

the TAPE

PRICE 1/6

February 1959
Vol. 1 No. 1

RECORDER



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12

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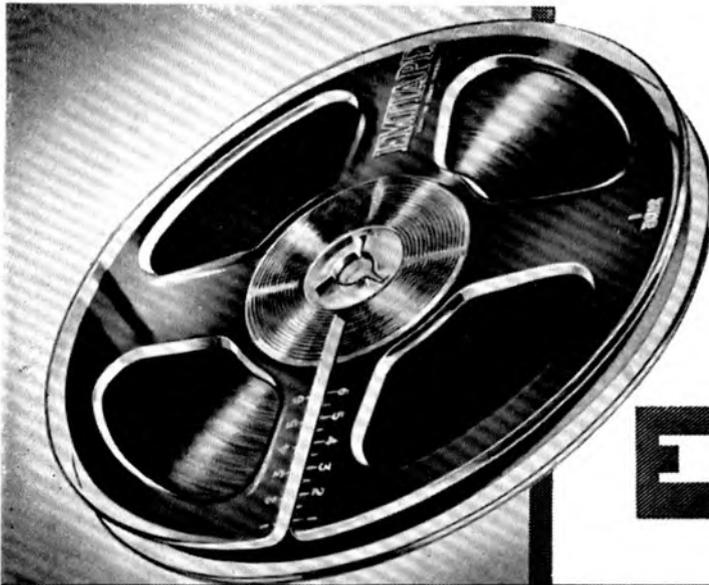


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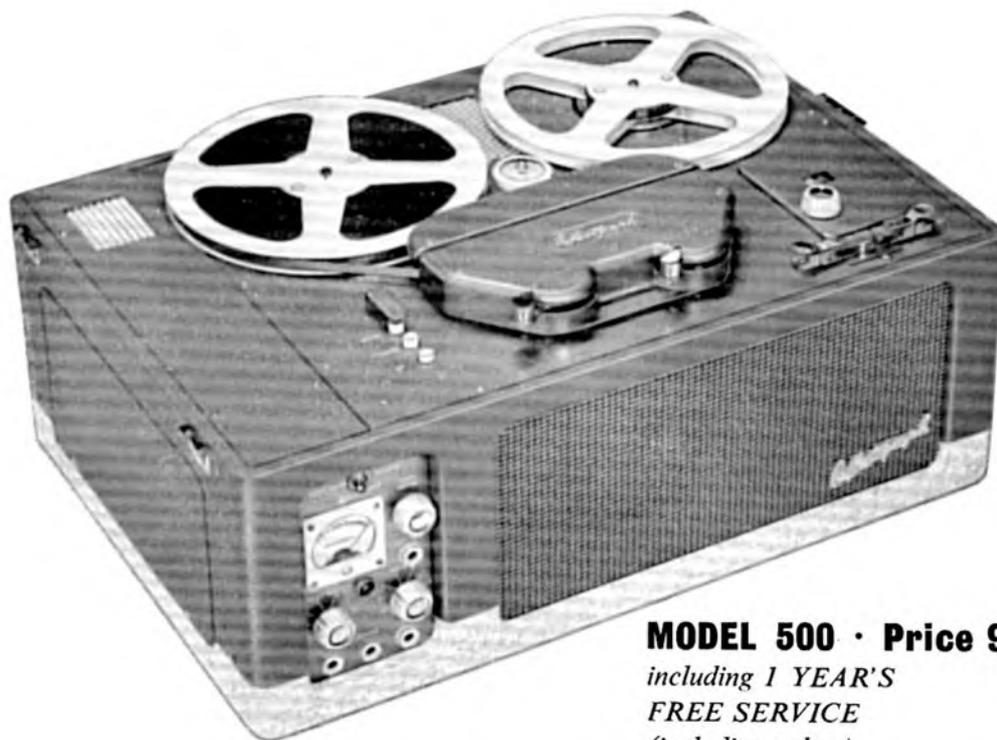
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OPINIONS OF TECHNICAL EXPERTS

P. Wilson, M.A., "The Gramophone"
 This is without doubt the most versatile domestic tape recorder that I have had the pleasure of trying out, and the quality, both of its recording and its playback, is of exceptionally high standard. For quality of performance, then, I give the instrument full marks: I know of no better. For the construction I have nothing but praise. There is nothing flimsy about it either as a piece of mechanism or on the electronic side. It is a fine piece of engineering up to the highest British standards.

D. W. Aldous, M.Inst.E., M.B.K.S., "The Gramophone Record Review"
 The separate motors and replay amplifiers make possible the direct monitoring from the tape during the actual recording and this facility is certainly a boon. There is no doubt whatever that when one has used this type of recorder one never wishes to return to the combined record/playback type of instrument. I have never heard better quality at $7\frac{1}{2}$ in.p.s. from any tape recorder that has passed through my hands. The "Reflectograph" is a pedigree tape recorder of immaculate construction and impeccable performance.

James Moir, "Hi-Fi News"
 Separate motors are used for capstan drive and both spools, all three motors being of Garrard manufacture. The overall impression after some months of use is that the machine is convenient and pleasant to handle, while the extra facilities make it very suitable for professional use.

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I must have a wide frequency range, full dynamic range and a really good signal/noise ratio.

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Outstanding features include:—

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★ **Permits use of 8¼ in. reels**

(2,400ft. of tape for long play; 1½ i.p.s. over 8 hours.)

★ **Three independent motors (B.T.H.)**

★ **Special foolproof interlocking controls** ★ **Instant stop without spillage** ★ **Pause control** ★ **Digital rev. counter** ★ **High quality amplifier** ★ **Recording level indicator** ★ **Monitoring facilities** ★ **Azimuth head adjustment** ★ **Provision for extra sound heads** ★ **Fast re-wind (1,200ft. in 45secs.)** ★ **Coloured signal lights.**

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Tape deck with provision for extra heads	...	28 gns.
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Mixer Unit	...	£2 18 0

Full details of the Mark 5 and the 3 star portable 58 gns. available on request

Brenell MARK 5



MARK 5

64 GNS.

(including 1,200 ft. of tape)

Brenell PERFORMANCE IS TRUE-TO-LIFE PERFORMANCE

Hand Made . . .

This is no idle statement, it virtually sums up the REPS recorders, for high quality products such as these cannot possibly be mass produced. Our production capacity is therefore strictly limited and for this we make no apology; rather we pride ourselves that all models manufactured comply with this published technical specification.

The whole mechanism is mounted on rubber which together with careful selection of motors reduces mechanical noise to a minimum.

Provision is made for the addition of a stereo head with both channels available either to an external stereo amplifier, or one channel through the internal amplifier and the other externally.

TECHNICAL SPECIFICATION

The R40

3½ ips 60—8,000 ± 3db

7½ ips 50—15,000 ± 3db

15 ips 40—20,000 ± 3db
(signal-noise ratio at 7½ ips—48db)

Separate record amplifier

2 per cent total harmonic distortion
at peak recording level 1 kc/s.

Push-pull bias erase oscillator for low
tape hiss

Separate bass and treble controls ± 15db
at 14 kc/s—15db at 40 c/s

Supplied complete with Acos 39/1 mic. stand.
and 1,200' P.V.C. tape

MODEL R 30/R 40



MODELS

R20 62 GNS. with magic eye record indicator
R30 66 GNS. with meter record level indicator
R40 70 GNS. as R30 but with push/pull sound
output.

HOW MANY CYCLES?

From the correspondence we receive it appears that a great deal of importance is attached to the frequency response in its relation to reproduction, generally to the exclusion of the other inter-relating factors—i.e., background noise, harmonic distortion, transient response, etc.

In tape recording a balance must be sought between these factors in order to approach as near as possible to the original sound. The designer must decide at any given speed whether wide frequency response, low distortion or negligible background noise should be given precedence for one can be improved at the expense of the other.

It is generally known that to obtain the best results the bias is adjusted individually on each machine to an optimum level. This implies that a series of recordings are made at some middle frequency, generally 1,000 c/s and the bias current adjusted until maximum output is obtained on playback. The bias is then increased until the output drops by approximately 10 per cent. This is the optimum point at which distortion and background noise from the tape is at minimum. However, the high frequency output from the Playback Head is attenuated as the bias increases towards optimum; the higher this frequency the greater this effect. It is not known for certain the reason for this attenuation; one theory suggests the bias causes partial erasure, which is accentuated as the bias current increases.

A more plausible answer takes into account that at 7½ in. per second at 7,500 c/s a distance of 0.0001 in. between tape and Playback Head results

in a loss of 6db or half the output; this loss is nearly proportional to frequency. Now below optimum bias the surface of the oxide coating on the recording tape is the most sensitive part and no distance loss can occur, subject to the tape making intimate contact with the Head. However, at optimum bias the point of maximum sensitivity or remanence is below the surface of the oxide giving a distance loss. This is borne out by the fact that a thinner oxide coating improves the treble response but with reduced overall sensitivity.

You are by now probably asking what all this boils down to—briefly then, a Playback Head with a very fine gap will not by itself improve the treble range unless:—

1. It is under-biased, which means higher background noise and greater harmonic distortion.
2. Receives large amount of treble boost during record which leads to increased distortion in the treble region, and excessive ringing on the transients.

Finally to see if you really need all those practically inaudible cycles try recording on a really good machine* at 7½ in. per sec. and then at 15 in. per sec. to compare the difference.

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interested in Model R.....

Mr.....

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EDITORIAL

IN offering readers this first number of a new magazine, we are doing something that we have planned, and looked forward to with growing eagerness, for nearly 3 years—in fact, ever since we launched *Hi-Fi News*, as the first British Hi-Fi Magazine, in June, 1956. In the intervening period, as many readers of this new magazine will know, *Hi-Fi News* has carried regular articles on all aspects of tape and tape recording, including reviews of recorders, mixers, microphones and accessories; and it has also catered for the Home Constructor with the first practical sub-amplifier, and a recording amplifier, enabling enthusiasts to build up their own Hi-Fi recording equipment with decks of their particular choice.

Nevertheless, despite all this variety of material about tape recording, stereo included, it became increasingly obvious to us, as the months passed, that there was still a wide and growing gap to be covered. *Hi-Fi News*, although many of its articles and other features are written for the everyday non-technical reader, has not been able to cater for the "tape-user" as fully as we would have liked. The hundred-and-one questions that reach this editorial office every week have shown us very clearly that there is an urgent need for a practical monthly magazine specifically and solely devoted to the problems and interests of the tape recording enthusiast—a magazine that will do one specific job and do it thoroughly.

And so, it is with very great pleasure indeed that we introduce you to **The Tape Recorder**, Vol. 1, No. 1. It is our earnest aim to build up and maintain this new magazine as the finest monthly publication in the world to cover this important field. Its regular monthly features will provide the information that you are seeking, and will answer the many questions that tape users everywhere are asking. Liberally illustrated with diagrams, photos and drawings, and written by a team of well informed authors, **THE TAPE RECORDER** will break new ground, and will bring a new slant on all tape matters to its readers in everyday non-technical language. For the technically-minded reader, *Hi-Fi News* is Britain's finest journal—and is rapidly becoming the world's most talked about publication. For the reader who wants a closer approach to the Facts of Tape, and with the best and most comprehensive coverage, we offer this latest publication to our range:

"THE TAPE RECORDER".

FEBRUARY - - - - - 1959
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COVER PICTURE

THIS month's cover shows one of our future Authors, B. R. Read, at work with an E.M.I. portable recorder (the famous L2) at London Airport, collecting another topical effect for the large and growing BBC library. The plane is a TWA Super Constellation, taking off for America. B. R. (Bill) Read has been recording effects for the BBC for years, and in his forthcoming series of articles he should have plenty of useful hints for amateurs.

NEXT MONTH

ONE of our main features next month will be a further pictorial instalment on *How To Splice Tape*—this time with the accent on editing. And on the important subject of *Tape Editing* we introduce the first of a planned series of articles by Maurice Brown. In less than three months the birds are scheduled to preen their feathers and burst into Spring Song, so to prepare readers for those warmer days we have briefed Eric Sims to write us a series on *Recording Bird Song*. Having specialised in this for many years for the B.B.C., he should have plenty to say of the greatest interest. *Readers' Letters*, *Details of New Tape Products*, *Reviews of Tape Recorders*, *Latest News* from all quarters, and *Club Notes and News*, plus *Reviews of Tape Records* are planned as regular features. *Beginners' Page* will be there, too; and so will another instalment of *What do these Things Mean to you?* The above features, and more, together with many photos and diagrams, should make our March issue a bright paper.

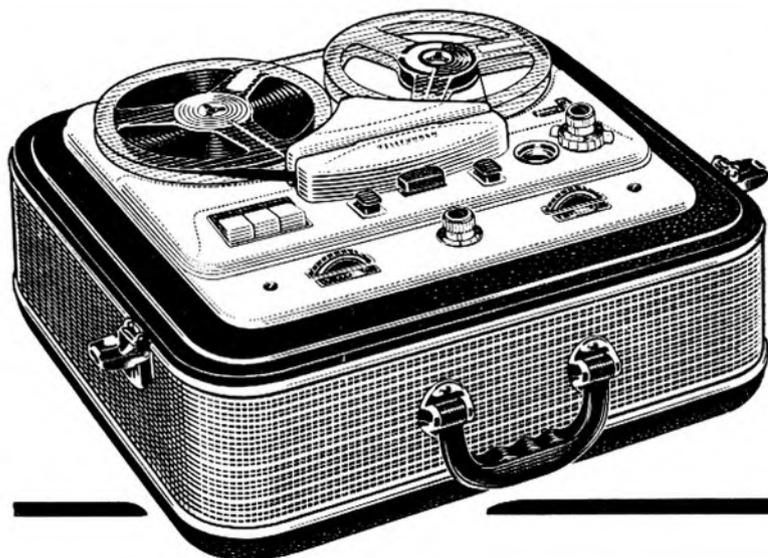


LOOK FOR THIS COVER!

SUBSCRIPTION RATES

The subscription rate to *The Tape Recorder* is 21/- per annum (U.S.A. \$3.00) from The Tape Recorder, 99 Mortimer Street, London, W.1. Subscription + Index, 24/- (U.S.A. \$3.25).

Here is a Genuine HI-FI SPECIFICATION!



SPECIAL TELEFUNKEN STEREO MODELS

KL 85 T Stereo—for use with HI-FI equipment 95 Gns.*
 KL 85 K Stereo—portable model complete in case 112 Gns.*

Send for free literature that gives full details of all these models and TELEFUNKEN tapes and accessories.

TELEFUNKEN

The originators of tape recording

To WELMEC CORPORATION, LTD., 147 Strand, London, W.C.2

Please send me details of items I have ticked.

KL85 range KL75 range Stereo models Accessories

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- FREQUENCY RANGE guaranteed by individual certificate for each machine. 30-20,000 cycles/sec. at $7\frac{1}{2}$ i.p.s. ± 3 dB and 30-15,000 cycles/sec. at $3\frac{3}{4}$ i.p.s.
- DC heated pre-amplifier valves eliminate all hum and background noise.
- Two matched loudspeakers give a quality and tone equal to first-class HI-FI radio.
- Separately controlled L.E. amplifier with treble and bass controls, permits use as straight-through amplifier, and allows incoming signals to be monitored.
- Fast forward and rewind in 1 min. 55 secs. with three digit counter to pinpoint any position.
- Tape splicing groove incorporated.
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- Connections for monitoring earphones, remote control, start-stop remote control, extension speaker, etc.
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TELEFUNKEN KL 85 K (Portable) 75 Gns.*
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TELEFUNKEN Model KL75K as above 50 Gns.*
 TELEFUNKEN KL75T Table Model 45 Gns.*
 TELEFUNKEN KL65K Specification as above but with compartment for accessories 57 Gns.*

* All prices excluding microphone — extra from 5 Gns.

By Rene Cutforth

RECORDING IN THE TROPICS

● Rene Cutforth has achieved international fame as a result of his dramatic documentary programmes for the BBC. Many readers will remember one of the first of these—*The 38th Parallel*—broadcast in the spring of 1952, and based on his book “Korean Reporter”: many more will recall his series, *The Adventures of Rene Cutforth*. Some of the reporting features he has collected on tape (and written and narrated himself) are *80° North*, when he visited the British North Greenland Expedition, *Six People*, a series of portraits and *Tinker, Tailor...* (currently being repeated on the Home Service).

IT was in Nigeria, in a riverside settlement so remote that they still spoke Pidgin English, that the best definition of my peculiar profession I have ever heard was delivered in that language. I had been recording one of Africa's white traders standing in his country store. My recorder lay open on the table: we stood among the bales of Manchester cottons, stewing in our sweat, while the vultures scratched and flopped on the tin roof above us, and a drum-beat like a fever-pulse went on and on somewhere outside in a landscape splintered by sunshine. Suddenly a huge, smiling country chief, dressed in a crimson Stetson hat and little else, came ambling up to be introduced; he had been buying steel-shafted golf clubs to make into an illicit still, and he was slightly drunk: the conversation went as follows:—

“Na, who dis feller?”

“Dis feller, he for B.B.C.”

“Na, what dis B.B.C.?”

“You sabby dem box, you twitch um, you listen um, dem Queen speak for London? Dis feller he go fill up dem box for London.”

“Oho.”

