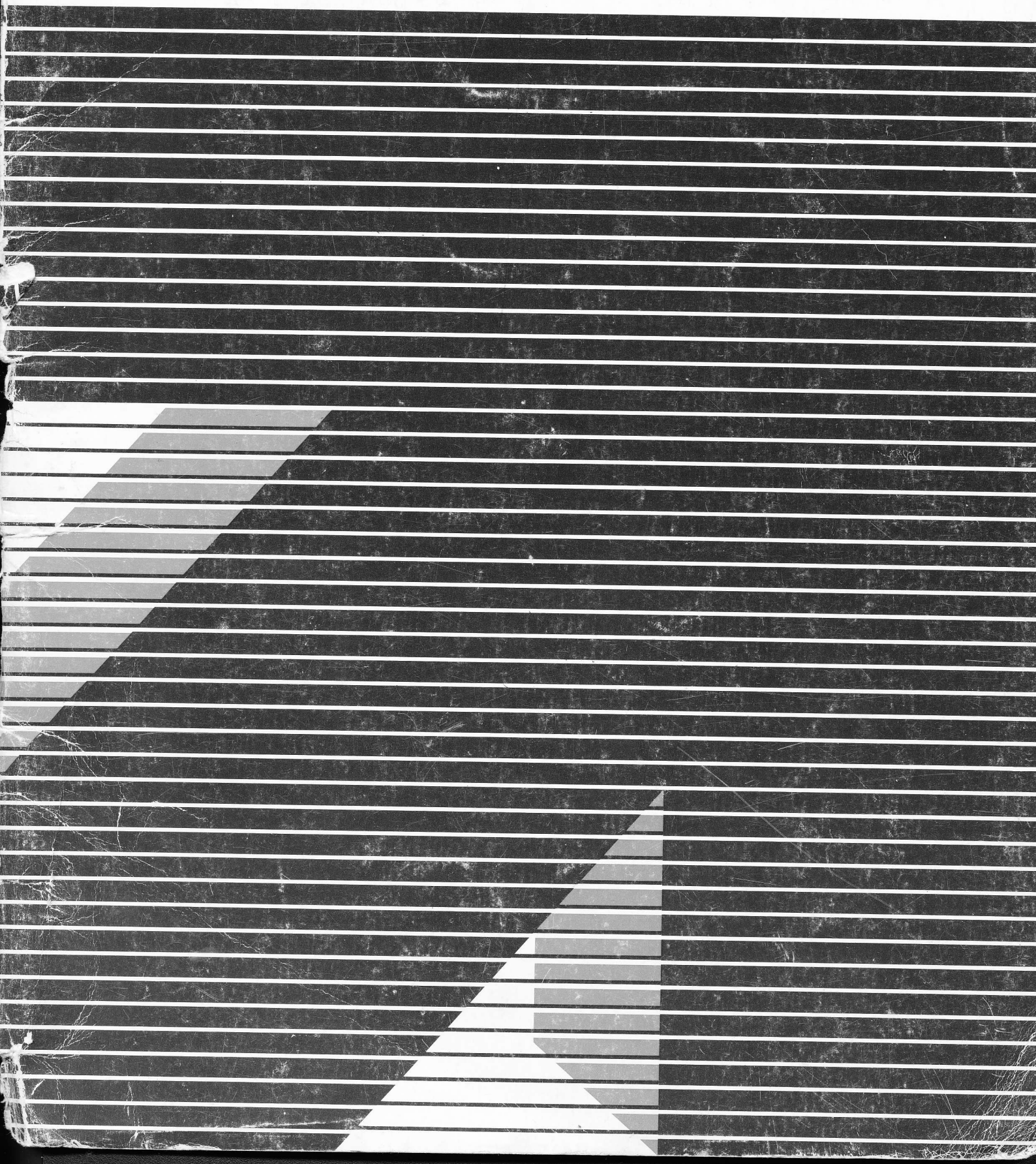
Handbook
Recommended Procedures for Motion Picture and Video Laboratory Services

ACVL
ASSOCIATION OF CINEMA AND VIDEO LABORATORIES
Fourth Edition



Handbook

Recommended Procedures for Motion Picture and Video Laboratory Services

Compiled by

Association of Cinema and Video Laboratories

Fourth Edition

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Foreword

The Association of Cinema and Video Laboratories is an international organization whose members are pledged to the highest possible standards of service to the film and video industries.

A unique relationship exists between the laboratory and its customers. Unlike other businesses that provide uniform products or services, the laboratory-customer relationship must be specially tailored to suit the individual needs of the client. For this relationship to work well, the customer needs a general knowledge of the processes, capabilities and limitations involved in the laboratory services. Communications between the customer and the lab must be in a language and terminology that both are familiar with and understand.

Some of the efforts to establish standards, such as terminology, have been conducted by the Society of Motion Picture and Television Engineers. Other portions, such as pre-print material preparation procedures, have been carried out through ACVL.

It is the purpose of this handbook to inform customers of ACVL laboratories of the standards and recommended procedures as well as the terminology used by most laboratories. Utilizing this information will enable your laboratory to provide the services you require.

The Association of Cinema & Video Laboratories
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Working with your ACVL Laboratory

Establishing the Business Relationship

Your association with your ACVL laboratory should begin before the first shipment of camera original or video material is sent. If you are doing business with the lab for the first time, it can be advantageous to visit the lab and meet the laboratory representative who will be handling your account. The laboratory will be able to provide better service if it has some knowledge of your personal requirements. It is also a good idea to discuss the financial arrangements in advance.

Pre-Production Planning

Selecting the Camera Film

Important among all the decisions that must be made before beginning production is the selection of the camera stock that will be used. Conditions under which a majority of the shooting will be done, the release format and the medium through which the release will be made are all factors which should be considered. Where possible, it is advisable that all of the film for a given production be of the same emulsion number.

Raw stock should be handled and stored according to the manufacturer's recommendations and shipped to the laboratory as soon as possible after exposure.

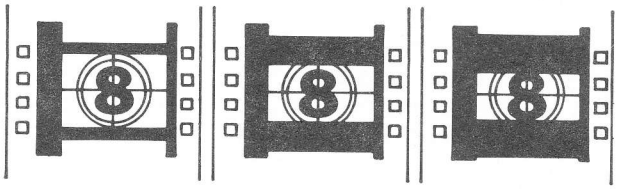
Selecting the Camera Aperture and Format

Since the advent of wide screen systems such as Panavision, Vistavision, Cinemascope and others, the theater-going public has become accustomed to the wide screen format. The Academy format, which was the standard for many years for 35mm theatrical projection, presented a height-to-width ratio on the screen of 1.33:1, or a proportion of 4 units wide to 3 units high. This format is still the standard for 16mm films and for television. However, today's theatrical films are projected in the wide screen format with an aspect ratio of 1.85:1 in the United States and 1.66:1 in Europe. Many films are shot in Academy format, with the aspect ratio 1.33:1, but are projected to fill the wide screen. This means that a mask is used in the 35mm projector which cuts off a portion of the top and bottom of the frame (Figure 1). It is important in the shooting to be aware of this, since the composition of the picture must be such that important information is not lost due to the projector masking. It is very helpful to the cinematographer to have these fields delineated on the viewfinder during shooting.

One advantage of the Academy aperture, even though the primary distribution will be in theaters, is that the prints are also acceptable for television without modification.

If a film is being shot on 16mm (Figure 2) but there are plans to make blow-ups for theater release, these projection formats must be considered. Other factors involved in 16mm to 35mm blow-ups will be discussed later in this handbook.

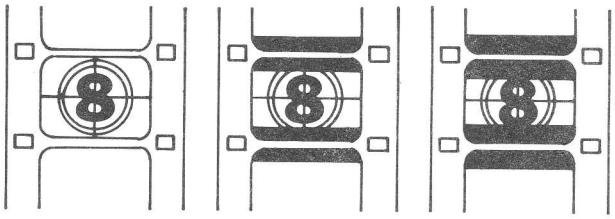
Figure 1
Projected 35MM Image



1.33:1 1.66:1 1.85:1

Aspect Ratio

Figure 2
16MM Camera Film



1.33:1 1.66:1 1.85:1

Aspect Ratio

Pre-Processing Planning

Identification and Record Keeping

The latent image on the exposed film represents the culmination of all the production efforts and must be handled with care. Packaging of this valuable material, the method of delivery or shipment, and the written instructions to the lab are very important.

Exposed film should be placed in the black bag which the manufacturer provides and in the same container from which it was removed. If the same container is not available, make certain that the proper raw stock identification is on the container used. If there is a different identification, cover it with tape and re-identify the stock that is enclosed. When the film has been placed in the bag and can, tape the can securely around the edge where the top and bottom of the can overlap, and clearly mark "EXPOSED."

Identify each can by roll number, so that when the film is returned to you, each roll can be checked off. The individual rolls will be joined by the laboratory into larger rolls for printing, and each individual roll will have your roll number on its leaders. Some producers shoot the roll number on the slate at the head of each roll.

Since the processed film may not be returned in the same container in which it was shipped, you can use the leader roll numbers, your camera log of the first scene and take on each roll, or the roll number on your slate to identify each individual roll.

Written Instructions to the Laboratory

Written instructions covering the work to be done should accompany each shipment of film to the laboratory. These instructions should include:

1. Customers name, address and phone number.
2. Job title and number, and purchase order number.
3. The number of rolls, roll numbers, length and type of film.
4. Instructions for operations to be performed.
5. Complete shipping instructions, including destination, carrier, and insurance requirements.
6. The disposition of original material: hold or return?

Here is a sample of how your order may be written:

To: ACVL Laboratory
Address
From: Blank Productions
Address and phone number
Job title and number
Purchase order number
With this order:
10-100′ rolls color negative type _____
(Rolls 1-10)
Please process and make one light dailies.
Print through latent image edge numbers.
Return dailies on cores via (carrier). Hold original.
Insure for $_____.
Contact: John Doe

This is, of course, just one example covering original processing and dailies. Your instructions could be different and cover different services. The important point is to make your instructions clear, understandable and complete.

Other Instructions

Occasionally, you may have special instructions to communicate to the lab. Some of your original may require special processing such as force processing or flashing. If you request these services, those rolls must be well marked and separate from footage which is to be processed normally.

Cautions to the Lab

While the lab checks all film prior to processing, if you suspect that problems which occurred during shooting may have caused physical damage to the film, it is imperative that you advise the lab of the suspected condition and identify the roll and approximate footage where the problem may exist. Unprocessed film can only be inspected in the dark by touch, and it is very easy to miss a nicked perforation or a crease under these conditions, which may lead to disaster during the processing.

Similarly, if you have original materials to be worked on which are damaged, shrunk, or may cause problems of any sort, make sure you notify the lab in advance. While the lab will notify you if they notice a problem, and do its best to provide services that meet your needs, the responsibility for the condition of material you supply and the usefulness of the resulting products rests with you.

Pre-Production and Pre-Processing Hints

- Store unexposed film per manufacturer's instructions.
- Avoid the use of outdated stock, or stock which has been improperly stored.
- Film requiring special handling, in processing, flashing or for other reasons, must be on separate rolls.
- Provide your ACVL lab with a name and phone number to call if they have any questions about the work to be done.
- If you must give verbal orders, confirm them in writing. Indicate that a written order is a confirmation of verbal orders.
- Identify cans and boxes with customer name and contents.
- Give adequate shipping and delivery instructions.
- Feel free to check with your lab on the progress of your work.
- Check your dailies for proper edge numbers before cutting.
- When in doubt, ask for information from your ACVL lab.

Film Laboratory Services

General Motion Picture Services

Original Processing
Original camera film must be processed under strictly controlled conditions to achieve consistent results within the specified tolerances of a particular film stock.

Dailies
Dailies are printed from camera originals using either reversal or positive print stock, depending on the type of original. This print is used to evaluate the production work and for editing. The edited dailies are called the work print. Many labs offer several classes of dailies, differing in the amount of correction applied in printing the daily. Check with your ACVL lab for the classes offered and to decide which best fits your needs.

Editing
This is the creative process of sequencing, arranging scene juxtaposition and sound tracks to achieve the desired effect in the finished production.

Original Conforming
Sometimes called negative cutting or matching, this is the process of cutting the camera original to exactly match the edited work print. Optical effects such as dissolves, fades, etc., are set up at this time.

Sound Transfers
This is the operation by which the original sound recording is transferred to sprocketed magnetic coated film for subsequent editing and mixing.

Sound Track Mixing
When multiple tracks are required such as narration, sync sound, music, etc., they must be combined and transferred to a single track. The relative levels of the various tracks are controlled to give the desired balance between voice, music, sound effects, etc.

Sound Transfers for Printing
The mixed sound track, recorded on magnetic film, is transferred to a photographic sound negative for printing.

Timing
Before the first trial composite print is made, the conformed picture original is analyzed for color and density. Scene to scene color and/or density balance is then accomplished during printing.

First Trial Composite Print
This is the first print made with picture and sound track, fades, dissolves and other effects incorporated. It also represents the first effort at scene to scene color and/or density balance. The first trial print allows the producer to evaluate the work before authorizing multiple release prints or the making of an intermediate.

Intermediates
To eliminate the cost of A&B roll release printing and the risk of damage to the original, an intermediate is made. The intermediate may be a master positive from which a duplicate negative is made, or a reversal duplicate negative (CRI), if the original material is a negative. If the original material is a reversal, the intermediate may be a reversal master or an internegative. The intermediate is generally a single picture roll which incorporates all of the optical effects, and the timing corrections applied to the approved trial print.

Check Print from Intermediate
After the intermediate has been made, it must be lined up with its photographic sound negative and a check print produced. This allows the producer to again evaluate the work before proceeding with multiple release prints.

Release Printing
After a satisfactory trial print or an approved check print from an intermediate has been obtained, multiple prints are made for distribution.

Optical Printing and Special Effects
Optical printing uses an optical method of transferring the picture image as opposed to contact printing. It can be used

for changing image size or position, for changing emulsion orientation, and for creating many special effects. The possible variations in optical printing are enormous, and you should discuss your needs and methods thoroughly with your ACVL lab before proceeding.

Finishing

This consists of preparing release prints for distribution. It includes inspection, assembly, mounting on reels, cans, labeling or packaging. In some formats it may include cartridge loading for use on special projectors.

Special Motion Picture Services

Forced Processing

Forced processing is most simply defined as over-developing the original in an attempt to compensate for under-exposure in the shooting.

We say "attempt to compensate" because along with over-development of the original comes such undesirable side effects as increased grain and higher contrast. These factors, added to the loss of detail in shadow areas due to under-exposure, often combine to produce pictures of less than satisfactory quality.

Depending on the amount of under-exposure and the lighting of a particular scene, a more pleasing picture can sometimes be made from an under-exposed negative that has been processed normally. In other cases, forced processing will help to produce a better result.

Unless you can shoot a doubtful scene twice, once for normal processing and once for forced processing, you will have to make the decision to force process ahead of time. Your best guide is to shoot a test before production begins, and if that cannot be done, to provide a representative end-test that can be processed and evaluated by you and the laboratory to determine how your film should be developed.

Flashing

Depending on the aims of the filmmaker, film can be flashed in two different ways:

Neutral flashing, to lower the apparent contrast and to sometimes improve shadow and highlight detail.

Color flashing, to create certain specific moods by lowering contrast of the three color layers unequally, according to the artistic goal of the filmmaker.

In either kind of flashing, the film is subjected to a low intensity exposure. This exposure causes an increase in the minimum density of each color layer in negative films, and a decrease in the maximum density of each color layer in reversal films. When the negative film has been printed, the effect on the screen is similar to the effect on reversal films, with the shadow areas appearing lighter than they would without the flashing.

In neutral flashing, the change in each color layer is approximately the same. In color flashing, the change is greatest in the color layer most sensitive to the color of the flash.

Thus, flashing with a red filter causes a change in the density of the red sensitive layer, and this results in a print which has a red cast in the shadow areas. The extent of the red cast depends upon the amount of the red flash received by the original film.

Flashing can be done either before or after camera exposure. The decision to flash or not to flash is based entirely on the subjective goals of the filmmaker. Film-making is an art form, and flashing is another technical tool to assist in accomplishing the creator's goal.

Any form of flashing requires a very close working relationship between the camera person and the film laboratory.

Selecting Print Takes

Generally, 16mm productions have dailies made of all original footage to avoid excessive handling of the original. In 35mm, the

laboratory will supply you with prints of selected takes. A copy of the camera report sheets must be included with the order.

Special Edge Numbering

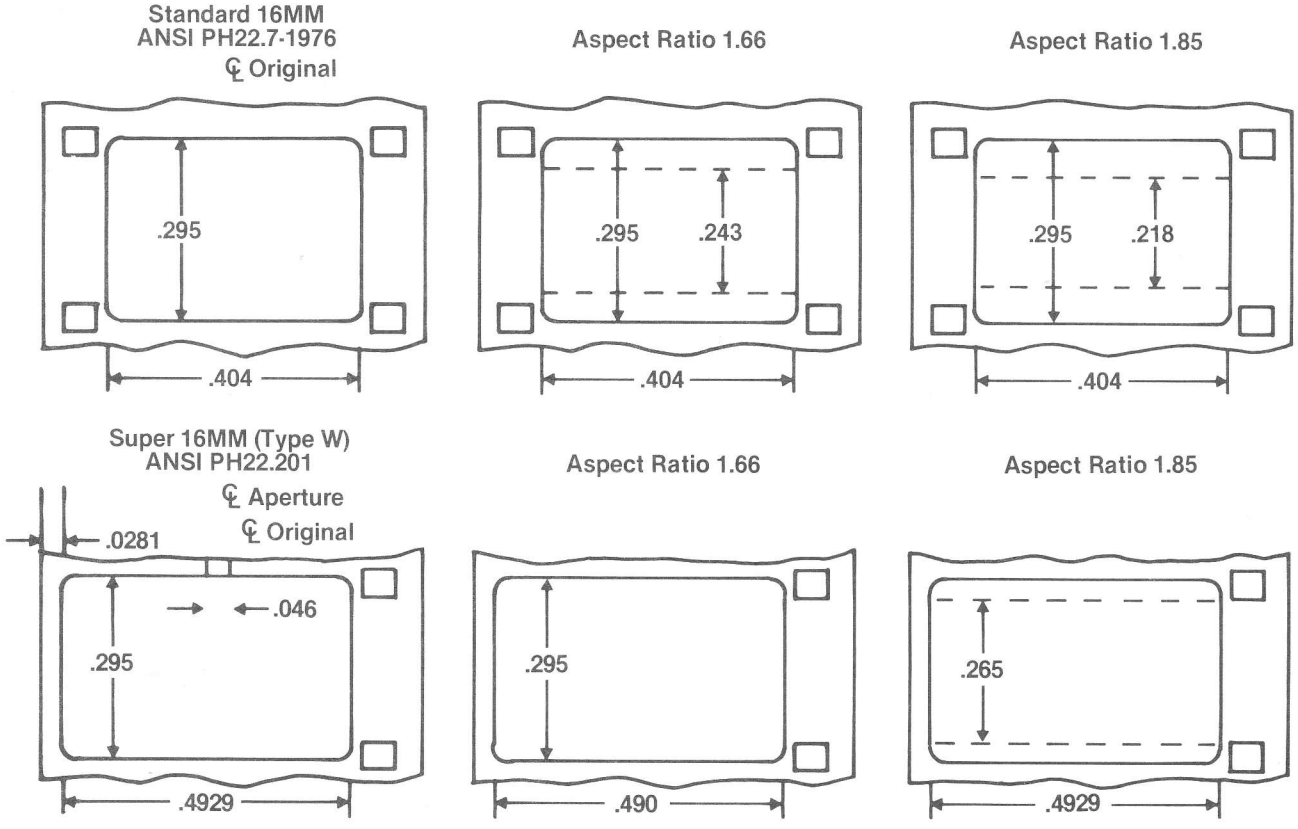
When there is a large amount of sync sound in a production, some editors line up all the slates with the magnetic track and have both the picture daily prints and the magnetic tracks ink edge numbered in matching sequence. This is particularly valuable in editing when two or more cameras have been used at the same time, such as a speech or a live stage performance. The picture rolls from all cameras sync with a single track and have corresponding inked edge numbers. It must be noted, however, that when this is done, the ink edge numbers cannot be used for conforming since the corresponding edge numbers will not appear on the original. The printed through numbers must be used for conforming.

