

CREATIVE VTR EDITING

New Time Code editing system facilitates production of taped programs and commercials, lowering production costs and cutting editing time. It utilizes high-speed search, the SMPTE time code, and key board entry. It automates routine functions, accurately synchronizing and recuing VTR machines. It permits the flexible double system of editing to be used, intercutting pictures from two sources while maintaining precise sound sync. It affords multi-track sound manipulation. Additional applications include fast push-button search and cue of tape segments, start and stop of external equipment at predetermined time. Altogether, this new system has substantially reduced time and effort required to produce high-quality VTR shows with professional effects.

By OSCAR F. WICK and JOHN H. FRISHETTE



Razor Blades To Time Code

Magnetic Video Recording was introduced to television broadcasting approximately fourteen years ago. Initially its principal usefulness was seen to fall in the time zone delay area. Kinescope Recording, performing this function, left much to be desired from the standpoint of quality, cost of operation, and processing time. Since Hollywood was the delaying point for the NBC Pacific Coast Network, the first Video Tape Equipment acquired by the Company was installed there.

Within a year after Video Tape became operational in Hollywood, the RCA Laboratories at Princeton developed circuitry and equipment to enable the monochrome machines to record and reproduce color. With this development came widespread interest in the use of Video Tape to pre-record television programs. Further, production people could see Video Tape as a replacement for Motion Picture Film in many television applications. The opportunity to use "Television Techniques", and thereby reduce production costs, was particularly attractive. The photographic process, however, still had several distinct advantages, especially in the areas of editing and duplication.

In the spring of 1958 a new recording facility was installed at the NBC Burbank Studios. A total of 12 Colorized Video Tape Recorders were included. With this expanded capability we were in a position to undertake pre-recordings that had not previously been possible. Within a short time, the need to edit and rearrange this material became very clear and the possibilities for doing so were investigated. The only implements available for the cutting and splicing of video tape were rather crude, a milled channel, a straight edge, and a razor blade. The splices produced invariably resulted in severe picture disturbance—an intolerable situation if we were to compete with motion pictures.

To improve our ability to assemble pre-recorded tapes with acceptably smooth transitions and to cope with other problems that had become apparent, such as the handling of picture and sound offset, a study and development project was initiated. This effort was quite productive and a procedure for the double system editing of Video Tape* (independent editing of pictures and sound) was evolved that has been in use to the present time. Many of NBC's top shows have been assembled using the tools and techniques that were developed in the course of this original project. The Bob Hope Shows and the Rowan and Martin "Laugh-In" series are specific examples.

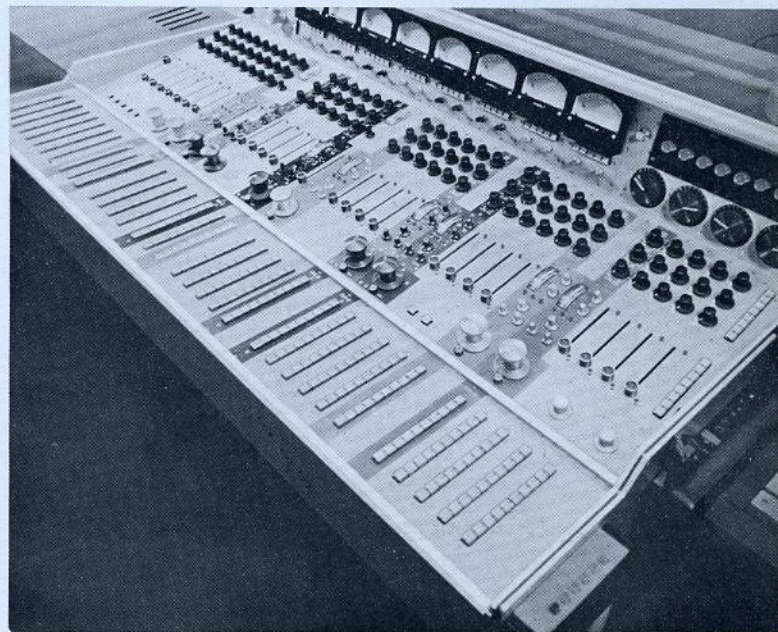
With the advent of the direct color recovery systems,

High Band Recording, and numerous other improvements, the duplication of video tapes became practical. This, in turn, made electronic editing feasible, but the original equipment designed for this activity had a rather limited range of usefulness—especially evident when complex sound track manipulation was required. Despite the limitations, however, a considerable number of major productions have been assembled using this "first generation" equipment, by ourselves as well as others.

