February 1952. Vol. 8, No. 2

audio record

Published by
AUDIO DEVICES, INC.
444 MADISON AVENUE, N. Y. 22, N. Y.

audiodiscs
audiotape
audiofilm
audiopoints

THEY SPEAK FOR THEMSELVES

A portion of the "Mutual Room" at WOR Recordiog Studios, showing 6 of the 12 rack-mounted Magnecorders and the specially designed central control panel for all machines. Here every Mutual program is taped and re-transmitted one hour later during daylight saving time. Story on Page 2.

In this issue

- WOR Recording Studios
- Berkeley Opera Workshop
- Radio Station Survey
- Effects of Head Wear

A World Of Recording at WOR

Here, in one of the country's largest and most modern sound studios, discs and tape now share the recording load on a 50-50 basis.

When you enter the WOR Recording Studios at 1440 Broadway in New York City, you enter a realm apart from the mad hubbub of the metropolis—a quiet, busy little world where sound is king. Yet, far from being isolated from the outside world, these studios are a veritable nerve center of New York's vast communications system—and programs recorded here are heard throughout the nation and even in the far corners of the world.

If you're looking for the finest in modern sound recording methods and equipment, you'll find them at WOR. And if you're interested in knowing just how far magnetic tape has revolutionized the recording industry, you'll find the answer at WOR, too. For here, in one of America's largest sound recording organizations, you can see the result of *ten years* of audio evolution.

The WOR Recording Studios were opened in 1942—with a full complement of what was at that time the finest disc recording equipment obtainable. For the next six years the entire operation was on a disc basis. Then, in 1948, tape entered the picture. It was at first tried out on an experimental basis, but later on, as the quality of both the tape and the recording equipment was improved, this phase of the operation grew rapidly in importance. And today, the recording work done here is about equally divided between discs and tape. During this period of evolution, the disc recording end of the business did not remain static either. For as quickly as improvements in disc equipment were made available, they were put into use at WOR, to keep the quality of the recorded sound at the highest level obtainable.

The combined tape and disc equipment now being used at WOR includes 12 Ampex tape recorders, 3 Rangertone tape recorders, 14 Magnecorder tape recorders, 8 Scully disc lathes, 12 Presto reference disc recorders and RCA and Fairchild transcription turntables.

There are nineteen different studios, including a theatre, each wired to a central control switchboard which connects any desired recorder combination to any studio at any time. But "four walls do not a prison make" and the WOR recording facilities are not limited to the studios at 1440 Broadway. By means of direct lines or connections through a central exchange, the WOR studios can make recordings of programs originating in practically any metropolitan radio station or remote point —including the Mutual Broadcasting System, The American Broadcasting Company, The Columbia Broadcasting System, Stations WNEW, WNYC, WINS and WMGM. Specially developed receiving equipment is also installed to permit off-the-air recording of the audio portion of any AM, FM or TV program material.

A quick look at some of the recording rooms will be of particular interest to our professional readers.

In the so-called "mutual room", there is an impressive array of twelve rack-mounted Magnecorder tape machines with a specially designed control console which puts the operation of the entire setup at the fingertips of the engineer in charge. This exceptionally large tape installation was designed to handle the Daylight Saving Time requirements of the Mutual Broadcasting System. From April to September, this equipment operates continuously 16 hours a day, 7 days a week, taping every Mutual program as it is aired and re-transmitting it one hour later. The taped programs are sent by wire line to local MBS stations in various part of the country where the later time coincides with local broadcasting schedules. Each program is recorded on duplicate tapes, and during playback, the two tapes are run simultaneously in synchronism, so that, in the event of a failure in any one machine, the other can be switched in instantly without any break in the program. This operation requires the use of about one million feet of tape.

