bined and interconnected easily to make the most effective, flexible and economical packages for custom-tailored installations.

International Compatibility

International trade in educational equipment for 24-V dc would be infinitely easier. All equipment would work in all countries without modification. Special transformers and rectifier modules would be needed at the individual setting or universal models for 100-, 120-, 240-V and 50–60-Hz could be developed.

Much educational equipment is needed where there are no electrical mains. Twenty-four volts can be easily supplied by portable generators, alternators and batteries. Sixteen dry cells in series or twelve lead-acid storage cells would provide 24-V dc. Two standard auto batteries in series would provide the suggested centertapped system to operate a great variety of equipment for a considerable time and they could be recharged by any automobile or service station. A new generation of special-purpose batteries could result.

A complete changeover from our present world-wide variety of completely noncompatible audio-visual equipment to standard voltage, outlets and plugs would require considerable debate and time. Perhaps a comprehensive standard could be approached in stages. New projector designs and new electronic designs might immediately include 24-V specifications even though they made use of internal transformers. Learning laboratories might have 24-V components specified. Research and development laboratories might plan toward such a new standard.

National and international standards organizations would need to establish or designate groups to study and prepare recommendations. This would be an unusual situation. Requests for standards are now often prepared and promoted by a single manufacturer with the hope of gaining wide acceptance. This proposal is by an educator who wishes that many manufacturers in many countries would develop and produce equipment that would better serve education by being safer, more portable, more efficient, less costly and universally usable throughout the world.

Call for Written Discussion

The suggestions of the reviewers of the first draft were many and varied; not all suggestions could be taken into account in the author's preparation of the final paper.

Because of the nature and status of this proposal, written commentary is especially desirable and needed as early as possible before the Meeting of IEC TC60C in the last two weeks of June in Munich. Commentary sent to the attention of the Editor at SMPTE Headquarters will be forwarded according to the best timing to reach the author.

Please send all commentary in double-spaced typewriting to facilitate review and preparation for clearance by all contributors for possible publication in the Journal after the TC600 Meeting.

standards and recommended practices

Draft American National Standards

Four Draft American National Standards, which are revisions of previous issues, are published here for a trial period and public review.

PH22.59, Dimensions of 35mm Motion-Picture Camera Aperture Images, reflects the agreement of the Film Projection Practice Committee members that the specified dimensions should be in accord with ISO dimensioning practices. Although the document specifies a minor change in dimensions, it is felt that it would not endanger U.S. practices. The same committee authorized revision of PH22.100, Screen Luminance and Viewing Conditions for 16mm Review Rooms, to bring it in line with current practices, i.e., deletion of the appendix on review room screens and modification of the one concerning projection sources.

PH22.141, Dimensions for 32mm Motion-Picture Film, 2R, and PH22.142, Dimensions for 32mm Motion-Picture Film, 4R, implement agreement by the Society's Film Dimensions Committee to consolidate standards that are similar in format and dimensioning. PH22.141, a revision of PH22.71–1965 and PH22.141–1965, combines the specifications applicable to 32mm film having two rows of perforations and a perforation pitch of either 0.2994 or 0.3000 inch. PH22.142 consolidates the revision of PH22.72–1965 and PH22.142–1965 for the same format except that the film has four rows of perforations. The proposed revisions do not reflect a change in specifications.

Comments should be addressed to Alex E. Alden, Staff Engineer, at Society Headquarters prior to 1 August 1973. The proposals have been submitted to American National Standards Committee PH22. All comments received through *Journal* publication will be reviewed before conclusion of action by that Committee.—Alex E. Alden, *Staff Engineer*

June 1973 Journal of the SMPTE Volume 82

Draft American National Standard

Dimensions of 35 mm Motion-Picture Camera Aperture Images

PH22.59

Revision of PH22.59-1966

1. Scope

1.1 This standard specifies the dimensions of the camera aperture images and the relative positions of the vertical and horizontal centerlines of the intended image area with respect to the reference edge and the perforations of the camera negative film for 35 mm motion-picture cameras.