After years of professionally toting a tape recorder round the globe you get a sixth sense about when to start recording. As the chief came ambling up to us I switched on; and thirty seconds later that splendid piece of dialogue was safe in the recording box. More than that, when I came to play the tape over I found I had caught the drum, too; and the heavy flopping of the vultures on the roof. One small but perfect snapshot in sound of Africa lay there in the tape waiting to be fitted like a jigsaw piece into the larger picture. I was making a sixty-minute radio feature called *Along the Niger*, and as usual the best, the most atmospherically compelling bit of the whole programme, had been captured not by planning but by pure luck and a quick finger on the switch.

Running Repairs

The Tropics, and particularly the African Tropics, seem to intensify all the problems of programme making. I do not mean the physical problems, though they can be considerable; and I still have vivid memories of a village in the south of the Sahara Desert. It had cost the B.B.C. several hundred pounds to get me and the recorder to that remote place. I had only a week to get my whole programme (which was about malaria), and when I switched on the recorder it just didn't do anything. The motor made a noise but the spools did not turn round.

Luckily, the English doctor with whom I was staying had a mechanical turn of mind, because I know absolutely nothing about engineering or electronics, except how to get results with various microphones; but all the same it took the two of us a day and half a night to discover that the drive in that particular recorder was transmitted through a fibre wheel by friction; and that in the intense dryness of the Sahara desert the wheel had shrunk until it no longer engaged. When we knew that, the rest was simple. We bored a little hole in the panel with a hammer and a nail, and the doctor lent me a hypodermic syringe; with this I squirted a spray of water over the drive-mechanism every twenty minutes or so. It worked perfectly.



This picture shows the author among some Nigerian villagers, explaining the mysteries of an E.M.I. portable L2 recorder. The Chief is listening through an earphone to a playback of his voice. The photo was taken by Marguerite Cutforth, the author's wife, who is now the producer of the new fortnightly hi-fi programme, “Sound”, on Network Three.

But the physical difficulties (even the thick green, spongy fungus which grew all over the inside of the recording box in Malaya; even the white ants which ate the box in India) are rarely insuperable. What the tropics do, though, is to intensify the contradictions which are basic and inherent in the “Radio-Feature” form.

In the old days, before recording equipment was made portable, a Radio-Feature was a simple affair. Lawrence Gilliam, the head of the B.B.C.'s Feature Department might ask me or any other radio writer to go to, say, Kano in Nigeria to get a half-hour feature on the subject. So I would go out there and soak myself in the atmosphere of Kano for about a month, and on my return I would write a feature using nothing but words and a few effects. The feature would have two parts; a narrator's part which I would read myself, and the dialogue which would be spoken by actors. This is still a very good sort of feature, but it has been killed stone dead by the portable recorder. Professional radio writers have now to think in terms not of words, but of sounds.

The Background

Now here is the problem: suppose you are lying in a thatched mud hut somewhere near Baro in Nigeria in the middle of a sweltering afternoon and you begin to think about how to convey the feeling of this African afternoon in terms of sound. The nearest sound will be the loud, fierce buzzing of a mud-wasp building its nest in the red clay wall of your circular room. Then there will be the distant lazy clanking of shunting trains. There is certain to be a drum somewhere, and perhaps someone singing in that low African drone—and the vultures flopping and scratching, and a maddening bird going *Pwoo-pwoo-pwoo-pwoo* all through the afternoon.

The problem is: “Do these sounds add up to a picture of an African afternoon?” My answer is “No, they do not.” But the very newest school of thought in Radio, a school which talks about “Pure Sound” and “Pure Radio” has the idea that you could make a feature out of sounds alone, strung together with almost no speech at all. Just a few captions. I think myself that this is a false theory, and based on a false analogy between tape-records and photographs. The photograph, in fact, conveys information much more precisely than a recording can do, and the true analogy is between tape-sound and colour. The basic problem remains: “How much of ‘colour’ in sound, and how much description in voice, and how to fit them together.”

TSL HIGH FIDELITY NEWS LETTER No. 2

Item No. 1—WE ARE NOW DELIVERING TO THE HIGH FIDELITY ENTHUSIAST THE HARTING STEREO TAPE RECORDER DECK TYPE HM55D

We believe this is the first time that a professional stereophonic tape recorder deck with facilities both for monophonic and stereophonic recording and playback has been made available to the public as a complete mechanical assembly. This deck may be used with any high fidelity sound equipment of suitable standard, and included with each deck is suggested circuitry and data etc.

Specification of this unit is as follows:

Frequency Response—30 c/s to 20 kc/s within ± 2 dB at $7\frac{1}{2}$ i.p.s.
30 c/s to 16 kc/s within ± 2 dB at $3\frac{3}{4}$ i.p.s.

Motor—Precision capacity split-phase motor with multiple poles manufactured by the ENGEL Company.

Playing Time—Standard Tape: 1 hr. at $7\frac{1}{2}$ i.p.s. 2 hrs. at $3\frac{3}{4}$ i.p.s.
L.P. Tapes: $1\frac{1}{2}$ hrs. at $7\frac{1}{2}$ i.p.s. 3 hrs. at $3\frac{3}{4}$ i.p.s.
Double Play Tape: 2 hrs. at $7\frac{1}{2}$ i.p.s. 4 hrs. at $3\frac{3}{4}$ i.p.s.

Wow and Flutter—Total of wow and flutter better than 0.1 of 1 per cent. Total of wow better than 0.06 of 1 per cent.

Signal to Noise Ratio—Better than 55 dB unweighted.

Power Supply—100 to 120 volts and 200 to 240 volts A.C. only, 50 cycles (other voltages and 60 cycle models to special order).

Drive—Very heavy indirect fly-wheel drive.

Mechanical Construction—All bearings and shafts are precision ground and honed within micro-inches thus ensuring extreme long life free from wow and flutter. All rotating parts such as capstans, fly-wheels and drives are statically and dynamically balanced within micro-grams.

Bias Frequency—Approximately 60 kc/s.

Reel Size—7 in. reels maximum.

Rewind Time— $2\frac{1}{2}$ minutes.

Braking and Stopping Speed—Instantaneous.

Automatic Stopping—Electronic micro-switch fitted.

Recording Level Indicator—Uses latest type EM84 Fluorescent beam with broad and narrow indicator paths.

Monitoring—Monitoring switch enables recording to be controlled at any required level.

Controls—(a) Record press button. (b) Right-hand fast rewind press button. (c) Left-hand fast rewind press button. (d) Playback press button. (e) Large stop bar. (f) Speed selector on ON/OFF control knob. (g) Dual co-axial control combining internal loudspeaker on-off switch with volume control, and monitor level control on recording. Volume and tone control on Play-back.

Record/Replay and Erase Head Details—These heads are of unique construction, and are manufactured by TELEFUNKEN Company of Germany for Messrs. HARTING.

Speed Tolerance—Better than ± 1 per cent for all speeds.

Sockets—(a) Microphone. (b) Radio. (c) Phono. (d) Remote Control. (e) External loudspeaker.

Playback Facilities—(a) Half-track. (b) Full track. (c) Stereophonically.

Recording Facilities—(a) Monophonic. (b) Stereophonic.

Cross talk separation between two half tracks better than 40 dB on stereo.

Price—42 gns.

Further details and catalogue are available on request, and these decks are now available from all high class High Fidelity, Radio and Music shops.

Item No. 2—STOP PRESS! TSL MASTER TAPE MIXER UNIT AVAILABLE LATE JANUARY

This unit enables three different inputs to be balanced at any pre-determined level, either separately or jointly, and to be fed to any tape recorder or amplifier which only has facilities for single level inputs.

Price—2 gns.

In case of difficulties write to:

TECHNICAL SUPPLIERS LIMITED

Hudson House, 63 Goldhawk Road, London, W.12

Telephone: SHEpherds Bush 2581/4794

Telegrams—Home: TEKNIKA LONDON Overseas: TEKNIKA

RECORDING IN THE TROPICS—(continued)

One Way of Using the Bits

The example I gave of lying in the hut near Baro was not a made-up one: it happened to me, and I never really found a good solution. I spent hours chasing the "Pwoo-pwoo bird", recording the train, persuading the fierce wasp to broadcast properly, and the gardener's boy in the dusty compound to hum his song (all separately of course: natural "mixes" are never any good; your ear makes discriminations that no microphone can do). In the end I used them like this:

Narrator: in the oven-heat of Baro while the gaudy red and black mud-wasp builds his tiny tube of nest in the red mud wall, listening to the slow African afternoon.

Fade in mix of Mud-Wasp into Pwoo-Pwoo Bird into Railway Shunting which hold under *Song* and *Drum* and slowly fade under.

Narrator: The sleepy railway shimmering and dancing in the white light, the drowsy song in the dust and glare of the compound, the ubiquitous drum and always the jagged angry buzzing of the wasp. **Fade up wasp, and out.**

Now I have to confess that I think that is a very poor solution to the problem because everything has been stated twice: once in speech and once in sound. But in my view you cannot afford *not* to have the speech, because in that case all the visual images disappear; and that is just what radio is short of. There is no real answer. Professional radio writers have been arguing these points violently, thumping on tables, for ten years now. *It would be nice if an amateur, perhaps after reading this article, suddenly saw in a flash some quite new method of marrying atmosphere with story.*

Recording Mosquitoes

Of course the "atmospheric feature" is not the only kind, but it is the kind the tropics make you think about, and some of the simplest, most evocative sounds in the tropics are very difficult to record. One of the most characteristic—the "ping" of a mosquito as it passes your ear. I only managed to catch it, in the end, by sticking the point of my elbow outside the mosquito net at night and hanging a crystal, all-directional microphone on the net just behind it.

It took five full fifteen minute tapes before I had four distinct "pings" on separate notes; and by that time my elbow was twice its normal size. In London, the expert engineers in the cutting studios got to work on those precious "pings". First they re-recorded them about five times each, and dubbed these re-recordings on to three different bands of tape, which were then made into short "loops" circulating endlessly through the recording heads of three machines, and "mixed" on the final tape. The result is like a room swarming with mosquitoes.

Those B.B.C. Engineers can do practically anything with tape. I once made a bad miscalculation with a microphone on the Benue river in Nigeria. I was trying to record a song which my canoe paddlers were singing as they swung us down the river. When I listened to the tape in London it had nothing on it but a faint scratching noise: I had turned the sensitivity adjustment far too low. But the engineers resurrected my song. They worked for hours. First they "blew it up", and over it came against a huge roar of background noise. Then, bit by bit, somehow or other they abstracted the background noise and there was my song, quite presentable.

Off the Record

Only one set of tapes of mine ever beat them, and it beat me and everybody else. I once recorded a Ju-Ju ceremony of witch-doctors in the Okene Hills. It was a very frightening ceremony and I was very lucky to get it. It represented the return of the village Ancestor ghosts from the dead to take over command of the village for one day and one night. At the climax of this ceremony, when the masked and hooded figures of the ghosts are doing their "power dance", they are supposed to have drained away the life-force out of everything in the area and everybody in the village for their own use.

It was a very precious recording, so I used two tape recorders. When I played over the tapes that night in the *Grand Salutation and God Help Us Hotel*, I discovered a very strange thing: **during the three minutes of that ceremony's climax neither recorder had recorded anything!** Both tapes were blank for just three minutes, and then went on as before.

I told my Nigerian driver about this, and he gave me the kind of tolerant smile you might give to a backward child; and he said very simply and sincerely "But of course".

TAKING UP TAPE

1. Choosing A Tape Recorder

MOST of the articles in this and future issues of *The Tape Recorder* require some experience of the medium for their full enjoyment and understanding. But in this column I shall be writing each month expressly for the complete newcomer to tape. Starting at the beginning and taking each joy and snag in turn, I hope to provide you with that minimum of knowledge which is so essential for the best results.

To begin with, let us assume that you are on the point of acquiring a tape machine for the first time. Choosing a tape recorder from the 60 or 70 types available, ranging in price from £30 to £300, is quite a problem, and I suggest that you should begin by making up your mind which of the basic types of recorder is right for the particular jobs you have in mind.

It is a pretty safe bet that you will become more and more ambitious as time goes on, so you should try and take your future needs into account even in the initial stages.

Basic Types of Tape Recorder

Tape recorders may be grouped together in a number of ways—they could be categorised by weight, like prize fighters, for instance—but I suggest the following four headings are sufficient for our purposes: (a) *General Purpose Recorders*; (b) *Semi-professional Recorders*; (c) *Miniature Recorders*; (d) *Professional Portable Recorders*.

General Purpose Recorders, of which **fig. 1** is a typical example, are widely used by people in every walk of life, and are produced in a host of designs. They can usually be described as "portable", though it is not everyone who would care to carry the heavier types—up to 60 lb.—more than a few yards. They will take up to a 7-inch diameter spool, i.e. 1,200 feet of standard recording tape. The playing times of the most common sizes of reel are listed in **Table 1**.

When making your final choice of a machine in this most popular category, do try the "feel" of the various controls. Some machines are more fiddling than others to operate, and you should select one that you find easy to handle. Decide which speeds are going to suit you best—fast for best quality and ease of editing; slow for economy of tape—and listen to the quality of reproduction at each speed. If the built-in loudspeaker gives a satisfactory sound—and preferably not only on the dealer's demonstration tape—all well and good. If you are anxious to get improved playback quality on occasion, or extra power to fill a large room or hall, check that facilities exist for feeding an external loudspeaker and/or amplifier.

There will often be a microphone offered as part of the recorder. Make a test recording on the spot, and try and get an idea if this microphone is going to be suitable for all purposes. If not, find out what alternative types can be used, and at the same time see what the arrangements are for recording from the radio, gramophone pickup, telephone, and other tape machines, as required. Finally, see whether the Level and Timing Indicators are adequate.



Fig. 1: *General purpose recorder. The Repts (Tape Recorders Ltd.) R20 has three speeds, 3½, 7½, and 15 i/s, and costs 62 guineas.*



Fig. 2: *E.M.I. TR51 professional transportable recorder takes up to 8½ inch spools; price £175.*

Semi-professional Recorders. It is impossible to draw a firm dividing line between machines in the previous category and semi-professional recorders—and I am certainly not going to try. And yet the "semi-professional" label may correctly be applied to quite a number of machines. Not surprisingly, these recorders cost more than their domestic counterparts, but generally speaking you get more for your money. Less preoccupied with "keeping his weight down", the designer is able to aim at superior standards of reproduction, in terms of speed consistency, and quality in general. Large spools of 8½ inch or 10 inch diameter are usually catered for, and comprehensive monitoring and editing facilities.

When choosing a semi-professional machine, you will naturally study the full technical specification in conjunction with that of the rest of your equipment, to see that they match up. It would be pointless to use a superior quality tape recorder with indifferent microphones, amplifiers and loudspeakers.

Spool Diameter	Length of Standard Tape	Playing Time			
		1½ i.p.s.	3½ i.p.s.	7½ i.p.s.	15 i.p.s.
3"	175'	18' 40"	9' 20"	4' 40"	2' 20"
5"	600'	64'	32'	16'	8'
7"	1,200'	128'	64'	32'	16'
10½"	2,500'	264'	132'	66'	33'

Table 1

Playing Times For Standard Tape. Notes to the above table: (1) These figures are for one track only. When both tracks are used, the available playing time is doubled; (2) Using the Long Play Tapes, which have a thinner base, the length of tape on a given size of spool and therefore the playing time may be increased by approximately 50%.

Lightweight Recorders

Miniature Recorders, such as the 4½ lb. Fi-cord are often used by business people as a kind of audio notebook to record facts and figures, interviews, etc. As speech intelligibility is important rather than musical quality, the slowest tape speeds are employed to give long running time even with spools of 3-inch diameter or less.

When choosing a machine under this heading, the things to check on are the types of battery employed, their operating life, and whether they are easy to replace. If you require to playback to a large group of people at any time, you should arrange for a demonstration of the recorded quality when reproduced over standard equipment.

Professional Portable Recorders, such as the E.M.I. machine visible on our cover picture, are best employed for recording in the field, or "on the move" when quality is important, e.g. for

British Recorders meet the challenge . . .

With the spur of increasing and substantial competition from continental designers certain British tape recording manufacturers have well and truly accepted the challenge. To name but a few—REFLECTOGRAPH, REPS, VERITONE, VERDIK. Come to Audio House and see for yourself how well these British recorders perform.



REPS

Practically a hand-made machine as a high quality tape recorder such as this cannot possibly be mass produced. Provision for stereo adaptation if desired.

R 20 62 gns. with magic eye record indicator.

R 30 66 gns. with meter record level indicator.

R 40 70 gns. as R 30 but with push/pull sound output.

REFLECTOGRAPH

Model 500. Entirely self-contained. Separate record and replay heads—two independent amplifiers. Push button controls with safety latch for record button. Clock type tape position indicator. Complete with output amplifier, two matched loudspeakers. 94 gns.



VERDIK

A fully monitored QUALITY tape recorder with a feature hitherto obtainable only in equipment costing double the price. Separate Record and Play-back amplifiers and heads allow playback as you record—no more ruined recordings. Speeds $3\frac{3}{4}$ "/sec., $7\frac{1}{2}$ "/sec. Five valves plus magic eye level indicator. High flux internal speaker. Frequency 40 c/s to 12 kc/s. Corrected output for play-back through your Hi-Fi amplifier. Provision for 15 ohm external speaker. Complete with 1,200 ft. tape and microphone. 45 gns.

Make full use of your recorder . . .

As a regular reader of *Hi-Fi News* you may be familiar with the excellent resources of our Tape Library and are enjoying the rich entertainment these facilities provide. There are still several users of tape recorders however, who are unaware of the hours and hours of pleasure afforded by this service. To those we say send for details today. 6d. in stamps. A grand selection of stereo and monaural recordings is available.