A word of caution concerning edge numbers. Regardless of the kind of edge numbers you use, when your dailies are returned, check to be certain that the edge numbers are legible and in sync before starting to cut. Avoid using rewound raw stock for shooting, since this places the latent numbers in descending order from the head and also places them on the wrong edge of the film for printing.

Blow-ups (from 16mm or Super 16mm to 35mm)

Particular care must be taken when shooting for blow-ups to 35mm. The 16mm frame is enlarged considerably when blown up to 35mm, resulting in a larger apparent grain size. To maintain the finest grain structure on the 16mm original, proper exposure and normal processing is essential. Flashing or forced processing should be avoided as both processes tend

Figure 3
16MM Motion Picture Camera Aperture Image



to increase grain size. Camera lenses and magazines should be thoroughly checked and tested.

A properly composed 16mm negative can be blown-up to 35mm at a 1.33:1 aspect ratio. This print can be used for television and projected theatrically in the United States and Europe. Refer to "Selecting the camera aperture and format" for guidelines on composing the image to allow for wide screen projection.

Super 16mm production yields a larger image on the 16mm original negative which matches the wide screen aspect ratio more closely than a standard 16mm frame. The increase in the useful picture area of a Super 16mm frame improves the image quality obtainable in a 35mm wide screen blow-up.

Wet Printing

The technique of wet printing coats the surface of the film being printed with a liquid having the same index of refraction as the film. As a result, light passing through the film is not refracted or bent at the scratches and digs in the film, and the effect is as if the defects were not there.

Wet printing is done in several different ways; with "wet gates" on optical printers, with "wet application" on optical or contact printers, and with "total immersion" on contact printers.

In all cases, wet printing can only affect surface damage on the film. If a film is scratched on the base surface, or if it is lightly scratched on the emulsion surface, wet printing will do a good job of hiding the damage, depending on its severity.

Wet printing cannot, however, replace missing information. If a scratch on the emulsion surface has removed some of the picture, wet printing obviously cannot put the information back. Wet printing cannot conceal the effect of foreign matter imbedded in the original, which cannot be removed.

Several rules must be followed on materials intended for wet printing. There must never be tape splices in wet printing materials. The wet printing liquid, which is a solvent, can dissolve the adhesive on the tape and smear it across adjacent frames, or, at worst, loosen the tape sufficiently to allow the splice to come apart. The same things can happen to tape repairs used on damaged perforations or other tape repairs to the film.

If the film has been treated or coated, there could be a problem in wet printing. There must be no markings or coatings on the film to be wet printed. Magnetic striping may be susceptible to the liquid. Check with your ACVL lab if there is anything on the film, and they will let you know if it is safe for wet printing.

ACVL Recommended Film Practices

Editing and Conforming

Work Print Leaders

To save time and confusion later, the head and tail leaders on your work print should be set up properly.

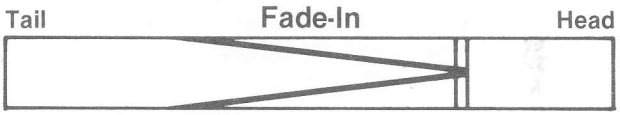
Splice an SMPTE Universal leader to the head of your work print, making sure that there are 47 blank frames between the single "2" on the Universal leader and the first frame of your picture. Splice at least 18 feet of single perf white leader to the beginning of the Universal leader.

Place the frame marked "Picture Start," which is next to the first number 8 in the Universal leader, at zero in your synchronizer. Measure off exactly 12 feet toward the head of the white leader, which will again bring you to a zero frame on the synchronizer, and mark this frame with a large "X." Label this frame "Edit Sync."

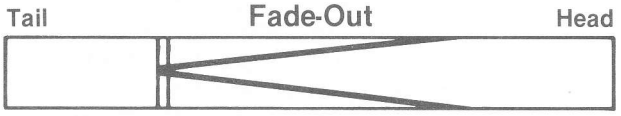
At the end of your show, splice on the tail portion of the Universal leader. Make sure that there are 87 blank frames between the last frame of your show and the frame marked "Finish" in the Universal leader. Splice 16 feet of single perf white leader to the end of the Universal leader. Set the "Finish" frame in your synchronizer at zero. Measure exactly 12 feet toward the end of the white leader, and mark this frame with a large "X." Label the frame "Tail Edit Sync." Splice 2 feet of black single perf leader on the tail of the white leader to complete the leadering.

Marking Work Prints

During the creative editing process, decisions are made as to what optical effects will be incorporated in the finished product and where and how they will be utilized to enhance the effectiveness of the production. The effects that can be achieved during the printing process are fades, dissolves, burn-ins and double exposures. When the editor determines the position and lengths of these effects he marks the work print according to the type of effect and its duration.



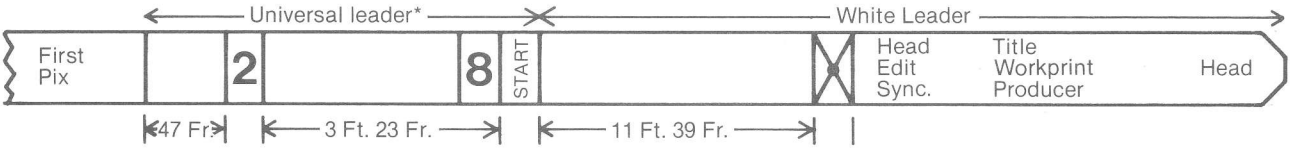
A fade-in should be marked by two straight lines forming a "V." These lines should start at the beginning of the scene in the center of the frame and extend for the length of the effect, ending at the edges of the work print.



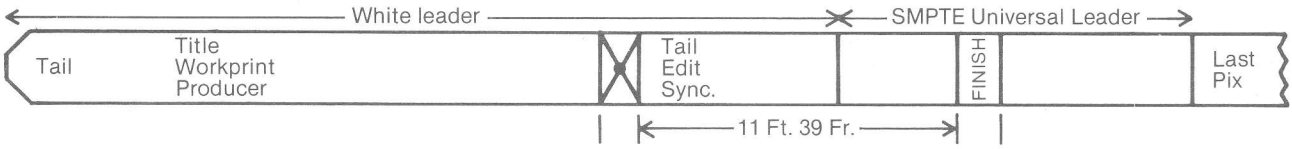
The fade-out is the reverse of the fade-in, extending from the beginning of the effect and at the edges of the film, to the last frame of the scene, where the two lines converge. In both effects, the point where the lines meet indicates a black screen.

Figure 4

Head Leaders

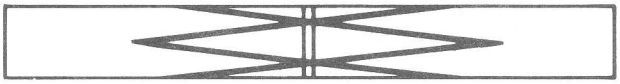


Tail Leaders



***Leader Markings and Identification** It is preferable that all workprints be submitted with a "Universal leader." This aids the laboratory in preparing the film for printing, and insuring that the track will not be printed out-of-sync. If you don't have Universal leader, you can simulate it. Place a piece of film in your synchronizer. Set your counter to 0-0 and mark that frame in the synchronizer "picture start." Advance the film to read 3'-24 frames and mark this frame "2." The first frame of picture should be spliced in at 4'-32 frames.

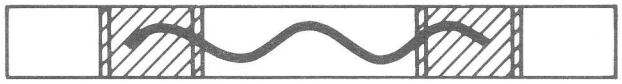
Tail **Dissolve** Head



A dissolve is actually a fade-in of one scene, superimposed over the fade-out of another. In this case, the center of the effect is at the scene change in the work print. In marking a dissolve, the lines are the same as for the fades, but are superimposed as in the illustration.

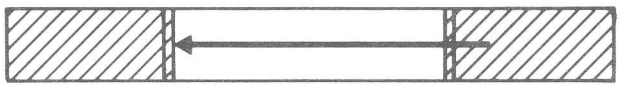
One word of caution. When cutting the work print where a dissolve is going to occur, make certain that the cut is far enough away from a slate or camera stop so there will be enough original to make the overlap. For example, where a 48 frame dissolve is going to occur, the work print splice is at the center of the dissolve. There must be at least 24 frames more original available for the A & B rolls to complete the total 48 frame overlap.

Tail **Double Exposure** Head



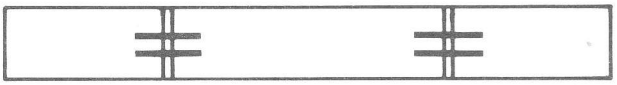
Double exposures, superimposed titles, etc. should be indicated by cutting into the background scene of the workprint, a few inches of work print of the scene to be superimposed. The start of this cut-in indicates where the overprint is to begin. A few more inches should be cut in to indicate where the effect is to end. At least one of these sections should have an edge number. The marking to indicate double exposure is a wavy line.

Tail **Extended Scenes** Head



Occasionally during the editing process, portions of the work print may become damaged and must be replaced with leader. To indicate to the conformer that the scene should be extended, an arrow is marked on the leader with the head indicating where the scene should end. If the splice occurs in the leader, then two arrows should be used as shown. It is advisable to replace the missing footage with white leader.

Tail **Unintentional Splices** Head



Splices occurring in the work print that are to be disregarded by the conformer should be indicated by two short parallel lines drawn through the splice and at right angles to it. This means that the scene is not to be cut at that splice. Any frames lost due to unintentional cuts, should be replaced by the same number of white leader frames.

Titles

Readability is the prime requisite of titles. They must be visible and legible. Be careful in using typestyles such as Old English, fancy scripts and type with extremes of thin and thick lines.

There must be sufficient contrast between letters and the background. A common fault is the use of white letters over a light background, or mottled with light and dark. Drop shadow style may be a solution, by use of optical intermediates, if you must use this type of background.

Titles must be positioned in the frame so that no part will be cut off by any format used. Edges may be cropped by rear-projection systems or television cut-off. The top and bottom of the frame may be masked to change proportions such as in wide screen projection of films shot in the Academy Aperture.

The "Safe Area" for television is the most restrictive in general use, so if you are within those boundaries, you are very likely safe against cut-off of essential information. It is advisable to consult the safe picture area and safe title area charts, SMPTE Recommended Practice #8.

Further suggestions in preparing and photographing titles:

1. Avoid overcrowded titles.
2. Make your smallest letters at least 1/25 the total height of your image. For television titles, this should be doubled.

3. A field chart will help the artist determine how to lay out titles. These are available for standard formats or you can make your own. A number 8 field for an Academy aperture (1.33:1 aspect ratio) is 8 inches wide and 6 inches high.

4. High contrast positive film is recommended in photographing either negative or positive titles. A positive title has a black background with a clear letter, shot from black type on a white card. A negative title has a clear background with a black letter, shot from white type on a black card. The black area of the high contrast film should be a minimum of 3.00 in density, and the clear area should be a maximum of 0.10 in density.

5. If your original printing materials are reversal or master positive, your superimposed titles should be positive.

6. If your original is negative, superimposed titles are more complex. Depending on whether your printing negative is going to be a color reversal intermediate or a duplicate negative made from a master positive, the titles and their emulsion positions will be different. 35mm prints with superimposed titles can be made in a single operation from a 35mm picture negative and a 35mm negative title on a contact printer. Check with your ACVL laboratory before you prepare titles for negative printing materials.

7. The camera original of a title will normally be in the B wind emulsion position. In contact printing, the emulsion position of the title should be the same as the printing material. If you need an A wind camera original of the title, this can be accomplished by preparing the type on a clear cel in either black or white as required, and then flipping the cel on the background card so that the title reads from right to left instead of left to right before photographing it.

8. Great care must be exercised in photographing titles in order for them to be steady on the screen.

Conforming Original to Work Print

When work print editing is completed and the editorial decisions for printer optical effects have been made and marked, the next step is matching the original to the edited work print. This procedure requires accuracy and cleanliness. Conforming errors are very difficult to correct, and often impossible without some compromise. A misread edge number that results in cutting the original at the wrong place cannot usually be corrected without the loss of at least one frame. If sync is involved, complicated adjustments between picture and sound track are involved. Mistakes at this stage of production can be costly and time-consuming.

Where black & white footage has to be intercut with color, or reversal footage cut with negative, it is important to contact your ACVL laboratory before any of the material is intercut. The method you choose will be determined by cost, quality and available services.

Cleanliness is very important, particularly in handling negative materials. Dust particles on reversal or positive original will show up as black spots on the screen and are not too disturbing but on negative they will appear on the screen as bright white spots which cannot be ignored by the viewer. Original should always be handled with clean, lint-free editing gloves.

Many producers prefer to have the laboratory or an independent service conform their original, especially when negative is used. If you do your own conforming, make certain that your splicer is properly adjusted and that you use fresh cement. Unused cement should be disposed of and replaced with fresh from the supply container at least at the beginning of each day's work.

Editing and Conforming Hints

- Handle pre-print material only when wearing clean, lint-free gloves.
- Be certain the film cement is fresh.
- Do not use tape splices on original.
- Check the alignment on your splicer before conforming.
- Secure ends of film on the outside of rolls with tape.

- Wind rolls tightly but be careful not to cinch.
- Include cue sheet indicating fades, dissolves, etc. when shipping.
- Do not have more than one printer sync mark on any roll.
- 16mm optical tracks must be the same wind as picture material.
- Use standard 16mm and 35mm Universal leaders on original sent to lab. American Standard Specifications for Leaders and Cue Marks for 35mm and 16mm Sound Motion-Picture Release Prints — ANSI PH22.55.
- Use proper nomenclature when ordering. American National Standard nomenclature for motion-picture film used in studios and processing laboratories — ANSI PH22.56.
- For proper color correction, a continuity sheet should accompany all original material, designating by footage night sequences, day for night, etc.
- If in doubt, communicate with your ACVL laboratory.

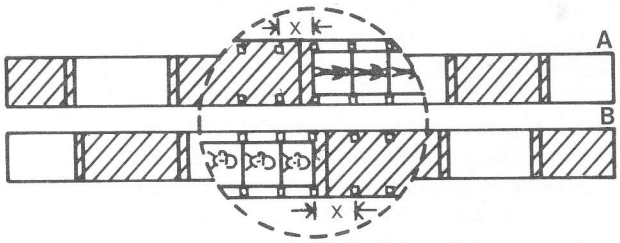
Preparing Original A & B Rolls for Printing

Preprint material is prepared in A & B rolls to achieve fades and dissolves in the printing process of both 16mm and 35mm film, without the use of costly opticals. It also enables the original to be cut in such a fashion that splices in 16mm are invisible on the screen. Sometimes it is necessary to prepare A, B & C rolls to achieve certain effects which might occur in montages or title sequences. It is recommended, however, that the printing rolls be held to a minimum.

Invisible Splices

In order to make 16mm splices invisible, A & B rolls may be prepared using the "checkerboard" technique. This is accomplished by alternating the scenes back and forth on the A & B rolls. The splices should be made in a splicer that makes one of the cuts on the frame line and the other cut in the picture area. When splicing the scene to black leader, the scene should be placed in the splicer in such a manner that the scraped portion of the splice occurs only in the scene and never in the black leader. After splicing the head of the scene, you will note that in order to make the splice correctly at the tail of the scene, it will be necessary to turn the scene around in the splicer. Be sure the splicer is properly aligned so that no white scrape line is visible on positive image film and no black overlap line is visible on negative.

Figure 5
Checkerboard Technique for Making Invisible Splices



Scrape picture only — never scrape emulsion from black leader

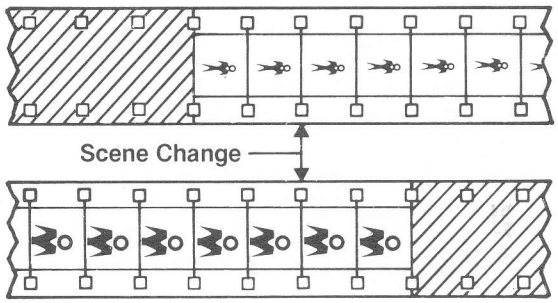
Be sure when making a l6mm splice for liquid gate optical printing that the cemented overlap of the splice maintains the proper pitch (x) between the perforation of the splice which is the first frame of picture negative and the perforation of the first frame of black leader. If this pitch or distance between these two perforations is not the same standard as the pitch between any two perforations where a splice does not occur, there will be a vertical jump in the picture at the scene change. The reason for this is that the registration pins on all l6mm full immersion optical wet gates are either one or two perforations away from the frame being exposed.

Thus, the frame being printed is in a position established by a perforation on the opposite side of the splice. If the splice is off pitch, as described above, the first frame, or the first 2 frames after the splice is improperly positioned, with the adjustment coming on the following frame when the pin is registered after the splice. This problem will not show up when you make a 16mm contact print from your A&B original because, on the 16mm continuous printer, the sprocket teeth register the film and raw stock at the area of exposure.

Original should be spliced with the utmost care. It is recommended that before splicing any original, several test splices be made to check the correct alignment of the splicer, the depth and width of the scraped area, and the continuity of perforation pitch. Use only enough cement to insure a good splice. Avoid winding a wet splice onto the roll because it will mark the next layer of film. Be sure the cement is fresh and clean. Cement in splicer bottles usually deteriorates in a few hours due to evaporation. It is a recommended practice that cement be stored in large supply bottles and dispensed into small bottles for use. Unused cement left in the small bottle from the previous day's use should be discarded and replaced with fresh cement from the supply bottle before the start of each day's work. It is advisable to use a weld time of not less than 10 to 15 seconds. A splicer with a heated block is highly recommended.

Zero Cuts

Another method of achieving invisible splices in printing from A & B rolls is to use the checkerboard technique, but extend each end of each scene at least two frames. When rolls so prepared are placed in a synchronizer, there would be a four frame overlap at the head and tail of each scene. Rolls prepared in this manner must be printed on a printer that will make scene changes by means of a shutter that rapidly opens or closes. Not all laboratories are equipped to print rolls prepared for zero cut, so check with your lab. Zero cuts made on a 16mm continuous release printer usually appear as less than one frame dissolves. Zero cuts made on a 16mm step contact or optical printer will appear as a perfect straight cut.



Black Leader

It is recommended that only black leader be used between scenes. To insure that the leader is opaque, it is suggested that the black leader be made by fully exposing a positive stock and developing in a positive bath to a minimum density of 3.00. Specify this minimum density when ordering black leader from your lab. If the black leader is old, it is wise to check it for shrinkage. Use black leader for 16mm negative A & B rolls and for 35mm negative rolls prepared for the checkerboard technique.

Double or Single Perforated Leader

16mm double perforated leader should be used only when all the original is double perforated. When some or all of the original is single perforated, the use of single perforated leader is recommended to avoid possible future damage to the original. The perforations in the leader should, of course, be on the same edge as the perforations in the original. It is recommended that head and tail leaders should be single perf in the same wind as the printing materials.

Fades

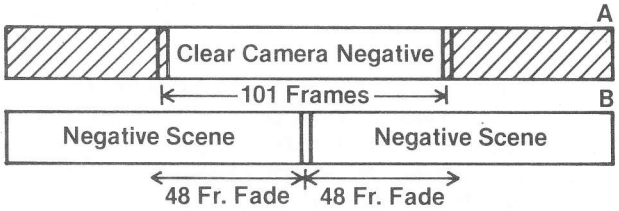
When a fade-out is followed by a fade-in from original **reversal** materials, it is recommended that the fade-in scene be carried across to the other roll without any overlap.

