audio record

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# Electronic Language Lab Opens at Georgetown University

## Multi-lingual Tape Recorder System Sets New Standards for Efficient Language Study

The use of tape recordings in language work is by no means new. But when the Georgetown University formally opened its new Electronic Language Laboratory last November, it also opened a completely new and ultra-modern chapter in the art of teaching foreign languages. For here, for the first time, is a carefully planned and executed system, designed to take full advantage of the tremendous educational potential of magnetic tape recording, on a University-wide basis.

The Electronic Language Laboratory, occupying spacious new quarters in centrally located Poulton Hall, is used by approximately 1200 foreign language students of the University's College of Arts and Sciences and School of Foreign Service—enabling them to master new languages better and faster than ever before.

Basically, the Language Lab is a large-scale sound recording and reproducing studio — functionally designed to permit 120 students to listen simultaneously and in privacy to recorded tapes in any of 6 different languages. There are 120 individual, semi-soundproof booths, with collapsible fronts to permit the use of visual aids (slide films and movies) in conjunction with the language work when desired.

Each booth is equipped with a set of headphones and a six-position IBM language selector switch. This enables each student to listen to any one of six different tape recordings, as specified in his language course. In the privacy of this booth, he can not only listen to verbal language drills, but repeat them aloud, without disturbing the other members of the "class".

The 120 "listening stations" are served by a master control console which contains a total of 12 brush magnetic tape recorders. Six of these are reserved for the use of language students of the School of Foreign Service, and six for those of the College of

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Master Control Console for Georgetown University's new Electronic Language Laboratory. *Left to right:* Rev. Brian McGrath, dean of the College of Arts and Sciences; Rev. Edmund A. Walsh, regent of the School of Foreign Service; Prof. Leon Dostert, director of the Institute of Language and Linguistics; and Dr. V. Gsovski, professor of Russian.

In individual, semi-soundproof booths, Georgetown language students learn foreign tongues faster by ear — via magnetic tape recordings.

# METHODS OF SOUND RECORDING FOR TV TRANSCRIPTIONS

## Present Practice Among Leading TV Networks Includes Both Optical and Magnetic Recording

Sound recording in television work involves a number of problems not encountered in radio — hence the methods and equipment used are quite different from those with which the radio engineer is ordinarily familiar.

The use of transcriptions, however, is essentially the same — to permit a given TV program to be broadcast at different hours in the different time zones throughout the country; to permit programs to be broadcast from stations which are not connected to the originating station by coaxial cable; and to provide reference recordings of complete shows, just as they went on the air.

As far as the network stations are concerned, practically all television transcriptions are made while the show is *on the air*. Since most programs require the use of several television cameras simultaneously—any one of which may be switched onto the air at the discretion of the supervising engineer—the most practical way to obtain a visual record of the program *as transmitted* is to copy it photographically from a kinescope picture.

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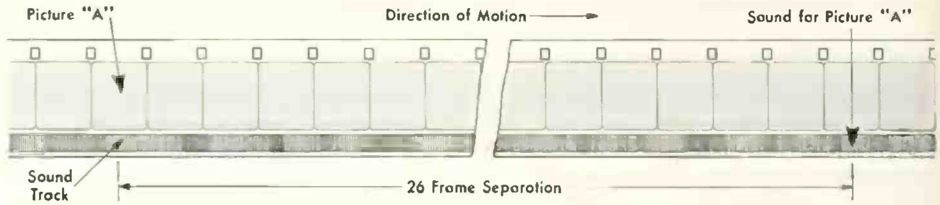


Fig. 2. Diagram showing separation between picture and corresponding sound on 16mm film.

## TV Transcriptions

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When a TV transcription is made, it is necessary to record both the picture and the sound, simultaneously and in synchronism. The sound recording part of this process is done in a number of different ways. However, the end result is the same—a 16mm sound moving picture, with the sound on the film in the form of an audio-modulated light track. This video transcription can be rebroadcast by standard equipment in any television station—with high fidelity of reproduction in both picture and sound.

Since a TV transcription requires the recording of sound on photographic film, the problems involved can best be understood if we first review some of the fundamental principles of sound-film projection.