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professional news reporting, bird song and other natural history recording, etc. They will usually incorporate the faster recording speed $7\frac{1}{2}$ i.p.s., in the interests of good frequency response, keeping the overall dimensions down by leaving off such luxuries as the playback amplifier, loudspeaker and even the erase head. The total weight must, of course, include the batteries, but serious playing back of the tapes is done on static equipment.

Depending on the amount of recording you expect to do on each assignment away from base, you should budget for a carrying case of spare tapes and batteries. If a mains supply is likely to be available you may include a battery charger to recharge the H.T. cells, while you rest after a day's recording!

Next month "Taking Up Tape" will deal with learning the language of tape.

Our readers write . . .

IN order to make this a lively feature we have decided to begin a monthly competition. The best letter received, in the Editor's opinion, will receive a prize of one 7-inch reel of recording tape. The second and third best will receive 5-inch and 3-inch reels respectively.

This *Readers' letters* feature will be expanded, starting with our second issue, and will provide an outlet for readers to express their views on everything to do with tape. Your queries and problems are welcome also, and will be answered in this column, if of general interest, or by post (S.A.E. please). A number of letters have already been received, and two are printed below to start the ball rolling.

Playing Discs Through a Tape Recorder

Dear Sir:—As I have just put my name down as a subscriber to *The Tape Recorder*, I may perhaps be the first to pose a technical query. We have the usual high quality set-up comprising:—Leak TL10 and Varislope, Dulci FM Tuner, Collaro, Ronette, Connoisseur motor unit, and Stentorian 10 in. plus Kelly Ribbon. In addition I have a "D" model Ferrograph Tape Recorder fitted with a new type capstan motor. The Ferrograph has given excellent service for six years, and if fed into the speakers gives all the quality and volume required for domestic conditions. In fact it makes the Leak and Varislope redundant, except for one feature. That is, I have been unable to play gramophone records through the Ferrograph because the treble and bass controls do not function on input, and there is no correction circuit for 78s and the various LP characteristics.

So the query is:—What additional equipment is necessary to play records through the Ferrograph Recorder, using a Collaro Transcription Pickup with Ronette Cartridge (TX88), Yours truly, **J. W. C. Gloucester.**

As you say, most tape recorders which incorporate tone controls apply the control only on the replay side. This means that playing straight through the built-in amplifiers gives no provision for equalising gramophone records. If separate equalisation is required for the various recording characteristics, then nothing short of a standard control unit will suffice. As you already have a Leak Pre-amplifier, it could probably be arranged to feed this into the high level input of the tape recorder, for this purpose, replugging when you propose to record.

Mixers for Use in Tape Recording

Dear Sir:—I am very interested in tape recording, and would be very obliged if you would give me details of where I could obtain a circuit of a sound mixer, enabling me to mix two ribbon mikes, one crystal pickup and one tape recorder (complete with playback amp.) into a Vortexion tape recorder. I am a reader of *Hi-Fi News* and am looking forward to the first edition of *The Tape Recorder* this month. Yours faithfully, **E. O'Connell, Dublin.**

Satisfactory mixing is achieved only with a fairly complicated mixer circuit. A summary of the available ready-made mixers will appear in our next issue (and articles describing mixers that you can make at home will follow).



FAMOUS husband and wife partnership, Cyril Smith and Phyllis Sellick, rehearse at home with the aid of a tape recorder. Robbed of the use of his left hand by illness, Cyril Smith and his wife are now playing works for three hands. Many of these they arrange themselves, but many prominent composers are writing works specially for them. Their story is told in their recently published book "Duet for Three Hands".

Ferrograph Introduce the New "Series 4"

BBRITISH Ferrograph Recorder Company Limited begin the New Year with an important new policy of rationalisation. As from January 1st, with the introduction of the "Series 4" decks and recorders, the Company is standardising production to the extent of cutting out unnecessary and uneconomic alternatives in colour schemes, and adding several really worthwhile features to its products in order to make them more elastic, in terms of conversion and adaptation, for the years ahead. Item by item, the changes are as follows:

Colour Schemes. All decks are now being made in one-tone grey. All cases are being supplied in a darker grey. All knobs, etc., are in a darker grey. The result is a standardised two-tone grey overall finish.

Mechanical Changes. (1) The function control—hitherto a large knob, which has proved difficult for some users to turn—has now been replaced by a lever-type knob. (2) The capstan motor is now on a resilient mounting, which makes the unit more silent. (3) The indicator, which used to be belt-driven, is now gear-driven, and gives accuracy to within one turn. (4) The "Brief Stop", hitherto an extra, becomes a standard feature on all models. (5) The plastic head cover, previously in two pieces, is now in one piece, and hinged to assist easy tape loading.

Most important of all, however, is the final item. (6) The introduction of plug-in heads. The new "Series 4" instruments are being sent out with heads as ordered, *plus* a dummy head and rocking device (for azimuth adjustment) in the unused position. The user can thus unplug the dummy head and replace it with any other head in the Ferrograph range . . . for monitoring, stereo replay, top or bottom track erase, etc. This plug-in arrangement will also make it possible to adapt the recorder for the new American double track, narrow tape stereo. The well established Ferrograph automatic stop, for tape breaks or end of spool, has been retained by incorporating it with the first (erase) head, thus leaving room under the cover for three heads.

Announcing these changes, Mr. Merrick (Managing Director of British Ferrograph) added that, in his view, the new "Series 4" should make it far easier for customers to buy with an unknown

NEWS PAGE

plan ahead of them, particularly with the possibility of stereo in mind. Conversion for stereo is not always easy; but with this new arrangement it certainly removes the greatest bother—that of sending the deck back to the factory!

Tape Recorders (Electronics) Ltd., 784-788 High Road, Tottenham, London, N.17, recently became sole distributors in this country for "Sonocolor" magnetic recording tape. Standard, long and double play tape will be available in a full range of sizes from 3-inch to 7-inch spools, and for standard play up to 10-inch. Prices for 7-inch spools are standard 35s., long play 50s. and double 75s. Also available are a wide range of jointing and editing accessories, including an *Accessory Kit* containing a splicer, 3 spools of leader tape, printing tape, jointing compound, 10 safety clips and spare parts for the splicer. Price 65s. Also available for the first time in this country is their super synchro-line tape on 5-inch spools.

Anonymous: A well known tape recorder dealer recently had a request from a lady customer for a tape recorder "for recording thoughts"—as that is what she said she was regularly receiving from her next door neighbour. The dealer is now looking for a "telepathic" tape recorder.

Also Anonymous: A recorder sent back to the manufacturer for repair was found to have a dead mouse, which had been electrocuted by the output transformer—they are now thinking of adding to their advertisements "Electronic Mousetrap!"

(Continued on page 14)



"The trouble is, Sir,—you have a half-track mind"

FREE!

40 page catalogue

For tape recorders or Hi-Fi, YOU MUST SEE this unique new catalogue from the Tape Recorder Centre. 40 illustrated pages, free of charge, giving details of all makes of tape recorders, accessories and Hi-Fi equipments. The most comprehensive catalogue of its kind, listing over 150 items. All orders over £30 on no interest Terms.

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NEWS PAGE—(continued)

The Tape Recorder Centre (Sypha Sound Sales Ltd.), of 75 Grand Parade, Harringay, London, N.9, have produced a most comprehensive and informative catalogue of tape records and Hi-Fi equipment. More than 150 items of equipment, 60 of which are illustrated, are described on its 40 pages. Full details are given of over 35 recorders. At the back is a useful table of suggested Hi-Fi combinations and their prices. This catalogue will be of great interest to everyone interested in the subject. Copies are available free on mention of *The Tape Recorder*.

The Tape Recorder Centre wish to make it quite clear that there is no connection whatsoever between them and a firm calling itself The Tape Recorder Club, of 73 Grand Parade, Harringay.

A Grundig to the Rescue

A tape recorder came to the rescue when the Rank Organisation decided to add five words to the dialogue of their production "Operation Amsterdam", starring Eva Bartok, Alexander Knox, Tony Britten and Peter Finch, after shooting had finished at Pinewood Studios. The star concerned, Alexander Knox, made a 50 mile dash from his home in Bamburgh Castle where a Newcastle dealer was standing by with a Grundig tape recorder. The tape was in the hands of the producer the following day.

Walter Sales-Aid



The photograph demonstrates the new "talking" sales aid which has been developed by Walter Instruments, Ltd., for their tape recorder range.

A continuous length of recording tape is placed round the reels of the recorder and passes the recording head. The retailer records a sales message on this tape and puts the recorder in the "play" position. The two arrows are fitted over the reel retaining nuts and

revolve as the message is being played. Behind the machine in the picture (a Walter 505), is the new Walter showcard, which gives details of three machines in the range.

Tape Recording Course

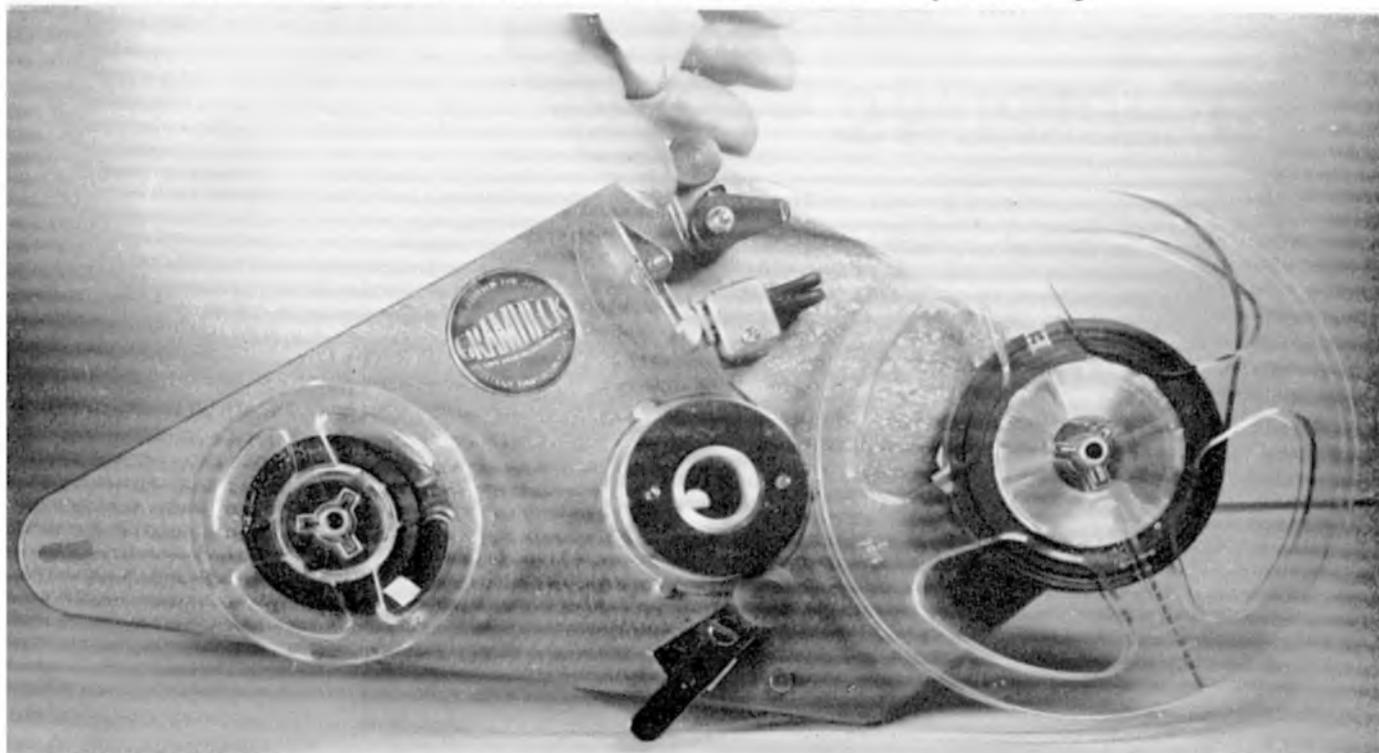
A SPECIAL Five Day Course on Tape Recording will be held next Easter—31st March to 4th April 1959 (inclusive)—at The Rose Bruford Training College. Lectures on interviewing, production, editing, sound effects, narration, equipment, etc., will be based on practical studio and field work done on the Course under professional supervision. Our Technical Editor, John Borwick, has been invited to give some of the lectures. Full details from: Special Courses Organiser, Rose Bruford Training College, Lamorbey Park, Sidcup, Kent.

Simon SP/4 Recorder Accessories

SIMON SOUND SERVICE have announced the conclusion of arrangements with Messrs. Bowmaker (Commercial), Ltd., whereby Simon appointed dealers will be able to offer their customers full hire purchase facilities on any Simon commercial product.

HI-FI NEWS FEBRUARY

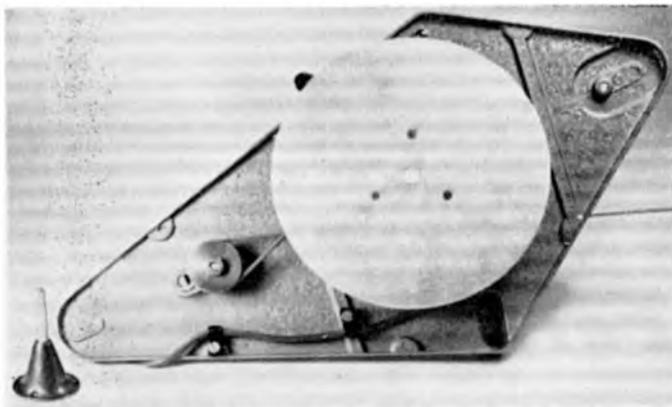
In the February issue of *Hi-Fi News* Stanley Kelly carries out the first technical analysis of the new RCA 4-track Cassette.



THE GRAMDECK CONVERTS GRAMOPHONES TO RECORDERS

* The *Gramdeck* is something completely new. It is ingenious. It is simple. It fulfils a useful purpose. It is cheap. It is, in fact, one of those rare inventions which make one exclaim: "Why on earth did no one think of it before!"

THERE are two good reasons why tape has taken a relatively long time to "catch on". The first is that it is a new medium which, compared with the gramophone record, the public are not used to handling. The second is that instruments for playing tape—for handling tape—are comparatively rare. There are of course several million tape recorders in use throughout the world; but there are probably 500 record players in domestic use for every 1 tape machine. How logical it all seems



Above is the underside view of the *Gramdeck*, showing the large diameter plate which sits on the gramophone turntable and provides the drive for the tape transport system. The belt drive to the tape take-up spool can be seen on the left; while on the extreme left is the cone-shaped table locating pillar.

therefore, to use the gramophone as a medium for introducing tape!

This is precisely what Mr. A. Tutchings has done by introducing the new *Gramdeck*. Its appearance and general layout need little description, for our two photographs show it off very adequately. Mechanically, it consists of a strong metal plate which carries a tape transport system of extreme simplicity, a sound head, a permanent-magnet erase head... and the heart of the idea, which is the drive link for making the gramophone turntable do the work. This is a large diameter metal plate which grips the turntable mat under pressure from the weight of the *Gramdeck* itself. This plate, or disc, is mounted on a short shaft, on the other end of which is the capstan wheel; and the shaft is precisely mounted in a ball race, which requires occasional one-drop applications of a light-oil, such as *three-in-one*.

The Mechanical Layout

A belt drive is taken from the shaft to a small pulley for the take-up spool, and completes the mechanism as such. Reference to the large photo at the beginning of this report will explain the sequence of components. Right, is the feed spool (up to 7-inch diameter). Top, between the fingers of the hand, is the tape guide; and immediately below it, with the safety catch swung back, is the permanent magnet erase head. For recording or replaying tapes, this catch is closed, and the tape is guided round the top of this small assembly. For erasure, the catch is swung back, as photographed, and the tape is guided past the magnet. From either of these two alternative channels, the tape passes to the sound head (see also the large photo of this unit), round the capstan roller in a clockwise direction, and is held firmly against it by the pinch roller. This is also a neat and simple device which automatically locks outward in the out-of-use position, and which clicks into "play" position on pressure of a small button beside it. From the capstan roller, the tape passes to the take-up spool on the left.

* This is NOT a review

1964
TOMORROW'S
 1963
Tape Recorder
 1962
is here
 1961
TODAY!
 1960
 1959



During the ten years that have elapsed since we first blazed the trail for Tape Recording an important new Industry has been created. To us it is a matter of pride that so many features of that first Ferrograph have since become standard practice and embodied in the designs of other manufacturers.

To-day we again look to the future and initiate a policy to ensure that—no matter how Tape Recording develops or for what purpose it is used—every Series 4 Ferrograph can be readily adapted at any future time for a variety of applications. To achieve this, space has been provided under the Head Cover to permit Head changes and additions for monitoring, stereo recording, stereo playback, dual track stereo to the new American standard or for lower track use. Such Heads are designed to be plugged in and are fitted with rocking facilities for azimuth correction.

This Ferrograph development, for example, permits any Series 4A to be instantly converted into a Series 4S merely by plugging in the additional stereo Head costing seven guineas.

Simultaneously the following important design improvements have been incorporated:

- * The capstan motor is resiliently mounted for quiet operation.
- * Function Switch Knob is re-fashioned for greater ease of operation.
- * Brief Stop (or pause control) is now a standard fitting on all Ferrographs.
- * The Head Cover—a one-piece moulding—is hinged for easy tape loading.
- * The Turns Counter—now gear driven—is accurate to a turn.