The preparation is the same as that used in preparing "Invisible splices." Instructions must be given so that the fades will be printed in at the desired places and in the desired lengths.

Fades can be made from **negative** A & B rolls (Figure 6) by keeping the fade-out scene and the fade-in scene on the same roll. Clear camera leader, which has been made by developing unexposed camera raw stock of the same type that was used to photograph the scenes, should be cut in opposite the area where the fade-out and fade-in will occur.

At least 5 extra frames of clear camera leader must be added for each fade-out and fade-in. In other words, if a standard 48 frame fade-out and 48 frame fade-in is desired, this length of 96 frames, plus 5 additional frames, make a total of 101 frames of clear camera leader that should be cut in opposite the fade-out and fade-in scenes.

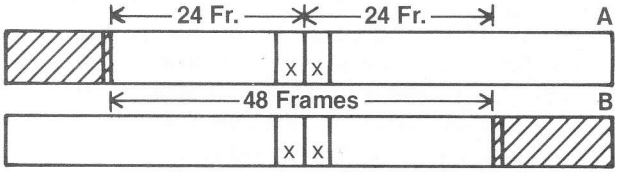
Figure 6
Fades for Negative Rolls



Dissolves

It is suggested that the middle of each dissolve be marked by making a small "x" in each of two adjacent frames in the center of each fade, on both the A and the B roll. These two small "x's" should be made on the emulsion side of the film outside the picture area. They will appear in the center of the effect on the perforated edge of 16mm film (not the track edge). The two "x's" in the A roll will then be exactly opposite the two "x's" in the B roll when both rolls are placed correctly in a synchronizer. Thus, the dissolve overlap can be easily checked and correct synchronization of the rolls verified. The 16mm emulsion can be scraped by a scriber to form the "x's" or they can be made with a pen using a white, waterproof, quick-drying ink. Black ink should be used on the track side on 35mm film (since the edge is clear).

Figure 7
Dissolves



Series of Effects and Cuts

When dissolves, fades and cuts follow each other at very short intervals, caution should be exercised. The editor should remember that on a single roll, no new effect or cut can be started before the last effect is over. It is suggested that you obtain your lab's recommendations before preparing negative rolls.

Length of Effects

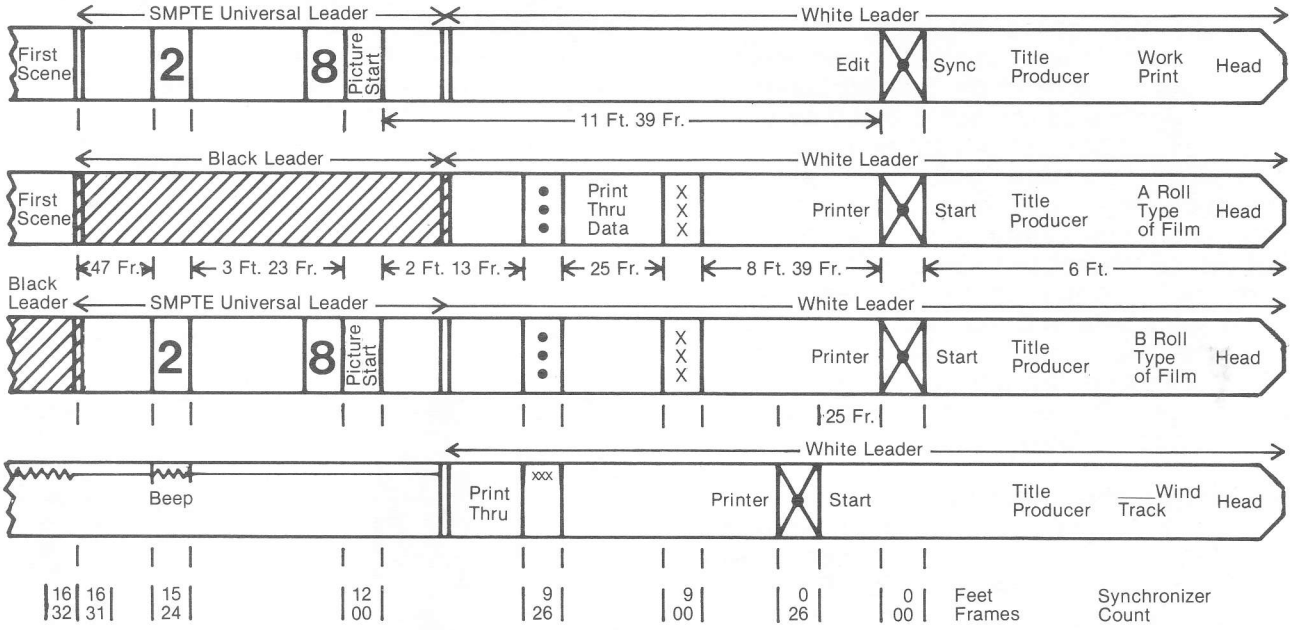
Forty-eight frames is the most common length of fades and dissolves. Most labs can, however, offer fades and dissolves of 16-24-32-48-64-96 frames in length. Check with your lab.

Instructions to the Laboratory

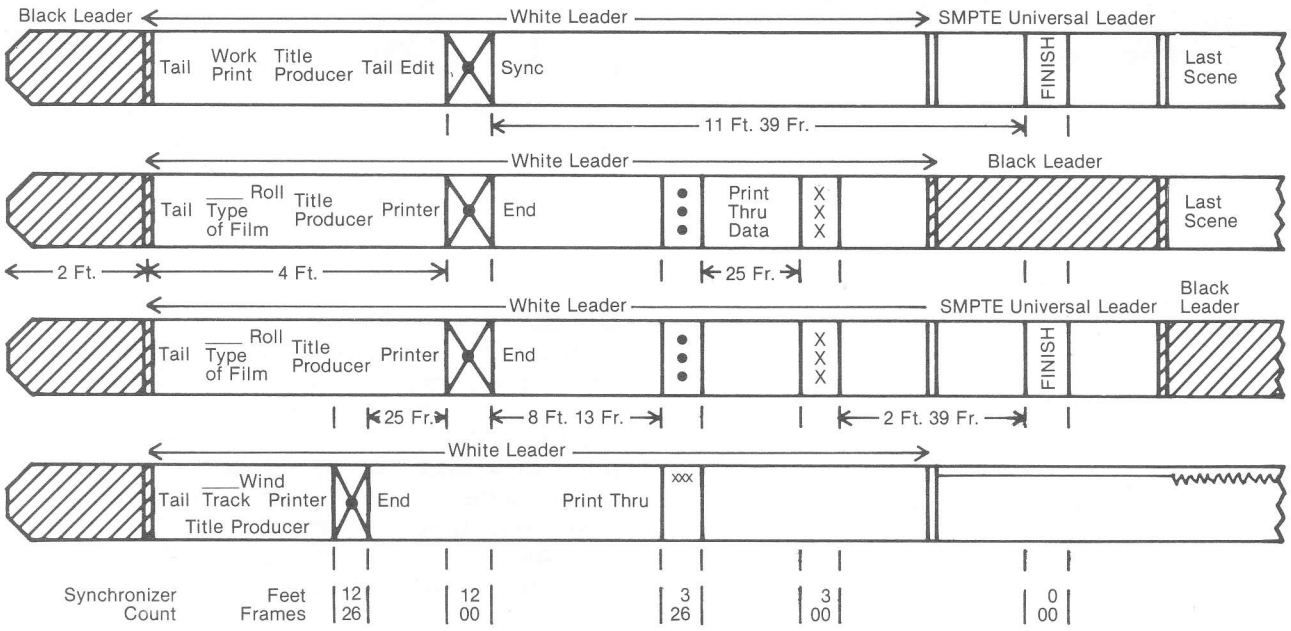
Instructions should accompany each film when sent to the laboratory and should indicate in detail all special effects. Use footage and frames to indicate where effects are desired, measuring from the printer start mark in the head leader. Your cut work print with all effects correctly marked is an invaluable aid to the laboratory timer. *Do not* use paper clips, grease pencil, Scotch tape, string, adhesive labels, etc., on the original to indicate where effects are desired.

Figure 8

16MM Head Leaders



16MM Tail Leaders



All rolls are in editorial sync as shown.

Start" frame of the track will now be 26 frames behind the "Printer Start" frames of the picture rolls to allow for projection sync.

Sound Tail Leaders (Figure 8)

Wind to the tail of the show, and again splice white leader to the photographic sound negative at the same place as the white leader was spliced to the picture rolls. Across from the three *dots* on the picture roll, mark three "x's" in the track area of the sound negative. Continue on toward the tail. Set the synchronizer to zero at the "Printer End" frame on the picture rolls, and again roll toward tails to 0 feet and 26 frames. Mark this frame on the track with a large "X" and label it "Printer End." Splice on 2 feet of black leader just as you did on the picture rolls to finish the job.

Identifying the Leaders

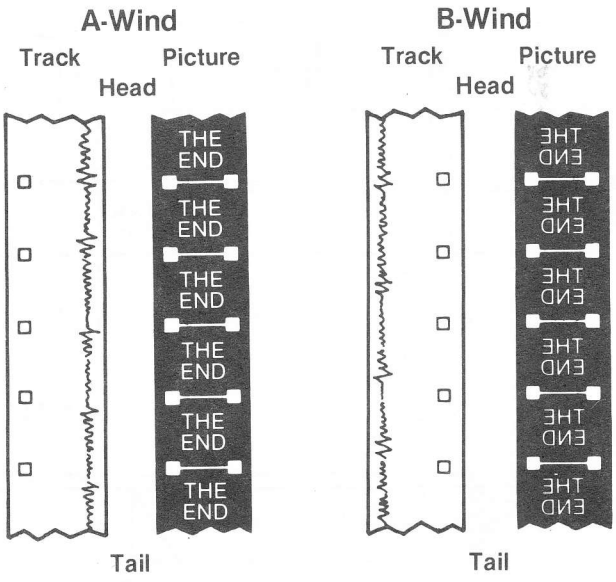
Mark the white leaders at the head and tail of each roll with the information shown in the illustration: Head and Tail, Roll designation, Type of film, Title, and Producer. On the photographic sound negative, mark the type and wind of the track.

Note that the print-through data should appear only on the roll that does *not* have the Universal leader.

A&B Wind Emulsion Positions

The terms "A" and "B" wind properly refer to the manufacturer's winding of single perforated 16mm raw stocks. These terms have also become widely used to designate the emulsion position of both 16mm tracks and picture elements. Because of this widespread usage with reference to emulsion position, it is important that it be explained.

Figure 9



Scene reads correctly thru the emulsion

Scene reads correctly *thru* the base or reads as an "original"

Note: Emulsion to the observer

Contact Printing

In contact printing, emulsion to emulsion, the image position of the finished material is always opposite of the image position of the printing material. The wind of the film alternates from "A" to "B" or "B" to "A" in each succeeding generation. In contact printing of titles, make sure your title is in the same emulsion position as the preprint material you are using.

Optical Printing

In optical printing it is possible to print the picture in either the same image position or in the opposite image position of

the preprint material. When ordering materials to be made optically, you must specify the wind you require, either "A" or "B", of the material to be made.

16mm Prints

A 16mm positive print can be either "A" or "B" wind. A print projected with the emulsion away from the lens is "A" wind, and with the emulsion toward the lens, "B" wind. "A" wind prints and "B" wind prints require different focus positions of the projector lens and, therefore, should not be spliced together.

35mm

"A" wind and "B" wind terminology is not used in 35mm, although the same changes in emulsion position occur. This is possible because 35mm printing follows an exact set of standards in which negatives, whether original, duplicate negatives or CRI's all read through the base.

35mm master positives always read through the emulsion. A standard 35mm release print reads through the emulsion, and is projected with the emulsion towards the light source.

When making 35mm prints or intermediates, the proper emulsion position is maintained automatically by contact printing emulsion to emulsion. The only exception is in making a CRI, and to maintain the proper emulsion position the CRI must be printed optically or with base to emulsion in a contact printer. If this must be done, a specular light source in the contact printer will help to maintain sharpness.

Screening Conditions

Trial prints and check prints should be screened free of interruptions, on good equipment in a properly darkened room. You cannot make consistent judgements if significant variations occur in the screening system and the environment. Potential variations in the projection system are: the screen type and size, distance from the projector to the screen, the projection light and lens, viewing angle and ambient light.

There are established standards of screen brightness for viewing prints intended for direct projection. The brightness at the center of the screen should be 16 foot lamberts (plus or minus 2) when the projector is running with no film in the gate. (Ref: ANSI PH 22.100 and ANSI PH22.133.)

16mm prints are made for projection with several colors of projector illumination. 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.

The following sources are in commercial use for projection of 16mm prints:

	Approximate Color Temperature
Incandescent Bulb	3450K
Modified Carbon Arc	4450K
High Intensity Carbon Arc	5400K
Zenon Arc Bulb	5400K

16mm prints made for television projection are normally balanced for 5400K screening.

After screening the first trial print or check print, if there are changes which need to made in density or color balance, the print must be returned to the lab along with instructions for those changes. Footage counts from the printer start mark should be used to indicate the locations of scenes to be changed. If any changes in the production itself have been made, such as scenes replaced or changed in length, this should be noted. Extensive changes may require a second trial print.

Release Prints

Release Printing Methods

When the trial print or check print of the production has been approved, release prints can be made. There are a number of factors that should be considered in determining which release printing method will be used.

Super 8mm Color Prints from 16mm and 35mm Materials

Chart I, page 19 shows the procedures for reduction printing from both 35mm and 16mm materials to Super 8 release. Either optical or magnetic sound tracks are available. If a photographic sound track is desired, an optical sound negative must be transferred from the magnetic sound master. Magnetic release prints are usually recorded directly from a splice-free 16mm magnetic dubbing master to the 8mm magnetic sound track.

Release prints can be made for either reel-to-reel projection or mounted in projection cartridges. Not all cartridge projection systems are compatible, so be sure to specify the system you intend to use so that the lab can make prints with the proper sound track advance for that system.

16mm Prints from 16mm Materials

Chart II, page 20 shows the processes for making 16mm release prints from 16mm color materials. Prints can be made from both original reversal or original negative A & B rolls if there are only a small number of release prints to be made. If a large number of release prints are to be made, it is advisable to have an intermediate made from the originals. From color reversal originals, this can be an internegative or a reversal master. In the case of color negative originals, the process calls for a color reversal intermediate (CRI) or a color master positive and a duplicate negative. Using the master positive, additional duplicate negatives can be produced without handling the original film.

16mm black and white negative originals require a master positive and a duplicate negative for release printing (Chart IIA, page 21.) Black and white internegatives are made from 16mm black and white reversal originals for release printing (Chart IIB, page 22).

35mm and 16mm Prints from 35mm Materials

Chart III, page 23 shows the available processes for making 35mm and 16mm color release prints from 35mm negatives. Chart IIIA, page 24 shows the methods for printing from 35mm black and white negatives to both 35mm and 16mm black and white release prints.

When reducing image size by optical printing, it is best to postpone the optical reduction to the last practical stage to obtain the maximum resolution.

