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## HI-FI

## YEAR BOOK

## 1966-1967

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## INTRODUCTION

Ever since its second edition, in 1957, Hi-Fi Year Book has followed more or less the same pattern of make-up, with photographs and specifications in adjoining columns, and with the main directory sections preceded by an introductory article. This style was chosen because, at the time, it seemed to offer the best method for keeping the directory entries in closest touch with their illustrations; but it lost its point with the passing of time, because numerous variations of text expanded the specifications columns so much that the photographs could not keep pace. And the position was further aggravated by spring publication dates which caught manufacturers at a time when their equipment was not ready for photography. All this made it necessary to punctuate text with pictures, and the result became untidy.

In this edition of Hi-Fi Year Book we have completely revised the method of presentation, so that text and illustrations can run independently within their own sections-each arranged as nearly as possible in alphabetical sequence. We think that this revision will make it much easier to locate and link-up pictures with directory entries, and it should also make for a smoother reading of text. In the past, in an effort to hold the two together, illustrations often had to be omitted. With the new method-assuming a continued growth in the number of products-it is possible to include all photographs that are submitted. And here we add a special reminder to manufacturers and agents that one of the aims of Hi -Fi Year Book is to illustrate all items of equipment that are of interest; and in this edition no photograph that was received in time has been left out. We therefore request an even greater selection for the 1967-68 edition.
A further revision of style will be seen in the grouping of all the articles at the beginning of the book. This, too, makes for smoother reading and a more compact form of presentation. In its new arrangement-articles, directories, advertisements-Hi-Fi Year Book is a more flexible reference work, and we hope that readers of this eleventh edition will find the changes useful.

There has again been a very large increase in the number of audio products on the market, and this is particularly noticeable among items of equipment from overseas sources. Indeed, with every succeeding edition Hi-Fi Year Book becomes more and more international in its content-a fact which is reflected in its own increasing sales in overseas countries.

As will be appreciated, a very great amount of work is involved in the collection and compilation of material and the checking of data, and while every care has been taken to avoid mistakes the publishers cannot accept responsibility for any errors or omissions.

# PICKUPS TODAY 

by Stanley Kelly

TThe prime function of a gramophone pickup is faithfully to translate the information stored mechanically on the gramophone record into a corresponding electrical signal. As is well known, it accomplishes this feat by the application of motion from a modulated Vee-shaped groove in the gramophone record via a hemispherical stylus coupled to the actual transducer element. Therefore the parameters of the record groove and the record material are major factors affecting the performance of the pickup.

Starting with the economics of the system, the first requirement is that both the record and the pickup shall have a long and trouble-free life; and apart from designed obsolescence the life of the record and of the pickup are determined by the mutual attrition of the groove and the stylus
tip. This mutual wear is due to friction at the interface of the stylus and the groove wall, aggravated by dust particles and in some cases additional mud left by abortive attempts at record cleaning. The rate of wear (other factors, e.g. coefficient of friction, etc., being constant) is a function of the pressure exerted between the stylus and the groove wall.

Present day styli are either sapphire or diamond, and are several orders of magnitude harder than the record material. Therefore upon the application of pressure between the stylus and the record, it is the record rather than the stylus that deforms. Fig 1 shows the deformation of a gramophone record versus the applied pressure of a spherical indenter. Curve A shows the indent diameter against stylus pressure;

below point X , the material behaves substantially as an elastic medium, whilst between X and Y it is progressively becoming more plastic with signs of permanent deformation; at loads above Y the material is stressed well beyond its elastic limit, usually showing surface damage in the form of hairline cracks and "crater" thrown up around the depression. At loads below X
( 1.5 gm .) experimental results are inconsistent, and the curve has been extrapolated until it meets curve B, which is the slope of the Young's Modulus, assuming that the material exhibits no hysteresis and faithfully follows Hooke's Law for all values of strain. In the interests of reduced record wear and concomitantly, stylus wear, the ideal limit would obviously be playing weights


less than $\frac{1}{2}$ gm., and certainly $1 \frac{1}{2}$ gm. can be taken as the upper limit to maintain optimum record life. Concurrently, stylus wear, expressed as the size of "flat" developed at the point of contact with the record, is likewise a function of playing weight.

Graph, fig 2, shows the life of a diamond stylus at two playing weights, 2 gm . and 5 gm ., and for different radii. It will be seen that even at only 2 gm . playing weight with a half thou. stylus point, the life is only 1,000 hours for a "flat" diameter of a quarter thou., which with wide-range low-distortion equipment is currently accepted as being the maximum flat diameter to be tolerated. Increasing the stylus radius to 0.7 thou. or 1 thou. considerably increases the life of the stylus, but this will be at the expense of increased tracing distortion.

The reintroduction of "elliptical" styli with major (supporting) axis of 0.7 thou. and minor (playing) axis of 0.35 thou. certainly reduces tracing distortion, but it must be remembered that the effective area of contact (and hence the pressure) is nearer to that of 0.35 thou. than an $0 \cdot 7$-thou. stylus, and the corresponding stylus life is proportionately reduced. The life of the elliptical stylus at 2 gm . playing weight is not much greater than 500 to 700 hours under normal conditions.

It may not be realised that although the vynil record is a great advance on the shellac-cumslate monolithic monsters, the coefficient of friction between the stylus and record is considerable and varies widely between records of dif-
ferent manufacturers: the range is between $0 \cdot 18$ and 0.35 ! and it is this frictional component together with the extremely high pressures which exist at the interface of the stylus and record, that account for the attrition of these two components! Incidentally, it does seem to cast some doubt on the efficacy of side thrust compensation, unless when setting the bias compensation one has accidentally chosen a record with a coefficient of friction which is the mean of the above values!

Whilst ideally the groove profile is an inverted Vee with an included angle of $90^{\circ}$, in practice it varies cyclicly and with modulation level. The bottom of the record groove should ideally be infinitely sharp, but with commercial pressings it is of an indeterminate radius; this is maintained at minimal value by the record manufacturers but can sometimes exceed half a thou.! indeed, until the advent of stereo recording, the groove bottom radius was not under strict manufacturing control and some of the earlier LP pressings are unplayable if the tip radius of the stylus is less than 1 thou.

The maximum reaction between record and stylus will be where the forces are greatest, and these will normally coincide with maximum mechanical impedance at the needle tip. At low frequencies this is determined by the compliance of the system (of which more anon) and at high frequencies by the acceleration and mass of the stylus with the rest of the system referred to it.



The high frequency reaction effect can be computed in two ways:
(a) Acceleration method. The stylus is kept in contact with the groove walls by a force due to gravity and the effective mass (playing weight) of the pickup system. If the upward force due to reaction between the record and stylus is greater than the playing weight the stylus will lose contact with the groove. A stereo record groove is modulated in two planes-vertical and lateral, but because the groove walls are set at an angle (nominally $45^{\circ}$ ) there will be a vertical component even from the lateral motion, and with records the maximum vertical and lateral velocities are about $10 \mathrm{~cm} / \mathrm{sec}$. at $10 \mathrm{Kc} / \mathrm{s}$.

The effective mass of a bodv is its static mass multiplied by its acceleration " "口":

$$
\begin{array}{rll}
\mathrm{g}=2 \pi \mathrm{fv} & \text { where } \pi & : 14 \\
\mathrm{f} & \text { Icuuency } \\
\mathrm{v} & \text { (clocity }
\end{array}
$$

Therefore stylus mass times " g " should be less than the playing weight.

(b) Impedance method. The force represented by the playing weight is divided by the maximum velocity and this gives the maximum modulus of mechanical impedance available. This impedance is converted into effective mass at the required frequency by dividing by $2 \pi \mathrm{f}$. It is important in all these operations to decide at the onset on the system of units to be used: i.e., M.K.S., c.g.s., or ft. lb. sec., etc. Results can be hilarious (and time consuming) if one metaphorically changes one's horse (power?) midstream.

So much for the basic requirements of playing weight set arbitrarily at a maximum of 1.5 gm .! To summarise our requirements: (1) Playing weight less than 1.5 gm . (2) Stylus tip radius 0.0005 inch maximum, or "elliptical", 0.00035 inch minor axis and 0.0007 inch major axis. (3) Maximum velocity at $10 \mathrm{Kc} / \mathrm{s}$ approx. $10 \mathrm{~cm} / \mathrm{sec}$.

A velocity of $10 \mathrm{~cm} / \mathrm{sec}$. at a frequency of $10 \mathrm{Kc} / \mathrm{s}$ is equivalent to an acceleration of approximately 650 g . The available tracking force is 1,500 dynes, thus maximum tip mass with no factor of safety, is 2.3 mgm . This value of tip mass may be predetermined by other considerations, i.e., high frequency resonance, etc. If it is decided to reduce this mass, then the playing weight may be reduced (always assuming that the compliance can be increased to accommodate the new value), or some factor of safety introduced - which, heaven knows, doesn't happen often nowadays.

Having defined the high frequency limit, let us turn our attention to the remainder of the fre-
quency band. The maximum low frequency modulation was determined by the record manufacturers initially by the minimum groove spacing, but in these days of variable groove depth and spacing (to accommodate even greater dynamic ranges in the search for realism) the ultimate limit is governed by how close to "burnt out" the recording engineer will run his equipment. Fig 3 shows the current (they may be higher next year!) maximum levels on highquality discs. The high frequency limit is determined by the "curvature" limit of the stylus radius-increasing the tip radius will reduce the maximum velocity at which the stylus maintains single point contact with each groove wall. Increasing either tip radius or recording level will result in stylus "bounce". The low frequency level is a "constant amplitude" curve and is determined by cutter capacity with an overall limit of about $25 \mathrm{~cm} / \mathrm{sec}$. Thus our limits are a maximum velocity of $10 \mathrm{~cm} / \mathrm{sec}$. at $10 \mathrm{Kc} / \mathrm{s}$, $2 \mathrm{~cm} / \mathrm{sec}$. at $20 \mathrm{c} / \mathrm{s}$, and $25 \mathrm{~cm} / \mathrm{sec}$. from $250-$ $3,000 \mathrm{c} / \mathrm{s}$.

We are now in a position to determine the maximum restoring force (minimum compliance of the system). By definition, compliance is displacement divided by force, and the displacement (peak amplitude) of a $20 \mathrm{c} / \mathrm{s}$ wave with a velocity of $2 \mathrm{~cm} / \mathrm{sec}$. is $1.6 \times 10^{-2} \mathrm{~cm}$. The limiting compliance is thus:

$$
\mathrm{Cm}=\frac{1.6 \times 10^{-2}}{1.5 \times 10^{+3}}=10^{-5} \mathrm{~cm} / \text { dyne }
$$



Query: How do modern highly damped cartridges meet with this specification when the resistive component is predominant? Answer: They generally don't!

An alternative method of specifying the parameters and, in the case of these pickups, probably the correct one, is in terms of needle tip impedance. This, by definition, is force divided by velocity, and the graph, fig 4 , shows the tracking weight versus needle tip impedance for a velocity of $20 \mathrm{~cm} / \mathrm{sec}$. One can obviously extrapolate this curve for other velocities, and for $10 \mathrm{~cm} / \mathrm{sec}$. at 1.0 gm . playing weight, the maximum needle tip impedance will be approximately 100 mechanical ohms. Fig 5 shows the maximum impedance of a hypothetical pickup to track the velocity curve of fig 3 . Note the higher impedance allowed at the low frequency end due to lower velocity.

The simplest mechanical structure a pickup


FIG. 7
can possess is one in which the stylus and armature can be concentrated as a unit mass with the restoring force concentrated at the remote end. The record is thought of as a constant velocity generator; that is, irrespective of the mechanical load presented to the record it will provide an invariable velocity. Shunted across the output of the generator is a compliance representing the compliance existing at the interface of the stylus tip and the record groove walls. For convenience, we can think of it as a pure compliance, although in practice it is not so. There is a loss component associated with it and under terms of high stress, a variable conductance.

Fig 6 shows the analogue of such a system. It will exhibit a series resonance formed by the restoring force and the circuit mass at some mid frequency (about $800 \mathrm{c} / \mathrm{s}$ ) and, at a substantially higher frequency, an anti-resonance (high impedance) formed by the two compliances in series resonating with the stylus mass. It will be

seen that the record tip compliance is two orders of magnitude greater than the restoring force, and to a first approximation the high frequency resonance can be determined by these two paramaters alone. In order to increase the frequency of resonance as much as possible, either the tip mass must be reduced, or the circuit compliance reduced.

Despite the claims of the advertising sections of the various pickup manufacturers, I have not yet to my satisfaction measured a commercial pickup with a dynamic mass of less than 1 mgm . The tip/record compliance is a function not only of the record material, but also of the playing weight and the tip radius. Reducing both increases the compliance. The value given on the analogue represents a fair mean, but an error of $2: 1$ in either direction can quite easily be obtained under different methods of measurement and interpretation.

At this stage, we will introduce another variable: namely, the tone arm. Fig 7 shows the analogue and an impedance curve of a typical

commercial pickup. It is seen that the tone arm represents a mass in shunt with the restoring force, and will resonate the total circuit compliance to some low frequency (the stylus and armature mass can be neglected) dependent only on the values chosen. It is desirable to place the frequency of this resonance below the lowest recording frequency. Current high fidelity units have resonances between $7 \mathrm{c} / \mathrm{s}$ and $20 \mathrm{c} / \mathrm{s}$, whilst domestic reproducers are usually in the 20 to $30 \mathrm{c} / \mathrm{s}$ region.

Having determined the mechanical constants, it only now remains to add the transducer proper to the stylus and we have a pickup! Commercially available pickups today are divided into two basic classes: magnetic units and crystal units. It is generally considered today that, because of the simpler mechanical structure of the transducer, the magnetic units offer a "higher fidelity" (whatever that means) than crystal units. What is factual is that the best examples of magnetic units offer a lower tip mass, a wider frequency response, and better crosstalk factors than any crystal cartridges, but a lot of the run-of-the-mill magnetic units do not fulfil the high promise claimed for them.

In the case of variable reluctance cartridges, the armature and the stylus tip are intimately connected; fig 8 shows a typical example. The dynamic mass in this armature, both lateral and vertical, is of the order of 1.6 to 1.8 mgm . It comprises a Mumetal tube 0.156 inch long, 0.022 inch diameter, and 3 thou. wall thickness. The mechanical configuration of the pickup is shown in fig 9 , in which the two outside coils are the lateral sensing coils, and the centre coil is the vertical unit. Fig $\mathbf{1 0}$ shows the circuit arrangement of this unit. This cartridge and the other British variable reluctance cartridge are, so far as I know, the only examples of sum and difference cartridges available anywhere. They do represent a stability and a consistency not found


## EMI EPU 100

on any other transducer. A typical response curve is shown in fig 11, and this is characterised by the extremely low crosstalk and absence of "wiggles" in the crosstalk response curve.

The second class of magnetic pickups are the moving magnet types, which are the current popular product in America although developed by Schmidt of Germany. The moving magnet cartridge has an extremely simple structure, and is of the general form shown in fig 12. The armature consists of a small magnet mounted at the end of a cantilever. Startling figures are claimed for this type of structure which are not borne out in my experience.

I recently disembowelled a unit with a claimed compliance in excess of $10^{-5} \mathrm{~cm} /$ dyne, and a dynamic mass of less than 1 mgm . The total mass was 20.39 mgm , comprising magnet 3 mm long $\times 1 \mathrm{~mm}$ diameter, weighing 17.08 mgm ; the cantilever was 7.5 mm long and weighed 3 mgm ; the diamond stylus tip was 0.21 mgm ; the thin
steel wire, cement, and the rubber bush amounted to the rest of the static mass. The rubber bush, which also acted as the restoring force, was secured in line with the front face of the magnet. This measured low frequency compliance of $1.2 \times 10^{-5} \mathrm{~cm} /$ dyne met the specification, but the effective mass varied between $2 \cdot 3$ and 3.7 mgm , depending on the frequency and method of measurement. This unit is typical of the moving magnet systems being offered today. There is, however, another point which we will touch on later, and that is the vertical tracking angle of the cartridge.

Crystal stereo cartridges today use almost exclusively ceramic elements as the generator. Because they have two completely independent generating systems, with no electrical interconnections, they must be separately excited and, as distinct from magnetic systems, they invariably are $45^{\circ} / 45^{\circ}$ systems. This complicates the mechanical system, and because of the

number of mechanical meshes involved, it is difficult to obtain a very smooth frequency response. Fig 13 shows the analcgue of a typical unit. Basically, the generator is of modified bimorph construction, 0.5 inch long $\times 0.062$ inch wide, and 0.025 inch thick. The basic resonant frequency of the crystal as a cantilever is $1,700 \mathrm{c} / \mathrm{s}$, and as a beam, $4,750 \mathrm{c} / \mathrm{s}$. The method of supporting the crystal usually results in the damped resonant frequency of the crystal being about $3 \mathrm{Kc} / \mathrm{s}$. The effective mass of the crystal varies between 25 and 50 mgm according to the frequency and method of mounting, whilst the stiffness is about $5 \times 10^{-8} \mathrm{~cm} /$ dyne.

It will be seen that the values of impedance are several orders of magnitude greater than is acceptable at the stylus tip, and it is usual to obtain this reduction in impedance by lightly clamping the crystal and providing a large measure of lost motion in the driving member to the crystal. Mathematical analysis is difficult, and the system must be devised by trial and error methods. The success of the unit is dependent on the right amounts of damping in the elastomers used for the mounts and drive, and the crosstalk is basically the ratio of the reflected impedances of the coupling members to the wanted and unwanted channel. These impedances are complex in that in addition to the selfcompliance and mass there is the reflected impedance of the crystal and its mounting and damping pads. It is not difficult to obtain compliances of the order of $10^{-5} \mathrm{~cm} /$ dyne, but it is impossible to obtain effective stylus dynamic mass in the same order as that of magnetic cartridges. The response curve of a cartridge is shown in fig 14.

Inherently, moving coil trarsducers should generate lower harmonic and intermodulation distortions than either magnetic or crystal cartridges, and in the only currently available example. the distortions are certainly of a very

low order. Mechanically, the moving coil lies midway between the variable reluctance and the crystal pickup in complexity. It consists of two coils, mutually perpendicular, with their planes arranged at $45^{\circ}$ to the horizontal. The coils are suspended so that they may oscillate circularly about the vertical plane, but are rigid longitudinally. The coils are driven via a cantilever, and the effective dynamic mass referred to the stylus tip is of the order of 1.7 mgm . The torsional compliance and moment of inertia are a little higher than in the best variable reluctance units, but lower than the moving magnets. Being essentially low impedance devices they must use matching transformers, which in turn require careful shielding to avoid hum pickup.

Amplifiers using transistors are becoming more popular, and each year their protagonists confidently claim that the days of the valve amplifier are numbered, but because of the noise limitation of transistor amplifiers, thought must be given to obtaining optimum power transfer between the pickup and the amplifier input. Most grounded emitter transistors present a load impedance to the generator of a few thousand ohms. In the case of moving coil pickups, the situation is simple, requiring only an alteration in the turns ratio of the transformers. $45^{\circ} / 45^{\circ}$ magnetic type pickups (this includes all

current moving magnets and one or two variable reluctance types) again present no real difficulties, the turns ratio and gauge of wire being adjusted to match the generator and load impedances.

With hill and dale/lateral summation pickups. the situation is more difficult. Fig 15 shows the schematic of the pickup coils, and it will be seen that the lateral coil is common to both channels. If the pickup is feeding into substantially an open circuit, no current will flow through the coils, and the voltages generated will summate correctly. If the load resistance is reduced so that current is derived from the pickup, current generated by the lateral coil will flow through both vertical coils in phase. and this current will increase the crosstalk by a significant amount. This philosophy also applies where the high frequency roll off is obtained by shunting the pickup with a low resistance, using the selfinductance of the pickup coils to obtain the necessary time constants.

With crystal cartridges, which are basically constant voltage generators in series with a small capacity, usually of the order of $1,000 \mathrm{pfd}$., the load impedance must be of the order of 1 megohm to obtain adequate bass response. However, the generated voltage is usually of the order of 50 to 200 millivolts, compared with the few millivolts obtained from magnetic units, and with valve amplifiers presents no difficulties; indeed, because the response is substantially corrected, no replay correction is required and, together with its high output, crystal cartridges show considerable economic advantages over magnetic types.

Three courses are open to the unfortunate transistor amplifier designer: One is to increase the input impedance of the amplifier (either by feedback or simply a series resistance) to the
required value. This results in a noisy system which is, however, adequate for domestic radiograms, record players, etc. The second course is to use intermediate input impedance and selective feedback to obtain a flat frequency response. This shows a little improvement in signal to noise ratio at high frequencies, but aggravates

the low frequency noise problem. Because of the variation in capacity with temperature of Rochelle Salt crystals, this system is not recommended, although it can be used with ceramic units which have a substantially zero temperature coefficient of capacity, and there is thus no frequency variation with temperature. The third course is to shunt the pickup with a high capacity, and this is probably the ideal method. A 5 mfd capacitor will reduce the output voltage to about 300 microvolts, which is the nominal input sensitivity of current transistor amplifiers. This method appears to offer the best compromise on the score of signal to noise ratio, component cost, etc. It may be advisable to add some series resistance to the 5 mfd shunt condenser to offset the top cut due to losses in the crystal itself.

This is the story of the pickup "works" as we know it today. A year ago we thought the millennium was just around the corner with the semiconductor "piezo-resistive" pickup; we cannot prognosticate this year, but next year?who knows?



# RADIO TUNERS 

by T.H.D. Attewell

$\mathrm{A}^{\mathrm{t}}$t first sight it seems paradoxical that a tuner, which comes first in the home hi-fi chain when in use, is usually the last item to be thought about. Most enthusiasts have strong views on turntables and pickups, and will cheerf ully take on all comers in wordy defence of a cherished loudspeaker enclosure, but tuners do not seem to induce the same enthusiasm. The facts are that superb quality reception is often (alas, not invariably) available, and that the enjoyment of this material can be made or marred by the choice of a tuner.

It may be that some of the misgivings about the quality of sound broadcasting are the result of well-meaning but misguided attempts to connect the audio outputs of transistor pocket portables, table radios or even monstrous radiograms to the input of a hi-fi amplifier and speaker, expecting good quality sound to emerge. The result is usually a travesty of the original, more often than not surrounded by a generous aura of mains hum. The reason is that the damage occurs before the signals reach the hi-fi input terminals.
Most of the commercially available radio sets are necessarily based on a compromise between cost and quality and, as far as audio output is concerned, there is a severe restriction already imposed by the size of the speaker and cabinet. The circuit designer will not be encouraged to waste time and money on development, caref ully designing out hum, for example, when the benefits of such clean design cannot be reproduced by the loudspeaker anyway. Connecting these sets to a wide-range system will swiftly reveal such design compromises, and "lash-ups" of this sort soon fail to satisfy all except the least critical of listeners. The best alternative is to invest in a tuner properly designed for the important job it has to do.
The problem is to decide on the type of tuner required. A look at the advertisements reveals a
selection ranging from a simple switch-tuned three-station job to the all-singing, all-dancing variety. Before plunging in too deeply, it is worth bearing in mind that there are several reasons for not buying something much more complicated than is needed-cost and reliability to name but two. On the other hand, it is infuriating to buy a simplified device, only to find a real need for just one particular extra facility a few weeks later. The primary consideration, however, must always be the type of transmission to be received, so let us consider first what transmissions are available.

All programmes for home reception are either amplitude-modulated (a.m.) or frequencymodulated (f.m.). A.M. sound transmissions are available on a number of wavelengths ranging from a few centimetres to a few kilometres. It can be said at once that special equipment is needed to deal with the centimetre transmissions, which are mainly experimental and of very short effective range. It can also be said that those who want to cover the whole of the remainder of the range would probably be better off with a communications receiver, since many of the a.m. transmissions are of low power, and subject to interference and fading.

Tuners catering for a.m. transmissions usually cover the long wave range (about $800-2,000 \mathrm{~m}$.), and/or the medium wave range ( $190-550 \mathrm{~m}$.) with, in some cases, other selections in the range $10-150 \mathrm{~m}$. A.M. sound transmissions also include the Band I and Band III television sound channels, which are also provided on some tuners.
F.M. transmissions, on the other hand, are found in the v.h.f. band $88-108 \mathrm{Mc} / \mathrm{s}$. Although many enthusiasts report frequent periods of good reception from the Continent (and even further) it is unlikely that, in general, consistent reception of really good quality material will be found more than $50-70$ miles from the trans-
mitter. There is also the problem that the aerial should be orientated for best results, and this is a fiddling job to most people. For f.m., therefore, the local service area is the only one of interest to the majority of listeners, and there are at present only three or four programmes to consider.

It is on the f.m. system that regular stereo broadcasts will (if we wait sufficiently long, no doubt) become available. Although no authoritative statement is yet available as to the stereo system to be used, there seems little doubt that the pilot-tone system which has been transmitted experimentally from Wrotham since 1962 will be finally adopted. Anyone owning a basic stereo system, or expecting to set one up in the foreseeable future, would therefore be well advised to make sure that the tuner of his choice is capable of doing justice to stereo f.m., and that it is fitted with, or capable of being used with, a decoder-of which more later.

It will now be clear that the basic choice of tuner must start from the questions a.m. or f.m.?-or both? We shall see that f.m. offers a number of solid advantages over a.m., and any-
one who requires really good quality reproduction should choose a tuner capable of receiving f.m. For the many who can find a sufficient choice of programme material in BBC transmissions, an f.m. tuner alone will be sufficient.

To roam Europe at the expense of a reduction in quality, a.m. facilities will be required as well. Should they be combined or separate? This is largely a personal choice, and considerations of cost or space may dictate the answer, but it is worth bearing in mind that in this present age we get pretty much what we pay for. To buy an a.m./f.m. tuner in which there has been no design compromise between the requirements for the two functions may cost almost as much as two separate units, and some may consider that the additional flexibility of the latter alternative is worth the difference. Before the choice can be finalised, however, the specification of the proposed "buy" must be assessed against its cost. To be able to do this properly we need to look a little more closely at some of the requirements for a.m. and f.m. tuners.

An a.m. transmission has a waveform such as that in fig 1a, where a complex sound is being

broadcast as a "carrier" wave of fixed frequency whose amplitude is made to vary to correspond with that of the audio signal. An analysis of the complete waveform shows that it consists of a group of frequencies similar to those in fig $\mathbf{1 b}$, of which the carrier is the central component, and the remainder of the group, called sidebands, extend upwards and downwards in frequency. The range of frequencies needed to transmit the full audio range up to $20 \mathrm{Kc} / \mathrm{s}$ extends for $20 \mathrm{Kc} / \mathrm{s}$ on both sides of the carrier. To reproduce this audio range in full, it would be necessary for the receiver to have a bandwidth of $\pm 20 \mathrm{Kc} / \mathrm{s}$, as shown in the dotted curve of fig $\mathbf{1 c}$. In practice, this bandwidth cannot be utilised, because the transmitters used for a.m. reception are spaced at $9 \mathrm{Kc} / \mathrm{s}$ (or lower) intervals. To avoid receiving more than one station at a time, the receiver bandwidth must usually be reduced to $\pm 4 \mathrm{Kc} / \mathrm{s}$ (full curve in fig 1c), especially at night, when distant stations enjoy more favourable propagation conditions.
Some idea of the quality restriction inherent in a bandwidth limitation of $4 \mathrm{Kc} / \mathrm{s}$ may be judged by the fact that even speech, surprisingly, requires frequencies well beyond this limit for realistic reproduction. Organ pipes have fundamental frequencies extending up to $8 \mathrm{Kc} / \mathrm{s}$ (1-foot pipe $C^{5}$ ), and most orchestral instruments, especially brass and percussion, fare badly with such a severe top-cut. It is not too much to say that nearly all music will sound dull and lifeless under these conditions.

Another disadvantage to a.m. for the serious listener is its proneness to man-made interference. Fig 2 shows how, for example, commutator noise from a mains-driven motor picked up by a tuner can appear as amplitude modulation *superimposed on the transmitted waveform. The detector cannot distinguish between the spurious and true modulations, and the result is an unpleasant noise. Even worse, high peaks can cut-off one or more stages (e.g. levels above the dotted line in fig 2) and this can paralyse the receiver for short periods-with disastrous (audible) results.

Non-linear distortion is also met too frequently in a.m. receivers. In a nutshell, the effect is that a pure sinewave modulation, after extraction by the detector, is found to be accompanied by unwanted harmonics, the number of harmonics and their amplitude with respect to the fundamental being a function of the depth of modulation. This can be avoided by correct design-but it is unfortunate that "correct" also means, quite often, "more expensive". Unless one is prepared to examine the circuit diagram of a proposed a.m. tuner in detail, and do a few sums, it is best to rely on the specification quoted by a reputable manufacturer. Again it must be


FIG. 2.
repeated that an efficient aerial system will help to maintain reasonable signals at the detector, and provide better linearity and signal/noise ratio. The traditional 6 inches of frayed wire held in the aerial socket by a broken matchstick does not give any design of tuner a fair chance.
Turning now to f.m. and its characteristics, a typical transmission has the form shown in fig 3a. Here the information is conveyed at constant amplitude by altering the frequency of the carrier wave. It is important not to confuse the ways in which the frequency and amplitude respectively of the audio signal are conveyed in this type of transmission. In brief, the amplitude information is contained in the extent of the frequency shift used, and the audio frequency is the frequency at which the shift occurs. The extent of the shift is called the deviation, which is therefore proportional to the amplitude of the audio signal transmitted. From the points of view of the designers of both transmitters and receivers, an upper limit must be set to this deviation, corresponding to the peak audio amplitude which will be used in practice, and this limit is set at $\pm 75 \mathrm{Kc} / \mathrm{s}$ about the mean carrier frequency. This deviation is only reached on extreme peaks, and the mean deviation of most programme material is very much less than this.
As in the case of a.m., a first glance at the apparent bandwidth required in the tuner to deal with this spectrum can lead to an overoptimistic guess that $\pm 75 \mathrm{Kc} / \mathrm{s}$ about the carrier will do. Unfortunately, the mathematics show that (as usual) there is more to it than appears, and the actual bandwidth needed is more like $\pm 125 \mathrm{Kc} / \mathrm{s}$ if non-linearity on loud passages is to be avoided. Unlike a.m., the effect of reduced bandwidth is not to limit the a.f. bandwidth conveyed, but only to introduce distortion on loud passages. Needless to say, it is of no use to turn down the volume control in an attempt to compensate for poor bandwidth! This only adds lack of realism to the distortion already present!

However, the $\pm 125 \mathrm{Kc} / \mathrm{s}$ quoted is sufficient for even the most fastidious, and, in practice, $\pm 75$ $\mathrm{Kc} / \mathrm{s}$ would be sufficient for a large proportion of the programme time. A reasonable compromise, and one that is not too difficult to attain, would be $\pm 100 \mathrm{Kc} / \mathrm{s}$.

As for the range of audio frequencies transmitted, this can be excellent where f.m. is used. Where programmes are routed over long land lines, there can be a noticeable loss of "top", but the best material covers a range extending from well below $50 \mathrm{c} / \mathrm{s}$ (often there is little fall-off down to $30 \mathrm{c} / \mathrm{s}$ ) and up to at least $15 \mathrm{Kc} / \mathrm{s}$ on stereo broadcasts or up to $20 \mathrm{Kc} / \mathrm{s}$ on some mono ones.

What of interference problems in f.m. reception? These still exist, but are of a rather different type. Only the higher frequency man-made interference such as radiation from unsuppressed ignition systems (should you have a guilty conscience about this, by any chance?) cause trouble. The tuner is only relatively insensitive to a.m. interference, and large amplitude pulses can produce audio output from the discriminator. However, the total interference is very much less with f.m. than a.m., and a good aerial placed as high as possible will do much to reduce it even further.

So far we have implicitly considered only
mono broadcasts. Since it is by f.m. that we shall hope to receive regular stereo broadcasts one day, it would be well to examine how this is done, and what additional requirements are placed on the tuner.

The system proposed for this country is that originally suggested by Zenith-G.E., and adopted as the F.C.C. standard, and is a compatible system-that is, programmes can be received in stereo by the appropriate receivers, but can equally well be received in mono by existing mono receivers.

Fig 4 shows the signal used to frequency modulate the carrier. This modulation is derived from two audio channels, A (= left hand) and B ( $=$ right hand), and it will be seen that the sum $(A+B)$ occupies the range $30 \mathrm{c} / \mathrm{s}$ to $15 \mathrm{Kc} / \mathrm{s}$. This part corresponds to the sum of the audio information arriving at the two microphones. If these are close together (Bliimlein technique), the phases of the signals arriving at the two microphones from one source will be substantially the same, and simple addition will occur, but with spaced microphones there can be problems. These are outside the scope of this article, but their existence is probably worth the mention in passing. The $(\mathrm{A}+\mathrm{B})$ signal is the one "recognised" by normal mono f.m. receivers.

Next comes the pilot tone at $19 \mathrm{Kc} / \mathrm{s}$-a fixed frequency, and of deviation $8-10 \%$ that of the


total deviation. Above the pilot tone lies a band occupied by the difference signal (A-B). This is amplitude modulated on a $38 \mathrm{Kc} / \mathrm{s}$ sub-carrier, which is then suppressed, so that the final modulation comprises the upper and lower sidebands of the (A-B) signal, with a "notch" at $38 \mathrm{Kc} / \mathrm{s}$.

In the tuner we must consider first what additional requirements are imposed on the circuits common to mono and stereo reception by this stereo signal, and also what decoding circuits must be added to obtain stereo outputs. We can dispose of mono reception quite simply by noting that only the $(\mathrm{A}+\mathrm{B})$ signal is required, and this is equivalent to the normal mono transmission although it will be noted later that there is a small degradation of signal/noise ratio. No additional requirements, therefore, arise in this case. For stereo, however, there are two important considerations.
First, the response at the discriminator, which demodulates the transmission to produce the audio outputs, must now have a linear characteristic over a wider frequency range. Ideally, its output without de-emphasis should be of constant amplitude and linear in phase from $30 \mathrm{c} / \mathrm{s}$ to at least $53 \mathrm{Kc} / \mathrm{s}$, but in practice some depar-
ture from this ideal can be tolerated, since compensation for a reasonable difference in level between sum and difference channels can be applied in the decoder.
Second, regarding the vexed question of random noise, as distinct from man-made noise, it is not always appreciated that a stereo transmission is inherently more noisy than the mono version. The reason is that the stereo receiver is required to demodulate the (A-B) signal as well as the sum signal, and in doing so it necessarily also demodulates all the noise components in this additional region of the spectrum. These would not appear in the output of a monophonic system, and account for a degradation of signal-to-noise ratio in the system discussed here of nearly 4 dB when the sum signal is used alone for mono reception, or about 21.5 dB when the A or B signals are used. This is a serious penalty, and care is needed to avoid making matters worse by poor tuner design and inferior aerial systems. It is not unusual to find listeners already putting up with a $\mathrm{s} / \mathrm{n}$ ratio at least 20 dB worse than it need be, so that by taking steps to rid themselves of unnecessary noise these people, at least, will be able to receive stereo at a $\mathrm{s} / \mathrm{n}$ ratio no worse than they are used to on mono!
There are three regions in which care in design and use of the tuner can cut down spurious noise. We start, as usual, at the aerial. Some of "he "bodges" used for f.m. reception have to be s.en to be believed-trailing bits of wire, indoor aerials of indeterminate length and polarisation (often intended for TV) and odd lengths of gas pipe propped up drunkenly among the roof joists are all too common, while the "feeder" might be anything from coaxial cable to lengths of bell-wire joined with bare, unsoldered twisted joints. Such horrors as these are often responsible for considerable noise on the present transmissions, and should be just about intolerable on stereo.

A good aerial costs little in relation to the years of good listening it can help to provide, and it should be connected to the tuner by a feeder of the correct type. A suitable feeder will


FIG. 4.
be specified by the tuner manufacturers, and the aerial chosen must be of a type which will work properly into that particular feeder. A reputable dealer should be able to supply a suitable combination to order, and if he is a local man he will probably be able to help with some idea of the complexity of the aerial required in his area. If in doubt, get a higher gain aerial rather than a lower one-it is easy enough to dispose of excess signal in the rare event of it being necessary to do so.

Next comes the input stage of the tuner. Low noise techniques for valve and transistor input stages are well known, and have to be weighed against their cost and any secondary disadvantages. For example, a triode may be less noisy than a pentode, but may require neutralising, and will usually have a lower gain. One valve circuit sometimes used in the cascade arrangement of fig 5, where V1 is a grounded-cathode stage in series with V2, a grounded-grid stage. The combination can give a gain comparable with that of a single pentode but with a noise figure little worse than that of a single triode.

Less well known is the fact that appreciable noise may also be introduced by the local oscillator stage. This can be reduced by the use of low-noise components in the circuit and low valve-currents-the latter also help to improve tuning stability - and by using a grid tuned circuit of as high a Q as possible. A particularly annoying source of audio noise can be produced in the local oscillator by microphony. When this occurs, external vibration (even from the programme listened to) causes a corresponding vibration in the oscillator valve, tuned circuit, or wiring. This frequency-modulates the oscillator, and the result is a clanging sound in the loudspeaker. In severe cases, the acoustic feedback is sufficient to cause a continuous howl. A good tuner includes suitable precautions against this trouble, and it should be possible to tap it lightly (with knuckles, not hammers!) without hearing undue clanking noises from the speakers. Transistors have an advantage here, of course, since they are inherently non-microphonic.

The third region in which random noise can



## fIG.7. BLOCK DIAGRAM OF STEREO DECODER

be introduced is in the limiter, discriminator and decoding circuits. To find out how, we must now examine these circuits more closely. Dealing with the first two, most f.m. tuners use either the Foster-Seely or the ratio detector discriminator. The Foster-Seely requires a prior limiting stage because it is sensitive to a.m. as well as f.m. signals: the ratio detector does not, because it has built-in dynamic limiting capability. The limiting action of the ratio detector is generally inferior to that of a properly designed separate stage, but is usually adequate except in conditions of heavy man-made noise. Neither of these arrangements contributes appreciably to the random noise when properly aligned.

There is another form of discriminator which has found some use, especially in amateur circles, namely the pulse counter discriminator, proposed for this application by Thomas Roddam. One basic type is shown in fig 6. It is a "diode pump" circuit into which the limited output of the i.f. amplifier is fed. At the positive edge of each pulse D1 conducts, and $C$ is charged to the peak voltage of the pulse. At the negative edge, D 2 conducts and the charge on C is transferred to CT whence it leaks away through R. The overall effect is analagous to attempting to fill a leaky bucket with a tin mug-the faster you work, the higher the level in the bucket. As soon as you stop, the water disappears-and if you work at a variable rate, the level will follow the variations. This is exactly what is wanted from a frequency discriminator, and when it is added that the linearity of such a discriminator is superior to that of either the F.S. or r.d. and that it requires absolutely no setting up, we may well ask where are the snags? Basically, there are two.

First, the i.f., as stated, must be low since the a.f. output is a function of the ratio of the maximum to minimum frequencies at the discriminator input. The i.f. has a minimum value determined by the frequency range of the audio com-
ponents to be detected and by the need to be able to filter these out from the i.f. itself. For stereo, this sets the desirable lower limit at about $200 \mathrm{Kc} / \mathrm{s}$.

Second, if the i.f. is to be as low as possible, it must not drift downwards, and a high stability is thus demanded of the local oscillator, and either a crystal-controlled oscillator or a good a.f.c. is necessary.

In all cases the audio output is lower than is obtainable with the more conventional circuits, and extra amplification is usually needed. If the limiter output cannot be increased, this amplification must be at a.f. In order to improve the sensitivity and secure positive limiting and a well-defined pulse, a limiter has been described in which a trigger circuit is followed by a pulseforming stage. ${ }^{1}$ This is a good system if adequate signal is available at the trigger stage, but if it is not, then triggering "jitter" can actually introduce further noise. It can be seen that it is rather expensive to take advantage of the undoubted merits of the P.C. discriminator, and so far it has attracted little commercial attention.

We now come to the decoder, which may be either built into the tuner, or provided separately. It is fed with the signal shown in fig 4, and must carry out the function shown in block form in fig 7. The discriminator output is passed through a $19 \mathrm{Kc} / \mathrm{s}$ bandpass filter, which selects out the $19 \mathrm{Kc} / \mathrm{s}$ pilot tone. This is amplified and frequency-doubled in the sub-carrier regenerator to provide the original $38 \mathrm{Kc} / \mathrm{s}$ sub-carrier
which was suppressed in transmission. Two antiphase versions of the sub-carrier are produced, and fed to a pair of synchronous demodulators which are, in practice, usually switched diode gates. The demodulators are also fed with the multiplex output from the tuner discriminator, and each produces one output channel from the input waveform. A suitable circuit for a transistor decoder has been designed by Mullard and is shown in fig 8. The $19 \mathrm{Kc} / \mathrm{s}$ tuned circuit extracts the $19 \mathrm{Kc} / \mathrm{s}$ pilot tone, which is amplified by V1 and passed to V2, the sub-carrier generator. V3 and V4 are the demodulators, their emitters being fed with the antiphase subcarrier switching waveform, and their bases with the multiplex signal from the input. The left- and right-hand outputs are taken from the collectors of V4 and V3 via normal de-emphasis networks. This circuit also has the property of reverse compatibility - that is, in the absence of a $19 \mathrm{Kc} /$ s pilot tone, normal monophonic audio signal will be fed to both A and B channels. As soon as the pilot tone appears, stereo decoding will begin.

Because of the degradation of $s / n$ ratio by interference components of the discriminator output higher than $53 \mathrm{Kc} / \mathrm{s}$, a filter before the decoder is desirable. The filter, like the discriminator, should have constant attenuation and linear phase characteristics from $30 \mathrm{c} / \mathrm{s}$ to $53 \mathrm{Kc} / \mathrm{s}$, but fortunately a simple practical filter cutting off just above $53 \mathrm{Kc} / \mathrm{s}$ is a good enough approximation to this ideal. The design require-

ments for decoders as a whole are complex, and, as one might expect, of ten conflicting, and those interested in the details might like to refer to a specialist article ${ }^{2}$ which also gives a number of further useful references.

There are a few general points in tuner specifications which remain to be discussed briefly. The first of these is the tuning arrangement used and the provision of a tuning indicator. Tuning controls may be of the continuous manual, push-button or switched variety. For a.m. use the continuous tuning may be preferable for


FIG.9.
genuine "aether roamers", while a switch or push-button is probably more handy where a limited number of stations are involved. For f.m. however, with virtually only three stations to choose from, manual tuning, with the need for specialised tuning indication, seems almost archaic, and pre-set switched tuning, if reliable and stable, will appeal to many. Crystal-control, of course, is the ideal for this system.

The second feature arising from the first is the need for a tuning indicator. For a.m. this may be superfluous (surely anyone can tune in an a.m. station by ear these days?) and in any case need only be a simple device to indicate when the d.c. component at the detector due to the carrier is at a maximum. For this purpose, any
of the proprietary devices, meters, neon tubes, magic eyes, etc., are equally effective. For f.m. however there is no corresponding maximum. A typical curve of discriminator output as a function of carrier frequency is shown in fig $\mathbf{9 a}$, and it will be seen that it is zero at the correct tuning point, and also at frequencies well above and below the nominal carrier frequency. The audio output from a modulated carrier varies with tuning as in fig $\mathbf{9 b}$, rising from the interstation noise level on either side to a flat maximum which does not allow the correct tuning point to be determined.

A meter utilising the discriminator d.c. component can be used, but is expensive, and various makers of tuners have introduced circuits to enable one magic eye or, in one case, two discharge tubes, to be used to find the correct point. It is important that some such device should be provided, and that it should be reliable in operation, since tuning by ear is unsatisfactory. It is sometimes suggested that the control be set halfway between the noise on the discriminator skirts, but this is not so easy to do accurately, and there is no guarantee that the discriminator is properly symmetrical.

Some tuners provide a.f.c. to overcome the effects of frequency drift in the oscillator. This sounds fine, but is no real substitute for a stable oscillator design. Moreover, the a.f.c. must have a high gain about the correct tuning point; that is, small deviation from correct tuning must produce adequate correction, otherwise "off-set" tuning results, especially if the manual tuning has been careless so that the a.f.c. is having to work hard. The luxurious answer is a stable oscillator, plus the facility for switching in a.f.c. only after the correct tuning point has been set, as indicated by an efficient meter. Once again, the best is expensive-but at least the cry "caveat emptor" has been raised!

Finally, a brief note on installation. Many hifi cabinets are poorly ventilated, so try to keep the tuner low down, near the cool air, and provide extra ventilation where this is feasible. Do not mount it on top of other power-dissipating equipment. Make all connections except power leads with co-axial cable, using the proper plugs and sockets. Do not earth the tuner independently, or hum may appear-earth it through the co-axial cables to the central earthed unit in your installation (of ten the pre-amp). When installing a tuner, or almost anything else, one could do worse than to note the sign that hangs in a certain self-service launderette-"when all else fails, try reading the instructions!"

# FM VHF AERIALS 

by G.F.Redgrave *

T'he advantages of the BBC's f.m. transmissions are too well known to hi-fi enthusiasts to need stating here. but what is not always appreciated is the importance of having a strong signal input to the set if a satisfactory signal-tonoise ratio at the output is to be achieved. By this is meant a signal strong enough to enable the limiter stage to operate properly. This usually means that a reasonably efficient aerial is required, but fortunately it need not be unduly expensive.

The aerial should be directional and should have a good front-to-back ratio of response in order to avoid picking up signals arriving from different directions due to reflection, and thus arriving at different times because they have travelled by paths of different lengths. This is particularly important in stereo broadcast reception.

Since the wavelengths of these transmissions are fairly short, there are no great mechanical difficulties involved in constructing aerials which are resonant, and which therefore provide a maximum response over the band of frequencies ( 87.5 to $100 \mathrm{Mc} / \mathrm{s}$ ) which comprise Band II. The simplest form of resonant aerial is a straight dipole, the physical length of which is approximately half the wavelength of the required signal (fig 1). The dipole is usually divided at the centre, where a coaxial cable is attached to conduct the signal to the receiver, as shown in fig 2.

The centre impedance of such an aerial is about 75 ohms, which is a convenient figure also for the cable and for the input circuit of the receiver. It is important that the impedances of these three circuit elements should be well matched in order that the maximum amount of signal energy can be transferred from the aerial to the set. If there is a mismatch at any point, some of the signal is reflected there, the amount depending on the degree of mismatch, and this reduces the forward signal. This simple aerial has very poor directional properties, responding well to signals from all round except in the direction of its length (figs 3 and 4). It must, of course, be erected horizontally, i.e. with its major axis in the same plane as the plane of polarisation of the signal, and for maximum signal pickup it should be positioned approximately at right-angles to the line joining the transmitter to the point of reception, as shown in fig 4.

If we could upset this symmetry of response, then the sensitivity would be correspondingly enhanced in one direction, which is really what we want. This can in fact be done quite easily by placing a slightly longer dipole as a parasitic element behind the aerial, where it acts as a reflector. The effect on the pattern of response in the horizontal plane is shown in fig 5 , where the backward facing lobe of the original figure-of-eight has been reduced in size, with a corresponding increase in the forward lobe, raising


* (Belling \& Lee Limited)

|  <br> UNIFORM RESPONSE OF HORIZONTAL <br> FIG. 3 DIPOLE IN THE VERTICAL PLANE |  |
| :---: | :---: |
|  |  |

the sensitivity, and hence the signal output, by about 3 dB . In addition, the forward lobe is now appreciably narrower, indicating increased directivity which may also be advantageous, as mentioned earlier.

A further improvement of some 1.5 dB , with still sharper directivity, can be achieved by placing another dipole (director) in front of the aerial, and one can increase the sensitivity indefinitely by adding more directors-but unfortunately with diminishing effect; so there is an economical limit as well as a mechanical one on how far it is practical to go.

It should be noted that the addition of parasitic elements has two other effects on the characteristics of the aerial; namely, it reduces the bandwidth and also the centre impedance. If necessary, the former can be counteracted to some extent by modifying the lengths of the parasitic elements and their spacing (but with a slight reduction of sensitivity), and the latter will require the use of a matching device between the aerial and the down-lead; this can con-
veniently take the form of a section of special cable of appropriate characteristic impedance and length.

There is one more very important factor affecting the performance of an aerial, and that is its siting. Fig 6 shows typical signal strength variations close to a two-storey house. Inside the building the variations can be even greater, due to screening and reflection effects. Bearing in mind that a $2: 1$ change in voltage results in a 6 dB change in signal picked up by the aerial, it will be seen that an improvement of this order or greater can of ten be obtained by the relatively simple expedient of raising an aerial from gutter level to a point well clear of the ridge of the roof.

After a certain stage of elaboration has been reached, therefore, it can be a much more practical and economical proposition to raise the height of an aerial rather than continue adding to its complexity; and it can even be better to use a fairly simple aerial mounted well above the highest point of the roof than a more elaborate array installed closer to the ground.

# AMPLIFIER SURVEY 

by George Tillett

Field effect transistors-FETS are only gradually appearing in audio equipment, and at the moment they are mainly used in studio mixers, low level amplifiers and microphone pre-amplifiers like the newSTC version (designed by M. Gayford). This may be due to their relatively high cost, but there is no doubt that the potential applications now seem to be even higher than first suspected, so it will be worthwhile having a further look at these interesting little devices.


Fig 1 shows the basic construction of a very simple type of junction gate FET. $A$ is a thin bar of high resistance semi-conductor, and on either side are thin wafers of low resistance semiconductor. One end of the bar is called the source $S$, and the other end $D$ is the drain. The source roughly corresponds to the emitter of an ordinary transistor or the cathode of a valve, and the drain can be likened to the collector or valve anode. The control region $G$-called the Gate is equivalent to the grid of a valve or transistor base. Like ordinary transistors FETS can be PNP (or P-channel) or NPN (or N-channel) and they can also be made of germanium or silicon compounds.

The symbols for P and N channel types are shown in fig 2 (note the direction of the arrows). Sometimes a connection is shown at Z , this is usually joined to the semi-conductor sub-strate and the metal case. Unfortunately, there is no international agreement about these symbols so
they may of ten differ slightly from those shown.
An interesting development of the FET is called the Insulated Gate type or IGFET (Fig 3) and here the gate electrode is insulated from the source-drain bar-usually by a glass film. The insulating layer is very thin indeed-of the order of one-tenth of a micron so IGFETS can be easily damaged by excess voltage. IGFETS are of ten made by thin-film techniques and they can be fantastically small. Some types use metal oxides and these are known as MOSFETS. There are dozens of other variations including doublegate types, epitaxials, diffusion, and planar unijunctions. They are used for computers, space equipment, high speed switching, microwave and RF applications and their relative freedom for cross-modulation problems will make certain types highly suitable for TV and FM "frontends" (the new Scott FM tuner uses a FET).

As far as audio amplifiers are concerned the main advantages of FETS are their low noise and their high input resistance (around 1 megohm for germaniums and several hundred megohms for silicons and IGFETS). The high

input resistance is easy to understand a s the FET input can be considered as a reverse biased diode instead of a forward biased diode as in an ordinary transistor. Another basic characteristic of FETS is that they are voltage controlled devices instead of current controlled-thus they closely resemble a valve in operation.

Fig 4 shows an input stage of an amplifier
using two Motorola 3N125 N-channel junction FETS. R1, R2, Cl and C2 form a passive equalising network for the standard R1AA characteristic. Total gain is 250 but the equalising reduces this to 25 at $1 \mathrm{Kc} / \mathrm{s}$. Thus an input of 4 milli-volts will produce an output of 1 volt. Under these conditions the signal-noise ratio (input shorted) is quoted as 54 dB . Noise is often considered as being aperiodic-i.e. not confined to any one frequency or band of frequencies, but this is not quite true.

Transistor noise has a definite low frequency component and FETS produce a much lower percentage of low frequency noise than any other transistors. So decibel figures will not necessarily give a true picture in this instance. It might be asked how does the FET compare with valves as far as noise is concerned? The diagram shown in fig 5 helps to answer that one. This graph shows the spot noise measured at $1 \mathrm{Kc} / \mathrm{s}$ for a 12 AX 7 (ECC83) valve, 2N3796 IGFET, 3N125 FET and a 2N3799 PNP silicon lownoise transistor operated at optimum current. The curves are plotted against input load resistance and it will readily be seen that the silicon transistor is superior at low input resistances but all three transistors are better than the valve.

In practise, because of the ratio of low frequency noise and other reasons, the FETS will give a lower effective noise figure with input resistances above 5 K ohms. Most audio amplifiers input stages are designed for a load of 50 K or thereabouts, so on this score the FET would be clearly superior. Noise is not the only criterion of course, and we must also consider voltage gain and distortion. Fig 6 shows the comparative figures for a DNL-Q-A FET and a 12AT7 (ECC82) valve. The FET is far more linear at low output levels, and in fact very little distortion is produced until the overload point. Noise figures for the DNL-Q-A (two in cascade) is




FIG.4. AMPLIFIER INPUT STAGE VSIM 2 FETS
quoted as being 8 dB better than a ECC83 and the overload factor is much higher. Note that a HT rail of 120 volts is used with this type of transistor.

The excellent linearity of FETS at low inputs is due to the input characteristics. Ordinary transistors produce some distortion because the base-emitter junction is inherently non-linear and can be considered as a diode working in a current mode with a small load resistance. On the other hand, the grid current in a valve also tends to make for non-linearity in the input circuit, so it would appear that FETS have a definite advantage on this score too. Of course, feedback could be used to straighten out distortion in conventional transistor or valve stagesbut at the expense of gain.

FETS can be used for other stages apart from front ends and fig 7 shows the tone control stages used with the pre-amplifier of fig 4. Two outputs are provided and S 1 is a phasing switch. The next transistor in the chain would be a conventional NPN silicon or germanium type, as the extra expense of another FET would hardly be justified. Baxandall tone control circuits are of ten used with transistors, but their inherently low impedance means a reduction in range-in fact some of the more expensive amplifiers use two or three transistors for this stage. Fig 8 shows a Baxandall arrangement which gives the full 20 dB lift and cut. Note that the component valves are similar to those used in valve circuits. Other FET applications include filter stages where transistor loading is important, and phase-splitters having low distortion with high
voltage swing. All-in-all then, FETS would seem to have very definite possibilities for audio applications.

Now for a quick look at amplifier developments over the past year, starting with Germany, which has not lagged behind with transistor research by any means; and firms like Telefinken, Siemens, and a few others have spent a lot of time and money on transistor development. Grundig was one of the first concerns to use transistors on a large scale and now most of their well knowntaperecorders are fully transistorised. About 2 years ago they released their SV 50 HiFi amplifier (reviewed in Hi-Fi News, March 1965) and now this has been followed by a larger version, the SV 80. This model does not use driver transformers and the overall performance is of a high standard. Output is 30 watts per channel at less than $0.5 \%$ distortion from 40 cycles to $15 \mathrm{Kc} / \mathrm{s}$, and half power points are 15 $\mathrm{c} / \mathrm{s}$ and $40 \mathrm{Kc} / \mathrm{s}$. These are sine-wave figuresMusic Power is quoted as some $30 \%$ higher.
Fig9 shows the arrangement used in the power amplifier; T 1 and T 2 are a complementary pair acting as a phase-splitter. Tl is a PNP type BSX 40 and its partner is a NPN BSY51. These transistors drive the output stage which comprises 4 2148's connected in parallel-push-pull. Note the use of inductors L1-L5 and the 7 stabilising diodes. HT is supplied from a conventional bridge rectifier, but the supply for the preamplifier section is stabilised.
Another well known German amplifier is the Telewatt Ts $100-\mathrm{A}$ by Klein \& Humme. The out-



put stage is not unlike the Grundig SV80 but the output of $2 \times 25 \mathrm{w}$ (sine wave) is rather less.

The input stage ( $\mathbf{F i g} \mathbf{1 0}$ ) is a little unusual since the first transistor functions as an emitter follower. The equalising feedback loop R1, R2, $\mathrm{R} 3, \mathrm{Cl}$ and C 2 is applied between the collector of T3 and the emitter of T2. Some DC stabilising is provided by R 4 and a certain amount of HF roll-off is given by the small capacitor C3 (220 $\mathrm{mf})$. Like many other Continental amplifiers, the TS 100-A has a presence switch which brings in a rise of 4 to 6 dB in the region of $4 \mathrm{Kc} / \mathrm{s}$. But the TS 100-A has something else - a switch that produces a rise at the lower frequencies. The curve is shown in fig $\mathbf{1 1}$ and is intended to compensate to some extent for deficiencies in small speaker systems.


FIG.II.

The Blaupunkt (Bluespot to us) combined receiver-amplifier has a fairly straightforward circuit, based on the usual LIN arrangement with AD149 outout transistors. Output is just over 12 watts (sine wave) per channel at about $0.5 \%$ distortion into 5 ohms . The most interesting feature of this receiver (which incidentally is called the "Santiago") is the use of an elaborate stabilised power supply (Fig 12) employing 3 transistors and a zener diode. The Loewe-Opta LO50 and Siemens "Klangmeister" also use similar circuits with stabilised power supplies.

Quite a lot of $\mathrm{Hi}-\mathrm{Fi}$ equipment is made in Denmark these days, but I suppose the $B \& O$ range is the best known here. The Beomaster 1000 amplifier was in fact reviewed in Hi - Fi News for February 1965. Again the circuit is based on the LIN arrangement with ADI49's in the output stage. The most striking feature of the 1000 is the actual styling, but the balance control cir-


cuit is rather unusual. As can be seen from fig 13, balance is achieved by varying the capacity across the emitter of one of the transistors in each channel-actually transistor number 4 in the line-up. As the slider of the control is moved, so the gain of one channel is increased and the gain of the other is decreased. Of course, impedances will change too, but not enough to cause illeffects.
Audiophiles in France have been rather slow in changing over to transistors, but designers have been very busy during the past 3 or 4 years and French transistor amplifiers use the most up-to-date techniques. Fig 14 shows the tone control stage of the Merlaud STT 215 which gives 15 watts per channel from two SFT213's in a LIN circuit. The bass and treble controls are passive and $\mathrm{R} 1, \mathrm{C} 1, \mathrm{C} 2$ form the HF filter. Attenuation is -3 dB at $6 \mathrm{Kc} / \mathrm{s}$ and -11 dB at $10 \mathrm{Kc} / \mathrm{s}$. The capacitor C3 is switched to form
the highpass or rumble filter. Power supply for the 215 is fully stabilised. The Tacuussel amplifier also uses a LIN circuit with stabilised supply ( 35 volts) but uses mainly NPN silicon transistors. The frequency band is divided into two with a cross-over point at $300 \mathrm{c} / \mathrm{s}(6 \mathrm{~dB}$ per octave) but only 3 power amplifiers are necessary for a stereo system as the bass channels are common. The outputs are BD11's and the total power per channel is 15 watts with half power point at $50 \mathrm{Kc} / \mathrm{s}$. Response is only -2 dB at 100 $\mathrm{Kc} / \mathrm{s}$ and distortion less than $0.4 \%$ from $20 \mathrm{c} / \mathrm{s}$ to $20 \mathrm{Kc} / \mathrm{s}$ (at $1 \mathrm{Kc} / \mathrm{s}$ it is only $0.2 \%$ ). The preamplifier uses 9 transistors for each channel-3 of which are in the tone control stages.

Fig 15 shows the arrangement: Tl is an emitter follower, and the Baxandall stage itself uses two more, plus an amplifying transistor T3. The CR network C1, R1 form an LF phase correction circuit. This amplifier is available in kit form. Other notable French transistor amplifiers include Concertone, Cabasse, Ribet-Desjardins, Schneider, and Jason. While valve amplifiers are represented by Hitone, Filson, Film et Radio, Clevox, Audiotechnic, etc. Some firms make both valve and transistor equipment, of course, but there is no doubt that even in France valves are losing ground.
Before discussing the latest amplifier developments in Great Britain, perhaps we can take a quick look at the American scene. Silicon transistors are still gaining ground although some very fine amplifiers have appeared using ger-maniums-like the new EV 1144 series and


FIG. 10.

Harmon-Kardon Stratosphere line. Sherwood announce that they will also market an inexpensive amplifier using germaniums in addition to their standard silicon range. Although it looks pretty certain that germaniums will eventually be superseded by silicons, both types will compete side by side for a while longer. Some firms like Fisher and $A D C$ use both kinds-thus getting the best of both worlds!

So what is new? Aeoustech still usethe original complementary pair LIN circuit, and their latest amplifiers incorporate refinements which bring down the distortion even lower. Scott use a slightly different arrangement in the 260 , as can be seen from the diagram fig 16. All the transistors are NPN silicon except T2 which is a PNP type. T2 functions as a phase-reverser, thus enabling identical drivers T3 and T4 to be em-


FIG.14. FILTER AND TONE CONTROL CIRCUIT OF MERLAUD STTZI5 AMPLIFIER

ployed. Frequency response of the 260 is only 1 dB down at $100 \mathrm{Kc} / \mathrm{s}$ - which marks a break away from this Company's previous "narrowband" policy. Power output is 30 watts per channel (both channels driven simultaneously) and distortion is less than $0.5 \%$ up to $10 \mathrm{Kc} / \mathrm{s}$ and less than $0.9 \%$ at $20 \mathrm{Kc} / \mathrm{s}$.

The KLH 16 amplifier is not exactly new but it is still very popular. It uses germanium transistors with a novel protection circuit (Fig 17). The resistor R1 ( $0 \cdot 33$ ohms) samples the output signal and produces a voltage drop. When this voltage is great enough it exceeds the threshold voltage rating of the diodes Dl and D2. These


FIG. 16.

will then conduct and so introduce a heavy negative feedback loop around the last two stages. Overall gain is reduced and so is the drive to the output transistors.

One of the most interesting circuits to come from America is the Sharma arrangement used in the Mattes amplifiers (Fig 18). Mr. Sharma is the Chief Engineer of that Company and in his circuit the output of the driver transistors is coupled directly to the speaker, as well as to the driver transf ormer via latching diodes (D1, D2). During each half-cycle of the signal the relationship between the driver and the output stage changes 4 times. (1) At very low signal levels the power transistors stay below the level of conduction. The driver transistor drives the load entirely. (2) As the signal level increases, the power transistors begin to conduct and supply some power to the load. (3) At higher voltage levels when the power transistors are operating fully they not only supply all the output power but also tend to drive themselves through the driver transformer. (4) When the signal level is larger than the power supply voltage of the driver, the latching diodes stop conducting. This isolates the two amplifiers and the signal flow is maintained through the driver transformer only.

It is claimed that the use of negative feedback "smoothes out" the transitions between the different modes, and the output is rendered free of non-linearities. As no bias current is involved the Sharma circuit is very efficient and the power
stage efficiency is of the order of $78 \%$. The Mattes SSP200 delivers 100 watts per channel continuously, with an intermodulation distortion of less than $0.3 \%$ at any power level. Harmonic distortion is quoted as less than $0.2 \%$ from 20 cycles to $8 \mathrm{Kc} / \mathrm{s}$ and below $0.5 \%$ at 20 $\mathrm{Kc} / \mathrm{s}$. The low pass filter in the output stage L 1 , $\mathrm{R} 1, \mathrm{R} 2, \mathrm{C} 1$ and C 2 attenuates the high frequency components generated by the amplifier due to the transit time effects. The output can be shorted at full power output without causing any damage. If the short is maintained for a long period thermal breakers would operate, due to heating of the output transistors which, incidentally, are special NPN silicons.

Back home to look at some new amplifiers. First, the Goodmans Stereo 30. This uses an all-silicon line-up with a complementary pair


driving two 40363 's. The drivers are a NPN 2 N 3053 with a PNP 2N 4037, and power output is rated at 15 watts per channel with a distortion less than $0.4 \%$. Three transistors are used in each pre-amplifier and number 3, the tone control stage, is shown in fig 20. It will be seen that an inductor is employed for the HF filter although the slope is restricted to some 12 dB per octave. The 3 dB -point is $10 \mathrm{Kc} / \mathrm{s}$. Five inputs are provided (including one for ceramic pickup) and there is a socket for earphones. An unusual feature of the Stereo 30 is the vertical presentation which matches the Maxim speaker system.
Another newcomer is the Decca which also uses a modified LIN circuit with 4063's in the output. These are driven by a NPN 40361 and a PNP 40362 and the power output is 30 watts per channel at a distortion less than $0.5 \%$. Halfpower points are $30 \mathrm{c} / \mathrm{s}$ and $30 \mathrm{Kc} / \mathrm{s}$. All the transistors are silicons and the power supply is

fully stabilised with 2 transistors plus a zener reference diode. The HT line is a constant 63 volts-hence the Music Power and continuous sine wave ratings are the same. Five transistors are used in each pre-amplifier and equalising is applied between the first two. After these comes a passive tone control system with a 2 -section RC HF filter which has two positions ( $7 \mathrm{Kc} / \mathrm{s}$ $12 \mathrm{Kc} / \mathrm{s}$ ) both at 12 dB per octave. The next stage T3 and T4 form a parallel-T high pass filter (Fig 21). The attenuation of this type of filter is very high and the quoted figures are -3 dB at $35 \mathrm{c} / \mathrm{s},-24 \mathrm{~dB}$ at $24 \mathrm{c} / \mathrm{s}$ and -12 dB at $15 \mathrm{c} / \mathrm{s}$. The feedback loop $\mathrm{R} 1, \mathrm{Cl}$ not only reduces distortion but tends to make the cut-off notch asymetric, and so reduces the rise at the extreme low frequencies.

The Leak stereo 30 and Pye HFS 30 mentioned in the last Year Book are both selling very wellso is the Truvox amplifier. On the other hand Quad, Rogers and Radford are kept pretty busy making valve amplifiers, so maybe the French are not so conservative after all! The Rogers Master Stereo amplifier has an extremely good specification and stability is unconditional. The output transformer has a low leakage reactance and the stability is achieved without excessive phase shifting in the feed-back loop. The Armstrong 221 is a "hybrid"-in other words it uses both valves and transistors. Two transistors are used in each "front end" and although these are not special low-noise types the signal-to-


noise ratio is exceptionally good-in fact above 60 dB . It just shows what can be achieved with clever design!

The Fisher 440T is a complete amplifier-tuner featuring multiplex FM with automatic stereomono switching, tuning meter, 4 -stage "front end" and other refinements. The sensitivity is 2 microvolts and the distortion at $100 \%$ modulation is quoted as being less than $0.5 \%$. Fig 19 shows the basic circuit of the amplifier output stage. The transistor T 1 drives a complementary pair, T2 and T3. (T2 is a PNP silicon-all the others are NPN silicons.) Two type 2N3055 are used in the output stage (T4, T5) which operates from a 46 volt line. R1 is a very small resistoractually 0.015 ohms, and its function is to pro-
vide a certain amount of current feedback (via NFB 2). If there is an accidental short across the speaker terminals, this feedback loop is still operative and so helps to protect the output transistors. VR2 is a bias control and VR1 allows the balance to be adjusted. The diodes D1, 2, 3 , 4 form a protective circuit which limits excessivecurrent in the output stage. Power output of the 440 T is 20 watts per channel RMS (continuous power, 8 ohm load) at a maximum distortion of $0.8 \%$ and the half-power points are $10 \mathrm{c} / \mathrm{s}$ and $30 \mathrm{Kc} / \mathrm{s}$.

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# MICROPHONES 

by Ralph West

Microphones can be classified in two wayswhat they do and how they do it. "What they do" concerns their directional behaviour and how they behave with sound sources at different distances. This is the most important aspect and is really all we need to know. With this knowledge and with the right thing to plug it into, a completely non-technical person could make the perf ect recording. He need never worry his head about the "innards" of the many microphones he uses in the course of his work!
However, many of us, besides the manufacturers, do like to know how they work. Not only is the knowledge interesting in itself, but it helps us to use them more intelligently and tells us even more of what they can and cannot do.

## Part 1: What they do

There are two main types of behaviourdirectional and non-directional microphones. The non-directional, often called omni-directional, is explained by its name. It responds equally well to sounds coming to it from any direction. In practice this will not be quite true for all microphones and all frequencies, but it goes for all omni-directional microphones at low frequencies. Whether they preserve this behaviour to the higher frequencies or not depends on their size and cost. Whether this matters or not, depends on what we are going to use them for, so there is room for all!

The omni-directional type always consists of a
rigid airtight box, of several possible shapes, with a flexible diaphragm closing the only opening in this box (Fig 1). There is a fixed quantity of air inside, pushing outwards against the diaphragm. Variations in air pressure outside, due to sound, push the diaphragm inwards with a varying force, thus causing it to oscillate in sympathy with the sound pattern. This little box is only affected by changes in air pressure outside the diaphragm, and it does not matter where they come from-front, back, or sides. Air pressure, like water pressure, is all pervading and flows round corners quite easily, as long as we don't hurry it too much.

Our ears work on this principle, so we too can pick up sound from any direction. A small practical point here: there must be a tiny air leak provided somewhere in the design, to equalise pressures, otherwise changes of temperature and barometric pressure would distort the diaphragm and make it less able to vibrate freely. Our ears too have such a leak-the eustachian tube.

As well as being unaffected by the direction from which the sound comes, the omnidirectional microphone is also unaffected by the distance of the source, except on the score of loudness of course. This means that it is not affected by the shape or radius of the sound wave fronts. As mentioned earlier, it is only sensitive to changes in air pressure and it does not matter where they come from. In practice this means

that sound quality does not vary when closemike techniques are used.
Directional microphones can be divided roughly into uni-directional and bi-directional types. Taking the latter type first, because it is the simpler, we have just about the opposite of the omni-directional type. Instead of a closed box, allowing sound to reach only one side of the diaphragm, we have an open framework which allows the sound free access to both sides of the diaphragm (Fig 2). While this microphone can produce exactly the same electrical signals, its action and directional behaviour is quite different.

Sounds coming from direction A in fig 3 will push the diaphragm to the left with varying pressure, as before, but these same varying air pressures also get to the other side of the diaphragm and push it the other way. Fortunately these two opposing actions do not quite cancel each other, as the sound reaching the far side arrives slightly later, having travelled slightly farther-roughly the width of the diaphragm. So the diaphragm does move after all. Sounds coming from the direction $\mathrm{A}^{\prime}$ will do exactly the same. Thus turning this microphone round $180^{\circ}$ will not alter the signal though it will reverse its phase. For simple mono use this is not likely to matter, but it would if used in conjunction with other microphones. It would matter for stereo too. For sounds coming from the directions B and $\mathrm{B}^{\prime}$ it is very different. Here the sounds reach opposite sides at exactly the same time and therefore cancel completely. This is in no way a disadvantage, rather a great advantage, as it is sometimes possible to cut out unwanted sounds or at least make them less noticeable. The zero pick-up actually embraces a plane containing $B-B^{\prime}$ i.e. no sound is picked up from overhead, or underneath, as well as from the sides.

Sounds from other directions, as $\mathbf{C}$ in fig $\mathbf{3}$ are picked up of course, but not quite so strongly as from the $\mathrm{A} \mathrm{A}^{\prime}$ directions. Up to $45^{\circ}$ either side of A or $\mathrm{A}^{\prime}$ (i.e. over an angle of $90^{\circ}$ ) the signal pickup only varies slightly, being 3dB down (just noticeable) at $45^{\circ}$. The pick-up is only halved at
$60^{\circ}$ either side of A or $\mathrm{A}^{\prime}$ and is still usef ul $(6 \mathrm{~dB}$ down). Outside this angle ( $120^{\circ}$ ) the pick-up falls off rapidly.

As this type of microphone operates not by the sound pressure, but by the pressure difference or gradient, it is sometimes called a pressure gradient microphone. As the pressure gradient is small, the mass of the diaphragm must be very small indeed in order to be moved enough to produce a reasonable signal. One can visualise this very light and flimsy membrane being carried along bodily by the oscillatory movement of the air particles themselves as sound passes it. For this reason, it is often described as a velocity microphone, in contra-distinction to the pressure microphone. In fact this is probably a better way to view its operation, and helps explain one of its peculiarities-its frequency response varies with distance from the sound source!

Close to a source of sound, the sound waves are expanding spherically outwards, barring obstacles. This continues indefinitely, but as the radius of the spherical wavefronts increase to large values, the wavefront becomes more or less plane. In these conditions, i.e. at a fair distance from the sound source, both pressure and velocity microphones will produce similar electrical signals.

Closer to the source the ratio of air particle oscillatory velocity to sound pressure increases. The increase depends on the ratio of the wavelength of the sound to the radius of the wavefront. Close up, the particle velocity increases disproportionately for low frequencies, so the velocity microphone will boost bass, whereas the pressure type behaves just as usual. This can be of advantage if one wishes to record a small upright piano and make it sound like a 9 foot concert grand. It can also be of advantage if one wishes to bring out the double bass and make it sound as loud as the bass drum (lovely effect!)

Unf ortunately it will do the same for close up speech-anything nearer than 4 to 5 feet becomes progressively "heavy". A soprano at 3 or 4 inches would sound like a sick cow, so we


usually do (or should) apply bass cut one way or another. This can be applied electrically, and the cut varied to suit the working distance. Alternatively, the microphone is sometimes fitted with felt and other pads which act as acoustic filters, designed to attenuate bass. Working at a distance, say when recording a large orchestra, neither electrical bass cut or filter pad would be used.
Again, while this type of microphone will probably produce an identical signal from the orchestra itself, compared to a pressure or omnidirectional type, it will pick up less general sound reflected from walls, ceiling and floor (i.e. ambience), and this produces a generally clearer result with less confusion. Such microphones are also very useful to the public, address engineer, for they give him a better chance of avoiding feedback from the loudspeaker, which produces an unpleasant "ring" or even a howl.

The other main type of directional micro-phone-the uni-directional-is a sort of cross between the two so far described. In fact it may actually consist of pressure type and velocity type matched elements in one case. Usually, though, it is more like the pressure type, with an opening in the back or sides of the box. Thus one side of the diaphragm (Fig 4) is freely open to the air, whilst the other side communicates via an obstructed passage. This may be a simple porous plug (of very accurate porosity) or a complicated system of passages and side turnings like Hampton Court maze!

From the front the uni-directional type behaves like any other microphone, but from the back its pick-up is much reduced-not quite zero, even with expensive microphones, but low enough to be really useful. Forwards it picks up over a much wider angle than the velocity typeapproximately $120^{\circ}$ between the 3 dB points and $180^{\circ}$ between the 6 dB points.

If the microphone pick-up versus angle is plotted on polar co-ordinates, we get a heartshaped curve-hence its popular name, Cardioid type (Fig 5). From the $A$ direction the pick-up is proportional to the distance $r$, from the $C$ direction $r^{2}$ and so on.

The performance of the two previous microphones, plotted in the same manner, produce a "figure-of-eight" for the velocity type (Fig 6) and a circle (Fig 7) for the omni-directional or pressure type.

Going back to the cardioid type, its frequency behaviour as might be expected is part way between the behaviour of the others. Thus it exhibits some bass boost for close working, but nowhere nearly as much as the figure-of-eight type. This factor, coupled with the fact that wanted and unwanted sounds are often in opposite directions, instead of at right angles to each other, makes it a very attractive microphone. It is more difficult to design, however, and therefore tends to cost very much more for the same goodness of sound quality. However, if its true cardioid behaviour is limited to the higher audio frequencies, where it generally matters most, and degrades to an omnidirectional behaviour in the bass, it need not cost much more than an ordinary omnidirectional microphone. Such types are becoming increasingly available and are rapidly gaining in popularity for all types of work.

These are the basic types of microphone, but there are of course more sophisticated ones, of correspondingly higher price. Two are worthy of mention, even though few people would need them (or be able to afford them in some cases!) Though the cardioid and figure-of-eight are described as directional, one can visualise situations where a really directional microphone would be useful-for example, to pick out one distant sound clearly against a noisy background. This can be done, but to make it
successful over a useful frequency range is extremely difficult, and the final product is quite large and costly. The "gun microphone" made by Electrovoice is a well-known example (Fig 8) though even this is nothing like as directional as a searchlight!

There is one cheap solution to this problem; at least it is cheap if it is limited to high fre-quencies-speech and bird song, say. This is to use a cardioid, or possibly an omni-directional and a parabolic reflector (Fig 9). It looks more convincing than it really is, because the parabola only obeys the well known optical laws with frequencies where the diameter of the reflector is many wavelengths!

Taking the Grampian 24 in . parabolic reflector for instance, at $12 \mathrm{Kc} / \mathrm{s}$ it is 24 wavelengths wide and its performance begins to approach its optical performance. At $1.2 \mathrm{Kc} / \mathrm{s}$ it is only 2.4 wavelengths and so "looks" with a much wider angle; but it is still useful down to $500 \mathrm{c} / \mathrm{s}$. Having a much larger area than a normal microphone, it interceptsfar more sound energy and concentrates this sufficiently well to give 14 dB (almost 5 times the voltage) over the range $500 \mathrm{c} / \mathrm{s}$ to $5 \mathrm{Kc} / \mathrm{s}$ with a suitable microphone. This is a most impressive signal increase, and is effectively an increase in signal to noise ratio, very useful out of doors, and equally useful when trying to pick up questions from the back of the lecture theatre!

These highly directional microphones obviously come into their own for rather distant sound sources. An entirely different approach is used when trying to hear the commentator in the middle of a noisy audience. The microphone must obviously be used close up, but no ordinary design would suffice. The general principle is to have a very small diaphragm so placed that sound can reach front and back not only equally easily but by effectively identical routes, so that cancellation occurs. In fact it becomes an exercise in designing a microphone that will NOT pick up sound! If, now, the lips are placed about half an inch from one of the openings, the two no longer balance and the sounds from those lips will be heard, but a sergeant-major's bellow at even a foot would be drowned in amplifier noise!

Returning to the three main microphone characteristics-omni, cardioid, and figure-of-eight-the choice of type to be used may well be decided by the situation involved. The deciding factors will be working distance and ambience. Neglecting changes in frequency response with distance, or using a pressure or omni-directional type, where the sound quality does not vary anyway with working distance, varying the microphone distance makes a profound variation in the overall effect.


Fig 9
When working very close to the source, the direct sound picked up is relatively large compared to the many reflected sounds that reach it. The result, when played back, sounds as though the source is very close, if the volume is high; or as though the source is in the open, or in dead surroundings, if the volume is lowered a little.

If the microphone is moved farther away, the direct sound reaching it is reduced, and more amplifier gain is needed. This, of course, also boosts all the other sounds picked up, i.e. reflected sounds, and general background sounds or ambience. Now when the result is reproduced it will make the source sound farther away if a low level is used; or as though it were in noisier or more reverberant surroundings, if a higher reproducing level is used.

Our senses largely judge distance by the ratio of direct sound to background sound. This is one of the main parameters or factors that the microphone user has at his disposal. By varying the microphone distance, he can to a large extent produce the acoustic effect he desires for the job in hand. Thus for speech a relatively close spacing would be most appropriate, unless he wished to make his speaker sound as though he were in a large room. For a large orchestra or chorus, a much greater distance would be used,
so that the performance sounded as though it really was in an appropriately large auditorium. For chamber music one would come in closer, because such music is generally intended for the more intimate, more or less domestic surroundings.

It is not always possible to place the microphone at just the right distance, but we can use the different directional properties of our microphones to cheat! If we use a cardioid type instead of an omni-directional type-at the same distance-we get the illusion of having moved much closer in. This is because the cardioid, aimed at the wanted sound source, picks up less general background sound (from the rear) and so produces a similar result to an omni-directional, and our own ears, at a shorter distance! A gun microphone, or a paraboloid reflection type, would be even more strikingthough only for high frequency sounds and speech. It might be thought that the figure-ofeight, having a narrower "looking angle", would simulate even closer working. It does and it doesn't! It doesn't because, being bidirectional, it picks up quite well all the sound from the far end of the room or hall. This generally tends to give the illusion of more spacious surroundings, but is nevertheless often very pleasant.
The cardioid probably gives the "clearest" result, but may or may not be the desired effect, so ... well this gives some idea of the scope we have!

Talking of cheating, we can equally well make something sound farther away than it actually is or was. If this sound is produced in the microphone's minimum pick-up direction-especially with the figure-of-eight type as it has a real nulthen little or no direct sound reaches the microphone. Sounds reflected from the walls and ceiling, coming from different directions are picked up, however, and give the perfect acoustic "illusion" of distance. Thus in fig 10, $A \& B$ will sound close to the microphone, $C$ a little farther away, and $D$ a long way away, though they are in fact all at the same distance.

All microphones to date involve the action of


FIG. IO.


Fig 11 Sectional view of an STC moving-coil microphone, showing the internal construction. Note the equalising tube.
air vibrations moving some solid object, usually a diaphragm, because we have discovered no direct method of converting air vibrations into electrical signals. Having got a diaphragm moving we have several available methods of producing an electrical signal, and each is theoretically capable of producing identical results. If extremely high standards of fidelity are required, then the design that has the smallest, simplest, and lightest moving parts, will be the chosen one. This must be explained.

If the electrical signal is to be an absolutely faithful copy of the original air vibrations, then it must not introduce any variations of its own. The moving bit that is producing the signal must be moving as one with the bit that is being pushed by the air. A small one-piece moving element is more likely to satisfy this requirement than several bits joined together.

Unless the moving parts are light, movement will be very small-as only very small air pressure variations exist with quite loud sounds. If movement is small, signal output will be small. Contrary to expectations, the mass of the moving parts does not directly affect the frequency response.

The size of the moving parts-in fact the size of the whole microphone-has quite a large effect. First, the microphone is an obstacle to the sound waves and modifies their distribution. Sound pressures are increased on the side of the microphone facing the source when the wavelength is equal to, or less than the diameter of the obstacle-and generally reduced somewhat on

the far side. This effect is easily demonstrated by bending down low to put the ear as near to the ground as possible, when all sounds seem louder. The ground is large enough to do this for all frequencies, but our microphone can only do it at high frequencies. This means that its directional properties tend to vary with frequency and may upset our calculations.

At $12,000 \mathrm{c} / \mathrm{s}$ a wavelength is almost one inch long, so this is the maximum size for a really first class microphone, though its protective wire cage can be larger than this without upsetting things. For accurate measurements covering the audio range, we would need to halve this size. The big difficulty, of course, is that reducing the microphone size almost invariably reduces the output signal as well, so it is not surprising that many microphones made and used, are rather larger than one inch diameter!

So much for the main properties of our microphones and what we can do with them, and none of these considerations has involved the mechanisms by which they work!

The oldest microphone-and still number one, numerically-allows the moving diaphragm to vary the pressure on a little box full of carbon granules. This varies their resisistance, which in turn varies the current flowing through them. While too noisy for high quality work, it is still the standard telephone microphone. But this basic method may yet return to favourusing one of the new semi-conductor materials.

The moving coil; or dynamic microphone is little more than a miniature loudspeaker or, more accurately, a miniature tweeter. The cone has shrunk to nothing, so that only the central dome, voice coil and suspension remain. The voice coil is usually around half-an-inch in diameter, so an eighth-of-an-inch of suspension, plus a case, brings it up to around one inch diameter. The diaphragm has been made of various materials in the past, even wood, but nowadays it is usually a plastic moulding. The front has only the protective grille between it and the air. The back of the diaphragm will be cut off from the air if it is an omni-directional type-except for the leak hole already mentioned. Sometimes
the reflex principle is adopted to maintain the bass response in a small overall volume. The "port" usually consists of a length of plastic tubing curled up inside the case, connecting the rear cavity with the outside air (Fig 11),
The cardioid types have a definite air path to the rear cavity. Cheap ones, which only exhibit true cardioid behaviour at middle frequencies, have little more than a felt-covered hole in the back of the case. More expensive cardioids have a far more elaborate rear leak which is several inches long, and usually have more than one opening to the air, sometimes a whole row of them (Fig 12).

Dynamic microphones are generally quite robust and give excellent quality on speech. The more expensive ones are also quite suitable for music recording. Their sensitivity is fairly high, and they are not unduly worried by a gentle breeze, so they are generally considered as a very good all-round type.

In order to keep the speech coil as light as possible, no attempt is made to wind on large numbers of turns, so the output voltage is very low and the impedance about $30-50 \Omega$. To feed a high impedance input on a tape recorder, a step-up transformer is needed. This can be a separate unit, but is of ten built into the microphone itself. Continental microphones tend to favour $200 \Omega$ instead of our $30-50 \Omega$, but they also cater for the same high impedance output as we do ( $50 \mathrm{~K} \Omega$ ). A separate section, later in this article, describes methods of connection, including the use of balanced lines.

Ribbon microphones have a very thin, aluminium-on-alloy ribbon suspended between pole pieces (Fig 13). Various magnet arrangements are used, but the general idea is to obstruct the ribbon as little as possible, otherwise its directional properties at high frequencies are upset. The ribbon is usually corrugated in some pattern, found by trial and error, to reduce its tendency to twist and squirm at certain frequencies. There must be a small gap to allow freedom of movement, so this cuts out the possibility of making a ribbon microphone of an omni-directional or pressure type; but, freely open back and front, it can make a perfect figure-of-eight type. With cunningly contrived obstruction on one side, of ten in the form of fabric screens, it becomes a cardioid type. Over what frequency range it achieves a uni-directional characteristic, depends on how cunning is the obstruction.

Because it has such a simple moving part, and because the sound-actuated bit itself generates the electrical signal, it is capable of extremely good quality indeed. The ribbon is so thin (sometimes under one micron thick) and so light, that it is effectively damped by the sur-


Fig 12
rounding air itself. This produces far less characteristic "ring" or colouration than any other type at a similar price. It truly gives professional quality at amateur prices.

Being in effect a single turn moving coil, its output voltage is very small indeed; and its impedance is very low; probably under one ohm. This is too low for general use, for the resistance of cables, plugs and sockets, etc, would cause very serious signal reduction. It is therefore always fitted with a step-up transformer, actually inside its case, to raise its output voltage and effective impedance to the same kind of values as used with moving coil types. Electrically, the two are thus interchangeable. Sensitivity wise, they are comparable with the moving coil, and they are the more sensitive when there is a difference.
Mechanically, the ribbon is of course more fragile than other types, but it only needs intelligent handling. If the microphone stand is liable to be knocked over, stick to a moving coil! As one would expect, the ribbon type is more easily affected by air movements. Even the lightest breeze is liable to produce thunderous' noises with the figure-of-eight type, for both sides are freely open to the air. When modified for a cardioid response, the ribbon is somewhat less sensitive to wind, but is still not recommended for outdoor use unless a wind shield is fitted. Very close speaking is almost as bad as a breeze out of doors, so for this type of use, the obstructions (fabric screens) are put on the working side, and sometimes on both sides.

Mechanically, the condenser microphone is the simplest of all microphones. It is therefore potentially capable of the best results; and indeed in practice it produces them, but unfortunately at a very high price. In its simplest form it consists of a very thin flat membrane, metal or metallised plastic, very close to a fixed metal plate. Fig 14 will clearly be an omnidirectional form, since it is a closed box type. Fig 15 has a perforated fixed metal plate and, being effectively "open" on both sides, has a figure-of-eight response.
With finer holes of an exact diameter-a controlled obstruction-it becomes a cardioid type. The fixed plate often has a complicated pattern of "through holes" and "blind holes" to get the exact magnitude and phase for the sound reaching the back of the diaphragm correct at all frequencies! An alternative form uses a sintered plastic element with carefully controlled porosity. An evaporated layer of metal (gold usually, as it will never tarnish) turns it into the fixed electrode.

To achieve this properly needs real precision. With a gap of $\cdot 001^{\prime \prime}$ to $\cdot 002^{\prime \prime}$, a tolerance of one-tenth thou is only $5 \%$ to $10 \%$, so the product cannot be cheap. On top of this we have to provide polarisation, for we have not yet managed to produce cheap and reliable permanent charges ("electrets"). The circuit is simple enough and the electrical consumption nil, but insulation must be well nigh perfect.

The circuit may work with loads as high as $500 \mathrm{M} \Omega$, but any leakage resistance in the


microphone must be at least thousands of times better than that or loud frying noises will be heard, especially in damp weather. This was a real headache years ago, but modern plastics have made life a little easier for manuf acturers. Even so, one of the best condenser microphones made specifically for accurate measurements (and real high fidelity too!) uses fused quartz with a surface silicone treatment for its vital insulation.

This type of microphone lends itself to a very cunning development. Fig 17 shows a double diaphragm design. It is effectively two cardioid microphones back to back. If only one plate, $A$ or $C$, is charged or polarised relative to the centre plate $B$, then only one half works, and it acts as a cardioid. If $A$ and $C$ are given equal voltagesso that pushing in either diaphragm produces the same output-then it acts as an omnidirectional. It still satisfies our closed box description. It merely has two diaphragms working in parallel.

If $A$ and $C$ are given equal voltages but opposite polarities, then an output will only occur when, say, $A$ is moving inwards whilst $C$ is moving outwards (i.e. $A$ and $C$ going in the same direction). This requires the sound to be coming from a definite direction and is obviously figure-of-eight behaviour.

Fig 18 shows the pattern of applied voltages to give these various directional properties. The voltage changes can be made with a switch on the microphone itself, but they are just as easily controlled remotely, making the condenser a really useful studio microphone.

A further factor which generally pushes up the cost of this type of microphone is its very high impedance. While it is possible to connect it with a good quality co-axial cable, the cable capacitance causes a serious loss of signal (but no upset of the frequency response). Two or three feet of

cable would probably halve the signal. There is a way out of this with a special double co-axial cable, but it is usually more satisfactory to put at least the first stage of the amplifier in the microphone case itself, and then to feed out at a lower impedance, and probably a higher signal level too. With valves this means using a multiconductor cable and complicated plugs and sockets, but at least the warmth of the valve heater also keeps the microphone dry! With transistors it is not easy to get the necessary high impedance, though the new FET types help; but the current supply is smaller and simpler. In fact, the batteries can be put in the microphone case!

While the condenser microphone element itself is pretty robust because of its extreme simplicity, the associated amplifier, needs handling carefully, especially if it is a valve type. Wind-wise, it is probably no more trouble than moving coil types.

If we are only interested in a limited frequency range, say for speech, then this type of microphone can be very cheap indeed. By increasing the area of the diaphragm, sensitivity can be increased-and not lost again in 3 or 4 feet of simple connecting lead. But it is when we want a response flat from $20 \mathrm{c} / \mathrm{s}$ to, say, $15 \mathrm{Kc} / \mathrm{s}$ that the cost rises. Such a response necessitates a small diameter device, less than one inch in diameter. This gives such a small signal, that everything else has to be that much more complicated and better. Even so, some very satisfactory kit condenser microphones have appeared.

There is another trick that can be performed with the condenser microphone. Instead of polarising it and using the resulting change of EMF, it is possible to put it in a bridge circuit and to feed it with RF. This can give a better signal/noise ratio as leakage is no longer a problem. Another variation of this theme is to put it in an RF Oscillation circuit and let it change the tuned frequency, i.e. use an F.M. technique.

Commercial designs have shown the feasibility of these methods, though they have been restricted to the more expensive professional types. However, they are by no means beyond the capabilities of the keen amateur.

Until a few years ago, practically all the
domestic tape machines sold in the U.K. were provided with a crystal microphone. The reasons were low cost and large output. While the production of crystal elements is an extremely tricky and relatively delicate process, as with transistors, once they are in mass production, their cost is very low indeed. Two very thin slices cut from a Rochelle salt crystal are cemented together, with a conducting paint and foil connection between them. The outer faces, likewise metallised, form the other electrode. This sandwich-or bimorph as it is called-is coated with an airtight protective paint and anchored at three of its four corners as shown in fig 19. To the fourth corner is attached the diaphragm. Movement of the diaphragm twists the crystal, and this distortion produces a voltage difference between the electrodes-the piezoelectric effect.
The crystal microphone is always (to date) made up as a closed box type and is therefore omni-directional. Left in its simplest form, as described, it usually has a pretty fierce resonance around 4 to $6 \mathrm{Kc} / \mathrm{s}$, but this does not matter much for speech. By judicious damping with a carefully controlled layer of woven fabric, a commendably smooth response can be produced, though the signal output is reduced somewhat. This just puts it in the "suitable for music" category, but crystal microphones have never been developed up to the top professional standards though one design of some fifteen years ago pretty well made the grade.

Mechanically, the crystal material is no stronger than a lump of sugar, so it doesn't do to throw these microphones around, cheap as they are. They don't like high temperatures either, the crystal effectively melts at $53^{\circ} \mathrm{C}$. (It actually disolves in its own water of crystallisation.)

The crystal microphone is a high impedance device, like the condenser microphone, and is affected in the same way by long leads and low
loads. Long leads lose signal, but do not upset the frequency response. Low loads cut bassideal for clear speech.

The capacitance of a crystal microphone is generally much larger than a condenser microphone, so that the connecting cable has much less effect. As its output is usually quite large, too, there is no need to build amplifiers into the case, unless very long leads are necessary. If they are necessary, the general advice would be not to use that type of microphone!

An alternative piezo-electric material is a special micro-crystallive ceramic. This has the advantage of mechanical ruggedness, and there is no fear of moisture penetrating a lacquer coating, as in the case of Rochelle salt crystal elements. While it has become quite popular in pickup design, it has not been fully exploited yet in microphones. The 1965/66 Hi-Fi Year Book lists but two-and, incidentally, less than a dozen crystal types! Looking through the microphone section of the last few editions of this book, one sees that the condenser type appears to be gaining in popularity; so it does seem that the technical problems touched upon are being tackled successfully.
We already have a loudspeaker with massless moving parts, or as near to it as we ever will get -the Ionofane. To date there does not seem to be any similar microphone technique and the Ionofane shows no sign of working backwards!

There are two main problems with circuitry for microphones. First, our microphone and input circuit must "match" each other in order to get satisfactory operation. Second, we sometimes have the problem of using the microphone at quite a distance from the associated amplifier or tape recorder. Let us look first at the problem of matching.
Consider the situation shown in fig 20. With nothing connected, the voltmeter should register $1 \frac{1}{2} \mathrm{~V}$ if the cell is in good condition. Now when a

"load" $R$ is connected, current flows from the cell through $R$ and the registered terminal voltage will fall. How much, depends on the value of $R$ and how big the cell is. A lower value of $R$ will obviously draw more current and cause a correspondingly larger voltage fall. A bigger size of cell would obviously show a smaller fall than a small one for the same load, because it has a much smaller internal resistance (impedance). Now we normally operate such a cell (and the mains too) with loads that hardly drop the terminal voltage. In general a microphone is best operated in this way, so that high impedance microphones should operate with high resistance loads, but low impedance types can, if necessary, operate with much lower value loads.

Microphones, when loaded, show more than a drop in output signal. The frequency response is upset as well. Magnetic types (i.e. moving coil and ribbon) have an internal impedance that is a mixture of resistance and inductance, and the reason is fairly obvious (Fig 21). While the resistance part behaves the same at all frequencies, the inductance has more effect at high frequencies. So if too low a resistance load is used, not only is the signal reduced, but the top is reduced even more, so we would notice a loss of high frequencies.

Crystal, ceramic, and condenser microphones are just about the opposite. They have two electrodes with insulation between themrespectively, Rochelle salt crystal, ceramic (like porcelain), and air. In other words, each is a condenser in principle (Fig 22). Thus a low load will cause loss of bass but relatively little loss of the higher frequencies, if any.

Now valve amplifiers can easily provide a high impedance load. The load, in fact, is the grid leak or the input volume control, and either of these can be of quite a high value. Tape recorder manufacturers may use as low a value as $100,000 \Omega$ in order to reduce hum problems, and this will suit most moving coil and ribbon types with a "high impedance" output, probably described as $50 \mathrm{~K} \Omega$. It will be quite satisf actory for crystal and condenser types, if used only for speech and possibly vocal works. To get any real bass with a crystal microphone-and it is possible-one needs to use an input impedance of not less than 4 or 5 megohms, whilst a condenser type may need ten to a hundred times this value to avoid bass loss. All plugs and sockets used with crystal microphones must be of the fully-screened type or hum will most certainly result.
Transistor equipment usually presents a somewhat lower load, depending on the choice of input transistors and circuit complexity. It is rarely above $50 \mathrm{~K} \Omega$ and often as low as a few thousand ohms. This puts crystal and condenser
types at a disadvantage, and they would need special coupling circuits. Moving coil and ribbon types, with a lower step-up ratio transformer, will be perfectly suited. This is where the popular Continental $200 \Omega$ impedance comes in conveniently.

No harm results from using a $200 \Omega$ or even a $50 \Omega$ microphone on a high impedance input. But while there is no loss of signal and no upset of the frequency response, there isn't much output voltage to begin with, so the extra amplifier gain needed will probably lead to excessive noise in the recorded signal. It is thus wiser to use a microphone of a more suitable impedance (ie, one with a transformer already built into its case) or to use an external matching transformer.

A $30: 1$ step-up microphone transformer will increase the output voltage by thirty times, and will make the microphone's effective output impedance $(30)^{2}$ times as large, i.e. $45,000 \Omega$ (Fig 23). One needs to specify "microphone transformer" because it is necessary to have a core material that wastes very little energy, and which will operate satisf actorily without distortion with the smallest signal. Mumetal is the most likely material. Also, as the power involved is generally well under a microwatt, the physical size can be quite small. Lastly, because this signal is small and will therefore be followed by considerable amplifier gain, the transformer will also need a Mumetal screening can to minimise pick-up of hum from the mains transformer, or from the tape machine motors. It is usually safe from hum at 1 to 2 feet from the machine, but good quality screened lead must be used between its secondary winding and the machine input socket. A screened plug will also probably be necessary, e.g. a phono plug. If it is a post-office type of jack plug, then an all-screened version must be used.

There are many occasions when the microphone must be some distance from the nearest piece of equipment, be it tape recorder, or amplifier, indoors or out of doors. Most microphones are supplied already equipped with some 6 to 8 feet of screened cable. Merely to increase this by joining on a further length of the same or equivalent type of cable is fraught with difficulties and dangers. The dangers are hum, upsetting the frequency response, and/or loss of some signal strength. The difficulty lies in trying to avoid or minimise these troubles.

First, it is generally not wise to do more than double the length of these leads. Second, the joints must be properly screened as well as being electrically sound, and properly insulated. An extra layer of insulating tape won't help reduce hum in the least. Only a layer of metal foil, overlapping the well-insulated joint, and overlapping itself turn by turn, and earthed to the braiding of
the cable, will positively stop the joint picking up hum. This is not easy to do, nor is it very elegant when done, so it is better to use screened plugs and sockets on the ends of the cable to be joined together. If only the screened plug can be found, a chassis mounting socket can be mounted in a small tobacco or throat pastille tin-which makes an excellent screen provided, of course, that it is earthed to the cable braiding.
The type of microphone being described here will generally be one with a high impedance output, all ready to plug into the tape recorder input, which in turn is usually high impedance. This is the cheapest way to do it, as the signal generally goes straight to the input valve grid. Our extra length of cable adds mainly capacitance to the load on the microphone. Another look at the previous diagrams, now seen with a capacitance load, shows a very different state of affairs.

The magnetic types form a resonant circuit (Fig 24), fortunately well damped, as a rule with
resistance in circuit, so the resonance is not likely to be heard, though it may well fall within the audible range. What will be noticed, however, is the severe loss above this resonant frequency. The longer the cable, the lower this resonant frequency, and the more noticeable the loss.

With the crystal microphone, as with the condenser, a long lead does not upset the frequency response; it merely reduces the signal level. The cable with the microphone merely forms a capacitative potentiometer (Fig 25). What with the extra amplification needed to use this weaker signal, and the consequent risk of amplifier hum and noise, and the hum risk in the long cable and its joints, it is not wise to extend a lead very far. With a moving coil type one would be able to stretch it quite a bit farther.

A far better idea is to use a low impedance microphone. This will have to be a moving coil or a ribbon. One could theoretically use a step-

down transformer with a crystal type, but this is not really satisfactory, even if one can find one made for the job. In emergency yes, but that's all.

The really long lead will go from the microphone to the transformer primary, and it will need to be screened unless it is a balanced line i.e. use a co-axial cable; earth the microphone case to the braid; and connect this also to the final co-axial braid that comes from the secondary winding (Fig 26). This latter cable should be between $1^{\prime}$ and $3^{\prime}$ long-short enough not to upset the high impedance points it connects, but long enough to be able to place the transformer far enough from the tape recorder's mains transf ormer and motors, whose stray magnetic fields might induce hum into it. This is despite the fact that microphone transformers are usually made with Mumetal cases, the best magnetic screening material we have. If for any reason this transformer has to be close to the rest of the equipment, and if hum is experienced, then it is usually possible to orient the little transformer and to find a nul position. Make sure this is done when the machine is switched to "Record". There is no need to run tape through it for this adjustment if one can monitor the recording signal. Cable runs of around 100 feet should give no trouble with this scheme, just a slight loss of signal maybe, but that is all.

If the microphone lead contains two wires inside the braiding, then it is far better to do this job properly! Use instead twin screened extension cable and a microphone transformer with a centre-tapped, balanced primary winding (Fig 27). Apart from some signal loss this lead can be

extended to any desired length without trouble. In fact it is possible with care to do this with plain lighting flex provided that the microphone is well insulated and that its case is NOT earthed to anything! The telephone service runs for miles and miles on this principle! The two conductors, being balanced with respect to earth, tend to cancel each other's hum, and so screening is not so vital.

The only thing that might introduce hum is by running this lead, screened or not, close to a mains transformer or something with a strong AC magnetic field. It is highly desirable that this lead be a twisted pair, to reduce magnetic interference. Of course, it is generally much wiser to use the screened version of the twin balanced cable. When fitting the microphone

with such a lead, be careful to see that both microphone connections go to nothing except the two screened wires, and that the case of the microphone goes only to the braiding. To earth one side of the microphone, or to connect the case to one output terminal is fatal, and hum results because the balance is now upset.

A few tape machines make provision for this type of input (generally $30 \Omega$ to $50 \Omega$ balanced) but it can be achieved just as easily by the simpler circuit, previously described, with an external transformer. If no centre-tapped transformer is available, then an artificial centre tap can be made with two $100 \Omega$ resistors as shown in fig 28 . The resistors should be physically small and preferably matched for value. This is a very useful circuit. It opens up so many new recording possibilities without compromising quality in any way that it is very well worth the effort of fitting it up.

Wind shields have been designed to operate in howling gales, but only when very loud sounds indeed have to be picked up. Quite light breezes, usually somewhat gusty at ground level (due to sundry obstacles) generally upset ordinary microphones, and the better quality they are, the more likely they are to be affected. However, it is surprisingly easy to make a windshield quite effective enough for a ribbon microphone to be used out of doors in a 3 to 4 mph breeze. A fine mesh cage of wire or fabric, with a smooth outline, spherical or nearly so, and of several inches greater diameter than the microphone, is surprisingly effective. Its effect on the sound picked
up is barely measurable, certainly not audible. The smooth outline is to reduce to a minimum eddies .and disturbances due to the extra obstruction, and its surf ace should be sufficiently far from the microphone for the distance to attenuate any faint noises it does produce. Thus a large diameter windshield will be more effective than one of a smaller diameter, but both sizes can be useful, depending on the prevailing conditions. For a ribbon microphone, a Rugby-football-shaped shield is convenient. Two layers of mesh, widely separated, are even more effective. While not as elegant as the commercially available wind shields, a homemade effort of wire and silk stocking, is just as effective. Fig 29 shows a design that proved very satisfactory with a stereo ribbon microphone used to record a dawn chorus. Windshields are sometimes necessary indoors-even when a microphone is on the end of a boom, following an actor, say in a TV play!

There is only one microphone arrangement that gives a completely non-ambiguous stereo result. It is also the only one with mathematical justification. This is the Blümlein crossedcoincident microphone system, and it uses two directional microphones placed as close together as possible. If they are of the figure-ofeight type (e.g. ribbon) they should be placed one above the other and at $90^{\circ}$ (Fig 30). They should in general be used so that the sound field to be covered subtends $90^{\circ}$ at the microphone position (Fig 31). Sounds emanating from extreme left will then produce a maximum signal in the left-looking element, and nothing from

the right-looking one as this point coincides with the RH microphone's null. Likewise direct sounds from the extreme right only register on the RH microphone. Central sounds will produce equal signals from the two, and from other positions appropriate ratios. Cardioid types can be used in just the same way, and the angle between them can be increased to about $120^{\circ}$ if desired.

There are of course quite a number of stereo microphones made in this form, some with fixed angles, some adjustable; but it is of course possible to use separate microphones as long as they are identical. Ideally, from acoustic considerations, it is better to mount them one above the other, turning the upper one upside down'so as to place its active element as close to the lower one as possible, as in fig 32. However, quite acceptable results are obtained by mounting them side-by-side, pointing outwards at the usual $90^{\circ}$ (or more). They should be as close together as possible without shadowing each other. From 3 in . to 5 in . is the kind of spacing to aim at (Fig 33).

If only a pair of omni-directional microphones are available, or, at a pinch, two different
ones, then some sort of stereo effect is still possible by using the widely spaced technique. The microphone separation used will depend on the distance and size of the original source of sound. This is still a worthwhile exercise, and in fact in some situations (say an organ recital in a large church) it will probably be every bit as good as the "correct" method.

There is one other form of stereo-synthetic stereo we might call it-that places single microphones very close to separated players or groups of players and mixes in the various signals, feeding the correct ratio of signal from each microphone to the $L$ and $R$ channels, so as to place the sound in the desired position in the final playback. This can use a variety of microphones and there is no advantage in their being alike. This and other techniques are dealt with at length in Burrell-Hadden's "Practical Stereophony," a book which will be found both interesting and helpful.

This is but a simple introduction to the ins and outs of microphones, but it may help the user to use his apparatus to better effect and enjoy the results.

# SPEAKER CHOICE 

by Rex Baldock

One of the most revealing methods for choosing audio components relies on comparison within a very short period, using similar programme material. If carried out under suitable acoustic conditions and with due regard to certain technical requirements, this technique can be effective in assisting the choice; in contrast, a haphazard approach may lead to all sorts of erroneous conclusions and subsequent disappointments.
After taking elementary precautions concerning proper loading and the setting of levels, the direct comparison of items such as radio tuners, tape recorders, gramophone pickups and amplifiers is reasonably straightforward and a quite good assessment of the major performance factors may be obtained from electrical measurements. With electro-acoustic apparatus, such as microphones and speakers, much greater care must be exercised if meaningful results are to be obtained, especially as regards the acoustic conditions during tests. Bearing these in mind, several microphones may be compared for overall effect without too much difficulty.

It is in the field of both objective and subjective speaker testing that the interpretation of results is most subject to error. With calibrated test equipment and a constant acoustic environment, quite accurate and repeatable measurements of output, distortion, frequency response and directional properties may be taken. These can be of great assistance towards indicating which of several speaker designs is most desirable, but for the critical listener only a comparative listening test will show which gives the closest reproduction of the original signals.

It is not possible generally to make the ultimate in comparisons-with the original sound itself. Except for pianos, quartets and the like the original sound source could not conveniently be accommodated within the type of room for which domestic speakers are designed. When
reproducing orchestral music, for instance, it is usually accepted that the listener will imagine the sound image beyond the room itself. Hence, except for rare cases where the listening room opens on to a concert hall or studio, direct comparisons with the original are impracticable.
Lacking this ideal facility, it is normally necessary for the listener who is assessing speakers to be thoroughly familiar with, and have an adequate aural memory of the type of sounds heard at live performances in various auditoria. This necessarily demands an in-built "reference", which can only be acquired by occasional attendance at concerts and recitals; not such an onerous task if one really enjoys music!

It might be noted at this stage that if a listener really requires a speaker that modifies signals to yield a sound that is more "exciting" than the original, then he has entered a realm in which no absolute standards can be specified. Consequently, anything, no matter how much a travesty of the original, may pass as acceptable or even desirable to this type of listener, and, as many will have found, discussion of results becomes fruitless.

It is unfortunate that progress towards natural sound reproduction has often been hampered by the appearance of speaker designs giving an excessive output in some region of the bass or treble range. When fed with programme material of limited or unbalanced range, the overall result may seem more acceptable than when heard via a speaker of smoother and wider range, but the usual consequence is a tendency to give all programme material spurious colouration. This is often the case where a speaker has a treble response rising to a sharp peak around 4 to $5 \mathrm{Kc} / \mathrm{s}$ with little output above this frequency. When programme material was restricted in range to about this limit, such artifices were quite legitimate and represented the best compromise under the circumstances. Persons subjected to this kind of reproduction, and also un-
familiar with live musical sounds, tend to show a marked preference for the former in comparison with more lifelike results. When "reeducated" by extended listening sessions at live performances or with wide range, smooth, resonance-free reproduction they, of ten with difficulty, finally realise that such sounds are more pleasing, much less fatiguing and enjoyable at high levels without strain.

So much for reference standards. Equipped with perceptive and musically educated ears, the listener is ready to investigate the relative merits of speakers. But before just casually connecting them in turn, it is essential to place them to best advantage, to use suitable signals and possibly to compensate for their particular electrical and acoustical characteristics.

There are two types of performance that a speaker may offer and they could be labelled "nominal" and "attainable". Starting with the former, if two or three speakers are merely switched in turn to a wide range, high-quality programme source via a power amplifier, then results may vary very noticeably as regards apparent output and frequency balance. Speaker efficiencies may range from under $1 \%$ to over $30 \%$, but the effective value may be somewhat obscured unless allowance is made for the system impedance. This, which is of ten quoted for an input frequency of $400 \mathrm{c} / \mathrm{s}$ and is only nominal, may lie anywhere in the range of about 2 to 20 ohms. Unless, therefore, the power amplifier in use is re-tapped to match each speaker system, the apparent efficiency observed will vary, even if otherwise their characteristics are identical.

The majority of high-quality power amplifiers deliver what is known as a "constant voltage" signal-within reasonable limits the effective voltage developed across the speaker terminals is independent of its impedance. Hence a 2 -ohm unit would draw 10 times the current taken by a 20 -ohm unit connected to the same amplifier, and its power efficiency, all other things being equal, would appear 10 times as high, a difference of 10 dB (power developed $=$ V.I or $\mathrm{I}^{2} . Z$, assuming for the purposes of this argument that Z is a linear resistance). A change in output of 10 dB is very noticeable, despite the compressive characteristics of the ear (something between 8 and 10 dB change gives a loudness change of $2: 1$ ), so the nominal efficiency of the 2 -ohm unit would seem quite high in comparison. However, its maximum output, found by proper matching to the power amplifier, would be similar to that of the higher impedance speaker under matched conditions. The first rule, therefore, is not to
confuse apparent efficiency with real efficiency or probable maximum output.

Assuming that comparisons are to be undertaken with units having the same nominal impedance, say 15 ohms, there may still be some discrepancy in apparent efficiency. This is because the actual impedance of a speaker, even at one frequency, may still lie between about 10 and 20 ohms, and yet be designated 15 ohms by the manufacturer. So the apparent efficiency of a 10 -ohm unit, all other parameters being otherwise equal, would still be 3 dB higher than the 20 -ohm unit; subjectively a mild but noticeable difference and sufficient to prejudice comparisons. Psychologically, the louder of two speakers tends to be favoured as superior.

Of course, if two speakers are of the same impedance and one yields more sound output for the same voltage input, then its efficiency is genuinely higher. This means that at moderate levels the output will be greater, but this does not imply that its maximum output is necessarily higher. A unit rated for 5 watts maximum input and having an efficiency of $5 \%$ will radiate $\frac{1}{4}$ acoustic watt, whereas another rated for 50 watts maximum input and of $1 \%$ efficiency will radiate $\frac{1}{2}$ acoustic watt, or 3 dB more.

Of initial interest to the listener is the comparison of several speakers, it being so arranged that similar apparent levels are obtained, thereby allowing assessment of other aspects of performance. Ideally, to achieve this, each speaker should befedf rom a separate matched amplifier, each amplifier being driven from a common programme source. Usually, it is only possible to use one amplifier, in which case the gain control must be adjusted to suit each speaker accordingly. Provided the speaker impedances are within the range of about $\frac{1}{2}$ to 2 times the nominal amplifier load, this will be quite satisfactory. To avoid drawing attention to differences in efficiency, it is best to diminish the output to a speaker to zero, switch to the next under test and restore the output until a similar acoustic output is obtained. In general, it is not satisfactory to insert attenuators between the amplifier and each speaker to obtain equality of sound output because the damping factors so obtained may vary widely and give misleading results. For all these tests it is obvious that an amplifier adequate in power to drive the least efficient speaker to a reasonable maximum level is necessary, but in addition bearing in mind that the output should not be more than 4 to 5 times the lowest speaker rating.

Having ensured that results are not appreciably affected by differences in speaker impedance and efficiency, the nominal performances
found may differ considerably in balance, particularly regarding the bass output below about $100 \mathrm{c} / \mathrm{s}$. This will not usually be experienced with large and expensive systems, but in recent years very compact enclosures have gained favour where space is limited. In most of these cases the nominal bass response, with tone controls set level, exhibits a falling characteristic, but although the response may fall, the "attainable" performance using some degree of bass lift may be equal or superior to another system of better nominal response.
To a lesser degree, some treble lift or cut may permit a speaker to sound better balanced. Some require treble lift of the "shelf" variety, perhaps a few dB at all frequencies above a few $\mathrm{Kc} / \mathrm{s}$. Certainly, some moderate change in tone control settings can swing opinions regarding the overall acceptability of a particular speaker. However, to be fair initially, controls should be set level. Later, when a good idea of the "nominal" performances has been discovered, tone controls may be reset to obtain information on the "attainable" possibilities.

In order to permit a rapid assessment of the relative performances and to detect subtle differences it is vital to have a selector switch close to the listener. Changing speaker connections manually is bound to take a few seconds at least, quite long enough for significant details to be missed. Switching near the speakers is permissible if an assistant is handy, but still inferior to personal control, especially when close timing is needed to correlate with the programme content.
When comparing two speakers only it is sometimes useful to use a rotary make-before-break switch (see fig 1). It is then possible to progress from " $A$ " to " $A+B$ " and then to " $B$ " alone. With similar speakers this can of ten be carried
out at a judicious point in the programme without the other listeners being aware of the change -occasionally a usef ul demonstration that some speakers really do sound alike! The lack of discontinuity using this or similar switching arrangements helps to cover up the speaker changeover. Some people can't help being biased by knowledge of the price or expected performance of a particular speaker system, and complete ignorance of the selector setting constitutes the only fair method of testing. Where, as earlier, the apparent efficiency of the speakers under examination varies noticeably, the best solution to avoid identification is given by reducing the gain control to zero between switch changes.

Having indicated that even connecting speakers for testing is perhaps not entirely without difficulty, it will come as no surprise that their relative, and to some extent absolute, placement within the listening room requires care if fair comparisons are to be maintained. It is unwise to try to compare more than 3 or 4 at one session and if they are bulky this may have to be restricted to only two. This is because the brain becomes confused by too many alternatives and, physically, unless the speakers are reasonably close together, quite erroneous conclusions may be drawn regarding the bass response achieved under listening room conditions.

Unless speaker placement is carried out with reasonable care, quite noticeable differences in response will be obtained, even from similar systems, and at fairly low frequencies the maximum output obtainable for a given level of distortion may vary with position by as much as 20 dB ( $100: 1$ in power!). It is important, therefore, to place the speakers as close as conveniently possible, say within a foot or two, and


preferably equally spaced from a wall or corner (see fig 2).

Some speakers have controlled directional characteristics and are only really satisfactory if angled correctly with respect to the listeners. The actual height of the speaker must be chosen suitably; if described as a "bookshelf" model, then it ought to be mounted around 2 to 3 feet from the floor. Other systems may be designed to operate close to a right-angled corner; unless so placed they may not give of their best. Others, again, particularlycertainelectrostatic speakers, must be used spaced away from a wall, otherwise undesirable reflections can degrade performance. But for other reasons, some of the smaller slim enclosures give best performance when close to a wall or large surface. So, before even attempting to judge relative performance, it is important to set up speaker systems as directed by the manufacturer.

For most testing it is sufficient to use a monophonic signal fed to one example of each speaker, but after sorting out their important characteristics, the suitability of each type for stereophonic working is best determined separately, final comparisons using a two-channel selector switch only being undertaken after optimising their positions.

Assuming that a programme source, amplifier, selector switch and speakers have been set up, the next problem arises-what sort of test signals should be used? Some experimenters like to start using a source of random noise. If it is of a suitable type this can be quite enlightening, and a skilled listener is able to detect inherent faults very rapidly. With practice it is often possible to locate high frequency resonances by
the apparent "pitch" produced. However, such a signal is very searching and may expose defects that will pass unnoticed on nearly all programme material. So, unless the listener is really experienced in interpreting results, it is best to restrict tests to musical signals; after all, these are what the speaker will normally be required to reproduce!

It must be emphasised that the proper choice of musical signal, together with its technical quality, is overwhelmingly important and if attention is not paid to this aspect, then results may be invalidated. Musical qualities aside, signals for testing speakers must be of low distortion and properly balanced. For many tests the actual frequency coverage need not be exceptional, but within that range if the balance is poor, judgements can be quite difficult and even misleading. Even 2 dB unbalance above $1 \mathrm{Kc} / \mathrm{s}$ is quite audible and could be sufficient to conf use the issue.

At audio exhibitions some speaker manufacturers use demonstration music which, although often quite pleasant, has had no real existence in the usual sense, being derived entirely from electronic instruments. Enhanced transient characteristics may yield "startling" effects, but such signals are of little value for determining whether a speaker is capable of giving natural reproduction.

Some authorities believe that speech reproduction constitutes the most stringent test for a speaker system. Undoubtedly, this type of signal often shows up colourations of various sorts, particularly if the reproduced voice is that of someone well known to the listener. Nevertheless, a large number of speakers are used prim-
arily for music reproduction and sometimes a fault easily heard on speech does not show itself on music. To some listeners a speaker that is natural sounding on speech sometimes; sems a little "thin" on music and they may. ius a. and.... of reasons. prefer anothe: for music that is somewhat inferior on specch. This is a matter of personal preference and until perfect speakers and rooms are available some differences of opinion are bound to arise.

For the rapid assessment of overall speaker performance, orchestral music is most suitable, the strings in particular constituting a good test for smoothness in the middle and upper frequency range. The bass drum and cymbals will quickly give an idea of the response at low and high frequencies and also show whether adequate acoustic output is obtainable at high levels without obvious distortion. Organ and choral music can be effective for checking whether
intermodulation is likely to occur, whilst other useful musical sounds might include piano, chamber music, dance band, military band and opera.

When with ing speakers. just what should one attompt to hear? Aside from general balancc, one of the most noticeable differences between speakers is the degree to which they sound like speakers. This is a difficult aspect to define, but usually an inferior speaker sounds somehow "artificial", "cramped", "hard" or just "boxy", whereas the better product is "natural", "open", "unforced" or "easy on the ear". All manner of things can contribut these impressions and the difference between a pleasant and unpleasant system may be duc to small but significant design detatla

If two speakers seem similarly balances. differ in character, then the usual reason is that one, and more probably both, suffer from some

residual colouration, usually contributed by diaphragm flexure, internal enclosure reflections or possibly unwanted panel vibrations. When these effects are mild it is quite easy to become accustomed to the sound of one speaker for a period and then, on switching to others, find that they all sound unnatural. However, if attention is concentrated on one of these speakers for a few minutes, it will of ten be found that on switching back to the original speaker it has now become the offender! This is quite a normal experience if the residual colourations are no worse than would be found due to the room itself. Even similar looking corners can sound quite different (try listening to someone talking in both in quick succession), but generally speaking their effect on speakers is fairly innocuous and soon forgotten in comparison with other more serious imperfections.

A speaker having a fairly high Q "ring" at a few $\mathrm{Kc} / \mathrm{s}$ (such as curve (a), fig 3) may at first sound more impressive than one falling smoothly, curve (b). On listening closely, however, unless the peak is very high up in the frequency range, any noise with the programme will tend
to be accentuated and become more of a hiss, whilst the programme itself will acquire an unnatural "edge" which can be quite irritating af ter a period of listening at realistic levels.

Similarly, a badly damped resonance in the range 70 to $150 \mathrm{c} / \mathrm{s}$ can give a superficial impression of good bass response, but familiarity with wider range and smoother reproduction will easily reveal that it lacks true "depth" and, lower still, "weight".
There are numerous other facets of speaker performance and comparisons that might be discussed, but perhaps sufficient has been mentioned to show that the subject is not simple and some skill must be applied if conf usion is to be avoided.
Possibly one of the most important rules in comparative speaker testing is-avoid hasty decisions. It is surprising how long it sometimes takes to be sure of a speaker's performance, although bad ones can be sorted out quite rapidly. But the subtle qualities of a good speaker take time to appreciate and, as with some people, continued acquaintance breeds greater respect.

## DIRECTORY OF PICKUPS AND ARMS

$\star$ In the abridged specifications of this directory, the following abbreviations are used for economy of space: P.w. = recommended playing weight; mg.=milligram; gm. = gram; Rec. load=recommended resistive load; $\mathbf{m V}=$ millivolt. In all cases where decibel limits for frequency response and frequency for stated separation are given by manufacturer, these are included. Output is usually referred to a recorded velocity of $1 \mathrm{~cm} / \mathrm{sec}$.; this figure should be multiplied by five for the practical music output.
denotes stereo equipment.

AUDIO AND DESIGN LTD., 40 Queen Street, Maidenhead, Berks. Tel.: Maidenhead 25204.

Laboratory 9.9 in. pickup arm designed for low-mass ultra-high compliant cartridges tracking at very low stylus pressures. Damped unipivot arm with no lead-out wires. Bias correction and lifting device incorporated. Lathe base all fully adjustable by finger locking levers. Price: £29. (U.K. purchase tax $£ 51 \mathrm{~s} .6 \mathrm{~d}$.).

AUDIO DYNAMICS CORPORATION, New York, U.S.A. Sole U.K. agents: KEF Electronics Ltd., Tovil, Maidstone, Kent. Tel.: Maidstone 58361. Cables: KEF, Maidstone.

OADC point four. Stereo cartridge. Induced magnet. $\frac{1}{2}$ in. fixing centres. Stylus 0.4 thou. diamond. P.w. $\frac{3}{4}-1 \frac{1}{2} \mathrm{gm}$. Compliance $30 \times 10^{-6}$ $\mathrm{cm} /$ dyne. Range $10 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Separation 30 dB from $50 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}$. Output 1 mV . Rec. load 47 K . $15^{\circ}$ vertical tracking angle. For use only with the ADC 40 arm . Price: $£ 20$ 10s. (U.K. purchase tax $£ 35 \mathrm{~s} .9 \mathrm{~d}$.).

OADC point four/E. Similar specification to ADC point four but with elliptical stylus $0.2 \times 0.8$ thou. Price: $£ 25$ (U.K. purchase tax £4 0s. 2d.).

OADC 660. Stereo cartridge. Induced magnet. For use with all high grade arms. Stylus 0.5 thou. diamond. Sensitivity 7 mV at $5.5 \mathrm{~cm} / \mathrm{sec}$. F.R. $10 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB} .15^{\circ}$ tracking angle. P.w. $1 \frac{1}{2}-4 \mathrm{gm}$. Compliance $20 \times 10^{-6} \mathrm{~cm} /$ dyne. Weight 7 gm . Separation $30 \mathrm{~dB} 50 \mathrm{c} / \mathrm{s}$ to $8 \mathrm{Kc} / \mathrm{s}$. Price: £12 (U.K. purchase tax $£ 1$ 18s. 6d.).

OADC 660/E. Similar specification to ADC 660 but with elliptical stylus $0.2 \times 0.8$ thou. and playing weight $1 \frac{1}{2}-3 \mathrm{gm}$. Price: $£ 174 \mathrm{~s}$. (U.K. purchase tax $£ 2$ 15s.).

OADC 770. Stereo cartridge. Induced magnet. For use with good quality automatic turntables and record changers. Sensitivity 8 mV at 5.5
$\mathrm{cm} / \mathrm{sec}$. Separation $30 \mathrm{~dB} 50 \mathrm{c} / \mathrm{s}$ to $8 \mathrm{Kc} / \mathrm{s}$. F.R. $10 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Stylus $0 \cdot 7$ thou. diamond. Vertical tracking angle $15^{\circ}$. P.w. 2-6 gm. Compliance $15 \times 10^{-6} \mathrm{~cm} /$ dyne. Weight 7 gm . Price: £9 (U.K. purchase tax £1 8s. 10d.).

ADC 40. Complete low inertia arm with side thrust compensator and anti-drag lead out arrangement. Single-thrust ball bearings used at four points. Accurately machined walnut nonresonant arm. Adjustable counterweight. Plugin head shell accommodates nearly all cartridges. Easy installation. Built-in arm rest. Arm length 105 in. overall. Pivot to stylus tip 9 in. Rear overhang $1_{4}^{3}$ in. Price: $£ 1515$ s. (U.K. purchase tax £2 10s. 6d.).

BANG \& OLUFSEN. U.K. Sales Division, Mercia Road, Gloucester. Tel.: Gloucester 26841. Cables: Debelec, Gloucester.

OSP.6, SP.7, SP.8. Stereo cartridges. Specification and prices to be announced.

OStereodyne SP. 1 and SP.2. Stereo cartridge. Moving iron. Plug-in. Stylus 0.7 thou. diamond. P.w. 2-4 gm. Range $30 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Separation 22 dB min. Output 7 mV . Rec. load 47 K. Price: $£ 55 \mathrm{~s}$. (U.K. purchase tax 15s. 2d.). Replacement styli $0.5,0 \cdot 7,1 \cdot 0,3 \cdot 0$ thou. diamonds. Price: $£ 25$ s. (U.K. purchase tax 7s. 6d.).

ST/L. 9 in. pickup arm, less cartridge. Price: £6 6s. (U.K. purchase tax 18s. 3d.).

OST/A arm. Arm with plug-in shell for use with SP. 1 cartridge, or will take all standard cartridges. Price: £6 6s. (U.K. purchase tax 18s. 3d.).

OST/P arm. Professional 12 in . arm. Price: £8 2s. (U.K. purchase tax £1 7s.).
-STL/150. Pickup arm. Specification and price to be announced.


Acos GP91-1 crystal mono cartridge


Acos GP.91-1 cartridge


Acos GP.94-1 cartridge


ADC professional cartridge
ADC professional cartridge

B.J. Super 90 arm
B.J. Super 90 arm


Acos GP93 crystal stereo

BSR LTD., Monarch Works, Powke Lane, Old Hill, Staffs. Tel.: Cradley Heath 69272. Telex: 33282.
C.1. Ceramic stereo turnover cartridge. Stylus: sapphire or diamond, $\cdot 0007 \mathrm{LP} /$ stereo, $\cdot 0025 / 78$. P.w. 2-6 gm. Lateral and vertical compliances $5 \times 10^{-6} \mathrm{~cm} /$ dyne and $3 \times 10^{-6} \mathrm{~cm} /$ dyne. F.R. $20 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$, up to $15 \mathrm{Kc} / \mathrm{s}-6 \mathrm{~dB}$. Output $0 \cdot 11 \mathrm{~V} \pm 2 \mathrm{~dB}$. Load impedance 2 megohms 100 pF . Prices: with sapphires $£ 2$ (U.K. purchase tax 6s. 5d.), with diamond LP $£ 2$ 12s. 6d. (U.K. purchase tax 8s. 5d.).

BURNE-JONES \& COMPANY LTD., 18 Brunswick Road, Sutton, Surrey.
B.J.Tan/11 arm. Designed to overcome tracking error. Total tracking error less than $\frac{1}{2}$ degree. Height adjustable. Price on application.
B.J. Super 90 Mk. II pickup arm. Two models. 12 in. and 16 in. Price (including plug-in shell to carry standard cartridges) on application.

CLARKE \& SMITH MANUFACTURING CO.
LTD., Melbourne Works, Wallington, Surrey. Tel.: Wallington 9252. Cables: Electronic, Wallington.

OE.M.I. EPU100. Complete stereo pickup. Variable reluctance type. Stylus diamond, 0.5$0 \cdot 6$ thou. stereo, $0 \cdot 8-1 \cdot 0$ thou mono LP, $2 \cdot 5-3 \cdot 0$ 78. P.w. pre-set at 2.5 gm . Tip mass 1 mg . Compliance $7 \times 10^{-6} \mathrm{~cm} /$ dyne lateral, $3.5 \times 10^{-6}$ vertical. Range $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Separation 20 dB at $1 \mathrm{Kc} / \mathrm{s}$. Output 1.5 mV . Rec. load $50-100 \mathrm{~K}$. Arm features built-in lowering device with all movement on a viscous damped uni-pivot. Price (stereo): £16 8s. 9d. (U.K. purchase tax £2 16s. 1s.); (mono):£15 13s. 1d.(U.K. purchase tax £2 13s. 5d.).

Spare heads: Price (type EPH/S (stereo)): £7 16s. 7d. (U.K. purchase tax £1 6s. 9d.); (type EPH/M (mono)): £7 0s. 11d. (U.K. purchase tax £1 4s. 1d.); (type EPH/78 (78)): £10 (U.K. purchase tax $£ 1$ 14s. 2d.).

CONNOISSEUR. See A. R. Sugden and Co. Ltd.

COSMOCORD LTD., Eleanor Cross Road. Waltham Cross, Herts. Tel.: Waltham Cross 27331. Cables: Acos, Waltham Cross.
-ACOS GP77 Stereo. Ceramic. For Hi-Light pickup. F.R. $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Output 30 $\mathrm{mV} / \mathrm{cm} / \mathrm{sec}$. Separation -20 dB at $1 \mathrm{Kc} / \mathrm{s}$. Rec. input impedance 2 megohms or higher. P.w. 2 gm. Compliance 6 micro-cm/dyne. Effective tip mass 0.9 mg . Diamond stylus, 0.5 thou. Price (with diamond stylus): $£ 26 \mathrm{~s}$. 6d. (U.K. purchase tax 7s. 6d.).

Acos GP77 Mono LP. Ceramic. F.R. $50 \mathrm{c} / \mathrm{s}-$ $18 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Rec. input impedance $2 \mathrm{meg}-$ ohms. P.w. 2 gm. Compliance 6 micro-cm/dyne. Effective tip mass 0.9 mg . Diamond stylus, 1.0 thou. Price (with diamond stylus): $£ 26 \mathrm{~s} .6 \mathrm{~d}$. (U.K. purchase tax 7s. 6d.).

Acos GP77 Mono 78. Specification as for LP head. Sapphire stylus, $2 \cdot 5$ thou. Price (with sapphire stylus): $£ 111 \mathrm{~s}$. (U.K. purchase tax 5 s.).

Acos GP91-1. Mono crystal cartridge. Turnover dual stylus. LP 0.8 thou. diamond or sapphire, $782 \cdot 5$ thou. sapphire. P.w. 3-6 gm. Tip mass 2.5 mg . dynamic. Compliance $5 \times 10^{-6}$ $\mathrm{cm} /$ dyne. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Output 160 mV . Load impedance 1 megohm. Low temperature co-efficient. Price: (sapphire/sapphire) £1 7s. 6d. (U.K. purchase tax 4s. 5d.); (diamond/sapphire) £1 16s. 1s. (U.K. purchase tax 5s. 10d.).

Acos GP92. Mono ceramic cartridge. Turnover stylus assembly. LP 0.8 thou. diamond or sapphire, 782.5 thou. sapphire. P.w. 5-10 gm. Tip mass 2.5 mg . dynamic. Compliance $2.5 \times$ $10^{-6}$. F.R. $150 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}, 12 \mathrm{~dB}$ down at $30 \mathrm{c} / \mathrm{s}$ relative to $1 \mathrm{Kc} / \mathrm{s}$. Output 100 mV . Load impedance 1 megohm. Low temperature coefficient. Price:(sapphire/sapphire) $£ 1$ 10s. (U.K. purchase tax 4s. 10d.); (diamond/sapphire) £2 (U.K. purchase tax 6s. 5d.).

OAcos GP93. Stereo crystal cartridge. Turnover dual stylus. Stylus $0 \cdot 6-0 \cdot 7$ thou. diamond or sapphire, $2 \cdot 5$ thou. sapphire. P.w. $4-8 \mathrm{gm}$. Tip mass 2.5 mg . dynamic. Compliance: vertical $2.2 \times$ $10^{-6} \mathrm{~cm} /$ dyne, lateral $2.2 \times 10^{-6} \mathrm{~cm} /$ dyne. F.R. flat $250 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}, 3 \mathrm{~dB}$ down at $100 \mathrm{c} / \mathrm{s}$ relative to $1 \mathrm{Kc} / \mathrm{s}$. Output 250 mV . Rec. load 1 megohm. Low temperature co-efficient. Price: (sapphire/ sapphire) $£ 2$ (U.K. purchase tax 6 s. 5 d .); (diamond/sapphire) £2 10s. (U.K. purchase tax 8s.).

Acos GP94. Stereo ceramic cartridge. Turnover dual stylus. Stylus 0.6-0.7 thou. diamond or sapphire, $2 \cdot 5$ thou. sapphire. P.w. 2-4 gm. Tip mass 2.5 mg . dynamic. Compliance: lateral 6


Decca Anti-Rumble pickup



Connoisseur stereo ceramic cartridge


Elac STS 322 cartridge


Elac KST 106 cartridge


Elac BST 406 cartridge
$10^{-6} \mathrm{~cm} /$ dyne, vertical $6 \times 10^{-6} \mathrm{~cm} /$ dyne. F.R. Flat $100 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}, 7-8 \mathrm{~dB}$ down at $30 \mathrm{c} / \mathrm{s}$ relative to $1 \mathrm{Kc} / \mathrm{s}$. Separation 20 dB at $1 \mathrm{Kc} / \mathrm{s}, 8 \mathrm{~dB}$ at $10 \mathrm{Kc} / \mathrm{s}$, minimum. Output 80 mV minimum. Load impedance: 1 megohm each channel. High capacity ceramic elements ( $1,000 \mathrm{pF}$ ). Low temperature co-efficient. Price: (sapphire/sapphire) $£ 25$ s. (U.K. purchase tax 7s. 3d.); (diamond/sapphire) £2 15s. (U.K. purchase tax 8s. 10d.).

DECCA SPECIAL PRODUCTS. Decca Radio and Television Division of The Decca Record Co. Ltd., Ingate Place, Queenstown Road, London, S.W.8. Tel.: Macaulay 6677.

Deram ceramic. Stereo/mono cartridge. White shell transcription quality. P.w. $2 \cdot 5 \mathrm{gm}$. Tip mass 0.6 mg . Compliance $9 \times 10^{-6}$ lateral, $5 \times 10^{-6}$ vertical. F.R. $18 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s} . \pm 3 \mathrm{~dB}$. Separation better than -20 dB at $1 \mathrm{Kc} / \mathrm{s}$. Output 50 mV per channel. Rec. load impedance 2 megohms. Stylus 0•5-0.6 thou. diamond. Price: $£ 41 \mathrm{~s} .4 \mathrm{~d}$. (U.K. purchase tax 13s. 2d.).

NOTE: All Deram cartridges are of transcription quality, the black shell range intended primarily for cheaper auto-changers is discontinued.

Deram ceramic. Mono cartridge. Stylus 1 thou. diamond. All other details as for stereo/ mono cartridge. Price: $£ 4$ 1s. 4d. (U.K. purchase tax 13s. 2d.).

Deram ceramic. Mono 78 cartridge. Stylus 3 thou. sapphire. All other details as for stereo/ mono Deram. Price: £2 9s. 7d.

Off ss Mk II head. Variable reluctance stereo/ mono head. F.R. $40 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Separation -20 dB at $1 \mathrm{Kc} / \mathrm{s} ;-15 \mathrm{~dB}$ at $50 \mathrm{c} / \mathrm{s}$ and 12 $\mathrm{Kc} / \mathrm{s}$. Output $1.2 \mathrm{mV} / \mathrm{cm} / \mathrm{sec}$. per channel. Stylus $0 \cdot 5$ thou. diamond. P.w. $3 \cdot 5 \mathrm{gm}$. Tip mass less than 1 mg . Compliance $10 \times 10^{-6}$ lateral, $2 \times 10^{-6}$ vertical. Rec. load 50 K . Price: $£ 13$ 2s. 5d. (U.K. purchase tax $£ 2$ 2s. 1d.).
ffss Mk. III head. Variable reluctance stereo/ mono head. Stylus $0.3 \times 0.7$ elliptical diamond. P.w. 2 gm . Compliance: $15 \times 10^{-6}$ lateral, $4 \times 10^{-6}$ vertical. F.R. $20 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Other details as for Mk. II. Price: $£ 1516 \mathrm{~s} .8 \mathrm{~d}$. (U.K. purchase tax $£ 2$ 10s. 10d.).
ffss Mono Elliptical. Variable reluctance mono equivalent of the Mk . III stereo/mono head.

Stylus $0.3 \times 1$ thou. elliptical diamond. Price: $£ 116 \mathrm{~s}$. 3d. (U.K. purchase tax $£ 116 \mathrm{~s}$. 3d.).
ffss Mono LP. Variable reluctance mono equivalent of Mk. II stereo/mono head. Stylus 1 thou. diamond. Price: £8 11s. 11d. (U.K. purchase tax £l 7s. 7d.).
ffss Mono 78. Variable reluctance 78 equivalent of Mk. II stereo/mono head. Stylus $2 \cdot 8$ thou. diamond. Price: £8 11s. 11d. (U.K. purchase tax £l 7s. 7d.).