Although the film travels through the projector at a uniform speed (7.2 inches per second), each frame actually *stops* for a fraction of a second as it passes the projection lens. The light is cut off during the interval in which the film is advanced from one frame to the next, resulting in the projection of a series of "still" pictures which the eye translates into smooth, uninterrupted motion. The picture part of the film therefore requires an intermittent motion at the point of projection. The sound track, however, must be reproduced while moving at a constant, uniform speed. This is taken care of in the projector by locating the sound pickup head in advance of the picture pickup, with film slack between the two elements to permit smooth motion for one and intermittent motion for the other. This is illustrated diagrammatically in Fig. 1.

It is obvious, therefore, that the picture and its corresponding sound can not be located physically adjacent to each other on the sound film. As shown in Fig. 2, the sound "leads" the picture, by a distance equal to the required film spacing between the picture projection aperture and the sound reproducing head. This "lead" distance has been standardized at 26 frames. Because of the displacement between picture and sound, it is impractical to edit completed sound-on-film programs by simply cutting and splicing the film. Any provision for editing must, therefore, be made before the program reaches the final sound film print stage.

With these facts in mind, it can be seen that the two basic problems in TV sound recording are: to provide positive synchronization between picture and sound during original recording, and to provide for editing of both sound and picture before the final sound-on-film negative is made.

There are two general methods in use today for recording TV sound the Single System and the Double System.

In the Single System, the sound is optically recorded on the same photographic film as the picture. Synchronization is taken care of automatically because picture and sound are recorded on the same piece of film. This system, however—unless modified in practice—does not permit editing.

In the Double System, the original sound is recorded on a separate medium (magnetic tape, magnetic film, or photographic

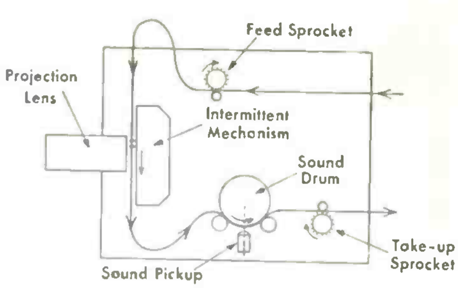


Fig. 1. Schematic diagram of typical sound film projector.

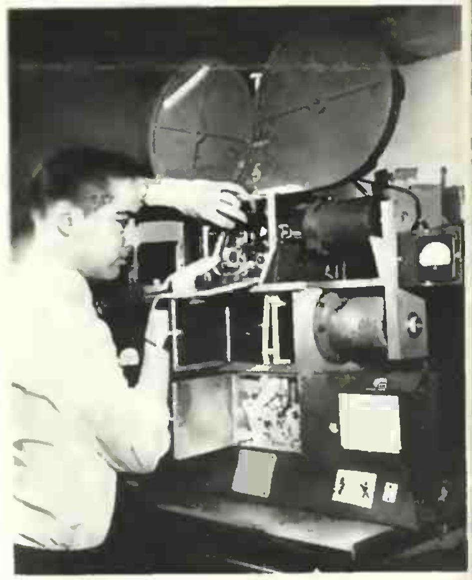

Fig. 4. Engineer Paul Ruckdeschel, of WJZ-TV, threads camera. Note wide separation between camera and optical sound recording unit below.

Fig. 3. One of ABC's kinescope recording rooms at Station WJZ-TV, New York, showing a matched pair of 16mm sound film recording units. Each unit consists of a Wall camera and special Maurer optical recorder mounted on an RCA Kinephoto recording monitor.

Fig. 5. Engineer Edward J. Greene demonstrates operation of Moviola sound film editing equipment, in one of the WJZ-TV editing rooms. Film at left is used for sound track, and at right, for picture. Any parts to be removed are marked on both picture and sound track, to be cut and spliced later.

Fig. 6. Sound recording equipment at NBC television studios, New York, showing a pair of RCA sound on film recorders. Engineer Michael A. Maneale threads 16mm magnetic film into one of the machines. In this double system, sound is recorded separately from the picture, on both magnetic and photographic film.

film), and transferred to the picture film during final processing. This method permits easy editing for removing any "fluffs" that might have appeared on the program, for altering the total playing time, or for changing commercial spots to provide local interest in different areas.