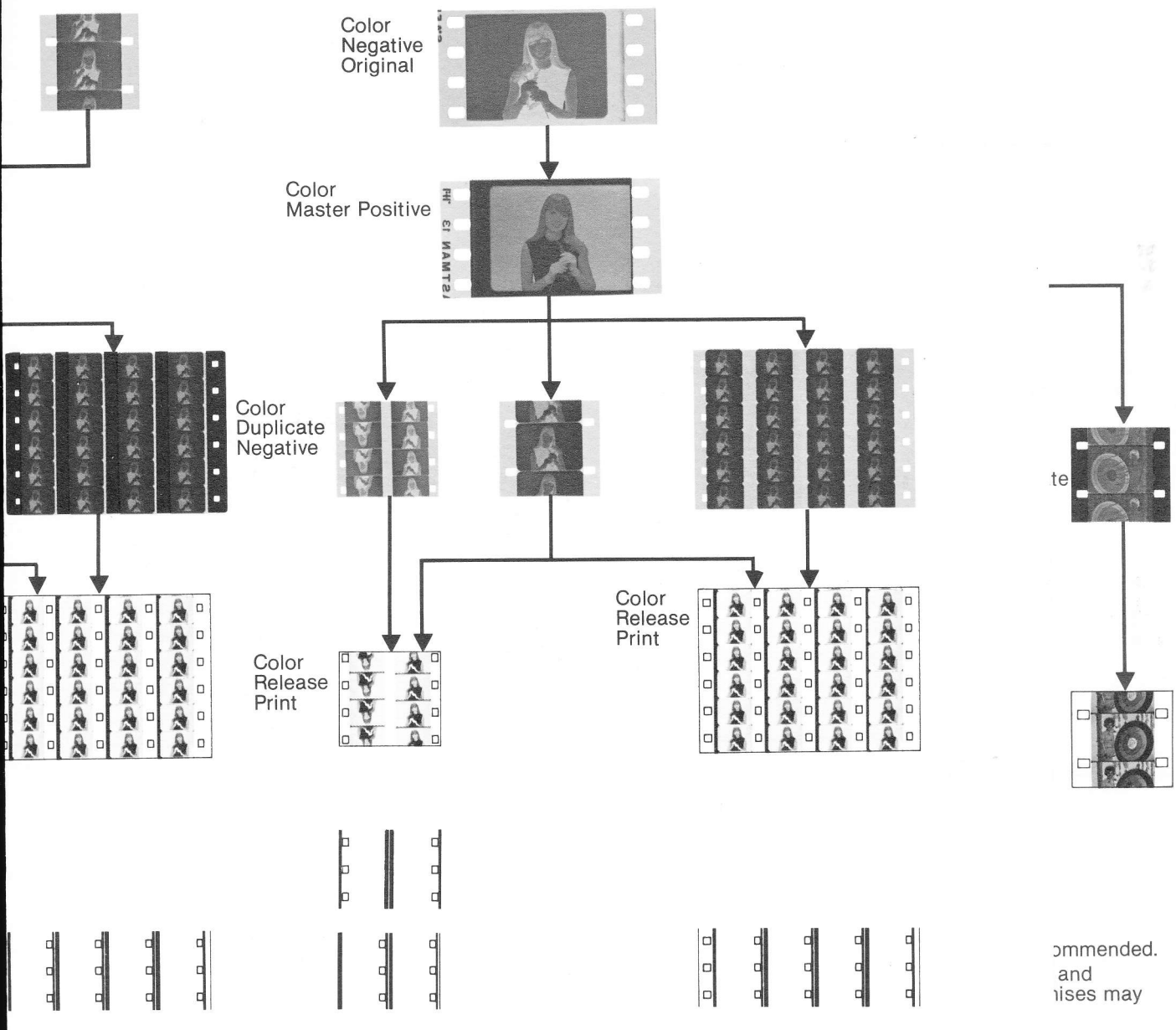


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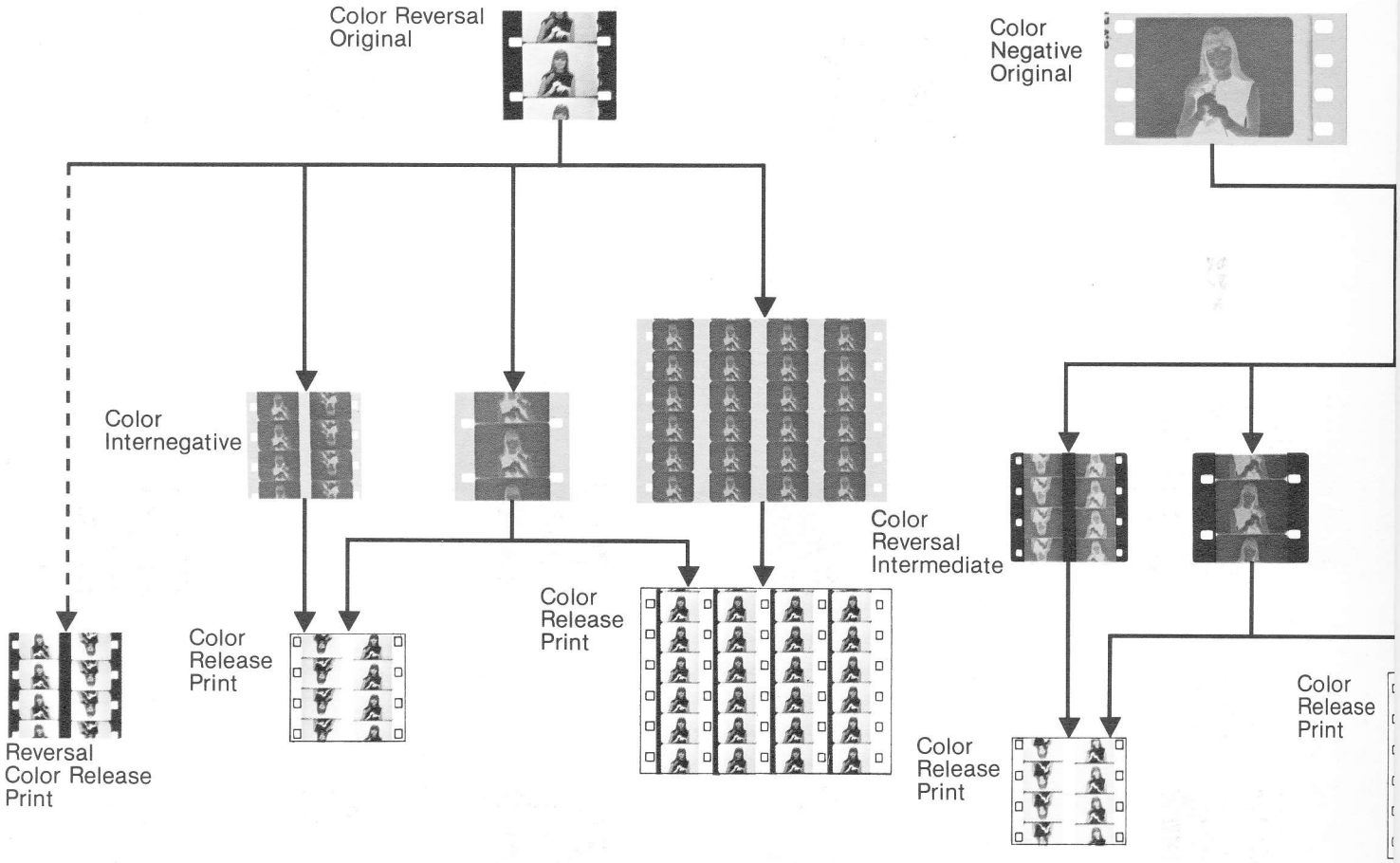
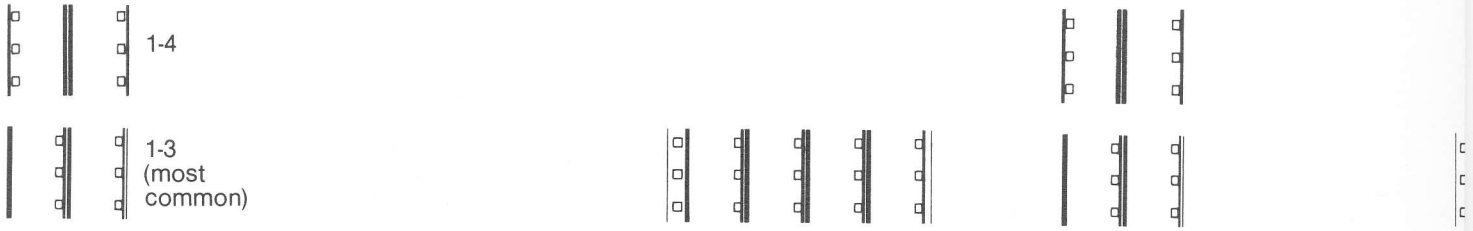
Chart I
Super 8 Color Prints from 16mm and 35mm Originals



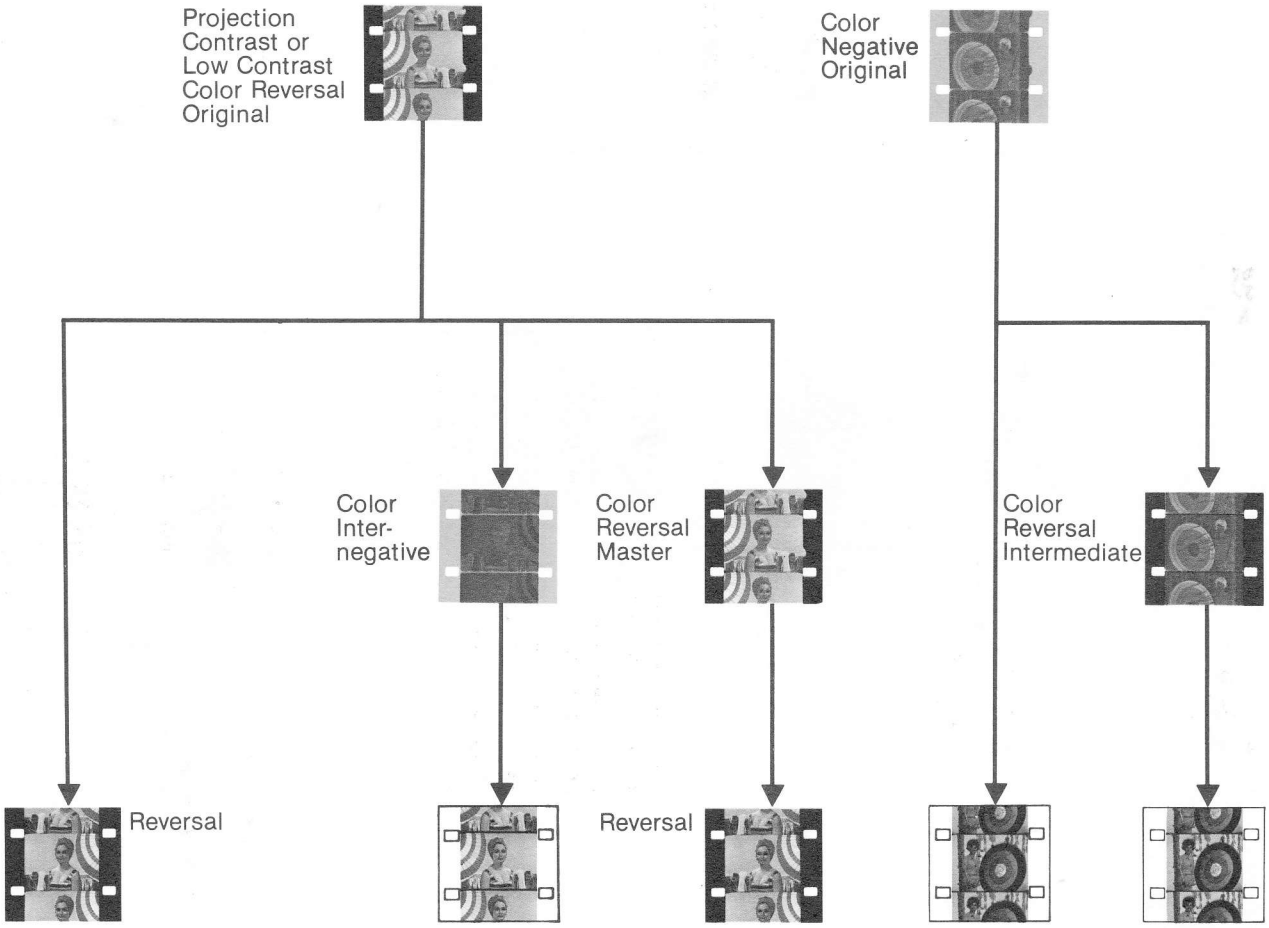
Position of the Magnetic Sound Stripes
Available formats:



NOTES

1. The choice of printing procedure depends on a number of factors, including the types of printing and processing facilities available and certain economic considerations. As a result, certain compromises may have to be accepted. The dotted lines show alternate, less common or satisfactory methods.
2. Where reduction stages are called for in this chart, it is usually best (in the interest of obtaining the highest definition in the final print) to postpone reduction until the last practical stage.
3. In all methods shown, the final print stock may be perforated in either the 8 mm or super 8 format and may be magnetically prestriped or unstriped.

Chart II
16mm Color Prints from 16mm Camera Originals



Color Release Prints

NOTES

1. Where multiple release prints are required, the use of a color reversal low-contrast original is recommended.
2. The choice of printing procedure depends on a number of factors, including the types of printing and processing facilities available and certain economic considerations. As a result, certain compromises may have to be accepted.

Chart IIA
Printing Flow Chart
16MM Black & White Negative

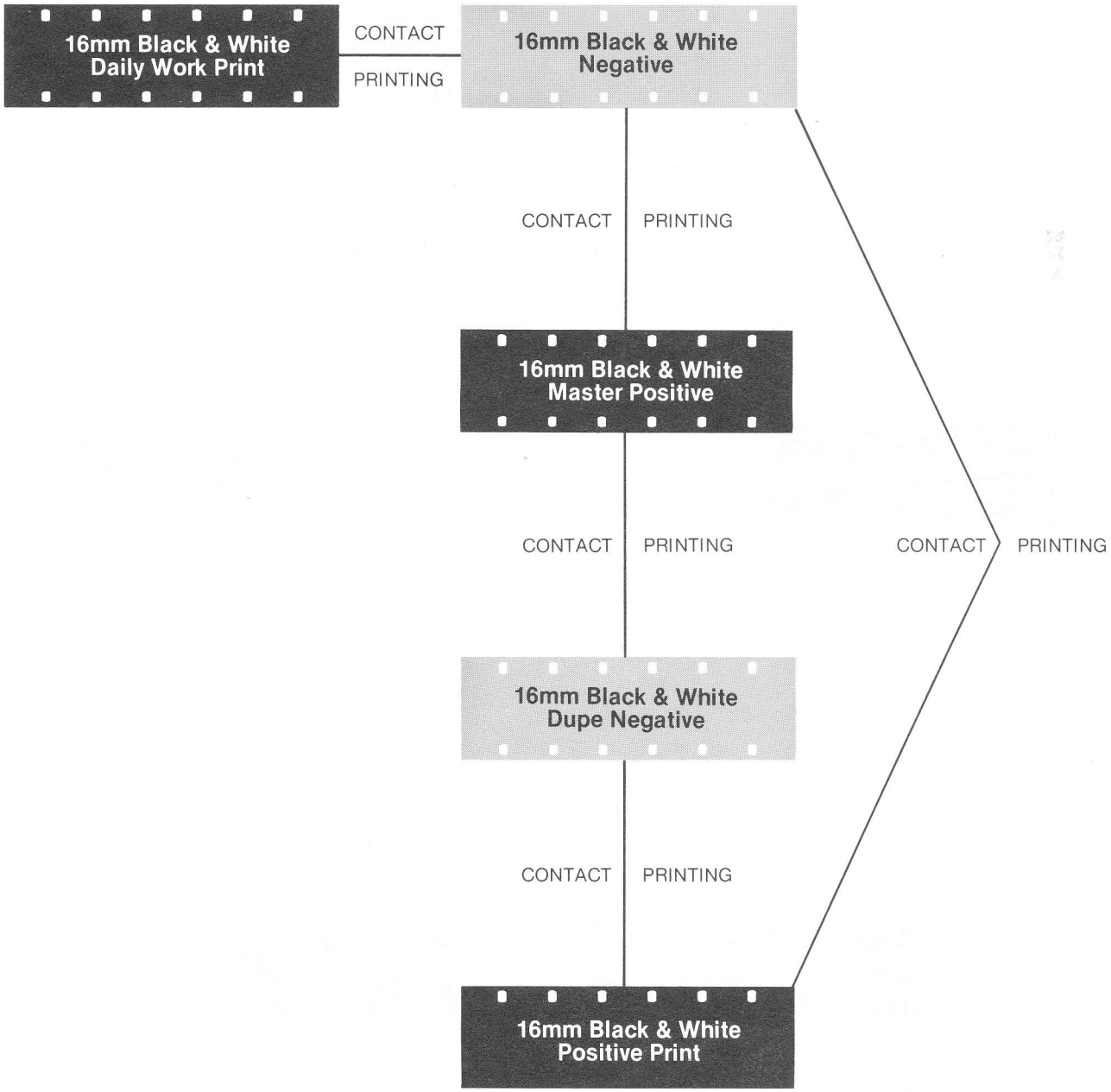


Chart IIB
Printing Flow Chart
16mm Black & White Reversal Original

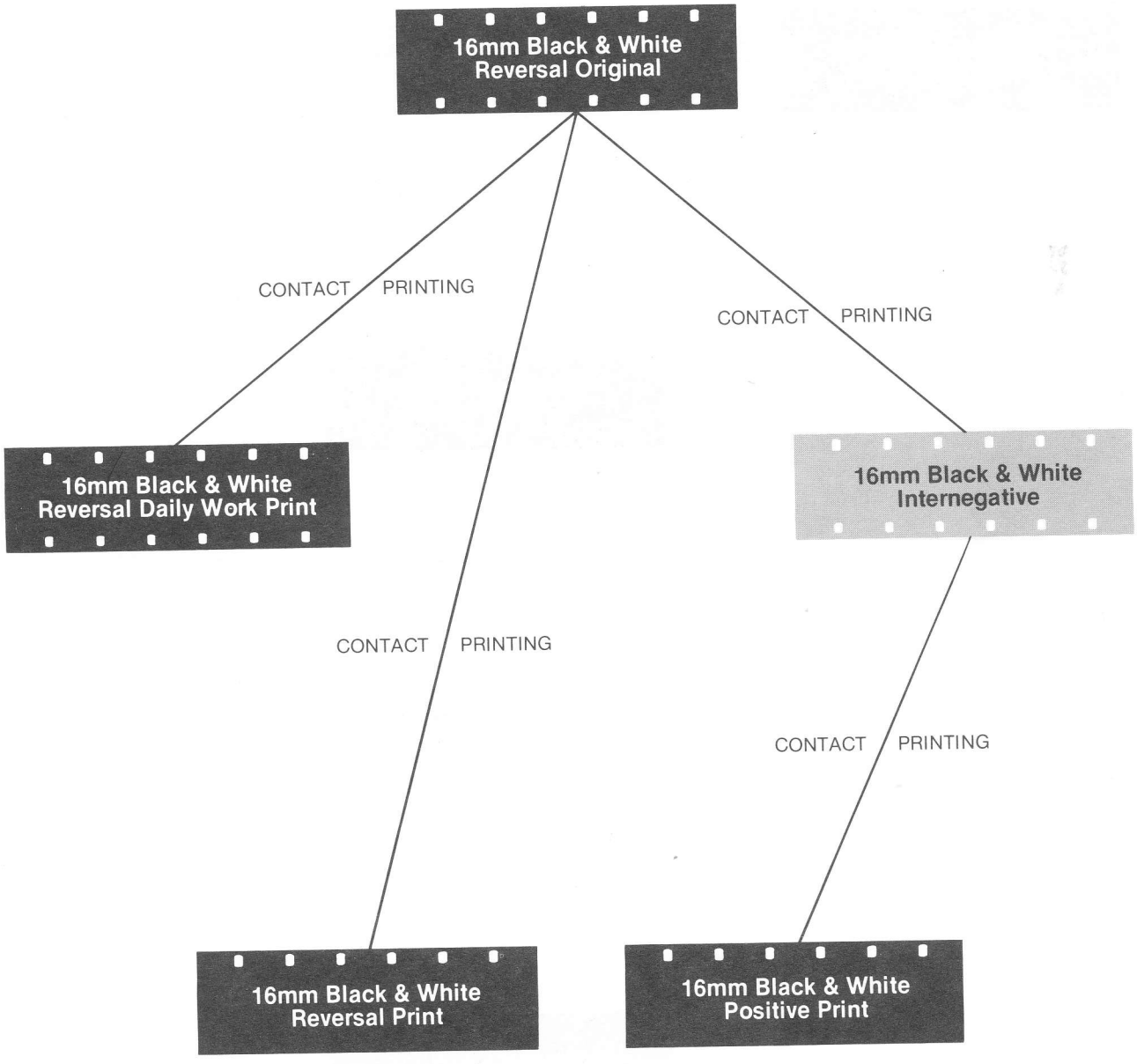
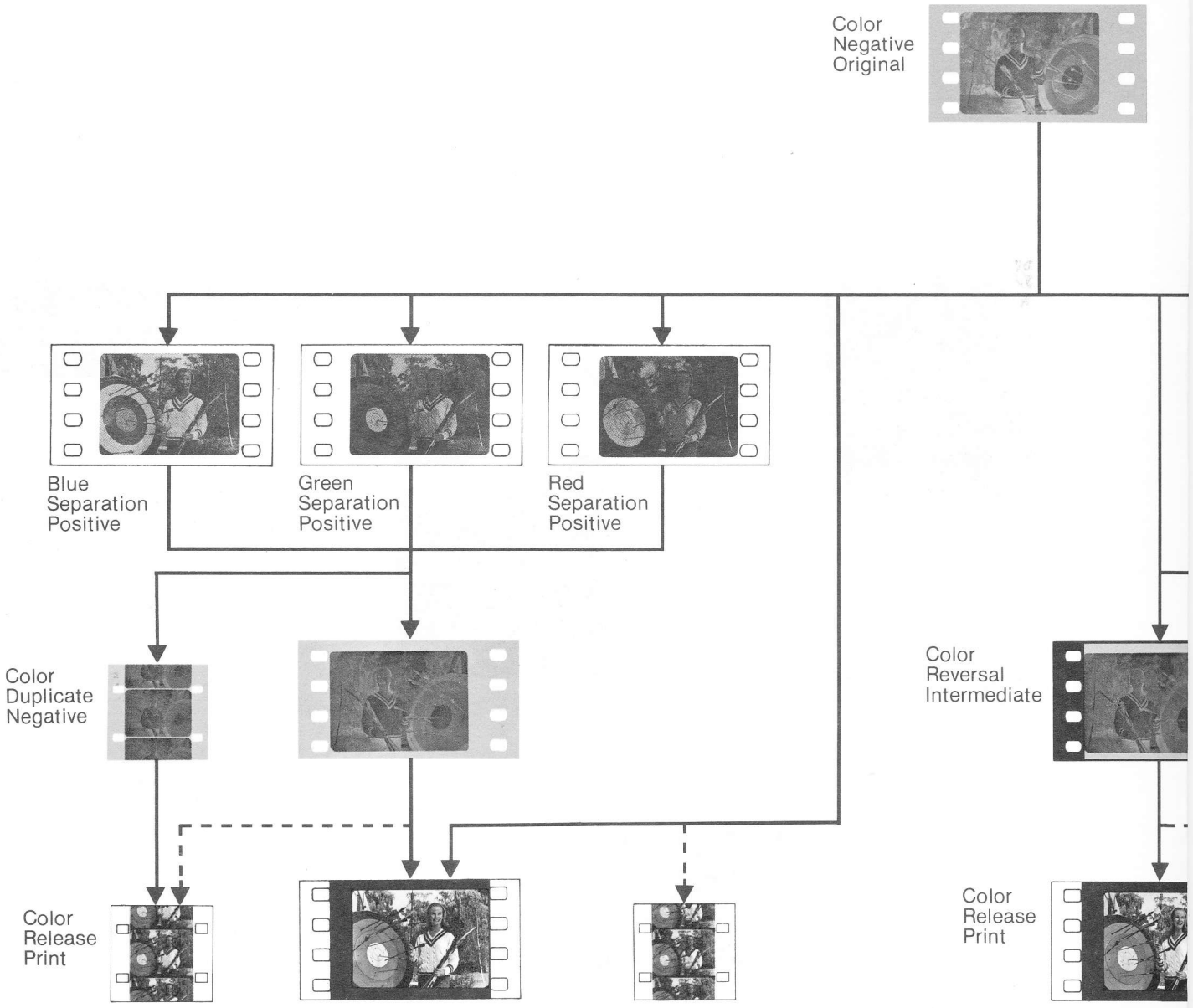


Chart III
35mm and 16mm Color Prints from 35mm Negatives



NOTES

1. The choice of printing procedure depends on a number of factors, including the types of printing and processing facilities available and certain economic considerations. As a result, certain compromises may have to be accepted. The dotted lines show alternate, less common or satisfactory methods.
2. An image size change indicates optical reduction printing. Where reduction stages are called for, it is usually best (in the interest of obtaining the highest definition in the final print) to postpone reduction until the last practical stage.