Deram ARI arm. Anti-rumble integrated design. Used with Deram cartridge achieves mechanical rumble filter without attenuation of wanted frequencies. Price: £5 17s. 7d. (U.K. purchase tax 18s. 11d.).
ffss Mk. I "Super". Transcription arm suitable for all ffss heads only. Price: £6 15 s . 9d. (U.K. purchase tax $£ 11 \mathrm{~s} .10 \mathrm{~d}$.).
ffss "Professional" Arm. Suitable for all ffss heads. Includes lowering device and pressure adjustment. Price: £15 16s. 8d. (U.K. purchase tax £2 10s. 10d.).

NOTES: Decca maintains that head and arm should be designed as an entity for optimum results. For this reason Decca ffss arms and heads have an exclusive head fitting, which also ensures accurate alignment. All ffss heads will fit all ffss arms, but heads with elliptical stylus should be used only with "Professional" arms, or arms reaching the "Super" specification. Original Mk. I arms not reaching "Super" specification can be converted for $£ 33 \mathrm{~s}$.

The anti-rumble properties of the ARI arm depend on its being used with a Deram cartridge. Deram heads are suitable for use with amplifiers having sensitivity of 150 mV .

Specifications for Deram heads assume the use of the latest (light blue) stylus assembly. The specification is less advanced with the white stylus although the output is greater. Styli for all Deram pickup heads, including diamond 78, are £1 5s. each including tax.

Decca ffss pickup heads can be inspected for a charge of 12 s . 6 d . When the stylus is worn on a Deccaffss head it must be returned to the maker for replacement. The service offered is complete replacement of the head with a reconditioned head having a new stylus. Performance is guaranteed to be as new. Prices for this service are: elliptical styli: $£ 66$ s. (including 17s. 6d. purchase tax); spherical stereo/mono styli: $£ 54 \mathrm{~s}$. 9d. (including 3s. 6d. purchase tax) ; mono


Decca ffss professional arm and head


Connoisseur SAU II pickup arm

and 78 styli: $£ 416$ s. 6 d. (including 3s. 6d. purchase tax).

Mk. I ffss heads are no longer in production but existing ones can be modified to Mk. II specification for $£ 22 \mathrm{~s}$.

EAGLE PRODUCTS. Distributors: B. Adler \& Sons (Radio) Ltd., 32a Coptic Street, London, W.C.1. Tel.: Museum 9606/7. Cables: Reldab, London.

Gold M.1007G. Cartridge. Stereo. Moving magnet. LP and stereo. 0.5 thou. diamond stylus. P.w. $1-2 \cdot 5 \mathrm{gm}$. Compliance $5 \times 10^{-6}$ $\mathrm{cm} /$ dyne. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Separation 22 dB at $1 \mathrm{Kc} / \mathrm{s}$. Output 5 mV at $5 \mathrm{~cm} / \mathrm{sec}$. at $1 \mathrm{Kc} / \mathrm{s}$. Rec. load 100K. Price: $£ 5$ 12s. 8d. (U.K. purchase tax 18s.).
-Silver M.1007F. Stereo cartridge. Moving magnet. LP and stereo. 0.7 thou. diamond stylus. P.w. 2-4 gm. Compliance $5 \times 10^{-6} \mathrm{~cm} /$ dyne. F.R. $20 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Separation 22 dB at $1 \mathrm{Kc} / \mathrm{s}$. Output 10 mV at $5 \mathrm{~cm} / \mathrm{sec}$. at $1 \mathrm{Kc} / \mathrm{s}$. Rec. load 100 K. Price: £4 17s. 6d. (U.K. purchase tax 15s. 8d.).

Prices quoted for Eagle products are approximate.

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ELAC. Electroacustic GmbH., Kiel, West Germany. Distributors: Mitchell Enterprises Ltd., 61 West Street, Dorking, Surrey. Tel.: Dorking 4229.
-STS240. Stereo cartridge. Moving magnet. $\frac{1}{2} \mathrm{in}$. fixing centres. Stylus 0.7 thou. diamond. P.w. $2 \cdot 5-4 \cdot 5 \mathrm{gm}$. Compliance $7 \times 10^{-6} \mathrm{~cm} /$ dyne. Range $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ (up to $15 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$ ). Separation 24 dB at $1 \mathrm{Kc} / \mathrm{s}$. Output $2 \cdot 2 \mathrm{mV}$. Rec. load $33-51$ K. Price: $£ 13$ 5s. 6d. (U.K. purchase tax £2 4s. 3d.).
-STS322. Stereo cartridge. Moving magnet. $\frac{1}{2}$ in. fixing centres. Stylus 0.5 thou. diamond. P.w. 2.5-3 gm. Compliance $12 \times 10^{-6} \mathrm{~cm} /$ dyne. Range $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Separation 26 dB at $1 \mathrm{Kc} / \mathrm{s}, 20 \mathrm{~dB}$ at $10 \mathrm{Kc} / \mathrm{s}$. Output 1 mV . Rec. load $33-51$ K. Price: $£ 16$ 18s. 6d. (U.K. purchase tax $£ 2$ 16s. 10d.).
-STS322/E. Similar specification to STS322 but with elliptical stylus. Price on application.

MST1. Mono magnetic cartridge. $\frac{1}{2}$ in. fixing centres. Stylus ( $33 \frac{1}{3}, 45$ ) 1 thou. diamond, (78) $2 \cdot 6$ thou. sapphire. P.w. $5-8 \mathrm{gm}$. Tip mass 2.5
mg. Compliance $5.1 \times 10^{-6} \mathrm{~cm} /$ dyne. Range $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Output 4.5 mV . Rec. load 37K. Price: Diamond $£ 6$ 14s. 3d. (U.K. purchase tax £1 2s. 5d.).

- BST406. Stereo ceramic cartridge. Stylus $\left(33 \frac{1}{3}, 45\right) 0.7$ thou. (78) $2 \cdot 6$ thou. P.w. $5-8 \mathrm{gm}$. Compliance $4 \times 10^{-6} \mathrm{~cm} /$ dyne. Range $20 \mathrm{c} / \mathrm{s}-$ $18 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Output 90 mV . Rec. load $0 \cdot 5-1$ megohm. Cross-talk damping at $1 \mathrm{Kc} / \mathrm{s} 20 \mathrm{~dB}$. Price: (sapphires) £3 15s. (U.K. purchase tax 12s. 6d.).

OKST106. Stereo crystal cartridge. Similar specification to BST406 but output 150 mV . Price: (sapphires) $£ 2$ 7s. 6d. (U.K. purchase tax 7s. 11 d .).

KST107. Similar specification to KST106 but with LP/stereo stylus only. Price: £2 7s. 6d. (U.K. purchase tax 7s. 11d.).

Full range of replacement styli available. STS240: standard, LP/stereo or handcut and polished stereo only. STS322: standard, handcut and polished stereo only or elliptical stereo only. BST406 and KST106: sapphire or diamond. 78 and LP/stereo turn-over, LP and stereo only turn-over, LP/stereo non turn-over.
E.M.I. See Clarke and Smith Ltd.

EMPIRE SCIENTIFIC. Distributors: How-land-West Ltd., 2 Park End, South Hill Park, London, N.W.3. Tel.: Swiss Cottage 6666.
888. Stereo/mono magnetic cartridge. Standard $\frac{1}{2}$ in. fixing. 0.7 thou. diamond stylus. P.w. $\frac{3}{4}-6 \mathrm{gm}$. Compliance $10 \times 10^{-6} \mathrm{~cm} /$ dyne. F.R. $10 \mathrm{c} / \mathrm{s}-24 \mathrm{Kc} / \mathrm{s}$. Separation better than 30 dB . Output 8 mV each channel. Rec. load 47 K . Price: $£ 11$ (U.K. purchase tax $£ 115 \mathrm{~s} .9 \mathrm{~d}$.).

888/P. Stereo/mono magnetic cartridge. Standard $\frac{1}{2}$ in. fixing. 0.6 thou. hand-polished diamond stylus. P.w. $\frac{1}{2}-4 \mathrm{gm}$. Compliance $15 \times 10^{-6}$ $\mathrm{cm} /$ dyne. F.R. $8 \mathrm{c} / \mathrm{s}-28 \mathrm{Kc} / \mathrm{s}$. Separation better than 30 dB . Output mV each channel. Rec. load 47K. Price: $£ 12$ (U.K. purchase tax $£ 119 \mathrm{~s}$. ).
-888/PE. Stereo/mono magnetic cartridge. Standard $\frac{1}{2}$ in. fixing. $0.2 \times 0.9$ thou. elliptical hand-polished diamond stylus. P.w. $\frac{1}{2}-3 \mathrm{gm}$. Compliance $20 \times 10^{-6} \mathrm{~cm} /$ dyne. Frequency response $6 \mathrm{c} / \mathrm{s}-30 \mathrm{Kc} / \mathrm{s}$. Separation better than 30 dB . Output 8 mV each channel. Rec. load 47K. Price: $£ 17$ (U.K. purchase tax $£ 2$ 15s. 3d.).


Decca Deram cartridge


Empire Series 888 cartridge


Goldring CS90 stereo ceramic cartridge


Goldring 580 cartridge


Elac MST 1 mono


Goldring G65 pickup


Goldring CS 80 ceramic stereo


Goldring SX 10/D stereo

EUPHONICS. Distributors: A. C. Farnell Ltd., 81 Kirkstall Road, Leeds, 3. Tel. : Leeds 35111 .

Miniconic. Semiconductor stereo cartridge. Crystalline silicon element treated so that changing pressures produced by stylus vary the resistance. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. P.w. 0.5 gm . Tracks up to $40 \mathrm{Kc} / \mathrm{s}$. Stylus: $0.2 \times 0.9$ elliptical diamond. Compliance: 25 micro$\mathrm{cm} /$ dyne horizontal and vertical. Output: dependent on setting of power supply unit and adjustable between 8 mV at 47 K to 400 mV at 500 K . Also supplies 100 mV at 600 ohms. Must have external power source which may be from a separate unit or derived from associated equipment. Price: (U15 LS laboratory standard) £24 19s.; (U15-LS-P1 plug-in type) £24 19s.; (U15-P professional, 0.5 thou. conical stylus) $£ 1412 \mathrm{~s} .5 \mathrm{~d}$.; (U15-P-Pl plug-in type) $£ 14$ 12s. 5 d . All prices include U.K. tax.

Miniconic PS-15 Power Supply. Supplies 6 mA polarising current to each element at 14 V DC. Inverts phase of one element to provide normal in-phase output signals. Matches impedances and levels to suit any type of preamplifier input. Price: $£ 1010 \mathrm{~s}$.

TA-15. Low mass professional pickup arm. Suitable for 12 in. turntables. Accepts U15 plug-in heads. Price: $£ 218 \mathrm{~s}$. 10d. including U.K. purchase tax.

EXPERT PICKUPSLTD., 74 Brownlow Road, New Southgate, London, N.11. Tel.: Bowes Park 5350.

Moving coil pickup heads. LP and 78. Output $0.25 \mathrm{mV} / \mathrm{cm} / \mathrm{sec}$. Impedance 10 ohms . (step up required for use with most preamplifiers). Stylus: 0.7 thou. or 1 thou. (LP), 2.5 or 3.5 thou. (78). Fit most shells with $\frac{1}{2}$ in. fixing centres. Price: $£ 7$ 12s. 9d. (U.K. purchase tax $£ 16 \mathrm{~s}$. 9d.).

Four-pin plug-in heads. Special for Ortofon, S.M.E. arms, styli as above. Price: £8 10s. (U.K. purchase tax £1 9s. 9d.).

Miniature Thorn Heads. Price: £6 10s. (U.K. purchase tax $£ 16 \mathrm{~s}$. 8d.). Four-pin angled type $£ 7$ 12s. 6d. (U.K. purchase tax $£ 16 \mathrm{~s}$. 8d.).

Pathé-Edison. Hill and dale disc reproducer for Expert, Ortofon, S.M.E. arms. Price: $£ 7$ 1s. 1d. (U.K. purchase tax £l 3s. 8d.).

Cantilever system replacement styli. Highly polished diamond in circular or elliptical tip. Radii from 0.5 thou. to 4 thou. Prices and details on request.

GOLDRING MANUFACTURING CO. (GREAT BRITAIN) LTD., 486/488 High Road, Leytonstone, E.11. Tel: Leytonstone 8343. Cables: Echovox, London.

CM160. Ceramic turnover cartridge fitted with sapphire LP and coarse groove styli. Load impedance 1 megohm. Output voltage 200 mV . Range $30 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. P.w. 5-7 gm. Price: £1 5s. (U.K. purchase tax 4s. 11d.).

CM60/D. As CM60 but fitted with LP diamond. Price: £2 1s. 6d. (U.K. purchase tax 6s. 9d.).

SX10/L. Stereo turnover cartridge. Fitted with sapphire LP and 78 styli. Output voltage 170 mV . Range $30 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s}$. Load impedance 1 megohm. P.w. 4 gm. Price: £l 8s. 6d. (U.K. purchase tax 4s. 8d.).

SX10L/D. As SX10/L but fitted with $0 \cdot 7$ thou. diamond. Price: £2 5s. (U.K. purchase tax 7s. 4d.).

CS80. Stereo-mono ceramic turnover cartridge. Stylus 0.7 thou. sapphire or diamond for stereo/LP and $2 \cdot 5$ thou. for 78. P.w. $2-4 \mathrm{gm}$. Compliance $4 \times 10^{-6} \mathrm{~cm} /$ dyne. Range $30 \mathrm{c} / \mathrm{s}-$ $14 \mathrm{Kc} / \mathrm{s}$. Separation $20 \mathrm{~dB}(1 \mathrm{Kc} / \mathrm{s}), 10 \mathrm{~dB}$ ( $10 \mathrm{Kc} / \mathrm{s}$ ). Output 200 mV . Rec. load 1-2 megohms. Price: (sapphire) £1 15 s . (U.K. purchase tax 5 s .8 d .); (diamond) £2 11s. 6d. (U.K. purchase tax 8s. 5d.).

CS90. Stereo ceramic cartridge. Stylus $0 \cdot 5$ or 0.7 thou. diamond. P.w. 2 gm. Compliante $8 \times$ $10^{-6} \mathrm{~cm} /$ dyne. Range $30 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Separation $25 \mathrm{~dB}(1 \mathrm{Kc} / \mathrm{s}) ; 10 \mathrm{~dB}(10 \mathrm{Kc} / \mathrm{s})$. Output 50 mV . Rec. load 1-2 megohms. Price: £4 4s. (U.K. purchase tax 13 s .8 d .).

CS91E. Stereo/LP ceramic cartridge. Stylus diamond elliptical. P.w. $1 \frac{1}{2}-3 \mathrm{gm}$. Tip mass 1 mg . F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Separation 25 dB . Output 20 mV . Rec. load 2 megohms. Price: £66s. (U.K. purchase tax $£ 10 \mathrm{~s} .6 \mathrm{~d}$.).
" $\mathbf{5 8 0}$ ". Variable rehuctance turnover cartridge. Sapphire stylus for LP, sapphire for 78. Output voltage 3.2 mV . Range $20 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. P.w. 6-7 gm. Load impedance 68 K . Price: $£ 44 \mathrm{~s}$. (U.K. purchase tax 13s. 8d.).


Leak stereo pickup

" 600 ". Variable reluctance turnover cartridge. $\frac{1}{2}$ in. centre, mounting holes. Diamond stylus for LP, sapphire for 78 . Output voltage $3 \cdot 2 \mathrm{mV}$. Range $20 \mathrm{c} / \mathrm{s}-21 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. P.w. 5 gm . Load impedance 68K. Price: $£ 88$ s. (U.K. purchase tax $£ 17 \mathrm{~s}$. 4d.).

G65. Low-mass tubular arm. Removable head slide, moving counterweight, stylus pressure adjustment, height adjustment. Price: £6 6s. (U.K. purchase tax £1 0s. 6d.).

Lenco L70. Stereo and mono transcription pickup arm. P.w. adjustable. Price: $£ 7$ 7s. (U.K. purchase tax $£ 13 \mathrm{~s}$. 11 d .).

Lenco P77. Transcription pickup arm. P.w. adjustable and calibrated in grammes. Lowering device incorporated. Can be balanced in all planes. Price: £25 6s. (U.K. purchase tax £4 12s. 6d.).
H. J. LEAK \& CO. LTD., 57/59 Brunel Road, East Acton, London, W.3. Tel.: Shepherds Bush 1173. Cables: Sinusoidal, Ealux, London.

Leak Mk. 4. Stereo pickup complete, Variable reluctance. Stereo/mono head. Stylus $0.3 \times 0.7$ thou. elliptical diamond. Easily replaceable by user. P.w. 2 gm . Compliance $10 \times 10^{-6}$ lateral, $10 \times 10^{-6}$ vertical. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. No high frequency or other peaks to cause noise or "edgy" reproduction. Separation -25 dB at $1 \mathrm{Kc} / \mathrm{s}$. Output 1.2 mV per $\mathrm{cm} / \mathrm{sec}$ RMS per channel. Rec. load $47 \mathrm{~K}-100 \mathrm{~K}$. Arm: single pivot bearing with light viscous damping. Friction not greater than 10 mg . Built-in raising and lowering device. Effective tip mass less than 1 mg . Coils individually screened with mu-metal, whole cartridge enclosed in mu-metal case. Price: £23. (U.K. purchase tax £3 16s. 8d.).
L.N.B. AUDIO SERVICES, 25 Cambridge Street, Loughborough, Leics. Tel.: Loughborough 61229 .

Unipoise Transcription Arm. Lightweight 9 in. arm employing true uni-pivot system. Very low bearing friction and moment of inertia. Tracking weight $0-3 \mathrm{gm}$. Tracking error less than 2 degrees. Universal $\frac{1}{2}$ in. cartridge fixing centres. Bias compensation. Finished black and polished aluminium. Price: £12 2s. 6d. (U.K. purchase tax £1 9s. 6d.).

MICRO SEIKI CO. LTD. Distributors: Living Sound, 11 Essex House, George Street, Croydon, Surrey. Tel.: Croydon 4663.

- Micro Seiki /LSM. Complete pickup and cartridge. Magnetic. Permalloy shielded. Stylus 0.5 thou. diamond. P.w. 1.5 gm . Compliance (lateral and vertical) $8 \times 10^{-6} \mathrm{~cm} /$ dyne. F.R. $10 \mathrm{c} / \mathrm{s}-28 \mathrm{Kc} / \mathrm{s}$. Channel separation -26 dB . Output 1.3 mV . Rec. load 70K. Pressure adjustment. Bias compensation. Lateral compensation. Plug-in shell interchangeable with S.M.E. and Ortofon. Price: $£ 234$ s. 11d. (U.K. purchase $\operatorname{tax} £ 215 \mathrm{~s} .10 \mathrm{~d}$.).

ORTOFON. Fonofilm Industri A/S Copenhagen. Distributed in the U.K. by MetroSound (Sales) Ltd., Bridge Works, Wallace Road, London, N.1. Tel.: Canonbury 8641. Cables: Metrosound, London.

Type AG. Moving coil, interchangeable head with vertical coils. Diamond stylus. Output voltage LP 0.5 mV . Range $20-14,000 \mathrm{c} / \mathrm{s} \pm 2 \mathrm{~dB}$. P.w. 5-7 gm. Load impedance 2 ohms (transformer required). Price: $£ 75$ s. (U.K. purchase $\operatorname{tax} £ 13 \mathrm{~s}$. 3d.).

Type C (without shell). Moving coil as above. Diamond stylus. Output voltage LP 0.3 mV . Range linear $20-20,000 \mathrm{c} / \mathrm{s}$. P.w. 3 gm . Load impedance 2 ohms (transformer required). Price: $£ 135 \mathrm{~s}$. (U.K. purchase tax $£ 2$ 2s. 5d.).

Type CE. As type C but with elliptical stylus. Price: $£ 185 \mathrm{~s}$. (U.K. purchase tax $£ 218 \mathrm{~s} .7 \mathrm{~d}$.).

Transformer. For use with above pickups. Price: $£ 35$ s.

SPU (without shell). Moving coil stereo cartridge. Diamond stylus $0 \cdot 00065-0 \cdot 0007$. Output voltage 0.05 mV . Range $20-20,000 \mathrm{c} / \mathrm{s}$. Separation 20-25 dB. P.w. 2 gm. Rec. load 2 ohms. Price: $£ 13$ 5s. (U.K. purchase tax $£ 2$ 2s. 5 d .).

SPU-T (without shell). Moving coil cartridge with built-in transformers. Diamond stylus. Channel separation 20-25 dB. Range 20-20,000 $\mathrm{c} / \mathrm{s}$. Load imp. 50 K ohms. P.w. 2 gm . Output voltage 2 mV . Available with pure stereo 0.0005 or 0.00065 diamond for use with mono/stereo. Price: $£ 15$ 5s. (U.K. purchase tax $£ 2$ 8s. 11d.).

SKG/212. 12 in. pickup arm with adjustable playing weight. Price: $£ 7$ (U.K. purchase tax £1 2s. 6d.).


SMG/212. 12 in. pickup arm for stereo and mono cartridges. Playing weight adjustable from $0-12 \mathrm{gm}$. Price: £11 (U.K. purchase tax £1 15s. 4d.).

RKG/309. 16 in. pickup arm. Details as for SKG/212. Price: £17 (U.K. purchase tax £2 14s. 8d.).

RMG/309. 16 in. pickup arm. Details as for SMG/212. Price: £21 (U.K. purchase tax £3 7s. 6d.).

RMG/212. Pickup arm with shell. Details as for RMG/309, but with plug insert for leads. For details of lowering device see Ortofon Hi-Jack. Price: £19 6s. (U!K. purchase tax £3 1s. 11d.).

SPU-E. (without shell). Stereo cartridge. Moving coil. Stylus elliptical diamond $23 \times 8$ microns. P.w. 2 gm. Tip mass 1 mg . Compliance $10 \times 10^{-6} \mathrm{~cm} /$ dyne. Range $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Separation 25 dB . Rec. load 2 ohms. Output voltage 0.05 mV . Price: $£ 185 \mathrm{~s}$. (U.K. purchase tax £2 18s. 7d.).

SPU-T/E. (without shell). Stereo cartridge with built-in transformers. Output voltage 2 mV . Rec. load 50 K . Other details as for SPU-E. Price: $£ 205$ s. (U.K. purchase tax $£ 35 \mathrm{~s}$.).

Shells. Type G shell for SPU and C Series cartridges. Price: $£ 1$ (U.K. purchase tax 3s. 3d.).

S15. Moving coil cartridge with 15 degree angle and wider compliance than previously obtained. Output impedance 2 ohms. Effective tip mass 0.9 mg . P.w. $1-2 \mathrm{gm}$. Output: $0.04 \mathrm{mV} /$ $\mathrm{cm} / \mathrm{sec}$. Stylus: 0.7 thou. diamond. Tracking angle 15 degrees. Compliance $20 \times 10^{-6} \mathrm{~cm} /$ dyne. Separation 20-30 dB. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ $\pm 2 \mathrm{~dB}$. Shielded against magnetic fields. Price: $£ 20$ 10s. (U.K. purchase tax $£ 35$ s. 10d.).

S15E. Similar to S15 but with $0.3 \times 0.7$ elliptical diamond stylus. Price: $£ 2510$ s. (U.K. purchase tax $£ 41 \mathrm{~s} .10 \mathrm{~d}$.).

S15T. Similar to S15 but with built-in transformers. Weight (including transformers): $18 \cdot 5$ gm. P.w. 1-2 gm. Output impedance 15 K . Rec. load 47 K . Output 2 mV . Price: $£ 22$ 10s. (U.K. purchase tax $£ 312 \mathrm{~s}$. 3 d .).

S15TE. Similar to S15T but with $0.3 \times 0.7$ elliptical diamond stylus. Price: $£ 27$ 10s. (U.K. purchase tax $£ 48 \mathrm{~s} .3 \mathrm{~d}$.).

Shells. Type M metal shells for 15 Series cartridges. Price: $£ 15 \mathrm{~s}$. (U.K. purchase tax 4 s . 3d.).

PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Avenue, W.C.2. Tel.: Gerrard 7777. Cables: Phillamps, London.

AG.3016. Crystal head fitted with sapphire styli. Output voltage 100 mV . Range $30-15,000$ c/s. P.w. 5-7 gm. Load imp. 470 K ohms. Replacement type for all mono heads with three contact socket connection. Price: £l 1s. 6d. (U.K. purchase tax 3s. 6d.).

AG.3401. Stereo magnetodynamic head with diamond stylus. Microgroove only with threecontact socket connection. Output voltage 2 mV per channel. Range 20-20,000 c/s. P.w. 3-5 gm. Load imp. 68 K per channel. Price: $£ 82 \mathrm{~s} .9 \mathrm{~d}$. (U.K. purchase tax $£ 16 \mathrm{~s}$. 3 d .).

AG.3301. Crystal stereo pickup cartridge with turnover head. Sapphire styli. Three-contact socket connection. Output voltage 120 mV per channel. P.w. 4-6 gm. Load imp. 470K per channel. Price: £l 8s. (U.K. purchase tax 4s. 6d.).

AG.3060. Crystal stereo pickup. Diamond 0.7 thou. stylus. Replacement type for Philips featherweight pickups. Three-contact socket connection. Range $30 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. Output voltage 120 mV per channel. P.w. 4-6 gm. Load imp. 470 K ohms per channel. Price: $£ 26 \mathrm{~s} .6 \mathrm{~d}$.). (U.K. purchase tax 7s. 6d.).

AG.3063. Identical to AG. 3060 but with sapphire $0 \cdot 7$ thou. stylus. Price: $£ 18$ s. (U.K. purchase tax 4s. 6d.).

AG.3304. Stereo crystal turnover head. Styli: 3 thou. sapphire for 78 , diamond 0.7 thou. for microgroove. Otherwise identical to AG.3301. Price: $£ 214 \mathrm{~s}$. 3d. (U.K. purchase tax 8s. 9d.).

AG.3402. Identical to AG. 3401 but with fivecontact plug connection. Price: £8 2s. 9d. (U.K. purchase tax $£ 16 \mathrm{~s}$. 3d.).

AG.3306. Stereo crystal head with turnover sapphire styli: 783 thou., LP 0.7 thou. Fivecontact plug connection. P.w. 3-6 gm. Compliance (lat.) $3 \times 10^{-6} \mathrm{~cm} /$ dyne; (vert.) $1.8 \times$ $10^{-6} \mathrm{~cm} /$ dyne. Range $30 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Separation 18 dB . Output 70 mV . Load imp. 470 K per channel. Price: £l 6s. 4d. (U.K. purchase tax 4s. 3d.).

AG.3310. Identical to AG. 3306 but with diamond LP stylus. Price: £2 14s. 3d. (U.K. purchase tax 8s. 9d.).

AG3407. Stereo magneto-dynamic head for


Ortofon $R M G / 212$ pickup arm and shell


Philips AG 3060 stereo head


Philips AG 3301 crystal stereo


Pickering V15


Pickering V15 AMI cartridge
microgroove records only. 0.7 thou. diamond stylus. P.w. 2-4 gm. Output $1 \cdot 2 \mathrm{mV} / \mathrm{cm} / \mathrm{sec}$. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 2.5 \mathrm{~dB}$. Separation better than 24 dB at $1 \mathrm{Kc} / \mathrm{s}$. Compliance (lateral): $6 \times 10^{-6}$ $\mathrm{cm} /$ dyne; (vertical): $5 \times 10^{-6} \mathrm{~cm} /$ dyne. Rec. load 68 K each channel. Price to be announced.

AG3409. Identical to AG3407 but with 3 thou. stylus for 78 rpm records only. Price to be announced.

PICKERING. Imported by Ad. Auriema Ltd., Impectron House, 125 Gunnersbury Lane, London, W.3. Distributed by Goldring Mfg. Co. Ltd., 486/488 High Road, Leytonstone, London, E. 11 .

Pickering 380A. Moving-magnet stereo cartridge with $\frac{1}{2}$ in. fixing centres. Stylus 0.7 thou. diamond. P.w. 2 gm. Output 3 mV . Price: $£ 12$ 12s. (U.K. purchase tax £2 0s. 11d.).

Pickering V15.AMI. Stereo/LP moving magnet cartridge. Stylus 0.7 thou. diamond. P.w. ${ }_{4}^{3}-3 \mathrm{gm}$. Tip mass 1 mg . F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Separation 35 dB . Output $1 \cdot 1 \mathrm{mV}$. Price: £9 9s. (U.K. purchase tax $£ 110 \mathrm{~s} .9 \mathrm{~d}$.).

Pickering V15.AMEI. Similar specification to V15.AMI but with elliptical diamond stylus. Price: £13 15s. (U.K. purchase tax £2 4s. 8d.).

Pickering V15.AT2. Price: £9 9s. (U.K. purchase tax £l 10s. 9d.).

Pickering V15.AC2. Price: $£ 8$ 12s. 6d. (U.K. purchase tax $£ 18 \mathrm{~s}$.).

RONETTE. U.K. Distributors: H. K. Harrison and Co. Ltd., 140 Park Lane, London, W.1. Tel.: Hyde Park 9363.

DC-395. Crystal turnover cartridge. Sapphire stylus. Load imp. 1 megohm 100 pF . Output voltage $1,000 \mathrm{mV}$. Range $30-6,000 \mathrm{c} / \mathrm{s}$. P.w. 6-10 gm. Price:£1 13s.9d.(U.K. purchase tax 5s. 7d.).

DC-284-OV. Crystal turnover cartridge. Sapphire stylus. Load imp. 1 megohm 100 pF . Output voltage 230 mV . Range $30-10,000 \mathrm{c} / \mathrm{s}$. P.w. 6-10 gm. Price: £1 13s. 9d. (U.K. purchase tax 5 s .7 d .).

DC-284-T. Crystal turnover cartridge. Sapphire stylus. Load imp. 1 megohm 100 pF . Output voltage 600 mV . Range $30-8,000 \mathrm{c} / \mathrm{s}$.
P.w. 6-10 gm. Price: £l 13s. 9d. (U.K. purchase tax 5s. 7d.).

DC-284-P. Crystal turnover cartridge. Sapphire stylus. Load imp. 1 megohm 100 pF. Output voltage 105 mV . Range $30-12,000 \mathrm{c} / \mathrm{s}$. P.w. 4-8 gm. Price: £1 13s. 9d. (U.K. purchase $\operatorname{tax} 5 \mathrm{~s} .7 \mathrm{~d}$.).

DC-395-S. Crystal turnover cartridge. Sapphire stylus. Load imp. 1 megohm 100 pF. Output voltage $1,450 \mathrm{mV}$. Range $30-6,000 \mathrm{c} / \mathrm{s}$. P.w. 10 gm. Price: £l 13s. 9d. (U.K. purchase $\operatorname{tax} 5 \mathrm{~s} .7 \mathrm{~d}$.).

TX-88. Crystal turnover cartridge. Sapphire stylus. Load imp. 1 megohm 100 pF . Output voltage 150 mV . Range $30-20,000 \mathrm{c} / \mathrm{s}$. P.w. 2-8 gm. Price: $£ 2$ (U.K. purchase tax 6 s .8 d .).

BF-40. Stereo single sided crystal cartridge. Sapphire 0.75 thou. stylus. Load imp. 1 megohm 100 pF . Output voltage 180 mV . Range 30$12,000 \mathrm{c} / \mathrm{s}$. P.w. 5-7 gm. Price: $£ 2$ 16s. 3d. (U.K. purchase tax 9s. 4d.).

Stereo 105. Stereo crystal turnover cartridge. Sapphire stylus. Load imp. 1 megohm 100 pF. Output voltage 250 mV . Range $30-12,000 \mathrm{c} / \mathrm{s}$. P.w. 3-6 gm. Price: £2 17s. 4d. (U.K. purchase $\operatorname{tax} 9 \mathrm{~s} .7 \mathrm{~d}$.).

Stereo 106. Stereo crystal turnover cartridge. Details as for 105 but output voltage 580 mV . Price: $£ 2$ 17s. 4d. (U.K. purchase tax 9s. 7d.).

Stereo 208. Stereo crystal turnover cartridge. Details as for 105 but output voltage 750 mV . Range $30-6,000 \mathrm{c} / \mathrm{s}$. P.w. 6-10 gm. Price: $£ 217 \mathrm{~s} .4 \mathrm{~d}$. (U.K. purchase tax 9s. 7d.).

SHURE ELECTRONICS LTD., 84 Blackfriars Road, London, S.E.1. Tel.: Waterloo 6361.

M3D-M. Stereo Dynetic cartridge. Moving magnet. $\frac{1}{2}$ in. fixing centres. Stylus 0.7 thou. diamond. P.w. 3-6 gm. Compliance $4 \times 10^{-6}$ cm/dyne. F.R. $20 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Separation 20 dB . at $1 \mathrm{Kc} / \mathrm{s}$. Output 1 mV . Load impedance 47 K . Price: $£ 7$ 10s. (U.K. purchase tax $£ 14 \mathrm{~s} .1 \mathrm{~d}$.).

M44-C. Stereo Dynetic cartridge. Moving magnet. $\frac{1}{2}$ in. fixing centres. Stylus 0.7 thou. diamond. ( 1 thou. and 3 thou. styli available.) P.w. 3-5 gm. Compliance $7.5 \times 10^{-6} \mathrm{~cm} /$ dyne. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Separation 25 dB at $1 \mathrm{Kc} / \mathrm{s}$. Output 1.4 mV . Load impedance 47 K . Price: $£ 11$ (U.K. purchase tax $£ 115 \mathrm{~s} .3 \mathrm{~d}$.).


Ronett BF-40 stereo


Ronette stereo 105 cartridge


Ronett TX88 mono cartridge


Shure M55-E cartridge


Shure M3D-M cartridge


Shure M44-5 cartridge


Shure M44-7 cartridge

M44-5. Stereo Dynetic cartridge. Moving magnet. $\frac{1}{2}$ in. fixing centres. Stylus 0.5 thou. diamond. ( 1 thou. and 3 thou. styli available.) P.w. $\frac{3}{4}-1 \frac{1}{2} \mathrm{gm}$. Compliance $25 \times 10^{-6} \mathrm{~cm} /$ dyne. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Separation 25 dB at $1 \mathrm{Kc} / \mathrm{s}$. Output 1.2 mV . Load imp. 47K. Price: $£ 12$ 10s. (U.K. purchase tax £2 0s. 1d.).

M44-7. Stereo Dynetic cartridge. Moving magnet. $\frac{1}{2}$ in. fixing centres. Stylus 0.7 thou. diamond. ( 1 thou. and 3 thou. styli available.) P.w. $1 \frac{1}{2}-3 \mathrm{gm}$. Compliance $20 \times 10^{-6} \mathrm{~cm} /$ dyne. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Separation 25 dB at $1 \mathrm{Kc} / \mathrm{s}$. Output 1.8 mV . Load imp. 47K. Price: £11 17s. 6d. (U.K. pürchase tax £1 18s. 1d.).

M55-E. Stereo Dynetic cartridge. Moving magnet. $\frac{1}{2}$ in. fixing centres. Stylus $0.7 \times 0.2$ thou. elliptical diamond. ( 3 thou. stylus available.) P.w. $\frac{3}{4}-1 \frac{1}{2} \mathrm{gm}$. Compliance $25 \times 10^{-6} \mathrm{~cm} /$ dyne. Load imp. 47K. Price: $£ 17$ 2s. 6d. (U.K. purchase tax£210s.).
S.M.E. LTD., Steyning, Sussex. Tel.: Steyning 2228.

Model 3009 (9 in.). Series II precision pickup arm. Extremely low vertical and lateral friction. Side-thrust compensation. Hydraulically damped lowering control. Tracking force applied precisely, without the need for a gauge. Rapidly adjustable for a wide range of cartridges and heads. Price (with S. 2 ultra lightweight shell): £22 17s. 6d. (U.K. purchase tax £3 16s. 3d.).

Model 3012 ( 12 in.). Series II precision pickup arm. Details as above. Price (with S. 2 ultra lightweight shell): £24 7s. 6d. (U.K. purchase tax £4 1s. 3d.).
S. 2 ultra lightweight shell. Weighs only 6 gm . with mounting hardware. Price: £l 16s. (U.K. purchase tax 6s.).

SONOTONE. Distributors: Metro-Sound Manufacturing Co. Ltd., Bridge Works, Wallace Road, London, N.1. Tel.: Canonbury 8641. Cables: Metrosound, London.

9TA. Stereo turnover cartridge. Ceramic. Diamond stylus. P.w. 2-4 gm. Tip mass 3.5 mg . Compliance $5.3 \times 10^{-6} \mathrm{~cm} /$ dyne. F.R. $30 \mathrm{c} / \mathrm{s}-$ $15 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Separation 27 dB . Output voltage $80-120 \mathrm{mV}$. Load imp. 2 megohm. Price (including diamond stereo/LP stylus): £3 5s. (U.K. purchase tax 10 s . 6 d .).

9TAHC. Stereo turnover ceramic cartridge. Choice of both sapphire styli or sapphire 78/ diamond stereo LP. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}( \pm 3 \mathrm{~dB}$ from $1 \mathrm{Kc} / \mathrm{s}$ ). Rec. load 2 meg. Sensitivity 55-85 $\mathrm{mV} / \mathrm{cm} / \mathrm{sec}$ at $1 \mathrm{Kc} / \mathrm{s}$. Lateral compliance $8.5 \times$ $10^{-6} \mathrm{~cm} /$ dyne. Separation 25 dB at $1 \mathrm{Kc} / \mathrm{s}$. P.w. $1-3 \mathrm{gm}$. Tip mass 2.5 mg . Capacitance 800 pF . Prices: sapphire/sapphire $£ 2$ (U.K. purchase tax 6 s .5 d .), sapphire/diamond $£ 3$ (U.K. purchase tax 9s. 8d.).

20T. Stereo crystal cartridge. Sapphire styli. F.R. $20 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}( \pm 4 \mathrm{~dB}$ from $1 \mathrm{Kc} / \mathrm{s}$ ). Rec. load 2 megohm. Sensitivity $270-535 \mathrm{mV} / \mathrm{cm} /$ sec at $1 \mathrm{Kc} / \mathrm{s}$. Compliance $1 \times 10^{-6} \mathrm{~cm} /$ dyne. Separation 20 dB at $1 \mathrm{Kc} /$ s. P.w. 8 gm. Capacitance $1,200 \mathrm{pF}$. Price: £l 10s. (U.K. purchase $\operatorname{tax} 5 \mathrm{~s}$.).
A. R. SUGDEN \& CO. (ENGINEERING) LTD., Market Street, Brighouse, Yorkshire. Tel.: Brighouse 2142. Cables: Connoisseur, Brighouse.

Connoisseur stereo ceramic cartridge SCU1. $\frac{1}{2}$ in. fixing centres. Stylus diamond $0 \cdot 5-0 \cdot 6$ thou., or 1 thou. for mono. P.w. $2-4 \mathrm{gm}$. Tip mass 1 mg . Compliance: lateral $12 \times 10^{-6} \mathrm{~cm} /$ dyne; vertical $8 \times 10^{-6} \mathrm{~cm} /$ dyne. Range $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Separation ( $1 \mathrm{Kc} / \mathrm{s}$ ) $25-30 \mathrm{~dB}$; $(10 \mathrm{Kc} / \mathrm{s}) 18 \mathrm{~dB}$. Output 6 mV into 100 K (constant velocity); 26 mV into 2 megohms load. Features: 4-terminal output; casily replaceable diamond armature. Price: $£ 4$ 10s. (U.K. purchase tax 14s. 3d.).

Connoisseur pickup arrn SAU1, with detachable head shell wired for stereo/mono. Optional lift/lower device. Single hole fixing. Single unipivot bearing. Accommodates all standard cartridges. Adjustable stylus force-calibrated weights supplied. Single lever height adjustment. Price (arm): £5 5s. (U.K. purchase tax 16 s .7 d .) ; (arm with lifting device): £6 5s. (U.K. purchase tax 19s. 9d.); (head shell): £1 2s. 6d. (U.K. purchase tax 3s. 7d.).

Connoisseur pickup arm SAU.II. Gimbal mountings on ball bearings set at $45 / 45$. Automatic bias compensator. Hydraulic lowering device. Decoupled counterbalance weight. Additional weight supplied to accommodate different cartridges. Single hole fixing. Height adjustable from 1 in. to 2 ins. Lightweight shell with $\frac{1}{2}$ in. fixing centres. Five-pin plug connection to base of pickup. Low resistance self-cleaning contacts. Supplied with set of leads. Price (provisional): £9 (U.K. purchase tax £1 8s. 9d.).


## Sonotone 9 TAHC cartridge

Sonotone 9 TAHC cartridge



Transcriptor arm


Worden Articulated Pickup Arm Worden Articulated Pickup Arm

TANNOY PRODUCTS LTD., West Norwood, London, S.E.27. Tel.: Gipsy Hill 1131. Cables: Tannoy, London.

Variluctance. Turnover cartridge. Output voltages: LP: $10-12 \mathrm{mV}$; $7818-20 \mathrm{mV}$. Range $20-16,000 \mathrm{c} / \mathrm{s} \pm 2 \mathrm{~dB}$. P.w. 5-6 gm. (less with professional arms). Load imp. 50 K ohms. Price (with 2 diamonds): £12 (U.K. purchase tax $£ 2$ 3s. 4d.); (with 1 diamond and 1 sapphire): £9 10s. (U.K. purchase tax £1 14s. 3d.); (with 2 sapphires): $£ 7$ (U.K. purchase tax $£ 15 \mathrm{~s} .3 \mathrm{~d}$.).
Single stylus version of Variluctance for LP also available. Price (with diamond): $£ 615 \mathrm{~s}$. (U.K. purchase tax $£ 14 \mathrm{~s}$. 4d.).

Vari-twin Mk. II. Magnetic stereo cartridge. Balance 4 -pole system. Diamond stylus 0.5 or 0.7 thou. Output voltage 7 mV per channel. Range $30-15,000 \mathrm{c} / \mathrm{s} \pm 1 \cdot 5 \mathrm{~dB}$. P.w. 4 gm . (less with professional arms). Load imp. 100 K ohms. Inductance 350 mH . Price: £9 19s. (U.K. purchase tax $£ 115 \mathrm{~s}$. 11 d .).

THORENS. Distributors: Metro-Sound (Sales) Ltd., Bridge Works, Wallace Road, Canonbury, London, N.1. Tel.: Canonbury 8641. Cables: Metrosound, London, N. 1 .

TP. 14 pickup arm. Precision 9 in. pickup arm. Horizontally and vertically balanced. Patented plug-in shell with adjustable vertical tracking angle. Viscous-damped lowering and lifting control. Anti-skating horizontal bias device. Stylus pressure adjustable $\frac{1}{2}$ to 4 gm . Price: $£ 17$ 10s. (U.K. purchase tax $£ 3$ 3s. 2d.).

TRANSCRIPTORS LTD., 551 Holloway Road, London, N.19. Tel.: Archway 6419.

Transcriptor Arm. Stereo or mono pickup arm only. Suitable for cartridges tracking at $0-5$ gm . Precision engineered in polished aluminium and chrome. Single-wheel raising and lowering device also provides lateral movement of arm. Fine adjustment of weight. Horizontal and vertical base adjustment. Low mass arm. Wired for stereo. Single hole fixing. Available in 10 in . or 12 in. with universal head fitting, and in 10 in. or 12 in. for E.M.I. EPU100, Decca ffss, Decca Deram, Shure Dynetic, and ADC range. Price: (all types) $£ 8$ (U.K. purchase tax $£ 17 \mathrm{~s}$.).

Transcriptor fluid arm. More sophisticated version of the Transcriptor arm. Incorporates fluid-damped unipivot mounting with various grades of oil to cater for different cartridges. Bias compensator. Models for ffss, EMI, and universal (not Deram). Price: $£ 11$ (U.K. purchase tax $£ 118 \mathrm{~s} .4 \mathrm{~d}$.).

WORDEN AUDIO DEVELOPMENTS LTD., 54 Chepstow Road, London, W.2. Tel.: Bayswater 4996.

Worden articulated arm. Radially operative single arm with articulated head piece. Tracking correct to $\pm \frac{1}{4}^{\circ}$. Vertical and lateral friction less than 50 mg . Adjustable counterbalance weight. Height adjustment. Detachable head-shell accepts all standard $\frac{1}{2}$ in. centre fixing cartridges. No resonances above $10 \mathrm{c} / \mathrm{s}$. Price: Complete with one head-shell, $£ 147$ s. (U.K. purchase tax $£ 27$ s. 9d.). Extra shells 15 s. (U.K. purchase tax 2s. 6d.). Decca ffss adaptor 7s. 6d. (U.K. purchase tax 1s. 3d.).

## PICKUP ACCESSORIES

ARENA. Distributors: Highgate Acoustics, 7173 Great Portland Street, London, W.1. Tel.: Museum 2901.

Arena F. 1 preamplifier. For magnetic pickups. Specially designed for use with Arena T.1900F tuner/amplifier. Power supply through cable connection from stereo output socket. Plastic case. Price: $£ 55 \mathrm{~s}$.

AUDIO AND DESIGN LTD., 40 Queen Street, Maidenhead, Berks. Tel.: Maidenhead 25204.

Pickup booster amplifier. For matching low output magnetic cartridges into equalised valve pre-amplifiers. Provides full loading and improved signal to noise ratio. Gain 20 dB . F.R. $10 \mathrm{c} / \mathrm{s}-100 \mathrm{Kc} / \mathrm{s}-3 \mathrm{~dB}$ at extremes. Power required: 9V. Supplied in card form for easy insertion into chassis. Price (mono): £6 10s.; (stereo): £11.


Auriol Mk. II pickup control


Acos stylus pressure gauge

AURIOL (GUILDFORD) LTD., Farnham Trading Estate, Farnham, Surrey. Tel.: Farnham 3366.

Auriol pickup control. This unit eliminates accidental damage to the record by the stylus, the control provides air cushioned lowering and positive vertical lifting and lowering of the stylus. The supporting arm is serrated and calibrated for accurate positioning of the stylus at any pre-selected position within 1-2 microgrooves. Three cursors are provided to mark starting positions and an indexing clip is supplied to suit any specified pick-up arm. Price: £3 1s. 3d. (U.K. purchase tax 10s. 3d.).

Auriol pickup control Mk. II. This is dimensionally similar to the above but the arm will swing clear of the turntable to allow its use with the Autochanger/Manual player units. $\cdot$ Price: £3 12s. (U.K. purchase tax 12s.).


Colton antistaticloth

BANG \& OLUFSEN. U.K. Sales Division, Mercia Road, Gloucester. Tel.: Gloucester 26841. Cables: Debelec, Gloucester.

M/lift. For Bang \& Olufsen arms only. Hydraulic operation. Price: $£ 3$ 13s. 6d. (U.K. purchase tax 10s. 8d.).

OType GF2. Transistorised stereo pickup preamplifier. Sensitivity: 7 mV input for 0.5 V output per channel. N.L. -62 dB . Price: $£ 55 \mathrm{~s}$.

Type GF3. Pre-amplifier. Specification and price to be announced.

BURNE-JONES \& CO. LTD., 18 Brunswick Road, Sutton, Surrey.

Counterweight unit. The addition of this unit to a B.J. pickup arm permits speed and accuracy in weight compensation. Price on application.

Alignment protractor. For measuring the tracking accuracy of all pickup assemblies. Made in plastic ivorine. Price: 8s.

CLENDISC (MAIL ORDER) LTD., c/o Mrs. E. Smith, 7 Trinity Court, Gray's Inn Road, London, W.C.1. Tel.: Terminus 9088.

Clendisc. An anti-static cleaner and preserver for records. Price: 4s. 1d. Clendisc record cleaning pad. Price: 3s. 4d. including tax.

COLTON \& CO. (LAPIDARIES) LTD., The Crescent, Wimbledon, London, S.W.19. Tel.: Wimbledon 9401.

Antistaticloth. A soft cloth impregnated with an anti-static material, for cleaning records. Price: 2s. 6d.

Colton E.P. record centre adaptors (45 r.p.m.). Small plastic centre pieces which enable E.P. records to be used again on slim spindle changers after the large centre piece has been removed. Price: 3s. per packet of one dozen. (U.K. purchase tax 6 d .).

Varilift. A precision instrument for lowering pickup on to record. Instantly adjustable for height using a single knurled nut. Screw valve provides variable rate of fall which, being hydraulically controlled, is smooth and indepen-
dent of pickup weight. Provision is made for locking in the raised position when required. Price: $£ 30$ s. 9d. (U.K. purchase tax 9 s . 9d.).

Precision level. Circular bubble-type spirit level in white plastic case $1 \frac{3}{16} \mathrm{in}$. diameter $\frac{1}{2} \mathrm{in}$. high. Three fixing holes provided or it may be fixed with adhesive. Ensures accurate levelling in all directions. Price: 8s. 3d.

Antistatimat. All-rubber 12 in. turntable mat. Accurately balanced and moulded with guard edge recess. Introduction of certain materials into the rubber renders it conductive to static charges on micro-groove records. When a record is placed on the mat static charges are dispersed freeing the record from induced noises without use of sprays, etc. Price: 13s. 6d. (U.K. purchase $\operatorname{tax} 2 \mathrm{~s}$. 2d.).

Plastisleeves. Made from 200-gauge polythene and designed to protect microgroove records from dust and damp. Supplied in packets of 12 . Prices: 7 in . round bottom $2 \mathrm{~s} .4 \mathrm{~d} ., 12 \mathrm{in}$. round bottom 5 s .

Plasticovers. Made from 200-gauge polythene and designed to protect record sleeves against rubbing and scratching. Supplied in packets of 12. Prices: 7 in . square bottom 1 s . 3 d ., 12 in . square bottom 3s. 1d.

Chek. Self-adhesive anti-slip pads for use with records played on auto-changers. Prevents records slipping one against another. Packets of 10. Price: 2s. 7d. (U.K. purchase tax 5d.).

Stylus microscope. Miniature pocket microscope with stylus locating slot and adjustable focus. Gives clear picture of stylus tip at X50 magnification. $4 \frac{1}{2}$ in. long and fitted with pen clip. Price: 14s. 11d.

COSMOCORD LTD., Eleanor Cross Road, Waltham Cross, Herts. Tel.: Waltham Cross 27331.

Acos changer dust bug. Developed in conjunction with Cecil Watts. Clips on to changer arms. Price: 17s. 6d. (U.K. purchase tax: 2s. 11d.).

Acos stylus pressure gauge. A spring balanced gauge calibrated $0-15 \mathrm{gm}$. Accurate to within 0.5 gm . Price: 9s. 6d. (U.K. purchase tax 1s. 7d.).


Transcriptor sweep arm record cleaner


Decca stylus cleaner


Transcriptor st ylus scales


Transcriptor stylus brush


Metro-Sound metro-mat

DECCA SPECIAL PRODUCTS, Decca Radio and Television Division of the Decca Record Co. Ltd., Ingate Place, Queenstown Road, London, S.W.8. Tel.: Macaulay 6677.

Magnetic bias compensator. Neat, simple, unobtrusive device using magnetism precisely to neutralise the forces which draw a pickup towards the centre of the turntable. Type A for Mk. I and Mk. I "Super" ffss arms, and for Deram ARI arm. Type B for current Decca "Professional" arm. Prices: Types A and B 18s. 1d. (U.K. purchase tax 2s. 11d.).

Counterweight adjuster. Placed on counterweight of Mk. I ffss arm produces tracking weight of 2 gm . for Mk. III and mono elliptical heads. Already supplied with Mk. I "Super" arms. Price: 6s. 6d. (U.K. purchase tax 1s.).

Centre locator. Fits on fffs arm like ffss head. Pickup arm is correctly positioned when the locator moulding fits the turntable centre spindle. Price: 4s. 9d. (U.K. purchase tax 9d.).

Decca Microlift. A device for raising and lowering a manual pickup arm at any point on the record for minimising risk of damage either to record or stylus through handshake. Easy to fit to any back-pivoted pickup. It does not hinder record handling by over-lapping the turntable. Price: £l 5s. 10d. (U.K. purchase tax 4s. 2d.).

Stylus cleaner. Incorporates wheel covered in soft hair, which engages with the stylus when in its rest position. A height adjustment screw enables the cleaner to be accommodated to suit all non-automatic record players on the market. Price: 18s. 1d. (U.K. purchase tax 2s. 11d.).

EAGLE PRODUCTS. Distributors: B. Adler \& Sons (Radio) Ltd., 32a Coptic Street, London, W.C.1. Tel.: Museum 9606/7. Cables: Reldab, London.

RC12 automatic record cleaner. Easily fitted to any pickup arm. No change on stylus force. The brush contains hairs of different thickness and length, set towards different directions, thus removing dirt and dust which is absorbed on a rotating roller. Complete with adjustable mounting bracket and operating instructions. Approximate price: 15 s . (U.K. purchase tax 2s. 6d.).
M. B. FITCH. U.K. Distributors: Metro-Sound Manufacturing Co. Ltd., Bridge Works, Wallace Road, London, N.1. Tel.: Canonbury 8641. Cables: Metrosound, London, N.l. Overseas Distributors: T. D. Bailey \& Son Ltd., 9 St. Helen's Place, London, E.C.3.

Cuematic Mk. II. Precision record groove locator and pickup lowering device with sufficient accuracy to locate within one microgroove. Price: £19 7s. 6d. (U.K. purchase tax £3 15s. 7d.).
"Hi-Jack" Model "D". A raising and lowering device specially designed for direct attachment to the Decca ffss pickup pedestal. All metal chrome plated construction, positive stops in fully raised and lowered positions. Price: £l ls. (U.K. purchase tax 3s. 6d.).
"Hi-Jack" Model "U". A raising and lowering device specially suited for use with the Garrard 4HF motor unit for which no extra fixing hole is required. $1 \frac{1}{2} \mathrm{in}$. height adjustment by means of sliding head. All metal chrome plated construction. One $\frac{3}{16} \mathrm{in}$. hole needed for fixing. Price: £l 1s. (U.K. purchase tax 3s. 6d.).

GARRARD ENGINEERING LTD., Newcastle Street, Swindon, Wilts. Tel.: Swindon 5381. Cables: Garrard, Swindon.

SPG3. Stylus pressure gauge. Suitable for all current pickup arms and heads. Elegantly styled. Range 0-12 gm. with $\frac{1}{2} \mathrm{gm}$. indications. Supplied with 5 gm . calibration checking weight. Price: 18s. 7d. (U.K. purchase tax 3s. 1d.).

GOLDRING MANUFACTURING CO. (GREAT BRITAIN) LTD., 486/488 High Road, Leytonstone, E.11. Tel.: Leytonstone 8343. Cables: Echovox, London.

STB.1. Stylus balance, a simple yet accurate gauge which operates a record level. Stylus pressure is read directly in grams off the calibrated scale. Price: 3s. 6d. (U.K. purchase tax 7d.).

Lenco STB.2. Stylus pressure balance. A simple and accurate device, not relying on springs. Price: 12s. 6d. (U.K. purchase tax 2s. 1d.).


Ortofon "Hi-Jack"

"Hi-Jack" $U$

"Hi-Jack" D


Decca Microlift

$S P G 3$


Stylovue

STB 1


Metro-Sound stylus cleaning kit

LENNARD DEVELOPMENTS LTD., 7 Slades Hill, Enfield, Middlesex. Tel.: Keats 0601.

Play-fair Stylus Timer. Manually operated device which indicates when stylus is due for replacement. Self-adhesive to attach to motor board if desired. Swiss mechanism. Neat plastics case with instructions. Two models: one for sapphires, one for diamonds. Price (either model): 17s. (U.K. purchase tax 2s. 9d.).

METRO-SOUND MANUFACTURING CO. LTD., Bridge Works, Wallace Road, Canonbury, London, N.1. Tel.: Canonbury 8641. Cables: Metrosound, London, N.1.

Metro-Mat. Carbon activated turntable mat. Discharges static from all LP records. Suitable for all turntables. Price: 10s. 6d. (U.K. purchase tax 1s. 9d.).

High Fidelity Stylus Cleaning Kit. Comprises bottle of special cleaning fluid, fine brush applicator and dirt remover. Safe for use with all pickups. Price: 6s. (U.K. purchase tax 1s.).

ORTOFON A/S. Distributors: Metro-Sound Sales Ltd., Bridge Works, Wallace Road, London, N.1. Tel,: Canonbury 8641. Cables: Metrosound, London, N.1.

Ortofon "Hi-Jack". Pickup arm lift/lowering device. All metal chromium plated. Special spring-loaded friction system for "air cushioned" lowering. Adjusting lowering speed. Positive positioning on record. Works independently of weight of cartridge or stylus force. Price: $£ 35$ s. (U.K. purchase tax 10s. 5d.).

Q-MAX (ELECTRONICS) LTD., Napier House, High Holborn, London, W.C.1. Tel.: Holborn 8534.

Stylovue. A device for projecting a magnified shadow of a stylus on to a screen facilitating inspection of a stylus in situ. Powered by torch batteries. Price: $£ 14 \mathrm{~s}$.

TRANSCRIPTORS LTD., 551 Holloway Road, London, N.19. Tel.: Archway 6419.

Stylus scales. Sensitive to less than 0.01 gm . Accuracy better than 0.02 gm . Weighs $0-5 \mathrm{gm}$.
in increments of 0.05 gm . Bubble read-out. Supplied with reference weights. Polished aluminium construction. British made. Price: £2 2s. (U.K. purchase tax 6s. 10d.).

Sweep arm. Record cleaning attachment. Permanently fitted to motor board cleans records whilst playing. Incorporates squirrel hair brush tracking at 0.75 gm . Unipivot with balance adjuster. Adjustable for height. Does not affect turntable speed. Precision engineered. British made. Price: $£ 2$ 2s. (U.K. purchase tax 7s. 1d.).

Stylus brush. For permanent installation. Incorporates squirrel hair brush for cleaning stylus. Adjustable for height. Single hole fixing. Polished aluminium construction. Price: $£ 15$ s. (U.K. purchase tax 4s. 3d.).

CECIL E. WATTS LTD., Darby House, Sun-bury-on-Thames, Middx. Tel.: Sunbury 3252.

The "Dust Bug". Claimed to be the most efficient method of removing all static and dust from records as they are played. Instantly fitted, suitable for all types of records. Record quality is improved, surface noise and wear reduced. Price: 17s. 6d. (U.K. purchase tax 2s. 11d.).

The "Parastat". For cleaning both sides of an LP disc simultaneously and making it inert to all static charges. Principally for trade use. Price: Mk. III.B. £18 10s. (U.K. purchase tax £31s. 8d.).

> "Parostatik" regd. Disc Preener. For record maintenance where anti-static agents are not desirable (where stylus force is less than 2 gm.). Price: 6 s .9 d . (U.K. purchase tax 1s. 2d.).

Manual parastat. Manual Model Parastat record cleaning machine. For the cleaning and application of anti-static agents to LP records. Price: $£ 25$ s. (U.K. purchase tax 7s. 6d.).

Spares and replacements. Dust Bug nylon bristle and plush pad. Price: 1s. 9d. New Formula dispenser (small). Price: 1s. 6d. Parastatik wicks (improved models only). Price 2s. (packet of four). Parastat brush. Price: 8s. 6d. Parastat nylon velvet pad covers. Price: 2s. Parastat white PVC sponge. Price: 1s. Humid Mop for use with manual Parastat. Price: 4s. 6d. Replacement sponges. Price: 2s. 6d. set. New Formula 1 oz . Parastatik dispenser. Price: 4s. 6d.


Braun PS400 motor and pickup
Braun PS400 motor and pickup

## DIRECTORY OF MOTOR UNITS

BANG \& OLUFSEN. U.K. Sales Division. Mercia Road, Gloucester. Tel.: Gloucester 26841. Cables: Debelec, Gloucester.

- Beogram 1000. Four-speed motor unit complete with pickup arm, cartridge and dust cover. Speeds $16_{3}^{2}, 33 \frac{1}{3}, 45,78 \mathrm{rpm}$ with fine speed control. Wow $0 \cdot 2 \%$. Rumble -35 dB at 1.4 $\mathrm{cm} / \mathrm{sec} .100 \mathrm{c} / \mathrm{s}$ NARTB. 12 in. turntable. Belt ${ }^{\prime}$ drive. Own motor. Type STL pickup arm. Builtin hydraulic arm lift. Stroboscopic mat. Antimicrophonic suspension. $£ 3514 \mathrm{~s}$ :
-GF2, GF3 Pre-amplifiers for above. See Pickup Accessories section.

BRAUN AG. Distributors: Fi-Cord International, Charlwoods Road, East Grinstead, Sussex. Tel.: East Grinstead 21351.

PS400. Turntable, pickup arm, cartridge, mounted on plinth with plexiglass lid. Speeds $16 \frac{2}{3}, 33 \frac{1}{3}, 45,78 \mathrm{rpm}$ with $\pm 3 \%$ fine adjustment. W . and F . less than $0.02 \%$. Rumble better than -56 dB . Turntable $10 \frac{1}{4} \mathrm{in} .5 \mathrm{lb}$. Stepped spindle, friction wheel, intermediate roller and drive belt. Four-pole synchronous motor. Tubular cranked metal pickup arm. Lowering and raising device. Cueing for 7 in ., 10 in . and 12 in . records. Tracking error: less than $\pm 2$ degrees. F.R. (Shure M44-7 cartridge) $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Size: $14 \frac{7}{8} \times 6 \frac{7}{8} \times 11 \frac{1}{4} \mathrm{in}$. Price: $£ 69$ including purchase tax.

PCS5. Turntable, pickup arm, cartridge, mounted on plinth with plexiglass lid. Speeds $16 \frac{2}{3}, 33 \frac{1}{3}, 45,78 \mathrm{rpm}$. Accuracy within $-0.3 \%$ and $+0.7 \%$. Wow less than $0.1 \%$. Flutter less than $0.05 \%$. Rumble -52 dB . Turntable $11 \frac{7}{8} \mathrm{in}$. diameter, 6.6 lb . Drive by stepped pulley, friction wheel, capstan, belt and idler. Hysteresis synchronous motor. 9 in. tubular metal pickup. arm. Lowering device. Cueing for $7 \mathrm{in} ., 10 \mathrm{in}$. and 12 in. records. Price (with Shure M44 cartridge fitted): $£ 108$ including purchase tax; (without cartridge): $£ 104$ including purchase tax.

PS2. Turntable unit with pickup arm and cartridge. Two-pole motor. Friction wheel drive. Speeds: $45,33 \frac{1}{3}, 16 \frac{2}{3} \mathrm{rpm}$. Speed fluctuations $<0.3 \%$. Turntable $7 \frac{1}{2} \mathrm{in}$. Rumble and noise: -50 dB . Dynamically balanced pickup
arm. Tracking pressure 5-7 gm. Adjustable counterweight. Cartridge: Elac KST107 with 0.5 thou. sapphire for mono and stereo. Automatic shut-off and disengagement of drive. Size: $12 \times 9 \times 4 \frac{1}{8}$ in. Price: $£ 18$ including purchase tax.

PCS 51. Same as PSC5 but fitted with Shure M222/226 Stereo-Dynetic pickup arm and cartridge. Price: $£ 176$ including purchase tax.

PCS 52. Same as PCS5 but fitted with SME 3009 pickup arm and Shure M55E cartridge. Price: $£ 185$ including purchase tax.

PS 1000. Four-speed motor unit with pickup arm. Speeds: 78, 45, $33 \frac{1}{3}, 16 \frac{2}{3}$ rpm. Speed adjustment $\pm 3 \%$. W. and F. below $0 \cdot 1 \%$. Rumble -60 dB . Pickup arm balanced horizontally by two adjustable counter weights. Tracking adjustable down to 0.4 gm . Hydraulic lowering device, relay-operated by feathertouch button. Automatic photo-electric shut off. Size: $17 \frac{1}{4} \times 6 \frac{7}{8} \times$ $12 \frac{7}{8}$ in. Price: $£ 187$ including purchase tax.

BSR LTD. Monarch Works, Powke Lane, Old Hill, Staffs. Tel.: Cradley Heath 69272. Telex 33282.

UA70. Manual/automatic motor unit with pickup. Speeds: 78, $45,33 \frac{1}{3}, 16_{3}^{2} \mathrm{rpm} .11 \mathrm{in}$. diameter deep-rim turntable. Pulley drive. Fourpole induction motor. Tubular counterbalanced pickup arm with coarse and fine adjustments. Detented and calibrated stylus pressure control. Automatic pickup lock. Interchangeable spindles. Automatic shut-off. Price (without cartridge): £10 19s. 6d. (U.K. purchase $\operatorname{tax} £ 115 \mathrm{~s}$. 3d.).

COLTON \& CO. (LAPIDARIES) LTD., The Crescent, Wimbledon, London, S.W.19. Tel.: Wimbledon 9401.

Jobo 2800S. Turntable unit. Speeds $33 \frac{1}{3}$ and 45 rpm . Fine speed control $\pm 4 \%$. Non-magnetic mineral loaded 4 lb . plastic turntable. Sixpole outside rotor Papst motor, capacitor start. Built-in spirit level and illuminated stroboscope. Belt drive. Motor board has space for pickup


Connoisseur Craftsman III


Connoisseur Craftsman II motor unit


Connoisseur Craftsman III on plinth with arm


Connoisseur Classic motor unit


Braun PCS-51 motor and pickup


Braun PS-1000 motor and pickup


Braun PCS-5 motor and pickup
arm at side. Price: (with accommodation for 9 in. arm) £37 15s. 6d., (with accommodation for 12 in . arm) $£ 397 \mathrm{~s}$.

Complete with pickup arm and Bang and Olufsen Stereodyne SP-1 cartridge. Price: £36 13s. 4d. (U.K. purchase tax £6 12s. 4d.).

CONNOISSEUR. See A. R. Sugden and Co. Ltd.

DECCA SPECIAL PRODUCTS, Decca Radio and Television Division of the Decca Record Co. Ltd., Ingate Place, Queenstown Road, London, S.W.8. Tel.: Macauley 6677.

ODD1. Deccadec motor unit with Deram pickup in teak table or shelf-mounting cabinet. Antirumble pickup. Autochanger version with Garrard AT6/l available at the same price. Price: $£ 23$ 10s. 7d. (U.K. purchase tax $£ 3$ 15s. 5 d .).
-Deccadec de luxe. Motor unit with Deram transcription head and arm including all fittings for cabinet mounting. Speeds $16 \frac{2}{3}, 33 \frac{1}{3}, 45,78$ rpm with no fine adjustment. $10_{2}^{\frac{1}{2}} \mathrm{in}$. nonmagnetic turntable. Pulley drive. Garrard motor. Automatic motor switch off and return of pickup at end of record. Built-in anti-rumble filter. Lifting and lowering device and bias compensation. Price: £15 7s. 7d. (U.K. purchase tax £2 9s. 5d.).

DUAL ELECTRONICS LTD., Radnor House, London Road, Norbury, London, S.W.16. Tel.: Pollards 9465/6.

Dual 1019. Transcription turntable and pickup with automatic record changing facility. Speeds: 78, 45, $33 \frac{1}{3}, 16 \frac{2}{3} \mathrm{rpm}$. Variable speed adjustment. Cue control enables pickup to be set down in exact groove required. Separate spindles for auto and manual operation. Direct dial bias compensation. Pickup arm adjustable for height. Plinths and covers available in walnut, teak and rosewood. Full specification on request. Price (less cartridge): $£ 4019 \mathrm{~s}$.
1009. Transcription turntable with automatic record changer. Speeds: $16 \frac{2}{3}, 33 \frac{1}{3}, 45,78 \mathrm{rpm}$ with $\pm 6 \%$ fine adjustment. Dynamically balanced low-mass tone arm. Four-pole magnetically shielded motor. Adjustable weight, $0-7 \mathrm{gm}$. Automatic stop and switch off. Dynamically balanced $7 \frac{1}{2} \mathrm{lb}$. non-magnetic turntable.

Friction damped rubber cushioned spring suspension. Suspension resonance $4 \mathrm{c} / \mathrm{s}$ vertically and horizontally. Available with B \& O SP.1, Shure 44-7, Shure 55-E. Will take any cartridge with $\frac{1}{2}$ in. fixing centres. Mains $110-220 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$, adaptmatic lowering device. Weight $13 \frac{1}{5} \mathrm{lbs}$. Price (less cartridge): $£ 35$ 14s. including purchase tax.

ELAC. Electroacustic GmbH., Kiel, West Germany. Distributors: Mitchell Enterprises Ltd., 61 West Street, Dorking, Surrey. Tel.: Dorking 4229.

Miracord $\mathbf{1 0 H}$. Four speeds, with automatic shut-off. Magnetic pickup cartridge STS222. (Can also be supplied without cartridge or with other Elac cartridges.) Studio tone arm with adjustable stylus force ( $2-6 \mathrm{gm}$.). Heavy balanced turntable, 12 in . dia. (driven by special hysteresis motor), $220 \mathrm{~V} \mathrm{AC}, 50 \mathrm{c} / \mathrm{s}$ or 110 V AC, $60 \mathrm{c} / \mathrm{s}$. Push-button control for various functions. Size $14 \frac{1}{2} \times 12 \frac{1}{2}$ in. Weight $14 \frac{3}{4} \mathrm{lb}$. Price: $£ 578 \mathrm{~s}$. (U.K. purchase tax£911s.).

Miraphon 18H. Design and basic technical characteristics same as for Miracord 10 H . Incorporates built-in arm raising and lowering device. Weight $14 \frac{3}{4} \mathrm{lb}$. Price: $£ 60$ 10s. (U.K. purchase tax $£ 101 \mathrm{~s} .8 \mathrm{~d}$.).

- Miracord 40. Transcription record changer with stereo pickup mounted on oiled walnut plinth. Speeds: $78,45,33 \frac{1}{3}, 16 \frac{2}{3} \mathrm{rpm} .12 \mathrm{in}$. nonferrous dynamically balanced 6 lb . turntable. Push-button control of motor and pickup arm. Studio type balanced arm. Stylus pressure adjustable $0-6 \mathrm{gm}$. Plug-in head. Normally fitted Elac STS240. Will play up to 10 records automatically. Various accessories available. Details on request. Price: $£ 46$ (U.K. purchase $\operatorname{tax} £ 7$ 13s. 4 d .).

GARRARD ENGINEERING LTD., Swindon, Wiltshire, England. Tel.: Swindon 5381. Cables: Garrard, Swindon.

Model 401. Transcription motor. Three speeds: $33 \frac{1}{3}, 45,78 \mathrm{rpm}$. Adjustable by eddy current brake. 6 lb . machined aluminium turntable with gear-cut illuminated strobe markings on rim. Statically balanced. Die-cast alu-


Elac Miracord 40


Goldring-Lenco GL70
minium unit plate. Completely screened springmounted shaded-pole motor. Anti-static turntable mat. Styled by Eric Marshall and finished in metallic charcoal with chrome relief. W. and F. less than $0.05 \%$ RMS. Rumble almost nonexistent. Mains: $110-125 \mathrm{~V}$ and $220-250 \mathrm{~V}, 50$ or $60 \mathrm{c} / \mathrm{s}$ according to pulley fitted. Size: $13 \frac{3}{4} \mathrm{in}$. wide, $14 \frac{5}{8}$ in. front to rear, $2 \frac{1}{8} \mathrm{in}$. above motor board, $3 \frac{15}{16}$ in. below top of board. Price: $£ 25$ 9s. 7d. (U.K. purchase tax $£ 3$ 19s. 10d.).

Lab 80. Transcription turntable with autochange facility. Two speeds: $33 \frac{1}{3}, 45 \mathrm{rpm} .12 \mathrm{in}$. diameter, heavy non-magnetic turntable. Statically balanced. Plug-in head with locking ring. Wood Afrormosia counter-balanced arm with aluminium stabilising channel. Bias compensator. Magnetic auto-trip. Anti-static mat. Stylus pressure fine click adjustment. Wired for mono and stereo. Dynamically balanced motor with spring suspension. Mains: $100-130 \mathrm{~V}, 200-$ $250 \mathrm{~V}, 50 \mathrm{c} / \mathrm{s}$ or $60 \mathrm{c} / \mathrm{s}$ according to pulley. Size: $15 \frac{3}{4}$ in. wide, $14 \frac{5}{32}$ in. front to rear, $5 \frac{1}{8}$ in. above and $3 \frac{7}{16}$ in. below lower edge of unit plate. Plus clearances. Price: £25 15s. 1d. (U.K. purchase tax $£ 43$ s. 9 d .) without cartridge.

A70. Developed from the Laboratory series Type A the A70 provides manual operation with autochange facility. Counter-balanced pickup arm. Plug-in head with locking ring. Bias compensator. Sandwich construction turntable. Four speeds: $16 \frac{2}{3}, 33 \frac{1}{3}, 45,78 \mathrm{rpm}$. Wired for mono and stereo. Balanced and screened motor. Pickup muting switch. Mains: 100$130 \mathrm{~V}, 200-250 \mathrm{~V}, 50 \mathrm{c} / \mathrm{s}$ or $60 \mathrm{c} / \mathrm{s}$ according to pulley. Size: $16 \frac{1}{4} \mathrm{in}$. wide, $13 \frac{1}{2} \mathrm{in}$. front to rear, 5 in . above and $2 \frac{3}{4} \mathrm{in}$. below lower edge of unit plate. Plus clearances. Price: £19 9s. 8d. (U.K. purchase tax $£ 33 \mathrm{~s}$. 4d.) without cartridge.

GOLDRING MANUFACTURING CO. (GREAT BRITAIN) LTD., 486/488 High Road, Leytonstone, London, E.11. Tel.: Leytonstone 8343.

Goldring-Lenco GL68. Integrated turntable and pickup arm. Infinitely variable speeds 30 80 rpm with preset click stops for $16 \frac{2}{3}, 33 \frac{1}{3}, 45$, 78 rpm . Wow $0 \cdot 2 \%$. Speed constancy: $1 \%$ change for $13 \%$ change in voltage. Turntable 12 in. diameter pressed steel. Drive via vertical idler. Four-pole motor. Pickup arm Goldring G65. Pickup lowering device. Idler wheel disengagement. Price: $£ 16$ 16s. (U.K. purchase tax £2 14s. 7d.).

GL70 transcription unit. Non-ferrous turntable, weight 8 lb . Speed may be continuously adjusted from above 80 rpm to below 30 rpm and from 15 to 18 rpm . Pre-set standard speeds. Four-pole constant velocity motor ( 15 watts). W \& F max. $0.2 \%$. Incorporates L. 70 pickup arm. Pickup lowering device. Price: $£ 2515 \mathrm{~s}$. (U.K. purchase tax $£ 4$ 3s. 8d.).

Goldring G66. Integrated turntable unit and arm. Four speeds with $10 \%$ fine adjustment. Wow $0.2 \%$. Turntable $8 \frac{1}{2} \mathrm{in}$. diameter pressed steel. Pulley drive. Two-pole motor. Die-cast aluminium arm with plug-in shell. Pickup arm lowering device. Prices: G66/MX2 £9 18s. 8d. (U.K. purchase tax £l 12s. 4d.); G66/CS80 $£ 10$ 10s. (U.K. purchase tax $£ 1$ 14s. 2d.); G66/ CS90 £12 12s. (U.K. purchase tax $£ 21 \mathrm{~s} .2 \mathrm{~d}$.).

Goldring G99. Transcription motor only. Infinitely variable speeds $30-80 \mathrm{rpm}$. Wow $0.1 \%$. Speed remains constant with $13 \%$ voltage change. Turntable 12 in. die-cast zinc. Vertical idler wheel with provision for disengagement. Four-pole motor. Built-in illuminated strobe. Push-button on-off. Price: £18 18s. (U.K. purchase tax $£ 31 \mathrm{~s} .5 \mathrm{~d}$.).

SP25. High quality single record player. Diecast non-magnetic turntable. Four speed. Magnetically screened motor. Cueing device to raise or lower pickup arm where required. Counterbalanced tubular aluminium arm. Plug-in head. Integral calibrated stylus pressure adjustment. Bias compensator. Automatic trip and return. Wired for stereo and mono. Mains: 100-130V, $200-250 \mathrm{~V}, 50 \mathrm{c} / \mathrm{s}$ or $60 \mathrm{c} / \mathrm{s}$ according to pulley. Size: $14 \frac{3}{4}$ in. wide, $12 \frac{1}{2}$ in. front to rear, $2 \frac{7}{8}$ in. above, $2 \frac{3}{4}$ in. below lower edge of unit plate. Plus clearances. Price: £11 13s. 3d. (U.K. purchase tax $£ 20$ s. 5 d .) without cartridge.

METZ. Distributors: Mitchell Enterprises Ltd., 61 West Street, Dorking, Surrey. Tel.: Dorking 4229.

Metz 421. Transcription motor with stereo pickup in walnut finished case with plexiglass lid. Motor speeds: 78, 45, $33 \frac{1}{3}, 16 \frac{2}{3} \mathrm{rpm}$. Accuracy within $\pm 0.1 \%$. Non-magnetic dynamically balanced 7 lb . turntable. Mains: $110 \mathrm{~V}, 220 \mathrm{~V}$, AC. Size: 19 in . wide, $13 \frac{1}{2} \mathrm{in}$. deep, 8 in . high. Weight: 25 lb . Price to be announced.


Connoisseur Classic with plinth


BSR UA70


Decca Deccadec


Goldring-Lenco GL68
Decca Deccadec


Braun PCS-52E motor and pickup


Goldring G99-S


Transcriptors turntable

PERPETUUM-EBNER. Distributors: How-land-West Ltd., 2 Park End, South Hill Park, London, N.W.3. Tel.: Swiss Cottage 6666.

PE Studio 33. Turntable with pickup arm. Speeds: $16 \frac{2}{3}, 33 \frac{1}{3}, 45,78 \mathrm{rpm}$ with fine control $+1 \%$ to $-2 \%$. Wow better than $\pm 0.15 \%$. Flutter better than $\pm 0.1 \%$. Rumble -46 dB . Turntable 11 in . diameter 4.4 lb . non-magnetic alloy casting. Belt drive via intermediate pulley. Shaded pole induction motor. Pickup arm adjustable 0-6 gm. stylus pressure. Slow motion lowering device. Automatic lift optional. Pushbutton on-off. Illuminated strobe. Size 14 in. wide, 13 in. deep, $3 \frac{5}{8}$ in. above, $3 \frac{7}{8} \mathrm{in}$. below. Weight 16 lb . Price: $£ 40$ (U.K. purchase tax £6 8s. 4d.).

PE.34. Turntable with pickup arm. Speeds: $16_{3}^{2}, 33 \frac{1}{3}, 45,78 \mathrm{rpm}$ with fine control $+1 . \%$ to $-2 \%$. Wow better than $\pm 0.15 \%$. Flutter $\pm 0.1 \%$. Rumble -42 dB . Turntable 11 in . diameter 3.9 lb . cast alloy. Belt drive via intermediate pulley. Four-pole induction motor. Pickup arm mounted on precision bearings with adjustable stylus pressure. Slow-motion arm lowering device. Price: $£ 25$ 10s. (U.K. purchase tax $£ 41 \mathrm{~s} .10 \mathrm{~d}$.).

PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Avenue, London, W.C.2. Tel.: Gerrard 7777. Cables: Phillamps, London.

AG2030. Four-speed transcription turntable unit with pickup arm and head. Speeds: 78, 45, $33 \frac{1}{3}, 16 \frac{2}{3} \mathrm{rpm}$. Preset to better than $0.5 \%$ accuracy by eddy current brake. 6 lb . turntable mounted on micro-finished shaft running in self-lubricating bearings with ball and plate thrust bearing. Belt drive from rubber mounted shaded-pole motor. Lightweight arm with damped counter weight. Adjustable pressure. Calibrated at 2, 3 and 4 gm .-lower pressures are possible. Side thrust compensation by low rate coil spring below chassis. Viscous damped lowering device permits arm to be lowered or raised at any point on a record. Start and speed change controls interlocked to prevent accidental damage to intermediate drive. W. and F . $\therefore 0 \cdot 12 \%$. Rumble better than -60 dB . Mains: $110,127,220$ or 240 V AC. Supplied with AG3407 head. Price to be announced.

AG2230. Identical turntable unit to AG2030 but supplied on teak plinth with transparent lid and mains and output leads. Size: $15 \frac{1}{4} \times 13 \frac{1}{2} \times$ 7 in . Price to be announced.

PIONEER. Distributors: Swisstone Ltd., 26 Leigh Place, Cobham, Surrey. Tel.: Cobham 2853.

PL.6. High quality transcription manual/ automatic record player unit complete with pickup and table or shelf-mounting cabinet. Full specification on request. Price: £66 3s. including U.K. purchase tax.

PL.7. High quality transcription manual/ automatic record player unit complete with pickup and table or shelf-mounting cabinet. Full specification on request. Price: £94 10s. including U.K. purchase tax.
A. R. SUGDEN \& CO. (ENGINEERS) LTD., Market Street, Brighouse, Yorkshire. Tel.: Brighouse 2142. Cables: Connoisseur, Brighouse.

Connoisseur "Craftsman" two speed transcription motor. Operates at $33 \frac{1}{3}$ and 45 rpm fixed speeds. Full 12 in. turntable of non-ferrous material. All bearings are adjustable throughout the life of the unit. Synchronous motor. Price: £14 14s. (U.K. purchase tax £2 8s. 11d.).

Connoisseur "Craftsman" three speed transcription turntable. Requires minimum mounting space. Heavy non-ferrous 12 in. turntable. 33,45 and $78 \mathrm{rpm} .4 \%$ variation on all speeds. Neon lit stroboscope fitted. Dynamically and electrically balanced synchronous motor. All bearings are adjustable. Price: £19 10s. (U.K. purchase tax £3 4s. 10d.).

Connoisseur Classic Turntable Unit. Motor and turntable only mounted on metal platform. Speeds: $33 \frac{1}{3}$ and 45 rpm (fixed). Wow: better than $0 \cdot 15 \%$. Flutter: better than $0 \cdot 1 \%$. Rumble: -50 dB when measured at RIAA characteristics referred to $7 \mathrm{~cm} / \mathrm{sec}$. at $1 \mathrm{Kc} / \mathrm{s} .10 \frac{1}{4} \mathrm{in}$. lathe turned aluminium turntable weighing approximately 2 lb . Soft rubber drive rollers. Two slowspeed ( 375 rpm ) motors, one for each record speed. Price: $£ 12$ 10s. (U.K. purchase tax £2 9s. 9d.).

Connoisseur Classic. Combined assembly of 2-speed motor, transcription arm and cartridge mounted on Afromosia plinth complete with Perspex dust cover. Two slow speed synchronous motors, $33 \frac{1}{3} \mathrm{rpm} 45 \mathrm{rpm}$ direct drive. All


Pioneer PL7 playing desk


Thorens TD 135


Thorens TD 150 AB


Thorens TD 124 Series 2


Pioneer PL-6A playing desk


Perpetuum Ebner PE Studio 33


Zenith 4-speed professional
spindles high quality carbon steel, phosphorbronze bearings. $10 \frac{1}{4} \mathrm{in}$. lathe turned aluminium turntable. Price: £25 10s. (U.K. purchase tax £40s. 9d.).

Craftsman plinth assembly. Available with Craftsman 2-speed or 3-speed motor with SAU1 arm with lifting device and head shell fitted with SCUl cartridge. Size: $16 \times 14 \times 7 \frac{1}{2} \mathrm{in}$. Finish: satin polished wood plinth, black base and with grey motor mounting board and Perspex cover. Price: 2-speed unit $£ 3311 \mathrm{~s} .6 \mathrm{~d}$. (U.K. purchase tax $£ 511 \mathrm{~s} .7 \mathrm{~d}$.); 3-speed unit $£ 39$ 2s. 6d. (U.K. purchase tax $£ 610 \mathrm{~s} .1 \mathrm{~d}$.).

THORENS. Distributors: Metro-Sound (Sales) Ltd., Bridge Works, Wallace Road, Canonbury, London, N.1. Tel.: Canonbury 8641. Cables: Metrosound, London, N.1.

TD. 124 Series II. Transcription turntable. Four speeds, variable $\pm 3 \%$. Neon lit stroboscope with mirror. Double turntable (nonferrous flywheel as standard but cast-iron available to order), with clutch action, four-pole motor. Belt plus idler drive system. Inbuilt levelling device with spirit indicator. Total W. and F. $0.15 \%$ p-p. Rumble -35 dB. New NAB stereo standards. Price: £34 2s. 6d. (U.K. purchase tax £6 3s. 2d.).

TD. 135 Series II. Transcription turntable and arm. Four speeds, variable $\pm 3 \%$. Belt plus idler drive system. 12 in . non-ferrous 7 lb . turntable. Four-pole motor. TP. 14 pickup arm incorporated, horizontally and vertically balanced. Precision raise/lower control. Total W. and F. $0.2 \%$ p-p, Rumble -30 dB . New NAB standards. Built-in levelling device. Price: $£ 34$ 2s. 6d. (U.K. purchase tax $£ 6$ 3s. 2d.).

TD.224. Transcription turntable and arm with autochange facility. Four speeds, variable $\pm 3 \%$. Built-in neon lit stroboscope. Incorporates BTD-12S arm. Total W. and F. $0 \cdot 15 \%$ p-p. Rumble -35 dB . New NAB standards. Auto-change facility with record stacking before and after play separate from turntable. Each record placed on turntable individually and removed after playing. Price: $£ 7017 \mathrm{~s} .6 \mathrm{~d}$. (U.K. purchase tax $£ 1215 \mathrm{~s} .8 \mathrm{~d}$.).

TD.150. Transcription turntable. Two speeds, $33 \frac{1}{3}$ and 45 rpm . Low-speed synchronous motor ( 375 rpm ). Belt drive. 12 in . non-ferrous $7 \frac{1}{2} \mathrm{lb}$. turntable. Spring-mounted damped support for turntable bearing and pickup wooden panel. Total W. and F. $0 \cdot 2 \%$ p-p. Rumble -35 dB . New NAB stereo standards. Price: £17 10s. (U.K. purchase tax £3 3s. 2d.).

TD.150.B. As TD. 150 plus wooden base mounting. Price: £20 15s. (U.K. purchase tax £3 14s. 10d.).

TD.150.A. As TD. 150 plus TP. 13 precision pickup arm horizontally and vertically balanced. Viscous damped lowering control. Patented plug-in shell with adjustable vertical tracking angle. Stylus pressure adjustable $\frac{1}{2}$ to 4 gm . Price: $£ 2315$ s. (U.K. purchase tax $£ 45$ s. 9d.).

TD.150.AB. As TD. 150 .B plus wooden base mounting. Price: £27 (U.K. purchase tax £4 17s. 5d.).

TRANSCRIPTORS LTD., 551 Holloway Road, London, N.19. Tel.: Archway 6419.

Transcriptor Turntable. Speed 20-80 rpm infinitely variable. Built-in strobe. PTFE bearings. Soft rubber drive belt. Shaded pole motor. Built-in spirit levels. Mains: 110 or $200-240 \mathrm{~V}$ 50 or $60 \mathrm{c} / \mathrm{s}$. Available free-standing or for cabinet mounting. Price: $£ 3411 \mathrm{~s} .7 \mathrm{~d}$. including U.K. purchase tax.

ZENITH RADIO CORPORATION. Distributors: United Mercantile Co. Ltd., 13/14 Queen Street, London, W.1. Tel.: Grosvenor 4901. Cables: Ramsaco, Telex, London.

Stereo Professional. Four-speed automatic record changer unit. Speeds, $16 \frac{2}{3}, 33 \frac{1}{3}, 45,78$ rpm. $11 \frac{3}{4} \mathrm{in} .4 \mathrm{lb}$. turntable. Belt drive. $8 \frac{9}{16} \mathrm{in}$. pickup arm. Floating-action cartridge. Ceramic cartridge with 0.7 thou. diamond and 3 thou. sapphire. Separation 25 dB . Output 350 mV . Rec. load 1-3 megohms. Price: $£ 52$ 10s. (U.K. purchase tax $£ 88 \mathrm{~s}$. 5 d .).


Acoustical AM tuner covering short, medium and long wave bands


Quad multiplex decoder


## DIRECTORY OF RADIO TUNERS

In the abridged specifications of these directory entries the following abbreviations have been used: P.s.n. $=$ Power supply needed; A.F.C. $=$ Automatic frequency control; A.G.C. $=$ Automatic gain control; Mc/s=Megacycles; ind.=Indicator; disc=Discriminator; imp.=Impedance; det. $=$ Detector.

## ACOUSTICAL MANUFACTURING CO.

 LTD., St.' Peter's Road, Huntingdon, Hunts. Tel.: Huntingdon 2561/2. Cables: Acoustical.Quad F.M. tuner. Variable tuning. Range $87 \cdot 5-108 \mathrm{Mc} / \mathrm{s}$. Special double neon display ind. P.s.n. 330 V at $27 \mathrm{~mA} ; 6.3 \mathrm{~V}$ at 1.85 amps . Size: $10 \frac{1}{2} \times 3 \frac{1}{2} \times 6$ in. Price: $£ 24$ (U.K. purchase tax £4 10s.).

Quad Multiplex decoder. Stereo multiplex adaptor for Quad FM tuner. Transistorised. P.s.n. 330 V DC, 8 mA mono plus extra 9 mA on stereo. Price: $£ 16$.

Quad A.M. II tuner (European). Variable tuning. Ranges: 800-2070 m., 185-588 m., 5•8$18 \cdot 5 \mathrm{Mc} / \mathrm{s}$. Magic eye indicator. Output 100 mV nominal for $30 \%$ modulation. Output resistance 15 K . Filter rejection $9 \mathrm{Kc} /$ s. P.s.n. 330 V at 35 $\mathrm{mA} ; 6.3 \mathrm{~V}$ at 1.2 amps . Size: $10 \frac{1}{2} \times 3 \frac{1}{2} \times 6 \mathrm{in}$. Price $£ 24$ (U.K. purchase tax $£ 4$ 10s.).

Quad A.M. II tuner (Overseas). Variable tuning. Ranges: $185-588 \mathrm{~m} ., 2 \cdot 2-6 \cdot 6 \mathrm{Mc} / \mathrm{s}, 5 \cdot 8-$ $18.5 \mathrm{Mc} / \mathrm{s}$. Filter rejection $10 \mathrm{Kc} / \mathrm{s}$. Magic eye indicator. Output 100 mV nominal for $30 \%$ modulation. Output resistance 15 K . P.s.n. 330 V at $35 \mathrm{~mA} ; 6.3 \mathrm{~V}$ at 1.2 amps . Size: $10 \frac{1}{2} \times 3 \frac{1}{2} \times$ 6 in. Price: £24 (U.K. purchase tax $£ 4$ 10s.).

AKAI. Distributors: Pullin Photographic Ltd., 11 Aintree Road, Perivale, Greenford, Middlesex. Tel.: Alperton 1541. Cables: Pullinfoto, Greenford, Middlesex.

Akai A.M./F.M. Stereo Tuner. Matching unit to AA-5000 integrated stereo amplifier. Specification and price to be announced.

ARMSTRONG AUDIO LTD., Warlters Road, Holloway, London, N.7. Tel.: North 3213/4.
A.M./F.M. tuner 223. Variable tuning. Range M.W. 180-600 m.; F.M. $87-108 \mathrm{Mc} / \mathrm{s}$. Foster Seeley disc. Tuning meter. Full facilities for
multiplex. Aerial imp. $70-80$ ohms and 300 ohms. Output $0-2 \mathrm{~V}$ variable from dual stereo outputs. P.s.n. $200-250 \mathrm{~V}$ AC. Size: $12 \frac{3}{8} \times 4{ }_{4}^{3}$ 9 in. Price: £24 11s. 3d. (U.K. purchase tax $£ 43 \mathrm{~s}$. 9d.).
F.M. tuner 224. Variable tuning. Range $87-$ $108 \mathrm{Mc} / \mathrm{s}$. Foster Seeley disc. Tuning meter. Full facilities for multiplex. Aerial imp. 70-80 ohms and 300 ohms. Output $0-2 \mathrm{~V}$ variable from dual stereo outputs. P.s.n. 200-250V AC. Size: $10 \frac{3}{8} \times 4 \frac{3}{4} \times 9$ in. Price: $£ 19$ 4s. 6d. (U.K. purchase tax £3 5s. 6d.).

Shelf mounting case. Optional extra. Price £3 10s.

BRAUN AG. Distributors: Fi-Cord International, Charlwoods Road, East Grinstead, Sussex. Tel.: East Grinstead 21351.

CE16. A.M./F.M. tuner. V.H.F. $88-108 \mathrm{Mc} / \mathrm{s}$, M.W. 188-545 m. Variable tuning. Foster Seeley discriminator. Meter indicator. Sensitivity $1.5 \mu \mathrm{~V}$. for 26 dB quieting. Aerial 300 ohms balanced. Output 200 mV . Optional multiplex. A.F.C. switchable. Mains 240V AC. Size: $12 \frac{7}{8} \times 8 \times 4$ in. Price: $£ 106$ including purchase tax.

CE1000. All-transistor tuner. L.W., M.W., S.W. and F.M./V.H.F. Stereo multiplex fitted. Push-button operation. Separate dials and drives for A.M. and F.M. Meter tuning indicator. A.F.C., automatically switches off when hand touches tuning knob. Variable A.M. selectivity. 30 transistors, 2 nuvistors, 18 germanium diodes, 9 silicon diodes, 2 photoelectric cells. Switchable F.M. noise suppression. Internal ferrite rod for M.W. and L.W. F.M. sensitivity: $0.8 \mu \mathrm{~V}$ for 30 dB quieting. M.W./L.W. sensitivity: $5 \mu \mathrm{~V}$ for 6 dB quieting. Limiting level $1 \mu \mathrm{~V}$. A.M. suppression better than 50 dB . F.M. bandwidth: $120 \mathrm{Kc} / \mathrm{s}$ below and $240 \mathrm{Kc} / \mathrm{s}$ above limiting level. Detector bandwidth $1 \mathrm{Mc} / \mathrm{s}$. Distortion factor $<0.5 \%$. Output approx. 0.5 V . Black steel cabinet with aluminium front plate. Size: $16 \times 4 \frac{3}{8} \times 13 \frac{3}{8} \mathrm{in}$. Price: $£ 338$ including purchase tax.


Braun CE-16 tuner


Braun CE-1000 tuner


Dynaco FM-3


Chapman FM 1005 AM/FM tuner

Chapman FM 1000 FM tuner


Clarke and Smith CS1658 Mk. 2 AM/FM tuner

BRYAN AMPLIFIERS LTD., 120 Ashley
Road, Hale, Altrincham, Cheshire. Tel.: Altrincham 6026.

Model 1000. Mains-powered transistor switch-tune F.M. tuner. Switch selection of three B.B.C. programmes with provision for fourth station. Range $86-97 \mathrm{Mc} / \mathrm{s}$. Sensitivity $<3 \mu \mathrm{~V}$ for 20 dB quieting. Provision for multiplex decoder. A.F.C. Mains input with zener stabilising. Voltage remains constant over input range $150-250 \mathrm{~V}$ AC. Audio output 850 mV for $30 \%$ modulation. Controls: volume and on/ off, station selector. Size: $11 \times 5 \frac{1}{2} \times 4 \frac{1}{4} \mathrm{in}$. Price: £28 7s. (including U.K. purchase tax).

CHAPMAN. See Derritron Ltd.

CLARKE \& SMITH MANUFACTURING CO. LTD., High Fidelity Components Division, Melbourne Works, Wallington, Surrey. Tel.: Wallington 9252. Cables: Electronic, Wallington.

CSI 658 Mk. II. A.M./F.M. Continuously variable tuning. Range M.W. $600 \mathrm{Kc} / \mathrm{s}-1 \cdot 6$ $\mathrm{Mc} / \mathrm{s}$; L.W. $150-320 \mathrm{Kc} / \mathrm{s}$; F.M. $88-108 \mathrm{Mc} / \mathrm{s}$. Ratio det. E.M. 87 M.E. ind. Multiplex conversion facilities. Aerial imp. 75 ohms. Output $0 \cdot 5 \mathrm{~V}$. Self-powered. Size: $4 \times 14 \times 8 \mathrm{in}$. Price: $£ 341 \mathrm{~s} .8 \mathrm{~d}$. (U.K. purchase tax $£ 516 \mathrm{~s}$. 4d.).

DERRITRON RADIO LTD., Chapman Division, 24 Upper Brook Street, London, W.1. Tel.: Hyde Park 2291.

## Chapman A.M./F.M. tuner model S6BS/FM.

Free-tuned. Range F.M. $87 \cdot 7-108 \mathrm{Mc} / \mathrm{s}$; A.M. 6 bandspreads: 11, 13, 16, 19, 25 and 31 m .; also 15-43, 43-140, 175-570 m., Wide-band ratio det. Magic eye ind. Self-powered. Size: $13 \frac{3}{4} \times 8 \frac{1}{4} \times$ $13 \frac{1}{2}$ in. Price: $£ 64$ (U.K. purchase tax $£ 114$ s.).

Chapman A.M. tuner model S6BS. Freetuned. Range 6 bandspread ranges: 11, 13, 16, 19,25 and 31 m. , also 13-43, 43-140, 175-570 m. Magic eye ind. P.s.n. 6.3V at 1.5 amps . Selfpowered. Size: $13 \frac{3}{4} \times 11 \times 8 \frac{1}{4}$ in. Price: $£ 48$ (U.K. purchase tax $£ 85 \mathrm{~s}$.).

Chapman FM1000. Transistorised F.M. tuner. Variable tuning. Range $87 \cdot 5-108 \mathrm{Mc} / \mathrm{s}$. A.G.C. Multiplex output. Aerial input 75 ohms coaxial. Output 150 mV . Self-powered. Later models
fitted with tuning meter. Size: $14 \frac{1}{2} \times 3 \frac{1}{2} \times 7 \frac{1}{4} \mathrm{in}$. Price: $£ 24$ 13s. (U.K. purchase tax $£ 412 \mathrm{~s}$. 5d.).

Chapman FM1005. Transistorised A.M./F.M. tuner. Variable tuning. Range F.M. 87-5-108 $\mathrm{Mc} / \mathrm{s}$; A.M. 16-50 m., 50-195 m., 195-550 m., $800-2000 \mathrm{~m}$. A.G.C. Multiplex output. Aerial imp. F.M. 75 ohms; A. M. high imp. Output 250 $\mathrm{mV}, 100 \mathrm{~K}$. Self-powered $100-125 \mathrm{~V}, 10 \mathrm{~W}$ consumption. Size: $14 \frac{1}{2} \times 5 \frac{1}{2} \times 7 \frac{1}{4}$ in. Price: $£ 42$ (U.K. purchase tax $£ 77 \mathrm{~s}$.).

DYNACO. Distributors: Howland-West Ltd., 2 Park End, South Hill Park, London, N.W.3. Tel.: Swiss Cottage 6666.

FM-3. Variable tuned V.H.F./F.M. tuner for shelf mounting or building in synchronous balanced-bridge detector. Twin indicators for tuning and stereo transmissions. Sensitivity $4 \mu \mathrm{~V}$ for 30 dB quieting. Output 2V. Multiplex decoder fitted. Four IF stages with progressive limiting. Completely stable without A.F.C. Can be fully aligned without use of test instruments. Size: $13 \frac{1}{2} \times 4 \frac{1}{2} \times 8 \mathrm{in}$. Mains power unit. Price: (assembled) £63 18s. 4d. (U.K. purchase tax $£ 11$ 13s. 8d.); (kit) £53 5s. 3d. (U.K. purchase tax $£ 914 \mathrm{~s} .9 \mathrm{~d}$.).

EAGLE PRODUCTS. Distributors: B. Adler \& Sons (Radio) Ltd., 32a Coptic Street, London, W.C.1. Tel.: Museum 9606/7. Cables: Reldab, London.

FMT 640 F.M. tuner. Variable tuning. Range $88-108^{\circ} \mathrm{Mc} / \mathrm{s}$. A.F.C. Armstrong circuit with dual limiters and wide-band discs. F.M. calibrated signal meter. Input for multiplex adaptor. Aerial imp. 300 ohms. Self-powered. Size: $11 \times$ $6 \frac{1}{2} \times 3 \frac{3}{4}$ in. Price: £24 (U.K. purchase tax $£ 319 \mathrm{~s}$. 1d.). (Price quoted is approximate.)

AFM 200. A.M./F.M. tuner. V.H.F./F.M. $88-108 \mathrm{Mc} / \mathrm{s}, \mathrm{M} . \mathrm{W} .187-560 \mathrm{~m}$. Variable tuning. Foster Seeley. Magic eye indicator. Sensitivity $2 \mu \mathrm{~V}$ for 20 dB quieting. Aerial input 300 ohms unbalanced. Socket for adding multiplex decoder. A.F.C. Mains 240 V AC. 11 valves (including magic eye). Price: $£ 30$ (U.K. purchase $\operatorname{tax} £ 416 \mathrm{~s} .4 \mathrm{~d}$.).

TAF.300. Transistor A.M./F.M. tuner. V.H.F. 88-108 Mc/s. M.W. 187-560 metres. Variable tuning. Sensitivity: (F.M.) $3 \mu \mathrm{~V}$ for 30 dB signal to noise, (A.M.) $100 \mu \mathrm{~V}$ for 20 dB signal to noise.


Chapman S6BS/FM Mk. II tuner


Grampian 571 FM tuner


Archon PF41 FM tuner


Eagle FMT 640 FM tuner


Jason FMT/4 tuner


Fisher R-200-B AM/FM stereo tuner
F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Meter tuning and level indicator. Output for F.M. multiplex. 23 transistors. 13 diodes. Mains 240V AC. Size: $13 \frac{3}{8} \times 11 \times 4$ in. Price: $£ 42$ 16s. 6d. (U.K. purchase tax £6 17s. 6d.).
(Prices quoted for all Eagle products are approximate.)

FISHER RADIO CORPORATION, Long Island City 1, New York, U.S.A. Distributors: Getz Bros. and Co. Inc., 2 Harewood Place, London, W.1. Tel.: Grosvenor 6901.

FM-90-B. F.M. stereo multiplex tuner. Synchrode front end. Three IF stages. Two limiters. Automatic stereo signal indicator. Meter tuning. Switchable noise filter. Front panel tape jack. Preset audio controls. Size: $15 \frac{1}{8} \times 4 \frac{3}{4} \times 11 \frac{7}{8} \mathrm{in}$. Weight: $11_{2}^{1} \mathrm{lb}$. Price: $£ 81$ 18s. (walnut cabinet version available at slightly higher cost).

R-200-B. Transistorised F.M. stereo/A.M. multi-band short wave tuner. F.M. section: synchrode front end. Sensitivity $1.8 \mu$ V. Stereo beacon indicates multiplex transmissions. Interstation muting. Tuning meter. Wide-band IF strip and discriminator. A.M. section: L.W. 850-2000 m., M.W. 184-590 m., S.W. 7-16.5 $\mathrm{Mc} / \mathrm{s}$, bandspread $49 \mathrm{~m} .(5 \cdot 9-6 \cdot 3 \mathrm{Mc} / \mathrm{s})$. Tuned R.F. stage. Three IF stages. A.G.C. Variable selectivity. Whistle filter. Internal ferrite rod for M.W. and S.W. Mains: all standard AC voltages. Size: $15 \frac{1}{8} \times 4 \frac{3}{4} \times 11 \frac{7}{8} \mathrm{in}$. Weight: $18_{4}^{3} \mathrm{lb}$. Price: $£ 1779 \mathrm{~s}$.

GRAMPIAN REPRODUCERS LTD., 19 Hanworth Trading Estate, Feltham, Middx. Tel.: Feltham 2657. Cables: Reamp, Feltham.
F.M. tuner 571. Free-tuned. Range 85-98 $\mathrm{Mc} / \mathrm{s}$. Ratio det. Magic eye ind. P.s.n. 300 V at $35 / 40 \mathrm{~mA} ; 6 \cdot 3 \mathrm{~V}$ at 2.5 amps . Size: $10 \frac{1}{4} \times 5 \frac{1}{2} \times$ $6_{4}^{1}$ in. Price: $£ 19$ 10s. (U.K. purchase tax $£ 34 \mathrm{~s}$.).

GRUNDIG (GREAT BRITAIN) LTD., Newlands Park, Sydenham, London, S.E.26. Tel.: Sydenham 2211.

- RT50. Stereo radio tuner incorporating 10 valves, 2 transistors and 15 diodes. Wavebands: A.M. M.W. $510-1,620 \mathrm{Kc} / \mathrm{s}$, F.M. $87-104 \mathrm{Mc} / \mathrm{s}$. Sensitivity: F.M. $1.4 \mu \mathrm{~V}$ for 26 dB quieting, A.M. $8 \mu \mathrm{~V}$ for 10 mV output. Output: 3.5 V across 2 K . Distortion less than $1 \%$ at maxi-
mum deviation. F.R. $30 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} . \pm 1 \mathrm{~dB}$. Separation better than 35 dB . Built-in multiplex decoder. Switchable A.F.C. Switchable interstation noise suppression. Mains $110,130,220$, $240 \mathrm{~V} 50-60 \mathrm{c} / \mathrm{s}$. Consumption 55 W . Shelf mounting walnut cabinet. Size: $15 \frac{3}{8} \times 10 \frac{1}{2} \times$ 6 in. Price: $£ 729$ s. including purchase tax.

HEATHKIT. See Kit section.

HENRY'S RADIO LTD. See Constructional Kits Section.

JASON ELECTRONIC DESIGNS LTD., 8 Stephen Street, Tottenham Court Road, London, W.1. Tel.: Museum 4666.
F.M. tuner FMT/4. Variable tuning. Range $88-108 \mathrm{Mc} / \mathrm{s}$. Transistoramplified. A.F.C. Ratio det. Multiplex adaptor output. Self-powered. Size: $11 \frac{1}{4} \times 6 \frac{5}{8} \times 4 \frac{3}{8} \mathrm{in}$. Better than $5 \mu \mathrm{~V}$ for 40 dB quieting. Price: $£ 175$ s. (U.K. purchase tax £2 15s. 4d.).

JTV/2 F.M. and A.M./TV sound tuner. Switched turret tuning. Automatic frequency control. Range $88-96 \mathrm{Mc} / \mathrm{s}$, plus all television channels. Disc. Self-powered. Size: $11 \frac{1}{4} \times 6 \frac{5}{8} \times$ 48. in. $10 \mu \mathrm{~V}$ for 40 dB quieting. Price: $£ 194 \mathrm{~s}$. (U.K. purchase tax $£ 3$ ls. 7d.).

## Monitor F.M. and A.M./TV sound tuner.

 Switched tuning. A.F.C. Range $40-212 \mathrm{Mc} / \mathrm{s}$. Foster-Seeley disc. P.s.n. 230 V at $35 \mathrm{~mA} ; 6.3 \mathrm{~V}$ at 1.5 amps . Size: $5 \times 5 \frac{1}{2} \times 7 \mathrm{in}$. Price: $£ 145 \mathrm{~s}$. (U.K. purchase tax $£ 25 \mathrm{~s} .8 \mathrm{~d}$.).H. J. LEAK \& CO. LTD., 57/59 Brunel Road, East Acton, London, W.3. Tel.: Shepherds Bush 1173. Cables: Sinusoidal, Ealux, London.

Trough line 3 F.M. tuner. Variable tuning. Range $88 / 108 \mathrm{Mc} / \mathrm{s}$. A.F.C. giving tuning stability from the instant of switching on. Foster-Seeley disc. Magic eye ind. Self-powered. Size: $11 \frac{1}{2} \times 4 \frac{1}{4} \times 8 \frac{1}{4}$ in. Price: $£ 27$ (U.K. purchase tax $£ 4$ 14s. 6d.).


Leak Troughline 3 FM tuner


Pye Brahms HFT300 AM/FM tuner

Rogers FM tuner (switched)


Rogers FM tuner Mk. III


Lowther FM tuner Mk. V

- Tripletone FM tuner Series 3


Fisher FM-90-B stereo multiplex tuner

L \& H. Distributors: Britimpex Ltd., 16-22 Great Russell Street, London, W.1. Tel.: Museum 7600. Cables: Britron, London.

Signalmaster Mk. II 6085A. Self-contained battery-operated F.M./V.H.F. tuner. Plug-in V aerial. Single knob tuning control. Transistorised. Built-in audio preamplifier. Switchable A.F.C. Volume control with on/off switch. Teak case. Range $87-105 \mathrm{Mc} / \mathrm{s}$. Batteries: Six U7 provide approximately one month's use at four hours a day. Output by screened lead. Size: $9 \frac{1}{2} \times 3 \times 3 \frac{1}{4}$ in. Price: $£ 188$ s. 6d. (U.K. purchase $\operatorname{tax} £ 2$ 19s. 6d.).

LL ELECTRONICS LTD., 5 Shakespeare Road, London, N.3. Tel.: Finchley 3332.

Model 700. Fully transistorised F.M. tuner incorporating A.F.C. Provision for adding multiplex adaptor. Full specification not available at time of going to press. Price expected to be about $£ 27$ 6s. including U.K. purchase tax.

LOWTHER MANUFACTURING CO., Lowther House, St. Mark's Road, Bromley, Kent. Tel.: Ravensbourne 5225. Cables: Lowther, Bromley.
F.M. tuner Mk. V self-powered. Twin gang tuning, horizontal scale. Range $87 \cdot 5-108 \mathrm{Mc} / \mathrm{s}$. A.F.C. Foster-Seeley disc. Switched ind. $50 \mathrm{c} / \mathrm{s}$ injection. Self-powered. Size: $13 \frac{1}{4} \times 5 \frac{1}{2} \times 5 \mathrm{in}$. Price: £24 10s. (U.K. purchase tax $£ 4$ 7s. 5 d .).
F.M. tuner Mk. V. Variable tuning. Range $87 \cdot 5-108 \mathrm{Mc} / \mathrm{s}$. A.F.C. Foster-Seeley disc. Switched A.F.C. and hum check ind. P.s.n. $250 \mathrm{~V} 30 \mathrm{~mA} ; 6.3 \mathrm{~V} 2 \mathrm{amps}$. Size: $10 \frac{1}{4} \times 4 \frac{3}{4} \times$ 7 in. Price: $£ 22$ (U.K. purchase tax $£ 318 \mathrm{~s} .5 \mathrm{~d}$.).

MARTIN ELECTRONICS LTD. See Constructional Kits section.

PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Avenue, London, W.C.2. Tel.: Gerrard 7777. Cables: Phillamps, London.

AG9024. All-transistor A.M./F.M. stereo tuner. Ranges: L.W. 750-2000 m., M.W. 185587 m., S.W. $16-51 \mathrm{~m} .$, F.M. $87 \cdot 5-108 \mathrm{Mc} / \mathrm{s}$. Duplex tuning drive. A.F.C. Quiet tuning facility. Teak veneered shelf mounting cabinet. Size: $15 \times 4 \frac{1}{2} \times 8 \frac{1}{2}$ in. Price to be announced.

PIONEER. Distributors: Swisstone Ltd., 26 Leigh Place, Cobham, Surrey. Tel.: Cobham 2853.

TX-5. A.M./F.M. Stereo multiplex tuner. V.H.F. 88-108 Mc/s. M.W. 187-560 m. Variable tuning. Ratio detector. Magic eye indicator. Neon stereo indicator. Sensitivity: $1.5 \mu \mathrm{~V}$ at 98 $\mathrm{Mc} / \mathrm{s}$ (IHFM). F.M. aerial input 300 ohms unbalanced. A.F.C. Tuned R.F. stage on A.M. Multiplex decoder incorporated. Valves. Mains $115-230 \mathrm{~V}$ AC. Size: $15 \frac{3}{4} \times 13 \frac{5}{8} \times 5 \frac{7}{8} \mathrm{in}$. Weight 19 lb . Price: $£ 105$ including U.K. purchase tax.

PYE LTD., High Fidelity Division, St. Peter's Road, Furze Platt, Maidenhead, Berks. Tel.: Maidenhead 23331.

Brahms HFT300. Transistorised tuner covering F.M./V.H.F. $87 \cdot 5-108 \mathrm{Mc} / \mathrm{s}$, M.W. 196-550 m., L.W. $1000-1800 \mathrm{~m}$. Variable tuning. FosterSeeley F.M. discriminator. Centre-zero meter indicator. Sensitivity: F.M. $3 \mu \mathrm{~V}$ for 20 dB signal-to-noise ratio, A.M. $10 \mu \mathrm{~V}$ for 100 mV output. F.M. aerial 75 ohms coaxial. Nominal output 500 mV . Switched A.F.C. Provision for multiplex decoder. Mains 110-250V AC. Sizes: chassis $11 \frac{1}{2} \times 8 \frac{1}{4} \times 3 \frac{1}{2}$ in., panel $12 \times 4$ in., cabinet $12 \frac{3}{4} \times 5 \frac{1}{2} \times 9$ in. Price: $£ 38$ (U.K. purchase tax $£ 62 \mathrm{~s}$.).

QUAD. See Acoustical Manufacturing Co. Ltd.

RADFORD ELECTRONICS LTD., Ashton Vale Estate, Bristol 3. Tel.: Bristol 662301/2.

FMT2 F.M. tuner. Range $87 \cdot 5-105 \mathrm{Mc} / \mathrm{s}$. Variable tuning. Aerial impedance 75 and 300 ohms. Sensitivity $3 \mu \mathrm{~V}$ for 30 dB signal to noise. Output up to 2 V at $100 \%$ modulation. All silicon transistors. Four-gang capacitor tuning. Incorporates inter-station quieting. Space for decoder. Mains powered $110-250 \mathrm{~V} 50 / 60 \mathrm{c} / \mathrm{s}$. Size: $10 \frac{1}{2} \times 3 \frac{3}{4} \times 12 \frac{5}{8}$ in., panel size: $10 \frac{3}{16} \times$ $3_{16}^{5} \mathrm{in}$. Weight 12 lb . Price: $£ 34$ (U.K. purchase tax $£ 5$ 17s. 11d.).

FMT2M F.M. tuner. Identical specification to FMT2 tuner but with multiplex decoder incorporated.

FMM adaptor. F.M. multiplex accessory. Price: $£ 15$.


Truvox FM 100 tuner


Veritone Saturn FM tuner


Symphony AM/FM Tuner


Trio AFE 220 AM/FM tuner


Sennheiser EFM 303


Sherwood S3300 all-silicon FM stereo tuner


ROGERS DEVELOPMENTS (ELECTRONICS) LTD., 4-14 Barmeston Road, Catford, London, S.E.6. Tel.: Hither Green 7424/ 4340. Cables: Rodevco, London, S.E.6.

Mk. III switched F.M. tuner. Range 87-96 $\mathrm{Mc} / \mathrm{s}$. A.F.C. Foster-Seeley discriminator. Multiplex conversion facilities. Aerial imp. 7090 ohms. Output 0.25 V RMS. Self-powered. Cathode follower output. Size: (chassis model) $11 \times 6 \frac{1}{2} \times 4 \frac{1}{2}$ in.; (case model) $11 \times 7 \frac{1}{4} \times 5 \frac{3}{8} \mathrm{in}$. Prices: (chassis model) $£ 16$ 16s. (U.K. purchase tax $£ 2$ 17s. 4d.); (case model) £19 10s. (U.K. purchase tax $£ 36$ s. 6d.).

Mk. III Variable F.M. Receiver. New design styled to match the Cadet III range. Suitable for use with Cadet III or HG88 III stereo amplifiers. Range $88-108 \mathrm{Mc} / \mathrm{s}$. Sensitivity $1.5 \mu \mathrm{~V}$ for 20 dB quieting. Twin limiters. Foster-Seeley discriminator. Accurate tuning indicator. A.F.C. Provision for adding multiplex decoder. A.G.C. Self-powered. Prices: (chassis model) $£ 2510$ s. (U.K. purchase tax £4 7s.); (cabinet model) $£ 29$ (U.K. purchase tax $£ 419 \mathrm{~s}$.).

Multiplex stereo decoder. Full details and price to be announced.

SENNHEISER ELECTRONICS. Distributors: Audio Engineering Ltd., 33 Endell Street, London, W.C.2. Tel.: Temple Bar 0033.

EFM. 303 Stereo Tuner. Range: 87.5-108.5 $\mathrm{Mc} / \mathrm{s}$. Variable tuning. Two meters for tuning indication. Sensitivity $<2 \mu \mathrm{~V}$ for 20 dB quieting. Output 0.5 V . Built-in multiplex decoder. Automatic stereo transmission indicator. Interstation noise suppression. Switched A.F.C. Mains $200-240 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$. Size: $15 \times 4 \times 9 \mathrm{in}$. Price: See VKL. 303 in Amplifier Section.

## SHERWOOD ELECTRONIC LABORATORIES INC. Distributors: Audioson Ltd., York House, Empire Way, Wembley, Middlesex. Diligence 1886.

©S-3300. All-silicon transistor F.M. multiplex tuner. Range $87 \cdot 5-108 \cdot 5 \mathrm{Mc} / \mathrm{s}$. Inter-station muting. Centre-zero tuning meter. Stereo indicator light. Stereo noise filter. Automatic switching to stereo in presence of multiplexed signal. $1 \cdot 6 \mu \mathrm{~V}$ sensitivity for 30 dB quieting. Slide rule
scale. Size: $14 \times 4 \times 10_{2}^{1}$ in. Available in chassis form or in walnut-grain leatherette case. Price on application.
(1)S-2100. A.M./F.M. tuner incorporating 12 valves, 2 silicon rectifiers and 9 diodes. Similar specification to S-3300 except F.M. sensitivity $1 \cdot 8 \mu \mathrm{~V}$, A.M. sensitivity $2.0 \mu \mathrm{~V}$. A.M. bandwidth (wide) $15 \mathrm{Kc} / \mathrm{s}$, (narrow) $5 \mathrm{Kc} / \mathrm{s}$. Size: $14 \times 4 \times 12 \frac{1}{2}$ in. Price on application.

S-3000 III. F.M. mono tuner. 7 valves, 2 silicon rectifiers and 3 diodes. Specification similar to S-3300 F.M. section except mono only. Size: $14 \times 4 \times 10_{2}^{1}$ in. Price on application.

S-2000. A.M./F.M. mono tuner. 9 valves. 2 silicon rectifiers and 3 diodes. Circuitry same as S-2100 except multiplex section omitted. Available in rack-mounting or cabinet versions. Size: $10 \times 4 \times 10_{2}^{\frac{1}{2}}$ in. Price on application.

SHIRLEY LABORATORIES LTD., 3 Prospect Place, Worthing, Sussex. Tel.: Worthing 30536.
F.M. tuner SB/V16. Variable tuning. Standard range. Ratio det. Magic eye ind. P.s.n. $200-300 \mathrm{~V} 15 \mathrm{~mA} ; 6 \cdot 3 \mathrm{~V} 2.5 \mathrm{amps}$. Price: $£ 20$ (U.K. purchase tax $£ 315 \mathrm{~s}$.).

STERN-CLYNE LTD., Head Office and mail order, 3-5 Eden Grove, Holloway, London, N.7. Tel.: North 8161. Branches throughout London, Liverpool, Manchester, Sheffield, Bristol and Nottingham.

FM1. F.M. tuner. $88-108 \mathrm{Mc} / \mathrm{s}$. Variable tuning. Ratio detector. Aerial input $70-80$ ohms coaxial. Output voltage 200 mV . Power requirements: 200 V 25 mA DC, $6.3 \mathrm{~V} \quad 1 \cdot 5 \mathrm{~A} \mathrm{AC}$. Size: $8 \times 5 \times 4 \frac{1}{2}$ in. Price: $£ 9$ (U.K. purchase tax £1 9s. 6d.).

STUZZI. See Tape Recorder Accessories Section for details of battery-powered tape tuner.

SYMPHONY AMPLIFIERS LTD., 16 Kings College Road, London, N.W.3. Tel.: Primrose 3314/5.

Symphony A.M./F.M. tuner. V.H.F. 88-110 $\mathrm{Mc} / \mathrm{s}$. M.W. 175-500 m. Variable tuning. Transistorised. Sensitivity: $20 \mu \mathrm{~V}$. Aerial inputs: 80 ohms coaxial. Output: $0 \cdot 25 \mathrm{~V}$ audio from $80 \%$ modulated carrier (or $75 \mathrm{Kc} / \mathrm{s}$ deviation on F.M.). Output impedance 3 K . Mains input 200250 V AC. Spare power available for indicator lamps, etc. Available in chassis or shelf mounting form. Size: $12 \frac{1}{2} \times 6 \frac{1}{4} \times 4 \frac{1}{4}$ in. Price (chassis): $£ 21$ including tax., (steel case) $£ 2$ 2s. extra.

TANSLEY-HOWARD LTD., 144 Holland Park Avenue, London, W.11. Tel.: Bayswater 2848.

Archon PF41F.M. tuner. Variable tuning. Range $88-108 \mathrm{Mc} / \mathrm{s}$. A.F.C. Self-powered. Size: $12 \times 6 \times 2 \frac{3}{8}$ in. Panel: $12 \frac{1}{2} \times 3$ in. Price: $£ 1815 \mathrm{~s}$. (U.K. purchase tax $£ 37 \mathrm{~s}$. 9 d .).

TRIO. Distributors: Winter Trading Co. Ltd., 95-99 Ladbroke Grove, London, W.11. Tel.: Park 1341. Cables: Winlec, London, W.11.

AFE220. Mains-operated valve tuner covering V.H.F., M.W., and L.W. Variable tuning. F.M./V.H.F. 88-108 Mc/s, M.W. 187-560 m., L.W. 855-2000 metres Meter tuning indicator. Sensitivity: F.M. $2 \cdot 1 \mu \mathrm{~V}$ at $98 \mathrm{Mc} / \mathrm{s}$, A.M. $20 \mu \mathrm{~V}$. Aerial 75 ohms coaxial. Output: F.M. 2 V at $400 \mathrm{c} / \mathrm{s} \pm 75 \mathrm{Kc} / \mathrm{s}$ deviation, A.M. 1.5 V at $400 \mathrm{c} / \mathrm{s} 30 \%$ modulation. Multiplex decoder available. A.F.C. Mains $115 / 230 \mathrm{~V} 50-60 \mathrm{c} / \mathrm{s}$. Size: $12 \frac{1}{4} \times 5 \times 5 \mathrm{in}$. Price: $£ 35$ 8s. 7d. (U.K. purchase tax $£ 60$ s. 11d.).

TRIPLETONE MANUFACTURING CO. LTD., 24la The Broadway, Wimbledon, S.W.19. Tel.: Liberty 1189.

Tripletone F.M. tuner Series 3. Variable tuning. Range $86-104 \mathrm{Mc} / \mathrm{s}$. A.G.C. and interstation quieting. Ratio detector. Aerial input $70-80$ ohms coaxial. Output: $0-500 \mathrm{mV}$ cathode
follower. Mains 200-250V AC for self-powered version, 250 V 25 mA DC and 2 A at $6 \cdot 3 \mathrm{~V}$ AC for un-powered version. Size: $11 \times 6 \frac{1}{2} \times 3 \frac{3}{4} \mathrm{in}$. Price (un-powered): $£ 1311 \mathrm{~s} .5 \mathrm{~d}$. (U.K. purchase tax $£ 27$ s. 6d.); (powered): $£ 152$ s. 10d. (U.K. purchase tax£2 13s.).

TRUVOX LTD., Neasden Lane, London, N.W.10. Tel.: Dollis Hill 8011. Cables: Truvoxeng, London, N.W.10.

FM100. Variable tuning F.M./V.H.F. tuner covering $87 \cdot 5-108 \cdot 5 \mathrm{Mc} / \mathrm{s}$. Ratio detector. Meter tuning indicator plus beacon for stereo transmissions. Sensitivity $1 \cdot 5 \mu \mathrm{~V}$ for 20 dB quieting. Aerial imp. 75 ohms coaxial, 300 ohms balanced. Output 0-1V variable. Internally-fitting decoder available. Switched A.F.C. Overload limiting diode. Preset output control. Mains 100-120V, $200-250 \mathrm{~V}, 40-60 \mathrm{c} / \mathrm{s}$. Price: $£ 3312 \mathrm{~s}$. including tax.

VERITONE. Stern-Clyne Ltd., 3-5 Eden Grove, London, N.7. Tel.: North 8161.

Veritone Saturn. F.M. tuner. Range 87.5$108.5 \mathrm{Mc} / \mathrm{s}$. Fully variable tuning. Ratio detector. Meter tuning indicator. Sensitivity: $5 \mu \mathrm{~V}$ for 20 dB quieting. Aerial input $70-80$ ohms coaxial. Output 150 mV at 22K. A.F.C. Multiplex decoder in preparation. Self-powered. Mains 240V 3W. Size: $12 \frac{1}{2} \times 7 \frac{1}{2} \times 4 \frac{1}{2} \mathrm{in}$. Shelf mounting teak cabinet available. Price: $£ 22$ 12s. 6 d. (U.K. purchase tax $£ 3$ 12s. 6d.).

ZENITH RADIO CORPORATION. U.K. Distributors: United Mercantile Co. Ltd., Sovereign House, 13/14 Queen Street, London, W.1. Tel.: Grosvenor 4901. Cables: Ramsaco, Telex, London.

MHT 15 stereo F.M./A.M. tuner. Range A.M. $550-1,600 \mathrm{Kc} / \mathrm{s}$, F.M. 88 to $108 \mathrm{Mc} / \mathrm{s}$. A.F.C. Ratio det. Limiter. Multiplex incorporated. Aerial imp. 300 ohms. Sensitivity $2-3 \mu \mathrm{~V}$ at 30 dB quieting. P.s.n. 110V. Dimensions: $13 \frac{1}{2} \times$ $6 \times 10$ in. Price: $£ 52$ 10s. (U.K. purchase tax: £8 8s. 5d.).

## DIRECTORY OF TUNER/AMPLIFIERS

$\star$ The abbreviations used in this section are defined at the beginning of the Tuner and Amplifier Sections.


#### Abstract

ARENA. Distributors: Highgate Acoustics Ltd., 71-73 Great Portland Street, London, W.1. Tel.: Museum 2901.


Arena T.1900F. Stereo tuner/amplifier. Transistorised. Range F.M. 87-104 Mc/s. S.W. 4051 m., 67-200 m.. M.W. 177-582 m.. L.W. 9252150 m . Variable tuning. Meter tuning indicator. Sensitivity: F.M. $1.5 \mu \mathrm{~V}$ for 20 dB quicting. A.M. $10 \mu \mathrm{~V}$ on external aerial $(400 \mu \mathrm{~V} / \mathrm{m}$ on ferrite rod) for 20 dB signal-to-noise ratio. Separate aerials for A.M. and F.M. Output 8W R.M.S. per channel. Available with or without multiplex decoder fitted. A.F.C. Mains 110 and $220 \mathrm{~V} 50 \mathrm{c} / \mathrm{s} .20$ transistors, 13 diodes. Bass control: $\pm 10 \mathrm{~dB}$ at $100 \mathrm{c} / \mathrm{s}$. Treble control $: \pm 15 \mathrm{~dB}$ at $10 \mathrm{Kc} / \mathrm{s}$. Pickup input: 450 mV for full output. For magnetic and other low-output pickups a stereo preamplifier is available as an optional extra. (See Pickup Accessories Section for details.) Finish in teak, Brasilian rosewood or light oak. Size: $16 \frac{1}{2} \times 8 \frac{1}{4} \times 5 \frac{3}{4}$ in. Socket for tape recorder. Price (without decoder): $£ 5315 \mathrm{~s}$. (U.K. purchase tax $£ 84 \mathrm{~s}$.); (with decoder): $£ 60$ 2s. 6d. (U.K. purchase tax £9 3s. 6d.).

ARMSTRONG AUDIO LTD., Warlters Road, Holloway, London, N.7. Tel.: North 3213/4.

Model 226. Stereo tuner/amplifier. A.M./ F.M. Variable tuning. Range M.W. 180-600 m.; F.M. 87-108 Mc/s. Foster-Seeley disc. Tuning meter. Full multiplex facilities. Aerial imp. 7080 ohms and 300 ohms. Output 10 W per channel. P.s.n. 200-250V AC. Inputs: gram. (1) $80 \mathrm{mV}, 2$ megohms; gram. (2) $3.5 \mathrm{mV}, 47 \mathrm{~K}$ (RIAA); tape playback $80 \mathrm{mV}, 2$ megohms; tape monitor $600 \mathrm{mV}, 100 \mathrm{~K}$. Controls: sel., vol., balance, bass, treble, waveband, tuning, treble filter, rumble filter, tape monitor, loudness. Treble filter $7 \mathrm{Kc} / \mathrm{s}, 12 \mathrm{~dB}$ per octave. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB} . \mathrm{H}$ and N better than -55 dB . H.D. less than $0.5 \%$ at 8 W (overall). Feedback 15 dB . L.S. matching 4, 8, 16 ohms. Output stages $4 \times$ ECL86. Free-standing. Size: $15 \frac{1}{4} \times 5 \frac{3}{8} \times 15$ in. Optional case. Price: $£ 522 \mathrm{~s}$. 3 d . (U.K. purchase tax $£ 817 \mathrm{~s}$. 9d.). Shelf-mounting case $£ 310$ s. extra.

Model 227. Stereo tuner/amplifier. A.M./ F.M. Variable tuning. Range M.W. 180-600 m., F.M. 87-108 Mc/s. Foster-Seeley disc. Tuning meter. Full multiplex facilities. Aerial imp. 7080 ohms and 300 ohms. Output 10W per channel. P.s.n. 200-250V AC. Inputs: gram. 80 mV , 2 megohms; tape playback 80 mV .2 megohms; Controls: sel., vol., balance, bass, treble, waveband, tuning. Rumble filter -6 dB at $35 \mathrm{c} / \mathrm{s}$. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB} . \mathrm{H}$ and N better than -55 dB . H.D. less than $0.5 \%$ at 8 W (overall). Feedback 15 dB . L.S. matching 4, 8, 16 ohms. Output stages $4 \times$ ECL86. Free-standing. Size: $15 \frac{1}{4} \times 5 \frac{3}{8} \times 15$ in. Optional case. Price: $£ 451 \mathrm{~s} .3 \mathrm{~d}$. (U.K. purchase tax $£ 7$ 13s. 9d.). Shelf-mounting case £3 10s. extra.

Model 227M. Mono tuner/amplifier. A.M./ F.M. Variable tuning. Range M.W. 180-600 m.; F.M. 87-108 Mc/s. Foster-Seeley disc. Tuning meter. Aerial imp. 70-80 ohms. Output 10W. P.s.n. 200-250V AC. Inputs: gram/tape playback 80 mV , 1 megohm. Controls: vol., bass, treble, sel., tuning. Rumble filter -6 dB at $35 \mathrm{c} / \mathrm{s}$. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB} . \mathrm{H}$ and N better than -55 dB . H.D. less than $0.5 \%$ at 8W (overall). Feedback 15 dB . L.S. matching 4, 8,16 ohms. Output stages $2 \times$ ECL86. Freestanding. Size: $13 \times 5 \frac{3}{8} \times 10 \frac{1}{2}$ in. Optional case. Price: $£ 318 \mathrm{~s}$. (U.K. purchase tax $£ 57 \mathrm{~s}$.). Shelfmounting case $£ 310$ s. extra.

BANG \& OLUFSEN. U.K. Sales Division, Mercia Road, Gloucester. Tel.: Gloucester 26841. Cables: Debelec, Gloucester.

Beomaster 1000. Transistorised F.M. tuner and stereo amplifier. Inputs: mag. PU 5 mV 47 K , crystal PU 180 mV 100 K . Controls: Scratch filter, rumble filter, bass, treble, volume, balance. Output 15 W per channel. Distortion $1 \%$ at full output. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Output imp. 3-5 ohms. Fitted with multiplex decoder. Size: $19 \frac{7}{8} \times 3 \frac{7}{16} \times 10$ in. Mains $110-240 \mathrm{~V}$. Price: $£ 82$ 19s.


Armstrong 227M tuner/amplifier


Armstrong 227 stereo tuner/amplifier


Armstrong 226 stereo tuner/amplifier


Beomaster 1000 stereo amplifier and FM tuner


Metz 420 tuner amplifier


Armstrong 227M mono tuner/amplifier


Korting 26.452 tuner/amplifier


Fisher 400 FM/stereo tuner amplifier


Fisher 700-T transistorised FM/stereo tuner amplifier


Fisher 800-C AM/FM stereo tuner amplifier

## TUNER AMPLIFIERS

BRAUN AG. Distributors: Fi-Cord International, Charlwoods Road, East Grinstead, Sussex. Tel.: East Grinstead 21351.

TS45. Stereo tuner/amplifier. Transistorised. V.H.F. 88-108 Mc/s. M.W. 188-545 m. Variable tuning. Foster-Seeley discriminator. Meter indicator. Sensitivity $1.5 \mu \mathrm{~V}$ for 26 dB quieting. Aerial 300 ohms balanced twin. Optional multiplex. A.F.C. switchable. Output 12W each channel. Distortion less than $1 \%$ at $1 \mathrm{Kc} / \mathrm{s}$ for 12 W output. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Output imp. 4 ohms. Mains $240 V$ AC. Size: $19 \frac{1}{4} \times 11 \frac{1}{4} \times$ $4_{8}^{3}$ in. Price: $£ 172$ including purchase tax.

FISHER RADIO CORPORATION, Long Island City 1, New York, U.S.A. Distributors: Getz Bros. and Co. Inc., 2 Harewood Place, London, W.1. Tel.: Grosvenor 6901.
400. Stereo tuner/amplifier. F.M. 86-108 $\mathrm{Mc} / \mathrm{s}$. Variable tuning. Ratio detector. Strip tuning indicator. Sensitivity $1.8 \mu \mathrm{~V}$ for 20 dB quieting. Aerial input 300 ohms balanced. Multiplex decoder fitted. A.F.C. Valves. Inputs: pickup (1) 4.4 mV , pickup (2) 14 mV , tape head 2.8 mV , auxiliary 280 mV . Controls: bass $\pm 22 \mathrm{~dB}$ at $50 \mathrm{c} / \mathrm{s}$, treble $\pm 22 \mathrm{~dB}$ at $10 \mathrm{Kc} / \mathrm{s}$, filter -3 dB at $5 \mathrm{Kc} / \mathrm{s}$, then 12 dB /octave above $6 \mathrm{Kc} / \mathrm{s}$. Output 25W R.M.S. each channel. H.D. $0.5 \%$ at $1 \mathrm{Kc} / \mathrm{s}$ at rated output. F.R. $25 \mathrm{c} / \mathrm{s}-$ $25 \mathrm{Kc} / \mathrm{s}$. Noise level -80 dB . Mains input 200W. Size: $17 \frac{1}{2} \times 13 \frac{1}{2} \times 5 \frac{3}{4} \mathrm{in}$. Weight: 31 lb . Price: $£ 103$ 19s. including purchase tax.

440-T. Stereo F.M. multiplex tuner/amplifier. Full specification on request. Price: £156 9s. including purchase tax.

800-C. Stereo A.M./F.M. multiplex tuner/ amplifier. Full specification on request. Price: $£ 156$ 9s. including purchase tax.

700-T. Transistorised F.M. stereo tuner/ amplifier. Front end field effect transistors. Two RF stages. Four IF stages. Three limiters. Automatic stereo switching. Full technical specification on request. Size: $16 \frac{3}{4} \times 5 \frac{1}{8} \times 12 \frac{3}{8} \mathrm{in}$. Weight: 24 lb . Price on application.

KORTING. Distributors: Europa Electronics Ltd., Howard Place, Shelton, Stoke-on-Trent. Tel.: Stoke-on-Trent 29316.
26452. Transistor stereo tuner/amplifier in modern style wood cabinet. Ranges: M.W.,
L.W., S.W., V.H.F./F.M. Variable tuning. A.F.C. on F.M. Meter tuning indicator. A.G.C. Internal rotatable ferrite rod for M.W. and L.W. Folding dipole for F.M. Output: 15W RMS each channel. 4.5 ohms. F.R. $20 \mathrm{c} / \mathrm{s}-100 \mathrm{Kc} / \mathrm{s}$. Controls: bass, treble, balance, volume. Eight push-buttons for A.F.C., stereo, F.M., L.W., M.W., S.W., pickup, tape, on/off. Output stages: two AD148 transistors each channel. Mains $110,127,220,240 \mathrm{~V}$ AC. $50 \mathrm{c} / \mathrm{s}$. Consumption 40W maximum. Stereo multiplex decoder incorporated. Size: $21 \frac{1}{4} \times 8 \frac{5}{8} \times 9$ in. Price: £82 19s. including tax.

METZ. Distributors: Mitchell Enterprises Ltd., 61 West Street, Dorking, Surrey. Tel.: Dorking 4229.

Metz 420. Transistorised stereo tuner/ amplifier. 42 transistors and diodes. Inputs for mic., tape, crystal PU. Controls: On-off, loudness, bass, treble, H.F. filter, rumble filter. Output 10W each channel. F.M./V.H.F. radio with auto-tuning. Size: $17 \frac{3}{4} \times 4 \frac{3}{4} \times 10$ in. Price: $£ 83$ 15s. (U.K. purchase tax £13 19s. 2d.).

PIONEER. Distributors: Swisstone Ltd., 26 Leigh Place, Cobham, Surrey. Tel.: Cobham 2853.

