A Test of Video Tape to Film in Educational TV

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Educational TV stations have a problem of economically producing program material available within their area. This paper briefly outlines the methods used to produce, with portable-type equipment, three half-hour programs and the transfer of the edited video-tape material to 16mm projection prints.

EDUCATIONAL television stations operate on extremely small budgets in comparison to their commercial brothers; therefore, cost is an important factor in producing programs. These programs are made available to the other educational stations throughout the United States. As one of the 57 educational television stations, KTCA-TV, Twin City Area Educational Television Corp., St. Paul, Minn., desired to produce several programs featuring the world-renowned St. Olaf College Choir.

Dr. Olaf C. Christiansen, the choir's Director, was eager to cooperate but was concerned as to the recording location, since acoustical excellence was an important factor. The Chapel on the campus of St. Olaf College, 40 miles from the studios of KTCA-TV, seemed an ideal choice. Other recordings and live broadcasts had already originated from this Chapel.

As is the case with many educational stations, no motion-picture cameras are owned by KTCA-TV; however, a truck equipped for remote pickups, complete with camera chains, audio equipment and accessories, is a part of the station's equipment. At the time, early 1961, KTCA-TV did not yet own a portable video-tape recorder; therefore an arrangement was worked out with WTCN-TV, one of the commercial stations in the Minneapolis-St. Paul area, for the loan of a mobile Ampex Videotape Recorder and truck.

Two trucks with the portable video-tape recorder, television cameras and lighting equipment were driven to the location early in the morning. The temperature was about 10° F, so there was some concern over dimensional changes in the video tape. However, by

Presented on October 6, 1961, at the Society's Convention at Lake Placid, N.Y., by Reid H. Ray (who presented the paper), Reid H. Ray Film Industries, 2269 Ford Pkwy, St. Paul 16, Minn., and Joseph T. McDermott and Wayne A. Mayer, KTCA-TV, St. Paul, Minn.
(This paper was received on July 11, 1962.)

recording time the temperature within the trucks had risen to about 65° F and the equipment was operated at near normal temperature.

Figure 1, the Chapel, shows the setup: *A*, the parking area for the two trucks with equipment and the Producer-Director; *B*, the power supply switchboard for the required 14-kw load; *C*, the choir location; *D-1* and *D-2*, podium locations for close-ups of the narrators; *E-1*, *E-2* and *E-3*, the three television cameras used; *F*, single microphone for pickup of choir; *G-1*, *G-2* and *G-3* lighting equipment used to supplement the normal lighting of the Chapel; and *H*, the audio control room.

The college operates its own power plant. From previous experience this caused some concern as a video-tape recorder is quite sensitive to line voltage and frequency variations. Here, however, no difficulty was experienced because the regulation and the frequency were well controlled.

An unforeseen problem did cause a delay of two hours. St. Olaf College has its own 5-kw radio station, WCAL, and shares the frequency of 770 kc with KUOM, with WCAL broadcasting from sunrise to 10:30 A.M. and 12:30 to 2:00 P.M. on Saturdays. The antenna is located less than one quarter of a mile from the Chapel. When the station was on the air the television cameras displayed the well-known interference patterns. No amount of readjusting and rerouting of cables would permit recording until the station went off the air at 2:00 P.M. That limited the time to record the three 30-min programs.

The audio pickup was arranged as follows: permanently installed in the Chapel were three Altec microphones, one at each podium and one suspended from the ceiling, 16 ft above the head of the Choir Director, and 10 ft ahead of the front row of the choir. This suspended microphone was used for the choir as well as the soloists, relying completely on the natural dynamics and balance of the singers. Between recordings, the choir was rearranged for solo parts for best dynamic results of the particular musical numbers, based on the experience of Choir Director Christiansen in making previous recordings in the Chapel. Selections were recorded in segments of 9 to 12 min each. Before and after each selection, the TV Producer-Director "went to black" to allow ample area for editing the video tape.