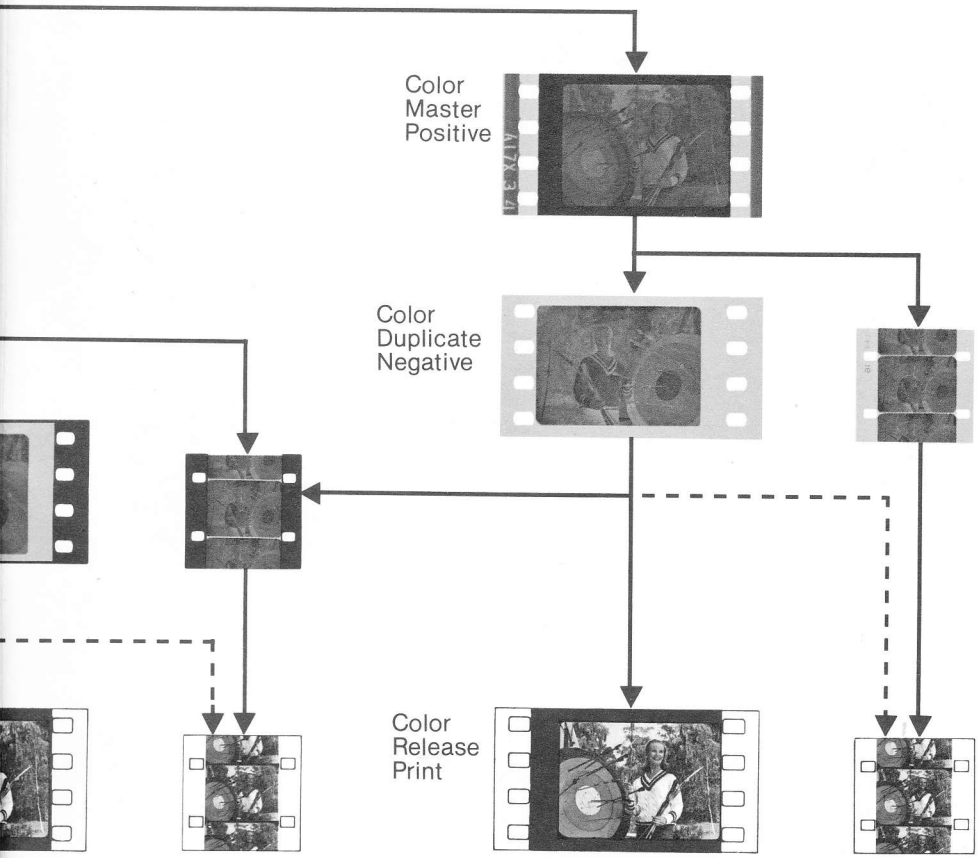
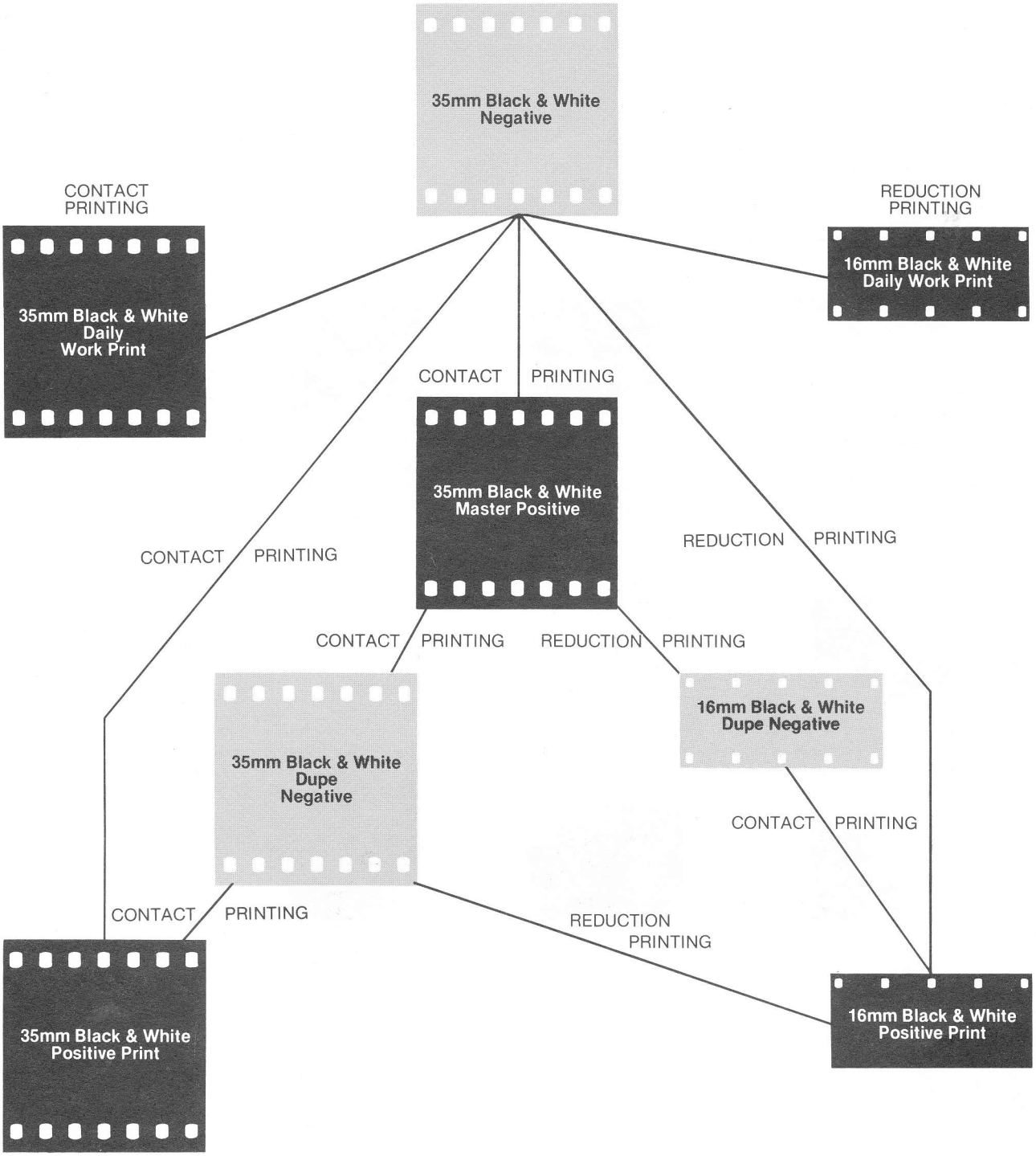

Color
Master
Positive
Color
Duplicate
Negative
Color
Release
Print

Chart IIIA
Printing Flow Chart
35MM Black/White Negative



Section Prints

Section prints are ordered to repair damaged release prints. Head and tail sections are most common because these segments sustain the most damage in projection and handling. Section prints cost more per foot than regular full roll prints since they require more handling and time in printing. Do not order section prints to the exact frame. Allow extra footage for handling.

Section printing subjects the negative to greater risks than normal printing. If a large number of release prints are in distribution, to save money and protect your printing intermediate, a separate intermediate and photographic sound negative of the head and tail section should be manufactured to make replacement prints for damaged head and tail sections.

Splices in Laboratory Prints

In release printing, it is recommended that there be a maximum of two splices per 400 feet of 16mm or 1000 feet of 35mm. These two splices may be insert splices, or one of the two splices can be a raw stock splice. There should never be two raw stock splices in the same reel. It is further recommended that spliced raw stock not be used in trial prints, dailies, TV spots or re-recording prints. It is customary practice to charge a premium for release prints that have no raw stock splices.

Special Release Print Stocks

Release prints can be special ordered on a polyester base film. This film is much stronger than standard acetate base film. It cannot be spliced with a standard cement splice, but must be ultrasonically spliced or tape spliced.

Mounting

16mm and 35mm Prints

All release prints are normally wound on cores, or "lab packed," for shipment. At your request, the laboratory will mount your prints on reels, either supplied by you or the laboratory. Metal, plastic or fiber containers are available in different sizes through many suppliers and most ACVL laboratories. Discuss with your ACVL lab the cost and what would best suit your requirements.

Super 8mm Prints

Release prints in Super 8 are either mounted on reels or in continuous projection cartridges or cassettes. Some continuous projection systems require special print treatment and lubrication. Discuss with your ACVL lab for guidance and cost.

Sound

Sound Mixing

The editing of the sound tracks and the preparation for mixing requires not only creativity, but also understandable directions for the mixing engineer.

Sound track rolls are designated according to the type of sound each contains, i.e., narrations, sync sound, sound effects, music or presence.

Although it is desirable to have as few tracks as possible, it is not a good idea to combine two types of sound on a single track. Often there will be differences in quality between narration and the sync sound although it is the same person's voice. This can be due to the difference in locations where the recordings were made or simply a difference in voice quality of the narrator over a space of time. The sound engineer can often compensate for these differences electronically but it is difficult if they are not on separate tracks.

Presence track may need further explanation. It is a very good practice when the original sound is being recorded, in the studio or on various locations, to record a few minutes of room tone. This track is then used to make transitions from location to location without abrupt background sound changes. It is also used to fill in blank spots in the edited tracks.

Even if you are going to be present during the mixing session, which is desirable, a detailed cue sheet should be made for the engineer to follow. This cue sheet tells the engineer where the various tracks begin and end and the approximate relative levels. Figure 10 on page 27 is a sample of a mixing cue sheet. The cue footage is in 16mm. Check with the mix studio if the cue footage should be indicated in 16 or 35.

Leader Markings and Identification

It is preferable that all workprints for sound mixing be submitted with a Universal leader as described under "work print leaders." This aids the laboratory in preparing the film for printing, and in assuring that the track will be in sync. If your work print does not have a Universal leader, you can simulate it. Place a piece of leader in your synchronizer. Set the counter to zero and mark that frame on the leader "Picture Start." Advance the leader to 3 feet and 24 frames, and mark this frame "2." The first frame of your picture is at 4 feet and 32 frames.

On each of your magnetic sound tracks, place a large "X" opposite the "Picture Start" frame in the Universal leader. Mark this frame "Pix Start." Place a beep tone on each roll of magnetic sound track opposite the "2" on your Universal leader. Continue your magnetic sound tracks in editorial sync with the picture work print.

You must insure that your final mixed magnetic track has one and only one beep in the head leader, and that the beep is in editorial sync with the "2" in your Universal leader. This beep will be used to line up the photographic sound negative with the original picture negatives. (Refer to the section on **Preparing 16MM Printing Leaders.**)

The diagram for setting up mixing rolls is shown in Figure 11, page 28. Before you prepare for a mix, check with your mixing studio in order to understand their requirements.

Figure 10

Film Productions Unlimited
Company

1 of 1
Page Number

Commercial Spot No. 227
Production Title

Editor

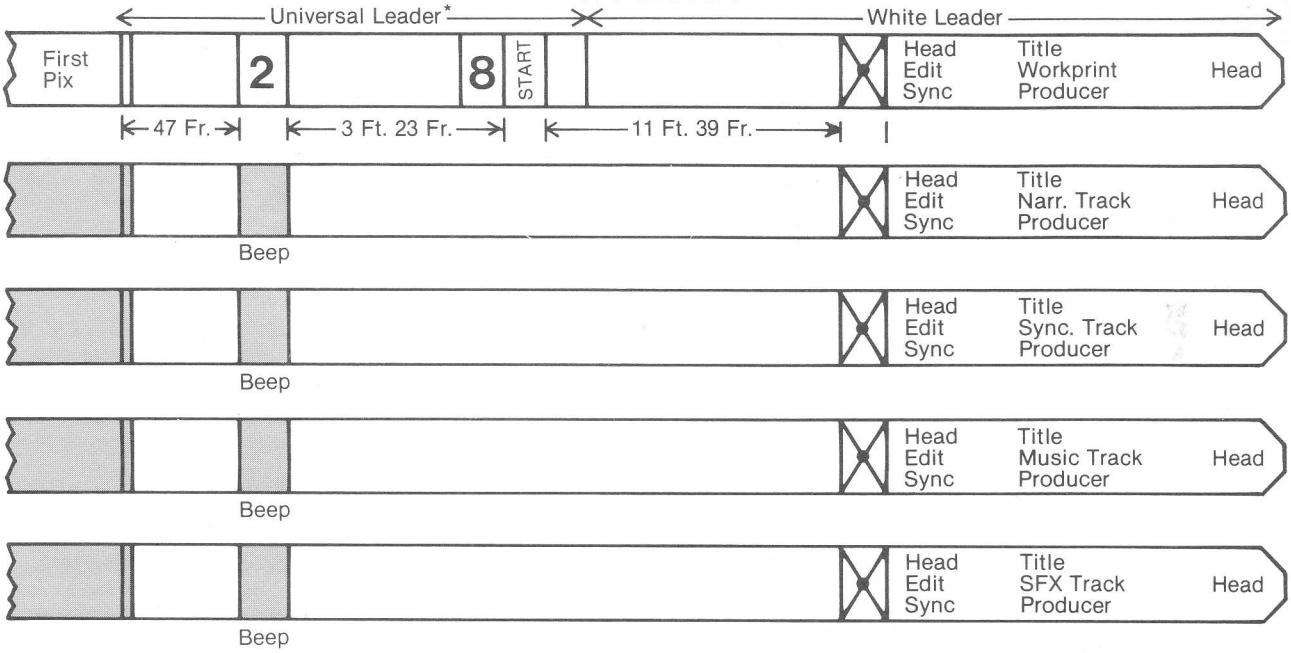
Phone Number

(*Universal Leader)

Narration	Sync	Music	SFX
0 = Picture Start* Ck. Beep at 2*	0 = Picture Start* Ck. Beep at 2*	0 = Picture Start* Ck. Beep at 2*	0 = Picture Start* Ck. Beep at 2*
		Fade in at *12 - 20*	
		Music Under	*15 - 34* *Birds* *20 - 23*
15 - 34 *Voice 1* *17 - 27*			
20 - 24 *Voice 2* *24-13*	*24 - 14* *27 - 39*		*25 - 26* *Crickets* *26 - 34*
28 - 00 *Voice 1* *33 - 17*			
		Music Up	
		Fade out by *35 - 15*	
Tail Edit Sync	*41 - 15 Beep*	*41 - 15 Beep*	*41 - 15 Beep*

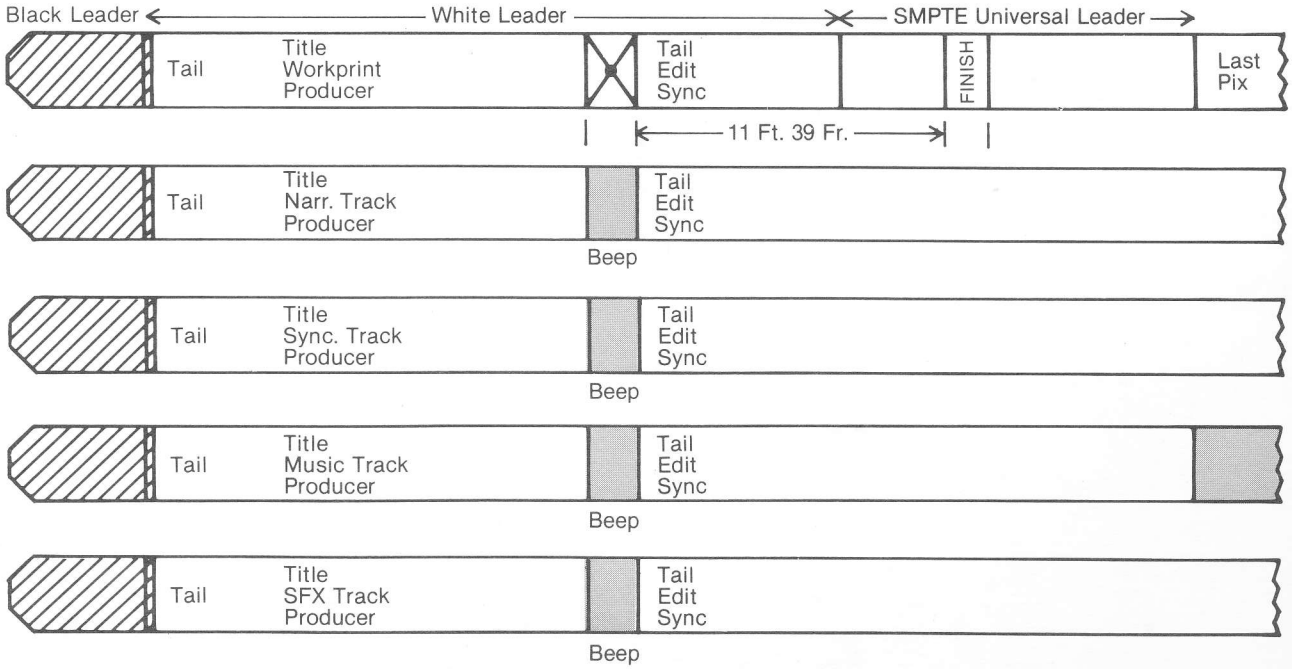
Figure 11
16MM Motion Picture Sound Mixing Log
Instruction for Setting Up Mixing Rolls

Head Leaders



Light struck leader base up.
Mag struck emulsion up.

Tail Leaders



***Leader Markings and Identification** It is preferable that all workprints be submitted with a "Universal leader." This aids the laboratory in preparing the film for printing, and insuring that the track will not be printed out-of-sync. If you don't have Universal leader, you can simulate it. Place a piece of film in your synchronizer. Set your counter to 0-0 and mark that frame in the synchronizer "picture start." Advance the film to read 3'-24 frames and mark this frame "2." The first frame of picture should be spliced in at 4'-32 frames.

Sound Tracks for Printing

Photographic Sound Negatives

Photographic sound negatives (variable area) are processed to a particular gamma and density to provide minimum cross modulation distortion when printed to a certain positive aim density. The photographic sound negative gamma and density and the print density will be different for each type of release print raw stock used. Photographic sound negatives are required when making composite prints from either negative or reversal picture materials. Photographic sound positives are required for making black and white reversal composite prints.

You must be sure, when ordering photographic sound negatives or positives, that you specify the correct type for the intended use, and that in 16mm, you specify the correct emulsion position, or "wind," to match the wind of the picture material it will be printed with. If you have any doubts, check with your ACVL lab and tell them what the final use of the sound will be. They will help you pick the proper combination.