Edit Control System

In 1967, a system of edit control was introduced that utilized recorded Time Code. The system not only provided a means for predetermining edit points, but also included high speed search and intermachine synchronizing capability.

At about this time we in Burbank were confronted with the need to expand our editing facilities, so a careful study of the new system was made. After considering as many of the factors as possible, we concluded that the Time Code System of Control had many immediate advantages and that there were potentially a number of other areas into which its usefulness might be extended. We decided to purchase two sets of this equipment and to construct a special edit room to contain the two VTR's so equipped. This was completed during the summer of 1968 and was used successfully on several of our major "prime time" shows during the fall season of that year.



*See "Double-System Recording and Editing with Video Tape" by Oscar F. Wick, JOURNAL OF THE SMPTE, March, 1960, p. 164.

After several months of experience—and a number of unexpected problems—the system was once again carefully examined and once again we concluded that it was the correct approach to the task at hand. Two additional sets were ordered and another special editing room constructed. However, our experience had shown that, with improved editing equipment, more complete video and audio switching facilities, immediately available to the editors, were also needed. So, the new room was designed to include these. Also, the Slow Motion Disc had become an indispensable accessory and this, too, was provided in the room.

This facility was placed in service in the fall of 1969 and since that time, except for a short slow period in the spring, has been in operation on an average of more than 12 hours per day. The Andy Williams Show and the Don Knotts Shows are regularly edited on this equipment as well as many "Specials", such as, the Bell Telephone "Switched on Symphony" and the "Bing Crosby Christmas Show".

RCA Time Code Editor

As the use of Time Code Editing Systems increased, more effort, on the part of several manufacturers, was devoted to the study of video tape editing problems. The advantages and disadvantages of the systems in use in our plant were discussed in detail with engineers from RCA Camden. As a result of their investigations, a new system was designed incorporating many improvements in "Human Engineering", and providing automation for several of the routine operations that must be performed repetitively. Examples are: the entry of edit point Time Code data directly into memory by depressing a single button, the performance of arithmetic calculations within the editing circuitry, and precise recuing by depressing a single button.

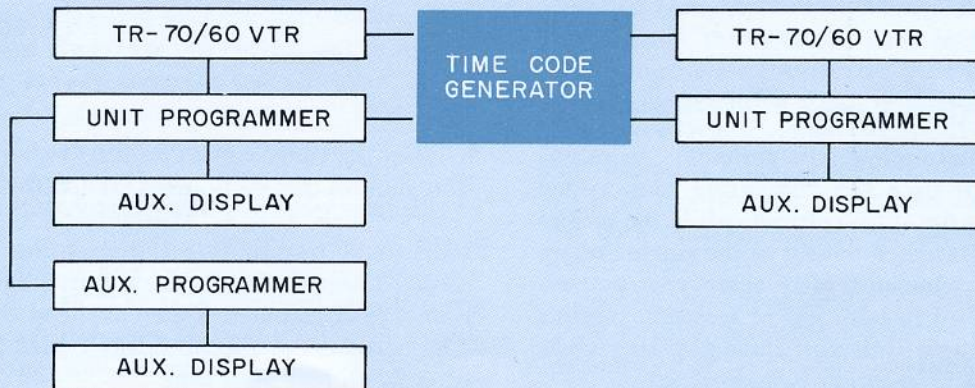
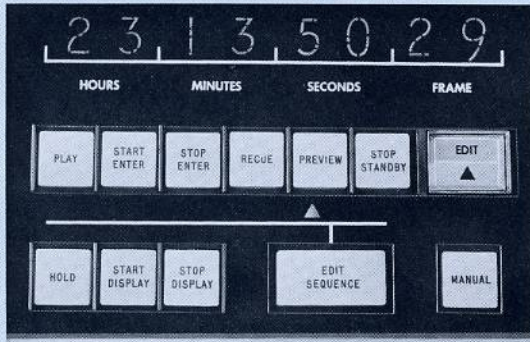
In view of the heavy schedule projected for the fall of 1970, still another editing facility for NBC Burbank came under consideration early in the year. It was decided that a third room complete with six channel audio and video switching equipment, video effects unit, slow-motion disc, and extensive video and audio monitoring facilities would be constructed. It would utilize the newly designed RCA Time Code Editing System. In September this latest editing complex was placed in operation and assigned to handle the post-production requirements on the Dean Martin and Red Skelton Shows.