The large Reference Recording Room contains a bank of 12 Presto disc lathes, designed primarily for air checks, line checks, and broadcast reference recordings. The equipment in this recording room also includes rack-mounted tape recording ma-

Ralph Schlegel, Recording Supervisor, at the control console in one of WOR's many sound-proof, air-conditioned recording rooms. A Rangertone tape recorder is shown in the foreground.

audio record
VOL. 8. NO. 2 FEBRUARY, 1952

Published monthly by Audio Devices, Inc., 444 Madison Avenue, New York City, in the interests of better sound recording. Mailed without cost to radio stations, recording studios, motion picture studios, colleges, vocational schools and recording enthusiasts throughout the United States and Canada.

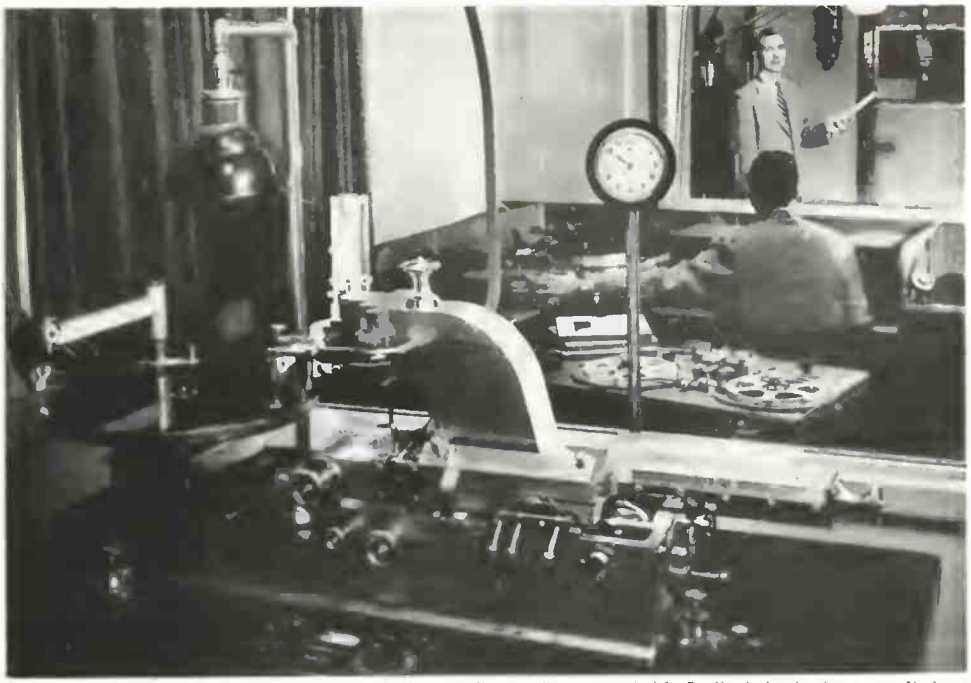
chines. Here, also, is the master control switchboard, with provision for connecting any recorder or combination of recorders to any of the 19 WOR recording studios as well as to practically any AM, FM or TV radio station in the metropolitan area.

The Central Cutting Room for tape includes four Ampex console type machines, with complete facilities for program feeds and tape editing. This extremely flexible setup makes it a simple matter to mix two tapes and record them on a third—combine any desired selections from two or more tapes on to a single, splice-free reel, etc.

In Studio C, a so-called workshop studio, is a unique, two-turntable re-recording console, designed by WOR recording engineers for the quality improvement of records or transcriptions submitted by clients. By means of complex equalizing networks and frequency-selective pre-emphasis and volume suppression, weird and wonderful things can be done to bring out the hidden quality of a disc recording—or, in other words, to make a "copy" the quality of which is actually far superior to the original record.

For cutting phonograph and transcription masters, only the finest Scully Lathes are used—including two fully automatic machines with continuously variable pitch and pre-selective push-button control of all disc recording functions. At the touch of a button, these machines will automatically perform every cycle of operation, from starting the turntable and lowering the cutter to tracing the center spiral control groove, thus eliminating the possibility of human error from this mechanical phase of master disc production.