Finally, to conform to our policy of rationalisation, the Ferrograph will be supplied only in one standard colour finish—a handsome two-tone grey. It is available in two forms, either as a portable or as a unit for installation into your own cabinet, in the following models:—

Series 4A	Series 4S
With standard monaural Recording/ Playback facilities	With optional stereo sound playback facilities in addition (when used with Stere-Ad Unit.)
Model 4A/N 3¼/7½ i.p.s. 81 gns.	Model 4S/N 3¼/7½ i.p.s. 88 gns.
*Model 4AN/CON 3¼/7½ i.p.s. 81 gns.	*Model 4SN/CON 3¼/7½ i.p.s. 88 gns.
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*The suffix CON denotes console form for building into own cabinet.

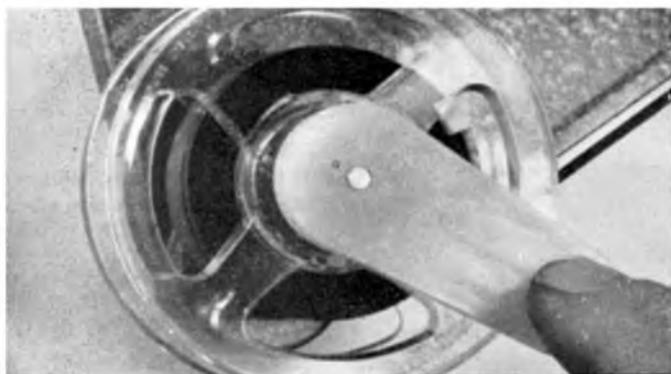
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GRAMDECK REPORT—(continued)



Tape rewinds at about $\times 3$ tape speed are possible through the normal turntable drive; but faster rewinds can be achieved by hand. For this purpose a small plastic "crank" is provided, with a finger hole at the end.

The only "fitting" that is required, in order to use the Gramdeck after unpacking it from its box, is the small locating pillar. This can be screwed to the motorboard by three self tapping screws, so that the slot in the deck drops over it—and thus prevents the whole deck from turning when the turntable revolves. Different turntable units have their motors mounted in different positions under the motor board; and since the sound head can pick up hum from the motor field, it is advisable to try the Gramdeck for the best position before fixing.

With the turntable set to a speed of 78 r.p.m., the tape speed of the Gramdeck is $7\frac{1}{2}$ i/s. At the 45 r.p.m. turntable speed, a



This close-up photo shows (top) the swing-back catch which permits the tape to be dropped into the channel for erase. The permanent magnet erase head is beneath the screw. (Bottom), the tape head, with the pressure pad which can be swung back by finger pressure on the arm.

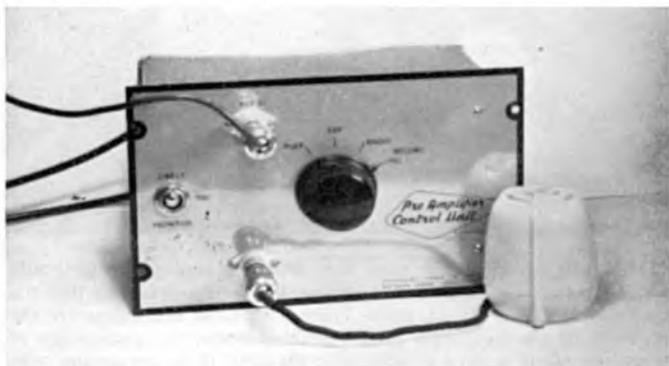
tape speed of 4.33 i/s is obtained. At the standard L.P. turntable speed of $33\frac{1}{3}$ r.p.m., the resultant tape speed is 3.20 i/s, and owners of 4-speed turntables can obtain an additional tape speed of 1.60 i/s with the gramophone's $16\frac{2}{3}$ r.p.m. speed. Although the Gramdeck thus provides only one "standard" tape speed, the other three speeds can be most useful for trick-dubbing, etc. And, of course, when two friends wish to send tapes by post to each other—as many people already do, in lieu of letters—the slow speed will be most useful, provided only that both parties own Gramdecks! One immediate use for this very

clever device will already have sprung to mind, so no further comment is required on this score—a ready-made "second-channel" for amateur tape editing and dubbing!

The leaflet supplied with this unit is by far and away the most informative that we have encountered for many a long day. It tells you absolutely everything that you could wish to know about both the Gramdeck itself, and its control unit. And, for the benefit of the home constructor, it includes circuits from which control units can be built up.

Microphones which are suitable for use with the Gramdeck include Reslo type P.G.D. (600 ohms); Gramplan type D.P.1/H or D.P.4/M. Lustraphone type D.P.M. Vitavox type C.N.180. These have impedances near the optimum 500 ohms and may be plugged directly into the control unit. Crystal microphones, such as Acos 33-1 : 39-1 : Mic 40, should be fitted with a series resistor of 100 K ohms mounted inside the co-axial plug. This resistor may be substituted by one of 50 K ohms if greater bass cut is desired.

The Gramdeck and its Control Unit are now being manufactured by Stevenage Tools and Switches Limited, an Associated



The pre-amplifier/control unit is as simple as it is efficient. A co-axial socket at the foot of the panel accepts the co-axial plug of the selected microphone. Connection to the tape head, is made via the second co-axial socket at the top of the panel. The main control knob is a switch with 4 positions for replay, off, and radio or mic record.

Company of Sanders (Electronics) Limited. At the time of writing this report, negotiations are in progress between the manufacturers and a large marketing company, with a view to exploiting the device on a world-wide basis. We hope to be able to include the address, and the prices of the units, as a Stop Press footnote. Failing this, these details will be given on our News Page next month (March number), and we earnestly request readers not to write to us for them in the meantime, for our Editorial Office is already over-burdened with correspondence.



This shows the Gramdeck on the turntable of a radiogram.

"Something New!" next month will be the R.C.A. Tape Cassette. Do not miss this first complete authoritative report.

THE STORY OF "TAPE"

- This is the first of two articles on the history, development, and manufacture of magnetic tape, prepared with the co-operation of E.M.I. Ltd. Next month's article will deal with the actual manufacturing processes.



by W. H. Y. Grainger

- At present, a comparatively small percentage of the enormous annual output of magnetic tape goes to produce E.M.I. Tape Records of popular and classical music for the domestic market, for use with single-channel and twin-channel tape players. This photograph shows a part of the H.M.V. Tape Record reproduction department, where "Master" and "Slaves" re-print music as required.

THE use of magnetic tape for sound recording is generally regarded as a modern innovation, but whilst it is true that the specialised, plastic based, oxide coated tapes in use today are the products of comparatively recent developments, the conception of recording along a strip of magnetic material is by no means new. As long ago as 1888, Oberlin Smith suggested weaving small magnetic particles, such as steel dust or short lengths of fine steel wire, into a cotton or silk thread, and using this for recording sound magnetically. The reason he suggested this particular method was, of course, due to the fact that at that time it was universally thought that magnetisation of any bar, strip or wire, would result in a single magnet with a North pole at one end and a South pole at the other. No one believed that it could be possible to induce differential magnetisation along such a length, and so Oberlin Smith naturally imagined that to produce a number of small magnetic fields within the material, one must start with a number of small magnets.

Despite these suggestions, however, it was not until ten years later, in 1898, that Vladimir Poulsen carried out the first practical work on this matter. He wondered whether it might not be possible to produce this differential magnetisation by using a magnetic material hard enough to prevent the magnetisation from spreading to the edges of the material. He took a hard steel plate and an ordinary bar magnet, and traced one end of the magnet over the surface of the plate in the shape of letters. When, afterwards, he sprinkled iron filings over the surface of the plate, he found that they did, in fact, adhere to the portions over which he had traced the letters, and not to the rest of the plate.

The First Magnetic Wire System

Having thus proved that differential magnetisation was possible if a hard enough material were used, Poulsen went on to develop his Telegrafone, using a hard steel wire drawn continuously past an energised magnetic pole. The invention of the Telegrafone caused a great stir at the time of its first appearance, but owing to the considerable developments taking place in the field of disc and film recording, interest tended to be concentrated on these media at the expense of the magnetic technique.

After Poulsen's Telegrafone, the only workable machine which was developed and perfected to such a state that it was usable for commercial purposes, was the Marconi-Stille recorder. This utilised a steel ribbon 3 mm. wide and .08 mm. thick, instead of Poulsen's steel wire, and thus became the first true magnetic tape

recorder. This steel ribbon was drawn at a continuously fast speed (1.5 metres per sec.) between two square section pole pieces which, on energisation, produced a transverse magnetisation through the ribbon as it passed between them.

1928... Tape

The Marconi-Stille recorder did produce quite good results, but the enormous reels, containing the 2,700 metres of steel ribbon necessary for a 30 minute recording, were so bulky and heavy that they practically needed two men to lift them into position, and constituted a serious drawback to the widespread use of the equipment.

It was, however, suggested by Pfelemer, in 1928, that a much better result might be obtained by using a tape coated with iron particles, and it is from this suggestion, with the later modification of using iron oxide instead of metallic iron, that present-day tapes have been developed. As a result of the very small particle size obtainable, an extremely smooth rate of change of flux can be attained, making for good quality of reproduction.

Throughout the 1930s, and during the war years, considerable development work was carried out on magnetic tapes, particularly on the Continent; and at the end of the war, tapes were commercially available in a form comparable with those used today.

Ring-type Recording Head

With the concurrently developed ring type recording head, which made it possible to impose a longitudinal magnetisation along the length of the tape, as opposed to the transverse magnetisation induced by the two separate pole pieces in the Marconi-Stille equipment, these new tapes were capable of such good results that the technique began to be increasingly adopted for record making and broadcasting applications; and subsequently, when it became possible to introduce a magnetic stripe down the edge of the film, for the motion picture industry. Most of the subsequent development which has been carried out on base films and magnetic oxides has been inspired by the needs of these various applications.

First British Tape Manufacture

When magnetic tape first began to be manufactured in this country in 1948, the most suitable base film which was obtainable to the very close limits required was cellulose acetate, and this medium was used successfully for some time. Its main disadvantage, however, was a susceptibility to varying humidity, and for

THE STORY OF "TAPE"

this reason it tended to be unsuitable for use in extreme climatic conditions.

To offset this disadvantage, a number of homogeneous tapes were made available in which the oxide, instead of being coated on to a film surface, was dispersed in a P.V.C. mixture which was then extruded or cast into a tensilised film of the desired thickness.

However, once Polyvinyl Chloride film became available in a very high degree of consistency, it was found to be a most excellent base for coated tapes, being impervious to changes in humidity. With its use, tapes can be produced which will remain flat throughout their lives and will not develop curl during storage, neither will they lose strength nor become brittle with age.

More recent developments in film have resulted in the use of a material known as Polyester for certain types of recording tape. Whilst this film tends to combine certain of the good qualities of cellulose film and retain the durability of P.V.C., its main disadvantage is that it is more expensive to produce, and is also liable to stretch to a much greater extent than either P.V.C. or the earlier cellulose material.

"Long Play" Tapes

With the development of new types of film, both P.V.C. and Polyester can now be used in a thinner form, and advantage has been taken of this to produce long-playing tapes; thus from a 7 in. diameter spool it is now possible to obtain 45 minutes of playing time instead of 30 minutes as previously. This is obviously a great advantage to users of domestic equipment, where the spool size is limited and the maximum possible playing time is desired.

These thinner films are naturally more fragile, and a recording tape made from these materials will stretch if excessive loads are applied. With reliable recording equipment, however, such excessive loads are not in evidence, and the material shows adequate strength and freedom from stretch.

One form of cellulose, the triacetate, is still used as a base for one particular magnetic recording field. Certain applications in the film industry call for 35 mm. coated tape, sprocketed in the



● This picture shows a stage in the making of magnetic tape. Note the wide strip unrolling from the machine on the right.

same way as photographic film, and used through a similar drive mechanism. In view of the somewhat stringent mechanical conditions, it has been found that a triacetate base .005 in. thick, as used for photographic film, is best for this particular requirement.

Concurrent with the development of base films, a very great deal of work has been done during the past eight years to improve the magnetic oxide itself, both with regard to uniformity and fineness of particle size, and also the magnetic properties of the particles themselves.

The oxide used on tapes manufactured in the immediate post-war period had a coercivity value in the region of 120 oersteds, and such tapes are now referred to as "low-coercivity." Very good results were obtainable from these tapes, but to achieve a satisfactory frequency response, a recording speed of 30 in./sec. had to be used. This was obviously a disadvantage as to economy of material, and also in view of the fact that even the large professional studio recorders would only normally accommodate spools of 3,250 ft. of tape, so that the unbroken recording time was limited to about 21 minutes.

Shortly afterwards, however, tapes were made available with a "high coercivity (about 270 oersteds) and this meant that equally good results could be obtained at a recording speed of 15 in./sec., and very good quality at even 7½ in./sec., a feature which was extremely important owing to the increasing domestic interest in this form of recording.

Since then, even newer tapes have been introduced, with oxides having a similar coercivity but higher sensitivity, with the result that a better signal to noise ratio is obtainable, and domestic equipments are enabled to be less complicated to achieve the same good results. In all, tape sensitivity has been increased by about 15 decibels since the first post-war production.

Another important feature of these newer types of tape is that two or more tracks can be recorded on the same ¼ in. width, a very great saving of material for domestic applications where a flexible editing facility is not normally required.

When it is considered that the newly available Tape Records have very high quality music recorded on a track only 110 in. wide at a speed of 7½ in./sec., whereas eight years ago it was necessary to record at 30 in./sec. and to use the whole ¼ in. width to achieve similar results, it will be realised what tremendous steps have been taken since the war in developing this "new" medium.

In next month's article, the manufacture of a specific type of recording tape will be described in some detail, together with information as to its testing and advice as to its use.

The above data provide an interesting summary of standards to which present day magnetic tape is manufactured.

Note: The term *Micron* is becoming more widely used in the audio world, now that styli tips are growing smaller and smaller. Instead of saying "one thou" (0.001) many people now say 25 microns. One micron = approximately one forty-thousandth part of an inch!

PHYSICAL CHARACTERISTICS OF P.V.C. BASED TAPE

	Standard	Long Play
Thickness:		
Base film (mean)	0.0016 in. 40 microns	0.001 in. 25 microns
Coating	0.0005 in. 12.5 microns	0.0005 in. 12.5 microns
Total thickness (not to exceed)	0.0023 in. 57.5 microns	0.00165 in. 39.0 microns
Width:	0.25 in.	+0 -0.004 in.
Tensile Strength (per ¼ in. width):	7.5 lb. 3.4 Kgm.	5.5 lb. 2.5 Kgm.
Elastic Elongation:		
At 1 lb. (0.454 Kgm.) load, 15 sec. application	Less than 0.5%	Less than 0.6%
Yield Point (per ¼ in. width):	4.5 lb. 2.04 Kgm.	2.75 lb. 1.25 Kgm.
Recommended Operational Tension:	3 oz. 85 grammes	3 oz. 85 grammes
Longitudinal Temperature Coefficient:	4 × 10 ⁻⁵ per degree F.	
Humidity Expansion:	Negligible	

**SOMEONE ELSE HAS DISCOVERED
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★ "The Tape Recorder" has invited I. W. Jarman to give readers a few pointers on professional tape editing. Mr. Jarman, who has been a recording engineer with the BBC for many years and was one of its pioneers of tape editing, is at the present time engaged on instruction in this field.

Not surprisingly the BBC is easily this country's biggest user of tape and some 80% of its pre-recorded programmes require editing at some stage of their production. With the tremendous demands made on tape room facilities, you will understand that speed of operation is at a premium.

As with most skilled craftsmen, Mr. Jarman gets his results by attention to detail and we feel that few home tape enthusiasts can fail to learn something from the photographs we have taken of his hands in operation.

* * *

AT some time or another you must have felt that some improvement could be made to your tape recordings. A mistake or a lengthy pause could be removed, a retake could be made of a particular portion to replace a poor first attempt, the transposition of a word or phrase to add "punch" to your technique—in fact, you feel you would like to edit your tape.

In a series of articles I shall be covering the mechanics of tape-editing and passing on hints which, I hope, will enable you to edit with speed and confidence.

The first of these articles deals with the repair of a broken tape and the accessories which will help you to achieve quick and efficient tape jointing. These you can see in **fig. 1** below.

HOW TO SPLICE TAPE

A PROFESSIONAL APPROACH TO TAPE EDITING

The ability to splice tape is an absolute essential for every owner of a tape recorder, for sooner or later a tape will break and it will have to be mended. Because of this elementary and inescapable fact it is obvious that nearly everyone who can use tape already knows how to join two lengths together. But, as with most things, there are good and bad ways—and, of course, there is a best! And since the best method is considerably easier than any other it is well worth mastering.

Firstly, the editing block, usually made of metal, channelled to the width of the standard recording tape and with a 45° slot cut in the centre. I recommend the use of a razor blade for cutting the tape. If you are using a double edged blade, it is advisable to cover one cutting edge with insulating tape to avoid cutting your fingers whilst using it. Care should be taken to prevent the razor blade becoming magnetised, since this could cause a noisy joint. The jointing tape should be of the same width or slightly narrower than the recording tape, i.e. ¼-inch.

I cannot stress too strongly the fact that only a recognised jointing tape should be used—this tape, especially made for the job, has a special "non-oozing" adhesive.

To mark the tape whilst editing, use a soft wax chinagraph pencil, preferably yellow, since this shows up most clearly. Finally, french chalk—a light dusting with which you can prevent any tendency to stickiness of the tape joints. The correct use of these accessories will be explained in detail as I deal with the circumstances in which you would require them.