1.2 Motion-picture cameras used for different purposes require different aperture sizes. This standard specifies the image dimensions resulting from three styles of apertures used for the following purposes:

Style A: Nonanamorphic sound motion pictures

Style B: Anamorphic sound motion pictures

Style C: Instrumentation photography and special processes

2. Dimensions

The dimensions shall be as specified in the figures and tables. They shall apply to measurements of the images formed on freshly exposed and processed film.

NOTE: The displacement of 0.050 inch (1.27 mm), Dimension G, of the vertical centerline of the image area for Styles A and B is in accord with current usage of low-shrinkage film base. However, there are in use many cameras in which the vertical centerline is displaced by 0.055 inch (1.40 mm), which is the dimension used prior to development of low-shrinkage film base.

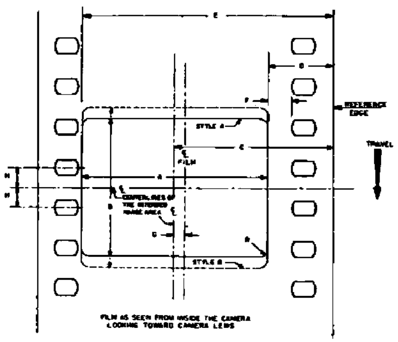

Figure 1
Styles A and B Camera Aperture Image Area

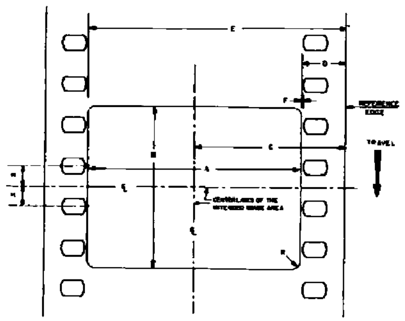

Figure 2
Style C Camera Aperture Image Area

Table 1. Style A

Dimensions	Inches	Millimeters
A	0.864 min	21.95 min
B	0.63 + 0.02 − 0.00	16.0 + 0.5 − 0.0
C	0.738 nom	18.75 nom
D	0.307 max	7.80 max
E	1.171 min	29.74 min
F	0.115 nom	2.92 nom
G	0.050 nom	1.27 nom
H	0.093 ± 0.002	2.36 ± 0.05
R	0.03 max	0.8 max

Table 2. Style B

B	0.732 + 0.008 − 0.000	18.59 + 0.20 − 0.00

Table 3. Style C

A	0.980 nom	24.89 nom
B	0.735 ± 0.002	18.67 ± 0.05
C	0.688 ± 0.002	17.48 ± 0.05
D	0.196 min	4.98 min
E	1.174 min	29.82 min
F	0.009 nom	0.23 nom
H	0.093 ± 0.002	2.36 ± 0.05
R	0.030 max	0.76 max

Draft American National Standard

Screen Luminance and Viewing Conditions for 16 mm Review Rooms

PH22.100

Revision of PH22.100-1967

1. Scope

1.1 This standard specifies the luminance (brightness) level and quality of the projection screen and the viewing conditions for 16 mm review rooms.

1.2 For review rooms intended for viewing motion-picture prints for television, see Note 4.

2. Definitions

2.1 The measurements of screen luminance and color of projection light are made with the projector in complete operation but with no film in the aperture.

2.2 The measurement of stray light is made by projecting onto the center of the screen an image of an opaque test object placed at the center of the projector aperture, and projecting onto the rest of the screen a simulated average image. The stray light level on the screen is the measured luminance in the sharply-focused image of the opaque test object.

2.3 Theatrical projection, as used in this standard, describes one class of projection and viewing conditions under which prints previously judged in the review room may ultimately be shown in fulfillment of their major objective. Theatrical projection facilities are generally of a semi-permanent nature wherein screen luminance due to stray light and ambient illumination is controllable at a low level; for example, under 1.0 percent of screen luminance.

2.4 Auditorium projection, as used in this standard, describes a second class of projection and viewing conditions under which prints previously judged in the review room may ultimately be shown in fulfillment of their major objectives. Auditorium projection facilities may be temporary or portable but are primarily distinguished by uncontrollable stray light and ambient illumination which may be found to produce stray light luminance equal to 1 to 10 percent of screen luminance. Such conditions may be encountered in classrooms, etc.

