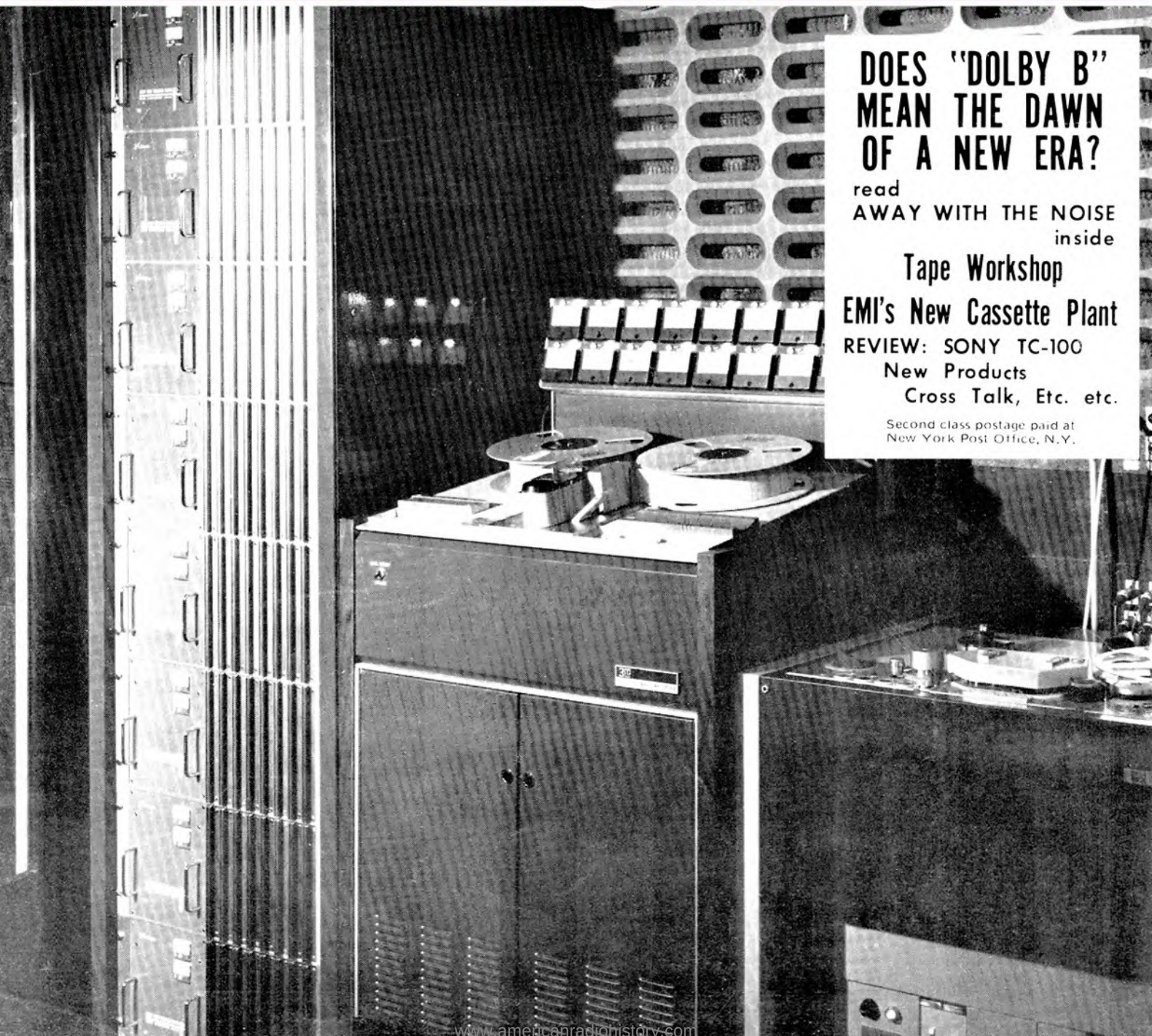
AUGUST 1970

TAPE

RECORDING MAGAZINE

2/6



DOES "DOLBY B" MEAN THE DAWN OF A NEW ERA?

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AWAY WITH THE NOISE
inside

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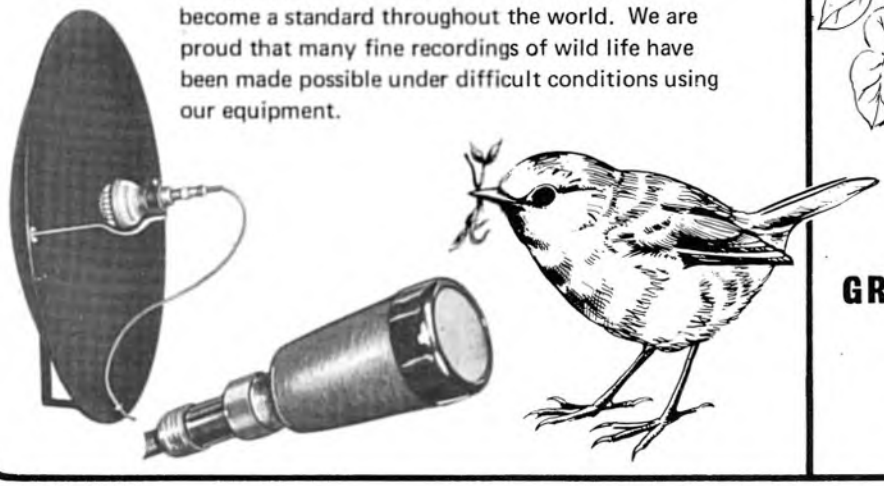

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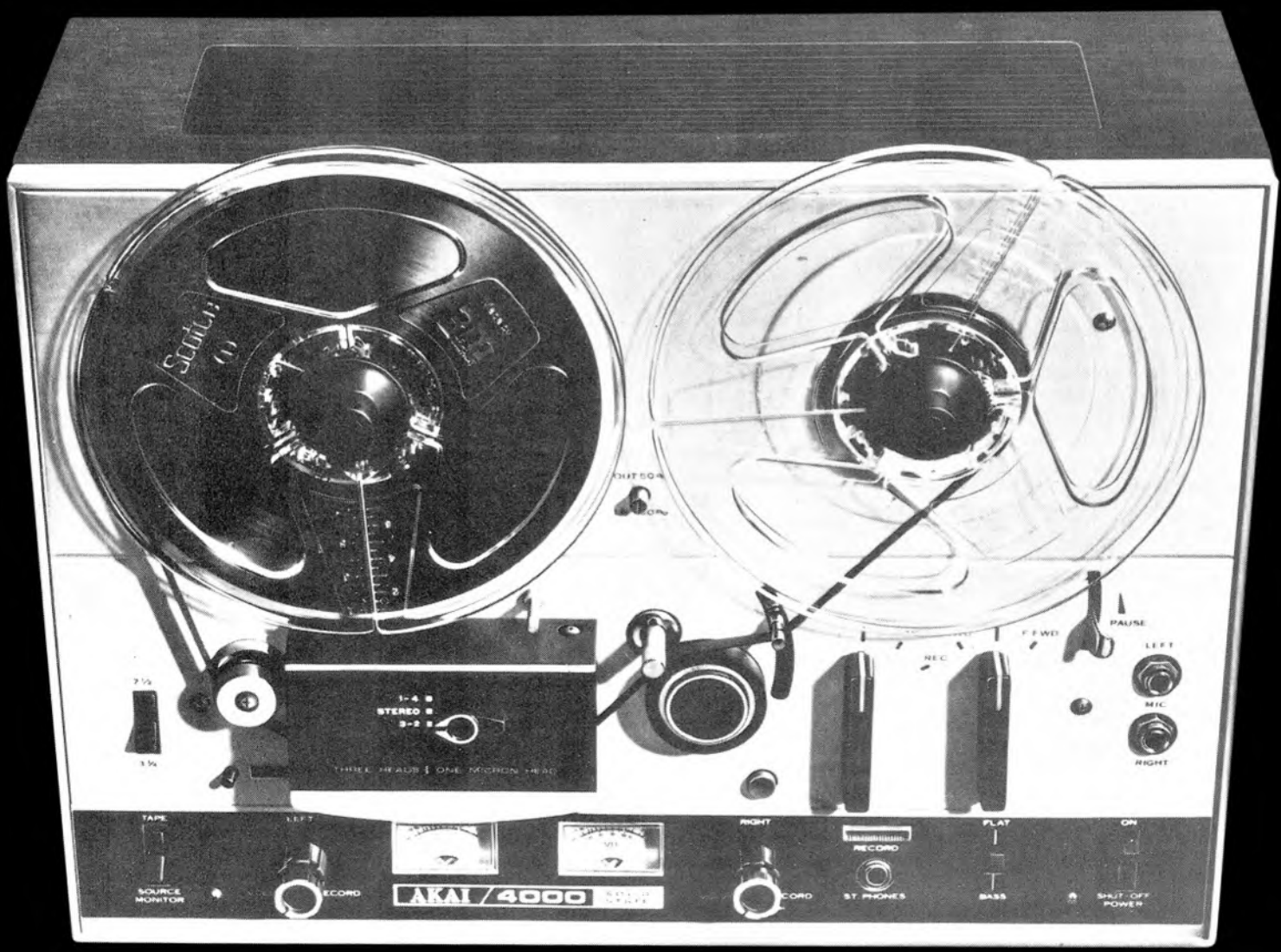

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7"/2400	76/7	56/3	50/4
5"/1800	61/9	45/4	40/7
5¾"/2400	76/5	56/3	50/2
7"/3600	95/1	70/1	62/4
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TAPE RECORDING MAGAZINE

Incorporating TAPE RECORDING & HI-FI MAGAZINE and STEREO SOUND MAGAZINE

Vol. 14 No. 8 August 1970

IN THIS ISSUE

Cover Photograph: This impressive professional setup was taken in the studios of Island Records Ltd. through whose courtesy we are able to publish the picture. It features a 16-track machine by the 3M Company alongside which is a towering bank of Dolby A301 noise reduction units. Compare this with the domestic equivalent shown on page 258, a cassette machine with built-in Dolby B systems. Differences in quality between the two are becoming narrower as we explain in our article, Away With The Noise!

"TAPE Recording Magazine" is published on the third Wednesday in the month by Print and Press Services Ltd., from 16a Bevis Marks, London, E.C.3.

