich and District TRC has also had its AGM recently. Retiring Secretary Mrs D. Wilding reviewed the successful and progressive programme undertaken during the past 12 months, and the Treasurer, Mr P. D. Rutterford, reported that the club was in a healthy financial position. Retiring Chairman Mr M. Wilding was unable to attend the meeting owing to business commitments but, not unnaturally, he recorded his report on tape and it was played to members at the appropriate stage of the meeting. Officers elected for the forthcoming year were Chairman Mr R. T. Burgess, Secretary Mr M. Wilding, Treasurer Mr P. D. Rutterford, with Mrs D. Wilding, Mr K. E. Lingley, Mr R. A. Parkins and Mr J. E. Steggall completing the committee. A comprehensive programme for the next 12 months has been arranged and the club welcomes anyone in the district to attend future meetings. Meetings are held at 7.30 pm on alternative Thursdays at the Royal George Hotel, Colchester Road, Ipswich, and full details of the programme can be obtained from the secretary at 4 Meadowvale Close, Ipswich. The club is interested in hearing from other clubs who would like to exchange taped details of their activities and examples of their work.

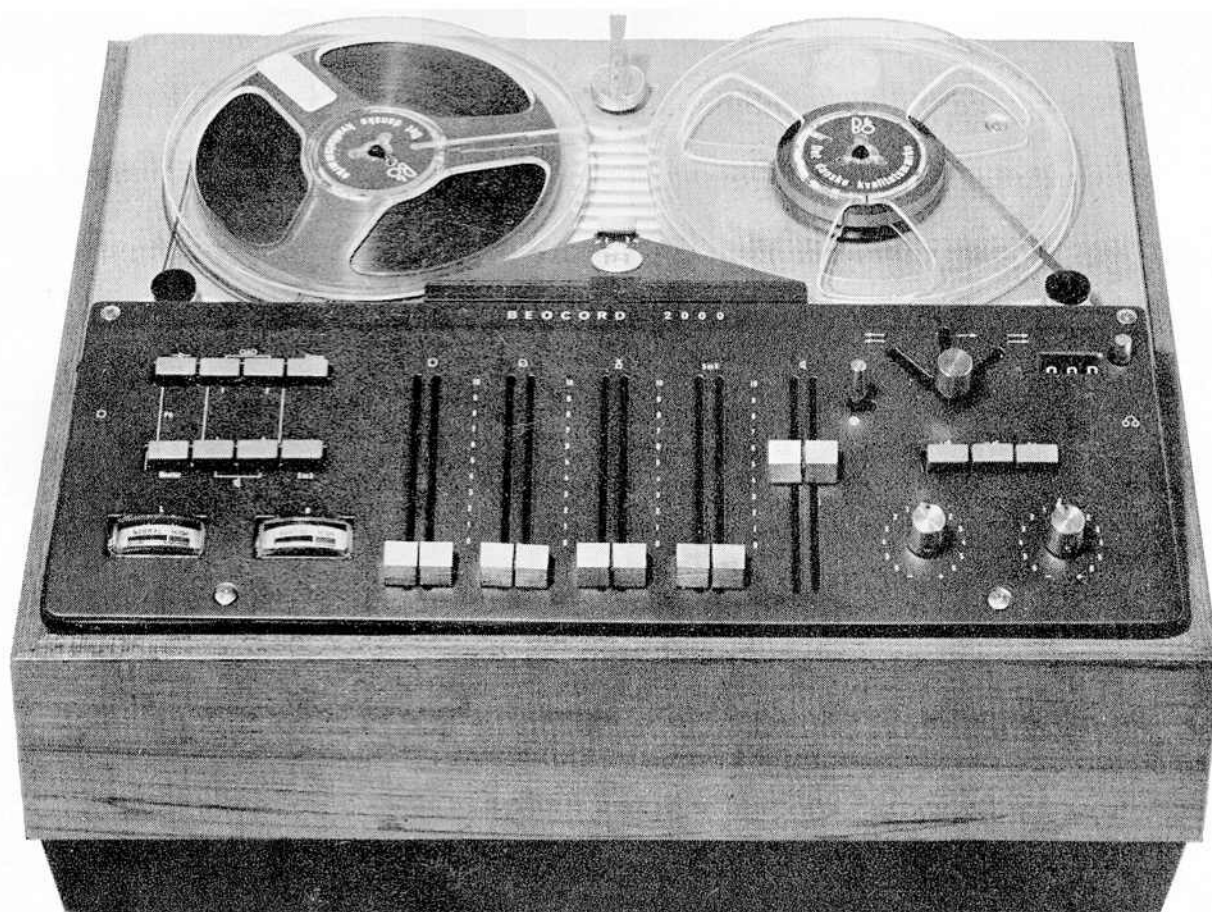
LEICESTER

Members of the Leicester TRC recently made a trip to Windsor and London Airport, ending with a river excursion up the Thames. Many recordings were made with battery portables, both at the airport and *en route*, and these are now being edited. John Moule and Howard Dutson recently demonstrated mixers and accessories, including a reverberation unit and 6-

continued on page 44



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TAPE CLUB NEWS

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channel mixer constructed by John Buckler. At the following meeting each member brought a tape and then gave a 5 minute talk explaining how it was recorded and why it was either their pride and joy, or alternatively what went wrong. At a visit to the Leicester City Ambulance Station, members recorded a mock turnout and a talk by the chief officer on ambulance facilities and the layout of the control room. Dummy messages were passed over the radio and one member with a portable recorder, rode in the ambulance which then speeded back to the station with blue light flashing and two-tone horn sounding. Another member recorded the event from the roadside while the remainder of the club in the yard at the rear recorded the scene as the driver and attendant alighted to attend to the 'patient' - the ensuing dialogue being read from a script. Members were shown a film of mouth-to-mouth resuscitation and the method was demonstrated on models, while the proceedings throughout were recorded.

LONDON

Committee members of the London TRC are rather concerned by a considerable drop in attendance at recent club meetings. As an added incentive, a special prize was presented at the October meeting for the best tape duly edited and presented in the style of a report for *Today*. The subject was the Thames Pageant celebrating the 300th anniversary of the Great Fire of London. The best tapes were also copied and filed into a programme for Tape Programmes for the Blind.

