

The Development of National Standardization of the One-Inch Helical Video Tape Recording Systems

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Introduction

On 24 January 1977 the SMPTE Engineering Vice-President received a letter, submitted by ABC and CBS following their joint study, requesting the Society to set up a special ad hoc committee to assist in resolving a potentially serious problem arising with the rapid development of one-inch helical tape recording systems. The letter reflected the broadcast industry's concern over the proliferation of systems with non-interchangeable formats and offered a proposed format for a continuous field (nonsegmented) one-inch helical system for professional broadcast quality applications. The letter stressed the need for prompt action and urged the Society to move expeditiously on the matter.

Following established SMPTE procedures, Mr. Roland Zavada, the SMPTE Engineering Vice-President, assigned the activity to the SMPTE Engineering Committee on Video Recording and Reproduction Technology under the chairmanship of Mr. Norman Ritter, who introduced the request to his committee at its meeting on 30 January 1977 in San Francisco.

The committee, recognizing the urgency reflected by the request, decided against the handling of the study within the Subcommittee on Helical Recording, which was already studying the first of the one-inch systems to have gained acceptance within segments of the industry, and recommended the formation of a new working group reporting directly to the main committee. Accepting the recommendation, the chairman formed two working groups, one on segmented systems and the other on continuous field systems.

Chairmen of the two working groups were selected from experts sponsored by users rather than from manufacturers in order to maintain as unbiased a posture as possible. The chairmanship of the working group on continuous field systems was undertaken by Mr. Frederick Remley, Jr., Director of Engineering for the Television Department of the University of Michigan at Ann Arbor, and Mr. L. Merle Thomas of the Public Broadcasting Service accepted the chairmanship of the working group on segmented type systems.

In the interest of obtaining as wide

The author would like to acknowledge the work of Joseph Roizen and C. Robert Paulson who were the Committee Members designated to assist in the preparation of this report.

a range of technical and operational inputs to the working groups, the Society's Manager of Engineering Services sent out a letter inviting participation in the working groups from all interested parties, as well as placing the invitation in the *SMPTE Journal*. It was amply evident from the first meeting onward that his invitation had not gone unheeded. The serious interest in this activity was clearly underlined by the presence at the organizational meeting, held following the closing of the main committee meeting, of experts sponsored by all major television networks, several groups of industrial television users and eight equipment manufacturers — Ampex, Bosch-Fernseh, IVC, NEC, Philips, RCA, Recortec and Sony.

In order to identify the various one-inch helical formats under consideration and to prevent any connotation of manufacturer interests, the Society has assigned type letters to the formats as they were completed by the working groups and submitted to the main committee for consideration. The three one-inch helical formats on which the preliminary technology has now been completed will be identified in the national standards documents as:

Type A — The one-inch continuous field format introduced by Ampex in 1974.

Type B — The one-inch segmented format, known as BCN, introduced by Bosch-Fernseh.

Type C — The one-inch continuous field format developed through the cooperation of the manufacturers to satisfy the basic parameters as requested by the users, both network and industrial.

Development of the Type A Format

The working group on the Type A format first submitted its drafts specifying the basic parameters in August 1975. These were editorially modified and, after additional review by the working group, were circulated to the main committee in March 1977. The basic format configuration is shown in Fig. 1.

The specifications are covered in two American National Standards and two SMPTE Recommended Practices:

V16.37, Draft American National Standard Basic System Parameters for 1-in Type A Helical Video Tape Recorders.

V16.38, Draft American National Standard Dimensions of Video, Audio and Tracking Control Records on 1-in

Type A Video Magnetic Tape Helically Recorded at 9.6 in/s.

V16.39, Proposed SMPTE Recommended Practice on Frequency Response and Operating Level of Recorders and Reproducers for Audio Record One for 1-in Type A Helical Video Magnetic Tape Operating at 9.6 in/s.

V16.40, Proposed SMPTE Recommended Practice on Reference Carrier Frequencies and Pre-Emphasis Characteristics for 1-in Type A Helical Video Magnetic Tape Recording.

These documents are currently being editorially modified and will once again be reviewed by the main Committee on Video Recording and Reproduction Technology. Once approved, they will be reviewed by the SMPTE Standards Committee and then published in the *SMPTE Journal* for public review and comment.