Sound Overlaps

In 35mm prints, sound overlaps are required at the reel changeover in theatrical projection. (Ref: ANSI PH 22.55.) Whenever composite prints are made in multiple reels, where these reels might be spliced together for projection, a sound overlap is required on the print at the end of the reel being spliced onto the head of the next reel. This overlap contains the sound information of the advance of the next reel (26 frames in 16mm and 20 frames in 35mm).

Magnetic Dubbing Masters

Magnetic dubbing masters are used when transferring sound onto magnetic striped prints. This is most common in Super 8 release printing. These should be splice-free and are frequently made on polyester-based magnetic stock for longer life.

Slide Duplicates and Filmstrips

While slide duplication is often considered the job of the still laboratory or photo-finisher, many motion picture laboratories use the high-volume production techniques employed in motion picture work to produce slide duplicates in large quantities. Similarly, filmstrips, both in 35mm and in small-format sizes such as 16mm, Super 8mm and 110 widths, are also frequently handled by motion picture laboratories.

Original Materials

Just as in the production of motion pictures, careful attention must be paid to the quality of the original material supplied to the laboratory or slide duplicate and filmstrip animator. Slides and filmstrips are produced from both photographic original transparencies (35mm slides, 4x5 sheet film, etc.) and from art work or other graphic material. In both cases, the contrast of the original materials is of extreme importance in producing best quality originals.

Transparencies

There are, unfortunately, no color reversal still camera films with contrast low enough to be utilized in the usual duplicating systems employed by motion picture labs. For this reason, color reversal still camera films ("chrome films") require special duplicating techniques to hold down the contrast.

The photographer of the original transparencies must keep his subject lighting as flat as possible, preferably not exceeding a lighting ratio of 4 to 1. Even with this reduced lighting ratio, "chrome" transparencies still require additional contrast reduction for optimum results. This contrast reduction can best be applied in the preparation of the master negative from which the slide duplicates or filmstrip prints will be made. (See Figure 12.)

The best contrast reduction technique involves the production of black and white contrast masks from the original transparencies. This is a costly and time consuming procedure, and is therefore used infrequently.

Other methods of lowering the contrast of the original transparency include "flashing" the master negative, as is sometimes done with motion-picture duplicates from high contrast originals. The success of this technique depends on the original subject. Since the effect of flashing is to either lighten the shadows or darken the highlights (depending on the kinds of films used and the stage at which flashing is introduced,) in the case of a flashed negative made from positive transparencies, the black shadows will be made lighter, or more grey, which may give the visual impression of lower contrast in the duplicates.

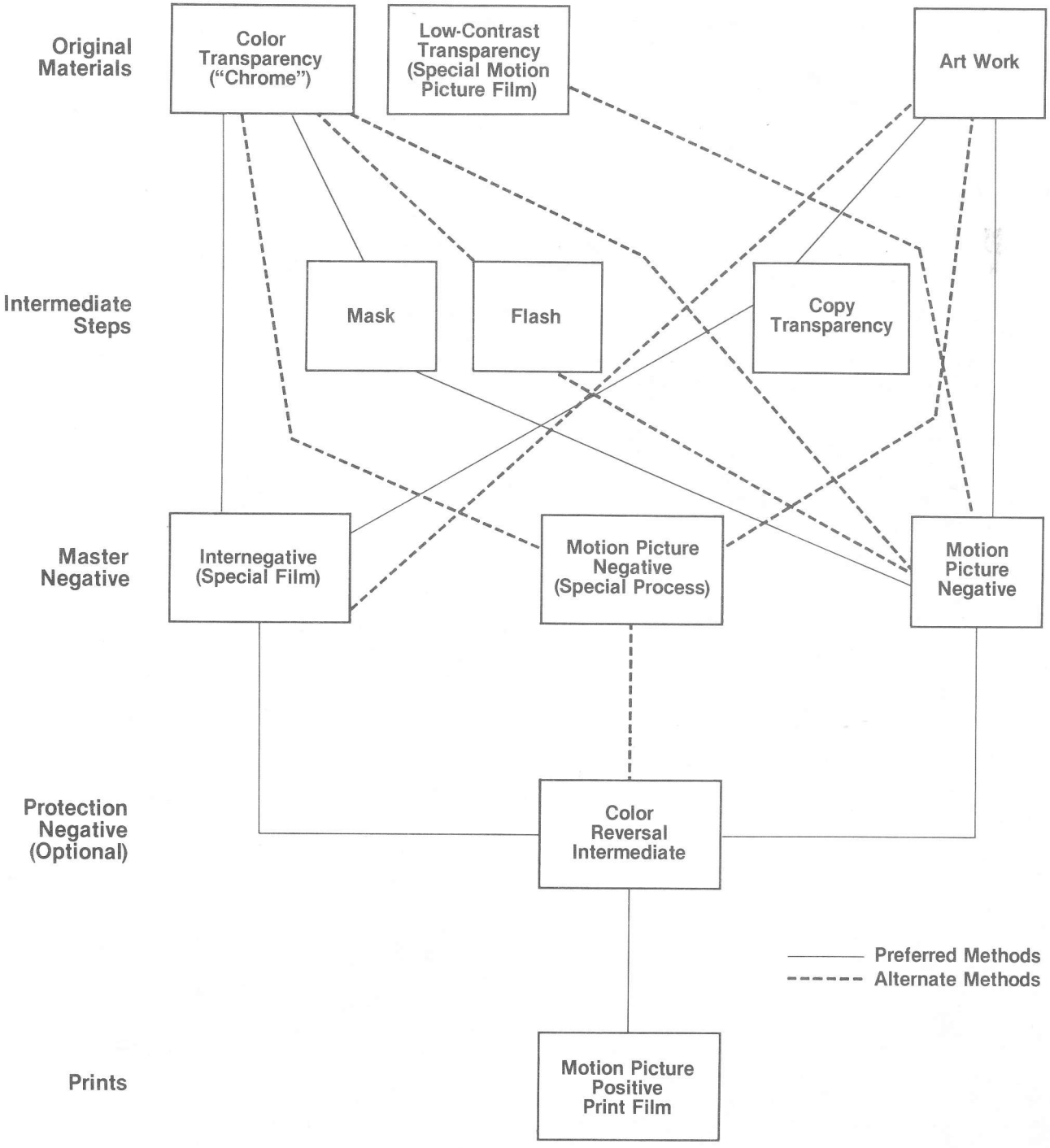
Some laboratories offer low-contrast processing of the negative shot from the original transparencies. The success of this technique is also dependent on the subject of the original photography. It is also possible to use low-contrast color reversal motion picture camera film for the original photography. This film is available in 35mm width but the laboratory must have 35mm processing facilities for it, and all photography must be done on the same film to insure a uniform result in the finished duplicates.

Perhaps the best compromise between cost and effectiveness that can be used in making duplicates from high contrast original photography is the use of a special internegative film for the duplicating negative. Not all motion picture laboratories are prepared to handle this film, although it is commonly used by filmstrip and slide animators and by labs which specialize in this kind of work.

Artwork

Photographing artwork or graphic materials into slide duplicates or filmstrips offers the opposite contrast problem from "chrome" original transparencies. In this case, the contrast of the art work is often too low for best reproduction. The artist should make every effort to keep his materials as contrasty and saturated as he can. In the photography of this artwork, polarizing screens can be used to further enhance the contrast and saturation. If an entire filmstrip or an entire set of slide duplicates is to be made from the art work, then the negative can be photographed on

Figure 12
Flow Chart — Filmstrip and Slide Duplicate Production



the same negative film used for motion picture production, and the contrast will be satisfactory.

However, if original "chrome" transparencies must be mixed with the art work in a single slide set or filmstrip, a single strand negative will have to compromise either the transparencies or the art work, depending usually upon which are most important in the finished duplicates. If the transparencies are paramount, the art work to be intermixed with it can first be copied to a similar "chrome" film, and then all of the transparencies of both the original photography and the art work can be copied to the special internegative film described earlier for a uniform result.

Another approach to the mixing of artwork and transparencies is to photograph each material in A & B roll fashion on its own best negative material. This method should be carefully discussed with the lab as to cost and technique.

Art work prepared for slide duplication or filmstrips should follow the same requirements as art work prepared for motion picture animation. Acetate cels are preferred for overlays, since polyester cels may exhibit "rainbows" or "hazing," especially under the polarized lights used on many copy stands. Pasted up art work should be avoided, unless carefully mortised in, particularly under cels, since the additional thickness of the paste-up can cause shadows at the edges.

Image Ratios and Cropping

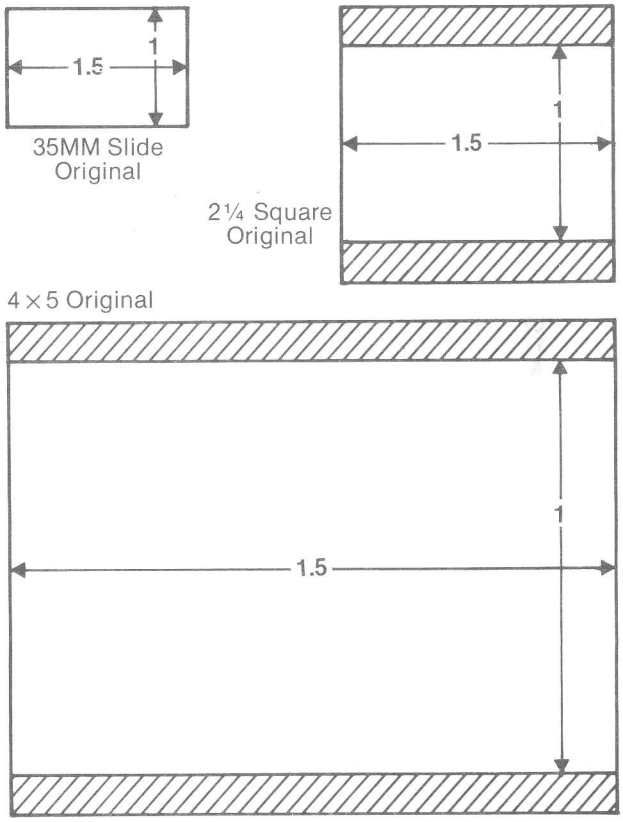
Each duplicate format requires special consideration in the composition of the original material. While original photography may be done in any format, ranging from 35mm slides to 8 x 10 transparencies, or even larger art work, they must all be reduced to fit the format of the final duplicates.

35mm Slide Duplicates

The image ratio of the finished slide duplicate is 1.5 units wide by 1 unit high (See Figure 13.) If these copies are being made from similar 35mm slide originals, the ratio is then the same for both the original and the duplicate. If the slide duplicates are to be made from any other original material, the originals will probably have some ratio other than 1.5 to 1. A 4 x 5 transparency, for example, has a ratio of 1.25 to 1, and a 2¼ square original has a ratio of 1 to 1. In these cases, some cropping of the original material must be done in copying it to the 35mm slide duplicate.

Thus, original photography must be composed and art work must be laid out with the final 1.5 to 1 ratio of the slide duplicate in mind. Only that area of the original material which fits within the 1.5 to 1 format will be reproduced. When making 35mm slide duplicates from a 35mm slide original, many copy cameras are set up to handle the original slide in its mount. When

Figure 13
Cropping of Various Originals to 35MM Slide Duplicates



this is done, the copy slide must usually be shot just inside the edges of the mount to avoid showing the mount edge. Thus there will be a small amount of cropping all around the original and a slight enlargement of the copy image.

Filmstrips

35mm, 16mm, 110 and Super 8mm format filmstrips all have final pictures in the 1.33 to 1 ratio. Since none of the conventional still cameras take pictures in this ratio, some cropping of the original pictures will always be necessary. The amount of cropping and the direction of cropping will depend on the format of the camera used for the original photography. (See Figure 14.) The photographer and the artist must keep this final 1.33 to 1 ratio in mind when composing photographs or preparing art work. Only the portion of the original picture or art work which fits within the 1.33 to 1 final ratio will be reproduced.

Figure 14
Cropping of Various Originals to Filmstrip Duplicates

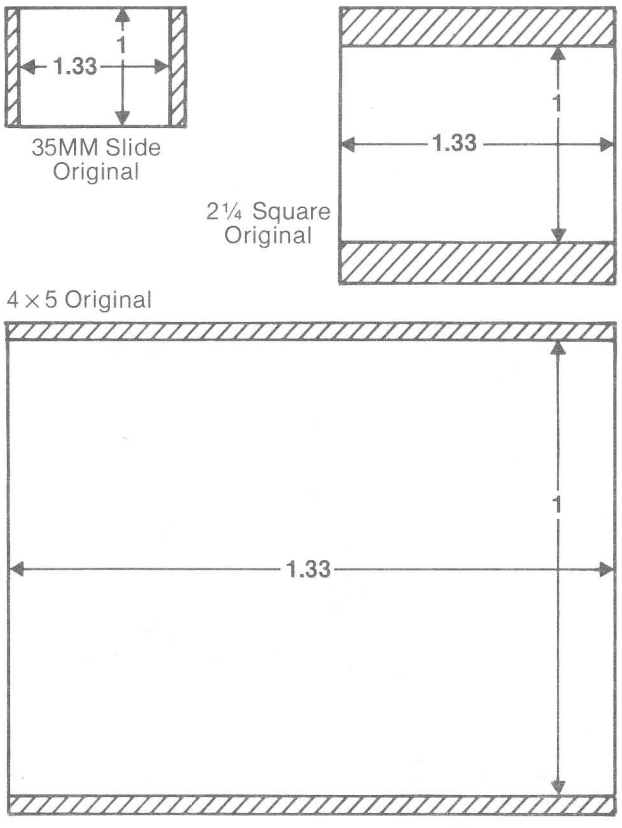
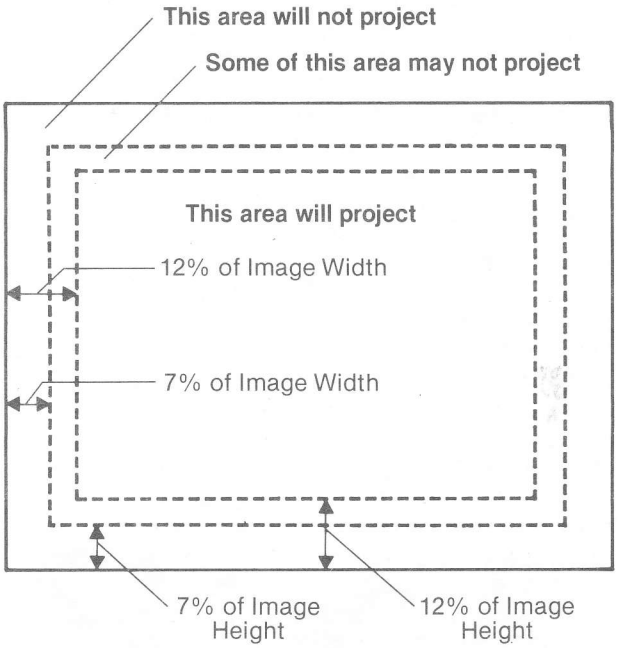


Figure 15
Rear Screen Projection System Cut Offs



Rear Screen Projection Systems

In addition to the cropping which takes place in copying still originals to the 1.33 to 1 filmstrip ratio, most rear screen projectors will crop some additional image on the way from the filmstrip print to the screen. As a general rule, the "safe areas" for rear screen filmstrip projection systems can be calculated by allowing a 7% border all around the 1.33 to 1 image. This "bleed" area will probably not be seen at all on the rear screen projection system. Within this 7% border, an additional 5% border all around the image must be allowed for bleed that may possibly be cut off at some of the edges of the rear screen due to mis-centering of the projection system. (See Figure 15.)

The result is that if something in the final picture must absolutely be seen in the final projection, it must be at least 12% in from each edge of the final picture. If the image is less important, it can be within 7% of the picture edges, and the image from the picture edge to the 7% border will probably not be seen at all.

A special case is the 35mm slide projection system that uses a square rear screen. Again, consideration must be made for cropping of the original photography so that it will fit the square screen. Since some projection systems of this type offer both normal and zoom lens positions, each will require different cropping, and the program should be clearly marked for the user to set his projector to the proper lens position. Figure 16 indicates the cropping that may occur from a 35mm slide in both cases.

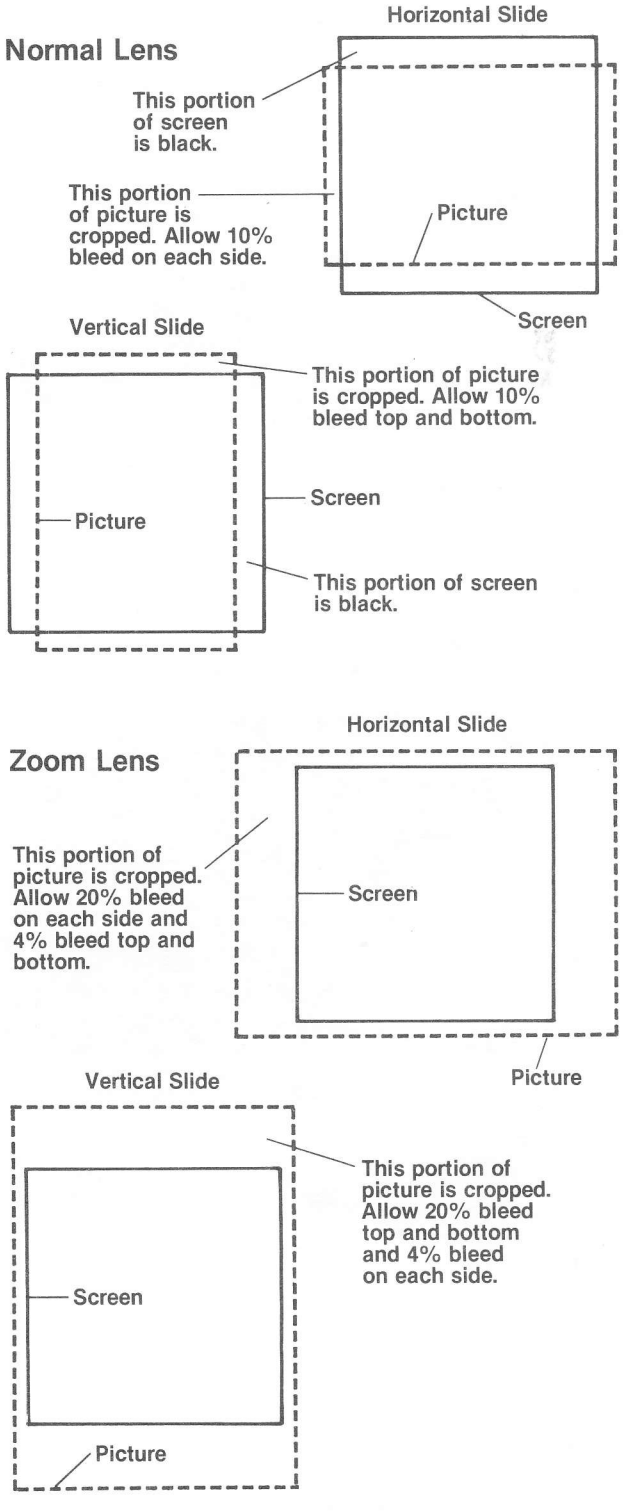
Sound

The sound used with both filmstrip projection systems and with sound slide projection systems varies in its technical specifications from system to system. Maximum and minimum program lengths, cue signal frequencies and spacing, and cue levels are different for each projection system. The actual requirements for any system are best determined by consultation with the system manufacturer or the laboratory.

In general, the producer is requested to supply the original sound on a ¼" 7½ ips dual track magnetic tape. The audio portion of the program should be on the A channel (left track), and the cue signals on the B channel (right track). Note that this is a dual track tape, and not the 4 track stereo used in home music systems.

If the producer wants the laboratory to add the cue signals, the producer must supply a clearly marked script that is an exact transcription of the audio track.