Mr. Ralph Schlegel, WOR's Recording Supervisor, believes that the studio's operation as carried on today, with a fairly equal division of load between tape and disc recording, is pretty well stabilized, and will continue on that basis for a long time to come. In his opinion, the lacquer disc still represents the finest available medium for top quality recording and reproduction and for permanent storage of valuable recordings. Tape, on the other hand, with its easy editing and very high quality standards, is the preferable medium for many types of recording work carried on in any large studio operation. Many clients prefer to use tape, even though the cost for a given program time is considerably higher—largely because changes and corrections can be made so easily after the recording is completed.

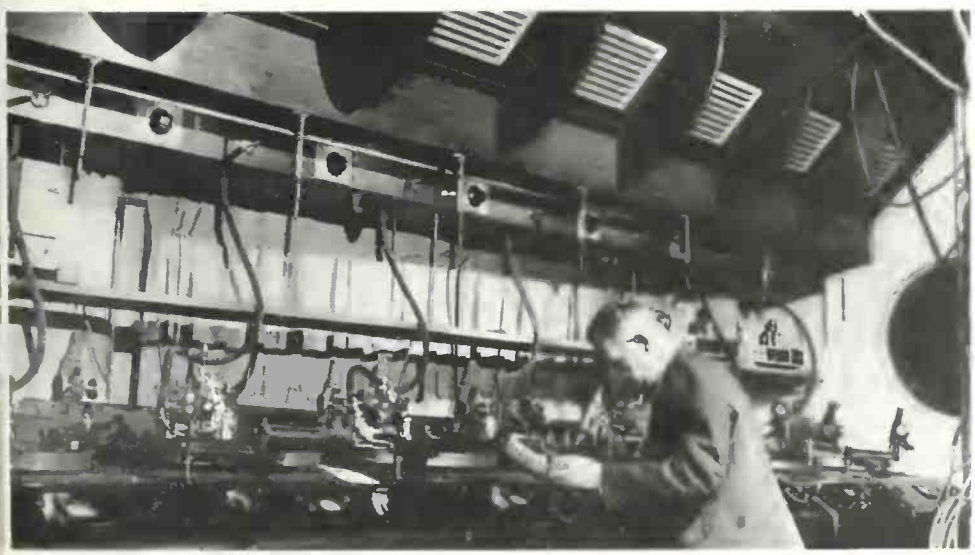


A typical WOR recording room setup, looking from disc cutting room (with Scully lathe in foreground) into glassed-in control room (with Rangertone tape machine) and into the studio beyond.

Where previously double discs were cut on every recording, it is now the usual practice to make one disc and one tape. Sometimes double tapes are made, with no disc recording at all. Tape recordings at WOR are made at 7½, 15 or 30 inch speed, with about 90 per cent of the work done at 15 inches per second. Studios and equipment for making high fidelity sound on film, with complete services for advertising agencies and TV producers are now being planned.

Mr. N. B. Lockwood, Manager, and Mr. John Hayes, Assistant Manager, explain that WOR's clients include practically all of the major advertising agencies

(*Continued on Page 6*)



A group of seven of the twelve Presto disc recorders in WOR's large reference recording room, where air checks, line checks and broadcast reference recordings are made.

This is WOR's specially designed re-recording console, with which it is possible to make disc "copies" which are actually superior in quality to the original.

The Use of Recordings at the Berkeley Opera Workshop

by John E. Meeker
Director of Recordings
Berkeley Opera Workshop
Berkeley, California

(One of the eleven first-prize winning entries in Audio Devices' educational recording contest.)

The Berkeley Opera Workshop is a function of the Berkeley Adult Evening School which aims to provide a class for those persons who are interested in singing in an opera production or playing in the orchestra for the production. It has as its chief purpose the provision of a place where practical experience may be had in singing opera music, either as a member of the chorus or as a principal. Members of the group are given a chance to try singing the leading roles during class sessions and any who feel up to it may have a chance to sing a leading role in one of the actual performances the group stages for the public. It is hoped that eventually the group will be able to organize a stagecraft and costume section to supplement the musical sections. In that way it will be possible to overcome some of the financial problems involved in staging an opera.