Development of the Type B Format

Following the organizational meeting in San Francisco on 30 January 1977, the working group received, through the Robert Bosch Corporation, the specifications covering the BCN format for consideration for standardization of the one-inch segmented systems.

In March 1977 the working group held its first meeting in Washington, D.C. and reached agreement on the acceptance of the data submitted by Bosch-Fernseh for standardization. The data were refined and edited into the appropriate format and circulated for formal consideration by the working group.

At its May 1977 meeting, the proposed drafts were again editorially modified for a second review and were approved at the June 1977 meeting for formal consideration by the main committee.

The five drafts specifying the Type B format are:

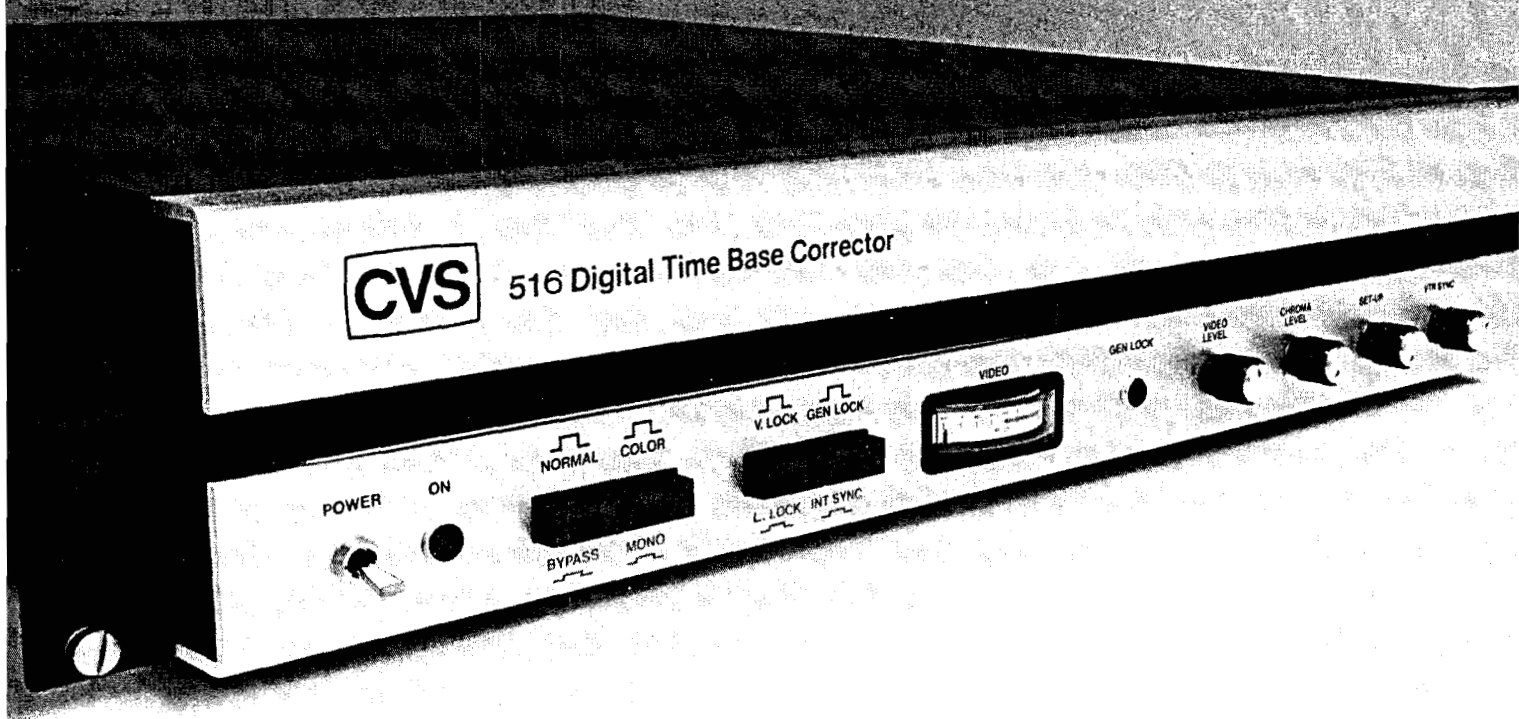
V16.21/2, Draft American National Standard Basic System Parameters for 1-in Type B Video Tape Recorders.