We have been asked to briefly discuss some of the operations currently being performed with this equipment and have selected the Dean Martin Show to provide a few interesting examples of its capability.

To begin, we should mention the fact that it is standard procedure, in our plant, to feed Time Code to all machines at all times. Whenever a recording is made, the cue track contains Time Code representing the accurate time of day. Normally, the editor, on a show such as the Dean Martin Show, also operates some of the recording equipment. This allows him to become familiar with all of the details and to log all "takes" as they occur using clock time. Later, during the editing session, these logged times are used to quickly locate any desired segment, utilizing the system's high speed search.

This high speed search capability is also used in non-editing functions. If we wish, for example, to play several segments of a football game in close sequence into a live Sports program, the Unit Programmer is set to cue the game tape precisely before each segment. All the video tape operator needs do is to enter the desired time into the Unit Programmer's Stop Register via the 10-key keyboard and press the Search button. Generally, a log of noteworthy activity is kept during the progress of these games and Time Code permits desired action to be *reliably cued without prior rehearsal*.





Using the Time Code Editor

On the Dean Martin Show it is customary to record two separate feeds from the originating studio. One feed carries the entire studio output, while the second represents the unswitched output of the single camera normally used for close-ups. Here again, the common Time Code supplied to both sets of recorders permits the two pictures to be "intercut" during editing while precise sound synchronization is maintained.

The principal elements of the Martin Show are recorded on Saturday evenings and editing is scheduled for Monday and Tuesday. A total of about 24 hours is required to complete the editing on the average show. Usually, two men are employed in the editing process, the editor and an assistant. The editor operates the VTR on which the show is being assembled, as well as the switching and effects equipment. The assistant

handles the playback VTR, it's Programmer and the slow motion disc equipment. When dissolves between reels are used, a second assistant and a third VTR are assigned. A 64-minute reel containing previously recorded Control Track, Black Burst, and Time Code from 0 to 60 minutes, is used as the assembly medium. This becomes our Electronically Edited Master and all edits are in real show time.

When "freeze" is employed, picture and sound from the segment to be frozen are assembled in the normal manner on the Master Reel. While this is being done, the picture is simultaneously recorded on the disc. The picture on the Master Reel is then replaced by a replay from the disc, with action stopped or frozen at the appropriate point. It is, of course, essential that precise synchronism be maintained between VTR and

disc, since the disc picture must exactly match the previously recorded sound up to the "freeze" point. To achieve this necessary condition, use is made of a contact closure that is externally available from the Unit Programmer. This closure is used to start the disc from the Master Reel Time Code when the material is recorded and, consequently, exact time relationship between VTR and Disc is insured for playback.

Time Code actuated contact closures are used to control a variety of external equipment in addition to the slow motion disc. Sound playback machines, auxiliary VTR's and automatic effects units are frequently started and switched by this means.

"A" and "B" Rolls

On the Martin Show, opening and closing titles are produced during the editing operation. Separate A and B rolls are prepared by careful assembly from selected portions of the original recordings, and these are played back in synchronism utilizing the synchronizing feature of the Unit Programmer . . . perhaps a brief description of the procedure used to prepare the closing titles might be of interest.

The standard closing for the Martin Show is 60 seconds long. Roll titles are matted over a series of shots opening with a still picture of Mr. Martin seated on a large soft-like set surrounded by a group of quite attractive young ladies, popularly known as The Gold-diggers. After several seconds, this picture dissolves to the first of a series of stills, of the girls, taken from the show. In conclusion, the group is again seen, but in normal motion, beginning medium tight on Mr. Martin and a part of the group and pulling out to include all of the girls. Finally, the scene fades to black. Sound during the closing is the show's theme.