In the series of accompanying photographs, you can see step by step the repair of a broken tape. The break shown in **fig. 2** is a simple one, i.e. a clean break where the two ends match. Firstly, ensure that the two ends to be jointed are clean, since

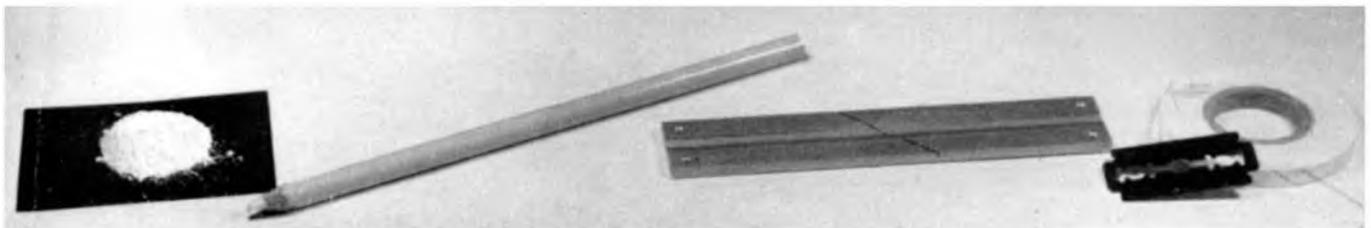


Fig. 1: Accessories required in tape editing—french chalk, yellow wax or chinagraph pencil, editing block, razor blade, and jointing tape.

★ FOLLOW THESE ACTION PICTURES



1
A
Clean
Break

Fig. 2: *A simple break, i.e., ends are undamaged and match perfectly.*



2
Butt
Ends
Together

Fig. 3: *Butt ends together in editing block, uncoated (glossy) side uppermost.*



3
Line up
Jointing
Tape

Fig. 4: *Approximately 1 inch length of jointing tape is placed over the break. Ensure that the jointing tape does not overlap the outer edges.*

AND SPLICE PROFESSIONALLY★

The ease with which tape can be edited—to cut out mistakes, to alter the timing, or even the rhythm of the whole, or in order to bring together a number of separate recordings—constitutes one of the major advantages of tape to a large broadcasting organisation. For the amateur, too, these facilities are available to improve the standard of home recordings. So, first things first—master the technique of professional tape splicing.

any foreign matter on the tape will affect the adhesive properties of the jointing tape.

In fig. 3 you will see that the broken ends have been butted together in the editing block with the uncoated (glossy) side uppermost.

The next stage is to cut off about an inch of jointing tape, taking great care not to handle the adhesive side more than necessary. Then, as shown in figs. 4 and 5, place the jointing tape over the break and smooth out firmly, ensuring that the jointing tape does not overlap the outer edges.

Next, lightly dust the joint with french chalk and run the tape between thumb and forefinger to remove any excess (fig. 6).

Fig. 7 shows inspection of the completed joint—no gap should

be visible between the two ends, and on playback of the tape the joint should not be audible.

That, then, is the repair of a clean break, where the recorded material has been unaffected. But consider the case when the tape has broken and some time has elapsed before you have spotted it and stopped the machine. Damage, such as fraying of the ends (caused by the tape lashing around unchecked), buckling, crimping or “bootlacing” (extreme stretching of the tape) due to the tape fouling parts of the drive mechanism, may have occurred.

In these circumstances it is obvious that straight jointing will not be satisfactory, and that some cutting of the tape, resulting in the loss of recorded material, will have to be effected.

4
Press
Down
Firmly



Fig. 5: Press down firmly to exclude air bubbles and ensure good adhesion.

5
Apply
French
Chalk

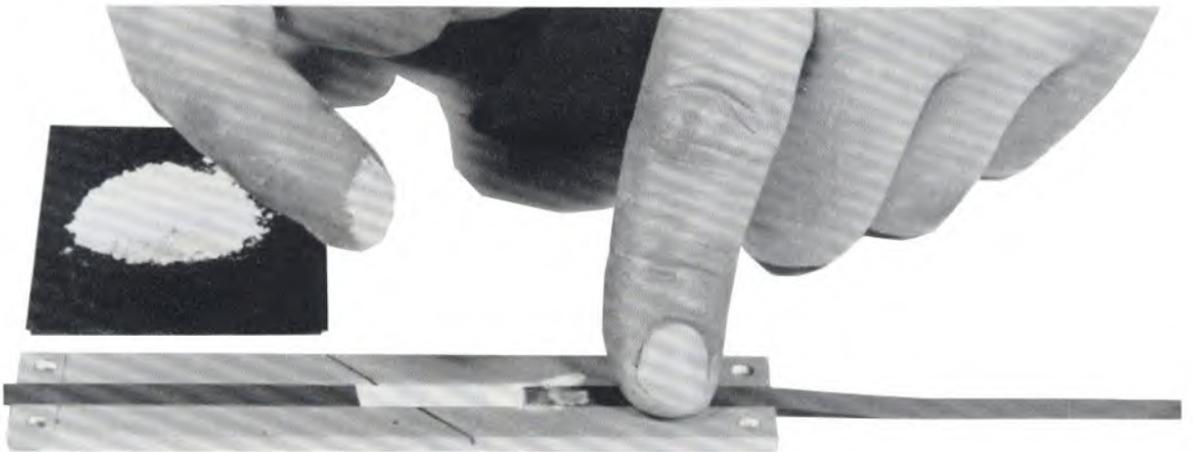


Fig. 6: Lightly dust with french chalk to remove any stickiness on or around the jointing tape, and remove surplus by running tape between thumb and forefinger.

HOW TO SPLICE: THE PROFESSIONAL APPROACH TO TAPE EDITING

You may find that it meets your requirements merely to cut away the damaged portion and make your joint irrespective of content. On the other hand you may feel that you wish to preserve the sense of continuity and you will, therefore, have to select and mark your cutting points carefully.

I shall be dealing with the actual marking and cutting of your tape in the next edition of this magazine. But in the meantime, should you have any queries on tape editing, please don't hesitate to write for advice.

I.W.J.

6
The
Perfect
Joint

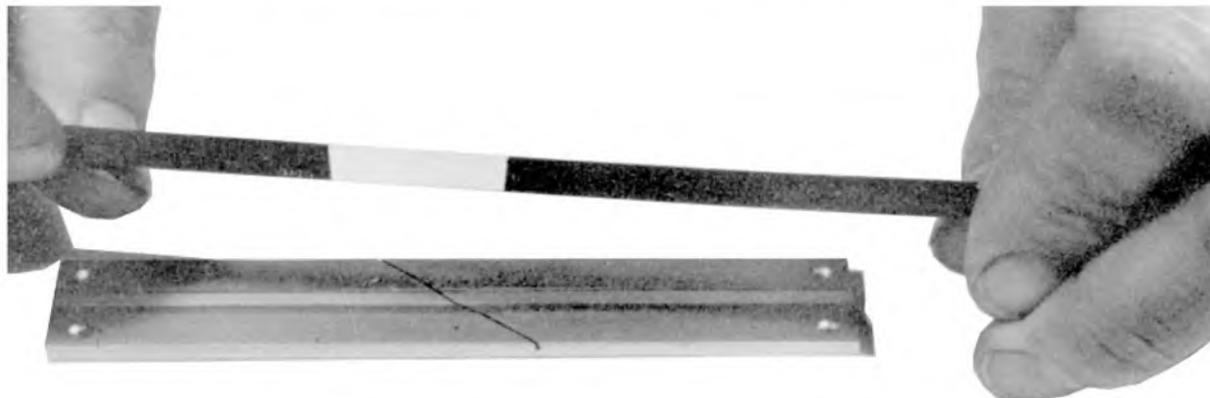


Fig. 7: Inspect the completed joint—no gap should be visible between the ends.

Editorial footnote: In the above article the author refers to jointing tape. It should be stressed that the ordinary types of "sticky tape" do not apply. They should *not* be used for this work. There are several makes of proper jointing tape on the market—for instance Agfa, Emitape, and Scotch Boy.—**Editor.**

★ It has been suggested that this photographic series, when complete, may be of use in the form of a handy reference booklet, and we shall welcome the views of readers on this point. At the same time we invite comments, criticism and suggestions for the possible expansion or modification of the feature.

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you own a recorder

NEXT, BUY A DECK



For those who want the best, the semi-professional Bradmatic 5D Deck takes 10½-inch spools, costs £50 with heads.

AS many keen users of tape machines have already discovered, you can get just so far with a single instrument—and then you come up against the impassable barrier. Beyond that barrier, which can only be crossed by the acquisition of a second machine, lie most fascinating new fields to be explored. With two machines, in fact, the opportunities for experiment and serious work are nearly doubled.

"That is all very fine!" replies the owner of a single machine, "but I have only just paid about £60 for a portable recorder; and I certainly cannot afford a second one. Have you any more bright suggestions?" And the answer is "yes." A second recorder is quite unnecessary at this stage. **Buy a Deck.**

The first and most important use for a second instrument, as suggested above, is for dubbing and editing; and for this work it is a *replay channel* that is needed—not a recorder. And this complete replay channel can be purchased for considerably less money than a complete recorder—certainly for less than £30.

You Need this Second Channel

Now at this point let us have a look at some of the more useful jobs that can be done with two instruments, as compared with one:

- (1) An existing recording made at any speed can be replayed and re-recorded at any other speed.
- (2) A recording from one track can be re-recorded to a clean tape for editing, thus avoiding cutting or interference with what is on the other track of the original.
- (3) The sound from an "edited" tape, with all its cuts and splices, can be transferred to a clean tape.
- (4) The sound being so transferred can be increased or decreased in level to match up with other recordings to which it may have to be married.
- (5) Additional sounds—commentary or effects—even a solo instrument—can be introduced on to the new tape as it is transferred.
- (6) Short loops of tape can be made, and played, and thus recorded as a continuous pattern by the recorder. (This subject is to be dealt with in detail by another author in the near future.)
- (7) Any tape recordings—or commercial "Tape Records"—can be played through the household radiogram, while the recorder is being used for other work.

And so, quoting the title of this article: "*You have a recorder: Now buy a deck!*" There are about a dozen different types of tape decks on the British Market, and they vary in price (according to their simplicity and/or technical quality) from about £20 to £85, complete with sound heads as required. The term "*Deck*", of course, means the mechanical part of a tape recorder *only*—with no electronics at all.

The Electronics are Added

In order to use such a deck one needs only a mains plug to connect the main lead to the household supply, and a *pre-amplifier* to boost the output from the leads of the sound head. This amplified output can then be fed to the "pickup" (P.U.) socket on a radio set, thus enabling the deck to be used for playing music from tape, instead of from discs; or it can be fed into the "Microphone" socket of the tape recorder for the various uses enumerated above (1) to (6).

So far, this article has only dealt with the subject in a general way. Let us now get down to the useful detail. It will be assumed that the reader who is sufficiently interested to "buy a deck" will eventually go further (and future articles will cover the still greater possibilities to be opened up by such progress); therefore the initial

purchase need not be too ambitious or costly. Since the deck will probably not be called upon to handle sounds of better quality than the recorder itself can record or reproduce, a deck of medium price will suffice. Later, if the interest grows, the enthusiast can buy a deck of really good professional quality—and he can convert it and use it for near-professional recording, too! So let us concentrate here upon good mechanical properties only, and as wide as possible a range of uses.

The *Collaro* deck is an immediate answer, bearing in mind the last eight words. It has a good "Wow and flutter" specification. It takes 7-inch spools. It provides three speeds (15—7½—3½ i/s). It has good brakes, and it costs only £25.

3-speed for Versatility

The advantage of three speeds on the deck can easily be seen, when coupled with a choice of three speeds on the recorder. Even when dubbing speech these various alternatives are useful; but when it comes to "playing around" with sound effects and backgrounds, the permutations are invaluable. Two examples of usefulness will suffice for emphasis. You have a recording made at 7½ i/s, and you wish to reduce it to 1½ i/s for a friend's machine. Your lowest speed is 3½ i/s. **Method:** play it back on the replay deck at 15 i/s, and re-record with the recorder set to a speed of 3½ i/s. The recording is now × 2 fast; and will then be at the correct speed for a machine at 1½ i/s.

Contrariwise, you have been sent a recording made at 1½ i/s, and your machine's lowest speed is 3½ i/s. **Method:** play it back on the deck at 7½ i/s and re-record with the recorder set to a speed of 7½ i/s. Then, when this is replayed at 3½ i/s, it will be at the correct speed.

Half-track Replay will do for a Start

The available makes of tape decks will be listed next month with their details and prices. For the simple duty of replay channel, only one head is necessary—a ½-track *replay* head. Though the *erase* head will be fitted, it can be ignored. The two wires from the sound head will provide the only electronic connection between the deck and the apparatus which follows it—the pre-amplifier.

This article is deliberately non-technical. Readers who wish to delve further will find an explanatory article in next month's number which will use diagrams and text to simplify connections between components. Suffice it to say here that the electrical output from a tape *replay* head is so feeble that it must be amplified about 1,500 times before it is strong enough to be used through the average domestic radio set fitted with "P.U." (pickup) sockets; and at least—times to make it strong enough to feed the "Microphone" socket of the average tape recorder.

There are several commercial "pre-amplifiers" on the market which have been made to do these jobs. *Cape Electrophonics* make a small tape "sub-amplifier" which incorporates CCIR connection for the three speeds (3½—7½—15 i/s). One of these sub-amplifiers is powerful enough to build up the tape output for feeding it to a recorder for dubbing. Two can be used (in series) to get the extra boost for feeding a radio's P.U. sockets for playing music. These sub-amplifiers cost £5. Complete "Record and Replay" electronics of very high quality are also available under the trade name "Masterlink". Details and prices will be supplied by Tele-Radio Ltd.

Owners of some Hi-Fi amplifiers can, of course, feed the output of the tape lead straight into their pre-amplifiers.

HOW NEW IS RECORDING?

(1) Liquid Erasure.

"... And the recording angel dropped a tear upon the word and blotted it out for ever."

(From "*Tristram Shandy*" vol. vi, ch. viii, by Laurence Sterne, 1713—1768)

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"SOUND" GOES ON THE AIR

THE NEW PROGRAMME FOR NETWORK THREE



This picture shows Marguerite Cutforth, producer of the new BBC programme "Sound", at work in the studio with John Borwick, preparing material for the first programme which was broadcast on Monday, January 5th. The two recorders in use are by EMI. In the background, the battery driven L2: in the foreground, the TR 90.

THE BBC's new Network Three programme "Sound" got off with a flying start on January 5th, and letters of congratulation, enquiry and suggestions began to reach Broadcasting House the following day. It may seem odd that, as pioneers of sound broadcasting, the title "Sound" should now attract so much interest after 30 years and more! However, after only brief thought it is not so strange—for although most of us have been listening to, and accepting, broadcast sound for as long as we can remember, it is only during the past decade that we have become really conscious of *sound* as a subject for experiment, concentration, and appreciation in terms of quality.

It was, indeed, the BBC's introduction of high quality sound broadcasts on the very high frequencies (by FM) that stirred the ears of the listening multitudes; and it is through this medium that tens of thousands of listeners will now be able to enjoy this new programme to the full.

Tape enthusiasts have already found much to enthral them in this new sound venture. Tristram Cary's practical demonstrations of what can be done, using a child's Xylophone and, again, a pair of spinning glass tumblers on a table, plus skilful editing, must have inspired many tape recorder owners to think very seriously about an enthralling new hobby which lies within their reach. Readers of this magazine will find several articles in our first number which fit in most happily with the original thoughts that he has suggested—the art of splicing, and the advantages of a second channel for tape editing.

This first "Sound" programme was re-broadcast on Monday, January 12th. The second edition may be heard on Monday evening (January 19th) at 6.45 p.m., and will also be re-broadcast on January 26th at the same time.

We congratulate the BBC on a very fine idea, very well put over; and we urge readers to follow it.



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YOUR LOCAL CLUB? (I)

The Etessa Tape Recording Club

Why "Etessa"? That is the first question asked by other clubs when meeting our members. "Etessa" is External Telecommunications Executive Sports and Social Association, which is the sports and social club of the Post Office Cable and Wireless. This club is unique in that all the members work for the same employer. The club boasts 56 recorder-owners including five lady members at present but owing to the shift duties performed by members it is impossible for them to all meet at one time, therefore, informal meetings and sessions are held at lunch time and during the evening and night breaks. A monthly general news review is issued and weekly bulletins keep members well informed of any new developments.



A lunchtime meeting of members listening to a tape of the Skiffie Group recorded at 2 a.m. the previous morning. L. to r. J. Attack; A. Howard (Chairman); E. Barrow; W. Jary; Joyce Murray; Frances Allaway; Ron Harper; Geoff. Jones (Secretary).

The section was formed at the end of 1957 by Geoff Jones, the present Secretary, and Stan Turney, the Treasurer. At the first AGM held in January 1958, the Secretary of the Musical Appreciation group, Alan Howard, was elected Chairman of Tape Club and so the two sections became closely linked.

Alan Howard had broadcasting experience with the British Forces in Hamburg, Geoff Jones was a disc-jockey when in the navy, Stan Turney another naval man is a very keen "Hi-Fi" fan, and has been able to impart some practical help on the mechanical and maintenance side to members.

When the club was formed it was given a grant of £25 towards the cost of a recorder, the balance was made up by the members and a Magnafon recorder purchased. The club also had a £15 loan to "stock shop" and now a range of all size tapes is available to members 24 hours a day. In this first year the treasurer has had over £600 pass through his hands, and as the cash-in-hand grew the club purchased a defluxer, portable autochange record player, a handbook and technical books for members use. The members subscription is only 5s. per annum.