V16.21/4, Draft American National Standard Dimensions and Locations of Records on 1-in Type B Helical Video Tape Recording.

V16.21/5, Draft American National Standard Frequency Response and Operating Level of Recorders and Reproducers for Audio Records of 1-in Type B Helical Video Tape Recorders.

V16.21/6, Proposed SMPTE Recommended Practice on Specifications of Tracking Control Record for 1-in Type B Helical Video Tape Record-

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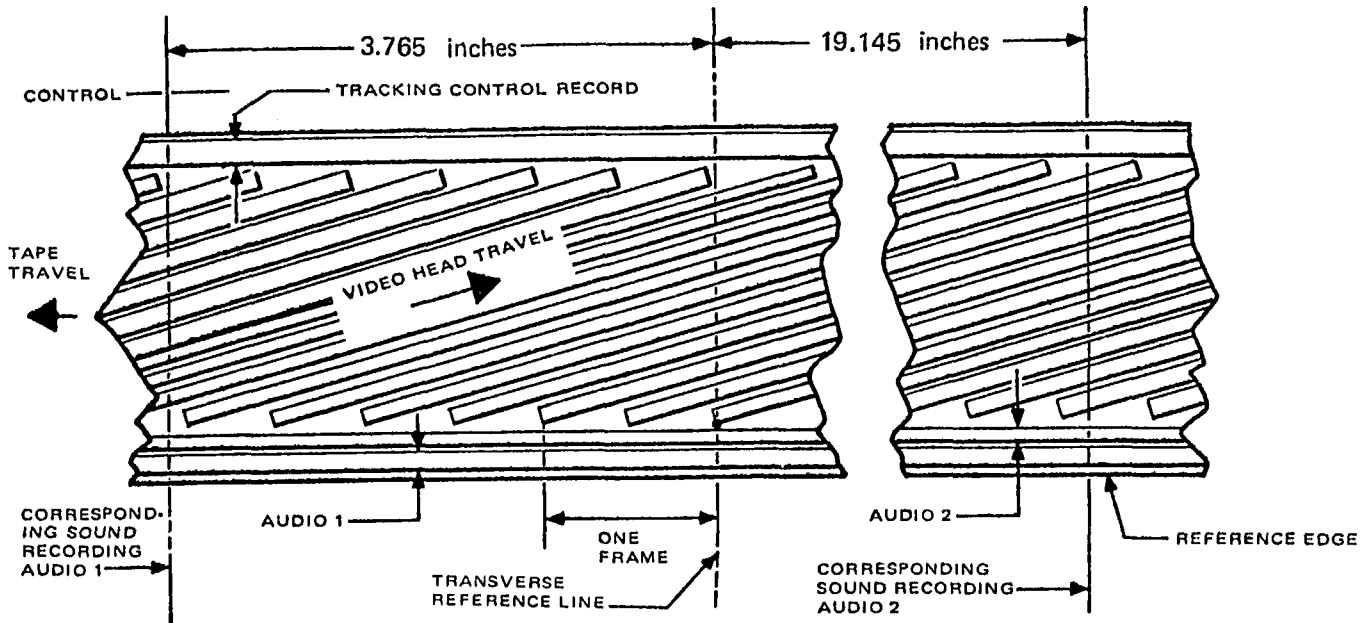


Fig. 1. Track layout.