FM-B101. A.M./F.M. mono tuner/amplifier. 22 valves and 2 diodes. F.M. section: 76-108 $\mathrm{Mc} / \mathrm{s}$, sensitivity $2 \cdot 5 \mu \mathrm{~V}$, S. to N .55 dB , aerial input 300 ohms unbalanced. A.M. section: M.W. 187-560 m., S.W. 25-79 m., sensitivity 35 $\mu \mathrm{V}$ and $100 \mu \mathrm{~V}$, selectivity $2.5 \mathrm{Kc} / \mathrm{s}$ (sharp) and $8 \mathrm{Kc} / \mathrm{s}$ (broad). Inputs: mag. pickup 2.5 mV , crystal/ceramic pickup 25 mV , aux. 150 mV . Output 7W RMS, 11 W music. H.D. $1 \%$ at rated output. F.R. $20 \mathrm{c} / \mathrm{s}-50 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Damping factor 8. Mains: $115-230 V$ AC. Size: $14 \frac{1}{4} \times$ $13 \frac{3}{8} \times 5 \frac{3}{8} \mathrm{in}$. Weight: $18 \frac{3}{4} \mathrm{lb}$. Price: $£ 63$ including U.K. purchase tax.

SX-34. A.M./F.M. multiplex stereo tuner/ amplifier. F.M. section: 88-108 Mc/s, sensitivity $3 \mu \mathrm{~V}$, aerial input 300 ohms balanced. A.M.
 ferrite aerial. Multiplex decoder fitted. Inputs: mag. pickup 2.5 mV , ceramic pickup 30 mV , aux. 300 mV , tape playback 350 mV . Controls: bass $\pm 10 \mathrm{~dB}$ at $50 \mathrm{c} / \mathrm{s}$, treble $\pm 10 \mathrm{~dB}$ at $10 \mathrm{Kc} / \mathrm{s}$, loudness +5 dB at $50 \mathrm{c} / \mathrm{s},+8 \mathrm{~dB}$ at $10 \mathrm{Kc} / \mathrm{s}$, with volume control set at -30 dB .14 valves, 10 diodes. Output: 11 W RMS, 17 W music, each channel. Output impedance 8 or 16 ohms.


Pioneer ER-420

Pioneer SX-600T

Pioneer SX-34


Pioneer SX-1000T



Pioneer SX-800


Saba Studio II stereo


Telefunken Concerto


Telefunken Operette

Output stages: two ECL82 push-pull each stage. Tape monitor and playback sockets. Stereo headphone jack. Mains: 115-230V AC. Size: $16 \frac{3}{4} \times 13 \frac{1}{2} \times 5 \frac{3}{8}$ in. Weight: $26 \frac{1}{2} \mathrm{lb}$. Price: $£ 939 \mathrm{~s}$. including U.K. purchase tax.

LX-34. A.M./F.M. multiplex stereo tuner/ amplifier. Similar specification to SX-34 but with additional L.W. band 834-1940 m. Price: £98 14s. including U.K. purchase tax.

ER-420. A.M./F.M. multiplex stereo tuner/ amplifier. F.M. section: $87-108 \mathrm{Mc} / \mathrm{s}$, sensitivity $2 \mu \mathrm{~V}, \mathrm{~S} . \mathrm{N}$. 55 dB , aerial input 300 ohms balanced. A.M. section: M.W. 187-560 m., sensitivity $20 \mu \mathrm{~V}$, selectivity $\pm 4 \mathrm{Kc} / \mathrm{s}$ (sharp), $\pm 10 \mathrm{Kc} / \mathrm{s}$ (broad), built-in ferrite rod with provision for external aerial. Inputs: mag. pickup $2.7 \mathrm{~m} V$, ceramic pickup 29 mV , tape head 1.8 mV , tape monitor 200 mV , aux. 200 mV . Output: 15W RMS each channel. Output impedance 8 or 16 ohms. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ $\pm 1 \mathrm{~dB}$. H.D. $<1 \%$ at rated output. H. and N. better than 68 dB (mag.). Controls: bass $\pm 14 \mathrm{~dB}$ at $50 \mathrm{c} / \mathrm{s}$; treble $+11 \mathrm{~dB},-13 \mathrm{~dB}$ at $10 \mathrm{Kc} / \mathrm{s}$, low filter -6 dB at $50 \mathrm{c} / \mathrm{s}$, high filter -14 dB at $10 \mathrm{Kc} / \mathrm{s} .18$ valves, 10 diodes. Two 6BQ5/EL84 push-pull each channel. Mains: $115-230 \mathrm{~V}$ AC. Size: $17 \frac{1}{2} \times 17 \frac{1}{2} \times 6$ in. Weight: 35 lb . Price: $£ 13812$ s. including U.K. purchase tax.

SX-800. A.M./F.M. multiplex stereo tuner/ amplifier. Automatic F.M. mono/stereo switching circuit. F.M. section: nuvistor front end, $88-108 \mathrm{Mc} / \mathrm{s}$, sensitivity $2 \mu \mathrm{~V}$, S.N. 55 dB , aerial input 300 ohms balanced. A.M. section: 187-560 metres, sensitivity $10 \mu \mathrm{~V}$, selectivity $\pm 7 \mathrm{Kc} / \mathrm{s}$ (broad), $\pm 4 \mathrm{Kc} / \mathrm{s}$ (sharp), internal ferrite rod, provision for external aerial. Inputs: mag. pickup 3 mV , ceramic pickup 30 mV , tape head 2 mV , monitor 150 mV , aux. 150 mV . Controls: bass $\pm 15 \mathrm{~dB}$ at $50 \mathrm{c} / \mathrm{s}$, treble $+10 \mathrm{~dB},-12 \mathrm{~dB}$ at $10 \mathrm{Kc} / \mathrm{s}$, low filter -8 dB at $50 \mathrm{c} / \mathrm{s}$, high filter -14 dB at $10 \mathrm{Kc} / \mathrm{s}$. Output: 75W music (total). 9 valves, 14 diodes and transistors. Two 7189A push-pull each channel. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ $\pm 1 \mathrm{~dB}$. Mains: $115-230 \mathrm{~V}$ AC. Size: $17 \frac{1}{2} \times$ $16 \frac{7}{8} \times 5 \frac{1}{2}$ in. Weight: 35 lb . Price: $£ 171$ 3s. including purchase tax.

OSX-600T. A.M./F.M. transistor multiplex stereo tuner/amplifier. Automatic stereo/mono switching circuit. 60 transistors, 4 nuvistors. F.M. section: nuvistor front end, $88-108 \mathrm{Mc} / \mathrm{s}$, sensitivity $2 \mu \mathrm{~V}, \mathrm{~S} . \mathrm{N} .60 \mathrm{~dB}$, aerial input 300 ohms balanced. A.M. section: 187-560 m., sensitivity $16 \mu \mathrm{~V}$, internal ferrite rod aerial with provision for external aerial. Inputs: mag. pickup 2.7 mV 60 K , ceramic pickup 70 mV 100 K , tape head 1.5 mV 150 K , tape monitor 330 mV

180K, aux. 240 mV 220K. Controls: bass +15 $\mathrm{dB},-14 \mathrm{~dB}$ at $50 \mathrm{c} / \mathrm{s}$, treble $+14 \mathrm{~dB},-13 \mathrm{~dB}$ at $10 \mathrm{Kc} / \mathrm{s}$, low filter -7 dB at $50 \mathrm{c} / \mathrm{s}$, high filter -13.5 dB at $10 \mathrm{Kc} / \mathrm{s}$. Output: 17.5W RMS each channel 16 ohms load. Output impedance 8-16 ohms. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Quiet tuning on F.M. Meter tuning indicator. Mains: 115230V AC. Size: $17 \frac{1}{2} \times 17 \times 5 \frac{7}{8}$ in. Weight: 27 lb . Price: $£ 18012$ s. including U.K. purchase tax.

SX-1000T. Transistor F.M. multiplex stereo tuner/amplifier. 88-108 Mc/s. Sensitivity $2 \mu \mathrm{~V}$. S.N. better than 60 dB . Aerial input 300 ohms balanced. Automatic mono/stereo switching. Inputs: mag. pickup 2.8 mV 45 K , ceramic pickup 87 mV 100 K , tape head 1.8 mV 130 K , tape monitor 225 mV 200 K , aux. 225 mV 200 K . Controls: bass $+16 \mathrm{~dB},-18 \mathrm{~dB}$ at $50 \mathrm{c} / \mathrm{s}$, treble $+14 \mathrm{~dB},-11 \mathrm{~dB}$ at $10 \mathrm{Kc} / \mathrm{s}$, low filter -7 dB at $50 \mathrm{c} / \mathrm{s}$, high filter -14 dB at $10 \mathrm{Kc} / \mathrm{s}$. Output: 40W RMS each channel. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ $\pm 2 \mathrm{~dB}$. H.D. $<1 \%$ at rated output. Damping factor $10 . \mathrm{H}$ and N better than 70 dB . Mains: $115-230 \mathrm{~V}$ AC. Size: $17 \frac{1}{2} \times 15 \frac{1}{8} \times 5 \frac{7}{8}$ in. Weight : 33 lb. Price: £204 15s.

SABA ELECTRONICS LTD., $3 / 5$ Eden Grove, Holloway, London, N.7. Tel.: North 8161. Cables: Arc Eeslon.

Studio IIA Stereo. Transistorised tuner/ amplifier. F.M./V.H.F. 87-104 Mc/s, L.W. 8322,140 m., M.W. 184-590 m., S.W. 49 m. bandspread. Variable tuning. Ratio detector. Meter tuning indicator. Sensitivity $3 \mu \mathrm{~V}$ for 20 dB quieting. V.H.F. aerialinput 240 ohms balanced. A.F.C. Multiplex decoder built-in. Output: 20W each channel. Mains: $115-240 V$ AC. Size: $16 \times$ $7 \frac{1}{2} \times 13$ in. Price: $£ 12015 \mathrm{~s}$.

Freiburg Studio. Transistorised tuner/amplifier. F.M./V.H.F., L.W., M.W., bandspread $25 \mathrm{~m} ., 31 \mathrm{~m} ., 49 \mathrm{~m}$. Electronic station searching. Remote control. 70 transistors. Built-in multiplex decoder. Output: 35W each channel. Mains: $115-240 \mathrm{~V}$ AC. Full specification on request. Price: $£ 326 \mathrm{lls}$.

## SHERWOOD ELECTRONIC LABORATORIES INC. Distributors: Audioson Ltd., York House, Empire Way, Wembley, Middlesex. Tel.: Diligence 1886.

S-7800. All-silicon solid state A.M./F.M. multiplex stereo tuner/amplifier. F.M. range: $87 \cdot 5-108 \cdot 5 \mathrm{Mc} / \mathrm{s}$. A.M. range: $179-555 \mathrm{~m}$. Out-


Metz 420 tuner/amplifier


Saba Freiburg stereo


Sherwood S-8800 FM/stereo tuner amplifier


## Telefunken Opus



Zenith AM/FM tuner/amplifier
put: 40W music per channel. Output impedance 8 ohms. H.D. $0.5 \%$. Inputs: tape head, pickup, tape monitor, aux. Size: $16 \frac{1}{2} \times 4 \frac{1}{2} \times 14$ in. Price on application.

S-8800. Similar specification to S-7800 but without A.M. band. Price on application.

TANDBERG. Distributors: Elstone Electronics Ltd., 81 Kirkstall Road, Leeds. 3. Tel.: Leeds 35111.

Huldra 8-55. A.M./F.M. tuner/amplifier. Range: F.M. $87 \cdot 5-108 \mathrm{Mc} / \mathrm{s}$, L.W. $857-2,000 \mathrm{~m}$., M.W. 186-590 m., marine $50 \cdot 9-187 \mathrm{~m} ., \mathrm{S} . \mathrm{W}$. $13-50.9 \mathrm{~m}$. Variable tuning, one system for F.M., one for A.M. Provision for multiplex decoder. Switched A.F.C. Four movable station markers for F.M. $9 \mathrm{Kc} / \mathrm{s}$ filter. Variable selectivity on A.M. Push-button operation of wavebands and function. Independent bass and treble controls plus six-position tone selector switch. Output: 10W RMS per channel. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}(30 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}-3 \mathrm{~dB})$. Input suitablef or all pickups including magnetic. Output impedance 4 ohms. Mains: 115, 130, 150, $220,240 \mathrm{~V} 50 / 60 \mathrm{c} / \mathrm{s} .5$ valves, 20 transistors. Printed circuit. Size: $19 \frac{3}{4} \times 85 \times 10 \mathrm{in}$. Price on application.

TELEFUNKEN. Distributors: A.E.G. (Great Britain) Ltd., Lonsdale Chambers, 27 Chancery Lane, London, W.C.2. Tel.: Chancery 9944. Cables: Welmcor, London.

Telefunken Operette. Transistorised stereo tuner/amplifier. Range (model 2650MX): F.M., S.W., M.W., L.W.; (model 5650MX) : F.M. up to $108 \mathrm{Mc} / \mathrm{s}$, M.W., S.W.l (6•8-16 Mc/s), S.W. 2 ( $2 \cdot 2-6 \cdot 9 \mathrm{Mc} / \mathrm{s}$ ). 25 transistors, 10 diodes, 3 rectifiers. Separate flywheel-powered tuning for A.M. and F.M. Independent bass and treble controls. Balance control. F.M. stereo decoder with automatic stereo indicator. 15W output. Distortion less than $1 \%$. Sockets for pickup, recorder, external aerial and earth. Size: $20 \times$ $7 \frac{1}{2} \times 6 \frac{3}{4} \mathrm{in}$. Price: $£ 895 \mathrm{~s}$.

Telefunken Opus Studio. Transistorised stereo tuner/amplifier. Range as for Operette except S.W. $16 \cdot 9-22 \cdot 5 \mathrm{Mc} / \mathrm{s} .19$ transistors, 11 diodes, 4 rectifiers, 1 stabiliser, 6 valves. Switchable A.F.C. Slow motion S.W. tuning. Separate bass. treble and balance controls. F.M. stereo decoder with automatic stereo indicator. Sensitivity: $1 \mu \mathrm{~V}$ for 30 dB signal to noise ratio.

Rumble filter. Noise filter. Stereo base adjustment. Automatic noise suppression. 50 W output. F.R. $20 \mathrm{c} / \mathrm{s}-30 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Distortion $0 \cdot 2 \%$ at $1 \mathrm{Kc} / \mathrm{s}$. Cabinet: light matt walnut or teak. Size: $25 \frac{1}{2} \times 10 \frac{3}{4} \times 10$ in. Price: $£ 103$ 19s.
© Concerto. A.M./F.M. tuner/amplifier. Fitted multiplex decoder. Four wavebands. Separate tuners for A.M. and F.M. Output 4W each channel. Light walnut cabinet. Matching speaker enclosures with 10 in . bass driver and $7 \times 5 \mathrm{in}$. mid-range and treble units available. Price on request.

TRIO. Distributors: Winter Trading Co. Ltd., 95-99 Ladbroke Grove, London, W.11. Tel.: Park 1341. Cables: Winlec, London, W. 11.
-WX400U. A.M./F.M. Stereo tuner/amplifier. Wavebands: F.M. $80-108 \mathrm{Mc} / \mathrm{s}$, A.M. 187560 m . Variable tuning. Neon indicator. Aerial: 75 ohms coaxial. Sensitivity: F.M. $1 \cdot 9 \mu \mathrm{~V}$ at $98 \mathrm{Mc} / \mathrm{s}$, A.M. $20 \mu \mathrm{~V}$ at $1,000 \mathrm{Kc} / \mathrm{s}$. Multiplex adaptor fitted. A.F.C. Rumble filter, noise filter, stereo headphone jack. Valves. Inputs: mag. PU 3 mV , crystal PU 30 mV , aux. 150 mV . Output 20W (peak) per channel. F.R. F.M. $20 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s}$, F.M. Stereo $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Both $\pm \frac{1}{2} \mathrm{~dB}$. Noise level -10 dB at $10 \mathrm{Kc} / \mathrm{s}$. Imp. $0-16$ ohms. Mains: $115 \mathrm{~V} / 240 \mathrm{~V}$ AC. Size: $17 \frac{3}{4} \times$ $5 \frac{1}{8} \times 14 \mathrm{in}$. Price: £88 6s. (U.K. purchase tax £15 13s.).

W38. A.M./F.M. Stereo tuner/amplifier. Wavebands: F.M. $76-108 \mathrm{Mc} / \mathrm{s}$, M.W. 187$560 \mathrm{~m} .$, S.W. $27-79 \mathrm{~m}$. Variable tuning. M.E. 75 ohms aerial input. Sensitivity: F.M. $2 \cdot 6 \mu \mathrm{~V}$ at $94 \mathrm{Mc} / \mathrm{s}$, M.W. $40 \mu \mathrm{~V}$ at $1 \mathrm{Mc} / \mathrm{s}$, S.W. $6 \mu \mathrm{~V}$ at $8 \mathrm{Mc} / \mathrm{s}$. Multiplex adaptor available. Loudness control. DC filament heating. Stereo headphone jack. Output 14W (peak) per channel. F.R. Up to $20 \mathrm{Kc} / \mathrm{s} \pm 0.5 \mathrm{~dB}$ at 500 mW output.

Inputs: mag. PU 30 mV , aux. 4 mV . Output imp. 0-16 ohms. Valves. Size: $18 \times 10 \frac{1}{2} \times 5 \frac{1}{2}$ in. Price: $£ 71$ 6s. 3d. (U.K. purchase tax $£ 12$ 3s. 3d.).

OKW33L. A.M./F.M. stereo tuner/amplifier. Wavebands: F.M. $88-108 \mathrm{Mc} / \mathrm{s}$, A.M. 187$560 \mathrm{~m} ., 858-2,000 \mathrm{~m}$. Variable tuning. Meter indicator. Foster-Seeley discriminator. Sensitivity: F.M. $2 \mu \mathrm{~V}$ at $98 \mathrm{Mc} / \mathrm{s}$, A.M. $10 \mu \mathrm{~V}$ at $1 \mathrm{Mc} / \mathrm{s}$. Aerial input 75 ohms coaxial. Multiplex decoder fitted. Inputs: mag. PU 1.5 mV , crystal PU 20 mV , aux. 100 mV . Output: 14W (peak) per channel. Size: $16 \frac{1}{2} \times 5 \frac{7}{8} \times 14 \mathrm{in}$. Price: $£ 79$ 19s. 4d. (U.K. purchase tax $£ 13$ 9s. 8d.).

- WE8S. A.M./F.M. tuner/amplifier. Wavebands: F.M. 88-108 Mc/s, M.W. 187-545 m., L.W. $858-2,000 \mathrm{~m}$. Variable tuning. FosterSeeley discriminator. M.E. Sensitivity: F.M. $2.5 \mu \mathrm{~V}$, M.W. $10 \mu \mathrm{~V}$, L.W. $10 \mu \mathrm{~V}$. Aerial input 75 ohms coaxial. Multiplex adaptor available. A.F.C.' Valves. Controls: Volume, balance, bass, treble, selector, tuning, power on-off, stereo/mono. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$ at 500 mW output. Output: 14W (peak) per channel. Output imp. 0-16 ohms. Size: $16 \frac{1}{2} \times$ $5 \times 11 \mathrm{in}$. Mains: $110 \mathrm{~V} / 220 \mathrm{~V}$ AC. Price: $£ 43$ 18s. 11 ld . (U.K. purchase tax $£ 7$ 10s. 1d.).

ZENITH RADIO CORPORATION. Distributors: United Mercantile Co. Ltd., 13/14 Queen Street, London, W.1. Tel.: Grosvenor 4901. Cables: Ramsaco, Telex, London.
A.M. and Stereo/F.M. tuner/amplifier. F.M./ V.H.F. $88-108 \mathrm{Mc} / \mathrm{s}$, M.W. 187-545 m. Pushbutton controls. Strip indicator. Separate bass, treble and presence controls. Indicator for stereo broadcasts. Combined loudness and balance control. A.F.C. 16 -transistor amplifier. 120W R.M.S. total output. Price: $£ 159$ (U.K. purchase tax $£ 25$ 10s. 2 d .).



Quad Q.C.II control unit


Quad II power amplifier


4kai AA-5000 integrated amplifier


Armstrong 222 stereo amplifier


Armstrong 221 integrated stereo amplifier

Quad 22 stereo control unit


Braun CSV13/60 integrated stereo amplifier


Braun CSV1000 integrated stereo amplifier


Bryan 900


Bryan 500 Mk. III

## DIRECTORY OF AMPLIFIERS \& CONTROL UNITS

$\star$ The following abbreviations are used in this directory section: H.D. $=$ Harmonic Distortion; $<=$ less than; $\mathbf{H}$ and $\mathbf{N}=$ Hum and Noise; P.a.t. $=$ Power supplies available for tuner; RMS $=$ root mean square; N.L. $=$ Noise level; Sel. $=$ Selector switch; P.s.n. $=$ Power supply needed; - Stereo equipment.

## ACOUSTICAL MANUFACTURING CO.

 LTD., St. Peter's Road, Huntingdon, Hunts. Tel.: Huntingdon 2561/2. Cables: Acoustical.Quad II Q.C. II control unit. Inputs: radio/ tape 100 mV ; mic. 1.5 mV ; gram. to suit pickup. Treble, bass, vol. and on/off, filter slope. Switch filter $5,7,10 \mathrm{Kc} / \mathrm{s}$ and "out". Tape record socket, switched playback socket. H.D. $<0 \cdot 1 \%$. H and $\mathrm{N}-70 \mathrm{~dB}$. Size: $10 \frac{1}{2} \times 3 \frac{1}{2} \times 6 \frac{1}{2} \mathrm{in}$. To operate with Quad II power amp or similar. Price: $£ 23$.

Quad 22 control unit. Inputs: radio/tape 70 mV at 100 K ; mic. 1.5 mV at 100 K ; pickup dependent on adaptor unit used. Vol. and on/ off, bass, treble, filter slope, filter switch 5, 7 and $10 \mathrm{Kc} / \mathrm{s}$. Push-button selection of channels, mono/stereo, and record equalisation. H.D. $<0.02 \%$. H and $\mathrm{N}-70 \mathrm{~dB}$ total. P.a.t. 330 V 35 mA each tuner; 6.3 V 3 amps . Size: $10 \frac{1}{2} \times$ $3 \frac{1}{2} \times 6$ in. Price: $£ 25$. To operate with Quad II amplifiers.

Quad II amplifier. 15W. Dist. total 3rd harmonic and higher. $<0 \cdot 1 \%$ at 12 W . Input for spec. output $1 \cdot 4 \mathrm{~V}$ RMS for 15 W . Response $20-20,000 \mathrm{c} / \mathrm{s} \pm 0.2 \mathrm{~dB} ; 10-50,000 \mathrm{c} / \mathrm{s} \pm 0 \cdot 5 \mathrm{~dB}$. Feedback incorporated in original ultra-linear arrangement. N.L. -80 dB at 15 W . Output imp. 7 and 15 ohms. Output KT66's. Original combined anode/screen current circuit. Size: $12 \frac{1}{2} \times$ $4 \frac{3}{4} \times 6 \frac{1}{2} \mathrm{in}$. To operate with Q.C.II or Q. 22 control units. Price: $£ 25$.

Quad 50. High quality transistor power amplifier primarily intended for professional and industrial use. Input: 500 mV RMS into 22 K in parallel with 180 pF for 50 W output. Output: 50W RMS. Two models available, one for 4,9 or 16 ohms load, the other for 50 V or 100 V line. Outputs in both cases are isolated. Damping factor 10. Total harmonic distortion $<0 \cdot 25 \%$ at any level up to 50 W output at $700 \mathrm{c} / \mathrm{s}$. Hum -83 dB . Consumption 24-120W depending on power output. Mains: $100-127 \mathrm{~V}$ or 200-250V $50-60 \mathrm{c} / \mathrm{s}$ to order. Size: $12 \frac{3}{4} \times 6 \frac{1}{2} \times$ $4 \frac{3}{4} \mathrm{in}$. Weight: 24 lb . This amplifier is not suitable for use with the Quad 22 control unit.

AKAI. Distributors: Pullin Photographic Ltd., 11. Aintree Road, Perivale, Greenford, Middlesex. Tel.: Alperton 1541. Cables: Pullinfoto, Greenford, Middlesex.

Akai AA-5000. Integrated stereo transistor amplifier. Inputs: tape 1.5 mV , pickup 3 mV , radio 400 mV , aux. 400 mV , tape monitor 400 mV . F.R. $20 \mathrm{c} / \mathrm{s}-35 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Bass control: $\pm 14 \mathrm{~dB}$ at $50 \mathrm{c} / \mathrm{s}$. Treble control: $\pm 11 \mathrm{~dB}$ at $10 \mathrm{Kc} / \mathrm{s}$. Low filter: -8 dB at $50 \mathrm{c} / \mathrm{s}$. High filter -8 dB at $10 \mathrm{Kc} / \mathrm{s}$. Loudness control: +8 dB -at $100 \mathrm{c} / \mathrm{s}$ and +8 dB at $10 \mathrm{Kc} / \mathrm{s}$. Output: 35W RMS per channel into 8 ohms, 23W RMS per channel into 16 ohms. Distortion $1 \%$ at $1 \mathrm{Kc} / \mathrm{s}$ at rated load. Noise level -90 dB .28 transistors, 6 diodes, 3 thermistors. Mains: $100 / 117$ or $210 / 220 / 240 \mathrm{~V}$ AC $50 / 60 \mathrm{c} / \mathrm{s}$. Size: $17 \times 5 \frac{3}{4} \times 10 \frac{5}{8} \mathrm{in}$. Weight: $17 \frac{1}{2} \mathrm{lb}$. Price to be announced.

ARMSTRONG AUDIO LTD., Warlters Road, Holloway, N.7. Tel.: North 3213/4.

Model 222. Integrated stereo amplifier. Inputs: gram. $80 \mathrm{mV}, 2$ megohms; tape playback $80 \mathrm{mV}, 2$ megohms; radio $80 \mathrm{mV}, 2$ megohms. Output 10W per channel. Controls: sel., vol., balance, treble, bass. Rumble filter -6 dB at $35 \mathrm{c} / \mathrm{s}$. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB} . \mathrm{H}$ and N better than -55 dB . P.s.n. $200-250 \mathrm{~V}$ AC H.D. less than $0.5 \%$ at 8 W (overall). Feedback 15 dB . L.S. matching 4, 8,16 ohms. Output stages $4 \times$ ECL86. Free-standing. Size: $12 \frac{3}{8} \times 4 \frac{3}{4} \times 10 \frac{5}{8} \mathrm{in}$. Price: $£ 27$ 10s. Shelf-mounting case $£ 310$ s. extra.

OModel 221. Integrated stereo amplifier. Valve and transistor. Inputs, pickup (1) 80 mV 2 megohms, pickup (2) 3.5 mV 50 K , tape playback 80 mV 2 megohms, tape monitor 600 mV 100 K , radio 80 mV 2 megohms. Controls: Volume, bass, treble, balance, treble filter, rumble filter, loudness, tape monitor, input selector. Noise level better than -55 dB on all inputs. Output 10W RMS per channel. Distortion $0.5 \%$ at 8 W . Response $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1$
dB. Feedback 15 dB . Output imp. 4, 8, 16 ohms. Mains input $100-130 \mathrm{~V}, 200-250 \mathrm{~V}$ AC. Size: $12 \frac{3}{8} \times 10 \frac{3}{8} \times 4 \frac{3}{4}$ in. Price: $£ 3315$ s. Shelf mounting case £3 10s. extra.

## ASSOCIATED ELECTRONIC ENGINEERS

LTD., 10 Dalston Gardens, Stanmore, Middx. Tel.: Wordsworth 4474/5/6. Cables: Astronic, Stanmore.

Astronic A1646 Response Control Unit. Input 700 mV at 600 ohms, output 700 mV at 600 ohms. Response in flat position $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Each octave independently variable from +13 dB to -12 dB . Size: $20 \times 8 \times 13$ in. Price: $£ 88$.

BRADMATIC LTD., 338 Aldridge Road, Streetly, Sutton Coldfield, Warwickshire. Tel.: Streetly 3171.

MA30. Transistor power amplifier. Output: 21.5 V RMS which will provide 30 W approximately into 15 ohms load. Distortion: $<0.5 \%$ at 15 W at $1 \mathrm{Kc} / \mathrm{s},<1 \cdot 0 \%$ at 30 W at $1 \mathrm{Kc} / \mathrm{s}$. F.R. $10 \mathrm{c} / \mathrm{s}-17.5 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. AC and DC feedback. Noise level: $-72 \cdot 5 \mathrm{~dB}$. Inputs: 100 mV at $10 \mathrm{~K}, 5 \mathrm{mV}$ at 10 K . Output impedance: 12 ohms or above. Power supply needed: 35 V balanced at $1.5 \mathrm{~A}(52 \mathrm{~W})$ at 30 W output. Designed to operate with most control units. Size: $7 \times 4 \times$ 4 in . Weight: $3 \frac{1}{4} \mathrm{lb}$. Price (MA30 amplifier): £14; (PP30X2 power unit, sufficient for two MA30 amplifiers): $£ 11$; (MA30PP amplifier and power unit on one chassis): $£ 24$.

BRAUN AG. Distributors: Fi-Cord International, Charlwoods Road, East Grinstead, Sussex. Tel.: East Grinstead 21351.

- CSV 10. Integrated transistor amplifier. Inputs: 3 mV mag. PU, 240 mV crystal PU, 40 mV mic., 150 mV tape/radio. Output 8W. 4 ohms. F.R. $30 \mathrm{c} / \mathrm{s}-30 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Mains: $110-240 \mathrm{~V}$ AC. Distortion less than $2 \%$ at 8 W. Size: $11 \frac{1}{4} \times$ $11 \frac{1}{4} \times 4$ in. Price: $£ 78$.
- CSV 13. Integrated stereo valve amplifier. Output 12 W . Distortion less than $0.5 \%$ at 12 W . Response $20 \mathrm{c} / \mathrm{s}-30 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}( \pm 0.5 \mathrm{~dB}$ $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$ ). Inputs: mag. PU 1.5 mV , crystal PU 3 mV , mic. 10 mV , radio 200 mV , tape 200 mV . Output imp. 4, 8,15 ohms and electrostatic. Mains: $110-240 \mathrm{~V}$ AC. Size: $16 \times 12 \frac{7}{8} \times$ 4 in. Price: $£ 112$.

OCSV 60. Integrated stereo valve amplifier. Output 30W. Distortion $0.8 \%$ for 30 W at $1 \mathrm{Kc} / \mathrm{s}$. F.R. $20 \mathrm{c} / \mathrm{s}-30 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB} .( \pm 1 \mathrm{~dB}$ $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$ ). Inputs: mag. PU 1.5 mV , crystal PU 3 mV , mic 10 mV , radio 200 mV , tape 200 mV . Output imp. 4, 8, 16 ohms and electrostatic. Mains: 110-240V AC. Size: $16 \times 12 \frac{7}{8} \times$ 4 in. Price: $£ 142$.

CSV.1000. Integrated stereo amplifier. All transistor. 55W RMS output per channel. F.R. $20 \mathrm{c} / \mathrm{s}-30 \mathrm{Kc} / \mathrm{s}$. Distortion $<0 \cdot 3 \%$ at $1 \mathrm{Kc} / \mathrm{s} .45$ silicon transistors, 13 silicon diodes, 2 zener diodes, 1 silicon rectifier. Five inputs with adjustable sensitivities. CCIR equalisation. Output impedance $4-16$ ohms. Black steel cabinet with aluminium front panel. Size: $16 \times 4 \frac{3}{8} \times$ $13 \frac{3}{8}$ in. Price: $£ 345$.

BRYAN AMPLIFIERS LTD., 120 Ashley Road, Hale, Altrincham, Cheshire. Tel.: Altrincham 6026.

OModel 500 Mk . III. Transistorised stereo control unit. Inputs: mag. pickup 3.0 mV 50 K , ceramic pickup 40 mV 100 K (R.I.A.A. corrected), radio, tape, aux. 75 mV 50 K . Output 100 mV . Controls: input sel., and mono/stereo function switches; bass, treble, balance. Filters: high-pass $70 \mathrm{c} / \mathrm{s}$ and $25 \mathrm{c} / \mathrm{s}$; low-pass 4, 6 and $9 \mathrm{Kc} / \mathrm{s}$ at $8-10 \mathrm{~dB}$ per octave. H and $\mathrm{N}-70 \mathrm{~dB}$ (including power amplifier. Model 700). Powered from Model 700 amplifier with which it operates. Size: $11 \times 4 \frac{1}{4} \times 6 \frac{1}{2} \mathrm{in}$.

OModel 700. Transistorised stereo amplifier. Output $13 \mathrm{~W}+13 \mathrm{~W}$ for 100 mV inputs. Feedback 60 dB . Response $\pm 1 \mathrm{~dB} 40 \mathrm{c} / \mathrm{s}-30 \mathrm{Kc} / \mathrm{s}$. Dist. less than $0.25 \%$ at 10 W . Size: $10 \times 6 \frac{1}{4} \times$ $6 \frac{1}{4}$ in. Price (together with Model 500): $£ 5614 \mathrm{~s}$.

OModel 3000. Integrated transistor stereo amplifier in teak case. Specification as for Models 500/700 Mk. III. Size: chassis $10 \frac{1}{4} \times$ $10 \frac{3}{4} \times 4 \frac{1}{4}$ in., case $11 \frac{3}{4} \times 11 \times 5 \frac{1}{4} \mathrm{in}$. Price: $£ 5614$ s.

OModel 900. Integrated trànsistor stereo amplifier. Output 10W RMS each channel. Controls: five-position input selector, mono/stereo mode switch, balance, bass, treble, filter ( $7 \mathrm{Kc} / \mathrm{s}$ ) and off, combined volume and mains on/off. Size: $13 \times 10 \times 4 \frac{1}{4}$ in. Price: $£ 34$.

CHAPMAN. See Derritron.

## CLARKE \& SMITH MANUFACTURING

 CO. LTD., High Fidelity Components Division, Melbourne Road, Wallington, Surrey. Tel.: Wallington 9252. Cables: Electronic, Wallington.(2655. Stereo integrated amplifier. Inputs, tape 3 mV 470 K , mag. PU $100 \mathrm{mV} \mathrm{33K}$, radio 100 mV 470 K , mic. 2 mV 470 K , aux. 100 mV 470 K , tape monitor 500 mV 1 megohm. Output 0.5 V and 10 W per channel $0.2 \%$ at $1 \mathrm{Kc} / \mathrm{s}$, less than $1.0 \% 40 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. Controls: volume, bass, treble, balance, input selector. Filters: high-pass $30 \mathrm{c} / \mathrm{s}$, low-pass $7 \mathrm{Kc} / \mathrm{s}$. Response $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ (depending upon input). Noise equivalent to $0.8 \mu \mathrm{~V}$ on R.I.A.A. input. Size: $4 \times 14 \times 13 \frac{3}{4}$ in. Price: $£ 442$ s.

DECCA SPECIAL PRODUCTS, Decca Radio and Television Division of the Decca Record Co. Ltd., Ingate Place, Queenstown Road, London, S.W.8. Tel.: Macaulay 6677.

- TSA33 Amplifier Mk. II. Transistorised integrated stereo amplifier. Inputs for PU, tape and radio. 90 mV on all inputs for 3 W output each channel. Controls: Selector, on/off, volume, balance, bass $(+12 \mathrm{~dB}$ and -5 dB at $40 \mathrm{c} / \mathrm{s}$ relative to $1 \mathrm{Kc} / \mathrm{s}$ ), treble ( +8 dB and -13 dB at $12 \mathrm{Kc} / \mathrm{s}$ relative to $1 \mathrm{Kc} / \mathrm{s}$ ). Noise level -50 dB . Output imp. 15 ohms. Mains $200-250 \mathrm{~V}$ in 10 V steps. $50 \mathrm{c} / \mathrm{s}$. Special stand available to carry DD1 or AT6/1 playing desk with Mk. II amplifier below. Price: (amplifier) £26 5s.; (stand) £3 19s. 4d. (U.K. purchase tax 4s. 8d.).

DERRITRON RADIO LTD., Chapman Division, 24 Upper Brook Street, London, W.l. Tel.: Hyde Park 2291.

Chapman 205B amplifier. 30W from 30$20,000 \mathrm{c} / \mathrm{s}$. Distortion $<0.05 \%$ at $20 \mathrm{~W} ; 0.1 \%$ at 30 W. F.R. $2 \mathrm{c} / \mathrm{s}-100 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Feedback 22 dB . Noise level -89 dB at 20W. Output impedance: 4 or 15 ohms. Output stage KT77s. Ultra linear. Price to be announced.

- Chapman integrated 310 stereo amplifier. Inputs: gram. $5 \mathrm{mV}, 100 \mathrm{~K}$ (R.I.A.A.); radio, aux. $100 \mathrm{mV}, 250 \mathrm{~K}$ flat; tape $50 \mathrm{mV}, 100 \mathrm{~K}$ flat. Controls: bass, treble, function, balance, vol., filter, press-button sel. Filters: low-pass, 5, 10. $20 \mathrm{Kc} / \mathrm{s}$ at 12 dB octave. Response ( $\pm 0.5 \mathrm{~dB}$ ) $36 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ including filters at 1 W level, 25 $\mathrm{c} / \mathrm{s}-25 \mathrm{Kc} / \mathrm{s}$ without filters. H and N (main amp) -75 dB ; (radio, tape, aux.) -60 dB ; (gram.)
-50 dB . P.s.n. 200-250V $50 \mathrm{c} / \mathrm{s}$. Output 10W per channel. H.D. less than $0.1 \%$ at $1 \mathrm{Kc} / \mathrm{s}$, intermodulation less than $1 \%$. Feedback 15 dB . Output imp. 3 or 15 ohms. Output $4 \times$ ECL86. Size: $14 \frac{1}{2} \times 5 \frac{1}{2} \times 9 \frac{1}{2}$ in. Free-standing. Fully tropicalised. Price: $£ 48$.

DUAL ELECTRONICS LTD., Radnor House, London Road, Norbury, London, S.W.16. Tel.: Pollards 9465/6.

- Dual CV.3. Transistorised integrated stereo amplifier. Inputs: pickup (mag) 6 mV 10 K , pickup (crystal) 130 mV 10 K , tape 1 V 100 K . radio 130 mV 100 K . Controls: bass +12 dB to -10 dB at $100 \mathrm{c} / \mathrm{s}$, treble +10 dB to -15 dB at $10 \mathrm{Kc} / \mathrm{s}$, volume control tone-contoured. balance $\pm 13 \mathrm{~dB}$. Output:7W RMS perchannel. Intermodulation distortion $<1 \%$. F.R. $30 \mathrm{c} / \mathrm{s}-$ $18 \mathrm{Kc} / \mathrm{s}$. S.N. $>70 \mathrm{~dB}$. Output impedance 5 ohms. Mains: $110,130,150,220,240 \mathrm{~V}$ AC. Size: $16 \frac{1}{2} \times 11 \times 4 \frac{1}{4} \mathrm{in}$. Price to be announced.
CV.2. Shelf-mounting transistorised stereo amplifier and control unit. 15 transistors, 4 diodes, 1 mains bridge rectifier. Output 10W RMS push-pull each channel. Inputs: mag. PU, crystal PU, tape, radio. Controls: Selector, mode switch, volume. balance, bass and treble. Separate on/off switch. Size: $16 \frac{1}{2} \times 11 \times 4 \frac{1}{4} \mathrm{in}$. Weight: $17 \frac{1}{2} \mathrm{lb}$. Price to be announced.

DYNACO. Distributor's: Howland-West Ltd., 2 Park End, South Hill Park, London, N.W.3. Tel.: Swiss Cottage 6666.
©PAS-2. Stereo valve pre-amplifier. Inputs: PU R.I.A.A. 1.45 mV , tape NAB 2.7 mV , special (optional for second PU, tape or mic.) 1.75 mV, F.M. multiplex, radio, auxilliary. Output 2 V . Controls: selector, volume, balance, blend (mono-stereo), separate bass and treble for each channel, tape monitor, loudness, H.F. filter, on/off. Noise 70-74 dB below level of 10 mV cartridge. Mains power unit. Suitable for use with ST35, ST70 or any other power amplifier. Size: $13 \frac{1}{2} \times 4 \frac{1}{4} \times 8 \mathrm{in}$. Price: (assembled) £40 19s.; (kit) £34 13s.

- PAS-3. Similar to PAS-2 but with de luxe finish brass panel and knobs. Price: (assembled) $£ 45$ 3s.; (kit) £38 17s.
-SCA-35. Integrated mono/stereo valve amplifier. Seven pairs of inputs covering high- and low-level PU ( 50 K ), tape head NAB 100 K , radio, tape and auxilliary. Controls: selector,


Bryan 3000


Dynaco ST 35 stereo amplifier


Dynaco ST 70 mono/stereo amplifier


Howland-West Dynaco SCA-35 stereo amplifier


Dynaco PAS 3 (or PAS 2) stereo pre-amplifier


Clarke \& Smith 655 integrated stereo amplifier


Decca TSA 33 integrated transistorised stereo amplifier



Howland-West System One
volume, balance, bass, treble, stereo-mono switch, loudness switch, H.F. filter switch, on/ off switch. Output $17 \frac{1}{2} \mathrm{~W}$ per channel. Distortion: less than $1 \%$ over whole range $\pm 0.25 \mathrm{~dB}$ of $17 \frac{1}{2} \mathrm{~W}$ per channel. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ $\pm 0.25 \mathrm{~dB}$. Noise: 70 dB below 10 mV input on low-level inputs, 80 dB below on high-level inputs. Output imp. 8 and 16 ohms and centre channel. Mains supply. Size: $13 \frac{1}{2} \times 4 \frac{1}{4} \times 10 \mathrm{in}$. Price: (assembled) $£ 5917 \mathrm{~s}$.; (kit) $£ 52 \mathrm{10}$.

ST-35. Stereo valve main amplifier. Output $17 \frac{1}{2} \mathrm{~W}$ per channel. F.R. $10 \mathrm{c} / \mathrm{s}-40 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Distortion: less than $1 \%$ from $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ within 1 dB of $17 \frac{1}{2} \mathrm{~W}$ each channel. Noise: more than 80 dB below. Input voltage for $17 \frac{1}{2} \mathrm{~W}$ output, 1V. Output imp. 8 and 16 ohms. Suitable for use with pre-amplifiers PAS-2, PAS-3.or any similar units. Size: $13 \times 5 \frac{1}{2} \times 4 \mathrm{in}$. Price: (assembled) $£ 4019 \mathrm{~s}$.; (kit) $£ 3413 \mathrm{~s}$.

ST-70. Stereo valve main amplifier. 35W per channel. F.R. $10 \mathrm{c} / \mathrm{s}-40 \mathrm{Kc} / \mathrm{s} \pm 0.5 \mathrm{~dB}$. Distortion less than $1 \%$ from $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ within 1 dB of 35 W output per channel. Noise more than 90 dB below 35 W on each channel. Input voltage for 35 W output, $1 \cdot 3 \mathrm{~V}$. Output imp. 4, 8 and 16 ohms. Mains power unit. Size: $13 \times$ $9 \frac{1}{2} \times 6 \frac{1}{2} \mathrm{in}$. To operate with PAS-2, PAS-3 or any other similar pre-amplifier. Price: (assembled) $£ 59$ 17s.; (kit) $£ 52$ 10s.

EAGLE PRODUCTS. Distributors: B. Adler \& Sons (Radio) Ltd., 32a Coptic Street, London, W.C.1. Tel.: Museum 9606/7. Cables: Reldab, London.
-SA. 80 integrated stereo amplifier. Output 4W per channel. H.D. $4 \mathrm{~W}, 1 \% ; 8 \mathrm{~W}, 2 \%$. Response $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. N.L. -40 dB . Inputs: gram. 5 mV ; tuner 50 mV . L.S. matching 16 ohms. Self-powered. Controls: sel., vol. A, vol. B, tone. Free-standing. Size: $7 \frac{1}{8} \times 3 \times 6$ in. Price: £10 10s.

SA.200. Integrated stereo amplifier. Inputs: mag. PU 5 mV , crystal PU 100 mV , radio 100 mV , tape 5 mV , mic. 5 mV . Output 7.5 W per channel. Controls: selector, mode, volume, bass, treble, loudness, speaker/phones, on/off. Distortion less than $1 \%$ at $15 \mathrm{~W} 1 \mathrm{Kc} / \mathrm{s}$, less than $0.25 \%$ at $1 \mathrm{~W} 1 \mathrm{Kc} / \mathrm{s}$. F.R. $50 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ $\pm 2 \mathrm{~dB}$. Output imp. 4, 8, 16 ohms. Valves. Size: $12 \frac{1}{4} \times 4 \frac{3}{4} \times 8 \frac{1}{4}$ in. Price: $£ 30$.
-TSA.300. Integrated transistor stereo amplifier. Inputs: mag. pickup 3 mV , radio 100 mV , aux. 100 mV . Controls: tone +13 dB and
-15 dB at $50 \mathrm{c} / \mathrm{s},+15 \mathrm{~dB}$ and -20 dB at $20 \mathrm{Kc} / \mathrm{s}$, loudness +7 dB at $100 \mathrm{c} / \mathrm{s}$, rumble filter -6 dB at $50 \mathrm{c} / \mathrm{s}$, scratch filter -6 dB at $10 \mathrm{Kc} / \mathrm{s}$. Output per channel: 32 W RMS at 4 ohms, 25W RMS at 8 ohms, 20W RMS at 16 ohms. H.D. less than $1 \%$ at $20 \mathrm{~W} 1 \mathrm{Kc} / \mathrm{s}$. F.R. $20 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB} .20$ transistors. Equalisation: mag. pickup RIAA, tape head NARTB. Size: $13 \frac{3}{8} \times 11 \times 4$ in. Price: $£ 584 \mathrm{~s}$.
Prices quoted for Eagle products are approximate.

## ELIZABETHAN ELECTRONICS LTD.,

 Crow Lane, Romford, Essex. Tel.: Romford 64101. Cables: Elizabethan, Romford.- Elizabethan Princess. Transistor integrated amplifier. Inputs: pickup (1) 3.5 mV 47 K , pickup (2) 35 mV 47 K , radio 100 mV 250 K , tape 2.5 mV 47 K . Controls: volume, balance, treble, bass, low pass filter, rumble filter. Output: 10 W RMS per channel. H.D. $0 \cdot 25 \%$. F.R. $25 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s}$ at 10 W output. Output transistors AD149. Output impedance 15 ohms. Size: $15 \times$ $7 \times 4 \frac{1}{2}$ in. Price to be announced.

ELSTONE ELECTRONICS LTD., 81 Kirkstall Road, Leeds, 3. Tel.: Leeds 35111.

- Stereo WAL Gain. Transistorised stereo preamplifier. To match pickups, tape or mic., at 50,000 at 3,500 ohms. Battery life $1,000 \mathrm{hrs}$. Size: $7 \times 2 \frac{1}{8} \times 2 \frac{1}{2}$ in. Price: $£ 7$ 10s.

WAL Gain. Impedance matching transistor pre-amp, battery operated ( 3,000 -hour life). Noise and distortion too low to measure, gain better than 100 . Suitable for use with low output pu. or for direct connection to tape head, mic., etc. Size: $3 \frac{5}{8} \times 2 \frac{1}{8} \times 2 \frac{1}{8}$ in. Price: $£ 510$ s.

FISHER RADIO CORPORATION, Long Island City 1, New York, U.S.A. Distributors: Getz Bros.. and Co. Inc., 2 Harewood Place, London, W.1. Tel.: Grosvenor 6901.

- X100-A. Integrated stereo amplifier. 20W per channel. H.D. $0 \cdot 8 \%$. Response $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ $\pm 1 \mathrm{~dB}$. N.L. better than -90 dB with vol. control at minimum. Inputs for mono and stereo pu., tape head, tuner, aux., tape monitor. Highpass filter. Independent tone controls for each channel. Output stages EL184s. P.s.n. 200-240V AC. Price (in chassis form): $£ 5715 \mathrm{~s}$. Also available in cabinet form.

X101-C. Integrated stereo amplifier. 27W RMS per channel. H.D. $0 \cdot 5 \%$ at 15 W . Response $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Feedback 20 dB . Damping factor 10 H and $\mathrm{N}-60 \mathrm{~dB}$ on pickup, -80 dB radio. Filter -10 dB at $10 \mathrm{Kc} / \mathrm{s}$. Bass control $\pm 22 \mathrm{~dB}$ at $50 \mathrm{c} / \mathrm{s}$. Treble control $\pm 20 \mathrm{~dB}$ at $10 \mathrm{Kc} / \mathrm{s} .10$ valves. Output stages: two 7591 push-pull each channel. Hinged control panel covers less frequently used controls. Centre channel for third speaker. Push-button programme selector. Size: $15 \frac{1}{8} \times 11 \frac{7}{8} \times 4 \frac{7}{8} \mathrm{in}$. Weight 26 lb . Price: $£ 718 \mathrm{~s}$.

TX300. Transistorised stereo amplifier. 31 transistors, 4 diodes and 1 selenium rectifier. 36W RMS per channel. Distortion $0.5 \%$ at rated output. Hum and noise -86 dB below rated output. Response $20 \mathrm{c} / \mathrm{s}-25 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. $200-250 V$ AC. Size: $15 \frac{1}{8} \times 4 \frac{3}{4} \times 11 \frac{7}{8}$ in. Weight: 24 lb. Price: $£ 141$ 15s.

Spacexpander K-10. Reverberation amplifier for use with radio, records or tape. Mono or stereo. 3 valves, single control. Price: $£ 298$ s.
A. R. FRANKLIN, Audio Engineer, 6 Kings College Mews, London, N.W.3. Tel.: Juniper 0480.

Pre-amplifier. Transistorised stereo preamplifier with inputs for mag. PU, radio and tape. Output 1: variable to 1 V. Output 2: variable up to 100 mV at $200-400$ ohms for stereophones. Unselected inputs before and after tone controls. Tape monitoring facilities. Blend control for headphone listening. Size: $10 \times 4 \frac{1}{2} \times 6$ in. Price: £31 10s.

Main amplifier. All-silicon transistorised stereo power amplifier. Designed for use with Franklin pre-amplifier. F.R. $20 \mathrm{c} / \mathrm{s}-50 \mathrm{Kc} / \mathrm{s}$ $\pm 1 \mathrm{~dB}$. Output: 15 W RMS per channel. Size: $8 \times 5 \times 3$ in. Price: $£ 298$ s.

GOODMANS INDUSTRIES LTD., Axiom Works, Wembley, Middx. Tel. : Wembley 1200. Cables: Goodaxiom, Wembley.

Maxamp 30. Integrated stereo transistorised amplifier. Inputs: pickup 3.5 mV 47 K or 50 mV 100 K , radio 100 mV 100 K , tape 150 mV 100 K , aux. 3 mV 50 K . Controls: Input selector, volume, balance, bass, treble, P-B L.F. filter, P-B H.F. filter, P-B mono/stereo mode, P-B on/ off. Indicator light when on. Output: 30W RMS (15W per channel) into 8 ohm load, 20 W RMS
(10W per channel) into 4 or 15 ohm load. H.D. Less than $0.4 \%$ for 15 W per channel into 8 ohm load at $1 \mathrm{Kc} / \mathrm{s}$. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm \frac{1}{2} \mathrm{~dB}$. Output impedance: 4, 8, 15 ohms. High level outlet for tape recorder. Mains: 105, 120, 200, 220, 240 V AC $40-60 \mathrm{c} / \mathrm{s}$. Size: $10 \frac{1}{2} \times 5 \frac{1}{2} \times 7 \frac{1}{4} \mathrm{in}$. Price: $£ 49$ 10s.

GRUNDIG (GREAT BRITAIN) LTD., Newlands Park, Sydenham, London, S.E.26. Tel.: Sydenham 2211.

SV50. Transistorised integrated stereo amplifier. 27 transistors plus two diodes. Output: 20W RMS ( 25 W music) into 5 ohms each channel. H.D. less than $0 \cdot 1 \%$ at 20 W per channel. Inputs: Microphone $6 \mathrm{mV}, 1$ megohm; mag. PU 3.5 mV , 50 K ; radio ( 1 and 2) 200 mV , 500 K ; tape $200 \mathrm{mV}, 500 \mathrm{~K}$. Output imp. 5-16 ohms. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB} . \mathrm{S}$ to N 85 dB below 20 W . Bass control $\pm 18 \mathrm{~dB}$ at $30 \mathrm{c} / \mathrm{s}$. Treble control +18 dB to -20 dB at $15 \mathrm{Kc} / \mathrm{s}$. Balance control $\pm 8 \mathrm{~dB}$. Push-button controls: On-off, gram, mic, tape, radio 1 , radio 2, mono/stereo, low pass filter, high pass filter, linear response, presence circuit. Transformerless output. Provision for reverberation unit. Mains: 110, 130, 220, 240V 50-60 c/s. Shelfmounting walnut cabinet. Size: $15 \frac{3}{8} \times 10 \frac{1}{2} \times$ 6 in. Price: $£ 82$ 19s.

HART ELECTRONICS, 321 Great Western Street, Manchester 14. Tel.: Rusholme 2212-3. Cables: Alloys Mcr.

Mono 10. Integrated transistorised amplifier. Output 10W. H.D. $0.25 \%$. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Feedback 60 dB . N.L. -70 dB . L.S. matching 3-15 ohms. Inputs: mag. pu $5 \mathrm{mV}, 6 \mathrm{~K}$; crystal pu $100 \mathrm{mV}, 100 \mathrm{~K}$; aux. $150 \mathrm{mV}, 100 \mathrm{~K}$; mic. $1.5 \mathrm{mV}, 1 \mathrm{~K}$; tape replay $2.5 \mathrm{mV}, 1 \mathrm{~K}$. Controls: input sel., on/off, bass, treble, filter, vol. Lowpass filters: $6,10,20 \mathrm{Kc} / \mathrm{s}$. Internal power supply. Free-standing or cabinet mounting. Size: $9 \times 6 \frac{1}{4} \times 3 \frac{1}{4}$ in. Price: $£ 2414 \mathrm{~s}$.

HEATHKIT. See Constructional Kits Section.

HENRY'S RADIO LTD. See Constructional Kits Section.

HOWLAND-WEST LTD., 2 Park End, South Hill Park, London, N.W.3. Tel.: Swiss Cottage 6666.
-System One/25. Stereo transistorised integrated amplifier. Inputs: radio (1) 100 mV 100 K , radio (2) 250 mV 150 K , pickup (1) 3 mV 50 K , pickup (2) 15 mV 100 K , pickup (3) 50 mV 2 megohms, pickup (4) 150 mV 2 megohms, tape (1) 25 mV 47 K , tape (2) 150 mV 47 K , both equalised for $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. Noise level: radio -55 dB , pickup (mag) -60 dB , pickup (crystal) -50 dB , tape -60 dB . Controls: volume, function, balance, bass, treble, blend (with off position. Suitable for two-channel mono function). Output: $12 \cdot 5 \mathrm{~W}$ RMS per channel for 15 ohms termination. H.D. at rated power $0.15 \%$ at $1 \mathrm{Kc} / \mathrm{s}$. F.R. $20 \mathrm{c} / \mathrm{s}-25 \mathrm{Kc} / \mathrm{s}-1 \mathrm{~dB}$ into 15 ohm termination. Feedback 28 dB . Output impedance 15 ohms. Mains. Size: $15 \times 4 \times 8 \mathrm{in}$. Price to be announced.
-System Two/40. Stereo transistorised integrated amplifier. Similar specification to System One/25 but providing 20W RMS output per channel. Size: $15 \times 4 \times 10 \mathrm{in}$. Price to be announced.

KERR McCOSH \& CO. LTD., 435 Sauchiehall Street, Glasgow, C.2. Tel.: Douglas 0988.

DSI stereo control unit. Inputs: pickup and tape head 4 mV ; crystal pickup and tape 140 mV ; mic. 1.5 mV . Sel. switch, on/off, separate vol., treble, bass for each channel, flat/tone control. Tape record sockets. Size: $12 \frac{1}{2} \times 4 \frac{1}{2} \times 10 \frac{1}{4} \mathrm{in}$. Price: $£ 34$.

OCWA 2/12. 12 W per channel. Distortion $0 \cdot 1 \%$ at 12 W . Noise level -95 dB . Response $25 \mathrm{c} / \mathrm{s}-30 \mathrm{Kc} / \mathrm{s} \pm 0.2 \mathrm{~dB}$. Output imps. 7.5 and 15 ohms. Input sensitivity 1V. Designed to operate with DSI pre-amplifier. Size: $20 \times 7 \times$ 8 in. Price: $£ 48$.

CWA 40. Mono amplifier. 40W peak continuous sine wave. Distortion $0.1 \%$ at 38 W . Noise level -98 dB. F.R. $25 \mathrm{c} / \mathrm{s}-30 \mathrm{Kc} / \mathrm{s} \pm 0.2$ dB. Output imps. 7.5 and 15 ohms. Input sensitivity 1V. Designed to operate with DSI preamplifier. Size: $20 \times 9 \times 8$ in. Price: $£ 45$.

JAMES B. LANSING SOUND INC. Distributors: Ad. Auriema Ltd., 125 Gunnersbury Avenue, London, W.3. Tel.: Acorn 8762.
-S6520E Graphic Controller. Transistorised stereo control unit. Inputs: pickup (1) 1 mV

47K, pickup (2) 1 mV 47 K , mic. 1 mV 47 K , tape play 0.3 V 35 K , aux. (front) 0.3 V 35 K , aux. (rear) 0.3 V 35 K , tuner (1) 0.3 V 35 K , tuner (2) 0.3 V 35 K . Output: 3 V RMS. Controls: variable turnover bass, variable turnover treble, balance, loudness switchable to volume, push-button selector, push-button mode, auxilliary controls under hinged panel. Size: $15 \frac{1}{2} \times 6 \frac{1}{2} \times 13 \mathrm{in}$. Mains: $110-125 \mathrm{~V}, 220-250 \mathrm{~V}$ AC $50 / 60 \mathrm{c} / \mathrm{s}$. Price: £265.
-SE400SE. Transistorised stereo power amplifier. Output: 40W RMS per channel. H.D. $0.15 \% 20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ at 80 W output. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 0.25 \mathrm{~dB}$ at 80 W output, $4 \mathrm{c} / \mathrm{s}-$ $320 \mathrm{Kc} / \mathrm{s} \pm 1.5 \mathrm{~dB}$ at 80 W . Noise level -90 dB . Input: $0 \cdot 8$ to 3.0 V depending upon plug-in speaker-matching equaliser board. Output impedance: 8 ohms rated, 4-16 nominal. Silicon transistors throughout. Mains: $110-120 \mathrm{~V}, 220-$ 240V AC. Size: $4 \frac{5}{8} \times 15 \frac{1}{4} \times 8 \frac{1}{2}$ in. Price: $£ 170$.

SA600E. Transistorised stereo integrated amplifier. Inputs: pickup 4 mV 47 K , tape head 2 mV 47 K , radio 250 mV 35 K , aux. 250 mV 35 K , tape 250 mV 35K. Noise level: pickup and tape head -72 dB , other inputs -85 dB . Controls: volume, balance, variable turnover bass, variable turnover treble, input selector, loudness, tape monitor, mode switch, test balance. Output: 40W RMS per channel. H.D. $0 \cdot 2 \%$ $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ at 80 W. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ $\pm 0.75 \mathrm{~dB}$ at 80 W . Output impedance: 8 ohms rated, 4-16 ohms nominal. Mains: 110-120, $220-240 \mathrm{~V}$ AC. Size: $5 \frac{1}{16} \times 16 \frac{3}{16} \times 13 \frac{3}{4}$ in. Price: £205.
H. J. LEAK \& CO. LTD., 57-59 Brunel Road, East Acton, London, W.3. Tel.: Shepherds Bush 1173. Cables: Sinusoidal, Ealux, London.

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Kerr, McCosh DSI stereo control unit


Kerr, McCosh CWA 2/12 stereo amplifier


Kerr, McCosh CWA 40 amplifier


Fisher $K-10$ reverberation amplifier


Eagle SA 80 stereo amplifier


Elizabethan DIT220 Princess


Fisher $X$-100- A integrated stereo amplifier


Fisher $X$-100-C $50 W$ stereo amplifier


Fisher TX-300 100W integrated stereo amplifier.
$20-20,000 \mathrm{c} / \mathrm{s}$. Feedback 26 dB . N.L. -84 dB . Output imp. 4, 8 and 16 ohms (other imps. to order). Output K T88s. Ultra-linear. Size: $11 \frac{1}{2} \times$ $9 \times 6 \frac{3}{4} \mathrm{in}$. To operate with any Leak control unit. Price: $£ 3510$ s.
-"Point One" stereo 20 amplifier. 11W each channel. Dist. $0.1 \%$ on each channel. Input for spec. output 125 mV . Response $20-20,000 \mathrm{c} / \mathrm{s}$. Feedback 24 dB. N.L. -80 dB . Output imp. 4, 8 and 16 ohms. Output EL84s. Ultra-linear. To operate with any Leak control unit. Price: £32 10s.
-"Point One" stereo 60 amplifier. Details as for stereo 20 but 30W each channel. Price: $£ 45$.

Varislope Mono control unit. Inputs: pu. (R.I.A.A. correction) $3.5 \mathrm{mV}, 70 \mathrm{~K}$; tape head (CCIR correction) 3 mV 120 K ; mic. 3 mV , 120 K ; tuner $50 \mathrm{mV}, 70 \mathrm{~K}$; tape amp. 125 mV , 70 K . Output 125 mV . Controls: input, bass, treble, filter, slope, vol. (AC-on/off), tape monitor. Low-pass filter-off, $9 \mathrm{Kc} / \mathrm{s}, 6 \mathrm{Kc} / \mathrm{s}$, $4 \mathrm{Kc} / \mathrm{s}$. Response: flat for tuner, mic., tape amp.; R.I.A.A. for pu; CCIR for tape head. H and $\mathrm{N}-60 \mathrm{~dB}$ (tuner, tape amp.); -52 dB (mic., pu, tape head). P.s.n. H.T. and L.T. supplied by TL/ 12 Plus; TL/ 25 Plus or TL/50 Plus. H.D. $0.01 \%$. Input level controls, tape record sockets with level control, tape monitor facility. To operate with TL/12 Plus, TL/ 25 Plus or TL/50 Plus. Size: $11 \frac{1}{2} \times 4 \frac{1}{4} \times 5$ in. Price: £ 15 l s.

Varislope 2 Stereo control unit. Inputs: pu. (R.I.A.A. correction) $3.5 \mathrm{mV}, 70 \mathrm{~K}$; tape head (CCIR correction) $3 \mathrm{mV}, 120 \mathrm{~K}$; mic. 3 mV , 120 K ; tuner $50 \mathrm{mV}, 70 \mathrm{~K}$; tape amp. 125 mV , 120 K . Output 125 mV . Controls: input, bass, treble, filter, slope, vol. (AC-on/off), tape monitor, function, balance. Low-pass filter-off, $9 \mathrm{Kc} / \mathrm{s}, 6 \mathrm{Kc} / \mathrm{s}, 4 \mathrm{Kc} / \mathrm{s}$. Response : flat for tuner, mic., tape amp.; R.I.A.A. for pu; CCIR for tape head. H and $\mathrm{N}-60 \mathrm{~dB}$ (tuner, tape amp.); -52 dB (mic., pu, tape head). P.s.n. H.T. and L.T. supplied by stereo 20 or stereo 60. Input level controls, tape sockets for recording with level control, tape monitoring facility. H.D. $0.01 \%$. To operate with stereo 20 or stereo 60 . Size: $11 \frac{1}{2} \times 4 \frac{1}{4} \times 6 \frac{1}{2}$ in. Price: $£ 25$.
©Stereo 30. Transistorised integrated amplifier. Inputs: pu (R.I.A.A. correction) $3.5 \mathrm{mV}, 47 \mathrm{~K}$; tape head (CCIR correction) $3 \mathrm{mV}, 47 \mathrm{~K}$; mic. $3 \mathrm{mV}, 33 \mathrm{~K}$; tuner $100 \mathrm{mV}, 100 \mathrm{~K}$; tape amp. $125 \mathrm{mV}, 50 \mathrm{~K}$. Output 10 W per channel at 15 ohms, 15 W at 4 ohms. Controls: input, bass, treble, filter, slope, vol. (AC-on/off), function, balance, tape monitor. Low-pass filter-off,
$9 \mathrm{Kc} / \mathrm{s}, 6 \mathrm{Kc} / \mathrm{s}, 4 \mathrm{Kc} / \mathrm{s}$. Response: flat on mic., tuner, tape amp.; R.I.A.A. on pu; CCIR on tape head. H. and N. -66 dB (tuner, tape amp.); -52 dB (mic., pu, tape head). H.D. $0.1 \%$ at $8 \mathrm{~W}, 15$ ohms. Feedback 60 dB . L.S. matching 4,15 ohms. N.L. (power amp., vol. at minimum) -82 dB . P.s.n. $110-250 \mathrm{~V}, 40-60 \mathrm{c} / \mathrm{s}$. Input level controls, tape outlets for recording with level control, tape monitor facility. Free-standing. Size: $13 \times 4 \frac{1}{4} \times 9$ in. Price: $£ 49$ 10s.

LINEAR PRODUCTS LTD., Electron Works, Armley, Leeds.

- Audio Fidelity Stereo-33. Integrated stereo transistor amplifier. Inputs:mag. pickup 3.5 mV , crystal/ceramic pickup 400 mV , mic. 5 mV , tape head 2 mV , aux. 100 mV . Sensitivities for 10 W RMS output per channel into 15 ohms, double these figures for 3-4 ohms load. F.R. $20 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s} \pm \frac{1}{2} \mathrm{~dB}$. Output: 10W RMS per channel into 15 ohms load, 15W RMS per channel into 3.75 ohms load. H.D. $0.1 \%$ at 5 W at $1 \mathrm{Kc} / \mathrm{s}, 0.3 \%$ at 10 W RMS at $1 \mathrm{Kc} / \mathrm{s}$. Damping factor $20 . \mathrm{H}$. and $\mathrm{N} .-80 \mathrm{~dB}$. Cross talk -42 dB to -53 dB . Bass control +11 dB to -16 dB at $40 \mathrm{c} / \mathrm{s}$. Treble control +15 dB to -15 dB at $10 \mathrm{Kc} / \mathrm{s}$. Equalisation: gram to R.I.A.A., tape head to CCIR. Steep cut filter at $7 \mathrm{Kc} / \mathrm{s}, 11 \mathrm{Kc} / \mathrm{s}, 15 \mathrm{Kc} / \mathrm{s}$. Size: $12 \frac{1}{2} \times 4 \times 8 \frac{3}{4} \mathrm{in}$. Weight: $12 \frac{1}{4} \mathrm{lb}$. Price: $£ 40 \mathrm{l} 9 \mathrm{~s}$.

LL ELECTRONICS LTD., 5 Shakespeare Road, London, N.3. Tel.: Finchley 3332.
-LL3S1. Transistorised stereo integrated amplifier. F.R. $15 \mathrm{c} / \mathrm{s}-50 \mathrm{Kc} / \mathrm{s}$ at 1 W output, $20 \mathrm{c} / \mathrm{s}-35 \mathrm{Kc} / \mathrm{s}$ at 3 W output. Output 3 W RMS perchannel. H. and N . -60 dB on tape and radio inputs, -52 dB on 12 mV pickup inputs. Crosstalk -64 dB . Bass and treble controls: $\pm 15 \mathrm{~dB}$. Output impedance 15 ohms. Shelf-mounting rosewood case. Size: $13 \frac{1}{2} \times 7 \frac{1}{4} \times 4 \mathrm{in}$. Price: £27 6s.

LOWTHER MANUFACTURING CO., Lowther House, St. Mark's Road, Bromley, Kent. Tel.: Ravensbourne 5225. Cables: Lowther, Bromley.

Lowther No. 2 control unit. Inputs: mic. 15 mV ; pu 15 mV ; radio 250 mV .4 -pos. sel., treble, bass, vol., on/off. Mic./tape input socket. H.D. $0 \cdot 1 \%$ on IV RMS. H. and N. -60 dB . Size: $10 \frac{1}{4} \times 2 \frac{1}{2} \times 3 \frac{1}{2} \mathrm{in}$. To operate with LL15. Price: £1010s.


LL Electronics LL.3S1 integratedstereo amplifier


James B. Lansing SE400 stereo amplifier


James B. Lansing SG520 Graphic controller pre-amplifier


James B. Lansing SA600E stereo amplifier


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Leak "Point One" TL/12 plus


Leak stereo 30 integrated amplifier


Leak "Point One" TL/50 plus


Lowther L18 amplifier. 18W. Distortion $<0.1 \%$. Input for specified output 0.75 V . Response $20 \mathrm{c} / \mathrm{s}-40 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Feedback 20 dB . Noise level -85 dB . Output impedance 16 ohms with adjustment. Output EL506 distributed load circuitry. P.a.t. Size: $12 \times 6 \times 6$ in. To operate with Mk. V or No. 2 control units. Price: $£ 25$ 10s.

Lowther LL26 Mk. I amplifier. 26W. Dist. $<0.1 \%$. Input for spec. output 0.75 V . Response $20-70,000 \mathrm{c} / \mathrm{s} \pm 1 \mathrm{~dB}$. Feedback 22 dB . N.L. -90 dB . Output imp. 16 ohms with adjustment. Output EL34s. Lowther Linear. Size: $11 \times 12 \times 7 \frac{1}{2}$ in. Weight: 33 lb . To operate with Mk. IV control unit. Price: $£ 47$.

Lowther Mk. V control unit. Inputs: mic. 3 mV ; pickup $3 \mathrm{mV}-300 \mathrm{mV}$; radio and aux. 100 mV . 5-pos. sel., vol., bass, treble, filter, equalisation. Filters: 9,7 and $4.5 \mathrm{Kc} / \mathrm{s}$. H.D. $<0.5 \%$. H. and N. -65 dB . Output cathode follower 1V RMS. To operate with Lowther L18 amplifier. With A-B test facility. Size: $10 \frac{1}{4} \times 45 \times 7$ in. Price: $£ 20$.

Lowther Mk. II stereo control unit. Input as for master control unit Mk. V. Tape input sockets. H.D. $0 \cdot 1 \%$. Dual low-pass filters. Dual output balanced and balance controls between channels. Size as Mk. V. To operate with L18S power amp. Price: $£ 40$.

Lowther L18S stereo amplifier. 18W output on each channel. Distortion $0.1 \%$. Input for specified output 0.75 V . Response $20 \mathrm{c} / \mathrm{s}-40 \mathrm{Kc} / \mathrm{s}$ $\pm 1 \mathrm{~dB}$. Noise level -85 dB . Output imp. 8.4 or 16 ohms. Output EL506 ultra linear. Size: $11 \times 12 \times 7 \frac{1}{2}$ in. To operate with Mk. II control unit. Price: $£ 47$.

MARTIN ELECTRONICS LTD. See Constructional Kits section.

METRO-SOUND MANUFACTURING CO. LTD., Bridge Works, Wallace Road, Canonbury, London, N.1. Tel.: Canonbury 8641. Cables: Metrosound, London, N.1.

MST-15. Integrated solid state stereo amplifier. 22 transistors plus two diodes. Inputs: mag. PU 2 mV 1 K , crystal PU 500 mV (source capacitance 500 pF ), radio 100 mV , tape 100 mV . Pickup correction R.I.A.A. Standard. Output: 15W per channel into 15 ohms inductive load, 20W per channel into 3 ohms inductive
load. Output imp. $<0 \cdot 2$ ohms $30 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Output 'stages two AD140's in AB pi-mode push-pull. Tone controls: Bass +12 dB to -13 dB at $100 \mathrm{c} / \mathrm{s}$, treble +8 dB to -12 dB at $10 \mathrm{Kc} / \mathrm{s}$. Filters: H.F. $8 \mathrm{Kc} / \mathrm{s}, 12 \mathrm{Kc} / \mathrm{s}, 20 \mathrm{Kc} / \mathrm{s}$. L.F. $20 \mathrm{c} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}, 80 \mathrm{c} / \mathrm{s}$. Mode selector: stereo, mono, reversed stereo. H. and N. 68 dB below full output on radio and tape, 56 dB below full output on both PU inputs. Cross talk better than -55 dB at $1 \mathrm{Kc} / \mathrm{s}$. Transient response : amplifier rise time $8 \mu$ secs. Suitable for shelf or cabinet mounting. Price: $£ 7512 \mathrm{~s}$.

Pickup/microphone matching unit stereo preamplifier. Transistorised. Input $0.05 \mathrm{mV}, 2 / 50$ ohms. Voltage gain 140. Response $20 \mathrm{c} / \mathrm{s}-30$ $\mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. P.s.n. 9 V battery, Type VT4, or equivalent. To operate with Ortofon SPUG, SPUG/E, SPU and SPU/E, and low impedance mics. Price: $£ 710$ s.

De-luxe version, with twin concentric precision w/w potentiometer. Price: £9 10s.

ORTOFON. Fonofilm Industri A/S Copenhagen. Distributed in the U.K. by MetroSound (Sales) Ltd., Bridge Works, Wallace Road, London, N.1. Tel.: Canonbury 8641. Cables: Metrosound, London.

OKS601 integrated stereo amplifier. Pre-amp. details: Inputs F.M., tape, aux. 100 mV ; mic. 2 mV ; pickup 2 mV at $1 \mathrm{Kc} / \mathrm{s}$. Controls: sel. switch, mono/stereo, vol., balance, bass, treble. Filter high-pass $20-10 \mathrm{c} / \mathrm{s}$ (adjustable).

Power amp. details: Output 15 W per channel. Dist. less than $1 \%$. Response $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ $\pm 1 \mathrm{~dB}$. Feedback 20 dB . Noise 7 mV at 3 ohm output. L.S. matching 3, 7 and 16 ohms. Output stages, two 6973 s per channel. P.s.n. 220V AC on request, 110 V AC. Price: $£ 95$.

PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Avenue, London, W.C.2. Tel.: Gerrard 7777. Cables: Phillamps, London.

AG9019. All-transistor integrated stereo amplifier. 20W RMS output per channel into 8 ohms. Inputs: pickup $3 \cdot 2 \mathrm{mV}$, crystal pickup 100 mV , radio 86 mV , tape 86 mV , aux. 86 mV . Push-button input selector. Rumble and scratch filters. Mode switch. Balance control with electrical balance indicator. Volume, treble and bass controls. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Crosstalk: -40 dB at $10 \mathrm{Kc} / \mathrm{s}$. Teak veneered shelf mounting cabinet. Size: $15 \times 11 \times 5 \frac{1}{2} \mathrm{in}$. Mains: $110,127,220$ or 240 V AC. Price to be announced.

AG9023. All-transistor integrated stereo amplifier. 12W RMS output per channel into 8 ohms. Inputs: pickup (mag) 2 mV , pickup (crystal) 100 mV , radio 80 mV , tape 200 mV . F.R. $35 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Crosstalk: -40 dB at $5 \mathrm{Kc} / \mathrm{s}$. Size: $13 \frac{1}{2} \times 8 \frac{1}{2} \times 5 \frac{1}{2} \mathrm{in}$. Other details as model AG9019. Price to be announced.

PIONEER. Distributors: Swisstone Ltd., 26 Leigh Place, Cobham, Surrey. Tel.: Cobham 2853.

SM-83. Integrated stereo amplifier. Valves. Inputs: tape head 2 mV , magnetic pickup 3 mV , mic. 2 mV , crystal/ceramic pickup 25 mV , aux. 150 mV , tape play 200 mV . Controls: bass $\pm 13 \mathrm{~dB}$ at $50 \mathrm{c} / \mathrm{s}$, treble $\pm 13 \mathrm{~dB}$ at $10 \mathrm{Kc} / \mathrm{s}$, high-cut filter -10 dB at $10 \mathrm{Kc} / \mathrm{s}$, low-cut filter -8 dB at $50 \mathrm{c} / \mathrm{s}$. Power output 40 W music. H.D. $<1 \%$ at rated output. F.R. $15 \mathrm{c} / \mathrm{s}-100 \mathrm{Kc} / \mathrm{s}$ $\pm 1 \mathrm{~dB} . \mathrm{H}$. and N. $<60 \mathrm{~dB}$ (magnetic), $<80 \mathrm{~dB}$ aux. Output valves two 7189A in push-pull for each channel. DC heater supply for preamplifier. High impedance outlet for tape recorder. Mains: $115-230 \mathrm{~V}$ AC. Size: $15 \frac{1}{2} \times$ $13 \frac{1}{2} \times 5 \frac{3}{4} \mathrm{in}$. Weight: $28 \frac{3}{4} \mathrm{lb}$. Price: $£ 84$.

SR-101. Double-scatter reverberation amplifier. Five valves. Delay time $1 / 28-1 / 35$ second. Reverb. time 2-3 seconds $1 \mathrm{Kc} / \mathrm{s} 8 \mathrm{c} / \mathrm{s}$ modulation. Distortion $<5 \%$. F.R. (reverb. sound only) $100 \mathrm{c} / \mathrm{s}-3 \mathrm{Kc} / \mathrm{s} \pm 10 \mathrm{~dB}$. Uses electrical circuit to create reverberation to increase "presence" and "brilliance". Visual indicator on front panel. Suitable for use with amplifiers with tape monitor sockets. Mains: 115-230V AC. Size: $12 \frac{3}{4} \times 8 \frac{7}{8} \times 4 \frac{1}{8} \mathrm{in}$. Weight: 18 lb . Price: $£ 442$ s.

PYE LTD., High Fidelity Division, St. Peter's Road, Furze Platt, Maidenhead, Berks. Tel.: Maidenhead 23331.

OBrahms HFS30T. Integrated stereo transistorised amplifier. Inputs: mag. PU 2.5 mV , crystal PU 70 mV , radio 35 mV . Controls: volume, bass, treble, balance, loudness, treble filter (rolloff from $5 \mathrm{Kc} / \mathrm{s}$ ), rumble filter (roll-off from $50 \mathrm{c} / \mathrm{s}$ reaching 12 dB per octave below $20 \mathrm{c} / \mathrm{s}$ ). Noise: PU -60 dB , radio -65 dB , amplifier only -90 dB . Output 15 W per channel (I.H.F.M.). Distortion less than $0.35 \%$ at $1 \mathrm{Kc} / \mathrm{s}$. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Imp. 15 ohms. Damping factor better than $50.110-250 \mathrm{~V}$ AC. Size: chassis $11 \frac{1}{4} \times 8 \frac{1}{2} \times 3 \frac{1}{4} \mathrm{in}$., panel $12 \times 4 \mathrm{in}$., cabinet $12 \frac{3}{4} \times 5 \frac{1}{2} \times 9$ in. Price: $£ 5513 \mathrm{~s}$.

QUAD. See Acoustical Manufacturing Co. Ltd.

RADFORD ELECTRONICS LTD., Ashton
Vale Estate, Bristol 3. Tel.: Bristol 662301/2.
OSC.22. Stereo control unit with wide range of facilities. Inputs: PU 2 mV , mic. 1.5 mV , aux. 1 100 mV , aux. 2200 mV , aux. 3300 mV . Outputs: Recording 100 mV nominal, 2 V adjustable for power amplifier. Treble filter 5, 7 aind $10 \mathrm{Kc} / \mathrm{s}$ with $12 \mathrm{~dB} /$ octave roll-off. Rumble filter $35 \mathrm{c} / \mathrm{s} 15 \mathrm{~dB} /$ octave. Bass and treble variable $\pm 12 \mathrm{~dB}$ at $50 \mathrm{c} / \mathrm{s}$ and $10 \mathrm{Kc} / \mathrm{s}$. P.s.n. $300 \mathrm{~V} 9 \mathrm{~mA}, 6 \cdot 3 \mathrm{~V} 1 \cdot 5 \mathrm{~A}$. Size: $10 \frac{1}{2} \times 3 \frac{3}{4} \times 12 \frac{5}{8} \mathrm{in}$. Weight: $9 \frac{1}{2} \mathrm{lb}$. Price: $£ 35$.

OSC.22P. Similar specification to SC. 22 but with self-contained mains power supply unit. Weight: 11 lb . Mains: $110-250 \mathrm{~V} 50 / 60 \mathrm{c} / \mathrm{s}$. Price: $£ 40$.
-SC.4-10. Transistorised stereo integrated amplifier and control unit. Inputs: mag. PU 4 mV , crystal PU 80 mV , radio 250 mV , aux. 1 250 mV , aux. 2500 mV . Distortion $0.1 \%$. Output 15 W into 16 ohm load, 20 W into 8 ohm load. Output imp. 8-16 ohms. Mains input 110$250 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$. Size: $10 \frac{1}{2} \times 3 \frac{3}{4} \times 12 \frac{5}{8} \mathrm{in}$. Weight: $16 \frac{1}{2} \mathrm{lb}$. Price: $£ 72$ 10s.

MA15. Power amplifier. Response $20 \mathrm{c} / \mathrm{s}$ $20 \mathrm{Kc} / \mathrm{s}$. Distortion less than $0 \cdot 1 \%$ over the major portion of the response at rated power output. Rise time less than $5 \mu$ secs. Sensitivity 500 mV . Output imp. 4, 8 and 16 ohms. Mains: $110-250 \mathrm{~V}$ AC. Weight: $19 \frac{1}{2} \mathrm{lb}$. Output 15 W . Size: $8 \frac{3}{4} \times 10 \frac{3}{4} \times 8 \frac{1}{2} \mathrm{in}$. Price: $£ 26$ 10s.

MA25. Power amplifier with similar specification to MA15 but with rated output 25 W . Weight: 20 lb . Price: $£ 32$.

STA.15. Stereo power amplifier with similar specification to MA15 but dual channel. Size: $14 \times 10 \frac{3}{4} \times 8 \frac{1}{2} \mathrm{in}$. Weight: 34 lb . Price: $£ 4210 \mathrm{~s}$.

STA.25. Stereo power amplifier with similar specification to MA25 but dual channel. Size: $14 \times 10 \frac{3}{4} \times 8 \frac{1}{2}$ in. Weight: 36 lb . Price: $£ 5210 \mathrm{~s}$.

IMA.30. Reference standard power amplifier. Provides larger power over frequency range $10 \mathrm{c} / \mathrm{s}$ to $50 \mathrm{Kc} / \mathrm{s}$ than is normally available from domestic hi-fi amplifiers. Patented feedback circuit. Sensitivity 500 mV to 2 V adjustable for rated power output. Output stage two KT88. Mains $110-250 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$. Output imp. 4, 8 and 16 ohms. Output: 30 W at $0 \cdot 1 \%$ distortion, 45 W
at $1.0 \%$ distortion. Size: $17 \times 17 \times 9$ in. Weight: 24 lb . Price: £42 10s.
-ISTA.30. Stereo reference standard power amplifier. Similar specification to IMA. 30 but dual channel. Size: $17 \times 9 \times 9 \mathrm{in}$. Weight: 42 lb . Price: $£ 67$ 10s.

ISTA.60. Stereo reference standard power amplifier. Similar specification to ISTA. 30 but rated power 60 W each channel at $0.1 \%$ distortion, 80 W each channel at $1.0 \%$ distortion. Weight: 50 lb . Price: $£ 85$.

RADON INDUSTRIAL ELECTRONICS CO. LTD., Brooklands Trading Estate, Orme Road, Worthing, Sussex. Tel.: Worthing 1063. Cables: Radon, Worthing.

R600.S Mk. II. Integrated transistorised stereo amplifier in shelf mounting cabinet. Inputs: mag. PU 5 mV , crystal PU 500 mV , radio 500 mV , aux. 150 mV . F.R. $20 \mathrm{c} / \mathrm{s}-25 \mathrm{Kc} / \mathrm{s}$ $\pm 3 \mathrm{~dB}$. H. and N. -100 dB at 10 W . Noise 20 dB below level of hum. Distortion $0.06 \%$ for 10 W output, $0 \cdot 1 \%$ for 12 W . Bass control +12 dB to -12 dB at $100 \mathrm{c} / \mathrm{s}$. Treble control +8 dB to -10 dB at $10 \mathrm{Kc} / \mathrm{s}$. H.F. filter $7 \mathrm{Kc} / \mathrm{s}, 9 \mathrm{Kc} / \mathrm{s}$ and flat. L.F. filter $20 \mathrm{c} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}, 80 \mathrm{c} / \mathrm{s}$. Output four AD140 transistors. Power output 10W RMS each channel ( 12 W peak). Output imp. 15 ohms. Separate output for recorder. Mains 220-250 AC. Chassis size: $14 \frac{1}{4}$ in. wide, $10 \frac{1}{4} \mathrm{in}$. deep, $5 \frac{1}{4} \mathrm{in}$. high. Perspex engraved panel in black with gold lettering. Cabinet in polished mahogany. Price: $£ 60$.

ROGERS DEVELOPMENTS (ELECTRONICS) LTD., 4-14 Barmeston Road, Catford, London, S.E.6. Tel.: Hither Green 7424/ 4340. Cables: Rodevco, London, S.E.6.

OMaster II stereo control unit. Inputs: mic. 1-10 mV, 100 K ; disc. $1,2-20 \mathrm{mV}, 68 \mathrm{~K}$; disc. 2 , $60-600 \mathrm{mV}, 2 \cdot 2$ megohms; tape $1-10 \mathrm{mV}, 68 \mathrm{~K}$; radio $15-100 \mathrm{mV}, 300 \mathrm{~K}$. (Impedance for mic. and disc. 1 inputs may be altered.) Output 750 mV . Controls: input sel., vol., balance, on/off, equalisation, bass, treble, mono/stereo switches, high-pass filter, low-pass filter with variable slope and frequency, speaker/phones switch. Low-pass filters $7 \mathrm{Kc} / \mathrm{s}$ and $10 \mathrm{Kc} / \mathrm{s}+$ slope; high-pass $20 \mathrm{c} / \mathrm{s}$ and $60 \mathrm{c} / \mathrm{s}$. To operate with Master stereo amplifier. Size: $14 \times 6 \frac{1}{2} \times 5 \frac{1}{8} \mathrm{in}$. Price: $£ 40$.

Cadet III. Stereo main amplifier and control unit. Inputs: radio 100 mV 470 K , mag. PU 3.8 mV 68 K , crystal PU 65 mV 2 megohms, tape 600 mV .F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Bass control $\pm 13.5 \mathrm{~dB}$ at $40 \mathrm{c} / \mathrm{s}$. Treble control +13.5 dB -16 dB at $10 \mathrm{Kc} / \mathrm{s}$. High-pass filter $60 \mathrm{c} / \mathrm{s}$ 10 dB /octave. Low-pass filter $6.5 \mathrm{Kc} / \mathrm{s} 10 \mathrm{~dB} /$ octave. Cross-talk 42 dB at $1 \mathrm{Kc} / \mathrm{s}, 26 \mathrm{~dB}$ at $10 \mathrm{Kc} / \mathrm{s}$. Signal to noise: radio 60 dB , mag. PU 54 dB , ceramic PU 52 dB . Balance control 9 dB range. Valves. Size: (control unit) $10 \frac{3}{4} \times 4 \frac{3}{4} \times$ $4 \frac{1}{8}$ in., front panel $11 \frac{1}{4} \times 4 \frac{1}{2} \mathrm{in}$. Output 10 W each channel. Distortion $5 \mathrm{~W} 0.25 \%$ at $1 \mathrm{Kc} / \mathrm{s}$, 10 W $0.8 \%$ at $1 \mathrm{Kc} / \mathrm{s}, \mathrm{H}$. and $\mathrm{N} .-80 \mathrm{~dB}$. Output imp. 3-5 ohms and 12-16 ohms. Mains 110-122-220$244 \mathrm{~V} 50 / 60 \mathrm{c} / \mathrm{s}$. Size (main amplifier): $10 \times 6 \frac{1}{2} \times$ 4 in. Prices: (chassis model) $£ 31$; (case model) £34 10s.

- Master Stereo Amplifier. Valved power amplifier. Input IV. Output 35W. Self-powered. Suitable for Master II Stereo control unit. Price: $£ 50$.

OHG88 Mk. III Integrated Stereo Amplifier. Latest version of the "Eighty-eight" features increased power, more comprehensive input and control facilities. Re-styled to match new Cadet III range. Features include high performance filters, plug-in pickup matching adaptors, tape monitoring facility, tape panel socket. Silicon mains rectifier. Available in chassis or cabinet form. Output 15W. Price: (chassis) $£ 42$; (in cabinet) $£ 46$ 10s.
H. H. SCOTT, 111 Powdermill Road, Maynard, Mass., U.S.A. U.K. Distributors: Elstone Electronics Ltd., Edward Street, Templar Street, Leeds 2. Tel.: Leeds 35111.

200 Integrated stereo amplifier. Inputs: radio 500 mV (including multiplex input), pickup 5 mV , tape 650 mV . Controls: mode switch and balance, treble, bass (separate treble and bass for each channel), loudness, input selector switches, scratch filter, on-off. Output 15 W (music) each channel. Output up to 2.5 V of derived centre channel for feeding additional amplifier and speaker. Socket for stereo phones. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}( \pm 3 \mathrm{~dB}$ at $20 \mathrm{c} / \mathrm{s})$. Distortion $0.8 \%$ at rated output. H. and N. 70 dB down. Automatic rumble filter cuts below $20 \mathrm{c} / \mathrm{s}$. Treble control +8 dB to -12 dB at $10 \mathrm{Kc} / \mathrm{s}$. Bass control +11 dB to -14 dB at $50 \mathrm{c} / \mathrm{s}$. Output imp. 4, 8, 16 ohms. Mains $220-$ $240 \mathrm{~V} 50 / 60 \mathrm{c} / \mathrm{s}$. Size: $15 \times 4 \frac{3}{8} \times 13 \mathrm{in}$. Price: £86 2s.


Lowther integrated stereo


Metro-Sound pickup/mic stereo pre-amplifier


Metro-Sound MST/15 stereo pre-amplifier


Radford MA15 or MA25 (similar appearance)


Lowther No. 2 pre-amplifier


Pioneer SMT-84


Pye Brahms HFS 30 T integrated transistorised stereo amplifier


Radford SC22 stereo control unit

260 Integrated stereo amplifier. Fully transistorised. Incorporates usual Scott features. Two 30W (music) outputs. Price: £156 9s.

299D integrated stereo amplifier. Pre-amp. details: inputs-tape (NARTB corrected) 3 mV ; mag. pickup 3 mV or 9 mV ; radio and aux. $0 \cdot 5 \mathrm{~V}$. Controls: treble, bass, vol. High-pass filters $20 \mathrm{c} / \mathrm{s}$, low-pass $5 \mathrm{Kc} / \mathrm{s}$. Response $20 \mathrm{c} / \mathrm{s}$ to $20 \mathrm{Kc} / \mathrm{s}$. Noise -80 dB high level input, equivalent to $10 \mu \mathrm{~V}$ on low level. Derived centre channel provided. Free-standing. Power amp. details: output $20+20 \mathrm{~W}$. Dist. $0 \cdot 8 \%$. Response $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Noise -80 dB . Input 3.0 mV . L.S. matching, 4,8 or 16 ohms. Output stages, 7591s ( 2 for each channel). P.s.n. 210250V AC. Size: $15 \times 4 \frac{3}{8} \times 13$ in. Walnut cabinet (overall) $16 \frac{1}{4} \times 13 \frac{1}{4} \times 6 \mathrm{in}$. Price: $£ 137$ 11s. Walnut cabinet $£ 77$ s. extra.

SENNHEISER ELECTRONIC. Distributors: Audio Engineering Ltd., 33 Endell Street, London, W.C.2. Tel.: Temple Bar 0033.
VRS. 303 Philharmonic. Armchair control unit. Transistorised stereo pre-amplifier designed to operate with VKL. 303 main amplifier and VMS. 303 mixer. Controls: bass, treble, balance, volume, stereo width. Power supplied from power amplifier. Size: $4 \times 9 \times 3$ in. Price: see VKL. 303.

VMS. 303 Philharmonic. Stereo transistorised mixer unit for use with VRS. 303 armchair control unit and VKL. 303 amplifier/speaker units. Inputs: mic. (1) 2 mV 50 K , mic. (2) 2 mV 50 K , pickup (crystal), pickup (magnetic) 2.5 mV 50 K , radio (1) 2 mV 50 K , radio (2) 500 mV 120 K , equalised tape 220 mV 100 K . Outlets: tape $2 \times 15 \mathrm{mV}$ low Z , tape $2 \times 300 \mathrm{mV}$ high Z , headphones $2 \times 1 \mathrm{~V} 100$ ohms. Controls: H.F. filter 15 dB /octave 3 dB at $6 \mathrm{Kc} / \mathrm{s}$, L.F. filter 15 dB / octave 3 dB at $60 \mathrm{c} / \mathrm{s}$, sensitivity control for each of three channels. Power drawn from main amplifier VKL.303. Size: $9 \times 9 \times 3$ in. Price: see VKL. 303.

VKL. 303 Philharmonic. Transistorised power amplifiers built-into speaker enclosures. Designed to operate with VMS. 303 mixer and VRS. 303 armchair control unit. Power output: 30W RMS per channel. H.D. $0 \cdot 1 \%$ at 20 W $30 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. F.R. (including speakers) $50 \mathrm{c} / \mathrm{s}-$ $15 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Feedback $>65 \mathrm{~dB}$ for all inputs. Noise level $>85 \mathrm{~dB}$ (power amplifier only). Mains $200-240 \mathrm{~V}$ AC. Infinite baffle enclosures with L.F. and H.F. units. Variable equalisers to compensate for speaker position, room acoustics and stereo symmetry. Price (VRS.303, VMS.303, two VKL.303): £415 16s. complete.

SHERWOOD ELECTRONIC LABORATORIES INC. Distributors: Audioson Ltd., York House, Empire Way, Wembley, Middlesex. Tel.: Diligence 1886.

S-9500. Transistor stereo integrated amplifier. Output: 20W RMS per channel. F.R. $12 \mathrm{c} / \mathrm{s}-35 \mathrm{Kc} / \mathrm{s}$. H.D. $0 \cdot 3 \%$ at rated output. H. and N . (pickup) -70 dB , (radio) -80 dB . Inputs: three pairs high-level, two pairs low-level. Sensitivity: tape head 1 mV , pickup 1.8 mV , radio 0.25 V . Outputs: stereo speakers 8 ohms ( 4 or 16 ohms -1 dB ), stereo record, phones. 22 silicon transistors, 2 silicon rectifiers. Size: $14 \times 10 \frac{1}{2} \times 4 \mathrm{in}$. Weight (shipping): 20 lb . Price on application.

S-5500 IV. Transistor stereo integrated amplifier. Output: 36 W RMS per channel. F.R. $35 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. H.D. $0.5 \%$ at rated output. H. and N . (pickup) -60 dB , (radio) -80 dB . Inputs: three high-level pairs, two low-level pairs. Sensitivity: tape head 1.8 mV , pickup 1.5 mV , radio $0 \cdot 25 \mathrm{~V}$. Output: stereo speakers, 4,8 or 16 ohms. 9 valves, 4 silicon rectifiers. Size: $14 \times 12 \frac{1}{2} \times 4 \mathrm{in}$. Price on application.

S-9900. Transistor stereo integrated amplifier. Output: 40W RMS per channel. F.R. $12 \mathrm{c} / \mathrm{s}-$ $35 \mathrm{Kc} / \mathrm{s}$. H.D. $0 \cdot 3 \%$ at rated output. H. and N. (pickup) -70 dB , (radio) -80 dB . Inputs: three high-level pairs, two low-level pairs. Sensitivity: tape head 1 mV , pickup 1.8 mV , radio 0.25 V . Output: stereo speakers, 4,8 or 16 ohms. 23 silicon transistors, 2 silicon rectifiers. Size: $14 \times$ $10 \frac{1}{2} \times 4 \mathrm{in}$. Weight: 22 lb . Price on application.

S-9000. Transistor stereo integrated amplifier. Output: 65W RMS per channel. F.R. $12 \mathrm{c} / \mathrm{s}-$ $25 \mathrm{Kc} / \mathrm{s} . \mathrm{H}$. and N. (pickup) -70 dB , (radio) -80 dB . H.D. $0.25 \%$ at rated output. Inputs: three high-level pairs, two low-level pairs. Sensitivity: tape head 1 mV , pickup 1.8 mV , radio 0.25 V . Output: stereo speakers, 4,8 or 16 ohms. 23 silicon transistors, 4 silicon rectifiers. Size: $14 \times 12 \frac{1}{2} \times 4 \mathrm{in}$. Weight: 24 lb . Price on application.

SHIRA. Distributors: Winter Trading Co. Ltd., 95-99 Ladbroke Grove, London, W.11. Tel.: Park 1341. Cables: Winlec, London, W.ll.

TRM 40. Integrated transistorised stereo amplifier. 14 transistors, 4 diodes. 22W IHFM per channel at 8 ohms. Inputs: mag PU 4 mV , ceramic or crystal PU 300 mV , tape head 2 mV , radio tuner 500 mV , aux. 300 mV . F.R. $15 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Output impedance 4-16 ohms.


Radford SC4-10 integrated amplifier


Radford IST A 30 and IST A 60


Radford STA15 or STA25 (similar appearance)


Radon $R 600 S$ Mk. II integrated amplifier


Rogers HG88 Mk. III integrated amplifier


Rogers Master II storeo control unit


Rogers Master stereo anıри!и"


Sherwood S-9500 silicon integrated stereo amplifier


Sherwood S-9000a all-silicon integrated stereo amplifier

Controls: on/off, volume, bass, treble (separate tone controls for each channel), balance, function, loudness, rumble filter, scratch filter, mode. Size: $11 \frac{1}{2} \times 9 \frac{1}{2} \times 3 \frac{3}{8} \mathrm{in}$. Mains $105-240 \mathrm{~V} 50 / 60$ $\mathrm{c} / \mathrm{s}$. Price: $£ 475 \mathrm{~s}$.

SHIRLEY LABORATORIES LTD., 3 Prospect Place, Worthing, Sussex. Tel.: Worthing 30536.
"Jupiter" SB/1-15E. Integrated mono amplifier. 12 W (17W peak). Dist. $0 \cdot 2 \%$ at $10 \mathrm{~W} 1 \mathrm{Kc} / \mathrm{s}$. F.R. $45 \mathrm{c} / \mathrm{s}-25 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. N.L. -80 dB . Inputs: radio/tape 100 mV ; gram. to suit pickup in use. L.S. matching, 15 ohms. Controls: bass, treble, vol., sel. P.a.t. $300 \mathrm{~V}, 30 \mathrm{~mA} ; 6 \cdot 3 \mathrm{~V}, 1.5$ amps. Output stages EL84s. Self-powered. Front panel $12 \times 3$ in. Price: $£ 232 \mathrm{~s}$.
-SBS/15 integrated stereo amplifier. 12 W per channel (17W peak). Dist. $0 \cdot 1 \%$. F.R. $45 \mathrm{c} / \mathrm{s}-$ $25 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. N.L. -85 dB . Inputs: radio 100 mV ; gram. (R.I.A.A.) 5 mV ; mic. 2 mV ; tape from head 3 mV ; tape recorder 100 mV . Output stages EL84s. Controls: variable vol., bass, treble, balance, switched sel., tape speed equalisation, mono/stereo. Self-powered. P.a.t. $300 \mathrm{~V}, 45 \mathrm{~mA} ; 6 \cdot 3 \mathrm{~V}$, c.t., 2 amps . Equalisation for two or three tape speeds. Facility for playing on both channels from monaural source. Price: $£ 63$.
See also Tape Amplifiers Section.

SINCLAIR RADIONICS LTD. See Kit Section.

STERN-CLYNE LTD., Head Office and mail order, 3-5 Eden Grove, Holloway, London, N.7. Tel.: North 8161. Branches throughout London, Liverpool, Manchester, Sheffield, Bristol and Nottingham.

Mullard 2 -valve pre-amplifier tone control unit. Inputs: pickup 5 mV (LP magnetic), pickup 70 mV (LP crystal), radio 300 mV , tape (1) 300 mV , tape (2) 3 mV , microphone 3 mV . 6-pos. sel., bass, treble, vol. P.s.n. 300 V at $3 \mathrm{~mA}, 6.3 \mathrm{~V}$ at 0.6 amps . Employs two EF86s. To operate with the 5-10 and similar power amplifiers. Size: $9 \frac{1}{2} \times 4 \frac{1}{2} \times 2 \frac{3}{8}$ in. Price: $£ 910$ s.; (also available in kit form); $£ 66 \mathrm{~s}$.

Mullard 3-valve pre-amplifier. Mono. Inputs: mag. pu $7 \mathrm{mV}, 12 \mathrm{mV}$; crystal $150 \mathrm{mV}, 270 \mathrm{mV}$; tape head 2.5 mV ; mic. 7.5 mV ; radio 250 mV ;
aux. 250 mV . Output 250 mV . Controls: sel., treble, bass, vol. High-pass filters, $160 \mathrm{c} / \mathrm{s}$, $80 \mathrm{c} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}, 20 \mathrm{c} / \mathrm{s}$; low-pass $5 \mathrm{Kc} / \mathrm{s}, 7 \mathrm{Kc} / \mathrm{s}$, $9 \mathrm{Kc} / \mathrm{s}$, flat. H . and N. : mag. and crystal -58 dB ; tapehead -47 dB ; mic. -44 dB ; radio and aux. -60 dB . P.s.n. 6 mA at 250 V .1 amp at $6 \cdot 3 \mathrm{~V}$. Jacks on front panel. Auxiliary input. Record output. Ferroxcube inductor in filter circuit. To operate with Stern/Mullard range power amplifiers (mono). Size: $11 \times 4 \times 4$ in.; (front panel): $12 \frac{1}{4} \times 4 \frac{1}{2}$ in. Price: $£ 1313 \mathrm{~s}$.; (kit): $£ 10$.

Mullard 5-10 mono amplifier. Output 10W. H.D. $0 \cdot 1 \%$. Response $30 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Feedback 26 dB . N.L. -65 dB . Input 40 mV . L.S. matching, 3.75 or 15 ohms. Output stages $2 \times$ EL84. Self-powered (AC mains 200-250V). Size: $10 \times 7 \times 7$ in. To operate with Stern/ Mullard 2- or 3 -valve pre-amplifiers. Price: $£ 13$ 10s.; (also available in kit form): $£ 10$.

SYMPHONY AMPLIFIERS LTD., 16 Kings College Road, London, N.W.3. Tel.: Primrose 3314/5.

Symphony integrated mono amplifier. 10W push-pull output ( 15 ohms). Dist. less than $0 \cdot 2 \%$ at 6 W . Input for spec. output 60 mV . Response $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. N.L. -85 dB . Fully enclosed in steel case, $12 \frac{1}{2} \times 9 \frac{1}{2} \times 4 \frac{1}{2} \mathrm{in}$. high. Suitable for shelf-mounting or dropthrough. Price: £21.

- No. 2 stereophonic amplifier. Output 10 W per channel. H.D. $0 \cdot 15 \%$. Response $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ $\pm 1 \mathrm{~dB}$. Feedback 27 dB . N.L. 75 dB below. Input 3 mV . L.S. matching, 15 ohms. Output stages EL84s in push-pull. P.s.n. 200-250V AC. Self-powered. Size: $13 \times 4 \frac{1}{2} \times 9 \frac{1}{2} \mathrm{in}$. Price: $£ 25$ 4s. (integrated). Magnetic cartridge model £29 8s.

TATES ELECTRONIC SERVICES LTD., 3 Waterloo Road, Stockport, Cheshire. Tel.: Stockport 7301.

OTates Electronics $\mathbf{1 0}+\mathbf{1 0}$. Integrated stereo transistorised amplifier. Inputs: ceramic PU 135 mV , crystal PU 660 mV , radio 56 mV , magnetic PU 2.45 mV , tape 3.2 mV . Signal-to-noise $>60 \mathrm{~dB}$ for all inputs. Controls: Selector, balance, bass, treble, volume, on/off, L.F. filter, H.F. filter. Output: 10W RMS per channel. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Output impedance 15 ohms . Output transistors: two Mullard AD140 in each channel. Mains $200-250 \mathrm{~V} \mathrm{AC} \mathrm{in} \mathrm{10V} \mathrm{steps}$. Size: $13 \times 9 \frac{1}{2} \times 4 \frac{3}{4} \mathrm{in}$. Weight: 15 lb . Price (ready assembled): £70 17s. 6d.; (kit): £49 17s. 6d.


Shirley Jupiter SB/1-15E


Stern 5-10 amplifier


Symphony integrated stereo amplifier


Symphony No. 2 integrated stereo amplifier


Tripletone Hi-Fi Major Series 3


Tates Electronics $10+10$ stereo amplifier


Tripletone Series 3 control unit


Tripletone stereo $8+8$ Series 3


Tripletone DP 12 amplifier Series 3

TRIO. Distributors: Winter Trading Co. Ltd., 95-99 Ladbroke Grove, London, W.11. Tel.: Park 1341. Cables: Winlec, London, W. 11.
-W41U. Integrated mains-operated stereo amplifier. Valves. Inputs: mag. PU 1.7 mV , tape head 1.7 mV , aux., radio, and tape play 110 mV . Controls: Power on/off, LS on/off, selector, mode, volume, balance, tape monitor, monostereo input, bass (LH), treble (LH), bass (RH), treble (RH). Loudness control. DC filament supply. Stereo headphone jack. Output 10W (RMS) per channel. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Output imp. 0-16 ohms. Mains 110-117V, 220230 V AC. Size: $12 \frac{1}{2} \times 5 \times 10 \frac{1}{8}$ in. Price: $£ 5715$ s.

OWE24. Integrated mains-operated stereo amplifier. Valves. Inputs: PU 3 mV , radio 520 mV , crystal PU 115 mV . Controls: selector, bass (LH), treble (LH), loudness, balance, volume, mode, bass (RH), treble (RH), mains on/off. Output 6W (RMS) per channel. F.R. $20 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s} \pm \frac{1}{2} \mathrm{~dB}$. Mains $110 \mathrm{~V}, 220 \mathrm{~V}, 50-60 \mathrm{c} / \mathrm{s}$. Size: $11 \frac{3}{4} \times 5 \times 7 \frac{1}{8}$ in. Price: $£ 4019 \mathrm{~s}$.

TRIPLETONE MANUFACTURING CO. LTD., 241a The Broadway, Wimbledon, S.W.19. Tel.: Liberty 1189.

Hi-Fi Major Series 3. Integrated mono amplifier. 5 valves. 12 W output. Output stage two EL84s. Output impedance 2-3 and 15 ohms. H.D. less than $0.2 \%$. Negative feedback 41 dB . Frequency response $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Inputs: pickup 80 mV 2 megohms, radio 200 mV 200K, tape 80 mV 100 K . Tape output: 500 mV 100 K . H. and N. -62 dB . Controls:- bass $\pm 18$ dB at $30 \mathrm{c} / \mathrm{s}$, middle $\pm 12 \mathrm{~dB}$ at $400 \mathrm{c} / \mathrm{s}$, treble $\pm 18 \mathrm{~dB}$ at $10 \mathrm{Kc} / \mathrm{s}$. Filter: $7 \mathrm{Kc} / \mathrm{s}$ turnover, 6 dB per octave slope. Mains $200-250 \mathrm{~V}$ AC. Auxiliary power: $200-270 \mathrm{~V} 20-40 \mathrm{~mA}$ DC, 6.3 V 2 A AC. Size: $11 \times 7 \frac{1}{2} \times 3 \frac{3}{4} \mathrm{in}$. Price: £17 16s. 8d.
D.P. 12 Series 3 power amplifier. 12W nom., 15 W max. H.D. $0 \cdot 15 \%$. Input 500 mV for 10 W . Response $15-50,000 \mathrm{c} / \mathrm{s} \pm 0.25 \mathrm{~dB}$. Feedback 16 dB . N.L. -80 dB . Output imp. 2-3 or 15 ohms switchable. Output EL84s. To operate with stereo S.C.P. 2 or mono C.P.10. Size: $12 \times$ $6 \times 5 \frac{3}{4}$ in. Price: $£ 1417 \mathrm{~s} .6 \mathrm{~d}$.
C.P. 10 Series 3 mono control unit. Inputs: pu (crystal or ceramic) $80 \mathrm{mV}, 2$ megohms; tape $200 \mathrm{mV}, 200 \mathrm{~K}$; radio $200 \mathrm{mV}, 200 \mathrm{~K}$; mag. pu (equalised to R.I.A.A. curve) 5 mV ; tape head (equalised to C.C.I.R. curve) 8 mV ; aux. 80 mV , 2 megohms. Output 500 mV . Controls: bass,
on/off, middle, treble, vol., sel., rumble filter, low-pass filter. Filters: rumble two positions, -20 dB at $20 \mathrm{c} / \mathrm{s},-15 \mathrm{~dB}$ at $20 \mathrm{c} / \mathrm{s}$; low-pass variable from $3-30 \mathrm{Kc} / \mathrm{s}$, slope $6 \mathrm{~dB} /$ octave. H . and $\mathrm{N} .-65 \mathrm{~dB}$. P.s.n. $6 \cdot 3 \mathrm{~V}, 0 \cdot 3 \mathrm{amps} ; 250 \mathrm{~V}$ DC, 3 mA . To operate with DP12. Size: $11 \times$ $3 \frac{1}{2} \times 3 \frac{3}{4}$ in. Price: $£ 1219 \mathrm{~s}$. 6 d .
-S.C.P. 2 Series 3 stereo control unit. Inputs: pu $80 \mathrm{mV}, 2$ megohms; radio $200 \mathrm{mV}, 100 \mathrm{~K}$; tape $80 \mathrm{mV}, 100 \mathrm{~K}$. Output 500 mV . Controls: bass, on/off, middle, treble, vol., sel. Response $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. H. and N. -62 dB . P.s.n. $6 \cdot 3 \mathrm{~V}, 0 \cdot 6 \mathrm{amps} ; 250 \mathrm{~V}$ DC, 6 mA . Dual-concentric controls allow very accurate balance. To operate with one or two D.P.12s and stereo 8-8 power chassis (not sold separately). Size: $11 \times$ $3 \frac{1}{2} \times 3 \frac{3}{4}$ in. Price: $£ 12$ 19s. 6d.
-Stereo 8-8.Series 3. Stereo amplifier including S.C.P. 2 control unit. 8 W per channel. H.D. $0 \cdot 2 \%$. Response $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Feedback 42 dB . N.L. -65 dB . Inputs: pu 80 mV , 2 megohms; radio $220 \mathrm{mV}, 100 \mathrm{~K}$; tape 80 mV , 100 K . L.S. matching $2-3$ or 15 ohms (switchable). Output stages ultra-linear ECL86s. Internal power supply. Size (main chassis): $12 \times$ $5 \frac{3}{4} \times 6$ in.; (pre-amp): $11 \times 3 \frac{1}{2} \times 3 \frac{3}{4}$ in. Price: £27 18s. 9d. complete.

Tripletone stereo 12-12 Series 3. Comprises two D.P. 12s and the S.C.P. 2 control unit. Details as above. Price: $£ 42$ 14s. 6d. for three units.

Transistorised pre-amplifier Series 3. Mono or stereo version. Inputs for magnetic cartridges or tape heads. Various tape/disc combinations. $\mathrm{S} / \mathrm{N} 70 \mathrm{~dB}$. Equalisation $\pm 2 \mathrm{~dB}$ (R.I.A.A. or C.C.I.R. curve). P.s.n. 200-300V DC. Octal plug connector. Size: $5 \times 2 \times 2 \mathrm{in}$. Price (mono): £3 17s. 6d.; (stereo): £5 10s.
-Stereo balance indicator Series 3. Indicates volumetric and tonal balance. Can be switched in or out as required, and gives channel reversal facilities. No power required. Price: $£ 2$ 16s. 3d.

Hi-Fi Paragon Series 3. Complete mono system comprising one C.P. 10 control unit and one D.P. 12 power amplifier. Price: $£ 27$ 17s.

TRUVOX LTD., Neasden Lane, London, N.W.10. Tel.: Dollis Hill 8011. Cables: Truvoxeng, London.
-TSA100. Transistorised integrated stereo amplifier. Inputs: PU. 150 mV 100K R.I.A.A.,

PU. 23.5 mV 50K R.I.A.A., tape 150 mV 100K, tuner 50 mV 100 K , aux. 50 mV 100 K . Controls: Treble, balance, volume, function switch, monitor switch, scratch filter, rumble filter. Noise $<-55 \mathrm{~dB}$ on $\mathrm{PU},<-60 \mathrm{~dB}$ other functions. $12 \cdot 5 \mathrm{~W}$ I.H.F.M. output per channel into 15 ohms. Distortion less than $0.25 \%$ at 10 W . F.R. $15 \mathrm{c} / \mathrm{s}-30 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Transformerless output will feed any speaker 8-600 ohms. Four AD140. Mains supply $100-240 \mathrm{~V} 40-60 \mathrm{c} / \mathrm{s}$. Chassis form or shelf-mounting cabinet. Size: $16 \times 6 \frac{7}{8} \times 5 \mathrm{in}$. Price: $£ 519 \mathrm{~s}$.

VERITONE. Stern-Clyne Ltd., 3-5 Eden Grove, London, N.7. Tel.: North 8161.

OVeritone Vega. Transistorised integrated stereo amplifier. Inputs: auxilliary 50 mV 100 K , tape 50 mV 100 K , radio 50 mV 100 K , pickup (ceramic) 50 mV 100 K , pickup (magnetic) $3-4 \mathrm{mV} 50 \mathrm{~K}$. Controls: bass $\pm 15 \mathrm{~dB}$ at $50 \mathrm{c} / \mathrm{s}$, treble $\pm 15 \mathrm{~dB}$ at $10 \mathrm{Kc} / \mathrm{s}$, balance $\pm 12 \mathrm{~dB}$ between channels, filter -3 dB at $6 \mathrm{Kc} / \mathrm{s}$ then $8 \mathrm{~dB} /$ octave, volume, monitor (source or tape), mode. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$ at lW. Feedback 60 dB . Noise level -55 dB . Output 15 W each channel. Output impedance 15 ohms. Output stage: four OC35 or OC29. Mains 240V AC. Size: $11 \times 6 \frac{3}{8} \times 4 \frac{1}{4}$ in. Price: $£ 40$ 19s., shelf mounting teak cabinet $£ 3$ 3s. extra.

VORTEXION LTD., 257/263 The Broadway, Wimbledon, London, S.W.19. Tel.: Liberty 2814, 6242/3. Cables: Vortexion, "Wimble", London.

30/50 watt amplifier. Can deliver 50 W of speech and music or over 30 W of continuous sine wave. Main amplifier has response of $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB} ; 0.15 \%$ distortion. Outputs $4,7,5,15$ ohms, 100 V line. Models are available with two, three or four mixed inputs for low impedance balanced line microphones, pickup or guitar. Price: $£ 70$.


Worden transistorised stereo control unit

120/200 watt amplifier. Can deliver its full audio power at any frequency in the range of $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Less than $0.2 \%$ distortion at $1 \mathrm{Kc} / \mathrm{s}$. Can be used to drive mechanical devices for which power is over 120 W on continuous sine wave. Input $1 \mathrm{~mW}, 600$ ohms. Output $100-120 \mathrm{~V}$ or $200-240 \mathrm{~V}$. Additional matching transf ormers for other impedances are available. Price: £112.

## WELLINGTON ACOUSTIC LABORATORIES. See Elstone Electronics Ltd.

## WORDEN AUDIO DEVELOPMENTS LTD.,

 54 Chepstow Road, London, W.2. Tel.: Bayswater 4996.Stereo transistorised control unit. Inputs: PU $4,8,10$ and 20 mV ; radio and tape 150 mV per channel. Output 150 mV per channel. Controls: selector, bass, treble, stereo/mono, combined volume, balance, on/off. Response $15 \mathrm{c} / \mathrm{s}-$ $25 \mathrm{Kc} / \mathrm{s}$. All pickup inputs equalised, radio and tape flat. Channel separation better than 55 dB . Available powered from main $10 \times 10 \mathrm{~W}$ amplifier or from separate power pack. Free-standing or for cabinet mounting. To operate with companion 10 W per channel stereo main amplifier, or any amplifiers with input sensitivity of 150 mV or less. Size: $8 \frac{3}{4} \times 8 \frac{1}{4} \times 2 \frac{3}{8} \mathrm{in}$. Front panel $9 \times 3$ in. Price: $£ 21$. Companion $10 \times 10 \mathrm{~W}$ main amplifier complete with above control unit. Price: £42. Specification on request.

Integrated $4 \times 4 \mathrm{~W}$ stereo amplifier. Sensitivity 80-100 mV per channel. Separation better than $55 \mathrm{~dB} . \mathrm{H}$. and N . better than -50 dB . Distortion $0.25 \%$ at $3 W$. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. ( 4 dB down at $40 \mathrm{Kc} / \mathrm{s}$.) Facilities for personal head-set listening. Controls: head-set blend, balance, bass, treble, selector, mono/stereo/ monitor switch. Price: £28.


Veritone Vega amplifier

## DIRECTORY OF SPEAKERS AND ENCLOSURES

This directory is divided into two parts. Part 1 deals with the range of drive units which, by makers' specifications, are within the Hi-Fi classification. Part 2 deals with complete speaker systems and enclosures. These, as a general rule, embody the drive units of Part 1. For economy of space the following abbreviations are used: H.C.-handling capacity; F.R.-frequency range; c/o-cut-off; v.c.i.-voice coil impedance; r.c.f.-recommended crossover frequency (and in Part 2) Rec.-recommended units; Height by Width by Depth are the order of printed dimensions.

## PART I—DRIVE UNITS

ACUSTICA-ELECTRONICA. Distributors: Britimpex Ltd., 16-22 Great Russell Street, London, W.C.1. Tel.: Museum 7600.

Roselson R1T. Horn tweeter. Copper voice coil. 8 or 15 ohms impedance. Gap flux 14,200 gauss. Total flux 34,000 maxwells. H.C. 10W RMS. F.R. $1 \cdot 5-15 \mathrm{Kc} / \mathrm{s}$. Size: $2 \frac{3}{4} \times 5 \frac{3}{4} \times 5 \mathrm{in}$. Price: £2 19s. 6d.

Roselson R2T. Mid-range horn. Copper voice coil. 8 or 15 ohms impedance. Gap flux 11,300 gauss. Total flux 41,300 maxwells. F.R. $450 \mathrm{c} / \mathrm{s}-$ $8 \mathrm{Kc} / \mathrm{s}$. H.C. 12 W RMS. Size: $5 \times 9 \times 105 \mathrm{in}$. Price: $£ 3$ 19s. 6d.

Roselson 12 DFC. Bass and mid-range coaxial unit. 12 in. cone. $1 \frac{1}{2}$ in. copper voice coil. 8 or 15 ohms. Gap flux 14,300 gauss. Total flux 113,300 maxwells. H.C. 12W RMS. F.R. $20 \mathrm{c} / \mathrm{s}-9 \cdot 5 \mathrm{Kc} / \mathrm{s}$. Price: £7 17s. 6d.

Roselson 12 3XLL. Full-range triaxial unit. 12 in. cone. Copper voice coil. 8 or 15 ohms. Gap flux 14,300 gauss. Total flux 113,300 maxwells. H.C. 15W RMS. F.R. $20 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Price: £15 4s. 6d.

ADASTRA ELECTRONICS LTD., 167 Finchley Road, Swiss Cottage, London, N.W.3. Tel.: Maida Vale 8164/5.

Silver Voice 15. Full range 12 in . cone unit. Impregnated moulded fibre cone with bakelised centre and foam plastic surround. $1 \frac{1}{2} \mathrm{in}$. dia. aluminium-wound voice coil. Impedance 15 ohms. Gap flux 13,000 gauss. Total flux 87,500 maxwells. Handling capacity 15W RMS, 30W peak. F.R. $25 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Heavy diecast chassis. Terminal connections. Price: £9 19s. 6d.

Top 20. 12 in . heavy duty cone speaker for guitars, electronic music or bass unit in multiple system. Impregnated fibre cone with corrugated surround. Aluminium voice coil, $1 \frac{1}{2} \mathrm{in}$. diameter.

Impedance 15 ohms. Gap flux 12,000 gauss. Total flux 80,000 maxwells. F.R. $20 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$, level over $100 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$. Bass resonance $80 \mathrm{c} / \mathrm{s}$. Heavy diecast chassis. Dustproof centring device. Price: $£ 55 \mathrm{~s}$.

RICHARD ALLAN RADIO LTD., Bradford Road, Gomersal, Near Leeds, Yorkshire. Tel.: Cleckheaton 2442/2. Cables: Acoustics, Bradford.

460T. 4 in. tweeter. Paper cone. Cambric surround. Voice coil $\frac{9}{16} \mathrm{in}$. Gap flux 6,000 gauss. Total flux 9,000 maxwells. H.C. 3 W. v.c.i. 8 or 15 ohms. F.R. $2 \mathrm{Kc} / \mathrm{s}-17 \mathrm{Kc} /$ s. r.c.f. $5 \mathrm{Kc} / \mathrm{s}$. Price: $£ 12 \mathrm{~s} .9 \mathrm{~d}$.

812F. 8 in. mid-range. Paper cone, doped cambric surround. Voice coil 1 in . Gap flux 12,000 gauss. Total flux 48,000 maxwells. H.C. 5W. v.c.i. 8 or 15 ohms. F.R. $50 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Price: £3 18s. 3d.

812FT. 8 in. paper cone plus tweeter inner. Doped cambric surround. Voice coil 1 in . Gap flux 12,000 gauss. Total flux 18,000 maxwells. H.C. 5 W. v.c.i. 8 or 15 ohms. F.R. $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Price: £4 1s. 3d.

CB4 Tweeter. 4 in. paper cone. Cambric surround. Voice coil $\frac{9}{16} \mathrm{in}$. Gap flux 10,000 gauss. Total flux 15,000 maxwells. H.C. 3 W. v.c.i. 15 ohms. F.R. $2 \mathrm{Kc} / \mathrm{s}-17 \mathrm{Kc} /$ s. r.c.f. $5 \mathrm{Kc} /$ s. Price: £1 17s. 9d.

CB10. 10 in. paper cone, doped cambric surround. Voice coil $1 \frac{1}{2} \mathrm{in}$. Gap flux 12,000 gauss. Total flux 90,000 maxwells. H.C. 8 W. v.c.i. 8 or 15 ohms. F.R. $40 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$. Price: $£ 75 \mathrm{~s}$. 3d.

CB10T. 10 in. paper cone, doped cambric surround plus tweeter inner. Voice coil $1 \frac{1}{2}$ in. Gap flux 12,000 gauss. Total flux 90,000 maxwells. H.C. 8 W. v.c.i. 8 or 15 ohms. F.R. $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Price: $£ 7$ 10s. 9 d .


Richard Allan CB10


Acustica-Electronica 12DFC


Richard Allan 812/F


Acustica-Electronica R2T


Richard Allan CG $12 T$


Adastra Silver Voice 15

CB12. 12 in. Single paper cone. Doped fabric surround. Voice coil $1 \frac{1}{2}$ in. (copper). v.c.i. 8 or 15 ohms. Gap flux 12.000 gauss. Total flux 90.000 maxwells. Ceramic magnet. H.C. 8W. F.R. 20 $\mathrm{c} / \mathrm{s}-9 \mathrm{Kc} / \mathrm{s}$. r.c.f. $1,000 \mathrm{c} / \mathrm{s}$. Price: $£ 7$.

CB12T. 12 in. Paper cone + tweeter inner. Doped fabric surround. Voice coil $1 \frac{1}{2}$ in. (copper). v.c.i. 8 or 15 ohms. Gap flux 12,000 gauss. Total flux 90,000 maxwells. Ceramic magnet. H.C. 8W. F.R. $25 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Price: $£ 75 \mathrm{~s}$.

CB12 Super. 12 in. paper cone. Doped cambric surround. Voice coil 2 in. Gap flux 12,000 gauss. Total flux 120,000 maxwells. H.C. 12W. v.c.i. 8 or 15 ohms. F.R. $25 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. Price: $£ 9$.

CB12 Super HD. 12 in. paper cone. Corrugated paper surround. Voice coil 2 in . Gap flux 12,000 gauss. Total flux 120,000 maxwells. H.C. 20W. v.c.i. 8 or 15 ohms. F.R. $60 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. Price: £9.

CB15. 15 in. paper cone. Doped cambric surround. Voice coil 2 in . Gap flux 14,000 gauss. Total flux 182,000 maxwells. H.C. $15 W$ W. v.c.i. 8 or 15 ohms. F.R. $20 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. Price: $£ 1510 \mathrm{~s}$.

CB15 HD. 15 in. paper cone and surround. Voice coil 2 in. Gap flux 14,000 gauss. Total flux 182,000 maxwells. H.C. 25 W. v.c.i. 8 or 15 ohms. F.R. $60 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. Price: £15 10s.

CG8T. 8 in. paper cone, doped cambric surround plus tweeter inner. Voice coil 1 in . Gap flux 14,000 gauss. Total flux 56,000 maxwells. H.C. 6 W. v.c.i. 8 or 15 ohms.F.R. $50 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}$. Price: £6 4s. 9d.

CG8. 8 in. paper cone, doped cambric surround. Voice coil 1 in . Gap flux 14,000 gauss. Total flux 56,000 maxwells. H.C. 6W. v.c.i. (copper). v.c.i. 8 or 15 ohms. Gap flux 14,000 gauss. Total flux 105,000 maxwells. Ceramic magnet. H.C. 10 W . F.R. $25 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Price: £6 1s. 9d.

CG10. 10 in. paper cone, doped cambric surround. Voice coil $1 \frac{1}{2}$ in. Gap flux 14,000 gauss. Total flux 105,000 maxwells. H.C. 10W. v.c.i. 8 or 15 ohms. F.R. $40 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$. Price: $£ 82 \mathrm{~s} .6 \mathrm{~d}$.

CG10T. 10 in. paper cone, doped cambric surround plus tweeter inner. Voice coil $1 \frac{1}{2} \mathrm{in}$. Gap flux 14,000 gauss. Total flux 105,000 maxwells. H.C. 10 W. v.c.i. 8 or 15 ohms. F.R. $40 \mathrm{c} / \mathrm{s}-15$ $\mathrm{Kc} / \mathrm{s}$. Price: $£ 88 \mathrm{~s}$. 3d.

CG12. 12 in. Single paper cone. Doped fabric surround. Voice coil $1 \frac{1}{2}$ in. (copper). v.c.i. 8 or

15 ohms. Gap flux 14,000 gauss. Total flux 105,000 maxwells. Ceramic magnet. H.C. 10W. F.R. $25 \mathrm{c} / \mathrm{s}-9 \mathrm{Kc} / \mathrm{s}$. r.c.f. $1,000 \mathrm{c} / \mathrm{s}$. Price: $£ 8$.

CG12T. 12 in. Paper cone + tweeter inner. Doped fabric surround. Voice coil $1 \frac{1}{2}$ in. 8 or 15 ohms. F.R. $50 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Price: $£ 85 \mathrm{~s}$.

CG12 Super. 12 in. paper cone, doped cambric surround. Voice coil 2 in . Gap flux 14,000 gauss. Total flux 182,000 maxwells. H.C. 15W. v.c.i. 8 or 15 ohms. F.R. $25 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. Price: £10 10s.

CG12 Super HD. 12 in. paper cone and surround. Voice coil 2 in . Gap flux 14,000 gauss. Total flux 182,000 maxwells. H.C. 25W. v.c.i. 8 or 15 ohms. F.R. $60 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. Price: $£ 10 \mathrm{l}$ 10s.

CG15. 15 in. paper cone, doped cambric surround. Voice coil 2 in. Gap flux 17,000 gauss. Total flux 220,000 maxwells. H.C. 20W. v.c.i. 8 or 15 ohms. F.R. $20 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. Price: $£ 17$ 10s.

CG15 HD. 15 in. paper cone and surround. Voice coil 2 in . Gap flux 17,000 gauss. Total flux 220,000 maxwells. H.C. 30 W. v.c.i. 8 or 15 ohms. F.R. $60 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. Price: £17 10s.

CP10. 10 in. paper cone. Doped cambric surround. Voice coil $1 \frac{1}{2} \mathrm{in}$. Gap flux 10,000 gauss. Total flux 75.000 maxwells. H.C. 7W. v.c.i. 8 or 15 ohms. F.R. $40 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$. Price: $£ 67 \mathrm{~s} .9 \mathrm{~d}$.

CP10T. 10 in. paper cone plus tweeter inner. Doped cambric surround. Voice coil $1_{2}^{1}$ in. Gap flux 10,000 gauss. Total flux 75,000 maxwells. H.C. 7W. v.c.i. 8 or 15 ohms. F.R. $40 \mathrm{c} / \mathrm{s}-15$ $\mathrm{Kc} / \mathrm{s}$. Price: $£ 6$ 13s. 6d.

CP12. 12 in. single paper cone. Doped cambric surround. v.c.i. 8 or 15 ohms. Voice coil $1 \frac{1}{2}$ in. (copper). Gap flux 10,000 gauss. Total flux 75,000 maxwells. Ceramic magnet. H.C. 8W. F.R. $25 \mathrm{c} / \mathrm{s}-9 \mathrm{Kc} /$ s. r.c.f. $1 \mathrm{Kc} / \mathrm{s}$. Price: $£ 6$.

CP12T. 12 in. paper cone and tweeter inner. Doped cambric surround. Voice coil $1 \frac{1}{2} \mathrm{in}$. (copper). v.c.i. 8 or 15 ohms. Gap flux 10,000 gauss. Total flux 75,000 maxwells. Ceramic magnet. H.C. 8 W. F.R. $25 \mathrm{c} / \mathrm{s}-9 \mathrm{Kc} / \mathrm{s}$. Price: $£ 65 \mathrm{~s}$.

CR5. 5 in. paper cone. Neoprene surround. Voice coil 1 in. Gap flux 14,000 gauss. Total flux 56,000 maxwells. H.C. 6 W . v.c.i. 8 or 15 ohms. F.R. $30 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Specifically designed for low volume infinite baffle. Price: $£ 62 \mathrm{~s}$. 6d.


Celestion CX1512 co-axial speaker


Eagle CR12AE


Eagle CT10 horn tweeter


Celestion CX2012 co-axial speaker


Eagle CX 300


Eagle HT20 rectangular horn tweeter

AUDIO AND DESIGN LTD., 40 Queen Street, Maidenhead, Berks. Tel.: Maidenhead 25204.

TCL Drive Unit. Titanium cone speaker module. 4 in. titanium piston with metal surround. $1 \frac{1}{2} \mathrm{in}$. dia. voice coil. Total flux 160,000 maxwells. Mean hemispherical power response: $20 \mathrm{c} / \mathrm{s}-22 \mathrm{Kc} / \mathrm{s}-3 \mathrm{~dB}$. Voice coil imp. $7 \cdot 5 \mathrm{ohms}$ at $400 \mathrm{c} / \mathrm{s}$. H.C. 15 W . RMS in suitable enclosure. Price: $£ 1815 \mathrm{~s}$.

BAKER REPRODUCERS LTD., Bensham Manor Road Passage, Thornton Heath, Surrey. Tel.: Thornton Heath 1665.

Stalwart. Full range 12 in . cone speaker. Paper cone with roll surround. Voice coil $1 \frac{1}{2} \mathrm{in}$. Copper voice coil. Impedance 3 or 15 ohms. Gap flux 12,000 gauss. H.C. 15 W. RMS. F.R. $45 \mathrm{c} / \mathrm{s}-$ $13 \mathrm{Kc} / \mathrm{s}$. Price: $£ 55 \mathrm{~s}$.

Standard. Full range 12 in . cone speaker. Similar to Stalwart but with 14,000 gauss gap flux giving F.R. $40 \mathrm{c} / \mathrm{s}-14 \cdot 5 \mathrm{Kc} / \mathrm{s}$. Cast aluminium chassis. Weight: 6 lb . Price: $£ 8$.

Deluxe Mk. II. Full range 12 in . cone speaker. 15 W . RMS. Bass resonance $32-38 \mathrm{c} / \mathrm{s}$. Gap flux 14,000 gauss. Copper voice coil $1 \frac{1}{2} \mathrm{in}$. diameter. Impedance 15 ohms. Paper cone with foam plastic surround. F.R. $25 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Cast aluminium chassis. Depth 6 in. Weight: 6 lb . Price: £9.

Bass Auditorium 12. Medium range 12 in . cone speaker suitable for bass unit in multispeaker system. H.C. 25W RMS. Bass resonance $36-45 \mathrm{c} / \mathrm{s}$. Gap flux 15,000 gauss. Copper voice coil $1 \frac{1}{2}$ in. diameter. Impedance 15 ohms. F.R. $25 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. Paper cone with roll surround. Cast aluminium chassis. Depth 7 in. Weight: 10 lb . Price: $£ 12$ 10s.

Bass Auditorium 15. High power 15 in . speaker suitable for bass unit in multi-speaker unit. H.C. 35W RMS. Similar specification to Auditorium 12 except 2 in. diameter voice coil and handling capacity 35W RMS. Depth: 8 in . Weight: 15 lb . Price: $£ 18$.

Laboratory Standard 12. Full range 12 in . speaker employing patented differential wave impedance cone. Resin-impregnated paper cone with central metallic ellipse. $1 \frac{1}{2} \mathrm{in}$. diameter aluminium voice coil. Foam plastic surround. Impedance 15 ohms. Gap flux 15,000 gauss. H.C. 15 W RMS. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Bass resonance $22-27 \mathrm{c} / \mathrm{s}$. Price: $£ 22$ 10s.

Laboratory Standard 15. Medium range 15 in . speaker employing patented differential wave impedance cone. Resin-impregnated paper cone with central metallic ellipse. Foam plastic surround. 2 in . diameter copper voice coil. Impedance 15 ohms. Cast aluminium chassis. Gap flux 15,000 gauss. H.C. 20W RMS. F.R. $20 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. Bass resonance $18-25 \mathrm{c} / \mathrm{s}$. Price: £28 10s.

Group 25. 12 in. cone speaker with heavy duty suspension for electronic music, guitars; etc. H.C. 25 W RMS. Impedance 15 ohms. Bass resonance $80 \mathrm{c} / \mathrm{s}$. F.R. $30 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Gap flux 12,000 gauss. Voice coil $1 \frac{1}{2}$ in. Depth: 6 in. Weight: 5 lb . Price: $£ 55 \mathrm{~s}$.

Group 35. 12 in. cone speaker with heavy duty suspension for electronic music, guitars, etc. H.C. 35W RMS. Impedance 15 ohms. Bass resonance $80 \mathrm{c} / \mathrm{s}$. F.R. $30 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Gap flux 14,000 gauss. Voice coil $1 \frac{1}{2} \mathrm{in}$. Depth: $6 \frac{1}{4} \mathrm{in}$. Weight: 6 lb . Price: $£ 8$ 18s. 6 d .

Group 50. 15 in. cone speaker with heavy duty suspension for electronic music, guitars, etc. H.C. 50W RMS. Impedance 15 ohms. Bass resonance $80 \mathrm{c} / \mathrm{s}$. F.R. $30 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Gap flux 17,000 gauss. Voice coil 2 in . Depth: 8 in. Weight: 15 lb . Price: $£ 1818 \mathrm{~s}$.

CELESTION LTD., Ferry Works, Thames Ditton, Surrey. Tel.: Emberbrook 3402/6. Cables: Voicecoil, Thames Ditton.

Studio Series CX1512. 12 in. coaxial unit comprising paper cone bass speaker and pressure driven tweeter. Plastaflex surround. Bass voice coil $1 \frac{3}{4}$ in. diameter, treble voice coil $\frac{3}{4} \mathrm{in}$. diameter, both copper wound. Imp. 15 ohms. Gap flux 13,000 gauss. Total flux 88,000 maxwells. H.C. $15 W$. F.R. $30 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Price: $£ 125 \mathrm{~s}$.

Studio Series CX2012. 12 in. coaxial unit comprising paper cone bass speaker and pressure driven tweeter. Hi-flex free surround. Bass voice coil $1 \frac{3}{4}$ in. diameter copper wound, treble voice coil 1 in. diameter aluminium wound. Imp. 15 ohms. Gap flux 17,000 gauss. Total flux 180,000 maxwells. H.C. 20W. F.R. $30 \mathrm{c} / \mathrm{s}-$ $18 \mathrm{Kc} / \mathrm{s}$. Price: $£ 17$ 10s.

DECCA SPECIAL PRODUCTS, Decca Radio and Television Division of the Decca Record Company Ltd., Ingate Place, Queenstown Road, London, S.W.8. Tel.: Macauley 6677.

Kelly ribbon Mk. II. Ribbon HF unit. 2 micron aluminium ribbon element. Imp. 15


Elac type $50 / 12$


Fane Ionofane 601 HF driver


Fane model 152/17


Fane 152/17A speaker


Fane 301 HF unit


Goodmans Audiom 91
ohms at $400 \mathrm{c} / \mathrm{s}$. Handling capacity 10W. F.R. $2 \cdot 5-25 \mathrm{Kc} / \mathrm{s}$. Rec. crossover $2 \cdot 5 \mathrm{Kc} / \mathrm{s}$. Rear face of ribbon sealed-in to permit mounting in enclosure without inter-modulation. Built-in transformer. Air coupling by catenoidal horn. Rigid diecast assembly. Price: $£ 1110 \mathrm{~s}$.

Kelly LF driver Mk. III/IIIA. 12 in. direct radiator. Curvilinear impregnated paper cone. Doped fabric concertina surround. $1 \frac{1}{2}$ in. diameter voice coil. Imp. 15 ohms at $400 \mathrm{c} / \mathrm{s}$. Gap flux 14,000 gauss. Total flux 110,000 maxwells. H.C. 15W. F.R. $30 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. Rec. crossover $2.5 \mathrm{Kc} / \mathrm{s} .6 \frac{1}{2} \mathrm{lb}$. ceramic ring magnet. Free air resonance $30-35 \mathrm{c} / \mathrm{s}$. Weight: $8 \frac{3}{4} \mathrm{lb}$. Price: £11 10s.