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Tape trends and tape talk

By Douglas Brown

A BOOK just out, *Big Brother in Britain Today**, has quite a lot to say about the more unattractive uses of the tape recorder. Its author, Anthony A. Thompson, sums up: "Thanks to the tape recorder, mass surveillance is now an economic possibility. The conversations of a great many people can now be monitored by just one man. Modern machines even save him the boring process of running through long sections of blank tape, since they start up automatically only when there is something to record."

Mr Thompson has some hair-raising suggestions about the way microphones are planted to pick up conversation, such as the "spike mic" which, he says, can be fired by gun from a distance into the fabric of a building, so turning it into "a gigantic sounding board."

When, some years ago, I was in Moscow I always behaved on the assumption that my hotel room was "bugged"; yet, at the same time, I felt that I was being melodramatic in doing so. But now Mr Thompson declares that during the last war American security men are believed to have "bugged" every hotel bedroom in and around Washington, Chicago and other cities.

How far has it gone in Britain? The author reports: "Today, Britain can boast of snooping equipment as sophisticated as any. Decades ago, the Japanese and Russians skimmed the cream of western technology by purchasing a single example of each item over the entire stock range offered by their foremost competitors, and then produced faithful copies with improvements of their own. Some manufacturers have used the same tactics to great advantage . . . British equipment is improving so fast that the incentive to 'buy foreign' is constantly diminishing."

The only reassurance the author offers is that equal ingenuity is being shown in devising counter-"bugging" equipment. For example, he cites a "noise machine" sold by Lustraphone; the machine produces enough noise to drown any conversation, but two persons using throat microphones and headphones can communicate without difficulty!

Will the Romeos and Juliets of the future have to carry around a noise machine to ensure that their sweet whisperings are not overheard?

** Michael Joseph, 35s.*

* * *

WITH 26 AFFILIATED clubs and almost 300 individual members, the Federation of British Tape Recordists and Clubs is now as big as it can conveniently grow if it is to continue to be administered by voluntary officials. This was the news given to the Federation's annual general meeting in London last month.

There was an interesting discussion on methods of helping members in practical ways, in particular of the problem of "providing an audience" for tapes once they have been made. Several delegates indicated disappointment with B.B.C. local radio stations as an outlet for amateur work. The Council of the Federation has this matter much in mind.

John Borwick, Chairman of the Federation, flew off to Tokyo on the day of the meeting, so sent his "chairman's address" on a tape which was played. With an introduction of Japanese music and a sound effect insert of dolphins at play at Windsor, it was the most enjoyable chairman's address I have ever heard.

* * *

TWO FEDERATION stalwarts, John Bradley and Peggy Buchanan (Mrs Bradley), will be spreading the word in Bedfordshire in November. The county education committee has organised a weekend course on Sound Drama and John and Peggy, with B.B.C. producer R. D. Smith, are the lecturers.

The course will be at Woburn and anyone interested should contact The Warden, Maryland, Woburn, Bletchley, Bucks.

* * *

THE RACE to mass-market a popular sound-and-vision system is an exciting one. Now it seems that an outsider is coming up on the rails and is set to surge into the lead.

Decca, in association with Telefunken, have come up with a video disc which can play back through a domestic TV set. First information is trickling through as I write: normal LP-size discs, playing time 12 minutes, speed of about 1,500 revolutions per minute, disc life of about 1,000 playings.

Cheapness is one of the big recommendations, say the developers – £60 to £120 for the turntable and stylus equipment.

And the limitations? For the time being, at least, only black and white reproduction. And, as far as I can judge from preliminary reports, no *recording* facility.

* * *

Rising costs, including substantial increases in printers' wages, compel us to increase the price of *TAPE Recording Magazine* to three shillings from next month.

TAPE WORKSHOP

By DENYS KILLICK

SO FAR in Tape Workshop we have dealt exclusively with problems related to "live recording", that is to say, recording actual sounds through the use of the microphone. There are, however, other kinds of recording in which the use of the microphone would be quite wrong; these involve the copying of existing recordings, either tape or disc, and recording "off the air", meaning taking one's signals directly from a radio set.

In work of this kind the recordist should be careful not to infringe copyright. Broadly speaking the copying of ordinary commercial gramophone records is prohibited (other than by special permission from the copyright owners or their agents) and it is immaterial whether the copying is done directly from your own gramophone or via the broadcast of a record. Pre-recorded tapes come under precisely the same prohibition. But the BBC does offer a very useful dispensation for the private enthusiast who is concerned only with his own entertainment at home. Periodically a panel is published in *Radio Times* in which the Corporation clearly sets out what can legally be recorded from their transmissions. Readers are recommended to study this carefully.

These copyright restrictions represent a burden under which recording enthusiasts in the United Kingdom have to suffer; but they are part of the law of the land and until that law is changed it has to be respected – and obeyed.

Having said which we can now consider the techniques of "recording without a microphone" a little more deeply.

First it must be stressed that it is *possible* to get a recording of sorts by merely placing a microphone in front of a radio loudspeaker, switching into the record mode and treating the whole thing like a voice recording. From our earlier experiments it should be quite apparent that this is the least efficient way of working. All the difficulties of room acoustics, noise break-through and microphone inadequacies at once arise, and to them are added the weakness of the loudspeaker producing the sound.

As we are now dealing with sound that has been converted to electrical energy at an earlier stage – in the making of a tape or record or within the broadcasting studio – it is much more convenient if we can continue to handle it as an electrical, rather than an audio, energy source. To do this we need only to establish an electrical connection between the tape recorder on which we shall copy and the radio, gramophone or second recorder from which the signals will originate.

All tape recorders have facilities for feeding such signals into them. This takes the form of an input socket usually labelled "Aux", "Radio", "Diode" or something similar. All that is needed is a length of cable fitted with the appropriate plugs at either end so that the two pieces of equipment can be directly connected.

These cables are now available commercially in wide variety to suit all manner of different sockets, and buying ready made can save a great deal of trouble and frustration with soldering irons. The cost is not great and the user is assured of electrical and mechanical reliability. An extremely useful lead to keep in one's work-box comprises a plug to suit the input connection on the tape recorder that is to receive the signal, wired to four or five feet of co-axial cable with the other end terminating in a pair of crocodile clips. These clips can then be used to "tap" bared ends of wire or can even be attached to the internal connection tags of plugs as a temporary expedient without the need for soldering.

When taking a signal from an ordinary domestic radio set we have first to decide what outlet to use. There are three possibilities; the set might be fitted with a socket labelled "Tape Out", it might lack that facility but have another socket marked "External Loudspeaker" or lastly there might be no connection facility at all, although this is rare in modern equipment.

Where "Tape Out" is provided then that is the obvious connection to use. All that is required is a lead with the correct plugs on either end. It will be found that a signal is present here at a fixed level irrespective of the setting of the volume control on the radio; in other words it is possible to record satisfactorily whether one is actually listening to the wireless or not.

If we have to use "External Loudspeaker" sockets then the situation is very different. In this case the adjustment of the volume control – and the tone control – on the radio will affect the strength and quality of the signal being passed to the tape recorder. As the volume is turned up so more signal will be passed to the recorder; as the tone control is altered so will the tonal quality of the recording be affected. It is usual to recommend that where a wireless has a single knob marked "Tone" then that should be set for maximum treble when recording from the external speaker sockets. The reason is because such a control is in the form of a simple "top cut" and in any other position one is losing quality on the tape.

If we are dealing with gramophone equipment then the same rules apply.

Where no provision has been made for external connections of this kind it will be necessary to slightly modify the radio or gramophone, and this is a job that can be carried out very cheaply by any dealer. However, since virtually all modern sets do have this facility the lack of it indicates that the radio is probably quite elderly and therefore the quality it will give is likely to be less than adequate for our purpose. Remember that one of the cardinal rules of recording is that it is impossible to get better quality *out* of a tape recorder than is fed *in* to it. A

poor signal will always give a poor recording, and it will not be the fault of the tape recorder.

In the world of radio the advantages of VHF transmissions are so well-known as not to require repeating here. Sufficient to say that Very High Frequency can give us a quality standard up to that of really good l.p. records, whereas Medium, Long or Shortwave radio can be equated with the standards of the old-fashioned 78 rpm records – plus interference of all kinds. A tape recording is something that one should be able to listen to repeatedly with pleasure; if its quality is poor it will annoy instead of please.

When copying from another tape recorder the correct outlet to use is the one marked "External Amplifier" or "Line Out". Here we will find in many cases that the signal is not influenced by tone and volume controls, but care is needed to check that this is so.

All that now remains is to insert the appropriate plugs of the interconnecting cable into the right sockets in the two pieces of equipment and then start recording. But first please observe one simple caution. When making such connections for the first time the level control on the machine that will be doing the copying should always be set first to zero. In fact it is good practice to *always* set this control to minimum whenever connecting plugs are inserted or removed. There is a danger – slight, but it is present – of causing damage to equipment due to the initial surge of current passing through the record amplifier. With the level turned back as far as it will go that can never happen.

And speaking of levels we now have to consider the question of matching in terms of sensitivities. If the signal source is too strong the copying machine will be working with its gain control hardly advanced at all. This will tend to lead to distortion and should be avoided, either by reducing the volume at the signal source, or, if that is not possible, by using some other form of reduction or "attenuation".

With increasing standardisation this problem crops up less and less frequently, but when it does it can be overcome very easily. Instead of using an ordinary connecting lead it will be necessary to buy an "attenuator lead". This has a resistive network built in and it will bring the signal down to a level that can be adequately handled by the recorder.

The ideal setting for the level control on the copying machine is likely to be somewhere within an arc formed by the centre third of its possible travel. It might be found that we have too little signal instead of too much. When this happens the level control has to be turned up near to maximum to get sufficient modulation. This will lead to increased noise due to the very high sensitivity of the record amplifier, and again it is a state of affairs to be avoided. This time increase the level at the signal source if possible, but if that can't be done then we have a much more serious problem on our hands.

It's easy to *reduce* a signal by attenuators, but what is needed now is to *increase,* and the only way that can be done is by amplification. So the remedy when too little signal is present is to introduce an additional stage of amplification, and that means using another piece of equipment. Fortunately there are many low-cost transistorised amplifiers suitable for this application now on the market, and the local dealer should be consulted. If a more sensitive input is available on the machine, then it would of course be correct to use that.

In case any reader should be frightened off it should be explained that we have been dealing with extreme cases; it is much more likely that a satisfactory interconnection will be achieved without any complications at all.

When dealing with voice recording it was suggested that quality could be improved by modifying the interpretation of the visual indication provided by the magic eye or meter. This was advised in order to help to overcome difficulties that are only associated with live recording. Now we have a completely different situation in which one should work strictly "according to rule". What is needed is the maximum possible modulation of the tape, and to achieve it the loudest passages should deflect the record level indicator to its maximum permissible position.