Figure 16
Cropping of 35MM Slide in Square Format Rear Screen Projection Systems



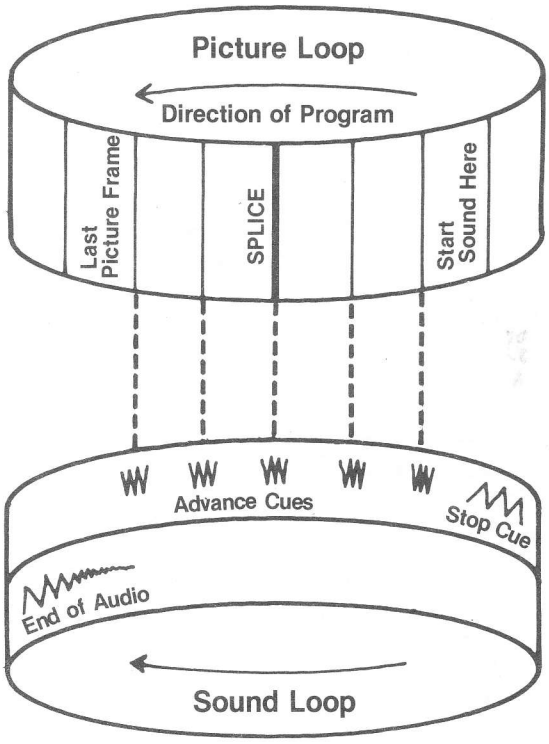
Synchronization

Since the picture and sound in a filmstrip or a sound-slide projection system are on two separate mediums, special precautions must be taken to insure that the picture and sound portions of the program are brought into synchronization when the program begins. The most common method of assuring this synchronization is to make the first picture on the filmstrip or the first slide in the set, a frame which clearly says "Start Sound Here." This frame is usually also a focus frame. The user of the program advances only the picture portion until the "Start Sound Here" frame appears, and then actuates the audio or system start. If leader frames are needed in a filmstrip program before the "Start Sound Here" frame, they can be black frames, or frames which say "Advance To Focus."

In sound filmstrip systems which use pictures and sound spliced into continuous loops, the producer must be careful to cue his audio to advance the picture loop through the frames between the last picture frame of the program and the "Start Sound Here" frame before the audio stops.

Four frames are usually used between the last picture frame of the program and the "Start Sound Here" frame to splice the picture loop together. This number should be confirmed with the laboratory before cueing the audio. If the lab does in fact use four frames, then five additional advance cues followed by a stop cue would be placed on the tape following the audio for the last picture frame. (See Figure 17.) This results in the program stopping with the "Start Sound Here" frame on the screen, and the audio tape in position for the start of the program.

Figure 17
Cueing of Continuous Loops to Return to Start



Video Services

Video Tape Format Fundamentals

A variety of formats are available to video labs and their clients. These range in widths from two inches to ¼ inch, and in record time from a maximum of three hours for some of the professional equipment to six hours for VHS home-video cassettes. The various formats can be played only on machines designed for that specific format. Furthermore, unlike motion picture film, which can be used on either 525-line US or foreign 625-line telecine equipment, video tape requires an electronic conversion and re-recording in order to be played on another standard.

The two-inch quadruplex format is available on open reels, and on cassettes for short recording such as spot commercials. One of the one-inch formats is available only on open reels, the other on either open reels or cassettes. However, the latter requires special cassette recording and playback equipment. On the other hand, the ¾-inch, ½-inch, and ¼-inch formats are available only on cassettes which thread automatically when inserted in a recorder or player.

All of the formats described in this handbook are recorded by video heads mounted on a rotating wheel which traverse the tape at a very high speed, compared to the speed of tape travel from reel to reel. In the basic two-inch format, four heads spaced equally on a wheel, scan across the tape at a right angle to the tape motion.

In the SMPTE Type-C 1-inch format, two heads, rotating in a drum assembly, scan the tape diagonally in long, helical tracks at a small angle to the tape motion. One head records the video signal of one complete television field, and the other the vertical-sync interval.

In the cassette formats two heads, also rotating in a drum assembly, scan the tape in a similar diagonal manner. However, each head, in turn, records the video and sync of one television field.

In the SMPTE Type-B 1-inch format each of two heads, rotating in a drum assembly, scans the tape diagonally to record a segment of each field.

The two-inch and one-inch formats provide the highest quality picture and sound reproduction, and are used for broadcast and related production applications. The SMPTE Type-E ¾-inch format, while initially used for educational, industrial, and cable applications, because of advances in technology and resultant higher quality, presently is finding an increasing application in broadcasting and production. The primary use in broadcasting is for electronic news gathering (ENG), and in production for off-line editing.

The SMPTE Type-G and Type-H ½-inch formats are used for home video, whereas the Type-K formats are intended for broadcast use in a combined recorder and camera.

The ¼-inch format is of interest as a means for recording home movies from a black-and-white or color television camera. Because of the short (¾ hour) record time, it has not found application in home-video entertainment-program recordings of motion picture films.

Open-Reel Quadruplex 2-Inch Format

Reels and Record Times

Reel Diameter		Nominal Record Time	Tape Length	
Inches	Millimeters	Minutes	Feet	Meters
6.5	165	10	750	229
8.0	203	22	1650	503
10.5	267	48	3600	1097
12.5	318	74	5540	1688
14.0	356	96	7230	2204
15.62	397	130	9700	2957

Tape Speed

The Primary, nominal rate of tape travel, and that normally used for production and broadcast operations is 15 inches per second (38.1 cm per sec.)

The Secondary, nominal rate of tape travel is 7.5 inches per second (19.05 cm per sec.) The Secondary speed is used only for applications requiring economy of tape at the sacrifice of some moderate loss in picture and sound quality.

Audio Channels

Track 1 Mønaural Program (top edge of tape)

Track 2 Cue, Time and Control Code, or ancillary program signal. (At bottom of tape between video and control tracks)

The width of Track 2 is less than half that of Track 1. Consequently, the quality is marginal for use on program applications such as stereo. In addition, it is subject to cross-talk degradation from the adjacent video and control tracks.

Open-Reel Helical 2-Inch Format IVC-9000

The International Video Corporation Model 9000 provides professional quality video and audio tape recordings with roughly half the tape consumption of quadruplex equipment operating at the normal speed of 15 inches per second. The format was not adopted as an industry standard, primarily because it was produced by only one manufacturer. Nevertheless, the IVC-9000 is in use in several production houses in the US and England.

Open-Reel Helical 1-Inch Formats SMPTE Types B and C

Reels and Record Times

Reel Diameter		Nominal Record Time	Tape Length	
Inches	Millimeters	Minutes	Feet	Meters
6.5	165	20	1000	305
9.0	229	60	3000	915
10.5	267	90	4600	1400
11.75	298	120	6000	1830
12.5	318	150	7500	2290
14.0	356	180	9000	2743

Tape Speed

Type-B 9.646 inches per second (245mm per sec.)

Type-C 9.606 inches per second (244mm per sec.)

Audio Channels

	Type-B	Type-C
Track 1	Stereo left (top edge of tape)	Monaural or stereo right (second from top edge of tape)
Track 2	Monaural or stereo right (second from top edge)	Stereo left (top edge of tape)
Track 3	Time and Control Code or cue (bottom edge)	Time and Control Code or cue (bottom edge of tape)

Notes: The SMPTE Type-B format is a segmented-field helical system.
The SMPTE Type-C format is a continuous-field system.

Two-Inch Quad and One-Inch Helical Parameters

	Quad	Type-B	Type-C
Tape Width	2 inches	1 inch	1 inch
Tape Speed	15 in/sec.	9.646 in/sec.	9.606 in/sec.
Video heads	4	2	1(+1 for sync)
TV Lines/ Head Pass	16	52	241(+15 for sync)
Video Track Length	1.8 inches	3.3 inches	16.2 inches
Writing Speed	1200 in/sec.	950 in/sec.	1000 in/sec.
Drum Diameter	2 inches	1.1 inches	5.3 inches
Track Angle (to tape travel)	90°	14.3°	2.5°
Audio Track 1	Monaural (top edge)	Monaural or Stereo Right (2nd from top)	Stereo Left (top)
Audio Track 2	Cue or Time Code (bottom)	Stereo Left (top edge)	Monaural or Stereo Right (2nd from top)
Audio Track 3	—	Cue, Time Code (bottom edge)	Cue, Cue, Time Code (bottom edge)

Cassette Formats

Tape Width Inches	Type Manufacturers	Type SMPTE	Nominal Record Time Hours
¾	U-Matic	E	1
½	Betamax I	G-B1	1
½	Betamax II	G-B2	2
½	Betamax III	G-B3	3
½	VHS-SP	H	2
½	VHS-LP	H	4
½	VHS-EP	H	6
½	Sony and RCA Proposals	K*	—
¼	Technicolor V-30	J*	¾

*Under consideration for standardization by the SMPTE.

Audio Channels

The SMPTE Recommended Practices for the E, G and H formats provide for two audio channels. However, not all recorders and players are equipped with the second channel.

Tape-to-Tape Duplication

Master Tape

The duplicator is provided with an edited master recording, usually on 1-inch helical or 2-inch quad, for duping to any of the reel-to-reel or cassette formats. Since 1- and 2-inch equipment are provided with integral time-base-correctors, they produce a stable time-base-corrected video signal, and the master may be duped directly without any processing and adjustments other than the setting of video and audio levels. This is done normally using color bars and tone on the leader as a reference (See USA Standard C98.9.)

When the master is on a ¾-inch or ½-inch cassette format, it is recommended that the video signal be processed by a digital time-base-corrector (TBC) to minimize the playback instability resulting from time-base errors in the master recording and in playback of the master.

Particularly in the case of cassette masters, additional processing by a digital noise reducer (DNR) is recommended to improve the quality by improving the signal-to-noise ratio. DNR processing should be used judiciously, in order to avoid objectionable lag or smear on moving objects. A test recording to determine the acceptable level of noise reduction is recommended before making the dupe. Generally, a reduction level of more than 4 to 6 dB may introduce excessive lag.

Color correction of the master may be desirable if the color balance and saturation throughout the recording or the matching among edited segments are unacceptable. This can be accomplished with a composite-signal corrector, either on-the-fly using a joy-stick control, or automatically during duping, in accordance with previously determined correction settings recorded on a punched tape or a floppy-disc storage.

Multiple Copies

The number of dupes that can be made during one playback of a master depends upon the facilities the duplicator can make available. This may vary from a few recorders for 1-inch and 2-inch formats to several hundred of the ¾-inch industrial/educational or ½-inch home video formats.

Short recordings, such as commercials, at some duplicators are recorded on a single reel from a repeated playback of the master, with either manual or automated control. The recorded tape is then cut apart and the individual recordings loaded onto small reels, in an off-line operation.

High-Speed Duplication

Systems have been developed which transfer the magnetic image from a master tape, recorded in a mirror image of the conventional master, to a dupe tape by passing the two tapes in close contact through a strong magnetic field. Because the master tape is a special, high-coercivity magnetic coating, it is not erased by the magnetic field.

The system for two-inch quad is no longer manufactured. The other systems, for ½-inch cassette formats, are in limited use.

Film-to-Tape Transfers

Camera and Projector Telecine Systems

Until the advent of continuous-motion film scanning equipment, intermittent film projectors and photo-conductive television cameras were used universally on 525-line standards for transfer of motion picture film to video tape. Telecine facilities using this system for film transfer have developed to a high degree of sophistication. Color correction can be programmed in a preview of the film and transferred with automatic control of the telecine camera from a computer, or punched tape, or floppy-disc storage of the correction cues. Using variable-speed 16mm and 35mm projectors the elapsed playing time can be compressed or expanded and, combined with

digital audio processing, the audio pitch maintained. Normally, only positive film can be transferred. Although some telecine cameras have been equipped to handle negative film, generally continuous- motion scanners are used for this application.

Several types of tubes may be employed in telecine television cameras. The most widely used is the Vidicon. More recently the Saticon has gained in popularity because of its lower lag, compared to the Vidicon. Also, the Plumbicon, most-used in studio and field cameras, has found limited use in telecines and provides performance similar to the Saticon.

Flying-Spot and Charge Coupled Device (CCD) Scanner Telecine Systems

The advantages of the scanner systems are freedom from lag and the capability of handling positive and negative film equally well. Scanner systems normally operate at 24 frames/sec. on 525-line US standards, and 25 frames/sec. on foreign 625-line standards. When provided with auxiliary video frame-store equipment, they are capable of variable-speed operation for time compression or expansion. In addition, in this mode of operation, it is desirable to provide digital processing of the audio to maintain true pitch.

Tape-to-Film Transfers

At one time, all live delayed broadcast television shows were transferred from video to film. These were known as "kinescopes" because it was merely a film camera photographing a black and white cathode ray tube. With the advent of video tape as a delayed broadcast medium, kinescope recording has declined in numbers and popularity. However, there is still enough tape to film demand to continually advance the State of the Art. Most of today's tape-to-film transfers are in color and the following are three of the principal methods:

Kinescope

The first and most popular is the kinescope method as illustrated in Figure 18, page 40. At the left is a video tape machine for playback. Following is a BB, or black box, that normally includes noise reduction, image enhancement, color masking, gamma correction, etc. Then the signal is displayed on a kinescope, either shadow mask, or in line phosphors at 30 frames per second. This display device can also be 3 cathode ray tubes with either black and white phosphors and appropriate color filters, or cathode ray tubes that have red, green and blue phosphors. These display devices are photographed with a special camera that either eliminates every fifth field and pulls down the film during vertical blanking, or has a special shutter that blanks half fields to make the conversion from 30 to 24 frames per second. A negative, or positive master is exposed and sent to the lab for processing and printing. Although sound can be recorded on the film in single system fashion, the normal method is to record sound separately.

Laser

Another method of transferring tape-to-film is illustrated in Figure 19, page 40, and is known as the laser scan system. The video tape machine, as in system #1, sends its signal to the BB for signal processing. In the laser scan system it is decoded to its red, green and blue video signal and modulates the light emitted from 3 lasers. The light output is combined by mirrors into one beam of light, then mechanically swept at 30 frames per second for vertical sweep and mechanically spun, at horizontal (H) rate, on a spinning prism. The beam is then focused on the film and the film is pulled at the fast pulldown rate and fifth field elimination for 30 to 24 frames per second. The exposed film is then sent to the laboratory for processing and printing.

Electron Beam

The third system is the electron beam recording system, as illustrated in Figure 20, page 41. The video tape machine delivers its signal to the black box for signal processing. The signal out of the processor is converted to 72 frames per second (3 x 24). The video is black and white sequential signal representing the red, green and blue components of the color signal. This time sequential video signal is delivered to an electron beam recorder. The beam writes directly on black and white film that is sensitive to electron bombardment. This film is processed at the lab, then put in an optical printer. When the decoded film red image is in the gate of the projector, a red filter is spun in front of it, and the red sensitive layer of the color film (loaded in the color film camera) is exposed. The color film then stays still and the black and white film is then shuttered and moved to the decoded film blue image, and the filter wheel is moved to the blue filter, and the blue sensitive layer of the color film is exposed over the red layer. The color film again does not move, while the black and white film is moved to the decoded film green image, and the filter wheel is moved to the green filter, and the green sensitive layer of the color film is exposed over the red and blue layer. Then the color film is shuttered and moved to its next frame and the whole exposure index starts over again, after which the color film is sent to the lab for processing.

Figure 18

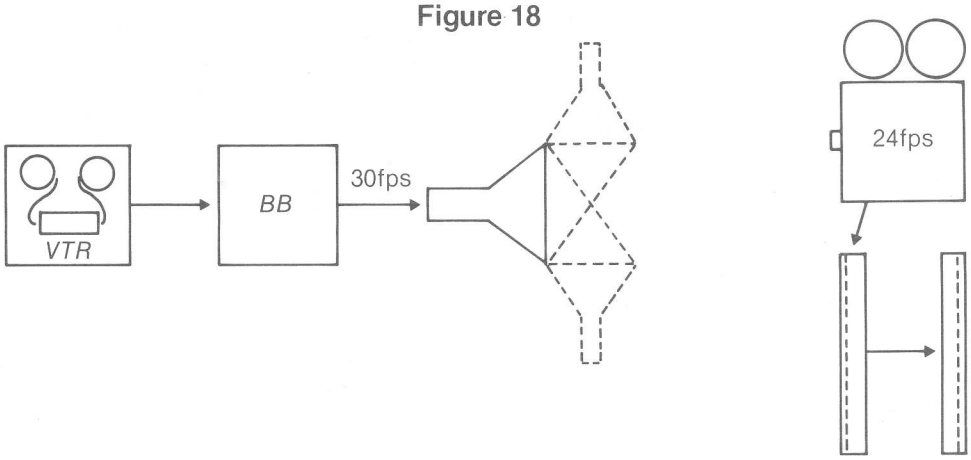


Figure 19

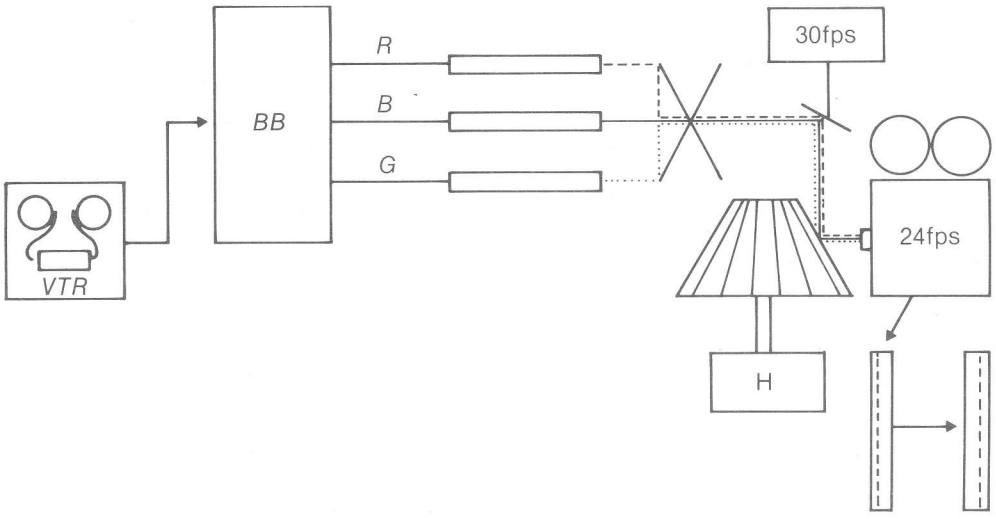
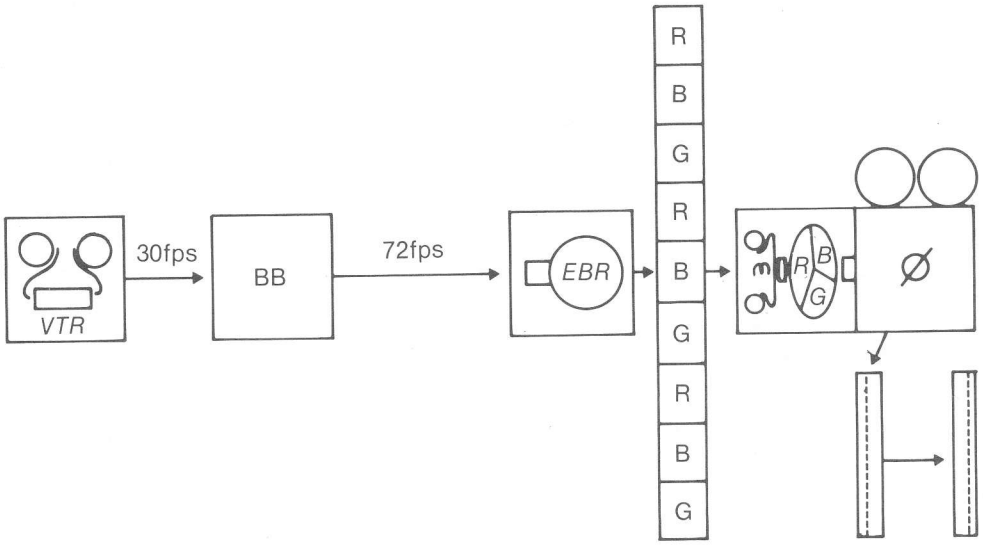


Figure 20



SMPTE Time Code

Code Format

The SMPTE Time Code was developed to provide a recorded frame-accurate identification signal on video tape for use in post-production editing. It consists of an eight-digit digitally-encoded signal recorded on an auxiliary audio track in the vertical-synchronizing interval of the video signal. The eight digits most frequently are allocated, two each, for hours, minutes, seconds, and frames in real clock time. Alternatively, the start or zero time of the code may be referenced to an abstract time; as an example, the start of a shooting session, or the "roll tape" start of a "take."