Kelly LF driver Mk. V/VG. 12 in. direct radiator. Curvilinear impregnated paper cone. Doped fabric concertina surround. Type VG has impregnated fibre surround. 2 in. diameter voice coil. Imp. 15 ohms at $400 \mathrm{c} / \mathrm{s}$. Gap flux 14,000 gauss. Total flux 250,000 maxwells. H.C. 35W. F.R. $30 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. Rec. crossover $2 \cdot 5 \mathrm{Kc} / \mathrm{s}$. Free air resonance: Type V $25 \mathrm{c} / \mathrm{s}$, Type VG 55 $\mathrm{c} / \mathrm{s} .11 \mathrm{lb}$. ceramic ring magnet. Weight: 13 lb . Price: $£ 14$.

Kelly LF driver Mk. VII/VIIG. 15 in. direct radiator. Curvilinear impregnated paper cone. Doped fabric concertina surround. Type V11G has impregnated fibre surround. 2 in. diameter voice coil embedded in polyester resin. Imp. 15 ohms at $400 \mathrm{c} / \mathrm{s}$. Gap flux 17,000 gauss. Total flux 350,000 maxwells. H.C. 50W. F.R. $30 \mathrm{c} / \mathrm{s}-$ $5 \mathrm{Kc} / \mathrm{s}$. Rec. crossover $2.5 \mathrm{Kc} / \mathrm{s}$. Price: $£ 20$.

DUODE LTD., Westfield Mills, Broad Lane, Bramley, Leeds, 13. Tel.: Pudsey 77536.

Duode Super 12. Linen moulded cone. Foam plastic surround. Incorporates original Barkerpatented aluminium speech coil former fitted with latex sleeve. This applies negative feedback and gives response $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Price: £17 10s.

EAGLE PRODUCTS. Distributors: B. Adler \& Sons (Radio) Ltd., 32a Coptic Street, London, W.C.1. Tel.: Museum 9606. Cables: Reldab.

CR12AE. 12 in. coaxial. Paper cone, plastic treated surround. 2 in. aluminium voice coil. v.c.i. 16 ohms. Total flux 85,000 maxwells. H.C. 10W. F.R. $30 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. c.f. $1,800 \mathrm{c} / \mathrm{s}$. Price: $£ 95 \mathrm{~s} .6 \mathrm{~d}$.

8A7. 8 in. coaxial. Paper cone, plastic treated surround. 1 in. aluminium voice coil. v.c.i. 16 ohms. Total flux 53,000 maxwells. H.C. 6W. F.R. $50 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Price: £3 15s. (U.K. purchase Tax 12s. 6d.)

CX300. 12 in. coaxial. Paper cone, plastic treated surround. 3 in. aluminium voice coil. v.c.i. 16 ohms. Gap flux (woofer) 12,000 gauss; (tweeter) 10,500 gauss. Total flux (woofer) 200,000 maxwells; (tweeter) 18,000 maxwells. H.C. 15W. F.R. $30 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$ c.f. $2,500 \mathrm{c} / \mathrm{s}$. Price: $£ 13$ 17s. 6d.

CR30AE. 12 in. coaxial with additional tweeter. Paper cone, plastic treated surround. $2 \frac{1}{2}$ in. aluminium voice coil. v.c.i. 16 ohms. Gap flux (woofer) 10,500 gauss; (tweeter) 11,000 gauss. Total flux (woofer) 15,000 maxwells; (tweeter) 13,000 maxwells. H.C. 10W. F.R. $30 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. c.f. $1,800 \mathrm{c} \mathrm{s}$ and $5,000 \mathrm{c} / \mathrm{s}$. Price: £11 15s:

8CX.50. Twin unit comprising 8 in. woofer and horn tweeter. Roll surround. Imp. 16 ohms. Woofer 10,500 gauss, tweeter 12,000 gauss. 15W. F.R. $30 \mathrm{c} / \mathrm{s}-22 \mathrm{Kc} / \mathrm{s}$. Resonant freq. $30 \mathrm{c} / \mathrm{s}$. Crossover $3 \mathrm{Kc} / \mathrm{s}$. Price: $£ 10 \mathrm{l} 5 \mathrm{~s}$.

HT.40. Horn tweeter with aluminium ribbon voice coil. Total flux 30,000 maxwells. 20W. F.R. $3 \mathrm{Kc} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Crossover $3 \mathrm{Kc} / \mathrm{s}$. Price: £4 19s. 6d.

CT10 Horn Tweeter. $3 \frac{1}{4}$ in. Aluminium cone and surround. Voice coil 1 in. (aluminium). v.c.i. 16 ohms. H.C. 10W. F.R. $1,500 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. r.c.f. $3,000 \mathrm{c} / \mathrm{s}$. Price: $£ 112 \mathrm{~s}$. 6d.

HT20 Rectangular Horn Tweeter. $4 \times 2$ in. Aluminium cone. Voice coil 1 in. (aluminium). v.c.i. 16 ohms. Gap flux 13,500 gauss. H.C. 20W. F.R. 1,500 c/s-18 Kc/s. r.c.f. $3,000 \mathrm{c} / \mathrm{s}$. Price: $£ 3$ 17s. 6d.

Prices quoted for Eagle products are approximate.

ELAC. Electro Acoustic Industries Ltd., Stamford Works, Broad Lane, Tottenham, London, N.15. Tel.: Tottenham 0505/9. Cables: Elac London, N. 15.

Elac Type 8N/148 (N/832). 8 in. Exponential paper cone. Paper surround, integral with cone. Voice coil 1 in. copper. v.c.i. 15 ohms. Gap flux 12,000 gauss. Total flux 48,300 maxwells. H.C. 5 watts. F.R. $55 \mathrm{c} / \mathrm{s}-11 \mathrm{Kc} / \mathrm{s}$ (loaded conditions). r.c.f. High frequency crossover $8,000 \mathrm{c} / \mathrm{s}$. Price: £2 15 s . (U.K. purchase tax 8 s .10 d .).


Goodmans Midax 650


Goodmans Twin Axiette 8


Goodmans Audiom 81


Goodmans Axiom 10


Goodmans Axiette 8


Goodmans Triaxiom 1220C

Elac 8N/148 Mk II ( $\mathbf{8 N} / \mathbf{1 8 5}$ ). Similar to $8 \mathrm{~N} / 148$ but frequency response $40 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. Price: £3 (U.K. purchase tax 9s. 9d.).

Elac 50/12 (Ceramic magnet). 8 in. Exponential paper cone, plus inner cone. Paperplasticised surround. Voice coil 1 in . copper. v.c.i. 3 ohms. Gap flux 10,000 gauss. Total flux 40,300 maxwells. H.C. 5 W. F.R. $55 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. r.c.f. High frequency crossover $8,000 \mathrm{c} / \mathrm{s}$. Price including tax: $£ 33$ s.

EMI SOUND PRODUCTS LTD., Hayes, Middlesex. Tel.: Hayes 3888. Cables: Emisound, London.

92390 PAL. $13 \frac{1}{2} \times 8 \frac{1}{8}$ in. elliptical. Paper main-cone/aluminium centre-cone. Paper surround. Voice coil 1 in . copper wire. v.c.i. 3 ohms. Gap flux 11,000 gauss. Total flux 43,500 maxwells. H.C. 10 W . F.R. $40 \mathrm{c} / \mathrm{s}-7 \mathrm{Kc} / \mathrm{s}$. r.c.f. $6,000 \mathrm{c} / \mathrm{s}$. Price: $£ 211 \mathrm{~s}$. 6d.

92390 PBL. Details as for PAL. v.c.i. 15 ohms.
92390 PEL. $13 \frac{1}{2} \times 8 \frac{1}{8}$ in. elliptical. Paper main cone/aluminium centre cone. PVC surround. Voice coil 1 in. copper wire. v.c.i. 3 ohms. Gap flux 13,000 gauss. Total flux 69,000 maxwells. H.C. 10W. (20W version also available). F.R. $20 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} /$ s. r.c.f. $4,500 \mathrm{c} / \mathrm{s}$. Price: $£ 519 \mathrm{~s}$.

92390 PFL. Details as for PEL. v.c.i. 15 ohms.
Four other versions with impedances 3-15 ohms and handling capacity $10-20$ watts. Details and prices on request.

92390 PE. Combination loudspeaker: $13 \frac{1}{2} \times$ $8 \frac{1}{8}$ in. elliptical with $3 \frac{1}{2} \mathrm{in}$. dia. tweeter. Paper main-cone/aluminium centre-cone/paper tweeter. PVC surround. Voice coil 1 in . copper wire. v.c.i. 3 ohms. Gap flux 13,000 gauss. Total flux 69,000 maxwells. H.C. 10W. F.R. $20 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s}$. r.c.f. $5,000 \mathrm{c} / \mathrm{s}$. L.C. filter is mounted on chassis. Price: $£ 85$ s.

92390 PF. Details as for PE. v.c.i. 15 ohms.
Six other versions with impedances 3-15 ohms and handling capacity 10-20 watts. Details and prices on request.

97492 J. $2 \frac{1}{2}$ in. hard PVC cone. Voice coil $\frac{1}{2}$ in. copper wire. v.c.i. 3 ohms. Gap flux 8,500 gauss. F.R. $5-15 \mathrm{Kc} /$ s. r.c.f. $6,000 \mathrm{c} / \mathrm{s}$. Price: $£ 1$ (U.K. purchase tax 3 s . 5 d .).

97492 E. Details as for Model J. v.c.i. 8 ohms.
97492 C. Details as for Model J. v.c.i. 15 ohms.
$99110 \mathrm{~N} .3 \frac{3}{8}$ in. curved paper diaphragm. Paper surround. Voice coil $\frac{1}{2}$ in. copper wire. v.c.i. 3 ohms. Gap flux 10,000 gauss. F.R. 3-20 $\mathrm{Kc} / \mathrm{s}$. r.c.f. $4,500 \mathrm{c} / \mathrm{s}$. Price: $£ 17 \mathrm{~s}$. 6 d . (U.K. purchase tax 4s. 9d.).

99110 J. Details as for Model N. v.c.i. 8 ohms.
$\mathbf{9 9 1 1 0}$ M. Details as for Model N. v.c.i. 15 ohms.

FANE ACOUSTICS LTD., Hick Lane, Batley, Yorks. Tel.: Batley 2114. Cables: Fane, Batley.
501. 5 in. mid-range unit. Gap flux 15,000 gauss. Total flux 60,000 maxwells. H.C. 20W. 1 in . diameter aluminium voice coil. Impedance 15 ohms. Rigid cone with neoprene surround. F.R. $400 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. Rec. crossover: $800 \mathrm{c} / \mathrm{s}$ and $3.5 \mathrm{Kc} / \mathrm{s}$. Price: $£ 55 \mathrm{~s}$. (U.K. purchase tax 17s. 3d.).
505. Similar to 501 but with 11,000 gauss magnet and H.C. 15W. Price: £3 3s. (U.K. purchase tax 10s. 4 d .).
502. 5 in. full-range unit for small enclosures. Gap flux 15,000 gauss. Total flux 60,000 maxwells. H.C. 8W. 1 in. copper voice coil. Price: $£ 55$ s. (U.K. purchase tax 17s. 3d.).
506. Similar to 502 but with 11,000 gauss magnet and H.C. 7W. Price: £3 3s. (U.K. purchase tax 10s. 4d.).

101/10. 10 in. ceramic magnet unit with 2 in. voice coil. H.C. 15W RMS. Impedance 15 ohms. Main resonance $60 \mathrm{c} / \mathrm{s}$. Gap flux 10,000 gauss. Total flux 100,000 maxwells. Single cone. copper voice coil. F.R. $40 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Price: $£ 4$ 17s. 6d. (U.K. purchase tax 16s.).

101/10a. Similar to 101/10 but with twin cone, aluminium voice coil and F.R. $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Price: £5 17s. 6d. (U.K. purchase tax 19s. 4d.).

101/12. Similar to $101 / 10$ but with 12,000 gauss magnet. Price: $£ 66 \mathrm{~s}$. (U.K. purchase tax £1 0s. 9d.).

101/12a. Similar to $101 / 12$ but with twin cone, aluminium voice coil and F.R. $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Price: $£ 7$ 7s. (U.K. purchase tax $£ 1$ 4s. 2d.).


Goodmans Audiom 61


Goodmans Trebax HF unit


Goodmans Audiom 51


Goodmans Axiom 301


Grampian 1255/15

101/14. Similar to $101 / 10$ but with 14,000 gauss magnet. Price: £8 8s. (U.K. purchase tax £1 7s. 8d.).

101/14a. Similar to $101 / 14$ but with twin cone, aluminium voice coil and F.R. $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Price: $£ 9$ 9s. (U.K. purchase tax $£ 111 \mathrm{~s}$. 1d.).

122/10. 12 in. ceramic magnet unit with 2 in . diameter voice coil. H.C. 20W RMS. Impedance 15 ohms. Main resonance $40 \mathrm{c} / \mathrm{s}$ or $70 \mathrm{c} / \mathrm{s}$ as required. F.R. $30 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. Gap flux 10,000 gauss. Total flux 100,000 maxwells. Copper voice coil. Single cone. Price: $£ 517 \mathrm{~s}$. 6d.

122/10a. Similar to $122 / 10$ but with twin cone, aluminium voice coil and F.R. $30 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Price: £6 17s. 6d.

122/12. Similar to $122 / 10$ but with 12,000 gauss magnet. Price: $£ 7$ 7s.

122/12a. Similar to $122 / 12$ but with twin cone, aluminium voice coil and F.R. $30 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Price: $£ 88 \mathrm{~s}$.

122/14. Similar to $122 / 10$ but with 14,000 gauss magnet and H.C. 22W. Price: £9 9s.

122/14a. Similar to $122 / 14$ but with twin cone, aluminium voice coil and F.R. $30 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Price $£ 1010$ s.

122/17. Similar to $122 / 10$ but with 17,000 gauss magnet, 25W handling capacity and F.R. $25 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$. Price: £1117s. 6d.

122/17a. Similar to $122 / 17$ but with twin cone, aluminium voice coil and F.R. $30 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}$. Price: $£ 12$ 17s. 6d.

152/12. 15 in. ceramic magnet unit with 2 in. diameter voice coil. H.C. 25 W RMS. Impedance 15 ohms. Main resonance $32 \mathrm{c} / \mathrm{s}$. Gap flux 12,000 gauss. Total flux 160,000 maxwells. Copper voice coil. Single cone. F.R. $25 \mathrm{c} / \mathrm{s}-2 \cdot 5 \mathrm{Kc} / \mathrm{s}$. Price: $£ 12$ 12s.

152/12a. Similar to $152 / 12$ but with twin cone, aluminium voice coil and F.R. $30 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Price: £13 13s.

152/14. Similar to $152 / 12$ but with 14,000 gauss magnet, H.C. 27W and F.R. $25 \mathrm{c} / \mathrm{s}-3 \cdot 5$ Kc/s. Price: £14 14s.

152/17. Similar to $152 / 12$ but with 17,000 gauss magnet, H.C. 30W RMS, and F.R. $25 \mathrm{c} / \mathrm{s}-$ $4 \mathrm{Kc} / \mathrm{s}$. Price: £16 16s.

152/17a. Similar to $152 / 17$ but with aluminium voice coil, twin cone and F.R. $30 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}$. Price: £17 17s.
153. 15 in. extra heavy duty unit with ceramic magnet and 3 in. diameter voice coil. Gap flux 14,500 gauss. Total flux 375,000 maxwells. H.C. 40W RMS. Copper voice coil. Single cone. F.R. $30 \mathrm{c} / \mathrm{s}-3 \cdot 5 \mathrm{Kc} / \mathrm{s}$. Impedance 15 ohms. Main resonance $40 \mathrm{c} / \mathrm{s}$. Weight: 20 lb . Price: $£ 18 \mathrm{l} 8 \mathrm{~s}$.
183. 18 in. extra heavy duty unit with ceramic magnet and 3 in. diameter voice coil. Gap flux 14,500 gauss. Total flux 375,000 maxwells. H.C. 60W. Copper voice coil. Single cone. F.R. 20 $\mathrm{c} / \mathrm{s}-3 \mathrm{Kc} / \mathrm{s}$. Impedance 15 ohms. Main resonance $30 \mathrm{c} / \mathrm{s}$. Weight: 22 lb . Price: $£ 254 \mathrm{~s}$.
Special low resonance versions of 10 in ., 12 in ., 15 in ., and 18 in . speakers are available at slightly higher prices. These are intended for use as bass units in high fidelity bass systems. They have rigid moulded fibre cones with rubber surround allowing free axial movement. Must be used in suitable reflex or infinite baffle cabinets. Not recommended for use with electric guitars or with small open baffles.

GOODMANS INDUSTRIES LTD., Axiom Works, Wembley, Middx. Tel.: Wembley 1200. Cables: Goodaxiom, Wembley.

Axiette 8. 8 in. Paper cone. Plastic treated surround. Voice coil 1 in . Gap flux 13,500 gauss. Total flux 53,000 maxwells. H.C. 6 W . v.c.i. 15 ohms. F.R. 40-15,000 c/s. Price: $£ 55 \mathrm{~s}$. (U.K. purchase tax 16 s . 10 d .).

Twin Axiette 8.8 in. twin cone version of Axiette 8. F.R. $40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Mechanical crossover at $2 \mathrm{Kc} / \mathrm{s}$. Other details as for Axiette 8. Price: £5 19s. (U.K. purchase tax 19s. 1d.).

Axiom 10. 10 in. Paper cone. Plastic treated surround. Voice coil 1 in . Gap flux 13,500 gauss. Total flux 53,000 maxwells. H.C. 10W. v.c.i. 15 ohms. F.R. 40-15,000 c/s. Price: £6 5s. (U.K. purchase tax $£ 1$ ).

Axiom 80. $9 \frac{1}{2}$ in. Twin Diaphragm paper cone, free edge surround. Voice coil 1 in . Gap flux 17,000 gauss. Total flux 62,000 maxwells. H.C. 6W. v.c.i. 15 ohms. F.R. $20-20,000 \mathrm{c} / \mathrm{s}$. Price: $£ 18$ 8s. 11d. (U.K. purchase tax $£ 2$ 19s. 2d.).

Trebax. Horn-loaded pressure tweeter. Aluminium diaphragm. Voice coil 1 in . H.C. suitable for inclusion in systems of up to 25 W . v.c.i. 15 ohms at $10 \mathrm{Kc} / \mathrm{s}$. F.R. 2,500-20,000 c/s. r.c.f. $5 \mathrm{Kc} / \mathrm{s}$. Price: $£ 616 \mathrm{~s}$. 11 d .


Isophon-Werke PH 2132/25/11


Jordon-Watts speaker drive module


KEF B1814 (rear view)


Trebax 5K/20XL. Horn loaded pressure tweeter. Built in L/C crossover ( $5,000 \mathrm{c} / \mathrm{s}$ ) and attenuator. Suitable for inclusion in systems of up to 20W. Dispersion angle 90]. Price: £7 13s. 9d.

Midax 650. Horn loaded pressure unit. Resin impregnated linen diaphragm. Diecast horn. Voice coil $1 \frac{1}{2}$ in. H.C. suitable for systems up to 25W. v.c.i. 15 ohms. F.R. $650-8,000 \mathrm{c} /$ s. r.c.f. 950 and $5,000 \mathrm{c} / \mathrm{s}$. Price: $£ 106 \mathrm{~s} .3 \mathrm{~d}$.

Audiom 51 bass. 12 in. Paper cone. Voice coil $1 \frac{3}{4} \mathrm{in}$. $(4 \cdot 4 \mathrm{~cm}$.). v.c.i. $15-16$ ohms. Gap flux 13,000 gauss. Total flux 87,500 maxwells. H.C. 15W. Fundamental resonance $35 \mathrm{c} / \mathrm{s}$. Price: £107s.

The Audiom 51 is available in two versions: Audiom 51 Bass-details as above, for use as bass unit in high fidelity systems. Audiom 51 Standard ( $50 \mathrm{c} / \mathrm{s}$ ) for PA, guitars and all arduous conditions.

Audiom 61 bass. 12 in. Paper cone. Voice coil ${ }^{13}$ in. ( 4.4 cm .). v.c.i. $15-16$ ohms. Gap flux 16,500 gauss. Total flux 185,000 maxwells. H.C. 20W. Fundamental resonance $35 \mathrm{c} / \mathrm{s}$. Price: $£ 15$.

The Audiom 61 is available in two versions: Audiom 61 Bass-details as above, for use as bass unit in high fidelity systems. Audiom 61 Standard ( $50 \mathrm{c} / \mathrm{s}$ ) for PA, guitars and all arduous conditions.

Axiom 201. 12 in. Twin diaphragm paper cone with pure plastic roll suspension. Voice coil $1 \frac{3}{4} \mathrm{in}$. ( $4 \cdot 4 \mathrm{~cm}$.) (aluminium). v.c.i. $15-16$ ohms. Gap flux 13,000 gauss. Total flux 87,500 maxwells, H.C. 15 W . F.R. $30 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Built-in mechanical crossover at $5,000 \mathrm{c} / \mathrm{s}$. Price: £118s. 9d.

Axiom 301. 12 in. twin diaphragm paper cone with pure plastic roll suspension. Voice coil $1_{4}^{3} \mathrm{in}$. ( $4 \cdot 4 \mathrm{~cm}$.) (aluminium). v.c.i. $15-16$ ohms. Gap flux 16,500 gauss. Total flux 185,000 maxwells. H.C. 20W. F.R. $30 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Built-in mechanical crossover of $5,000 \mathrm{c} / \mathrm{s}$. Price: $£ 168 \mathrm{~s}$.

Triaxiom 1220C. Three-way speaker assembly comprising 12 in . bass cone, a mid-range radiator, and a pressure driven horn-loaded H.F. unit with independent magnet system. Bass cone paper with pure plastic edge, mid-range cone bakelised paper, H.F. unit aluminium horn. Bass voice coil $1_{4}^{3} \mathrm{in}$. diameter copper wound, H.F. voice coil 1 in . diameter aluminium wound. Imp. 15 ohms. Main gap flux 16,500
gauss. Total main gap flux 185,000 maxwells. H.C. 20 W. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Built-in crossover at $2 \mathrm{Kc} / \mathrm{s}$ to mid-range and at $5 \mathrm{Kc} / \mathrm{s}$ to H.F. unit. Price: $£ 19$ 19s.

Audiom 81 bass. 15 in. Paper cone. Pure plastic roll suspension. Voice coil 3 in . ( 7.6 cm .). v.c.i. $15-16$ ohms. Gap flux 14,000 gauss. Total flux 269,000 maxwells. H.C. 25W. Fundamental resonance $30 \mathrm{c} / \mathrm{s}$. Price: $£ 256 \mathrm{~s}$. 3d.

The Audiom 81 is also available in $60 \mathrm{c} / \mathrm{s}$ version for special purposes.

The Audiom 81 bass (details above) with $30 \mathrm{c} / \mathrm{s}$ fundamental resonance is specially designed for use as the bass unit in a multiple system (with Midax and Trebax). In this case it must be mounted in the correct size of enclosure.

Audiom 91 bass. 18 in. Paper cone. Voice coil 3 in. diameter. Imp. 15-16 ohms. Gap flux 14,000 gauss. Total flux 269,000 maxwells. H.C. 50W. Fundamental resonance $30 \mathrm{c} / \mathrm{s}$. Price: £28 11s. 10d.

The Audiom 91 is also available with a resonance of $55 \mathrm{c} / \mathrm{s}$ (Standard version) for especially arduous conditions, PA, bass guitars, etc.

GRAMPIAN REPRODUCERS LTD., Hanworth Trading Estate, Middx. Tel.: Feltham 2657/8/9. Cables: Reamp, Feltham.

Grampian 1255/15. 12 in. Paper impregnated cone and surround. Voice coil $1 \frac{13}{4} \mathrm{in}$. Gap flux 14,500 gauss. Total flux 130,500 maxwells. H.C. 10W. v.c.i. 15 ohms. F.R. $35-15,000 \mathrm{c} / \mathrm{s}$. Price: £10 10s.
T.C.12. 12 in. twin cone. Paper cones with plastic treated surround. Voice coil $1_{4}^{3} \mathrm{in}$. diameter. Long type voice coil. Imp. 15 ohms. Gap flux 14,500 gauss. Total flux 130,500 maxwells. H.C. 10W. F.R. $35 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Price: £11.

ISOPHON-WERKE. Distributors: Britimpex Ltd., 16/22 Great Russell Street, London, W.C.1. Tel.: Museum 7600.

Orchester. 12 in. coaxial. Voice coil dia. $1 \frac{1}{2}$ in. (main unit), $\frac{1}{2} \mathrm{in}$. dia. (tweeter). Copper voice coils. Impedance adjustable 4-16 ohms. Gap flux (main unit) 10,500 gauss, (tweeter) 8,500 gauss. Total flux (main unit) 63,700 maxwells, (tweeter) 10,000 maxwells. H.C. 12.5W RMS. F.R. $25 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Price: £19 19s.


KEF B1814 (front view)


Lowther PM2 Mk. 1


James B. Lansing LE175DLH driver

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Philips 9710 M


Philips AD 5200 M


James B. Lansing LE20 2 in HF radiator

PH.2132.E. Full-range coaxial unit. $13 \times 8$ in. Paper cone and surround. 1 in . diameter bass voice coil, $\frac{1}{2}$ in. diameter tweeter voice coil. Impedance 4 ohms. Gap flux (bass): 10.500 gauss. (tweeter): 8.500 gauss. Total flux (bass): 81,500 maxwells, (treble) 10,000 maxwells. H.C. 8 W RMS. F.R. $35 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}$. Crossover $4 \mathrm{Kc} / \mathrm{s}$. Price: £7 17s. 6d.

JORDAN-WATTS. Distributors: Boosey and Hawkes (Sales) Ltd.. Sonorous Works, Deansbrook Road. Edgware, Middlesex. Tel.: Edgware 5581.

Jordan-Watts Modular. 6 in. square frame. Aluminium diaphragm with plastic surround. Voice coil $1 \frac{1}{2}$ in. Ceramic magnet. Impedance 3-5 ohms and $7 \frac{1}{2}-16$ ohms. H.C. 12W. F.R. 25 $\mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Price: $£ 10$ 10s.

KEF ELECTRONICS LTD., Tovil, Maidstone, Kent. Tel.: Maidstone 58361. Cables: Kef, Maidstone.

B139. $13 \times 9$ in. Exp. plastic and aluminium cone. Neoprene surround. Voice coil 2 in. (copper). v.c.i. $8-16$ ohms. Gap flux 10.500 gauss. Total flux 137.000 maxwells. H.C. 15W. F.R. $30 \mathrm{c} / \mathrm{s}-4 \mathrm{Kc} / \mathrm{s}$. r.c.f. $1,000 \mathrm{c} / \mathrm{s}$. Price: $£ 1110 \mathrm{~s}$.

T15 tweeter. $1 \frac{1}{2}$ in. Melinex dome. Centre pole. Alcomax magnet. Melinex surround. Voice coil $1 \frac{1}{2} \mathrm{in}$. (aluminium). v.c.i. 8-16 ohms. Gap flux 15,000 gauss. Total flux 53,500 maxwells. H.C. 15W. Treble only. F.R. $600-20,000 \mathrm{c} /$ s. r.c.f. $1,000 \mathrm{c} / \mathrm{s}$. Price: $£ 6$.

B1814. $18 \times 14$ in. Exp. plastic and aluminium cone. Plastic coated cloth surround. Voice coil 2 in. copper. v.c.i. 8-16 ohms. Gap flux 12,700 gauss. Total flux 165,000 maxwells. H.C. 25 W . F.R. $20 \mathrm{c} / \mathrm{s}-2 \mathrm{Kc} /$ s. r.c.f. $500 \mathrm{c} / \mathrm{s}$. Price: $£ 19$.

K2 Baffle. Two units. Baffle size $22 \frac{1}{2} \times 13 \frac{1}{2}$ in. Unit 1: $13 \times 9$ in.; plastic and aluminium cone; neoprene surround; voice coil 2 in . copper. Gap flux 10,500 gauss; total flux 137,000 maxwells. Unit 2: $1 \frac{1}{2}$ in. Melinex dome; Melinex surround; voice coil $1 \frac{1}{2} \mathrm{in}$. copper; gap flux 15,000 gauss; total flux 53,500 maxwells. Both units: v.c.i. 8-16 ohms; H.C. 15W. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. r.c.f. $1 \mathrm{Kc} / \mathrm{s}$. Price: £24.

KELLY. See Decca Special Products.

JAMES B. LANSING SOUND INC. Distributors: Ad. Auriema Ltd.. 125 Gunnersbury Avenue, London, W.3. Tel.: Acorn 8762.

LE20. 2 in. H.F. direct radiator. Moulded paper cone. Surround integral with diaphragm. Voice coil 5 in. v.c.i. 8-16 ohms. Gap flux 16,750 gauss. H.C. 25W music with network. Rec. crossover $2 \mathrm{Kc} / \mathrm{s}$ or higher. Price on application.

LE175DLH. H.F. driver. Horn type with acoustic lens. Aluminium diaphragm. Voice coil $1 \frac{3}{4}$ in. v.c.i. 8-16 ohms. Gap flux 16,500 gauss. H.C. 25 W music with network. Rec. crossover $500 \mathrm{c} / \mathrm{s}$. Price on application.
075. H.F. ring radiator-horn/driver. Annular aluminium diaphragm. Voice coil $1_{4}^{13} \mathrm{in}$. v.c.i. 8-16 ohms. Gap flux 18,000 gauss. H.C. 20W music with network. Frequency range: upper limit above normal audibility. Rec. crossover $2.5 \mathrm{Kc} / \mathrm{s}$ or higher. Price on application.

D123. 12 in. full range. Moulded paper cone. Treated paper bellows surround. Voice coil diameter 3 in . Voice coil edge-wound aluminium strip. v.c.i. 8-16 ohms. Gap flux 9,300 gauss. Total flux 160,000 maxwells. H.C. 20W RMS. Price on application.

LE14A. 14 in. L.F. driver. Moulded paper cone with "Lans-a-plas" coating. Moulded "Lans-a-loy" surround. Voice coil 4 in . Voice coil edge-wound copper strip. v.c.i. 8-16 ohms. Gap flux 11,000 gauss. Total flux 250,000 maxwells. H.C. 30W RMS. Rec. crossover $2 \mathrm{Kc} / \mathrm{s}$ or lower. Price on application.

D130F. Full-range 15 in . unit for electrical musical instruments. Moulded paper cone with treated paper roll surround. Voice coil diameter 4 in . Voice coil edge-wound aluminium strip. v.c.i. 8-16 ohms. Gap flux 9,500 gauss. Total flux 215,000 maxwells. H.C. 25 W RMS. Price: £61.

D130. 15 in. full-range unit. Moulded paper cone. Moulded paper corrugated surround. Voice coil diameter 4 in. Voice coil edge-wound aluminium strip. Impedance $8-16$ ohms. Gap flux 11,500 gauss. Total flux 260,000 maxwells. H.C. 25W. Price: £61.

130A. 15 in. low frequency unit. Moulded paper cone with integral corrugated surround. Voice coil diameter 4 in . Voice coil edge-wound copper strip. v.c.i. 8-16 ohms. Gap flux 11,500 gauss. Total flux 260.000 maxwells. H.C. 25W. Rec. crossover $1,200 \mathrm{c} / \mathrm{s}$. Price on application.


Jumes B. Lansing LE14A 14 in driver


James B. Lansing PR15 passive radiator


James B. Lansing D. 123


James B. Lansing LE15A 15 in woof er


James B. Lansing D130F full-range 15 in uniı


James B. Lansing 130A LF driver

PR15. 15 in. passive radiator. Moulded paper cone. Moulded "Lans-a-loy" surround. No voice coil, magnet or wiring. For use in conjunction with LE15A to double effective bass radiating area. Price on application.

LE15A. 15 in. L.F. unit. Moulded paper cone. Moulded "Lans-a-loy" surround. Voice coil 4 in. diameter. Voice coil edge-wound copper strip. v.c.i. $8-16$ ohms. H.C. 60W RMS. Rec. crossover $500 \mathrm{c} / \mathrm{s}$. Price on application.

LOWTHER MANUFACTURING CO., Lowther House, St. Mark's Road, Bromley, Kent. Tel.: Ravensbourne 5225. Cables: Lowther, Bromley.
P.M.6. 6 in. Selected paper cone. Plastic surround. Voice coil 39 mm . Gap flux 17,500 gauss. Total flux 196,000 maxwells. H.C. 6W; 20W. programme material. v.c.i. 16 ohms. F.R. $30-18,000 \mathrm{c} / \mathrm{s}$. Price: $£ 1818 \mathrm{~s}$.
P.M.7. 6 in. Selected paper cone. Plastic surround. Voice coil 39 mm . Gap flux 19,650 gauss. Total flux 250,000 maxwells. H.C. 6W ; 20W programme material. v.c.i. 16 ohms. F.R. $30 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s}$. Price: $£ 28$.
P.M. 2 Mk. I. 6 in. Selected paper cone. Plastic surround. Voice coil 39 mm . Gap flux 21,000 lines per sq. cm. Total flux 281,000 maxwells. H.C. 6 W ; 20 W programme material. v.c.i. 15 ohms. F.R. $30-20,000 \mathrm{c} / \mathrm{s}$. Price: $£ 30$.
P.M. 2 Mk. II. 6 in. Selected paper cone. Plastic foam șurround. Voice coil 39 mm . Gap flux 23,000 gauss. Total flux 350,000 maxwells. H.C. $6 \mathrm{~W} ; 20 \mathrm{~W}$ programme material. v.c.i. 15 ohms. F.R. 25-22,000 c/s. Price: $£ 40$.
P.M. 2 Mk. III. Details as P.M. 2 Mk. I but with special bracket for securing within AcoustaTwin Enclosure.
P.M.3. 6 in. Selected paper cone. Plastic surround. Voice coil 39 mm . Gap flux 22,000 gauss. Total flux 307,750 maxwells. H.C. 6 W ; 20W programme material, v.c.i. 15 ohms. F.R. 20$20,000 \mathrm{c} / \mathrm{s}$. Not sold separately from enclosure type T.P.I.
P.M.4. 6 in. Selected paper cone. Plastic surround. Voice coil 37 mm . Gap flux 24,000 gauss. Total flux 385,000 maxwells. H.C. 6W ; 20W programme material. v.c.i. 16 ohms. F.R. 25$24,000 \mathrm{c} / \mathrm{s}$. Price: $£ 50$.

PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Avenue, London, W.C.2. Tel.: Gerrard 7777. Cables: Phillamps, London.

9710M. 8 in. Dual cone. Paper corrugated surround. Voice coil 1 in . Gap flux 8,000 gauss. Total flux 97,600 maxwells. H.C. 10W RMS. v.c.i. 7 ohms. F.R. $40-19,000 \mathrm{c} / \mathrm{s}$. Price: $£ 4$ 19s. 6d. (U.K. purchase tax 16s.).

AD5200M. 12 in. Dual cone. Paper corrugated surround. Voice coil $1 \frac{1}{4}$ in. Gap flux 11,000 gauss. Total flux 134,000 maxwells. H.C. 20W. v.c.i. 7 ohms. F.R. $35-15,000 \mathrm{c} / \mathrm{s}$. Price: $£ 10$ 10s.

PIONEER. Distributors: Swisstone Ltd., 26 Leigh Place, Cobham, Surrey. Tel.: Cobham 2853.

AS-303A. Kit of speakers and crossover networks for assembling bookshelf speaker system. Cabinet materials not included. Kit comprises: 12 in. bass unit, 5 in. mid-range unit, horn tweeter, crossover network, level control, sound absorbing material, terminal strip, wire and instructions. Specification when built: F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$, impedance 16 ohms, crossovers $800 \mathrm{c} / \mathrm{s}$ and $6 \mathrm{Kc} / \mathrm{s}$, H.C. 20W RMS. Size: $26 \times$ $15 \frac{3}{8} \times 11 \frac{3}{4}$ in. Price: $£ 3918 \mathrm{~s}$.

AS-305A. Kit of speakers and crossover networks for assembling hi-fi speaker assembly. Cabinet materials not included. Kit comprises: 12 in . bass unit, 5 in . mid-range unit, two cone tweeters, one horn tweeter, crossover network with level control, connecting cables, acoustic padding, mounting hardware and instructions. Specification when built: F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$, crossovers $500 \mathrm{c} / \mathrm{s}$ and $3.5 \mathrm{Kc} / \mathrm{s}$, impedance 8 ohms, H.C. 50 W . Size: $26 \times 15 \frac{3}{8} \times 11 \frac{3}{4} \mathrm{in}$. Price: $£ 53$ 11s.

## REPRODUCERS AND AMPLIFIERS LTD.,

 Frederick Street, Wolverhampton. Tel.: Wolverhampton 22241 (5 lines).R and A $780 \mathbf{M k}$. V. 8 in. dual cone unit. Impedance 15 ohms ( 3 or 8 ohms to order). Gap flux 12,000 gauss. Total flux 55,000 maxwells. Bass resonance $60 \mathrm{c} / \mathrm{s}$. H.C. 6W RMS. Integral mechanical crossover. Rec. enclosures: Design Furniture GD8 or Record Housing Viking. Price: £3 18s. 6d. including U.K. purchase tax, packing and postage.


James B. Lansing D130 15 in full-range unit


James B. Lansing 075 HF ring radiator


Vitavox DU 121


Tripletone Twin cone 8 or 10 in


Vitavox $S 2$


Tannoy Monitor "Twelve"

R and A 7100 Mk . V. 10 in. dual cone unit. Impedance 15 ohms ( 3 or 8 ohms to order). Gap flux 12,000 gauss. Total flux 55,000 maxwells. Bass resonance $55 \mathrm{c} / \mathrm{s}$. H.C. 8 W RMS. Integral mechanical crossover. Rec. enclosures: Design Furniture GD10 or Record Housing Strauss. Price: $£ 4$ 13s. including U.K. purchase tax, packing and postage.

R and A 7120 Mk. V. 12 in. unit. Dual cone system with integral mechanical crossover. Gap flux 12,000 gauss. Total flux 55,000 maxwells. Bass resonance $50 \mathrm{c} / \mathrm{s}$. H.C. 10W RMS. Rec. enclosure: Design Furniture GD12. Price: £4 18s. 6d. including packing and postage.

R and A 1251. 12 in. dual unit with crossover. Price: $£ 910$ s. including postage and packing.

R and A 1262. 12 in. dual unit with built-in crossover. Price: $£ 65$ s. including postage and packing.
All R and A speaker units are available direct from the makers at the prices quoted. Specification sheets and enclosure construction data on request.

STENTORIAN. See Whiteley Electrical.

TANNOY PRODUCTS LTD., West Norwood, London, S.E.27. Tel.: Gipsy Hill 1131. Cables: Tannoy, London.

Direct radiator. 12 in. Moulded fibre cone. Plastic treated surround. Voice coil 2 in. Gap flux 14,000 gauss. H.C. 15W. v.c.i. 20 ohms. F.R. $40-16,000 \mathrm{c} / \mathrm{s}$. Price: $£ 1414 \mathrm{~s}$.

III LZ. 12 in. dual concentric. Moulded fibre cone. Plastic impregnated surround. Gap flux (L.F.) 10,000 (H.F.) 15,000 gauss. H.C. 10W. F.R. $23-20,000 \mathrm{c} / \mathrm{s}$. r.c.f. (supplied) $1,300 \mathrm{c} / \mathrm{s}$. v.c.i. 15 ohms. Price: $£ 22$ 10s.

Monitor "Twelve". 12 in. Moulded fibre cone. Plastic treated surround. Voice coils (H.F. and L.F.) 2 in. Gap flux (L.F.) 11,500 (H.F.) 15,000 gauss. H.C. 30W. F.R. 25-20,000 c/s. r.c.f. 1,700 $\mathrm{c} / \mathrm{s}$ (supplied). Price: $£ 30 \mathrm{l} 5 \mathrm{~s}$.

Monitor "Fifteen". 15 in. Moulded fibre cone. Plastic treated surround. Voice coils (H.F. and L.F.) 2 in. Gap flux (L.F.) 13,500 (H.F.) 18,000 gauss. H.C. 50W. F.R. 23-20,000 c/s. r.c.f. 1,000 c/s (supplied). Price: £37 10s.

Director radiator for electronic instruments. 15 in . Moulded fibre cone. Plastic treated surround. Voice coil 2 in. v.c.i. $7 \cdot 5$ ohms. Gap flux 14,000 gauss. H.C. 40 W. F.R. $25 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s}$. Price: £22.

TRIPLETONE MANUFACTURING CO. LTD., 241 a The Broadway, Wimbledon, S.W.19. Tel.: Liberty 1189.

Tripletone 8 in. Full-range hi-fi unit. 8 in. Impedance: 2-3 ohms or 15 ohms. Flux density 12,000 lines/sq. cm. Bass resonance $60 \mathrm{c} / \mathrm{s}$. H.C. 6W RMS. F.R. $30 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}$. Price: $£ 47 \mathrm{~s} .6 \mathrm{~d}$. including purchase tax.

Tripletone 10 in. Full-range hi-fi unit. 10 in. Impedance: $2-3$ ohms or 15 ohms. Flux density 12,000 lines/sq. cm. Bass resonance $55 \mathrm{c} / \mathrm{s}$. H.C. 8W RMS. F.R. $30 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}$. Price: $£ 417 \mathrm{~s} .6 \mathrm{~d}$. including purchase tax.

VITAVOX LTD., Westmoreland Road, London, N.W.9. Tel.: Colindale 8671. Cables: Vitavox, London, N.W.9.

Duplex coaxial DU121. 12 in. paper cone. Plastic treated paper surround. 3 in . polyester film cone and surround. Voice coil (L.F.) 1.78 in . (H.F.) 0.65 in. Gap flux (L.F.) 16,000 gauss, (H.F.) 12,000 gauss. Total flux (L.F.) 180,000 maxwells, (H.F.) 15,000 maxwells. H.C. 15W. v.c.i. 15 ohms. F.R. $30 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$ nominal. Price: £19 19s.

AK123 Heavy Duty. 12 in. paper cone. Paper surround. Voice coil 1.78 in . Gap flux 16,000 gauss. Total flux 180,000 maxwells. H.C. 20W. v.c.i. 15 ohms. F.R. $50 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}$. Price: $£ 1410 \mathrm{~s}$.

AK124. 12 in. paper cone. Paper surround. Voice coil 1.78 in. Gap flux 16,000 gauss. Total flux 180,000 maxwells. H.C. 15 W. v.c.i. 15 ohms. F.R. $30 \mathrm{c} / \mathrm{s}-13 \mathrm{Kc} / \mathrm{s}$. Price: $£ 1410 \mathrm{~s}$.

K15/40. 15 in. paper cone. Paper surround. Voice coil $2 \frac{1}{4} \mathrm{in}$. Gap flux 14,000 gauss. Total flux 260,000 maxwells. H.C. 40 W nominal. F.R. $50 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}$ nominal. (H.C. and F.R. determined by enclosure). v.c.i. 15 ohms. Price: £265s.

AK150. 15 in. paper cone. Treated paper surround. Bass resonance $30-35 \mathrm{c} / \mathrm{s}$. Voice coil $2 \cdot 25$ in. Gap flux 14,000 gauss. Total flux 260,000 maxwells. H.C. 25 W nominal. F.R.


Wharfedale Super $12 / R S / D D$


Whiteley T10 HF unit


Vitavox K15/40


Whiteley T 359 HF unit


Vitavox AK124
Wharfedale Super 3 HF unit
$30 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. nominal. (H.C. and F.R. determined by enclosure). v.c.i. 15 ohms. Price: £275s.
AK151. Driver for bass horn of dual channel system. 15 in. paper cone, paper surround. Bass resonance $40-50 \mathrm{c} / \mathrm{s}$. Voice coil $2 \frac{1}{4} \mathrm{in}$. Gap flux 14,000 gauss. Total flux 260,000 maxwells. D.C. resistance of voice coil $5 \cdot 5-6 \cdot 5 \mathrm{ohms}$. H.C. and F.R. determined by associated horn characteristics. Price: £275s.

AK152. Driver for bass horn of dual channel system. Treated paper surround. Bass resonance $30-35 \mathrm{c} / \mathrm{s}$. Other details as for AK151. Price: $£ 285$ s.

S2 HF pressure unit. Diaphragm pressureformed from lightweight aluminium alloy. Voice coil 3 in. diameter. Gap flux 16,000 gauss. Total flux 150,000 maxwells. H.C. above $200 \mathrm{c} / \mathrm{s} 10 \mathrm{~W}$. Nominal F.R. $200 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Rec. crossover $500 \mathrm{c} / \mathrm{s}$. Price: $£ 35$.

HF Dispersive Horn. Designed for use with S2 pressure unit. Cast in aluminium alloy. Nonresonant. Cut-off frequency $300 \mathrm{c} / \mathrm{s}$. Price: $£ 18$.

WHARFEDALE WIRELESS WORKS LTD., Idle, Bradford. Tel.: Idle 1235-6. Cables: Wharfdel, Idle, Bradford.

Super 3. 3 in. Bakelised paper cone with integral dome. Foam plastic surround. Voice coil 1 in. (aluminium). Gap flux 14,500 gauss. Total flux 60,000 maxwells. H.C. 6 W above $1,000 \mathrm{c} / \mathrm{s}$. v.c.i. $2-3$ or $10-15$ ohms. F.R. $1,000-$ $20,000 \mathrm{c} / \mathrm{s}$ r.c.f. $4,000 \mathrm{c} / \mathrm{s}$. Price: £6 2 s . 6 d . including purchase tax.

Super 5.5 in. Bakelised paper cone. Voice coil 1 in. (aluminium). Gap flux 14,500 gauss. Total flux 60,000 maxwells. H.C. 6 W RMS. F.R. $400 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}$. v.c.i. $10-15$ ohms. Price: £6 8s. 4d. including purchase tax.

Super 8/RS/DD. 8 in. Double diaphragm paper cone. Roll surround. Voice coil 1 in. (aluminium). v.c.i. $10-15$ ohms. Gap flux 14,500 gauss. Total flux 60,000 maxwells. H.C. 6 W , 12 W peak. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Price: $£ 7$ including purchase tax.

Super 10/RS/DD. 10 in. Paper (double diaphragm) cone. Roll surround. Voice coil 1 in . Gap flux 16,000 gauss. Total flux 85,000 maxwells. H.C. 10W. v.c.i. $12-15$ ohms. F.R. 30$20,000 \mathrm{c} / \mathrm{s}$. Price: $£ 1113 \mathrm{~s}$. 4d. including purchase tax.

Super 12/RS/DD. 12 in. Double diaphragm assembly. Roll surround. Voice coil $1 \frac{3}{4}$ in. (aluminium). Gap flux 17,000 gauss. Total flux 190,000 maxwells. H.C. 20W. v.c.i. $12-15$ ohms. F.R. 25-20,000 c/s. Price: $£ 17$ 10s.

W12/FRS. 12 in. unit with Flexiprene roll surround. v.c.i. 15 ohms. Voice $1_{4}^{3} \mathrm{in}$. Gap flux 14,000 gauss. Total flux 156,000 maxwells. H.C. 15W RMS. F.R. $30 \mathrm{c} / \mathrm{s}-4 \mathrm{Kc} / \mathrm{s}$. Bass resonance $23-28 \mathrm{c} / \mathrm{s}$. Weight: 12 lb . Price: £11 15s.

W15/RS. 15 in. Paper cone. Roll surround. Voice coil 2 in. Gap flux 13,500 gauss. Total flux 180,000 maxwells. H.C. 20W. v.c.i. $12-15$ ohms. F.R. $25-2,000 \mathrm{c} /$ s. r.c.f. $800 \mathrm{c} / \mathrm{s}$. Price: $£ 1815 \mathrm{~s}$.

PST/4. 4 in. Paper and polystyrene cone. Cloth surround. Voice coil $\frac{3}{4}$ in. v.c.i. $10-15$ ohms. Gap flux 11,500 gauss. Total flux 28,800 maxwells. H.C. 5W, 10W peak. F.R. $300 \mathrm{c} / \mathrm{s}-$ $15 \mathrm{Kc} / \mathrm{s}$. r.c.f. $300 \mathrm{c} / \mathrm{s}$. Price: $£ 3$ 12s. 11d. including purchase tax.

8 in. Bronze/RS/DD. 8 in. full range unit. Paper double diaphragm cone. Fabric roll surround. Voice coil 1 in. aluminium. v.c.i. $12-15$ ohms. Gap flux 10,500 gauss. Total flux 41,500 maxwells. H.C. 4 W. F.R. $50 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Price: $£ 41 \mathrm{~s}$. 8 d . including purchase tax.

10 in. Bronze/RS/DD. 10 in. full range unit. Paper double diaphragm cone. Fabric roll surround. Voice coil 1 in . aluminium. v.c.i. 12-15 ohms. Gap flux 10,500 gauss. Total flux 41,500 maxwells. H.C. $6 \mathrm{~W} . \mathrm{F}$. R. $35 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Price: $£ 55$ s. including purchase tax.

Golden 10/RS/DD. 10 in. Double diaphragm assembly. Roll surround. Voice coil 1 in . Gap flux 14,500 gauss. Total flux 60,000 maxwells. H.C. 8 W. v.c.i. $12-15$ ohms. F.R. $30-20,000 \mathrm{c} / \mathrm{s}$. Price: $£ 815 \mathrm{~s}$. including purchase tax.

RS/12/DD. 12 in. Paper cone. Roll surround. Voice coil $1_{4}^{3} \mathrm{in}$. (aluminium). v.c.i. 15 ohms. Gap flux 14,000 gauss. Total flux 156,000 maxwells. H.C. $15 \mathrm{~W}, 30 \mathrm{~W}$ peak. F.R. $25 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}$. Price: $£ 12$.

WHITELEY ELECTRICAL RADIO CO. LTD., Victoria Street, Mansfield, Notts. Tel.: Mansfield 1762-5. Cables: Whitebon, Mansfield.

Stentorian HF.812. 8 in. Composite (paper and cambric) cone. Cambric surround. Voice coil 1 in . Gap flux 12,000 gauss. Total flux 47,400 maxwells. H.C. 5W. v.c.i. universal (3,
7.5 and 15 ohms). F.R. $50-12,000 \mathrm{c} / \mathrm{s}$. Price: £3 19s. 4d. (U.K. purchase tax 13s. 5d.).
H.F.816. 8 in. Composite.(paper and cambric) cone. Cambric surround Voice coil 1 in . Gap flux 16,000 gauss. Total flux 63,000 maxwells. H.C. 6 W . v.c.i. universal $3,7.5$ and 15 ohms. F.R. $50-14,000 \mathrm{c} / \mathrm{s}$. Price: $£ 6 \mathrm{10s}$. 6d. (U.K. purchase tax $£ 12 \mathrm{~s}$.).
H.F.817. 8 in. Paper cone. Cambric surround. Voice coil 1 in . Gap flux 17,000 gauss. Total flux


Whiteley 15 in. concentric duplex

67,000 maxwells. H.C. 10 W in cabinet. v.c.i. 15 ohms. F.R. $60-22,000 \mathrm{c} / \mathrm{s}$. Price: £10 16s. 1d. (U.K. purchase tax $£ 116 \mathrm{~s} .5 \mathrm{~d}$.):
H.F.912. 9 in. Composite (paper and cambric) cone. Cambric surround. Voice coil 1 in . Gap flux 12,000 gauss. Total flux 47,400 maxwells. H.C. 7W. v.c.i. universal ( $3,7 \cdot 5$ and 15 ohms). F.R. $40-13,000 \mathrm{c} / \mathrm{s}$. Price: $£ 43 \mathrm{~s}$. 8d. (U.K. purchase tax 14s. 1d.).
H.F.916. 9 in. Composite (paper and cambric) cone. Voice coil 1 in . Gap flux 16,000 gauss. Total flux 63,000 maxwells. H.C. 7 W. v.c.i. universal ( $3,7.5$ and 15 ohms). F.R. $40 \mathrm{c} / \mathrm{s}-$ $14 \mathrm{Kc} / \mathrm{s}$. Bass resonance $45 \mathrm{c} / \mathrm{s}$. Price: $£ 6 \mathrm{l} 5 \mathrm{~s}$. (U.K. purchase tax $£ 12 \mathrm{~s}$. 9 d .).
H.F.1012. 10 in. Composite (paper and cambric) cone. Cambric surround. Voice coil 1 in . Gap flux 12,000 gauss. Total flux 47,400 maxwells. H.C. 10 W . v.c.i. universal $3,7.5$ and 15 ohms. F.R. $30-14,000 \mathrm{c} / \mathrm{s}$. Price: $£ 415 \mathrm{~s}$. 5d. (U.K. purchase tax 16s. 1d.).
H.F.1016. 10 in. Composite (paper and cambric) cone. Cambric surround. Voice coil 1 in . Gap flux 16,000 gauss. Total flux 63,000 maxwells. H.C. 10 W. v.c.i. $3,7.5$ and 15 ohms. F.R. 30-15,000 c/s. Price: $£ 7$ 12s. 4d. (U.K. purchase tax $£ 15 \mathrm{~s} .8 \mathrm{~d}$.).
H.F. 1016 Major. 10 in. Paper cone. Cambric surround. Voice coil 1 in. (aluminium). v.c.i. 15 ohms. Gap flux 16,000 gauss. Total flux 64,000 maxwells. H.C. 10W. F.R. $60 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$ or $30 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$ (depending upon cabinet). Price: £9 15s. 4d. (U.K. purchase tax £1 12s. 11d.).


Isophon-Werke G. 3037

10 in. Concentric Duplex. Composite (paper and cambric) cone. Cambric surround. Voice coil 1 in. Gap flux (L.F.) 12,000 (H.F.) 13,000 gauss. Total flux 47,400 maxwells. H.C. 10W. v.c.i. 15 ohms. F.R. $30-14,000 \mathrm{c} /$ s. r.c.f. 3,000 $\mathrm{c} / \mathrm{s}$ built-in. Price: $£ 12$ 16s. 9d. (U.K. purchase tax £2 3s. 3d.).
H.F.1214. 12 in. Composite (paper and cambric) cone. Cambric surround. Voice coil $1 \cdot 5 \mathrm{in}$. Gap flux 14,000 gauss. Total flux 106,000 maxwells. H.C. 15 W. v.c.i. 15 ohms. F.R. 25$14,000 \mathrm{c} / \mathrm{s}$. Price: $£ 13$ 1s.
H.F.1216. Composite (paper and cambric) cone. Cambric surround. Voice coil $1 \frac{1}{2} \mathrm{in}$. Gap flux 16,000 gauss. H.C. 15W. F.R. 20-16,000 c/s. Price: $£ 200 \mathrm{~s} .3 \mathrm{~d}$.

12 in. Concentric Duplex. Composite (paper and cambric) cone. Cambric surround. Seriesgap Alcomax III magnet. L.F. gap flux 14,000 gauss. H.F. gap flux 17,000 gauss. Total flux 220,000 lines. v.c.i. 15 ohms. Built-in cross-over network. F.R. $25 \mathrm{c} / \mathrm{s}-17,000 \mathrm{c} / \mathrm{s}$. Bass resonance $35 \mathrm{c} / \mathrm{s}$. H.C. 15W. Pressure die-cast Mazak chassis. H.F. metal diaphragm protected and loaded by central pressure horn. Price: £34 18s. 9d.

15 in. Concentric Duplex. Composite (paper and cambric) cone. Cambric surround. Voice coil 2 in. Gap flux (L.F.) 14,000 (H.F.) 17,000 gauss. Total flux 350,000 maxwells. H.C. 25 W . v.c.i. 15 ohms. F.R. $20-18,000 \mathrm{c} / \mathrm{s}$ r.c.f. $3,000 \mathrm{c} / \mathrm{s}$ built-in. Price: $£ 57$ 3s. 6d.
H.F.1514. 15 in. Composite (paper and cambric) cone. Cambric surround. Voice coil 2 in . Gap flux 14,000 gauss. Total flux 178,000 maxwells. H.C. 25 W. v.c.i. 15 ohms. F.R. 25$5,000 \mathrm{c} /$ s. r.c.f. $1,500-3,000 \mathrm{c} / \mathrm{s}$. Price: $£ 33$ 0s. 6 d .


Acustica-Electronica 5HRM
T. 10 Tweeter. Aluminium cone and surround. Voice coil 1 in . Gap flux 14,000 gauss. Total flux 44,000 maxwells. H.C. 5 W. v.c.i. 15 ohms. F.R. $2,000-14,000 \mathrm{c} / \mathrm{s}$. r.c.f. $3,000 \mathrm{c} / \mathrm{s}$. Price: £5 12s. 3d.
T. 12 Tweeter. Aluminium cone and surround. Voice coil 1.5 in . Gap flux 17,000 gauss. Total flux 110,000 maxwells. H.C. 12 W . v.c.i. 15 ohms. F.R. $2,000-17,000 \mathrm{c} /$ s. r.c.f. $3,000 \mathrm{c} / \mathrm{s}$. Price: £16 16 s.
T.816. 8 in. Paper cone and surround. Voice coil 1 in . Gap flux 16,000 gauss. Total flux 63,000 maxwells. H.C. 15 W. v.c.i. 15 ohms. F.R. 1,500 to $17,000 \mathrm{c} / \mathrm{s}$. r.c.f. $1,500 \mathrm{c} / \mathrm{s}$. Price: £6 3s. 8d.
T.359. $3 \frac{1}{2}$ in. Paper cone and surround. Voice coil 0.625 in . Gap flux 9,000 gauss. Total flux 14,900 maxwells. H.C. 15 W with crossover. v.c.i. 5 or 15 ohms. F.R. $3,000-17,000 \mathrm{c} /$ s. r.c.f. 3,000 c/s. Price: £1 13s. 4d. (U.K. purchase tax 5s. 8d.).
L. G. WOOLLETT \& COMPANY LTD., 21 Anerley Station Road, London, S.E.20. Tel.: Sydenham 9003.

12 in. L.R. Low resonance 12 in . dynamic unit. Paper cone with foam surround. H.C. 15W RMS. F.R. $20 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. Special unit for use with Woollett electrostatic treble speakers. Price: $£ 12$ 12s.

Type C. Constant charge push-pull electrostatic. Imp. 15 ohms. H.C. 15W RMS. F.R. $1.5 \mathrm{Kc} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Integral crossover. Attenuator, mains polariser. Rear sealed for mounting in bass cabinet behind horizontal $9 \times 6 \frac{1}{2} \mathrm{in}$. hole. Price: £1414s.


Wharfedale Super $8 / R S / D D$

## DIRECTORY OF SPEAKER ACCESSORIES

RICHARD ALLAN RADIO LTD., Bradford Road, Gomersal, Near Leeds, Yorkshire. Tel.: Cleckheaton 2442/3. Cables: Acoustics, Bradford.

CN. 54 Crossover Unit. Two-way quarter section. Recommended for use with CR5 bass unit and 460T tweeter. Crossover frequency $5 \mathrm{Kc} / \mathrm{s} .8$ or 15 ohms. Price: $£ 2$.

CN. 104 Crossover Unit. A two-way halfsection parallel network. Crossover frequency $5,000 \mathrm{c} / \mathrm{s}$. All terminations 15 ohms . Price: £2 10s.

CN. 1284 Crossover Unit. A three-way crossover with main crossover operating from half wave parallel network and subsidiary crossover capacity fed. Crossover frequencies 1,100 and $5,000 \mathrm{c} / \mathrm{s}$. All terminations 15 ohms. Price: £ 315 s.

DECCA SPECIAL PRODUCTS, Decca Radio and Television Division of The Decca Record Co. Ltd., Ingate Place, Queenstown Road, London, S.W.8. Tel.: Macaulay 6677.

Kelly Crossover CO/1/15. Designed to feed power at correct levels and frequencies to the Kelly L.F. drive units and Mk. II H.F. ribbon. Crossover frequency $2.5 \mathrm{Kc} / \mathrm{s}$. Low pass slope 12 dBs per octave. High pass slope initially 12 dBs per octave and final slope 40 dBs per octave. Attenuation to frequencies below $700 \mathrm{c} / \mathrm{s}$ greater than 40 dB . Imp. 15 ohms. Price: $£ 33 \mathrm{~s}$.

Kelly Acoustic Lens. For use with Kelly ribbon H.F. speaker Mk. II to disperse high frequencies so that a stable stereo image is obtained over a wider area than normal. Up to $15 \mathrm{Kc} / \mathrm{s}$ the sound pattern is constant to within 3 dBs over a 150 degree angle. From $15 \mathrm{Kc} / \mathrm{s}$ to $20 \mathrm{Kc} / \mathrm{s}$ this dispersion is maintained over an angle of 135 degrees. Price: $£ 33 \mathrm{~s}$.

EAGLE PRODUCTS. Distributors: B. Adler \& Sons (Radio) Ltd., 32a Coptic Street, London, W.C.1. Tel.: Museum 9606/7. Cables: Reldab, London.

CN3. Universal three-way crossover network. Provides six combinations of crossover fre-
quencies and incorporates brilliance and presence controls. Two-way with 2,500 or 5,000 ; three-way with 350 and 5,$000 ; 350$ and 2,500 ; 700 and 2,500; 700 and 5,000. Price: £5 10s. 6d.

SS.70.S Stereo Selector Switch. Seven-position stereo switch for selecting up to seven different combinations of hi-fi speaker systems. Rated up to 60W. In metal wall mounting box. Gold finish with ivory selector knob. Price: £1 10s.

CN. 23 and CN.216. Two-way speaker crossover networks. Cross-over frequency $3 \mathrm{Kc} / \mathrm{s}$. CN. 233 ohms, CN. 21616 ohms. Price: 15s.

Prices quoted for Eagle products are approximate.

EMI SOUND PRODUCTS LTD., Hayes, Middlesex. Tel.: Hayes 3888. Cables: Emisound, London.

Crossover network 99970B. Combines any 3 ohm L.F. driver with two 15 ohm H.F. tweeters in parallel. Price on application.

Crossover network 99970F. Combines any 15 ohm L.F. driver with two 8 ohm H.F. tweeters in series. Price on application.

Networks available for áll other speaker combinations. Separate chokes and capacitors for crossover networks. Prices and details on application.


Goodmans XO/950

FANE ACOUSTICS LTD., Hick Lane, Batley, Yorks. Tel.: Batley 2114. Cables: Fane, Batley.

Model 2X1. Crossover unit for two-speaker system. Crossover frequency $2 \mathrm{Kc} / \mathrm{s} .15$ ohms. Cut-off $6 \mathrm{~dB} /$ octave. Size: $5 \frac{5}{8} \times 3 \frac{1}{4} \times 1 \frac{1}{2} \mathrm{in}$. Price: £3.

Model 3X1. Crossover unit for three-speaker system. Crossover frequencies $800 \mathrm{c} / \mathrm{s}$ and $5 \mathrm{Kc} / \mathrm{s}$. Impedance 15 ohms. Cut-off $6 \mathrm{~dB} /$ octave. Size: $5 \frac{5}{8} \times 3 \frac{1}{4} \times 2 \frac{1}{2}$ in. Price: $£ 4$.

Model 3X2. Crossover for three-speaker system. Similar to one used in Ionophane 602 and 603. Crossover frequencies $800 \mathrm{c} / \mathrm{s}$ and $3.5 \mathrm{Kc} / \mathrm{s}$. Matching impedance 15 ohms . Cutoff 12 dB /octave. Size: $6 \times 5 \frac{1}{4} \times 2 \frac{3}{4}$ in. Price: $£ 5$ 5s.

GOODMANS INDUSTRIES LTD., Axiom Works, Wembley, Middx. Tel.: Wembley 1200. Cables: Goodaxiom, Wembley.

XO/5000-Crossover Unit. A two-way halfsection crossover network, operating at 5,000 $\mathrm{c} / \mathrm{s}$. All termination 15 ohms. Price: £2 2s. 2 d .

XO/950-Crossover Unit. A two-way halfsection, crossover network, operating at 950 $\mathrm{c} / \mathrm{s}$. All terminations 15 ohms. Price: $£ 517 \mathrm{~s}$. 2 d .

X0/950/5000. Crossover Network. A multiple crossover network comprising four half-section L.C. filters. Crossover frequencies are $950 \mathrm{c} / \mathrm{s}$ and $5,000 \mathrm{c} / \mathrm{s}$. All attenuation rates are $12 \mathrm{~dB} /$ octave. All terminations 15 ohms. Price: £7 14s. 8d.


Wharfedale WMT2 isolating andmatching transformer

ARU Units. These units combine both reflex port and acoustic resistance in one complete unit. The port area and resistance are calculated to suit a particular cabinet volume and speaker cone resonance, thus being usable with a variety of cabinet designs and driving units. Price: £3 11s. 3d.

KELLY. See Decca Special Products.

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STENTORIAN. See Whiteley Electrical.

VITAVOX LTD., Westmoreland Road, London, N.W.9. Tel.: Colindale 8671. Cables: Vitavox, London, N.W.9.

CN232 Crossover. Half section. Crossover $500 \mathrm{c} / \mathrm{s}$. Attenuation $12 \mathrm{~dB} /$ octave. All terminations 15 ohms. Balance control giving $0-8 \mathrm{~dB}$ H.F. attenuation incorporated. Price: $£ 10$.

CN233 Crossover. Half section. Crossover $1 \mathrm{Kc} / \mathrm{s}$. Attenuation $12 \mathrm{~dB} /$ octave. All terminations 15 ohms. Balance control giving $0-8 \mathrm{~dB}$ H.F. attenuation incorporated. Price: $£ 910 \mathrm{~s}$.

WHARFEDALE Wireless Works Ltd., Idle, Bradford, Yorks. Tel.: Idle 1235-6. Cables: Wharfdel, Idle, Bradford.

QS/800. Crossover frequency $800 \mathrm{c} / \mathrm{s}$. $\frac{1}{4}$-section. Rate of attenuation 6 dB per octave. L.S. matching $7-16$ ohms. Size: $5 \times 4 \times 2 \frac{1}{4} \mathrm{in}$. Weight: 15 oz . Price: $£ 35 \mathrm{~s}$.


HS/400/3. Crossover frequency $400 \mathrm{c} / \mathrm{s}$ and $5,000 \mathrm{c} / \mathrm{s}$. $\frac{1}{2}$-section 3-way. Rate of attenuation 12 dB per octave. L.S. matching 7-16 ohms. Size: $7 \times 5 \times 3 \mathrm{in}$. Weight: 2 lbs. Price: $£ 610 \mathrm{~s}$.

QS.3000. Crossover frequency $3 \mathrm{Kc} / \mathrm{s}$. $\frac{1}{4}$-section. 15 ohms only. Rate of attenuation about 6 dB per octave. Price: $£ 35 \mathrm{~s}$.

WMT1 Matching Transformer. Auto transformer for matching $10-16$ ohms or $7-9$ ohms speakers to sets with $2-5$ ohms output or vice versa. Response $20-15,000 \mathrm{c} / \mathrm{s} \pm 1 \mathrm{~dB}$. Handling capacity 15 W . Can also match speakers of different imps. to crossover unit in 2 or 3 speaker systems. Size: $2 \frac{7}{8} \times 2 \frac{3}{4} \times 2 \frac{3}{4} \mathrm{in}$. Weight: 121 $\frac{1}{2}$ ozs. Price: 13s. 6d.

WMT2 Isolating and Matching Transformer. Similar to WMT1, but having separate windings with heavy insulation. Response $20 \mathrm{c} / \mathrm{s}-$ $15 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. H.C. 15W. Size: $2 \frac{1}{4} \mathrm{in}$. high, $2 \frac{7}{8}$ in. wide. Weight: $13 \frac{3}{4}$ oz. Price: 13s. 6d.

WHITELEY ELECTRICAL RADIO CO. LTD., Victoria Street, Mansfield, Notts. Tel.: Mansfield 1762-5. Cables: Whitebon, Mansfield.

CX500 Crossover Unit. A two-way halfsection crossover network operating at $500 \mathrm{c} / \mathrm{s}$. All terminations 15 ohms. Price: $£ 115 \mathrm{~s}$.

CX1500 Crossover Unit. As CX500, but operating at $1,500 \mathrm{c} / \mathrm{s}$. Price $£ 211 \mathrm{~s}$.

CX3000 Crossover Unit. As CX1500. but operating at $3,000 \mathrm{c} / \mathrm{s}$. Price: $£ 20 \mathrm{~s}$. 3 d .

Constant impedance volume control. T-pad type attenuator having 10 steps of attenuation. Impedance presented by the load remains constant while the volume level is varied. In three versions for 3,8 or 15 ohms. Price: $£ 18 \mathrm{~s}$.
L. G. WOOLLETT AND COMPANY, LTD., 21 Anerley Station Road, London, S.E.20. Tel.: Sydenham 9003.

XS1. Speaker matching transformer. Converts 15 ohms to 7.5 ohms and 7.5 ohms to 3.75 ohms. Bifilar wound. Grain oriented laminations. Ratio $1: 0.707$ auto. F.R. $16 \mathrm{c} / \mathrm{s}-30 \mathrm{Kc} / \mathrm{s}$ $\pm 0 \cdot 6 \mathrm{~dB}$. Price: $£ 33 \mathrm{~s}$.

XS2. Speaker isolating and matching transformer. Converts 15 ohms to 3.75 ohms. Grain oriented laminations. Ratio $1: 1$ double wound. F.R. $16 \mathrm{c} / \mathrm{s}-100 \mathrm{Kc} / \mathrm{s} \pm 0 \cdot 6 \mathrm{~dB}$. Attenuates -6 dB and -12 dB while maintaining heavy damping on speaker and offering correct load to amplifier. Suitable for electrostatic bass stereo system. Note: Not suitable for mains isolating in live chassis equipment. Price: $£ 33 \mathrm{~s}$.

## PART 2—SPEAKER ENCLOSURES

ABBOTT \& RICHARDSON, 7 Agnew Road, Forest Hill, London, S.E.23. Tel.: Forest Hill 1031.
R.A. Reflex Enclosure (GRA10). Complete system. Forward facing full range speaker with tapering depth. Two units: 10 in . bass, hornloaded pressure unit for treble. Rec. Goodmans Axiom 10, Goodmans Trebax 5K/20XL. Twin $\frac{1}{4}$-section crossover network. Finish: Walnut, oak, mahogany or teak. Size: $31 \times 17 \frac{1}{2} \times 10 \frac{1}{2}$ $\max$. to $7 \frac{1}{2}$ in. min. Price: (with specified units) $£ 26$, enclosure only $£ 15$.
R.A.8. Suitable for Axiette and Wharfedale 8 in. drive units. Finish: teak and mahogany. Size: $24 \times 16_{4} \times 8$ in. Price (with Axiette speaker): $£ 17$ 10s., enclosure only $£ 13$ 10s.
R.A.12. Based on Goodmans specifications and fitted with ARU. Available with 12 in . twincone drive unit and in two-way and three-way systems. Finish: Mahogany or teak. Size: $37 \frac{1}{2} \times 21 \frac{1}{2} \times 13$ in. Price (with 12 in. twin-cone driver): £32.

Enclosures built to customers own requirements. Home demonstrations in the London area. R.A. enclosures also available from Lee and Son (Development Company), 98 Lordship Lane, London, S.E.22, and Parkfield Studio, 20 Parkfield Road, New Cross, London, S.E. 14.

ACOUSTICA ASSOCIATES. Distributors: LL Electronics Ltd., 5 Shakespeare Road, Finchley, London, N.3. Tel.: Finchley 3332.

Acoustica Lamp-Speakers. $6 \frac{1}{2}$ in. Jensen bass driver, electrostatic high frequency unit incorporated in lampshade. Crossover $300 \mathrm{c} / \mathrm{s}$. Impedance 8 ohms. H.C. 20W. RMS. F.R. $35 \mathrm{c} / \mathrm{s}-$ $30 \mathrm{Kc} / \mathrm{s}$. Various finishes available including walnut, antique white, leather and glazed ceramic in choice of colours. Price: from $£ 1105 \mathrm{~s}$. (U.K. purchase tax $£ 1517 \mathrm{~s} .10 \mathrm{~d}$.) to $£ 136$ 10s. (U.K. purchase tax $£ 19$ 13s. 6d.).

ACOUSTICAL MANUFACTURING CO. LTD., St. Peter's Road, Huntingdon, Hunts. Tel.: Huntingdon 2561/2. Cables: Acoustical.

Quad Electrostatic Loudspeaker. Full range doublet covering $45 \mathrm{c} / \mathrm{s}$ to $18 \mathrm{Kc} / \mathrm{s}$. Attenuation
outside band asymptotic to $18 \mathrm{~dB} / 8 \mathrm{ve}$. Total integrated radiation at max. output equivalent to 95 phons in rooms of up to $5,000 \mathrm{cu}$. ft . with average reverberation. Dispersion approx. 70 deg. horizontal; 15 deg. vertical. Imp. 30-15 ohms, $40 \mathrm{c} / \mathrm{s}$ to $8 \mathrm{Kc} / \mathrm{s}$ falling above $8 \mathrm{Kc} / \mathrm{s}$. Designed for use with standard Quad II Amplifier. Suitable for A.C. supplies $100-120$ or 200$250 \mathrm{~V} .50-60 \mathrm{c} / \mathrm{s}$. Free standing unit requires no enclosure or cabinet. Weight: 35 lb . Price: $£ 57$ complete.

ACUSTICA-ELECTRONICA. Distributors: Britimpex Ltd., 16-22 Great Russell Street, London, W.C.1. Tel.: Museum 7600.

5 HRM. Infinite baffle. F.R. $50 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. H.C. 7W RMS. Standard finish: walnut. Size: $10_{2}^{1} \times 5 \frac{1}{8} \times 6_{8}^{7}$ in. Price: $£ 12$ 13s. 4 d. (U.K. purchase tax £2 0s. 8d.).

Soprano. Infinite baffle. 8 in. main unit plus 4 in. tweeter. F.R. $60 \mathrm{c} / \mathrm{s}-13 \mathrm{Kc} / \mathrm{s} . \mathrm{H} . \mathrm{C} .7 \mathrm{~W}$ RMS. Standard finish: walnut. Size: $20 \frac{1}{2} \times 12 \frac{5}{8} \times 5 \frac{3}{4} \mathrm{in}$. Price: $£ 16$ 14s. 10d. (U.K. purchase tax £2 13s. 8d.).

AKAI. Distributors: Pullin Photographic Ltd., 11 Aintree Road, Perivale, Greenford, Middlesex. Tel.: Alperton 1541. Cables: Pullinfoto, Greenford, Middlesex.

Akai SS30. Infinite baffle with unit. Impedance 8 ohms. F.R. $100 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. H.C. 3W RMS. Wood cabinet covered dark grey Rexine. Size: $13 \frac{1}{2} \times 14 \times 3 \mathrm{in}$. Weight: $6 \frac{1}{2} \mathrm{lb}$. Price: $£ 12$ (U.K. purchase tax $£ 20$ s. 11d.).

OAkai SS88A. Infinite baffle with units. 8 in. bass driver, $2 \frac{1}{2}$ in. tweeter. Impedance 8 ohms. F.R. $60 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}$. H.C. $4 W$ RMS. Slim-line wood cabinet with rosewood finish. Freestanding or wall mounting. Size: $23 \frac{1}{4} \times 193 \times$ $2_{4}^{3} \mathrm{in}$. Weight: $10 \frac{1}{2} \mathrm{lb}$. Sold in pairs only. Price (pair): $£ 32$ 6s. 6d. (U.K. purchase tax $£ 57$ s. 9 d .).

OAkai SS55. Horn type enclosure with two units and crossover. 8 in . bass driver, $2 \frac{1}{2} \mathrm{in}$. tweeter. Impedance 8 ohms. F.R. $60 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. H.C. 3W RMS. Wood cabinet finished dark grey Rexine. Size: $20 \times 19 \times 15_{4}^{3} \mathrm{in}$. Weight (two speakers): $35 \frac{1}{4} \mathrm{lb}$. Sold in pairs only. Clip


Akai SS-55


Abbott \& Richardson RA 12


Abbott \& Richardson GRA 10


Braun L1000 13-unit infinite baffle


Akai SS110


Quad electrostatic
together for easy carrying. Price (pair): £38 (U.K. purchase tax £6 6s. 5d.).

OAkai SS110. Infinite baffle with twin unit and crossover. 10 in . driver with integral $3 \frac{1}{2} \mathrm{in}$. tweeter. Impedance 8 ohms. F.R. $50 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}$. H.C. 6W RMS. Wood cabinet covered dark grey Rexine. Clip together for easy carrying. Size: $20 \frac{1}{8} \times 19 \times 15 \frac{3}{4} \mathrm{in}$. Weight (two speakers): 36 lb . Sold in pairs only. Price (pair): $£ 45$ (U.K. purchase tax $£ 7$ 10s.).

Akai SS120. Infinite baffle with two units and crossover. 12 in. bass driver, 4 in. tweeter. Impedance 8 ohms. F.R. $50 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. H.C. 16 W RMS. Size: $16 \frac{1}{2} \times 23 \frac{1}{4} \times 12 \frac{1}{8}$ in. Weight: 25 lb . Price: $£ 3315$ s. (U.K. purchase tax $£ 512 \mathrm{~s}$. 6 d .).

These speaker enclosures are primarily for use with Akai tape recorders.

RICHARD ALLAN RADIO LTD., Bradford Road, Gomersal, Near Leeds, Yorkshire. Tel.: Cleckheaton 2442/3. Cables: Acoustics, Bradford.

SC5. Minette. Infinite baffle bookshelf enclosure. 5 in. bass unit, 4 in. tweeter. F.R. $50 \mathrm{c} / \mathrm{s}-$ $17 \mathrm{Kc} / \mathrm{s}$. H.C. 10 W . Size: $11 \frac{1}{2} \times 7 \times 6 \frac{1}{2} \mathrm{in}$. Weight: 9 lb . Price: $£ 17$ 10s. 6 d . including units.

SC12 Mk. II. Infinite baffle enclosure. Bass unit CG12 Super, mid-range unit 812F, tweeter CB4. F.R. $40 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}$. H.C. 15 W . Size: $30 \times$ $19 \frac{1}{2} \times 7 \frac{1}{4}$ in. Price: $£ 36$ complete with units.
High Fidelity Module. Integrated speaker assembly comprising 5 in . bass unit, 4 in . tweeter and crossover network mounted on Duralumin baffle for direct mounting into small bookshelf enclosure. Price: to be announced.

ARENA. Distributors: Highgate Acoustics Ltd., 71-73 Great Portland Street, London, W.1. Tel.: Museum 2901.

Arena HT7. Pressure chamber speaker system. One $8 \frac{1}{4}$ in. bass unit, one 2 in. treble unit. 4 or 16 ohms. H.C. 6 W RMS. F.R. $50 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Builtin crossover. Cabinet in teak or Brasilian rosewood. Size: $20 \frac{1}{2} \times 9 \frac{7}{8} \times 10 \frac{5}{8}$ in. Price: $£ 1313 \mathrm{~s}$. 6 d . (U.K. purchase tax $£ 2$ 1s. 6 d .).

Arena HT9. Pressure chamber speaker system. One 12 in . bass unit, one 5 in . mid-range unit, one 2 in. treble unit. 4 or 16 ohms. H.C. 25W RMS. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Built-in crossover.

Cabinet in teak or Brasilian rosewood. Size: $26 \frac{3}{4} \times 19 \frac{3}{4} \times 11 \frac{7}{8}$ in. Price: $£ 284$ s. 11d. (U.K. purchase tax $£ 46 \mathrm{~s}$. 1d.).

Arena HT10. Pressure chamber speaker system. One 8 in . unit, one 2 in . unit. H.C. 8 W RMS. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Teak or Brasilian rosewood. Size: $22 \frac{3}{4} \times 5 \frac{1}{8} \times 16 \frac{1}{8}$ in. Price: £14 11s. 6d. (U.K. purchase tax £2 4s. 6d.).

Arena HT14. Pressure chamber speaker system. One $7 \times 5$ in. unit, one $2 \frac{1}{2}$ in. unit. H.C. 6W RMS. F.R. $60 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Recommended for use with T 1900 F tuner/amplifier. Teak or Brasilian rosewood. Size: $6 \frac{1}{4} \times 10 \frac{5}{8} \times 11 \mathrm{in}$. Price: £10 18s. 8d. (U.K. purchase tax £1 13s. 4d.).

Arena HT15. Pressure chamber speaker system. One $8 \frac{1}{4}$ in., one 5 in ., one $2 \frac{1}{2}$ in. units. H.C. 6 W RMS. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Teak or Brasilian rosewood. Size: $26_{4}^{3} \times 11_{8}^{3} \times 11$ in. Price: $£ 192$ s. 8d. (U.K. purchase tax $£ 2$ 18s. 4 d.).

Arena HT16. Pressure chamber speaker system. One $7 \times 5$ in., one $2 \frac{1}{2} \mathrm{in}$. units. H.C. 12W RMS. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Teak or Brasilian rosewood. Size: $193 \times 7 \frac{7}{8} \times 5 \frac{7}{8} \mathrm{in}$. Price: $£ 12$ 15s. 2d. (U.K. purchase tax £1 18s. 10d.).

Arena HT17. Pressure chamber speaker system. One $5 \frac{3}{4}$ in., one $2 \frac{1}{2}$ in. units. H.C. 8 W RMS. F.R. $70 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Teak, Brasilian rosewood or oak. Size: $12 \frac{5}{8} \times 9 \frac{7}{8} \times 4 \frac{3}{8} \mathrm{in}$. Price: £10 18s. 8d. (U.K. purchase tax £1 13s. 4d.).

Arena HT18. Pressure chamber speaker system. One $5 \frac{3}{4} \mathrm{in}$., one $2 \frac{1}{2}$ in. units. H.C. 25 W RMS. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Teak or Brasilian rosewood. Size: $25 \times 16 \times 10 \frac{1}{4}$ in. Price: $£ 30$ 1s. 6d. (U.K. purchase tax $£ 411 \mathrm{~s} .6 \mathrm{~d}$.).

AUDIO AND DESIGN LTD., 40 Queen Street, Maidenhead, Berks. Tel.: Maidenhead 25204.

D15/30. Incorporates one TCL module. F.R. $30 \mathrm{c} / \mathrm{s}-22 \mathrm{Kc} / \mathrm{s}-3 \mathrm{~dB}$. Mean hemispherical power response substantially flat throughout pass band. H.C. 15 W RMS. Natural teak finish. Size: $30 \times 15 \times 8$ in. Price: $£ 36$ 15s. (professional finish version £39).

D30/20. Incorporates two TCL modules. F.R. $20 \mathrm{c} / \mathrm{s}-22 \mathrm{Kc} / \mathrm{s}-3 \mathrm{~dB}$. Mean hemispherical power response substantially flat throughout pass band. H.C. 30W RMS. Natural teak finish. Size: $30 \times 17 \times 13$ in. Price: $£ 595 \mathrm{~s}$. (professional finish version £64).


Braun L450 slim line infinite baffle


Braun LS75 infinite baffle


Decca-Kelly Kardioid


Decca-Kelly Mini


Design GD 8


Celestion Ditton 10 enclosure

Clarke \& Smith CSI 619

D60/20. Professional studio monitor incorporating four TCL modules. Performance as for D30/20 but power handling 60W. Switchable polar response. Finish to order. Price: $£ 120$.

BANG \& OLUFSEN. U.K. Sales Division, Mercia Road, Gloucester. Tel.: Gloucester 26841. Cables: Debelec, Gloucester.

Type B. Compact enclosure to handle 5W. Two units; one $6 \times 4 \mathrm{in}$. plus $2 \frac{1}{2} \mathrm{in}$. tweeter. Crossover at $4 \mathrm{Kc} / \mathrm{s}$. F.R. $60 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Finished in teak or rosewood. Suitable for vertical or horizontal use. Size: $11 \times 5 \frac{1}{2} \times 10 \frac{1}{2}$ in. Weight: 7 lb . Price: $£ 1313$ s. including purchase tax.

Type M. Free-standing vertical or horizontal enclosure. One 8 in . main driver plus $2 \frac{1}{2} \mathrm{in}$. tweeter. Crossover $4 \mathrm{Kc} / \mathrm{s}$. 7 W . power handling capacity. F.R. $50 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Finish in teak or rosewood. Size: $19 \times 9 \frac{1}{2} \times 9_{4}^{3}$ in. Price: $£ 1616$ s. including purchase tax.

Type $\mathbf{V}$. Teak or rosewood finished enclosure with $7 \times 5$ in. driver and $2 \frac{1}{2}$ in. tweeter. F.R. $55 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Handling capacity 5W. Crossover $3 \mathrm{Kc} /$ s. Size: $19 \frac{1}{2} \times 13 \frac{3}{4} \times 3 \frac{1}{8} \mathrm{in}$. Price: $£ 1515$ s. including purchase tax.

Type S. Horizontal or vertical free-standing enclosure finished in choice of teak or rosewood. One 8 in. driver plus $2 \frac{1}{2}$ in. tweeter. Crossover $3 \mathrm{Kc} / \mathrm{s}$. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Handling capacity 10W. Size: $25 \times 11_{4}^{3} \times 11_{4}^{3} \mathrm{in}$. Price: $£ 21$ including purchase tax.

Type K. Three-unit floor standing enclosure finished in teak or rosewood. 12 in . bass driver. 5 in. mid-range unit, $2 \frac{1}{2} \mathrm{in}$. tweeter. Crossover at $700 \mathrm{c} / \mathrm{s}$ and $4 \mathrm{Kc} / \mathrm{s}$. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Handling capacity 18 W . Size: $32 \frac{1}{4} \times 19 \times 15 \frac{1}{2} \mathrm{in}$. Price: £36 15s.

BRAUN AG. Distributors: Fi-Cord International, Charlwoods Road, East Grinstead, Sussex. Tel.: East Grinstead 21351.

L25. Infinite baffle. Wide range twin-cone 7 in . driver. F.R. $70 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Floor or wall mounting. Wood case finished laminated white plastic. Anodised aluminium grille. Size: $19 \frac{1}{4} \times$ $11 \frac{1}{4} \times 5 \frac{1}{4}$ in. Price: $£ 26$.

L40. Infinite baffle. $8 \frac{3}{8} \mathrm{in}$. bass and mid-range unit. 4 in. tweeter. F.R. $50-18 \mathrm{Kc} / \mathrm{s}$. Wood
cabinet finished in white or dark grey laminated plastic. Anodised aluminium grille. Size: $22 \frac{5}{8} \times$ $9 \frac{7}{8} \times 11 \frac{1}{4} \mathrm{in} .15 \mathrm{ft}$. lead with plug supplied. Price: $£ 35$.

L60/4. Infinite baffle. $10_{8}^{7}$ in. bass driver. $3 \frac{5}{8}$ in. tweeter. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Wood cabinet finished in white plastic laminate. Anodised aluminium grille. 15 ft . lead with plug. Chrome stand optional extra. Size: $26 \times 14 \frac{3}{8} \times 11_{4}^{1} \mathrm{in}$. Price: £53; (stand) $£ 9$ extra.

LS75. Infinite baffle. F.R. $40 \mathrm{c} / \mathrm{s}$ to above upper audible limit. H.C. 75W RMS. Impedance 15 ohms. Four bass drivers and four tweeters. Wood cabinet finished in white laminated plastic. Anodised aluminium front grille. Size: $16 \times 39 \frac{1}{4} \times 5 \frac{3}{4} \mathrm{in}$. Price: $£ 122$.

L80. Infinite baffle enclosure incorporating dynamic and ribbon units. F.R. $25 \mathrm{c} / \mathrm{s}$ to above upper audible limit. H.C. 10W RMS. Impedance 15 ohms. One Leak $13 \frac{1}{4}$ in. bass driver, one Kelly ribbon tweeter, one 4 in . mid-range speaker. Size: $16 \frac{7}{8} \times 34 \times 13 \frac{1}{4}$ in. Cabinet of wood finished in laminated white plastic or matt walnut veneer. Perforated aluminium grille. Optional diecast aluminium stand. Price (speaker enclosure with units): £168; (stand) £37.

L300. Compact infinite baffle. F.R. $42 \mathrm{c} / \mathrm{s}$ to above upper audible limit. H.C. 20W RMS. Impedance 4 ohms. One $5 \frac{1}{4} \mathrm{in}$. bass driver, one $2 \frac{5}{8}$ in. tweeter. Wood cabinet finished white laminated plastic or walnut veneer. Anodised aluminium grille. Provision for horizontal or vertical wall mounting. Size: $6 \frac{3}{8} \times 9 \frac{3}{8} \times 55 \mathrm{in}$. Price: $£ 35$.

L450. Slim-line infinite baffle incorporating two units. F.R. $35 \mathrm{c} / \mathrm{s}$ to beyond upper audible limit. H.C. 20W RMS. One $7 \frac{1}{4} \mathrm{in}$. bass driver, one $3 \frac{3}{8} \times 25 \mathrm{in}$. pressure chamber tweeter. Wood cabinet finished white or graphite laminated plastic or walnut veneer. Provision on back for horizontal or vertical wall mounting. Size: $18 \frac{7}{8} \times 11_{4}^{\frac{1}{4}} \times 4$ in. Price: $£ 51$.

L700. Infinite baffle enclosure incorporating two units. F.R. $30 \mathrm{c} / \mathrm{s}$ to beyond upper audible limit. H.C. 40W RMS. Impedance $8-16$ ohms. One 10 in . bass driver, one hemispherical calotte design tweeter. Wood cabinet finished white laminated plastic or walnut veneer. Anodised aluminium front grille. Optional screw-on stand for vertical or horizontal mounting. Size: $26 \times$ $14 \frac{3}{8} \times 8 \frac{7}{8}$ in. Price (enclosure with units): $£ 77$; (stand) $£ 12$.

L1000. Infinite baffle acoustically damped enclosure of over $7 \mathrm{cu} . \mathrm{ft}$. Three bass drivers, eight mid-range units (four adjustable for direction), two pressure chamber tweeters. Crossover: $500 \mathrm{c} / \mathrm{s}, 4 \mathrm{Kc} / \mathrm{s}$. F.R. $20 \mathrm{c} / \mathrm{s}$ to beyond upper audible limit. H.C. 80 W RMS. Impedance 8-16 ohms. Finish: Wood cabinet finished white laminated plastic, perforated aluminium front grille. Size: $30 \times 40 \times 13 \frac{1}{4} \mathrm{in}$. Price: $£ 523$.

BURNE-JONES \& CO. LTD., 18 Brunswick Road, Sutton, Surrey.
B.J. Treble 20. Omni-directional multi-horn. One 4 in. unit. Crossover built-in. Response $1,000-18,000 \mathrm{c} / \mathrm{s}$. Size: $6 \times 5 \mathrm{in}$. Weight: $1 \frac{1}{2} \mathrm{lb}$. Price: $£ 315$ s. including tax.
B.J. Treble Twin. Omni-directional horn. Two 4 in. drive units. Crossover included. Response $900-18,000 \mathrm{c} / \mathrm{s}$. Size: $9 \times 4 \frac{3}{4} \times 6 \mathrm{in}$. Weight: 2 lb . Price: $£ 72 \mathrm{~s}$. 9 d . including tax.

CELESTION LTD., Ferry Works, Thames Ditton, Surrey. Tel.: Emberbrook 3402/6. Cables: Voicecoil, Thames Ditton.

Ditton 10. Infinite baffle compact system. Long-throw 5 in . bass unit, pressure driven H.F. unit. Built-in half-section crossover $3,500 \mathrm{c} / \mathrm{s}$. F.R. $35 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Available in walnut or teak. H.C. 10 W . Size: $12 \frac{3}{4} \times 6 \frac{3}{4} \times 8 \frac{1}{4} \mathrm{in}$. Weight: 13 lb . Price: £16•10s. (U.K. purchase tax £2 16s.).

CLARKE \& SMITH MANUFACTURING CO. LTD., High Fidelity Components Division, Melbourne Works, Wallington, Surrey. Tel.: Wallington 9252. Cables: Electronic, Wallington.

CSI 619. Infinite baffle. Complete system. Forward-facing. Three units: bass $13 \frac{1}{2} \times 8 \frac{1}{8} \mathrm{in}$. ( 92390 PFL ); pair of tweeters $3 \frac{3}{8} \mathrm{in}$. cone (99110J). Crossover (Type 99970F) 4,500 c/s. F.R. $50 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Size: $24 \times 13 \times 11 \frac{1}{2} \mathrm{in}$. Finish: natural walnut veneer, matt finished. Price: $£ 265$ s.

CONNOISSEUR. See A. R. Sugden and Co. Ltd.
A. DAVIES \& COMPANY, $3 / 11$ Parkhill Place, off Parkhill Road, Hampstead, London, N.W.3. Tel.: Gulliver 5775.

Sherwood type. Based on Goodmans design for Axiom speakers. Approved for Goodmans Axiom 201, Axiom 301 and Goodmans threeway system. Padded front with contemporary Tygan pattern in black and white. Finish: Sapele oak, walnut, teak, afromosia. Full polish or satin finish. Size: $23 \frac{1}{2} \times 27 \frac{1}{2} \times 19 \frac{1}{2}$ in. Price (without units or ARU172): de luxe version $£ 19$, standard finish version $£ 17$.

Bass reflex. Suitable versions are made for good quality 8 in ., 10 in . and 12 in . speakers. Cabinets lined with 1 in . acoustic felt. Finish : Sapele, walnut, oak, teak. Full polish or satin finish. Sizes: all cabinets are 34 in. high; 8 in model 15 in . wide, 12 in . deep; 10 in . model $15 \frac{3}{4}$ in. wide, $13 \frac{1}{2}$ in. deep; 12 in. model $17 \frac{1}{2}$ in. wide, $15 \frac{1}{2} \mathrm{in}$. deep. Prices: Standard finish, 8 in . $£ 11$ 10s.; 10 in. $£ 12 ; 12 \mathrm{in} . £ 12$ 10s. (teak 10s. extra). De luxe versions $£ 2$ extra.

Speaker enclosures and cabinets made to customers requirements.

DECCA SPECIAL PRODUCTS, Decca Radio and Television Division of the Decca Record Co. Ltd., Ingate Place, Queenstown Road, London, S.W.8. Tel.: Macaulay 6677.

301 (re-styled). Vented enclosure. Specialcone $13 \times 8$ in. driver, exclusive Decca 3 in. H.F. unit. Crossover $5 \mathrm{Kc} / \mathrm{s}$. Finished in medium polished teak. Size: $21 \frac{1}{2} \times 12 \frac{1}{2} \times 9 \mathrm{in}$. H.C. 6 W . Price: $£ 1515 \mathrm{~s}$.

Decca-Kelly Mini Enclosure. Infinite baffle miniature shelf-mounting enclosure. Solid piston direct radiator bass unit. Melinex diaphragm direct radiator H.F. unit. Crossover $2 \mathrm{Kc} / \mathrm{s}$. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ flat to within 3 dB . H.C. 15W RMS. Matching of driving area to enclosure volume for high efficiency and good bass response (British Patent 36994/64). Piston diaphragm of expanded thermo-setting resin. H.F. unit contoured to give omni-directional sound distribution up to $16 \mathrm{Kc} / \mathrm{s}$. Suitable for amplifiers of 8-16 ohms output impedance. Standard finish: medium teak with tygan front. Size: 10 in . high, 16 in . wide, $7 \frac{1}{2} \mathrm{in}$. deep. Weight: 23 lb . Price: £21.

Decca-Kelly Kardioid Enclosure. Reflex enclosure fitted with two units and crossover. One

DK1 12 in. bass driver, one Mk. II ribbon H.F. unit with acoustic lens. Crossover CO/2/15 $2 \cdot 5$ $\mathrm{Kc} / \mathrm{s}$ with variable slope high pass filter. H.C. 10W RMS. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Acoustic lens produces H.F. dispersion over 150 degrees with not more than 3 dB variation at $15 \mathrm{Kc} / \mathrm{s}$, and over 135 degrees with not more than 3 dB variation at $20 \mathrm{Kc} / \mathrm{s}$. Suitable for amplifiers of $\dot{8}-16$ ohms output impedance. Standard finish: medium teak with black bevelled surround to tygan front and with bright trim. Size: 36 in. high, $16 \frac{1}{2}$ in. wide, 13 in . deep. Price: $£ 497 \mathrm{~s}$.

DESIGN FURNITURE LTD., Calthorpe Manor, Banbury, Oxfordshire. Tel.: Banbury 4726.

GD8. Approved by Goodman Industries Ltd. for Axiette 8. 8 in. loudspeaker. Size: $31 \frac{1}{2} \times$ $17!\frac{1}{2} \times 8 \frac{1}{2}$ in. Can be used vertically or horisontally. Walnut, sapele mahogany or teak finish. Price: $£ 13$ 5s.

GD10. Approved by Goodman Industries Ltd. for Axiom 10. Size: $29 \times 18 \times 11 \frac{1}{2}$ in. Can be used vertically or horizontally. Walnut, sapele mahogany, teak or rosewood finish. Price: $£ 1317 \mathrm{~s} .6 \mathrm{~d}$.

GD12. Approved by Goodman Industries Ltd. for Axiom 201, Axiom 301, Triaxiom 1215 and 1220, Audiom 51 Bass and Audiom 61 Bass. Size: $22 \frac{1}{2} \times 35 \frac{1}{4} \times 14 \frac{1}{8}$ in. Walnut, sapele mahogany, teak or rosewood finish. Price: $£ 1519 \mathrm{~s}$. 6d. (Acoustic Resistance Unit £311s. 3d. extra).
$\mathbf{C 1 5} / 20$. Designed for use with the Celestion CX1512 and CX2012 Co-axial 12 in. speakers. Mounted on castors. Cut-out provided for "brilliance control" supplied with CX2012 de luxe model. Size: $36 \times 21 \times 10 \mathrm{in}$. Walnut or teak finish. Price: $£ 16$ 10s.
D.N.H. Den Norske Hoyttalerfabrikk A/S. Distributor: Douglas A. Lyons and Associates Ltd., 32 Grenville Court, Dulwich, London, S.E.19. Tel.: Gipsy Hill 2833. Cables: Daliona, London, S.E. 19.

B-455/T. Infinite baffle. High efficiency 6 in. driver with 4 in. H.F. unit. F.R. $50 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. H.C. 10W. Imp. 4 and 15 ohms. Choice of slotted teak front or fabric front. $0.31 \mathrm{cu} . \mathrm{ft}$. Standard finish teak. Size: $10 \frac{1}{2} \times 6 \frac{3}{4} \times 7 \frac{1}{2}$ in. Weight: 8.3 lb . Price: $£ 1212 \mathrm{~s}$.

B-520/T. Infinite baffle. $2 \cdot 2 \mathrm{cu} . \mathrm{ft} .12 \mathrm{in}$. bass driver. 4 in. tweeter. F.R. $40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Imp. 4 and 15 ohms. H.C. 20W. Choice of slotted teak front or fabric front. Standard finish teak. Slim-line construction. Size: $23 \frac{1}{2} \times 16 \frac{1}{2} \times 6 \frac{1}{2}$ in. Weight: 22 lb . Price: $£ 21$ 10s.

DUAL ELECTRONICS LTD., Radnor House, London Road, Norbury, London, S.W.16. Tel.: Pollards 9456/6.

CL2. Compact enclosure incorporating bass driver and tweeter. One $10 \times 7 \mathrm{in}$. main unit with 5 in. H.F. unit. Gap flux (main): 12,000 gauss;(H.F.) 6,500 gauss. H.C. 10 W music. F.R. $50 \mathrm{c} / \mathrm{s}^{-}$ $16 \mathrm{Kc} / \mathrm{s}$. Impedance 5 ohms . Finish: inlaid walnut veneer. All surfaces finished to allow horizontal or vertical operation or for use away from a wall. Size: $19 \times 10 \frac{1}{2} \times 7 \mathrm{in}$. Weight: 13 lb . approx. Price: £19 8s. 6d.

CL3. Full-range three-speaker enclosure. 10 in. bass driver, $3 \frac{3}{4}$ in. mid-range unit, $3_{4}^{3} \mathrm{in}$. tweeter. H.C. 35W music. F.R. $40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Impedance 5 ohms. Finished all sides inlaid walnut veneer. Size: $23 \frac{1}{2} \times 13 \times 8 \frac{3}{4}$ in. Weight: 21 lb . approx. Price: $£ 3817 \mathrm{~s}$.

DUODE LTD., Westfield Mills, Broad Lane, Bramley, Leeds, 13. Tel.: Pudsey 77536.

Duode Compact. Full-range enclosure incorporating special Duode Super 12 in. with Barker-patented aluminium speech coil former covered with latex sleeve. Speaker design applies negative feedback and gives response $35 \mathrm{c} / \mathrm{s}$ $20 \mathrm{Kc} / \mathrm{s}$. Price: $£ 34$.

DYNA-STA TIC. See Electrostatic Loudspeaker Mfg. Co.

ELAC. Electroaucustic GmbH. Kiel, West Germany. Distributors: Mitchell Enterprises Ltd., 61 West Street, Dorking, Surrey. Tel.: Dorking 4229.

LK10. Reflex enclosure. Wide-range $8 \frac{1}{4} \mathrm{in}$. drive unit plus tweeter. $1_{4}^{1} \mathrm{in}$. diameter voice coil. Magnetic flux 95,000 maxwells. F.R. $45 \mathrm{c} / \mathrm{s}-$ $16 \mathrm{Kc} / \mathrm{s}$. H.C. 18W. Imp. 6-18 ohms. Finish: Oiled walnut. Back of cabinet also veneered permitting use in centre of room. Internally

A. Davies bass reflex


## Design GD 10



Empire 8200


Design GD 12


Expert Mk. III acoustic column
damped. Size: $11 \frac{3}{8} \times 214 \times 9_{4}^{3} \mathrm{in}$. Weight: $27 \frac{1}{2} \mathrm{lb}$. Price: £27 15s.

LK100. Reflex enclosure with four drive units. Bass unit 9 in. diameter with 1 in. speech coil and gap flux 14,700 gauss. Midrange 5 in . unit and two 2 in . tweeters. Crossover at $4,000 \mathrm{c} / \mathrm{s}$ and $750 \mathrm{c} / \mathrm{s}$. F.R. $30 \mathrm{c} / \mathrm{s}-$ $18 \mathrm{Kc} / \mathrm{s}$. H.C. 22 W. Imp. 8 ohms. Finish: Oiled walnut. Back of cabinet also veneered permitting use in centre of room. Size: $13 \frac{3}{4} \times 25 \frac{3}{8} \times 11 \frac{1}{4} \mathrm{in}$. Weight: 36 lb . Price: $£ 42$ 10s.

LK500. Reflex enclosure with four drive units. $9 \frac{3}{4}$ in. bass speaker, $6 \frac{1}{2}$ in. mid-range speaker, two $2 \frac{1}{2}$ in. tweeters. Crossover at 500 $\mathrm{c} / \mathrm{s}$ and $5 \mathrm{Kc} / \mathrm{s}$. F.R. $25 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. H.C. 36W. Imp. 8 ohms. Finish: oiled walnut. Back of cabinet is also veneered permitting use in centre of room. Size: $13 \frac{3}{4} \times 25 \frac{1}{2} \times 11 \frac{1}{4} \mathrm{in}$. Weight: $34 \frac{1}{2} \mathrm{lb}$. Price: $£ 5110 \mathrm{~s}$.

ELECTROSTATIC LOUDSPEAKER MFG. CO., 82 East Barnet Road, New Barnet, Herts. Tel.: Barnet 6605. Export agents: Metro-Sound (Export) Ltd.

Dyna-Static Doublet. Forward-facing units in special design doublet enclosure which provides both front and rear radiation. 12 in. bass unit. 2 in. dia. voice coil. Total flux 160,000 maxwells. Shackman electrostatic tweeter. Crossover approx. $1 \mathrm{Kc} / \mathrm{s}$. H.C. 20W RMS. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Impedance $8-16$ ohms. Finish: walnut laminate with gold/brown Vynair front. Built-in mains unit for electrostatic unit. Standard version $200-250 \mathrm{~V}$ AC, export model 110 V if required. Size: $28 \times 22 \times 6 \mathrm{in}$. Weight: 40 lb . approx. Price: £39 18s.

Dyna-Static Mark II. Infinite baffle type enclosure using RJ principle. 12 in . bass unit. 2 in. dia. voice coil. Total flux 160,000 maxwells. Shackman electrostatic tweeter. Crossover approx. $1 \mathrm{Kc} / \mathrm{s}$. H.C. 20W. Impedance $8-16$ ohms. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Finish: walnut laminate with gold/brown Vynair front. Built-in mains unit for electrostatic unit. Standard version $200-250 \mathrm{~V}$ AC, export model 110 V if required. Size: $33 \times 18 \times 12 \mathrm{in}$. Weight: 60 lb . approx. Price: $£ 48$.

EMI SOUND PRODUCTS LTD., Hayes, Middlesex. Tel.: Hayes 3888. Cables: Emisound, London.

EL.100. Infinite baffle corner enclosure available with or without legs. $13 \frac{1}{2} \times 8 \frac{1}{8}$ in. bass driver, $2 \frac{1}{2}$ in. tweeter with capacitor crossover. F.R. $75 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Impedance 3 or 15 ohms. H.C. 10W. Finish: walnut, sapele or teak. Approx. volume $1 \frac{1}{2} \mathrm{cu}$. ft. Size: 24 in . high, 12 in . wide, $11 \frac{1}{2} \mathrm{in}$. deep. Price on application.

EL.200. Infinite baffle floor standing console. $13 \frac{1}{2} \times 8 \frac{1}{8}$ in. ceramic magnet elliptical bass driver, two $3 \frac{3}{8}$ in. tweeters with capacitor crossover. H.C. 10W (15W to special order). F.R. $65 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Impedance 3 or 15 ohms . Finish: figured walnut or sapele. Approx. volume $2 \frac{1}{2}$ cu. ft. Size: 27 in . high, 12 in . wide, $14 \frac{1}{2} \mathrm{in}$. deep. Price on application.

EL.301. Slim line enclosure suitable for floor, shelf or wall-mounting. $13 \frac{1}{2} \times 8 \frac{1}{8} \mathrm{in}$. bass driver, two $3 \frac{3}{8}$ in. tweeters with crossover network. H.C. 10W ( 20 W to special order). F.R. $45 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Impedance 3 or 15 ohms. Finish: walnut, sapele or teak. Approx. volume $2 \frac{1}{2} \mathrm{cu}$. ft. Size: 31 in . high, 18 in . wide, $8 \frac{1}{2} \mathrm{in}$. deep. Price on application.

EL.400. Infinite baffle small bookshelf enclosure. $13 \frac{1}{2} \times 8 \frac{1}{8}$ in. bass driver, two $3 \frac{3}{8}$ in. tweeters with crossover network. H.C. 10W (20W to special order). F.R. $55 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Impedance 3 or 15 ohms. Finish: walnut. Approx. volume 2 cu .ft. Size: $13 \times 24 \times 12 \frac{1}{4} \mathrm{in}$. Price on application.

EMPIRE SCIENTIFIC. Distributors: How-land-West Ltd., 2 Park End, South Hill Park, London, N.W.3. Tel.: Swiss Cottage 6666.

Grenadier 8000. Divergent lens enclosure. 12 in . bass unit, mid-range direct radiator, domed H.F. tweeter. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Circular design gives completely omni-directional sound. Finish: Satin walnut. Size: 29 in. high, $15 \frac{1}{4}$ in. diameter. Price: $£ 115$ 10s.

Grenadier 8000P. Divergent lens enclosure. 12 in . bass unit, mid-range direct radiator, domed H.F. tweeter. F.R. $25 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Circular design gives completely omni-directional sound. Finish: satin walnut, hand rubbed, with marble top. Handling capacity up to 100 W music power. Size: 29 in. high, 16 in. diameter. Price: $£ 136$ 10s.

Grenadier 8400. Features a louvered L.F. hyperbolic horn, 12 in. mass-loaded bass unit with floating suspension, diecast mid-frequency/ high-frequency full dispersion acoustic lens,


DNH B-455/T


Expert Bookshelf Unit


Goodmans Eleganzia II


Elac LK. 100


Empire Grenadier 8000


Elac LK 500
with mid-range radiator and domed H.F. tweeter. F.R. $25 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Power handling capacity up to 100 W music. Treble adjustment. Finish: satin walnut, hand rubbed. Size: $25 \times$ $13 \frac{3}{4} \times 12 \frac{3}{4}$ in. deep. Price: $£ 1271 \mathrm{~s}$.

Grenadier 8200. Similar to 8400 except frequency response $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ and dimensions $24 \frac{3}{4} \times 14 \times 12 \frac{1}{8} \mathrm{in}$. deep. Price: $£ 115$ 10s.

Grenadier 9000M. Divergent lens enclosure. 15 in. bass unit, mid-range direct radiator, domed H.F. tweeter. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Circular design gives completely omni-directional sound. Finish: Satin walnut. Size: 29 in. high, 22 in. diameter. Price: $£ 173$ 5s.

EXPERT. F. A. Canton Ltd., 26 Thurloe Street, London, S.W.7. Tel.: Knightsbridge 3916.

Expert Bookshelf Unit. Labyrinth enclosure with unit. One Wharfedale special Super 8 with special cone, cloth surround and airtight aluminium dome at apex of cone. F.R. $50 \mathrm{c} / \mathrm{s}-$ $12 \mathrm{Kc} / \mathrm{s} \pm 4 \mathrm{~dB}$. H.C. 10W RMS. Smooth response, high efficiency and broad radiation pattern. Patented design enclosure. Size: $16 \times$ $9 \frac{1}{2} \times 9$ in. Finish: rosewood with black Vynair grille, teak with black Vynair grille, elm with buff Vynair grille. Price: $£ 17$ 10s. (U.K. purchase tax $£ 210$ s.).

Expert Bookshelf Major. Labyrinth enclosure with unit. One Wharfedale special Super 10 with special cone, cloth surround and airtight aluminium cone at apex of cone. F.R. $42 \mathrm{c} / \mathrm{s}-$ $7.8 \mathrm{Kc} / \mathrm{s} \pm 0.5 \mathrm{~dB}$ with extra smooth roll-off above and below. H.C. 12W RMS. Smooth response, high efficiency and broad radiation pattern. Patented design enclosure. Size: $28 \times$ $12 \times 12$ in. Finish: rosewood with black Vynair grille, teak with black or stone Vynair grille, elm with stone Vynair grille. Price: $£ 2615$ s. (U.K. purchase tax $£ 35 \mathrm{~s}$.).

Expert Mk. III Acoustic Column. Column type enclosure with unit. One Wharfedale special Super 10 with special cone, cloth surround and airtight aluminium dome at apex of cone. F.R. $38 \mathrm{c} / \mathrm{s}-7.8 \mathrm{Kc} / \mathrm{s} \pm 0.5 \mathrm{~dB}$. with extra smooth roll-off above and below. H.C. 12W RMS. 360 degree radiation pattern, making for easier stereo positioning. Available in Burma teak, French walnut, oak or mahogany with Vynair grille to suit as standard. Also available in any finish, including painted, panelled, decorated, etc., to special order at slight additional cost. Available with Lowther PM6 or

PM7, providing extended frequency range, at additional cost. Size: $12 \times 12 \times 44 \mathrm{in}$. high. Price: £31 16s. (U.K. purchase tax $£ 44$ s.).

FANE ACOUSTICS LTD., Hick Lane, Batley, Yorks. Tel.: Batley 2114. Cables: Fane, Batley.

Ionofane 602. H.F. Ionophone unit combined with new 5 in. high flux mid-range unit and $12 \mathrm{~dB} /$ octave crossover. Mounted in compact veneered cabinet and designed to operate with existing bass unit. F.R. $800 \mathrm{c} / \mathrm{s}-50 \mathrm{Kc} / \mathrm{s}$. Power handling abọve $800 \mathrm{c} / \mathrm{s}$ : 20 W peak. Impedance 15 ohms. Mains power 200/250V AC required. Size: $14 \times 9 \times 7 \frac{1}{2}$ in. Price: $£ 475$ s. (U.K. purchase tax $£ 715$ s. 6 d .).

Ionofane 603. Full-range speaker comprising Ionofane 601 H.F. unit, 501 mid-range 5 in. unit, 152/17LR 15 in . low resonance bass unit and 12 dB /octave three-way crossover. Whole assembly mounted in veneered reflex cabinet. Finish walnut or sapele. F.R. $20 \mathrm{c} / \mathrm{s}-50 \mathrm{Kc} / \mathrm{s}$. H.C. 20W RMS. Impedance 15 ohms. Mains power 200/250V AC required. Size: $35 \times 22 \frac{1}{2} \times$ 14 in. Price: $£ 78$ 15s.

FISHER RADIO CORPORATION, Long Island City 1, New York, U.S.A. Distributors: Getz Bros. and Co. Inc., 2 Harewood Place, London, W.1. Tel.: Grosvenor 6901.

XP-5. Speaker enclosure. Infinite baffle. One 8 in . bass unit, 12,500 gauss $2 \frac{1}{2} \mathrm{lb}$. magnet. One $2 \frac{1}{2} \mathrm{in}$. treble unit. Crossover $2 \mathrm{Kc} / \mathrm{s}$, rolloff $12 \mathrm{~dB} /$ octave, F.R. $38 \mathrm{c} / \mathrm{s}-18.5 \mathrm{Kc} / \mathrm{s}$. Handling capacity 15W. Size: $20 \times 10 \times 9 \mathrm{in}$. Can be used horizontally or vertically. Weight: 15 lb . Walnut finish. Price: $£ 309 \mathrm{~s}$.

XP-6. Speaker enclosure. Infinite baffle. Three units: one 10 in . bass unit, 13,000 gauss $5 \frac{1}{2} \mathrm{lb}$. magnet, one 5 in . mid-range unit, one $1 \frac{1}{2}$ in. treble unit. Crossover $300 \mathrm{c} / \mathrm{s}$ and $2.5 \mathrm{Kc} / \mathrm{s}$. F.R. $35 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. H.C. 25 W . Size: $23 \times 13 \times$ $10 \frac{1}{2} \mathrm{in}$. Can be used horizontally or vertically. Weight: 35 lb . Walnut finish. Price: $£ 464 \mathrm{~s}$.

GOODMANS INDUSTRIES LTD., Axiom Works, Wembley, Middlesex, England. Tel.: Wembley 1200. Cables: Goodaxiom, Wembley.

Eleganzia II. Acoustically sealed enclosure, exceptionally slim. Forward facing. Two units,


Goodmans Magnum-K


Isophon-Werke HSB20


Imhofs BS4


Goodmans Maxim, Mezzo and Magnum


Ionofane 602 enclosure


Grundig Box 70

12 in . bass unit especially designed for this enclosure, employing Goodmans Superfoam diaphragm, and one back-loaded mid-range and H.F. unit. Crossover unit $900 \mathrm{c} / \mathrm{s}$. F.R. $35 \mathrm{c} / \mathrm{s}-$ $15 \mathrm{Kc} / \mathrm{s}$. H.C. 15 watts. Imp. $15 / 16$ ohms. Size: $27 \times 20 \times 6 \frac{1}{4} \mathrm{in}$. Weight: 42 lb . Price: $£ 27$ 10s.

Maxim. Infinite baffle. Forward facing. Incorporates two units specially designed for this box. Crossover included. F.R. $45 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. H.C. 8 W. Imp. 15 ohms. Size: $10 \frac{1}{2} \times 5 \frac{1}{2} \times 7 \frac{1}{4} \mathrm{in}$. Weight: approx. 7 lb . Price: $£ 15$ (U.K. purchase tax £2 10s. 6d.).

Mezzo. Infinite baffle containing two units. 8 in. bass unit with inductance/capacitance crossover at $2,200 \mathrm{c} / \mathrm{s}$. Sealed back 3 in. treble unit. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. H.C. 15 W . Impedance $8-15$ ohms. Bookshelf speaker enclosure. Finish: teak or walnut to order. Size: $10 \frac{3}{4} \times 18 \frac{1}{4} \times 8$ in. Price: $£ 229$ s. 3d. (U.K. purchase tax $£ 315 \mathrm{~s} .9 \mathrm{~d}$.).

Magnum-K. Infinite baffle containing three units. 12 in . bass speaker, mid-range direct radiator, back-loaded direct H.F. radiator. Built-in multiple section crossover, $1.5 \mathrm{Kc} / \mathrm{s}$ and $6 \mathrm{Kc} / \mathrm{s}$. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. H.C. 25 W . Aircushion suspension to bass unit. Two attenuators allow sound tailoring to room acoustics. Classic styling in teak or walnut. Imp. 4-8 ohms. Price: £36 15 s .

GRUNDIG (GREAT BRITAIN) LTD., Newlands Park, Sydenham, London, S.E.26. Tel.: Sydenham 2211. Cables: Grundig, London, S.E.26. Telex: 22854.

Box 70. Infinite baffle 2.8 cu . ft. Four-speaker system comprising 12 in . bass unit, three $7 \frac{1}{8} \times$ $5 \frac{3}{16}$ in. mid- and upper-frequency units. Response $30 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Natural walnut matt finish. Black matt steel legs. Handling capacity $25 W$. Size: $33 \frac{1}{2} \times 193 \times 12 \frac{1}{2}$ in. Price: $£ 519$ s.

Box 100. Infinite baffle $3 \cdot 9$ cu. ft. Nine-speaker system comprising 12 in . bass unit, two $7 \frac{7}{8} \times$ $5 \frac{3}{16}$ in. mid-range units, six $6 \times 2 \frac{3}{16}$ in. tweeters. Cross-over $500 \mathrm{c} / \mathrm{s}$ and $5,000 \mathrm{c} / \mathrm{s}$. Handling capacity 25 W . Natural walnut matt finish. Black matt steel legs. Size: $33 \frac{1}{2} \times 21 \times 16$ in. Price: £72 9s.
C. E. HAMMOND \& CO. LTD., 90 High Street, Eton, Windsor, Berks. Tel.: Windsor 63388. Telex: 84316.

Hammond Europa. Infinite baffle enclosure. Four units: One 12 in. dual cone bass unit, one

5 in. closed back mid-range unit, two 2 in. cone tweeters. Crossover $750 \mathrm{c} / \mathrm{s}$ and $4 \mathrm{Kc} / \mathrm{s}$. F.R. $25 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Size: $33 \frac{1}{2} \times 16 \times 11 \frac{1}{4} \mathrm{in}$. Weight: 25 lb . Imp. 16 ohms only. Finish: Teak with wood grille fillet, satin metal fillet extra. Price: £30 9s.

Hammond L.7. Infinite baffle enclosure. One $6 \frac{1}{2}$ in. twin-cone unit. F.R. $45 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Impedance 8 or 16 ohms. Finish: teak. Size: $20 \times 30 \times 4 \frac{3}{4}$ in. Weight: 6 lb . Price: $£ 110 \mathrm{~s}$. 6 d .

HEATHKIT. See Kit section.

THOMAS HEINITZ, 100 Queensway, London, W.2. Tel.: Bayswater 2077.
C.Q. Junior. Controlled Q reflex enclosure. Units special Goodmans or Peerless $10 \times 6$ in. F.R. $45 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$ depending on unit. Finishes: Teak, walnut, mahogany, all-white (others to order at no extra charge). Size: $16 \frac{1}{2} \times 9 \frac{1}{2} \times 10 \frac{1}{4}$ in. Weight: 7 lb . Price: $£ 818 \mathrm{~s}$. 4 d .

IMHOFS. 112-116 New Oxford Street, London, W.C.1. Tel.: Museum 7878. Cables: Imcase, London, W.C.1.

Imhof BS/4. Reflex cabinet with speaker and cross-over. Unit: Goodmans 8 in . Twin Axiette. Cross-over: mechanical at $2 \mathrm{Kc} / \mathrm{s}$. F.R. $40 \mathrm{c} / \mathrm{s}-$ $18 \mathrm{Kc} / \mathrm{s}$. Handling capacity 6W. Finish: oiled teak. Size: $23 \times 11 \times 11 \mathrm{in}$. Weight: 18 lb . Price: £16 19s. 6d. (U.K. purchase tax 17s. 6d.).

ISOPHON-WERKE, Berlin-Templehof. U.K. Distributors: Britimpex Ltd., 16/22 Great Russell Street, London, W.C.1. Tel.: Museum 7600.

HSB20. Three-speaker system. Totally closed box damped internally. Forward-facing with switch at back to amplify high-midrange. Three units: 8 in . bass unit and two $3 \times 5 \mathrm{in}$. midrange/ H.F. speakers. H.C. 20W. Crossover $1.5 \mathrm{Kc} / \mathrm{s}$. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Size: $24 \frac{3}{8} \times 11 \times 8 \frac{5}{8} \mathrm{in}$. Finish: walnut. Weight: $24 \frac{1}{4} \mathrm{lb}$. Price (with units): $£ 25$ 1s. (U.K. purchase tax $£ 7$ 10s.).

HSB45. Three-speaker system. Totally closed box damped internally. Forward-facing with control at the back adjusting level $+3-7 \mathrm{~dB}$ to


Kirkman Home Concert Hall


KEF Duette


KEF Portable Celeste


KEF Celeste


James B. Lansing Paragon D. 44000


James B. Lansing Libra enclosure
room conditions. Three units (arranged angularly for wide radiation): 10 in . bass unit and two $3 \times 5$ in. midrange/H.F. speakers. H.C. 45W. Crossover $1,500 \mathrm{c} / \mathrm{s}$. F.R. $25 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Finish: walnut. Size: $25 \frac{3}{8} \times 13 \frac{1}{2} \times 11 \frac{1}{4} \mathrm{in}$. Weight: $39{ }_{8}^{3} \mathrm{lb}$. Price (with units): $£ 53$ 7s. 9d. (U.K. purchase tax £8 11s. 3d.).

G3037. Folded horn diffuser. Four-speaker system 12 in. bass unit mounted in bitumenised soundproof case, wide angle diffuser, two 4 in . tweeters. H.C. 15W. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Wood finished cabinet. Size: $23 \frac{5}{8} \times 17 \frac{3}{4} \times 7 \frac{7}{8}$ in. Weight: 2914 lb . Price (with units): £33 1s. 6d. (incl. tax).

JORDAN-WATTS. Distributors: Boosey and Hawkes (Sales) Ltd., Sonorous Works, Deansbrook Road, Edgware, Middlesex. Tel.: Edgware 5581 .

Jumbo. Infinite baffle. Power handling 12 W . Forward facing. Shelf or wall mounting. Incorporates one Jordan-Watts modular unit. F.R. $80 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Size: $16 \frac{1}{2} \times 8 \times 3 \frac{1}{2} \mathrm{ins}$. Weight: 13 lb . Finish: teak. Price: $£ 17$ 12s. 6d.

Jason. Folded column. Power handling 12W. Omni-directional. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Size: $9 \times 9 \times 21 \mathrm{in}$. Weight: 23 lb . Price: $£ 24 \mathrm{l} 10 \mathrm{~s}$.

Juno. Reflex enclosure. Power handling 12W. Forward facing. Incorporates one JordanWatts modular unit. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Size: $24 \frac{1}{2} \times 12 \frac{1}{2} \times 6 \frac{1}{2}$ in. Weight: 27 lb . Price: $£ 2410 \mathrm{~s}$.

Gemini. Reflex enclosure. Power handling 25 W . Forward facing. Incorporates two JordanWatts modular units. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Size: $30 \times 13 \frac{1}{2} \times 7 \frac{1}{2} \mathrm{in}$. Weight: 50 lb . Price: $£ 3915 \mathrm{~s}$.

Jupiter. Reflex enclosure. Power handling 25W. Forward facing. Incorporates two JordañWatts modular units. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Size: $34 \times 15 \times 10 \frac{1}{2}$ in. Weight: 70 lb . Price: $£ 5410 \mathrm{~s}$.
D.P.S. 100. Delayed phase full-room stereophonic speaker. Omni-directional. Power handling: 50W each channel. Incorporates eight Jordan-Watts modular units and delay phase network. Size: $41 \times 11 \times 30 \mathrm{in}$. Price: £185.

Line source columns. 50W and 100W line source columns available to order. Full details on request.

KEF ELECTRONICS LTD., Tovil, Maidstone,

Kent. Tel.: Maidstone 58761. Cables: Kef, Maidstone.

Celeste Mk. II. Totally enclosed. Forward facing. Two drive units $13 \times 9 \mathrm{in}$. and $1 \frac{1}{2} \mathrm{in}$. dia. Crossover $1,000 \mathrm{c} / \mathrm{s}$. Size: $18 \times 10_{4}^{3} \times 6_{4}^{3} \mathrm{in}$. Weight: 24 lb . Price: $£ 26$ 10s.

Portable Celeste. Totally enclosed. Forwardfacing. Two units: B139 $13 \times 9$ in.; T15 $1 \frac{1}{2} \mathrm{in}$. dia. Crossover 1,000 c/s half-section. Size: $20 \times$ $12 \frac{1}{2} \times 7 \frac{1}{2}$ in. Weight: 26 lb . Price: £28.

Concord. Totally enclosed. Forward-facing. Two units: B139 $13 \times 9 \mathrm{in}$.; T15 $1 \frac{1}{2} \mathrm{in}$. dia. Crossover $1,000 \mathrm{c} / \mathrm{s}$ half-section. F.R. $30 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s}$. Size: $24 \times 15 \times 9 \frac{7}{8} \mathrm{in}$. Weight: 45 lb . Price: £39 19s.

Group 4 Cantata. Designed for Group 4 hi-fi assembly but also available separately. Interior arrangement similar to the Celeste but larger enclosure gives improved bass response. Cabinet styling by Wright and Connor. Size: $24 \times 16 \times$ 6 in. Weight: $27 \frac{3}{4} \mathrm{lb}$. Imp. 15 ohms. H.C. 15 W RMS System. Resonance $60 \mathrm{c} / \mathrm{s}$. F.R. $40 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s}$. Finish teak veneer with brushed silver trim and lustre black grille fabric. Price: £32 14s. 4d.

KIRKMAN (CRA WLEY) LTD., 40 The Broadway, Crawley, Sussex. Tel.: Crawley 26670.

Home Concert Hall de Luxe. Tapered reflex enclosure with speakers and crossover. Two 10 in. Wharfedale Bronze/RS and two Celestion HF1300 pressure tweeters fitted. Series capacitors for H.F. units. F.R. -6 dB at $35 \mathrm{c} / \mathrm{s}$ and $15 \mathrm{Kc} / \mathrm{s}$. H.C. 15 W RMS. Omni-directional throughout frequency range in horizontal plane. Inside and outside of enclosure employed to maintain non-resonant closely controlled acoustic load. Finish: teak with bronze grille. Size: $31 \times 18 \times 8 \frac{1}{2} \mathrm{in}$. Weight: 44 lb . Price: $£ 45$.

KORTING. Distributors: Europa Electronics Ltd., Howard Place, Shelton, Stoke-on-Trent. Tel.: Stoke-on-Trent 29316.

LSB 30 (26951). Infinite baffle twin speaker system. One $9 \frac{1}{2}$ in. bass speaker with large cone movement and low resonance. One $7 \times 5 \mathrm{in}$. high flux mid- and upper-frequency unit. Power handling capacity 18 W continuous RMS. Frequency range $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Impedance 4.5 ohms. Cabinet of satin finished walnut with rare wood trim. Supplied with 10 ft . lead and plus. Size: $14 \times 26 \times 7$ in. Price: $£ 309$ s.


James B. Lansing C. 37 Lowboy


James B. Lansing Paragon


James B. Lansing Baron 032


James B. Lansing Olympus $S 7 R$


James B. Lansing Lancer 101


James B. Lansing Rhodes 001

JAMES B. LANSING SOUND INC. Distributors: Ad. Auriema Ltd., 125 Gunnersbury Avenue, London, W.3. Tel.: Acorn 8762.

Libra (D53LE14C). Reflex hi-fi enclosure. Composite unit comprising 14 in . bass driver and 2 in . H.F. tweeter. Crossover $1.8 \mathrm{Kc} / \mathrm{s}$. H.C. 30 W music. Large cone area for compact enclosure. Finish: oiled walnut. Size: $23 \frac{1}{2} \times$ $14 \times 12 \frac{1}{2}$ in. Weight: 50 lb . Price: $£ 117$.

Baron 032 (D38032). Reflex hi-fi enclosure fitted two units. 12 in. L.F. driver, LE20 H.F. direct radiator. Crossover $2.5 \mathrm{Kc} / \mathrm{s}$. H.C. 25 W music. Finish: oiled walnut or tawny walnut. Size: $24 \frac{3}{8} \times 23 \frac{3}{4} \times 15 \frac{7}{8}$ in. Weight: 68 lb . Price: £130.

Lancer 101 (L101). Reflex hi-fi enclosure. 14 in. bass driver, H.F. horn driver with acoustic lens and LX10 crossover. Crossover $1.5 \mathrm{Kc} / \mathrm{s}$. H.C. 30W RMS. High frequency radiation uniformly distributed through 90 degree solid angle. Finish: oiled walnut or tawny walnut with Adriatic marble top and hand-carved fretwork grille. Size: $23 \times 17 \frac{1}{2} \times 12 \frac{3}{8} \mathrm{in}$. Weight: 86 lb . Price: £210.

Rhodes 001 (D37001). Reflex hi-fi enclosure comprising 15 in. (130A) bass driver with LE17 H.F. driver/horn assembly. Crossover 1,200 c/s. Uniform distribution of high frequencies through 90 degrees solid angle. Finish: oiled walnut or tawny walnut. H.C. 25 W music. Size: $28 \frac{7}{8} \times 36 \times 16$ in. Weight: 106 lb . Price: £245.

Olympus S7R. Infinite baffle enclosure. 15 in. L.F. driver, LE85 H.F. driver, HL91 horn and acoustic lens assembly, PR15 passive radiator. Crossover $500 \mathrm{c} / \mathrm{s}$. H.C. 50W music. Passive radiator doubles effective bass area. Slant-plate acoustic lens distributes H.F. through 120degree horizontal angle. Finish: oiled walnut, tawny walnut or Danish teak. Size: $26 \frac{1}{2} \times 40 \times$ 20 in. Weight: 165 lb . Price: $£ 395$.

Paragon (D44000). Horn type hi-fi stereo speaker assembly. Two 15 in. LE15A bass units, two 375 H.F. drivers, two horn assemblies and two 075 ring radiators. Crossovers: two L-C type LX5 $500 \mathrm{c} / \mathrm{s}$, two N7000 L-C $7 \mathrm{Kc} / \mathrm{s}$. Integrated stereo system. Patented radial refraction arrangement combines two channels into single three-dimensional sound source. H.C. 60W per channel. Finish: oiled walnut or tawny walnut. Size: $35 \frac{1}{4} \times 103 \frac{5}{8} \times 24$ in. Weight : 694 lb . Price: £1,345.
H. J. LEAK \& CO. LTD., 57-59 Brunel Road, East Acton, London, W.3. Tel.: Shepherds Bush 1173. Cables: Sinusoidal, Ealux, London.

Sandwich. Forward facing. Two units, bass 13 in., treble 3 in. Half section crossover filter. Cabinet can be placed in vertical or horizontal position. The unique sandwich construction diaphragm behaves as a rigid piston, thus eliminating break-up distortion and resulting in a remarkably smooth frequency response. Impedance 15 ohms. Crossover $900 \mathrm{c} / \mathrm{s}$. Sixelement filter. Finish: Walnut, sapele mahogany or teak. Other finishes to order at slightly higher cost. Size: $26 \times 15 \times 12 \mathrm{in}$. Weight: $49 \cdot 5 \mathrm{lb}$. Price: $£ 39$ 18s.

Mini-sandwich. Forward facing. Two units, bass 12 in. elliptical, treble 3 in. Half-section crossover filter. Cabinet can be placed in vertical or horizontal position. Sandwich construction diaphragm behaves as a rigid piston, thus eliminating break-up distortion and providing a smooth frequency response. Performance indistinguishable from standard Sandwich except for the lowest octave. Size: $18 \frac{1}{2} \times 11 \times 7$ in. Weight: 22 lb . Price: $£ 27$ 10s.

LL ELECTRONICS LTD., 5 Shakespeare Road, Finchley, London, N.3. Tel.: Finchley 3332.

LL.SPK1. Infinite baffle enclosure with two units and crossover. Goodmans $6 \frac{1}{2}$ in. longthrow bass driver, Goodmans 4 in. tweeter. Crossover $2 \mathrm{Kc} / \mathrm{s}$, $\frac{1}{4}$-section. F.R. $50 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. H.C. 10W. Finish: teak. Size: $16 \times 10 \times 7$ in. Price: £10 17s. 2d. (U.K. purchase tax £1 14s. 10d.).
L.N.B. AUDIO SERVICES, 25 Cambridge Street, Loughborough, Leics. Tel.: Loughborough 61229.

Labyrinth 10 Mk. I. Free-standing enclosure consisting of 9 ft . folded pipe designed to minimise resonances and extend response. Rec. unit: Wharfedale Golden 10/RS/DD. F.R. $30 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s}$. Finish: sapele/teak with Vynair front. Size: $29 \frac{3}{4} \times 19 \times 12$ in. Weight: 36 lb . Price (cabinet only): £21 10s.

Labyrinth 8 Mk. II. Free-standing enclosure consisting of 7 ft . folded tunnel designed to minimise resonances and extend response. Material: $\frac{1}{2}$ in. chipboard in rigid tube construc-


Jordan-Watts A25 Reflex Enclosure


Luxor SH207


Leak Mini-Sandwich


Lockwood LE1/AS


Lockwood LE1/W AS
tion. Rec. unit: Wharfedale Super 8/RS/DD or Bronze 8/RS/DD. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Finish: sapele/teak. Size: $24 \times 15 \times 9 \mathrm{in}$. Weight: 26 lb . Price (cabinet only): sapele $£ 13$ 10s., teak $£ 14$ 14s.

Labyrinth 5 Plus. Free-standing enclosure employing labyrinth principle to reduce resonances, etc. Special 5 in. drive unit with selected tweeter. F.R. $40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. H.C. 10 W music. Impedance $10-15$ ohms. Finish: teak or sapele. Approximate price: $£ 20$ complete including tax.

Compact. General purpose bass reflex enclosure for any 8 in . unit. Suitable for budget stereo or PA. Size: $24 \times 12 \times 9$ in. Material: $\frac{1}{2}$ in. chipboard. Finish: sapele/teak. Price (enclosure only): sapele £7 17s. 6d., teak £8 18s. 6d.

LOCKWOOD \& CO. (WOODWORKERS) LTD., 63 Lowlands Road, Harrow, Middx. Tel.: Byron 3704.

Mini-slim. Reflex, forward facing. 12 in. units. Rec. Tannoy 12 in. dual concentric, Tannoy III LZ dual concentric. Size: $27 \frac{1}{2} \times 19 \times 9 \frac{1}{8}$ in. Price (with specified units): $£ 5115 \mathrm{~s} ., £ 4310 \mathrm{~s}$.

Minor Slim. Reflex, forward facing. 12 or 15 in. units. Rec. Tannoy 12 or 15 in. dual concentric, and units listed for Mini-slim. Size: $33 \frac{1}{8} \times 20 \times 11 \frac{1}{4}$ in. Price (with specified units): $£ 62$ 10s., $£ 55$ 15s., $£ 48$ 10s.

Major Slim. Reflex, forward facing. 12 or 15 in. units. Rec. Tannoy 12 in. and 15 in . dual concentric. Size: $38 \times 24 \times 11 \frac{1}{4} \mathrm{in}$. Price: $£ 6115 \mathrm{~s}$., £68 10s.

These reproducers can also be supplied complete with units by Goodmans, K.E.F., Vitavox, Stentorian and Wharfedale. Prices on application.

LEI/AS Mk. III and LEI/WAS. Studio quality monitoring speakers. Full details and prices on request.

LOWTHER MANUFACTURING CO., Lowther House, St. Mark's Road, Bromley, Kent, England. Tel.: Ravensbourne 5225. Cables: Lowther, Bromley.

Corner Reproducer TP1. Folded bass horn/ direct H.F. horn type. One specially designed 6 in. pressure unit PM3. Acoustical crossover.

Response $40-22,000 \mathrm{c} / \mathrm{s}$. Size: $47 \times 32 \times 31 \mathrm{in}$. from corner. Weight: 70 lb . Price of Standard Model A : £108; Model B £125.

Acousta Cabinet. Models $\mathrm{FH} / \mathrm{V}, \mathrm{FH} / \mathrm{H}$. Folded horn type, forward facing, with rear folded horn. Vertical on runners, or horizontal on 12 in. legs. One unit, 6 in. or 8 in. Rec. Lowther PM6. Response 40-18,000 c/s. Size: $32 \times 18 \frac{1}{4} \times 14 \frac{1}{2}$ in. Weight: 60 lb . Price without unit $£ 21$. Special finishes $£ 23$ 10s. Selected veneers $£ 26 \mathrm{l}$ s.

Mini Acousta. Model FH/V /vertical) and FH/H (horizontal). Folded horn type. Forward facing with rear folded horn. Veneered all round. One 6-8 in. unit. Rec. Lowther PM6 or PM7. Response $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Size: $27 \times 15 \times$ 13 in. Price without unit $£ 23$. Special finishes to order at extra cost.