When handling sound that has already been transformed into another (electrical) energy form it must be realised that the work of "modulating" the signal has already been done for us in the broadcasting or recording studio. There the engineers have "set their levels" according to the sound output and the programme will not have (or should not have!) any passages louder than a certain fixed limit. When copying we have, therefore, only to establish that limit and from thence on the level at the copying machine should be left strictly alone.

On very quiet musical passages there is a temptation to wrench the gain up as little movement is seen in the level indicator. To give way to this impulse is the equivalent of attempting to turn a whisper into a shout and it must be resisted at all costs if the dynamic range of the original sound is to be preserved.

The technique is to set the copying machine into the record mode with the level control at zero. Next feed the signal in via the connecting lead and *gently* bring up the level on the copying machine until the loudest passages are showing maximum modulation. During this process it might be necessary to hold the tape still by means of the brief pause control.

Take careful note of the setting of the gain control. This will be our established recording level; any less would result in a weakly recorded (or undermodulated) tape which would need too much amplification on playback leading to excessive hiss, any more would distort the loudest parts of the programme. It is quite a critical setting.

Ideally we should then return the gain to zero, start the tape in motion (still in the record mode of course), bring the level up to our pre-determined position and thus record the programme. At the conclusion the level should be "faded down" gradually and the tape transport stopped only after running for a short period at minimum setting.

By adopting this formula our copy tape will have been neatly prepared, commencing with silence, followed by a fade up of hiss and noise as the programme comes in and a corresponding fade down into silence at the end. Now in practice this is not always possible, especially when copying from radio. One might have to start recording quite suddenly to secure the section of the programme required; similarly it might be better to stop dead at the end instead of fading down on the beginning of another, unwanted item.

But so long as one adheres to the principle of working in this way, producing recordings neatly separated by passages of silence whenever possible, it will make listening so much more pleasant.

This month we could not detail precise experimental procedures because equipment will vary so much from reader to reader. It is suggested that a wide variety of copying investigations should be undertaken, using different level settings, different signal sources and, where available, different input sockets on the recording machine. Compare results, particularly noting the unpleasant effect of stopping the recording machine dead at the end of a programme when the tape being used already contains an existing recording. The effect of "crashing" from one item into what must be a random position in an old, unwanted recording is very disturbing and unpleasant. It is avoided completely by running on for a short time after recording so as to erase a suitable length of tape to give that essential period of silence.

Interconnection of equipment is not difficult. In this article it has been treated simply for the benefit of beginners, but even the most experienced will find that a reassessment of the basic requirements is of great help in generally improving the quality of recordings.

Ferrograph
Series 7 tape recorder

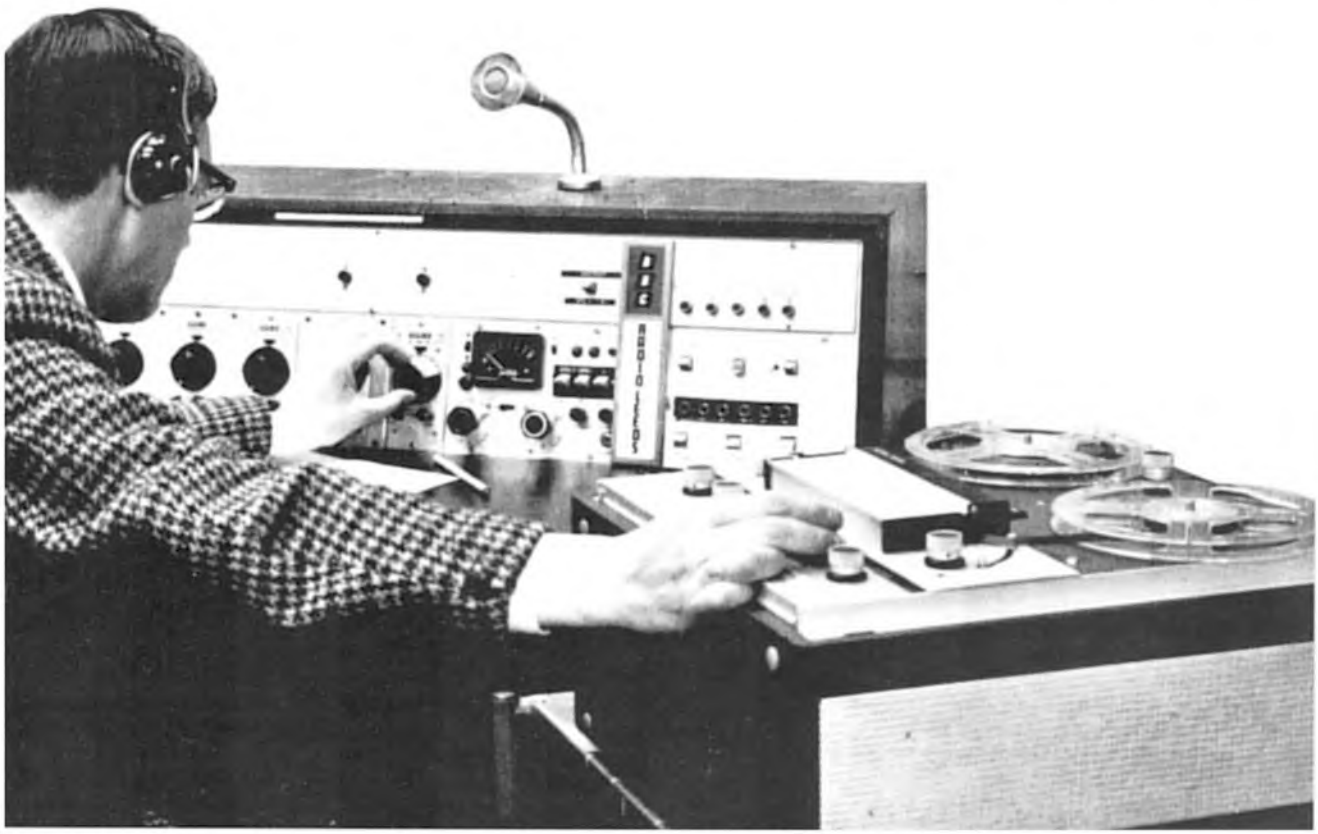
Where a tape recorder must be good and reliable, you'll find Ferrographs. In a radio station, for example, tape recorders are in constant use. Technical performance is all-important; absolute dependability and split-second control are essential. So Radio Leeds uses Ferrograph recorders.

Ferrograph Series 7 tape recorders are British made, available in mono and stereo, with and without end amplifiers. All instruments are solid state, three speeds. All incorporate an unrivalled range of facilities, including two inputs per channel with independent mixing, independent tone controls on each channel, endless loop, signal-level meters for each channel on playback and record, re-record on stereo models, and many others. The output is 10 watts per channel. Ferrograph recorders are available in elegant hardwood or in a vinyl case to suit any decor and method of use.

Follow the professionals; choose the recorder you know will serve you best at home and in your work: Ferrograph. Your local Ferrograph specialist will be pleased to demonstrate it to you. Alternatively, please write or ring for details and address of nearest stockist. The Ferrograph Co Ltd, The Hyde, Edgware Road, Colindale, London NW9 Tel: 01-205 2241, Telex: 27774

International Distributors:
Leroya Industries Pty,
266 Hay Street, Subiaco,
Western Australia 6008,Australia;
Matelectric,
Boulevard Leopold II, 199,
1080 Brussels, Belgium;
H Roy Gray Ltd,
14 Laidlaw Boulevard,
Markham, Ontario, Canada;
Cineco,
72 Avenue des Champs Elysees,
Paris 8e, France;
Henry Wells & Co. KG,
1040 Wien 4, Danhausergasse 3,
Austria
Ferropilot GmbH & Co., KG,
Hamburg 39, Sierichstrasse 43,
West Germany;
Hi-Fi Installations,
P.O. Box 2430, 276 Andries Street,
Pretoria, South Africa;
Elpa Marketing Industries Inc,
New York Park, New York 11040,
New York, U.S.A.
There are Ferrograph Distributors also in most other countries. Please obtain details from the London office.

Ferrograph



Recording studios use it every day.

'Scotch' low noise 'Dynarange' Magnetic Tape is the choice of top recording studios such as CBS, Decca, De Lane Lea, Lansdowne and Pye. Both the tapes and cassettes are now available in smart new plastic packaging.

Your dealer stocks the complete range.

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CROSS TALK

By Audios

THE THIRD annual exhibition of professional recording equipment organised by the Association of Professional Recording Studios took place at the Waldorf Hotel last month. This event is a "mini Audio Fair" with the accent heavily on the professional side of the business. Although the general public are not admitted many of the exhibitors' names are only too familiar to the enthusiast. But at the Waldorf they were presenting themselves to their studio clients showing some very sophisticated – and, to the amateur, expensive – equipment.

This question of cost is relative. An investment of £1,000 does not represent such a staggeringly large outlay for a firm whose business depends on audio. In fact most studios would regard such a price ticket as modest for an efficient piece of equipment. To get things in perspective one has to understand that to equip a studio from scratch is going to cost many, many thousands of pounds. What with mixing desks, multi-track machines, microphones and all the other accessories, not to mention acoustic adjustment of the premises, professional recording has advanced a long way from the days when any competent enthusiast could successfully enter the business on his own if he had a couple of hundred pounds in his pocket and a Ferrograph in the back room. Which is a pity, because in those days one only needed to add a sense of adventure and the whole thing became a most exciting project.

Amongst the more interesting exhibits was a new Nagra from Hayden Laboratories. The very name of Nagra means to the envious enthusiast a quality standard and performance level that he is unlikely ever to afford. The new machine, fascinating though it is, is no exception. We give full details in our New Products' section this month, not because it is thought that you or I are likely to rush out and try to buy one (we couldn't if we wanted to; the equipment is reserved for professional and industrial use thanks to purchase tax limitations) but because it is a brilliant demonstration of the direction in which recording is moving.

It should be remembered that twenty-five years back *all* recording equipment was professional; at that time it was not thought that the amateur would ever be able to concern himself in what was then regarded as a strictly professional field. But look how things have changed! It would be a bold man, or a foolish one, who would say with certainty that equipment like the Nagra SN will never appear in the domestic market.