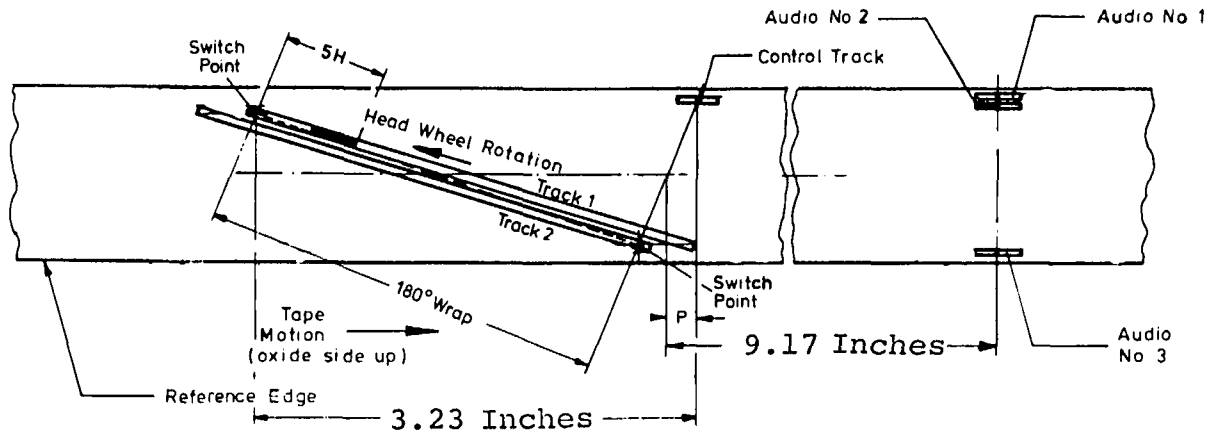


Fig. 2. Track layout.

ings.

V16.21/7, Proposed SMPTE Recommended Practice on Video Reference Carrier Frequencies and Pre-Emphasis Characteristics for 1-in Type B Helical Video Tape Recording.

These drafts were reviewed by the Committee on Video Recording and Reproduction Technology and approved at its 31 August 1977 meeting, held in New York City, and have now been submitted to the SMPTE Standards Committee. Once approved by this

group, they will be published in the *SMPTE Journal* for public review and comments. The basic format configuration is shown in Figs. 2 and 3.

Development of the Type C Format

The preliminary meeting held in San Francisco on 30 January 1977 by those interested in the subject presented a positive start toward the avowed goal and, due to the recognized urgency, the first meeting of the Working Group was scheduled for 23-24 February 1977 in New York City.

This first formal meeting resulted in a roster of 34 experts sponsored by virtually every major supplier or user of video tape recorders. From the manufacturers' side, Ampex, Bosch Fernseh, IVC, NEC, Philips, RCA, Recortec and Sony sponsored one or more experts. The network-sponsored experts included NBC, ABC, CBC, CBS, NHK, PBS and Group W. Industrial television users like the Prudential Insurance Company and American Telephone and Telegraph represent a significant share

of the 1-inch market and their needs were represented by sponsored experts. A telex from the BBC indicated that the EBU G2 Group on Magnetic Video Tape Recording would be represented by a liaison member at future meetings, showing the high interest in this matter from the European television community.

The meeting started with contributions from the various members who reflected the preferences expressed by user experts for a new format design. Various configurations and format options were subjected to polls of those present to achieve some plateau of consensus on which to build a common format. The following points emerged from these polls:

(a) Most network users wanted to record the entire vertical blanking interval. Even those users who saw the vertical blanking interval recording as an option did not want to give up that potential by assigning that area on the tape for other uses.

(b) Two high-quality audio chan-

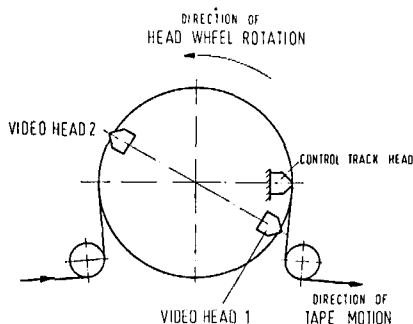


Fig. 3. Head layout.