When the original sound is separately recorded, positive synchronization with the picture is obtained in a number of ways, depending on the medium used. Sound separately recorded on photographic film is synchronized by sprocket holes, spaced the same as the sprocket holes in the picture film. For recording magnetically instead of optically, 16mm magnetic film is available—consisting of a cellulose acetate base having standard sprocket holes, but with a red oxide magnetic coating in place of the photographic emulsion. In addition, standard 1/4-inch magnetic tape can be used, with special recording equipment designed to provide "sprocketless synchronization" by means of timing pulses recorded on the tape along with the sound. Rangertone, Inc., of Newark, New Jersey, has developed a line of sprocketless synchronous magnetic tape recorders, in which magnetic pulses of the 60-cycle power driving the camera are recorded on the tape at magnetic right angles to the sound. This enables the projector and tape to be "locked" in step, regardless of tape stretch or possible fluctuations in the power supply frequency.

All of the above methods are in use today in the various TV stations and networks.

The ABC network, for example, uses a modified Single System method of kinescope photography which gives essentially the same flexibility for editing as the Double System. Although the sound is optically recorded directly on the same film as the picture, *two* copies are made of each show—resulting in an original, and a "safety". If any editing is required, one copy is treated as the *sound* print and the other as the *picture* print. Each can then be cut and spliced as required, and the two combined again in a single print at the film processing laboratory. The ABC system has also been modified to permit recording with higher fidelity than is ordinarily obtained with Single System recording. This has been achieved by special design of the video and audio recording apparatus—involving an 88 or 100 frame separation between picture and sound. This, of course, is reconverted to the standard 26 frame separation during final processing.

Fig. 7. This kinescope camera—one of a bank of similar machines at NBC—records the picture separately on 16mm photographic film. Duplicate films are made of every recorded show.

A typical example of the double system is that used by NBC. Here the kinescope picture is copied on 16mm motion picture film, without sound track. At the same time, the sound is recorded both optically and magnetically on separate equipment. The optical recording is made on standard 16mm photographic film, and the magnetic recording on magnetically coated 16mm film. In general practice, the optical sound recording is considered as the "master" and the magnetic recording as the "safety". If, after development, it is found that the photographic sound track is satisfactory and requires little editing, it is transferred to the final 16mm sound picture film, and the magnetic recording is erased so that the magnetic film can be used over again. However, if the optical sound print is unsatisfactory for any reason, the magnetic recording is used as the master, and is rerecorded onto a new photographic negative. This set up, as used at NBC, is completely flexible, and may be varied to meet specific recording requirements. Since the RCA film sound recorders used are equipped with both optical and magnetic heads, either medium may be used interchangeably as desired. In cases where exceptionally high fidelity is required, both the "master" and the "safety" sound recording is made on magnetic film and the sound is played back on a magnetic film phonograph operating synchronously with the TV film projector.

Equipment currently in use by the other major TV networks is, in general, similar to one of the two systems described above. In addition to magnetic film recording, however, standard 1/4-inch magnetic tape, with sprocketless sychronization, is also used in Double System recording. Tape re-

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Fig. 8. R. M. Fraser, of NBC engineering laboratory, checks a recording on a modified Moviola editing machine, equipped with a magnetic head for playback of the 16mm magnetic film (*at left*). Picture print is on right hand reel.

## TV Transcriptions

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corders for this application are supplied by both the Fairchild Recording Equipment Corporation and Rangertone, Inc.

The use of magnetic recording in television work is still relatively new. And although this application is growing rapidly, on the basis of presently available materials and equipment, TV and recording engineers are confident that the future will bring great improvements in the magnetic recording of synchronized sound and pictures. One significant avenue of research in this direction is the development of "striped film" — that is, photographic film with a narrow strip of magnetic coating where the sound track would normally be located. This system, when perfected, would permit recording the picture and magnetic sound track on the same film, simultaneously. A film of this type, however, requires a magnetic coating which will be impervious to the developing and fixing solutions used, and which will not be altered either physically or magnetically, during photographic processing. Since the normal 16mm film speed is 7.2 inches per second (remarkably close to the 7.5 inch standard tape speed) high fidelity of magnetic recording directly on the film appears entirely feasible.

Eventually, it may even be possible to record both the sound *and the picture* magnetically. Since a TV picture is actually a series of extremely high-speed electrical impulses, this concept is not as fantastic as it might seem. Such impulses could, theoretically, be recorded on magnetic tape. However, means will first have to be developed to avoid having to run the tape at fantastically high speeds in order to give the necessary split-second timing between signals. Since most of the consecutive impulses are duplicates of the preceding ones, it may be possible to work out a system in which it is only necessary to record the *variations* in consecutive patterns, in which case magnetic picture recording might be possible with reasonable tape speeds.