Our old friends Audio Engineering were showing a range of their own equipment as well as many of the Sennheiser products. By the way, they have available free of cost to interested readers a very comprehensive and lavishly produced catalogue of Sennheiser equipment. If you would like a copy please write to them at 33, Endell Street, London, W.C.2. enclosing postage stamps for about one shilling. The cost of producing a publication of this size and quality must be formidable, so please write only if you are seriously interested in items of this quality and price range.

How many British firms manufacture condenser microphones? An interesting question. Germany and Austria seem to have cornered this market during the last decade, so it is good news to find that up in the wilds of Yorkshire a group of young enthusiastic men are manufacturing and marketing condenser microphones at prices that are only a fraction of those charged for imported models. They point out that great savings are possible through producing at home and they claim that their products are comparable in quality and reliability to foreign imported models.

Again we are reporting in detail on the full range in New Products this month, but for further information write to Calder Recordings Ltd., Regent Street, Hebden Bridge, Yorkshire. To demonstrate the robust construction Sales Director John Howard Smith deliberately dropped one of his display instruments on the floor and showed us another one (which he claimed was still fully operational) with what appeared to be a thoroughly dented case. We invited him to appear on our front cover wielding a fourteen-pound sledge hammer over one of his microphones, but, not surprisingly, he declined!

The subjects of noise and distortion are being tackled very seriously by the tape manufacturers. Both BASF and EMI had available printed copies of technical papers on these matters. Since noise in a recording system has as its content a relatively large amount of what is loosely known as "tape hiss", and since the amount of audible noise is dependent on the level of the signal recorded, the tape manufacturer can obviously make some very worthwhile contributions in this field.

Similarly distortion can be caused, in fact *is* caused, through the mechanical and magnetic processes that take place at the head. With advances in electronics we can reduce distortion in an amplifier to very low levels indeed; what is now wanted is an equally low level in the recording process. Thanks to the work being done in the tape laboratories we can look forward to the day when that will be the case. But not yet.

Secretary John Borwick, who will be familiar to many of our readers, was responsible for the organisation and administration of the exhibition and he is to be congratulated on its success. I am now looking forward to next year's.

* * *

"THE DAY of the audio-visual cassette is almost upon us". Those are the first words of a new news-sheet published by a new firm, W. H. Smith Cassettes Ltd. As you might guess this company is an off-shoot of W. H. Smith Ltd., the famous booksellers. Smiths have been retailing gramophone records for many years, and recently their audio activities were extended to cover Musicassettes. But now they feel that tape in all its various forms is so important that it warrants a completely separate organisation to look after it.

Do you remember the pre-war W. H. Smith lending libraries? These were only abandoned when there ceased to be a public need for such a service. Nowadays people prefer to buy paper-back editions rather than borrow. Smith's now hint that this service might well re-emerge in the future – loaning not books but programme material on tape in cassette form.

This is an event to which I look forward with the greatest enthusiasm. In their first edition of "Seen and Herad" Smith's refer to tape as being "a new portable medium for education and entertainment, a logical development of the written word of books, newspapers and magazines". Naturally they have their sights fixed firmly on the advent of the video cassette. If this proves to be successful in the mass market there will be enormous business to be done; even in the more limited and specialised field of education there will be plenty of scope for commercial enterprise. We shall follow the fortunes of W. H. Smith Cassettes Ltd very closely and keep you in touch with the latest developments.

* * *

NO EXCUSES are offered for bringing up a subject that has nothing whatever to do with recording or audio. Recently two members of our staff witnessed a terrible and tragic experience, an experience that could have been avoided very easily. So I now wish to remind you of a few simple facts, which, if observed, could save a life.

Young children, especially those who cannot swim, should NEVER be permitted near water without supervision and some form of artificial buoyancy. Even if that water is an ordinary, "harmless" swimming bath. A few weeks ago a seven-year-old child was drowned in a pool whilst people were swimming, laughing and playing. His body was discovered by chance on the floor of the bath at the deep end. No-one saw any signs of an accident and his parents were only a few yards away all the time.

Never believe "it couldn't happen to me" or "it couldn't happen here". It could happen to you and it could happen anywhere. Danger is greatest during the hot weather. Children love to play in the water and there's no reason why they shouldn't provided proper precautions are taken. So if you are a parent please take special care of your own children; if not a parent then please bother to keep an eye on other people's youngsters when going for a swim. IT COULD SAVE A LIFE.

AWAY WITH THE NOISE!

A Harman Kardon cassette machine with its own Dolby noise reduction system built in. This equipment was shown for the first time a few days ago at The New York Consumer Electronics Show.

A sophisticated "black box" incorporating full Dolby B equipment for record and playback with any tape recorder. It is believed that such devices will be made and marketed in the U.K. at prices up to a little over £100. Through its use the amateur might achieve a quality standard previously obtainable only in the studio.

"PEOPLE just fall about laughing when I tell them. They don't believe it and you really can't blame them." Ioan Allan, Sales Manager of Dolby Laboratories Inc., was talking to us about his claim to be able to produce a 1⅞ ips Compact Cassette copy of a half-track, 15 ips professional master tape with such a high quality standard on the cassette version that even experienced ears detect little or no difference between the two. And it is rather funny when you when you come to think about it. Imagine an impressive studio machine standing in its console with its illuminated press buttons, 10½-inch spools and standard width tape; a machine as costly as it is efficient with every facility required by the most fastidious of studios, a machine that represents the last word in sophisticated recording techniques. By comparison the cassette is little more than a toy, and to talk about there being little or no difference between the sound that each produces could only be ludicrous. So let's all have a good laugh together and start talking about something sensible.

There's just one snag, though. *If you were to hear the Dolby demonstration you would not be able to tell the difference.* The quality of the open spool master is superb, yet the cassette copy is as near to a mirror image as it would be possible to get. How does this miracle happen? Is it just a gimmick or does this have any relation to the practical requirements of the enthusiast working at home? It was our search for the answers to these questions that took us to the premises of Dolby Laboratories Inc. in London. What we there learned was as exciting as it is encouraging. There is no doubt in our minds that what we have seen and heard heralds a new age for the recording enthusiast. For the first time since the gramophone record was invented we have the possibility of bringing true professional quality sound into the home. And at modest cost. And the self-same benefits will apply to every recording taken by the amateur, whether dubbing off the air or working live, whether using Compact Cassette or open spool.

It all sounds too good to be true, so first let us try to explain what the Dolby system is all about. Far from being any kind of a gimmick it is a well-proven method of reducing the noise levels in tape recordings. More than a thousand Dolby units are in use and they can be found in professional studios both here, in America and throughout the world. The cost of the equipment is prohibitive from an amateur point of view – £560 for a two-channel record/playback appliance which must, of course, be used in conjunction with standard tape recording apparatus.

It works by a process of amplifying low level signals *before* the inherent noise of the tape system is added so that when on playback they are attenuated, or "stretched" as the Dolby engineers say, the noise is attenuated too. In order to accommodate the characteristics of the human ear the professional Dolby unit divides the complex programme signals fed to it into four separate bandwidths and each is treated separately. Such a recording can only be properly reproduced via the Dolby unit in its playback mode; in other words it could be described as "non-compatible".

What actually happens in this Dolby Type A device is that the programme is split up into bands of frequencies. These are below 80 Hz., from 80 to 3,000 Hz, from 3,000 to 9,000 Hz. and from 9,000 Hz. and above. All signals within each of these bandwidths and above a certain high level pass through the equipment without change; weaker signals are given a boost of from 10 to 15 dB before being fed to the recorder. In effect it is a complex compressor that amplifies the quieter passages of a piece of music to deliberately destroy the original dynamic range. A recording produced in this way has nothing recorded on it other than relative loudness – and, of course, noise.

When we come to play back we *must* reverse the process to restore the dynamic range of the performance. It's not difficult to understand why and how the noise disappears. It is present on the tape because there is no way of recording without it, but as the recording is de-emphasised all the weaker signals are attenuated. The noise content is present in the form of a weak signal; it will therefore receive some 10 dB of attenuation and in practice this is approximately the resultant signal-to-noise ratio improvement that can be expected.

Let us hasten to add that this explanation is a gross over-simplification of what is in reality a highly complex process. The great thing is that it works brilliantly and many of our major gramophone record companies have been using it for a number of years with every success. There can be few readers who have not at one time or another heard a Dolby recording in this form. It can usually be recognised by the almost complete absence of "surface noise" (actually tape noise) when reproduced on good transcription equipment.

Up until recently this would have been the beginning and end of the story. Dolby could have been described as an ingenious invention of great interest to professional engineers but of little consequence to anyone else. Had the gramophone record been destined to retain its supremacy for all time then that would undoubtedly have been the limit of possible development of the device. But now the world of home music is reeling under the impact of tape, and of Compact Cassette in particular. The technical staff of Dolby Laboratories are only too well aware of the advantages of tape over disc and they have reasoned that if cassette quality could be improved to the point where it would equal or even surpass that of the best gramophone records then the cassette is bound to sweep the board. It will win hands down.

But factors other than noise reduction are involved. That is only one of the problems. In spite of the support that we at *TAPE Recording Magazine* have given to the cassette system in the past many people have doubted its quality potential.

It has almost become a vicious circle. If the record companies do not bother too much about the quality of their Musicassettes then the equipment manufacturers will themselves believe the system is basically "lo-fi" and will not trouble to build into their machines any of the so-called "hi-fi" attributes. This is why we have seen the import of so many poor quality cassette recorders. Only a handful of enlightened specialists had faith in the possibilities of ultra-narrow tracks running at ultra-slow speed. With commendable foresight they began to improve cassette tapes and to design machines with extended frequency responses and acceptable wow and flutter figures. Cassette recorders built to this high specification are already available in small numbers and they will rapidly become more and more popular. It is because such equipment is being produced that the Dolby engineers began to look at what they regard as being the last hurdle to overcome – the reduction of noise.

We all know that narrow tracks and slow speeds are detrimental from the noise point of view. By the very nature of the recording process it is bound to be there. We cannot help thinking of the number of excellent open spool machines we have reviewed in the past when we have had to say that the only difference between recording off the air at 3¾ ips and 7½ ips was the increased level of hiss at the slower speed. For "hiss" read "noise" and it will be understood what all this is about. Reduce the speed still further to 1⅞ ips and the noise can be unacceptable for quality work. Remove that noise and we at once have the possibility of elevating slow speed operation to high fidelity level.

To meet these domestic requirements a completely new Dolby system has been evolved. Instead of working on four separate bandwidths it operates only in the high frequency area of the audio spectrum and thus reduces both the complexity and cost of the equipment by 75% at a single stroke. The electronics can be miniaturised to such an extent that all the necessary circuitry can be built into an ordinary sized mains cassette machine that looks no different to the models with which we are all familiar. And the final plus that makes the whole thing feasible – the new Type B Dolby recordings *are* compatible; they can be successfully reproduced via a non-Dolby machine, although in that case there will of course be no resultant noise reduction.