At the moment the group is rather small but those who come are very much interested in it and we are planning on putting on a production in the near future. Meetings are held twice a week in the new music building the Berkeley High School completed last year. For our productions we have available the complete facilities of either the large community theater with its great stage or the small Little Theater which is more compact.

The use of recordings in conjunction with the activities of the Opera Workshop consists in making spot checks of rehearsals and complete recordings of performances given on the stage. Both of these uses give the members of the group an opportunity to hear themselves in action. The original recordings are made on Audiotape and disc copies of excerpts are available to those who wish them. A nominal charge is made for the discs to cover cost of materials used. A master copy of each complete recording is copied onto discs to be filed as a permanent record of the group's accomplishments.

Typical recording setup as used for making rehearsal tests during class session of the Berkeley Opera Workshop. Equipment shown includes two portable Magnecorders and separate amplifier chassis.

The recording equipment is furnished by one of the members of the group who is operating a more or less non-profit recording service and is very much interested in the activities of the Opera Workshop and in educational recording for music students. The tape recorders are Magnecord PT6-AH units operated from a custom built recording amplifier. The amplifier has facilities for mixing three mikes and is also equipped to dub from tape to tape. The present disc recorder is a Presto 6-N machine which is used for making the disc copies of tape recordings. All original recordings are made on tape and then copied onto discs. The tape machines are equipped with carrying cases and a changeover switch for continuous recording on location. An accessory gadget that has been picked up is a small hand crank which fits over the spindle and into the slots on the tape reels. This simplifies hand rewinding during a performance when the recorders are in a position which would make use of the motor rewind out of the question due to the noise produced. We find it simpler to keep track of the sequence of reels if they are rewound immediately. A tape speed of fifteen inches per second is used when recording for the Workshop and that allows fifteen minutes in which to rewind the reel and place the new reel on the machine ready for operation. It has also been found that the noise of rewinding by motor gets picked up by the other tape when recording.

When the equipment is used at the class sessions for making spot recordings of the rehearsal, the recorders are set up at the rear of the classroom on portable folding tables and positioned so that the operator can watch the director of the class and

receive instructions from him as to what and when to record. The mike is placed on a boom and put in a front-center position where it will give reasonably adequate pickup of the singers and piano. With a small group it is simpler to figure out the mike placement than it is with a larger group due to the fact that the larger the group the more spread out it will be in a sideways direction. The speaker for playback is placed in a suitable spot at the front of the room where it will be heard by all the members of the group. In actual operation the director of the group requests that specified portions of the music be recorded and then played back immediately. During playback he will point out any special items that he wishes to bring to the attention of the class. In this the class hears itself as a group and the individuals can find out if they are blending in with the whole group or not.

During the past year, two complete opera productions have been staged by the class in the big community theater which will seat three thousand persons. Complete recordings were made of each production and the results were quite good, especially for a first attempt. The first production was Aida and it provided an excellent opportunity to find out by trial and error how to record a live opera complete with chorus, orchestra and principals. The mike placement was figured out by guesswork plus a bit of semi-experiment at the dress rehearsal. For this opera the mike was hung from the spotlight bridge approximately over the center front of the stage just back of the main curtain. There was no practical way of stringing the mike in front of the curtain and it was also desired to keep the orchestra from drowning out the chorus and soloists. Experimental recordings made during the dress rehearsal provided some idea of how well the orchestra would be picked up from a position near the footlights. The mike was about fifteen feet above the stage floor which was a prominent position. However, there were three other mikes hanging at the same level to provide p.a. reinforcement when needed so the "looks" factor was put aside for this production. The results achieved with this mike placement were sufficiently good to warrant its continuance with slight modifications at the next opera production. The second opera we staged was Die Fledermaus and it had a feature which Aida had not had. This time there was spoken dialogue to record as well as music. The mike was again hung from the spotlight bridge but this time it was placed so that it would be as inconspicuous as possible. The mike barely protruded beyond the edge of the horizontal border fringe that formed the top border of the main curtain. This put it about thirty feet above the stage floor and yet there was still plenty of reserve gain during the singing. The mike used was an Electro-Voice dynamic microphone (model 635) which was suspended vertically facing the floor of the stage. This position provided a 360 degree angle of pickup and resulted in surprisingly good balance between singers and orchestra. The only other mikes we had available were velocity type instruments which nullified their usefulness since they reinforced the orchestra as well as the singers. When we have the necessary equipment we will place two cardiod type mikes in the footlights to pick up the action at stage right and stage left. That will give better results when the principals are off at the edges of the stage and at a great distance from the central mike. However, the one mike did remarkably well most of the time with only two or three places where the sound quality was not as good as it should have been. In the Little Theater the distances will be much smaller which will simplify things greatly.