3. Luminance Level

3.1 The distribution of projection illumination shall be symmetrical about the geometric center of the screen.

3.2 The luminance at the center of the screen shall be 16 ± 2 footlamberts (55 ± 7 candelas per square meter), as measured within the standard observing area (defined in 6.1).

3.3 The luminance at a distance 5 percent of the screen width from the side edges of the screen, and on its horizontal axis, shall be 80 ± 10 percent of the center luminance as prescribed and measured in 3.2 above.

3.4 The maximum luminance for any point on the screen measured from any point within the standard viewing area shall be no greater than 18 fL (62 cd/m^2).

4. Spectral Distribution

4.1 16 mm prints are made for projection with several colors of projector illuminant (See Appendix A7).

4.2 The color quality of the projection light in the review room should be adjusted as closely as possible to that of the final print use.

4.3 When the intended illuminant cannot be specified uniquely, it is possible as a compromise to group the sources into two bands of color quality, a low color temperature (3000 to 4500 K) and a high color temperature band (5000 to 6500 K) (See Appendix A7.2).

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5. Stray Light

The standard review room shall be adjusted so that luminance from stray light on the screen, measured as described in 7.3, shall be no more than 0.4 percent of the screen luminance at the center of the screen.

6. Viewing Conditions

6.1 The standard observing area, within which all observers shall be seated during use of the facilities as a review room, shall be:

(1) Within the limits of 15 degrees on each side of a perpendicular to the midpoint of the screen as a center, in both the horizontal and vertical planes.

(2) Within the limits of 3 ± 1 picture heights from the screen.

6.2 No stray light or illuminated area with a luminance in excess of 1 fL (3.4 cd/m^2) shall be visible from the standard observing area.

6.3 Observers should have an accommodation period of 5 minutes to the brightness level of normal stray light in the review room.

7. Measurement

7.1 Screen luminance shall be measured with a photometer having the spectral sensitivity of a standard observer as specified by the International Commission on Illumination in 1924. The acceptance angle of the photometer shall be 2° nominal and shall be so used that it accepts light from a screen area no larger than a circle whose diameter is 15 percent of the screen height.

7.2 To determine the color quality of the reflected light from the screen, the projector shall be operated in the normal manner, except that there shall be no film in the gate. With the film plane in focus on the screen surface, the color-temperature meter or other measuring device shall be placed so that it receives a representative sample of the reflected light returned by the screen into the audience area.

7.3 Stray light shall be measured by comparing the screen luminance with the luminance of the image of an opaque test object placed in the center of the projector aperture. The test object preferably should have a diameter of 0.020 in (0.51 mm [5 percent of frame width]) and should not exceed 0.050 in (1.27 mm). The balance of the projected beam is attenuated by any suitable neutral density film that produces through the normal projection system an average screen luminance equal to 10 percent of the luminance of the screen as defined in 2.1. All sources of illumination in the auditorium, such as exit and aisle light, shall be used in their normal manner while stray light is being measured.

NOTE 1: Because of limitations on the sensitivity of some instruments, it may at times be necessary to measure the color quality of the incident light and correct the result by the selective reflection characteristics of the screen.

NOTE 2: Color quality is preferably expressed in terms of the CIE chromaticity coordinates x and y.

NOTE 3: As discussed in 2.3 and 2.4, 16 mm prints may be used under widely varying conditions of stray light. For some purposes, it may be desirable to review certain prints under higher levels of stray light to determine whether they lend themselves to meaningful use under these viewing conditions.

NOTE 4: SMPTE Recommended Practice RP 41-1970, Color and Luminance of Review Room Screens Used for 16 mm Color Television Prints, defines the necessary conditions to permit critical evaluation of color balance and contrast of films intended for television use.

Appendix

(The Appendix is not a part of this American National Standard, but is included for information purposes only.)