In any event, it can safely be assumed that magnetic recording will play an ever increasing role in the television field. And — as in radio — television engineers can look with confidence to Audio Devices for magnetic recording materials that will meet the highest standards of quality and uniformity.

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**WANTED: Stories about your recording activities, for Audio Record — which is read by more than 14,000 sound recording enthusiasts. Please address your contributions to: Editor, Audio Record, 444 Madison Avenue, New York 22, N. Y.**

## Georgetown University

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Arts and Sciences. Each of the machines may play a different language, all at one time, or more than one may play the same language at different levels of instruction.

The 120 booths are wired into three sections of 40 booths each, permitting considerable flexibility in transmitting language drills from the master console. For example, elementary French may be played on Channel 1 in Section 1 (the first 40 booths), and intermediate French can be played on the same Channel 1 in Section 2 (the next 40 booths) and Section 3 (the remaining 40 booths). Laboratory drills are scheduled at regular hours for the various language classes, and are conducted on a group basis, each group having a block of seats assigned to it during three given periods per week.

The tapes are so prepared as to give the student the opportunity to repeat the words and sentences recorded and to formulate replies to questions based on the recorded text.

The laboratory is equipped with a public address system of five loud speakers. A lecture can be recorded at the time it is delivered and thus remain available for future use.

The whole concept of laboratory drill work in language study is based on the fact that magnetic tape recording permits the reproduction and dissemination of the *spoken* form of language, just as the printing press has heretofore been the means for dissemination of the *written* form of language. The objective is to achieve a practical program which lies between the traditional three-hour-per-week language course and the intensive, wartime-developed instruction.

The use of recorded language drills, especially prepared by the faculty to synchronize with the work done in the classroom, affords the students an opportunity for intensive repetitive drills not possible in the classroom. In broad terms, the "speaking" possibility offered by laboratory drills represents a total of some 50 hours, during the school year, as contrasted to less than 5 hours per school year in the classroom. In other words, the student is able to speak the foreign language in the laboratory for from 15 to 20 minutes during each period, whereas he can speak for only one minute during a given class instruction period.

The facilities of this laboratory will permit approximately 3600 student contact hours per week, or a total of 108,000 student contact hours during the academic year of 30 weeks. To make possible the same amount of language contact drill through individual instructors would require the addition of 15 members to the present language faculty.

The Electronic Language Laboratory was designed by Professor Leon Dostert, Director of the University's Institute of Languages and Linguistics. It is the outgrowth of a somewhat similar tape recorder system which was introduced by Professor Dostert at the Institute several months previously. The earlier system, which is on a considerably smaller scale, has individual tape recorders in each of the student listening booths, instead of in a master control console. Professor Dostert, who is responsible for the development of both of these "language laboratories", is one of the country's leading figures in language work. During the last war, he served as interpreter for General Eisenhower—later becoming liaison officer to General Giraud. Also, it was Professor Dostert who developed the first simultaneous translation system, used at the famous Nuremburg trials. This same Dostert system was later introduced into the United Nations, where it has proved to be of inestimable value.

The editor of Audio Record had the pleasure of being present at the official opening of the new Electronic Language Laboratory at Georgetown University. It is his firm belief that this radical departure from traditional teaching methods is one which other institutions of learning will do well to watch carefully. For this unique tape-recorder installation has set a pattern that is likely to have far-reaching effect throughout the entire educational field.

## STANDARDS FOR EDUCATIONAL RECORDING MACHINES

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

The past three years have seen about 35 new types of magnetic recorders offered for school use. Some are well suited to educational needs, but many have only limited application in the class room. Educators therefore realize the need for establishing some basic minimum performance standards to serve as a guide in selecting the correct equipment.

This subject was thoroughly discussed in an article by C. J. LeBel, which appeared in a recent issue of The Quarterly Journal of Speech. Reprints of this article are now available. If you are interested in educational recording, we will be glad to send you a copy without obligation, of course. Write to Audio Devices, Inc., 444 Madison Ave., New York 22, N. Y.