The club is affiliated to both the BTRS and BFTRC and in August acted as host club to the 3rd AGM of the BTRS, the first one held in London. Many members were allocated gratis tickets for the IBC, London Audio Fair and the Tape Section of the Radio Show. The club have been able to help the Association's Drama Group during the year and now have available a complete recording of Emlyn Williams play "Trespass".

The club has had good co-operation from manufacturers, and the Secretary will always be pleased to receive literature and information to pass on to members. In the coming year the club hope to make visits to a tape manufacturing factory and a Recorder assembly factory.

Club Roundabout

● **Coventry.** At the Annual General Meeting on December 18th, new officers of the club were elected. Mr. Peter Warden remaining as Chairman, Mr. Roy Reynolds becomes the Secretary, Mrs. D. Newell the Treasurer. Other members are: Ron Longmore, Mr. Howard Freer, Mr. Dave Reynolds. For the meeting on January 8th, nine interesting items were on the agenda, including Pt. II of Mr. Penfold's tape—"Strange to your Ears", and recordings of Moari Songs and War Dances received from Mr. Bill Palmer's contact in New Zealand. Twenty tickets have been offered to the Club to attend the Television Show "Ask me Another" transmitted from Birmingham on January 27th.

● **London.** Meetings are held on the first Thursday in each month (next meeting February 5th) at 7.30 p.m. The meeting

TAPE CLUBS

Notes and News

place is The Abbey Community Association, 29 Marsham Street, Westminster, S.W.1. Each month the club issues a newsletter giving news of its latest meetings and future activities. Secretary—E. Roger Aslin, 29 Belmont Road, Uxbridge, Middx.

● **Luton.** At a meeting held on December 30th the guest speaker was Mr. John Amphlett, who gave a fully illustrated talk entitled "The Uses of a Tape Recorder". This finished at 8.45 p.m. and was followed by Question Time. Meetings are held once a month at the Midland Hotel, Williamson Street, Luton, and there is no charge for the first visit. Dates of future meetings can be obtained from the Secretary, M. Nichols, 53 Sundon Park Road, Sundon Park, Luton, Beds.

● **The Reading and District Cine and Tape Recording Club** was recently formed from the Reading Cine Club. Membership is £1 per member. Application forms from the Secretary, L. Beilby, 104 Whitley Wood Lane, Reading, Berks.

● **Rugby.** Amateur Tape Recording Society meets every 3 weeks on Thursdays or Fridays; at the moment they are using the local C.D. Headquarters. Regular tapespondence is carried out with the Norwich Club. At a recent meeting the President, Mr. S. S. Fishlock, was the subject of a tape version of "This is Your Life"; the whole venture was a complete success. Messages on tape were obtained from friends and relatives all over the country. The Hon. Secretary is Mike Brown, 219 Clifton Road, Rugby, Warwickshire.

● **Ulster Amateur Tape Recording Society** formed in June 1958, has a membership of 30, including 3 lady members. The Society meets every Thursday evening at 8 p.m. in their club room at 2 Donegall Pass, Belfast. Tea is served by the ladies at the close of each meeting. Each month a tape magazine is presented entitled "Tape Time". This magazine is produced by W. J. Scott and edited by C. Jordan, and contains news of the Society and the members, and other items of interest. All members may have a copy on their own tape; the running time is about 25 minutes. The Society is now open for associate members anywhere in the World; each associate member will receive a copy of the sound magazine "Tape Time" free. Full details of the Society may be had from the Hon. Secretary, W. J. Scott, 41 Haypark Avenue, Ormeau Road, Belfast, N. Ireland.

● The next meeting of the **West Middlesex Club** will be a social to be held on Thursday, January 29th, at 7.30 at the St. Andrew's Church Hall, High Street, Uxbridge, a buffet is being arranged for which there will be a charge of 2s. 6d., plus 1s. towards the hire of the room. New members will be made most welcome. The club was recently mentioned in the January issue of Good Housekeeping, in an article on "Words and Music by the Mile". There are now 25 members of the club. The Secretary is H. E. Saunders, 20 Nightingale Road, Hampton, Middlesex.

● On this page each month we will give details of new Tape Clubs and report on the activities of established clubs. We invite secretaries to keep us fully informed of their clubs activities so that they can be included in this feature.

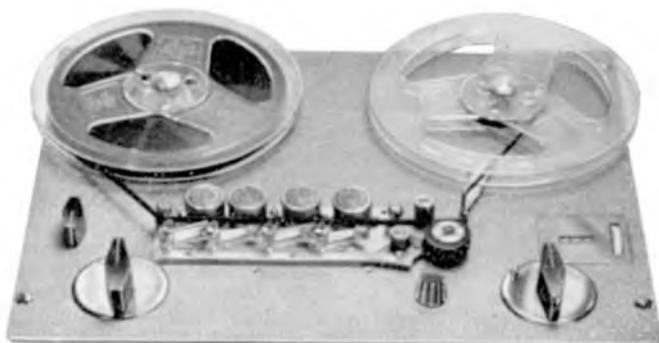
New Look for the Escort



EAP (Tape Recorders), Ltd., announce that their popular Elizabethan Escort tape recorder has been restyled. Current models are a smart two-tone fabric of the latest contemporary type and design, giving a striking effect in

matching shades of blue. The price remains at £47 5s.

THE BRENELL Mk.V



The deck with four heads fitted and cover removed.

Technical Specification

● **Mains Voltage:** 200/250 V; 50 c/s or 110 V; 60 c/s to order; **Four Tape Speeds:** 1½, 3½, 7½, 15 i/s; **Three Motors:** B.T.H. 4 pole (shaded); **Spool Sizes:** any size up to 8½ in. diameter; **Place Indicator:** digital revolution counter; **Playing Times:** per 2,400 ft. tape 8 hours at 1½ i/s, 4 hours at 3½ i/s, 2 hours at 7½ i/s, 1 hour at 15 i/s; **Heads:** Erase-low impedance; record/playback—High impedance (suitable for extra heads—up to four in all); **Record/Playback Head:** (Azimuth adjustment on all Record/Playback heads) D/C Resistance 60 ohms, impedance at 45 Kc/s—50,000 ohms, 10 Kc/s—16,000 ohms, 1 Kc/s—1,800 ohms; Bias Voltage, 50 volts, Bias Current: 1 milliamp; Recording Current: 100 microamps, R/PB Head Gap: 0.00025 in.; **Erase Heads:** D/C Resistance 0.5 ohms, Imp. at 45 Kc/s—450 ohms. **Erase Power:** 2.5 watts; **Erase Voltage:** 30 volts; **Erase Head Gap:** 0.005 in. **Rewind Time:** Approximately 45 secs. per 1,200 ft. tape; **Size:** Deck plate, 15 in. × 11½ in. Depth below plate, approximately 5 in.; 8½ in. spool overlap at rear 1½ in., overlap on each side 1½ in.; **Mounting:** Horizontal; **Weight:** 16 lb.; **Finish:** Hammered gold; **Record/Playback and Rewind Switches:** These are fitted with extended centre spindles to enable extra wafers to be added.

Price Details

● Manufactured and distributed by Brenell Engineering Co. Ltd., 1a, Doughty Street, London, W.C.1. Telephone: CHAncery 5809 and HOLborn 7358.

Prices: Mark 5 tape deck, £29 8s. Extra heads, upper or lower track, £2 each, pressure pads 4s. each. Mark 5 amplifier £24 complete with Power Pack. TP2 Pre-amplifier, £17 17s. Power unit £4 18s., twin channel equipment complete, £81 16s., mounting rack, £12 extra. Mixer Unit, £2 18s.

THE Brenell Mk. 5 deck is probably one of the most versatile general purpose decks at present on the market. It was first shown at the London Audio Fair, April 1958, and has been in full production since May 1958. The most outstanding features are the provision of 4 operating speeds, and the fact that up to 4 heads can be fitted and can take up to 8½-inch professional spools.

The deck is very simple to operate; there are only two switches, controlling *Record*, *Playback*, *Wind* and *Rewind*. These are interlocked to prevent damage to the machine and the tape. Also incorporated is a safety device to prevent accidental erasure. The rewind and record/playback switches are fitted with extended shafts to enable extra wafers to be added for individual requirements. This feature makes the deck quickly adaptable for use with a variety of Hi-Fi equipment. A large statically and dynamically balanced flywheel is used to ensure speed stability. The brakes are mechanically operated, cork lined levers acting on the spoolholder drums.

Pause Mechanism for Editing

To facilitate editing, a simple pause mechanism is provided. Three BTH shaded four pole motors are used, these are fitted with oil impregnated bearings, oiling only being necessary every 1,000 hours of use. The motors are designed to operate at high temperatures (50°C plus ambient), so adequate ventilation is recommended. For instance, the deck can be raised ¼ in. above the mounting board on rubber buffers or grommets, and air intakes provided at the base and rear of the cabinet. The digital revolution counter is coupled to the driving pulley of the take-up spoolholder by means of a plastic or rubber belt. The head assembly is very cleverly designed. The addition of extra heads is a very simple operation, as the heads are clamped to a detachable head mounting plate, which is held to the deck by six screws. The deck is supplied with two heads fitted; *record/replay* and *erase*. With the addition of an extra upper track *record/replay* head, tape monitoring is possible. For dual track recordings extra lower track *record/replay* and *erase*

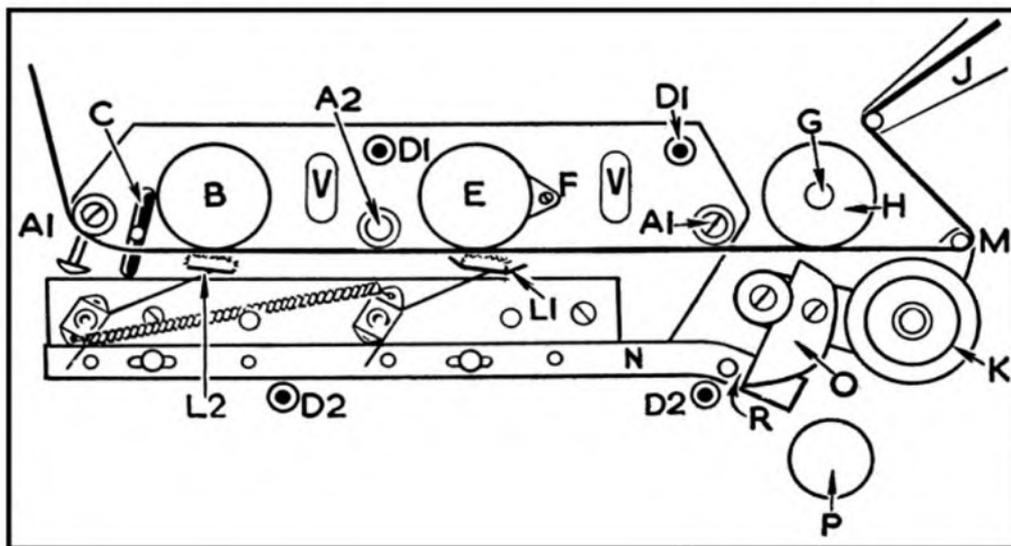


Diagram showing layout under head cover.

A1, A2. Tape Guides. B. Erase Head. C. Tape Contact Release Pin. D1. Retaining Post for upper half Head Cover. D2. Retaining Post for lower half Head Cover. E. Record/Playback Head. F. Azimuth adjustment Screw. G. Capstan Spindle. H. Capstan Sleeve. J. Tape Tensioner. K. Rubber Pinch Wheel. L1, L2. Pressure Pads. M. Take-up Pin. N. Pressure Pad operating lever. O. Crescent shaped lever. P. Pause Control. R. 1/16" free movement. S. Speed Change. V. Mounting slots for extra heads.

THE BRENNELL Mk.V

TAPE DECKS ANALYSED* . . . (I)

head are needed. This layout can also be used for staggered stereo *record/replay*.

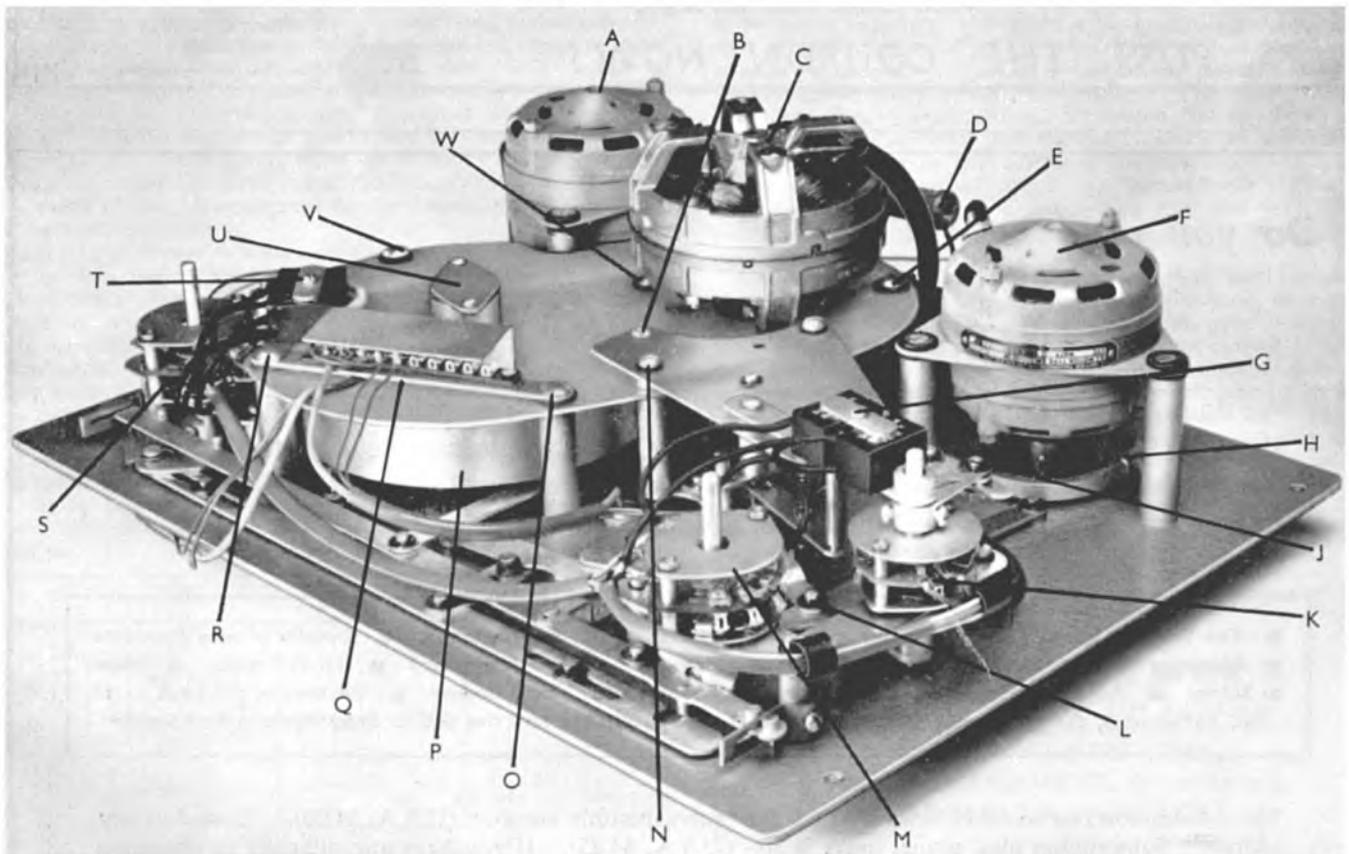
Dual track recordings are of particular use to the cine-enthusiast, Background music, etc., is played through on one track while the commentary is added on the second. This avoids the problems usually associated with superimposing on a single track when the bias partially erases the original recording; also, with twin tracks, the volume on each track can be varied at will in relation to each other. The **Eunig** Imperial Synchroniser works particularly well with the Brenell deck, and no modification is necessary. Stacked stereo heads can also be fitted if required.

Many well-known authorities have installed the Mk. 5 deck in recent months, these include The Admiralty, Senior Psychologists Department and the Research Laboratory at Teddington; Atomic Weapons Research Laboratory, Aldermaston; Associated British Picture Corporation; Central Electricity Generating Board; G.P.O. Engineering Dept. (Circuit Laboratory), E.C.1; Decca Radar; General Electric Co.; Huddersfield Education Committee—

Visual Aids Dept.; Metropolitan Police; Ministry of Education; Mullard, Ltd.; The National Institute for The Blind and the United States Air Force.

The Brenell Mk. 5 Record/Playback Amplifier is specifically designed for use with this deck. It has frequency compensation to CCIR standards at $7\frac{1}{2}$ and 15 i/s, and further compensation for speeds below $7\frac{1}{2}$, for which no specified standard is in operation. Input sensitivities are for high impedance microphone, 2.5 millivolts into 2 Megohms and Radio/Pickup 250 millivolts into 700 K/ohms. Output is 4 watts. For stereo and twin track use, a special rack mounting is available, this takes the deck and two Mk. 5 amplifiers or two TP2 pre-amplifiers if the unit is to be used in conjunction with existing Hi-Fi equipment. The size of the rack is: top, $11\frac{1}{2}$ in. \times $16\frac{1}{2}$ in., base $17\frac{1}{2}$ in. \times $16\frac{1}{2}$ in., height, 11 in., weight of the complete unit: 43 lb. Brenell also manufacture a small mixer primarily for high impedance sound sources.