The implications are tremendous. Negotiations are already taking place with the repertoire companies and it is anticipated by Dolby that within the near future we shall find that at least half the pre-recorded cassettes on sale are being produced to the Dolby B characteristic. Such cassettes can be replayed normally on a normal machine, requiring only a little top cut to bring them back to flat. Or, when the new "Dolbyised" equipment becomes available, they can be reproduced with all the advantages of what is a virtually silent background. Provided a high specification playback machine is used, and provided the high speed copying has been competently carried out, then the sound quality will be as good as, or better than, the best gramophone record.

Now to come to cost. Dolby Laboratories do not themselves propose to make any of this domestic equipment. Instead they will license manufacturers to use their system, so final retail prices will not depend upon them. However the first cassette machines incorporating a full Type B record/playback unit have just been released in America at a cost of 250 dollars so we could anticipate a U.K. price ticket of something under £100. That is for a complete stereo machine which will confer the benefits of Dolby noise reduction on all the recordings it makes. For the owners of existing equipment there will be "black boxes" available, add-on units that can be used with any recorder. The simplest will be playback only, and these will enable advantage to be taken of the pre-recorded Dolbyised repertoire at the fairly modest cost of under £20 for two-channel stereo. The enthusiast with a battery of top-grade equipment will not be neglected; for him there will be more sophisticated black boxes giving complete recording/playback facilities, probably with in-built mixing as well. Cost here will be related to versatility with a top price level of around £100 or a little more. A single device of this kind could be used in conjunction with a number of tape recorders, both open spool and Compact Cassette, and provided the equipment and the tape used is good the amateur will find himself producing fine quality recordings at the slower tape speeds, thus saving a great deal of money in tape costs. Relating benefits to cost we find these prices to be truly modest, but such a judgement can only be made after actually hearing the equipment in use and that is what we have been doing.

For his first demonstration Ioan Allan erased a cassette in a domestic machine and then played back the blank tape with the amplifier volume control turned well up. Try it yourself. The hiss and noise is appalling. The process was then repeated with Type B Dolby in circuit. With the amplifier volume control unaltered the reduction in noise could only be described as dramatic. What had been an offensive hiss at something approaching programme level became an unobtrusive background whisper.

Next Ioan played back some ordinary Musicassettes of poor quality to show how bad the cassette can be at its worst. We have had to comment about this in some of our music reviews and so we required no convincing that under bad conditions the cassette can perpetrate some pretty terrible things. However these were admittedly some of the exceptionally worst examples.

By contrast we then carried out the most interesting experiment of the day. A 15 ips half-track master tape of *Der Rosen Kavalier* provided by courtesy of Decca Records Ltd. was laced up on a C37 Studer studio machine. The tape was played back and re-recorded on to Compact Cassette using a BASF C90 in an American Wollensak domestic machine made by the 3M Company. A Type B Dolby was in the circuit.

After winding back the tape and the cassette both recordings were carefully synchronised so they could be played together. We were then invited to carry out A/B switching tests, listening to the programme on a pair of KEF Monitor speakers driven by an HH Electronics 100 Watt amplifier. We did *not* fall about laughing. If there were any differences we could not detect them in the short time available. As we said earlier, the cassette copy was a mirror image of the master. It was the most incredible audio demonstration we have ever heard. It proved in the only possible way that the quality potential of the cassette system has been grossly underestimated, even by us. Any enthusiast would have been proud to think that he had obtained such a quality standard working open spool at 15 ips.

What, then, are the snags? First and most important the Dolby device will not perform miracles and for optimum results it demands the use of the very best recorder and tape. There is no point in reducing noise if the recording is full of dropouts and nasty wow. The engineers here believe that most of the drop-out problems associated with cassette originate from poor head contact rather than faults in the tape itself. After an intensive investigation they conclude that *tape thickness* is the decisive factor and a C90 cassette gives the best wrap-round without being too thin.

Next, because Dolby B is restricted to the upper frequencies it will *not* reduce the level of mains hum if this should be present. The correct treatment here is to cure the cause of the hum.

Finally the greatest advantage from a practical point of view will be obtained when the noise level is greatest. Noise increases as tape speed decreases and tracks become narrower, so the most dramatic improvements will be obtained in slow speed, narrow track, recordings. Which is why it is ideal for Compact Cassette. Conversely when working on

Please turn to Page 263

Don't forget your favourite LP's

Ever tried listening to a 4-track down on the beach? Or playing a gramophone record in your car?

With a Philips compact cassette machine, you can enjoy the best of both worlds—and a whole lot more. It's the only recorded sound system yet devised that makes it a sheer pleasure to take your favourite music with you wherever you go. Play it whenever you please.

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TEST BENCH

SONY TC-100

INVESTIGATED BY D. KILLICK

MANUFACTURER'S SPECIFICATION
Sony TC-100

Power Requirements: 4 flashlight batteries each 1.5 Volts, or AC 100, 110, 117, 120, 220 and 240 Volts or Sony rechargeable battery pack BP-9 (optional extra).

Cassette Tape: Sony C60, C90 or equivalent.

Tape Speed: 1 7/8 ips.

Tracks: Dual (monaural).

Power Output: 1 Watt maximum.

Frequency Range: 50 to 10,000 Hz.

Inputs: Microphone jack sensitivity -80 dB (0.078mV). Auxiliary jack sensitivity -20 dB (0.078V). Input impedance 100K Ohms.

Output: Monitor jack, level 0dB (0.775V) impedance 10K Ohms.

Speaker: 2¾ x 4 inches dynamic.

Battery Life: Up to 7 hours of recording.

Included Accessories: Carrying case with strap, F95 dynamic cardioid microphone with stop/start, cassette tape C30, connecting cord RK36, magnetic earphone ME20, four UM2 cells, AC power cord and accessory pouch.

Dimensions: 5¾ inches wide by 2 3/8 inches high by 9 3/8 inches deep.

Weight: 3 lbs. 13 ozs.

Recommended Retail Price: £42.5.6d, including purchase tax.

Distributors: Sony (U.K.) Ltd., Ascot Road, Bedfont, Feltham, Middlesex.

SONY TC-100 TEST CHART

Frequency Hz	Overall Response dB	Playback Only dB	Signal/Noise Ratio Battery dB	Signal/Noise Ratio Mains dB	Distortion %
40		−14.0			
63	−16.0	+7.0			
125	−1.5	+2.5			
250	−0.7	0			
333	0	0	54.7	43.5	3.0
500	+0.7	0			
1000	+3.0	+2.0			
2000	+4.5	+3.5			
4000	+6.0	+3.5			
6300	+6.0	+1.0			
8000	+3.0	−6.5			
10000	−6.0	−28.5			
Wow & Flutter	0.16%				

NOTES: The Overall Response figures relate to record and playback using a BASF C60 cassette. Playback Only relates to the reproduction of a standard Philips calibration cassette, reference TC-FR.

For Signal-to-Noise Ratio the tape was recorded at standard reference level and then the signal was removed from the record amplifier. With the tape still in motion the (bulk-erased) tape noise in relation to signal level is quoted for best battery and worst mains results, but see text for further information.

Distortion is quoted against a 333 Hz. signal recorded at the same reference level and alternative measurements are given in the text.

Wow and Flutter is total RMS, the test frequency being 3,000 Hz. Test equipment used included: Bruel and Kjaer Signal Generator, B & K Frequency Analyser Type 2107, B & K Level Recorder Type 2305 and Gaumont-Kalee Wow and Flutter Meter.

FOR THIS MONTH'S review we are taking a look at a Compact Cassette machine manufactured by Sony of Japan. It is of particular interest because it is the first cassette equipment that we have examined from this firm and the recorder itself has a rather higher value placed on it than the prices asked for other makes of similar format. We shall therefore be asking ourselves what advantages the user might expect to get if he invests a little more than he might lay out for run-of-the-mill equipment.

The machine is the Sony TC-100, superficially typical of the smaller battery portable cassette recorders. However as soon as we mention the power supply important differences are at once noted. An AC mains converter unit is built into the equipment and it is only necessary to plug in the mains lead provided to change from battery to 240 volt operation. And if the user prefers to save money by running on rechargeable cells then an optional accessory nickel cadmium power pack can be purchased to replace the completely detachable dry cell container. So here we have the choice of three power sources: 4 1.5 Volt batteries, AC mains or (at an extra cost of £10.0s) a rechargeable battery pack that will give a claimed 11 hours continuous recording time at a single charge.

As is usual with the small portables, record and playback is monophonic, although thanks to the compatibility of the Compact Cassette system stereophonic recordings can be reproduced without any losses. The equipment comes complete with the usual leather (?simulated) carrying case and separate pouch for a comprehensive range of included accessories.

Our Test Chart quotes response figures for playback only based on the reproduction of a Philips TC-FR calibration cassette and also the overall response (record to playback) using a BASF C60 cassette. Before commenting further on these figures we must, in the interests of fair reportage, explain certain difficulties we experienced in arriving at the overall curve.

When reviewing Sony equipment in the past we were able to persuade the manufacturer of the need to indicate clearly the kind of tape for which the

recorder had been adjusted. Our advice was acted upon with commendable promptitude and this is the reason why every Sony instruction manual now carries a boldly printed slip specifying the recommended tape. We noted with approval that the guarantee card with the TC-100 had such a slip printed in red stapled to it. It said: "This model has been designed both electronically and physically to give optimum performance using Sony C60 and C90 cassettes."

This is a very clear statement of fact and so the measurements (undertaken for us this month by an independent laboratory) were first related to a Sony C60. The merest glance at the pen graph as it came off the B & K equipment was enough to tell us that something was seriously wrong. Although disappointed we were not too surprised to get what amounted to a silly answer because this model relies solely on an automatic gain control without manual over-ride. We shall comment on this later in the review, but from a technical point of view it does present the engineers with some unusual difficulties. For instance, it is impossible to accurately set the test level because one doesn't know what the AGC is doing to the signal; similarly as some of these automatic systems are frequency conscious they could play havoc with established measurement techniques.

After discussing the problem with Sony U.K. Ltd. we examined, at their request, another two models from stock. Comparing results with our original sample variations were noted but the overall curve was still unsatisfactory. The whole thing was quite incomprehensible because our findings did not agree with measurements taken by Sony engineers in their own works. We knew there *must* be an explanation but did not discover what it was until after spending many hours of frustrating (and completely wasted) effort.