The audio mixing was done on a permanent console in a small room,

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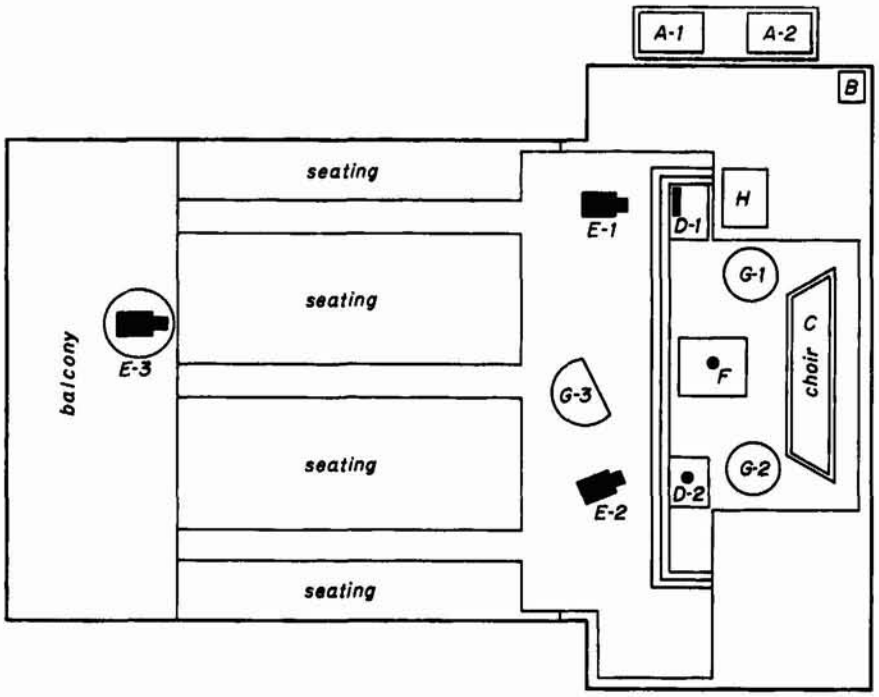

Fig. 1. Setup at St. Olaf Chapel.

adjacent to the choir location, with windows for visual contact with the choir, Director of the choir, and the announcers. The Audio Engineer was left virtually on his own while the Producer-Director, located in the truck with the video monitors and controls, was arranging camera movements, camera cuts and following the script, and had no time for audio directions.

Most of the light came from large windows along both sides of the Chapel, with a huge stained-glass window behind the choir providing some backlight. This stained-glass window also provided interesting visual detail. Two 1000-w lights were placed on each side of the choir, and one 2000-w scoop was set in the middle for front fill light. The existing interior lighting of the Chapel brought the light level to a satisfactory reading during the first half of the recording session.

However, as the afternoon winter sun waned, the natural light faded progressively and it was necessary frequently to adjust lens openings to maintain a degree of good picture quality. The difficulty of maintaining gray-scale match and balance between three cameras with a total of nine lenses under such conditions can hardly be overstated. It resulted in an occasional deterioration of picture quality from the beginning to the end of a particular choral number. Remote iris control would have been most useful and welcome in this situation.

The three half-hour programs were recorded in approximately four hours. Timing and program order had been determined in advance, so very little time was spent in rehearsal.

Later at the KTCA-TV studio, the separate sequences were edited into three 29-min programs. Almost all of the video-tape splicing was done in "black," thus eliminating the usual problems of editing a composite sound and picture tape. From a quality point of view, the programs turned out to the satisfaction of both St. Olaf College and KTCA-TV. To increase the use to which the programs could be put it was decided to transfer the three programs to film so that 16mm prints could be made available for wider distribution in educational areas with projection equipment. Naturally, it was desirable to retain as much of the fidelity of the sound and picture as possible.

First, the audio from the video tape was transferred (Fig. 2) using an RCA PM-64 35mm magnetic recorder with full-coat 3-M magnetic film. The RCA Recorder was fed from the Ampex audio system. At the end of each 1000-ft roll of film a lap-over of the sound was made. An audible note was recorded onto the audio track of video tape before the start of each program to be used as a synchronization mark for the film laboratory when the picture and sound negatives were conformed for printing.

The video-tape picture was then transferred to Eastman 16mm Television Recording Film, Type 7374, using KTCA-TV's General Precision Laboratories Kinescope Recorder (Fig. 3). This negative was developed in a modified D-76 developer to a gamma of 1.00 with the black end-point density

Fig. 2. Transfer of audio from video tape to 35mm magnetic film.

Fig. 3. Transfer of picture from video tape to 16mm negative.

Fig. 4. Re-recording from 35mm magnetic film to 16mm negative soundtrack.

of 1.20 and the white end-point density of 0.3. During this transfer a single-system variable-density soundtrack was included. This aided in the conforming of the double-system track and picture negatives for the composite prints. The 35mm full-coat magnetic recording was then rerecorded to a 16mm B wind variable-area negative soundtrack (Fig. 4).

The composite print, made on Eastman 16mm fine grain release positive, Type 7203, was developed to a gamma of 2.30, for normal screen projection.

This experiment met the basic requirements of a program produced at a remote location within the economical limitations of an educational television station's budget.

At the Convention a 4-min sequence from one program was projected to show the results.