★ This is a report—not a review.



A Take-up motor : **C** Main drive motor : **D** 500 ohms 10 watt resistor : **F** Feed motor : **G** Suppressor Unit : **H** Mechanical brake : **K** Speed change switch : **M** Rewind switch : **P** Fly-wheel : **Q** Head leads, anchoring strip : **S** Record playback switch : **T** Suppressor Unit : **U** Lower bearing—Capstan Spindle : **B** & **N** retaining screws of speed change mechanism, to be removed to get to idler pulley : screws **E**, **O**, **V** & **W**, circlips **J** & **L** and suppressor unit **G** & **T** to be removed to extract main drive motor plate and speed change mechanism.

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KL85KL Complete Recorder 6 w output, 79 gns.

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MODEL 75 takes 5" spools 60-16,000 c.p.s. at 3¾ i.p.s. and 60-10,000 at 1¾ i.p.s. Light weight (approx. 20 lb.). Push-button controls, over 4 hours play at 1¾ i.p.s. on extra long play tape.

KL75T Table Model (Deck and Pre-amp only) 45 gns.

KL75K Complete Recorder, 50 gns.



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- Hi-Fi Physics
- How to Solder
- Adjusting Home-Built Test Gear
- Absolute Beginners' Corner
- Reviews of the Leak TL 12 and Varislope 3, the Goodmans IB3, the Tannoy Stereo Cartridge and the G.E.C. Baby Periphonic Speaker

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CLASSICAL RECORD NEWS LTD. 99 Mortimer Street, London, W.1

WHAT DO THESE THINGS MEAN TO YOU? (1) FREQUENCY RESPONSE

★ If you are about to buy a tape recorder—or if you already own one—there are about six points in the manufacturers' specification which will concern you. But don't be blinded by them. Their importance varies, according to your own demands from your recorder. This series of articles is written in order to explain them in daily, matter-of-fact terms.

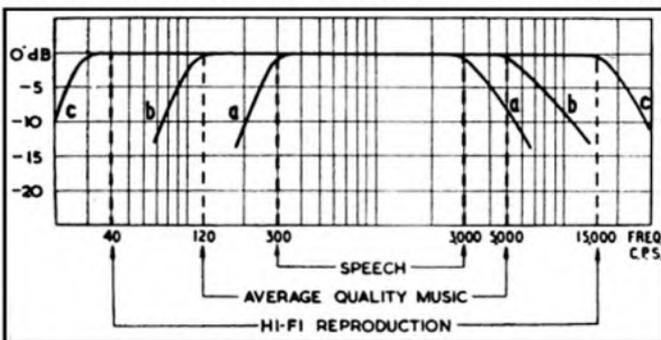
FREQUENCY RESPONSE is about the most confusing red herring ever drawn across the trail of the novice enthusiast in search of a good tape recorder, or other audio equipment. For some reason, and started by some ambitious manufacturer at some unrecorded date in the past 10 or 15 years, it has become customary to quote a "frequency response" as a major selling point. If all quoted frequency responses were reliable (*which they are not*), and if all users of tape recorders needed instruments with a wonderful frequency response (*which they do not*), then there would be some point to it all.

Probably, more than half of the present-day users of tape recorders use their machines for speech, making very occasional demands upon them for snatches of music, song and effects—or, alternatively, use them for recording and replaying music of good average quality from disc and radio. *And for such uses a "fabulous frequency response" is quite unnecessary.*

However, let me make a very important observation here; namely, that the user should always look for—and, similarly, the manufacturer should always strive to produce—the best possible value for money, measured in quality. This is plain common sense, in terms of everyday progress; for one should never encourage a backsliding tendency!

Any instrument with a high specification must cost more money to produce than a lower one, assuming always that the factory is efficient. This is why there is such a difference between ordinary sound and "Hi-Fi" sound. Therefore, if you want top quality you must be prepared to pay for it; and if you don't need it, then why waste money on it? But, much more important, don't spend money for something you are not getting; as it will be quite obvious to any intelligent buyer, (once he knows the pitfalls) that his good hard-earned cash can be better spent than handed-over for something which cannot possibly live up to the claims made for it.

So, to proceed, what do you want from a recorder in terms of frequency response? The diagram below will help you to decide. For the recording of speech, an overall frequency



This diagram shows the frequency ranges for three standards of reproduction. (a-a) Speech only; (b-b) Average domestic reproduction; (c-c) High Fidelity.

response (a) of $3\frac{1}{2}$ musical octaves is necessary—from 300 cycles per second (written c/s) in the bass to 3,000 c/s in the treble. For average quality music, as it is available from most domestic radios and radiograms, the requirements will be met with a frequency response (b) of 120 c/s in the bass extending up to 5,000 c/s in the treble (written 5 Kc/s—K being Kilo, or 1,000). For Hi-Fi results, this frequency response must be extended at both ends of the scale to give (c) a range of about 40 c/s to 15 Kc/s (15,000 c/s) minimum, and up to 20 Kc/s for near perfection.

Now in terms of practical assessment, a tape recorder that cannot record and reproduce range (a) with reasonable fidelity is not worth buying; for such a frequency response is so easy to achieve to-day, there is no excuse for not making it available.

Range (b) is harder to achieve, in terms of a truthful spec.

Range (c) is normally only achieved by professional or semi-professional recorders in the really high price bracket. Therefore, if you see it offered for less—look out for snags!

Now when looking for these snags, watch one point carefully: A claimed frequency response of 30-15,000 c/s means less than nothing unless it is qualified by the term, "within so-and-so" (usually 2 or 3 dB). Don't worry about the 'dB.' The claim means, precisely "this recorder will record and reproduce a note of 30 c/s as faithfully, and with the same relative volume, as a note of 15,000 c/s, and all the other notes in between." Ask yourself (1) does it? and (2) do I need to pay for such fidelity?

Next, realise that the frequency response of the tape recorder must depend upon a combination of several factors. First, the quality of the electronics (the electrical innards) of the instrument; Second the type and quality of the tape used; Third, the design of the recording and reproducing "sound heads". Finally, the speed at which the tape runs. And it is this final point which again brings us back to down-to-earth advice and information.

Any good recorder should be able to reproduce good speech—range (a) at a speed of $3\frac{1}{2}$ i.p.s. If the design is good, its second speed (double) of $7\frac{1}{2}$ i.p.s. should yield range (b) quite easily. In other words, a medium powered 2-speed recorder (speeds $3\frac{1}{2}$ i.p.s. and $7\frac{1}{2}$ i.p.s.) or $1/5$ should give the average user all he requires.

Similarly, a well-designed 3-speed recorder (speeds $1\frac{7}{8}$: $3\frac{1}{2}$: $7\frac{1}{2}$ i/s) will enable the user to save tape by using the $1\frac{7}{8}$ i/s speed for speech, and for recording average quality song and music at $3\frac{1}{2}$ i/s, with the $7\frac{1}{2}$ i/s speed reserved for better quality music. And, a final word; do not forget that a recorder with a good frequency response at $7\frac{1}{2}$ i/s can be used for replaying the many (and many very beautiful) recorded tapes in the HMV and Columbia catalogue.

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HI-FI YEAR BOOK

1959 Edition

The Fourth annual edition of Hi-Fi Year Book is now in the course of preparation, and is scheduled for publication, as before, at

MID APRIL

This publication is styled simply "Hi-Fi Year Book", as before; and should not be confused with any other annual. Its price, as in the previous three years, is 10s. 6d.—or 11s. 6d., including postage, from the following address.

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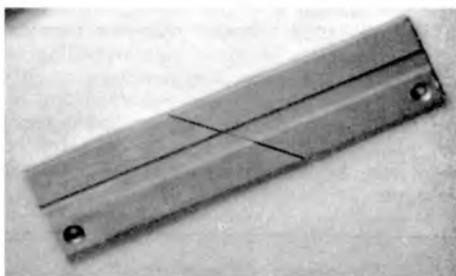
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TAPE RECORDS

IN opening this feature—which we hope to expand as the months pass—we begin with the assumption that many of our readers have not yet bought or heard a commercial tape record. The E.M.I. lists, under the *Columbia* and *HMV* trademarks, have already many dozens of titles, both popular and classical, stereo and monaural, ranging from short tapes to works covering four full 7-inch spools. Technical Suppliers Ltd. have recently entered this field, too, with a catalogue of tape records under the trademark *Phonoband*.

For the benefit of those who have yet to hear a tape record, and who would like to sample something good, here are three. No apology is made for the inclusion of a really expensive item in this first list, for it is worth every penny of its cost to those who appreciate such music.

Der Rosenkavalier. Richard Strauss. Columbia (Stereo) tapes, BTA 126, 127, 128, 129. Playing times, respectively and approximately, 45; 52; 50; 45 minutes (total 3 hrs. 12 mins.). Price per tape, 63s. (complete opera 12 gns.).

Those who know the opera will be content to know that the performance on these tapes is positively brilliant, and that the recording is in the very top class. Those who do *not* know it will wonder how they can have missed such pleasure for so long. Try tape 128 first, for the sampler, for it contains the famous waltz. The cast is a wonderful array of singers, headed by Elizabeth Schwarzkopf as the *Marschallin*. The orchestra is the famous Philharmonia, and it is conducted by Herbert von Karajan. There are a few "cuts" in the work, noted in view of the above phrase "complete opera", but these are not of significant importance.

Yesterdays, Columbia monaural tape CDT 862, is a very good shot for those who like the trumpet. This reviewer thinks that 10 items of trumpet are a bit much, if played at one session; but there is no need to listen in such quantity! The playing is brilliant, the recording matches it. The accompaniment is by Peter York and his orchestra. The titles are *Yesterdays; Confessing; I'm getting sentimental over you; Maybe; As time goes by; You go to my head; Imagination; Mean to me; Poor Butterfly; In the still of the night*. The tape plays for 32½ minutes, and the price is 55s.

The Tarriers, Columbia monaural tape CDT 870, was selected by *Hi-Fi News* (December) as outstanding. It is worth buying for two of its numbers alone: *Pretty Boy* and *Oh, Chacoun*. It is a vocal tape. The singers are The Tarriers. The titles are: *Pretty Boy; I know where I'm going; Rock Island Line; East Virginia; Drill ye Tarriers, Drill; Shadrack; Those Brown Eyes; O, Chacoun; Acres of Clams; Lonesome Traveller*. After a lot of instrumental and orchestral releases, one often turns with relief to the human voice. This tape will provide a lot of pleasure—provided one likes rhythm and singing, as suggested by the titles. The playing time is about 25 minutes. The price is 55s.

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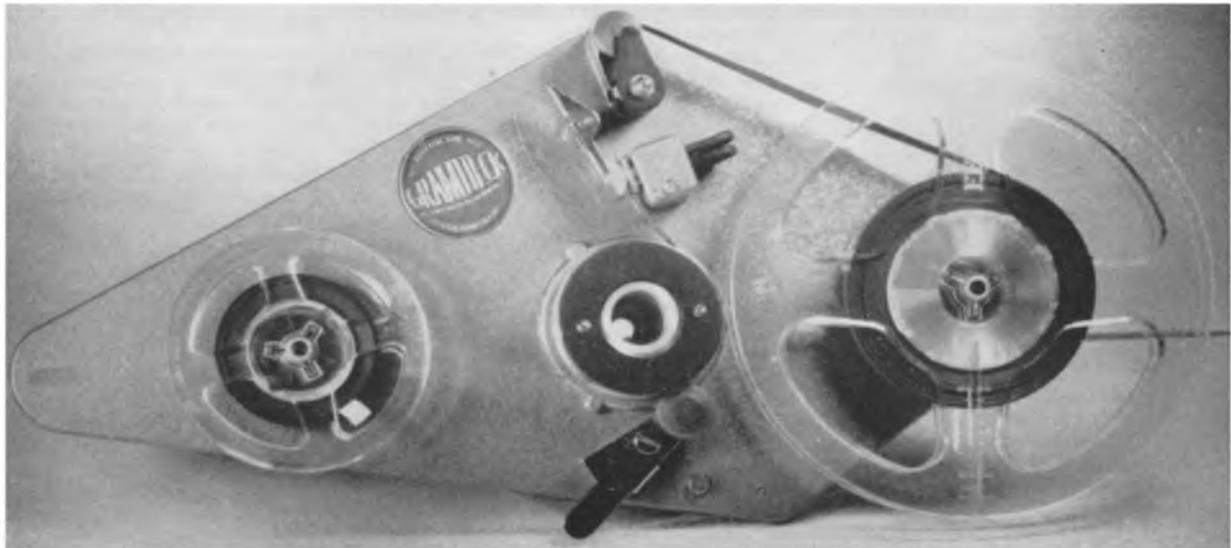
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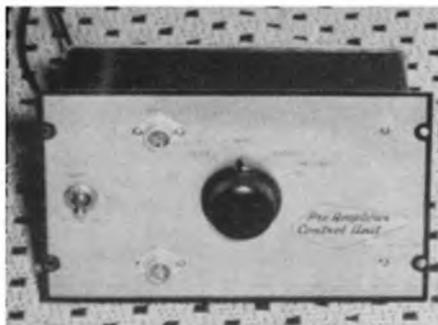


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THE Gramdeck consists of two self-contained units only. The *Tape Table*, which is placed on the turntable of any gramophone, giving an immediate tape speed of $7\frac{1}{2}$ inches per second from the standard 78 r.p.m. turntable speed. It handles spools up to 7 inch diameter. It provides a rewind speed of more than $\times 3$ the $7\frac{1}{2}$ -inch replay speed (plus an alternative and faster hand rewind). Other turntable speeds provide slower tape speeds.

The second unit, *Control Unit*, contains a dry battery with a useful life in excess of 600 hours, enabling recordings to be made from microphone, or radio, and playbacks to be made through radio or radiogram via pickup input—or directly to the Hi-Fi pre-amplifier and amplifier. A selector switch controls these facilities.

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NEW PRODUCTS—(continued)

Truvox Stereo Recorder and Player



TRUVOX have announced a Twin-set Tape Recorder which will record and replay both stereophonically and monaurally.

The complete equipment comprises units A and B, which have identical exteriors and serial numbers. Unit A is a standard Truvox R2 Recorder fitted with a Truvox stacked stereophonic head. A co-axial socket is fitted in the microphone pocket for connection to unit B. Unit B contains an amplifier and speaker identical with those in unit A, and has a similar co-axial socket connection. Two coupling leads are supplied fitted with co-axial plugs at each end. The short cable for recording, the long cable for playing back. When both units are used, stereophonic recording can be made from any of the usual sources and reproduced through the built-in speakers. Unit A only is used as a standard Truvox R2 Recorder (but with a better quality head). This is portable and gives all the facilities of the standard model.

Previously this twin-set has only been exported but is now available to the home market at a list price of £115 10s., for the complete twin-set, which includes matched loudspeakers, or £53 11s. for supplying unit B and the fitting of a stereophonic head to the customer's own Truvox Recorder. Further details from, **Truvox Ltd., Neasden Lane, London, N.W.10.**



The Connaught Console Recorder featuring an infinite baffle speaker system.

CONNAUGHT (TAPE RECORDERS), LTD., are a new firm in the recorder field. They recently announced the introduction of a deluxe Tape-O-Gram selling for £210 in its

basic form, the 1A, with Harting tape deck and a Garrard Auto-Change. The IC Stereo model with a Decca pickup costs £375. Also introduced was the Connaught Console Recorder fitted with a Harting tape deck, which operates at $3\frac{3}{4}$ and $7\frac{1}{2}$ i/s. There are separate record and replay amplifiers giving instant monitoring facilities of the incoming signal and the recorded signal. The peak power output is 12 watts. The claimed frequency response at $7\frac{1}{2}$ i/s is 30-16,000 c/s

± 3 dB and 30-10,000 c/s ± 3 dB at $3\frac{3}{4}$ i/s. There are low and high impedance inputs for microphone, radio and pickup.

The deck is virtually mounted in the top of an infinite baffle speaker enclosure incorporating a modified Bradford Baffle system that includes glass wool padding and contains three drive units, a foam mounted 12 in. and two Lorenze tweeters.

The price with a Film Industries Ribbon microphone and one spool of long play tape is £125. Manufactured by **Connaught (Tape Recorders), Ltd., 3-4 Berners Street, London, W.1.**



The New Walter 1000 Console Tape Recorder

WALTER INSTRUMENTS first showed their Model 1000 console tape recorder at this year's Radio Show. This instrument is housed in an attractive cabinet with a walnut veneer finish. The dimensions are 33 in. high, 41 in. long and 17 in. wide. The recorder consists of a Walter Mark II deck, which uses the well known "joystick" control. The amplifier has a 10 watts output and there are five speaker units; an FM tuner can be fitted as an extra.

The deck operates at $3\frac{3}{4}$ and $7\frac{1}{2}$ i/s, and is fitted with 7 in. spools. There is a magic eye level indicator, a safety record button, a monitor control, and digital type tape position locator. The recording amplifier has a sensitivity of 2mV on microphone and 300mV on Radio, this socket is also suitable for an external pickup. The main amplifier has an ultra-linear, push-pull output stage. The speakers consist of two 10 in. round, one 9×5 in. elliptical, and two 4 in. tweeters. Facilities:—1, Straight play through from internal FM tuner if fitted; and 2, recording from internal FM tuner if fitted; 3, replay from tape and recording from external source such as microphone, radio or pick-up; 4, straight-play through main amplifier from external source either microphone or radio/pickup. The power supply required is 200-250 v., 50 c/s, consumption approximately 125 watts. There is a special model, available only to order, that is suitable for a power supply of 100-250 v. A.C. at 40, 50 or 60 c/s. Price, complete with a microphone, is £136 10s. Further details can be obtained from **Walter Instruments Ltd., Garth Road, Morden, Surrey.**

A Small Professional Recorder

THE Telefunken M23 recorder is now available in this country.