The fact is that both we and Sony were equally correct. To our mutual chagrin we found that the differences between us were entirely due to differences in tape! It seems that a brown-coloured tape had been used in the earlier Sony cassettes and this was the recording medium on which their engineers had based their measurements. We had supplied to us cassettes from the latest delivery and these contained a different tape of darker colour. The one we had used was faulty, although others checked later were satisfactory, so we settled finally for a BASF C90 on which our published figures are based.

All of which goes to show how important tape is to the user. We have explained these unusual circumstances at some length, so as to emphasise this fact. As to the faulty Sony cassette – it could occur in any firm and we are quite sure it will be investigated and corrected if necessary.

Frequency response figures were measured from the output at the Monitor socket, and as this is influenced by the settings of the single tone control (top cut) and volume control we set the tone for maximum treble response. Instead of taking as our datum the response at 1,000 Hz. (as is usual when dealing with open spool equipment) we have here referred to the reference level on the calibration cassette at 333 Hz. For the sake of consistency our overall curve has been plotted in the same way.

It will be noted that at 1,000 Hz. the overall response is plus 3 dB relative to the output at 333 Hz. To adjust the figures to relate to output at 1,000 Hz. it is therefore only necessary to subtract 3 dB from every reading quoted in that column. If that is done then we arrive at an astonishingly flat curve extending all the way up to 10,000 Hz., the only dubious entries being at the extreme lower end. Please note that adjusting figures in this way makes not the slightest difference to what one *hears* – it just makes them *look* better, and in this case is perhaps a more fair way of regarding them.

Playback only (which of course does not depend on the kind of tape or the recording characteristics of the machine) are rather less good with a fall-off between 6,300 and 10,000 Hz. We checked the azimuth alignment and found it to be correct. Here we must criticise the specification which is technically very inadequate – many of the parameters are not quoted at all – and no tolerance limits are imposed on the frequency range. Publishing figures in this way is quite meaningless; it is a dodge sometimes deliberately adopted by unscrupulous firms with the intention of misleading. Sony is absolutely above suspicion in this respect so it is all the more puzzling that they should adopt such a formula. The more so when it is seen that some of our results from laboratory tests on the TC-100 reveal quality standards higher than we have ever measured on cassette equipment before.

Typical is both long term and short term speed stability. Elsewhere in this issue we refer to the elevation of slow speed recording into the realm of true high fidelity, but before that can happen we must have acceptable wow and flutter figures. The TC-100 gives us just that. We checked on mains and battery operation and both gave us a total RMS wow and flutter content of 0.16%. This is outstanding for cassette equipment; it would not be at all bad for open spool running at 7½ ips yet Sony have achieved it at 1⅞ ips. Long term stability is even better. The deviation from absolute accuracy (as measured on an electronic counter and checked on a drift meter) was so small that we can only describe it as 100% O.K. Why, oh why, should such important facts be ignored in the specification?

Signal to noise is good too. We measured this in three different ways and then duplicated to give comparative mains and battery readings. The best unweighted figure against bulk erased tape was 54.7 dB referred to the 333 Hz. level on the calibration cassette. This deteriorated to 43.5 dB unweighted on mains due to the breakthrough of mains hum, although we confirmed that the hum recorded is actually negligible. When checking noise against tape erased in the machine we found a variation in the figures due to a cyclic increase in background hiss occurring approximately every 5 seconds. This is probably caused through the action of the AGC "hunting" for a signal; it accepts the low level noise, amplifies it and then rejects it. It was an effect not noted in practical user tests and we suspect that it would only occur under the relative false conditions of trying to record with no signal at the input.

On playback we established a distortion level at 3% third harmonic when reproducing reference level. The built-in meter has a VU characteristic; when at zero it reads 8.5 dB below reference so we checked again at zero output on the meter and this gave us less than 1% third harmonic. To complete distortion tests we recorded a series of three-second bursts of tone (to defeat the AGC!) at zero plus 8 dB and in no case did distortion exceed 3%. This approximates actual working conditions and is a pretty exacting test.

Sensitivity at the microphone socket was shown to be 150 microvolts for zero on the meter and both input and output impedances were better than specification. From a visual check the safety standard of the internal mains connections appeared to be good in conformity with British Specification 145 1967.

This concluded our laboratory investigation and we now pass on to user trials. At this point we must comment very favourably on the appearance and "feel" of the machine. Solidly constructed it inspires confidence in the user in sharp contrast to some of the cheap and flimsy recorders that have been appearing in the shops. The aristocracy of its pedigree is at once apparent to both the eye and the touch.

The carrying case is of a fairly standard design, but the soft leather pouch included for accessories is unusual and thoroughly excellent. It is laced through the strap at one end whilst at the other is a strip of self-adhesive fabric which

latches on to a similar strip on the other side of the case, thus keeping the pouch both neatly under control and completely secure. We give this arrangement full marks after our experience of very nearly losing an accessory wallet from a machine of different make just before setting off on a holiday abroad last year.

Tape transport is controlled by press keys set in the upper edge and as might be expected these are a positive joy to use. Interlocking between keys is perfect; there is no Pause provided but this is not necessary as the red Record safety key locks into position and enables the user to observe deflections on the meter with the tape stationary. The meter itself is a typical rotary "compass" set in the upper surface. Very small in size – not much larger than a big shirt button – it is not easy to read although this is not so important where level setting is completely automatic. On battery operation it indicates the state of the cells.

The cassette compartment has a transparent plastic cover and insertion and removal of cassettes is simplicity itself. A key on the upper edge of the machine has two positions: press and the lid flies open; move to the left and the cassette is ejected. Two edge-type rotary controls set in the same upper edge are marked Tone and Volume, and next to them is a recessed panel with input and output sockets. These are all miniature jack (we would have liked to find a DIN socket) and they are from left to right: Monitor, Aux., Remote and Microphone. The remote socket enables the machine to be started and stopped from the switch on the microphone provided and also accepts the plug from an optional accessory foot switch. This latter could be useful if the recorder is used as a dictation machine, but we must remind readers that the capstan and pinch-wheel are under pressure contact when the tape is stationary through the use of the remote control and so this should only be employed briefly. For longer pauses the Stop key should be actuated, and, of course, the machine should never be left with any of the other transport keys depressed.

Set in the bottom of the right hand side is the voltage selector giving a choice between 100, 110/120 and 220/240 volt operation and immediately below that is the mains input socket. The battery compartment is found on the underside, and this takes the form of a completely separate container which clicks and clips firmly into place. Polarity of cells is clearly marked but we did find the insertion of batteries to be a little awkward owing to the strength of the contact springs. We were pleased to note that the underside is fitted with anti-scratch rubber buffers to protect furniture.

An unusual feature of the TC-100 is the "End Alarm". Sony cassettes are fitted with metallic foil in the same way as reels of standard tape. When in the record mode this foil actuates an alarm signal – a loud buzzing noise – as soon as the end of the tape has been reached. This is a convenience that could be very useful, although we do not know of any other cassettes fitted with foil and naturally it does not work if the foil is not present.

Our first recording tests were of speech using the microphone provided. This, too, is of unusual design, being rectangular in section. It is a dynamic cardioid and we were impressed with its quality potential which seemed to us to be rather better than that obtainable with the microphones included in the price of cheaper machines. The Sony instrument is certainly more impressive in appearance, although we did miss the little plastic table stand that usually accompanies the other round, stick types.

But as soon as we started to record we began to miss a manual record level control. Although automatic setting has many advantages we do feel that at the price asked for this machine it should have been equipped with a manual override. We found this restriction to the use of the AGC without any option to be frustrating, but having said that it must be admitted that the automatic system works very well for both speech and music recordings.

Judgements on audio quality based on the sound produced at the internal speaker are bound to be invidious. No small cassette machine gives anything approaching good sound from a quality point of view; the internal dimensions prohibit the fixing of anything other than the smallest cone. The TC-100 is no exception in that respect and so we fed the output from the Monitor socket to a Quad amplifier and a pair of Quad Electrostatic speakers.

Programme material recorded on the machine and reproduced in this way had a quiet background and good response up to 10,000 Hz. as shown by our response curve. Playing back Musicassettes revealed an additional lightness at the upper end and we feel it is a pity that the playback curve does not parallel the overall response. Perhaps the manufacturers would care to take a look at this problem because a machine that is so excellent in so many other ways certainly warrants this attention.

To summarise our findings we can refer to the Sony TC-100 as being a robust, well-made machine offering a mechanical efficiency that is quite outstanding in its class. Our two criticisms relate to the lack of a manual record gain control and to the playback response. We feel that its extra cost is more than justified for the man who can afford to purchase those rather abstract qualities of reliability and efficiency that we reviewers find it difficult to deal with. It represents an excellent buy for the individual who values his equipment and likes to take a genuine pride in it and we look forward to examining other Sony cassette models in the future.

AWAY WITH THE NOISE
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full width tape at high speeds, say 15 ips, the noise level should be well down in the first place and although we should get a further reduction of about 10 dB this will not be so dramatically obvious. What was already quiet merely becomes that much quieter.

It would be a mistake to believe that through Dolby we can solve all recording problems; to the contrary this new device is but a single link in a new chain that is now being forged for our benefit. We have said nothing about the use of chromium dioxide tape. News of the existence of this advanced recording medium was first announced by us more than a year ago. It was then said by many that such tape would never be used domestically. We have just been handling an American machine (Compact Cassette) with a switched bias facility so that it can be adjusted to accept either normal iron oxide tape or the new chromium dioxide. We have also handled cassettes containing Crolyn, the trade name for the Du Pont tape of this kind, and we have heard recordings made on them.

One of the effects of changing to chromium tape is to increase frequency response at slow speeds. However good a cassette machine might be the new tape should add at least 3,000 Hz. to its upper limits. At least, that is what we have been told. And yet one manufacturer has already discussed with us the possibility of extending the response up to at least 16,000 Hz. through the use of new materials in the record head whilst still working with conventional tape.

In our Test Bench review this month we discuss a cassette machine with wow and flutter figures of 0.16% and long term speed stability that can only be described as 100% accurate. Its distortion figure of 3%, combined with these other parameters, clearly indicates the direction being taken by our better manufacturers. It is obviously towards the ultimate goal of a fidelity standard that will satisfy the most discriminating of enthusiasts. With the advent of the Dolby Type B system of noise reduction we are taking yet another enormous stride forward. The real era of tape and tape recording is only just beginning.