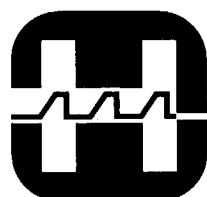
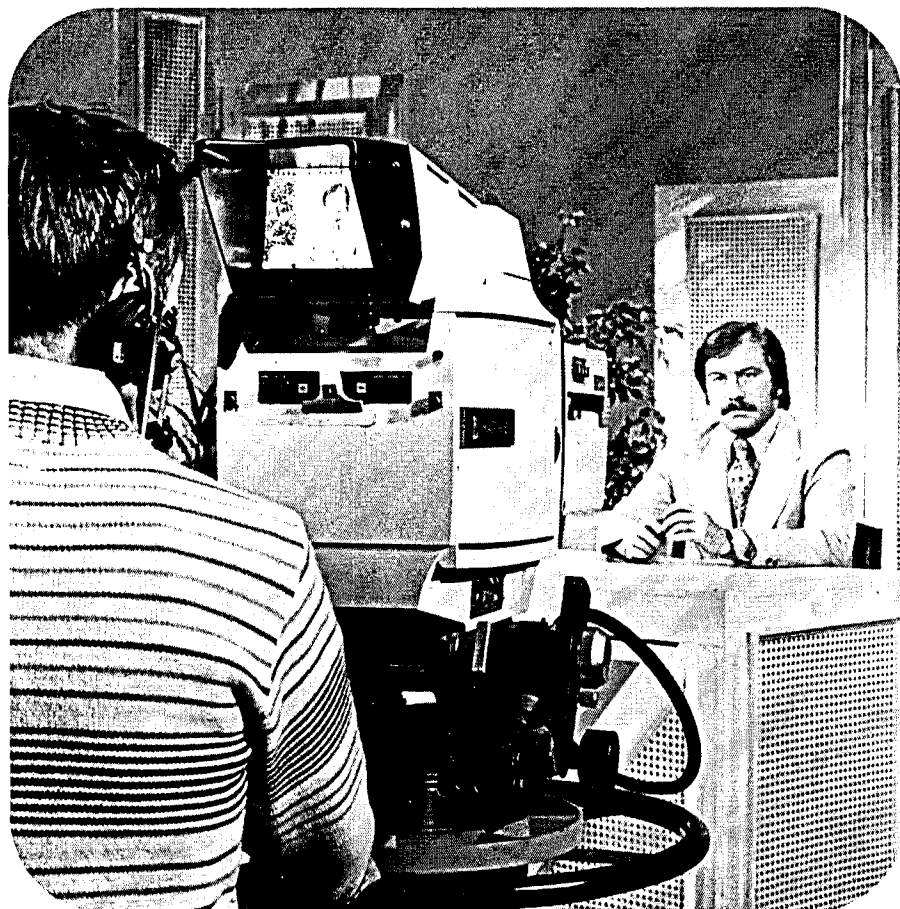
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nels, either for uncorrelated audio recordings or for stereo operation, were considered mandatory.

(c) A third audio channel of equal quality as a cue track and/or possible use as a time-code track was considered desirable.

(d) A separate control should be provided but it must not be located between the audio tracks.

(e) The format should have the widest possible systems application and recognize the needs for 625/50 television systems applications.

(f) The format should allow for the following: (1) independent rerecording of all tracks (no overlays); (2) not exclude the concept for cassette tape loading; (3) compacting of hardware for portability; and (4) recovery of time code for editing purposes from 0.1 normal play speed to 30X play speed.

It was generally accepted that the development and implementation of such a format meant delays in equipment delivery due to retooling; and the users apparently were prepared for this delay.

This portion of the meeting was followed by manufacturer-sponsored experts' comments on the specified needs and the potential technical aspects which would have to be considered. They established the time-frame needed for careful analysis of the ramifications which may be encountered by the suggested design considerations.

The second, an informal meeting, held 16 March 1977 in New York City, principally included user experts from major broadcasting networks. The objective was to review the progress made at the first meeting and to discuss the potential of the format for portability and ease of editing.

At its third meeting, 31 March 1977 in Washington, D.C., the group reviewed the proposed changes to existing formats as introduced by Ampex and Sony. This meeting resulted in a number of agreements and compromise considerations which needed further studies.

The across-the-table discussions, information, and data exchange continued for six additional meetings bringing the design proposal closer and closer until complete accord was reached.

These six meetings were held on: 9 May 1977, Burlingame, California; 10 June 1977, Montreux, Switzerland; 7 July 1977, Chicago, Illinois; 7-8 September 1977, Burlingame, California; and 20 October 1977, Los Angeles, California.