A1. Review Rooms

During the preparation of motion pictures, the producer, the motion-picture film laboratory personnel, and others examine the film many times from the original test shots through many stages to the final release prints. The films are projected in a specialized theater known as a review room. These installations are designed to permit judgments of projected picture quality and determinations of the suitability and acceptability of release prints, daily and work prints, production tests, printer and processing tests, etc. The rooms are constructed to accommodate a small reviewing group of usually 5-10 people. The actual picture size may be small or large depending upon the space available, but the viewing conditions are chosen to duplicate as nearly as possible actual theater viewing from the most desirable seating locations. All viewing conditions can be precisely controlled, and it is generally practical in review rooms to hold variables to a minimum tolerance.

A2. Normal Print

To provide interchangeability in motion-picture projection, it is desirable that print quality conform to that of a normal print so that theaters can operate at known projection conditions and will thereby be able to exhibit projected pictures of good pictorial quality. It has not been possible to specify this normal print in terms of its optical density and other objective measurements because of the difficulties of specifying artistic quality in scientific terms. Accordingly, the normal print is defined as that print which conveys the desired artistic impression when projected under review room conditions as described by this standard.

A3. Image Luminance

Note that this standard specifies screen luminance with the projector operating and no film in the aperture. When films are projected, the average image luminance is considerably below this level and approximates the conditions of 7.3 for measurement of stray light.

A4. Theatrical Projection

Standards for theater screen luminance, such as American National Standard Specifications for Screen Luminance for Indoor Motion-Picture Theaters, PH22.124-1970, are intended to reproduce for the theater audience the same artistic impression given in the review room. It is anticipated that there will be only one review room condition, but that there may be several theater conditions, providing as nearly as possible identical pictorial impressions under such widely different viewing conditions existing in indoor theaters, auditoriums, classrooms, stores, offices, etc.

A5. Prints for High Ambient Light Viewing

When stray light levels are high, there is very little that can be accomplished in preparing the print to compensate. Proper provision for such usage patterns must be made in the original picture planning, direction and cinematography, and usually implies a restriction on subject matter.

A6. Meter Acceptance Angle

The maximum permissible acceptance angle of the luminance photometer depends upon the instrument design and method of use, the size of the screen, and other factors. Suitable baffling against external sources and for control of internal reflections is essential. The acceptance angle of a suitable instrument must be such that a reduction in this angle (followed by necessary recalibration) does not change the magnitude of any reading specified in Section 2 by more than $\pm$ 5 percent. The limiting conditions for the reliable use of such meters should be included in the manufacturer's specifications.

A7. Color Quality

A7.1 Projected Pictures. It has been observed that the range in color quality of prints made for one source and projected with another can be greater than that to which a normal audience will accommodate readily. The color quality of projected pictures is influenced by a number of factors including (1) color quality of the projection light source, (2) color balance of the film print, (3) selective color transmission of the projection optics, (4) selective color reflection of the projection screen and (5) color quality of the surround in the projection area (and other factors influencing observer accommodation). Although all of these are important, in practice the control of these factors is divided among several responsibilities. The color quality of the projection light source is determined at the time of installing the projection facility on the basis of required light output, convenience, and other factors. The selective performance of the lens and screen is established by their manufacturers. The color print is usually matched to the color quality of the intended projection source as specified on the print order, but even this correction may be limited by the variation in dye absorption from sources that are visually equivalent but spectrophotometrically different.

A7.2 Projection Sources. The following sources are in commercial use for projection of 16 mm prints:

	Approximate Color Temperature	*Approximate Chromaticity* *x*	*y*
Low Temperature Band			
Incandescent bulb (including lamphouse optics)	3450 K	0.41	0.41
Modified carbon arc	4450 K	0.36	0.37
High Temperature Band			
High-intensity carbon arc and corrected xenon arc bulb	5400 K	0.34	0.36

It is recommended that the review room projection light source be matched in color quality to that intended as the exhibition source for the print. When this source cannot be uniquely specified, it is current practice to consider the two color temperature bands as indicated above and prepare the print for one of these. It has been observed that a print may be acceptable if projected within the band for which it was balanced, but usually it is unacceptable over the full range of sources.

A7.3 Correction of Source. When color quality of the source is modified by the use of filters to more closely approximate the desired value, care must be taken that filters are not inserted between the film and the projection screen unless they are especially designed to have no degrading effect upon the image-forming quality of the projection system.