NATURE NOTES FOR AUGUST

BY RICHARD MARGOSCHIS

DURING the second week-end of May thirty-four members of the Wildlife Sound Recording Society were gathered at Woodchester Park Field Centre in Gloucestershire for the annual spring meeting; perhaps it is needless to say that, as Officers of the Society, my wife and I were there. Such meetings are very important to a Society with members scattered throughout the country, for they give us a chance to get to know each other and to exchange information about techniques; at the same time an opportunity is offered for putting ideas into practice. All this was done, and much midnight oil burnt in the process.

It would probably stagger you to see the amount and range of equipment scattered about the lecture room – and elsewhere! Tape recorders ranged from the Fi-Cord 1A to the Nagra, with the Uher still well to the fore numerically. Parabolic reflectors, of all sorts and sizes, showed an ever increasing trend towards home made models; this, I considered, indicated that our members are giving more thought to weight, size and focal length. (Manufacturers please note). Glass fibre is undoubtedly the most popular material for home construction.

As might be expected, microphones were not so varied as the recorders. The Grampian DP4 is still very popular and the DP6 was in evidence; they are in a popular price range, give decent quality and are good for mounting in a reflector. At the other end of the scale was the Fi-Cord condenser microphone with self container power-pack – ideal for the reflector. Incidentally, these instruments are now being manufactured by Calder Recordings Ltd. of Hebden Bridge, and have been modified to overcome their earlier incompatability with certain recorders.

The microphone which attracted most interest, however, was the Sennheiser MKH 805 gun microphone. I am indebted to Audio Engineering Ltd. for the loan of this instrument for demonstration purposes. All present had an opportunity to listen to the signal from this microphone and compare it, by the flick of a switch, with the signal from a condenser microphone in a reflector. This clearly demonstrated that the reflector was very much more directional than the gun and, as one would expect, presented a stronger signal, but the gun scored on the point of quality. It has a great advantage in that it is much easier to handle and carry than a reflector (overall weight around 2¾lbs including wind shield). I think that so far as natural history work is concerned it must be used as one would normally use any open microphone. At around £200 for the complete gun kit amateurs would be well advised to be sure they have top class recording machines before considering the purchase of such an expensive microphone.

It is inevitable that with such a gathering there will be much discussion on open-microphone versus reflector. We got off to a good start on this one when John Fisher, our Secretary, presented a talk on the theory and techniques involved in the reflector. He used, as an example, an extract from one of our circulating tapes in which John Kirby, a well known nature recordist, recorded the same bird with and without a reflector. I believe that John Kirby's exercise has proved beyond doubt that, when the reflector is properly used, it is very difficult, if not impossible, to tell the difference. Many people say that a reflector makes the recording sound 'tinny' but, in notes that have come to me, this argument has been applied, unknowingly of course, to the wrong recording!

Victor Lewis makes all his recordings "the hard way" – with open microphones. When he talked to us he demonstrated, with the aid of slides, some of the problems of this technique. For instance, to record and photograph a Lobby falcon he and a friend found it necessary to erect a scaffold to support a hide ninety feet above the ground. They were rewarded with both beautiful photographs and unusual recordings. Vic's last remark to me about reflectors was most revealing – "If they had not been invented I should have made a lot more money!" Incidentally, he tells me he has two more discs published. *Bird Songs in Close-up Vol 2* on Marble Arch at 14/6d and *Guess the Birds* on H.M.V. at 22/6d. The first follows the lines of his last disc under that label and the latter verbally identifies birds and then mixes them up for the listener to identify. Both will be good in helping to improve your aural recognition of birds.

Reg Kelly, who runs Woodchester Park Field Centre, plans to hold another week-end course on natural history sound recording in October. It will be open to anybody, so if you are interested write to me now for details – don't be put off by the month, there is always something going on in this game.

MUSICASSETTE REVIEW

THE LAST NIGHT OF THE PROMS. BBC Symphony Orchestra conducted by Colin Davis. Philips CPC 0088 49s 11d including purchase tax.

The Last Night of the Proms is not so much a musical evening as a ritual event. This album is a recording from the Albert Hall, complete with the commentator's voice, and it brings vividly to life the excitement and the thrill of the occasion. It's all there. The applause. The encores. The final speech by Colin Davis. And now I find myself listening to it at the beginning of yet another Promenade season.

There is little need to comment in detail on the musical programme of the Last Night. It is traditional, as is the reaction of the audience. It comprises: *Cockaigne Overture Opus 40* and *Pomp and Circumstance March No. 1 Opus 39*, both by Elgar, and in the second half *Fantasia on British Sea Songs* arranged by Sir Henry Wood and *Jerusalem* by Parry arranged by Elgar. The *Sea Songs Fantasia* in this performance given on September 13th., 1969, was in the original unaltered Henry Wood arrangement.

Sir Malcolm Sargent died the year before. Everyone wondered what changes would be made to the Last Night repertoire. Would we still have *Rule Britannia?* Rumour said no, but it is, of course, included in the *Fantasia*, much to the evident delight of the audience.

In the sleeve notes we are reminded that the present popularity enjoyed by the Proms dates only from the time that Sargent took over. Now they are being continued in the same tradition by Colin Davis, and I think it is a tradition worth preserving. Here we have hundreds of young people enjoying themselves and listening to music at the same time. The Promenade Concerts underline the fact that today's youth is *not* solely concerned with pop – give them what they want, give them that sense of occasion that is so much part of the Albert Hall season, and they will attend in their thousands. And jolly good luck to them, too.

As to my recommendation – the Last Night recommends itself. It is sufficient to say that it is well recorded. You will know just what to expect – and you will get it. I enjoyed it. I hope you will.

NOTE: Our usual music reviews will be back next month.

WHERE THE MUSIC COMES FROM

The new Gauss high-speed copying equipment at EMI's Hayes factory.

THE STORY of music on tape in this country goes back sixteen years to 1954. It was in that year that the Hayes, Middlesex, factory of EMI Records Ltd. produced their first tape records. These half-track, 7½ ips mono recordings were discontinued only three years ago when the demand for them finally ceased. Stereo tapes first came out in 1955, and these too were half-track 7½ ips. It was not until thirteen years later, in November 1968, that we saw EMI four-track 3¾ ips stereo tapes for the first time, and now, in 1970, EMI Records have opened their own high speed cassette and cartridge copying department.

Up until now all the EMI repertoire in cassette form has been manufactured for them at the Walthamstow plant of Philips Records. But with faith in the future of tape EMI have invested £100,000 in the latest American equipment to create their own production capacity of up to 30,000 units weekly. It is estimated that even after drastic pruning of their catalogue from which much of the early material will be deleted EMI will have 500 titles in cassette form alone by the end of this year.

We were invited to inspect this new plant at Hayes and to discuss the whole subject of tape records with EMI executives. They had much of interest to tell us.

The first Hayes-produced cassette will be, appropriately, the new Beatles' album *Let It Be.* This is one of twenty to be released in July. We asked if classical music will be represented and were assured that approximately three issues in twenty will be of serious items. This proportion reflects the relative commercial sales potential – the big sellers of all labels are the pops with classics lagging far behind.

It is not felt at Hayes that tape will have replaced the gramophone record by 1980, although it is believed that by the end of this decade the demand for both cassettes and cartridges will have increased enormously. In spite of the declining sales of open spool pre-recorded tapes it is *not* proposed to discontinue production so long as customers continue to ask for them. This is regarded as a service to those people who have bought, and are still buying, four-track open spool equipment.

We looked first at the open spool copying department and found eighteen "slave" machines copying from three playback masters in batches of six. Each slave works on the "one off" principle; with blank tape on the left-hand hub, the empty spool on the right is the one that will contain the finished record. Pre-printed leaders are spliced on – red first because the recording is backwards so it will come off the machine right-way-round – and all six slaves start, record and stop under instructions from their master machine. The girl operatives then snip the tape, splice on the outer leader and slip the finished record into its plastic box. Another six pre-recorded tapes have been made. As the speed ratio is four to one it take approximately five minutes to "make" six tape records. All four tracks are, of course, recorded at the same time on this EMI equipment which has been specially modified by their own engineers.

But what we had really come to see was the cassette and cartridge plant. In this section of the works stand nine American Gauss machines, two playback masters and seven slaves. Here the speed ratio is thirty-two to one; the one-inch wide master tape travels at 240 ips when working on cartridges and 120 ips for cassettes. There are no spools used on this very sophisticated device; the master tape is made into an endless loop housed in what is euphemistically called a "bin" where it forms itself into a loose, concertina-like bunch. As the tape flashes past the playback head the slack in the bin performs the most fantastic gyrations while its patterns constantly change. It is a fascinating sight.

At the end of each programme a subsonic signal is recorded on the tape. When the "pancake" of recorded tape is removed from the slave this signal is sensed by the cutting machine and again girl operatives snip and splice as they fill the cassette cases. Production of cartridges follows a similar procedure. Quality control and music testing forms an important part of record manufacture. Every production batch from every slave machine is stored separately so that if a fault is found all the copies from that source can be examined. Every third pancake of recorded material is checked at the beginning and end and the first programme from every pancake is discarded. This waste has to be taken into account because at such high operational speeds the equipment takes time to run up to working condition. For music testing a number of specially trained girls (who *must* have a love for music!) monitor factory samples on headphones. If any one of them should detect a fault on a tape then the entire batch from that slave is examined.

In answer to our question as to whether EMI propose to issue cassettes recorded to the Dolby B charactersitic in the future we were told that although this matter is under discussion there are as yet no plans to do so. One of the difficulties lies in the fact that unlike some of the other gramophone companies EMI have not yet used the Dolby A system in their studios, and so the initial advantage would be lost on all their existing masters. They do point out, however, that they are using a noise reduction system of their own instead.

As a first step in the price war they are bringing out a "budget" cassette at the end of August. This will be a sampler album with a selection of well-known artistes all taken from the main catalogue and will sell at an inclusive price of 29s 11d instead of 47s 6d. At least that is a start, but we should have liked to hear of a full range of budget items as already exists on disc. It will almost certainly come either from EMI or elsewhere, but we shall have to wait a little longer for it.

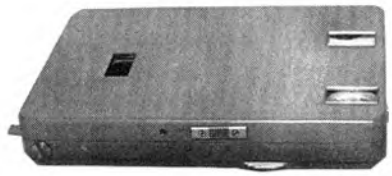
This, then, is the continuing story of taped music from Hayes. After sixteen years in the business EMI are now re-equipped with the very latest machinery. They intend to stay in the music on tape industry for many years to come.