The recordings of the show were played back for the class soon after the weekend of the performance and they thus had a chance to hear how they had actually sounded. Of course, the balance between orchestra and singers was not the same on the recordings as it was to those sitting in the audience but we did not aim to duplicate that particular set of conditions. In fact, the balance on the recordings was better than that out in the audience. All members of the group who wanted disc copies of portions of the show were given an opportunity to order what they wished and before the tapes are re-used a master copy will be made for the class files.

It is hoped that in the near future we will be able to make spot checks of the orchestra rehearsals as well as continuing with the chorus rehearsal checks. We find that this procedure is of great help in smoothing out rough spots in the blend of the ensemble since the members of the group can hear for themselves what they sound like in combination with other voices. While singing they are primarily conscious of their own performance and perhaps the performance of the person next to them but find it difficult to achieve an adequate conception of the total sound produced by the group. The playback of the tape shows them how they are related to the other singers and whether or not they stand out too strongly as individual voices when it is desired to produce a smooth blend of composite voices. All musicians should have periodic practice recordings made so that they may study their performances and spot the little flaws that may not be very noticeable during the actual performance. A recording gives a permanent record of a fleeting sound and can be given close study under relaxed conditions with a resulting improvement in technique and interpretation. We of the Opera Workshop are thoroughly convinced of the importance and practical value of high quality recordings as an aid to the study of music and the performance of music.

AND HERE'S THE "PAYOFF"

Author John Meeker (right) finds that the preparation of this first-prize winning article was quite profitable. Here he receives his $25 check from Miss Florence Erikson of Photo and Sound Co., Audio Devices' distributor in San Francisco. Mr. Charles N. Meyer of the W. C. Hitt Co., one of Audio's Factory Representatives, stands ready to award the additional prize of 10 reels of plastic base Audiotape.

All sound recordists who attend the IRE Show at Grand Central Palace will certainly want to visit the Audio Devices exhibit.

There will be a complete display of all Audio Devices products for fine sound recording and reproduction—including Audiodiscs, Audiotape, Audiofilm and Audiopoints. And in the sound-proof theatre, there will be regular showings of the full-color sound moving picture, "Audiotape Speaks for Itself". This film conducts you on a tour of the plant where Audiotape is made — shows the whole process from beginning to end.

If you can't get to the show, and would like to obtain a 16mm copy of this film for showing to any interested group, just write to Audio Devices, Inc., 444 Madison Ave., New York 22.

RADIO STATION SURVEY SHOWS IMPORTANT TRENDS IN USE OF TAPE AND DISC RECORDINGS

78% of stations use discs — Audiodiscs leading by a 3-to-1 margin

98% of stations use tape — Audiotape gaining rapidly in popularity

Audio Devices, Inc. has just completed a nation-wide survey among radio stations to determine:

1. The extent to which broadcasting stations use recording discs and magnetic tape.
2. How AUDIODISCS and AUDIOTAPE compare in popularity with other makes of discs and tape.