A7.4 Choice of Surround. The surround for both review rooms and final projection areas should present an essentially neutral color balance to the observers seated in the standard observing area, with no significant areas of selective color reflection within 30° of the

projected picture (measuring the included angle from the area in question to the centerline of the screen).

A8. Stray Light

Stray light, as defined in 2.2, includes non-image-forming light, such as lens flare, re-reflected projection light, ambient light, etc. Since the factors responsible for such stray light do not change unexpectedly, it will usually be sufficient to make stray light measurements at intervals. The two measurement procedures recommended for securing the proper screen image are as follows: (1) Prepare a test film with an average light transmission of 10 percent, having in the center of each frame a black, circular test object of density 3.0 or greater or (2) Mount in the projector an opaque heat-resisting disk as a test object, locating it at the center of the aperture, between the aperture plane and the projection lens and within 1/16 in (1½ mm) or less of the film plane; simultaneously project a film which has been printed to give a uniform transmission of 10 percent (or by other neutral means attenuate the light in the picture aperture to 10 percent of its operating value).

A9. Conversion of Units

Screen luminance in the U.S. is customarily measured in footlamberts, although in the International System of Units (SI Units), the candela per square meter is the preferred unit. One candela per square meter equals 0.2919 footlamberts; 1 footlambert equals 3.426 candelas per square meter. The name "nit" is sometimes applied to the unit of luminance instead of candela per square meter.

Draft American National Standard

Dimensions for 32 mm Motion-Picture Film, 2R

PH22.141

Revision and consolidation of PH22.71-1965 and PH22.141-1965

1. Scope

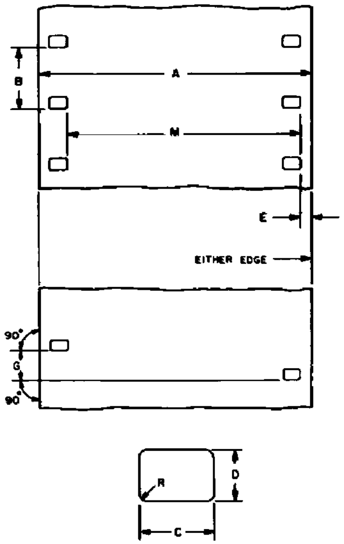
This standard specifies the cutting and perforating dimensions for 32 mm motion-picture film having two rows of 16 mm-type perforations, one row near each edge, and a perforation pitch of either 0.2994 or 0.3000 in.

2. Dimensions

2.1 The dimensions shall be as given in the figure and table.

2.2 The dimensions pertain to a safety film as defined in American National Standard Specifications for Motion-Picture Safety Film, PH22.31-1967.

2.3 The dimensions apply at the time of cutting and perforating for film adjusted to a temperature of 23 ± 1°C (nominally converted to 73 ± 2°F) and a relative humidity of 50 ± 2 percent. The manufacturer may indicate other nominal humidity conditions under which the dimensions apply.



	Dimensions	Inches	Millimeters
A	Film width	1.256 ± 0.001	31.90 ± 0.03
B	Perforation pitch (long)	0.3000 ± 0.0004	7.620 ± 0.010
B'	Perforation pitch (short)	0.2994 ± 0.0004	7.605 ± 0.010
C	Perforation width	0.0720 ± 0.0004	1.829 ± 0.010
D	Perforation height	0.0500 ± 0.0004	1.270 ± 0.010
E	Edge to perforation	0.0355 ± 0.0020	0.902 ± 0.051
G	Perforation skewness	0.001 max	0.03 max
L	100 consecutive perforation pitches	30.00 ± 0.03	762.0 ± 0.8
L'	100 consecutive perforation pitches	29.94 ± 0.03	760.5 ± 0.8
M	Lateral perforation displacement	1.113 ± 0.001	28.27 ± 0.03
R	Radius of perforation fillet	0.010 ± 0.001	0.25 ± 0.03

THIS PROPOSAL IS PUBLISHED FOR COMMENT ONLY

NOTE 1: The title of this standard was established by the application of a nomenclature system developed for all film dimension standards: Each title provides an indication of the film width, a code designation for the perforation shape (BH, KS, DH or CS) or the number of rows of perforations (1R, 2R, etc.), depending upon which is the significant factor, or the perforation pitch without the decimal point.