NORTH LONDON

A double celebration was held by members of the North London Tape and Hi-Fi Club on the occasion of the club's sixth birthday and the 100th edition of the *Enfield Microphone*. The recording of local news on tape, which started early in 1961 with two tape recorders, was first distributed amongst a dozen blind people at the instigation of the Toc H. Following reorganization, the tape club took over the problems of production, while Toc H and the Apollo Blind Club dealt with the transport of playback machines among blind people in the area. In September 1962 the first edition of the *Enfield Microphone* in its present form was distributed, and today the service employs 16 tape recorders, including a battery machine for listeners without electricity. The 100th edition, now in circulation, includes a short message from Richard Collinson in Melbourne, Australia, and *Townsmen's Notes* read by Sinclair Scott in Luton, both former producers of the programme. 'The club recently had cause to be grateful to a member who obviously has an ear for potentially good recording material: Mike Biggins had, back in his college days, recorded Peter Cook and Dudley Moore, and the tape was played back.

NORWICH

Another busy and successful month has been recorded by the Norwich TRS. The club's programme *Sounds Interesting* was presented with great success to the North branch of the International Friendship League, and the Treasurer gave a talk to the Canadian and US Parents' Association. It is hoped that several of their members can be helped to contact friends and relatives by tape; already two are being arranged. The club has also been asked by the IFL to arrange

a playback in Lübeck, in Germany. For once the club is at a loss and pleading for anybody who could possibly arrange this for them. Summer meetings of the club had been somewhat disrupted, not by the tourist industry but by the World Cup. Fortunately, attendances are once again at a very high percentage of total membership. In a competition with the Great Yarmouth TRS, Norwich won by 101 points to 99, with maximum points of 108 - a very high standard from both teams.

RUGBY

Following the sudden and tragic death of the club's Treasurer, 22-year-old Ron Barrett (as reported in *ATR* last month), the management committee of the Rugby TRS asked Len Stephens to take over as Treasurer.

The club's entry in the AEI Apprentice Association Rag Carnival Procession was entitled *Tape it from Here*. In keeping with the theme, *Pioneers*, the seemingly authentic studio on the float was revealed on closer inspection to be very 'Heath Robinson', including a microphone boom made of an old broom handle. An old piano was also featured on the stand and the difficulty of transporting this from a house to the float was reminiscent of a Bernard Cribbins record! Work on the float continued throughout the night and four members slept with the lorry to guard against boarding parties until daylight.