A brief questionnaire was sent to 2,319 radio stations and replies were received from 1,527 of them—a return of 66%. The following questions were asked:

Do you use recording discs? Yes.... No....
If yes, is the brand AUDIODISCS.... Or other make....?
Do you use magnetic recording tape? Yes.... No....
Is the brand AUDIOTAPE.... Or other make....?

The replies revealed that 78% of the stations use recording discs in their work and 98% use magnetic recording tape.

Of those using recording discs, 85% use AUDIODISCS either exclusively or with other brands — 63% use AUDIODISCS exclusively and only 15% use other makes exclusively.

Of those using tape, 63% use AUDIOTAPE either exclusively or with other brands—25% use AUDIOTAPE exclusively—and 37% use other tapes exclusively.

To give an impartial basis of comparison and eliminate overlapping percentages, a "point system" of scoring was applied to these figures, counting one point for every station where AUDIODISCS or other makes of discs are used *exclusively*, and ½ point for each station where *both* are used. This indicates a 74% use of AUDIODISCS as compared to 26% for all other makes of discs combined.

A similar calculation for tape shows a volume of 44% for AUDIOTAPE as compared with a total of 56% for all other makes of tape combined.

A detailed breakdown of results from this survey is given in the following tabulation:

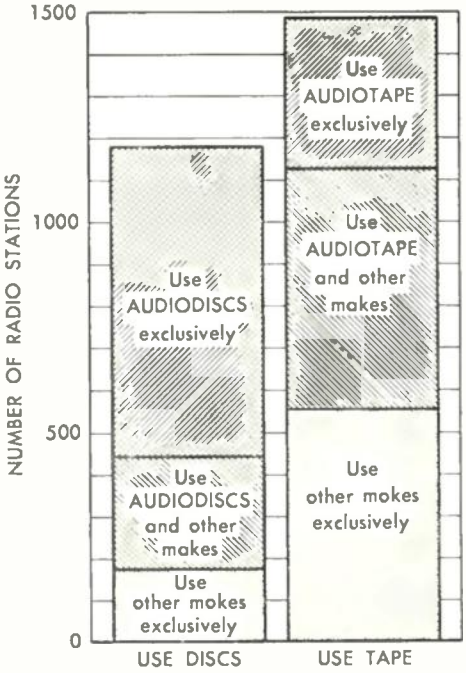
		%
No. of Stations	2,319	—
No. of Replies	1,527	66
Use Discs	1,193	78
Use AUDIODISCS	1,018	85
Use other discs	446	37
Use AUDIODISCS exclusively	747	63
Use other discs exclusively	175	15
Use magnetic tape	1,496	98
Use AUDIOTAPE	943	63
Use other tapes	1,122	75
Use AUDIOTAPE exclusively	374	25
Use other tapes exclusively	553	37

Reliability of Survey

It will be noted that questionnaires were sent to all radio stations, and replies received from 66% —a very high proportion in any survey. Further, the calculations on volume, as previously mentioned of 74% for AUDIODISCS and 26% for all other makes, check very closely with several previous surveys made in the past few years.

In the case of AUDIOTAPE, the volume of 44%, as compared to all other makes, is most encouraging since AUDIOTAPE has only been on the market half as long as some other brands.

The survey figures by sales territories also check very closely with previously known facts with reference to these territories.



WOR Recording Studios

(*Continued from Page 3*)

in New York, and that their radio and TV commercials and transcribed programs constitute a large part of the work carried on here. Fund raising organizations, slide film companies, and independent phonograph record companies also account for an important share of the recording work. He also states that the majority of pressings used throughout the country bear the familiar WOR label which has come to be accepted as a mark of quality recording in radio stations throughout the country. WOR offers its clients a *complete* recording service—including studio rental, tape recording, disc recording, phonograph record and transcription masters and pressings. They take full responsibility for the entire job, even to the extent of maintaining inventories of pressings and taking care of all shipments and deliveries as requested.