The last meeting was held concurrently with the 119th SMPTE Technical Conference, which helped to assure a large turnout of members and

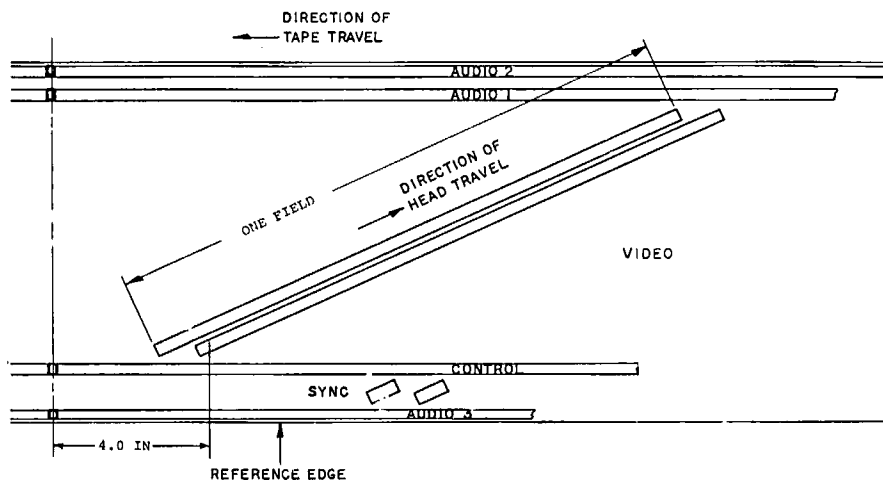


Fig. 4. Track layout.

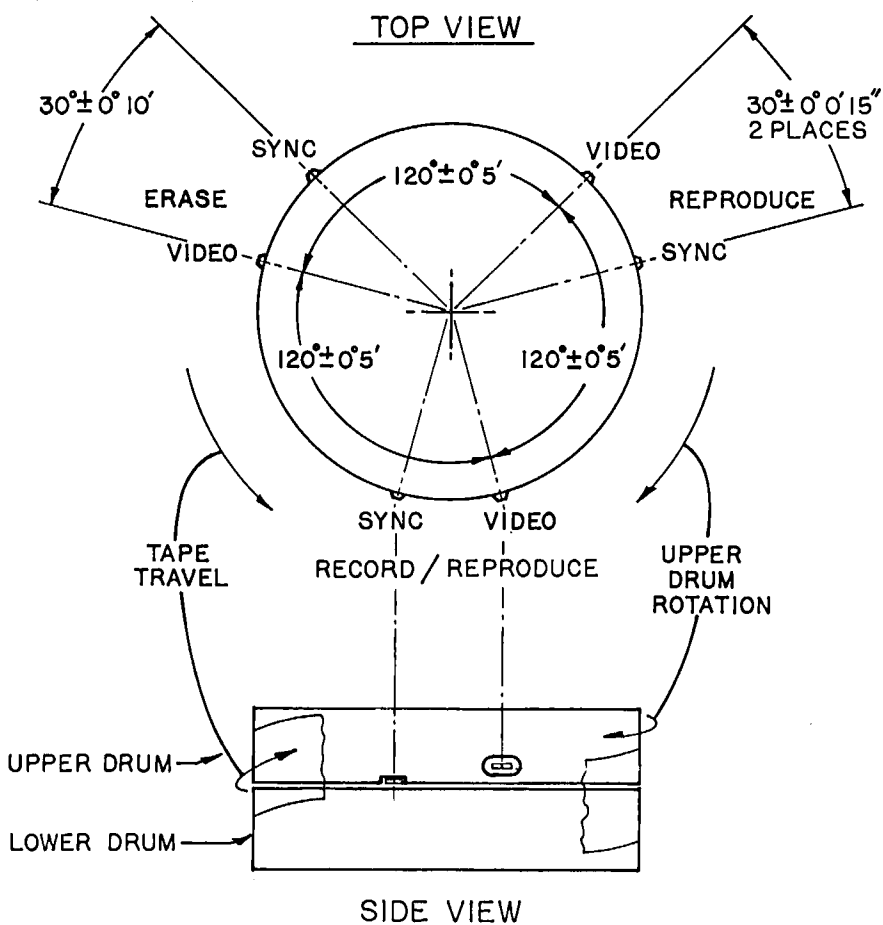


Fig. 5. Head layout.

observers (over 40) who filled the Brentwood Room at the Century Plaza Hotel to capacity.