One club meeting, devised by Ernie and Jean Crane, presented a programme which dealt with the club's tape library and included extracts from many of its tapes. At the following meeting Mr W. N. Tyson of Leamington, a designer and supplier of audio equipment, presented a programme on microphones, and this was followed by a meeting dealing with unorthodox recordings.

SOUTH DEVON

Two members of the South Devon TRC participated in a recent tape recording course for teachers held at Dartington Hall, Totnes. President Don Aldous and Secretary Gordon Furneaux presented an hour of amateur recordings at one session, and Mr Aldous also gave a lecture on microphones. The four-day course covered all aspects of tape recording in schools, including video recording.

Methods of producing various sound effects were discussed at one club meeting and many members brought their own recordings for demonstration purposes. This was followed by a report on the latest developments in tape cassettes by Don Aldous. A visit to Westward television studios at Plymouth has been planned to take place later this month.

SOUTHEND

Following the news of what is believed to be the first award in the sound appreciation section of the Duke of Edinburgh's Gold Medal Scheme, I hear that four members of the Southend Teenagers Recording Society are also in the throes of their work to qualify for this award. They have spent many months' hard work on successfully waterproofing both tape and cine equipment. The four set out on a pot-holing expedition, which they taped and filmed.

Other events have included full coverage of the Southend Carnival week. From the first trumpet blast in the main procession to the last hymn in the Thanksgiving Service, members of the Society were on the spot all the way. They were fortunate in having their own reserved enclosure, and the main procession yielded several hours of excellent recording with the aid of a Truvox, while a moving coil mic suspended above the roadway picked up incidental effects. A mobile crew with an Opta cord and DB4 mic travelled along the route recording the military and jazz bands. Other events covered included the official Carnival opening, Talent Contests, Carnival Queen's Reception, Fetes, Parades, two excellent concerts by

the Vancouver Boys' Band, and an interview with the Mayor, who is also President of the Carnival Association. The latter led to an invitation for the club to join him in the Mayor's Parlour for morning coffee, after which members were personally conducted on a tour of the Civic House. Members were also gratified to receive a very encouraging letter which commended the Society for their hospital programme work and commented on the enjoyment derived by the patients.

THORNTON HEATH

The social work for the blind and for Robin Barclay's Cultural Services for the Disabled taken up by the Thornton Heath TRC as a result of a letter in *ATR* really caught the imagination of club members. A large roster of readers has been established and organized by Morris Webb for a blind aeronautical student. Books and magazines on assorted subjects are also being recorded, though not without difficulty. A long article from an aeronautical magazine about Japanese Airlines contained so many unpronounceable names that the reader was reported to be in danger of lockjaw or something similar! The material to be dubbed was received as a magazine already read on to a 900 ft reel at 3½ ips, together with eight similar reels of tape onto which the master could be copied. Morris, having completed four copies at home brought four more along to be done simultaneously at the club, but again difficulties arose, this time of a mechanical nature. First of all a full-scale hum arose on the junction box, and after this was cured cries of distress were heard from members at various receiving machines; those similar reels of tape were not, after all, exactly similar and some had run out. The meeting having already run somewhat over closing time (the club rooms are on licensed premises), gear had to be packed and Morris burned more midnight oil to get the job done in time.

WALTHAMSTOW

Ingenuity of the members of the Walthamstow and District TRS was put to the test recently when instructions were given to collect local sound effects commencing with specific letters of the alphabet. As one might expect, the last few letters proved the most difficult, but despite this, some interesting results were obtained and much was learned from the exercise. Following the Society's outing to Hythe earlier this year, Social Secretary Mrs Joan Watson has been arranging further similar events. These include a visit to Southend, the London docks, one to the Tower of London to record the Ceremony of the Keys, and a further one to the local telephone exchange. A demonstration by Fi-Cord International Ltd has been followed by similar visits from Telefunken and Akai. The newly formed workshop section headed by Ted Higgs is planning to build a four-channel mixer which will be put to good use in future club activities.

WORLD-WIDE TAPE TALK

Among the groups in London for the recent Thames Pageant was a team of eight members of the World-Wide Tape Talk whose task was to photograph and record the proceedings for a tape and slide show which is to be made available to any WWT member who wishes to see it.