Audiovector. Compound horn. Upward facing mid- and high-frequency horn with rear folded horn. One 6 in. unit. Acoustic crossover. Range $40-22,000 \mathrm{c} / \mathrm{s}$. Rec. PM2, PM2 Mk. II or PM4. Size: $26 \frac{1}{2} \times 19 \times 34 \mathrm{in}$. Weight: 75 lb . Price with specified units $£ 108$, without units $£ 58$.

Acousta-twin. Dual folded horn. Side facing and rear folded horn system for mono and stereo reproduction. Two PM6, PM7 or PM2 Mk. III 6 in. drive units. Acoustic crossover. Response 40-18,000 c/s. Size: $40 \times 16 \frac{1}{2} \times 18 \mathrm{in}$. Price: £43. Special finishes $£ 4610$ s. Selected veneers $£ 48$ (enclosure only). $£ 80$ 16s. or $£ 103$ complete.

Dual Acousta. Folded horn. Rearward facing into corner or along wall at 45 degrees. Bass outlets coupling into corner of room or along wall. One 6 in. high flux unit. Rec. Lowther PM6 or PM7. F.R. $40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Size: $32 \times 9 \frac{1}{2}$ $\times 18$ in. Price without unit $£ 21$. Special finishes $£ 23$ 10s. Selected veneers $£ 26$ 10s.

LUXOR. Distributors: Britimpex Ltd., 16/22 Great Russell Street, London, W.C.1. Tel.: Museum 7600.

SH105. Floor-standing console enclosure incorporating four units. One high-flux 10 in. bass driver, one 5 in . mid-range speaker, two $2 \frac{1}{2}$ in. H.F. tweeters. F.R. $50 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Impedance 8 ohms. H.C. 8 W RMS. Finish: teak or rosewood. Size: $25 \frac{5}{8} \times 17 \frac{3}{4} \times 4 \frac{3}{4}$ in. Price: $£ 17$ 12s. 11d. (U.K. purchase tax $£ 216 \mathrm{~s}$. 7 d .).

SH207. Compact floor or shelf mounting enclosure with specially designed $10 \times 7$ in.


Lowther Acousta Twin



Leak Sandwick


Lowther TP1


Pye Brahms HF3BS
elliptical speaker. Impedance 4 ohms. Finish: teak, oak or mahogany. Price: $£ 1010$ s.

MEDLEY MUSICAL LTD., 134 Plumstead Road, London, S.E.18. Tel.: Woolwich 1738.

Medley Musette. Twin unit enclosure. 8 in. high-flux bass unit with plasticised surround. 3.9 in. tweeter. Power handling 10W RMS. Impedance 3 or 15 ohms. F.R. $50 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}$. Crossover $5,500 \mathrm{c} / \mathrm{s}$. Finished in oiled teak. Walnut and other finishes to order. Tygan front. Corner brackets fitted for horizontal or vertical wall mounting. Size: $30 \times 10 \times 7 \frac{1}{2}$ in. Price: £18 18s.

Medley Maestro. Twin unit enclosure. Bass driver has rigid moulded fibre cone with rubber suspension. Specially designed H.F. tweeter. Power handling 15 W . Impedance $8-16$ ohms. F.R. $40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Finish in teak or walnut to order. Size: $26 \frac{1}{2} \times 16 \times 12 \frac{3}{4}$ in. Price: $£ 33$.

METZ. Distributors: Mitchell Enterprises Ltd., 61 West Street, Dorking, Surrey. Tel.: Dorking 4229.

Metz 450. Speaker enclosure complete with two units and crossover network. Special 8 in. bass unit. 10,500 gauss. $7 \times 5 \mathrm{in}$. middle and upper frequency unit. 9,500 gauss. F.R. $55 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s}$. Cross-over frequency $3 \mathrm{Kc} / \mathrm{s}$. Impedance 5 ohms. H.C. 20W RMS, 30W music. Size: 21 in . high, $11_{2}^{1} \mathrm{in}$. wide, 8 in . deep. Weight: 22 lb . Walnut finish. Price to be announced.
V. J. MONK LTD., 140/141 Plumstead Road, London, S.E.18. Tel.: Woolwich 2369.

Variline. Folded column enclosure similar to the Paraline in performance having an adjustable reflector board which can be "tuned" to individual requirements. Rec. unit Elac $8 \mathrm{~N} / 185$ F.R. nominally $40 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. Finish: Walnut, mahogany or teak beaumel (laminated plastic). Imp. 15 ohms. H.C. 5W. May be wall mounted or free-standing. Size (closed): $36 \times 22 \times 5 \mathrm{in}$. Weight: 30 lb . with unit. Price: Cabinet only $£ 13$ 13s. with speaker $£ 1710$ s.

Variline Mk. II. Specification as for standard Variline but with the addition of two Lorenz tweeters. Frequency range extended to $17 \mathrm{Kc} / \mathrm{s}$.

Variline Mk. II has no reflector board. Cabinet finished back and front so the unit can be used as a reflecting system or forward facing. Price: £20.

Paraline Tweeter Kit. Comprising two Lorenz LPH65 tweeters, 2 mF capacitor, sealing strip, wiring diagram and fitting template. Note: One kit is required for each Paraline. Price: $£ 315$ s.
V. J. Monk Ltd. also manufacture the R. N. Baldock Paraline speaker enclosure. Full details and prices on request.

MORDAUNT SOUND SALES, Division of Soundcraft Co., 1 Stanley Road, off Napier Road, Bromley, Kent. Tel.: Ravensbourne 5673.

Stirling. Totally enclosed. Forward facing. Two units: 12 in . bass. $1 \frac{1}{2} \mathrm{in}$. hemispherical treble. Crossover $1,750 \mathrm{c} / \mathrm{s}$. F.R. $35 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. H.C. 15 W RMS. Size: $29 \times 15 \times 11 \mathrm{in}$. Price (with units): £33 12s.

Arundel Mk. II. Totally enclosed. Forward facing. Two units, 12 in. bass, ribbon tweeter. Crossover $2,750 \mathrm{c} / \mathrm{s}$. F.R. $30 \mathrm{c} / \mathrm{s}-25 \mathrm{Kc} / \mathrm{s}$. H.C. 12/15 watts. Size: $33 \times 15 \times 11 \mathrm{in}$. Wèight: 44 lb. Price: $£ 442 \mathrm{~s}$.

Conway. Totally enclosed. Forward facing. Two units, 12 in. bass, ribbon tweeter. Crossover $2,750 \mathrm{c} / \mathrm{s}$. F.R. $25 \mathrm{c} / \mathrm{s}-25 \mathrm{Kc} / \mathrm{s}$. H.C. 1215W. Size: $33 \times 18 \times 12 \mathrm{in}$. Fitted with acoustic lens. Price: $£ 519 \mathrm{~s}$.

MUSICRAFT HI-FI CENTRE, 63 High Street, Hounslow, Middlesex. Tel.: Hounslow 4640.

Modular. Complete forward-facing system, using reflex enclosure principle for bass loading. Designed to match Modular tape and equipment cabinets. Designed for single 12 in . unit. Celestion CX1512 recommended. Size: $20 \times$ $20 \times 20 \mathrm{in}$. Finish in sapele mahogany or teak. Price: $£ 12$ 12s. (cabinet only without unit).

PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Avenue, London, W.C.2. Tel.: Gerrard 7777. Cables: Phillamps, London.

AD5061. Vented enclosure employing 8 in. round, full range, twin cone drive unit. H.C. 10W RMS. Impedance 8 ohms. Teak veneered cabinet with grey fabric grille. Size: $23 \frac{1}{2} \times 12 \times$ 9 in . Price to be announced.


Mordaunt Arundel, Warwick or Sterling


Musicraft modular enclosure


Sonotone Solent

AD5062. Infinite baffle enclosure employing three drive units with crossover network. 12 in. bass driver with air damped foam plastic cone, two $7 \times 5$ in. dual cone mid and high note units with major axes at right angles to each other to improve distribution. H.C. 20W RMS. Impedance 8 ohms. Teak veneered cabinet with grey fabric grille. Size: $26 \times 14 \times 11 \frac{1}{2} \mathrm{in}$. Price to be announced.

AD5064. Compact infinite baffle with two drive units with crossover. 7 in. bass driver with plastic foam cone, 4 in . dual cone mid and high note unit. H.C. 10W RMS. Impedance 8 ohms. Teak veneered cabinet with grey fabric grille. Size: $17 \frac{1}{2} \times 9 \frac{3}{4} \times 7 \frac{1}{2} \mathrm{in}$. Price to be announced.

PIONEER. Distributors: Swisstone Ltd., 26 Leigh Place, Cobham, Surrey. Tel.: Cobham 2853.

CS-51. Miniature infinite baffle enclosure. One 5 in . unit, one $2 \frac{1}{4} \mathrm{in}$. tweeter. F.R. $50 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s} . \mathrm{H} . \mathrm{C} .20 \mathrm{~W}$ music. Impedance 16 ohms. Size: $9 \frac{7}{8} \times 5 \frac{7}{8} \times 6 \frac{1}{2} \mathrm{in}$. Weight: $8 \frac{1}{2} \mathrm{lb}$. Oiled walnut finish with perforated metal grille. Supplied with wall mounting brackets. Price: £31 10s.

CS-A50. Infinite baffle five unit enclosure. Onc 12 in . bass unit, one 5 in . mid-range unit, two cone tweeters, one horn tweeter. Crossover frequencies $500 \mathrm{c} / \mathrm{s}$ and $3.5 \mathrm{Kc} / \mathrm{s}$. F.R. $30 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s}$. H.C. 40 W . Size: $26 \times 15 \frac{1}{4} \times 12 \frac{3}{8}$ in. Weight: 34 lb . Oiled walnut finish with aluminium trim. Impedance 8 ohms. Price: $£ 895$ s.

PYE LTD., High Fidelity Division. St. Peter's Road, Furze Platt, Maidenhead, Berks. Tel.: Maidenhead 23331.

Brahms HF3BS. Infinite baffle for floor, shelf or wall mounting. Two drive units, $10 \times 6 \mathrm{in}$. twin-cone bass and mid-range speaker, 4 in . tweeter. F.R. $40 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s} .15 \mathrm{~W}$. Finish: light walnut with black trim. Size: $21 \frac{1}{2} \times 11 \frac{3}{4} \times 6 \frac{1}{2}$ in. Price: £15 7s. 8d. (U.K. purchase tax £2 9s. 4d.).

RADFORD ELECTRONICS LTD., Ashton Vale Estate, Bristol 3. Tel.: Bristol 662301/2.

Bookshelf. Two drive units equalised and integrated by an eight-element network. Flatfaced expanded polystyrene foil-stressed bass driver. 2 in. voice coil. Gap flux 13,500 gauss.

Sealed direct radiator pressure type H.F. unit. Enclosure sealed and internally lagged. Flat response down to $60 \mathrm{c} / \mathrm{s}$ with gradual roll off below. H.C. 30 W . Size: $21 \times 12 \times 8 \mathrm{in}$. Weight: 28 lb . Price: $£ 27$ 10s.

Executive. Same units as the Bookshelf but with a more complex 11 element integrating network. Acoustic phase corrector fitted. Dimensions same as Bookshelf except $8 \frac{1}{2}$ in. deep and the panel to which the fret material is fixed is removable from the front. H.C. 30W. Weight: 30 lb . Price: $£ 35$.

Monitor. Three drive units and 18 element network. Crossover at $500 \mathrm{c} / \mathrm{s}$ and $5 \mathrm{Kc} / \mathrm{s}$. Response $40 \mathrm{c} / \mathrm{s}-13.5 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Cabinet 1 in . thick Afromosia. H.C. 45 W. Size: $25 \frac{3}{4} \times 15 \times$ $11 \frac{1}{2} \mathrm{in}$. Weight: 38 lb . Price: $£ 47 \mathrm{los}$.

Studio. Identical driving system as the Monitor but with the rear of the bass driver acoustically loaded to extend flat response to below $30 \mathrm{c} / \mathrm{s}$. Size: $35 \times 17 \frac{1}{4} \times 15 \mathrm{in}$. Weight: 60 lb . Price: $£ 70$.

RECORD HOUSING, Brook Road, London, N.22. Tel.: Bowes Park 7487.

Folded Horn Enclosure. Forward facing freestanding. One 8 in. unit. Rec. Goodmans Axiette 8 or Wharfedale Super 8. Size: $27 \frac{1}{2} \times$ $16 \frac{1}{4} \times 10 \mathrm{in}$. Finish: walnut, mahogany or teak. Price (cabinet only): £10 19s.

Hi-flex 10/12. Reflex enclosure with slotted wood fascia. Two drive units ( 10 in . or 12 in .) with tweeter. Rec. units: Celestion CX.15/12 and CX. 20/12 or Wharfedale Super 12. Size: $32 \times 17 \times 10 \frac{1}{2}$ in. Finish: walnut, mahogany or teak. Price: £11 19s. (cabinet only).

Scan speaker enclosure. Reflex cabinet with slotted wood fascia. One 8 in. unit. Recommended: Wharfedale Super 8 or Goodmans Axiette 8. Size: $193 \times 15 \times 8 \mathrm{in}$. Finish: teak, walnut or mahogany. Price: £8 8s. (cabinet only).

THE RECTAVOX COMPANY, Central Buildings; Wallsend, Northumberland. Tel.: Wallsend 624845 (STD ONE-2).

Omni 8. Specially shaped reflex enclosure providing unique versatility of positioning. Designed for 8 in. drive unit with provision for

R.T.M. Acoustics 20-20


## Radford bookshelf




Rectivox Omni Mk. II


Sugden Craftsman Major
tweeter. Frequency range dependent on drive unit employed. Finish: Teak, walnut or mahogany laminated plastic veneers with satinchrome brass frame. Size: $24 \frac{1}{2}$ in. maximum dimension. Price: (enclosure only) $£ 18$. May be converted to Omni 10 by adding tweeter and changing driver unit.

Omni. Reflex enclosure with special shape giving low resonant frequency and unique versatility of positioning. Units: K.E.F. B139 foilstressed expanded polystyrene diaphragm bass and mid-range driver, K.E.F. T15 hemispherical dome tweeter. Crossover four-element $\frac{1}{2}$-section $1 \mathrm{Kc} / \mathrm{s}$. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Imp. 15 ohms. H.C. 15W. Finish: Teak, walnut or mahogany laminated plastic wood grain veneers, Tygan fret material, satin-chrome brass frame. Size: $24 \frac{1}{2} \mathrm{in}$. maximum dimension, fret front $18 \frac{3}{4} \times 1 \frac{5}{8}$ in. Weight: 40 lb . Price: $£ 3910 \mathrm{~s}$. with units; (enclosure only $£ 18$ ).

Ambi. Similar performance to the Omni but in a compact enclosure of more orthodox rectangular shape. Size: $18 \frac{3}{4} \times 11 \frac{5}{8} \times 9 \frac{3}{4} \mathrm{in}$. Weight: 35 lb . Price (with units): $£ 3610 \mathrm{~s}$.; (enclosure only): £15.

Conversion kits. Tweeter and crossover. Price: $£ 10$. Bass driver unit. Price: $£ 1110$ s.

## ROGERS DEVELOPMENTS (ELECTRONICS), LTD., Rodevco Works, 4-14 Barmeston Road, Catford, S.E.6. Tel.: Hither Green 7424 and 4340. Cables: Rodevco, London.

Cadet III. Compact shelf or floor-standing enclosure. 12 in. bass unit with separate tweeter. Enclosure internally damped with Fibroceta. F.R. $30 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. H.C. $10-12 \mathrm{~W}$. Imp. 15 ohms. Finish: Teak or dark Australian walnut Formica laminate with Vynair front. May be used horizontally or vertically. Size: $20 \times 13 \frac{3}{4} \times$ 9 in. Price (either finish): $£ 25$.

Wafer speaker system. Infinite baffle. 5 in. unit plus tweeter. F.R. $40-16,000 \mathrm{c} / \mathrm{s}$. H.C. 12 W . Imp. 15 ohms. Size: $13 \frac{1}{8} \times 16 \frac{5}{8} \times 2 \frac{1}{2}$ in. Woodgrain finish Formica. Price: $£ 14$ 10s. (U.K. purchase tax £2 9s. 6d.).
R.T.M. ACOUSTICS, 387 Mare Street, Hackney, London, E.8. Tel.: Amherst 9591.

RTM 20-20. Exponential horn. 12 in. bass driver, $\frac{1}{2}$ in. Vitavox treble driver. Two separate
horns with mechanical and electrical crossover at approximately $600 \mathrm{c} / \mathrm{s}$. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. H.C. 18W. Imp. 15 ohms or switched transformer to order. Adjustable polar diagram from highly directional to completely omni-directional. Independent controls for middle and top frequencies. Mahogany, walnut or teak. Other finishes to order. Size: $35 \times 20 \times 16 \frac{1}{2} \mathrm{in}$. Weight: 74 lb . Price: $£ 61 \mathrm{19s}$.
S.H.B. Svenska Hogtalarefabrken AB. Distributors: Metro-Sound (Sales) Ltd., Bridge Works, Wallace Road, Canonbury, London, N.1. Tel.: Canonbury 8641. Cables: Metrosound, London, N.1.
B.7. Speaker enclosure. Infinite baffle. H.C. 8W. F.R. $45 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Double layer cone system. Imp. 3-4 ohms or 15-16 ohms. Cabinet finished white or teak. Size: $16 \frac{1}{2} \times 11 \frac{3}{4} \times 3 \frac{1}{2} \mathrm{in}$. Price: $£ 10$ 10s. (U.K. purchase tax $£ 115 \mathrm{~s}$. 5 d .).

Mini-B Speaker Enclosure. Infinite baffle. H.C. 8 W. F.R. $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Double layer cone system. Imp. 3-4 ohms or 15-16 ohms. Cabinet in Scandinavian teak with blue-grey facing: Size: $10 \times 53 \times 7$ in. Price: $£ 10$ (U.K. purchase - $\operatorname{tax} \mathrm{fl} 13 \mathrm{~s}$. 8d.).

## SHERWOOD ELECTRONICLABORATOR-

 IES INC. Distributors: Audioson Ltd., York House, Empire Way, Wembley, Middlesex. Tel.: Diligence 1886.Newport. Two-speaker enclosure. 10 in. bass driver, 4 in. tweeter. F.R. $53 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s} \pm 2 \frac{1}{2}$ dB. H.C. 45 W music. Crossover $1.8 \mathrm{Kc} / \mathrm{s}$. Impedance 8 ohms. Finish: walnut, or birch (unfinished). Size: $24 \times 13 \times 9 \frac{1}{2} \mathrm{in}$. Weight (shipping): 33 lb . Price on application.

Ravinia. Three-speaker enclosure. 12 in. bass driver, 8 in . mid-range, $3 \frac{1}{2} \mathrm{in}$. omni-polar tweeter. F.R. $48 \mathrm{c} / \mathrm{s}-17.5 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. H.C. 60 W music. Crossover: $600 \mathrm{c} / \mathrm{s}, 3.5 \mathrm{Kc} / \mathrm{s}$. Impedance 8 ohms. Size: $26 \frac{1}{4} \times 15 \times 13 \frac{1}{4} \mathrm{in}$. Weight (shipping): 55 lb. Finish: walnut, or birch (unfinished). Price on application.

Berkshire. Three-speaker enclosure. 10 in. bass driver, 8 in . mid-range, $3 \frac{1}{2}$ in. tweeter. F.R. $53 \mathrm{c} / \mathrm{s}-17,500 \mathrm{c} / \mathrm{s} \pm 2 \frac{1}{2} \mathrm{~dB}$. H.C. 50 W music. Crossover: $600 \mathrm{c} / \mathrm{s}, 3.5 \mathrm{Kc} / \mathrm{s}$. Impedance 8 ohms. Size: $24 \times 13 \times 9 \frac{1}{2} \mathrm{in}$. Weight (shipping): 36 lb . Finish: walnut, or birch (unfinished). Price on application.


Tannoy III LZC


Radford Executive or Monitor (similar appearance)


Rectavox Ambi enclosure


Vitavox Bitone 3200


Wharfedale Linton


Variline folded column

Tanglewood. Fourway speaker enclosure. Two 10 in . bass drivers, 8 in . mid-low unit, 8 in . midhigh unit, one omni-polar tweeter. F.R. $29 \mathrm{c} / \mathrm{s}-$ $17,500 \mathrm{c} / \mathrm{s} \pm 2 \frac{1}{2} \mathrm{~dB}$. H.C. 70W music. Crossover: $200 \mathrm{c} / \mathrm{s}, 600 \mathrm{c} / \mathrm{s}, 3.5 \mathrm{Kc} / \mathrm{s}$. Impedance 8 ohms. Finish: walnut, or birch (unfinished). Size: $24 \times 31 \frac{1}{2} \times 13 \mathrm{in}$. Weight (shipping): 73 lb . Price on application.

SONOTONE. Technical Ceramics Ltd., New Lane, Havant, Hants. Tel.: Havant 6344.

Solent. Infinite baffle two-unit miniature enclosure. $6 \frac{1}{2}$ in. bass unit with 1 in . diameter voice coil and 10,000 gauss magnet. $3 \frac{3}{4} \mathrm{in}$. acoustically loaded tweeter. L/C crossover at $2 \mathrm{Kc} / \mathrm{s}$. F.R. 40 $\mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Handling capacity 12 W . Impedance 8 ohms (suitable for valve or transistor amplifiers with output $8-15$ ohms). Matt walnut Scandinavian style cabinet with slotted front. Size: $14 \times 9 \times 8 \frac{1}{2}$ in. Weight: $9 \frac{3}{4} \mathrm{lb}$. Price: $£ 158 \mathrm{~s}$. (U.K. purchase tax $£ 2$ 12s.).

SOUNDCRAFT. See Mordaunt Sound Sales.

STENTORIAN. See Whiteley Electrical.
A. R. SUGDEN \& CO. (ENGINEERS) LTD., Market Street, Brighouse, Yorks. Tel.: Brighouse 2142. Cables: Connoisseur, Brighouse.

Connoisseur Craftsman Minor. Column reflex with upward facing ports. Omni-directional $360^{\circ} .15$ ohms impedance at $400 \mathrm{c} / \mathrm{s}$. One unit, 8 in. foam surround with H.F. dome. 812/FS recommended. Response $40-12,000 \mathrm{c} / \mathrm{s}$. Size: $36 \times 11_{2} \mathrm{in}$. max. dia. Weight: 17 lb . Price: enclosure, $£ 108 \mathrm{~s} .9 \mathrm{~d} . ; 8 \mathrm{in}$. unit for above $812 / \mathrm{FS}$ $£ 27 \mathrm{~s}$. 6 d . (U.K. purchase tax 7s. 10d.).

Connoisseur Craftsman Major. Column reflex with upward facing ports. Omni-directional $360^{\circ} .15$ ohms impedance at $400 \mathrm{c} / \mathrm{s}$. One 8 in . foam surround unit, one 3 in . tweeter. G8/FS and $\mathrm{LPH} / 65$ recommended. Capacitor filter. Response $30-17,000 \mathrm{c} / \mathrm{s}$. Size: $43 \times 14 \frac{1}{2} \mathrm{in}$. max. dia. Price: enclosure only, £15 10s. 8d.; G8/FS $£ 3$ (U.K. purchase tax 10s.); LPH/65 £2 (U.K. purchase tax 6s. 8d.).

Connoisseur "Junior". Column reflex. Upward facing port, omni-directional $360^{\circ}$. One
unit: 3 or 15 ohm available. $6 \frac{1}{2}$ in. foam surround. F.R. $50 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. Size: $26 \times 9 \mathrm{in}$. max. dia. Weight: 10 lbs . Price: (with unit) $£ 711 \mathrm{~s}$. 10d.


SYMPHONY AMPLIFIERS LTD., 16 Kings
College Road, London, N.W.3. Tel.: Primrose 3314/5.

Symphony Bass Reflex Cabinets. A range of forward facing systems to take 8,10 or 12 in . units. Price, ready built: $£ 7$ 10s.

TANDBERG. Distributors: Elstone Electronics Ltd., 81 Kirkstall Road, Leeds, 3. Tel.: Leeds 35111.

Model 9. Shelf mounting enclosure with unit. $6 \frac{1}{2}$ in. dual cone speaker. F.R. $80 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s}$. H.C. 5W RMS. Impedance 5 ohms. Teak cabinet. Size: $14 \frac{5}{8} \times 10_{8}^{3} \times 9 \frac{3}{4} \mathrm{in}$. Price on application.

System 113/106-10. Miniature shelf mounting enclosure incorporating two units. $6 \frac{1}{2}$ in. bass driver, 2 in. tweeter. Crossover $3 \mathrm{Kc} /$ s. F.R. 60 $\mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. H.C. 8 W RMS. Impedance 4 ohms. Teak cabinet. Size: $7 \frac{1}{8} \times 9 \frac{1}{8} \times 9 \frac{1}{8}$ in. Price on application.

System 112-7. Compact shelf or floor mounting enclosure incorporating dual coaxial unit. $10 \times 6 \mathrm{in}$. bass driver, 2 in . tweeter mounted coaxially. F.R. $60 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. H.C. 10 W RMS. Impedance 3.2 ohms. Crossover $3 \mathrm{Kc} / \mathrm{s}$. Teak cabinet. Size: $20 \frac{1}{2} \times 10 \frac{1}{4} \times 9 \frac{3}{4} \mathrm{in}$. Price on application.

System 114/116-B. Shelf or floor mounting enclosure incorporating dual coaxial unit. 10 in. bass driver with 2.5 in . tweeter mounted coaxially. F.R. $45 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. H.C. 20W. Crossover $3 \mathrm{Kc} / \mathrm{s}$. Impedance 4 ohms. Teak cabinet. Size: $27 \frac{5}{8} \times 13 \frac{3}{8} \times 11 \mathrm{in}$. Price on application.

TANNOY PRODUCTS LTD., West Norwood, London, S.E.27. Tel.: Gipsy Hill 1131. Cables: Tannoy, London.

Audio Metric. Infinite baffle. Forward facing. One 12 in. bass and mid-range unit, single suspension small diaphragm presence unit. H.C. 15W RMS. Frequency response $40 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Size: $32 \frac{1}{2} \times 17 \times 7$ in. Price: $£ 27$ 10s.


I'itarox Klipschor"n

Stentorian LC92


Woollett Electrostatic


Whiteley Thoresby bass reflex


Wharfedale PST/8


Wharfedale Dovedale

III LZC. Mk. II. Infinite baffle forward facing. Tannoy III LZ dual concentric unit. Response $30-20,000 \mathrm{c} / \mathrm{s}$. Size: $14 \times 10_{4}^{3} \times 23 \frac{1}{4} \mathrm{in}$. Price: $£ 32$ 10s.

Lancaster. Reflex (single port) forward facing. Free standing. One 12 in . Monitor. Size: $33 \frac{1}{2} \times 21 \frac{1}{2} \times 12 \frac{1}{2}$ in. wih 2 in. plinth. Price: $£ 50$.

Lancaster. Reflex (single port) forward facing. Corner placing. One 12 in . $11, \cdots h(1)$. Size: $33 \times 25 \times 16_{4}^{3}$ in. with 2 in. pla ヶ. Prive: (5).

Lancaster. Aperiodic free standing enclosure. One Monitor 15 in . drive unit. Size: $33 \frac{1}{2} \times$ $21 \frac{1}{2} \times 12 \frac{1}{2}$ with 2 in. plinth. Price: $£ 5710$ s.

Lancaster. Aperiodic corner enclosure. One Monitor 15 in. drive unit. Size: $33 \times 25 \times 16 \frac{3}{4}$ in. with 2 in. plinth. Price: $£ 57$ 10s.

Rectangular York. Reflex (single port). For-ward-facing. Complete with 15 in . dual concentric unit (Monitor 15). Crossover $1,000 \mathrm{c} / \mathrm{s}$. F.R. as for speaker units. Size: (front to back) $15 \times 23 \frac{1}{2} \times 42$ in. Price: $£ 75$.

York. Reflex. Forward facing unit, dual throated ports, for corner placing. 12 in. or 15 in. dual concentric unit. Response $35-20,000 \mathrm{c} / \mathrm{s}$. Size: $45 \frac{1}{2} \times 32 \times 22 \frac{1}{2}$ in. Price: with 12 in . unit, $£ 66$; with 15 in. $£ 75$.

Rectangular GRF. Single folded horn. For-ward-facing with front exits. Complete with 15 in. dual concentric unit (Monitor 15). Special crossover $1,000 \mathrm{c} / \mathrm{s}$. F.R. as speaker unit. Size (front to back): $17 \frac{1}{4} \times 23 \frac{1}{2} \times 42$ in. Price: $£ 105$.
G.R.F. Folded horn. Rear horn loaded, for-ward-facing unit, for corner. One 15 in . dual concentric unit. Response $20-20,000 \mathrm{c} / \mathrm{s}$. Size: $48 \times 38 \times 29$ in. Price: $£ 122$.

Guy R. Fountain Autograph. Folded horn. Front and rearhorn-loaded unit, forward-facing for corner placing. 15 in . dual concentric unit. Response $20-20,000 \mathrm{c} / \mathrm{s}$. Size: $58 \frac{1}{2} \times 43 \times 26 \frac{1}{2}$ in. Price: $£ 165$.

TRUVOX LTD., Neasden Lane, London, N.W.10. Tel.: Dollis Hill 8011. Cables: Truvoxeng, London, N.W.10.

LS100. Tuned-port bass reflex enclosure suitable for vertical or horizontal operation. Freestanding. Heavy internal lagging. Units: 12 in. roll-surround bass unit with ceramic magnet.

Celestion H.F. pressure unit. $\frac{1}{4}$-section L/C crossover operates at $4 \mathrm{Kc} / \mathrm{s}$. F.R. $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Finish: Afrormosia. Size: $27 \frac{1}{4} \times 18 \times 7 \frac{1}{2} \mathrm{in}$. Weight: 29 lb . Price: $£ 26.5 \mathrm{~s}$.

VARILINE. See V. J. Monk Ltd.

VITAVOX LTD., Westmoreland Road, London, N.W.9. Tel.: Colindale 8671. Cables: Vitavox, London, N.W.9.

Klipschorn. Double channel horn system. Folded L.F. horn with AK152 drive unit. For-ward-facing H.F. horn with S2 pressure unit. Filter network incorporated. Crossover $500 \mathrm{c} / \mathrm{s}$. Response $30 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. High translational efficiency. Size: $51 \times 30 \times 27 \mathrm{in}$. Weight: 210 lb . with drive units. Price: $£ 165$ (nett).

Bitone Series 3200. Double channel sound system comprising three-cell horn (distribution $60^{\circ}$ wide $\times 20^{\circ}$ high) with 12 in. L.F. driver in vented enclosure. Filter network $1 \mathrm{Kc} / \mathrm{s}$ crossover attenuation 12 dB per octave. H.F. balance control $0-8 \mathrm{~dB}$ attenuation. H.C. 20W. F.R. 50 $\mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Size: $24 \times 20 \times 19 \mathrm{in}$. Weight: 70 lb . Price: from $£ 60$.

Bitone Series 6200. Similar specification to 3200 but with six-cell horn giving distribution $60^{\circ}$ wide $\times 40^{\circ}$ high. Size: $29 \times 20 \times 20$ in. Weight: 78 lb . Price: from $£ 73$.

## WHARFEDALE WIRELESS WORKS LTD.,

 Idle, Bradford. Tel.: Idle 1235-6. Cables: Wharfedel, Idle, Bradford.Linton. Two-speaker system, incorporating 8 in. Flexiprene-surround bass unit, 3 in. treble unit. Veneered finish. Can be used vertically or horizontally. Free-standing. Size: $19 \times 10 \times 9 \frac{1}{2}$ in. Price: $£ 187 \mathrm{~s} .4 \mathrm{~d}$.

Dalesman. Two-speaker system, incorporating 12 in. Flexiprene-surround bass driver, 5 in. treble unit. Veneered finish. Slimline construction. Can be used free-standing or wall mounting. Size: $25 \times 20 \times 6 \frac{1}{4}$ in. Price: $£ 2510 \mathrm{~s}$.

Dovedale. Two-speaker system, incorporating 12 in. Flexiprene-surround bass driver, Super 5 in. treble unit. Free-standing. Veneered linish. Size: $24 \times 14 \times 12$ in. Price: $£ 31$ 10s.

Tecsdale. Three-speaker system, incorporating 15 in . bass unit, 5 in . mid-range unit, 3 in . tweeter. Impedance 15 ohms. H.C. 15 W RMS. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Standard finish: teak, mahogany or walnut. Rosewood finish at slightly higher price. Size: $34 \frac{1}{2} \times 18 \frac{1}{2} \times 11 \frac{1}{2}$ in. Weight: 51 lb . Price (standard finishes): $£ 52$ 10s.; (rosewood finish): £55.

Airedale Reflex. Omni-directional. Three units, 15 in . bass, 8 in. middle, 3 in. treble. Crossovers 400 and $5,000 \mathrm{c} / \mathrm{s}$. F.R. $20 \mathrm{c} / \mathrm{s}-20$ $\mathrm{Kc} / \mathrm{s}$. Size: $39 \times 28 \frac{1}{2} \times 14 \mathrm{in}$. Weight: 91 lb . Price: $£ 69$ 10s.

WHITELEY ELECTRICAL RADIO CO.,
LTD., Victoria Street, Mansfield, Notts. Tel.: Mansfield 1762/3/4/5. Cables: Whitebon, Mansfield.

Model C3. Stentorian Junior Console. Bass reflex for corner position. 1 or 2 drive units. Rec. HF816 or HF1012 with T10 tweeter, if required. Crossover $3,000 \mathrm{c} / \mathrm{s}$. Response HF816. 50-14,000 $\mathrm{c} / \mathrm{s} ; \mathrm{HF} 1012$ and $\mathrm{T} 1030-14,000 \mathrm{c} / \mathrm{s}$. Size: $33 \times 22 \frac{1}{2} \times 18 \frac{1}{2}$ in. Price without units: £13 18s. 3d.

Model C2. Stentorian Senior Corner Console. Bass reflex for corner position. 10 in . or 12 in . drive unit with tweeter, if required. Crossover $3,000 \mathrm{c} / \mathrm{s}$. Response with HF1012 and T10 30$14,000 \mathrm{c} / \mathrm{s}$; with HF1214 and T12 25-17,000 c/s. Size: $35 \times 30 \times 19$ in. Price without units: £17 4s. 9d.

Model C4. Corner Console. Similar design to Model C2 but suitable for smaller room. Designed for Stentorian HF810 or HF812. Size: $26 \times 17 \times 7 \frac{1}{2}$ in. Price without unit: $£ 711 \mathrm{~s}$. 3 d .

Model C14. Thoresby Bass Reflex Corner Console. Designed to utilise acoustic properties of walls. Takes 8 in . or 10 in . units with provision for tweeter. Size: $31 \times 19 \frac{3}{8} \times 17 \mathrm{in}$. Choice of mahogany. (C14) or walnut (C14A) finish. Prices: (mahogany) $£ 14$ 7s. 6d.; (walnut) £14 13s. 6d.; without units.

Model C15. Thoresby Bass Reflex Console. Designed for 8 in . or 10 in . units with provision for tweeter. Size: $31 \times 19 \frac{3}{8} \times 18 \mathrm{in}$. Choice of mahogany (C15) or walnut (C15A) finish. Prices: (mahogany) £15 11s. 6d.; (walnut) £16 0s. 9d.; without units.

Model C17. Thoresby Slim Line. Designed to accommodate any of the Stentorian range of 8 in. or 10 in . units. Provision made for cone type or pressure tweeter and crossover. Substantially constructed and acoustically proportioned for balanced response. Size: $31 \times 20 \times$ $9 \frac{1}{4} \mathrm{in}$. Choice of mahogany (C17) or walnut (C17A). Prices: (mahogany) £12 8s.; (walnut) $£ 12$ 14s.; without units.

Model C18. Thoresby Stereo Column. Domeshaped diffuser above speaker gives 360 degrees radiation. Speaker mounted horizontally near the top. Finished in walnut. Price without units: £16 18s. 9d.

Stentorian Clumber enclosure. Compact shelfor floor-mounting speaker enclosure in walnut. A matched 9 in. unit in reflex arrangement with internal absorption filters. H.C. 9W. Imp. 15 ohms. F.R. $100 \mathrm{c} / \mathrm{s}-13 \mathrm{Kc} / \mathrm{s}$. Price: £15 4s. (U.K. purchase tax $£ 211 \mathrm{~s} .3 \mathrm{~d}$.).

Stentorian LC. 92. Slim-line acoustic labyrinth incorporating 9 in . drive unit with graded cone and extended treble response. Cabinet in walnut with satin melamine finish. Imp. 15 ohms . Size: $29 \times .24 \times 6 \mathrm{in}$. deep. Weight: $25 \frac{1}{2} \mathrm{lb}$. Price with unit: $£ 1815$ s. 1ld. (U.K. purchase tax £3 3s. 4d.).
L. G. WOOLLETT \& COMPANY LTD., 21 Anerley Station Road, London, S.E.20. Tel.: Sydenham 9003.

Leven. Electrostatic mid-range and H.F. system. Constant charge push-pull electrostatic unit. Crossover $1.5 \mathrm{Kc} / \mathrm{s}$, $-6 \mathrm{~dB} /$ octave. F.R. $1.5 \mathrm{Kc} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} . \mathrm{H} . \mathrm{C} .15 \mathrm{~W}$. RMS. Imp. 15 ohms. Cabinet contains mains polarising unit, crossover, phase correcting network, depolarising circuit, pre-set treble attenuator ( 12 dB range). Mains $200-250 \mathrm{~V}$ ( $100-125 \mathrm{~V}$ to order). Finish: Veneered wood, with white/brown flecked gold Vynair. Size: $11 \frac{1}{2} \times 8 \frac{3}{4} \times 8 \frac{1}{4} \mathrm{in}$. Weight: 4 lb .12 oz . Price: $£ 17 \mathrm{l} 17 \mathrm{~s}$.

Lomond. Infinite baffle enclosure intended for use as bass speaker in conjunction with Leven HF unit. Speaker unit 12 in . foam surround. F.R. $20 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s} .15 \mathrm{~W}$ RMS. 15 ohms imp. Cabinet finish as for Leven. Size: $39 \frac{1}{2} \times 17 \times 17$ in. Weight: 40 lb . Price: $£ 36 \mathrm{l}$ s.

Kelsey. Infinite baffle frontal-loaded enclosure intended for use as a bass speaker. Unit 12 in. foam surround. F.R. $20 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. H.C. 15 W RMS. Imp. 15 ohms. Finish: veneered wood. Size: $33 \frac{3}{4} \times 18 \times 14 \mathrm{in}$. Weight: 52 lb . Price: $£ 42$.

Kelsey full range. Infinite baffle. Two units: electrostatic treble and 12 in . foam surround bass. Crossover $\frac{1}{4}$-section $1.5 \mathrm{Kc} / \mathrm{s}$. F.R. $20 \mathrm{c} / \mathrm{s}$ $20 \mathrm{Kc} / \mathrm{s}$. H.C. 15W RMS. Imp. 15 ohms. Mains polarising unit integral. Mains 200-250V (100125 V to order). Finish: veneered wood with brown flecked Vynair. Size: $33 \frac{3}{4} \times 18 \times 14 \mathrm{in}$. Weight: 56 lb . Price: $£ 55$ 13s.

Thirlmere. Specification as for Kelsey but 47 in. high, 16 in. diameter. Price: $£ 519$ s.

## WORDEN AUDIO DEVELOPMENTS LTD.,

 54 Chepstow Road, London, W.2. Tel.: Bayswater 4996.Panosona Reproducer. Double horn with diffusing chamber. Corner reproducer, designed for near plane-wave distribution from one speaker unit. Available in three versions: Model A, $54 \times 24 \times 14 \frac{1}{2}$ in. to corner; F.R. from below $30 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Price: (enclosure only) $£ 31$. Wharfedale Special Super 10 drive unit with 16,000 gauss magnet, $£ 10$. (U.K. purchase tax £1 13s. 4d.). Model B, $48 \times 21 \frac{1}{2} \times 12 \frac{1}{2}$ in. to corner; F.R. $30 \mathrm{c} / \mathrm{s}$ to over $15 \mathrm{Kc} / \mathrm{s}$. Price: (enclosure only) $£ 28$. Wharfedale Special Golden 10 drive unit with 14,500 gauss magnet, $£ 710$ s. (U.K. purchase tax $£ 15 \mathrm{~s}$.). Model C, $27 \times 24 \times$ 13 in. to corner; F.R. from below $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Price: (enclosure only) $£ 19$ 10s. Wharfedale Special Super 8 drive unit with 14,500 gauss
 tively the Lowther P.M. 6 drive unit (Price: $£ 18$ 18s.) may be used with all models.

Finish: choice of light, medium or dark walnut, mahogany, or oak. Matt or polished finish. Special finishes to order.

## $\star$

ZENITH RADIO CORPORATION. Distributors: United Mercantile Co. Ltd., 13/14 Queen Street, London, W.1. Tel.: Grosvenor 4901. Cables: Ramsaco, Telex, London.
-Stereo Speaker Kits. Two sets of Zenith speakers, each set consisting of one 12 in ., one horn, two $3 \frac{1}{2}$ in. units, Supplied complete with crossovers. Price: £93 (U.K. purchase tax £14 18s. 5d.).


Worden Panosona-three versions


Wharfedule Dalesman


Akai M8

Bang \& Olufsen Beocord 2000


Brenell Mk. 5 type M Series 3 recorder



Akai PT. 5011


EMI RE301

## DIRECTORY OF TAPE RECORDERS

The abbreviations used for the specifications in this directory are as follows: F.R. $=$ frequency response; $\mathbf{i} / \mathbf{s}=$ inches per second; P.s.n. $=$ power supply needed; $<=$ better than; M.E. $=$ magic eye; W. and F. = wow and flutter; Replay char. = replay characteristic; H. and $\mathbf{N} .=$ hum and noise.
OStereo equipment.

## PROFESSIONAL and SEMI-PROFESSIONAL


#### Abstract

AKAI. Distributors: Pullin Photographic Ltd., 11 Aintree Road, Perivale, Greenford, Middlesex. Tel.: Alperton 1541. Cables: Pullinfoto, Greenf ord, Middlesex.


Akai PT5011. Professional $\frac{1}{2}$-track or fulltrack recorder and reproducer. Mono or stereo. Choice of two speeds between $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ and $30 \mathrm{i} / \mathrm{s}$. Max spool $10 \frac{1}{2} \mathrm{in}$. W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}<0.15 \%$, $15 \mathrm{i} / \mathrm{s}<0 \cdot 1 \%$. H. and N. better than 55 dB . F.R. $15 \mathrm{i} / \mathrm{s} 30 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}, 7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$ $\pm 2 \mathrm{~dB}$. Replay char. NARTB or CCIR. Inputs: mic. 70 dBm 600 ohms, line 20 dBm 600 ohms and 10 K . Outlet: line 600 ohms, level +4 dBm . Three motors: hysteresis two-speed motor for capstan drive, two six-pole motors for tape transport, fast wind and fast rewind. Own deck. All push-button operation. Monitoring. Mains $100-240 \mathrm{~V} 50 / 60 \mathrm{c} / \mathrm{s}$. Size: $37 \frac{3}{4} \mathrm{in}$. high, $23 \frac{1}{2} \mathrm{in}$. wide, $26 \frac{3}{8} \mathrm{in}$. deep. Weight 132 lb . Further details from distributors. Price (mono): £650. Stereo price on application.

OAkai X-355. Professional $\frac{1}{4}$-track or $\frac{1}{2}$-track transistorised mains recorder. Mono or stereo. Speeds: $15,7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{in}$./sec. Max. spool $7 \frac{1}{2} \mathrm{in}$. ( $10 \frac{1}{2}$ with extra arms). W. and F. $15 \mathrm{i} / \mathrm{s}<0.06 \%$, $7 \frac{1}{2} \mathrm{i} / \mathrm{s}<0.08 \%, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}<0.14 \%$. H. and N . better than 50 dB at all speeds. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 30 \mathrm{c} / \mathrm{s}-24 \mathrm{Kc} / \mathrm{s}$ $\pm 3$ dB. Replay char. NARTB. Professional VU meters (2). Rewind time 45 secs. $1,200 \mathrm{ft}$. Inputs: mic. 0.5 mV . 10 K , line 50 mV 100 K . Output 17 W RMS per channel. Speakers: two $6 \frac{1}{2}$ in. Outlets: line $1 \cdot 22 \mathrm{~V} 2 \mathrm{~K}$, ext. speakers 8 ohms, phones. Own deck. Three motors: two-speed hysteresis for capstan drive, two four-pole induction for fast forward and rewind. Superimpose. Pause can be fitted. Four-digit tape counter. Straightthrough amplifier. Monitoring. Input mixing. Printed circuit amplifiers. Facilities for automatic reverse, repeat and shut-off. Sound on sound. Sound with sound. Echo chamber effects. Vertical or horizontal operation. Remote control. Crossfield head. Mains $100-240 \mathrm{~V}$ AC. Size: $17 \frac{3}{8} \times 16 \times 12$ in. Weight $62 \frac{3}{4} \mathrm{lb}$. Price: £250 19s.

- Akai X300. Studio type $\frac{1}{4}$, $\frac{1}{2}$, or full-track mains recorder. Mono or stereo. Speeds: 15, $7 \frac{1}{2}$, $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Max. spool $10 \frac{1}{2} \mathrm{in}$. W. and F. $15 \mathrm{i} / \mathrm{s}$ $<0.04 \%, 7 \frac{1}{2} \mathrm{i} / \mathrm{s}<0.05 \%, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}<0.15 \%$. H. and N . better than 50 dB at all speeds. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ $30 \mathrm{c} / \mathrm{s}-24 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 30 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s} \pm 3$ dB. Replay char. NARTB. VU meter. Rewind time 45 secs. $1,200 \mathrm{ft}$. Inputs: mic. $0.5 \mathrm{mV} \mathrm{10K}$, line 50 mV 100 K . Output: 17 W RMS per channel. Speakers: two $6 \times 4 \mathrm{in}$. Outlets: line $1 \cdot 22 \mathrm{~V} 2 \mathrm{~K}$, phones, ext. speakers 8 ohms. Transistors. Three motors. One external-rotor motor for capstan drive, two induction motors for fast forward and reverse. Superimpose. Four-digit tape indicator. Monitoring. Input mixing. Built-in tape cleaner. Three heads (plus crossfield). Auto-stop. Biased and filtered for stereo multiplex radio. Mains $100-240 \mathrm{~V}$ AC. Size: $13 \frac{3}{8} \times 16 \frac{1}{8} \times 9 \mathrm{in}$. Weight: 47 lb . Price: £199 10s.

Akai M8. Semi-professional $\frac{1}{4}$ - or $\frac{1}{2}$-track mains recorder. Mono or stereo. Speeds: 15, $7 \frac{1}{2}$, $3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool $7 \frac{1}{2} \mathrm{in}$. W. and F. $7 \frac{1}{2}$ $<0 \cdot 15 \%, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}<0 \cdot 25 \%, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}<0.35 \%$. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-21 \mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$ $40 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$, all $\pm 3 \mathrm{~dB}$. Replay char. NARTB. Two VU meters. Rewind time $1 \frac{1}{2}$ mins. $1,200 \mathrm{ft}$. Inputs: mic. 2.0 mV 500 K , line 200 mV 1 megohm. Output: 6W RMS per channel. Speakers: two $4 \times 2 \mathrm{in}$. Outlets: line 800 mV 3 K , ext. speakers 8 ohms. Valves and transistors. Own deck. One motor. Superimpose. Pause. Four-digit tape indicator. Straightthrough amplifiers. Monitoring. Built-in tape cleaner. Horizontal or vertical operation. Crossfield head. Mains $100-240 \mathrm{~V}$ AC. Size: $20 \times 13$ $\times 9$ in. Weight: $47 \frac{1}{4} \mathrm{lb}$. Price: $£ 142$ 16s. (or $£ 153$ 6s. with accessory kit).

Akai X-1V and X-PK1. See Battery Operated Portable section.

Akai 910 and 1700. See General Purpose Recorder section.

AMPEX (GREAT BRITAIN) LTD., Acre Road, Reading, Berkshire. Tel.: Reading 84411. Cables: Videotape, Reading.

Ampex 300 series. Professional recorders. One to eight tracks. Speeds 15 and $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. Three motors. 14 -in. spools up to 1 in . wide. F.R. 15 $\mathrm{i} / \mathrm{s}, 30-18,000 \mathrm{c} / \mathrm{s} ; 7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 40-12,000 \mathrm{c} / \mathrm{s}$, both $\pm 2 \mathrm{~dB}$. Large scale VU meter. H. and N. -60 dB full track, -55 dB multi-track. W. and F . less than $0.1 \%$ at $15 \mathrm{i} / \mathrm{s}$. Prices on application.

Ampex 351. Prof essional recorder in console. portable or rack-mounted form. Full or $\frac{1}{2}$-track. Speeds 15 and $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$, or $7 \frac{1}{2}$ and $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Three motors. $10 \frac{1}{2} \mathrm{in}$. NAB spools. F.R. $15 \mathrm{i} / \mathrm{s}$, $30-18,000 \mathrm{c} / \mathrm{s} ; 7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 40-12,000 \mathrm{c} / \mathrm{s} ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$, $50-8,000 \mathrm{c} / \mathrm{s}$, all $\pm 2 \mathrm{~dB}$. Large scale VU meter. H. and N. -70 dB full track, $-65 \mathrm{~dB} \frac{1}{2}$-track and $15 \mathrm{i} / \mathrm{s}$. W. and F . less than $0.15 \%$ at $15 \mathrm{i} / \mathrm{s}$. Size (console): $48 \times 24 \times 28 \mathrm{in}$. Weight: 168 lb . Price ( 15 and $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ ) on application.

Ampex 352. Professional reproducer only in console or rack-mounted form. Full or $\frac{1}{2}$-track, or stereo. Speeds 15 and $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. Three motors. $10 \frac{1}{2}$ in. NAB spools. F.R. $15 \mathrm{i} / \mathrm{s}, 30-18,000 \mathrm{c} / \mathrm{s}$; $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 40-12,000 \mathrm{c} / \mathrm{s}$, both $\pm 2 \mathrm{~dB}$. H. and N . -70 dB full track, -65 dB half track. W. and F . less than $0 \cdot 15 \%$ at $15 \mathrm{i} / \mathrm{s}$. Size (console): $35 \times 24 \times 24 \mathrm{in}$. Weight: 199 lb . Price on application.

Ampex 602. Professional portable recorder. Speed $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. One motor. $7-\mathrm{in}$. spools. F.R. $40-10,000 \mathrm{c} / \mathrm{s} \pm 2 \mathrm{~dB}$. Large scale VU meter. H . and N. -55 dB full track, -50 dB half track. $W$. and $F$. less than $0 \cdot 17 \%$. Size: $16 \frac{1}{2} \times 13 \frac{3}{4} \times 8$ in. Weight: 28 lb . Price on application.

- Ampex 602-2. Stereo version of Ampex 602. Size: $24 \frac{1}{2} \times 13 \times 8 \mathrm{in}$. Weight: 42 lb . Price on application.
-PR-10. Professional recorder. Stereo or mono versions. Full or $\frac{1}{2}$-track. $\frac{1}{4}$-track version available shortly. Speeds $15,7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ or $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and F. $15 \mathrm{i} / \mathrm{s}, 0 \cdot 15 \%$; $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 0 \cdot 18 \% ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 0 \cdot 25 \%$. H. and N. -60 dB at $15,7 \frac{1}{2} \mathrm{i} / \mathrm{s}$, full track. F.R. $15 \mathrm{i} / \mathrm{s}, 30 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB} ; 7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 30 \mathrm{c} / \mathrm{s}-12$ $\mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Replay char. NAB/CCIR/AME ( $15 \mathrm{i} /$ s only) plug-in equalisers. Various inputs by plug-in transformers and pre-amps. Outlet from pre-amp +4 dBm into 600 ohms. One motor. $7-\mathrm{in}$. spool. Rewind $1 \frac{1}{2}$ mins. VU meter. Remote control. Size (transport); $19 \times 8 \frac{3}{4} \times 6 \mathrm{in}$.; (electronics): $19 \times 5 \frac{1}{4} \times 5 \frac{3}{8}$ in. Weight (unmounted): 44 lb .; (in case): 53 lb . Price on application.
- E65. Transistorised stereo recorder. $\frac{1}{2}$-track. Speeds $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and F. $0 \cdot 3 \%, 7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. H. and N. $-50 \mathrm{~dB}, 7 \frac{1}{2} \mathrm{i} / \mathrm{s} ;-44 \mathrm{~dB}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$, F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. $150 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB} ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 150 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$ $\pm 2 \mathrm{~dB}$. Replay char. NAB. Inputs: line 0.5 V , mic. 0.5 mV . Outlets from pre-amp: 1, headset $2 \mathrm{~K}, 1 \mathrm{~V} ; 2$, line $2 \mathrm{~K}, 1 \mathrm{~V} ; 3$, to speaker/amplifier. One motor. 7 -in. spool. $1 \frac{1}{2}$ mins. rewind. Special educational and language study recorder. Size: $8 \times 13 \frac{3}{4} \times 16 \frac{1}{2}$ in. Weight: 30 lb . Price to be announced.

MR70. Professional standard console style master recorder. Speeds: $7 \frac{1}{2}$ and $15 \mathrm{i} / \mathrm{s}$ or 15 and $30 \mathrm{i} / \mathrm{s}$. Tape sizes: $\frac{1}{4}$ in. 1 or 2 channels, $\frac{1}{2}$ in. 2,3 , or 4 channels, 1 in. 3, 4, 6, or 8 channels. Spool size $1 \frac{1}{2}$ in. EIA, NAB or CCIR reels. Automatic equalisation. Fully Nuvistorised. F.R. $30 \mathrm{c} / \mathrm{s}-20$ $\mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB} .( \pm 1 \mathrm{~dB} 50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s})$ at $15 \mathrm{i} / \mathrm{s}$. Plug-in $150 \mathrm{Kc} / \mathrm{s}$ bias/erase oscillator. W. and F. $15 \mathrm{i} / \mathrm{s}$ less than $0.05 \%$ RMS, $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ less than $0.08 \%$ RMS. Start time: tape speed within $\pm 0.2 \%$ of nominal speed in 0.5 sec . Timing accuracy better than $\pm 0.15 \%$. Mains $115-242 \mathrm{~V}$ in six steps. Wide range of versions to order. Prices on application.

2000 series. Stereo tape recorders in three versions. Model 2073 portable recorder, Model 2083 furniture style tape deck, Model 2053 rack mounting tape deck. Speeds $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 30 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}, \pm 2 \mathrm{~dB}$. Signal to noise -52 dB . W. and F. $0.001 \%$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. Automatic reverse. Automatic threading. Dual capstan drive. Automatic switch-off, including amplifiers. Three heads. Vertical or horizontal operation. $\frac{1}{4}$-track stereo. Valves and transistors. M.E. Provision for automatic slide projector synchronizing. Size: $185 \times 13 \times 7 \mathrm{in}$. Weight 30 lb . in case with speakers. Prices on application.

- 800 series. Stereo tape recorders available as deck with pre-amplifiers, deck with preamplifiers and power amplifiers, or deck with pre-amplifiers and power amplifiers in oiled walnut cabinet. Straight-line threading. Speeds $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Twin VU meters. Independent controls for each channel. Dual capstan drive. Fully transistorised. Automatic switch off. Digital position indicator. Prices on application.

BANG \& OLUFSEN. U.K. Sales Division, Mercia Road, Gloucester. Tel.: Gloucester 26841. Cables: Debelec, Gloucester.

- Beocord 2000. Transistorised stereo recorder in $\frac{1}{4}$-track and $\frac{1}{2}$-track versions. Speeds $7 \frac{1}{2}, 3 \frac{3}{4}$,
$1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Spool size 7 in . W. and F. $0 \cdot 075 \%$ at $7 \frac{1}{2}$, $0.11 \%$ at $3 \frac{3}{4}, 0 \cdot 18 \%$ at $1 \frac{7}{8}$. H. and N. $\frac{1}{4}$-track -50 dB , $\frac{1}{2}$-track -55 dB . F.R. $40 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$ at $7 \frac{1}{2}, 40 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$ at $3 \frac{3}{4}, 50 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$ at $1 \frac{7}{8}$, all $\pm 2 \mathrm{~dB}$. Replay char. CCIR. Inputs: mic. $150 \mu \mathrm{~V}$ 200 ohms, mag. PU 2 mV 33 K , crystal PU 1V 220 K , radio diode 2 mV 45 K . Outputs: line 800 mV , LS 8 W per channel. Two VU meters. Rewind time 3 mins. $1,800 \mathrm{ft}$. One Papst motor. Own deck. Superimpose. Pause. Position indicator with PB reset. Straight-through amplifier. Mains $110-240 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$. Size: $17 \frac{3}{4} \times 13 \frac{3}{4} \times 10 \frac{1}{2} \mathrm{in}$. Weight 35 lb . Price (table model): $£ 124 \mathrm{19s}$.; (portable model): £129 3s.
- Beocord 2000 Deluxe. Transistorised stereo recorder. Full specification and price to be announced.

BRAUN AG. Distributors: Fi-Cord International, Charlwoods Road, East Grinstead, Sussex. Tel.: East Grinstead 21351.

TG.60. Semi-professional stereo tape recorder. Three motors. Automatic tape tension fine adjustment. Servo brakes. Capstan drive motor and head-support rigidly mounted on robust diecast bridge. $\frac{1}{2}$-track record and playback. Three heads. Separate dual channel record and playback amplifiers. All transistor. Pushbutton operation via relays and magnetic circuits. Operates in any position. F.R. $20 \mathrm{c} / \mathrm{s}-$ $16 \mathrm{Kc} / \mathrm{s}$. Distortion at full recording level below $3 \%$. S.N. better than 55 dB . W. and F. below $0 \cdot 1 \%$. Size: $16 \frac{7}{8} \times 6 \frac{3}{4} \times 11 \frac{1}{4}$ in. Mains 220 V $50 \mathrm{c} / \mathrm{s}$. Price: $£ 308$.

BRENELL ENGINEERING CO. LTD., 231/5 Liverpool Road, London, N.1. Tel.: North 8271 (5 lines).

Mk. 5. Type M. Series 3. Speeds 15 , $7 \frac{1}{2}$, $3 \frac{3}{4}$, $1 \frac{7}{8}, \mathrm{i} / \mathrm{s}$. Three motors. $8 \frac{1}{4} \mathrm{in}$. spools. F.R. $15 \mathrm{i} / \mathrm{s}$, $40-20,000 \mathrm{c} / \mathrm{s} ; 7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 40-18,000 \mathrm{c} / \mathrm{s} ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ $40-13,000 \mathrm{c} / \mathrm{s} ; 1 \frac{7}{8} \mathrm{i} / \mathrm{s}, 40-6,000 \mathrm{c} / \mathrm{s}$. Level meter. H. and N. -45 dB . W. and F. $1 \frac{7}{8} \mathrm{i} / \mathrm{s},<0.25 \%$; $3 \frac{3}{4} \mathrm{i} / \mathrm{s},<0 \cdot 15 \% ; 7 \frac{1}{2} \mathrm{i} / \mathrm{s},<0 \cdot 1 \%$. Outlet from pre-amp. Mixing. Superimposing. Tape monitoring, Input monitoring. Size: $18 \times 18 \times 9 \mathrm{in}$. Weight: 40 lb . Price: £97 13s.

Mk. 5. Series 3. $15,7 \frac{1}{2}, 3 \frac{3}{4}$ and $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Three motors, $8 \frac{1}{4} \mathrm{in}$. spools. F.R. $15 \mathrm{i} / \mathrm{s}, 40-15,000 \mathrm{c} / \mathrm{s}$, $\pm 2 \mathrm{~dB} .7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 40-14,000 \mathrm{c} / \mathrm{s} ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 40-11,000 \mathrm{c} / \mathrm{s}$; $1 \frac{7}{8} \mathrm{i} / \mathrm{s}, 40-6,000 \mathrm{c} / \mathrm{s} . \pm 3 \mathrm{~dB}$. M.E. level ind. (Meter available). H. and N. -45 dB W . and F.
$0.05 \%$ at $15 \mathrm{i} / \mathrm{s}$. Hi-fi outlet at 200 mV . Straightthrough amp. Switched frequency correction. Pause control and monitoring. Size: $18 \times 18 \times 8$ in. Weight: 38 lb . Price: $£ 77$ 14s.; with meter £82 19s.

STB2. Stereo/mono recorder. See Tape Units section.

## CLARKE \& SMITH MANUFACTURING

 CO. LTD., Melbourne Works, Wallington, Surrey. Tel.: Wallington 9252/7.TR634. Transistorised mono recorder. $\frac{1}{2}$ track. Speeds $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 0 \cdot 2 \%$; $3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 0 \cdot 3 \%$. H. and N. $7 \frac{1}{2} \mathrm{i} / \mathrm{s},-50 \mathrm{~dB} ; 3 \frac{3}{4} \mathrm{i} \mathrm{i} / \mathrm{s}$, -48 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$; $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$, $50 \mathrm{c} / \mathrm{s}-9 \mathrm{Kc} / \mathrm{s}( \pm 3 \mathrm{~dB})$. Replay char. CCIR. Inputs: $1 \frac{1}{2} \mathrm{mV}, 15 \mu \mathrm{~V}, 60 \mathrm{mV}$. Outlet from preamp. 15 ohms. 70 V line and 1 V at 5 K . Three motors, $8 \frac{1}{4} \mathrm{in}$. spools. Level meter. Mixing. Tone controls. Size: $17 \frac{1}{2} \times 17 \times 10 \mathrm{in}$. Weight: 45 lb . Price: $£ 113$.

EMI ELECTRONICS LTD., Hayes, Middx. Tel.: Hayes 3888. Cables: Emidata, London.

TR52/D. Professional portable stereo/mono recorder. Speeds $7 \frac{1}{2}$ and $3 \frac{3}{4} \mathrm{i} /$ s. One motor, $7-\mathrm{in}$. spools. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 50-10,000 \mathrm{c} / \mathrm{s} ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$, $50-6,000 \mathrm{c} / \mathrm{s}$, both $\pm 2 \mathrm{~dB}$. W. and F. less than $0 \cdot 25 \%$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. Crosstalk. -45 dB . VU meter. Size: $20 \times 17 \frac{1}{2} \times 13 \frac{1}{2} \mathrm{in}$. Weight: 80 lb . Price on application.

RE301. Stereo/mono recorder in transportable rack or trolley form. $\frac{1}{2}$-track. Speeds 15 , $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$, or $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and F. $0 \cdot 2 \%$ at $15 \mathrm{i} / \mathrm{s}$, $0.25 \%$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 0.3 \%$ at $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. H. and N .50 dB below peak level. F.R. $15 \mathrm{i} / \mathrm{s}, 50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$; $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 50 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s} ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 50 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$ (all $\pm 2 \mathrm{~dB}$ ). Replay char. CCIR. Inputs: mic. 30/50 ohms, less than $100 \mu \mathrm{~V}$ for peak recording level. Line floating and bridging for 600 ohms, less than 200 mV for peak record level. One motor. $8 \frac{1}{4}-\mathrm{in}$. spool. $1 \frac{3}{4}$ mins. rewind. Plug-in record and replay amplifiers. VU meter. Size: $14 \frac{3}{16} \times$ $19 \frac{1}{4} \times 18 \frac{1}{8} \mathrm{in}$. Weight: 97 lb . Price on application.

Type BTR4. Professional stereo/mono recorder. Full, twin, three, four track. Speeds $3 \frac{3}{4} / 7 \frac{1}{2}$ or $7 \frac{1}{2} / 15 \mathrm{i} / \mathrm{s}$. W. and F. $15 \mathrm{i} / \mathrm{s}$, better than $0.1 \%$; $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 0 \cdot 1 \% ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 0 \cdot 15 \%$. H. and N. $(2 \%$ distortion) -60 dB unweighted. F.R. $15 \mathrm{i} / \mathrm{s}$, $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} ; 7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 30 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s} ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$, $40 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}( \pm 2 \mathrm{~dB})$. Replay char. CCIR,


EMI BTR4


EMT Studer C37 (interior view)


EMT Studer C37 Console


NARTB, aux. switched. Input 10 K bridging, and 200 or 600 ohm line. Balanced floating output at 35,200 or 600 ohms. Three motors. $11_{4}^{1}$-in. spools (European). Rewind (NAB spool) $1_{4}^{\frac{1}{4}}$ mins. VU meter. Separate track erasure on multi-channel machines. Size (deck): $19 \times 17 \times$ 12 in ., 80 lb .; (amplifier): $19 \times 16 \frac{1}{4} \times 7 \mathrm{in}$., 32 lb . Price on application.

EMT WILHELN FRANZ GMBH, Switzerland. Sole U.K. Agents: F. W. O. Bauch Ltd., Holbrook House, Cockfosters, Herts. Tel.: Hadley Green 3277.
-Studer A62. Professional transistorised studio recorder. Stereo/mono. Full track or $\frac{1}{2}$-track. Speeds, $15,7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. W. and F. $15 \mathrm{i} / \mathrm{s}, 0.04 \%$; $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$, $0.06 \%$. H. and N. $15 \mathrm{i} / \mathrm{s},-60 \mathrm{~dB} ; 7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. -56 dB . F.R. $30 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 1.5 \mathrm{~dB}$. Replay char. CCIR or NARTB (either by request). Inputs: -6 dBm to +22 dBm , balanced 1 K . Outlet from pre-amp. Three motors. $10-\mathrm{in}$. spools. $1 \frac{1}{2}$ mins. rewind. No speaker or power amplifier. Size: $19 \times 14 \times 8 \frac{1}{4} \mathrm{in}$. Weight: 57 lb . (complete chassis). Price on application.
Studer C37. Professional studio recorder. Interchangeable head blocks: full-track, stereo and switchable. Erase head stereo, also available with pilot tone head. Speeds: $15,7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. W. and F. $15 \mathrm{i} / \mathrm{s} \pm 0.015 \%, 7 \frac{1}{2} \mathrm{i} / \mathrm{s} \pm 0.025 \%$. S.N. $15 \mathrm{i} / \mathrm{s}$ $-70 \mathrm{~dB}, 7 \frac{1}{2} \mathrm{i} / \mathrm{s}-66 \mathrm{~dB}$. F.R. $30 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$ $+1 \mathrm{~dB}-2 \mathrm{~dB}$. Replay char. switchable CCIR to NAB or CCIR to AME. Inputs: $0 \cdot 7-7 \mathrm{~V}$ $(0 \mathrm{dBm}$ to $+20 \mathrm{dBm})$ balanced input. Impedance $>15 \mathrm{~K}$. Separate equalisation for $7 \frac{1}{2}$ and $15 \mathrm{i} / \mathrm{s}$ CCIR and NAB. Output from preamp. Three Papst motors. Max. spool 12 in. Rewind time 2 mins . $2,400 \mathrm{ft}$. No power amplifiers or speakers. Size: $21 \times 26 \times 17 \mathrm{in}$. Weight 172 lb . Price on application.

Studer J37. Professional studio recorder. $\frac{1}{2}$ in. or 1 in . tape. Interchangeable head blocks. Three-track or four-track. Speeds: 15, $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. W. and F. (1 in. tape, weighted) $15 \mathrm{i} / \mathrm{s} \pm 0.075 \%$, $7 \frac{1}{2} \mathrm{i} / \mathrm{s} \pm 0 \cdot 1 \frac{1}{2}$. H. and $\mathrm{N} .15 \mathrm{i} / \mathrm{s}-76 \mathrm{~dB}, 7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ -70 dB. F.R. $15 \mathrm{i} / \mathrm{s}$ (CCIR) $30 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$, $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 45 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. Replay char. switchable from CCIR to NAB. Inputs: $0 \cdot 7-7 \mathrm{~V}(0 \mathrm{dBm}$ to +20 dBm ). Balanced input. Impedance $>15 \mathrm{~K}$. Output: $0 \cdot 7-7 \mathrm{~V}$ into 200 ohms balanced. Separate equalisation for $7 \frac{1}{2}$ and $15 \mathrm{i} / \mathrm{s}$ CCIR and NAB. Three Papst motors. Guide track amplifier. Monitoring before and after recording. Four synchro playback amplifiers. Max. spool size 12 in . Rewind time 3 mins. 3,300 ft 1 in . tape. No power amplifiers or speakers. Size: $27 \times 25 \frac{1}{2}$ $\times 40 \mathrm{in}$. (high). Console style. Weight: 330 lb . Price on application.

FERROGRAPH CO. LTD., Ferrograph House, 84 Blackfriars Road. London. S.E.1. Tel.: Waterloo 1981.
631. $\frac{1}{2}$-track mono recorder. Speeds $7 \frac{1}{2}, 3 \frac{3}{4}$, $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Spool size $8 \frac{1}{4} \mathrm{in}$. W. and F. less than $0 \cdot 16 \%$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. H. and N. -52 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ $30 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$, both $\pm 3 \mathrm{~dB}$. $1_{8}^{7} \mathrm{i} / \mathrm{s} 50 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s} \pm 8 \mathrm{~dB}$. Inputs: 3 mV at 1 megohm, 150 mV at 80 K . Outputs: $2 \frac{1}{2} \mathrm{~W}$ into internal $10 \times 6 \mathrm{in}$. speaker or into external 15 ohms load, 0.75 V at 80 K . Three motors. Synchronous capstan motor with ball-bearing races. Rewind time 1 min . for $8 \frac{1}{4} \mathrm{in}$. spool. Sustained-peak record level meter. Single-screw azimuth adjustment. Pause control. Gear-driven angled tape position indicator. Bias and erase links fitted. Tropicalised. Takes endless loop cassette. Auto-stop at end of reel. Space for additional head. Separate bass and treble. Mains 200-250V $50 \mathrm{c} / \mathrm{s}$ standard. Suffix A 117V $60 \mathrm{c} / \mathrm{s}$, suffix E 110V $50 \mathrm{c} / \mathrm{s}$. Size: $17 \frac{3}{4} \times 18 \frac{1}{4} \times 9 \frac{5}{8}$ in. Weight: 48 lb . Price: $£ 9915 \mathrm{~s}$.

631H. Similar specification to 631 but having speeds of $15,7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ and CCIR characteristics of 200,100 and $35 \mu$ secs. Price: $£ 105$.
632. $\frac{1}{2}$-track stereo recorder having separate record, replay heads and amplifiers and an output monitor stage with built-in speaker. Inputs: 2 mV at 1 megohm. 35 mV at 500 K . Outputs: 1W into 5 in . internal monitoring speaker, 1V per track at approximately 1 K . Input/output comparison switch. Input-mixing facilities with separate controls. Other details similar to 631 model. Price: $£ 1326$ s.

632H. Specification as for 632 but with tape speeds $15,7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} /$ s and recording characteristics as for model 631 H . Price: $£ 138$ 12s.
634. Speeds $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Intended especially for the North American market. Provides facilities for twin $\frac{1}{4}$-track recording and playback. Layout and controls similar to other stereo models. Price: $£ 138$ 12s.

Connoisseur 633. Monophonic instrument approaching professional standard. Specification includes all Series 6 features plus the following. Separate record and replay heads and amplifiers to provide direct comparison of recorded and live perf ormance and for echo effects. Level meter operates on both record and replay. Mixing facilities for two signals with separate gain controls. Compensated input socket for magnetic pickups. 3W output. Headphone monitor socket on front. Spot erase facility. Modular construction. Individual test certificate


Tandberg Series 12


Ferrograph Connoisseur 633


Vortexion W.V.B.


Vortexion C.B.L.
supplied with each machine. Guaranteed three years. Price: $£ 126$.

LEEVERS-RICH EQUIPMENT LTD., 319
Trinity Road, Wandsworth, London, S.W.18. Tel.: Vandyke 9054. Cables: Leemag, London, S.W.I8.

Series $\mathrm{E} \frac{1}{4}$ in. professional recorders. Available in rack mounting ( R ), console ( M ), or portable ( P ) versions.

E141, E242. Speeds 15 and $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$, or 30 and $15 \mathrm{i} / \mathrm{s}$, or $7 \frac{1}{2}$ and $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Spool $11_{2}^{\frac{1}{2}} \mathrm{in}$. Three motors. Full track, half track or dual track. F.R. $30 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$ at $15 \mathrm{i} / \mathrm{s} \pm 2 \mathrm{~dB}$. Noise: full track -62 dB , half track -58 dB . W. and F . better than $0.1 \%$. VU level meter, PPM to order. Plug-in record, replay and monitor amplifiers. Pricesfrom£550.

Series $\mathrm{H} \frac{1}{2}$ in. professional recorder.
H444. Four track heavy duty recorder suitable for high quality master recordings. Speeds 15 and $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. Spools $10 \frac{1}{2} \mathrm{in}$. NAB. Three motors. Four tracks. F.R. to BS. 1568:1960. NAB to special order. Noise better than -55 dB . Crosstalk better than 45 dB below adjacent track level at $1 \mathrm{Kc} / \mathrm{s}$. Input: 80 mV into 600 ohms (terminating) or 20 K (bridging). Plug-in record, replay amplifiers. VU meter in each channel. Prices from $£ 1,060$.

NAGRA. See Battery Tape Recorder section.

PHILIPS. Distributors: Peto Scott Electrical Instruments Ltd., Addlestone Road, Weybridge, Surrey. Tel.: Weybridge 45511. Cables: Megacycle, Weybridge.

- EL3566. Professional recorder. Stereo/mono full and $\frac{1}{2}$-track. Speeds 15 and $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ or $7 \frac{1}{2}$ and $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and F. $15 \mathrm{i} / \mathrm{s} 0 \cdot 1 \%, 7 \frac{1}{2} \mathrm{i} / \mathrm{s} 0 \cdot 15 \%$. H. and N. $15 \mathrm{i} / \mathrm{s}$ better than $-56 \mathrm{~dB}, 7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ better than -54 dB. F.R. $15 \mathrm{i} / \mathrm{s}, 60 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}+0-2$ $\mathrm{dB}, 40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}+0-4 \mathrm{~dB} ; 7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 60 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}$ $+0-2 \mathrm{~dB}, 40 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}+0-4 \mathrm{~dB}$. Replay char. CCIR. Inputs: mic. $0 \cdot 1 \mathrm{mV}, 400$ ohms; line $0 \mathrm{dBm}, 600$ ohms balanced. Monitor (headphones) and line outputs. Three Papst motors. 11 in . spools. 2 min . rewind, $3,300 \mathrm{ft}$. VU meter. Provision for adding pilot-tone head. Time indicator in mins. and secs. Suitable for 19 in:
rack mounting. Size (deck): $20 \times 15 \frac{1}{2} \times 10 \frac{1}{2}$ in.; (amplifier, mono): $20 \times 15 \frac{1}{2} \times 5 \frac{1}{4} \mathrm{in}$. Weight (deck): 60 lb .; (amp): 24 lb . Price on application.

REVOX. Distributors: C. E. Hammond \& Co. Ltd., 90 High Street, Eton, Windsor, Berks. Tel.: Windsor 63388. Telex: 84316.

- Model 736. Stereo recorder. $\frac{1}{2}$ - or $\frac{1}{4}$-track versions. Speeds $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and F. less than $0.1 \%$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. H. and N. -60 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$, $30 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}+2-3 \mathrm{~dB} ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$ $+2-3 \mathrm{~dB}$. Replay char. DIN. Inputs (3 per channel): mic. $3 \mathrm{mV}, 2$ megohms, diode 3-50 $\mathrm{mV}, 47 \mathrm{~K}$; radio 50 mV , 1 megohm. Outlet from pre-amp. Three motors. $10 \frac{1}{2}$ in. NAB spool. $1_{1}^{1}$ min. rewind, $2,400 \mathrm{ft} .2 \mathrm{VU}$ meters. Three heads, remote control, switchable tape tension, superimpose, mixing, echo, on and off tape monitoring, multiplay. Size: $18 \frac{1}{2} \times 12 \frac{1}{4} \times 11 \frac{1}{2}$ in. Weight: 45 lb . Price (chassis model): £123 18s.; (with portable case): £1304s.
- Model 736/HS. Details as for Model 736, but. with $15 \mathrm{i} /$ stape speed. Price: $£ 1525$ s.


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SONY. U.K. Sales Division, Mercia Road, Gloucester. Tel.: Gloucester 26841. Cables: Debelec, Gloucester.

TC777A. Transistorised mono recorder. $\frac{1}{2}$ track. Speeds $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 0 \cdot 15 \%$. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 30 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s} ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 30 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$ ( $\pm 2 \mathrm{~dB}$ ). Replay char. NARTB. Inputs: mic. low impedance, aux. high impedance. Outlet from replay head. Three motors. 7 in . spools. VU meter. Three heads. Remote control. Size: $16 \frac{1}{8} \times 10 \frac{11}{16} \times 18 \frac{3}{4} \mathrm{in}$. Weight: 42 lb . Price: £162 15s.

TC600. $\frac{1}{4}$-track valve and transistor mains operated stereo recorder. Speeds $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Spool 7 in. W. and F. $0 \cdot 15 \%$ at $7 \frac{1}{2}, 0 \cdot 2 \%$ at $3 \frac{3}{4}$. F.R. $30 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 50-15 \mathrm{Kc} / \mathrm{s}$ at $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Replay char. CCIR. Low imp. input -72 dB , high imp. input 80 mV . Line output 1.5 V . VU meter. Rewind time $3 \frac{1}{2}$ mins. $1,800 \mathrm{ft}$. Superimpose. Pause. Position indicator with PB reset. One motor. Own deck. Mains 110-240V $50 \mathrm{c} / \mathrm{s}$. Size: $16 \frac{3}{4} \times 18 \frac{3}{16} \times 10 \frac{3}{4} \mathrm{in}$. Weight: 48 lb . Price: $£ 133$ 7s.

TANDBERG. U.K. distributors: Elstone Electronics Ltd., 81 Kirkstall Road, Leeds, 3. Tel.: Leeds 3-5111.

Tandberg Series 6. Speeds $7 \frac{1}{2}, 3 \frac{3}{4}$ and $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. F.R. $30-20,000 \mathrm{c} / \mathrm{s}$. $\frac{1}{4}$-track. 7 in . spools. H. and
N. $-55 \mathrm{~dB} . \mathrm{W}$. and F. $0.1 \%$ M.E. level ind. Outlet from pre-amp. No power amplifier or speaker. Superimposing. Size: $15_{4}^{1} \times 11_{8}^{7} \times 6$ in. Weight: 25 lb . Price: £115 10s. Alternative $\frac{1}{2}$-tack model also available: $£ 11510$ s.

TEAC. Distributors: Audio and Design Ltd., 40 Queen Street, Maidenhead, Berks. Tel.: Maidenhead 25204.

Teac Series 310. Professional mains recorders. Speeds: $15,7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Max. spool $10 \frac{1}{2} \mathrm{in}$. S.N. better than 60 dB (full track), 55 dB (half track). F.R. $15 \mathrm{i} / \mathrm{s} 30 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}, 7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-$ $15 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. W. and F. better than $0 \cdot 15 \%$ at $15 \mathrm{i} / \mathrm{s}$, better than $0.2 \%$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. Large VU meter. Full remotecontrol facilities. Price (R311 full-track mono): £295; (R313 half-track stereo): £385.

VORTEXION LTD., 257/263 The Broadway, Wimbledon, London, S.W.19. Tel.: Liberty 6242/3. Cables: Vortex, Wimbledon.

Model WVA. Complete semi-professional mono $\frac{1}{2}$-track recorder. Speeds: $15,7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ or $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 0 \cdot 16 \% ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$,
$0.2 \%$. H. and N. (after erasure) -50 dB . F.R. $15 \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}, 7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} .3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. $40 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$. All $\pm 3 \mathrm{~dB}$. Replay char. CCIR. Inputs: mic., $12 \mu \mathrm{~V}$ on 30 ohms; gram/radio 20 mV on $\frac{1}{2}$ megohm. Output 15 ohms at $3 \frac{1}{2} \mathrm{~W}$. Three motors, $8 \frac{1}{4}$ in. spools, less than 1 min . rewind for $1,750 \mathrm{ft}$. tape. Level meter. Size: $8 \frac{1}{4} \times 22 \frac{1}{2} \times 15 \frac{3}{4} \mathrm{in}$. Weight: 51 lb . Pause control. Price: £96 7s. with speeds of $1 \frac{7}{8}, 3 \frac{3}{4}, 7 \frac{1}{2} \mathrm{i} / \mathrm{s} ; £ 1073 \mathrm{~s}$. with speeds $3 \frac{3}{4}, 7 \frac{1}{2}, 15 \mathrm{i} / \mathrm{s}$.

Model WVB. Details as for WVA, but facilities for monitoring, adding echo, superimpose. Price: $£ 11510$ s. with speeds of $1 \frac{7}{8}, 3 \frac{3}{4}$, $7 \frac{1}{2} \mathrm{i} / \mathrm{s} ; £ 128$ with speeds of $3 \frac{3}{4}, 7 \frac{1}{2}, 15 \mathrm{i} / \mathrm{s}$.

Model CBL. Stereo/mono $\frac{1}{2}$-track recorder. Speeds: $15,7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$, or $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 0 \cdot 16 \% ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 0 \cdot 2 \%$. H. and N. (after erasure) -50 dB . F.R. $15 \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$, $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$, $40 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$. All $\pm 3 \mathrm{~dB}$. Replay char. CCIR. Inputs: mic. $10 \mu \mathrm{~V}$ on 30 ohms; gram/radio 60 mV on 300 K (mixable on each amplifier). Output: 15 ohms at $3 \frac{1}{2} \mathrm{~W}$ each amplifier. Three motors. $8 \frac{1}{4} \mathrm{in}$. spools, less than 1 min . rewind for $1,750 \mathrm{ft}$. tape. Level meter. Size: $16 \frac{3}{8} \times 27 \frac{1}{2} \times 8 \frac{5}{8}$ in. Weight: 69 lb . Pause control, monitoring, mixing, echo, superimpose. Price: $£ 172$ with speeds of $1 \frac{7}{8}, 3 \frac{3}{4}, 7 \frac{1}{2} \mathrm{i} / \mathrm{s} ; £ 180$ with speeds of $3 \frac{3}{4}, 7 \frac{1}{2}, 15 \mathrm{i} / \mathrm{s}$.

## BATTERY OPERATED PORTABLES

AKAI. Distributors: Pullin Photographic Ltd., 11 Aintree Road, Perivale, Greenford, Middlesex. Tel.: Alperton 1541. Cables: Pullinfoto, Greenford, Middlesex.

Akai X-IV. $\frac{1}{4}$-track mains/battery portable recorder. Mono or stereo. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8}$, $\frac{15}{16} \mathrm{i} / \mathrm{s}$. Max. spool 5 in . W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}<0.16 \%$, $3 \frac{3}{4} \mathrm{i} / \mathrm{s}<0.17 \%, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}<0.28 \%$, $\frac{15}{16} \mathrm{i} / \mathrm{s}<0.35 \%$. H. and N. 40 dB at all speeds. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}, 1 \frac{7}{8}$ i/s $30 \mathrm{c} / \mathrm{s}-11 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}, \frac{15}{16} \mathrm{i} / \mathrm{s} 30 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$ $\pm 3 \mathrm{~dB}$. Replay char. NARTB. Two VU meters. Rewind time: $1 \frac{1}{4}$ mins. 600 ft . Inputs: mic. $0 \cdot 1$ mV 600 K , line 60 mV at 4 K . Output: 2 W RMS per channel. Speaker $5 \times 3$ in. Outlets: line 700 mV 4 K , phones, ext. speakers 8 ohms. Transistors. One DC micro-motor (maintains tape speed deviation within $0.8 \%$ even after 1,000 hours continuous operation). Three-digit tape indicator. Monitoring. Power from 6 V rechargeable battery or mains adaptor $100-240 \mathrm{~V}$

AC. Size: $4 \times 9 \frac{1}{4} \times 10 \mathrm{in}$. Weight: $11 \frac{1}{4} \mathrm{lb}$. Price (with all accessories): £137 11s.

Akai X-PK1. $\frac{1}{2}$-track transistorised pocket recorder. Speeds: $1 \frac{7}{8}, \frac{15}{16} \mathrm{i} / \mathrm{s}$. Max. spool $3 \frac{1}{4} \mathrm{in}$. W. and F. $<0.6 \%$. H. and N. 35 dB. F.R. $1 \frac{7}{8} \mathrm{i} / \mathrm{s} 100$ $\mathrm{c} / \mathrm{s}-9 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}, \frac{15}{16} \mathrm{i} / \mathrm{s} 100 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. Replay char. NARTB. VU meter. Input: mic. Output: 85 mW . Speaker 2 in. Outlets: line, phone. One 6V DC micro-motor. Monitoring. Remote control from mic. Capstan drive. Crossfield head. Power supply: four U2 cells. Size: $9 \frac{1}{8} \times 4 \frac{3}{8} \times 2 \frac{1}{2}$ in. Weight: 3 lb . Price: $£ 298 \mathrm{~s}$.
C. BRADDOCK (BLACKPOOL) LTD., 266 Waterloo Road, Blackpool, Lancs. Tel.: Blackpool 45049.

Q-Cord R119K. Transistorised mono recorder. Battery-mains with adaptor. $\frac{1}{2}$-track.

Speed: $3_{13}^{3} \mathrm{i} / \mathrm{s}$. W. and F. $<0.5 \%$ H. and N. -50 dB. F.R. $60 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$ dB. Replay char NARTB. Inputs: radio mic. gram./tele-adaptor 2 mV 50 K . Straight-through amplifier. Outlet from pre-amplifier at 10 K . One motor. $4!\mathrm{in}$. spool. Rewind 4 mins. DM70 level indicator. Pause control. Can be used in any position. Size: $9 \frac{1}{4} \times 4 \times 9 \frac{9}{4}$ in. Price: $£ 3312 \mathrm{~s}$.

Q-Cord 203. 6 or 12V battery/mains with adaptor. Remote control. Size: $10 \times 4 \times 10 \frac{1}{2}$ in. Other details as for R119K. Price: $£ 3514 \mathrm{~s}$.

Q-Cord 203/7⿺辶 ${ }^{\frac{1}{2} \text {. Similar specification but with }}$ speed $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. Price: $£ 39 \mathrm{18s}$.
All machines supplied with batteries, headset, dual-impedance dynamic mic., $1,200 \mathrm{ft}$. TP tape, empty reel, radio lead, spare plug and head cleaning kit.
Full range of accessories stocked. Details on request.

Saja. C. Braddock (Blackpool) Ltd. is sole U.K. agent for spares for now obsolete Sa ja recorders. By return service. 24-hour telephone answering service, Blackpool 45049.

BUTOBA-Sole U.K. distributors: Denham \& Morley Ltd., Denmore House, 175 Cleveland Street, London, W.1. Tel.: Euston 3656. Cables: Denmorl, Wesdo, London.

Butoba MT5. Transistorised battery portable. Speeds: $3 \frac{3}{4}$ and $1 \frac{7}{8} \mathrm{i} / \mathrm{s}, \frac{1}{2}$-track. W. and F. $3_{4}^{3} \mathrm{i} / \mathrm{s}$, $0 \cdot 11 \% ; 1 \frac{7}{8} \mathrm{i} / \mathrm{s}, 0 \cdot 16 \%$. H. and N. -57 dB . Replay char. CCIR. Inputs: $200 \mu \mathrm{~V}, 200$ ohms; 100 $\mathrm{mV}, 100 \mathrm{~K}$. Outlet from pre-amp. 5 in . spools, $2 \frac{1}{2}$ min . rewind. Pause control, straight amplifier. M.E. level ind. Two motors. F.R. $3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 50-$ $13,000 \mathrm{c} / \mathrm{s} ; 1_{8}^{7} \mathrm{i} / \mathrm{s}, 60-5,000 \mathrm{c} / \mathrm{s}$. Battery life 20-40 hours. Eight 1.5 V batteries. Size: $12 \times 9 \frac{1}{4} \times 6$ in. Weight including batteries: 12 lb . Price: $£ 61 \mathrm{l9s}$. Mains converter: £11 11s.

Butoba MT225. Transistorised portable recorder operating on dry batteries, car battery, rechargeable battery or AC mains. Speeds: $7 \frac{1}{2}$, $3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. $\frac{1}{2}$-track. 17 transistors 4 diodes. Spool size 6 in. with lid closed. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-18$ $\mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-9 \mathrm{Kc} / \mathrm{s}$. H. and N. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}-50 \mathrm{~dB}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}-46 \mathrm{~dB}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$ -40 dB . Output: 1.5 W at $3.0 \%$ distortion, 1 W at $1.5 \%$ distortion. Inputs: mic. 200-500 ohms at 0.15 mV , radio 100 K at 20 mV . VU meter. Three motors. Digital tape indicator. Autostop. 7 in . speaker. Size: $12 \frac{1}{4} \times 10 \times 5 \mathrm{in}$. Weight: 12 lb . Price: $£ 939 \mathrm{~s}$.

DANSETTE PRODUCTS LTD., Dansette House Honcypot Lane. Stanmore. Middlesex. Tel. : Wordsworth 0021.

JTR909. Battery recorder with mains operation by optional adaptor. Twin track. Drop-in cartridge loading. AC bias. $2 \frac{1}{2} \mathrm{in}$. speaker. 400 mW output. Power supply: four U2 cells. Dynamic mic. with on/off switch. Meter level and battery indicator. Push-button operation. Carry handle. Size: $8 \times 5_{4}^{3} \times 2 \frac{1}{4} \mathrm{in}$. Weight: 3 lb . Price: $£ 26$ 5s.

JTR93. $\frac{1}{2}$-track battery/mains recorder. Speeds: $3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Capstan drive. 3 in . speaker. Output: 800 mW . Automatic recording level. Power supply: four U2 cells or $110-125 \mathrm{~V}$ or $220-240$ V AC mains. Stick mic. with on/off switch stored in handle. Moulded case with carrying handle. Size: $8 \frac{1}{4} \times 10 \times 2 \frac{7}{8} \mathrm{in}$. Weight: 5 lb . Price: $£ 221 \mathrm{~s}$.

EMI ELECTRONICS LTD., Hayes, Middx. Tel.: Hayes 3888. Cables: Emidata, London.

L4. Professional portable transistorised recorder in three versions. Type A $\frac{1}{2}$-track, Type B full-track, Type C adaptable for film and sound sync. Spool $4 \frac{1}{4}$ in. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and F. better than $0.2 \%$ at $7 \frac{1}{2}, 0 \cdot 25 \%$ at $3 \frac{3}{4}$. H. and N . -45 dB . F.R. $7 \frac{1}{2} 50 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}, 3 \frac{3}{4} 50$ $\mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s} \pm 6 \mathrm{~dB}$. Inputs: Two mic. $50 \mu \mathrm{~V} 30-50$ ohms, line 250 mV 20K. Outputs: line 600 ohms, LS 200 mW 65 ohms. Meter. Rewind time 2 min . $4 \frac{1}{4} \mathrm{in}$. standard tape. One motor. Own deck. Four heads. Remote control. Operates with lid closed. Power: 14 V rechargeable lead acid accumulator. Size: $7 \times 11_{4}^{3} \times 5_{4}^{3} \mathrm{in}$. Weight: $10_{4}^{3} \mathrm{lb}$. Prices: Model A $£ 120$, Model B $£ 120$, Model C $£ 130$ (excluding fourth head and accessories).

FI-CORD LTD., Charlwoods Road, East Grinstead, Sussex. Tel.: East Grinstead 21351.

Fi-Cord 202A. Battery portable recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and $\mathrm{F} .7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ less than 0.3 RMS, $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ less than 0.4 RMS. Signal to noise ratio 45 dB unweighted at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. F.R. $7 \frac{1}{2} \cdot \mathrm{i} / \mathrm{s} 50$ $\mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 50 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Head gap 0.14 thou. Erase frequency $60 \mathrm{Kc} / \mathrm{s}$. $\frac{1}{2}$-track. Rewind time: $1_{2}^{1}$ mins. at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ for 4 in . LP tape. Forward wind: $2 \frac{1}{2}$ mins. at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ for 4 in. LP tape. Separate batteries for motor and electronics. Internal batteries or provision for mains or car battery operation. Input: $<0.2 \mathrm{mV}$ for fully modulated tape. Built-in 3 in . speaker.


## Akai X-PK1

Akai X-PK1


Akai X-IV
 Loewe-Opta Optacord 416


EMI L4


Telefunken Magnetophon 301

Butoba MT5

Output: 180 mW and IV at outlet socket. Size: $9 \times 6 \frac{1}{2} \times 4 \frac{1}{2} \mathrm{in}$. Weight: $6_{4}^{3} \mathrm{lb}$. including batteries. Price: $£ 696$ s. including LP tape and mercury batteries.

Accessories include leather carrying case $£ 99 \mathrm{~s} . ;$ mains power pack $£ 710 \mathrm{~s}$.; car battery power pack $£ 510$ s.; Universal mixer $£ 115 \mathrm{~s}$.; also cables, connectors, tapes, headset, mics., etc.

GRUNDIG (GREAT BRITAIN) LTD., Newlands Park, Sydenham, London, S.E.26. Tel.: Sydenham 2211.

TK6L. Transistorised battery/mains $\frac{1}{2}$-track mono recorder. Speeds: $3 \frac{3}{4}, 1 \frac{7}{7} \mathrm{i} / \mathrm{s}$. Max. spool $4 \frac{1}{4} \mathrm{in}$. W. and F. $3 \frac{3}{4} \mathrm{i} / \mathrm{s} \pm 0 \cdot 5 \%$, $1 \frac{7}{8} \mathrm{i} / \mathrm{s} \pm 0 \cdot 8 \%$. F.R. $3 \frac{3}{4} \mathrm{i} / \mathrm{s} 50 \mathrm{c} / \mathrm{s}-13 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 50 \mathrm{c} / \mathrm{s}-9 \mathrm{Kc} / \mathrm{s}$. Replay char. NARTB. Inputs: mic. $0 \cdot 3-20 \mathrm{mV}$. 10 K , radio diode $5-100 \mathrm{mV}$. 10 K , pickup $50-$ $1,500 \mathrm{mV} .500 \mathrm{~K}$ with special lead. Outputs: 0.5 W on battery, 1.6 W on mains. High impedance outlet: 550 mV .18 K . Meter level indicator. Rewind time 2 mins. 10 secs. for $1,200 \mathrm{ft}$. Own deck. Pause control. Position indicator. Monitoring. DC brushless motor. Supply: 110-240V $50 \mathrm{c} / \mathrm{s}$, six LPU2 batteries. Size: $12 \frac{3}{4} \times 5 \frac{1}{4} \times 9 \frac{1}{2}$ in. Weight: $13_{\frac{3}{4}} \mathrm{lb}$. Price: $£ 729 \mathrm{~s}$.

LOEWE-OPTA. Sole U.K. distributors: Highgate Acoustics, 71/73 Great Portland Street, London, W.1. Tel.: Museum 2901.

Optacord 408. $\frac{1}{2}$-track transistorised mono mains/battery recorder. Speed: $3 \frac{3}{4}$ i/s. Spool size $4 \frac{1}{2} \mathrm{in}$. F.R. $90 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Inputs: mic., radio/diode, aux. Output: 800 mW . Rewind time 2 mins. 20 secs. One motor. Own deck. High frequency controlled motor. Push-button controls. Record level and battery meter. W. and F. less than $0.3 \%$. 10 transistors plus 4 diodes. Operates from AC mains $110 \mathrm{~V} / 240 \mathrm{~V} 50-60 \mathrm{c} / \mathrm{s}$, four 1.5 batteries or car battery 6 V or 12 V . Size: $9 \frac{1}{2} \times 7 \frac{1}{2} \times 3_{8}^{3} \mathrm{in}$. Weight: $6 \frac{1}{2} \mathrm{lb}$. Price: $£ 4019 \mathrm{~s}$.

Optacord 416. $\frac{1}{2}$-track transistorised mono mains/battery recorder. Speeds: $3 \frac{3}{4}, 1_{8}^{\frac{7}{8}} \mathrm{i} / \mathrm{s}$. Spool size $4 \frac{1}{4}$ in. F.R. $50 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$ at $3 \frac{3}{4}, 90 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$ at $1 \frac{7}{8}$. Inputs: mic., radio/diode, aux. Output: 1.8 W . Rewind time 2 mins. 20 secs. One motor. Own deck. Operates from AC mains $110 \mathrm{~V} / 240 \mathrm{~V}$ $50-60 \mathrm{c} / \mathrm{s}$, five 1.5 V batteries, five rechargeable Deac cells, or car battery 6 V or 12 V . Meter level indicator and battery voltage check. Push-button control. Operates while carried. Remote-control mic. facility. Internal speaker can be switched
off. Shock proof polyester case. Size: $15 \times 9_{4}^{3}$ $\times 4 \frac{1}{2}$ in. Weight: 9 lb . Price: $£ 5311 \mathrm{~s}$.

Optacord 416 DIA. Specification as for 416 but plus built-in synchronising unit for use with slide projector. Upper track records commentary, lower track takes pulses to control slide changes. Pulse frequency $50 \mathrm{c} / \mathrm{s}$. Projector control relay S.P. 7A contact. Four additional transistors. Price: $£ 652 \mathrm{~s}$.

NAGRA. Distributed by: Livingston Laboratories Ltd., Greycaines Estate, Bushey Mill Lane, North Watford, Herts. Tel.: Watford 44344.

Nagra III BH. Professional battery portable recorder. Mono. Full track. Speeds: $15,7 \frac{1}{2}, 3 \frac{3}{4}$ $\mathrm{i} / \mathrm{s}$. W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 0 \cdot 2 \%$. H. and N. $15,7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. -62.5 dB . F.R. $15 \mathrm{i} / \mathrm{s}, 30 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$; $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 1.5 \mathrm{~dB} ; 3_{4}^{3} \mathrm{i} / \mathrm{s}, 50 \mathrm{c} / \mathrm{s}-7$ $\mathrm{Kc} / \mathrm{s}$. Replay char. CCIR (or Ampex on request). Inputs: mic. $0 \cdot 2-10 \mathrm{mV}, 200 \mathrm{ohms}$, or $0 \cdot 1-5 \mathrm{mV}$, 50 ohms ; line $0 \cdot 5-10 \mathrm{~V}, 100 \mathrm{~K}$, or $10 \mathrm{mV}-1 \mathrm{~V}, 2 \cdot 5 \mathrm{~K}$. Outlet from pre-amp. One motor. 5 in . spool ( 7 in. with lid raised). Level meter. Mixing of various inputs. 3 heads. Monitor speaker. Batteries, twelve 1.5 V torch cells, life approx. 20 hours. On alkaline accumulators, approx. 70 hours' life. Size: $8 \frac{3}{4} \times 12 \frac{1}{2} \times 4 \frac{1}{4} \mathrm{in}$. Weight approx.: $15 \frac{1}{2} \mathrm{lb}$. Price: including duty $£ 334$ (plus $£ 244 \mathrm{~s}$. 5 d . import surcharge).

Nagra III PH. Similar to III BH but fitted with the "Neopilot" system which provides the additional capability of achieving lip sync. in filming. The "Neopilot" head is used to record a $50 \mathrm{c} / \mathrm{s}$ or $60 \mathrm{c} / \mathrm{s}$ signal transversely on the tape. Price: including duty $£ 357$ (plus $£ 2515$ s. 11d. import surcharge).

NATIONAL. Matsushita Electric Co., Japan. Distributors: United Africa Mechanical and Electrical Ltd., United Africa House, Blackfriars, London, S.E.1. Tel.: Waterloo 2070.

RQ101S. Battery operated $\frac{1}{2}$-track mono recorder. Speeds: $3 \frac{3}{4}, 1 \frac{7}{8}$ i/s. Spool size $3!$ in. F.R. $100 \mathrm{c} / \mathrm{s}-7 \mathrm{Kc} / \mathrm{s}$ at $3 \frac{3}{4}, 100 \mathrm{c} / \mathrm{s}-4 \mathrm{Kc} / \mathrm{s}$ at $1 \frac{1}{8}$. Mic. input: 20K. Output:LS 8 ohms. Neon indicator. Six transistors. Rewind time less than 3 mins. for 300 ft . One motor with controlled speed. Single switch control. Power requirements: Six U2 batteries, or will operate from mains via 9 V adaptor. Size: $8 \frac{1}{8} \times 3 \frac{1}{8} \times 8 \mathrm{in}$. Weight: $3 \frac{1}{4} \mathrm{lb}$. Price: £19 19s.


Telefunken Magnetophon 300


Telefunken Magnetophon 401


Stella 471
Stella 471


Sanyo Mountie MR. 212


Nagra 111B
Nagra $111 B$


Sony TC900 recorder


Uher 4000 Report-L
Uher 4000 Report-L

RQ115. Miniature battery operated $\frac{1}{2}$-track mono recorder. Speeds: $3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Spool size $3 \frac{3}{4}$ in. W. and F. less than $0 \cdot 35 \%$ at $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. F.R. 100 $\mathrm{c} / \mathrm{s}-7 \mathrm{Kc} / \mathrm{s}$ at $3 \frac{3}{4}, 100 \mathrm{c} / \mathrm{s}-4 \mathrm{Kc} / \mathrm{s}$ at $1 \frac{7}{8}$. Mic. input unbalanced 30 K .8 ohms output. VU meter. Six transistors. Rewind time less than $1 \frac{1}{2}$ mins. for 200 ft . One controlled-speed motor. Single lever control. Remote control on mic. Power requirements: 12 pen light cells, or will operate from mains via 9V adaptor. Size: $8 \times 2 \frac{1}{2} \times 7 \frac{7}{8}$ in. Weight: 4 lb . Price: $£ 3817 \mathrm{~s}$.

RQ116. Miniature battery operated $\frac{1}{4}$-track mono recorder. Similar specification to RQ115 but four-track. Price: $£ 431 \mathrm{l}$.

RQ150. Versatile mono battery-operated $\frac{1}{2}$ track recorder. Speeds: $3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Spool size $3 \frac{1}{4}$ in. F.R. $100 \mathrm{c} / \mathrm{s}-7 \mathrm{Kc} / \mathrm{s}$ at $3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 100 \mathrm{c} / \mathrm{s}-4 \mathrm{Kc} / \mathrm{s}$ at $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Mic. input 20K. LS output 8 ohms. VU meter. Nine transistors. One regulated motor. Own deck. Slide and cine synchronishing. Voice operated on/off control. Self-threading tape. Remote control mic. Monitoring through internal speaker when recording. Power requirements: Six U2 or 9 V mains adaptor. Size: $12 \frac{1}{8} \times 3 \frac{1}{8} \times 9 \mathrm{in}$. Weight: $5 \cdot 9 \mathrm{lb}$. Price: $£ 486 \mathrm{~s}$.

PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Avenue, London, W.C.2. Tel.: Gerrard 7777. Cables: Phillamps, London.

EL3301. Mono $\frac{1}{2}$-track miniature battery recorder using $\frac{1}{8}$ in. tape and cassette loading. Speed: $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. W. and F. $<1 \%$ (p-p). H. and N. -40 dB . F.R. $100 \mathrm{c} / \mathrm{s}-7 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Input: combined mic., diode, PU 0.3 mV 2 K . Outputs: $0.5 \mathrm{~V} 20 \mathrm{~K}, 200 \mathrm{mV} 1.5 \mathrm{~K}$ for playback phones. Meter indicator. Transistorised. Rewind time 70 secs. One motor. Own deck. Remote stopstart. Battery voltage indicator. Batteries: five U11 or equivalent. Size (including carrying case): $8 \frac{1}{4} \times 6 \frac{1}{2} \times 2 \frac{1}{2} \mathrm{in}$. Weight: 4 lb . (including case and batteries). Price: $£ 276$ s.

EL3587. Mono $\frac{1}{2}$-track transistorised recorder. Speed: $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Spool 4 in. W. and F. $<1 \%$ (p-p). H. and N. -40 dB. F.R. $80 \mathrm{c} / \mathrm{s}-8$ $\mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Input: combined mic., diode, PU $0 \cdot 3 \mathrm{mV} .20 \mathrm{~K}$. Outputs: $0 \cdot 5 \mathrm{~V}, 20 \mathrm{~K}, 0 \cdot 5 \mathrm{~V} .1 \cdot 5 \mathrm{~K}$ for playback phones. Meter indicator. Rewind time $1 \frac{1}{2}$ mins. for 300 ft . One motor. Own deck. Battery voltage indicator. Batteries: six U2 or equivalent. Size: $11 \frac{1}{2} \times 8 \frac{7}{8} \times 3 \frac{3}{4} \mathrm{in}$. Weight: 8 lb . including batteries. Price: $£ 276 \mathrm{~s}$.

Stella ST471. Mono battery portable recorder. $\frac{1}{2}$-track. Speed: $1 \frac{7}{8} \mathrm{i} /$ s. W. and F. $1 \%$ (peak-to-
peak). H. and N. -40 dB . F.R. $80 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}$ $\pm 3 \mathrm{~dB}$. Inputs: mic./radio/gram. $0.3 \mathrm{mV}, 2 \mathrm{~K}$. Outlet from pre-amp. One motor. 4 in . spools. Moving-coil meter. Headphone playback facility, remote control facility, connection for mains unit, battery voltage indicator. Size: $12 \frac{1}{2} \times 9 \times 4 \frac{1}{2} \mathrm{in}$. Weight: 8 lb . Price: $£ 276 \mathrm{~s}$.

Stella ST472. Mono $\frac{1}{2}$-track miniature battery recorder using $\frac{1}{8} \mathrm{in}$. tape and cassette loading. Speed: $1 \frac{7}{8}$ in. W. and F. $<1 \%$ (p-p). H. and N. -40 dB. F.R. $100 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}$ within 6 dB . Meter level indicator. Rewind time 70 secs. Input: mic./radio/pickup 0.3 mV 2 K . Output: 250 mW . $2 \frac{1}{2}$ in. speaker. Outlets: 0.5 V 20 K , phones $200 \mathrm{~mW} 1 \cdot 5 \mathrm{~K}$. Transistorised. Own deck. One motor. Tape position scale on cassette. Battery voltage indicator. Headphone playback. Stop/ start control on mic. Power requirements: five Ull or equivalent. Mains supply unit available. Size: $8 \times 4 \frac{3}{4} \times 2 \frac{1}{2}$ in. Weight: 3 lb . Price: $£ 276 \mathrm{~s}$.

Q-CORD. See C. Braddock (Blackpool) Ltd.

SANYO. Sole U.K. agents: Sanyo Service \& Sales, 23 Savage Gardens, Trinity Square, London, E.C.3. Tel.: (Service) Royal 7154, (Sales) Royal 4154.

MR225. $\frac{1}{2}$-track transistorised battery recorder. Speed: $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool $2 \frac{1}{2}$ in. F.R. $200 \mathrm{c} / \mathrm{s}-3 \mathrm{Kc} / \mathrm{s}$. Rewind time 2 mins. Inputs: mic., radio. Output: 450 mW . Speaker $3 \frac{1}{8} \times 2 \mathrm{in}$. One motor. Own deck. Batteries: six U7 (9V). Mains adaptor available. Size: $6 \times 6 \frac{1}{4} \times 2 \mathrm{in}$. Weight: 2 lb . Price: $£ 16$ 16s.

MR212. $\frac{1}{2}$-track transistorised battery recorder. Speeds: $3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool $3 \frac{1}{4} \mathrm{in}$. W. and F. $3 \frac{3}{4} \mathrm{i} / \mathrm{s} 0.35 \%, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 0.45 \%$. H. and N. better than 40 dB . F.R. $3 \frac{3}{4} \mathrm{i} / \mathrm{s} 150 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$, $1 \frac{7}{8}$ $\mathrm{i} / \mathrm{s} 150 \mathrm{c} / \mathrm{s}-3 \mathrm{Kc} / \mathrm{s}$. Rewind time $2 \frac{1}{4}$ mins. Input: mic. Outlet: monitor ext. speaker. Output: normal 500 mW , max. 600 mW . Speaker $4 \times 2 \frac{5}{8}$ in. One motor. Own deck. Automatic level control. Batteries: six U2 (9V). Monitoring. Provision for footswitch. Mains adaptor available. Size: $7 \frac{7}{8} \times 9 \frac{3}{4} \times 3 \frac{1}{8} \mathrm{in}$. Weight: 4 lb . Price: $£ 232 \mathrm{~s}$.

MR101 Reporter Mk. III. $\frac{1}{2}$-track transistorised battery recorder. Speeds: $3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool $3 \frac{1}{4}$ in. W. and F. less than $0.45 \%$. H. and N. better than 40 dB . F.R. $3_{4}^{3} \mathrm{i} / \mathrm{s} 200 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$, $1 \frac{7}{8}$ $\mathrm{i} / \mathrm{s} 200 \mathrm{c} / \mathrm{s}-3 \mathrm{Kc} / \mathrm{s}$. Meter level indicator. Rewind time $2 \frac{1}{2}$ mins. Inputs: mic., radio, phone adaptor. Outlet: earphone. Output: 500 mW .

Speaker $4 \frac{1}{4} \times 2 \frac{3}{4} \mathrm{in}$. One motor. Own deck. Batteries: six U2 (9V). Mains adaptor available. Size: $8 \frac{7}{8} \times 10 \times 3$ in. Weight: 6 lb .10 oz . Price: £29 8s.

MR110 Batmain. $\frac{1}{2}$-track transistorised mains/ battery recorder. Speeds: $3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool 5 in. W. and F. less than $0.4 \%$. H. and N. better than 40 dB . F.R. $3 \frac{3}{4} \mathrm{i} / \mathrm{s} 100 \mathrm{c} / \mathrm{s}-7 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 100$ $\mathrm{c} / \mathrm{s}-4 \mathrm{Kc} / \mathrm{s}$. Meter level indicator. Rewind time $2 \frac{1}{2}$ mins. Inputs: mic., radio, remote control. Outlet: monitor. Output: 800 mW undistorted, 1 W maximum. Speaker $4 \frac{1}{8} \times 2 \frac{3}{4} \mathrm{in}$. One motor. Own deck. Automatic level control. Mains: 110, $117,220,240 V$ AC. Batteries: six U2 (9V). Size: $11 \frac{1}{2} \times 10 \frac{1}{2} \times 3 \frac{5}{8} \mathrm{in}$. Weight: 8.6 lb . Price: $£ 3716 \mathrm{~s}$.

SONY. U.K. Sales Division, Mercia Road, Gloucester. Tel.: Gloucester 26841. Cables: Debelec, Gloucester.

TC. 900. Battery/mains tape recorder. Specification and price to be announced.

STELLA. See Philips Electrical Ltd.

TELEFUNKEN. Distributors: A.E.G. (Great Britain) Ltd., Lonsdale Chambers, 27 Chancery Lane, London, W.C.2. Tel.: Chancery 9944. Cables: Welmcor, London.

Magnetophon 300. $\frac{1}{2}$-track mono mains/ battery recorder. Speed: $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. F.R. $40 \mathrm{c} / \mathrm{s}-14$ $\mathrm{Kc} / \mathrm{s}$. W. and F. $0 \cdot 2 \%$. H. and N. -50 dB . Speaker $4 \times 2 \frac{3}{4}$ in. Ten transistors, one rectifier. Push-button operation. Records and plays back in horizontal or vertical position. Easy-toread tape position scale. Pause control in handle. Built-in splicing groove. Speaker muting switch. Power supply: 6V dry batteries, storage battery, mains unit or car adaptor unit. Replay
char. NARTB. Inputs for radio and mic. Spool size 5 in. VU meter. Size: $10 \frac{1}{2} \times 3 \times 10 \frac{3}{4} \mathrm{in}$. Weight: 7 lb . Price: $£ 51$ 9s., mains adaptor $£ 13$ 13s., rechargeable battery $£ 517 \mathrm{~s}$. 6 d .

Magnetophon 301. $\frac{1}{4}$-track version of model 300. Push-button selection for tracks. Parallel track play-back. Other details as for 300 . Price: £56 14s.

Magnetophon 401. $\frac{1}{2}$-track mono transistor battery recorder with DC System cassette tape loading. Playing time $2 \times 45 \mathrm{mins}$. or $2 \times 60$ mins. Speed $2 \mathrm{i} / \mathrm{s}$. F.R. $40 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. S.N. better than 45 dB . Electronically governed motor, no brushes or commutator. Two contrarotating flywheels provide dynamic compensation. W. and F. $<0.4 \%$. 12 transistors, 8 diodes. Output: 2 W . Input: radio or mic. 0.25 mV 5 K . Outlets: $0.6 \mathrm{~V} 15 \mathrm{~K}, 1.5 \mathrm{~V} 15 \mathrm{~K}$. Combined VU level meter and battery indicator. Push-button control. Speaker $6 \times 3 \frac{1}{2}$ in. Power supply: six U 2 cells or M401 mains pack. Monitoring. Size: $11 \frac{1}{2} \times 8 \times 3 \frac{3}{4}$ in. Weight: $7 \frac{3}{4} \mathrm{lb}$. Price: £48 6s.

UHER. U.K. distributors: Bosch Ltd., 205 Great Portland Street, London, W.1. Tel.: Langham 2672/5.

4000 Report L. Transistorised mono battery portable recorder. $\frac{1}{2}$-track. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8}$, $\frac{15}{16} \mathrm{i} / \mathrm{s}$. W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, \pm 0 \cdot 15 \%$. H. and N . -55 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 50 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$, $50 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s} ; 1 \frac{7}{8} \mathrm{i} / \mathrm{s}, 50 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$; $\frac{15}{16} \mathrm{i} / \mathrm{s}$, $50-4,500 \mathrm{c} / \mathrm{s}$. Replay char. NARTB. Inputs: mic. $0 \cdot 1 \mathrm{mV}, 2 \mathrm{~K}$; radio 1.3 mV ., 47 K ; gram 25 $\mathrm{mV}, 1$ megohm. Outlet direct from pre-amp. One motor. 5 in . spool. Means of operation: mains, car battery, 1.5 V cells, rechargeable accumulator. Size: $10 \frac{1}{2} \times 8 \frac{1}{2} \times 3 \frac{1}{4}$ in. Weight: 7 lb . Price (including mic. and tape): $£ 1083 \mathrm{~s}$. Combined mains unit and battery charger: £124s.

## GENERAL PURPOSE TAPE RECORDERS

AKAI. Distributors: Pullin Photographic Ltd., 11 Aintree Road, Perivale, Greenf ord, Middlesex. Tel.: Alperton 1541. Cables: Pullinfoto, Greenford, Middlesex.

Akai 910. $\frac{1}{4}$ - or $\frac{1}{2}$-track mono mains recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Max. spool $7 \frac{1}{2}$ in. W. and F . $7 \frac{1}{2} \mathrm{i} / \mathrm{s}<0 \cdot 15 \%, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}<0 \cdot 25 \%$. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-$ $12 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}, 33 \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Replay char. NARTB. Meter level indicator. Rewind time $2 \frac{1}{2}$ mins. for $1,200 \mathrm{ft}$. Inputs: mic. 1.0 mV 500 K , line 100 mV 250 K . Output: $3 \cdot 2 \mathrm{~W}$ RMS. Valves. Own deck. One motor. Outlet: ext. speaker 8 ohms. Pause. Three-digit tape indicator. Straight-through amplifier. Monitoring. Input mixing. Tone control. Horizontal or vertical operation. Mains $100-240 \mathrm{~V}$ AC. Size: $15 \frac{1}{2} \times 13 \frac{1}{4} \times 7 \frac{1}{2}$ in. Weight: $27 \frac{1}{2} \mathrm{lb}$. Price: $£ 652 \mathrm{~s}$.

OAkai 1700. $\frac{1}{4}$-track mains recorder. Mono or stereo. Max. spool 7 in . Speeds: $1 \frac{7}{8}, 3 \frac{3}{4}, 7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ ( $15 \mathrm{i} / \mathrm{s}$ with optional accessories). W. and F . $7 \frac{1}{2} \mathrm{i} / \mathrm{s}<0 \cdot 18 \%$. H . and N . better than 42 dB at all speeds. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ $40 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s}$. Replay char. NARTB. VU meter. Rewind time $2 \frac{1}{2}$ mins. $1,200 \mathrm{ft}$. Inputs: mic. 1.5 mV 2.2 megohms, line 100 mV 2.2 megohms. Output: 6W RMS total. Speakers: two $7 \times 5$ in. Outlets: amplifier 700 mV 100 K , ext. speakers 8 ohms, phones. Valves and transistors. Own deck. One motor. Pause. Three-digit tape indicator. Monitoring. Input mixing. Suitable for FM multiplex radio. Vertical or horizontal operation. Auto-stop. Mains $100-240 \mathrm{~V}$ AC. Size: $13 \frac{1}{2} \times 13 \frac{1}{2} \times 9$ in. Weight: 33 lb . Price: $£ 80$ approximately.

See also Professional Recorder section and Battery Operated Portable section.

ALBA (RADIO/TELEVISION) LTD., Tabernacle Street, London, E.C.2. Tel.: Clerkenwell 1322. Cables: Abalgramo, Ave, London.

R17. Mono recorder. $\frac{1}{4}$-track. Speed $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and F. $0 \cdot 4 \%$. H. and N. -47 dB. F.R. $100 \mathrm{c} / \mathrm{s}-9 \mathrm{Kc} / \mathrm{s}$. Replay char. CCIR. Input 3 mV , 100 K . Outlet direct from pre-amp. One motor. $5 \frac{3}{4} \mathrm{in}$. spools. Rewind 3 mins. for 850 ft . EM87 level indicator. Rev. counter, pause control. Size: $14 \times 12 \frac{1}{2} \times 6$ in. Weight: $17 \frac{1}{4} \mathrm{lb}$. Price: £28 7s.

R16. $\frac{1}{2}$-track model of R17. Price: $£ 25$ 14s. 6d.

ARENA. Distributors: Highgate Acoustics Ltd., 71-73 Great Portland Street, London, W.1. Tel.: Museum 2901.

Arena Stereo Tape Recorder. Full specification and price to be announced.

BAIRD. Radio Rentals (U.K.) Ltd., Seymour Mews House, Wigmore Street, London, W.1. Tel.: Welbeck 9191.

Baird Tapemaster 282. $\frac{1}{2}$-track mono recorder. Speed $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Spool size $5 \frac{3}{4} \mathrm{in}$. W. and F. $0.4 \%$ RMS. H. and N. -50 dB . F.R. $60 \mathrm{c} / \mathrm{s}-8$ $\mathrm{Kc} / \mathrm{s}$. Replay char. non-standard. Inputs: mic. 2-3 mV 6 megohms, radio 100 mV 500 K . Output: LS $3-5$ ohms. M.E. Valves. Rewind time 3 mins. for 850 ft . One motor. BSR TD2 deck. Pause. Mains 200-250V $50 \mathrm{c} / \mathrm{s}$. Size: $14 \frac{1}{2} \times 12 \times$ 5 in . Weight: 18 lb . Price: $£ 209 \mathrm{~s} .6 \mathrm{~d}$.

Baird Varsity 101. $\frac{1}{4}$-track mono three-speed recorder. Speeds $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Spool size 7 in . W. and F. $0 \cdot 3 \%$ RMS. H. and N. -42 dB . at $7 \frac{1}{2},-36 \mathrm{~dB}$. at $3 \frac{3}{4},-30 \mathrm{~dB}$ at $1 \frac{7}{8} \mathrm{i} /$ s. F.R. $70 \mathrm{c} / \mathrm{s}-11 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$ at $7 \frac{1}{2}, 70 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$ at $3 \frac{3}{4}, 70 \mathrm{c} / \mathrm{s}-4 \cdot 5 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$ at $1 \frac{7}{8}$. Replay char. NARTB. Inputs: Mic. 1 mV 20 K , radio/PU 200 mV 250K. Inputs may be mixed by means of independent controls. Output: 3.5W. Strip indicator. Transistor pre-amp., remainder valves. Rewind time $2 \frac{1}{2}$ mins. for 850 ft . One motor. BSR TD10 deck. Superimposition by recording separate tracks and playing back in parallel. Position indicator. Pause. Mains 210$250 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$. Size: $16 \times 16 \frac{1}{2} \times 8 \mathrm{in}$. Weight: 24 lb . Price: £34 15s.
C. BRADDOCK (BLACKPOOL) LTD., 266 Waterloo Road, Blackpool, Lancs. Tel.: Blackpool 45049.

Q-Cord. Battery/mains recorders. For details see Battery Operated Portables section.

BRENELL ENGINEERING CO. LTD., 231/5 Liverpool Road, London, N.1. Tel. : North 8271 (5 lines).

Mk. 5 Series 3. See Professional and SemiProfessional Tape Recorder section.


Akai 910


Baird Tapemaster 282


Baird Varsity 101


Ampex 2000


Bush TP50

Mk. 5 Type M. Series 3. See Professional and Semi-Professional Tape Recorder section.

STB2. See Tape Units section.

BRITISH RADIO CORPORATION LTD., 284 Southbury Road, Enfield, Middlesex. Tel.: Howard 2477.

HMV 2206. $\frac{1}{4}$-track mains tape recorder. Speeds $3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool $5 \frac{3}{4} \mathrm{in}$. F.R. $3 \frac{3}{4} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$. Magic eye level indicator. Three-digit tape position indicator. Fast wind or rewind $2 \frac{1}{2}$ mins. for 850 ft . Inputs: mic. 1.5 mV 10 megohms, radio 1.5 mV 68 K , pickup 75 mV 3.3 megohms . Outlets: external amplifier 500 mV 22 K . LS 3 ohms $3 \mathrm{~W}, 30 \mathrm{~V} 50 \mathrm{~mA}$, record output (without bias). Output 3W. Speaker $7 \times 3 \frac{5}{8}$ in. Valves. One four-pole motor. Thorn deck. Inching both directions. Pause controls on deck and mic. Auto-stop. Parallel track replay. Monitoring. Superimpose. Size: $16 \frac{1}{4} \times 15 \frac{5}{8} \times 7$ in. Mains 200-250V AC $50 \mathrm{c} / \mathrm{s}$, 60W. Price: $£ 35$ 14s.

Marconiphone 4206. $\frac{1}{2}$-track mains tape recorder. Speed: $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Max. spool $5 \frac{3}{4} \mathrm{in}$. Magic eye level indicator. Rewind time $2 \frac{1}{2}$ mins. 900 ft . Inputs: mic. 1.5 mV 10 megohms, radio 1.5 mV 68 K , pickup 75 mV 3.3 megohms. Outlets: external amplifier 500 mV 22 K , LS 3 ohms 3 W . Output: 3W. Valves. One four-pole motor. Thorn deck. Pause. Inching both directions. Digital tape indicator with PB reset. Speaker $7 \times 35 \mathrm{in}$. Mains $200-250 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$, 60W. Size: $14 \frac{1}{2} \times 12 \frac{3}{4} \times 7 \frac{1}{4}$ in. Price: $£ 287 \mathrm{~s}$.

Marconiphone 4208. $\frac{1}{4}$-track mains tape recorder. Speeds: $3 \frac{3}{4}$, $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool $5 \frac{3}{4} \mathrm{in}$. W. and F. $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ better than $0.2 \%$. Signal to noise 40 dB F.R. $3 \frac{3}{4} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$, $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$ $60 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$. EM87 strip level indicator. Inputs: mic. 1.5 mV 10 megohms, radio diode 1.5 mV 68 K , pickup 75 mV 3.3 megohms. Outlets: 500 mV 22K, 3 ohms 3W. Output: 3W. Speaker $7 \times 3 \frac{5}{8} \mathrm{in}$. One four-pole motor. Thorn Mk II deck. Remote control. Superimpose. Pause. Inching both directions. Auxiliary DC output for transistor units. Monitoring. Parallel track replay. Slide projector sync. Autostop. Threedigit position indicator with PB reset. Mains 200-250V AC. Size: $14 \frac{1}{2} \times 12 \frac{3}{4} \times 7 \frac{1}{4}$ in. Price: £35 14s.

Marconiphone 4210. $\frac{1}{4}$-track three-speed tape recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max reel 7 in. W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ better than $0 \cdot 15 \%, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ better than $0.2 \%, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$ better than $0.25 \%$. Signal to noise 40 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$
$40 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-7 \mathrm{Kc} / \mathrm{s}$. Meter level indicator. Rewind time $2 \frac{1}{2}$ mins. $1,200 \mathrm{ft}$. Inputs: radio 180 mV 68 K , pickup (1) 180 mV 250 K , pickup (2) 75 mV 3.3 megohms, mic. 1.5 mV 10 megohms. Outlets: $1 \mathrm{~V} 22 \mathrm{~K}, 3$ ohms 3 W . Valves and transistors. Output: 3W. Speaker $7 \times 4$ in. Thorn deck. Superimpose. Pause. Inching both directions. Four-digit position indicator, PB reset. Straight-through amplifier. Monitoring. Input mixing. Autostop. Remote control. Parallel track replay. Automatic head defluxing. Auxiliary DC supply for transistorised units. Slide projector sync. Size: $16_{4}^{3} \times$ $14 \frac{1}{2} \times 7 \frac{1}{2}$ in. Mains $200-250 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}, 60 \mathrm{~W}$. Price: $£ 47$ 5s.

Ultra 6204. $\frac{1}{4}$-track two-speed mains tape recorder. Speeds: $3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool $5 \frac{3}{4} \mathrm{in}$. W. and F. $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ better than $0.2 \%$. Signal to noise 40 dB F.R. $3 \frac{3}{4} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-$ $6 \mathrm{Kc} / \mathrm{s}$. EM87 strip level indicator. Rewind time $2 \frac{1}{2}$ mins. 900 ft . Inputs: mic. $1 \cdot 5 \mathrm{mV} 10 \mathrm{megohms}$, radio diode 1.5 mV 68 K , pickup 75 mV 3.3 megohms. Outlets: $500 \mathrm{mV} 22 \mathrm{~K}, 3$ ohms 3 W . Output: 3 W . Speaker $7 \times 3 \frac{5}{8} \mathrm{in}$. Valves. Thorn Mk II deck. Superimpose. Pause. Remote control on mic. Inching both directions. Three-digit tape indicator with PB reset. Straight-through amplifier. Monitoring. Parallel track replay. Autostop. Slide projector sync. Auxiliary DC supply for transistorised units. Size: $12 \frac{1}{2} \times 14 \times$ 7 in. Weight: 19 lb . Mains 200-250V $50 \mathrm{c} / \mathrm{s}$, 60W. Price: $£ 3514 \mathrm{~s}$.

Ultra 6206. $\frac{1}{4}$-track three-speed tape recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool 7 in . W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}<0 \cdot 15 \%, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}<0.2 \%, 17 \mathrm{i} \mathrm{i} / \mathrm{s}<0.25 \%$. Signal to noise 40 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$, $3 \frac{3}{4} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-7 \mathrm{Kc} / \mathrm{s}$. Meter level indicator. Rewind time $2 \frac{1}{2}$ mins. $1,200 \mathrm{ft}$. Inputs: radio 180 mV 68 K , pickup (1) 180 mV 250 K , pickup (2) 75 mV 3 3 megohms, mic. $1 \cdot 5$ mV 10 megohms. Outlets: $1 \mathrm{~V} 22 \mathrm{~K}, 3$ ohms 3 W . Valves and transistors. Output: 3W. Speaker $7 \times 4$ in. Thorn deck. Superimpose. Pause. Inching both directions. Four-digit position indicator, PB reset. Straight-through amplifier. Monitoring. Input mixing. Autostop. Remote control. Parallel track replay. Automatic head defluxing. Auxiliary DC supply for transistorised units. Slide projector sync. Size: $17 \frac{1}{2} \times$ $14 \frac{1}{2} \times 7 \frac{1}{2}$ in. Mains $200-250 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$, 60 W . Price: $£ 464 \mathrm{~s}$.

BUSH RADIO LTD., Division of the Rank Organisation, Power Road, London, W.4. Tel.: Chiswick 6491. Cables: Supasetz, London, W.4.

TP50. Mono recorder with BSR TD2 deck.


Clarke \& Smith TR 634


Dansetic Limpress


Dansette Consort 2


CWS Defiant T 18


CWS Defiant T 15


Elizabethan LZ-102
${ }_{4}^{1}$-track. Speeds: $3_{4}^{3} \mathrm{i} / \mathrm{s}$. W. and F. $<0 \cdot 2 \%$. H. and N. -40 dB F.R. $80 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Inputs: mic. $0.35 \mathrm{mV}, 1$ megohm; radio $25 \mathrm{mV}, 250 \mathrm{~K}$. Separate outlet from second track of replay head. One motor. $5 \frac{3}{4} \mathrm{in}$. spool $2 \frac{3}{4} \mathrm{~min}$. rewind. "Spirit-level" type M.E. Monitor socket for phones. Pause control, digital counter. Size: $7 \frac{3}{4} \times 14 \times 13 \frac{3}{4} \mathrm{in}$. Weight: $25 \frac{1}{2} \mathrm{lb}$. Price (including microphone): $£ 39 \mathrm{l} 8 \mathrm{~s}$.

BUTOBA. See Battery Tape Recorder section.

CINECORDER. See K.G.M. Electronics Ltd.

CLARKE AND SMITH MFG. CO. LTD., Melbourne Works, Wallington, Surrey. Tel.: Wallington $9252 / 7$.

TR634. See Professional and SemiProfessional Tape Recorders section.

CONTRONICS LTD., Garth Works, Deepcut Bridge Road, Blackdown, Camberley, Surrey. Tel.: Deepcut 336 .

Carol TR4. Mono recorder. $\frac{1}{2}$-track. Speed $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and F. $0 \cdot 4 \%$. F.R. $50 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}$. Replay char. CCIR. Inputs: mic. radio, gram. Outlet from pre-amp. One motor. $5 \frac{3}{4} \mathrm{in}$. spools. M.E. Line outlet. Size: $13 \frac{3}{4} \times 12 \frac{3}{4} \times 7$ in. Weight: 20 lb . Price: $£ 209 \mathrm{~s} .6 \mathrm{~d}$.

Carol TR/7. Similar specification as TR4 but with built-in synchronising circuit for 8 mm . cine projectors. Weight: 25 lb . Price: $£ 45$.
See Tape Accessories section for Carol cine sync unit.
C.W.S. LTD., Radio and Television Department, Alma Park, Warley Street, Upminster, Essex. Tel.: Upminster 3200.

Defiant T15. Mono recorder. $\frac{1}{2}$-track. Speed: $3_{4}^{3} \mathrm{i} / \mathrm{s}$ W. and F. $0.2 \%$. H. and N. -40 dB at $1 \mathrm{Kc} /$ s. F.R. $100 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Compromise replay char. Inputs: mic. 4 mV , radio 100 mV . One motor. $5 \frac{3}{4} \mathrm{in}$. spools. 3 min . rewind. DM70 tuning indicator. Tape counter. Size: $6 \frac{1}{8} \times 13_{8}^{3}$ $\times 12 \frac{3}{8}$ in. Price: $£ 232 \mathrm{~s}$.

T18. Mono $\frac{1}{4}$-track recorder. Speed: $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Spool $5 \frac{3}{4}$ in. W. and F. $0 \cdot 26 \%$. H. and N. -40 dB. F.R. $80 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Inputs: $180 \mu \mathrm{~V}$ $2 \mathrm{~K}, 5 \mathrm{mV} 47 \mathrm{~K}, 100 \mathrm{mV} 1$ megohm. LS socket 10-15 ohms. Meter indicator. Transistorised. BSR TD2 deck. Superimpose. Mains. Size: $14 \frac{1}{2} \times 12 \frac{1}{2} \times 6 \mathrm{in}$. Weight: $16 \frac{1}{2} \mathrm{lb}$. Price: $£ 3211 \mathrm{~s}$.

DANSETTE PRODUCTS LTD., Dansette House, H.oneypot Lane, Stanmore, Middx. Tel.: Wordsworth 0021.

Consort. Mono recorder, $\frac{1}{2}$-track. Speed: $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and F. $0 \cdot 4 \%$. H. and N. -50 dB . F.R. $60 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Replay char. CCIR. Inputs: high imp. for mic., medium imp. for radio/gram. One motor. $5 \frac{3}{4} \mathrm{in}$. spools, $3 \frac{1}{2} \mathrm{~min}$. rewind. M.E. Size: $14 \times 12 \frac{1}{2} \times 7 \mathrm{in}$. Weight: $16 \frac{1}{2} \mathrm{lb}$. Price: £23 2s.

CONSORT 4. Similar specification as above but $\frac{1}{4}$-track. Price: $£ 254 \mathrm{~s}$.

Empress. Mono $\frac{1}{4}$-track recorder. BSR deck. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Position indicator. Inputs for mic. and radio or PU. Outlets for extension LS. Monitor stereo. $8 \times 5 \mathrm{in}$. speaker. Output: $3 \cdot 5 \mathrm{~W}$. Response $75 \mathrm{c} / \mathrm{s}-13 \cdot 5 \mathrm{Kc} / \mathrm{s}$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. Spool size 7 in . Recorder accommodates two 7 in . spools, microphone and leads. Size: $17 \frac{3}{8} \times 15 \frac{1}{2}$ $\times 8 \mathrm{in}$. Weight: 23 lb . Price: $£ 3817 \mathrm{~s}$.

See Battery Operated Portables section for Dansette battery/mains recorders.

ELIZABETHAN ELECTRONICS LTD., Crow Lane, Romford, Essex. Tel.: Romford 64101. Cables: Elizabethan, Romford.

Automan 2. $\frac{1}{2}$-track mono mains recorder. Speed: $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and F. $0.4 \%$. F.R. $60 \mathrm{c} / \mathrm{s}-$ $10 \mathrm{Kc} / \mathrm{s}$. Inputs: mic. 2 mV ., pickup 200 mV . Outlet from pre-amp. One motor. Spool size $5 \frac{3}{4} \mathrm{in}$. Tape position indicator. Superimpose. Fully automatic or manually controlled recording level. Size: $15 \times 14 \times 5 \mathrm{in}$. Price: $£ 287 \mathrm{~s}$.

Automan 4. Specification as for Automan 2 except $\frac{1}{4}$-track and no superimpose. Price: £30 9s.

LZ32. $\frac{1}{2}$-track mono mains recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool 7 in . W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ $0.15 \%, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 0.25 \%, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 0.35 \%$. H. and N . $7 \frac{1}{2} \mathrm{i} / \mathrm{s}-40 \mathrm{~dB}$. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 50 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}, 3_{4}^{3} \mathrm{i} / \mathrm{s}$ $50 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 50 \mathrm{c} / \mathrm{s}-4 \mathrm{Kc} / \mathrm{s}$. Replay char.


Ferguson 3214


Ferguson 3222


Ferguson 3218


Grundig TK 17L


Grundig TK 40


Grundig TK41


CCIR. Magic eye. Rewind time 312 mins. 1.2000 ft . Inputs: mic. 2 mV 2 megohms. radio/pickup 250 mV 250 K . Output: 3W RMS. Outlets: Monitor 5V 220K. ext. LS 3W 3 ohms. Speaker $10 \times 4 \mathrm{in}$. One two-pole motor. BSR TD10 deck. Digital position indicator. Straight-through amplifier. Monitoring. Valves. Superimpose. Mains $200-250 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$. Size: $15 \times 15 \frac{1}{2} \times 7_{4}^{3} \mathrm{in}$. Weight: 24 lb . Price: $£ 33$ 12s.

LZ34. Specification as for LZ32 except $\frac{1}{4}$-track and no superimpose. Price: $£ 3514 \mathrm{~s}$.

LZ102. $\frac{1}{4}$-track monomains recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool 7 in . W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ $<0.15 \%, 33 \mathrm{i} / \mathrm{s}<0.25 \%$. H. and N. -45 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}$, $1 \frac{7}{8} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. Replay char. CCIR. Meter level indicator. Rewind time 2 mins. 1,200 ft. Inputs: mic. 3 mV high impedance, radio/phono 250 mV high impedance. Output 5W RMS. Outlets: amplifier 200 mV 10K, ext. stereo $2 \cdot 5$ mV tape head, ext. LS 5W 15 ohms. Transistorised. Speaker $10 \times 4 \mathrm{in}$. plus tweeter. Magnavox 363 deck. Digital tape indicator. Pause. Monitoring. Size: $16 \times 16 \frac{1}{2} \times 9 \mathrm{in}$. Weight: 26 lb . Price: $£ 519 \mathrm{~s}$.

FERGUSON RADIO CORPORATION LTD., Thorn House, Upper St. Martin's Lane, London, W.C.2. Tel.: Temple 2444. Cables: Fergusad, Lesquare, London.

Model 3218. Mono recorder. $\frac{1}{4}$-track. Speeds: $3 \frac{3}{4}, 1_{8}^{7} \mathrm{i} / \mathrm{s}$. W. and F. $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$, better than $0.2 \%$; $1 \frac{7}{8} \mathrm{i} / \mathrm{s}, 0 \cdot 3 \%$. H. and N. -40 dB . F.R. $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$, $60 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s} ; 1 \frac{1}{8} \mathrm{i} / \mathrm{s}, 60 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$. Replay char. CCIR. Inputs: mic. 1.5 mV , 10 megohms; radio $1.5 \mathrm{mV}, 68 \mathrm{~K}$; gram $75 \mathrm{mV}, 3.3$ megohms. Outlets from replay head and pre-amp. One motor. $5 \frac{3}{4} \mathrm{in}$. spools. $2 \frac{1}{2} \mathrm{~min}$. rewind, 850 ft . EM87 Electron beam level indicator. Pause key. Mic. stop/start switch. Auto-stop operated by foil on tape. Facility for stereo. Size: $13 \frac{1}{2} \times 12$ $\times 6_{2}^{1}$ in. Price: £35 14s.