More than any of the other meetings, the last one was characterized by continued agreement among the various experts as to the fine details in the emerging format and the future hardware that will produce it. The mechanical dimensions and tolerances and the electrical characteristics being proposed and ratified were incorporated into the final draft for a one-inch Type C continuous field helical video format.

The chairman agreed that he could now forward the documents to the parent Committee on Video Recording and Reproducing Technology where it was anticipated that due to the careful preparation of these documents there was a strong possibility of approval. These documents have been forwarded and consist of:

V16.22/2, Proposed Draft American National Standard Basic System and Transport Geometry Parameters for One-Inch Type C Helical-Scan Video Tape Recorders.

V16.22/4, Draft American National Standard Dimensions and Locations of Records on One-Inch, Type C, Helical-Scan Video Tape Recordings.

V16.22/5, Draft American National Standard Frequency Response and Reference Level of Audio Records for One-Inch, Type C, Helical-Scan Video Tape Recordings.

V16.22/6, Proposed SMPTE Recommended Practice Specifications on Tracking Control Record for One-Inch, Type C, Helical-Scan Video Tape Recordings.

V16.22/7, Proposed SMPTE Recommended Practice on Video Record Parameters for One-Inch Type C Helical-Scan Video Tape Recordings.

As with the other proposals, once approved by the parent committee, they will be reviewed by the SMPTE Standards Committee and then published in the *SMPTE Journal* for public review and comment. The basic format configuration is shown in Figs. 4 and 5.

Basic Standards for All One-Inch Formats

An additional working group under Mr. H. L. Marks is currently preparing

standards for one-inch tape and one-inch tape reels which will be common for all three formats. These are:

V16.42, Draft American National Standard Dimensions of One-Inch Video Magnetic Tape.

V16.41, Draft American National Standard Dimensions of One-Inch Video Magnetic Tape Reels.

Summary

It was noted that, in accordance with SMPTE, the documents specifying the three formats are published in the *SMPTE Journal* once they are cleared by the SMPTE Standards Committee. This *Journal* publication affords all those concerned with the subject being proposed for standardization the opportunity to review the proposals and to recommend modification or rejection of any parts of the documents. Concurrently with *Journal* publication, the draft standards will also be reviewed by the American National Standards Committee C98 on Magnetic Video Tape Recording for acceptance as proposed national standards.

Upon completion of these two ac-

tions (approximately six weeks) all comments received are cleared by the originating groups and the documents are submitted by SMPTE to the American National Standards Institute for consideration and acceptance as national standards.

The impact of the Society's forthright action in bringing about a standard for the three formats is immense. From an operational standpoint, every future user of a one-inch helical video tape recorder will benefit greatly from the ease of interchange, uniformity of equipment, post-production adaptability and, most of all, standardized distribution formats for recorded programs.

The Society and the television industry must indeed extend a vote of gratitude to the many experts who devoted their valuable time and the many organizations, both national and international, which gave their support to this tremendous task assuring its unprecedented rapid conclusion. In the long run, all of the committee participants, manufacturers, users and even viewers are the beneficiaries of comprehensive and practical standards.

Standards & Recommended Practices

Approved SMPTE Recommended Practices

On 31 March 1977, the Executive Committee for Standards Approval, acting on behalf of the Board of Governors, approved the following SMPTE Recommended Practices: RP 9-1977, Dimensions of Double-Frame 35-mm 2 X 2 Slides for Precise Applications in Television, and RP 16-1977, Specifications of Tracking Control Record for 2-in Quadruplex Video Magnetic Tape Recordings. Copies of SMPTE Recommended Practices are available from Society Headquarters for \$1.00 per copy.

Reaffirmed SMPTE Recommended Practices

On behalf of the Board of Governors, the Executive Committee for Standards Approval reaffirmed two SMPTE Recommended Practices on 7 October 1977: RP 33-1968, Specifications for 35mm Subjective Picture Test Film for Theaters and Review Rooms, and RP 46-1972, Density of Color Films and Slides for Television. — Alex E. Alden, *Manager of Engineering Services*