One very large tape recording operation which is carried on here is of particular interest and world-wide significance right now. That is the recording of all program material for Radio Free Europe—an organization which operates a group of radio transmitters situated in Europe on the "free" side of the Iron Curtain. These stations beam their programs directly into "Behind the Iron Curtain" countries, giving them a true picture of what's going on in the outside world. This is an all-tape operation and WOR records all of the material in many different foreign languages. The recorded tapes are flown overseas for local broadcast by the Radio Free Europe stations.

It can therefore truly be said that the sound recordings made at WOR are heard around the world.

Another view of the WOR "Mutual Room" shown on this month's cover. This installation includes a bank of 12 rack-mounted Magnecorders, 6 on each side of the control console shown above.

audio pointers for the Recordist

by C. J. LeBel, Vice President
Audio Devices, Inc.

OVERLOOKED RESULT OF HEAD WEAR

C. J. LeBel

Users of magnetic recorders have paid insufficient attention to the heads of their machines. Conventionally, loss of high frequency response has been taken as the sole indication of head wear, and a more serious effect (grooving) has been ignored.

Wear and High Frequency Response

Whenever two surfaces rub (as in an automobile engine) wear results after a time. The tape chemist formulates a lubricant into the binder material, or puts a little on the tape surface, and thereby minimizes the wear, but he cannot prevent it completely any more than an engine can run forever without repair. The tape must touch the heads' surface, after all, or a disastrous loss of high frequency response will occur, so the lubricating layer can be of only molecular thickness. The loss of head high frequency response results from the effect shown in figure No. 1. Note the increase in gap length of the worn head.

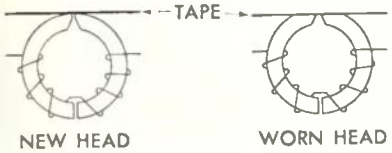


Fig. 1. Diagram showing how continued head wear increases effective slot width, with corresponding loss of high-frequency response.

Grooving

The effect we wish to consider here is much more rapid than gap length increase, and results principally from the high precision with which tape and machines must be built. Although the RTMA standard for tape width permits a range of .244" to .250", we try to hold it within a range of variating of .001" to .002". The conscientious machine manufacturer in turn tries to guide the tape path very accurately. As a result, a groove is worn in the head, as shown in exaggerated form in figure No. 2. Nevertheless, the accurate width and guiding cannot be sacrificed, for otherwise azimuth error could occur, leading to an erratic loss of high frequency response.

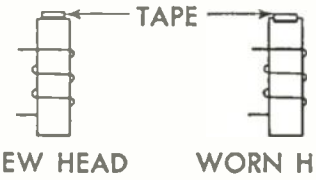


Fig. 2. Edge-wise view of the same two heads shown in Fig. 1, illustrating the groove which has been worn into the second head.

In figure No. 3, we have magnified the tape thickness enough so that wear effects are more apparent, and in figure No. 4 we show the effect of normal variation in tape width. If the tape is wider than the groove, loss of high frequency response and signs of poor motion occur, at their worst when the tape is only very slightly wider than the groove.

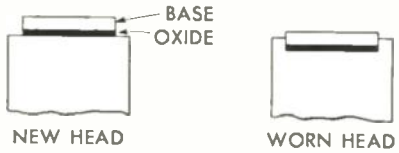


Fig. 3. Enlarged view of heads shown in Fig. 2, better illustrating the grooving effect of normal head wear. In this and the following sketches, relative base and oxide thickness are exaggerated for clarity, and are not in their true proportions.

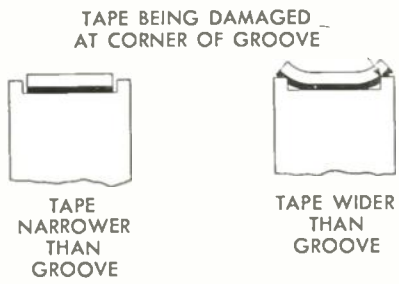


Fig. 4. Diagram of worn heads showing the effects of normal variation in tape width.