It is intended for the more serious user and is, in fact, described as a "small studio professional model". A particularly attractive feature of this machine is that the complete head assembly can be withdrawn in a matter of seconds and replaced by another combination, giving a choice of single track, double track, stereo, etc., these alternative assemblies are, of course, extra. Standard head assembly is $\frac{1}{2}$ track erase, record, and playback.

There are two operating speeds, $3\frac{3}{4}$ and $7\frac{1}{2}$ i/s tape spools of up to 9 inches can be used. Frequency response at $3\frac{3}{4}$ i/s is claimed to be 30-12,000 ± 3 dB and 30-16,000 ± 3 dB at $7\frac{1}{2}$; wow and flutter at $7\frac{1}{2}$ i/s less than 0.15% and a signal to noise ratio related to full moderation greater than 46 dB overall.

Price of standard chassis is £140, with wooden table cabinet £150 and £180 for the portable version with power stage and 4 built-in loudspeakers. Further details from **Welme Corp. Ltd., 147 Strand, London, W.C.2.**

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EQUIPMENT REVIEWED



★
THE GRUNDIG
TK35
TAPE
RECORDER
★

★ **Manufacturer's Specification:** Mains Voltage: 110-125, 190-210, 210-230, 230-250 volts, A.C. 50 c/s. **Consumption:** Approximately 85 watts. **Valves:** EF86, ECC81, EL84, EL95, EM84, plus 3 metal rectifiers. **Recording level meter:** Magic eye. **Tape speeds:** $7\frac{1}{2}$ i/s, $3\frac{3}{4}$ i/s and $1\frac{1}{8}$ i/s. **Frequency response:** At $7\frac{1}{2}$ i/s, 50-18,000 c/s ± 3 dB, at $3\frac{3}{4}$ i/s, 50-14,000 c/s ± 3 dB, at $1\frac{1}{8}$ i/s, 100-8,000 c/s ± 3 dB. **Recording sense:** Top track, left to right. **Signal to Noise Ratio:** Better than 43 dB. **Wow or flutter:** Less than $\pm 0.2\%$ at $7\frac{1}{2}$ i/s. Less than $\pm 0.25\%$ at $3\frac{3}{4}$ i/s. Less than $\pm 0.4\%$ at $1\frac{1}{8}$ i/s. **Fast rewind time:** Approx. $2\frac{1}{2}$ minutes. **Automatic stop switch** at ends of tape. **Superimposition** (erase cut out button). **Remote control facilities.** **Temporary stop.** **Loudspeaker:** 1 permanent dynamic $5\frac{1}{2}$ in. \times $8\frac{1}{2}$ in. **Inputs:** Microphone (1.5 mV/1.5 Mohm). Diode (1.5 mV/22 K ohm). Radio: L.S./Gram: P.U. (100 mV/1 Mohm). **Outputs:** Low impedance (extension loudspeaker 3 ohms). High impedance: (600 mV/5 Kohm). **Output power:** 3.5 watts. **Price:** £86 2s.—no microphone supplied.

Manufactured by Grundig (Gt. Britain) Limited, Newlands Park, Sydenham, London, S.E.26.

THE TK.35 tape recorder is sold by Grundig (Great Britain) Ltd. but manufactured in West Germany and notable for, among other things, an exceptionally wide frequency response at all three tape speeds. It is undoubtedly one of the machines that justifies careful examination by British designers, for it is attractive both in appearance and performance. Three members of the family commented favourably on its appearance immediately it was removed from its stout packing carton.

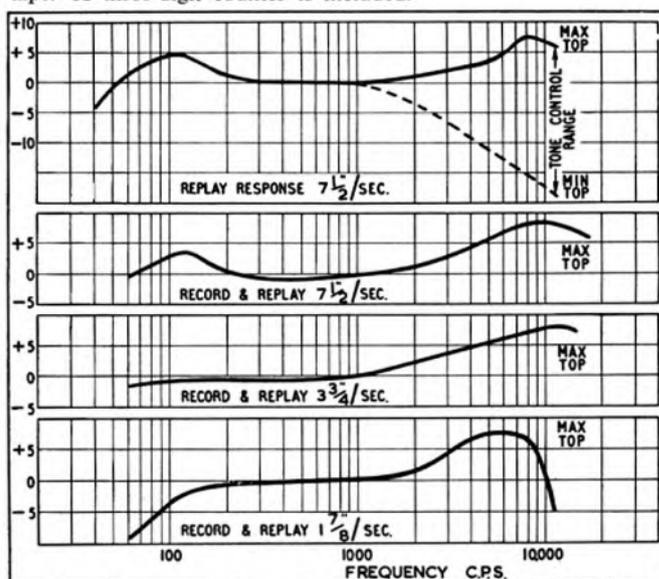
Weighing only 36 lb., and measuring roughly 17 in. \times 16 in. \times 9 in., the machine is genuinely portable without any extrapolation of the meaning of the word "portable". The case is finished in two shades of grey (or is it grey and blue?) and is fitted with two lockable catches of unusual design, a very useful feature for the man with a young family.

The top deck is compactly arranged with the spools behind all the controls. Seven-inch diameter spools are the maximum that can be accommodated, but when using thin l.p. tape this allows 45 minutes playing time (per track) at $7\frac{1}{2}$ in./sec, when the best possible performance is required, and nearly three hours per track when recording speech at the lowest speed of $1\frac{1}{8}$ in./sec. Two of the three tape speeds are selected by a combined speed change and mains switch lever, the bottom speed being obtained by depressing an auxiliary button with the lever in the $3\frac{3}{4}$ in./sec position. This push button is balanced by a similar button on the left-hand side of the deck, providing a mechanical interlock against accidental erasure of a valuable tape. Grouped at the front left are four piano key switches selecting "stop", "start", "wind on" and "rewind". All are delightfully easy to operate, the key surface being large and the operating pressure low.

Symmetrically placed on the right-hand side is a group of three rocker-type switches, mechanically interlocked and having

function indicator tabs visible through a small window in front of the knobs. These switches make a choice of the three available input signals connected to the input sockets on the rear of the machine. Input sockets are provided for a low level microphone signal, a high level radio or gram signal, and a low level radio signal taken from the diode load terminals of a radio receiver. This implies that European radio receivers have the diode load terminals brought out, a facility that is unknown in British radio practice.

A raised section in the front centre of the deck carries two edgewise controls, *replay volume* on the left, balanced by a dual control of *replay tone* (top cut) and *recording volume*. At the front centre is an "instantaneous stop" button, and behind it a volume indicator of the neon bar type (EM84). This "instantaneous stop" button merely moves the tape out of contact with the drive capstan, leaving the rest of the mechanism in motion. It is particularly useful when editing or typing from a recorded tape. A three-digit counter is included.



● *Frequency Response.* All curves taken with the controls in the "max. top" position.

The wide frequency range claimed for the TK.35 on each of its three speeds is a point of immediate interest when studying the performance details. The instruction book claims, for instance, that a frequency range of 50-14,000 c/s ± 3 dB is obtained at a tape speed of only $3\frac{3}{4}$ in./sec, and reference to fig. 1 will show that this claim is justified. The secret is just meticulous care in design and manufacture, plus a considerable amount of equalisation in the recording, but this point will be considered again a little later. The data in fig. 2 also demonstrates another unusual feature, that there is a considerable amount of "top boost" provided when the tone control is in the zero position. A flat response is obtained with the tone control in an intermediate position.

In the present stage of the art, an exceptionally wide frequency response is only obtained at some sacrifice of the signal/noise ratio, and it is a real headache to the designer (and Sales Manager) to know just where to place the compromise. Wide frequency range appears to have greater sales appeal than a high signal/noise ratio. In the TK.35 a very good compromise has been struck, for though the signal/noise ratio is significantly lower at the bottom tape speed, it is still useably high.

Data on the signal/noise ratio at all three speeds is given in table 1, the S/N figure being the ratio, in dB of the 1 Kc/s

THE TAPE RECORDER CLUB

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January 1959

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signal, recorded at full modulation, as shown by the neon volume indicator, to the noise remaining after the signal has been erased on the machine. The S/N is seen to fall off as the tape speed is lowered, but it is comparable with that achieved by l.p. disc recordings, even at a tape speed of 1½ in./sec. There is a remarkably small difference between the weighted and unweighted values, a sure indication that mains frequency (hum) noises do not make a very significant contribution to the total noise.

Neon Bar Type of Indicator

The introduction of a large amount of pre-equalisation in recording may also result in the introduction of harmonic and intermodulation distortion at the high frequency end of the range but, surprisingly enough, this can be minimised by the use of a suitable type of volume indicator. High frequency signals are characteristically of short duration, and they are thus easily overlooked by a meter-type of volume indicator having a movement of even average inertia. Chronic distortion then occurs when recording light music which has prominent high frequency components, and this can only be avoided by recording at an unreasonably low signal level, as indicated by the meter. The TK.35 avoids this particular trouble by using a neon bar type of indicator (EM84) having a high speed response. Nevertheless, it is always wise to make a preliminary "run through" before recording any light orchestral item, at either of the two lower tape speeds, for the pre-equalisation generally results in the maximum signal amplitudes appearing at the high frequency end of the spectrum, rather than at the low frequency end where they occur at the top tape speed.

Table 1—Signal/Noise Ratios

Tape speed 7½ in./sec.	Unweighted	46 dB
	Weighted	48 dB
Tape speed 3½ in./sec.	Unweighted	45 dB
	Weighted	46 dB
Tape speed 1½ in./sec.	Unweighted	40 dB
	Weighted	42 dB

Table 2—Wow and Flutter

Tape speed 7½ in./sec.	Replay only	·2%
	Record and replay	·15%
Tape speed 3½ in./sec.	Record and replay	·25%
	Record and replay	·3%
Tape speed 1½ in./sec.	Record and replay	·3%

Table 3—Input Sensitivity

Signal (1 Kc/s) required to produce closing of the magic eye.		
Microphone input	1·75 mV	
Diode	1·75 mV	
Radio/Gram.	86 mV	

The recording and replaying of "Whatever Lola Wants" (Decca LAF2) is a severe test for any tape recorder, but the TK.35 passed with honours. Though the recording made at the top speed (7½ in./sec) was easily the best, a recording at a speed of 1½ in./sec was still acceptable without having to use the low tape speed as an excuse. At this speed the TK.35 was one of the two best machines so far tested.

The performance of the tape transport system on the particular machine sent for review was not quite so outstanding as some other aspects of the machine's performance. The measured values of wow and flutter are shown in table 2, and are seen to be within the figures claimed in the manufacturers' literature; but the irregularities from minute to minute were rather high, a facet of the wow and flutter performance that is not indicated by the single figure always quoted. Rather surprisingly, the irregularities were at their worst at the highest tape speed. At all speeds the flutter content was on the high side, though it should again be emphasised that the combined wow and flutter was within the manufacturers' claims.

Mechanically, the machine is very quiet and smooth running, and the braking system is completely effective in preventing tape spillage, even at the end of a fast wind or rewind. The rewind time (2½ minutes) is rather long, but it is doubtful whether it could be shortened without risk of damage to thin l.p. tapes.

A group of five sockets of excellent design are provided on a small recessed panel at the rear of the machine. Three of the sockets accommodate the signal input plugs, one socket provides a 3-ohm outlet for an extension speaker, while the remaining socket is intended to take a remote control connection, another facility that is almost universal on machines of continental design. Though a socket is provided for an external speaker, the internal speaker (which can be muted by a small switch on the rear panel) has a remarkably good performance, bearing in mind the restrictions imposed by cabinet size.

Table 3 lists the signal voltage required at the three input sockets to give full modulation of the tape. The sensitivity is adequately high for almost any application.

The machine created a very favourable impression on the other members of the family when put into domestic service, though the performance was marred by an occasional failure of the "record relay" to close when the record button was depressed. The universal cure for all ills, a slap on the side of the machine, was always effective in persuading the relay to operate! No doubt this trouble was peculiar to the particular machine tested. The TK.35 is a tape recorder that must cause a lot of concern among other manufacturers in this country and certainly leaves no British manufacturer with any reason for complacency.

James Moir

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A bulk eraser frequently consists of a stack of "E" transformer laminations on the centre limb of which is a winding for connection to the 50 c.p.s. mains supply. The laminations are usually mounted in a case, provided with a spindle placed so that a radius of the spooled tape completes the magnetic path across the open end of the E. The spool is then rotated so that all the tape is taken through the area of maximum flux, when recorded signals are erased. A bulk eraser of this kind usually costs between £5 and £10.

The "Instant" bulk eraser uses a small block of E laminations with a winding on the centre limb, but all other non-essentials are dispensed with to enable the low price of 27s. 6d. to be reached. The plastic case carries a mains switch and is supplied with a length of twin flex. Although the unit cannot be described as robust, it is quite adequate for normal careful use.

The absence of a spindle for the rotation of the spool presents no difficulty provided the user bears in mind the principle of erasure outlined above. The instructions supplied with the unit are not sufficiently detailed and the following method was formulated. The eraser is connected to an AC mains supply (200-250 volts) and is held in the hand so that the operating switch is under the first finger and the mottled face of the casing pointing outwards. (If a wrist watch is worn it is prudent to remove it!) The tape for erasure is placed flat on a table on its spool and the eraser placed against it, mottled side downwards, the switch finger near the centre of the spool and the long dimension of the eraser on a radius of the spool. The switch is then depressed and the eraser moved back and forth along the radius from the centre of the spool to the outer edge, the spool being slowly turned with the free hand until it has made several complete revolutions. Keeping the switch depressed, the eraser is slowly lifted from the spool to a height of about 3 feet and the switch released. For maximum erasure the process can be repeated after turning the spool over.

The above procedure was followed for erasure of a spool of tape which had been recorded at a high level and the signal was found to have been almost completely erased. The tape was then run through a tape machine switched to record but with no input signal and on replay it was found that the erase head had removed any residue of signal. The erase head is normally operating when a tape is re-recorded so that this second erasure is automatic.

The "Instant" bulk eraser is recommended as being cheap yet efficient and is a worthwhile investment for all users of tape recorders, providing a quick means of completely erasing previously recorded material, an essential requirement when a high quality recording is to be made.

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Tape Recorders for Hire

WHAT DO YOU KNOW?

IN this experimental column are one or two mental exercises, a catch or two, and some straightforward quiz questions. If you like the column, and if we can successfully pick the brains of our contributors and other experts for the right material, we will try to make it—or something like it—into a regular feature. The answers are printed at the foot of the column, upside down. Don't look too soon!

1. If you had two good amplifiers and speakers, and you fed a note of 20,000 c/s through one, and a note of 21,000 c/s through the other, you might expect to hear a 'beat' note. What would you hear?

2. What was the occasion of the first stereo demonstration? And the date?

3. What are the internationally agreed standards for the following? (a) Width of recorded track on twin track tape (b) width of unrecorded separation between upper and lower tracks.

4. I have inadvertently replayed a tape with the shiny side towards the heads instead of the coated (dull) side. What do I hear (a) with a full-track recording (b) with a half-track recording?

5. Right or wrong? In a stereo tape recording, the upper track feeds the left speaker, and the lower track the right speaker.

6. How many complete cycles (vibrations) of International Pitch A will there be on a 12-inch length of tape recorded at 15 inches per second?

7. You are lucky enough to possess two tape recorders, at least one of which operates at $7\frac{1}{2}$ and $1\frac{1}{2}$ inches per second. You perform the following sequence of operations: (a) record 1,000 tone at $7\frac{1}{2}$ i/s; (b) playback at $1\frac{1}{2}$ i/s while re-recording at $7\frac{1}{2}$ i/s; (c) playback at $1\frac{1}{2}$ i/s. What do you hear?

8. Which of the following sets of initials is out of place in this audio world? CCIR: MFD: NARTB: PDSA: IPS. And do you know what they all stand for?

— THE ANSWERS —

1. Nothing, unless you happen to be very young, or possess a truly remarkable pair of ears. The resultant beat note would have a frequency of 1 Kc/s; but unless you can hear the 20 and 21 Kc/s notes you cannot hear the beat.
2. A system using headphones was installed in the Paris Opera House by Hospitalier in 1881.
3. (a) 0.1 inches, (b) 0.03 inches.
4. What happens to you? I should hear (a) the recording as planned but very much attenuated particularly at high frequencies; (b) a muffled version of the other track running backwards.
5. Right.
6. 352 cycles.
7. The 1,000 c/s note will have been twice divided by 4, to give a note of 62.5 c/s, but you will also hear a high-pitched whistle. This is due to successive reduction of the original bias frequency recording through 4 octaves, e.g. for a bias frequency of 60 Kc/s, you would hear a note of 3,750 c/s.
8. Comité Consultatif International des Radiocommunications; Microfarad; National Association of Radio and Television Broadcasters; People's Dispensary for Sick Animals; inches per second. We leave you to decide which is out of place.

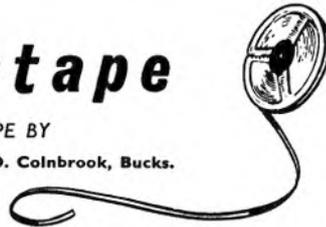


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