Model 3220. Mono recorder. $\frac{1}{2}$-track. Speed $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and F. better than $0.2 \%$. H. and N. -40 dB. F.R. $60 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Replay char. CCIR. Inputs: mic. 1.5 mV , 10 megohms; radio $1.5 \mathrm{mV}, 68 \mathrm{~K}$; gram $75 \mathrm{mV}, 3.3$ megohms. Outlet from pre-amp. One motor. $5 \frac{3}{4} \mathrm{in}$. spools. $2 \frac{1}{2} \mathrm{~min}$. rewind, 850 ft . EM87 electron beam level indicator. Pause key. Size: $13 \frac{1}{2} \times 12 \times 6 \frac{1}{2} \mathrm{in}$. Price: £26 5s.

Model 3222. Same specification as 3218 but in teak furniture-style cabinet. Price: $£ 3615 \mathrm{~s}$.

Model 3214. Mono recorder. 1 -track. Speeds: $7 \frac{1}{2}, 3 \frac{3}{2}, 1 \frac{1}{5} \mathrm{i} / \mathrm{s}$. Max. spool 7 in . W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ $0.15 \%, 3_{4}^{3} \mathrm{i} / \mathrm{s} 0.2 \%$. $1 \frac{1}{8} \mathrm{i} / \mathrm{s} 0.25 \%$. H. and N. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}-45 \mathrm{~dB}, 3_{3}^{3} \mathrm{i} / \mathrm{s}-43 \mathrm{~dB}, 1 \frac{1}{8} \mathrm{i} / \mathrm{s}-40 \mathrm{~dB}$. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}, 3 \frac{3}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s}$, $1 \frac{7}{8} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}$. Replay char. NARTB. Meter level indicator. Rewind time $3 \frac{1}{2}$ mins. 1.800 ft . Inputs: mic. 1.5 mV 10 megohms, radio (diode) 1.5 mV 68 K , pickup (1) 170 mV 500 K . pickup (2) 75 mV 3.3 megohms. Outlets: hi-fi amplifier 1 V (peak) 22 K , ext. speaker 3 W 3 ohms. Output: 3 W RMS. Speaker $7 \times 4 \mathrm{in}$. Valves. Thorn RC43 deck. One motor. Pause. Inching both ways. Four-digit tape position indicator with PB reset. Straight-through amplifier. Monitoring. Input mixing. Parallel track replay. Auto-stop. Remote pause on mic. Auxiliary socket for Syncro-amp slide unit, stereo playback and first track monitor. Size: $16 \frac{1}{8} \times 14 \times 7 \frac{7}{8}$ in. Weight: $22 \frac{1}{2} \mathrm{lb}$. Mains $200-$ $250 \mathrm{~V} 50 \mathrm{c} / \mathrm{s} .60 \mathrm{~W}$. Price: $£ 464 \mathrm{~s}$.

Model 3216. Same specification as 3214 but in teak furniture-style cabinet. Price to be announced.

FIDELITY RADIO LTD., Olaf Street, London, W.11. Tel.: Park 0131. Cables: Amplify, London, W.11.

Playmaster-2TR. Transistorised mono mains portable recorder. $\frac{1}{2}$-track. Speed: $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Max. spool 53 in. Rewind time 3 mins. 850 ft . F.R. $60 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Output: 3W RMS. Speaker $8 \times 3 \mathrm{in}$. Magic eye level indicator. W. and F. $0.25 \%$ RMS. S.N. -50 dB . Output transistors: two ACl 28 . Oscillator $50 \mathrm{Kc} / \mathrm{s}$. Erase damping -70 dB at $1 \mathrm{Kc} / \mathrm{s}$. Crystal microphone. Inputs for mic., radio/pickup. Outlets for ext. speaker ( 15 ohms) and monitor headphones. Size: $15 \times 12 \times 5 \frac{3}{4}$ in. Weight: 15 lb . Price: $£ 232 \mathrm{~s}$. (tape position indicator 2 gns. extra).

Playmaster-4TR. Features and specification as for Playmaster-2TR but $\frac{1}{4}$-track and with tape position indicator fitted as standard. Price: £26 5s.

Playmatic-2. $\frac{1}{2}$-track three-speed mono mains portable recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool 7 in . W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 0.15 \%, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 0.25 \%$, $1 \frac{7}{8} \mathrm{i} / \mathrm{s} 0.35 \%$. S.N. -50 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-$ $15 \mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-7 \mathrm{Kc} / \mathrm{s}$. Manual or automatic level control. EM87 indicator. Rewind time $3 \frac{1}{2}$ mins. $1,200 \mathrm{ft}$. Inputs: mic. 2 mV , radio/pickup 200 mV . Output: 3 W RMS. Outlets: monitor 750 mV , ext. LS 15 ohms. Bass control: 8 dB at $80 \mathrm{c} / \mathrm{s}$. Treble
control: 14 dB at $7 \mathrm{Kc} / \mathrm{s}$. Replay char. CCIR. Bias oscillator $52 \mathrm{Kc} / \mathrm{s}$. Superimpose. Valves and transistors. Crystal mic. Digital tape position indicator. Mains $200-250 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$ (overseas to suit local supplies). Mixing facilities. Polished teak, metal and plastics case. Size: $16 \frac{1}{4} \times 13 \frac{3}{4} \times 7 \frac{1}{2}$ in. Weight: 20 lb . Price: $£ 298 \mathrm{~s}$.

Playmatic-4. Similar to Playmatic-2 but $\frac{1}{4}$ track. Price: £32 11s.

GRUNDIG (GREAT BRITAIN) LTD., Newlands Park, Sydenham, London, S.E.26. Tel.: Sydenham 2211. Cables: Grundig, London, S.E.26. Telex: 22854.

TK14L. Mono $\frac{1}{2}$-track recorder. Speed $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Spool $5 \frac{3}{4} \mathrm{in}$. W. and F. $\pm 0 \cdot 2 \%$. H. and N. -47 dB. F.R. $60 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}+3-5 \mathrm{~dB}$. Replay char. NARTB. Inputs: mic, 2 mV 0.5 megohm, diode 80 mV 1 megohm. Outputs: 500 mV 15 K , LS 5 ohms. M.E. Valves. Rewind time 3 mins. One motor. Own deck. Size: $13 \frac{1}{4} \times 13 \frac{1}{2} \times 6 \frac{3}{4} \mathrm{in}$. Weight: 22 lb . Pausecontrol. Position indicator. $110-240 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$ : Price: $£ 38$ 17s.

TK17L. Mono $\frac{1}{4}$-track recorder. Speed $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Spool $5 \frac{3}{4}$ in. W. and F. $\pm 0 \cdot 2 \%$. H. and N. -45 dB. F.R. $60 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}+3-5 \mathrm{~dB}$. Replay char. NARTB. Inputs: mic. 2 mV 1.5 megohms, diode 2 mV 22 K , PU 100 mV 1 megohm. Outputs: 700 mV 15 K , LS 5 ohms. M.E. Valves. Rewind time 3 mins. One motor. Own deck. Pause. Position indicator. Monitor. 110-240V $50 \mathrm{c} / \mathrm{s}$. Size: $13 \frac{1}{4} \times 10 \frac{1}{2} \times 6 \frac{3}{4} \mathrm{in}$. Weight: 22 lb . Price: $£ 45$ 3s.

TK18L. Mono $\frac{1}{2}$-track recorder. Speed $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Spool $5 \frac{3}{4} \mathrm{in}$. W. and F. $\pm 0 \cdot 2 \%$. H. and N. -48 dB. F.R. $60 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}+3-5 \mathrm{~dB}$. Replay char. NARTB. Inputs: mic. $2-45 \mathrm{mV} 1.5$ megohms, diode $100 \mathrm{mV}-1 \mathrm{~V} 1$ megohm. Outputs: 485 mV 15K, LS 5 ohms. Valves. Rewind time 3 mins. One motor. Own deck. Pause. Position indicator. Fully automatic recording level and synchronous recording. $110-240 \mathrm{~V}$ $50 \mathrm{c} / \mathrm{s}$. Size: $13 \frac{1}{4} \times 10 \frac{1}{2} \times 6 \frac{3}{4} \mathrm{in}$. Weight: 22 lb . Price: $£ 431 \mathrm{~s}$.

TK23L. Mono $\frac{1}{4}$-track recorder. Speed $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Spool $5 \frac{3}{4}$ in. W. and F. $\pm 0 \cdot 2 \%$. H. and N. -45 dB. F.R. $60 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}+3-5 \mathrm{~dB}$. Replay char. NARTB. Inputs: 2 mV 1.5 megohms, diode $2 \mathrm{mV} 22 \mathrm{~K}, \mathrm{PU} 100 \mathrm{mV} 1$ megohm. Outputs: 700 mV 15K, LS 5 ohms. M.E. Valves. Rewind time 3 mins. One motor. Own deck. Superimpose. Pause. Position indicator. Automatic and manual recording level. Synchronous recording. $110-240 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$. Size: $13 \frac{1}{4} \times 10 \frac{1}{2} \times 6 \frac{3}{4}$ in. Weight: 22 lb . Price: $£ 519 \mathrm{~s}$.

TK40. Mono $\frac{1}{4}$-track recorder. Speeds: $7 \frac{1}{2}$, $3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Spool 7 in . ( $5 \frac{3}{4} \mathrm{in}$. with lid). W. and F. $7 \frac{1}{2} \pm 0 \cdot 1 \%, 3 \frac{3}{4} \pm 0 \cdot 12 \%, 1 \frac{7}{8} \pm 0 \cdot 2 \%$. H. and N. $7 \frac{1}{2}, 3 \frac{3}{4}-42 \mathrm{~dB}, 1 \frac{7}{8}-38 \mathrm{~dB}$ F.R. $7 \frac{1}{2} 60 \mathrm{c} / \mathrm{s}-$ $18 \mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} 60 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} 60 \mathrm{c} / \mathrm{s}-9 \mathrm{Kc} / \mathrm{s}$, $+3 \mathrm{~dB}-5 \mathrm{~dB}$. Replay char. NARTB. Inputs: mic. 2 mV 1.5 megohms, diode 6 mV 39 K , PU 475 mV 1 megohm. Outputs: $7 \frac{1}{2}, 3 \frac{3}{4} 1150 \mathrm{mV}$ $10 \mathrm{~K}, 1 \frac{7}{8} 750 \mathrm{mV} 10 \mathrm{~K}$, LS $2 \cdot 5 \mathrm{~W}$. M.E. Valves. Rewind time $1,700 \mathrm{ft} .2 \frac{3}{4}$ mins. One motor. Own deck. Superimpose. Pause. Position indicator. Monitoring. Inching. Remote control. Autostop. Mixing. Tape jointing channel. Synchronous recording. $110-250 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$. Size: $16 \frac{1}{8} \times 15$ $\times 7 \frac{3}{4} \mathrm{in}$. Weight: 28 lb . Price: $£ 917 \mathrm{~s}$.

TK41. Mono $\frac{1}{2}$-track recorder. Speeds: $7 \frac{1}{2}$, $3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Spool 7 in . (53 in in. with lid). W. and F. $7 \frac{1}{2} \pm 0 \cdot 1 \%, 3 \frac{3}{4} \pm 0 \cdot 12 \%, 1 \frac{7}{8} \pm 0 \cdot 2 \%$. H. and N . $7 \frac{1}{2}, 3 \frac{3}{4}-47 \mathrm{~dB}, 1 \frac{7}{8}-44 \mathrm{~dB}$. F.R. $7 \frac{1}{2} 60 \mathrm{c} / \mathrm{s}-18$ $\mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} 60 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} 60 \mathrm{c} / \mathrm{s}-9 \mathrm{Kc} / \mathrm{s},+3-5$ dB. Replay char. NARTB. Inputs: mic. 2 mV 1.5 megohms, diode 2 mV 33 K , PU 100 mV 1 megohm. Outputs: LS 7W 5 ohms, $7 \frac{1}{2}, 3$ $700 \mathrm{mV} 15 \mathrm{~K}, 1 \frac{7}{8} 470 \mathrm{mV}$ 15K. M.E. Valves. Rewind time $1,700 \mathrm{ft} .2 \frac{3}{4} \mathrm{mins}$. One motor. Own deck. Superimpose. Pause. Position indicator. 7 W straight-through amplifier. Monitoring. Inching. Auto-stop. Remote control. Tape jointing channel. $110-250 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$. Size: $16 \frac{1}{8} \times 15 \times$ $7 \frac{5}{8} \mathrm{in}$. Weight: $28 \frac{1}{2} \mathrm{lb}$. Price: $£ 873 \mathrm{~s}$.

TK120. Mono $\frac{1}{2}$-track recorder. Speed: $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Max. spool $5 \frac{3}{4}$ in. W. and F. $\pm 0 \cdot 2 \%$. F.R. $40 \mathrm{c} / \mathrm{s}-12.5 \mathrm{Kc} / \mathrm{s} . \mathrm{H}$. and N. -48 dB . EM84 level indicator. Output: $2 \frac{1}{2} \mathrm{~W}$. Own deck. One motor. Easy-to-use single dial control. Price: £30 19s. 6d.

TK340/TS340. Stereo $\frac{1}{4}$-track recorder employing 6 valves and 12 transistors. Speeds: $7 \frac{1}{2}$, $3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} \pm 0 \cdot 1 \%, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ $\pm 0 \cdot 12 \%, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} \pm 0 \cdot 2 \%$. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-18$ $\mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Output: 8 W per channel, also two 600 mV high impedance outlets. TS340 has natural walnut case with fold-away handle and thick polished perspex lid. Prices: TS340 £147; TK $340 £ 1525$ s.

TK400. Mono $\frac{1}{4}$-track recorder. Speeds $7 \frac{1}{2}$, $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Max. spool 7 in . W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} \pm 0.2 \%$, $3 \frac{3}{4} \mathrm{i} / \mathrm{s} \pm 0 \cdot 3 \%$. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Output: $2 \cdot 5 \mathrm{~W}$ approx. Replay char. NARTB. Automatic recording level. Tape position indicator. Own deck. One motor. Price: $£ 497 \mathrm{~s}$.

TK6L. Battery/mains recorder. For details see Battery Operated Portables section.

HMV. See British Radio Corporation.
K.G.M. ELECTRONICS LTD., Bardolph Road, Richmond, Surrey. Tel. : Richmond 7171. Cables: Kelec, Richmond, Surrey.

Cinecorder Model A. Mono recorder with B.S.R. deck. $\frac{1}{2}$-track. Speed $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and F. $0.4 \%$. F.R. $60 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Replay char. CCIR. Two channel mixing with two inputs per channel. 4W, 15 ohm output. One motor. $5 \frac{3}{4}$ in. spools. 10 in. elliptical speaker housed in detachable lid with 24 ft . cable. Separate bass and treble controls. Boost and cut. Superimposition. "Shift-track" tape control for dual recordings. Tapelift/Pause control for cueing, cross-fading. Remote control. Accessories: mic. and ext. cables, perforated Cinetape, tape sprockets. Size: $16 \frac{1}{2} \times 14 \times 8 \frac{1}{2} \mathrm{in}$. Weight: 28 lb . Price: $£ 75$.

KORTING. Distributors: Europa Electronics Ltd., Howard Place, Shelton. Stoke-on-Trent. Tel.: Stoke-on-Trent 29316.

MT2223. Mono recorder. $\frac{1}{4}$-track. Speeds: $7 \frac{1}{2}, 33 \mathrm{i} / \mathrm{s}$. H. and N. -42 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$, $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB} ; 33 \mathrm{i} / \mathrm{s}, 30 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s}$ $\pm 3 \mathrm{~dB}$. Inputs: radio $0.5 \mathrm{mV}, 4.7 \mathrm{~K}$; mic. 0.1 mV , 200 ohms; gram. 200 mV , 2 Meg. Outputs: line $1.5 \mathrm{~V}, 33 \mathrm{~K}$; speaker 4.5 ohms, 2 W . One motor. 7 in . spool. Rewind 3 mins. M.E. indicator. Transistor input. Tape counter. Monitoring, Bass/treble control. Size: $14 \frac{1}{2} \times 12 \times 7 \frac{1}{2} \mathrm{in}$. Weight: 20 lb . Price: $£ 58$ 16s.

OMT3623. Stereo recorder. $\frac{1}{4}$-track. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. H. and N. -42 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$, $30 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB} ; 33_{4} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s}$ $\pm 3 \mathrm{~dB}$. Inputs: radio $0.5 \mathrm{mV}, 4.7 \mathrm{~K}$; mic. 0.1 $\mathrm{mV}, 200$ ohms; gram. $100 \mathrm{mV}, 1$ megohm. Outlets: line $0.7 \mathrm{~V}, 33 \mathrm{~K}$; speaker 4.5 ohms, 2 W . One motor. 7 in. spool. Rewind 5 mins. M.E. indicator. Transistor input. Tape counter. Pause control. Superimpose. Monitoring. Bass/treble control. Size: $16 \frac{1}{2} \times 12 \frac{3}{4} \times 7 \frac{1}{2} \mathrm{in}$. Weight: 24 lb . Price: $£ 72$ 19s. 6d.

- MT3624. $\frac{1}{4}$-track mains operated stereo tape recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Spool size 7 in . H. and N. -54 dB at $7 \frac{1}{2},-52 \mathrm{~dB}$ at $3 \frac{3}{4},-48 \mathrm{~dB}$ at $1 \frac{1}{8}$. W. and F. $\pm 0 \cdot 12 \%$ at $7 \frac{1}{2}, \pm 0 \cdot 2 \%$ at $3 \frac{3}{4}$. $\pm 0.3 \%$ at $1 \frac{7}{8}$. F.R. $30 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$ at $7 \frac{1}{2}, 40 \mathrm{c} / \mathrm{s}-$ $14 \mathrm{Kc} / \mathrm{s}$ at $3_{2}^{3}, 40 \mathrm{c} / \mathrm{s}-7 \mathrm{Kc} / \mathrm{s}$ at $1_{8}^{7}$. Inputs: mics. (2) $70 \mu \mathrm{~V} 200$ ohms, PU 150 mV 1 megohm.
radio(A) $300 \mu \mathrm{~V} 2 \mathrm{~K}$, radio( W ) $2 \times 700 \mathrm{mV} 33 \mathrm{~K}$. Outputs: crystal headphones 220 K , hi-fi amplifier $2 \times 700 \mathrm{mV} 33 \mathrm{~K}$, LS $2 \times 3 \mathrm{~W} 4$ ohms. Transsistors and valves. Position indicator. Bass and treble controls. Monitoring. Dubbing. Reverberation. Rewind time 4 mins . for $2,400 \mathrm{ft}$. Electro-magnetic pause. Automatic stop at end of tape. Two M.E. Three stereo sound heads. Size: $20_{4}^{3} \times 14 \times 8$ in. Weight: 35 lb . Price: $£ 102$ 18s. (less mic.), No. 169 dynamic mic. $£ 44 \mathrm{~s}$.

LOEWE-OPTA. Sole U.K. distributors: Highgate Acoustics, 71/73 Great Portland Street, London, W.1. Tel.: Museum 2901.

Optacord 408, 416, 416 DIA. Battery/mains recorders. For full details see Battery Operated Portables section.

LUXOR INDUSTRI AKTIEBOLAG. Motala, Sweden. Distributor: Britimpex Ltd., 16-22 Great Russell Street, London, W.C.1. Tel.: Museum 7600.

Luxor MP-283. Mains $\frac{1}{2}$-track mono recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max spool 7 in . W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ W. $0.01 \%$, F. $0 \cdot 1 \%, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ W. $0.02 \%$, F. $0.2 \%, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$ W. $0.04 \%$, F. $0.3 \%$. H. and N. -50 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 50 \mathrm{c} / \mathrm{s}-19 \mathrm{Kc} / \mathrm{s}, 3_{4}^{3} \mathrm{i} / \mathrm{s}$ $50 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 80 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$, all $\pm 4 \mathrm{~dB}$. Replaychar.NARTB. Magiceyelevel indicator. Rewind time $3 \frac{1}{2} \mathrm{mins} .1 .800 \mathrm{ft}$. Inputs: mic. 0.5 mV 1 megohm, PU 20 mV 1 megohm, radio 20 mV 1 megohm. Output: 3W RMS. Speaker $6 \times 4$ in. Outlets: amplifier IV 47K, ext. speaker 8 ohms. Valves. Own deck. One Luxor A22 four-pole motor. Digital position indicator. Pause. Straight-through amplifier. Size: $143 \times$ $12 \frac{1}{2} \times 6 \frac{1}{2} \mathrm{in}$. Weight: 23 lb . Price: $£ 629 \mathrm{~s} .6 \mathrm{~d}$.

OLuxor MP-423. Stereo recorder. $\frac{1}{4}$-track. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 0 \cdot 1 \%$; $3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 0.2 \%, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}, 0.35 \%$ (peak to peak). H . and N. -50 dB (weighted with recorded tape). F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 50 \mathrm{c} / \mathrm{s}-19 \mathrm{Kc} / \mathrm{s} ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 50 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. $1_{8}^{7} \mathrm{i} / \mathrm{s}, 80 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$ (all $\pm 3 \mathrm{~dB}$ ). Replay char. NARTB. Inputs: mic. 7 mV ; gram. 200 mV ; radio 30 mV , Imp. 1 megohm. Outlet from preamp. One motor. 7 in . spool. Rewind 2 min . for 7 in. tape. Two M.E.s. Separate balance control. Separate level indicator. Facilities for mixing. Size: $14 \frac{1}{8} \times 11 \frac{3}{8} \times 6 \frac{3}{4} \mathrm{in}$. Weight: $24 \frac{1}{4} \mathrm{lb}$. Price: £77 14s.

MP-424. Details as for MP-423. Size: $14_{4}^{3} \times$ $11 \frac{3}{4} \times 6{ }_{2}^{1}$ in. Weight: $28 \frac{1}{2} \mathrm{lb}$. Price: $£ 8017 \mathrm{~s}$.


Korting MT 2223


KGM Cinecorder model A


Luxor MP-423/424 stereo


Korting MT 3623


Korting MT. 3624


Luxor MP-463


- Luxor MP-463. Mono/stereo $\frac{1}{4}$-track mains recorder. Speeds: $7 \frac{1}{2}, 3_{4}^{3}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool 7 in . W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ W. $0.01 \%$ F. $0.1 \%, 3_{4}^{3} \mathrm{i} / \mathrm{s}$ W. $0 \cdot 02 \%$, F. $0 \cdot 2 \%, 1 \frac{1}{8} \mathrm{i} / \mathrm{s}$ W. $0.04 \%$, F. $0 \cdot 3 \%$. H. and N. -50 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 50 \mathrm{c} / \mathrm{s}-19 \mathrm{Kc} / \mathrm{s}, 3_{4}^{3} \mathrm{i} / \mathrm{s}$ $50 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}, 1_{8}^{\bar{R}} \mathrm{i} / \mathrm{s} 80 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$, all $\pm 4 \mathrm{~dB}$. Replay char. NARTB. Magic eye indicator. Rewind time $3 \frac{1}{2}$ mins. $1,800 \mathrm{ft}$. Inputs: mics. (2) 7 mV 1 megohm, PU (2) 100 mV 1 megohm, radio (2) 50 mV 1 megohm. Output: two 2 W RMS. Speaker $6 \times 4$. Outlets: amplifier (2) 0.5 V 20 K , phones 10 K , three speakers 6 ohms. Valves. Own deck. One luxor A-22 four-pole motor. Pause. Digital position indicator. Straight-through amplifier. Size: $14 \frac{1}{2} \times 11 \frac{1}{2} \times 6$ in. Weight: 25 lb . Price: $£ 82 \mathrm{19s}$.

Luxor MP-464. Mono/stereo $\frac{1}{4}$-track mains recorder. Similar specification to MP-463 except $8 \times 3 \mathrm{in}$. speaker and weight 29 lb . Price: £80 17s.

Luxor MP-473. Mono/stereo $\frac{1}{4}$-track mains recorder in table cabinet with moulded perspex lid. Specification similar to MP-463 except no speakers and size and weight different. Size: $15 \frac{1}{2} \times 12 \frac{3}{4} \times 7 \frac{1}{2} \mathrm{in}$. Weight: 28 lb . Price to be announced.

MARCONIPHONE. See British Radio Corporation.

NATIONAL. Matsushita Electric Co... Japan. Distributors: United Africa Mechanical and Electrical Ltd., United Africa House, Blackfriars, London, S.E.1. Tel.: Waterloo 2070.

RQ303. Mains operated $\frac{1}{2}$-track mono. recorder. Speed: $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Spool size $3 \frac{1}{4} \mathrm{in}$. W. and F. less than $0.5 \%$. F.R. $150 \mathrm{c} / \mathrm{s}-1.4 \mathrm{Kc} / \mathrm{s}$. Input: mic. 25 K . Outputs: LS 8 ohms, phone 700 mW . Neon indicator. Transistorised. Rewind time 70 secs. 200 ft . One shaded-pole motor. Own deck. Push-button operation. Mains 240 V $50 \mathrm{c} / \mathrm{s}$. Size: $8 \times 7 \frac{1}{2} \times 3_{4}^{3} \mathrm{in}$. Weight: 4 lb . Price: £16 16s.

RS753. Stereo/mono $\frac{1}{4}$-track mains operated recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Spool size 7 in . W. and F. less than $0 \cdot 2 \%$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. F.R. $60 \mathrm{c} / \mathrm{s}-$ $15 \mathrm{Kc} / \mathrm{s}$ at $7 \frac{1}{2}, 60 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$ at $3 \frac{3}{4}, 60 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$ at $1 \frac{7}{8}$. Inputs: two mics. 20 K , two aux. 1 megohm. Outputs: two 8 ohm. LS 2.5 W each, two 47 ohm lines. Two VU meters. Six transistors, three valves. One motor. Own deck. Multi-track recording and playback. Push-
button operation. Mains $100,115,125,200$, $250 \mathrm{~V} 50-60 \mathrm{c} / \mathrm{s}$. Size: $135 \times 9{ }^{1} \times 14 \mathrm{in}$. Weight: $34 \frac{1}{2} \mathrm{lb}$. Price: $£ 84$.

PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Avenue, W.C.2. Tel.: Gerrard 7777. Cables: Phillamps.

EL3552. $\frac{1}{2}$-track mono recorder. Speed: $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Spool $5 \frac{3}{4}$ in. W. and F. $<0 \cdot 6 \%$ (p-p). H. and N. -40 dB . F.R. $80 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. Input 0.2 mV 3 K . Outlet: 750 mV 20K. Strip level indicator. Valves and transistors. Rewind time: 3 mins. for $1,200 \mathrm{ft}$. One motor. Own deck. Pause. Automatic record level control. Mains 110, 127, 200-250V AC. Size: $14 \frac{1}{2} \times 10 \times 5 \mathrm{in}$. Weight: 13 lb . Price: $£ 254 \mathrm{~s}$.

EL3553. $\frac{1}{4}$-track mono recorder. Speeds: $3_{4}^{3}$, $1_{8}^{\frac{7}{8}} \mathrm{i} / \mathrm{s}$. Max. spool 7 in . W. and F. $<0 \cdot 6 \%$. H. and N. $>45 \mathrm{~dB}$. F.R. $3_{4}^{3} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}, 1_{8}^{\frac{7}{8}} \mathrm{i} / \mathrm{s}$ $60 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}$. Meter level indicator. Rewind time 3 mins. $1,800 \mathrm{ft}$. Inputs: mic. $0 \cdot 2 \mathrm{mV} 2 \mathrm{~K}$, radio (diode) 2 mV 20 K , pickup 70 mV 680 K . Output: $1 \cdot 8 \mathrm{~W}$ RMS. Speaker $8 \times 3$ in. Outlets: amplifier 750 mV 20 K , phones $0-1.5 \mathrm{~V} 50$ ohms, ext. speaker 3-7 ohms. Transistors. One motor. Own deck. Pause. Tape position counter. Straight-through amplifier. Monitoring. Input mixing. Parallel track replay. Multiplay with EL 3787A pre-amplifier. Mains $110,127,200-250 \mathrm{~V}$ AC $50 \mathrm{c} / \mathrm{s}$. Size: $16 \times 11 \frac{3}{4} \times 5 \frac{1}{2} \mathrm{in}$. Weight: $15 \frac{1}{2} \mathrm{lb}$. Price: $£ 37$ 16s.
-EL3555. $\frac{1}{4}$-track stereo recorder. Valves and transistors. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool 7 in . W. and F. $<0 \cdot 6 \%$. H. and N. $>45 \mathrm{~dB}$. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$, $1_{8}^{\frac{7}{8}} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}$. Magic eye. Rewind time $<3$ mins. $1,800 \mathrm{ft}$. Inputs: mic. 0.25 mV 2 K , radio (diode) 2 mV 20 K , pickup 200 mV 500 K . Output: 2.5 W RMS per channel. Outlets: amplifier 1 V 50 K , phones $0-1.5 \mathrm{~V} 1.5 \mathrm{~K}$, ext. speaker 3-7 ohms. Own deck. One motor. Pause. Tape position counter. Straight-through amplifier. Monitoring. Input mixing. Parallel track replay. Multiplay. Second channel speaker in detachable lid. Size: $17 \frac{1}{2} \times 13 \frac{1}{2} \times 8 \frac{1}{2} \mathrm{in}$. Weight: 24 lb . Price: $£ 7815 \mathrm{~s}$.

EL3556. $\frac{1}{4}$-track mono recorder. Speeds: $7 \frac{1}{2}$, $3 \frac{3}{4}, \frac{17}{8}, \frac{15}{16} \mathrm{i} / \mathrm{s}$. Max. spool 7 in . W. and F. $<0.6 \%$. H. and N. $>47 \mathrm{~dB}$. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$, $3_{4}^{3} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}, 1_{8}^{7} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}$; ${ }_{16} \mathrm{i} \mathrm{i} / \mathrm{s}$ $60 \mathrm{c} / \mathrm{s}-4 \cdot 5 \mathrm{Kc} / \mathrm{s}$. Magic eye. Rewind time $<3$ mins. $1,800 \mathrm{ft}$. Inputs: mic. 0.25 mV 2 K , radio (diode) 2 mV 20 K , pickup 100 mV 500 K . Output: 4 W RMS. Speaker $7 \times 5 \mathrm{in}$. Outlets:
amplifier 1 V 50 K , phones $0-1.5 \mathrm{~V} \quad 1.5 \mathrm{~K}$, ext. speaker 3-7 ohms. Valves and transistors. Own deck. One motor. Tape position counter. Straight-through amplifier. Input mixing. Pause. Monitoring. Parallel track replay. Multiplay with EL3787A pre-amplifier. Mains 110, 127, $200-240 \mathrm{~V}$ AC $50 \mathrm{c} / \mathrm{s}$. Size: $17 \frac{1}{2} \times 13 \frac{1}{4} \times 6 \frac{1}{2} \mathrm{in}$. Weight: 22 lb . Price: $£ 65$ 2s.

EL3558. $\frac{1}{4}$-track mono recorder. Speeds: $3 \frac{3}{4}$. $1 \frac{7}{8} \mathrm{i} /$ s. Max. spool 7 in . W. and F. $<0.6 \%$. H. and N. $>45 \mathrm{~dB}$. F.R. $3 \frac{3}{4} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$, $1 \frac{7}{8} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}$. Meter level indicator. Rewind time $<3$ mins. $1,800 \mathrm{ft}$. Inputs: mic. 0.2 mV , radio (diode) 2 mV 20 K , pickup 70 mV 680 K . Output: $1 \cdot 8 \mathrm{~W}$ RMS. Speaker $8 \times 3 \mathrm{in}$. Transistors. Outlets: amplifier 750 mV 20 K , phones $0-1.5 \mathrm{~V} 50$ ohms, ext. speaker 3-7 ohms. Own deck. One motor. Pause. Tape position counter. Straight-through amplifier. Monitoring. Input mixing. Parallel track replay. Automatic recording level. Multiplay with EL3787A pre-amplifier. Size: $16 \frac{1}{4} \times 11 \frac{3}{4} \times 6 \mathrm{in}$. Weight: 16 lb . Mains $110,127,200-250 \mathrm{~V}$ AC $50 \mathrm{c} / \mathrm{s}$. Price: $£ 442 \mathrm{~s}$.

Stella ST461. $\frac{1}{2}$-track mono recorder. Speed: $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Max. spool $5 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and F. $<0 \cdot 6 \%$. H. and N. $>40 \mathrm{~dB}$. F.R. $80 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. Magic eye. Rewind time $<2$ mins. $1,200 \mathrm{ft}$. Input: mic./ radio/PU 0.2 mV 3K. Output: 1.5 W . Speaker 4 in. Outlet: 750 mV 20K. Valves and transistors. Own deck. One motor. Pause. Scale for tape position. Mains $110,127,200-250 \mathrm{~V}$ AC $50 \mathrm{c} / \mathrm{s}$. Size: $15 \times 10 \frac{1}{2} \times 5 \mathrm{in}$. Weight: 13 lb . Price: £25 4s:

Stella ST462. $\frac{1}{4}$-track mono recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8}, \frac{15}{16} \mathrm{i} / \mathrm{s}$. W. and F. $<0.6 \%$ (p-p). H. and N. $>47 \mathrm{~dB}$. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ $60 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}, \frac{15}{16} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-$ $4.5 \mathrm{Kc} / \mathrm{s}$, all $\pm 3 \mathrm{~dB}$. Magic eye. 7 in . spool. Rewind time $<3$ mins. $1,800 \mathrm{ft}$. Inputs: mic. $0 \cdot 25 \mathrm{~V} 2 \mathrm{~K}$, radio (diode) 2 mV 20 K , pickup 100 mV 500 K . Output: 4W RMS. Speaker $7 \times 4$ in. Transistors and valves. Outlets: amplifier 1 V 50 K , phones $0-1.5 \mathrm{~V} 1.5 \mathrm{~K}$, ext. speaker 3-7 ohms. Own deck. One motor. Tape position counter. Straight-through amplifier. Monitoring. Pause. Input mixing. Parallel track replay. Headphone playback. Stereo playback, multiplay, etc. with EL3787A pre-amplifier. Mains 110, 127, 200-250V AC $50 \mathrm{c} / \mathrm{s}$. Size: $17 \frac{1}{2} \times 13 \frac{3}{4} \times 7 \frac{3}{4}$ in. Weight: 21 lb . Price: $£ 652 \mathrm{~s}$.

Stella ST463. $\frac{1}{4}$-track mono recorder. Speeds: $3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool 7 in . W. and F. $<0 \cdot 6 \%$ (p-p). H. and N. $>45$ dB. F.R. $3 \frac{3}{4} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-$ $13 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Magic eye. Rewind time $1,800 \mathrm{ft}$. Inputs: mic. $0 \cdot 2 \mathrm{mV} 2 \mathrm{~K}$,
radio (diode) 2 mV 20 K , pickup 200 mV 500 K . Output: $2 \cdot 5 \mathrm{~W}$. Speaker $8 \times 3 \mathrm{in}$. Outlets: amplifier 1 V 50 K , phones $0-1.5 \mathrm{~V} 1.5 \mathrm{~K}$, ext. speaker 3-7 ohms. Valves and transistors. Own deck. One motor. Pause. Tape position counter. Straight-through amplifier. Monitoring. Input mixing. Parallel track replay. Headphone playback. Automatic recording level. Stereo playback, duoplay, multiplay with EL3787A preamplifier. Mains $110,127,200-250 \mathrm{~V}$ AC $50 \mathrm{c} / \mathrm{s}$. Size: $16 \frac{3}{8} \times 13 \frac{1}{4} \times 6 \frac{3}{8} \mathrm{in}$. Weight: 18 lb . Price: £40 19s.

PORTADYNE RADIO, Portadyne Works, 30-34 Gorst Road, N. Acton, London, N.W.10. Tel.: Elgar 7541-3.

TR300. Mono recorder. $\frac{1}{2}$-track. Speed: $3 \frac{3}{4}$ $\mathrm{i} / \mathrm{s}$. W. and F. $0 \cdot 4 \%$. H. and N. -50 dB . F.R. $100 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Replay char. CCIR. Inputs: mic. $1 \mathrm{mV}, 1$ megohm; radio 20 mV , 47 K . Output from pre-amp $1 \mathrm{mV}, 10 \mathrm{~K}$. One motor. $5 \frac{3}{4} \mathrm{in}$. spool. Rewind 3 min ., 850 ft . DM70 level indicator. Size: $17 \frac{1}{4} \times 12 \frac{3}{4} \times 5 \frac{1}{2} \mathrm{in}$. Price: $£ 209$ s. 6d.

Q-CORD. See Battery Operated Portables section.

REPS (TAPE RECORDERS) LTD., Colville Road, Acton, London, W.3. Tel.: Acorn 4141.
R.10. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}$ and $1 \frac{7}{8} \mathrm{i} /$ s. F. R. $7 \frac{1}{2}$, $40-16,000 \mathrm{c} / \mathrm{s} \pm 3 \mathrm{~dB} ; 3 \frac{3}{4}, 40-10,000 \mathrm{c} / \mathrm{s}$; $1 \frac{7}{8}$, $50-6,000 \mathrm{c} / \mathrm{s}$. Level meter, H. and N. -50 dB . W. and F. $0 \cdot 1 \%$. Size: $15 \frac{1}{2} \times 15 \times 9 \mathrm{in}$. Weight: 31 lb . Price (with tape, crystal mic., and recording lead): $£ 61$ 19s. two track; $£ 729 \mathrm{~s}$. four track.
R. 10 Mark III. Similar electrical specification to R. 10 but with Continental deck. Additional facilities include automatic stop and latch-down pause control. Price: $£ 61$ 19s. two track; $£ 729$ s. four track.

ROBUK ELECTRICAL INDUSTRIES LTD., 559/561 Holloway Road, London, N.19. Tel.: Archway 1022.

Regal RK5. $\frac{1}{2}$-track three-speed mono mains recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool 7 in . W. and F. $0 \cdot 2 \%$ at $7 \frac{1}{2}, 0 \cdot 3 \%$ at $3 \frac{3}{4} \mathrm{i} /$ s. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$
$40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 50 \mathrm{c} / \mathrm{s}-9 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$, $1 \frac{7}{8} \mathrm{i} / \mathrm{s} 50 \mathrm{c} / \mathrm{s}-4 \mathrm{Kc} / \mathrm{s}$. Signal-to-noise better than 45 dB . Replay char. CCIR. Inputs: mic. $1 \cdot 8 \mathrm{mV}$ high Z, radio/pickup 350 mV 250K. Output: 5W RMS push-pull. Output stage two ECL82. Outlet: 15 ohms ext. speaker. Internal speaker 8 in. elliptical. Magic eye level indicator (EM84 or EM87). Input mixing. Own deck. Three motors. Pause. Superimpose. Monitoring with independent control. Three-digit tape position indicator. Piano key controls. Four-track version uses Miniflux heads. Size: $20 \frac{1}{2} \times 14 \frac{1}{2} \times$ $8 \frac{1}{2} \mathrm{in}$. Weight: 30 lb . Price: $£ 442 \mathrm{~s}$.

Regal RK54. $\frac{1}{4}$-track version of RK5. Similar specification. Price: $£ 475$ s.

SABA ELECTRONICS LTD., $3 / 5$ Eden Grove, Holloway, London, N.7. Tel.: North 8161. Cables: Arc Eeslon.

- TK230-S. Transistorised pre-amp, valve output. $\frac{1}{4}$-track stereo recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Spool 7 in. W. and F. $7 \frac{1}{2} \pm 0.15 \%, 3 \frac{3}{4} \pm 0.25 \%$. H. and N. better than 48 dB . F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 40-15 \mathrm{Kc} / \mathrm{s}$ at $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Inputs: two mics. 1 mV 200 ohms, radio 10 mV 100 K, PU 200 mV 1 megohm. Outputs: 1V radio-stereo, 5W each channel to internal speakers or to 4-6 ohms ext. units. $22 \frac{1}{2} \mathrm{~V}$. output for mixer or slide synchroniser. Rewind time 5 mins . for $2,400 \mathrm{ft}$. Own deck. Superimpose. Pause. Position indicator. Track-to-track recording. Provision for slide projector. Size: $16 \frac{1}{2} \times 15 \times 7 \frac{1}{2}$ in. Weight: $28 \frac{1}{2} \mathrm{lb}$. Mains $125-240 \mathrm{~V}$ AC. Price: $£ 9814 \mathrm{~s}$.

SANYO. Sole U.K. agents: Sanyo Service \& Sales, 23 Savage Gardens, Trinity Square, London, E.C.3. Tel.: (Service) Royal 7154, (Sales) Royal 4154.

MR701 Brigadier. $\frac{1}{2}$-track mains recorder. Speeds: $3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. W. and F. $3 \frac{3}{4} \mathrm{i} / \mathrm{s} 0.35 \%, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$ $0.45 \%$. H. and N. better than 40 dB . F.R. $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ $100 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 100 \mathrm{c} / \mathrm{s}-4 \mathrm{Kc} / \mathrm{s} .7 \mathrm{in}$. spools. Meter indicator. Rewind time 3 mins. $1,200 \mathrm{ft}$. Inputs: mic., radio. Output: $2 \cdot 4 \mathrm{~W}$. Speaker $6 \frac{1}{4} \times 3 \frac{1}{2}$ in. Transistorised. One motor. Digital tape position indicator. Monitoring. Provision for foot control. Mains $110-117 \mathrm{~V}, 220-240 \mathrm{~V}$, AC. Size: $12 \frac{1}{2} \times 10 \times 5 \frac{7}{8} \mathrm{in}$. Weight: 12 lb . Price: $£ 40$ 19s.

- MR909 Twintone. $\frac{1}{2}$-track stereo mains recorder. Transistorised. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Spool capacity 7 in . W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ less than $0.25 \%$, $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ less than $0.35 \%$. H. and N. better than 40
dB. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 30 \mathrm{c} / \mathrm{s}-13 \mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 70 \mathrm{c} / \mathrm{s}-7 \mathrm{Kc} / \mathrm{s}$. Replay char. CCIR. Meter level indicator. Rewind time 3 mins. $1,200 \mathrm{ft}$. Inputs: mics. (2), auxilliary. Outlet: line. Output: 3W RMS each channel. Speakers $4 \times 2$ in. One motor. Digital tape position indicator. Monitoring. Automatic level control. Mains $90 / 100 / 117 / 220 / 240 \mathrm{~V}$ AC. Size: $13 \times 12 \frac{3}{4} \times 5 \frac{1}{2} \mathrm{in}$. Weight: 38 lb . Price: $£ 75$ 12s.

See Battery Portables section for details of Sanyo mains/battery models.

SHARP. Distributors: Wholesale Supplies (Swinton) Ltd., 16/18 Worsley Road, Swinton, Manchester. Tel. : Swinton 3232.

Sharp RD-503. Mains tape recorder. $\frac{1}{2}$-track. Speeds: $3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool 5 in . W. and F . $<0 \cdot 35 \%$ at $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. F.R. $120 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}$ at $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Pilot lamp level indicator. Rewind time 33 secs. All transistor. IW output. Speaker $4 \frac{3}{8} \times 2 \frac{3}{4} \mathrm{in}$. Three motors. Own deck. Monitoring by phone or internal speaker. Size: $9 \frac{1}{4} \times 5 \frac{7}{8} \times 9$ in. Weight: 7 lb . Complete with dynamic mic., tape, spare spool, radio lead, splicing tape. Price: $£ 265$ s.

SONY. U.K. Sales Division, Mercia Road, Gloucester. Tel.: Gloucester 26841. Cables: Debelec, Gloucester.

TC200. Stereo recorder. $\frac{1}{4}$-track. Speeds $7 \frac{1}{2}$, $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and F . $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$, less than $0 \cdot 19 \% ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$, less than $0.25 \%$. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 50 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s}$; $3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 50 \mathrm{c} / \mathrm{s}-11 \mathrm{Kc} / \mathrm{s}( \pm 2 \mathrm{~dB})$. Replay char. NARTB. Inputs: mic. low impedance, aux. high impedance. Outlet from pre-amp. One motor. 7 in. spool. 2 VU meters. Size: $15 \times 9 \times 15 \frac{7}{8}$ in. Weight: 27 lb . Price (inc. ext. speakers, 2 mics., leads): $£ 75$ 12s.

TC357/4. Tape recorder. Specification and price to be announced.
-TC250A. Transistorised $\frac{1}{4}$-track stereo $/$ mono recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 30 \mathrm{c} / \mathrm{s}-$ $18 \mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 30 \mathrm{c} / \mathrm{s}-13 \mathrm{Kc} / \mathrm{s}$. S.N. better than 50 dB . W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}<0.19 \%, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}<0.25 \%$. Bias frequency $55 \mathrm{Kc} / \mathrm{s}$. Two VU meters. Inputs: mic. $0 \cdot 2 \mathrm{mV} 250-1,000$ ohms, aux. $0 \cdot 2 \mathrm{~V}$ high impedance. Outlets: low impedance and aux. Size: $14 \frac{1}{4} \times 11 \frac{1}{2} \times 6 \frac{3}{8}$ in. Weight: 17 lb . approx. Three-digit tape position indicator. Auto-stop. Price: £61 19s.

TC.260. Tape recorder. Specification and price to be announced.


Luxor MP-473


Marconiphone 4208


Marconi phone 4210


Sharp RD. 503


Marconiphone 4206


Saba TK230-S


Sanyo Reporter MR. 101 Mk. III


Sony TC135 recorder

TC.135. Tape recorder. Specification and price to be announced.

SOUND. See Tape Recorders Electronics Ltd.

STELLA. See Philips Electrical Ltd.

STEREOSOUND PRODUCTIONS LTD. 12-14 Wakefield Road, Brighouse, Yorkshire. Tel.: Brighouse 1755.

Carousel RT5 Radiotape. Cabinet tape recorder with space to add radio tuner. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1_{8}^{7} \mathrm{i} / \mathrm{s}$. Max. spool size 7 in . Digital position indicator. $\frac{1}{2}$-track. Magic eye level indicator. Treble boost control. Monitoring. Pause. BSR TD10 deck. Transistor oscillator. Speaker $9 \times 5 \mathrm{in}$. Straight-through amplifier. Storage space for tapes. Teak veneered cabinet. Size: $23 \frac{3}{4} \times 13 \frac{1}{2} \times 21 \frac{3}{4}$ ins. (including legs). Price: $£ 3514$ s. (radio tuner $£ 99$ s. extra).

STUZZI. U.K. Distributors: Recording Devices Ltd., 197 Lower Richmond Road, Richmond, Surrey. Tel. : Prospect 4463.

Stuzzi Tricorder. Speeds: $3 \frac{3}{4}, 1 \frac{7}{8}$ and $\frac{15}{16}$ i/s. Papst motor. $5_{4}^{3}$ in. spools. F.R. $3_{4}^{3} \mathrm{i} / \mathrm{s}$, $40-$ $16,000 \mathrm{c} / \mathrm{s} ; 178 \mathrm{i} / \mathrm{s}, 40-8,000 \mathrm{c} / \mathrm{s} ;{ }^{15} \mathrm{i} / \mathrm{i}$ s, $40-4,000$ $\mathrm{c} / \mathrm{s}$. M.E. level ind. H. and N. -40 dB . W. and F. $0.25 \%$. Mixing. Variable Superimposing, Monitoring and remote control. Size: $13 \times 10 \times 6$ in. Weight: 18 lb . Price: $£ 57 \mathrm{l} 5 \mathrm{~s}$.

802FM. Mono recorder. $\frac{1}{2}$-track. Speeds $7 \frac{1}{2}$, $3_{4}^{3} \mathrm{i} / \mathrm{s}$. W. and F. $0.25 \%, 7 \frac{1}{2} \mathrm{i} / \mathrm{s} ; 0.3 \%, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. H. and N. -43 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Replay char. close to CCIR. Outlet direct from pre-amp. One motor. 7 in . spool. $2 \frac{1}{2} \mathrm{~min}$. rewind. M.E. Built-in transistorised F.M./V.H.F. radio. Size: $15 \frac{1}{4} \times 11_{4}^{1} \times 6 \frac{1}{4} \mathrm{in}$. Weight: $19 \frac{1}{2} \mathrm{lb}$. Price: £82 19s.

ST1002. Fully transistorised mains recorder. $3_{4}^{3} \mathrm{i} / \mathrm{s}$. W. and F . less than $\pm 0 \cdot 3 \%$. H. and N . -45 dB . F.R. $60 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s}$. Size: $14 \times 12 \times 6$ in. Weight: $15 \frac{1}{2} \mathrm{lb} .7 \mathrm{in}$. spools. Meter level indicator. Price: $£ 3514 \mathrm{~s}$.

SYMPHONY AMPLIFIERS LTD., 16 Kings College Road, London, N.W.3. Tel.: Primrose 3314/5.

Symphony Pre-SleepStudy Outfit. Comprises: Special recorder with full electronic control to permit time-switch control without incurring "flats". Large dial time switch for easy setting. Dynamic mic. Data tape, 900 ft ; Induction tape (learning). Price: $£ 508 \mathrm{~s}$.

TANDBERG. U.K. distributors: Elstone Electronics Ltd., 81 Kirkstall Road, Leeds. 3. Tel.: Leeds 35111.

Tandberg 74. Stereo/mono recorder. $\frac{1}{4}$-track. Speeds: $7 \frac{1}{2}, 3_{4}^{3}, 1_{8}^{7} \mathrm{i} / \mathrm{s}$. W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 0.15 \%$; $3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 0 \cdot 2 \% ; 1 \frac{7}{8} \mathrm{i} / \mathrm{s}, 0 \cdot 3 \%$. H. and N. -53 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s} ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$; $1 \frac{7}{8} \mathrm{i} / \mathrm{s}, 50 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$ (all $\pm 2 \mathrm{~dB}$ ). Replay char. NARTB. Inputs: 7 mV ; mic. 1.5 mV . One motor. 7 in . spools, 2 mins. rewind. Two EAM86 M.E.s. Pause control. Playback on one channel while recording on other channel. Size: $153 \times$ $1113 \times 67 \mathrm{in}$. Weight (instrument alone): $27 \frac{1}{2}$ lb .; (with carrying case): $32 \frac{1}{2} \mathrm{lb}$. Price: $£ 9713 \mathrm{~s}$.

[^2]Tandberg Series 8. Portable tape recorders in $\frac{1}{2}$-track and $\frac{1}{4}$-track versions, fabric covered or teak cases. Valves. Speeds: $3 \frac{3}{3}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Speed tolerance $\pm 2 \%$. F.R. $3 \frac{3}{4} \mathrm{i} / \mathrm{s} 30 \mathrm{c} / \mathrm{s}-13 \mathrm{Kc} / \mathrm{s}$ $( \pm 2 \mathrm{~dB} 60 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}), 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 30 \mathrm{c} / \mathrm{s}-7 \mathrm{Kc} / \mathrm{s}$ ( $\pm 2 \mathrm{~dB} 80 \mathrm{c} / \mathrm{s}-5 \cdot 5 \mathrm{Kc} / \mathrm{s}$ ). W. and F . better than $0.2 \%$ at $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$, better than $0.3 \%$ at $1_{8}^{7} \mathrm{i} / \mathrm{s}$. Distortion at maximum output $5 \%$. Signal to noise: four-track 50 dB , two-track 53 dB . Inputs: mic. 2 mV 1 megohm, radio $2-7 \mathrm{mV}$ adjustable, $300 \mathrm{~K}-500 \mathrm{~K}$. Output: 3W. Size: (portable case) $15 \frac{3}{4} \times 7 \frac{1}{8} \times 11 \frac{1}{8}$ in., (teak cabinet) $15 \times 6 \frac{1}{2} \times 11 \frac{5}{8} \mathrm{in}$. Weight: (portable case) $22 \frac{1}{2}$ lb., (teak cabinet) $20 \frac{1}{2} \mathrm{lb}$. Prices: Model 822 (portable case $\frac{1}{2}$-track) $£ 59$ 17s.; Model 823 (teak cabinet $\frac{1}{2}$-track) $£ 56$ 14s.; Model 842 (portable case $\frac{1}{4}$-track) $£ 652 \mathrm{~s}$.; Model 843 (teak cabinet $\frac{1}{4}$-track) $£ 61 \mathrm{l} 9 \mathrm{~s}$.

Tandberg Series 9. Model $92 \frac{1}{2}$-track portable recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Speed tolerance $\pm 1.5 \%$. Record/playback char. NAB. F.R. $7 \frac{1}{2}$ $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}, 3_{4}^{3} 80 \mathrm{c} / \mathrm{s}-13 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} 30 \mathrm{c} / \mathrm{s}-$ $7 \mathrm{Kc} / \mathrm{s}$. W. and F. $7 \frac{1}{2} 0 \cdot 15 \%, 3 \frac{3}{4} 0 \cdot 2 \%, 1 \frac{7}{8} 0.3 \%$. Distortion $5 \%$ at rated output. Signal to noise 56 dB . Inputs: mic. 2 mV 1 megohm, radio adjustable $2-7 \mathrm{mV} 300 \mathrm{~K}-500 \mathrm{~K}$. Output 3 W . Size: $15 \times 6_{4}^{3} \times 115 \frac{15}{8}$ in. Weight: $20 \frac{1}{2} \mathrm{lb}$. (with carrying case $25 \frac{1}{2} \mathrm{lb}$.). Price: $£ 729 \mathrm{~s}$.


Sony TC200


Sony TC 260 recorder


Sony TC 357/4 recorder



Symphony Pre-Sleep Study Outfit


Tandberg 74 stereo


Magnetophon 85


Telefunken Magnetophon 200

Series 12. $\frac{1}{4}$-track transistor portable mains recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1_{8}^{7} \mathrm{i} / \mathrm{s}$. Max. spool 7 in . W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}<0.15 \%, 3_{4}^{3} \mathrm{i} / \mathrm{s}<0.2 \%, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$ $<0.3 \%$. H. and N. -55 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s}, 3_{4}^{3} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-7 \mathrm{Kc} / \mathrm{s}$. Level indicators: two EAM86. Rewind time: 2 mins. $1,200 \mathrm{ft}$. Inputs: two mics. $1 \cdot 5 \mathrm{mV} 200$ ohms, line 75 mV 1 megohm, line 7.5 mV 100 K . Output: 10W RMS each channel. Outlets: amplifier 300 mV 10 K (two), centre channel amplifier 750 mV 82 ohms. Speakers: two $7 \times 4$ in. (power on internal speakers limited to 3W each channel). 35 transistors. Erase and bias frequency $85.5 \mathrm{Kc} / \mathrm{s}$. Stereo multiplex filter. Bass control: -12 dB at $80 \mathrm{c} / \mathrm{s}$. Treble control: -15 dB at $15 \mathrm{Kc} / \mathrm{s}$. All input connections parallel for British, American or Continental plugs. Size: $15 \frac{3}{8} \times 11 \frac{7}{8} \times 6 \frac{7}{8} \mathrm{in}$. Weight: 23 lb . Price: £1105s.

TAPE RECORDERS ELECTRONICS LTD. 197 Lower Richmond Road, Richmond, Surrey. Tel.: Prospect 4463. Cables: Rudionics, Richmond, Surrey.

Sound TRE14. Mono $\frac{1}{2}$-track mains recorder. Speed: $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Spool $5_{4}^{3}$ in. F.R. $60 \mathrm{c} / \mathrm{s}-13 \mathrm{Kc} / \mathrm{s}$ $\pm 3 \mathrm{~dB}$. Inputs: mic. 1 mV 1 megohm, radio diode $3 \mathrm{mV} 2 \cdot 5 \mathrm{~K}$, radio/PU 150 mV 1 megohm. Output: 3W. Outlets: LS 3 ohms, line 100 mV 1 K . Signal-to-noise ratio better than 40 dB . Tape position indicator. Tone control. Volume/ record level control. DIN sockets. Size: $14 \frac{3}{4} \times$ $13 \times 6$ in. Strip indicator. Price: $£ 254 \mathrm{~s}$.

Sound TRE23. Same specification as TRE14 but $\frac{1}{4}$-track. Price: $£ 287 \mathrm{~s}$.

Sound TRE32. Mono $\frac{1}{2}$-track mains recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Spool 7 in . Tape position indicator. Otherwise specification as for TRE14. Size: $15 \frac{3}{4} \times 13 \frac{1}{2} \times 6 \frac{1}{2} \mathrm{in}$. Price: $£ 3110 \mathrm{~s}$.

Sound TRE34. Same specification as TRE32 but $\frac{1}{4}$-track. Price: $£ 3413 \mathrm{~s}$.

Sound TRE40. $\frac{1}{4}$-track mono mains recorder. Speeds $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Spool 7 in. F.R. $60 \mathrm{c} / \mathrm{s}-$ $13 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Inputs: mic. 1 mV 1 megohm, radio diode $3 \mathrm{mV} 2 \cdot 5 \mathrm{~K}$, radio PU 150 mV 1 megohm. Output: 3W. Outlets: LS 3 ohms, line 100 mV 1 K . Signal/noise ratio better than 40 dB . DIN sockets. Strip level indicator. Separate bass and treble controls. Three speakers. Parallel track superimposing. Mixing. Straight-through amplifier. Tape position indicator. Size: $15 \frac{3}{4} \times 13 \frac{1}{2} \times 6 \frac{1}{2} \mathrm{in}$. Price: $£ 475 \mathrm{~s}$.

TELEFUNKEN. Distributors: A.E.G. (Great Britain) Ltd., Lonsdale Chambers, 27 Chancery Lane, London, W.C.2. Tel.: Chancery 9944. Cables: Welmcor, London.

Magnetophon 85 de Luxe. Mono recorder. $\frac{1}{2}$-track. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$, $0.15 \% ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 0.2 \%$. H. and N. -55 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s} ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Replay char. CCIR and NARTB, selected by switch. Inputs: radio $2 \mathrm{mV}, 47 \mathrm{~K}$; mic. 2 mV , 2 megohms. Outlet from pre-amp. One motor. 7 in . spools, 3 min . rewind (long play tape). Fluorescent bar levelindicator. Mixing facilities. Size: $8 \frac{1}{2} \times 18 \frac{1}{4} \times 16 \frac{3}{4} \mathrm{in}$. Price : $£ 9511 \mathrm{~s}$.

Magnetophon 105. $\frac{1}{2}$-track mono mains portable recorder. Speeds: $3 \frac{3}{4}$, $1 \frac{7}{8}$ i/s. F.R. $40 \mathrm{c} / \mathrm{s}-$ $16 \mathrm{Kc} / \mathrm{s}$ at $3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-9 \mathrm{Kc} / \mathrm{s}$ at $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Replay char. NARTB. Inputs for mic. and radio. One motor. Spool size $5 \frac{3}{4}$ in. Fluorescent bar indicator. Size: $15 \times 6 \frac{1}{2} \times 12 \frac{1}{4} \mathrm{in}$. Weight: $25 \frac{1}{2} \mathrm{lb}$. Price: $£ 652 \mathrm{~s}$.

Magnetophon 200. $\frac{1}{2}$-track mono mains recorder. Speed: $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. F.R. $60 \mathrm{c} / \mathrm{s}-13 \mathrm{Kc} / \mathrm{s}$. Speaker: $5 \times 3 \mathrm{in}$. Six transistors, one rectifier. Meter level indicator. Inputs for radio, mic., pickup. Outlets for radio, phones, ext. speaker. Mains $110,127,220,240 \mathrm{~V}$ AC ( $50 \mathrm{c} / \mathrm{s}$ convertible to $60 \mathrm{c} / \mathrm{s}$ ). Max. spool 7 in. Push-button operation. Pause control. Three-digit counter. Tone control. Built-in splicing groove. Storage space for two extra spools. Compartment for audio lead, mic., etc. Size: $15 \frac{1}{2} \times 12 \frac{1}{4} \times 6 \frac{1}{4} \mathrm{in}$. Weight: 21 lb . Price: $£ 4019 \mathrm{~s}$.

Magnetophon 201. $\frac{1}{4}$-track version of model 200. Track selector provides: mono 1, mono 2, parallel playback. Price: $£ 464 \mathrm{~s}$.

Magnetophon 203. $\frac{1}{4}$-track stereo mains recorder. Max. spool 7 in. Speeds: $3 \frac{3}{4}$, $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Equalisation NARTB. F.R. $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$ at $3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}$ at $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Speaker $5 \times 3 \mathrm{in}$. twelve transistors, one rectifier. Stereo recording. Stereo playback with ext. amplifier. Multiplay. Inputs for radio, mic., pickup. Output for ext. speaker. Pause. Monitoring. Three-digit counter. Auto stop. Level indicator. Mains 110, $127,220 / 240 \mathrm{~V}$ AC ( $50 \mathrm{c} / \mathrm{s}$ convertible to $60 \mathrm{c} / \mathrm{s}$ ). Size: $15 \frac{1}{2} \times 12 \frac{1}{4} \times 6 \frac{1}{4} \mathrm{in}$. Weight: 21 lb . Price: £72 9s.

Magnetophon 204E. $\frac{1}{4}$-track stereo mains recorder designed for vertical and horizontal operation. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Max. spool 7 in . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Two $7 \times 4 \frac{1}{8} \mathrm{in}$. speakers. 18 transistors, 2 diodes,


Telefunken Magnetophon 204.E



Telefunken Magnetophon 201

Truvox $R 44$


Truvox R102


Telefunken Magnetophon 203

1 rectifier. Stereo output sockets for ext. amplifiers, phones, ext. speakers ( 10 ohms). Stereo input sockets for radio, pickup, mics. Controls: volume, tone, level. Two VU meters. Push-button deck controls. Output: 6W RMS per channel. W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}<0 \cdot 15 \%, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ $<0.2 \%$. Distortion $<6 \%$. S.N. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}>50 \mathrm{~dB}$, $3_{4}^{3} \mathrm{i} / \mathrm{s}>45 \mathrm{~dB}$. Multiple sound on sound. Autostop. Mains $110,127,220,240 \mathrm{~V}$ AC $50 / 60 \mathrm{c} / \mathrm{s}$. Size: $18 \frac{1}{2} \times 8 \frac{1}{4} \times 13 \frac{3}{4} \mathrm{in}$. Weight: $30 \frac{1}{2} \mathrm{lb}$. Price: £1149s.

Magnetophon 300, 301, 401. See Battery Operated Portables section.

TRUVOX LTD., . Neasden Lane, London, N.W.10. Tel.: Dollis Hill 8011. Cables: Truvoxeng, London, N.W. 10 .

R44. Transistorised mains operated $\frac{1}{4}$-track mono recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Spool capacity 7 in . W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}<0 \cdot 15 \%, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ $<0.25 \%, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}<0.35 \%$. H. and N. -42 dB at all speeds. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$, $3_{4}^{3} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$ $\pm 3 \mathrm{~dB}$. Replay char. New CCIR. Meter level indicator. Rewind time 2 mins . $1,200 \mathrm{ft}$. Inputs: mic. $50 \mu \mathrm{~V} 25 \mathrm{~K}$, radio/PU 100 mV 100 K . Outlets: ext. speaker 15 ohms 3 W , ext. amplifier $0-1 \mathrm{~V}$ variable 10 K . Output: 3 W RMS. Speaker $8 \times 5$ in. One motor. Magnavox deck. Pause. Three-digit tape counter. Straight-through amplifier. Monitoring. Input mixing. Parallel track replay. Mains $100-120 \mathrm{~V}, 200-250 \mathrm{~V}, 50 / 60$ $\mathrm{c} / \mathrm{s}$. Consumption 75 W . Size: $16 \frac{1}{2} \times 14 \times 8 \mathrm{in}$. Weight: 22 lb . Price: $£ 464 \mathrm{~s}$.

R42. $\frac{1}{2}$-track version of R44. All details the same except no parallel track replay. Price: £46 4s.

R104. Transistorised $\frac{1}{4}$-track mono recorder. Speeds: $7_{2}^{1}, 3_{4}^{3}, 1_{8}^{7}$ i/s. Spool 7 in. W. and F. $<0 \cdot 1 \%$ at $7 \frac{1}{2}, 0 \cdot 15 \%$ at $3 \frac{3}{4}, 0.25 \%$ at $1 \frac{7}{8}$. H. and N. -50 dB . F.R. $7 \frac{1}{2} 30 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s} \pm 2$ $\mathrm{dB}, 3_{4}^{3} 40 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}, 1 \frac{7}{8} 60-8 \mathrm{Kc} / \mathrm{s} \pm 3$ dB. Replay char. new CCIR. Inputs: mic. 1 mV $500 \mathrm{~K}, \mathrm{rad} / \mathrm{PU} 50 \mathrm{mV} 100 \mathrm{~K}$. Outputs: LS 5 W , amp IV 100 ohms. Level meter. Rewind time $1,200 \mathrm{ft} .1 \mathrm{~min}$. Three motors, capstan motor outer-rotor type. Own deck. Superimpose. Pause. Four-digit position indicator. Straightthrough amplifier. Source/tape monitor. Three heads. Multi-play. Mains $200-250 \mathrm{~V}$ AC. Size: $16 \times 17 \frac{3}{4} \times 8 \frac{1}{2} \mathrm{in}$. Weight: 34 lb . Price: $£ 82 \mathrm{l9}$.

R102. Transistorised $\frac{1}{2}$-track mono recorder. Specification as for R104. Price $£ 79$ 16s.

UHER. U.K. distributors: Bosch Ltd., 205 Great Portland Street, London, W.1. Tel.: Langham 2672/5.

Uher Universal 5000. Transistorised mono recorder. $\frac{1}{2}$-track. Speeds: $3 \frac{3}{4}, 1 \frac{7}{8}, \frac{15}{16} \mathrm{i} / \mathrm{s}$. W. and F. $\pm 2 \%$. H. and N. -50 dB . F.R. $3_{4}^{3} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-$ $16 \mathrm{Kc} / \mathrm{s} ; 1_{8}^{7} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s} ;{ }_{16}^{15} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-4 \mathrm{Kc} / \mathrm{s}$. Replay char. NARTB. Inputs: mic. $0 \cdot 1 \mathrm{mV}, 4 \mathrm{~K}$; radio $1 \mathrm{mV}, 47 \mathrm{~K}$; gram 30 mV , 1 megohm. Outlet direct from pre-amp. One motor. $5_{4}^{3} \mathrm{in}$. spools. Rewind 2 mins. Three figure counter. Price (incl. 4-position remote control, mic. and $5 \frac{3}{4} \mathrm{in}$. tape): £99 15 s .

OUher Royal Stereo 784. Transistorised stereo recorder. $\frac{1}{4}$-track. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8}, 16 \mathrm{i} / \mathrm{s}$. W. and $\mathrm{F} .7 \frac{1}{2} \mathrm{i} / \mathrm{s} \pm 0 \cdot 15 \%$. H. and N. -50 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 50 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 50 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$, $1 \frac{7}{8} \mathrm{i} / \mathrm{s}, 50 \mathrm{c} / \mathrm{s}-9 \mathrm{Kc} / \mathrm{s} ;{ }_{16}^{5} \mathrm{i} / \mathrm{s}, 50 \mathrm{c} / \mathrm{s}-4 \mathrm{Kc} / \mathrm{s}$. Replay char. NARTB. Inputs: mic. $0 \cdot 15 \mathrm{mV}, 2 \mathrm{~K}$; radio $5 \mathrm{mV}, 50 \mathrm{~K}$; gram 300 mV .1 megohm. Outlets direct from replay head, and pre-amp. One motor. 7 in. spool. Rewind 3 mins. Four figure counter. Pause control. 11-position selector. Mixing. Size: $15 \times 14 \times 7$ in. Weight approx.: $23 \frac{1}{2} \mathrm{lb}$. Price: $£ 1359 \mathrm{~s}$.

7000/724L. Mains operated mono-stereo $\frac{1}{4}$ track recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Spool: 7 in . Fully transistorised. W. and F. $\pm 0 \cdot 2 \%$. F.R. $40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 40 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s}$ at $3_{4}^{3} \mathrm{i} / \mathrm{s}$. Volume intensity range 50 dB . Inputs for mic., diode and PU. Output: $2 \times 2 \mathrm{~W}$. Mains 110,130 , 150 and 220V. Price: $£ 7815 \mathrm{~s}$.

ULTRA. See British Radio Corporation.

VAN DER MOLEN LTD., 42 Mawney Road, Romford, Essex. Distributors: H. O. Thomas Electronics Ltd., 68/69 Avenue Chambers, 4 Vernon Place, London, W.C.1. Tel.: Holborn 5178.

Van der Molen VR4. $\frac{1}{4}$-track mains mono recorder. Speeds: $7 \frac{1}{2}, 3_{4}^{3}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool 7 in . W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 0.15 \%, 3_{4}^{3} \mathrm{i} / \mathrm{s} 0.25 \%, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$ $0.35 \%$. H. and N . better than 40 dB on all speeds. Frequency response: $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-15$ $\mathrm{Kc} / \mathrm{s}, 3_{4}^{3} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$, $1 \frac{7}{8} \mathrm{i} / \mathrm{s} 60 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$, all $\pm 3 \mathrm{~dB}$. Replay char. DIN. Meter level indicator. Rewind time 3 mins. $1,800 \mathrm{ft}$. Inputs: mic. 2 mV 50 K , radio 30 mV 1 megohm, aux. 200 mV 100K. Output: 4W RMS. Speaker 8 in. high flux. Outlets: pre-amplifier $1-4 \mathrm{~V} 10 \mathrm{~K}$, alternative head 2 mV at $1 \mathrm{Kc} / \mathrm{s}$, ext. LS 8 ohms.


Uher 724/1 recorder


Uher Universal 5000


Ultra 6204


Ultra 6206


Van Der Molen VR4


Wyndsor 707 II-IV


Wyndsor Sabre II

Three-digit tape position indicator. Straightthrough amplifier. Monitoring. Input mixing. Parallel track replay. One motor. Polished teak vertical style cabinet. Mains 200-250 $50 \mathrm{c} / \mathrm{s}$ or $110 \mathrm{~V} 60 \mathrm{c} / \mathrm{s}$. Size: $15 \frac{1}{4} \times 12 \frac{1}{4} \times 7 \frac{3}{4} \mathrm{in}$. Price: £61 19s.

WYNDSOR RECORDING CO. LTD., (inc. Magnetic Recording Co.), Wyndsor Works, 2 Bellevue Road, Friern Barnet, London, N. 11 . Tel.: Enterprise 2226/7. Cables: Wyndreco, London.

Sabre II. Mono $\frac{1}{2}$-track. Speed: $3_{4}^{3}$ i/s. Spool 53 in. F.R. $40 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Inputs: 2 mV 1 megohm, 250 mV 1 megohm. Outputs: 500 mV 1 megohm, $2 \cdot 5 \mathrm{~W} 3$ ohms. Strip indicator. BSR deck. Superimpose. Pause. Size: $15 \times 13 \frac{3}{4} \times 7 \mathrm{in}$. Weight: $18 \frac{1}{2} \mathrm{lb}$. Price: $£ 254 \mathrm{~s}$.

707-11. Mono $\frac{1}{2}$-track. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Spool 7 in. F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}, 3 \frac{3}{4}$ $\mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$ $\pm 4 \mathrm{~dB}$. Inputs: 2 mV 1 megohm, 250 mV 1 megohm. Outputs: 500 mV 1 megohm, $3-5 \mathrm{~W}$

3 ohms. Strip indicator. Valve. BSR deck. Size: $16 \frac{1}{2} \times 14 \frac{1}{2} \times 8 \frac{1}{2}$ in. Weight: 22 lb . Price: $£ 3312 \mathrm{~s}$.

707-IV. Mono $\frac{1}{4}$-track. Outputs: 8 mV at 3 K stereo, 3-5W at 3 ohms. Track change switch. Parallel replay switch. Other details as for 707-11. Price: £36 15s.

Vanguard. $\frac{1}{4}$-track mains recorder. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool 7 in . W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ $0.16 \%, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 0.25 \%$, $1 \frac{7}{8} \mathrm{i} / \mathrm{s} 0.3 \%$. S.N. better than 50 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 40$ $\mathrm{c} / \mathrm{s}-9 \mathrm{Kc} / \mathrm{s}, 1_{8}^{7} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-6 \mathrm{Kc} / \mathrm{s}$, all $\pm 3 \mathrm{~dB}$. Meter record level indicator. Inputs: mic. $2 \mathrm{mV} \mathrm{1-2}$ megohms, radio/gram. 0.25 V 1 megohm. Output: 4W RMS. 8 in . speaker in detachable lid. Outlet: 0.5 V 10 K . Valves. Superimpose. Pause. Straight-through amplifier. Monitoring from tape or signal. Parallel track replay. Track-totrack recording. Three heads. Separate record and playback amplifiers. Bass and treble controls. Push-button operation. Digital tape counter. Oscillator $66 \mathrm{Kc} / \mathrm{s}$. Stereo output socket 0.3 mV (uncorrected). Mains $110-240 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$. Size: $18 \times 14 \times 18$ (packed). Weight: 40 lb . Price: £61 19s.

## DECKS—GENERAL PURPOSE and SEMI-PROFESSIONAL

ADASTRA ELECTRONICS LTD., 167 Finchley Road, Swiss Cottage, London, N.W.3. Tel.: Maida Vale 8164/5.

- Adastra. Mono or stereo $\frac{1}{2}$-track and $\frac{1}{4}$-track mains tape decks. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. W. and and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 0 \cdot 15 \%, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 0 \cdot 25 \%$. Two heads fitted as standard, space for third head. One four-pole induction motor. Max. spool 7 in. Rewind time $2 \frac{1}{2}$ mins. for $1,200 \mathrm{ft}$. Three-digit tape position indicator. Pause control. Size: $13 \frac{1}{2} \times 11 \mathrm{in}$. Weight: 10 lb . Supplied with 7 in . $1,200 \mathrm{ft}$. Synchrotape and spare spool. Recommended prices ( $\frac{1}{2}$-track): $£ 143 \mathrm{~s} .6 \mathrm{~d}$.; ( $\frac{1}{4}$-track) $£ 15 \mathrm{l} 5$ s.

BRENELL ENGINEERING CO. LTD., 231/5 Liverpool Road, London, N.1. Tel.: North 8271 (5 lines).

Mark 5 Series 3. G.P. tape deck, 15, $7 \frac{1}{2}, 3 \frac{3}{4}$ and $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Three motors. $8 \frac{1}{4} \mathrm{in}$. spools. W. and F . $0 \cdot 1 \%$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ accommodates up to four heads. Size: $15 \times 11 \frac{1}{2} \times 5 \mathrm{in}$. Weight: 16 lb . Price: $£ 38$ with two heads.

Mark 510 Series 2. Deck mechanism. $\frac{1}{2}$ - or $\frac{1}{4}$ track. Speeds: $15,7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. W. and F. $15 \mathrm{i} / \mathrm{s}$, $<0.05 \% ; 7 \frac{1}{2} \mathrm{i} / \mathrm{s},<0.1 \% ; 3 \frac{3}{4} \mathrm{i} / \mathrm{s},<0.15 \%$; $1 \frac{7}{8} \mathrm{i} / \mathrm{s},<0 \cdot 25 \%$. Three motors (synchronous type for capstan). $10 \frac{1}{2} \mathrm{in}$. NAB spools, 45 secs. per $1,200 \mathrm{ft}$. rewind. Pause. Accommodates 4 heads. Size: $15 \times 11 \frac{1}{2} \times 6 \mathrm{in}$. Weight: 16 lb . Price (less heads): $£ 46$ 12s. (Prices with heads on application).

BSR LTD., Monarch Works, Powke Lane, Old Hill, Staffs. Tel.: Cradley Heath 69272. Telex: 33282.

BSRTD2. G.P. deck $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. One motor. $5 \frac{3}{4} \mathrm{in}$. spools. F.R.: with good amplifier equalisation $30-10,000 \mathrm{c} / \mathrm{s} \pm 3 \mathrm{~dB}$. 2 heads. W. and F. better than $0.26 \%$. RMS. Size: $13 \times 8 \frac{3}{4} \mathrm{in}$. Price: $£ 12$ 12s.; with 4 track head: $£ 14$.

BSR TD10. G.P. deck. $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. One motor. 7 in . spools. F.R. $30 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Two or three heads. W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 0.15 \%$; $3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 0 \cdot 26 \%$; $1 \frac{7}{8} \mathrm{i} / \mathrm{s}, 0 \cdot 3 \%$. Size: $12 \frac{1}{4} \times 8 \frac{3}{8} \mathrm{in}$. Price: $£ 14$;(with 4-track heads): $£ 1515 \mathrm{~s}$.


BSR Monardeck TD2

B.S.R. TD20


Scopetronics 825


Scopetronics 1150


BSR TD 10


Brenell Mk. 5 Series 3


Planet CD2

BSR TD20. G.P. deck. $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Mains. Mono or stereo. $\frac{1}{4}$-track or $\frac{1}{2}$-track. Two heads. F.R.: $1 \frac{7}{8} \mathrm{i} / \mathrm{s} 30 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s} 30 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$, $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 30 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$, all $\pm 3 \mathrm{~dB}$. One motor. Pause control. Max. spool $5_{4}^{3} \mathrm{in}$. Three- or fourdigit tape position indicator with PB reset. Approximate size: $12 \frac{1}{2} \times 10 \times 43$ in. Price: to be announced.

THE MAGNAVOX ELECTRONICS CO. LTD., Alfred's Way, By-pass Road, Barking, Essex. Tel.: Rippleway 5533. Cables: Magnavox, Barking.
363. GP tape deck. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. W. and F. $0 \cdot 15 \%$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 0 \cdot 25 \%$ at $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. $\frac{1}{4}$-track or $\frac{1}{2}$-track heads. Accommodation for three heads. Mains $100-125,200-250 \mathrm{~V}, 50 \mathrm{c} / \mathrm{s}$. One four-pole induction motor. Rewind time $2 \frac{1}{4}$ mins. $1,200 \mathrm{ft}$. 7 in. spool. Three-digit position indicator. Pause control. Size: $13 \frac{1}{2} \times 11 \mathrm{in}$. Weight: 10 lb . Prices: ( $\frac{1}{2}$-track) $£ 1310 \mathrm{~s}$. ( $\left(\frac{1}{4}\right.$-track) $£ 15 \mathrm{l} 0 \mathrm{~s}$.

PLANET PROJECTS LTD., Goodman Works, Belvue Road, Northolt, Middlesex. Tel.: Viking 1775.
C.D.2. Tape deck. Speed: $1_{8}^{7}$ or $3_{4}^{3} \mathrm{i} / \mathrm{s}$. W. and F. Less than $0.2 \%$ at both speeds. Miniflux heads. $\frac{1}{2}$-track mono or $\frac{1}{4}$-track stereo. Two heads, one for each track. F.R. dependent on speed and heads. One Papst hysteresis motor. Spool size 7 in. Automatic track change and reversal of tape direction at end of spool, no fast rewind required. Uses standard $\frac{1}{4}$ in. tape. Single knob control. Provides over $8 \frac{1}{2}$ hours uninterrupted playing at $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Mains $220-$ $230 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$. Size: $14_{4}^{3} \times 11_{4}^{3} \times 6 \mathrm{in}$. Weight approximately: 10 lb . Price: $£ 685 \mathrm{~s}$. (ex works).

SCOPETRONICS LTD., Crown Works, Church Road, Kingston-upon-Thames, Surrey. Tel.: Kingston-upon-Thames 1275/4135.

Scopetronics 825. General purpose mains tape transport. Speeds: $7 \frac{1}{2}, 3_{4}^{3} \mathrm{i} / \mathrm{s}$. Max. spool $8_{4}^{\frac{1}{4}} \mathrm{in}$. W. and F. $0 \cdot 15 \%$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 0 \cdot 2 \%$ at $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Three motors. Capstan motor Papst. Superimpose. Pause. Inching. Three-digit tape indicator. Takes up to four Scopetronics heads. Size: $16 \frac{3}{4} \times 14$ in. Price: $£ 49$ 10s.

TEAC. Distributors: Audio and Design Ltd., 40 Queen Street, Maidenhead, Berks. Tel.: Maidenhead 25204.

Teac Series 310. Professional tape deck. Speeds: $15,7 \frac{1}{2} \mathrm{i} /$ s. Max. spool $10_{2}^{1} \mathrm{in}$. W. and F . better than $0 \cdot 15 \%$ at $15 \mathrm{i} / \mathrm{s}$, better than $0 \cdot 2 \%$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. Full remote control facilities. Full specification on request. Price: $£ 220$.

WRIGHT AND WEAIRE LTD., 84 Blackfriars Road, London, S.E.1. Tel.: Waterloo 1981. Cables: Writewea, London, S.E.

Wearite 6A, 6B, 6C. Semi-professional tape deck. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Three motors. Spool size $8 \frac{1}{4} \mathrm{in}$. W. and F. $0 \cdot 16 \%$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. Size: $16 \frac{1}{2} \times 13 \times 7$ in. Weight: 18 lb . Model 6A standard mono record/replay. Price: $£ 44$. Model 6B mono record/replay plus monitor head. Price: £49. Model 6C industrial dual track. Price: $£ 53$ 10s.

O Wearite GE. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Mono record/replay plus stereo replay. Price: $£ 57$ 10s.


Brenell STB2 tape unit


Truvox PD104


Gramdeck


Scopetronics 1150


## TAPE UNITS

AKAI. Distributors: Pullin Photographic Ltd., 11 Aintree Road, Perivale, Greenford, Middlesex. Tel.: Alperton 1541. Cables: Pullinfoto, Greenford, Middlesex.

OAkai X-100D. $\frac{1}{4}$ - or $\frac{1}{2}$-track transistorised tape unit. Mono or stereo. Speeds: $15,7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Max. spool $7 \frac{1}{2}$ in. W. and F. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}<0.15 \%$, $3 \frac{3}{4} \mathrm{i} / \mathrm{s}<0.25 \%, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}<0.35 \%$. H. and N. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ 45 dB . F.R. $7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-21 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ $40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$ $\pm 3 \mathrm{~dB}$. Replay char. NARTB. Two VU meters. Rewind time $1_{2}^{1}$ mins. $1,200 \mathrm{ft}$. Inputs: mic. 2.0 mV 500 K , line 200 mV 1 megohm. Outlets: amplifier 800 mV 3 K , phones. Own deck. One motor. Pause. Three-digit tape indicator. Monitoring. Built-in tape cleaner. Auto-stop. Crossfield head. Horizontal or vertical operation. Mains $100-240 \mathrm{~V}$ AC. Size: $13 \frac{1}{2} \times 13 \frac{1}{2} \times 9 \mathrm{in}$. Price: £95 approximately.

Akai X300. Available as tape unit only. See Professional and Semi-professional Recorders section. Price on application.

Akai X355. Available as tape unit only. See Professional and Semi-professional Recorders section. Price on application:

BANG \& OLUFSEN. U.K. Sales Division, Mercia Road, Gloucester. Tel.: Gloucester 26841. Cables: Debelec, Gloucester.

- Beocord 1500. Transistorised stereo tape unit in $\frac{1}{4}$-track and $\frac{1}{2}$-track versions. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}$, $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Spool size 7 in . W. and F. $0.075 \%$ at $7 \frac{1}{2}$, $0 \cdot 11 \%$ at $3 \frac{3}{4}, 0 \cdot 18 \%$ at $1 \frac{7}{8}$. H. and N. $\frac{1}{2}$-track -55 dB , $\frac{1}{4}$-track -50 dB . F.R. $40 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 40-12 \mathrm{Kc} / \mathrm{s}$ at $3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 50-6 \mathrm{Kc} / \mathrm{s}$ at $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Replay char. CCIR. Inputs: mic. $150 \mu \mathrm{~V} 200$ ohms, mag. PU 2 mV 33K, crystal PU IV 220K, radio diode 2 mV 45 K . Output: line 800 mV . Rewind time 3 mins. $1,800 \mathrm{ft}$. One Papst motor. Own deck. Superimpose. Pause. Position indicator. Two VU meters. Mains $110-240 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$. Size: $17 \frac{3}{4} \times 13 \frac{1}{4} \times 8 \frac{5}{8} \mathrm{in}$. Weight: 33 lb . Price: £93 9s.

BRENELL ENGINEERING CO. LTD., 231/5 Liverpool Road, London, N.1. Tel.: North 8271 (5 lines).
-STB2. Stereo/mono deck mechanism with
pre-amplifiers. $\frac{1}{2}$ or $\frac{1}{4}$-track. Speeds: $15,7 \frac{1}{2}, 3 \frac{3}{4}$, $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$, W. and F. $15 \mathrm{i} / \mathrm{s},<0.05 \% ; 7 \frac{1}{2} \mathrm{i} / \mathrm{s},<0 \cdot 1 \%$; $3 \frac{3}{4} \mathrm{i} / \mathrm{s},<0 \cdot 15 \% ; 1 \frac{7}{8} \mathrm{i} / \mathrm{s},<0 \cdot 25 \%$. Outlet from pre-amp. Three motors, $8 \frac{1}{4} \mathrm{in}$. or $10 \frac{1}{2}$ in. NAB spools to order. Two illuminated level meters. Twin record and replay pre-amps. Tape monitoring facilities. Price: ( $8 \frac{1}{4} \mathrm{in}$. spools) $£ 150$; ( $10 \frac{1}{2}$ in. spools) $£ 170$.

OSTB2. Monitor amplifier for use with STB2 tape unit. Valves. 3W per channel. Distortion $2 \%$ at 3 W . Response $25 \mathrm{c} / \mathrm{s}-25 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Noise level -50 dB . Input: 1 V for 3 W output. Output impedance 3 and 15 ohms. Complete with two $5 \times 3$ in. speakers. Price: $£ 25$.

GRAMDECK. U.K. distributors: Andrew Merryfield Ltd., 29/31 Wright's Lane, Kensington, London, W.8. Tel.: Western 3603. Cables: Technology, Kens, London.

Gramdeck. Head and drive mechanism for attachment to gramophone turntable. Speeds: $7 \frac{1}{2}, 4 \cdot 33,3 \cdot 2$ and $1.6 \mathrm{i} / \mathrm{s}$ for the standard disc speeds. $5 \frac{3}{4} \mathrm{in}$. spools. F.R. $60-10,000 \mathrm{c} / \mathrm{s} \pm 3 \mathrm{~dB}$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. W. and F. $0 \cdot 15 \%$. Mic. to be used, Lustraphone LD61 medium impedance. Size: $13 \frac{1}{2} \times 6 \mathrm{in}$. Weight: approx. 2 lb . with tape. Price (including transistor pre-amplifier, tape and mic.): £9 19s. 6 d .

HEATHKIT. See Kit section.

LL ELECTRONICS LTD., 5 Shakespeare Road, London, N.3. Tel.: Finchley 3332.

TR1000. Magnavox tape deck built into lowline console cabinet with LL Electronics 3S1 5W amplifier. Perspex lid. Space for fitting radio tuner or for tape storage. Price (excluding speakers): expected to be about $£ 82$ 19s.

LUXOR INDUSTRI AKTIEBOLAG. See General Purpose Tape Recorder section for details of Luxor MP-473 mono/stereo $\frac{1}{4}$-track recorder without speakers.

PLANET PROJECTS LTD., Goodman Works, Belvue Road, Northolt, Middlesex. Tel.: Viking 1775.
C.D.2.P.A. This comprises model C.D.2. tape deck (see Tape Deck section) with built-in pre-amplifier and power supply. Power supply provides correct voltages for operating both relays and also a stabilised supply for the preamplifier. Pre-amplifier is three-stage direct coupled block using high frequency silicon planar transistors. Equalisation and stability is achieved with multiple feedback loops operating down to DC. Average output: 250 mV . Output impedance: 200 ohms to be fed into a load not less than $2 \cdot 5 \mathrm{~K}$. F.R. $30 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}+3 \mathrm{~dB}$. H.D. not greater than 3 dB . Signal to noise ratio 50 dB . Price: $£ 80$ (ex works).

SCOPETRONICS LTD., Crown Works, Church Road, Kingston-upon-Thames, Surrey. Tel.: Kingston-upon-Thames 1275/4135.

Scopetronics 1150. Professional mains tape unit with pre-amps. Mono or stereo. $\frac{1}{2}$-track or full-track. Speeds: $7 \frac{1}{2}, 15 \mathrm{i} / \mathrm{s}$. Max. spool $11 \frac{1}{2} \mathrm{in}$. W. and $\mathrm{F} .0 \cdot 08 \%$ at $15 \mathrm{i} / \mathrm{s}, 0 \cdot 14 \%$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. F.R. $15 \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}, 7 \frac{1}{2} \mathrm{i} / \mathrm{s} 40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$ $\pm 3 \mathrm{~dB}$. Replay char. NARTB and CCIR. Broadcast type peak programme meter. Rewind time $1 \frac{3}{4}$ mins. for $2,400 \mathrm{ft}$. NAB spool. Input: record input +8 dB or 1 mW at 600 ohms. Output: 1 mW at 600 ohms. H. and N. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ $-54 \mathrm{~dB}, 15 \mathrm{i} / \mathrm{s}-57 \mathrm{~dB}$. Valves. Three motors (ext. rotor type). Superimpose. Pause. Inching. Straight-through pre-amplifier. Monitoring. Variable speed spooling. Removable head bridge. Drop-in loading. Mains $250 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$. Price (rack mounting): £319 16s.; (full-track stereo): £451 7s.

SONY. U.K. Sales Division, Mercia Road, Gloucester. Tel.: Gloucester 26841. Cables: Debelec, Gloucester.

TC250A. $\frac{1}{4}$-track mains operated transistorised stereo tape unit. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Spool 7 in . W. and F. less than $0 \cdot 19 \%$ at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$, less than $0.25 \%$ at $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. F.R. $30 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$ at $7 \frac{1}{2}$, $30 \mathrm{c} / \mathrm{s}-13 \mathrm{Kc} / \mathrm{s}$ at $3 \frac{3}{4}$. Replay char. CCIR. Low impedance inputs -72 dB , high impedance inputs -12 dB . Output: 1 V at 600 ohms. VU meter. Rewind time $3 \frac{1}{2}$ mins. $1,800 \mathrm{ft}$. One motor. Own deck. Superimpose. Pause. Position indicator. Mains $110-240 \mathrm{~V} 50 \mathrm{c} / \mathrm{s}$. Size: $14 \frac{1}{4} \times 6 \frac{1}{4}$ $\times 11 \frac{1}{2}$. Weight: $16 \frac{1}{2} \mathrm{lb}$. Price: $£ 6119 \mathrm{~s}$.

TANDBERG. U.K. distributors: Elstone Electronics Ltd., 81 Kirkstall Road, Leeds, 3. Tel.: Leeds 3-5111.

Tandberg Series 6. For details see Professional and Semi-professional Tape Recorders section.

TRUVOX LTD., Neasden Lane, London, N.W.10. Tel.: Dollis Hill 8011. Cables: Truvoxeng, London, N.W.10.

PD 104. $\frac{1}{4}$-track transistorised stereo tape unit. Speeds: $7 \frac{1}{2}, 3 \frac{3}{4}, 1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Spool 7 in . W. and F. $<0 \cdot 1 \%$ at $7 \frac{1}{2}, 0.15 \%$ at $3 \frac{3}{4}, 0.25 \%$ at $1 \frac{7}{8}$. H. and N. -50 dB . F.R. $7 \frac{1}{2} 30 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}, 3 \frac{3}{4}$ $40 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}, 1 \frac{7}{8} 60-8 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Replay char. new CCIR. Inputs: mic. 1 mV $50 \mathrm{~K}, \mathrm{rad} / \mathrm{PU} 50 \mathrm{mV} 100 \mathrm{~K}$. Outputs: two 1 V across 100 ohms. Two level meters. Rewind time $1,200 \mathrm{ft} .1 \mathrm{~min}$. Three motors, capstan motor outer-rotor type. Own deck. Pause. Four-digit position indicator. Straight-through pre- amplifier. Source-tape monitor. Three heads. Mixing. Track-to-track copying. Mains $200-250 \mathrm{~V}$ AC. Size: $16 \times 16 \frac{5}{8} \times 8$ in. Weight: 28 lb . Price: £93 9s.

PD102. $\frac{1}{2}$-track transistorised stereo tape unit. Specification as for PD104. Price: $£ 97$ 13s.

## TAPE AMPLIFIERS AND MIXER UNITS

AMPEX (GREAT BRITAIN) LTD., Acre Road, Reading, Berkshire. Tel.: Reading 84411. Cables: Videotape, Reading.

Ampex 622 Speaker/amplifier. Comprises 8 in. drive unit in special enclosure. Acoustically flat from 60 to $10,000 \mathrm{c} / \mathrm{s}$. The built-in amplifier has 10 watts output. F.R. $20-20,000 \mathrm{c} / \mathrm{s} \pm 0 \cdot 5 \mathrm{~dB}$. Price on application.

- Ampex MX10. Stereo mixer unit. Inputs: 4 mic., or 2 mic. 2 line. Mic. 200 ohms, Line 100 K bridging. Gain -67 dBm mic., -27 dBm line will produce IV output. Up to 4 mixers may be coupled to give 12 in ., 2 out channels. Output: 1V normal, 30 V max. unbalanced. F.R. 40$15,000 \mathrm{c} / \mathrm{s}$. Signal/noise 65 dB for inputs of -55 dBm . Controls: 4 pots, two gang master gain. Key switches, Line/Mic. AC line switch, mixer couple switch. Key switches, channel A, B or both. Four channels in, two out. Self-powered $105-125 \mathrm{~V}, 30 \mathrm{~W}$. Size: $5 \frac{7}{32} \times 19 \times 5 \frac{3}{16} \mathrm{in}$. Price on application.

Ampex MX35. Identical to MX10, except in physical appearance.

## ASSOCIATED ELECTRONIC ENGINEERS

LTD., 10 Dalston Gardens, Stanmore, Middx. Tel.: Wordsworth 4474/5/6. Cables: Astronic, Stanmore.

Astronic A.1446. Six channel electronic mixer unit. Designed for 5 low imp. sources each $10 / 30$ ohms, 0.5 mV ; 1 high imp. source 250 K ohms, 0.2 volts. There are four output sockets supplying $0 \cdot 7 \mathrm{~V}$ into 600 ohms. A master gain fader is incorporated, and each channel has an indicator lamp to show which sources have been faded up. AC mains required. Size: $9 \times 11 \times 8 \frac{1}{2}$ in. Price: $£ 58$ 10s.

BINSON. See Modern Electrics Ltd.

BRENELL ENGINEERING CO. LTD., 231/5
Liverpool Road, London, N.1. Tel.: North 8271 (5 lines).

Mk. 5 Series 3 Record/playback amplifier. Inputs: mic. 2 Series 2 mV , radio/gram 75 mV , both high imp. Outputs: 200 mV at 50,000 ohms,
and 4 W into 15 ohms for direct connection to loudspeaker. Headphone monitoring M.E. level ind. or meter if required. Price: $£ 26$. Meter: £5 5s. extra.

Brenell Mixer Unit. Three channel unit. High imp. sources. There are 4 sockets for jack plugs for the three inputs and the output lead, each input having a volume control. Price: $£ 218 \mathrm{~s}$.
(2) Hi-Fi Tape Link. Stereo tape pre-amplifier and oscillator unit. 9 valves. Input (record): 75 mV stereo, 100 mV mono, into 1 megohm. Input (playback): 1.5 mV . Output: variable up to 1 V at 47 K . F.R. $40 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s}$ at tape speed $7 \frac{1}{2} \mathrm{i} / \mathrm{s} \pm 3 \mathrm{~dB}$. Equalisation to new CCIR at all speeds. Two level meters. H. and N. -50 dB . Controls: Tape speed compensation switch, variable bias, record track selector, monitor original/tape, record gain, playback gain, function. Separate mains unit $110-250 \mathrm{~V}$. DC heater supply. Suitable for Brenell three-head stereo decks, $\frac{1}{4}$ - or $\frac{1}{2}$-track. Sizes: tape link $13 \frac{3}{4} \times 4 \times 8 \frac{3}{4}$ in., front panel $15 \frac{1}{2} \times 4 \frac{1}{2}$. Power unit $6 \frac{1}{2} \times 4 \times 4 \mathrm{in}$. Weight: 18 lb . including power unit. Separate record and playback preamplifiers. Price: $£ 46$.

STB2 Monitor amplifier. See Tape Units section.

DEIMOS LTD., 8 Corwell Lane, Hillingdon, Middx. Tel.: Hayes 3561.
 tape amplifier system available with many alternative features to suit various decks and tape heads. Separate playback and record amplifiers. Basic input sensitivity: radio 50 mV , mic. 0.5 mV . Cathode follower output. Equalisation for any standard speed or playback characteristic. Level indicator optional, meter or M.E. Separate power supply available. Full details and prices on request.

EAGLE PRODUCTS. Distributors: B. Adler \& Sons (Radio) Ltd., 32a Coptic Street, London, W.C.1. Tel.: Museum 9606/7. Cables: Reldab, London.

Model MM. 4 4-Channel Microphone Mixer. 4 high imp. inputs, with individual gain


Astronic A1446 mixer


Eagle MM. 4 microphone mixer


Benson Echorec Mk. 2


Gramdeck preamp


Deimos tape amplifier
controls; max. signal 1.5 V . One output, max. signal $2 \cdot 5 \mathrm{~V}$. Self-powered ( 9 V battery). Size: $6 \times 3 \frac{1}{4} \times 2$ in. Price: $£ 2$ 19s. 6d.

OM.X miniature audio mixer. Two inputs each with independent gain control. Phono sockets for inputs and output. Size: $2 \frac{3}{4} \times 1 \frac{3}{4} \times \frac{7}{8} \mathrm{in}$. Price: £1.
Prices quoted for Eagle products are approximate.

ELECTRONIC \& SCIENTIFIC INSTRUMENTS (WORTHING) LTD., Distributors: Shirley Laboratories Ltd., 3 Prospect Place, Worthing, Sussex. Tel.: Worthing 30536.

Esimix Minor. Details as for Major. P.s.n. 250-300V DC, $10 \mathrm{~mA} ; 6 \cdot 3 \mathrm{~V}, 0 \cdot 6 \mathrm{amps}$. Price: $£ 12$ 12s.; (4 mic. version): £13 13s.

Esimix Major. Four-channel electronic mic. and signal mixer. F.R. at full gain: $15 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$ $\pm 2 \mathrm{~dB}$. H . and N . better than -50 dB . Channels 1 and 2 (mic.): 2 mV input for 200 mV output; channels 3 and 4 (radio, etc.): 100 mV input for 200 mV output. Cathode-follower output, permitting the use of long connecting lines without risk of hum. Self-powered. 230-250V AC. Price: £19 19s.; (4 mic. version): £21.

Power Supply Unit available for Esimix Minor. Price: $£ 3$ 13s. 6d.


ESIMIX. See Electronic and Scientific Instruments (Worthing) Ltd.
A. R. FRANKLIN, Audio Engineer, 6 Kings College Mews, London, N.W.3. Tel.: Juniper 0480.

Mixers and tape amplifiers. Built to customers specific requirements. Wide range of facilities offered.

GRAMPIAN REPRODUCERS LTD., 19 Hanworth Trading Estate, Feltham, Middx. Tel.: Feltham 2657. Cables: Reamp, Feltham.

Grampian Mike 3. Transistorised electronic mixer. Inputs: 2 low level mics. $300 \mathrm{mV}, 600$ ohm; 1 high level aux. for tape or radio 500 mV , 1 megohm (other imps. available). Output: 1V,

600 ohms. F.R. $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$ on all inputs. Signal/noise : overall (all channels closed, tone controls level) 68 dB , full output; (all channels open, tone controls level) 50 dB , full output. Controls: supply switch, bass cut, treble cut, aux. gain, mic. 2 gain, mic. 1 gain. Three channels. Powered by internal 9 V dry battery. Size: $8 \frac{1}{4} \times 5 \frac{1}{4} \times 3 \frac{1}{2}$ in. Weight: (incl. battery) less than 4 lb . Price: $£ 20$ 10s. (battery extra).

GRUNDIG (GT. BRITAIN) LTD., Newlands Park, Sydenham, S.E.26. Tel.: Sydenham 2211. Cables: Grundig, London. Telex: 22054.

Stereo/Mono Mixer Type 608. F.R. substantially flat, $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Fully transistorised. Fed from two batteries type PP3 (or equivalent). Connecting sockets for two mics. (left-hand and right-hand channels), a further mic., and connection of radio and stereo pickup. Mono/stereo output socket provided. Linear fading controls. Inputs from mono mic. or radio connected to appropriate socket can be mixed with stereo programme, and with aid of a "Directional Control" these mono inputs may be mixed with either left- or right-hand channels, or combined with both. Coarse level controls provided, and two press buttons select appropriate mono signal and feed this to directional control. Size: $9 \frac{1}{2} \times 8 \times 3 \mathrm{in}$. Weight: $3 \frac{3}{4} \mathrm{lb}$. Price: $£ 18$ 18s.

HEATHKIT. See Kit section.

THE LOWTHER MANUFACTURING CO., St. Mark's Road, Bromley, Kent. Tel.: Ravensbourne 5225. Cables: Lowther, Bromley.

Companion Supply Unit No. 2. H.T. and L.T. power supply suitable to power radio tuners. Pre-amp and tape bias amplifier. Output: 250 V at $40 \mathrm{~mA}, 6 \cdot 3 \mathrm{~V}$ at 3 amps . Price: $£ 55 \mathrm{~s}$.

Companion Supply Unit No. 3. H.T. and L.T. power supply suitable to power radio tuners. Pre-amp and tape bias amplifier. Output: 350 V at $35 \mathrm{~mA}, 6 \cdot 3 \mathrm{~V}$ at 3 amps . Price: $£ 515 \mathrm{~s}$.

LUSTRAPHONE LTD., St. George's Works, Regent's Park Road, London, N.W.1. Tel.: Primrose 8844. Cables: Lustraphon, London.
M.U.577. Transistor mixer unit. Inputs: 1 and 2 are balanced and are suitable for low imp.


Lustraphone MU577


Brenell Hi-Fi tape link


Philips ET 1042/10 mixer


Shirley TW/PA4


Grampian mike 3 mixer
mics. (line or high imps. to order). 3 and 4 are high imp. and suitable for radio or pu. High imp. output. F.R. substantially flat $50-14,000 \mathrm{c} / \mathrm{s}$. Power by mercury cell with 1,000 hours life. Alternative input and output imp. to specification. Price, standard model: £22.

A range of transistorised power amplifiers, up to 50 watts, and complete public address systems. Model PPA/570. Price: $£ 60$. Details on application.

MODERN ELECTRICS (RETAIL) LTD., 120 Shaftesbury Avenue, London, W.1. Tel.: Gerrard 9692 and Temple Bar 7587. Cables: Modcharex.

Binson Echorec Mark 2. Pre-amplifier and echo unit. Enables echo to be imposed on any audio signal in a wide choice of timing. Facilities for the imposition of swell and reverberation. Three channels which can be selected as required. Completely portable. Operates from AC Mains supply. An exclusive design of magnetic wheel with transistorised circuitry. Price: $£ 176$ 8s.

Binson Echorec Export. Single channel version of the Mark 2, for echo and swell. Price: $£ 1105 \mathrm{~s}$.

PENCO PRODUCTS, 36 Coniston Road, Kings Langley, Herts. Tel.: Kings Langley 3134.

Epigram Mix/4. Three channel unit. Incorporates 3 transistors and is designed for 2 low imp. 15/30 ohms and one high imp. input. Power derived from $4 \frac{1}{2} \mathrm{~V}$ battery. Output is high imp. Rectangular case: $12 \times 3 \times 2 \frac{1}{2}$ in. Price: $£ 1515 \mathrm{~s}$.

Enquiries invited for special models built to customers' particular requirements. Quotations on request.

PETO SCOTT LTD., Addlestone Road, Weybridge, Surrey. Tel. : Weybridge 45511.

ET 1042/10. Four channel mixer unit. Input: imp. 50 ohms, 0.2 mV . Outputs: 50,000 ohms at 200 mV or 6,500 ohms at 10 mV . Four individual mic. input controls and master. F.R. 50$12,000 \mathrm{c} / \mathrm{s}$ with speech filter giving 6 dB cut at $60 \mathrm{c} / \mathrm{s} . \mathrm{S}-\mathrm{N}-70 \mathrm{~dB}$. Self-powered, 200-250V $50 \mathrm{c} / \mathrm{s}$ AC. Suitable for all Philips amplifiers. Size: $13 \frac{1}{2} \times 7 \times 3 \frac{1}{16}$ in. Price: $£ 35$.

PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Avenue, London, W.C.2. Tel.: Gerrard 7777. Cables: Phillamps, London.

Philips EL3787A tape pre-amplifier. Used in conjunction with Philips EL3553, EL3558, EL3556 and Stella ST462 and ST463 mono mains recorders the EL3787A pre-amplifier, together with additional equipment, offers the following facilities: playback of pre-recorded stereo tapes; duoplay (playback of one track while recording on the parallel track); multiplay (copying from one track to another and simultaneously adding an accompaniment). Price: £6 10s.

SABA ELECTRONICS LTD., $3 / 5$ Eden Grove, Holloway, London, N.7. Tel.: North 8161. Cables: Arc Eeslon.

Regie-Mixer. Transistorised stereo mixer. Inputs: $3 \mathrm{mV} 3 \mathrm{~K}, 15 \mathrm{mV} 3 \mathrm{~K}, 15 \mathrm{mV} 3 \mathrm{~K}, 500 \mathrm{mV}$ 1 megohm. Output: 80 mV . Independent slider controls on all inputs. Noise better than 40 dB . Power supply: B122 $22 \frac{1}{2} \mathrm{~V}$ battery or from TK230-S recorder. Size: $8 \frac{1}{2} \times 7 \frac{1}{2} \times 3 \frac{1}{4}$ in. Price: £18 18s.

SHIRLEY LABORATORIES LTD., 3 Prospect Place, Worthing, Sussex. Tel.: Worthing 30536.

TW/PA4. Recording amplifier for use with high quality power amplifier. Inputs: 1.5 mV and 60 mV . Bias and erase oscillator. Full corrections. Valve voltmeter modulations level ind. For use with Wearite or Ferrograph tape decks (TW/PA4U for Planet decks), can be supplied to order for any deck. Size: $10 \times 5 \frac{1}{2}$ $\times 5 \frac{1}{4}$ in. P.s.n. from main amp. or power pack can be supplied at $£ 616 \mathrm{~s}$. 6d. Price: $£ 3413 \mathrm{~s}$.

TWA/1515HG. Complete stereo record and replay amplifier. Inputs: radio 50 mV , gram. 5 mV (RIAA), mic. 2 mV , tape 3 mV . Output: 12W per channel (17W peak). F.R. $45 \mathrm{c} / \mathrm{s}-25$ $\mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$ on radio input. Low distortion bias and erase oscillator included. Valve voltmeter level indicator. H. and N. -85 dB . Controls: bass, treble, vol., pre-set balance, meter pre-set, bias pre-set, sel., rec/replay, equalisation, mono/ stereo. Heavy duty power pack on. separate chassis. Size (control unit): $23 \times 7 \frac{1}{2} \times 7$ in.; (power unit): $10 \times 8 \times 7 \frac{1}{2}$ in. TWP/ 1515 HG for Planet decks. TWA/1515HG for Ferrograph decks. TWH/1515HG for Brenell and similar decks. Price: $£ 115$ 10s.

TW/15HG. Single channel mono version of TWA/1515HG. Price: $£ 53$ 11s.

SOUND NEWS PRODUCTIONS, 10 Clifford Street, New Bond Street, London, W.1. Tel.: Regent 2745.

Unimixer 1.3 channel unit. Channels 1 and 2 have independently controlled duplicate sockets for low or high imp. mics. 30 ohms or 400 K approx. Recommended load imp. not less than 500 K ohms. F.R. from 30 ohm input $50-10,000$ $\mathrm{c} / \mathrm{s} \pm 3 \mathrm{~dB}$. Price: $£ 99 \mathrm{~s}$.

Unimixer 2. 3 channel unit. Inputs as above but high imp. is 5 megohms in channels 1 and 2. Power supply needed $200 / 300 \mathrm{~V}$ DC at 5 mA , 6.3 V at 0.3 amps balanced. Special connectors available to obtain power supplies direct from Ferrograph or Vortexion recorders without any alteration. Price: $£ 1515 \mathrm{~s}$.

STERN-CLYNE LTD., Head Office and mail order, 3-5 Eden Grove, Holloway, London, N.7. Tel.: North 8161. Branches throughout: London, Liverpool, Manchester, Sheffield, Bristol and Nottingham.

HF/TR3 Mk. II. Tape amplifier. Inputs: mic. 2.5 mV , radio/pickup 300 mV . F.R. $35 \mathrm{c} / \mathrm{s}-17$ $\mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$ at $15 \mathrm{i} / \mathrm{s}$. Equalisation available for $15,7 \frac{1}{2}$ and $3 \frac{3}{4} \mathrm{i} /$ s or $7 \frac{1}{2}, 3 \frac{3}{4}$ and $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. 3 W output into 3 , $7 \frac{1}{2}$ or 15 ohms. To Mullard design. Suitable for Brenell and Magnavox decks. Price with separate power unit: $£ 19$ (also available in kit form): $£ 1313 \mathrm{~s}$.

Type C Mk. II. Tape pre-amplifier. Inputs: mic. 0.5 mV , radio/pickup 250 mV . F.R. $30 \mathrm{c} / \mathrm{s}-$ $17 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$ at $15 \mathrm{i} / \mathrm{s}$. Equalisation available for $15,7 \frac{1}{2}$ and $3 \frac{3}{4} \mathrm{i} /$ s or $7 \frac{1}{2}, 3 \frac{3}{4}$ and $1 \frac{7}{8} \mathrm{i} / \mathrm{s}$. Audio output: 250 mV . To Mullard design. Suitable for Brenell and Magnavox decks. Price with separate power unit: $£ 19$ 10s. (also available in kit form): $£ 14$.

TELE-RADIO (1943) LTD., 189 Edgware Road, London, W.2. Tel.: Paddington 4455.

Masterlink M3. Tape pre-amplifier. Mainly for Wearite series of decks, but suitable for

Collaro and Brenell. Inputs: mic. $3 \mathrm{mV}, 1$ megohm; radio/pickup $100 \mathrm{mV}, 1$ megohm. Output: approx. 200 mV . Response at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ with Wearite deck $30-14,000 \mathrm{c} / \mathrm{s}$. Equalisation for $15,7 \frac{1}{2}, 3 \frac{3}{4}$ and $\frac{17}{8} \mathrm{i} /$ s. EM84 level ind. Controls: bias, selector, indicator, equaliser, gain. Self-powered (separate power pack). Price: £22 1s.

Master-Mixer. 4-channel electronic mixer, complete with power supply, in matching case and finish to Masterlink M3. Separate output control. Input sensitivity 3 mV per channel at high imp. for maximum output of 250 mV . Inputs and output connection at rear by jack sockets. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Modifications to specific requirements, also to low imp. channels available on request. Price: $£ 22$ 1s.

TRIPLETONE MANUFACTURING CO. LTD., 241a The Broadway, Wimbledon, S.W.19. Tel.: Liberty 1189.

Transistorised Pre-Amplifier. For details see Amplifiers Section.

UHER. Distributors: Bosch Ltd., 205 Great Portland Street, London, W.1. Tel.: Langham 2672/5.

A121. Stereo/mono mixer unit. Input: $0 \cdot 1$ $\mathrm{mV}, 2 \mathrm{~K}$. Output approx.: 30 mV . F.R. $20 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s}$. Five glider controls. Five channels. P.s.n. 9V. Price: $£ 47$ 6s. 9 d .

VORTEXION LTD., 257/263 The Broadway, Wimbledon. Tel.: Liberty 6242/3. Cables: Vortexion, Wimble, London.

Electronic mixers. Various types of mixers available: 3-channel with accuracy within 1 dB . Peak programme meter. 4- 6- 8-10- and 12channel mixers. Also twin 5-channel stereo. Tropicalised controls. Built-in screened supplies. Balanced line mic. inputs. Outputs: 0.5 V at 20 K , or alternative 1 mW 600 ohms, balanced, unbalanced or floating. Prices on application.

## TAPE ACCESSORIES and COMPONENTS

ABBEY TAPE RECORDERS, 5 Shakespeare
Road, London, N.3. Tel.: Virginia 9871.
Slide synchronising unit. Specially designed for use with tape recorders using Thorn tape decks, in particular HMV, Ferguson, Marconiphone and Ultra. Price (with full instructions): £7 7s.

AGFA-GEVAERT LTD., 27 Great West Road, Brentford, Middlesex. Tel.: Isleworth 2131. Cables: Artoveg, Brentford, Hounslow.

Tape Accessory Kit. Plastic case containing red, green and white leader tape, adhesive splicing tape, silver stop foil, non-magnetic scissors, tape clips and splicing template. Price: $£ 114 \mathrm{~s} 6 \mathrm{~d}$.

Leader tapes. AmG/25 Green leader tape 82 ft . 2 s . 6 d .; AmR/25 Red leader tape 82 ft . 2s. 6d.

Empty spools. Supplied in boxes with tape clip and plastic bag. 3 in . $3 \mathrm{~s} . ; 4 \mathrm{in}$. 3 s . 9 d .; 5 in . 4 s . 3d.; $5 \frac{3}{4} \mathrm{in} .4 \mathrm{~s} .6 \mathrm{~d} . ; 7 \mathrm{in} .4 \mathrm{~s} .9 \mathrm{~d} . ; 8 \frac{1}{4} \mathrm{in} .7 \mathrm{~s} . ; 10 \mathrm{in} .12 \mathrm{~s} .3 \mathrm{~d}$.

AKAI. Distributors: Pullin Photographic Ltd., 11 Aintree Road, Perivale, Greenford, Middlesex. Tel.: Alperton 1541. Cables: Pullinfoto, Greenford, Middlesex.

Endless Tape AE-1. Continuous spool formed by splicing together the two ends of the tape. Price: $£ 311 \mathrm{~s}$.

Telephone Pickup AS-2. Miniature pickup coil with rubber suction attachment, screened lead and jack-plug. Price: $£ 2$ 3s.

Tape Splicer AS-3. Easy action and rapid splicing. Price: $£ 11 \mathrm{~s} .6 \mathrm{~d}$.

Personal Phone AM-4 and AM-4P. Personal phone complete with lead and plug. AM-4 has right-angled plug, AM-4P has perpendicular plug. Price (both models): 16s. 6d.

Head de-magnetiser AH-6. Mains-operated head de-magnetiser. Price: $£ 210$ s.

Bulk tape eraser ATE-7. Compact mainsoperated eraser accommodating reels from 3 in .
to $10 \frac{1}{2}$ in. Push-button operation for power and tape rotation. Price: $£ 132 \mathrm{~s}$.

OStereo Headphones ASE-8S. Lightweight comfortable headphones specially designed for use with Akai recorders. Price: $£ 5$ 19s.

DIN Jack Connection Cord D100. Consists of screened lead terminated at one end with a DIN plug and at the other with a DIN socket. Price: £1 6s.

Remote Control 345-RC-11. Designed for use with Akai recorder Model 345 and tape decks 345D and $345-$ NC. Provides remote operation of all essential controls. Price: $£ 811 \mathrm{~s} .9 \mathrm{~d}$.
$10 \frac{1}{2}$ in. Extension Arms. Permit the use of $10 \frac{1}{2}$ in. spools. Suitable for Model 345 recorder and 345D and $345-\mathrm{NC}$ tape decks. Price: $£ 12$ 15s.

AKG. (Akistische und Kino-Gerate GmbH.). Distributors: Politechna (London) Ltd., 182184 Campden Hill Road, Kensington, London, W.8. Tel.: Park 0711/3, 5008.
A.K.G. K50. Dynamic headphones. F.R. 20$25,000 \mathrm{c} / \mathrm{s}$. Impedance 75 ohms per earpiece. Suitable for stereo or mono. Weight: 80 grams. Price: $£ 7$ 10s. Ear pads available.

AMOS OF EXETER LTD., Weircliffe Court, Exwick, Exeter. Tel.: Exeter 72132. Cables: Amos, Exeter.

Weircliffe Bulk Erasers. Models 6, 7, and 8. Model 6 accepts reels up to $8 \frac{1}{2} \mathrm{in}$. diameter of $\frac{1}{4}-1 \mathrm{in}$. tape. Capacity $180-400$ reels per hour. Model 7 accepts $8 \times 8$ in. cassettes of $\frac{1}{4}$ in. tape. Model 8 accepts reels of up to $14 \frac{1}{2}$ in. diameter containing tape from $\frac{1}{4}$ in. audio up to 2 in. video including $\frac{1}{2} \mathrm{in}$. and 1 in . instrument tape and 16 and 35 mm film. Capacity $100-400$ reels per hour. (NATO catalogue No. 5835-99-972-5371). Sizes (Models 6 and 7): $11 \frac{1}{2} \times 12 \frac{1}{4} \times 7 \frac{1}{2} \mathrm{in}$. Weight: 43 lb . Size (Model 8): $20 \frac{1}{2} \times 20 \frac{1}{2} \times 10^{\frac{1}{2}} \mathrm{in}$. Weight: 92 lb . Prices: Models 6 and $7 £ 32$ (ex works), Model $8 £ 75$ (ex works). Models available for $115 \mathrm{~V} 60 \mathrm{c} / \mathrm{s}$.


Akai AP-2 telephone pickup


Akai AS-3 tape splicer


Akai AE-1 endless tape


Akai ATE-7 tape eraser


Akai 345 remote control


Amplivox Jetlite JL256

AMPLIVOX LTD., Beresford Avenue, Wembley, Middlesex. Tel.: Wembley 8991. Cables: Amplivox, Wembley.

Jetlite JL25. Lightweight moving coil headphones. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Sensitivity: 0.5 mW produces comfortable listening level. Power input: 700 mW for $2 \%$ total distortion (3W momentary overload). Impedance: 200 ohms per earphone, may be connected in series, parallel or wired independently for stereo. Contoured earshells with detachable foam cushions. Fully adjustable headband. Special version with boom mic. (JL256). Price on application.

BASF Chemicals Ltd., 5a Gillespie Road, London, N.5. Tel.: Canonbury 2011.

Cutter Box. Contains automatic splicer, spare knife, 4 tape clips, stop foils, splicing tape, 3 leader tapes, spool labels and marking pencil. Price: £2 12s. 6d.

Splicing Set. Plastic box with bonding groove and 33 ft . of splicing tape. Price: 5 s .

- Tape Library Boxes. See tape section.

BEYER. Distributors: Fi-Cord International, Charlwoods Road, East Grinstead, Sussex. Tel.: East Grinstead 21351.

DT48. Studio quality dynamic headphones. Response $16 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Output level $\pm 1 \mathrm{~dB}$ $114 \mathrm{~dB} / \mathrm{mW}$. Impedance 5 or 25 ohms. Price: £30 15s. 6d.

DT49. Dynamic single earpiece. Response $30 \mathrm{c} / \mathrm{s}-13 \mathrm{Kc} / \mathrm{s}$. Output level $111 \mathrm{~dB} / \mathrm{mW}$ at $400 \mathrm{c} / \mathrm{s}$. Impedance 15 ohms. Price: $£ 105 \mathrm{~s}$.

DT90. Dynamic peak performance headphone. Impedance 200 ohms. Price: $£ 18$.

DT96. Ultra-lightweight dynamic headphones. Response $30 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}$. Output level: $110 \mathrm{~dB} / \mathrm{mW} \pm 3 \mathrm{~dB}$ at $400 \mathrm{c} / \mathrm{s}$. Impedance $2 \times 100$ ohms. Price: $£ 1014 \mathrm{~s} .6 \mathrm{~d}$.

DT98. Type DT96 lightweight headphones with lip mic. attached. Designed primarily for use in language laboratories. Price: $£ 219 \mathrm{~s}$.

DT508. Lightweight headphones with LR7 lead and potentiometer. Price: $£ 105 \mathrm{~s}$.

Various accessories including eartips, plastic earpads, rubber earpads, leads and transformers.

BRADMATIC LTD., 338 Aldridge Road, Streetly, Sutton Coldfield, Warwickshire. Tel. : Streetly 3171.

A range of twin track high impedance sound heads, single hole fixing, pole pieces are cylindrically ground flush with caps. Screening cans available.

Type 5 RP. Combined record/replay head 0.0004 in. gap. Price: $£ 35 \mathrm{~s}$.

Type 6 RP. Super fidelity record/replay head $0 \cdot 0002$ in. gap. Price: $£ 315 \mathrm{~s}$.

Type 5R. Record only 0.0007 in. gap. Price: £3 5s.

Type D5E. Erase head. Price: $£ 35 \mathrm{~s}$.
Full track versions of the above are also available.

Type ST-RP. Stereo record/replay head. Price with screen can, without fixing stem: $£ 6$.

## A. BROWN \& SONS LTD., 24-28 George Street, Hull. Tel.: Hull 25413.

Tape recorder covers to suit most makes from $£ 115 \mathrm{~s}$. to $£ 99 \mathrm{~s}$.
S. G. BROWN LTD., King George's Avenue, Watford, Herts. Tel.: Watford 23301. Cables: Radiolink, Watford.

A range of headphones suitable for recording and dictating equipment, e.g. lightweight miniature model. Price: from $£ 35 \mathrm{~s}$.

Super "K". Moving coil headphones. Available as monaural or binaural. Price: £6 17s.

Diplömat. Lightweight, high quality headset. Frequency response substantially flat from 30 $\mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. Price: $£ 66 \mathrm{~s}$.

Dynamic headset 4C 701 series. High fidelity dynamic headset for both mono and stereo reproduction. Particularly applicable for language laboratories, recording studios and the partially deaf. Low impedance receivers. Robust construction. Wide range of adjustment enables headset to be fitted to small child or large adult. Circumaural earpads ensure weight taken on bone structure of the head rather than on the


AKG K50 headphones

S. G. Brown diplomat headset

S. G. Brown dynamic headset

A. Brown recorder cover


Eagle SE1 stereo headphone
ears. Generous dimensions of earpads provide maximum comfort with large degree of ambient noise exclusion. Price: £6.

Headset 102190. Identical appearance to 4 C 701 but capable of handling sound pressure level of 130 dB . Approved by Royal National Institute for the Deaf. Prices on request.

Control Unit for use with headphones. Stereo or mono. Separate volume control for each channel, allows compensation for hearing deficiencies. Channel-blend device for stereo use. Isolation transformer. Impedance matching to 15 ohms or 600 ohms. Price to be announced.

COLTON \& CO. (LAPIDARIES) LTD., The Crescent, Wimbledon, London, S.W.19. Tel.: Wimbledon 9401.

Call Boy. Counter-type position indicator, incorporating three-figure counter and reset wheel. Provides accurate cueing for tape recorders with no counter device. Fitted by means of a suction pad. Drive taken direct from spool, obviating slip and ensuring accuracy. Coupling device, used to connect the counter with the spool, can be placed into position, or removed, swiftly and without disturbing tape. Available in two spool fitting. Price: $£ 22 \mathrm{~s}$.

Precision level. Spirit level of circular bubble type in white plastic case $1 \frac{3}{16} \mathrm{in}$. diameter, $\frac{1}{2} \mathrm{in}$. high. Three fixing holes provided or it may be secured with adhesive. Ensures accurate levelling in all directions. Price: 8s. 3d.

Tape storage rack. Constructed in heavy gauge welded wire finished in black polythene with matching or contrasting feet. May be used for tapes and books. Accommodation for 21 tapes. Sliding "tidy" keeps tapes upright when smaller quantity stored. Price: £1 1s. (U.K. purchase tax 1s. 4d.).

CONTRONICS LTD., Garth Works, Deepcut Bridge Road, Blackdown, Camberley, Surrey. Tel.: Deepcut 336.

Carol CS/1. Electronic synchronising unit for use with 8 mm cine projectors and stereo tape recorders. Price: $£ 25$.

COUSINO. Distributors: D. T. V. Group. 126 Hamilton Road, West Norwood, London. S.E.27. Tel.: Gipsy Hill 6166.

Audio Vendor. Single reel continuous loop tape magazine complete with friction-free tape. Versions for $3,5,8,12,15$ or 30 mins. running. Model C for clockwise feed reel rotation, Model CC for counter-clockwise. Prices: 3 min . $£ 37 \mathrm{~s} .6 \mathrm{~d} ., 5 \mathrm{~min} . £ 315 \mathrm{~s} ., 15 \mathrm{~min} . £ 416 \mathrm{~s} ., 30 \mathrm{~min}$. £9.

Various mounting accessories, spare magazines, anti-friction tape, etc. Details on request.

EAGLE PRODUCTS. Distributors: B. Adler \& Sons (Radio) Ltd., 32a Coptic Street, London, W.C.1. Tel.: Museum 9606/7. Cables: Reldab, London.

TD. 79 Tape Head Demagnetiser. 250V mains operation. Price: £1 9s. 6d.

TD. 109 Two-probe Tape Head Demagnetiser. 250 V mains operation. Price: $£ 118 \mathrm{~s}$. 9 d .
T. 635 Tape Splicer. Complete with cutting and trimming blades. Price: 16 s .
S.E.1. Professional Stereo Headphones. F.R. $25 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s} .3 \mathrm{in}$. dynamic speakers. Isolated right and left channels. "Flexifoam" seals. Dual adjustment. $\frac{1}{2} \mathrm{~W}$ input. Complete with control box for remote operation and impedance matching network. Price: $£ 75 \mathrm{~s}$.
S.E.2. Stereo Headphones. F.R. $25 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}$. Individual volume and balance controls on each earpiece. Soft foam rubber earpads. Adjustable headband. Impedance 8-16 ohms. Wired for stereo. Price: $£ 715 \mathrm{~s} .3 \mathrm{~d}$.
S.E.21. Professional Two-way Stereo Headphones. F.R. $25 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Each headphone contains $2 \frac{1}{2}$ in. LF unit and $\frac{5}{8}$ in. treble unit. Level controls and built-in attenuator to protect ears. Impedance 16 ohms. Stereo cable and plug. Adjustable headband. Foam rubber earpads. Price: $£ 86 \mathrm{~s}$. 9 d .

Prices quoted for Eagle products are approximate.

ELIZABETHANELECTRONICSLTD.,Crow
Lane, Romford, Essex. Tel.: Romford 64101. Cables: Elizabethan, Romford.

Elizabethan Stethoset Headphones. Lightweight, high impedance. Price: $£ 1 \mathrm{ls}$.


BASF tape editing kit


Global tape head cleaning tool

Grampian reverberation unit


Emitape accessory kit API24



Global Mk. 2 bulk eraser

ELSTONE ELECTRONICS LTD., 81 Kirkstall Road, Leeds, 3. Tel.: Leeds 35111.

WAL Tape Eraser. A mains operated tape demagnetiser, accommodates from 5 to 10 in . reels, push button operated. Erases both tracks in a few seconds. Available for $200-250 \mathrm{~V} .50 \mathrm{c} / \mathrm{s}$ or 111-125V, $60 \mathrm{c} / \mathrm{s}$. Price: $£ 618 \mathrm{~s}$. 6d.

WAL D-MAG. A mains operated head demagnetiser providing complete degaussing circuit. Suitable for erasing short passages from tape or striped film. Price: $£ 210 \mathrm{~s}$.
E.M.I. TAPE LTD., Blythe Road, Hayes, Middlesex. Tel.: Hayes 3888. Cables: Emitape, London.

Emiguide AP128. Set of 6 instructional tapes. giving practical guidance in tape recording. Price: $£ 211 \mathrm{~s}$. Available separately: 8s. 6d. each.
"Emitape Guide to Better Recording". All elements of tape recording described in straightforward terms by John Borwick. 56 pages fully illustrated. Price: 2s. 6d.

Emitape Jointing Compound. AP35 for C.A. base tape. AP77 for PVC base tape. A jointing fluid for making permanent welded joints in magnetic tape. Price: 7s. 6d. per bottle.

Emitape Jointing Tape. Adhesive jointing tape for simple and quick splicing and editing of magnetic tape. Price (AP102, $\frac{7}{32} \mathrm{in}$. wide): 4 s . 9 d . per reel; (AP103, $\frac{1}{2} \mathrm{in}$. wide): 7 s . 6 d . per reel.

Emitape P.V.C. Leader Tapes. A range of six coloured tapes to enable colour code references to be inserted in a reel of recorded tape for quick editing and indexing purposes. Packed in plastic dispensers. AP38/1 white; AP38/2 red; AP38/3 yellow; AP38/4 blue; AP38/5 orange; AP38/6 green; AP38/7 grey. Price: 4s. 6d. per reel.

Emitape Jointing Block AP123. The undercut channel holds the tape securely enabling a clean cut at $45^{\circ}$ or $90^{\circ}$. Price: 10 s . 6 d .

Emitape Non-magnetic Scissors. AP39. Made of non-ferrous metal, the scissors may be used for splicing magnetic tape without risk of magnetising, so ensuring a completely noiseless joint. Price: 16 s .

Emitape Accessory Kit AP124. Holds three reels of coloured leader tape, 1 reel of jointing, 1 reel of stop foil, 1 Emitape jointing block, 2
cutters. Packed in plastic rack (to hold 7 spools), designed for the workbench. Price: $£ 117 \mathrm{~s}$. 6d.

Emitape Metallic Stop Foil. AP125. Sufficient for 50 tapes. In plastic container. Price: 6 s . 6 d .

Emitape Plastic Spools in cartons. Price (AP93, 3 in.): 2s. $6 \mathrm{~d} . ;$ (AP93N, $\left.3 \frac{1}{4} \mathrm{in}.\right): 3 \mathrm{~s} . ;$ (AP84, 4 in.): 3 s .; (AP85, 5 in.): 3s. 6d.; (AP86, $5 \frac{3}{4} \mathrm{in}$.): $3 \mathrm{~s} .6 \mathrm{~d} . ;\left(\mathrm{AP} 87,7 \mathrm{in}\right.$.): 4 s .; (AP88, $8 \frac{1}{4} \mathrm{in}$.): 8s. 6d.

Emicase Polystyrene containers. Price (AP113, 3 in.) : 2s.; (AP114, 4 in.): 3s.; (AP115, 5 in .): 3s. 6d; (AP116, $5 \frac{3}{4} \mathrm{in}$.): 3s. 6d.; (AP117, 7 in .): 4 s .

Emitape plastic spool in library case. Selfstanding library case with empty spool and index. Compact programme storage. Price (AP143, 3 in.): 2s. 6d.; (AP144, 4 in.): 4s.; (AP145, 5 in.): 5s.; (AP146, 54 in .): 5s.; (AP147, 7 in .): 6 s .

GEV AERT. See Agfa-Gevaert Ltd.

GLOBAL PRODUCTS, 14 Underwood Road, Rothwell, Kettering, Northants. Tel.: Rothwell 540.

Bulk eraser Mk.2. Hand-operated bulk eraser housed in die-cast aluminium case $4 \frac{1}{2} \times 3 \frac{1}{2} \times 3 \frac{1}{2}$ in. finished in hammer blue. Single push-button control with neon indicator to show when "on". Transformer double-insulated and instrument earthed via two yards three-core mains lead. Versions for $100-130 \mathrm{~V}$ and $200-250 \mathrm{~V}$. AC only. Weight: 3 lb .2 oz . Price: $£ 514 \mathrm{~s} .6 \mathrm{~d}$.

Head assembly cleaning tool. Felt polisher and fibre scraper mounted on aluminium shaft with centre plastic grip enables heads, guides, pinchwheels, etc., to be reached for cleaning. Special materials cannot harm tape head faces. Price: 5 s .

GRAMPIAN REPRODUCERS LTD., Hanworth Trading Estate, Feltham, Middx. Tel.: Feltham 2657. Cables: Reamp, Feltham.

Grampian G.7. Matching units, consisting of double wound transformer in a Mu-metal case with jack socket on the primary and a screened lead on the secondary. Dimensions: $35 \times 1 \frac{1}{4} \mathrm{in}$. diameter. Versions available for matching 15/30 ohms, 600 ohms and 50,000 ohms or greater. Price: $£ 310 \mathrm{~s}$.


Grampian G7 matching unit


Koss SP3X stereo phones


Grampian Parabolic reflector


Harvey bulk eraser


Koss PRO-4 stereo phones


Koss $T 5$ remote control

Grampian Parabolic Reflector. Diameter 24 in., depth 5 in. Gain 14 dB over range of $500 \mathrm{c} / \mathrm{s}$ to $5,000 \mathrm{c} / \mathrm{s}$. To take Grampian DP4 and DP6 mics. Weight: $4 \frac{3}{4} \mathrm{lb}$. Price: $£ 610 \mathrm{~s}$.

Grampian Reverberation Unit. Self-contained portable unit, transistorised and operated from internal dry batteries. Independent input channels, low level and high level. Output 1V, 600 ohms. Size (including detachable lid): $17 \frac{1}{2} \times$ $5 \frac{1}{4} \times 6 \frac{1}{4} \mathrm{in}$. Weight: 12 lb . Price: $£ 52$ (batteries extra). Mains unit available.

Boom arm. Suitable for use with various types of mics. and stands. The clamp, locked by a single lever, allows the reach and angle to be readily adjusted as required. Length: 34 in. Weight: $1 \frac{3}{4} \mathrm{lb}$. Thread termination for mic. $\frac{5}{16}$ in. BSF male, thread termination for stand $\frac{5}{8}$ in. $\times$ 27 t.p.i. female. Supplied with adaptor to $\frac{5}{16} \mathrm{in}$. BSF female. Adaptors for other sizes available. Price: $£ 5$.

Windshields. For use with DP4, DP6 and DP8 mics. Pressure moulded cage with an inner lining and acoustic resistance network to reduce air turbulence to a low value. Size: $2 \frac{3}{4} \mathrm{in}$. diameter. Weight: $\frac{3}{4} \mathrm{oz}$. Price: 17 s . 6 d .

GRUNDIG (G.B.) LTD., 40 Newlands Park, Sydenham, London, S.E.26. Tel.: Sydenham 2211.

Sona Dia. Designed to synchronise a tape recorder with automatic slide change projector. Recording sense: lower $\frac{1}{4}$-track. Power consumption 3W. Control Pulse Frequency $100 \mathrm{c} / \mathrm{s}$. Price: $£ 1515 \mathrm{~s}$.

HARVEY ELECTRONICS LTD., 308 Farnborough Road, Farnborough, Hants. Tel.: Farnborough 41129. Cables: Harvelec, Farnborough, Hants.

A range of bulk erasers for $200-250 \mathrm{~V}$ or $100-130 \mathrm{~V}$ mains, $40-60 \mathrm{c} / \mathrm{s}$. Smallest model will take $3 \frac{1}{4}$ to 5 in . spools of $\frac{1}{4} \mathrm{in}$. tape, and the largest $3 \frac{1}{4}$ to 12 in . spools of 1 in . tape. Prices: from $£ 65 \mathrm{~s}$. to $£ 1510 \mathrm{~s}$.

ILFORD LTD., 201/3 Wardour Street, London, W.1. Tel.: Regent 8731.

Splicing tape. $108 \mathrm{ft} . \times \frac{1}{4} \mathrm{in}$. Price: 3 s . 6 d .
Metallic StopFoil. $100 \mathrm{ft} . \times \frac{1}{4}$ in. Price: 4s. 6d.

KOSS. Distributors: Audioson Ltd., York House, Empire Way, Wembley, Middlesex. Tel.: Diligence 1886.
-SP3X. Stereo headphones. Response $10 \mathrm{c} / \mathrm{s}$ $15 \mathrm{Kc} / \mathrm{s}$. Impedance 4-16 ohms. Moving coil. Sponge foam earpads. Distortion less than $1 \%$ at maximum audio output. 8 ft . 4 -way lead. Weight: 15 oz. Supplied with adaptor plate to facilitate use with mono and stereo systems. Colour: dark brown with beige ear and head cushions. Price: £9 18s.
-PRO-4. Professional quality stereo headphones. Response $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Impedance $4-50$ ohms. Moving coil. Fluid-filled ear cushions. Boom mic. attachment. Distortion less than $1 \%$ at maximum audio output. 8 ft . 4 -way lead. Weight: 19 oz . Ear cushions removable for washing. Colour: grey-green cups with green ear cushions. Price: $£ 17$ 10s.

T-5. Remote control listening station. The T-5 box can be placed in the most convenient spot and separate gain controls for each channel enable balance and volume to be set precisely at the listening position. Switch to cut off speakers and jacks for stereophones. Size: $5 \frac{7}{8} \times 3 \frac{1}{8} \times 2 \frac{7}{8}$ in. Weight: 14 oz. Price: $£ 4$.

LEEVERS-RICH EQUIPMENT LTD., 319 Trinity Road, Wandsworth, London, S.W.18. Tel.: Vandyke 9054/6. Cables: Leemag, London, S.W. 18 .

LeeRaser. Junior ER30A; Standard ER31B; Senior ER32B. Ultra rapid demagnetisers for spools of tape and accessories. Price: $£ 7$ 10s.; £ 10 ; $£ 20$.

6 Band Audio Equaliser Model 46X. Wide range equaliser covering spectrumin 6 separately adjustable and overlapping bands, suitable for use in transcription to match widely differing recordings to a common quality standard. Price: $£ 166$.

LENNARD DEVELOPMENTS LTD., 7 Slades Hill, Enfield, Middlesex. Tel.: Keats 0601.

Dry-splice. Pre-cut splicing tape for editing, repairing and splicing magnetic recording tape.