NOTE 2: The metric values in the table of dimensions are converted from the inch values in accordance with conversion principles outlined in American National Standard Practice for Inch-Millimeter Conversion for Industrial Use, B48.1-1947 (R-1933).

Appendix

(The Appendix is not a part of this American National Standard, but is included for information purposes only.)

A1. The user is reminded that, as a plastic, film can change dimensions temporarily due to moisture or temperature, or permanently due to solvent loss or strain effect.

A2. Film for positive use has a longitudinal pitch 0.2 percent longer than its companion negative. Shrinkage of the negative during aging and processing prior to printing will generally not exceed 0.2 percent. Thus, the negative stock is expected to be 0.3 ± 0.1 percent shorter than the positive. This difference will minimize slippage between the two on the 12-inch circumference sprocket of the printer, assuming a film thickness of 0.0055 to 0.0065 in (0.140 to 0.165 mm).

A3. The uniformity of pitch, hole size and margin (Dimensions B, C, D and E) is an important variable affecting steadiness. Variations in these dimensions, from roll to roll, are of little significance compared to variations from one perforation to the next within any small group of consecutive perforations. As an example, the uniformity of the margin is uniquely critical for optical printing. During the printing process, the placement of the image on the film is usually with respect to successive lateral pairs of perforations at one-frame intervals. During subsequent projection, however, the portion of the image projected is usually located, not by these perforations, but by the edge of the film. The lateral steadiness of the projected image is, therefore, directly related to the frame-to-frame uniformity of the margin.

A4. For historical background on the development of this standard, refer to A. J. Miller and A. C. Robertson, "Motion-picture film — its size and dimensional characteristics," Jour. SMPTE, 74: 3-11, Jan. 1965.

Draft American National Standard

Dimensions for 32 mm Motion-Picture Film, 4R

PH22.142

Revision and consolidation of PH22.72-1965 and PH22.142-1965

1. Scope

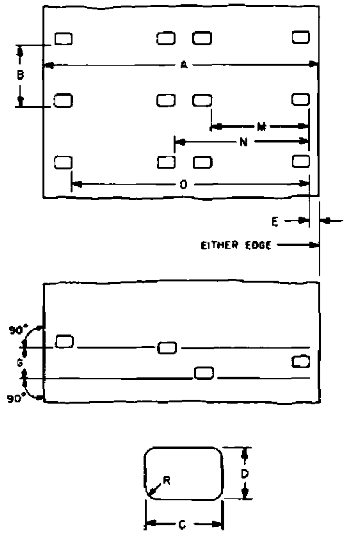
This standard specifies the cutting and perforating dimensions for 32 mm motion-picture film having four rows of 16 mm-type perforations and a perforation pitch of either 0.2994 or 0.3000 in.

2. Dimensions

2.1 The dimensions shall be as given in the figure and table.

2.2 The dimensions pertain to a safety film as defined in American National Standard Specifications for Motion-Picture Safety Film, PH22.31-1967.

2.3 The dimensions apply at the time of cutting and perforating for film adjusted to a temperature of 23 ± 1°C (nominally converted to 73 ± 2°F) and a relative humidity of 50 ± 2 percent. The manufacturer may indicate other nominal humidity conditions under which the dimensions apply.



	Dimensions	Inches	Millimeters
A	Film width	1.256 ± 0.001	31.90 ± 0.03
B	Perforation pitch (long)	0.3000 ± 0.0004	7.620 ± 0.010
B′	Perforation pitch (short)	0.2994 ± 0.0004	7.605 ± 0.010
C	Perforation width	0.0720 ± 0.0004	1.829 ± 0.010
D	Perforation height	0.0500 ± 0.0004	1.270 ± 0.010
E	Edge to perforation	0.0355 ± 0.0020	0.902 ± 0.051
G	Perforation skewness	0.001 max	0.03 max
L	100 consecutive perforation pitches	30.00 ± 0.03	762.0 ± 0.8
L′	100 consecutive perforation pitches	29.94 ± 0.03	760.5 ± 0.8
M	Lateral perforation displacement	0.485 ± 0.001	12.32 ± 0.03
N	Lateral perforation displacement	0.628 ± 0.001	15.95 ± 0.03
O	Lateral perforation displacement	1.113 ± 0.002	28.27 ± 0.05
R	Radius of perforation fillet	0.010 ± 0.001	0.25 ± 0.03