Top Ten for October

1. Thornton Heath; 2. Rugby; 3. Leeds; 4. Dublin;
5. Doncaster; 6. Leicester; 7. Brighton; 8. Middlesex; 9. South Devon; 10. N London.

Top Ten for November

1. Leicester; 2. Derby; 3. Southend; 4. N London;
5. BTRAC; 6. Rugby; 7. Thornton Heath; 8. Boston;
9. Friern Barnet; 10. Walthamstow.



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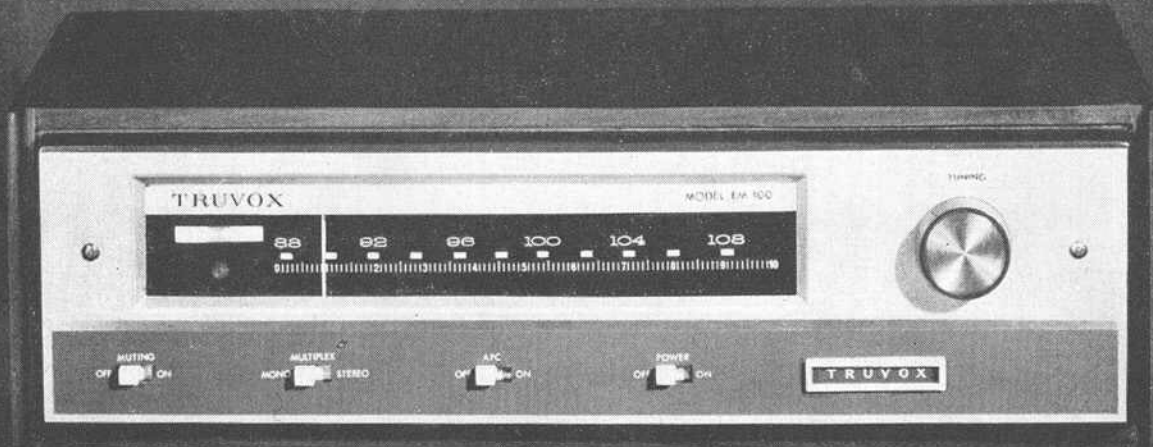
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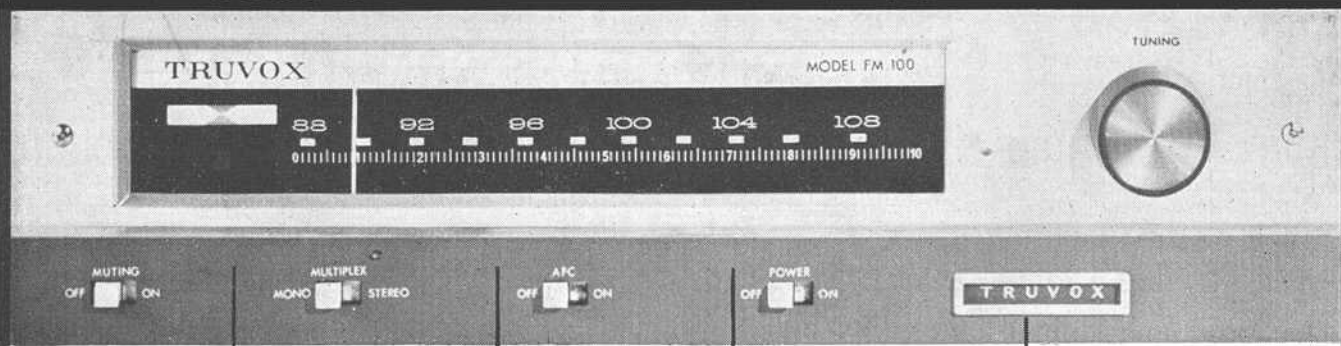
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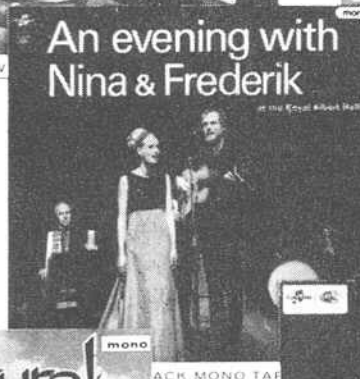
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