Leevers-Rich six-band equaliser


Metro-Splicer


Metro-Sound tape strobe


Leevers-Rich Leeraser ER32B


Metro-Sound tape accessories set


Multicore "Bib" flex tidy

No need for splicing block, scissors, razor blades, etc. Applied in same manner as selfadhesive plasters. Especially suitable for beginners and where speed is required. Supplied in packets of 24 splices with cardboard applicator. Price: 4s. 11d.

MASTERTAPE (MAGNETIC) LTD., Colnbrook, Slough, Bucks. Tel.: Colnbrook 2431.

Splicing kit. Contains five reels leader tape, one reel metallic strip, one reel adhesive, plastic splicer. Price: $£ 11 \mathrm{~s}$.

Empty spools in boxes. 3 in. 2s. 3d., 4 in. 3 s., 5 in. 3 s . $6 \mathrm{~d} ., 5 \frac{3}{4} \mathrm{in} .3 \mathrm{~s} .9 \mathrm{~d} . ; 7$ in. 4 s . 4 d .; $8 \frac{1}{4} \mathrm{in}$. 5s. 6d.

Leader Tape. Colours: red, white, blue, orange, yellow, gold. Price: 2s. 6d.

Metallic Strip. Price: 4s. 6d.
Jointing compound. 2 oz. bottle in box with brush. Price: 3s. 9d.

Tape retaining clips. Packet of 12 comprising three each, red, blue, yellow, green. Price: 2s. 6d.

MB ELECTRONIC. Distributors: Denham and Morley Ltd., Denmore House, 173/5 Cleveland Street, London, W.1. Tel. : Euston 3656. Cables: Denmorl, London, W.1.

- K64. Dynamic headphone for mono or stereo. F.R. $20 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}$. Impedance 200 ohms. Power requirements $60 \mathrm{mV} /$ system. Weight: 5 oz. Round or oval earpads. Connection: two single screened leads 5 ft .9 in . long. Price: $£ 66 \mathrm{~s}$.

K65. Dynamic headphone for mono or stereo. Similar specification to K64 but with the addition of boom mounted moving coil mic. K84N. Price: $£ 10$ 10s.

- K85. Dynamic headphone for mono or stereo. Standard model 200 ohms. Other impedances available 50, 100, 700 and 1500 ohms. F.R. 20 $\mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}$. Power requirements $60 \mathrm{mV} /$ system. Weight: 5 oz. Round or oval earpads. Price: £132s. 6d.

Various accessories available. Details and prices on request.

METRO-SOUND MANUFACTURING CO. LTD., Bridge Works, Wallace Road, Canonbury, London, N.1. Tel.: Canonbury 8641. Cables: Metrosound, London, N.1.

Metrostrobe. New design stroboscope for checking accuracy of tape recorder speeds at $3 \frac{3}{4}-7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ and $15 \mathrm{i} / \mathrm{s}$. Dials included for $50 \mathrm{c} / \mathrm{s}$ and $60 \mathrm{c} / \mathrm{s}$. Price: 12 s . 6d.

Klenzatape. Cleaning outfit for removing oxide deposits, dirt, etc., from tape heads in situ. Comprises a length of brushed velvet rubberbacked cleaning tape, two 3 in . spools and a bottle of cleaning fluid. Price: 13s. 6d. Replacement fluid 4 s ., replacement tape 6 s .

Metro-Tabs. Set of coloured identifying tabs for affixing to recording tape. Visible on the wound spool and may be catalogued on the folder supplied. Price: 3s. 11d.

Metro-Brush. Made with specially angled Feathersoft Nylon for cleaning inaccessible places on tape decks, ciné cameras, projectors, etc. Price: 2s. 6d.

Metro-Splicer. Suitable for splicing tape and 8 mm ciné film. Cuts at any angle. Nonmagnetic blade. Price: 15 s .

Metro-Stop. Auto-stop actuator fluid. Should be applied to tape to actuate the auto-stop mechanism of the tape recorder. Special removing fluid is also supplied and the kit includes rod applicator for both Metro-Stop and remover. Price per set: 17 s . 6 d .

Tape Accessories Set. Contains Klenzatape, Metro-Splicer and Metro-Brush. Price: $£ 110$ s.

Leader Tape Set. Five colours. Price (per set): 5s.

Tape Splicing Block. Precision splicer with stainless steel non-magnetic cutter. Price: 9s. complete.

Maintenance Kit. Tape recorder mechanical maintenance kit. Price: $£ 115 \mathrm{~s}$.

MINNESOTA MINING AND MANUFACTURING COMPANY LTD., 3M House, Wigmore Street, London, W.1. Tel.: Hunter 5522. Cables: Minnesota, London.

Scotch Accessory Kit. Contains Splicer, roll of No. 41 Splicing tape on dispenser, roll of


Bib tape splicer


Wearite Defluxer


Pioneer SE- 2 P headphones


Symphony model B tape timer


[^3]

Valradio type $12 / 35$ T DC converter


WAL $D-M A G$


No. 24 White Leader and Timing tape, cutter, 10 magnetic tape fastening clips. Price: £1 14s. 6d. Available separately: Tape clips. Price (per packet of 10): 2s. 6d. No. 24 Leader and Timing Tape. Price ( $\frac{1}{4} \mathrm{in} . \times 100 \mathrm{ft}$ ): 6 s . No. 41 Splicing Tape ( $\frac{1}{2} \mathrm{in} . \times 150 \mathrm{in}$.): 3s. 6 d ., $\left(\frac{7}{32} \mathrm{in} . \times 66 \mathrm{ft}\right.$ ): 4 s . $6 \mathrm{~d} .,\left(\frac{1}{2} \mathrm{in} . \times 66 \mathrm{ft}\right.$.): 6 s .6 d . No. 51 SensingTape.Price ( $\frac{7}{32} \mathrm{in} . \times 150 \mathrm{in}$.): 14 s .

Scotch Tape albums. See magnetic tape section.

MULTICORE SOLDERS LTD., Multicore Works, Hemel Hempstead, Herts. Tel.: Boxmoor 3636.

The "Bib" Tape Splicer. This splicer enables the tape to be joined easily and to be edited to the accuracy of a syllable. Supplied complete with razor cutter and mounted on flock-covered panel. Price: 18s. 6d.

The "Bib" instrument cleaner. Ideal for cleaning tape heads, plastics, instrument panels, etc. Does not smear, is anti-static. Size A plastic bottle. Price: 4s. 6d.

The "Bib" flex shortener. Keeps your equipment leads neat, tidy and out of harms way. Made in clear plastics and supplied in packs of four. Price: 2s. 6d. per pack.

OSMABET LTD., 46 Kenilworth Road, Edgware, Middlesex. Tel.: Stonegrove 9314.

> "Instant" Bulk Tape Eraser and Recording Head Demagnetizer. Operates from AC mains to provide rapid and complete erase of tapes prior to making quality recordings. Weight: 18 oz. Price: $£ 115 \mathrm{~s}$.

PHILIPS ELECTRICAL LTD., Electroacoustics Division, Century House, Shaftesbury Avenue, London, W.C.2. Tel.: Gerrard 7777.

Empty spools. 3 in. 2s. 6d., 4 in. 3s., 5 in. 3s. 6d., $5 \frac{3}{4} \mathrm{in} .3 \mathrm{~s} .9 \mathrm{~d} ., 7 \mathrm{in} .4 \mathrm{~s}$.

Leader Tapes. White, green, red, blue. 32 ft . reels. Price: 2s. each.

Switching foil. 16 ft . reels. Price: 2 s . 9d.
Adhesive jointing tape. 32 ft . reel. Price: 5 s .

EL1901/50. Splicing kit. Contains white, green, red and blue leader tape, switching foil, adhesive tape, adhesive labels, cutting blade, splicing jig and instructions. Contained in plastic case. Price: $£ 13 \mathrm{~s}$.

Stethoscope headphones. Various models. For use with Philips and Stella recorders. Price: (mono) £3 10s.; (stereo) $£ 510 \mathrm{~s}$.

PIONEER. Distributors: Swisstone Ltd., 26 Leigh Place, Cobham, Surrey. Tel.: Cobham 2853.

OSE-21. Two-way stereo headphones. Each earpiece comprises $2 \frac{1}{2}$ in. LF unit and $\frac{5}{8} \mathrm{in}$. HF unit. Individual level controls. Built-in overload protection attenuator. Fully adjustable. Lightweight with soft rubber earpads. Price: $£ 1010$ s.

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REVOX. Distributors: C. E. Hammond \& Co. Ltd., 90 High Street, Eton, Windsor, Berks. Tel.: Windsor 63388. Telex: 84316.

Slide-o-matic. Transistorised accessory for the Revox 736 stereophonic tape recorder which enables pulses to be recorded for the remote control of automatic transparency projectors. Price: £17 17s.

SCOPETRONICS LTD., Crown Works, Church Road, Kingston-upon-Thames, Surrey. Tel.: Kingston-upon-Thames 1275/4135.

Scopetronics Tape Heads. Full-track, $\frac{1}{2}$-track, stereo $\frac{1}{2}$-track, stereo $\frac{1}{4}$-track. All heads same size and fixing. Impedances to suit customers' requirements. Also commercial heads for drum and ciné use. Prices and further details on application.

SCOTCH. See Minnesota Mining and Manufacturing Co. Ltd.

SENNHEISERELECTRONICS. Distributors: Audio Engineering Ltd., 33 Endell Street, London, W.C.2. Tel.: Temple Bar 0033.

OHD. 110 Stereo Headphones. Robust moving coil headphones wired for mono or stereo. Full details and prices on application.

STC LTD., Electro-mechanical Division, West Road, Harlow, Essex. Tel.: Harlow 26811.
-Stereo headset. F.R. $30 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 4 \mathrm{~dB}$. Sensitivity 1 dyne/volt +50 dB . Impedance 300 ohms. Transformer fitted. Foam rubber earpads. Price: $£ 7$ 7s.

STUZZI.U.K.Distributors:Recording Devices Ltd., 197 Lower Richmond Road, Richmond, Surrey. Tel.: Prospect 4463.

Stuzzi Tape Tuner. A.M. tuner variable tuning F.R. $190-550 \mathrm{~m}$ and $1,500 \mathrm{~m}$ preset. Powered by one PP3 battery. Printed circuit construction. Size: $5 \frac{3}{4} \times 4 \frac{1}{4} \times 1 \frac{7}{8} \mathrm{in}$. Price: $£ 41 \mathrm{~s}$. 10 d . (U.K. purchase tax 13s. 2d.).

SYMPHONY AMPLIFIERS LTD., 16 King's College Road, London, N.W.3. Tel.: Primrose 3314/5.

Model A Tape Timer Unit. Contains special electric Time Unit with normal 12 hour dial. Neon Indicator. Fitted to take 13 amp or 15 amp socket for mains output on the back of the cabinet. Mains input is by flying lead. Price: £10 10s.

Model B. Similar to Model A, but in place of the neon indicator there is a special Process Timer with readings in one minute divisions up to 60 minutes. Price: $£ 16$ 16s.

TAPE RECORDER SPARES LTD., 323 Kennington Road, London, S.E.11. Tel.: Reliance 5252.

TapeHead Cleaning Brush. Specially designed slim style brush with angled head for cleaning heads and guides, inside recorder sound channel, etc. Price: 4s. 3d.

Comprehensive range of plugs, sockets, jackplugs, connecting leads and inter-connecting leads for all makes and models. Available through all tape recorder retailers. Illustrated list on request.

TELEFUNKEN. Distributors: A.E.G. (Great Britain) Ltd., Lonsdale Chambers, 27 Chancery

Lane, London, W.C.2. Tel.: Chancery 9944. Cables: Welmcor, London.

Endless Tape Cassette. Price: $£ 2$ 17s. 6d.

TUTCHINGSELECTRONICSLTD., 14 Rook Hill Road, Friars Cliff, Christchurch, Hants. Tel.: Highcliffe 2019.

Tapesponder's kit. Magnetic rubber for completely erasing tape and 40 ft . white noise azimuth alignment tape. Price: 5 s . including postage.

UHER. Distributors: Bosch Ltd., 205 Great Portland Street, London, W.1. Tel.: Langham 2672/5.

W211. Midget earphones. Price: $£ 1$ 14s. 6d.
W671. Stereo magnetic headphones. Price: £7 10s.

VALRADIO LTD., Browells Lane, Feltham, Middlesex. Tel.: Feltham 4837/4242. Service department, 57 Fortess Road, Kentish Town, London, N.W.5. Tel.: Gulliver 5165.
D.C. Converters for operating tape recorders, etc., from car or boat battery, or ship's supply 110 V DC and/or 220 V DC. Prices from £14 14s. 6d.

Type 12/35T. Transistorised DC converter providing an output of $230 \mathrm{~V} 50 \mathrm{c} / \mathrm{s} 25 \mathrm{~W}$ from a 12 V positive earth input (negative earth input available). Built-in switch-socket complete with input lead and fixing feet. Size: $9 \frac{1}{2} \times 3 \frac{1}{4} \times 2 \frac{5}{8} \mathrm{in}$. Weight: 4 lb . Price: £9 16s. 6d.

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WRIGHT \& WEAIRE LTD., 84 Blackfriars Road, London, S.E.1. Tel.: Waterloo 1981. Cables: Writewea, S.E.

Wearite Defluxer. For depolarising heads of tape recorders and players. It ensures maximum signal/noise ratio from any tape recorder and protects recorded tapes from cumulative background noise and the gradual attenuation of the higher frequencies. Price: $£ 210 \mathrm{~s}$.

ZONATAPE. See Ilford.

## DIRECTORY OF MAGNETIC TAPE

AGFA-GEVAERT LTD., 27 Great West Road, Brentford, Middlesex. Tel.: Isleworth 2131. Cables: Artoveg, Brentford, Hounslow.

Magneton PE31. Long Play. 3 in. spool 210 ft . 9 s .; 4 in . spool 450 ft . 14 s . 6 d .; $4 \frac{1}{4} \mathrm{in}$. spool 600 ft . $£ 11 \mathrm{~s} . ; 5 \mathrm{in}$. spool $900 \mathrm{ft} . £ 18 \mathrm{~s} . ; 5 \frac{3}{4} \mathrm{in}$. spool $1,200 \mathrm{ft} . £ 115 \mathrm{~s} . ; 7 \mathrm{in}$. spool $1,800 \mathrm{ft} . £ 210 \mathrm{~s} . ;$ $8_{4}^{\frac{1}{4}} \mathrm{in}$. spool $2,400 \mathrm{ft}$. $£ 312 \mathrm{~s}$. 6 d .; 10 in . spool 3,280 ft. £4 8s. 6d.

Magneton PE41. Double Play. 3 in. spool 300 ft. 13s. $9 \mathrm{~d} . ; 4 \mathrm{in}$. spool 600 ft . $£ 14 \mathrm{~s}$. 3 d .; $4 \frac{1}{4} \mathrm{in}$. spool 900 ft . $£ 112 \mathrm{~s}$. $3 \mathrm{~d} . ; 5 \mathrm{in}$. spool $1,200 \mathrm{ft}$. $£ 20 \mathrm{~s} .3 \mathrm{~d} . ; 5_{4}^{3} \mathrm{in}$. spool $1,800 \mathrm{ft} . £ 217 \mathrm{~s} .6 \mathrm{~d} . ; 7 \mathrm{in}$. spool $2,400 \mathrm{ft}$. $£ 316 \mathrm{~s} .6 \mathrm{~d} . ; 8 \frac{1}{4} \mathrm{in}$. spool $3,600 \mathrm{ft}$. $£ 516 \mathrm{~s} .6 \mathrm{~d} . ; 10 \mathrm{in}$. spool 4,600 ft. $£ 7$ 2s. 6 d .

Magneton PE65. Triple Play. 3 in. spool 450 ft. $£ 12 \mathrm{~s} .6 \mathrm{~d} . ; 4 \mathrm{in}$. spool 900 ft . $£ 119 \mathrm{~s} . ; 4 \frac{1}{\mathrm{in}}$. spool $1,200 \mathrm{ft}$. £2 6 s . 3 d .; 5 in . spool $1,800 \mathrm{ft}$. $£ 36 \mathrm{~s}$. 3 d .; $5 \frac{3}{4}$ in. spool $2,400 \mathrm{ft}$. $£ 48 \mathrm{~s}$.; 7 in . spool $3,600 \mathrm{ft} . £ 515 \mathrm{~s}$.
$5,5 \frac{3}{4}$ and 7 in. reels also available in plastic library boxes at additional cost of 2 s . 6 d .

Details of Magneton professional tapes available on request.

Gevasonor Type M. Standard Play. Triacetate base, 3 in . spool $150 \mathrm{ft} .5 \mathrm{~s} .3 \mathrm{~d} . ; 4 \mathrm{in}$. spool 300 ft . 10s. $6 \mathrm{~d} . ; 5 \mathrm{in}$. spool 600 ft . 18s.; $5 \frac{3}{4} \mathrm{in}$. spool 900 ft . £1 3s. 6 d .; 7 in . spool $1,200 \mathrm{ft}$. $£ 110 \mathrm{~s}$.; $8 \frac{1}{4} \mathrm{in}$. spool $1,800 \mathrm{ft}$. $£ 23 \mathrm{~s}$. 6 d .; 10 in . spool $2,400 \mathrm{ft}$. $£ 215 \mathrm{~s}$.

Gevasonor Type LR. Long Play. Triacetate base. 3 in . spool 300 ft . 8 s .; 4 in . spool 450 ft . 13s. 6d.; 5 in. spool 900 ft . $£ 14 \mathrm{~s}$.; $5 \frac{3}{4}$ in. spool $1,200 \mathrm{ft}$. £1 8s. 6d.; 7 in. spool $1,800 \mathrm{ft}$. £2 2s.; $8 \frac{1}{4} \mathrm{in}$. spool $2,400 \mathrm{ft}$. $£ 215 \mathrm{~s}$.; 10 in . spool 3,600 ft. £4.

Gevasonor Type LRP. Long Play. Tensilised polyester. 3 in . spool 300 ft . 9 s . 6 d .; 4 in . spool $450 \mathrm{ft} .16 \mathrm{~s} . ; 5 \mathrm{in} . \mathrm{spool} 900 \mathrm{ft} . £ 18 \mathrm{~s} . ; 5_{4}^{3} \mathrm{in} . \mathrm{spool}$ $1,200 \mathrm{ft} . £ 115 \mathrm{~s} . ; 7 \mathrm{in}$. spool $1,800 \mathrm{ft} . £ 210 \mathrm{~s} . ; 8 \frac{1}{4}$ in. spool $2,400 \mathrm{ft}$. $£ 35 \mathrm{~s}$.; 10 in . spool $3,600 \mathrm{ft}$. £4 15s.

Gevasonor Type DP. Double Play. Tensilised polyester. 3 in . spool 400 ft . 17 s .; 4 in . spool 600 ft . $£ 15 \mathrm{~s}$.; 5 in . spool $1,200 \mathrm{ft} . £ 25 \mathrm{~s} . ; 5_{4}^{3} \mathrm{in}$. spool $1,700 \mathrm{ft} . £ 215 \mathrm{~s} . ; 7 \mathrm{in}$. spool 2,400 ft. $£ 4$.

Gevasonor Type TRP. Triple Play. Tensilised polyester. 3 in . spool $450 \mathrm{ft} . £ 11 \mathrm{~s} .6 \mathrm{~d}$.; 3 in . spool 600 ft . £1 7s. $6 \mathrm{~d} . ; 4 \mathrm{in}$. spool 900 ft . £1 18s. 6d.; 5 in . spool $1,800 \mathrm{ft}$. $£ 35 \mathrm{~s}$. 6d.

BASF CHEMICALS LTD., 5a Gillespie Road, London, N.5. Tel.: Canonbury 2011.

LGS 52. Standard Play. PVC base. 5 in . spool 600 ft . $£ 1 \mathrm{ls}$.; $5 \frac{3}{4}$ in. spool 900 ft . $£ 18 \mathrm{~s} . ; 7 \mathrm{in}$. spool $1,200 \mathrm{ft}$. $£ 115 \mathrm{~s}$.; $8 \frac{1}{4} \mathrm{in}$. spool $1,800 \mathrm{ft}$. £2 17s. 6d.

LGS 35. Long Play. PVC base. 3 in. spool 210 ft. 9 s . $; 4 \mathrm{in}$. spool 450 ft . 14 s . $6 \mathrm{~d} . ; 4 \frac{1}{4}$ in. spool 600 ft. $£ 11 \mathrm{~s}$.; 5 in. spool 900 ft . $£ 18 \mathrm{~s} . ; 5 \frac{3}{4} \mathrm{in}$. spool $1,200 \mathrm{ft} . £ 115 \mathrm{~s} . ; 7 \mathrm{in}$. spool $1,800 \mathrm{ft} . £ 210 \mathrm{~s} . ; 8{ }_{4}$ in. spool $2,400 \mathrm{ft}$. $£ 312$ s. 6 d.; 10 in . spool 3,600 ft. $£ 415 \mathrm{~s}$.

LGS 26. Double Play. PVC base. 3 in. spool 300 ft . 14s.; 4 in . spool 600 ft . $£ 15 \mathrm{~s}$.; $4 \frac{1}{4} \mathrm{in}$. spool $900 \mathrm{ft} . £ 110 \mathrm{~s}$.; 5 in . spool $1,200 \mathrm{ft} . £ 22 \mathrm{~s}$.; $5 \frac{3}{4} \mathrm{in}$. spool $1,800 \mathrm{ft}$. $£ 215 \mathrm{~s}$.; 7 in . spool $2,400 \mathrm{ft}$. £3 17s. 6d.

PES 18. Triple Play. Polyester base. 3 in. spool $450 \mathrm{ft} . £ 12 \mathrm{~s} . ; 4 \mathrm{in}$. spool $900 \mathrm{ft} . £ 119 \mathrm{~s} . ; 4 \frac{1}{4} \mathrm{in}$. $1,200 \mathrm{ft} . £ 29 \mathrm{~s}$. $; 5 \mathrm{in}$. spool $1,800 \mathrm{ft}$. $£ 36 \mathrm{~s}$. $; 5 \frac{3}{4} \mathrm{in}$. spool $2,400 \mathrm{ft} . £ 410 \mathrm{~s} . ; 7 \mathrm{in}$. spool $3,600 \mathrm{ft} . £ 515 \mathrm{~s}$.

Tape Library Box. Holds three tapes, in swivel-open cassettes to provide easy reference. Available with one or three LP or DP tapes.

With one LP 5 in. $£ 111 \mathrm{~s} . ; 5 \frac{3}{4} \mathrm{in} . £ 118 \mathrm{~s}$. 6d.; $7 \mathrm{in} . £ 215 \mathrm{~s}$.
With three LP 5 in. $£ 44 \mathrm{~s} . ; 5 \frac{3}{4} \mathrm{in} . £ 55 \mathrm{~s} . ; 7 \mathrm{in}$. £7 10s.

With one DP 5 in. $£ 25$ s.; $5 \frac{3}{4}$ in. $£ 2$ i8s. 6d.; 7 in. £4 2s. 6d.

With three DP 5 in. $£ 66 \mathrm{~s} . ; 5 \frac{3}{4} \mathrm{in} . £ 85 \mathrm{~s} . ; 7 \mathrm{in}$. £11 12s. 6d.
C.B.S. TAPES. Distributors: Denham and Morley Ltd., Denmore House, 175 Cleveland Street, London, W.1.

CIP Standard Play. Acetate base. 3 in. spool $150 \mathrm{ft} .6 \mathrm{~s} .6 \mathrm{~d} . ; 5 \mathrm{in}$. spool 600 ft . £1 1s.; $5 \frac{3}{4} \mathrm{in}$. $900 \mathrm{ft} . £ 18 \mathrm{~s} . ; 7 \mathrm{in} .1,200 \mathrm{ft}$. $£ 113 \mathrm{~s}$.

CMXP Double Play. Mylar base. 3 in. spool $300 \mathrm{ft} .12 \mathrm{~s} .6 \mathrm{~d} . ; 5 \mathrm{in}$. spool $1,200 \mathrm{ft} . £ 116 \mathrm{~s} . ; 5 \frac{3}{4} \mathrm{in}$. spool $1,800 \mathrm{ft} . £ 210 \mathrm{~s} . ; 7 \mathrm{in}$. spool $2,400 \mathrm{ft}$. $£ 38 \mathrm{~s}$.

CMT36 Triple Play. 7 in. spool $3,600 \mathrm{ft} . £ 55 \mathrm{~s}$.

## DE VILLIERS (ELECTRONIC WORLD)

LTD., 16-20 Strutton Ground, Westminster, London, S.W.1. Tel.: Abbey 5960.

Standard Play. PVC base. Spool sizes: 3 in., 150 ft . Price (four spools): $18 \mathrm{~s} .$, ( 1 doz . spools): £2 8s.; 4 in., 300 ft . Price (four spools): £1 6s.; 5 in., 600 ft . Prices (two spools): $£ 16 \mathrm{~s} ., 5 \frac{3}{4} \mathrm{in}$., 900 ft . Price: 16 s .; $7 \mathrm{in} ., 1,200 \mathrm{ft}$. Price: 19 s .

Long Play. Pre-stressed polyester base. Spool sizes: 3 in., 225 ft . Price (four spools): $£ 12 \mathrm{~s}$., ( 1 doz. spools): $£ 3 ; 4$ in., 450 ft . Price (two spools): $£ 11 \mathrm{~s} . ; 5 \mathrm{in} ., 900 \mathrm{ft}$. Price (two spools): £1 15s., $5 \frac{3}{4} \mathrm{in} ., 1,200 \mathrm{ft}$. Price: £14s.; $7 \mathrm{in} ., 1,800$ ft. Price: $£ 111 \mathrm{~s} . ; 8 \frac{1}{4}$ in., $2,400 \mathrm{ft}$. Price: $£ 25 \mathrm{~s}$.; $10 \mathrm{in} .3,600 \mathrm{ft}$. Price: $£ 310 \mathrm{~s}$.

Double Play. Pre-stressed polyester base. Spool sizes: 3 in., 375 ft . Price (two spools): $£ 1$, ( 1 doz. spools): $£ 58 \mathrm{~s}$.; 4 in., 600 ft . Price (two spools): $£ 110 \mathrm{~s} . ; 5 \mathrm{in} ., 1,200 \mathrm{ft}$. Price: $£ 17 \mathrm{~s} . ; 5 \frac{3}{4}$ in., $1,800 \mathrm{ft}$. Price: $£ 115 \mathrm{~s} . ; 7 \mathrm{in} ., 2,400 \mathrm{ft}$. Price: $£ 25 \mathrm{~s}$.; $8 \frac{1}{4} \mathrm{in} ., 3,200 \mathrm{ft}$. Price: $£ 36 \mathrm{~s}$.; 10 in ., $4,800 \mathrm{ft}$. Price: $£ 5$.

Triple Play. Pre-stressed polyester base. Spool sizes: 3 in ., 475 ft . Price (two spools): $£ 16 \mathrm{~s}$. 6d., ( 1 doz. spools): $£ 710 \mathrm{~s}$.; $3 \frac{1}{4}$ in., 650 ft . Price: 17 s .; 4 in., 900 ft . Price: $£ 13 \mathrm{~s} .6 \mathrm{~d} . ; 5 \mathrm{in} ., 1,800 \mathrm{ft}$. Price: $£ 2 ; 5 \frac{3}{4}$ in., $2,400 \mathrm{ft}$. Price: $£ 2$ 12s. 6d.; 7 in., $3,600 \mathrm{ft}$. Price: $£ 4$.

All "Electronic World" tapes are sold by mail order direct from De Villiers Ltd., and the prices given are post free.
E.M.I. TAPE LTD., Blythe Road, Hayes, Middlesex. Tel.: Hayes 3888. Cables: Emitape, London.
"88" Standard Play. PVC base. 3 in. spool 175 ft . 7 s . $6 \mathrm{~d} . ; 3 \frac{1}{4} \mathrm{in}$. spool 175 ft . 7s. 6d.; 4 in . spool $300 \mathrm{ft} .10 \mathrm{~s} .6 \mathrm{~d} . ; 5 \mathrm{in}$. spool 600 ft . £1 1s.; $5 \frac{3}{4} \mathrm{in}$. spool 900 ft £ $18 \mathrm{~s} . ; 7 \mathrm{in}$. spool $1,200 \mathrm{ft}$. £1 $15 \mathrm{~s} . ; 8 \frac{1}{4} \mathrm{in}$. spool $1,800 \mathrm{ft}$. $£ 217 \mathrm{~s} .6 \mathrm{~d} . ; 10 \frac{1}{2} \mathrm{in}$. spool $£ 318 \mathrm{~s}$. 9 d .; $11 \frac{1}{2} \mathrm{in}$. spool $£ 3$ 13s. 6d.
" 99 " Long Play. P.E. base. 3 in . spool 210 ft . 9 s .; $3 \frac{1}{4} \mathrm{in}$. spool 210 ft . 9 s .; 4 in . spool 450 ft .
$14 \mathrm{~s} .6 \mathrm{~d} . ; 5 \mathrm{in}$. spool 900 ft . $£ 18 \mathrm{~s}$.; $5 \frac{3}{4} \mathrm{in}$. spool $1,200 \mathrm{ft} . £ 115 \mathrm{~s} . ; 7 \mathrm{in}$. spool $1,800 \mathrm{ft} . £ 210 \mathrm{~s}$.; $8 \frac{1}{4}$ in. spool $2,400 \mathrm{ft} . £ 312 \mathrm{~s} .6 \mathrm{~d} . ; 10 \frac{1}{2}$ in. spool £5 10s.
"100" Double Play. Polyester base 3 in. spool 300 ft . 14s.; $3 \frac{1}{4} \mathrm{in}$. spool 300 ft . 14s.; 4 in . spool $600 \mathrm{ft} . £ 15 \mathrm{~s} . ; 5 \mathrm{in}$. spool $1,200 \mathrm{ft}$. $£ 22 \mathrm{~s}$.; $5 \frac{3}{4} \mathrm{in}$. spool $1,800 \mathrm{ft}$. £2 15 s . $6 \mathrm{~d} . ; 7 \mathrm{in}$. spool 2,400 ft. £2 17s. 6d.
"300" Triple Play. Polyester base. 3 in. spool $450 \mathrm{ft} . £ 12 \mathrm{~s} . ; 4 \mathrm{in}$. spool $900 \mathrm{ft} . £ 118 \mathrm{~s} . ; 5 \mathrm{in}$. spool $1,800 \mathrm{ft}$. $£ 316 \mathrm{~s}$.

FERRANIA. Distributors: Radio and Television Services Ltd., P.O. Box 11, Cambridge. Tel.: Cambridge 59101.

Standard Play. Polyester base. 3 in. spool 150 ft. $5 \mathrm{~s} .3 \mathrm{~d} . ; 5 \mathrm{in}$. spool $600 \mathrm{ft} . £ 10 \mathrm{~s} .6 \mathrm{~d} . ; 5 \frac{3}{4} \mathrm{in}$. spool 850 ft . $£ 17 \mathrm{~s}$. $6 \mathrm{~d} . ; 7 \mathrm{in}$. spool $1,200 \mathrm{ft}$. £1 15 s .

Long Play. Polyester base. 3 in . spool 300 ft . 9s. 6 d .; 5 in. spool 900 ft . $£ 17 \mathrm{~s}$. 6 d .; $5 \frac{3}{4} \mathrm{in}$. spool $1,200 \mathrm{ft} . £ 114 \mathrm{~s} .6 \mathrm{~d} . ; 7 \mathrm{in}$. spool $1,800 \mathrm{ft} . £ 29 \mathrm{~s}$.

Double Play. 3 in. spool 400 ft. 16s. 6d.; 5 in. spool $1,200 \mathrm{ft}$. $£ 2 \mathrm{ls}$. 9 d .; $5 \frac{3}{4} \mathrm{in}$. spool $1,800 \mathrm{ft}$. £2 15 s .

GEVAERT. See Agfa-Gevaert Ltd.

ILFORD LTD., 201/3 Wardour Street, London, W.1. Tel.: Regent 8731.

Zonatape. Standard Play. PVC base. 3 in. spool 150 ft . 5 s . $9 \mathrm{~d} . ; 3 \frac{1}{4} \mathrm{in}$. spool 175 ft . 7 s . 6d.; 4 in . spool 300 ft . 10s. 6 d .; 5 in . spool 600 ft . £1 1s.; $5 \frac{3}{4} \mathrm{in}$. spool 900 ft . $£ 18 \mathrm{~s}$.; 7 in . spool 1,200 ft. $£ 115 \mathrm{~s}$.; $8 \frac{1}{4} \mathrm{in}$. spool $1,800 \mathrm{ft}$. $£ 217 \mathrm{~s}$. 6 d .; $10 \frac{1}{2}$ in. spool $2,400 \mathrm{ft}$. $£ 318 \mathrm{~s}$. 6d.

Zonatape. Extra Play. Polyester base. 3 in. spool 225 ft . 9 s .; $3 \frac{1}{4} \mathrm{in}$. spool 300 ft . 12s.; 4 in . spool 450 ft . 14s. $6 \mathrm{~d} . ; 5 \mathrm{in}$. spool 900 ft . $£ 18 \mathrm{~s}$.; $5 \frac{3}{4}$ in. spool $1,200 \mathrm{ft}$. $£ 115 \mathrm{~s} . ; 7 \mathrm{in}$. spool $1,800 \mathrm{ft}$. $£ 210 \mathrm{~s}$.; $8 \frac{1}{4} \mathrm{in}$. spool 2,400 ft. $£ 312 \mathrm{~s}$. 6 d .; $10 \frac{1}{2} \mathrm{in}$. spool $3,600 \mathrm{ft}$. 558 s .

Zonatape. Double Play. Polyester base. 3 in. spool 300 ft . 13s. $6 \mathrm{~d} . ; 3 \frac{1}{4} \mathrm{in}$. spool $400 \mathrm{ft} .17 \mathrm{~s} . ;{ }^{\circ}$ 4 in . spool 600 ft . £1 5s.; 5 in . spool $1,200 \mathrm{ft}$.
$£ 25 \mathrm{~s} . ; 5 \frac{3}{4} \mathrm{in}$. spool $1,800 \mathrm{ft} . £ 217 \mathrm{~s} .6 \mathrm{~d} . ; 7 \mathrm{in}$. spool $2,400 \mathrm{ft} . £ 317 \mathrm{~s} .6 \mathrm{~d} . ; 8 \frac{1}{4} \mathrm{in}$. spool $3,600 \mathrm{ft}$. £6.

Zonatape. Triple Play. Polyester base. 3 in. spool $450 \mathrm{ft} . £ 12 \mathrm{~s} . ; 3 \frac{1}{4} \mathrm{in}$. spool $600 \mathrm{ft} . £ 17 \mathrm{~s} .6 \mathrm{~d}$.; 4 in . spool $900 \mathrm{ft} . £ 119 \mathrm{~s}$.; 5 in . spool $1,800 \mathrm{ft}$. $£ 36 \mathrm{~s} . ; 5 \frac{3}{4} \mathrm{in}$. spool $2,400 \mathrm{ft} . £ 410 \mathrm{~s}$.

KODAK LTD., Kodak House, Kingsway, London, W.C.2. Tel.: Holborn 7841.

T100. Standard play. Triacetate base. 5 in. spool 600 ft . 18 s .; $5 \frac{3}{4} \mathrm{in}$. spool 900 ft . £l 4s. 6 d .; 7 in . spool $1,200 \mathrm{ft} . £ 110 \mathrm{~s}$.

V150. Long play. Pre-stretched PVC base. $3 \frac{1}{4}$ in. spool $300 \mathrm{ft} .11 \mathrm{~s} . ; 5$ in. spool $900 \mathrm{ft} . £ 18 \mathrm{~s}$.; $5 \frac{3}{4} \mathrm{in}$. spool $1,200 \mathrm{ft} . £ 115 \mathrm{~s}$.; 7 in . spool $1,800 \mathrm{ft}$. £2 10s.

P200. Double play. Pre-stretched polyester base, $3 \frac{1}{4} \mathrm{in}$. spool $400 \mathrm{ft} .17 \mathrm{~s} . ; 4 \mathrm{in}$. spool 600 ft . $£ 14$ s. 6 d .; 5 in. spool $1,200 \mathrm{ft} . £ 25 \mathrm{~s}$.; $5 \frac{3}{4} \mathrm{in}$. spool $1,650 \mathrm{ft} . £ 215 \mathrm{~s} . ; 7 \mathrm{in}$. spool $2,400 \mathrm{ft} . £ 4$.

P300. Triple play. Pre-stretched polyester base. 3 in. spool 450 ft . £l 1s. 6 d .; $3 \frac{1}{4} \mathrm{in}$. spool $600 \mathrm{ft} . £ 17 \mathrm{~s} .6 \mathrm{~d} . ; 4 \mathrm{in}$. spool 900 ft . £1 18s. 6d.; 5 in. spool $1,800 \mathrm{ft} . £ 35 \mathrm{~s} .6 \mathrm{~d} . ; 5 \frac{3}{4} \mathrm{in}$. spool 2,400 $\mathrm{ft} . £ 410 \mathrm{~s} . ; 7 \mathrm{in}$. spool $3,600 \mathrm{ft} . £ 515 \mathrm{~s}$.

P400. Quadruple play. Pre-stretched polyester base. 3 in. spool 600 ft . $£ 113 \mathrm{~s}$. 6 d .; $3 \frac{1}{4} \mathrm{in}$. spool $800 \mathrm{ft} . £ 22 \mathrm{~s} . ; 4 \mathrm{in}$. spool $1,200 \mathrm{ft} . £ 218 \mathrm{~s} .6 \mathrm{~d}$.

LEDA TAPES, 30 Baker Street, London, W.1. Tel.: Welbeck 0441/2.

Standard Play. PVC base. 3 in. spool 150 ft . 2s. $3 \mathrm{~d} . ; 4$ in. spool 300 ft .3 s . 9 d .; 5 in . spool 600 ft. 8s. 6d.; $5 \frac{3}{4} \mathrm{in}$. spool 900 ft .10 s .3 d .7 in . spool $1,200 \mathrm{ft} .12 \mathrm{~s} .6 \mathrm{~d}$.

Long Play. PVC base. 3 in. spool 225 ft .3 s .; 4 in. spool $450 \mathrm{ft} .5 \mathrm{~s} .3 \mathrm{~d} . ; 5 \mathrm{in}$. spool 900 ft .10 s .; $5 \frac{3}{4}$ in. spool $1,200 \mathrm{ft} .12 \mathrm{~s} .6 \mathrm{~d}$.; 7 in . spool 1,800 ft. 17s. 6d.

Double Play. PVC base. 3 in. spool 300 ft . 4s. 6d.; 4 in. spool 600 ft .8 s . 6d.; 5 in. spool $1,200 \mathrm{ft} .16 \mathrm{~s} . ; 5 \frac{3}{4} \mathrm{in}$. spool $1,800 \mathrm{ft} . £ 11 \mathrm{~s} . ; 7 \mathrm{in}$. spool $2,400 \mathrm{ft}$. $£ 15 \mathrm{~s}$.

Triple Play. PVC base. 3 in. spool 600 ft . $9 \mathrm{~s} .6 \mathrm{~d} . ; 4$ in. spool 900 ft .15 s .; 5 in . spool 1,800
ft. $£ 14 \mathrm{~s} . ; 5 \frac{3}{4} \mathrm{in}$. spool $2,400 \mathrm{ft}$. $£ 112 \mathrm{~s} .6 \mathrm{~d} . ; 7 \mathrm{in}$. spool $3,600 \mathrm{ft}$. $£ 27 \mathrm{~s}$. 6 d .

Leda Tapes are supplied direct to users from the above address.

LEE PRODUCTS (GREAT BRITAIN) LTD. - (Concessionaires of Audio Devices Inc. (U.S.A.), 10-18 Clifton Street, London, E.C.2. Tel.: Bishopsgate 6711. Cables: Leprod, London.

Audiotape. A range of 8 grades and thicknesses for amateur and professional use. Spool sizes: $3,3 \frac{1}{4}, 4,5,5 \frac{3}{4}, 7 \mathrm{in}$.

MAGNETON. See Agfa-Gevaert Ltd.

MASTERTAPE (MAGNETIC) LTD., Colnbrook, Slough, Bucks. Tel.: Colnbrook 2431.

Standard. 3 in. spool 150 ft . 6 s .; 4 in . spool 300 ft . 10 s .; 5 in . spool 600 ft . $17 \mathrm{~s} . ; 5 \frac{3}{4} \mathrm{in}$. spool 900 ft . £1 2s. $6 \mathrm{~d} . ; 7 \mathrm{in}$. spool $1,200 \mathrm{ft} . £ 111 \mathrm{~s} .6 \mathrm{~d}$.

Long Play. 3 in. spool 225 ft. 8s. 6d.; 4 in. spool $450 \mathrm{ft} .12 \mathrm{~s} .6 \mathrm{~d} . ; 5 \mathrm{in}$. spool 900 ft . $£ 15 \mathrm{~s}$.; $5 \frac{3}{4} \mathrm{in}$. spool $1,200 \mathrm{ft} . £ 111 \mathrm{~s} . ; 7 \mathrm{in}$. spool $1,800 \mathrm{ft} . £ 22 \mathrm{~s}$.; $8 \frac{1}{4} \mathrm{in}$. spool $2,400 \mathrm{ft} . £ 312 \mathrm{~s} .6 \mathrm{~d}$.

Double Play. 3 in. spool 300 ft. 12s. 6d.; 4 in. spool $600 \mathrm{ft} . £ 11 \mathrm{~s} . ; 5 \mathrm{in}$. spool $1,200 \mathrm{ft} . £ 119 \mathrm{~s}$.; $5 \frac{3}{4} \mathrm{in}$. spool $1,800 \mathrm{ft}$. $£ 29 \mathrm{~s} . ; 7 \mathrm{in}$. spool $2,400 \mathrm{ft}$. £3 9s.

Triple Play. 3 in. spool 600 ft . $£ 12 \mathrm{~s} . ; 4 \mathrm{in}$. spool 900 ft . $£ 118 \mathrm{~s}$. $6 \mathrm{~d} . ; 5 \mathrm{in}$. spool $1,800 \mathrm{ft}$. $£ 36$ s.; $5 \frac{3}{4}$ in. spool 2,400 ft. $£ 410 \mathrm{~s} . ; 7 \mathrm{in}$. spool $3,600 \mathrm{ft}$. $£ 515 \mathrm{~s}$.

Mini Voice Letter. 3 in. spool 100 ft . standard tape. With box and two labels. 1 oz . Price: 3s. 3d.

Sendamessage. $1 \frac{3}{4} \mathrm{in}$. spool 100 ft . triple play tape. Special two-way envelope. Weight: under $\frac{1}{2} \mathrm{oz}$. Price: 3s.

MINNESOTA MINING AND MANUFACTURING COMPANY LTD., 3M House, Wigmore Street, London, W.1. Tel.: Hunter 5522. Cables: Minnesota, London.

Scotch 111. Standard Play. Acetate base 4 in. spool 300 ft . $9 \mathrm{~s} . ; 5 \mathrm{in}$. spool 600 ft . 18 s .; $5 \frac{3}{4} \mathrm{in}$. spool 850 ft . $£ 14 \mathrm{~s}$. $6 \mathrm{~d} . ; 7 \mathrm{in}$. spool $1,200 \mathrm{ft}$. £110s.

Scotch 175. Standard Play. Polyester base. 5 in . spool 600 ft . $£ 10 \mathrm{~s} .6 \mathrm{~d}$.; $5 \frac{3}{4} \mathrm{in}$. spool 850 ft . £1 7s. $6 \mathrm{~d} . ; 7 \mathrm{in}$. spool $1,200 \mathrm{ft}$. £1 15 s .

Scotch 150. Long Play. Polyester base. 3 in. spool 300 ft . $9 \mathrm{~s} .6 \mathrm{~d} . ; 4 \mathrm{in}$. spool 450 ft . 14s. 6d.; 5 in . spool 900 ft . $£ 17 \mathrm{~s} .6 \mathrm{~d} . ; 5 \frac{3}{4} \mathrm{in}$. spool 1,200 ft. £1 14s. 6 d .; 7 in . spool $1,800 \mathrm{ft}$. $£ 29 \mathrm{~s}$.; $8 \frac{1}{4} \mathrm{in}$. spool 2,400 ft. £3 12s. 6d.

Scotch 200. Double Play. Tensilised polyester. 3 in . spool 400 ft .16 s . 6 d .; 4 in . spool 600 ft. $£ 14 \mathrm{~s} .6 \mathrm{~d} . ; 5 \mathrm{in}$. spool $1,200 \mathrm{ft}$. $£ 2$ 1s. $9 \mathrm{~d} . ; 5 \frac{3}{4}$ in. spool $1,800 \mathrm{ft}$. $£ 215 \mathrm{~s}$.; 7 in . spool 2,400 ft. £3 16s. 6d.

Scotch 290. Triple Play. Tensilised polyester. 3 in . spool 600 ft . $£ 14 \mathrm{~s}$. $9 \mathrm{~d} . ; 4 \mathrm{in}$. spool 900 ft . £118s. 6d.

Scotch Dynarange 202. Standard Play. Polyester base. 5 in . spool 600 ft . $£ 14 \mathrm{~s}$.; $5 \frac{3}{4} \mathrm{in}$. spool $850 \mathrm{ft} . £ 112 \mathrm{~s} .3 \mathrm{~d} . ; 7 \mathrm{in}$. spool $1,200 \mathrm{ft} . £ 21 \mathrm{~s}$.

Scotch Dynarange 203. Long Play. Polyester base. 5 in . spool $900 \mathrm{ft} . £ 112 \mathrm{~s}$. $3 \mathrm{~d} . ; 5 \frac{3}{4} \mathrm{in}$. spool $1,200 \mathrm{ft} . £ 20 \mathrm{~s} .6 \mathrm{~d} . ; 7 \mathrm{in}$. spool $1,800 \mathrm{ft} . £ 217 \mathrm{~s} .6 \mathrm{~d} . ;$ $8 \frac{1}{4} \mathrm{in}$. spool $2,400 \mathrm{ft}$. $£ 43 \mathrm{~s}$. 6 d .

Scotch Tape Albums. Gold-embossed green leatherette book type tape storage. Available in three sizes: 5 in., $5 \frac{3}{4}$ in., 7 in. Albums supplied with one tape and room for another. Selfadhesive spine and spool labels included. Builtin index.

Standard Play Album. Acetate base. With one tape. 5 in. £1 0s. 9 d .; $5 \frac{3}{4}$ in. £1 7s. 6d.; 7 in. £1 13s. 3d.

Standard Play Album. Polyester base. With one tape. $5 \mathrm{in} . £ 1$ 3s. $3 \mathrm{~d} . ; 5 \frac{3}{4} \mathrm{in} . £ 110 \mathrm{~s} .6 \mathrm{~d} . ; 7 \mathrm{in}$. £1 18s. 3 d .

Long Play Album. Polyester base. With one tape. 5 in. $£ 1$ 10s. $3 \mathrm{~d} . ; 5 \frac{3}{4} \mathrm{in} . £ 117 \mathrm{~s} .6 \mathrm{~d} . ; 7 \mathrm{in}$. £2 12s. 3d.

Double Play Album. Polyester base. With one tape. 5 in. $£ 24 \mathrm{~s} .6 \mathrm{~d} . ; 5 \frac{3}{4} \mathrm{in} . £ 218 \mathrm{~s} . ; 7 \mathrm{in} . £ 319 \mathrm{~s} .9 \mathrm{~d}$.

PHILIPS ELECTRICAL LTD., Electroacoustics Division, Century House, Shaftesbury Avenue, London, W.C.2. Tel.: Gerrard 7777.

Standard Play (Green). 3 in. audio letter, 150 ft. 5 s . $6 \mathrm{~d} . ; 4 \mathrm{in}$. spool $300 \mathrm{ft} .10 \mathrm{~s} .6 \mathrm{~d} . ; 5 \mathrm{in}$. spool 600 ft . £1 1s.; $5 \frac{3}{4}$ in. spool 900 ft . $£ 18 \mathrm{~s} . ; 7 \mathrm{in}$. spool $1,200 \mathrm{ft}$. £1 15s.

Long Play (Red). 3 in. spool 210 ft 9s.; 4 in . spool 450 ft . 14s. $6 \mathrm{~d} . ; 5 \mathrm{in}$. spool 900 ft . $£ 18 \mathrm{~s}$.; $5 \frac{3}{4} \mathrm{in}$. spool $1,200 \mathrm{ft}$. $£ 115 \mathrm{~s} . ; 7 \mathrm{in}$. spool $1,800 \mathrm{ft}$. £2 10s.

Double Play (Blue). 3 in. spool 300 ft .14 s .; 4 in . spool 600 ft . £1 5 s .; 5 in . spool $1,200 \mathrm{ft}$. £22s.; $5 \frac{3}{4}$ in. spool 1,800 ft. $£ 215 \mathrm{~s} .6 \mathrm{~d} . ; 7 \mathrm{in}$. spool 2,400 ft. £3 17s. 6 d .

Triple Play (Grey). 3 in. spool 450 ft . $£ 12 \mathrm{~s}$.; 4 in . spool 900 ft . $£ 119 \mathrm{~s} . ; 5 \mathrm{in}$. spool $1,800 \mathrm{ft}$. £3 6s.

CE. 10 Endless Loop. Approximately 195 ft . Playing time 40 mins. at $\frac{15}{16} \mathrm{i} / \mathrm{s}$. Price: $£ 310 \mathrm{~s}$.
C. 60 Compact Cassette. Playing time one hour. Price: 19s. 6d.
C. 90 Compact Cassette. Playing time $1 \frac{1}{2}$ hours. Price: £1 7s. 6d.
R.C.A. GREAT BRITAIN LTD., Lincoln Way, Windmill Road, Sunbury-on-Thames, Middx. Tel.: Sunbury-on-Thames 5511.

Vibrant Sound tape. Standard play. Acetate base. 5 in. spool 600 ft . 18s.; 7 in. spool 1,200 ft. $£ 110 \mathrm{~s}$.

Vibrant Sound tape. Long play. Mylar base. 5 in . spool 900 ft . $£ 17 \mathrm{~s}$.; $5 \frac{3}{4} \mathrm{in}$. spool $1,200 \mathrm{ft}$. £1 14s.; 7 in. spool $1,800 \mathrm{ft}$. $£ 28 \mathrm{~s}$.

Vibrant Sound tape. Double play. Tensilised mylar base. 5 in . spool $1,200 \mathrm{ft} . £ 22 \mathrm{~s} . ; 5 \frac{3}{4} \mathrm{in}$. spool $1,800 \mathrm{ft}$. £2 $15 \mathrm{~s} . ; 7 \mathrm{in}$. spool $2,400 \mathrm{ft}$. £3 16 s.

Special low noise and low print tapes in $\frac{1}{4} \mathrm{in}$., $\frac{1}{2}$ in. and 1 in . widths available on plastic or metal reels. Also NAB metal hub spools.

RECOTAPE. Distributors:Transatlantic Music Tapes Ltd., 250 Grand Buildings, 1 Strand, London, W.C.2. Tel.: Whitehall 6331.

Standard Play. Polyester base. 3 in. spool 150 ft. 3 s . $9 \mathrm{~d} . ; 5 \mathrm{in}$. spool $600 \mathrm{ft} .14 \mathrm{~s} .6 \mathrm{~d} . ; 5 \frac{3}{4}$ in. spool $900 \mathrm{ft} .18 \mathrm{~s} . ; 7 \mathrm{in}$. spool $1,200 \mathrm{ft} . £ 12 \mathrm{~s} .6 \mathrm{~d}$.

Long Play. Polyester base. 3 in . spool 300 ft . 5s. $9 \mathrm{~d} . ; 5 \mathrm{in}$. spool 900 ft . 18 s .; $5 \frac{3}{4} \mathrm{in}$. spool 1,200 ft. £1 2s. $6 \mathrm{~d} . ; 7 \mathrm{in}$. spool $1,800 \mathrm{ft}$. £1 11s. 6 d .

Double Play. Polyester base. 3 in. spool 400 ft . 8s. 6d.; 5 in. spool $1,200 \mathrm{ft}$ £1 8s.; $5 \frac{3}{4} \mathrm{in}$. spool $1,800 \mathrm{ft} . £ 115 \mathrm{~s} .6 \mathrm{~d} . ; 7 \mathrm{in}$. spool $2,400 \mathrm{ft} . £ 2{ }^{\circ} 7 \mathrm{~s} .6 \mathrm{~d}$.

Triple Play. Polyester base. 3 in. spool 600 ft . 19 s .; 5 in . spool $1,800 \mathrm{ft}$. $£ 27 \mathrm{~s}$. $6 \mathrm{~d} . ; 5 \frac{3}{4} \mathrm{in}$. spool $2,400 \mathrm{ft}$. $£ 212 \mathrm{~s} . ; 7 \mathrm{in}$. spool $3,600 \mathrm{ft} . £ 419 \mathrm{~s}$.

## $\star$

SONY. U.K. Sales Division, Mercia Road, Gloucester. Tel.: Gloucester 26841. Cables: Debelec, Gloucester.

MY Long Play. Polyester base. Spool sizes: 3 in., 260 ft .; 5 in., 900 ft ., 7 in., 1,800 ft. Prices on application.

SYNCHROTAPE. Sole distributors: Adastra Electronics Ltd., 167 Finchley Road, Swiss Cottage, London, N.W.3. Tel.: Maida Vale 8164.

Standard Play. PVC base. 3 in. spool 150 ft . 4s. 9 d .; 5 in . spool $600 \mathrm{ft}$.15 s .; 53 in in. spool 900 ft. 18s. 6d.; 7 in. spool 1,200 ft. £1 2s. 6d.

Long Play. PVCbase. 3 in. spool 225 ft. 6s. 3d.; 4 in . spool 450 ft .12 s .; 5 in . spool 900 ft . 18 s . 6 d. ; $5 \frac{3}{4}$ in. spool $1,200 \mathrm{ft}$. $£ 12 \mathrm{ds} .6 \mathrm{~d} . ; 7 \mathrm{in}$. spool 1,800 ft. £1 8s. 6d.

Double Play. Tensilised polyester base. 3 in. spool 300 ft . 8 s . $9 \mathrm{~d} . ; 4 \mathrm{in}$. spool 600 ft . 18 s .; 5 in . spool $1,200 \mathrm{ft}$. $£ 18 \mathrm{~s}$. $6 \mathrm{~d} . ; 5 \frac{3}{4} \mathrm{in}$. spool $1,800 \mathrm{ft}$. £1 16s.; 7 in. spool $2,400 \mathrm{ft}$. $£ 28 \mathrm{~s}$.

Triple Play. Tensilised polyester. 3 in. spool 450 ft .13 s . $9 \mathrm{~d} . ; 4 \mathrm{in}$. spool 900 ft . 1 ll 7 s .

Except for 3 in. spools, all Synchrotapes have Double Leader and Double Stop-Foils.

TAPE 70. Distributors: Leda Tapes, 30 Baker Street, London, W.1. Tel.: Welbeck 0441/2.

Standard Play. PVC base. 3 in. spool 150 ft . 3s. 3d.; 4 in. spool 300 ft . 6 s . $6 \mathrm{~d} . ; 5 \mathrm{in}$. spool 600 ft. 11s. $6 \mathrm{~d} . ; 5 \frac{3}{4} \mathrm{in}$. spool 900 ft . 14s. 6 d .; 7 in . spool 1,200 ft. 17s. 6d.

LongPlay. PVC base. 3 in . spool 225 ft .4 s .3 d. ; 4 in . spool 450 ft . 7 s . 6 d .; 5 in . spool 900 ft . 14s. $6 \mathrm{~d} . ; 53$ in. spool 1,200 ft. 17s. $6 \mathrm{~d} . ; 7 \mathrm{in}$. spool $1,800 \mathrm{ft}$. £1 5 s .

Double Play. PVC base. 3 in. spool 300 ft . 6 s . 6 d .; 4 in . spool 600 ft . 12 s .; 5 in . spool 1,200 ft. $£ 12 \mathrm{~s}$. $6 \mathrm{~d} . ; 5 \frac{3}{4}$ in. spool $1,800 \mathrm{ft} . £ 19 \mathrm{~s} .6 \mathrm{~d} . ; 7 \mathrm{in}$. spool 2,400 ft. £1 17s. 6d.

Triple Play. PVC base. 3 in. spool 600 ft . 13s.; 4 in . spool 900 ft . 17 s . $6 \mathrm{~d} . ; 5 \mathrm{in}$. spool $1,800 \mathrm{ft}$. $£ 115 \mathrm{~s} . ; 5 \frac{3}{4} \mathrm{in}$. spool $2,400 \mathrm{ft} . £ 28 \mathrm{~s}$. 6 d.; 7 in . spool $3,600 \mathrm{ft}$. $£ 32 \mathrm{~s}$. 6 d .

TELEFUNKEN. Distributors: A.E.G. (Great Britain) Ltd., Lonsdale Chambers, 27 Chancery Lane, London, W.C.2. Tel.: Chancery 9944. Cables: Welmcor, London.

Telefunken. Long Play. PVC base. 5 in. spool 900 ft . $£ 1$ 12s. $6 \mathrm{~d} . ; 5 \frac{3}{4} \mathrm{in}$. spool $1,200 \mathrm{ft}$. £1 17s. $6 \mathrm{~d} . ; 7 \mathrm{in}$. spool $1,800 \mathrm{ft}$. $£ 2$ 12s. 6 d .

Telefunken. Double Play. PVC base. 5 in. spool $1,200 \mathrm{ft}$. £2 $4 \mathrm{~s} . ; 5 \frac{3}{4} \mathrm{in}$. spool $1,800 \mathrm{ft}$. £2 17s. 6d.; 7 in. spool 2,400 ft. £4.

Telefunken Endless Tape Cassette. Price: £2 17s. 6d.

TONEMASTER TAPES. Messrs Chart Edge Ltd., 18/21 Jermyn Street, London, S.W.1. Tel.: Regent 1443.

Standard Play. PVC base. 3 in. spool 150 ft . 2s. $3 \mathrm{~d} . ; 4 \mathrm{in}$. spool 300 ft . $5 \mathrm{~s} . ; 5 \mathrm{in}$. spool 600 ft . 6 s. $6 \mathrm{~d} . ; 5 \frac{3}{4} \mathrm{in}$. spool $900 \mathrm{ft} .8 \mathrm{~s} . ; 7 \mathrm{in}$. spool $1,200 \mathrm{ft}$. 9s. 9d.

Long Play. PVC base. 3 in. spool 225 ft . 2s. 8 d .; 4 in. spool 450 ft. 5 s. 6 d .; 5 in . spool 900 ft. 9 s .; $5 \frac{3}{4}$ in. spool $1,200 \mathrm{ft}$.11 s . $3 \mathrm{~d} . ; 7 \mathrm{in}$. spool $1,800 \mathrm{ft} .13 \mathrm{~s} .9 \mathrm{~d}$.

Double Play. Polyester base. 3 in. spool $300 \mathrm{ft} .5 \mathrm{~s} . ; 4 \mathrm{in}$. spool $600 \mathrm{ft} .7 \mathrm{~s} .3 \mathrm{~d} . ; 5 \mathrm{in}$. spool $1,200 \mathrm{ft} .13 \mathrm{~s}$. $3 \mathrm{~d} . ; 5 \frac{3}{4} \mathrm{in}$. spool $1,800 \mathrm{ft} .17 \mathrm{~s}$. 9 d .; 7 in . spool $2,400 \mathrm{ft}$. $£ 1 \mathrm{ls}$. 9 d .

Triple Play. Polyester base. 3 in . spool 600 ft . 9s. $6 \mathrm{~d} . ; 4 \mathrm{in}$. spool 900 ft . 13s.; 5 in . spool $1,800 \mathrm{ft} . £ 15 \mathrm{~s} . ; 5 \frac{3}{4} \mathrm{in}$. spool $2,400 \mathrm{ft} . £ 115 \mathrm{~s} . ; 7 \mathrm{in}$. spool $3,600 \mathrm{ft}$. $£ 25 \mathrm{~s}$.

Leaders and stop foils on LP, DP and TP 5 in. to 7 in. All Tonemaster Tapes are British made and supplied sealed in individual boxes. 2 s. 9 d . postage on orders up to $£ 3$; over $£ 3$ post free. By-return postal service.

UHER. Distributors: Bosch Ltd., 205 Great Portland Street, London, W.1. Tel.: Langham 2672/5.

Long Play. 5 in. spool 900 ft £1 8s.; $5 \frac{3}{4} \mathrm{in}$. spool $1,200 \mathrm{ft}$. £l $15 \mathrm{~s} . ; 7 \mathrm{in}$. spool $1,800 \mathrm{ft}$. £2 10s.

ZONATAPE. See Ilford.

| Length of tape in feet | Type of spool | Maximum playing times in hours and minutes |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 1 Track |  |  |  | 2 Tracks |  |  |  | 4 Tracks |  |  |  |
|  |  | 15i/s | 71 $\mathrm{i} / \mathrm{s}$ | $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ | 178 | $15 \mathrm{i} / \mathrm{s}$ | $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ | $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ | 178i/s | $15 \mathrm{i} / \mathrm{s}$ | $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$ | $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ | $17 \frac{7}{8} \mathrm{i} / \mathrm{s}$ |
| 3.600 | $84^{\prime \prime}$ DP | 48 | 136 | 312 | 624 | 136 | 312 | 624 | 1248 | 312 | 624 | 1248 | 2536 |
| 2,400 | $\begin{aligned} & 7^{\prime \prime} \text { DP } \\ & 8 \frac{1}{4 \prime \prime} \text { LP } \end{aligned}$ | 32 | 14 | 28 | 416 | 14 | 28 | 416 | 832 | 28 | 416 | 832 | 174 |
| 1,800 | $\begin{aligned} & \hline 5^{\prime \prime} \text { TP } \\ & 7^{\prime \prime} \text { LP } \\ & 84_{4}^{\prime \prime} \mathrm{S} \end{aligned}$ | 24 | 48 | 1.36 | 3.12 | 48 | 1.36 | 3.12 | 6.24 | 1.36 | 3.12 | 6.24 | 12.48 |
| 1,700 | $5 \frac{3}{4 \prime}$ DP | 22 | 47 | 130 | 31 | 45 | 130 | 31 | 62 | 130 | 3. 1 | 62 | 125 |
| 1,200 | $\begin{aligned} & \hline 5^{\prime \prime} \mathrm{DP} \\ & 5 \frac{3}{4}^{\prime \prime} \mathrm{LP} \\ & 7^{\prime \prime} \mathrm{S} \end{aligned}$ | 16 | 32 | 14 | 28 | 32 | 14 | 28 | 416 | 14 | 28 | 416 | 832 |
| 900 | $\begin{aligned} & 4^{\prime \prime} \mathrm{TP} \\ & 5^{\prime \prime} \mathrm{LP} \end{aligned}$ | 12 | 24 | 48 | 136 | 24 | 48 | 136 | 312 | 48 | 136 | 3.12 | 624 |
| 850 | 53" S | 11 | 22 | 45 | 130 | 22 | 45 | 130 | 31 | 45 | 130 | 31 |  |
| 600 | $\begin{aligned} & 4^{\prime \prime} \text { DP } \\ & 5^{\prime \prime} \mathrm{S} \end{aligned}$ | 8 | 16 | 32 | 14 | 16 | 32 | 14 | 28 | 32 | 14 | 28 | 416 |
| 450 | $\begin{aligned} & 3^{\prime \prime} \mathrm{TP} \\ & 4^{\prime \prime} \mathrm{LP} \end{aligned}$ | 6 | 12 | 24 | 48 | 12 | 24 | 48 | 136 | 24 | 48 | 136 | 312 |
| 400 | $31_{4}^{\prime \prime}$ DP | 5 | 10 | 21 | 42 | 10 | 21 | 42 | 125 | 21 | 42 | 125 | 250 |
| 300 | $\begin{aligned} & 33_{4}^{\prime \prime} \text { LP } \\ & 4^{\prime \prime} \mathrm{S} \end{aligned}$ | 4 | 8 | 16 | 32 | 8 | 16 | 32 | 14 | 16 | 32 | 14 | 28 |
| 200 | $34^{\prime \prime}$ S | $2 \frac{1}{2}$ | 5 | 10 | 21 | 5 | 10 | 21 | 42 | 10 | 21 | 42 | 125 |
| 150 | 3" S | 2 | 4 | 8 | 16 | 4 | 8 | 16 | 32 | 8 | 16 | 32 | 14 |

## DIRECTORY OF TEST TAPES \& DISCS

AMPEX (GREAT BRITAIN) LTD., Acre Road, Reading, Berkshire. Tel.: Reading 84411. Cables: Videotape, Reading.

31334-01. $3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 200 \mu \mathrm{Sec}$. characteristic tape.
31331-01. $3 \frac{3}{4} \mathrm{i} / \mathrm{s} .120 \mu \mathrm{Sec}$. characteristic tape.
31321-01. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. NAB characteristic tape.
31321-04. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. NAB characteristic tape, for four-track recorders.

31323-01. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. CCIR characteristic tape.
31336-01. $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. flutter test tape.
31326-01. $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. flutter test tape.
All these tapes are priced at $£ 8$.

London, N.5. Tel.: Canonbury 2011.
Calibration Tape 19. $7 \frac{1}{2} \mathrm{q} / \mathrm{s}, 100 \mu \mathrm{Sec}$. characteristic. Azimuth alignment section included, also an unrecorded section for adjustment of bias, etc. Price: £11.

Calibration Tape 9. $3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 120 \mu \mathrm{Sec}$. (high) and $3 \cdot 180 \mu \mathrm{Sec}$. (low) characteristics. Other details as for Tape 19. Price: $£ 11$.

Calibration Tape 38. $15 \mathrm{i} / \mathrm{s} .35 \mu \mathrm{Sec}$. characteristic. Other details as for Tape 19. Price: $£ 11$.

DECCA SPECIAL PRODUCTS, Decca Radio and Television Division of the Decca Record Co. Ltd., Ingate Place, Queenstown Road, London, S.W.8. Tel.: Macaulay 6677.

LXT 5346. 12 in. mono (lateral) frequency test disc covering the range $30 \mathrm{c} / \mathrm{s}$ to $18 \mathrm{Kc} / \mathrm{s}$, with fixed bands on one side and gliding tone on the other. Follows RIAA curve, with level reduced by 6 dB above $10 \mathrm{Kc} / \mathrm{s}$. Price: $£ 112 \mathrm{~s}$. 3 d . (U.K. purchase tax 5s. 3d.).

45-71123. 7 in. mono (lateral) frequency test disc covering the range $50 \mathrm{c} / \mathrm{s}$ to $10 \mathrm{Kc} / \mathrm{s}$ in fixed bands. Follows RIAA curve. Price: 5s. 9d. (U.K. purchase tax 11d.).

SXL 2057. 12 in. stereo (45/45) frequency test disc covering the range $40 \mathrm{c} / \mathrm{s}$ to $12 \mathrm{Kc} / \mathrm{s}$ in fixed bands, with left-hand channel only on side A and right hand on side B. Follows RIAA curve. Crosstalk at $1 \mathrm{Kc} / \mathrm{s}$ better than -20 dB . Price: £1 12s. 3d. (U.K. purchase tax 5s. 3d.).

EMI ELECTRONICS LTD., Hayes, Middx. Tel.: Hayes 3888. Cables: Emidata, London.

SRT12. Professional frequency test tape, $15 \mathrm{i} / \mathrm{s}, 35 \mu \mathrm{Sec}$. CCIR characteristic. $15 \mathrm{Kc} / \mathrm{s}-$ $40 \mathrm{c} / \mathrm{s}$, with $15 \mathrm{Kc} / \mathrm{s}$ tone for azimuth alignment. $3 \mathrm{Kc} / \mathrm{s}$ band for wow and flutter checking has total wow and flutter contents better than $0.08 \%$ RMS. Length of tape with strobe markings for speed check included. Price: $£ 10$. *

SRT13. Professional frequency test tape, $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 100 \mu \mathrm{Sec}$. CCIR characteristic. $10 \mathrm{Kc} / \mathrm{s}-$ $40 \mathrm{c} / \mathrm{s}$, with $10 \mathrm{Kc} / \mathrm{s}$ tone for azimuth alignment. $3 \mathrm{Kc} / \mathrm{s}$ band for wow and flutter checking has total wow and flutter contents better than $0.08 \%$ RMS. Length of tape with strobe markings for speed check included. Price: $£ 10$.

SRT14. Professional frequency test tape, $3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 120 \mu \mathrm{Sec}$. characteristic as proposed by I.E.C. (British $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$ pre-recorded tapes use this). Other details as for SRT13, but no strobe section. Price: $£ 10$.

SRT15. Professional frequency test tape, $3 \frac{3}{4} \mathrm{i} / \mathrm{s}, 200 \mu \mathrm{Sec}$. characteristic. $6 \mathrm{Kc} / \mathrm{s}-40 \mathrm{c} / \mathrm{s}$, with $6 \mathrm{Kc} / \mathrm{s}$ tone for azimuth alignment and $4 \mathrm{Kc} / \mathrm{s}$ for equaliser setting. $3 \mathrm{Kc} / \mathrm{s}$ wow and flutter band. Price: $£ 10$.

EMI LTD., Tape Record Department, Hayes, Middx. Tel.: Hayes 3888. Cables: Emitron, London.

Type TBT 1. Full track tape, $7 \frac{1}{2} \mathrm{i} / \mathrm{s}, 100 \mu \mathrm{Sec}$. CCIR characteristic. Range $40 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$, with $8 \mathrm{Kc} / \mathrm{s}$ Azimuth alignment band. Price: $£ 3$.

EMI RECORDS (The Gramophone Co. Ltd.), EMI House, 20 Manchester Square, London, W.1. Tel.: Hunter 4488.

TCS 101. 12 in. stereo (45/45) frequency test disc covering the range $30 \mathrm{c} / \mathrm{s}$ to $20 \mathrm{Kc} / \mathrm{s}$, with fixed bands on alternate left and right channels. Follows RIAA curve, with level reduced by 6 dB above $10 \mathrm{Kc} / \mathrm{s}$. Both sides identical. Price: £117s. 6d.

TCS 102. 12 in. stereo (45/45) frequency test disc covering same range as TCS 101, but with gliding tone. Side A, left channel; side B, right channel. Price: $£ 1$ 17s. 6d.

TCS 104. 12 in. mono (lateral) frequency test disc covering same range as TCS 101, with fixed bands on one side and gliding tone on the other. Price: $£ 1$ 17s. 6d.

TCS 105. 12 in. vertical-cut frequency test disc covering same range as TCS 101, with fixed bands on one side and gliding tone on the other. Price: £1 17s. 6d.

POLYDOR RECORDS LTD., 17/19 Stratford Place, Oxford Street, London, W.1. Tel.: Hyde Park 7401 (10 lines). Cables: Polydor, London, W.1.

Polydor SNH 220497.7 in. stereo test disc for setting-up purposes. Side A carries signals permitting adjustments for correct balance, response and speaker phasing. Side B carries demonstration recordings of a tramcar, train, aircraft and dance orchestra. Price: 6s. 8d.

TUTCHINGS ELECTRONICS LTD., 14 Rook Hill Road, Friars Cliff, Christchurch, Hants. Tel.: Highcliffe 2019.

Test Tape No. 1. Pure tones $40 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$ with voice identification of each band. Recorded to new CCIR $70 \mu \mathrm{Sec}$. characteristic at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$. Track 2 carries continuous $7.5 \mathrm{Kc} /$ s tone for azimuth alignment.

Test Tape No. 2. Pure tones $40 \mathrm{c} / \mathrm{s}-7 \cdot 5 \mathrm{Kc} / \mathrm{s}$ with voice identification of each band. Recorded to new CCIR $140 \mu \mathrm{Sec}$. characteristic at $3 \frac{3}{4} \mathrm{i} / \mathrm{s}$. Track 1 carries four identical frequency runs. Track 2 is recorded with continuous $5 \mathrm{Kc} / \mathrm{s}$ tone for azimuth alignment.

Test Tape No. 3. White noise, one third octave bands $40 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$ with voice identification of each band. Recorded to new CCIR $70 \mu \mathrm{Sec}$. characteristic at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$.

Test Tape No. 4. White noise, one octave bands $100 \mathrm{c} / \mathrm{s}-6 \cdot 4 \mathrm{Kc} / \mathrm{s}$ centre frequencies with voice identification of each band. Track 2 carries full range unfiltered white noise. Recorded to new CCIR $70 \mu \mathrm{Sec}$. characteristic at $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$.

Test Tape No. 5. Azimuth and vertical head alignment tape. Full track unfiltered white noise with track 3 blank. Can be used without test equipment. at all tape speeds on two- or four-track recorders.

All tapes on 3 in. spools. Price: $£ 1$ 10s. each including postage.

Full-track recordings of any single frequency can be supplied with low wow and flutter content at $£ 15$ s. per 3 in. reel.

## DIRECTORY OF MICROPHONES

In these abridged specifications, the following abbreviations are used: Imp.-microphone source impedance. Rec. load imp.-recommended load impedance, and sensitivity is given in dB with reference to 1 volt $/ \mathrm{dyne} / \mathrm{cm}^{2}$, unless otherwise stated.

Stereo.

AKAI. Distributors: Pullin Photographic Ltd., 11 Aintree Road, Perivale, Greenford, Middlesex. Tel.: Alperton 1541. Cables: Pullinfoto, Greenford, Middlesex.

Akai 345-CM15. Hand or stand condenser microphone. F.R. $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$ approximately. Sensitivity -50 dB . Impedance about 200 ohms. Rec. load $>500 \mathrm{~K}$. Size: approximately 6 in . long, 1 in . dia. Satin chrome finish. Weight: about 1 lb . including cable. Preamplifier: $7 \frac{3}{4} \times 5 \frac{1}{2} \times 5 \frac{3}{4} \mathrm{in}$. Weight: $7 \frac{3}{4} \mathrm{lb}$. Mono or stereo. Mains $100,110,117,200,220,230 \mathrm{~V}$ AC. Microphone DC bias 170V. Price: approximately $£ 104$.
A.K.G. (Akustische und Kino-Gerate G.m.b.H.). Distributors: Politechna (London) Ltd., 182184 Campden Hill Road, Kensington, London, W.8. Tel.: Park 0711/3, 5008.

C12A. Professional condenser microphone. Variable polar diagram covering cardioid, omni, figure-of-eight and six intermediate positions. F.R. $10 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Sensitivity -68 dB . Impedance 50 and 200 ohms. Rec. load $\geq 150$ and 500 ohms. Fitting: $\frac{3}{8} \mathrm{in}$. Whit., $\frac{1}{2}$ in. 26 tpi , $\frac{5}{8} \mathrm{in} .27 \mathrm{tpi}$. Metal case finished matt silver. Price: $£ 139$.

C24. Stereo condenser. Sensitivity $1 \mathrm{mV} / \mathrm{bar}$. Imp. 200 or 500 ohms. Response $30-20,000 \mathrm{c} / \mathrm{s}$. Omni-directional cardioid; bi-directional, hyper-cardioid. Plus 5 intermediate patterns. Sensitivity approx. 1 mV per microbar (at 200 ohms output terminals) -33 dB re 1 milliwatt at a sound pressure of 10 dynes $/ \mathrm{cms}$. Crosstalk between channels $<40 \mathrm{~dB}$ throughout entire range. Imp. $<200$ ohms when delivered. 50 ohms by changing solder connections. N. 24 power supply unit. Remote control unit. Twin remote control cable. Price: $£ 230$.

C28C. Condenser studio. Cardioid or omnidirectional. Response $30 \mathrm{c} / \mathrm{s}-30 \mathrm{Kc} / \mathrm{s}$. Sensitivity (with CK28 cardioid capsule) -58 dB (with CK26 omni-capsule), -60 dB . Imp. 50 ohms or 200 ohms, from built-in transformer. Low noise, professional standards. Variations C29C, C30C.

Price (including N28A power unit, 22 yds . microphone cable, 2 yds. power cable, and wood carrying case): C28C: £98.; C30C: £123 10s.; C28/29/30C: $£ 134$ 10s.

C61. Cardioid or omni condenser microphone. F.R. $20 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s} \pm 2 \cdot 5 \mathrm{~dB}$. Sensitivity -64 dB . Impedance 50 and 200 ohms. Rec. load $\geq 150$ and 500 ohms. Stand fitting: $\frac{3}{8}$ in. Whit., $\frac{1}{2} \mathrm{in} .26$ tpi, $\frac{5}{8} \mathrm{in} .27$ tpi. Supplied with stabilised power supply, 22 yds. microphone cable, 2 yds. power cable. Metal case finished matt silver. Price: £84.

D7A. Moving coil. Omni-directional. Response $80 \mathrm{c} / \mathrm{s}-13 \mathrm{Kc} / \mathrm{s} \pm 5 \mathrm{~dB}$. Sensitivity -74 dB ( 200 ohms), $-52 \mathrm{~dB}(50 \mathrm{~K}$ ). Imp. 200 ohms or 50 K available from built-in transformer. Price: $£ 44$ s.

D11C. Moving coil with cardioid directional pattern. Response $80-12,000 \mathrm{c} / \mathrm{s}$. Imp. 200 ohms or 50 K ohms. Fitted with collapsible stands and 5 ft . screened cable. Price: $£ 6$.

D12. Moving coil with cardioid directional pattern. Response $40-12,000 \mathrm{c} / \mathrm{s} \pm 4 \mathrm{~dB}$. Front to back ratio 15 dB . Sensitivity - 77 dB . Imp. 60 ohms, or to order. Price: $£ 28$.

D14. Dynamic cardioid microphone. Imp. $60-40,000$ ohms. Response $\cdot 50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. On/off switch swivel joint fits all stand threads. Supplied with $5 \frac{1}{2}$ yds. two-core screened lead. Weight: 8 oz. Price: $£ 10$.

D19C. Moving coil with cardioid directional pattern and bass cut switch. Response: $40 \mathrm{c} / \mathrm{s}-$ $16 \mathrm{Kc} / \mathrm{s}$. Impedance: 60 or 200 ohms. Price: £17 10s.

D19E. Moving coil with cardioid directional pattern. Response $40 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Built-in transformer provides 3 different impedances: 50, 200 ohms, 50 K . Price: $£ 21$ 10s.

D58. Moving coil, close-talk microphone. Response $50-12,000 \mathrm{c} / \mathrm{s}$. Sensitivity $0 \cdot 1 \mathrm{mV} / \mathrm{bar}$. Imp. 200 ohms. Price: $£ 11$ 10s.


Acos Mic 39-1


AKG D109


Acos Mic 60


AKG C12A



Acos mic 80


AKG C12A professional condenser


D66. Stereo moving coil. Cardioid diagram. F.R. $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 4 \mathrm{~dB}$. Sensitivity -73 dB . Impedance 200 ohms. Rec. load $\geq 400$ ohms. Stand fitting $\frac{3}{8}$ in. Whit. Supplied with two desk stands. Microphones can be detached and used separately. Moulded cases. Price (complete with stands): £11 10s.

D109. Omni-directional moving coil. F.R. $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 3 \cdot 5 \mathrm{~dB}$. Sensitivity -98 dB . Impedance: 60 and 200 ohms. Rec. load $\geq 400$ ohms. Hand and lavalier type. Supplied with lavalier cord. Higher frequencies boosted when lavalier attached. Metal case nickel plated. Price: $£ 11$.

D119CS. Dynamic cardioid microphone. "Sophisticated" version of D19C. Black finish with chrome stripes. Higher sensitivity. On/off switch. Imp. 200 ohms. Response $40 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Front-to-back ratio better than 15 dB at 180 degrees sound incidence at $1 \mathrm{Kc} / \mathrm{s}$. Price: £20 10s.

D119ES. Same specification as D119CS but with built-in transformer for 60-200 ohms and high impedance. Sand blast finish. Price: £24 10s.

DX11A. Dynamic cardioid microphone with built-in reverberation unit (Echo microphone). Reverb effect can be controlled during pick up from 0 to $2 \frac{1}{2}$ seconds. Connects to low and high impedance amplifiers. 9V Ever Ready battery recommended for built-in amplifier. Supplied with $5 \frac{1}{2}$ yds. three-core cable. Weight: 14 oz . Price: £30 10s.

D202ES.! Móving coil microphone with marked cardioid response ( -20 dB minimum). F.R. $30 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Sensitivity -53 dB . Impedance 200 ohms. Rec. load $\geq 400$ ohms. Stand fitting swivel adaptor, $\frac{3}{8} \mathrm{in}$. Whit., $\frac{1}{2} \mathrm{in}$. 26 tpi, $\frac{5}{8} \mathrm{in} .27 \mathrm{tpi}$. On-off switch and variable bass control providing 0 to -20 dB at $50 \mathrm{c} / \mathrm{s}$. Strong black metal case with sintered bronze grille. Price: $£ 30$.

D501. Moving coil cardioid and omnidirectional microphone. F.R. $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$ $\pm 3.5 \mathrm{~dB}$. Sensitivity -73 dB . Impedance 200 ohms. Rec. load. $\geq 400$ ohms. Hand or stand type. Fitting: $\frac{3}{8}$ in. Whit., $\frac{1}{2}$ in. 26 tpi, $\frac{5}{8}$ in. 27 tpi. Omni/cardioid switch. Remote control switch. Built-in windshield. Quick release adaptor. Leatherette carrying bag. Moulded case with metal grille. Price: $£ 12$ 10s.

D503. Moving coil cardioid stand microphones. F.R. $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 3 \cdot 5 \mathrm{~dB}$. Sensitivity - 73 dB . Impedance: 200 ohms. Rec. load
$\geq 400$ ohms. Fitting: $\frac{3}{8}$ in. Whit., $\frac{1}{2}$ in. 26 tpi, ${ }_{8}^{5}$ in. 27 tpi. Supplied with attached flexible shaft. Moulded case with metal grille. Price: $£ 15$.

D505. Moving coil omni-directional hand microphone. F.R. $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 3 \cdot 5 \mathrm{~dB}$. Sensitivity -74 dB . Impedance: 200 ohms. Rec. load $\geq 300$ ohms. Fitting: $\frac{3}{8}$ in. Whit., $\frac{1}{2}$ in. 26 tpi, $\frac{5}{8}$ in. 27 tpi. Remote control switch. Antinoise. Quick release adaptor. Moulded case with metal grille. Price: $£ 13$ 15s.

D507. Moving coil omni-directional stand microphone. F.R. $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 3 \cdot 5 \mathrm{~dB}$. Sensitivity -74 dB . Impedance: 200 ohms . Rec. load $\geq 300$ ohms. Fitting as for D505. Antinoise. Supplied with attached flexible shaft. Moulded case with metal grille. Price: $£ 15$.

ST200. Microphone floor stand. Telescopic. Height: 42 to 77 in . Three collapsible feet with main support locking device. Anti-vibration characteristics. Microphone may be clamped to face any direction. Price: $£ 1310$ s.

K58. Microphone headset. Incorporates microphone D58 and headset K50 (see Tape Recorder Accessories). Price: £13 10s.

BANG \& OLUFSEN. U.K. Sales Division, Mercia Road, Gloucester. Tel.: Gloucester 26841. Cables: Debelec, Gloucester.

MD8. Moving-coil omni-directional. F.R. $50 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s} \pm 5 \mathrm{~dB}$. Sensitivity: 80 dB below $1 \mathrm{~V} /$ microbar. Imp. 200 ohms at $1 \mathrm{Kc} / \mathrm{s}$. Supplied with desk stand and lavalier cord. Can be used as hand mic. Price: $£ 88 \mathrm{~s}$.

- BM5. Stereo microphone. Response $30 \mathrm{c} / \mathrm{s}$ $13 \mathrm{Kc} / \mathrm{s} \pm 2 \cdot 5 \mathrm{~dB}$. Imp. 200 ohms per channel. Price: $£ 232 \mathrm{~s}$.

BM6. Same specification as BM5 but mono only. Price: $£ 13$ 2s. 6d.

BM7. Same specification as BM5. This is an add-on unit to convert the BM6 (mono) into a BM5 (stereo). Price: $£ 11$ 0s. 6d.

Desk stand for BM5. Price: £1 12s. 6d. Floor stand for BM5. Price: $£ 7$ 7s.


## AKG D58 moving coil



AKG D1 1N moving coil


AKG D19E moving coil


AKG D501 cardioid moving coil


AKG D202 moving coil


AKG D12 moving coil

BEYER. Distributors: Fi-Cord International, Charlwoods Road, East Grinstead, Sussex. Tel.: East Grinstead 21351.

M41. Moving coil. Directional. Imp. 200 ohms. Supplied with $4 \frac{1}{2} \mathrm{ft}$. lead. Price: $£ 1615 \mathrm{~s}$.

M41S. Moving coil. Directional. Imp. 200 ohms. Built-in switch. Fitted $4 \frac{1}{2} \mathrm{ft}$. lead. Price: £18 6s.

M51. Moving coil. Omni-directional. Response $100 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Sensitivity $0 \cdot 12$ $\mathrm{mV} /$ microbar at 200 ohms. Imp. 200 ohms. Price: £6 10s.

M57. Moving coil hand microphone. Imp. 200 ohms. Fitted $4 \frac{1}{2} \mathrm{ft}$. lead. Price: $£ 1316 \mathrm{~s}$.

M64. Moving coil. Directional. Imp. 37.5 or 200 ohms. Supplied with 16 ft . or $4 \frac{1}{2} \mathrm{ft}$. leads respectively. Prices: ( $37 \cdot 5$ ohms) $£ 19$ 2s., (200 ohms) $£ 183 \mathrm{~s}$.

M69. Moving coil. Directional. Imp. 37.5, 200 ohms, or 50 K . Supplied with 16 ft ., $4 \frac{1}{2} \mathrm{ft}$., or 12 ft . leads respectively. Price: ( 37.5 ohms ) $£ 29$ 4s., (200 ohms) £28 5s., (50K) £32 17s.

M88. Moving coil. Directional. Imp. 200 ohms or 50 K . Fitted $4 \frac{1}{2} \mathrm{ft}$. lead or 12 ft . lead respectively. Prices: ( 200 ohms) $£ 605$ s., ( 50 K ) £64 17s.

M100. Moving coil. Omni-directional. Response $40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s} . \pm 2 \mathrm{~dB}$. Sensitivity $0 \cdot 1$ $\mathrm{mV} /$ microbar. Imp. $37 \cdot 5$ ( 16 ft . lead), 200 ohms ( $4 \frac{1}{2} \mathrm{ft}$. lead), 50 K ( 12 ft . lead). Prices: ( 37.5 ohms) £61 4s., ( 200 ohms) £60 5s., ( 50 K ) $£ 64$ 17s.

M110. Moving coil. Lavalier. Directional. F.R. $60 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. Imp. 200 ohms. Fitted $4 \frac{1}{2} \mathrm{ft}$. lead. Price: £28 11s.

M119. Moving coil. Omni-directional. Response $50 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s} \pm 2.5 \mathrm{~dB}$. Sensitivity $0.22 \mathrm{mV} / \mathrm{microbar}$. Imp. 200 ohms. Fitted $4 \frac{1}{2} \mathrm{ft}$. lead. Price: $£ 22$ 19s.

M130. Ribbon. Figure of eight. Imp. 200 ohms. Fitted $4 \frac{1}{2} \mathrm{ft}$. lead. Price: $£ 61 \mathrm{l} 6 \mathrm{~s}$.

M160. Double ribbon. Cardioid. Response $40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s} \pm 2.5 \mathrm{~dB}$. Sensitivity $0.08 \mathrm{mV} /$ microbar. Imp. $37 \cdot 5,200$ ohms or 50 K . Prices: ( $37 \cdot 5 \mathrm{ohms}$ ) $£ 6018 \mathrm{~s}$., ( 200 ohms ) $£ 59$ 19s. ( 50 K ) £64 11s.

M260. Ribbon. Directional. Imp. 37.5, 200 or

50 K ohms. Supplied with 16 ft ., $4 \frac{1}{2} \mathrm{ft}$. or 12 ft . leads respectively. Prices: ( $37 \cdot 5 \mathrm{ohms}$ ) $£ 2411 \mathrm{~s}$., (200 ohms) $£ 23$ 12s., (50K) $£ 6411 \mathrm{~s}$.

M610. Moving coil. Directional. Built-in switch. Imp. $37 \cdot 5,200$ ohms or 50 K . Prices: ( $37 \cdot 5 \mathrm{ohms}$ ) $£ 2219 \mathrm{~s}$., ( 200 ohms) $£ 2312 \mathrm{~s}$., ( 50 K ) £26 12 s .

M55. Moving coil. Omni-directional. Dual imp. 200 ohms and 50 K . Supplied with stand and lead. Price: $£ 617 \mathrm{~s}$.

M80. Moving coil. Cardioid. F.R. $50 \mathrm{c} / \mathrm{s}-$ $16 \mathrm{Kc} / \mathrm{s}$. Dual imp. 200 ohms and 50K. Supplied with table stand and cable. Price: $£ 1218 \mathrm{~s}$.

Microphone stands. ST260 table stand $£ 3$ 12s. 6d. ST201/1 standard adjustable £8 4s. 6d. ST201A/1 heavy duty $£ 1015$ s. ST1 99 portable telescopic $£ 67 \mathrm{~s}$. SCH211 boom arm $£ 57 \mathrm{~s}$. 6d. SH126 gooseneck $8 \frac{1}{4} \mathrm{in}$. lightweight with plug £311s. SH127 gooseneck 16 in. heavy duty with plug £6 15s. KV24. Adaptor clamp for all stands 9s. 6d.
Accessories. Windshields, plugs, sockets, cables, adaptors, etc.

Also see Fi-Cord microphones.

BOUYER. Distributors: Douglas A. Lyons and Associates Ltd., 32 Grenville Court, Dulwich, London, S.E.19. Tel.: Gipsy Hill 2833. Cables: Daliona, London, S.E.19.
709. Moving coil microphone with marked cardioid response. Rear to front attenuation 20 dB . F.R. $150 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Sensitivity -63 dB reference 1 volt $/$ dyne $/ \mathrm{cm}^{2}$. Imp. 20 ohms. Rec. load $30-150$ ohms. Robust construction. Stand fitting with flexible stem. Hand grip available. Price (cardioid head): $£ 1315 \mathrm{~s}$. Fittings extra as required.
S. G. BROWN LTD., King George's Avenue, Watford, Herts. Tel.: Watford 23301. Cables: Radiolink, Watford.

Dual Function (IC.600/1). Stick type dynamic microphone suitable for hand or stand use. Operation of a shutter mechanism changes characteristic from a conventional pressureoperated configuration to differential operation. This renders the microphone sensitive only to sounds originating close to it. Designed to deal with all types of programme situation. Directional pattern figure-of-eight. Response: $50 \mathrm{c} / \mathrm{s}$ $12 \mathrm{Kc} / \mathrm{s}$. Output: 0.6 mV . Impedance: 150 K . Price: £6 6s.


AKG D14 cardioid


Akai condenser mic pre-amp


AKG D503 moving coil cardioid



Akai condenser mics

COSMOCORD LIMITED, Eleanor Cross Road, Waltham Cross, Herts. Tel.: Waltham Cross 27331. Cables: Acos, Waltham Cross.

Acos Mic. 39-1. Crystal. Response $40 \mathrm{c} / \mathrm{s}-$ $15 \mathrm{Kc} / \mathrm{s} \pm 6 \mathrm{~dB}$. Sensitivity -60 dB . Imp. equals 800 pF capacity. Rec. load imp. not less than 4.7 megohms. 8 ft . cable. Desk stand available. Price: $£ 33 \mathrm{~s}$.

Acos Mic. 40. Available in three versions: Crystal, ceramic, magnetic. Crystal: Response $30 \mathrm{c} / \mathrm{s}-7 \mathrm{Kc} / \mathrm{s}$. Sensitivity -52 dB . Rec. load 5 megohms. Ceramic: specification as for crystal but sensitivity -62 dB . Magnetic: Response: $200 \mathrm{c} / \mathrm{s}-5 \mathrm{Kc} / \mathrm{s}$. Sensitivity -75 dB . Rec. load 2 K. Prices: Crystal £1 15s., ceramic $£ 2$, magnetic £2 5s.

Acos Mic. 55. Lapel microphone. Available in three versions: Crystal, ceramic, magnetic. Crystal: Response $30 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Sensitivity -58 dB . Rec. load 4.7 megohms. Ceramic: Response $20 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Sensitivity -58 dB . Rec. load 10 megohms. Magnetic: Sensitivity -75 dB . Rec. load 2K. Prices: Crystal £2 2s., ceramic $£ 27 \mathrm{~s}$., magnetic $£ 215 \mathrm{~s}$.

Acos. Mic. 60. Stick microphone. Available in three versions: Crystal, ceramic, magnetic. Specifications and prices as for Mic. 55.

Acos Mic. 70/1. Moving coil. F.R. $80 \mathrm{c} / \mathrm{s}-$ $12 \mathrm{Kc} / \mathrm{s}(10 \mathrm{~dB}$ down at $50 \mathrm{c} / \mathrm{s}$ and $15 \mathrm{Kc} / \mathrm{s}$ ). Impedance: 200 ohms. Sensitivity -80 dB . Price: $£ 7$ 10s.

Acos Mic. 70/4. Moving coil. F.R. as for Mic. 70/1. Impedance: 50 K nominal. Sensitivity -58 dB . Price: $£ 88 \mathrm{~s}$.

Acos Mic. 80. Robust moving coil microphone particularly suited for PA: Satin chrome finish. F.R. $50 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. Sensitivity -87 dB . Impedance: 30-50 ohms balanced. Other impedances to order. Price: $£ 1210 \mathrm{~s}$.

DERRITRON LTD., See Reslosound.


EAGLE PRODUCTS. Distributors: B. Adler \& Sons (Radio) Ltd., 32a Coptic Street, London, W.C.1. Tel.: Museum 9606/7. Cables: Reldab, London.

DM. 15R. Moving-coil microphone for stand mounting. Response: $60 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. Imp. 50 K .

Swivel-action mounting. Chrome finish. With stand adaptor and cable. Size: 5 in. long, $1 \frac{1}{2} \mathrm{in}$. dia. Price: $£ 316 \mathrm{~s} .6 \mathrm{~d}$.

DM.16HL. Moving-coil. Cardioid. Response $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Sensitivity -62 dB . Imp. 500 ohm (low), 50 K (high). Transformer fitted. Built-in high/low impedance switch. Price: $£ 85$ s.

DM.18HL. Moving-coil microphone for hand, desk or floor stand use. Response $70 \mathrm{c} / \mathrm{s}$ $12 \mathrm{Kc} / \mathrm{s}$. Dual imp., 600 ohms and 50 K . Tapered body. Removable desk stand. Supplied with desk stand, adaptor for floor stand and cable. Price: $£ 515 \mathrm{~s} .6 \mathrm{~d}$.

UD.19HL. Moving-coil. Undirectional cardioid. Range $100 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s}$. Sensitivity -75 dB $\pm 3 \mathrm{~dB}$ at 600 ohm; $-55 \mathrm{~dB} \pm 3 \mathrm{~dB}$ at 50 K . Imp. 600 ohm (low), 50K (high). Transformer fitted. Price: $£ 165 \mathrm{~s}$.
S.M.D100 Stereo. Moving-coil, with two units angled at $90^{\circ}$. Response $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Sensitivity -60 dB . Imp. 50 K . Built-in transformers. Stereo/mono switch. Price: £6 18s. 6d.

MC70. Crystal. Omni-directional. Response $50 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Sensitivity -75 dB . Price: £3 5s. 6d.

DM.20H. Extra slim dynamic microphone in solid cast tapered case. Response: $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Sensitivity -52 dB . Pear-shaped response pattern. Impedance: 50 K . Built-in switch. With cable and stand adaptor. Price: $£ 418 \mathrm{~s} .9 \mathrm{~d}$.

DM.21M. High output omni-directional dynamic microphone. Response: $50 \mathrm{c} / \mathrm{s}-11 \mathrm{Kc} / \mathrm{s}$. Built-in switch. Impedance: 600 ohms. Satin chrome finish. Stand adaptor, table base and screened lead. Price: $£ 45$ s. 8d.

DM.14S. Miniature wide range pencil dynamic microphone. Response: $40 \mathrm{c} / \mathrm{s}-13 \cdot 5 \mathrm{Kc} / \mathrm{s}$. Sensitivity -52 dB . Size: $3 \frac{1}{2} \times \frac{7}{8}$ in. Impedance 50 K . With cable, desk stand and adaptor. Price: $£ 3$ 19s. 8d.
100.C. Three-way crystal stick type microphone. Response: $60 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. For hand, stand or desk use. Locking on-off switch. 7 ft . cable, stand adaptor and lavalier cord. Size: $5 \times 1 \frac{1}{8} \mathrm{in}$. Price: $£ 1$ 19s.

DM.17HL. Dual impedance cardioid dynamic microphone. Response: $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Sensitivity -52 dB . Impedance: 50 ohms and 50 K . Special grille for close-talking applica-

## -ara <br> 12

## AKG C24 stereo



Beyer M160 double ribbon


Beyer M100 moving coil


Beyer M260 ribbon


Eagle DM 16HL moving coil


Eagle SM.D100 stereo


Eagle UD 19HL moving coil

S. G. Brown dual-function
tions. Ideal pop singers. On-off switch. Stand adaptor and cable. Size: $7 \frac{1}{4} \times 1 \frac{7}{8}$ in. Price: £6 15s. 6d.

DM.12. Streamlined dynamic microphone. Response: $60 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. Sensitivity -52 dB . Impedance: 50 K . Omni-directional used vertically, cardioid when tilted. Swivel mounting. Onoff switch. Size: $10 \times 1 \frac{1}{4} \mathrm{in}$. With cable and stand adaptor. Price: $£ 7$ 1s. 3d.

Table, desk and floor stands available.
All prices quoted are approximate.

ELECTROVOICE. See KEF Electronics.

FI-CORD LTD., Charlswood Road, East Grinstead, Sussex. Tel.: East Grinstead 21351.

FC 801. Studio quality moving coil. Omnidirectional. F.R. $50 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Shock proof and resistant to temperature changes. Especially suitable for outdoor work. Price: $£ 165$ s.

FC 901. Studio quality moving coil. Cardioid. Damping at $180^{\circ} 15-18 \mathrm{~dB}$. F.R. $40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Suitable for use in unfavourable acoustic conditions. Shock proof. Finished in matt dark grey with matt chrome head. Price: $£ 17$ 10s.

FC 1200. Condenser microphone with cardioid or omni-directional pattern. F.R. $30 \mathrm{c} / \mathrm{s}-20$ $\mathrm{Kc} / \mathrm{s} \pm 2 \cdot 5 \mathrm{~dB}$. Interchangeable head. Front to back response differential pattern 20 dB . Output imp. 300 ohms or 30 ohms balanced. Polarising voltage 60 V DC. One Nuvistor type 7586 or 6CW4. Sizes: Capsule 1 in . diameter $1 \frac{7}{8} \mathrm{in}$. long, pre-amplifier 1 in . diameter, $5 \frac{3}{8} \mathrm{in}$. long, complete microphone 1 in . diameter $6 \frac{7}{16} \mathrm{in}$. long. Weight: 10 oz . Finished in satin chrome or satin nickel. Supplied with windshield, microphone stand clamp, power unit and leads. Price: $£ 98$.

FILM INDUSTRIES LTD., 90 Belsize Lane, London, N.W.3. Tel.: Hampstead 9632/3. Cables: Troosound London.

M7. Moving coil. Response: $60 \mathrm{c} / \mathrm{s}-9 \mathrm{Kc} / \mathrm{s}$. Imp. 20 ohms. 12 ft . twin screened cable standard, other lengths if required. Table, desk and floor stands available. Price: $£ 8$ 15s., (with on/off switch): $£ 107$ s. 6d.

M8. Ribbon. Response: $50 \mathrm{c} / \mathrm{s}-13 \mathrm{Kc} / \mathrm{s}$. Figure-of-eight polar diagram. Available
matched to all impedances up to 57 K . Plug and socket joint between microphone head and flexible. Fitted with 12 ft . screened cable, other lengths to order. Table, desk and floor stands available. Price (all impedances): $£ 9$ 9s., (with on/off switch): £1111s.

M8A. Ribbon. Similar unit to M8 but without plug and socket connection between head and flexible. Small detachable desk stand provided. Other stands available. Available in all impedances up to 57 K . Price: $£ 9$., (with on/off switch): £10 12s. 6d.

M8S. Ribbon. Similar unit to M8 but with angled base in place of flexible. Small detachable desk stand provided. Other stands are available. Available in all impedances up to 57 K . Price: £8 15s., (with on/off switch): £107s. 6d.

Microphone stands. Desk, table and floor stands. Grey hammer finish with cast iron bases. Stems in satin chrome. Pricesfrom $£ 15 \mathrm{~s}$.

Matching transformer. In mu-metal screened case for fitting into microphone lead. Impedance ratio: 30 ohms to 60 K . Price: $£ 310$ s.

Microphone switch assembly. Suitable for use with M7 and M8 microphones. Price on request.

GELOSO. See Lee Products (Great Britain) Ltd.

GRAMPIAN REPRODUCERS LTD., Hanworth Trading Estate, Feltham, Middx. Tel.: Feltham 2657/8. Cables: Reamp, Feltham.

DP4/H. Moving coil. Response: $50-15,000$ c/s. Sensitivity $-52 \mathrm{~dB},-70 \mathrm{~dB},-86 \mathrm{~dB}$, for high, medium and low impedance. $50,000,600$ and 25 ohms. Tubular case. Price including lead: high or medium impedance: $£ 95 \mathrm{~s}$.; low impedance: £85s.

DP6. Moving coil. Omni-directional. Response $200 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Sensitivity -87 dB ( 25 ohms), -75 dB ( 200 ohms), -50 dB ( 600 ohms), $-52 \mathrm{~dB}(50 \mathrm{~K})$. Built-in transformer fitted to all but low impedance model. Price (low impedance): $£ 85 \mathrm{~s} . ;$ (other three models): $£ 95 \mathrm{~s}$.

GR1. Ribbon. Unequal figure of eight. Response $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Sensitivity -90 dB ( 25 ohms), -81 dB ( 200 ohms), -76 dB ( 600


Bouyer cardioid moving coil


Film Industries M8 ribbon on S. 6 desk stand


Film Industries M8S ribbon on S. 6 desk stand


Eagle MC70 crystal



Fi-Cord FC801
ohms), $-58 \mathrm{~dB}(50 \mathrm{~K})$. Imp. 25, 200, 600 ohms. 50 K . Built-in transformer. Easily replaceable ribbon. Price (including lead, swivel holder, case): £11 15s.

GR2. Details as for GR1, but equal figure of eight response.

GCI series. Moving coil cardioid microphones. Response: $40 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s} \pm 5 \mathrm{~dB}$. Nonmetallic diaphragms. Interchangeable leads. Various stands and accessories. Imp. GCl/L 25 ohms, rec. load $15-50$ ohms; GCl/X 200 ohms, rec. load 150-300 ohms; GCl/M 600 ohms. rec. load 500-1,000 ohms; GCl/H 50 K , rec. load 50 K and upwards. Sensitivities: GCl/L $-86 \mathrm{~dB}, \mathrm{GCl} / \mathrm{X}-75 \mathrm{~dB}, \mathrm{GCl} / \mathrm{M}$ $-70 \mathrm{~dB}, \mathrm{GCl} / \mathrm{H}-52 \mathrm{~dB}$. Prices: GCl/L $£ 14$; GCl/X, GCl/M, GC1/H £15.

DP8 series. Moving coil omni-directional microphones. Response: $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 5 \mathrm{~dB}$. Built-in on/off switch. Interchangeable leads. Hand type with swivel holder for stand use. Sensitivities, impedances and rec. loads as for GCl series. Prices: DP8/L £9 10s.; DP8/X, DP8/M, DP8/H £10 10s.

GRUNDIG (GREAT BRITAIN) LTD., Newlands Park, London, S.E.26. Tel.: Sydenham 2211. Cables: Grundig, London, S.E.26. Telex: 22854.

GDM302. Moving coil omni-directional. Response: $150 \mathrm{c} / \mathrm{s}-11 \mathrm{Kc} / \mathrm{s} \pm 5 \mathrm{~dB}$. Sensitivity $0.35 \mathrm{mV} /$ microbar. Imp. 400 ohms. General purpose hand mic. Price: $£ 44 \mathrm{~s}$.

GDM312. Moving coil omni-directional. Response: $100 \mathrm{c} / \mathrm{s}-11 \mathrm{Kc} / \mathrm{s} \pm 5 \mathrm{~dB}$. Impedance: 200 ohms and 55 K (built-in transformer). Sensitivity $0.15 \mathrm{mV} /$ microbar and $2.2 \mathrm{mV} /$ microbar. General purpose hand stick microphone. Price: $£ 77$ 7.
-GDSM202. Moving coil. Figure of eight. Response: $80 \mathrm{c} / \mathrm{s}-13 \mathrm{Kc} / \mathrm{s} 5 \mathrm{~dB}$. Sensitivity - 54 dB . Imp. 50 K . Transformers integral with plugs. Each unit may be detached and used independently. Price: $£ 14$ 14s.

HAMMOND \& CO. LTD., 90 High Street, Eton, Windsor, Berks. Tel.: Windsor 63388. Telex: 84316.

Hammond M.100. Condenser microphone with omni-directional response. Mono version
M. 100 +SU1. Stereo version M. 100 +SU2. Freq. response: $50 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. $\pm 3 \mathrm{~dB}$. Impedance 60 ohms. Replaceable capsules. Cannon connectors. Transistorised power supply. Price: $£ 309 \mathrm{~s}$. (mono), £51 9s. (stereo).

KEF ELECTRONICS LTD., Tovil, Maidstone, Kent. Tel. : Maidstone 58361. Cables: KEF.

Electro-Voice 642. Moving coil. Cardiline, uni-directional. Response: $30 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Sensitivity -68 dB . Imp. 50, 150 and 250 ohms. Transformer fitted. Cardioid up to $500 \mathrm{c} / \mathrm{s}$, sharply directional above. Price: $£ 107$ 18s.

Electro-Voice 655C. Moving coil. Omnidirectional. Response: $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Sensitivity - 77 dB . Imp. 50, 150, 250 ohms. Transformer fitted. Very slim design with nonreflecting finish for TV work. Price: $£ 702 \mathrm{~s}$.

Electro-Voice 635A. Moving coil. Omnidirectional. Response: $70 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Sensitivity -57 dB . Imp. high or 150 ohms. Transformer fitted. Price: $£ 28$ 17s. 6d.

Electro-Voice 666. Moving coil. Cardioid. Response: $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Sensitivity -75 dB . Imp. 50, 150, 250 ohms. Transformer fitted. Slim cardioid with single moving element. Price: $£ 896$ s.

Electro-Voice 649B. Moving coil. Omnidirectional. Response: $100 \mathrm{c} / \mathrm{s}-9 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Sensitivity -81 dB . Imp. 20-250 ohms. Transformer fitted. Only $1 \frac{1}{2}$ oz. less cable. Price: £28 17s.

Electro-Voice 668. Moving coil. Cardioid. Response $30 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Sensitivity -78 dB . Imp. 50, 150, 250 ohms. Transformer fitted. Specially designed for boom operation. Price: £1757s.

Electro-Voice 652. Moving coil. Omnidirectional. Response $100 \mathrm{c} / \mathrm{s}-7 \mathrm{Kc} / \mathrm{s}$. Sensitivity -80 dB . Imp. 50, 150, 250 ohms. Transformer fitted. Semi-rigid tube microphone. Price: £42 15s.

Electro-Voice 643. Moving coil. Super cardiline. Response $30 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Sensitivity -67 dB . Imp. 50, 150, 250 ohms. Transformer fitted. Super directional with inbuilt $100 \mathrm{c} / \mathrm{s}$ high-pass filter. Long range pickup. Price: $£ 460$.


LEE PRODUCTS (G.B.) LTD., Elpico House, Longford Street, London, N.W.1. Tel.: Euston 5754. Cables: Leprod, London, N.W.1.

Geloso M51. Stick type crystal hand microphone. Omni-directional. F.R. $60 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Sensitivity $1.1 \mathrm{mV} /$ microbar. Imp. 500K. Price: £5 5s.

Geloso B72/1110. Crystal microphone for hand or stand use. Omni-directional. F.R. $60 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Sensitivity $1.1 \mathrm{mV} /$ microbar. Imp. 500 K . Built-in switch. Table stand, head lifts off for hand use. Price: $£ 77 \mathrm{~s}$.

Geloso B92/1110. Similar to B72/1110 but with floor stand. Price: £11 11s.

Geloso M23. Moving coil wide angle microphone with gooseneck mounting. F.R. $60 \mathrm{c} / \mathrm{s}-$ $14 \mathrm{Kc} / \mathrm{s}$. Sensitivity $1.2 \mathrm{mV} /$ microbar. Imp. 45 K . Price: $£ 9$ 9s.

Geloso M68. Hand type moving coil. Cardioid. F.R. $80 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s}$. Sensitivity 1.7 $\mathrm{mV} /$ microbar. Imp. 250 ohms. Fitted special "sibilance" protector. Plug-in lead. Price: £10 10s.

Geloso M69. Similar to M68 but imp. 45K. Price: $£ 10$ 10s.

Geloso M18. Lavalier moving coil. Cardioid. F.R. $60 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s}$. Sensitivity $1 \cdot 2 \mathrm{mV} /$ microbar. Imp. 250 ohms. Price: $£ 1010$ s.

Geloso M19. Similar to M18 but imp. 45K. Price: $£ 10$ 10s.

LEM. Distributors: Douglas A. Lyons and Associates Ltd., 32 Grenville Court, Dulwich, London, S.E.19. Tel.: Gipsy Hill 2833. Cables: Daliona, London, S.E. 19 .

DH80. Miniature moving coil. Omnidirectional. F.R. $70 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s} . \pm 4 \mathrm{~dB}$. Imp. 50 ohms or 80 K . Sensitivity (low imp.) - 82 dB , (high imp.) -52 dB . May be used as hand microphone, desk stand, or attached to floor stand. Prices: (low imp.) £6 15s., (high imp.) £8 10s.

DO35. Miniature Lavalier moving coil microphone. Omni-directional. F.R. $80 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$ $\pm 3 \mathrm{~dB}$. Sensitivity -80 dB . Imp. 200 ohms. Can also be used as hand or stand microphone. Size: $2 \frac{1}{2}$ in. long, $\frac{7}{8}$ in. diameter. Weight: $1 \frac{13}{4} \mathrm{oz}$. Price: £19 19s.

DO21B. Studio-quality omni-directional moving coil microphone. F.R. $30 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$ $\pm 3 \mathrm{~dB}$. Imp. 50 ohms or 200 ohms. Sensitivity ( 200 ohms) -77 dB . Individually calibrated response curves. Suitable for hand or stand use. Prices on application.

DO24. Hand or stand-type moving coil. Omni-directional. F.R. $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Imp. $30-50$ ohms. Sensitivity -82 dB . Internal element resiliently mounted to avoid mechanical shock. Price: $£ 1015 \mathrm{~s}$.

LENNARD DEVELOPMENTS LTD., 7 Slades Hill, Enfield, Middlesex. Tel.: Keats 0601.

Microphones. Stick type crystal microphones for tape recorders, also dynamic versions. Full details on request.

LONDON MICROPHONE CO. LTD., Eardley House, 182/4 Campden Hill Road, Kensington, London, W.8. Tel.: Park 0711/3, 5008. Telex: 23894.

LM.100. Dynamic omni-directional microphone. F.R. $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Impedances: $50-60$, 200,500 , or 50 K . Sensitivity 60 ohms $0 \cdot 1 \mathrm{mV}$, 200 ohms 0.2 mV , 500 ohms 0.3 mV , 50 K 3 mV . Cable: two yards twin screened. Finish: twotone grey moulded plastic. Size: $4 \frac{1}{2}$ in. long, $1_{4}^{\frac{1}{4}} \mathrm{in}$. diameter. Weight: 3 oz . Suitable for hand, table stand and lavalier use. Price: LM.100/200 ohms $£ 2$ 19s. 6d., LM.100/500 ohms $£ 2$ 19s. 6d., LM. 100/50-60 ohms £3 2. 6d., LM.100/50K £3 14s. 6d. Accessories: keyhole wire stand 1 s . 6 d. , table wire stand 3s. 9d., lavalier attachment 7s. 6d.

LUSTRAPHONE LTD., St. Georges Works, Regents Park Road, N.W.1. Tel.: Primrose 8844. Cables: Lustraphon, London.

Lustrette LD/61 Series. Moving coil. Response $70-12,000 \mathrm{c} / \mathrm{s}$. Source imp. low, line and high. Built-in trans, when required. 6 ft . cable. Price: $£ 44$ s. (low), $£ 414 \mathrm{~s}$. 6d. (line and high).

Master C51. Moving coil. Response 50-8,000 $\mathrm{c} / \mathrm{s}$. Source imp. low, line and high. Built-in trans. for line and high. 3-pin moulded mic. plug. Stand as required. Price: low $£ 66 \mathrm{~s}$.; line and high $£ 616 \mathrm{~s}$. 6 d .


Lem model DO24


Newmann U67 condenser


Peiker TM. 3 dynamic


Neumann condenser Peiker TM. 135 dynamic


Lusiraphone LFV/59 moving coil


Peiker TM. 120 dynamic and PM. 16 crystal

Master C48 and C48/S with Switch. Moving coil. Response $50-8,000 \mathrm{c} / \mathrm{s}$. Source imp. 20 ohms. 3-pin moulded mic. plug. 6 ft . cable. Price: C48 £6 6s.; C48/S £7 17s. 6d.

Hand Pencil LFV/H59. Moving coil. Response $100-14,000 \mathrm{c} / \mathrm{s}$. Source imp. low, line and high. Built-in trans. for line and high. 20 ft . cable for low and line. 9 ft . for high. Price: $£ 99 \mathrm{~s}$. (low), £9 19s. 6d. (line and high).

Full-Vision LFV/59. Moving coil. Response $100-14,000 \mathrm{c} / \mathrm{s}$. Source imp. low, line and high. Built-in trans. for line and high. 20 ft . cable with low and line. 9 ft . with high. Stand as required. Price: £9 19s. 6d.

Lavalier LV/59. Neck halter moving coil. Response $100-14,000 \mathrm{c} / \mathrm{s}$. Low, line and high imp. Price: £9 19s. 6d.

LD/66. Moving coil. Response $70-12,000 \mathrm{c} / \mathrm{s}$. Sensitivity $-88,-75$, and -52 dB , for low line and high imp. respectively. Price: $£ 412 \mathrm{~s}$. 6 d . low imp.; $£ 55$ s. line and high imp. Stand fitting 15s. extra.

Tubular Hand TH59/SB. Moving coil with switch. Response $100-14,000 \mathrm{c} / \mathrm{s}$. Sensitivity -88 dB at 25 ohms, -75 dB at 600 ohms, and -54 dB at 50,000 ohms. Transformer as required. Price: $£ 10$ 10s.

Studio VR/53. Ribbon velocity. Response substantially flat to $14,000 \mathrm{c} / \mathrm{s}$. Source imp. low, line and high. Built-in trans. 3-pin moulded mic. plug. 6 ft . cable. Stand as required. Price: £1111s.

Ribbonette VR/64. Ribbon. Response substantially flat 50 to $13,000 \mathrm{c} / \mathrm{s}$. Source imp. low, line and high. Built-in transformer. 20 ft . cable for low and line. 9 ft . for high. Table base. Price: $£ 8$ 18s. 6d.
-Stereolus VR/65NS. Dual head ribbon. Response $50-13,000 \mathrm{c} / \mathrm{s}$. Sensitivity stereo -90 dB at 20 ohms. Price: $£ 1818 \mathrm{~s}$.

Lapel Mic. LP/62. Electro-Magnetic. Response, substantially maintained up to $6,000 \mathrm{c} / \mathrm{s}$. Source imp. 30 and 1,000 ohms. 6 ft . cable. Price: $£ 4$ 4s.

Chest Harness D59/BS. Moving coil. Response, substantially flat from $100-14,000 \mathrm{c} / \mathrm{s}$. Source imp., low, line, high. 6 ft . cable. Price: $£ 12$ 12s.

Velodyne VC52/THSB. Noise cancelling
moving coil with switch. Response rising to $1,700 \mathrm{c} / \mathrm{s}$, flat to $3,500 \mathrm{c} / \mathrm{s}$ then falling. Source imp. 25 ohms or as required. Transformer as necessary. Price: $£ 1010 \mathrm{~s}$.

Contadyne Model CMC/68. Moving coil. Small contact microphone with noise cancelling feature. Imp. 20 ohms at $1 \mathrm{Kc} / \mathrm{s}$. Price: $£ 818 \mathrm{~s}$. 6d.

Microdyne Model CDA/72. Miniature electromagnetic contact transducer. Price: $£ 8$ 18s. 6d.

LT/59. Tubular hand model with P/1467 flexible tube support and table base. Price: £9 19s. 6d.

LV59/UV. Lavalier unit with adjustable neck halter. Dynamic. Low or line impedance. Price: £9 19s. 6d.

MB ELECTRONIC. Distributors: Denham and Morley Ltd., Denmore House, 173/5 Cleveland Street, London, W.1. Tel.: Euston 3656. Cables: Denmorl, London, W.1.

MB101. Moving coil. Omni-directional. Imp. 200 ohms. F.R. $40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Sensitivity -74 dB . Size: cap $1 \frac{1}{8}$ in. dia., shaft $\frac{7}{8}$ in. dia., $5 \frac{1}{2}$ in. long. Weight: 4 oz . Price: $£ 1414 \mathrm{~s}$.

MB201. Moving coil. Cardioid. Imp. 200 ohms. F.R. $50 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Front to back ratio $15-18 \mathrm{~dB}$. Sensitivity -76 dB . Size and weight as for MB101. Price: $£ 1515 \mathrm{~s}$.

MB215. Moving coil. Cardioid. Imp. 200 ohms. Response $50 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s} \pm 2 \cdot 5 \mathrm{~dB}$. Front to back ratio $15-18 \mathrm{~dB}$. Sensitivity -76 dB . Size: head $\frac{1}{2}$ in. dia., shaft $\frac{7}{8}$ in. dia., length 6 in. Weight: 5 oz . Price: $£ 1616 \mathrm{~s}$.

MB150TR. Omni-directional. Dual impedance ( 200 ohms and 50 K ). Moving coil. Stick microphone with table stand. Complete with lead and 3-pin plug. Price: £3 3s.

MB250TR. Cardioid. Moving coil. F.R. $100 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Front-to-back ratio $12-15 \mathrm{~dB}$. Sensitivity -76 dB . Dual impedance ( 200 ohms and 50 K ). Size: $1 \frac{1}{2} \times 1 \frac{1}{2} \times 5 \frac{1}{2}$ in. Stick type with table stand. Price: $£ 4$ 14s. 6d.

MB301. Cardioid. Studio quality ribbon stick microphone. 200 ohms. Complete with blast screen and MB-TSK mounting clamp. Price: £22 1s.

Accessories including leads, plugs, matching transformers, folding table stands, etc. Details and prices on application.

NEUMANN G.m.b.H. Distributors: F. W. O. Bauch Ltd., Holebrook House, Cockfosters, Herts. Tel.: Hadley Green 3277.

M49c. Condenser. Remote-controlled: omnidirectional, cardioid, figure-of-eight (continuously variable). Response $35 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 2$ dB. Sensitivity across $1 \mathrm{~K}: 0.7 \mathrm{mV} /$ dyne $/ \mathrm{cm}^{2}$. Imp. 50 and 200 ohms. Built-in transformer. Remote-controlled pressure-gradient mic. Price on application.

M50c. Condenser. Omni-directional. Response $40 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Sensitivity across $1 \mathrm{~K}: 1.5 \mathrm{mV} /$ dyne $/ \mathrm{cm}^{2}$. Imp. 50 and 200 ohms. Built-in transformer. Pressure mic. Price on application.

KM56c. Condenser. Switchable: omnidirectional, cardioid, figure-of-eight. Response $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Sensitivity across 1 K : $0.8 \mathrm{mV} /$ dyne $/ \mathrm{cm}^{2}$. Imp. 50 and 200 ohms. Builtin transformer. Miniature pressure-gradient type mic. Price on application.

KM53c. Condenser. Omni-directional. Response $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Sensitivity across $1 \mathrm{~K}: 1 \cdot 2 \mathrm{mV} /$ dyne $/ \mathrm{cm}^{2}$. Impedance 50 and 200 ohms. Built-in transf ormer. Miniature pressuretype mic. Price on application.

KM54c. Condenser. Cardioid. Response 40 $\mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Sensitivity across 1 K : $0.8 \mathrm{mV} /$ dyne $/ \mathrm{cm}^{2}$. Impedance 50 and 200 ohms. Built-in transformer. Miniature pressuregradient type mic. Price on application.

SM2c. Stereo condenser. Both systems separately remote controlled: omni-directional, cardioid, figure-of-eight. Response $40 \mathrm{c} / \mathrm{s}-15$ $\mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Sensitivity across $1 \mathrm{~K}: 1 \mathrm{mV} /$ dyne/ $\mathrm{cm}^{2}$. Imp. 50 and 200 ohms. Built-in transformer. Miniature mic. Price on application.

M269c. Condenser. Remote-controlled: omni-directional, cardioid, figure-of-eight. Response $30 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Sensitivity across $1 \mathrm{~K}: 1.55 \mathrm{mV} /$ dyne $/ \mathrm{cm}^{2}$ in cardioid; $1 \mathrm{mV} /$ dyne $/ \mathrm{cm}^{2}$ in omni-directional and figure-ofeight, Imp. 50 and 200 ohms. Built-in transformer. Special sensitivity and bass cut switches. Price on application.

U67. Condenser. Switchable: Omnidirectional, cardioid, figure-of-eight. Response $30 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Sensitivity across $1 \mathrm{~K}: 2 \mathrm{mV} /$ dyne $/ \mathrm{cm}^{2}$ in cardioid, $1.1 \mathrm{mV} /$ dyne $/ \mathrm{cm}^{2}$ in nondirectional, $1.4 \mathrm{mV} /$ dyne $/ \mathrm{cm}^{2}$ in figure-of-eight. Impedance 50 and 200 ohms. Built-in transformer. Special sensitivity and bass cut switches. Printed circuit. Price on application.

KM64.P. Announcer desk condenser microphone. Cardioid. Response up to $18 \mathrm{Kc} / \mathrm{s}$ with bass cut for better intelligibility. Miniature type. Imp. 50 and 200 ohms. Built-in transformer. Special sensitivity switch (approx. -14 dB ). Price on application.

KTM. Fieid effect transistor condenser microphone. Cardioid. Response $40 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Sensitivity across $1 \mathrm{~K}: 3 \mathrm{mV} /$ dyne $/ \mathrm{cm}^{2}$. Imp. 1 K . Miniature type. Power required: 9V (PP3) or DC ring supply unit $12 / 24 \mathrm{~V}$. Microphone cable length can be several hundred yards. Price on application.

KM64. Condenser. Cardioid. Response 40 $\mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Sensitivity across $1 \mathrm{~K}: 0.9$ $\mathrm{mV} /$ dyne $/ \mathrm{cm}^{2}$. Imp. 50 and 200 ohms. Built-in transformer. Special sensitivity switch $(-14 \mathrm{~dB})$. Miniature pressure-gradient type mic. Price on application.

U64. Condenser. Cardioid. Response $40 \mathrm{c} / \mathrm{s}$ $18 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Sensitivity across $1 \mathrm{~K}: 1 \cdot 1 \mathrm{mV} /$ dyne $/ \mathrm{cm}^{2}$. Imp. 50 and 200 ohms. Built-in transformer. Special sensitivity switch ( -14 dB ). Miniature pressure-gradient type mic. Available with combined power units for two or six microphones. Price on application.

SM23c. Double-stereo condenser. Both systems separately remote-controlled: omnidirectional, cardioid, figure-of-eight. Response $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Sensitivity across 1 K : $1 \mathrm{mV} /$ dyne $/ \mathrm{cm}^{2}$. Imp. 50 and 200 ohms. Built-in transformers. Miniature pressure-gradient type mics. Price on application.

SRM64. Condenser. Cardioid. Response 40 $\mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Sensitivity across 1 K : $0.8 \mathrm{mV} /$ dyne $^{2} / \mathrm{cm}^{2} .50$ and 200 ohms. Built-in transformer. Special sensitivity switch ( -14 dB ). Miniature pressure-gradient type height-adjustable stand mic. Price on application.
-SM69. Double-stereo condenser. Both systems separately remote-controlled: omnidirectional, cardioid, figure-of-eight. Response $30 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}+2 \mathrm{~dB}$. Sensitivity across 1 K : $1.5 \mathrm{mV} /$ dyne $/ \mathrm{cm}^{2}$, Imp. 50 and 200 ohms. Builtin transformers. Pressure-gradient type mics. Price on application.

PEARL. Distributors: C. E. Hammond \& Co. Ltd., 90 High Street, Eton, Windsor, Berks. Tel.: Windsor 63388. Telex: 84316.

EC61. Condenser. Figure-of-eight. Response
$30 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Sensitivity -50 dB . Imp. 50 , 200, 600 ohms. Fitted with transformer, selfcontained amplifier. Price (incl. mains power supply unit or battery power supply unit): $£ 42$.

LD14. Moving coil. Omni-directional. Response $95 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Sensitivity -54 dB . Output imp. 30-200 ohms. Transformer fitted. Price: £12 18s.

LD18. Moving coil. Omni-directional. Response $80 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Sensitivity -54 dB . Output imp. 30-200 ohms. Transformer fitted. Price: $£ 146 \mathrm{~s}$.

RD16. Moving coil. Cardioid. Response $50 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Sensitivity - 54dB. Output: imp. $30-200$ ohms. Transformer fitted. Price: $£ 1414 \mathrm{~s}$.

RD34. Moving coil. Cardioid. Response $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Sensitivity -54 dB . Output imp. 30-200 ohms. Transformer fitted. Price: £15 15s.

RD32. Moving coil. Cardioid. Response $60 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Sensitivity -55 dB . Output imp. 30-200 ohms. Price: £29 5s.

C2. Condenser. Response $20 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Sensitivity -55 dB . Output imp. 200 ohms. complete with power supply unit Type E. 3000. Price: $£ 82$ 19s.

C12. Condenser. Response $100 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Sensitivity -50 dB . Output imp. 200 ohms. complete with power supply unit Type E. 3000 . Price: $£ 77$ 14s.

CK. Condenser. Response $20 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Sensitivity -55 dB (Cardioid) -60 dB ; (Omnidirectional). Output imp. 200 ohms. Complete with power supply unit Type E. 3000. Price: $£ 82 \mathrm{l9s}$.

Flexible Swan-neck connectors. For dynamic microphones. Model 1903 less switch. 3 pole connector. Length 175 mm . Price: $£ 3$ 17s. 4 d .

PEIKER ACUSTIC. Distributors: Britimpex Ltd., 16-22 Great Russell Street, London, W.C.1. Tel.: Museum 7600.

Peiker TM3. Moving coil omni-directional hand, stand or lavalier microphone. F.R. $40 \mathrm{c} / \mathrm{s}-$ $14 \mathrm{Kc} / \mathrm{s} \pm 2.5 \mathrm{~dB}$. Sensitivity (low Z): -70 dB ; (high Z): -45 dB . Impedance 200 ohms and/or 80K. Fitting: $\frac{5}{8}$ in. 27 tpi. Metal case chrome finish. Price (low Z): £14 14s.; (high Z): £14 14s.

Peiker TM15. Moving coil omni-directional studio microphone. F.R. $30 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Impedance 200 ohms and/or 80 K . Sensitivity (low Z): -72 dB ., (high Z): -47 dB . Swan neck with $\frac{5}{8} \mathrm{in} .27$ tpi fitting. Built-in switch. Metal case finished anodised chrome. Price (low Z): £37 16s., (high Z): £39 18s.

Peiker TM17. Moving coil cardioid stand microphone. 15 dB back suppression. F.R. $40 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Impedance 200 ohms and/or 80 K . Sensitivity (low Z): -72 dB , (high $\mathrm{Z}):-47 \mathrm{~dB} . \frac{5}{8} \mathrm{in}$.27 tpi fitting. Variable bass control ( 20 dB ). Built-in windshield ( 15 dB ). Anti-echo. Metal case finished matt chrome. Price to be announced.

Peiker TM35. Moving coil cardioid stand microphone. $15-24 \mathrm{~dB}$ back suppression. F.R. $50 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s} \pm 2 \cdot 5 \mathrm{~dB}$. Impedance: 200 ohms and/or 80 K . Sensitivity (low Z): -70 dB ., (high Z): -45 dB . Swan neck with $\frac{5}{8} \mathrm{in}$. fitting. Built-in switch. Metal case finished chrome. Price (low Z): £19 19s., (high Z): £21.

Peiker TM120. Moving coil omni-directional studio stand microphone. F.R. $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$ $\pm 2 \cdot 5 \mathrm{~dB}$. Impedance 200 ohms and/or 80 K . Sensitivity (low Z): -70 dB , (high Z): -45 dB . Swan neck with $\frac{5}{8}$ in. 27 tpi. Built-in switch. Metal case finished chrome hammer. Price (low Z): £17 17s., (high Z): £18 18s.

Peiker TM135. Moving coil cardioid stand microphone. $15-18 \mathrm{~dB}$ back suppression. F.R. $35 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Impedance 200 ohms and/ or 80 K . Sensitivity (low Z): -72 dB ., (high Z): -47 dB . Swan neck with $\frac{5}{8}$ in. 27 tpi fitting. Variable bass control ( 20 dB ). Built-in windshield ( 15 dB ). Anti-echo. Metal case finished matt chrome. Price (low Z): £26 5s., (high Z): £28 7s.

PETO SCOTT LTD., Addlestone Road, Weybridge, Surrey. Tel.: Weybridge 45511.

Philips EL.6014/00. Moving coil. Response $100 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Sensitivity -74 dB or -57 dB . Source impedance 500 ohms or 25 K . On/off switch. Price: $£ 8$.

Philips EL.6021/60. Moving coil. Response $60 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Source impedance 50,500 or 10 K . On/off switch. Price: $£ 1210 \mathrm{~s}$.

Philips EL.6061/02. Moving coil, noise cancelling. On/off and control switch. Response $200 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Source impedance 500 ohms. Mounting bracket. Price: $£ 715 \mathrm{~s}$.


Peiker TM. 17 dynamic


Peiker TM. 35 moving coil


Philips P. 31 hyper-cardioid moving coil


Philips EL. 6033 studio moving coil


Philips EL. 6022 cardioid moving coil


IIII
Reslo RBTS/L


Peiker TM. 15 dynamic

Philips EL.7500. Moving coil microphone kit. Includes table stand, on/off switch and neck cord. Source impedance 200 ohms, 500 ohms or high Z. Price(kit) : £7 7s.

Philips P.31. Moving coil. Hyper-cardioid. Response $70 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Sensitivity -74 dB or -58 dB . Source impedance 500 ohms or 25 K . On/off switch and table base with flexible shaft and cable. Price: $£ 18$ 18s.

Philips P.33. Moving coil. Switched cardioid or omni-directional pattern. Response $80 \mathrm{c} / \mathrm{s}-$ $15 \mathrm{Kc} / \mathrm{s}$. Impedance 500 ohms. Sensitivity -72 dB relative to $1 \mathrm{~V} / \mu$ bar. In cardioid position sensitivity 17 dB more to the front compared with the rear. Quick release holder for stands. with $\frac{3}{8} \mathrm{in}$., $\frac{1}{2}$ in., or $\frac{5}{8} \mathrm{in}$. Whit. threads. 16 ft . detachable twin screened lead. Vibrationdamper mount optional extra. Price (microphone): £24.; (vibration damper): £3.

Philips EL.6031/50. Moving coil. Hyper cardioid. Response $70 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Source impedance 500 ohms or 25 K . Sensitivity -74 dB or -58 dB . On/off switch and flexible shaft. Price: $£ 17$.

Philips EL.6033/10. Moving coil. Studio quality. Switchable cardioid or omnidirectional. Response 80 c/s-15 Kc/s. Sensitivity -72 dB. Source impedance 500 ohms (EL.6033/00 50 ohms). Special vibration damper optional extra. Supplied with cable and stand adaptor. Price: £24.; vibration damper $£ 3$ extra.

Philips EL.6022. Moving coil. Cardioid. Speech/music switch. Impedance 50 ohms. Cable and plug extra. Price: $£ 17$.

Philips EL.6041. Moving coil. Cardioid. Studio quality. Response $30 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}$. Source impedance 200 ohms. Sensitivity -75 dB . Stand and swivel adaptor supplied. Price: $£ 54$.

Philips EL.6152. Miniature studio quality condenser microphone. Cardioid. Mains preamplifier. Swivel stand clamp. Supplied with cable and plugs. Response $40 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s}$. Source impedance 200 ohms or 50 ohms. Sensitivity -62 dB or -68 dB . Price: $£ 84$.

ET1045. Miniature moving coil. Halter. Omni-directional. Response $150 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$ $\pm 3 \mathrm{~dB}$. Sensitivity -88 dB . Imp. 50 ohms. 15 , 30, 60 feet extension cables available. Quick release attachment of cable. Price: $£ 10$.; cable extra.

PHILIPS ELEC"TRICAL LTD., Century House, Shaftesbury Avenue, London, W.C.2. Tel.: Gerrard 7777. Cables: Phillamps, London.

EL3755. Moving coil. Cardioid. Response $150 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Output: $0.34 \mathrm{mV} /$ microbar at $1 \mathrm{Kc} / \mathrm{s}$. Imp. 500 ohms. Price: $£ 310 \mathrm{~s}$.

EL3757. Stereo moving coil. Cardioid. Output: $0.2 \mathrm{mV} /$ microbar at $1 \mathrm{Kc} / \mathrm{s}$. Imp. 500 ohms per insert. Two inserts at $90^{\circ}$ for stereo recording. Price: $£ 10$ 10s.

EL3791. Moving coil. Omni-directional. Response $150 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Output: $0.36 \mathrm{mV} /$ microbar at $1 \mathrm{Kc} / \mathrm{s}$. Imp. 500 ohms. Price: £3 10s.

EL3782. Moving coil. Cardioid. Response $150 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Output: $0.22 \mathrm{mV} /$ microbar at $1 \mathrm{Kc} / \mathrm{s}$. Imp. 500 ohms. Speech/music switch, bass cut in speech position. Price: $£ 5$.

EL3797. Moving coil. Omni-directional. Specially designed for use with Philips EL3300 recorder. Includes EL3796 remote control (detachable). Response $150 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Output: $0.23 \mathrm{mV} /$ microbar at $1 \mathrm{Kc} / \mathrm{s}$. Imp. 500 ohms. Price: $£ 45$ s.

RESLOSOUND LTD., Spring Gardens, London Road, Romford, Essex. Tel.: Romford 49087/46645.

RBT Series. High quality miniature ribbon. F.R. $50 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Figure-of-eight, modified as required by filter pads. Sensitivity 58 dB below at 40 K . Imp. RBT/L 30-50 ohms; RBT/M 250 or 600 ohms; RBT/H 30-50 ohms or 40 K . A switched model also available with the switch included in a slightly longer body (RBTS/L, RBTS/M, RBTS/H). Finish: Satin chrome or silver grey hammertone enamel. Acoustic filter pad for close-talking use. Prices: RBT/L £11 0s., RBT/M, RBT/H £11 10s. For switched models add $£ 210$ s.

CR2 Series. High quality miniature ribbon. F.R. $40 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}(-2 \mathrm{~dB}$ at $60 \mathrm{c} / \mathrm{s}$, $+10 \mathrm{~dB}$ at $16 \mathrm{Kc} / \mathrm{s}$.). Cardioid, figure-of-eight partially suppressed at the rear. Sensitivity 58 dB below for high-Z model. Imp.: L, M and H as for RBT Series. Flexible swan neck stem. Finish: Satin chrome perforated front, diecast case, silver grey hammertone enamel. Prices: CR2/L £11 10s., CR2/M, CR2/H £12.


Reslosound CPD cardioid pencil dynamic


Reslo RL1/L


Reslosound type MPD


Reslo Studios SR1 ribbon



Reslo type VRT


A pair of Reslo RBT/L


Schoeps condenser microphone system

PR Series. Pencil type ribbon. F.R. $50 \mathrm{c} / \mathrm{s}-$ $16 \mathrm{Kc} / \mathrm{s}$. ( $\pm 5 \mathrm{~dB} 100 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$ ). Modified figure-of-eight with pads fitted. Sensitivity 60 dB below at 40 K . Imp.: $\mathrm{L}, \mathrm{M}$ and H as for RBT Series. Removable fibre-glass damping pads. Finish: Satin chrome and silver grey hammer. Other finishes to order. Prices: PRL £9. PRM, PRH £9 10s.

RL1 Series. Lightweight ribbon Lavalier type. F.R. $100 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s}(-10 \mathrm{~dB}$ at $100 \mathrm{c} / \mathrm{s}$, +6 dB at $16 \mathrm{Kc} / \mathrm{s}$ ). Cardioid above $200 \mathrm{c} / \mathrm{s}$, minimum underneath and side pick up at $5 \mathrm{Kc} / \mathrm{s}$. Sensitivity 89 dB below at $30-50$ ohms. Imp.: RL1/L $30-50$ ohms, RL1/M 300 or 600 ohms. Other impedances to quantity order. Direct contact noise reduced to minimum. Lower bass frequencies attenuated to control chest tones. Black nylon neck cord with quick release loops. Mazak diecast case finished polychromatic grey with aluminium mesh. Prices: RL1/L £15, RL1/M £15.