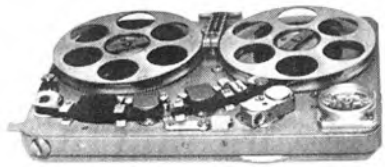
NEW PRODUCTS

MINIATURE FROM NAGRA

LATEST Nagra product from Kudelski is claimed to be unique. It is the long awaited miniature professional recorder, model SN, which is said to have full professional characteristics whilst being so small it will fit comfortably into a coat pocket.

Apart from obvious applications in the film, television and broadcasting industries, a vast new field of applications is visualised for this product. It is suggested that it will be invaluable as a small portable data recorder in medical work; as it is so small it could be carried around by the patient where constant monitoring of the physical condition is necessary. The new machine could have an important use in security work.





In spite of its tiny size the SN is a three-head machine with separate amplifiers for recording and playback giving full A/B monitoring. There is also a remote control facility available. The machine operates from manganese batteries, alkaline sealed accumulators or from a separate AC mains power supply. Level control is automatic only (it is too small to carry knobs!) and a special anti-distortion circuit is built in. In spite of the automatic control the metering facilities are sophisticated; instead of indicating recording levels the needle displays the relative compression of the signals imposed by the automatic control. The same meter also reads the battery voltage. A pilot system is available for synchronous filming and a crystal control is offered as an optional extra.

With dimensions of 5¾ x 4 x 1 inches the SN weighs only 19 ounces including batteries and tape. Because of its small size special tape has to be used and the width is 0.15 inches, a little over one-eighth of an inch. Hayden Laboratories state that tape in this configuration will be readily available. Working speeds are 3¾ and 1⅞ ips (who would have ever thought to see a Nagra running at 1⅞ ips?) and the playing times are 26 minutes at the faster speed and 52 minutes at the slower.

Performance figures at 3¾ ips are quoted as: average speed stability plus or minus 0.5%, wow and flutter measured to the DIN standard plus or minus 0.1%, frequency response 80 to 15,000 Hz. plus or minus 2 dB, signal to noise ratio relative to 2% third harmonic distortion through ASA A filter 60 dB and the average battery life is said to be 8 hours. Inputs are provided for line source and 200 Ohm microphone.

Amongst the accessories for the SN are: an omni-directional condenser microphone, a condenser microphone with manual level control and built in "modulometer" and a separate AC power supply with battery charger.

Owing to the limitations of purchase tax the Nagra model SN will be reserved for professional, commercial and industrial use when it is available towards the end of this year. The price will be approximately £365.

Another new product from Hayden is a professional cassette tape recorder and reproducer with cue signals, the Appel model 316/SS.

Designed to work on endless loop cassettes it will record and reproduce cue signals simultaneously with programme material. These cue signals could be used for automatic starting and stopping of the equipment itself, or in complex audio installations they could control secondary playback or record machines. Such an appliance has a very wide range of industrial uses as well as its obvious convenience for broadcasting, television, film and public address. Like the Nagra SN it will not be generally available to the public.

Full details of all products handled by Hayden Laboratories are available from them at:

East House, Chiltern Avenue, Amersham, Bucks., or their new London showrooms, *12/13, Poland Street, London, W1V 3DE.*

BSR HI-FI UNITS

THE BRITISH firm of BSR announce their entry into high fidelity with their range of BSR McDonald gramophone units. But first they offer free of cost to

the public their little booklet entitled *BSR's Guide to Good Listening.* This is available from the address quoted below and it sets out objectively many of the true facts relating to good quality sound reproduction. It explains how sound, and stereo sound in particular, is produced from a record, gives a glossary of technical terms and suggests complete systems covering various price ranges.

Four record playing units are available, all based on the design of the new model MP 60. Differences lie in the facilities offered, not in the performance standard of the range. Common to all is the new pick-up arm of square section with adjustable counter-balance. The arm is mounted on modified ball race bearings which are said to allow tracking at lighter stylus pressures whilst giving greater stability and freedom of movement.

The newly-designed light-weight cartridge shell has a new slide-in cartridge holder which will accept all types of standard cartridges. Counterforce is applied to the arm providing anti-skating to neutralize the tendency of the arm to move faster towards the centre of the disc than the groove will allow. It is this "inwards pull" that frequently causes distortion in that part of the record nearest to the centre.

To protect records and to provide convenience of operation a viscous cueing device is incorporated. This is silicone damped for ultra-slow descent and it is claimed that the arm can be raised and lowered accurately at any point.

Prices of the range are: £12 6s 5d plus £2 13s 7d purchase tax for model MP 60, manual play only. The other three versions incorporate an autochange mechanism, but in each the changer arm can be moved right away clear of the turn-table when not in use, so converting to single manual play. Model 610 is £15 11s 9d plus £3 7s 9d purchase tax and is virtually an MP 60 plus autochange. Model 510 has a lighter platter and costs £13 3s 5d plus £2 17s 1d purchase tax whilst the lowest cost model in which refinements have been reduced to the simplest is priced at £10 13s 2d plus £2 12s purchase tax.

A teak plinth is available at £4 8s 10d including tax and a styrene cover at £3 3s 4d inclusive.

BSR Ltd., Monarch Works, Cradley Heath, Warley, Worcestershire.

LOW COST CONDENSER MIKES

THE PRIVATE ENTHUSIAST need no longer regard condenser microphones as being too expensive for other than fully professional use. A new range of instruments from Calder Recordings Ltd. are priced at levels no higher than, and in many cases lower than, good quality dynamics.

Lowest cost is the 600 series with model CM 600, an omni-directional, at £23 4s., and CM 652, a cardioid, at £28 11s. It is claimed that all the instruments in this range have a smooth extended frequency response as well as an excellent transient response for clear, natural sound. It is in the transient response that some of the dynamics are weakest and this is one of the greatest advantages in turning to condensers.

It is also claimed that the wide acceptable dynamic range eliminates the possibility of overload and construction is robust with shock-resistant encapsulated techniques employed. Circuitry is based on the use of field effect transistors and an unusual feature of importance to the amateur is the variable output on the power pack which is said to make the microphones suitable for matching into any impedance input. This increased versatility means that the same microphone equipment could be used in conjunction with any tape recorder, including cassette equipment. As impedance alterations also vary the output voltage, matching in sensitivity is also possible.

Other models include Series 800; the CM 800 is a miniature studio omni-directional instrument at £43, with its companion model CM 850, a similar cardioid at £46. In the 1000 Series we have model CM 1000, a professional omni at £44 6s and the cardioid CM 1050 at £48 16s.

All these microphones need to be powered by a separate power pack, and these are available in a number of versions, both mains and battery operated. Typical is the battery model CP 611 supplied complete with attached microphone lead at £7 10s, or the mains equivalent CP 621 at £10 7s. Both these packs accept a single microphone but multiple packs to take from two to six instruments are also offered.

A wide range of stands, windshields and other accessories are listed, all at highly competitive prices, as well as complete microphone kits priced from £43 10s to £162 12s. These are based on various combinations of instruments and power packs and offer a useful and convenient method of storing and transporting the gear.

For further information, including full technical specifications, please write to the makers:

Calder Recordings Ltd., Regent Street, Hebden Bridge, Yorkshire.

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Rate. — One shilling per word: box numbers, 2s 6d extra. Payment with copy, which should be sent to Advertising Department, "TAPE Recording Magazine," 16a Bevis Marks, London, E.C.3.

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BLACKBURN has Lancashire's leading Hi-Fidelity/Tape Recorder stockists and Electronic Engineers at HOLDINGS AUDIO CENTRE, MINCING LANE/DARWEN STREET, BLACKBURN. (Tel. 59595).

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Truvox R.204 4-track Mono Tape Recorder, Portable Model, 3-speeds, monitor head, 3-watt amplifier, complete Mic., Tape £103 0s 0d.

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Akai 3000D, Stereo Tape Deck, 4-track, 2-speeds, Record/Play-back/erase Heads, complete in wood cabinet £82 0s 0d.

Sanyo MR 800. Stereo Tape Deck, 4-track, 3-speeds, complete in wood cabinet. £72 0s 0d.

Sloman & Pettitt, Pudding Lane, Maidstone — Tel: 54124-51478.

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SECOND FOLD HERE

FLAP A

FLAP B

FIRST FOLD ALONG THIS LINE

Fold along lines as indicated and then tuck Flap A into Flap B

Thumbs up. Your tape patching days are over.

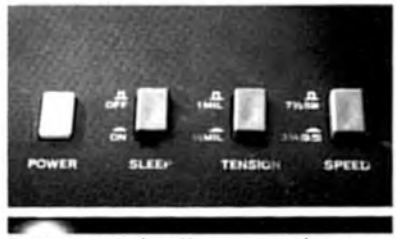
And your stereo pleasure just beginning. The all-new Sansui SD-7000 stereo tape deck, rich in tape protection devices, is here to put an end to all the awkward patching that until now seemed an inevitable drawback to owning a quality taping unit.

The end product after 10 experimental models and three years of research, the 3-motor 4-head SD-7000 goes to great lengths to save you most of that irritating splicing and fumbling. For example:

It precludes tape breaking or slack in going from either Fast Forward or Rewind to the Stop and the Play modes. It prevents the tape stretching that results from excessive tension. It minimizes resistance during Fast Forwarding. It ensures proper "pull" speeds, and it makes accidental erasures or reversing impossible.

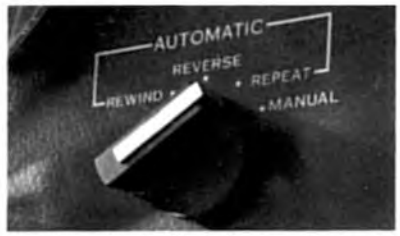
No comparably priced tape deck on the market, in fact, offers so much in the way of tape protection. The SD-7000 wins. Hands down.

But Sansui gave it a lot more very attractive features as well. Like *Automatic Rewind, Reverse* and *Repeat* by either recorded 20Hz signals or sensing strips. Like *a self-locking*



Pause switch, Sleep switch, automatically resetting reel clampers, responsive pushbutton controls, and *separate volume controls for two line inputs* and *another for headphones.*

The tonal quality is unsurpassed. Frequency response is 15 to 25,000 Hz, the S/N ratio is better than 60dB, and wow and flutter is less than 0.06% at 7½ ips.



The SD-7000 will be available soon at authorized Sansui dealers, and it will pay you to check it out more fully. Unless of course you want to go on playing patch-up stereo.

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