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A4. For historical background on the development of this standard, refer to A. J. Miller and A. C. Robertson, "Motion-picture film — its size and dimensional characteristics," Jour. SMPTE, 74: 3-11, Jan. 1965.

After an historical review, in which the development of the electronic editing of television tape-recordings is described and the need for still better processes is stressed, a description is given of the E.B.U. Standard for a time-and-control code for television tape-recordings for the 625-line/50-field television systems.

The main content of the 80-bit code, which is recorded on the cue-track of the television tapes, is the time information in hours, minutes and seconds and the television frame number. With the aid of this time information, it is possible to programme the electronic-editing process.

Additional information of many kinds, which can be laid down in thirty-two spare bits, can be utilised for checking purposes (tape-number, title of programme), for the automatic or semi-automatic transmission of tapes, the electronic correction of the video signal etc.

The article deals with the various details of the code, such as the BCD-coded time information, the composition and method of modulation of the code, the relationship of the code word to the television signal, the waveform of the code and some other aspects.

The E.B.U. code has been reproduced as E.B.U. document Tech. 3097 [1].

Reprinted by permission from Georges Hansen, Editor, *E.B.U. Review*, ave. Albert Lancaster 32, 1180 Bruxelles, Belgium, from pp. 4–13 of *E.B.U. Review — Technical Part*, No. 137, Feb. 1973.

A standardised time-and-control code for 625-line/50-field television tape-recordings

R. van der Leeden *

1. Introduction

As television tape-machines are being used increasingly for the production of ever-more complicated programmes, the need for quick and accurate editing is increasing too.

Evolution has already taken place in the editing systems. In the early 1960s, the only way of editing consisted of actually cutting and splicing the recorded tape *(Fig. 1)*. A number of disadvantages, such as degradation of the tape by the splice and the need for high positional accuracy of the splice to prevent discontinuities in the playback signal *(Fig. 2)* led to the search for re-recording or electronic method of editing.

Electronic editing has become widely-used in practice since the introduction of " high-band " television tape-machines, with which several generations of copies can now be made with entirely acceptable quality. In this way one, two or even more re-recordings (or re-editings) are possible, even with colour signals.

Electronic editing was introduced as an additional facility for existing machines (Electronic Editor or Electronic Splicer). The editing was accomplished by pressing a button, which caused the television tape-machine to switch from the playback to the record-mode, and by subsequently pressing another button, which restored the playback mode again. Precautions had to be taken, such as adjusting the timing and servo functions, to avoid discontinuities in the resulting video signal. A major disadvantage of this system was that each such operation was irrevocable, in that a portion of programme material was lost, being *replaced* by other programme material.

As a result, a more sophisticated device (known as " Editec ", Editing Programmer) was developed, which could be considered as a control unit for the electronic editing unit *(Fig. 3)*. It utilises the cue track, on which cue tones can be recorded, indicating the position on the tape where the edit has to take place. After the cue tone (or cue tones) has been recorded, the edit can be rehearsed and, if desired, the edit point can still be shifted backwards of forwards, before the editing is actually carried out. Even with this system a great deal of skill is required on the part of the operator, in adjusting both the playback and recording television tape-machines in such a way that they both reach the wanted position at the same instant.

For several years, systems have been on the market that cope even with this last-mentioned problem [2]. They make use (on the playback as well as on the recording machine) of a time code recorded on the cue tracks of both tapes. The editing points are identified as

* Mr. van der Leeden is with the Nederlandse Omroep Stichting. He is Chairman of the ad-hoc group of E.B.U. Sub-group G2 which is studying time-and-control codes for television tape machines.