SR1 Series. Professional studio ribbon. F.R. $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Nominal figure-of-eight. Damping pads available. Sensitivity 73 dB at 300 ohms. Imp. : SR $1 / L 30-50$ ohms, SR1/M 250 or 300 ohms. Developed for use by broadcasting authorities and recording studios. Finish: satin Florentine bronze. Other finishes to quantity order. Price: (both models) $£ 27$.

VRT Series. Special miniature ribbon. F.R. $30 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s},-2 \mathrm{~dB}$ at $40 \mathrm{c} / \mathrm{s},+2 \mathrm{~dB}$ at $16 \mathrm{Kc} / \mathrm{s}$. Nominal figure-of-eight. Damping pads available. Sensitivity 81 dB below at 300 ohms. Developed for broadcast and recording studios. Satin chrome finish. Price: $£ 17$.

PD Series. Pencil moving coil with lightweight tapered housing. F.R. $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s},-4 \mathrm{~dB}$ at $100 \mathrm{c} / \mathrm{s},+4 \mathrm{~dB}$ at $14 \mathrm{Kc} / \mathrm{s}$. Omni-directional with microphone vertical. With microphone horizontal rear response -18 dB at $11 \mathrm{Kc} / \mathrm{s}$. Sensitivity 88 dB below at $30-50$ ohms. Imp.: PDL $30-50$ ohms, PDM Dual 250 or 600 ohms, PDH Dual $30-50$ ohms or 40 K . Switched version available; PDS/L, PDS/M, PDS/H. Finish: Silver grey hammer or black crackle. Prices: PDL $£ 11$ 10s., PDM, PDH $£ 12$ 10s. For switched versions add $£ 110$ s.

MPD Series. Miniature pencil moving coil. F.R. $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s},-12 \mathrm{~dB}$ at $100 \mathrm{c} / \mathrm{s},+4 \mathrm{~dB}$ at $14 \mathrm{Kc} / \mathrm{s}$. Omni-directional with microphone vertical, rear response -18 dB at $11 \mathrm{Kc} / \mathrm{s}$ with microphone horizontal. Sensitivity 88 dB below at $30-50$ ohms. Imp.: MPD/L $30-50$ ohms, MPD/H high impedance (comprises MPD head, LTU1 line transformer, A922 flexible stem and

C930 cable set). Suitable close-talking applications without additional filters. MPD/L supplied with Lavalier cord and quick-release clips. Finish: Satin tint laquer. Other finishes to quantity order. Prices: MPD/L $£ 10$ 10s., MPD/ H $£ 14$.

CPD Series. Cardioid pencil dynamic microphone. F.R. $15 \mathrm{c} / \mathrm{s}-17 \mathrm{Kc} / \mathrm{s}$. Uni-directional partly suppressed at rear. Rear pick up - 10-20 dB over range $200 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Sensitivity - 88 dB at $30-50$ ohms. Size: $8 \frac{1}{2}$ in. overall length, $1_{2}^{1}$ in. maximum diameter (head). Impedances (switched model): $\mathrm{L}=30-50$ ohms, $\mathrm{M}=$ dual 250 or 600 ohms, $\mathrm{H}=$ dual $30-50$ ohms or 40 K . Unswitched model in low impedance only. Finish: Fine-grain black shrivel case with matt silver head and cap. Supplied with cable set and plastic stand holder. Prices: CPD/L £15., $\mathrm{CPD} / \mathrm{M}$ and CPD/H $£ 16$. Unswitched low impedance model $£ 14$.

VMC2. High-output moving coil. Rugged construction. F.R. $50 \mathrm{c} / \mathrm{s}-16 \mathrm{Kc} / \mathrm{s} \pm 5 \mathrm{~dB}$. Imp. 15 ohms. On/off switch. Price: $£ 95 \mathrm{~s}$.

HM Series. THM1/L moving coil insert in high-impact off-white plastic case for hand use. Input load $30-50$ ohms. CHM1 crystal insert in similar case to THM1/L. Incorporates switch and low capacity coaxial cable. Suitable domestic tape recording. Prices: THM1/L £6 5s., THM1 £7.

Coupler unit GE1. Suitable for use with any impedance microphone. Designed for external use adjacent to the tape recorder or amplifier. Gain $35-40 \mathrm{~dB}$. Response $50 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Fitted 36 in. screened lead and jack plug. Selfcontained PP4 battery with average life of 1,500 hours. Price: $£ 8$.

Coupler unit GE2. Similar to GE1 but with addition of a $30-50$ ohm input transformer for balanced-to-earth input. Permits use of long microphone lines with low noise and hum. Price: $£ 12$.

Coupler transformer LTU1. Designed for use between a low impedance microphone (15-50 ohms) and a high impedance microphoneinput socket. Nominal input 40 ohms, nominal output 100 K for valve grid circuit. Response $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} .1 \mathrm{~dB}$. Price: $£ 47 \mathrm{~s} .6 \mathrm{~d}$.

Microphone transformers MT101, MT102. Designed for internal mounting in equipment having only high impedance inputs. Input imp.: MT101 15-50 ohms, MT102 300-600 ohms. Nominal output imp. 100K. Response $50 \mathrm{c} / \mathrm{s}-$


Shure $55 S$ small Unidyne
Shure 545 Unidyne III


STC 4037-A moving coil


STC 4108 condenser


Shure model 535
$15 \mathrm{Kc} / \mathrm{s} \pm 2 \mathrm{~dB}$. Prices: MT101 £2 15s., MT102 £3.

Microphone stands.
MS. 100A. Adjustable floor stand. Minimum height 3 ft .4 in., maximum height 5 ft .2 in . Grey hammertone base and outer stem, chrome inner extension piece. Price: $£ 710 \mathrm{~s}$.

MS. 110A. Similar to the MS. 100A but with chrome stem. Price: $£ 710 \mathrm{~s}$.

A boom fitting (MS.175) is available for use with Reslo floor stands. Details on application.

MS. 200. Adjustable table stand. Minimum height 1 ft .4 in., maximum height 2 ft .2 in . Grey hammertone base with chrome stem and extension piece. Price: $£ 45$ s.

MS. 300. Circular desk stand. Grey hammertone base fitted with 3 in. chrome stem. Price: £2 5s.

MS 400. Rectangular desk base. Fitted foam pads. Finished in silver grey hammertone. Muting switch optional extra. Price: $£ 2$, with switch £2 15 s.

MS. 500. Rectangular desk base. Similar to MS. 400 but fitted with rubber feet. Price: £1 15s., with switch $£ 2$ 10s.

Other accessories available include mounting units, cables, reducers, adaptors, etc. All prices include packing and postage.

RONETTE. U.K. Distributors: H. K. Harrisson and Co. Ltd., 140 Park Lane, London, W.1. Tel.: Hyde Park 9363.

Ronette MM-65. Crystal. Omni-directional. Response $30 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Imp. 5 megohms. 300 pF . Small and rugged. Price: $£ 25 \mathrm{~s}$.

SCHOEPS. Distributors: C. E. Hammond \& Co. Ltd., 90 High Street, Eton, Windsor, Berks. Tel.: Windsor 63388. Telex: 84316.

Miniature condenser microphone system, consisting of power supply, body and various screw-in capsules.

M221B. Microphone body.
N20B. Power supply unit.
MK24. Capsule. Cardioid.

MK22. Capsule. Omni-directional.
MK23. Capsule. Omni-directional with slight treble lift.

MK240. Capsule. Cardioid. Has slight bass cut. Front-to-back ratio at $1 \mathrm{Kc} / \mathrm{s}$ better than 31 dB .

MK26. Cardioid/bi-directional/omni-directional.

MK28. Capsule. Bi-directional:
M934B. Cardioid/omni-directional.
Full range of accessories available, including elastic suspension cradle and breath shield. Prices on application.

SENNHEISER ELECTRONIC. Distributors: Audio Engineering Ltd., 33 Endell Street, London, W.C.2. Tel.: Temple Bar 0033.
MD.21HN. Omni-directional moving coil hand or stand microphone. F.R. $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$ $\pm 3 \mathrm{~dB}$. Sensitivity -53 dB . Impedance 200 ohms and 30 K . Rec. load 200 ohms or 100 K . Light alloy case finished hammer stove enamel. Windshield MZW22 optional extra. Price (microphone): £22 15s.; (windshield MZW22): £3 18s.; (desk stand MZT21): £2 19s.
MD.42. Cardioid moving coil noise-cancelling hand microphone. F.R. $200 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Sensitivity $0.16 \mathrm{mV} / \mu \mathrm{bar}$. Impedance 200 ohms. Rec. load 200 ohms. Reduces acoustic feedback and unwanted noise. Ideal for use with high power equipment. Metal case finished grey stove enamel. Price: $£ 147$ s.
MD.211. Omni-directional moving coil miniature studio microphone. Hand or stand use. F.R. $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s} \pm 2 \cdot 5 \mathrm{~dB}$. Sensitivity -57 dB . Impedance 200 ohms. Rec. load 200 ohms. Metal case with satin chrome finish. Windshield MZW211 optional extra. Price (microphone): £35 15s., (windshield MZW211): $£ 415 \mathrm{~s}$.; (small tripod desk stand MZT102): £4 18s.
MD.214. Omni-directional moving coil lavalier microphone. Built-in "natural voice" equaliser to studio standards. F.R. specially designed for lavalier operation. Sensitivity - 59 dB. Impedance 200 ohms. Rec. load 200 ohms. Metal case finished special "non-glare" enamel. Price: £29 17s.


STC 4033 moving coil and ribbon


STC 4126 capacitor microphone


Vitavox $B 50$ moving coil


Walchris 63M



STC 4038 A ribbon
MD.403. Super cardioid moving coil stand microphone. F.R. $100 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s}$. Sensitivity -56 dB . Impedance 200 ohms. Rec. load 200 ohms. Built-in desk stand and thread adaptor. Black metal case. Price: $£ 1111 \mathrm{~s}$.
MD.406. Super cardioid moving coil hand or stand microphone. F.R. $70 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Sensitivity - 55 dB . Impedance 200 ohms . Rec. load 200 ohms. Supplied with pocket clip. Metal case finished satin chrome. Price: $£ 1419 \mathrm{~s}$.
MD. $\mathbf{4 0 7 H N}$. Cardioid moving coil desk stand microphone. F.R. $100 \mathrm{c} / \mathrm{s}-12 \mathrm{Kc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Sensitivity $1.6 \mathrm{mV} / \mu$ bar. Impedance 200 ohms or 80 K . Rec. load 200 ohms or $>100 \mathrm{~K}$. Black metal case. Price: $£ 106 \mathrm{~s}$.
MD.408. Super cardioid moving coil microphone with flexible shaft. F.R. $100 \mathrm{c} / \mathrm{s}-14 \mathrm{Kc} / \mathrm{s}$ $\pm 3 \mathrm{~dB}$. Impedance 200 ohms. Sensitivity -55 dB. Case of light gauze woven wire cloth. Price: £19 2s.
MD. 421 HN . Cardioid moving coil hand or stand microphone. Special frequency response with built-in variable bass attenuator. Impedance 200 ohms or 24 K . Rec. load. 200 ohms or $>50 \mathrm{~K}$. $\frac{3}{8}$ in. thread adaptor supplied. Light grey die-cast case. Windshield MZW22 and heavy desk stand MZT421 optional extras. Price (microphone): £32 10s.; (windshield MZW22): £3 18s.; (desk stand MZT421): £2 19s.

MDS.1. Cardioid stereo moving coil stand microphone. F.R. $60 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s} \pm 5 \mathrm{~dB}$. Sensitivity -57 dB . Impedance 200 ohms . $\frac{3}{8}$ in. female thread. Microphones can be removed from their respective arms. Grey moulded plastic case. Price: $£ 25$ 3s. 9d.

MZS.142. Lightweight telescopic tripod microphone stand with neat carrying case. Price: $£ 63 \mathrm{~s}$.

SHURE ELECTRONICS LTD., 84 Blackfriars Road, London, S.E.1. Tel. : Waterloo 6361.

55S Small Unidyne. Cardioid moving coil. Response $50-15,000 \mathrm{c} / \mathrm{s}$. Sensitivity -57 dB at high impedance. Source imps. 35-50, 150-250 ohms, and high. Switched transformer built-in. Price: $£ 27$ 13s. 4d.

535 Slendyne. Moving coil. Response $60-$ $13,500 \mathrm{c} / \mathrm{s}$. Sensitivity -61 dB . Source imps. $50-250$ ohms and high. Switched built-in transformer. Price: £24 6s. 8d.

545 Unidyne III. Cardioid moving coil. Response $50-15,000 \mathrm{c} / \mathrm{s}$. Sensitivity - 55 dB . Source impedance $25-250$ ohms and high. Built-in transformer. Price: $£ 286 \mathrm{~s} .8 \mathrm{~d}$.

Sonodyne II Model 540S. Moving coil microphone. Response $60-15,000 \mathrm{c} / \mathrm{s}$ variable. High output. High and low impedance. Price: £16 13s. 4d.

SIMON EQUIPMENT LTD., 48 George Street, Portman Square, W.1. Tel.: Welbeck 2371. Cables: Simsale, London.

Cadenza Ribbon. Response $50-12,000 \mathrm{c} / \mathrm{s}$. Sensitivity, high impedance -58 dB , low impedance -93 dB , or with suitable line transformer -58 dB . Source imp. 30 ohms and 80 K ohms. Price: $£ 818$ s. 6 d .; with tripod desk stand and 11 ft . cable: $£ 1010 \mathrm{~s}$.

STC LTD., Electro-mechanical Division, West Road, Harlow, Essex. Tel.: Harlow 26811.

4021-J. Spherical omni-directional moving coil. Flat response $30-15,000 \mathrm{c} / \mathrm{s}$. Impedance 30 ohms. Sensitivity -80 dB . Price: $£ 16$ 10s.

4033-A. Cardioid microphone. Moving coil and ribbon element which can be used individually or in combination. Flat response $30-10,000$ $\mathrm{c} / \mathrm{s}$. Impedance 50 ohms. Sensitivity -80 dB . Front to back ratio 15-20 dB. Price: $£ 65$.

4037-A. Moving coil unobtrusive pencil microphone. Flat response $30-15,000 \mathrm{c} / \mathrm{s}$. Impedance 30 ohms. Sensitivity -84 dB . Price (long or short model): $£ 22$.

4038-A. Studio ribbon microphone. Accurate figure-of-eight response. Flat frequency response $30-15,000 \mathrm{c} / \mathrm{s}$. Impedance 30 ohms. Sensitivity - 85 dB . Non-linear distortion $0.1 \%$. Controlled transient response. Price: $£ 50$.

4104-B\&C. Commentator's lip microphone. High degree of noise cancellation. Flat response $70-10,000 \mathrm{c} / \mathrm{s}$. Impedance 30 ohms. Output: -82 dB ref. IV for 10 dyne/cm. Price: $£ 70$.

4105-A. Cardioid moving coil microphone specially designed for speech. Flat response $60-10,000 \mathrm{c} / \mathrm{s}$. Impedance 30 ohms. Sensitivity -82 dB . Front to back ratio $15-20 \mathrm{~dB}$. Price: £22 10s.


Vitavox $B 64$ moving coil


Vitavox M100


Woollett stereo condenser


Woollett condenser
4108. Cardioid condenser microphone. Response $30-16,000 \mathrm{c} / \mathrm{s}$. Sensitivity -60 dB . Impedance 30 or 300 ohms. Transformer fitted. Small size directional studio microphone. Price: £96.
4113. Ribbon cardioid microphone. 60-15,000 $\mathrm{c} / \mathrm{s}$. Specially suitable for speech and music recording. Two versions available. 4113-A: 30 ohms impedance. Output: -87 dB .4113 -B: 50 K impedance. Output: -54 dB . Suitable most domestic recorders. Price: $£ 1111$ s. (both models).
4119. Double ribbon (for improved sensitivity) hand-held or stand-mounted microphone. High -quality suitable for studio and domestic hi-fi, speech and music. Available $30-300$ ohms or 50 K . Complete with nine feet cable and zip case. Price: $£ 26$ (both models). $30-300$ ohms model with switch. Price: $£ 27$.

NOTE: 411950 K model is not available with switch.
4126. Cardioid condenser microphone using field effect transistor head amplifier. Very high
quality. Response $30-16,000 \mathrm{c} / \mathrm{s}$. Sensitivity -84 dB . Impedance 30 or 300 ohms. Complete kit comprising transit cases, mains power pack, 30 ft . cable, and outlet plug. Price: $£ 1086 \mathrm{~s} .6 \mathrm{~d}$. With battery power pack instead of mains unit, £94 16s.

TRIX. Ultra Electronics Ltd., Telecommunications Division, Western Avenue, London, W.3. Tel.: Acorn 3434. Cables: Radwaves, London.

G7823. Ribbon. Response $50-12,000 \mathrm{c} / \mathrm{s}$. Source imp. 30 ohms. 18 ft . cable, 3 pin locking type plug. Stands as required. Price: $£ 107 \mathrm{~s}$.

G7852. Moving coil. Response $50-9,000 \mathrm{c} / \mathrm{s}$. Source imp. 30 ohms. Cable and connector. Price: $£ 1010 \mathrm{~s}$.

G7852/F. Moving coil. Similar to G7852 but incorporating flexible stem. Cable and connection. Price: £11 2s.

G7852/FP. Moving coil. Similar to G7852 but priority microphone on base with switch. Price: £16 10s.

G7854. Moving coil. Response $100 \mathrm{c} / \mathrm{s}-11$ $\mathrm{Kc} / \mathrm{s}$. Imp. 30 ohms. Hand-type, complete with cable. Price: $£ 82 \mathrm{~s}$. Can be used with neck sling attachment G7977/N, also with stand fitting with swivel clip attachment G7979/C: £1.

M76A. Moving coil. Cardioid. Response 10() $\mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Sensitivity -63 dB . Imp. 30 ohmı. Attenuation-rear to front-20 dB. Pricu: $£ 2115$ s.

G7871/D. Moving coil. Response $50 \mathrm{c} / \mathrm{s}-\stackrel{\aleph}{ }$ $\mathrm{Kc} / \mathrm{s}$. Source imp. 30 ohms. 18 ft . cable, with switch. Stands as required. Price: $£ 87$ s.

TURNER. Distributors: Ad Auriema Ltd., 125 Gunnersbury Lane, Acton, London, W.3. Tel.: Acorn 8762.

SR90D. Robust hand type pressure-operated dynamic unit. Response $200 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Imp. 200 ohms or 25 K . Built-in switch with spare
contacts. Die-cast case finished brushed chrome. Weight: 1 lb .6 oz . including self-coiling lead. Price: $£ 14$ 8s. 10d.
58. Miniature dynamic designed for lavalier use. Omni-directional. Response $60 \mathrm{c} / \mathrm{s}-13 \mathrm{Kc} / \mathrm{s}$. Imp. interchangeable 150 ohms and 30 K . Size: 4 in. long, 1 in. diameter. Weight: $3 \frac{1}{2}$ oz. Desk stand optional extra. Price: $£ 197$ s. 4 d .
500. Hand or stand dynamic unit with cardioid response. Frequency response $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Imp. 150 ohms and 40 K . Die-cast alloy case finished satin chrome. Size: $6 \frac{3}{4} \mathrm{in}$. long, $1 \frac{1}{2} \mathrm{in}$. diameter. Weight: 12 oz . (excluding cable). Price: £29 14s. 4d.
510. Hand or stand dynamic unit with cardioid response. Frequency response $40 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$. Imp. 50 ohms and 200 ohms. Designed for broadcast use. Shock mounted. Die-cast alloy case finished matt blue-grey. Size: $6 \frac{3}{4}$ in. long, $1 \frac{1}{2}$ in. diameter. Weight: 12 oz. (excluding cable). Price: $£ 50$ 19s. 4d.

UHER. Distributors: Bosch Ltd., 205 Great Portland Street, London, W.1. Tel.: Langham 2672/5.

M152. Moving coil. Omni-directional. F.R. $50 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Imp. 200 ohms. Record/Stop/ Start/Rewind control. Price: £11 15 s .

M153. Dynamic microphone with remote control switch providing: record, stop, start, rewind. F.R. $50 \mathrm{c} / \mathrm{s}-10 \mathrm{Kc} / \mathrm{s}$. Impedance 200 ohms. Price: $£ 86 \mathrm{~s} .8 \mathrm{~d}$.

VITAVOX LTD., Westmoreland Road, London, N.W.9. Tel.: Colindale 8671. Cables: Vitavox, London, N.W.9.

B50. Moving coil. Response $60 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}$. Sensitivity -85 dB . Source imp. 25 ohms. 6 ft . cable. Built-in control switch. Price: $£ 617 \mathrm{~s}$.

B54. Moving coil incorporating built-in transformer. Response $60 \mathrm{c} / \mathrm{s}-8 \mathrm{Kc} / \mathrm{s}$. Sensitivity - 85 dB (excluding transformer). Source imp. 200, $500,10 \mathrm{~K}, 100 \mathrm{~K}$ ohms according to transformer. Built-in control switch. Price: $£ 85$ s.

B60. Similar specification to B50 but weatherproof version. Price: $£ 817 \mathrm{~s}$.

B64. Similar specification to B54 but weatherproof version. Price: $£ 105$ s.

M100. Moving coil incorporating tapped transformer giving choice of $25,200,10 \mathrm{~K}$ ohms and high impedance. Response $50 \mathrm{c} / \mathrm{s}-15 \mathrm{Kc} / \mathrm{s}$ $\pm 3 \mathrm{~dB}$. Sensitivity $-80 \mathrm{~dB},-71 \mathrm{~dB},-54 \mathrm{~dB}$, -44 dB according to impedance. 9 ft . cable and flexible support. Price: $£ 18$.

WALCHRIS. Distributors: Britimpex Ltd., 16/22 Great Russell Street, London, W.C.1. Tel.: Museum 7600. Cables: Brytron, London, W.C.1.

63M. Velocity type studio microphone available in high or low impedance versions. Figure of eight. Response $30 \mathrm{c} / \mathrm{s}-18 \mathrm{Kc} / \mathrm{s} \pm 2 \cdot 5 \mathrm{~dB}$. Sensitivity (high Z) $1 \mathrm{mV} /$ microbar. Imp.: 50 ohms, 200 ohms, or 80 K . Special impedances to order. Weight: 7 oz . Resilient mounting isolates unit from shocks or vibration through the support. Price: $£ 1616$ s.

Base: semi-flexible stand, 10 ft . cable and connector. Available in chrome and grey or black crackle finish. $£ 44 \mathrm{~s}$. Shielded transf ormers, connectors, extension leads, switch units, etc.
L. G. WOOLLETT \& COMPANY LTD., 21 Anerley Station Road, London, S.E.20. Tel.: Sydenham 9003.
-Stereo/condenser. Separate plug-in cells. Stereo or mono. Figure of eight, velocity. Stand type units fits international photographic thread $\left(\frac{1}{4} \mathrm{in}\right.$. Whitworth). Specification not available at time of going to press. Price: Velocity head $£ 14$ 14s. (two required for stereo), Head amplifier $£ 1818$ s., isolator power supply $£ 232$ s.

WYNDSOR RECORDING CO. LTD., (inc. Magnetic Recording Co.), Wyndsor Works, 2 Bellevue Road, Friern Barnet, London, N.11. Tel.: Enterprise 2226/7. Cables: Wyndreco, London.

Wyndsor WL.30. Ribbon hand or desk-stand microphone. F.R. $50 \mathrm{c} / \mathrm{s}-13 \mathrm{Kc} / \mathrm{s}$. High impedance with built-in transformer. Finished satin chrome. Supplied with 12 ft . screened cable and jack plug. Recommended for use with Wyndsor Vanguard recorder. Price: $£ 815 \mathrm{~s}$.

## DIRECTORY OF CONSTRUCTIONAL KITS

DYNACO. See amplifier and radio tuner sections for details of Dynaco models available in kit form.

HART ELECTRONICS LTD., 321 Great Western Street, Manchester, 14. Tel. : Rusholme 2212-3.

Complete kits for hi-fi and high power audio amplifiers including Dinsdale Mk II and Mullard Pi-Mode circuits. Full details on request.

HEATHKIT. Manufactured by Daystrom Ltd., Bristol Road, Gloucester. Tel.: Gloucester 20217.

AA-22U. Transistorised stereo integrated amplifier. Inputs: PU 6 mV , radio 250 mV , tape 250 mV , aux. 1. 250 mV , aux. 2. 250 mV . Controls: Balance, selector switch, mode switch, volume, bass, treble, filter, filter (3-position; flat, $4 \mathrm{Kc} / \mathrm{s}, 8 \mathrm{Kc} / \mathrm{s} 12 \mathrm{~dB} /$ octave). Noise -50 dB on PU, -65 dB all other inputs. Output: 20W per channel RMS. Distortion $0.3 \%$ at 20 W . F.R. $15 \mathrm{c} / \mathrm{s}-30 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Feedback 35 dB . Output: imp. 4, 8 or 16 ohms. Pre-set gain controls accessible from the front. Mains 110 , $200-250 \mathrm{~V} 50-60 \mathrm{c} / \mathrm{s}$. Size: $15 \frac{1}{2} \times 3 \frac{7}{8} \times 12 \frac{1}{8} \mathrm{in}$. Price (kit): less cabinet $£ 3910 \mathrm{~s}$.; cabinet $£ 25 \mathrm{~s}$. extra; (assembled) complete $£ 6816 \mathrm{~s}$.

S-99. Stereo amplifier kit. Output: 9W, 3 or 15 ohms, per channel. Distortion $0 \cdot 2 \%$ at $1 \mathrm{Kc} / \mathrm{s}$, $0.35 \%$ at $4 \mathrm{Kc} / \mathrm{s}, 0.42 \%$ at $40 \mathrm{c} / \mathrm{s}$. F.R. $30 \mathrm{c} / \mathrm{s}-$ $20 \mathrm{Kc} / \mathrm{s} \pm 0.5 \mathrm{~dB}$. Feedback 26 dB . H. and N. pickup 1 (magnetic) - 55 dB ; pickup 2 (crystal -55 dB ; Aux. (microphone, etc.) -60 dB ; radio, tape -65 dB . Inputs: pickup $1,4 \mathrm{mV}$, 100 K continuously variable; pickup $2,180 \mathrm{mV}$, 47 K continuously variable; Aux. $20 \mathrm{mV}, 500 \mathrm{~K}$ linear; radio, tape 100 mV . 350 K linear. P.s.n. 100-125, 200-210, 220-230, 240-250V, 50-60 c/s. 100W. Printed circuit boards for easy assembly. High sensitivity to suit all types of pickups. Variable filter. Price (kit): £28 9s. 6d.; (assembled): $£ 389 \mathrm{~s} .6 \mathrm{~d}$.

S-33. Stereo amplifier kit. 3W per channel. Distortion $0.3 \%$. Input: 100 mV at 1 megohm. Bass, treble, balance, volume. Price (kit): £13 7s. 6d.; (assembled): £18 18s.

S-33H. Stereo/mono amplifier. Output: $3 \cdot 5 \mathrm{~W}$. Distortion, less than $0.6 \%$ at $1,000 \mathrm{c} / \mathrm{s}$ for $3 \mathrm{~W} . \mathrm{H}$. and N. gram -55 dB , radio -60 dB (referred to 3W). Sensitivity: gram 50 mV (high imp.), aux. 150 mV , radio 100 mV . P.s.n. $100-$ $125,200-210,220-230,240-250 \mathrm{~V}$ AC $40-60 \mathrm{c} / \mathrm{s}$. Size: $11 \frac{3}{4} \times 5 \frac{1}{4} \times 10$ in. Based on Model S-33, but an extra stage is incorporated to increase the sensitivity required for the new high quality Ceramic pickups. Choice of three inputs provided, and close matched twin ganged potentiometers used for volume and tone controls. Price (kit): $£ 1517 \mathrm{~s} .6 \mathrm{~d} . ;$ (assembled): $£ 217 \mathrm{~s} .6 \mathrm{~d}$.

MA-5. Monaural amplifier. Output: 5W. Distortion less than $0.5 \%$ at $1,000 \mathrm{c} / \mathrm{s}$; less than $1 \%$ at $5 \mathrm{Kc} / \mathrm{s}$. Sensitivity: radio $200 \mathrm{mV}, 0.5$ megohms; gram $200 \mathrm{mV}, 0.5$ megohms. Rec. imp. 2-4 and 14-16 ohms. H. and N. less than -60 dB referred to 5 W . Output stages: ECC83, EZ81, $2 \times$ EL84. P.s.n. 100-110, 200-210, $220-230,240-250 V$ AC $40-60 \mathrm{c} / \mathrm{s}$. Size: $11 \times 6 \frac{5}{8}$ $\times 4 \frac{3}{4}$ in. Panel $11 \frac{3}{4} \times 5 \frac{1}{4} \mathrm{in}$. Suitable for most crystal pickups. Provision for connection of radio tuner or tape recorder. Price (kit): $£ 1019 \mathrm{~s} .6 \mathrm{~d} . ;$ (assembled): $£ 1510 \mathrm{~s}$.

MA-12. Mono amplifier. Output: 10W rms (12W max.) between $30 \mathrm{c} / \mathrm{s}$ and $10 \mathrm{Kc} / \mathrm{s}$. Distortion: less than $0 \cdot 1 \%$ at $10 \mathrm{~W}, 1 \mathrm{Kc} / \mathrm{s}$; less than $0.2 \%$ at $10 \mathrm{~W}, 5 \mathrm{Kc} / \mathrm{s}$; less than $0.4 \%$ at 10 W , $40 \mathrm{c} / \mathrm{s}$. F.R. $20 \mathrm{c} / \mathrm{s}-30 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Feedback main loop 26 dB , subsidiary loop 6 dB . H. and $\mathrm{N} .-85 \mathrm{~dB}$ at 10 W . Input: 120 mV for 10 W output. Output: imp. 2-4, 8-11, 14-16 ohms. Valves, EF86, ECC83, EL84 (2), GZ34. P.s.n. 100-117V, 200-250V AC, 40-60 c/s, 100W. Size: $11 \frac{1}{8} \times 6 \frac{3}{4} \times 5 \frac{3}{4} \mathrm{in}$. Weight: $12 \frac{1}{2} \mathrm{lb}$. Price (kit): £11 18s.; (assembled): £15 18s.

USC-1. Stereo pre-amplifier. Inputs: pickup 1, 3-4 mV 50 K ; pickup 2, 150 mV 1 megohm; tape $1,2 \cdot 5 \mathrm{mV} 80 \mathrm{~K}$ CCIR, tape $2,150 \mathrm{mV}$ 100 K ; radio 150 mV ; mic. $3 \mathrm{mV}, 1$ megohm; aux., $4-150 \mathrm{mV}, 1$ megohm. Controls: bass, treble, rumble filter, variable low pass filter, balance, volume, function, channel reverse. Power required, $250 \mathrm{~V} 10 \mathrm{~mA}, 6.3 \mathrm{~V} 1.5 \mathrm{amps}$. Output voltage: $1 \cdot 3 \mathrm{~V}$ R.M.S. Price (kit): $£ 19$ 10s.; (assembled): £26 10s.

UMC-1. Mono control unit. Inputs: mag. pu. $9 \mathrm{mV}, 100 \mathrm{~K}$, RIAA; crystal pu. 50 mV variable, 1 megohm linear: Aux. $120 \mathrm{mV}, 500 \mathrm{~K}$ linear; mic. $4 \mathrm{mV}, 130 \mathrm{~K}$ linear; radio 100 mV


Heathkit MA-5 monaural amplifer


Heathkit AFM/I AM/EM tuner
Heathkit AFM


Heqthkit TA-1M tape amplifier


Heathkit FM tuner
Heathkit FM tuner


HeattklkitUSSP-1 booster amplifier booster amplifier



variable, 330 K linear. Output up to $0 \cdot 25 \mathrm{~V}$. Controls: sel., bass, treble, filter, volume on/off. Low pass filter. H. and N. -65 dB P.s.n. $180-$ $300 \mathrm{~V}, 3 \mathrm{~mA}$ DC, $6 \cdot 3 \mathrm{~V}, 0.6 \mathrm{amps}$ AC. Suitable for free standing or cabinet installation. Price (kit): £8 12s. 6d.; (assembled): $£ 13$ 12s. 6d.

USP-1. Booster amplifier. Suitable for stereo and monaural sources of low sensitivity, e.g. pickups, tape heads or microphones. Input sensitivity: $2-20 \mathrm{mV}$. Output: adjustable from 20 mV to 2 V . Maximum gain 100. Power requirements $180-250 \mathrm{~V}, 3-5 \mathrm{~mA} ; 6 \cdot 3 \mathrm{~V} 0.5 \mathrm{amps}$. Price (kit): £7 7s. 6d.; (assembled): £10 9s. 6d.

TM-1. Four-channel mixer. Two high imp. inputs with sensitivity 1.5 mV and two aux. inputs with sensitivity 180 mV . Output: 200 mV at approximately 600 ohms. Individual and master volume controls. Walnut veneered cabinet. Size: $11 \frac{3}{4} \times 3 \frac{3}{4} \times 7 \frac{1}{2}$ in. Price (kit): £11 16s. 6d.; (assembled): £16 17s. 6d.

TA-1M. Pre-amplífier. Inputs: Mic. 0.5 mV . Radio 250 mV . Switched controls, record/ replay, bias, level, mic., radio. H.D. $<0 \cdot 1 \%$ for $500 \mathrm{mV} \mathrm{H}$. and N. -60 dB for 500 mV . Power supply required 290 V 20 mA DC 6.3 V 1 amp per channel. Size: $4 \frac{1}{2} \times 13 \frac{1}{2} \times 12 \mathrm{in}$. Price (kit): £19 18s.; (assembled): £28 18s.

TA-1S. Stereo version of TA-lM. Price (kit): $£ 25$ 10s.; (assembled): £35 18s.

TA-1C. Conversion Unit for TA-1M to convert to TA-1S. Price: $£ 615 \mathrm{~s}$.

V-7A: Valve voltmeter kit. Printed circuit. Measures AC volts ( $0-1 \cdot 5,5,15,50,150,500$, $1,500)$ R.M.S., AC volts $(0-4,14,40,140,400$, $1,400,4,000$ ). Peak-to-peak, DC volts ( $0-1 \cdot 5,5$, $15,50,150,500,1,500$ ). Ohms (with 10 ohms centre) $\times 1,10,100,1,000,10 \mathrm{~K}, 100 \mathrm{~K}, 1$ megohm $0 \cdot 1$ ohms to 1,000 megohms with internal battery. Input resistance: 11 megohms. $200 \mu \mathrm{~A}$ meter movement. Price (kit): $£ 13 \mathrm{ss}$. 6d.; (assembled): £19 18s. 6d.

IM-13U. Laboratory valve-voltmeter kit. Printed circuit. Gimbal mounting, for viewing from any angle. Measures AC volts $(0-1 \cdot 5,5$, $15,50,150,500,1,500$ R.M.S.; AC volts ( $0 \cdot 4$, 14, 40, 140, 400, 1,400, 4,000) peak-to-peak). DC volts $(0-1 \cdot 5,5,15,50,150,500,1,500)$. Ohms (with 10 ohms centre) X1, X10, X100, X $1000,10 \mathrm{~K}, 100 \mathrm{~K}, 1$ megohm. $0 \cdot 1$ ohms to 1,000 megohms with internal battery. Input resistance: 11 megohms. $200 \mu \mathrm{~A}$ meter movement. Price (kit): $£ 1818 \mathrm{~s} . ;$ (assembled): $£ 2618 \mathrm{~s}$.

MGP-1. Power supply unit. 200, 250, 270V, $120 \mathrm{~mA} ; 6 \cdot 3 \mathrm{~V}, 2 \cdot 5 \mathrm{amps}$. Price (kit): $£ 5$ 2 2 s .6 d. ; (assembled): $£ 612 \mathrm{~s} .6 \mathrm{~d}$.

OS-2. Service oscilloscope. $2 \frac{3}{4}$ in. tube. Vertical bandwidth $2 \mathrm{c} / \mathrm{s}$ to $3 \mathrm{Mc} / \mathrm{s}$. Automatic lock-in sync. Mu-metal CRT shield. Printed circuit. Switched ext./int. Y plate connections. Vertical amplifier: sensitivity $100 \mathrm{mV} / \mathrm{cm}$., input impedance: $3 \cdot 3$ megohms shunted by 20 pF ., response $2 \mathrm{c} / \mathrm{s}-3 \mathrm{Mc} / \mathrm{s} \pm 3 \mathrm{~dB}$. Horizontal amplifier: sensitivity $100 \mathrm{mV} / \mathrm{cm}$., input impedance: 10 megohms shunted by 20 pF , response $2 \mathrm{c} / \mathrm{s}-3 \mathrm{Mc} / \mathrm{s}$. Time base: $20 \mathrm{c} / \mathrm{s}-200 \mathrm{Kc} / \mathrm{s}$ in four steps. Size: $5 \times 7 \frac{3}{8} \times 12 \mathrm{in}$. Weight: $9 \frac{3}{4} \mathrm{lb}$. Price (kit): £22 18s.; (assembled): £30 8s.

IO-12U. General purpose oscilloscope kit. 5 in. flat face C.R. tube. Printed circuits. Vertical band-width $3 \mathrm{c} / \mathrm{s}$ to $4.5 \mathrm{Mc} / \mathrm{s}$. Built-in 1V calibrator. Y-sensitivity 10 mV R.M.S. per cm at $1 \mathrm{Kc} / \mathrm{s}$, X-sensitivity 50 mV R.M.S. per cm at $1 \mathrm{Kc} / \mathrm{s}$. Price (kit): £35 17s. 6d.; (assembled): $£ 4515$ s.

S-3U. Electronic Switch (oscilloscope trace doubler). Converts a single beam oscilloscope to double beam. Switching rates $150,500,1,500$, 5,000 and $15,000 \mathrm{c} / \mathrm{s}$. Signal frequency response $0-100 \mathrm{Kc} / \mathrm{s} \pm 1 \mathrm{~dB}$. Signal input range $0 \cdot 1$ to $1 \cdot 8 \mathrm{~V}$ RMS. Price (kit): £12 18s. (assembled): £18 10s.

C-3U. Resistance-capacitance bridge. Selfcontained and powered. Capacitance range $0 \cdot 00001$ to 1,000 microfarads. Resistance range 100 ohms to 5 megohms. Power factor and leakage also indicated. Polarising voltages available from 5 to 450 V . Price (kit): $£ 10$ 10s.; (assembled): £16.

AV-3U. Audio valve millivoltmeter. Measure voltages as low as 1 mV to a maximum of 300 V at high impedances in 10 ranges. Frequency range $10-400,000 \mathrm{c} / \mathrm{s}$. Uses a $4 \frac{1}{2} \mathrm{in}$. meter. Cathode follower output. Price (kit): $£ 16$ 10s.; (assembled): £22 18s.

309-CU. RF probe. Extends the range of a valve voltmeter to $100 \mathrm{Mc} / \mathrm{s}$. Uses a printed circuit board. Price (kit):£113s.6d.;(assembled) £2 2s.

AW-1U. Audio wattmeter. Uses external loads or the following internal loads: $3,8,15$ and 600 ohms. 5 power ranges from $0-5 \mathrm{~mW}$ to 50 watts. $4 \frac{1}{2}$ in. meter calibrated in watts and dB. Price (kit): $£ 175 \mathrm{~s} . ;$ (assembled): $£ 2318 \mathrm{~s}$.


Heathkit Cotswold MFS
Heathkit Cotswold MFS


Heathkit MGP-1 power unit
Heathkit MGP-1 power


Heathkit AA-22U
Heathkit AA-22
Sersefegplififlifier


Hfeathkit TM-1 four-channel mixer


HedathkititMM-13U valve valtme volter



AO-1U. Inexpensive audio genera tor covering $20 \mathrm{c} / \mathrm{s}-150 \mathrm{Kc} / \mathrm{s}$ sine wave, $20 \mathrm{c} / \mathrm{s}-25 \mathrm{Kc} / \mathrm{s}$ square wave. Output up to 10 V RMS sine wave or 80 V peak-to-peak square wave. Size: $9 \frac{1}{2} \times 6 \frac{1}{2} \times 5 \mathrm{in}$. Price (kit): $£ 1415 \mathrm{~s}$.; (assembled): $£ 215 \mathrm{~s}$.

IM-12U. Low-priced audio distortion meter. Simple to use. Measures distortion at frequencies between $20 \mathrm{c} / \mathrm{s}$ and $20 \mathrm{Kc} / \mathrm{s}$. Size: $13 \times 7 \times$ $8 \frac{1}{2}$ in. Price (kit): $£ 2415 \mathrm{~s}$.; (assembled): $£ 34$.

IG-82U. Audio generator covering $20 \mathrm{c} / \mathrm{s}-1$ $\mathrm{Mc} / \mathrm{s}$. Sine and square wave available simultaneously. Sine wave output up to 10 V RMS, square wave output up to 10 V peak-to-peak. Rise time $0.15 \mu \mathrm{Sec}$. Size: $13 \times 8 \frac{1}{2} \times 7 \mathrm{in}$. Price (kit): $£ 2410 \mathrm{~s} . ;$ (assembled): $£ 3610 \mathrm{~s}$.

AG-9U. Audio signal generator. Range $10 \mathrm{c} / \mathrm{s}$ to $100 \mathrm{Kc} / \mathrm{s}$. Distortion less than $0.1 \%$ from $20 \mathrm{c} / \mathrm{s}$ to $20 \mathrm{Kc} / \mathrm{s}$. Decade switching over 8 voltage ranges from 3 mV to 10 V monitored. Uses $4 \frac{1}{2}$ in. meter. Price (kit): £22 10s.; (assembled): $£ 3010$ s.

AFM/1. AM/FM tuner. Variable tuning. FM frequency range $88-108 \mathrm{Mc} / \mathrm{s}$. AM frequency range $16-50,200-550,900-2,000$ metres. Wide band ratio discriminator plus two limiters. Magic eye tuning indicator. Self-powered. Size: $10_{4}^{3} \times 11 \frac{1}{8} \times 4 \frac{1}{2}$ in. Price (kit): $£ 275 \mathrm{~s}$. (for both units).

FM tuner. Comprises model FMT-4U tuner unit and FMA-4U IF strip and power supply. Flywheel tuning, thermometer tuning indicator, three IF stages with two limiters, printed circuit board and prealigned coils. Tuning range 88$108 \mathrm{Mc} / \mathrm{s}$. Sensitivity $2 \cdot 5 \mu \mathrm{~V}$ for 20 dB quieting. Price (kit): £ 168 s . (for both units).

OTFM-1. Tuner. Comprises TFM-T1 tuner unit, TFM-1M (mono) IF strip and power supply, or, TFM-1S (stereo) IF strip and power supply. TFM-1C stereo conversion unit available separately. Range: $88-108 \mathrm{Mc} / \mathrm{s}$. Variable tuning. Ratio detector. Sensitivity: $2 \mu \mathrm{~V}$ for 20 dB quieting. Aerial input 75 ohms coaxial. Output: 250 mV . Multiplex decoder fitted. All transistor. Mains. Size: $15 \frac{5}{8} \times 3 \frac{7}{8} \times 10_{4}^{1} \mathrm{in}$. Price (kit): mono (less cabinet) $£ 2019$ s. for both units; (kit) stereo (less cabinet) $£ 24$ 18s.; cabinet $£ 25$ s. extra. Also available ready assembled.

SSU-1. Speaker system kit. Comprises 8 in. and 4 in . matched drive units, and ducted-port bass reflex cabinet. Response $40-16,000 \mathrm{c} / \mathrm{s} \pm 5$ dB , crossover frequency $3,000 \mathrm{c} / \mathrm{s}$. Imp. 15
ohms. Size: $23 \times 11 \frac{1}{2} \times 11 \frac{3}{4} \mathrm{in}$. Available for horizontal or vertical mounting. Price complete (kit): $£ 1212 \mathrm{~s}$.; without legs (kit): $£ 1117 \mathrm{~s} .6 \mathrm{~d}$.

Cotswold. High fidelity three speaker system. Drive units are 12 in . bass, $8 \times 5 \mathrm{in}$. elliptical, and pressure tweeter. Range $30-20,000 \mathrm{c} / \mathrm{s}$. Two volume controls. Celotex lined enclosure. In white wood ready cut and drilled. Dimensions: $26 \times 23 \times 14 \frac{1}{2}$ in. Price complete with crossover unit, etc. (kit): £25 12s.; assembled in the white: £33 17s.

Cotswold MFS. Almost identical to the Cotswold, but specially designed to occupy minimum floor space. Slight reduction in output below $40 \mathrm{c} / \mathrm{s}$ with smaller source area. Recommended for small rooms. Dimensions: $36 \times 16 \frac{1}{2} \times 14 \mathrm{in}$. plus two legs. Price (kit): $£ 2512 \mathrm{~s}$.; assembled in the white: $£ 3317 \mathrm{~s}$.

Gloucester. Cabinet for hi-fi equipment. Space available to house records, tapes, etc. Mk. 1 accommodates tape deck or record player, F.M. tuner, and stereo amplifier. Mk. II accommodates both tape deck and record player, FM tuner and stereo amplifier. Dimensions: $46 \frac{1}{8} \times$ $30 \times 21$ in. Price (kit): £18 10s.

Malvern. Cabinet for hi-fi equipment. Space available for transcription record player, tape deck, radio tuner, audio amplifier (or control unit and separate power amplifiers) and tape record/replay amplifier. Price (kit): $£ 18$ 1s.

Berkeley. Infinite baffle hi-fi enclosure with speakers and cross-overs. One 12 in . lowresonance bass unit, one 4 in . middle and top unit. Inductance/capacitance cross-over at 900 $\mathrm{c} / \mathrm{s}$. Handling capacity 15W RMS. Kit includes ready finished cabinet shell. Finish : oiled walnut veneer. Size: 26 in. high, 17 in . wide, $7 \frac{3}{4} \mathrm{in}$. deep. Price (kit): £18 10s.; (assembled): £23.

HENRY'S RADIO LTD., 303 Edgware Road, London, W.2. Tel.: Paddington 1008/9.

Hi-Fi 10. Transistorised amplifier kits. Six models: TPA3, TPA15, MP2, SP4, MPA25, SM2.

TPA3. Output: 10W at $400 \mathrm{c} / \mathrm{s}$. Distortion $0 \cdot 25 \%$ at 10 W . Response $30 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Feedback 60 dB . N.L. -70 dB . Input: 100 mV into 33 K from 10 K (or less) source. L.S. matching 3-4 ohms. Output stages: matched OC35s, Class B. P.s.n. 24V DC, 15 mA (static), 300 mA (average for 10 W ). To operate with pre-amp.


Heathkit AO-1U audio generator


Philips EL.7500/00 moving coil mic kit


Jason JTV2


Heathkit $10-12$ U oscilloscope

Model MP2 (mono) or SP4 (stereo). Size: $4 \times 2 \frac{1}{2} \times 1 \frac{1}{8}$ in. Printed circuit and $4 \times 4 \times 1 \mathrm{in}$. radiator for output pair. Price (assembled): $£ 510$ s. Mono or stereo mains units $£ 219 \mathrm{~s} .6 \mathrm{~d}$.

TPA15. LS matching 15-16 ohms. P.s.n. 40 V DC, 12 mA (quiescent), 150 mA average for 10W. Price (assembled): $£ 519 \mathrm{~s}$. 6d. Other details as for TPA3.

MPA25. 25W transistor power amplifier. Input: 150 mV into 33 K for maximum output. F.R. $20 \mathrm{c} / \mathrm{s}-20 \mathrm{kc} / \mathrm{s} \pm 1 \frac{1}{2} \mathrm{~dB}$. Output: $17 \frac{1}{2}$ to 27W RMS. 22 to 33 W music power.. Peak output up to 50 W . Output impedance $7 \frac{1}{2}-16$ ohms. Damping factor 30 to 80 . Eight transistors with AC and DC feedback. Transformerless pushpull output. Power supply needed: 60 V 15 mA quiescent, 50 V 550 mA at 18 W ( 15 ohms ), 50 V 900 mA at 26 W ( 8 ohms). Price (assembled): £8 19s. 6d.

Model MP2. Transistor mono pre-amplifier. Inputs: (pickups) $5 \mathrm{mV}, 6 \mathrm{~K}$; $100 \mathrm{mV}, 100 \mathrm{~K}$; $250 \mathrm{mV}, 400 \mathrm{~K}$; correction for microgroove and 78 rpm ; (tuners) $150 \mathrm{mV}, 100 \mathrm{~K} ; 5 \mathrm{mV}, 1 \mathrm{~K}$; $50 \mathrm{mV}, 50 \mathrm{~K}$; (tape) $2.5 \mathrm{mV}, 1 \mathrm{~K}$ corrected for $7 \frac{1}{2} \mathrm{i} / \mathrm{s}$; (mic.) mag. and crystal $1.5 \mathrm{mV}, 1 \mathrm{~K}$. Controls: bass, treble, switched low-pass filter, volume, input selector. Filters: low-pass $4 \mathrm{Kc} / \mathrm{s}$, $6 \mathrm{Kc} / \mathrm{s}, 10 \mathrm{Kc} / \mathrm{s}, 20 \mathrm{Kc} / \mathrm{s}$; high-pass, roll-off below $40 \mathrm{c} / \mathrm{s}$. Response: flat, but with standard correction for records and tape. Noise -70 dB with controls level; no hum. P.s.n. 9/12, 18/24, $35 / 45 \mathrm{~V}$ DC at $2 \frac{1}{2} \mathrm{~mA}$ nominal. Printed circuit. For use with TPA3 or TPA15 amplifiers. Dimensions: $9 \times 2 \frac{1}{2} \times 1_{4}^{1}$ in. Price (assembled): £5 10s.; (front panel 8s. 6d. extra).

SM2. Transistor matching unit for SP4 to permit use with (a) Decca Deram or similar, and (b) low output dynamic cartridges. Input: 3 to 5 mV at 40 to 100 K . Price (assembled): £1 19s. 6d.

Model SP4. Two-channel stereo version of Model MP2. For use with two TPA3 or TPA15 power amplifiers. Size: $9 \times 3 \frac{1}{4} \times 1 \frac{7}{8} \mathrm{in}$. Price (assembled): $£ 1019 \mathrm{~s} .6 \mathrm{~d}$.; (front panel 12s. 6d. extra).

Transistorised FMTuner. Geared slow motion full tuning. Range $87-105 \mathrm{Mc} / \mathrm{s}$. A.G.C., A.F.C. Ratio detector. Multiplex adaptor. Aerial imp. 75 ohms. Output: max. 80 mV for $100 \mu \mathrm{~V}$ aerial; min. $2 \frac{1}{2} \mathrm{mV}$ for $1 \mu \mathrm{~V}$ aerial. P.s.n. 9 V , 9 mA . Size: $3 \frac{1}{2} \times 2 \frac{1}{4} \times 4 \mathrm{in}$. Price (kit): $£ 719 \mathrm{~s} .6 \mathrm{~d}$.

JASON ELECTRONIC DESIGNS LTD., 8 Stephen Street, Tottenham Court Road, London, W.1. Tel.: Museum 4666.
F.M.T.I. Standard F.M. tuner kit. 4 valves only are used, giving an aerial sensitivity of better than $100 \mu \mathrm{~V}$. A ratio detector is combined with a limiter for low distortion and good noise rejection. Price without valves and power supply: $£ 519 \mathrm{~s}$. Power Pack kit: $£ 2$ 14s.
F.M.T.2.This is the sameunit as the F.M.T.1., but built into a shelf mounting case. Price, less valves, but with power supply: $£ 99$ s.
F.M.T.3. A fringe F.M. tuner with automatic frequency control. Two limiters combat the effects of aeroplane flutter and car interference. Price with case but less seven valves required: £109s.

JTV2. Tuner kit. See details of built model in Radio Tuner section. May be built for $£ 140$ s. 4 d . Inc. purchase tax 18s. 1d. Four extra valves required.

Mercury 2. Tuner kit. See details of Monitor in Radio Tuner section. May be built for $£ 915 \mathrm{~s} .4 \mathrm{~d}$. Inc. purchase tax 18s. 1d. Three extra valves required.

MARTIN ELECTRONICS LTD., 154-155 High Street, Brentford, Middx. Tel.: Isleworth 1161/2.

Audiokit 1/4. Transistorised mono control unit. Inputs: from 3 mV according to signal input requirements; RIAA correction on pu input. Output: 200 mV . Controls: sel. switch (tape head, mag. pu, crystal pu, radio, aux., mic.). Filters: bass cut and lift, treble cut and lift, low pass $20 \mathrm{Kc} / \mathrm{s}$. Response $45 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. H. and N. -70 dB . P.s.n. $9-15 \mathrm{~V}$ DC. Easily adapted to stereo. To operate with Audiokit 5. Size: $8 \times 3 \frac{1}{4} \times 1 \frac{3}{4} \mathrm{in}$. Price: $£ 510 \mathrm{~s}$.

Audiokit $\mathbf{1 / 4} / \mathrm{S}$. Transistorised stereo control unit. Details as for $1 / 4$. Size: $8 \times 3 \frac{1}{4} \times 3_{4}^{3} \mathrm{in}$. Price: $£ 11$.

Audiokit $\mathbf{1 / 2}$. Transistorised mono control unit. Inputs: from 3 mV according to signal input requirements; RIAA correction on pu input. Output: 200 mV . Controls: sel. switch (tape head, mag. pu, crystal pu, radio, aux., mic.). Response $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. H. and N. -70 dB. P.s.n. 9-15V DC. Easily adapted to stereo. To operate with Audiokit 5. Size: $5 \frac{3}{4} \times 3 \frac{1}{4} \times 1 \frac{3}{4}$ in. Price: $£ 45 \mathrm{~s}$.

Audiokit 1/2/S. Transistorised stereo control unit. Details as for $1 / 2$. Size: $5 \frac{3}{4} \times 3 \frac{1}{4} \times 3 \frac{3}{4} \mathrm{in}$. Price: £9 10s.

Audiokit 5. Transistorised mono amplifier. 10W. H.D. $0.25 \%$. Response $40 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Feedback 60 dB . N.L. -85 dB . Input: 100 mV . LS matching 3 ohms. P.s.n. 24V DC, 0.8 amps . To operate with Audiokits $1 / 2,1 / 4,2 / 3,3 / 4$. Size: $4 \frac{1}{2} \times 4 \times 3 \frac{1}{2}$ in. Price: $£ 512$ s. 6 d .

Audiokit 7. Similar to Audiokit 5 but for 15 ohms speaker. Operates from 40V.

Audiokit 3/4. Transistorised mono 3-channel pre-amplifier/mixer. Plug-in adaptors available to match almost any input. Output: 200 mV , 8 K. F.R. $45 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Controls: one per channel plus bass, treble, vol. P.s.n. 9-15V DC. Size: $11 \frac{3}{8} \times 2 \frac{1}{8} \times 3 \frac{1}{2}$ in. Price: $£ 87 \mathrm{~s} .6 \mathrm{~d}$.

Audiokit 3/4/S. Transistorised stereo 3channel pre-amplifier/mixer. Details as for $3 / 4$. Price: £16 15 s .

Audiokit 2/3. Transistorised mono 3-channel pre-amplifier/mixer. Plug-in adaptors to match almost any input. Output: $200 \mathrm{mV}, 8 \mathrm{~K}$. F.R. $45 \mathrm{c} / \mathrm{s}-20 \mathrm{Kc} / \mathrm{s}$. Controls: one per channel plus volume. P.s.n. 9-15V. Size: $11 \frac{3}{8} \times 2 \frac{1}{8} \times 2$ in. Price: $£ 7$ 2s. 6d.

Audiokit 2/3/S. Transistorised stereo 3channel pre-amplifier/mixer. Details as for $2 / 3$. Price: £145s.

Audiokit 15, 16 and 17. FM/VHF tuner. Variable tuning 88-108 Mc/s. Ratio detector. Sensitivity $2 \mu \mathrm{~V}$ for 20 dB quieting. Aerial input: 75 ohms balanced or coaxial. Output: 100 mV 100 K . Multiplex decoder will be available when service starts. A.F.C. Power supply 9V battery. Consumption 12 mA . Size: $9 \frac{1}{2} \times 3 \frac{1}{2} \times 4 \mathrm{in}$. behind panel. Supplied as three units for home assembly into cabinet. Price: $£ 12$ 0s. 3d. (U.K. purchase tax 17s. 3d.).

New range of tape pre-amplifiers, tape amplifiers and complete tape recorders in kit form available shortly. Details not ready as we go to press.

PETO SCOTT LTD., Addlestone Road, Weybridge, Surrey. Tel.: Weybridge 45511.

Philips EL.7500. Moving coil microphone kit. Includes table stand, on/off switch and neck cord. Source impedance 200 ohms, 500 ohms or high Z. Price (kit): £7 7s.

SINCLAIR RADIONICS LTD., 22 Newmarket Road, Cambridge. Tel.: Cambridge 52731.

Sinclair Z-12. Transistorised mono amplifier. Eight transistors. Output into 3 ohm load: 5 W RMS at $12 \mathrm{~V}, 8 \mathrm{~W}$ RMS at 15 V , 13W RMS at 18 V . Output into 1.5 ohm load: 10 W RMS at 12V, 16W RMS at 15 V . F.R. $15 \mathrm{c} / \mathrm{s}-50 \mathrm{Kc} / \mathrm{s}$ $\pm 1 \mathrm{~dB}$. Sensitivity: 2 mV into 2 K . Signal to noise: better than 60 dB . Total distortion less than $1 \%$. Size: $3 \times 1.8 \times 1.3$ in. Quiescent consumption on 12 V : 15 mA . DC supply required 6-20V. Price: $£ 49 \mathrm{~s} .6 \mathrm{~d}$. (ready built). Power pack $£ 2$ 14s. extra.

STERN-CLYNE LTD., Head office and mail order: 3-5 Eden Grove, Holloway, London, N.7. Tel.: North 8161. Branches throughout: London, Liverpool, Manchester, Sheffield, Bristol and Nottingham.

Type C Mk. II Tape pre-amplifier. To Mullard design (see Tape Amplifier section). Price: $£ 11$; power supply unit $£ 3$ extra.

HF/TR3 Mk. II Tape Amplifier. To Mullard design (see Tape Amplifier section). Price, including power supply unit: $£ 13$ 13s.

Mullard 2 Valve Pre-amplifier Tone Control Unit. (See Amplifier section). Price: £6 6s.

Mullard 3-Valve Pre-amplifier. (See Amplifier section). Price: £10.

FM1. F.M. tuner. (See Radio Tuner section). Price: $£ 7$ 9s. 6d.

TATES ELECTRONIC SERVICES LTD., 3 Waterloo Road, Stockport, Cheshire. Tel.: Stockport 7301.

Tates Electronics $10+\mathbf{1 0}$. For full specification see Amplifier section. Price (kit): $£ 49$ 17s. 6d.

## DIRECTORY OF FM/VHF AERIALS

AERIALITE LTD., Hargreaves Works, Congleton, Cheshire. Tel.: Congleton 2471/3.

Aerloft. Band II loft mounting dipole with rigid elements. Light, easily fitted, adjustable base. Price: 17s. 6d.

Aerpole 900/MU. Band II outdoor dipole with stand-off arm and universal bracket to fit up to 2 in. diameter masts. Price: $£ 18 \mathrm{~s}$.

Aeraitch $901 / \mathrm{XU}$. Band II wide-spaced H array with attachment to fit masts up to 2 in . diameter. Price: £1 17s.

Aerfringe $902 / \mathrm{XU}$. Band II three-element array comprising director, folded dipole and director. Bracket for mast attachment up to 2 in. diameter. Price: $£ 2$ 12s. 6d.

FM adaptors 616. Comprises two add-on units for clamping to existing Band I dipole with $\frac{1}{2}$ in. diameter vertical elements.

ANTIFERENCE LTD., Bicester Road, Aylesbury, Bucks. Tel.: Aylesbury 2511.

Loft 233. Band II three-element loft aerial with folded dipole. Universal mounting clamp with stand-off arm. Fully adjustable for angle and direction. Price: $£ 117 \mathrm{~s}$.

214/1A. Band II single dipole array with 7 in. stand-off arm and universal "grip-on" clamp to fit masts up to 2 in. diameter. Price: $£ 19 \mathrm{~s}$.

214/2B. Band II wall mounting single dipole array. $15 \mathrm{in} . \times 1 \mathrm{in}$. stand-off arm and universal fitting bracket. Price: $£ 112 \mathrm{~s}$. 3d.

214/9C. Band II chimney mounting single dipole array. $3 \mathrm{ft} . \times 1 \mathrm{in}$. swan-neck arm and single lashing. Price: $£ 213 \mathrm{~s}$.
224. Band II dipole and reflector array with universal clamp to fit masts up to 2 in. diameter. Price: £1 17s.

224/9M. Band II dipole and reflector array with $5 \mathrm{ft} . \times 1 \mathrm{in}$. cranked mast and single chimney lashing. Price: $£ 314 \mathrm{~s}$. 3 d .
234. Band II three-element array comprising folded dipole, director and reflector with universal clamp for masts up to 2 in . diameter. Price: $£ 2$ 12s. 6d.

234/9M. Band II thrce-element array with $5 \mathrm{ft} \times 1 \mathrm{in}$. cranked mast and single lashing. Price: £4 9s. 9d.

Addex-FM. Adaptor stubs for adding to vertical Band I, III or Band I/III arrays with $\frac{3}{8}$ in. or $\frac{1}{2}$ in. diameter elements. Price: 9s. 6d. pair.

ARRELL ELECTRICAL ACCESSORIES LTD., Demmings Works, Brookfield Road, Cheadle, Cheshire. Tel.: Gatley 3235/6. Depots at: Bristol, Dublin, Glasgow, London, Newcastle, Sheffield, Wolverhampton.

2AO. FM stubs for attaching to existing Band I or III aerial. Price: 11s.

DV/2. Loft mounting inverted $\mathrm{V} \frac{1}{4}$-wave aerial. Price: 15s. 4 d .

2UA. Band II single dipole with universal clamp for fixing to masts up to 2 in . diameter. Price: £1 3s. 6d.

2WA. Band II wall mounting dipole with stand-off arim and fixing bracket. Price: £1 10s. 8d.

2CA. Band II single dipole with 3 ft . cranked alloy arm and chimney lashing equipment. Price: £2 8s.
$\mathbf{2 H A}$. Band II dipole and reflector with 5 ft . 6 in. straight alloy mast and chimney lashing equipment. Price: $£ 26 \mathrm{~s} .6 \mathrm{~d}$.

2UH. Band II dipole and reflector with universal clamp for fixing to masts up to 2 in. diameter. Price: £1 17s. 3d.

2SA3. Band II three-element array with 5 ft . 6 in. cranked alloy mast and chimney lashing equipment. Price: $£ 413 \mathrm{~s}$.

2UA3. Band II three-element array with universal clamp for fixing to existing masts up to 2 in. diameter. Price: $£ 27 \mathrm{~s}$. 1 d .

Full range of straight and cranked masts, Ubolts, lashing wire, chimney and wall brackets, wall nails and complete lashing kits.

1075 BII. Band II low-noise mast-head amplifier. Gain 16 dB . Bandwidth $6 \mathrm{Mc} / \mathrm{s} \pm 1.5 \mathrm{~dB}$. Battery powered via feeder. Price: $£ 516 \mathrm{~s}$. 3d.

BELLING-LEE (AERIALS) LTD., Heysham Road, Netherton, Bootle 10, Liverpool, Lancs. Tel.: Aintree 1736. London Sales Office: Belling and Lee Ltd., Great Cambridge Road, Enfield, Middlesex. Tel.: Enfield 5393.

1F/FM. Band II dipole for indoor use. Twoelement array with elements adjustable to form V if required. Swivel base. Vertical or horizontal mounting. Suitable for room or loft use. Price: 18 s . 6 d .

1A/FM. Band II dipole array for outside use. Price: £1 0s. 6d.

2A/FM. Band II H aerial comprising dipole and reflector mounted on boom. Universal clamp to fit all masts. Price: $£ 16 \mathrm{~s}$. 9d.

3A/FM. Band II three-element array comprising director, dipole and reflector with feeder matching link. Universal clamp to fit all masts. Price: £2 12s. 6d.

A1/FM. Band II stubs for attaching to Band I dipoles. Price: 10s. 6d. pair.
Wide range of masts, stand-off arms, mounting brackets and lashings available.

BEN NEVIS AERIALS, Andrew Sloss Ltd., Belmont Works, Belmont Site, Lewis Street, Stranraer, Scotland. Tel.: Stranraer 2677/8.

Ben Nevis V1. Band II single dipole with stand-off arm and universal mast clamp for 1-2 in. masts. Price: $£ 16 \mathrm{~s}$. 6d.

Ben Nevis V2. Band II dipole and reflector with boom and stand-off arm and universal mast clamp. Price: £1 16s.

Ben Nevis V3. Band II three-element array comprising director, folded dipole and reflector, with stand-off arm and universal mast clamp. Price: $£ 2$ 10s.

Ben Nevis V4. Band II four-element array comprising two directors, folded dipole and reflector, with stand-off arm and universal mast clamp. Price: $£ 3$.

Regal RV1. Similar to V1 but aerial array plastic-coated by Plastalux process and fitted anti-vibration insulators. Ideal for exposed locations or where subject to corrosion. Price: £1 16s.

Regal RV2. Similar to V2 but array plastic-
coated and fitted anti-vibration insulators. Price: £3.

Regal RV3. Similar to V3 but array plasticcoated and fitted anti-vibration insulators. Price: $£ 411 \mathrm{~s}$.

Regal RV4. Similar to V4 but array plasticcoated and fitted anti-vibration insulators. Price: $£ 511 \mathrm{~s}$.
K.V.A. ELECTRONICS, 27 Central Parade, New Addington, Surrey. Tel.: Lodge Hill 2266.

FML. Band II loft dipole. Two-screw fixing bracket, rotatable base, arms of dipole adjustable to V for optimum results or to clear obstructions. Price: 12s. 6d.

FM.SD/W. Band II wall mounting single dipole with fixing bracket, stand-off arm and provision for swivelling aerial for optimum results. Price: $£ 110 \mathrm{~s}$.

FML/H. Band II loft-type H aerial comprising dipole, reflector, mounting boom and stand-off arm. Fixing bracket permits aerial to be orientated for best results. Price: $£ 110$ s.

FML/Y3. Band II three-element loft array comprising director, folded dipole and reflector with stand-off arm and fixing bracket. Particularly suitable in areas where signal strength is poor or where "ghosting" causes distortion. Price: $£ 2$ 12s. 6d.

FML/Y4. Similar to FML/Y3 but with two directors. Price: £2 17s. 6d.

FM/HC. Band II horizontally polarised outside H aerial comprising dipole, reflector, boom, cranked arm mast and chimney lashing equipment. Price: £3 8s. 6d.

LABGEAR LTD., Cromwell Road, Cambridge. Tel.: Cambridge 47301.

Labgear 202. Band II dipole with single reflector. Price: £1 11s.

Labgear 203. Band II three-element array comprising director, folded dipole and reflector. Price: $£ 215 \mathrm{~s}$.

Labgear 205/W. Band II dipole with cranked arm and wall bracket. Price: 13s.

Labgear 205/L. Band II dipole for loft mounting. Price: 9s.

Alloy masts from $6 \mathrm{ft} . \times 1 \frac{1}{2}$ in. to $16 \mathrm{ft} . \times 2 \mathrm{in}$., cranked arms and single and double chimney lashings.

MAXVIEW AERIALS LTD., Maxview Works, Setch, Kings Lynn, Norfolk. Tel.: Watlington (Norfolk) 376.

Maxview Dipole D/HM. Band II wall-mounting dipole with stand-off arm and adjustable swivel fitting. Price: $£ 110 \mathrm{~s}$.

Maxview Dipole D/DW. Band II dipole array with bracket for mast fitting. Price: $£ 15 \mathrm{~s}$.

Maxview H D/S3. Band II array comprising dipole and reflector on boom. Bracket for mast mounting. Price: $£ 116 \mathrm{~s}$.

Maxview D/FD3 straight. Band II threeelement array comprising director, dipole and reflector. Bracket for mast mounting. Price: £2 2 s .

Maxview D/STB folded. Band II three-element array comprising director, folded dipole and reflector. Bracket for mast mounting. Price: £2 10s.

Maxview FM stubs. Add-on units for TV aerials to boost Band II reception. Price: 12s. 6d. set.

Full range of alloy poles, steel poles, chimney lashings, wall brackets, ground installation equipment and accessories. All component parts of Maxview aerials available separately.

## TELEFIELD MANUFACTURING CO. LTD.,

 2 Tucker Street, Bristol 2. Tel.: Bristol 28339.Telefield D2.F. Band II outdoor single dipole with stand-off arm for wall, eaves or fascia mounting. Price: $£ 13 \mathrm{~s} .9 \mathrm{~d}$.

Telefield D2.U. Band II outdoor single dipole with universal clamp for mast attachment. Price: £1 6s.

Telefield S2. Band II stub adaptors for attaching to existing Band I or Band III aerial. Price: 9s.

Telefield H2. Band II dipole and reflector array. Price: $£ 115 \mathrm{~s}$.

Telefield 3FD2. Band II three-element array comprising director, folded dipole and reflector. Complete with clamp for mast attachment. Price: $£ 2$ 10s.

Telefield 4FD2. Band II four-element array comprising two directors, folded dipole and reflector. Complete with mast fixing clamp. Price: £3 2s. 6d.

Accessories include straight and cranked steel or alloy masts, wire clamps, single and double lashing kits, universal mounting clamps and wall stand-off brackets.

VISTA GAIN SALES CO., St Mary-le-bow House, 54 Bow Lane, London, E.C.4. Tel.: City 3376/1878.

Vista Gain K.2. Band II indoor dipole. Heavily-plated three-step telescopic dipoles adjustable for optimum results. Capacity coupled elements for complete safety. Heavy base. Supplied with three yards low-loss coaxial cable. Price: £2 5s.

WOLSEY ELECTRONICS, Division of AB Metal Products Ltd., Dinas, Rhondda, Glamorgan, South Wales. Tel.: Porth 2711 (4 lines).

FM/DU. Band II dipole array to fit all masts. Price: £1 4s.

FM/DW. Band II dipole array with 27 in. stand-off arm for wall or loft mounting. Price: £17s.

FM/DL/2. Band II dipole array with $3 \mathrm{ft} \times 1$ in cranked mast and lashing equipment for chimney mounting. Price: $£ 213 \mathrm{~s}$.

FM/HU. Band II horizontal H array to fit all masts. Price: $£ 113 \mathrm{~s}$.

FM/HL/1. Band II horizontal H array with $4 \mathrm{ft} .6 \mathrm{in} . \times 1 \mathrm{in}$. cranked mast and lashing equipment for chimney mounting. Price: $£ 36 \mathrm{~s}$.

FM/4U. Band II four-element array with folded dipole. To fit all masts. Price: $£ 218 \mathrm{~s} .6 \mathrm{~d}$.

FM/4L/1. Band II four-element array with folded dipole and $4 \mathrm{ft} .6 \mathrm{in} . \times 1 \mathrm{in}$. cranked mast and lashing equipment for chimney mounting. Price: $£ 47 \mathrm{~s} .6 \mathrm{~d}$.

FM/CS. Conversion stubs. To fit Band I dipole or H aerial. Complete with fitting clamps. Price: 10s. 6d. pair.

A. Davies contemporary horizontal


Design furniture EQC4


Franklin Queen Anne-style chest


Design furniture EQC 11


Design furniture RC77


Design Furniture EQC 17


Design furniture RC 192

## HI-FI FURNITURE

A. DAVIES \& COMPANY, 3/11 Parkhill Place, off Parkhill Road, Hampstead, London, N.W.3. Tel.: Gulliver 5775.

Contemporary horizontal. Horizontal style cabinet with full-width lift-up lid in choice of sapele, oak, walnut, or teak. Rosewood front if desired. Pneumatic lid stay. Overall size: 29 in. high (including 12 in . legs), 20 in . deep, and in widths of $25 \frac{1}{2}$ in., 36 in., 48 in., 60 in., and 72 in. Prices: ( $25 \frac{1}{2}$ ) £17 10s., (36) £21, (48) £26 5s., (60) $£ 3310 \mathrm{~s} .,(72) £ 42$. Extra for rosewood front.

Will quote for special cabinets to customers requirements.

DESIGN FURNITURE LTD., Calthorpe Manor, Ban'bury, Oxfordshire. Tel.: Banbury 4726.

EQC 4. Upright cabinet with glide-away doors, in rosewood. The well and control panel finished ìn grey. Suwide. Takes gram unit, tape deck, tuner, amplifiers, etc. Two lift-up lids covered in black Lanide. Overall size: $43 \times 21 \times$ 31 in . (inc. $10 \frac{1}{2} \mathrm{in}$. legs). The control panel is removable and the inner top shelf adjustable down to $6 \frac{1}{4}$ in. deep. Price: $£ 3811 \mathrm{~s}$. 6 d .

EQC 7. Upright cabinet with tambour doors, in walnut, sapele, mahogany or teak. Takes gram unit, tape deck, tuner, amplifiers, etc. Lift-up lid. Overall size: $43 \times 21 \times 28 \frac{1}{2}$ in. (inc. 6 in. legs). The control panel is removable and the inner top shelf adjustable down to 6 in . deep. Price: $£ 395$ s.

EQC 8. Upright cabinet with tambour doors, in walnut, sapele, mahogany or teak. Takes gram unit, tape deck, tuner, amplifiers and record storage space (approx. 130 records). Lift-up lid. Overall size: $43 \times 21 \times 28 \frac{1}{2}$ in. (inc. 6 in. legs). Price: $£ 42$ 15s.

EQC 9. Upright cabinet in walnut, sapele, mahogany or teak. The well and inner top shelf finished in grey Suwide. Takes gram unit or tape deck. Lift-up lid. Overall size: $2078 \times 17 \times 28 \frac{3}{4}$ in. (inc. $6_{4}^{3}$ in. legs). Price: $£ 16$.

EQC 11. Upright cabinet with two doors, in walnut, mahogany or teak. Takes gram unit, tape deck, tuner, amplifiers, etc. Lift-up lid. Overall size: $41 \frac{1}{2} \times 21 \times 29$. in. (inc. $8 \frac{1}{2} \mathrm{in}$. legs).

Free access to inner top shelf. The control panel is removable and the inner top shelf adjustable down to 6 in. Price: $£ 3714$ s.

EQC 14. Lowline cabinet in walnut, sapele, mahogany or teak. Takes gram unit, tape deck, tuner, amplifiers, etc. Lift-up lid. Overall size: $59 \times 21 \times 24 \frac{1}{4}$ in. (inc. $9 \frac{1}{4}$ in. legs). The motor board can be divided and "stepped" in height using the loose division supplied. Price: $£ 3515$ s.

EQC 15. Lowline cabinet in walnut, sapele, mahogany or teak. Takes gram unit or tape deck. Lift-up lid. Overall size: $41 \frac{7}{8} \times 21 \times 22 \frac{1}{2} \mathrm{in}$. (inc. $7 \frac{1}{2}$ in. legs). Price: $£ 2815 \mathrm{~s}$.

RC 522. Upright record cabinet in walnut, sapele, mahogany or teak. Takes 144 10- or 12in. and $967-\mathrm{in}$. records. A further $4612-\mathrm{in}$. can be housed by removing shelf. Fall front with combined hinge and stay. Overall size: $26 \times$ $14 \frac{1}{2} \times 27 \frac{1}{4}$ in. Price: $£ 128$ s.

RC 77. Upright record cabinet in walnut, mahogany or teak. Takes 17010 - or $12-\mathrm{in}$. and 1007 -in. records. Fall front with combined hinge and stay. Overall size: $30 \times 16 \times 25$ in. Specially designed to match model EQC 11. Price: $£ 17$ 10s.

RC300. Upright record cabinet with bow front, in walnut or teak. Takes 280 records of all sizes. Tambour doors. Overall size: $30 \frac{1}{2} \times 15 \times$ 27 in. Interior lined with Storoflex. Brassferruled slim tapered legs. Price: $£ 21$ 12s. 6d.

RC144. Upright record cabinet in walnut, mahogany or teak. Takes approx. 144 records. Two doors. Overall size: $19 \frac{3}{4} \times 14 \frac{7}{8} \times 24_{4}^{3}$ in. Price: £8 5s.

## EXPERT GRAMOPHONES (SERVICES)

LTD., 26 Thurloe Street, London, S.W.7. Tel.: Knightsbridge 3916.

Specialists in top quality tailor-made high fidelity installations. Special control units, etc. designed and made to customers' exact requirements. Commissions undertaken to design and manufacture modern furniture and/or built-in units for high fidelity housing.

Import and also manufacture unusual and interesting types of hi-fi housing. Typical examples include brass inlaid Indian dowry boxes and reproduction stripped pine chests.


Franklin transcription box (closed)


GKD Huntingdon Mk. II


GKD Anglian Mk. II


GKD Duette


Howland-West Malmo II
A. R. FRANKLIN, Audio Engineer, 6 Kings College Mews, London, N.W.3. Tel.: Juniper 0480.

Lowline. Finish in wood-grained material. Accommodation for turntable, tuner, main amplifier, control unit. Table top for tape. Hinged perspex lid which can be lifted off. Based on coffee table principle on castors with shelf to carry large main amplifier. Overall dimensions 42 in. long, 18 in. wide. Lid section $20 \times 16$ in. Legs 12 in. with castors. Price: $£ 254 \mathrm{~s}$.

Queen Anne Style Chest. Tailored to individual requirements. Finish in walnut, mahogany or curl mahogany. Matching speaker cabinets suitable for Tannoy, Goodmans, KEF, Wharfedale, etc. Also matching record cabinets. Typical chest, size: $48 \times 18 \times 26$ in. high. Price (walnut ot mahogany): £45; (curl mahogany): £57.

Quotations for other sizes and finishes, also for speaker enclosures and record cabinets.

Transcription Box. In unpolished oiled teak to match "Laderex" furniture. Lift-off or hingeback tinted perspex lid. Size: $23 \times 15 \frac{3}{4} \times 8 \mathrm{in}$. (or to special order, quotation on request). Price: $£ 12$ 12s.

Transcription Box. Finished hard wearing wood-grained material. Lift-off or hinge back tinted perspex lid. Size: $18 \times 16 \times 8 \mathrm{in}$. Price: £10 10s.

Special cabinets. Individually styled cabinets to customers' requirements. Equipment built-in to existing furniture.
G.K.D. LTD., 45 Crawley Green Road, Luton, Beds. Tel.: Luton 26661/2.

Leak shelf cabinet. Shelf-mounting cabinet to take Leak pre-amplifier or tuner. Finish: Formica, natural teak or dark Australian walnut. Size: $12 \frac{1}{8} \times 9 \frac{1}{2} \times 5$ in. Price: $£ 44 \mathrm{~s}$.

Leak Stereo 30 shelf cabinet. Shelf-mounting cabinet to take Leak Stereo 30 integrated amplifier. Finish: Formica, natural teak or dark Australian walnut. Size: $13{ }_{8}^{5} \times 9 \frac{1}{2} \times 5$ in. Price: $£ 412 \mathrm{~s}$. 6 d .

Southdown Accessory Cabinet Mk. II. Lowline style to house most tape recorders, tape. records, accessories, etc. Finish: Teak wood or Formica, natural teak or dark Australian walnut. Lift-up lid. Matches Southdown and Chil-
tern equipment cabinets. Size: $20 \frac{5}{8} \times 19 \frac{1}{4} \times 13_{4}^{3}$ in. Price: $£ 1515$ s. (including U.K. purchase tax).

Huntingdon Accessory Cabinet Mk. II. Lowline style to house most tape recorders, tape, records, accessories, etc. Finish: Formica, natural teak or dark Australian walnut. Lift-up lid. Matches Huntingdon and Anglian equipment cabinets. Size: $20 \frac{5}{8} \times 21 \frac{1}{8} \times 13 \frac{3}{4}$ in. Price: £15 15s. (including U.K. purchase tax).

Southdown Mk. II. Lowline cabinet designed exclusively for all current Leak equipment (including Stereo 30), gram unit or tape deck. Finish: Teak wood or Formica, natural teak or dark Australian walnut. Lift-up lid. Sprung motor board. Concealed spring-loaded drawer houses equipment and control knobs. Amplifier section free for storage when Stereo 30 used. Size: $34 \times 21 \times 25$ in. (including legs). Motor board $18 \frac{1}{4} \mathrm{in}$. wide, $19 \frac{1}{4} \mathrm{in}$. deep, 4 in . above, $8 \frac{1}{4}$ in. below. Price: $£ 309 \mathrm{~s}$.

Huntingdon Mk. II. Lowline cabinet suitable for most equipment including Quad, Leak, Rogers, Armstrong, Truvox, Chapman, etc. Finish: Formica, natural teak or dark Australian walnut. Lift-up lid giving easy access to controls, gram unit and tape deck. Size: $35 \frac{3}{4} \times 21 \frac{1}{8} \times 25 \frac{1}{4}$ in. (including legs). Motor board $17 \frac{3}{4}$ in. wide, $19_{4}^{3} \mathrm{in}$. deep, 4 in . above, $8_{4}^{1}$ in. below. Price: $£ 309 \mathrm{~s}$.

Chiltern Mk. II. Lowline cabinet designed exclusively for all current Leak equipment including Stereo 30. Finish: Teak wood or Formica, natural teak or dark Australian walnut. Lift-up lid. Spring-loaded drawer houses equipment and controls. Top compartment takes gram unit, tape deck, or complete recorder in its case. Size: $54 \times 21 \times 25$ in. (including legs). Motor board $18_{4}^{\frac{1}{4}}$ in. wide, $1_{4}^{1}$ in. deep, 4 in. above, $8_{4}^{\frac{1}{4}} \mathrm{in}$. below. Price: $£ 4019 \mathrm{~s}$.

Anglian Mk. II. Lowline cabinet suitable for most equipment including Quad, Leak, Rogers, Armstrong, Truvox, Chapman, etc. Finish: Formica, natural teak or dark Australian walnut. Lift-up lid giving easy access to controls, gram unit and tape deck. Size: $55 \frac{1}{8} \times 21 \frac{1}{8} \times 25 \frac{1}{4}$ in. (including legs). Combined motor board and tape section 37 in . wide, $19{ }_{4}^{3} \mathrm{in}$. deep, 4 in . above, $8_{4}^{3} \mathrm{in}$. below. Price: $£ 4019 \mathrm{~s}$.

Duette. Wall or free-standing cabinet assembly. Can be used as room divider. Comprises two units: upper cabinet for control units, tuner or integrated amplifier; lower cabinet for gram unit, tape deck and main amplifiers. Suitable for Leak Stereo 30 or other similar integrated ampli-


Howland-West Clearview amplifier cabinet HW4


Howland-West Trondheim II


Howland-West Clearview Junior HW5


Holder Pearce free-standing assembly


Imhofs wall unit


Imhofs W.S. 1
fiers. Top cabinet has drop-down lid, lower cabinet has lift-up lid. Finish: Formica, natural teak or dark Australian walnut. Size: $38 \times 21 \times$ 58 in. Lower cabinet 34 in. wide, 19 in. deep, 11 in. high (motor board height adjustable). Upper cabinet (internal) $333_{8}^{7} \mathrm{in}$. wide, $13 \frac{1}{4} \mathrm{in}$. deep, $7 \frac{1}{4}$ in. high. Fascia panel $34 \times 7 \frac{1}{4}$ in. Price: $£ 475$ s. Extension frame and two shelves to extend up to ceiling $£ 44 \mathrm{~s}$. extra.

HAMPSTEAD HIGH FIDELITY, 91a/9lb Heath Street, Hampstead, London, N.W.3. Tel.: Hampstead 6377.

Hampstead. Low upright cabinet with separate lift-up lids for gram unit and tape deck compartments. Pull-out front hopper for tuner and control unit or integrated amplifier. Will accommodate gram unit, tape deck, tuner, control unit and amplifier. Takes any pre-amplifier or integrated amplifier not exceeding 14 in . in depth. Available with tape section made into well to hold complete recorder up to 9 in . in height. Special version for Ferrograph and Revox with professional size spools 2 in . longer. Size (standard model): $36 \times 26 \times 20 \mathrm{in}$. Prices: Mahogany and walnut $£ 37$, teak $£ 38$, special model for Revox and Ferrograph $£ 44$ in all finishes.

Special cabinets and fitments made to order. Designs and drawings prepared for complete room or house hi-fi schemes.

HEAL AND SONS LTD., 196 Tottenham Court Road, London, W.1. Tel.: Museum 1666.

Wall cabinets veneered in teak for Quad equipment. Full details and prices on request.

HEATHKIT. Manufactured by Daystrom Ltd., Bristol Road, Gloucester. Tel.: Gloucester 20217.

Malvern. Horizontal cabinet. Available in kit form or assembled "in the white". Takes gram unit, tape deck, tuner and amplifier. Lift-up lid, sliding doors. Overall size: $39 \frac{1}{8} \times 21 \frac{3}{4} \times 32 \mathrm{in}$. Price: $£ 18$ 1s. kit form.

Gloucester. Horizontal cabinet. Available in kit form or assembled "in the white". Takes gram unit or tapedeck, tuner and amplifier. Lift-up lid. Overall size: $46 \frac{1}{8} \times 21 \times 30 \mathrm{in}$. Price: $£ 18$ 10s. kit form.

Chepstow. Upright cabinet. Available in kit form or assembled "in the white". Takes gram unit, tuner and amplifier. Lift-up lid. Overall size: $18 \times 34 \times 32 \frac{3}{4}$ in. Price: $£ 11$ 12s. 6 d. kit form.

HOLDER PEARCE LTD., 66 Grove Road, Eastbourne, Sussex. Tel.: Eastbourne 26565.

Built-in or free-standing equipment cabinets designed and built to meet customer's exact requirements. Lift-up or drop-down lids, accommodation to suit any equipment, all standard finishes and also special finishes to blend with furnishings. Details and prices on application.

HOWLAND-WEST LTD., 2 Park End, South Hill Park, London, N.W.3. Tel.: Swiss Cottage 6666.

Oslo II. Upright cabinet in teak, walnut or teak with rosewood front panel. Takes gram unit or tape deck and amplifier. Single lift-up lid. Plinth can be stowed inside for transport. Overall size: $21 \times 22 \times 25 \frac{3}{4}$ in. Prices: Teak or walnut $£ 1414 \mathrm{~s}$.; Teak/Rosewood front panel £15 4s. 6d.

Karelia de Luxe. Lowline cabinet in rosewood with beech interior or teak with beech interior. With anodised aluminium skids. Takes all combinations of equipment. Lift-up lid and front opening door. Overall size: $60 \times 20_{4}^{1} \times 16$ in. plus legs 8 in . Small compartment $16 \frac{1}{4} \mathrm{in}$. wide. Price: $£ 51 \cdot 9 \mathrm{~s}$.

Malmo II. Horizontal cabinet in teak or walnut. Takes all combinations of equipment. Liftup lid and front opening doors. Overall size: 36 in . wide, 22 in . deep, 26 in . high (inc. 9 in. legs). Motor board $34 \frac{3}{4} \times 20 \mathrm{in}$. Front panel $35 \times 8 \frac{1}{4} \mathrm{in}$. Front panel is recessed 2 in . Magnetic door catches. Motor board adjustable to maximum clearance of 6 in . above. Price (both finishes): £26 5s.

Trondheim II. Horizontal cabinet in teak, walnut or teak with rosewood front panel. Takes any combination of equipment. Two lift-up lids. Overall size: $66 \times 22 \times 25_{4}^{3} \mathrm{in}$. Prices: Teak or walnut $£ 43$ 1s.; Teak/Rosewood front panel £45 3s.

Tromso II. Lowline cabinet in teak, walnut, or teak with rosewood front panel. Takes gram


Imhofs HFU/16M Jacobean


Imhofs HFU/18 Jacobean


Imhofs Trolley type 10


Imhofs HFU/2 Regency


Imhofs Trolley L (Jacobean)


Imhof HFU/IL
unit or tape deck, tuner and amplifier. Two liftup lids. Overall size: $48 \times 20 \times 14$ in. less plinth. Prices: Teak or walnut $£ 309$ s.; Teak/Rosewood front panel $£ 3110$ s.

Clearview H.W.1. Cabinet in teak, walnut or rosewood. Takes gram unit or tape deck. Liftoff perspex lid. Overall size: $18 \frac{1}{4} \times 16 \frac{1}{2} \times 8 \frac{1}{2} \mathrm{in}$. Clearance above board $3 \frac{3}{4}$ in., below board $4 \frac{1}{2}$ in. Price: $£ 819 \mathrm{~s}$. 6d. (all finishes).

Clearview H.W.4. Amplifier cabinet in teak only. Takes gram unit or tape deck with amplifier/control unit beneath. Ventilated bottom and rear. Overall dimensions: $18 \frac{1}{4} \times 16 \frac{1}{2} \times 14 \frac{1}{2}$ in. high. Space above motor board $3_{4}^{3}$ in., space below 9 in. Matching Clearview record storage cabinet also available. Price: £11 19s. 6d. (legs optional extra £2).

Clearview H.W.5. Gram unit or tape deck cabinet in teak only. Lift-off perspex lid. Overall size: $18 \frac{1}{4} \times 16 \frac{1}{2} \times 7 \frac{1}{2} \mathrm{in}$. Space above motor board $3 \frac{3}{4}$ in., space below $3 \frac{5}{8}$ in. Price: $£ 619 \mathrm{~s}$. 6 d .

Extra high top. Special versions of the H.W.1, H.W. 4 and H.W. 5 provide 6 in. clearance above motor board. Additional cost $£ 1$ 2s. 6d.

Clearview H.W.12. Cabinet in teak. Takes gram unit or tape deck. Lift-off perspex lid. Overall size: $23 \frac{1}{2}$ in. $\times 19 \times 8 \frac{1}{2}$ in. Clearance above board $3 \frac{3}{4}$ in., below board $4 \frac{1}{2}$ in. Price: £11 19s. 6d.

IMHOFS. 112-116 New Oxford Street, London, W.C.1. Tel.: Museum 7878. Cables: Imcase, London, W.C.1.

HFU/10. Control cabinet with three compartments. Will house the largest of control equipment including tape decks. Finish: Light or dark sapele mahogany, walnut, bleached pine or teak. Separate lift-up lid to each of the three compartments. Size: $52 \times 27 \times 21$ in. (including legs). Compartments 15 in., 18 in., and $16 \frac{1}{2}$ in. wide, all $19 \frac{1}{8}$ in. deep. Prices: $£ 3918 \mathrm{~s}$.; Teak $£ 42$. (A two-compartment version is available at $£ 3010$ s. or $£ 32$ in teak.)

HFU/12. Modern sideboard style equipment cabinet with accommodation for tape deck, transcription motor, amplifier, tuner and over 250 records. Centre sliding section conceals instrument panel and two other panels giveaccess to storage space. Centre portion of top surface hinges up to provide access to turntable or tape deck. Size: 60 in. wide, 22 in. deep, 30 in. high
(including 6 in . base). Two $19 \times 19 \mathrm{in}$. motor boards. Control panel 19 in. wide, $15 \frac{1}{2}$ in. high. Lefthand compartment 19 in . wide, 19 in . deep, 11 in. high. Righthand compartment 19 in. wide, 19 in. deep, 18 in. high. Finish: teak, elm, afrormosia. Price: $£ 52$ 10s.

HFU/12 Regency. Similar to HFU/12 but in Regency styling. Size: 61 in. wide, 24 in. deep, 30 in. high (including 6 in. legs). Price: $£ 66$ 3s.

HFU/16M. Two compartment cabinet with drawer for tape recorder. Either side will accommodate any transcription motor (or autochanger) and is large enough for the SME3012 arm. Finish: Teak and rosewood; two-tone sapele mahogany; walnut. Single lift-up lid at top. Righthand side has drop-down panel with withdrawable deck. Size: $41 \frac{1}{4} \times 28 \times 22$ in. (including $7 \frac{1}{2}$ in. legs). Compartments all 19 in. wide, 20 in . deep. Height above tape recorder deck is 12 in. Price: $£ 3817$ s.

HFU/16M Jacobean. Similar to HFU/16M but in Jacobean styling. Size: 42 in. wide, $22 \frac{1}{2}$ in. deep, 27 in. high (including legs). Price: $£ 42$.

HFU/1L. Control cabinet. Designed to allow a tuner to be fitted alongside a transcription motor. Finish: Walnut, mahogany, bleached pine, teak. Lift-up lid. Size: $28 \times 19 \times 26$ in. (including 10 in. legs). Price: $£ 232 \mathrm{~s}$.

Type L. Trolley cabinet with two compartments. Easy-running finger-tip movement. Finish: Light or dark sapele mahogany, twotone mahogany, walnut, teak. Two lift-up lids. Size: $35 \frac{3}{4} \times 24 \times 18 \frac{1}{2}$ in. (including castors). Compartments $17 \frac{1}{2}$ in. and $15 \frac{1}{2} \mathrm{in}$. wide, both 16 in. deep. Price: $£ 3010 \mathrm{~s}$.; teak $£ 32$.

Type L Jacobean. Similar to Type L but in Jacobean style. Size: $36 \frac{1}{2}$ in. wide, 19 in. deep, 24 in. high (including 3 in. concealed castors). Internal sizes as trolley L. Price: $£ 36$.

Type 10. Trolley equipment cabinet. A larger version of the trolley $L$ cabinet. A third compartment has been added to accommodate a tape recorder or to provide storage space for records. Three separate lids, each with a stay, give access to the compartments. Size: $54 \frac{1}{4}$ in. wide, 21 in . deep, 24 in . high (including 3 in . castors). Motor boards: left 17 in . wide, centre $18 \frac{3}{4} \mathrm{in}$. wide, right 10 in . wide, all 19 in . deep. Finish : light or dark sapele mahogany, two-tone mahogany or walnut. Teak or Jacobean styling at slight extra cost. Price: $£ 39$ 18s.


Imhof trolley type $L$


Largs Quartette


Lowther 3 cabinet


Largs Fidelia


Largs Classic cabinet


Largs Opera cabinet

HFU/18 Mk. II. Compact upright style cabinet with lift-up lid and two front opening doors concealing control panel. Designed to house the average small hi-fi system. Ideal unit for modern homes. Size: 24 in . wide, 19 in . deep, 28 in . high (including 6 in . legs). Motor board $21 \frac{3}{4} \mathrm{in}$. wide, 17 in . deep. Control panel $21 \frac{3}{4} \mathrm{in}$. wide, 14 in . high. Finish: mahogany, teak or walnut. Price: £17 17s.

Imhof W.S.1. Wall or shelf mounting unit suitable for transistorised or smaller type valve equipment. Size: 24 in . high, 16 in . wide, 15 in . deep. Motor board: 15 in . wide, $13_{4}^{3} \mathrm{in}$. deep, 3 in. below. Maximum amplifier size: $15 \times 12 \frac{1}{2}$ $\times 6$ in. Finish: oiled teak (to match $\mathrm{BS} / 4$ speaker), walnut or sapele mahogany. Price: $£ 1515$ s. (cut-outs to suit motor and control units, as selected: $£ 22$ s. extra).

Imhof Wall Unit. Two upper shelves for speaker, tuner, amplifier, etc. Lower swivel-front compartment for motor unit. Size (overall): 34 in. wide, 12 in . deep, 72 in . high. Finish: mahogany or walnut. Price: $£ 3514 \mathrm{~s}$.

IMIII/AT6. Designed to house the Garrard AT6 motor. Finish: walnut or mahogany. Liftup lid. Size: $17 \times 9 \frac{1}{2} \times 15 \frac{1}{2}$ in. Price: $£ 88$ s.

IMIIIB. Similar to above but measuring $19 \times 8 \times 18 \frac{1}{4}$ in. Price: $£ 88$ s.

Most Imhof cabinets can be supplied in finishes other than those listed to special order. Enquiries invited.

KIRKMAN (CRAWLEY) LTD., 40 The Broadway, Crawley, Sussex. Tel.: Crawley 26670.

Deerswood. Lowline contemporary equipment cabinet on plinth. Two lift-up lids, one drop-down. Accommodation for turntable, tape deck, tuner, control unit, amplifiers. All equipment in horizontal plane with direct ventilation below and above each unit. Particularly suitable for Quad and integrated shelf units. Shelf may be fitted above centre compartment for record storage cabinet, speaker enclosure or television. Standard finish teak, other finishes to order. Size: 59 in. wide, 18 in. deep, 24 in. high (including 15 in . plinth). End sections: $16 \frac{1}{4} \times 16 \frac{1}{2} \times 7 \frac{7}{8}$ in. Centre section: $22 \times 16 \frac{1}{2} \times 7 \frac{7}{8}$ in. Price to be announced.

Ashdown. Lowline contemporary shelfmounting equipment cabinet. One lift-up lid, one drop-down lid. Accommodation for turn-
table unit, tuner, control unit, amplifier. Specially suitable for SP25 or GL68 gram units and Armstrong 221/224 or Rogers Cadet tuner and amplifier. Standard finish teak, other finishes to order. Size: $39 \frac{1}{4}$ in. wide, $14 \frac{1}{4} \mathrm{in}$. deep, $6 \frac{1}{2} \mathrm{in}$. high (plus 1 in. feet). Lefthand section $14 \frac{7}{8} \times$ $12 \frac{7}{8} \times 5$ in. Righthand section $22 \frac{3}{8}+12 \frac{7}{8}+5$ in. Price to be announced.

LARGS OF HOLBORN, 76-77 High Holborn, London, W.C.1. Tel.: Chancery 2626.

Continental. Wall mounted cabinet in sapele or mahogany veneer. Takes gram unit, amplifier, record storage, tuner and loudspeaker enclosure. Choice of "drop-down" or sliding doors. Overall size: $69 \times 18 \times 22$ in. Four compartments. Price: $£ 519 \mathrm{~s}$.

Fidelia. Upright cabinet in sapele or mahogany veneer (other finishes by arrangement). Takes gram unit, amplifiers and tuner. Lift-up lid. Overall size: $30 \times 18 \times 14 \mathrm{in}$. (plus 15 in . for legs). Price: $£ 16$ 16s.

Libretto. Upright cabinet complete with room divider, in teak veneer. Takes gram unit, tuner, amplifiers, tape deck. Lift-up lid with brass/ nylon tid stays. Overall size: $37 \frac{1}{2} \times 18 \times 26 \frac{1}{2} \mathrm{in}$. Control panel (lower section) covered by sliding doors. Super-structure 6 ft .2 in . high, two shelves 36 in . wide by $8 \frac{1}{4} \mathrm{in}$. deep, one shelf 18 in . wide by $8 \frac{1}{4}$ in. deep. Price: $£ 442 \mathrm{~s}$.

Olympic. Upright cabinet with pull-out control panel in sapele or mahogany veneer (other finishes by arrangement). Takes gram unit, tape deck, tuner and amplifiers. Lift-up lid with tensioned lid stays. Fitted with Shepherd castors. Overall size: $40 \times 22 \times 29$ in. Particularly suitableforQuad, Leak, and Ferrograph equipment. Price: $£ 508 \mathrm{~s}$.

Quartette. Lowline cabinet in sapele or mahogany veneer (other finishes by arrangement). Takes gram unit, amplifiers, tuner, tape deck, record storage. Lift-up lid. Overall size: $66 \times 18 \times 17$ in. on 9 in. legs. Matching loudspeaker enclosures by arrangement. Price: £38 17s.

Classic. Traditional style upright equipment cabinet with top lid for gram or tape unit and two front opening doors giving access to front panel with record storage below. Overall size: $24 \frac{3}{4}$ in wide, $19 \frac{1}{2} \mathrm{in}$. deep, 39 in . high including plinth. Motor board $23 \frac{1}{2}$ in. wide, $16 \frac{1}{2}$ in. deep, 4 in. below lid. Control panel 23 in. wide, $9 \frac{1}{2} \mathrm{in}$.


Musicraft modular tape and speaker cabinets


Musicraft Richmond


PWB model A2


Record Housing Schubert


Record Housing Lowflex


Record Housing Playview
high. Finish: Walnut, sapele or mahogany veneer. Price: $£ 45$. (Record storage $£ 3$ 3s. optional extra.)

Opera. Period style long-line cabinet with two lift-up lids and accommodation for tuner, control unit, gram unit, tape deck, and record storage. Overall size: 69 in. wide, $29 \frac{1}{2}$ in. high (inc. legs), $20 \frac{1}{2} \mathrm{in}$. deep. Control panel 17 in . wide, $18 \frac{1}{4} \mathrm{in}$. deep, $3 \frac{3}{4} \mathrm{in}$. below lid. Motor compartment 17 in . wide, $18 \frac{1}{4} \mathrm{in}$. deep, 5 in . below lid. Tape deck compartment $16 \frac{1}{2} \mathrm{in}$. wide, $18 \frac{1}{4} \mathrm{in}$. deep, $3 \frac{3}{4} \mathrm{in}$. belowlid. Record storage 14 in . wide, $18 \frac{1}{4} \mathrm{in}$. deep. Various finishes to order. Prices: from $£ 99$ 15s.

The high fidelity equipment cabinets listed and illustrated represent only a small selection of Largs' táilor-made products. Largs operates its own cabinet factory and invites enquiries for cabinets to customers own specifications.

Prices quoted include delivery in Great Britain. Largs cabinets cost from $£ 16$ 16s. In many instances delivery is ex-stock.

LOWTHER MANUFACTURING CO., Lowther House, St. Mark's Road, Bromley, Kent. Tel.: Ravensbourne 5225. Cables: Lowther, Bromley.

Model 1. Lowline compact cabinet. Blockboard construction. Finished in walnut, sapele, oak, tola. Lift-up lid. Detachable unit mounting board, rear panel and legs. Size: $36 \times 19 \times 29 \mathrm{in}$. Mounting board $34 \frac{1}{2} \times 17 \frac{1}{2} \mathrm{in}$. On short legs with adjustable brass feet. Price: $£ 30$ ex works.

Model 2. Lowline cabinet with similar specification to Model 1 but larger. Size: $50 \times 19 \times$ 29 in . (including $11 \frac{1}{2} \mathrm{in}$. for legs). Mounting board $48 \times 17 \frac{1}{2} \mathrm{in}$. Depth inside lid $3 \frac{3}{8} \mathrm{in}$. Single lid with two pneumatic stays. Price: $£ 50$ ex works.

Special model 56 in. wide made to order. Price on request.

MEDLEY MUSICAL LTD., 134 Plumstead Road, London, S.E.18. Tel.: Woolwich 1738.

Medley Duo. Wall-mounting or floor-standing cabinet with accommodation for integrated amplifier and motor unit. Motor unit and pickup housed in lower portion with hinged perspex lid, amplifier in upper portion giving eye-level controls. For floor use there is optional stand. Built-in levelling indicator. Normally supplied fully assembled but available packed flat for the
benefit of overseas customers. Price: £18 18s., stand $£ 25$ s. extra.

MM8 Transcription Box. Suitable for most combinations of turntables and arms. Perspex cover hinged or removable. Easily dismantled and assembled for transit. Size: $18 \times 18 \times 8 \frac{1}{2}$ in. Price: $£ 88$ 8.

MM9 Transcription Box. As MM8 but smaller and suitable for SP25, AT60, etc. Size: $16 \times 15 \times 8 \frac{1}{2}$ in. Price: $£ 715 \mathrm{~s}$.

Teak Cases for Leak. Teak shelf-standing cases for Leak Stereo 30 and Troughline tuner. Price: £3 15s.

Plinths and covers. Small plinth $16 \times 15 \times 3 \frac{1}{2}$ in. Price: $£ 316 \mathrm{~s}$. Small cover $16 \times 15 \times 5 \mathrm{in}$. Price: $£ 33$ s. Large plinth $18 \times 16 \times 3 \frac{1}{2}$ in. Price: $£ 47 \mathrm{~s}$. 6 d . Large cover $18 \times 16 \times 4 \mathrm{in}$. Price: $£ 3$ 10s. Plinth and cover for Garrard LAB. 80. Price: $£ 88$ s. Cover for Truvox 99 and 100 series. Price: £3 10s.

MUSICRAFT HI FI CENTRE, 63 High Street, Hounslow, Middlesex. Tel.: Hounslow 4640.

Richmond. Medium line modern cabinet in oiled teak. Takes gram unit, amplifier and tuner. Lift-up lid. Overall size: $26 \times 17 \frac{1}{2} \times 25 \mathrm{in}$. Price: £18 18s.

Sutton. Lowline cabinet in teak with lid and supporting frame in white or black. Takes gram unit, amplifier and tuner. Lift-up box lid for player. Lift-up slab lid for controls. Overall size: $42 \times 20 \times 24$ in. (inc. $13 \frac{1}{2}$ in. frame). Price: £30 9s.

Dorking. Lowline cabinet in oiled teak. Takes gram unit, tuner, amplifier and tape deck. Two lids which fold away from centre section then lift up. Overall size: $60 \times 20 \frac{3}{4} \times 19 \frac{1}{4}$ in. (inc. $8 \frac{1}{2}$ in. legs). Can be used in centre of room. Price: $£ 3413$ s. with black vynair front panel, $£ 3615$ s. with teak front panel.

Modular Tape Unit. One of five 20 in. cube module cabinets. Finished in rosewood/sapele, mahogany or teak. Top and upper half of front open to provide easy access for a portable tape recorder. Lower drawer. Cutaway back to take leads. Matching speaker and amplifier cabinets available. Size: $20 \times 20 \times 20 \mathrm{in}$. with 7 in . base frame with adjustable feet. Price: $£ 18$ 18s. (cabinet), single base unit $£ 3$, double base unit £3 10s.


Record Housing Scan assembly

## Record Housing Mobiley



Musicraft Dorking


Rogers lowline with legs


Rogers case for HG88 Mk. III stereo amplifier

Modular Amplifier Unit. 20 in. cube module cabinet in rosewood/sapele, mahogany or teak Satin black handles. Lift-up lid, drop-down half front. Matching cabinets can be added as equipment grows. Size: $20 \times 20 \times 20$ in. with 7 in. base frame with adjustable feet. Price: $£ 1818 \mathrm{~s}$. (cabinet), single base unit $£ 3$, double base unit £3 10s.
P.W.B. AUDIO LTD., 33 Call Lane, Leeds 1, Yorkshire. Tel.: Leeds 28559.

Model A1. Lowline style with single lift-up lid. Takes gram unit, tuner and amplifier. Finish: Teak, walnut, mahogany or oak. Matching or black legs. Rosewood drop on front of lid optional extra. Size: $36 \times 16 \frac{1}{2} \times 27 \mathrm{in}$. Motor board $17 \frac{1}{2} \times 15 \mathrm{in}$. deep. Amplifier section $17 \frac{1}{2} \times 15$ in. deep. Price: $£ 25$.

Model A2. Lowline style with twin lift-up lids, smaller lefthand lid over amplifier and tuner section, larger righthand lid over gram unit and record storage section. Finish: Teak, walnut, mahogany, oak. Matching or black legs. Rosewood drop on front of lids optional extra. Takes gram unit, tuner, amplifier, and has provision for record storage. Record storage section lifts out to permit tape deck to be fitted. Size: $52 \times 16 \times 27 \mathrm{in}$. Internal sections dimensioned as required. Price: $£ 35$.

RECORD HOUSING, Brook Road, Wood Green, London, N.22. Tel.: Bowes Park 7487.

Longfellow. Lowline cabinet in walnut, mahogany or teak. Takes gram unit, tape deck, tuner, amplifier. Record storage (150). Two liftup lids. Overall size: $76 \frac{1}{2} \times 21 \times 14 \mathrm{in}$. (plus 9 in . for legs). Will take complete tape-recorder and largest players, transcription or autochange. Price (walnut, mahogany or teak): $£ 464 \mathrm{~s}$.

Nielsen. Upright cabinet in walnut, mahogany or teak. Takes gram unit, tuner, amplifier, etc. Lift-up lid. Overall size: $19 \frac{3}{4} \times 18 \frac{1}{2} \times 29$ in. Motor board size: $18 \frac{1}{2} \times 16_{\frac{1}{2}}^{2} \mathrm{in}$. Moves on castors. Price (walnut, mahogany or teak): £18 18s.

Lowflex. Lowline cabinet in walnut, mahogany or teak. Takes gram unit, tape deck, tuner, amplifier, etc. Lift-up lids, one with pneumatic stay. Overall size: $59 \times 21 \times 14 \mathrm{in}$. (plus 9 in . for legs). Record storage on left. Partition removable if not required. Price (walnut, mahogany or teak): $£ 3312 \mathrm{~s}$.

Schubert. Upright cabinet in walnut, mahogany or teak. Takes gram unit, tape deck or complete recorder, tuner, amplifier and record storage. Lift-up lids, front opening doors, righthand compartment for storage. Overall size: $42 \times 21 \times 25 \mathrm{in}$. (plus 6 in . for legs). Price (walnut, mahogany or teak): $£ 3817 \mathrm{~s}$.

Hi-Flex Equipment Unit. Lowline equipment with optional legs. One lift-up lid. Accommodation for gram unit (or tape deck), amplifier and tuner. May be used with legs as free-standing cabinet or combined with others to form matching system. Finish: teak, walnut or mahogany. Price: $£ 13$ 16s. 6d.

Scan Equipment Cabinet. For use as shelf unit or with optional legs. One lift-up lid. Accommodation for gram unit (or tape deck), tuner and amplifier. Size: $19 \frac{3}{4}$ in. wide, $16 \frac{1}{2}$ in. deep, 15 in. high. Finish: teak, walnut or mahogany. Price: $£ 88 \mathrm{~s}$.

Lowline Two. Lowline equipment cabinet. Single lift-up lid controlled by pneumatic stay. Accommodation for (1): gram unit, tuner, amplifier and records, or (2): complete tape recorder, gram unit, tuner, amplifier. Space for complete Ferrograph recorder or turntable unit with SME 12 in . arm. Size: 42 in . wide, 21 in . deep, 15 in . high (including 6 in. legs). Finish: teak, walnut. Price: to be announced.

Mobiley Equipment Cabinet. Trolley type unit on castors. Two glass sliding lids. Accommodation for gram unit (or tape deck), tuner and amplifier. Size: 36 in. wide, 18 in. deep, 25 in. high. lef thand section $18 \frac{1}{2} \times 16 \frac{1}{2}$ in., righthand section $16 \frac{1}{2} \times 16 \frac{1}{2}$ in. "See-through" cabinet. Finish: teak, walnut or mahogany. Price: £25 19s.

Shelwall Transcription Unit. Shelf or wall mounting unit to house transcription or autochanger gram turntable. Drop-down front carries unit. Enables gram unit to be fitted into shelf assembly. Depth when closed only 10 in . Size: 20 in. wide, 18 in . high, 10 in . deep. Finish: teak only. Price: £9 19s.

Britten. Upright style equipment cabinet with record storage. One lift-up lid. Accommodation for gram unit (or tape deck), tuner and amplifier plus 150 records. Size: 20 in . wide, $19 \frac{1}{2} \mathrm{in}$. deep, 36 in. high. Finish: teak, walnut or mahogany. Price: £25.

Playview. Shelf unit to accommodate gram turntable. Patented hinge or lift-off lid. Size: 19 in. wide, 19 in. deep, 8 in. high. Price: £8 19s. 6d.

ROGERS DEVELOPMENTS (ELECTRONICS) LTD., 4/14 Barmeston Road, Catford, London, S.E.6. Tel.: Hither Green 7424/4340. Cables: Rodevco, London, S.E.6.

Lowline. Lowline cabinet in teak or dark Australian walnut. Takes gram unit, tuner, control unit and main amplifier. Lift-up lid. Designed especially for Rogers Cadet III or HG88 III. Square section black steel legs optional extra. Overall size: $36 \frac{1}{4} \times 17 \frac{1}{4} \times 8 \frac{3}{4} \mathrm{in}$. Price: (cabinet) $£ 14$ 6s.; (legs) £1 10s.

STENTORIAN. See Whiteley Electrical.

SYMPHONY AMPLIFIERS LTD., 16 King's College Road, London, N.W.3. Tel.: Primrose 3314/5.

Equipment cabinet. Modern style cabinet for table use or, with legs, for use as floor unit. Available in walnut, mahogany or teak. Designed to accommodate most amplifiers, preamplifiers, tuners and gram units in smallest space consistent with adequate ventilation. Single, double and triple models available having same depth and height but with different widths. Size: $20 \times 17 \mathrm{in}$. (with legs 26 in . high).

Motor board $17 \times 18 \mathrm{in}$. Single model 18 in . wide, double 36 in . wide, triple 54 in . wide. Prices: (single) £11 6s.; (double) £20 6s. 10d.; (triple) $£ 26$ 13s.

TYSONS, 41 Russell Street, Leamington Spa. Tel.: Leamington Spa 24935.

Tysonic Dower Chest. Lowline style in oak. Suitable for gram unit, tape deck, tuner, amplifier. Lift-up lid. Generally 36 in. to 48 in. long. Prices: $£ 35$ to $£ 50$.
Equipment installed in antique or reproduction furniture to customers' requirements. Dower chests a speciality.

WHITELEY ELECTRICAL RADIO CO. LTD., Victoria Street, Mansfield, Nottinghamshire. Tel.: Mansfield 1762-5. Cables: Whitebon, Mansfield.

C16 Thoresby Equipment Console. Upright style equipment cabinet with lift-up lid. Takes most makes of gram unit or tape deck, amplifier, control unit and tuner. Available in mahogany or walnut. Supplied packed flat and easily assembled in a few minutes with a screwdriver only. Size: $19 \frac{3}{8} \times 18 \times 31 \mathrm{in}$. Price: (mahogany) £18 3s.; (walnut) £18 15s.
We make no apology for the price of this cabinet-we think it is well worth it, but for those people with a limited budget we do have an extensive range of cabinets priced from £6.19.6. Space does not allow us to show any other models but we will be pleased to send you fully illustrated literature of our complete range.

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## DIRECTORY OF HI-FI DEALERS

IMPORTANT NOTE: The following list is of shops where stocks of equipment are kept, and where facilities for demonstration exist. It is not necessarily a complete list, and we invite new dealers to submit details for future publications.

## LONDON AREA

berkeley Acoustics, 31 Crawford Street, W.I BERRY'S RADIO LTD., 25 High Holborn, W.C.I BOWMAN BROS. LTD., Camden High Street, N.W.I CHELSEA RECORD CENTRE, 203 King's Road, S.W. 3
CUSTOM HIGH FIDELITY, 371 Green Lanes, Palmers Green, N. 13

DAVENSET RADIO, 2 Burnt Ash Parade, Lee Green, S.E. 12
H. NORMAN DAVIS LTD, 91 The Broadway, Mill Hill, N.W. 7

DAYSTROM LTD, 233 Tottenham Court Road, W.I
DYNAMIC STORES (SOUND) LTD, 118 Edgware Road, W. 2
EXPERT GRAMOPHONES (SERVICES) LTD, 26 Thurloe Street, South Kensington, S.W. 7
J. J. FRANCIS (WOOD GREEN) LTD, 123 Alexandra Road, Hornsey, N. 8
FRANCIS OF STREATHAM, 169-173 Streatham High Road, s.w. 16
C. C. GOODWIN (SALES) LTD, 7 The Broadway, Wood Green, N. 22
HAMPSTEAD HIGH FIDELITY, 91 Heath Street, Hampstead, N.W. 3

HAMPTONS OF KENSINGTON, 7 Kensington High Street, W. 8

THOMAS HEINITZ, 100 Queensway, W. 2
HERALDIC STUDIOS LTD, 114 Broadway, Wimbledon, S.W. 19
ALFRED IMHOF, II2-116 New Oxford Street, W.C.I
LARGS OF HOLBORN, 76-77 High Holborn, W.C.I
LASKY'S RADIO, 207 Edgware Road, W.2; 152-I53 Fleet Street, E.C.4; 33 Tottenham Court Road, W.I
LEE ELECTRONICS, 400 Edgware Road, W. 2
LEWIS RADIO, 100 Chaseside, Southgate, N. 14
MAC'S CAMERA SHOPS LTD, 250-252 King Street, Hammersmith, W. 6
MASSEYS CENTRE OF SOUND, 121-123 High Road, W. 4
MODERN ELECTRICS LTD, 120 Shaftesbury Avenue, W.I
V. J. MONK LTD, I40-14I Plumstead Road, S.E. 18

NATIONAL RADIO SERVICE \& TELEVISION CO, 82 St. John's Wood High Street, N.W. 8
NEWBURY RADIO (FOREST GATE) LTD, 272 and 305 Romford Road, Forest Gate, E. 7
NORTHERN RADIO SERVICES, 16 Kings College Road, N.W. 3

NUSOUND, 93 Mortimer Street, W.I; 242-244 Pentonville Road, N.I; 228 Bishopsgate, E.C.2; 36 Lewisham High Street, S.E.13; 2 Maryland Station, E.15; 205 High Street North, E.6; 82 High Holborn, W.C.I
the parkfield studio, 20 Parkfield Road, New Cross, S.E. 14

THE RECORDER CO, 188 West End Lane, West. Hampstead, N.W. 6

RECORD RETAILERS LTD, Music Man Record Centre, 487a Oxford Street, W.I
R.E.W.EARLSFIELD, 266 Upper Tooting Road, S.W. 17
R. S. C. (MANCHESTER) LTD, 238 Edgware Road, W. 2
R.T.M. (RADIO \& TELEVISION) SERVICE LTD, 387b Mare Street, E. 8
SHEEN TAPE RECORDER CENTRE, 3 and 4 Station Parade, Sheen Lane, S.W. 14
H. L. SMITH \& CO LTD, 287-289 Edgware Road, W. 2

STERNE-CLYNE LTD, 9 Camberwell Church Street, S.E.5; 309 Edgware Road, W.2; 109 Fleet Street, E.C.4; I8 and 23 Tottenham Court Road, W.I
STUDIO 99, 57 Fairfax Road, Swiss Cottage, N.W. 6
TELERADIO, 189 Edgware Road, W. 2
TELESONIC LTD, 92 Tottenham Court Road, W.I

TELETAPE LTD, 33 and 59a Edgware Road, W.2; 84-88 Shaftesbury Avenue, W.I
TEL-LEE-RADIO, 220 The Broadway, Wimbledon, S.W.I9
T.M.B. (ELECTRONICS) LTD, 115 and 130 Tanners Hill, S.E. 8

UNITED TECHNICAL SUPPLIES LTD, 29 Tottenham Court Road, W.I
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THE GROVE, 8-16 George Street
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bexley heath
HI-FI CENTRE, BROADWAY RADIO, 228 Broadway

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NORMAN H. FIELD ELECTRONICS, 68 Hurst Street, 5
GRIFFIN RADIO LTD, 94 Bristol Street, 5
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STEREO LECTRICS LTD, I 50 Higher Bridge Street

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NATIONAL RADIO SUPPLIES, 70-72 Holdenhurst Road

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ERRICK'S, 4 Thornton Road, I
CHRISTOPHER PRATT \& SONS LTD, 33 North Parade, I
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The Ditton 10 is a compact high fidelity reproducer


The Ditton 10 Price (inc. P. Tax) £19.6.0d. measuring only $12 \frac{3}{4}^{\prime \prime} \times 6 \frac{34^{\prime \prime}}{} \times 8 \frac{1^{\prime \prime}}{}{ }^{\prime \prime}$. We, along with many thousands of satisfied users throughout the world, consider it to be the finest loudspeaker in its class - sales certainly substantiate this. If you are in doubt ask your audio dealer to demonstrate the Ditton 10 against any other comparable system.

## Brief Specification

Power handling capacity 10 watts R.M.S.
Overall frequency response $35-15,000 \mathrm{c} / \mathrm{s}$
Impedance 15 ohms
Size $12 \frac{33^{\prime \prime}}{} \times 6 \frac{3}{4}{ }^{\prime \prime} \times 8 \frac{1}{4}{ }^{\prime \prime}(323 \times 171 \times 203 \mathrm{~mm})$


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Power handling.capacity Overall frequency response Impedance

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- Elliptical stylus for minimum tracing distortion on both stereo and mono records.
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T 2400 Module-built transistorised stereo amplifier and FM radio with 17 diodes and 24 transistors, radicator, electronic programme scanning, push-button selection of pre-tuned FM stations. Connections for tape-recorder, microphone, FM aerial, and five speakers. Danish-style cabinet in teak or Brazilian rosewood. Power output: $2 \times 15$ watts, sine-wave. Dimensions: $9 \times 50 \times 25 \mathrm{~cm}$. $\left(3 \frac{3}{4} \times 19 \frac{3}{4} \times 9 \frac{7}{8} \mathrm{in}\right.$.).


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IT CAN record monaurally or sterephonically with its own mixed inputs from Gram, Radio microphones, etc., the result is a suitable master for disc manufacturers. "Before and Afte IT CAN also make a recording on one track and then transfer it to the other track while r IT CAN repeat the process and transfer this combined signal to the first track with one or th and the other cueing signals or commentary and either may be altered without the other. IT CAN playback stereophonically or monaurally with its own amplifiers of $3 \frac{1}{2}$ watts each.

Speeds $1 \frac{7}{8} / 3 \frac{3}{4} / 7 \frac{1}{2}$ i.p.s
Speeds $3 \frac{3}{4} / 7 \frac{1}{2} / 15$ i.p.s
The Vortexion W.V.B. is a high quality monaural machine with "Before and After" monitol and a high impedance socket for radio, etc., either of which can be selected by a switch. requirements. This model cannot be converted for stereo playback, but it is a thoroughly re

Speeds $1 \frac{7}{8} / 3 \frac{3}{4} / 7 \frac{1}{2}$ i.p.s Speeds $3 \frac{3}{4} / 7 \frac{1}{2} / 15$ i.p.s
The Vortexion W.V.A. is a monaural machine which has a performance equal in sound qua After" monitoring, Dubbing and Echoes. The recording being made can be heard on the int

Speeds $1 \frac{7}{8} / 3 \frac{3}{4} / 7 \frac{1}{2}$ i.p.s
Speeds $3 \frac{3}{4} / 7 \frac{1}{2} / 15$ i.p.s
All tape recorders have adjustable bias controls, low impedance mic. inputs for unlimited le bias.

## VORTEXIO

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Telephones: LIBerty 2814 and 6242-3.

## y Equipment



TYPE C.B.L.
other sources and from high grade low impedance balanced line microphones. With good monitoring is provided together with adjustable metered bias for perfection.
suring and listening to it and adding one or two more signals also metered.
nore signals. Composers use it for this purpose. One track may have music or commentary

## Price: $£ 17200$ <br> Price: $£ 18000$

$\therefore$ The recording inputs are a high sensitivity socket for moving coil or ribbon microphone erimposing and echo work can be done and the playback has reserve gain for abnormal le machine for the engineer specialising on monaural work.

```
Price: fll5 l0 0
Price: fl28 0 0
```

to the other models. It possesses all the features of the W.V.B. except for "Before and al loudspeaker as in the W.V.B. and C.B.L. The controls are uncomplicated.

Price: |  |
| :--- | :--- |

Price: $f 10730$
hs of cable, highly accurate position indicators and meters to measure recording level and

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bledon, London, S.W. 19
Telegrams: "Vortexion, Wimble, London"

# THIT TDP TWO for the initiand taper rear ing aillisishat 

'Hi-Fi News' covers the whole range of subjects involved in the pursuit of realistic music reproduction in domestic surroundings. Whether it be amplifiers or aerials, turntables or tweeters, cartridges or cabinets, your particular audio niche is bound to be there.
In addition to authoritative articles on fundamental matters, there are constructional features for the do-it-yourself enthusiast, reliable stereo record reviews, audio news pages, details of new products, descriptions of readers' bi-fi installations, lively correspondence columns, answer's to readers' problems, a VHF/FM reception diary, and perhaps most important for those aboüt to büy new equipment-thorough fearless technical reviews of equipment submitted by manufacturers.

Published on the 28th. From newsagents and bookstalls. Postal Subscription Rates: Great Britain and Overseas: Post paid for 12 months $38 /-, 6$ months 19/-.

'T.ape Recorder' covers the whole range of subjects involved in the pursuit of realistic sound recording on tape recorders and covers both the technical and creative aspects of this fascinating hobby. Regular features include: how tape machines work; constructional information on useful accessories; regular servicing articles; news from the world of tape; sound and cine; tape plays for amateur production; making imaginative use of your machine.

Published on the 14th. From newsagents and bookstalls. Postal Subscription Rates: Great Britain: Post paid for 12 months 30/-; 6 months 15/-. Overseas: Post paid for 12 months 32/6; 6 months 16/3.

## tape recorder

## B.B.C. VHF SOUND

| STATION | Frequencies ( $\mathrm{Mc} / \mathrm{s}$ ) |  |  | Version of Home Service | Maximum ERP (Each Prog.) |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | Light | Third | Home: |  |  |
| Ambleside |  |  |  |  |  |
| Ashkirk | 89.1 | 91.3 | 93.5 | Scottish | 18 kW* |
|  |  |  |  |  |  |
| Ballycastle | 89.0 | 91.2 | 93.4 | N. Ireland |  |
| Barnstaple | 88.5 | $90 \cdot 7$ | 92.9 | West | 148 W* |
| $\dagger$ ¢ath | 88.8 | 91.0 | 93.2 | West | $36 \mathrm{~W}^{*}$ |
| $\dagger$ Belmont | 88.8 | $90 \cdot 9$ | 93.1 | North | 15.5 kW* |
|  |  |  |  |  |  |
| Blaen-plwyf | 88.7 | 90.9 | 93.1 | Welsh | 60 kW |
| Brecon | 88.9 | 91.1 | 93.3 | Welsh | 9.7 W* |
| Bressay | 88.3 | 90.5 | 92.7 | Scottish | $9 \mathrm{kW*}$ |
| $\dagger$ Brighton | 90.1 | $92 \cdot 3$ | 94.5 | West | 25 W* |
| Brougher Mountain | 88.9 | 91.1 | $93 \cdot 3$ | N. Ireland | 2.5 kW |
| Cambridge | 88.9 | 91.1 | 93.3 | Midland/E. Anglian | 17.W* |
| Campbeltown 80.0 |  |  |  |  |  |
| Carmarthen | 88.5 | 90.7 | 92.9 | Welsh | $8.4 \mathrm{~W}^{*}$ |
| Churchdown Hill | 89.0 | 91.2 | 93.4 | Midland | 27 W* |
| Divis | 90.1 | $92 \cdot 3$ | 94.5 | $N$. Ireland | 60 kW |
| $\dagger$ Dolgellau | 90.1 | $92 \cdot 3$ | 94.5 | Welsh |  |
| Douglas | 88.4 | $90 \cdot 6$ | 92.8 | North | 5.5 kW* |
| Ffestiniog |  |  |  |  |  |
| Forfar | 88.3 | 90.5 | 92.7 | Scottish | 9.6 kW* |
| Fort William | 89.3 | 91.5 | 93.7 | Scottish | 1.5 kW |
| Grantown | 89.8 | 92.0 | 94.2 | Scottish | 360 W* |
| Haverfordwest | 89.3 | 91.5 | 93.7 | Welsh | 10 kW* |
| Hereford | 89.7 | 91.9 | 94.1 | Midland | 26 W* |
| Holme Moss | 89.3 | 91.5 | 93.7 | North | 120 kW |
| $\dagger$ Kendal | 88.7 | 90.9 | 93.1 | North | 23 W* |
| Kilkeel |  |  |  |  |  |
| Kingussie |  |  |  |  |  |
| Kinlochleven Kirk o'Shotts | 89.7 89.9 | 91.9 92.1 | 94.1 94.3 | Scottish | 120 kW |
| Larne | 89.1 | 91.3 | 93.5 , | N. Ireland | 16 W* |
| Les Platons | 91.1 | 94.75 | 97.1 | West | 1.4 kW* |
| Llanddona | 89.6 | 91.8 | 94.0 | Welsh | 12 kW |
| Llandrindod Wells | 89.1 | $91 \cdot 3$ | 93.5 | Welsh | 1.3 kW |
| Llangollen | 88.85 | 91.05 | 93.25 | Welsh | 11 kW* |
| Llanidloes |  |  |  |  |  |
| Lochgilphead Londonderry | 88.3 | 90.55 | 92.7 | N. Ireland | 13 kW* |
| $\dagger$ Station not in service at time of going to press. |  |  |  |  |  |
| * Directional transmitting aerial. <br> Where frequencies and ERP are not shown these are not finallsed. |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| List fully corrected | June, 19 | . |  |  |  |

## BROADCASTING STATIONS

| STATION | Frequencies (Mc/s) |  |  | Version of Home Service | Maximum ERP (Each Prog.) |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | Light | Third | Home: |  |  |
| Machynlleth | 89.4 | 91.6 | 93.8 | Welsh | 62 W* |
| Meldrum | 88.7 | $90 \cdot 9$ | 93.1 | Scottish | 60 kW |
| Melvaig | 89.1 | $91 \cdot 3$ | 93.5 | Scottish | $21.7 \mathrm{~kW}^{*}$ |
| $\dagger$ Morecambe Bay | 90.0 | 92.2 | 94.4 | North | 4.1 kW* |
| Newry | 88.6 | 90.8 | 93.0 | $N$. Ireland | 28 W* |
| $\dagger$ Northampton | 88.9 | 91.1 | 93.3 | Midland | 60 W* |
| North Hessary Tor | 88.1 | 90.3 | $92 \cdot 5$ | West | 60 kW |
| Oban | 88.9 | 91.1 | 93.3 | Scottish | 1.5 kW |
| †Okehampton | 88.7 | 90.9 | $93 \cdot 1$ | West | $16 \mathrm{~W}^{*}$ |
| Orkney | 89.3 | 91.5 | 93.7 | Scottish | 20 kW* |
| Oxford | 89.5 | 91.7 | 93.9 95.85 | Midland West | 22 kW* |
| Penifiler | 89.5 | 91.7 | 93.9 | Scottish | 6.2 W* |
| Peterborough | 90.1 | $92 \cdot 3$ | 94.5 | Midland/E. Anglian | 21 kW* |
| Perth | $89 \cdot 3$ | 91.5 | 93.7 | Scottish | 13.5 kW* |
| Pitlochry | 89.2 | 91.4 | 93.6 | Scottish | 200 W* |
| Pontop Pike Portrush | 88.5 | 90.7 | $92 \cdot 9$ | North | 60 kW |
| Redruth | 89.7 | 91.9 | 94.1 | West | 9 kW * |
| Rosemarkie | 89.6 | 91.8 | 94.0 | Scottish | 12 kW * |
| Rowridge | 88.5 | 90.7 | 92.9 | West | 60 kW |
| Sandale | 88.1 | $90 \cdot 3$ | 92.5 94.7 | Scottish North | 120 kW |
| Scarborough | 89.9 | 92.1 | 94.3 | North | 25.5 W* |
| Scilly |  |  |  |  |  |
| Sheffield | 89.9 | 92.1 | 94.3 | North | 59 W |
| Skriaig | 88.5 | 90.7 | 92.9 | Scottish | 9.6 kW* |
| Sutton Coldfield | 88.3 | 90.5 | 92.7 | Midland | 120 kW |
| Swingate | 90.0 | 92.4 | 94.4 | London | 6.5 kW* |
| Tacolneston | $89 \cdot 7$ | $91 \cdot 9$ | $94 \cdot 1$ | Midland/E. Anglian | 120 kW |
| Thrumster | 90.1 | $92 \cdot 3$ | 94.5 | Scottish | 10 kW* |
| Toward | 88.5 | 90.7 | $92 \cdot 9$ | Scottish | 238 W* |
| Ventnor |  |  |  |  |  |
| Weardale Wensleydale/Swaledale | 89.7 | 91.9 | 94.1 | North | 100 W* |
| Wenvoe | 89.95 | 96.8 | $\begin{aligned} & 94 \cdot 3 \\ & 92 \cdot 125 \end{aligned}$ | Welsh West | 120 kW |
| Whitby Wrotham | 89.1 | 91.3 | 93.5 | London | 120 kW |
| $\dagger$ Station not in service at time of going to press. <br> * Directional transmitting aerial. <br> Where frequencies and ERP are not shown these are not finalised. <br> List fully corrected to 20th June, 1966. |  |  |  |  |  |

## POSTSCRIPTS

## PURCHASE TAX

While this book was being printed, the Government announced an increase in the rate of U.K. Purchase Tax. All items which carry this tax are affected. The increase is an additional $10 \%$ surcharge on the existing tax:-in other words, an item on which tax was $10 /-$ will now carry tax of $10+\mathrm{I}=\mathrm{II} /$-.

## TELEPHONE NUMBER

The telephone number of the editorial office of the Hi-Fi Yea. Book is ... MUSeum 3967.

## PHOTOGRAPHS

Manufacturers and Agents are invited to send photographs of new equipment to the editorial office as they become available. This will enable the production department to work on them in good time, throughout the year, instead of having to tackle several hundreds in the space of a few weeks! Co-operation in this matter will be greatly appreciated, and particularly if the photographic prints are clearly captioned.

## IMPORT SURCHARGE

Readers are reminded that the Imports Surcharge Tax (originally $25 \%$, later reduced to $15 \%$ ) is due for reduction or removal in November 1966. This may or may not affect the prices listed for imported items of equipment, because in some cases the importers absorbed the tax instead of passing it on to customers. However, it is a point worth checking.

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 "I would certainly not advise ansone now' 10 spend more than ren shillings on Offenbach's Gaire Parisienne (Saga-XID/STXID S244). Repeated hearings have convinced me more than ever"and
THE GRAMOPHONE "Hadyn's Spven Last Words plajed by the Aeolian Quartet (Saga XID/STXID S245) seems to me the bargain of the year, and much to be preferred to the more expensive performances of this deeply tragic music".

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## and

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## and

THE GRAMOPHONE
"In steren Saga's La Boutique Fantasque (XID STXID 5257) is the best ten-shillings-worth I have heard so far. The sound is hoth spacious ant clean. This is one of my favourites".

## and

AUDIO \& RECORD REVIEW $\because T h e$ delights of this tuneful ballet suite (La Beintique Fantasque-Saga XID/STXID S257) need not he e:vpounded again. The sound is very pleasant, warm, clear and spacious and very effective in stereo".
and
AUDIO \& RECORD REVIEW "A well-fell and well-halanced per formance of Lis:I Missa Choralis (Saga XID/STXID jlOS) by the BBC, Northern Singers at the astonishing price of $101 \cdot=$ ". "The overall effect is excellent, with well maiched rempos and a splendid instrumental presentation (Mendelssohn Symphony No. 4/ Italian. Saga XID/STXID SOS6.)

## and

MUSICAL OPINION
"Mozart's Horn Quintet (Saga XID/STXID S127) is excellently recorded. Full of charm".

## and

MUSICAL OPINION
"Here we have true chamber music. A Bargain classic with an arresting Cezanne reproduction thrown in". (Ravel Trio in A Minor/Debussy ${ }^{\circ}$ Cello and Violin Sonatas. Saga XID/STXID 5255).
and
EMS
" Masterly performances of three mojor' classics' of modern chamber music". (Ravel Trio in A MinorlDebussy 'Cello and Violin Sonalas. Saga XID/STXID S25S).

AUDIO \& RECORD REVIEW
"A real bargain: members of the English Boise Trio playing Debussy's violin and cello sonatas and Ravel's piano irio, all for 10/- on Saga XID/STXID S255".
and
Joan Chissell, B.B.C.
"This is a fine piece of programme building such as no expensive label has ever offered us. It is perhaps the most outstanding recent bargain in music. It comes from Saga".
(Ravel Trio in A Minor/Debussy 'Cello and Violin Sonatas. Saga XID/STXID S25S.)

## and

EMG "A very enjoyable performance. Clean and clear". (Beelhoven Violin Concerto in D Major. Saga XID/STXID S025).

AUDIO \& RECORD REVIEW
"Saga's Beethoven Violin Concerio (XIDJ, STXID SO25) is a very fine performance. The quality of the playing makes the price absurdly cheap".
and
John Warrack, B.B.C.
"This is by any standards a marvellous record:" (Beethoven "The Archduke" XID/STXID S226.)



[^0]:    "Point One" TL/12 plus amplifier. 12W. Dist. $0.1 \%$. Input for spec. output 125 mV . Response $20-20,000 \mathrm{c} / \mathrm{s} \pm 0 \cdot 25 \mathrm{~dB}$. Feedback 26 dB . N.L. -82 dB . Output imp. 4, 8 and 16 ohms. Output EL84s. Ultra-linear. Size: $10 \times 8 \times 6$ in. To operate with any Leak control unit. Price: $£ 20$.
    "Point One" TL/25 plus amplifier. 25W. Dist. $0 \cdot 1 \%$. Input for spec. output 125 mV . Response $20-20,000 \mathrm{c} / \mathrm{s} \pm 0 \cdot 25 \mathrm{~dB}$. Feedback 26 dB . N.L. -83 dB . Output imp. 4, 8 and 16 ohms (other imps. to order). Output EL34s. Ultra-linear. Size: $10 \times 8 \times 6 \frac{3}{4} \mathrm{in}$. To operate with any Leak control unit. Price: $£ 26$ 10s.
    "Point One" TL/50 plus amplifier. 50W. Dist. $0.1 \%$. Input for spec. output 125 mV . Response

[^1]:    Lowther stereo control unit

[^2]:    OTandberg 72. $\frac{1}{2}$-track version of Tandberg 74. Details as above, but H. and N. -56 dB .

[^3]:    WAL tape eraser