In a first step, as indicated previously, the editors prepare A and B rolls of the entire series. These are rolls of tape that contain successive show segments so arranged that, in playback, dissolves may be made from roll A to roll B, and vice versa, and thus produce the sequence desired. The stills required are obtained by freezing selected frames from the original recordings. In making the assembly, a third VTR, also started by contact closure in the Unit Programmer, is used to playback previously recorded roll titles. All picture signals are routed via the switching equipment in the room so that the roll titles may be matted and the dissolves executed. Theme music is also "laid down" at this time. The Time Code Editing System has substantially reduced the time and effort required to produce a sequence of this type.

Sweetening the Sound

When shows are edited, it is generally necessary to re-process the sound track because small but objectionable changes in background level and quality often occur at the edit points. This is especially noticeable when the splice is made during applause or laughter. Then too, it is sometimes necessary to add sound effects, musical bridges, and audience reaction—if an audience was not present during the recording. The Dean Martin Show is performed before a live audience and the response is quite adequate. However, "Sweetening", as it is called, is necessary to obtain a complete, smooth, and uniform finished track.

The average Martin Show contains 15 to 20 sketches, songs, etc., and each of these frequently requires some internal editing, making for an average of about 90 splices in the completed Master Tape. During "Sweetening", the jumps in the edited track are bridged by sound similar to that already existing—for example, if the edit occurs in applause, similar applause would be mixed in to cover the discontinuity.

After editing on the show has been completed, the sound track and Time Code are transferred to 2 tracks of a 4 track audio recorder. This recorder is of the type employing a capstan servo and sync track, so synchronism with the VTR is absolute. During the "Sweetening" session, the 4 track audio machine is used in the playback mode to provide program sound, and is also used as the source of Time Code to which the VTR is synchronized via the Unit Programmer's synchronizing feature. This results in a situation wherein picture is supplied from the Edited Master Tape and program sound from the 4 track, both in precise interlock. These signals are routed to a Post Production Studio containing extensive audio mixing and equalizing facilities as well as excellent audio and video monitoring. Any necessary modifications to the original track are made in this studio and the composite sound output fed back to and recorded on the VTR as the final sound track.

Looking back, one could say that the art of Video Tape Editing has come a long way from the days of the razor blade; but, from our point of view, the future is even more exciting. With the introduction of new production tools and with the Time Code System available for their automation and control, the possibilities are limitless.

The authors wish to thank Mr. Peter Groom and Mr. Stan Jenkins, members of the Burbank Video Tape Technical Staff, for their help with the details in the preparation of this article.



OSCAR F. WICK

After about ten years in radio receiver manufacturing and electronic equipment servicing, Mr. Wick joined NBC in 1942 as a Maintenance Engineer in Hollywood. When the Company began television operations on the west coast in 1948, he became a member of the original staff of station KNBH (now KNBC). His assignment, after a period of training at NBC in New York, was that of Technical Director in the Film Studio.

As the NBC Television Network grew into a coast to coast operation, the activity in Hollywood increased considerably and Mr. Wick was promoted to the newly created position of Film Studio Supervisor. With the introduction of Video Tape in 1956, this, too, became part of his responsibility. In 1965, he was promoted to the position of Manager, Video Tape and Kinescope Recording.

Mr. Wick studied engineering at the University of Southern California, UCLA, and Los Angeles Valley College.



JOHN H. FRISHETTE

John Frishette joined the NBC Radio Network at Chicago in the spring of 1950, and transferred to Television Technical Operations in the fall of that year. He worked in Studio Operations and Television Maintenance until September of 1955, at which time he transferred to NBC Burbank.

Since that time he has been a Master Control Engineer, Video Tape Engineer, Maintenance Engineer, and supervised many of the new installations at NBC Burbank. He has been a Supervisor of Video Tape Operations since 1966 and has been closely associated with the Time Code Systems installation and use in the NBC Burbank Plant.

Prior to joining the NBC Network, John Frishette graduated from the Electronics Material School, Naval Research Laboratory in Washington, D. C. and is also a graduate of the American Television Institute in Chicago, Illinois.