It is apparent that if we could use narrower tape after the groove were cut, a temporary improvement would occur (but only until a narrower groove were cut as in figure No. 5). In fact, a brief competitive advantage might accrue to the manufacturer who disregarded standards and reduced his tape width by .002" per month. If this kept up, every machine would need narrower guides every few months, and we would have ⅛ inch wide tape in about five years! One manufacturer actually tried this last year, until forcibly dissuaded, but an engineering remedy would be preferable.

Fig. 5. Diagram showing two consecutive stages of head wear resulting from the use of successively narrower tape widths.

Remedies

The easiest remedy would be to replace the heads whenever they show signs of grooving. Another remedy is available, but it must be used with the greatest of caution: This is to lap the head surfaces flat once more with a very fine abrasive stone. In our laboratory quality control section, heads are used day in and day out for tape uniformity tests, so our toolmaker uses a very lightly oiled Arkansas stone. Perhaps a Belgian water stone might be finer and less risky in unskilled hands.

A Precaution

If you do choose to use an abrasive, do check frequency response before and after stoning. If you have too heavy a hand, equalizer readjustment may be necessary, and in the extreme the head may be ruined.

If we may anticipate the obvious question, yes, machines differ greatly in rate of head wear. Different makes are most different, but successive heads from the same manufacturer will not wear equally. Tape tension, angle of wrap, guiding accuracy, and hardness of metal all have their effect.

Since smooth surfaces wear less, it is important that the tape surface be smooth. While all tapes become smooth after some use, many organizations do not use a given tape enough times to polish it, and the smoothness when brand new becomes significant. For this reason, AUDIOTAPE is given a special polishing before shipment. Thus the surface is smooth right from the beginning, which also stabilizes the frequency response of the tape.

If you stone your heads, be sure to use the lightest touch possible. You are trying to remove only a few thousandths of an inch and a modern stone cuts fast.

Any Questions?

If there's anything that's puzzling you about the technical aspects or operational procedure involved in your tape or disc recording work, just drop us a line.

Our staff of recording experts will be glad to give you the answer—without obligation, of course. Questions and answers published in Audio Record won't mention any names, so don't be bashful. Address your questions to: Editor, Audio Record, 444 Madison Ave., New York 22, N. Y.

columbia LP records

mean maximum **L***istening* **P***leasure*

—thanks to the finest in modern sound recording methods and equipment

Music lovers everywhere know that Columbia LP records mean more listening pleasure—not in playing time alone, but in superb quality of reproduction. Yet few listeners outside the professional circle realize the degree of perfection which this record quality requires in every step of manufacture and processing. Take the original sound recordings and the processing masters, for example. Frequency response, signal-to-noise ratio, distortion and surface noise must measure up to standards which would have seemed entirely impractical a few years ago. But Columbia has found that Audiotape and Audiodiscs are an ideal combination for meeting all of these exacting requirements—Audiotape for recording the original sound and Audiodiscs for the masters from which stampers are made. In fact this same record-making combination is now being used with outstanding success by America's leading producers of fine phonograph records and broadcast transcriptions.

You can get this same sound perfection in *your* recording work, too—with Audiodiscs and Audiotape. Their superior quality is the result of more than 12 years of specialized experience by the only company in America devoted solely to the manufacture of fine sound recording media, both tape and discs.

℗ The exclusive trade-mark of Columbia Long Playing Records—symbol of highest quality. Trade-Marks "Columbia," "Masterworks," ℗ℒ. ℗ Reg. U.S. Pat. Off. Marcas Registradas.

AUDIO DEVICES, Inc.
444 MADISON AVE., NEW YORK 22, N. Y.
Export Dept.: 13 East 40th St., New York 16, N. Y., Cables "ARLAB"

...including
audiotape*
for the original sound

...and **audiodiscs***
for the master recording

**Trade Mark*