Supplementary Coded Information — User Bits

Another variation preferred by some producers is to delete the hour notation and substitute reel numbers, or if more than one camera is used, camera numbers. However, the code format is designed to accommodate such supplementary information, without the need to delete or disturb the time code, by the use of additional **User Bit words.** Of the total of 80 bits in the full code signal, 25 are designated as User Bits. These can be used by the director to record references such as "scene 10-take 11," date of recording, etc.

An example of a different, technical application for the User Bits is to record a synchronizing reference signal from an audio recorder operating in conjunction with the video tape recorder.

Non-Drop-Frame Mode Timing Error

In the use of the SMPTE Time Code for some applications, consideration must be given to a small error in real time that is inherent in the generation of the signal. Because the code is generated in synchronism with the color video-signal frame rate of 59.94 cycles per second, rather than the slightly faster ac power-line frequency of 60 cycles per second, the elapsed time of a one-hour time-code count will be in error by plus 3.6 seconds (0.06 seconds per minute).

Drop-Frame Mode

In most editing work this is of no consequence. Nevertheless, when a precise count of time is required this can be provided by operation in the Drop-frame mode, wherein the count is corrected automatically approximately every minute. It is essential that all material for a production be recorded with the same time code format, i.e.: Drop-frame or Non-drop-frame, since most computer editing programs cannot handle a mix of the two.

Video Tape Editing

The several different procedures for electronic editing on video tape may be classified broadly as On-line and Off-line. In On-line editing, the original first-generation recordings are used directly. The alternate Off-line methods use dupes of the original material, usually on another format for reasons either of lower cost or convenience. The Off-line edited tape then is used to conform the original material in a computer-controlled On-line editing system.

On-line Editing

On-line editing systems are available for use with 2-inch (quad or helical formats), 1-inch (Type-B or C formats) and ¾-inch video tape equipment. In addition, some recorders are equipped with an editing capability and can be used for insert and assembly editing without the use of external equipment. However, if effects other than cuts among tapes are required, the use of an editing system is necessary. On-line editing studios typically use one record and two playback VTR's, with a third playback available, if required. In addition to the normal video switching, dissolves, and split screens, titling by means of a character generator and electronic frame-store special effects can be made available, providing arrangements to reserve the facilities are made in advance of the editing session. Other supplementary facilities include black-and-white titling cameras for use with graphic-art cards, transparent 2 x 2 slide-transmission equipment, and audio tape playback equipment which can be synchronized with video equipment.

Off-line Editing

Off-line editing systems utilize either ¾-inch or ½-inch cassette video tape equipment to permit editing decisions to be made on dupes from the original one or two-inch recordings, much in the same manner as a work print is used in film editing. In the simplest form, the editor may merely make notes of his decisions, including the footage or SMPTE Time Code identification where cuts, dissolves, or other special effects are to be made in the final, edited tape. The time code may be displayed on a reader, or superimposed on the video signal for display on a picture monitor. Generally, however, a computer- controlled editing system with three video tape machines, two playback and one record, is used to produce an edited dupe. After approval by the producer or director, this tape may be used as an instruction for assembly of the original material onto an edited master using an on-line system. Alternatively, if the facility is available, a recording of the off-line edit decision list on a punched tape, or more commonly a floppy disc, can be used with an assemble edit computer program to produce the edited master automatically.

With the increasing use of the narrower, helical formats for broadcast and cable originations, many off-line editing facilities are provided with the ancillary equipment for special effects and graphics so that they can serve for on-line editing, as well.

Care and Handling of Video Tape

Recording and Playback Environment

Control of temperature and humidity in operating areas is necessary in order to avoid tape and head damage, and signal distortions. Excessive temperature or humidity can cause a significant reduction in head life, and low humidity can result in static discharges which, in turn, may appear as flashes in the picture. Static discharges also can wipe out the programming of

computer-controlled editing systems and necessitate a time-consuming reloading of the program.

Before recording or playback, tapes that have been exposed to temperature or humidity conditions outside those specified in this handbook should be acclimatized for 24 hours. Failure to observe this precaution can result in playback picture distortions and permanent tape damage. It is of particular importance in the case of helical recordings to be used in playback without the benefit of time-base correction (TBC), for example; home video, industrial and educational applications. The most prevalent distortion will be horizontal synchronizing errors, evidenced as skewing at the top of the picture.

Before recording on a new cassette, it is advisable to fast forward and rewind, in order to relieve the tension from the tight wind normally provided by the tape manufacturer.

Cleanliness in storage and operating areas, as well as shipping and receiving, is essential if an increase in dropouts is to be avoided and head life maximized.

The metal foil used on the end of cassette tapes to actuate automatic rewind circuitry causes a deformation of the tape wind for several layers back from the tail end. This departure from an even, cylindrical wind may result in mistracking upon playback. Consequently, it is not advisable to use the last five minutes of a cassette for program recording.

Recommendations for environmental control are listed below.

Temperature, storage and operating areas	70 ± 4 °F 21 ± 2 °C
Humidity, storage areas	50 ± 20% RH
Humidity, operating areas	50 ± 10% RH

Note: The tolerance on humidity for operating is narrower than that suggested for storage areas in order to reduce the possibility of static discharges and to reduce the time-base errors encountered with helical equipment. This tolerance is narrower than that permitted by the SMPTE in RP-103 in order to provide recordings with more-nearly optimum recorded track dimensions.

Dust, storage and operating areas	90% filter efficiency

Note: The figure for dust filtering is based upon the National Bureau of Standards Dust Spot Efficiency Test — Atmospheric Dust.

Building Conditions

Floors should be finished so that pedestrian traffic does not generate dust or debris. Tile floors should not be waxed. Cement floors and walls should be sealed. Carpeting, if used, should be indoor-outdoor type with static-drain treatment. Smoking, eating, and drinking should not be permitted in operating areas, or where tapes are being packed or unpacked.

Cleaning of Tape Equipment

All surfaces of the transport that are in contact with either side of the tape should be cleaned frequently in accordance with the manufacturer's instructions. Quad equipment, where oxide shedding is more prevalent, should be cleaned after each use. This applies to the video and audio heads, as well as the capstan and guides.

Storage of Tape

It is recommended that open reels and cassettes be given a continuous, smooth full-length rewind before storage. Reels and cassettes should be stored vertically so that telescoping of the wind will not occur. Reels should be stored in such a manner that they are supported by their hubs. The outer end of the tape on a reel should be secured by an adhesive strip that will leave no residue after removal. Materials such as masking tape or electrician's tape are unacceptable. Reels of tape and cassettes should be stored in boxes designed for the purpose.

Shipping of Tape

The recommendation for a smooth rewind in order to provide a uniform and even winding before storage applies to tapes to be shipped, as well.

Shipping containers should be designed to withstand rugged handling without the tape or reel incurring damage. Heavy reels used for 1-inch and 2-inch tape should be supported in the container by the hub, and be free to rotate inside the container. The end of the tape should be secured in the manner recommended for storage.

Unrecorded, raw tape stock can withstand a wide range of temperature and humidity during shipment without deformation or damage. However, recorded tapes may be subject to dimensional changes under extreme conditions of temperature and humidity, which will result in time-base and tracking errors. In general, extreme conditions of temperature and humidity should be avoided.

Glossary and Definition Of Video Tape Terms

Balance (White Balance) Equal levels in the red, blue and green signals which produce a neutral gray scale from black to white. Imbalance in color-signal levels will result in incorrect color values in the reproduced picture.

Banding In quadruplex recording, evenly spaced horizontal bands across the picture, each 16 or 17 scanning lines in height, which differ in brightness, color hue or saturation, or noise level from the rest of the picture.

Blanking The portion of the video signal intended to prevent visibility of the scanning beam during horizontal retrace to the left of the picture, and vertical retrace to the top of the picture.

On an underscanned receiver or monitor, the blanking signal will be seen as a black border on all sides of the picture. The FCC Rules and Regulations require that blanking not exceed 11.4 microseconds for horizontal and 21 scanning lines for vertical.

Camera Match Identical brightness and color reproduction of signals from two or more cameras improperly matched may exhibit differences in level, color balance or colorimetry, which will cause picture quality to change from shot to shot. One of the most critical tests of camera match is on skin tones.

Cassette An assembly of two spools of tape in a case, designed to be inserted into a tape transport for automatic record or play.

CCD Scanner A telecine device for the transfer of motion-picture film to a video signal using an incandescent light source with a continuous-motion film transport, and charge-coupled-devices (CCD) to sense the film image line-by-line. On US 525-line standards the film moves at the standard film projection rate of 24 frames/sec. On foreign 625-line standards the flm moves at 25 frames/sec. See: Flying-Spot Scanner.

Chroma Level Color saturation. Low chroma level produces *pastel, washed-out* color. High chroma level produces *heavy, saturated* colors.

Chroma Noise Noise appearing in color areas of a picture, usually most noticeable in highly-saturated reds and blues.

Cinching Slippage between layers of tape in a loosely-wound reel which appears as a series of *buckles, creases,* or *folds.*

Clipping A limiting circuit, usually incorporated in cameras, to prevent overly bright or dark signals. When improperly adjusted, *clippers* can cause a loss of picture information in very bright or very dark areas. Clipping can occur also because of a circuit malfunction.

Color Frame The number of television frames during which the phase of the reference color synchronizing burst, relative to horizontal sync, completes a phase reversal and returns to the initial relationship. In US 525-line standards this is two frames, or two pairs of interlaced fields. In foreign 625-line PAL standards, a color frame is eight fields. If an edit is made between two signals which are not in the

same color-frame timing, a horizontal displacement equal to a half cycle of color subcarrier will occur. See: Edit Errors.

Colorimetry The color analysis in a camera, or color reproduction by a receiver or monitor. Television cameras may not reproduce all colors accurately because of differences in pickup tubes (for example, Plumbicons compared to Saticons) and in optical components. Differences among picture-tube phosphors will be evident as errors in color reproduction.

Compression Lack of separation in signal levels. Commonly called *Black Compression* or *White Compression* indicating a lack of detail or gradation in the very dark or very light areas of the picture.

Control Track A synchronizing signal on the edge of the tape which provides a reference for tracking control and tape speed. Control tracks which have heavy dropouts, or which are improperly recorded, may cause tracking errors or picture jumps. See: Tracking.

Crease A tape deformity remaining after a *fold* has been corrected by rewinding. The effect is a discontinuity in the playback picture, in helical as a vertical or diagonal line, in quad as a dot every 16 or 17 scanning lines.

Cue Track An audio track used for information related to production requirements, electronic editing time-code signals, or an ancillary program audio signal.

Deck The tape transport elements and their support plate.

Degauss To remove all remnants of magnetism from tape, or magnetic materials such as video and audio heads, by subjecting it to an alternating magnetic field of gradually diminishing strength.

Degausser An ac-powered device to demagnetize tape or magnetic materials.

Demodulator The section of video tape playback equipment which recovers the video signal from the tape-recorded FM signal.

Deviation In FM systems used for video tape recording, the difference in the frequencies corresponding to *sync tip* and *peak white,* or the frequency corresponding to the peak luminance or chrominance signal. See: Over-deviation.

Dropout Loss of picture information because of imperfections in the magnetic coating of video tape, or the presence of dust particles on the coating.

Dropout Compensator (DOC) An electronic device that detects the presence of a dropout and replaces it with similar information from another part of the picture, usually from the preceding scanning line.

Dub A tape copy produced by any duplication process. To dub: To make a tape copy.

Edge Curl Edge curl usually occurs in the outside 1/16th inch of the video tape. If the tape is sufficiently deformed it will not make proper contact with the play-back heads, resulting in a loss of the audio, cue, or control signal.

Edit Errors A normal edit will produce a change of picture without disturbing synchronizing pulses or the video signal. An improperly made edit may produce a momentary flash, video dropout, color-hue shift or, if color frames are not matched, a horizontal shift of the picture at the edit point. See: Color Frame.

Edit Pulse (Frame Pulse) A pulse derived from vertical sync, and occurring during the vertical-sync interval of the even field recorded on the control track. The pulse was used in early mechanical, cut-and-splice editing, and in later equipment to control electronic editing equipment.

Enhancement A form of signal processing which artificially increases image sharpness by accentuating the transitions of edges within the picture. Enhancement must be used judiciously, if excessive ringing and an objectionable increase in noise are to be avoided.

First-Line Error In quadrature recording, a velocity error (color hue difference) confined to the first line of the 16 or 17 scanning lines from each of the four video heads on the head wheel.

Flagging A horizontal displacement of the upper portion of a picture played back from a helical video tape machine, without time-base correction (TBC), where the tape tension or *skew* adjustment is incorrect. The displacement becomes increasingly greater nearer the top of the picture and usually varies randomly. The effect is greater on some receivers, particularly of older, US manufacture. Because of the faster horizontal-sync time-constant of Japanese manufactured receivers, they are not subject to the effect. Also called: Skewing.

Flying-Spot Scanner A telecine device for the transfer of motion-picture film to a video signal using a scanned blank television cathode-ray tube as a light source with a continuous-motion film transport, and photo-electric cells (PEC) to instantaneously sense the film image. See: CCD Scanner.

Hum A 60 Hz powerline signal, or 120 Hz harmonic, which has cross coupled into the video signal, or into camera or monitor horizontal scanning circuits. In the video signal it will appear as a horizontal line or bar moving slowly up the picture. In sweep circuits it will result in a horizontal displacement of scanning lines and appear as a scalloping of vertical lines, slowly moving up the picture.

Interchange The ability of a tape recording to be reproduced properly when played back on a machine other than the one on which it was recorded. Non-interchangeable recordings generally result from recorders not in alignment in accordance with the manufacturer's specifications, or extreme conditions of temperature and humidity during recording.

Lag (Comet Tail) Under some lighting conditions and high-contrast scenes, camera pickup tubes may be subject to image retention in bright areas of the picture, which will appear as *comet tails* or *smears* when the camera is panned or the bright objects move. Because of differences in retention response among pickup tubes, *lag,* or the resultant comet tail, often appears in color.

To correct this shortcoming, some pickup tubes have an Anti-comet-tail (ACT) design feature.

Level In video, measurement of a video-signal voltage, relative to either blanking or sync. A low signal level indicates low brightness and contrast. In audio, a measurement of signal voltage, usually in Volume Units (VU's) on a Volume Indicator (VI). Some audio mixers, particularly in Europe, prefer to use meters which indicate the peak-signal level, rather than the approximation of the root-mean-square (RMS) level indicated by VI's.

Microphonics (Video) Video level distortions caused by sound or mechanical vibration picked up by sensitive pickup tubes or other video equipment. These appear as random horizontal lines and bars across the picture.

Moire The effect produced when a signal of one frequency is superimposed over another signal of a different frequency. This may be observed when a pattern such as a pinstriped suit is transmitted through a television system. When the camera is close enough to resolve the stripes, the striped area will flicker with larger stripes of light and dark. Multi-color effects are produced

when the frequency of the stripe signal approach sub-carrier frequency. In some video tape equipment, moire is produced by the FM carrier frequency overlapping the color sub-carrier.

Noise (Video) A random signal generated in cameras and transmission systems and present throughout the video signal spectrum. Noise in picture signals is similar in concept and appearance to film grain.

Over Deviation (Bearding) Caused by a high chroma or video signal level which results in FM signal frequencies in excess of those which can be recorded on tape.

Port-Hole Shading A brighter circular area in the center of a picture.

Phase (Color) Hue color signals in correct phase will reproduce color as picked up and encoded by the camera. Signals which are *out of phase* will exhibit *hue shift.* The most noticeable and objectionable hue shift generally occurs in flesh tones, resulting in magenta or green reproduction of faces.

Registration The alignment of the red, green and blue images precisely on top of one another. When one or more of the color images are misaligned slightly, color fringing appears at sharp transitions. Gross misalignment will result in clearly displaced red, blue, or green images.

Resolution Subjectively apparent as sharpness. The ability of a system to reproduce fine detail and sharp edges.

Retention An image which remains for a period of time after exposure. The condition is more prevalent with some types of camera tubes than others. The effect is not present with continuous-motion telecine scanners. See: Lag.

Ringing An edge effect which is commonly seen on sharp black-to-white or white-to-black transitions. Ringing appears as a secondary edge (or ghost edge) on the right hand side of a transition. When excessive image enhancement is used, ringing may appear on all sides of a sharply defined object, or in titles and graphic art work.

Safe Title and Safe Action Areas Geometrical boundaries recommended by the SMPTE (Society of Motion Picture and Television Engineers) as guidelines to avoid the placement of important titles or action in areas of the picture which may be cropped on overscanned home receivers.

Scratches Video tape scratches appearing in quadruplex recordings as an evenly-spaced series of dropouts forming a diagonal line across the picture. In helical recordings, a scratch will appear as a solid line. See: Creases.

Shading (Color) Uneveness in level in all or one or more of the red, green, or blue color signals, producing color variations in some areas of a picture, or throughout a field. See: Porthole Shading.

Shedding A condition in which the oxide, which forms the recording surface of the videotape, has begun to separate from the base. Loose oxide may clog videoheads, causing a loss of picture.

Streaking (Clamp) An electronic defect which results in a brightness change of one or more television lines containing the reproduction of a bright object.

SMPTE Time-Code A digital code of recorded or real time, and other identification information useful for electronic editing, recorded either in an audio cue track or in the video signal with the vertical synchronizing pulses.

Sync Synchronizing pulse. The pulses in the video signal which provide a synchronizing reference for each frame and scanning line of the picture. Defects in this pulse may cause picture *jump, roll,* or *breakup.*

Telecine A motion picture projector and a television camera or film scanner dedicated to the transfer of motion-picture or slides to television video and audio signals. See: Flying-Spot Scanner and CCD Scanner.

Time-Base Error A variation in the repetition rate of a video signal, compared to a stable, color synchronizing signal. All video tape signals are subject to time-base errors, which is eliminated in professional equipment by an *analog or digital* time-base corrector (TBC). In the lower-cost helical formats, where the high cost of a TBC cannot be justified, the resultant time-base errors may be large enough to cause geometric distortion of the picture. See: Flagging.

Thread To unwind tape from the supply reel, or take-up reel, and feed it through the transport onto the other reel, to be ready for record or playback, or for rewind. In Britain: Lace.

Tracking The process by which the video head on a playback machine follows exactly the same path as that of the video head during recording of the signal. Loss of tracking is evidenced by picture break-up or loss of video in segments of the picture. The recorded control-track signal, used to maintain tracking, is the *electronic* equivalent of *sprocket holes* in film.

Transients Spurious interference in video signals from sources such as power lines, motors, fluorescent lights, power switches, or other video signals, causing flaws in the picture in the form of flashes, or either stationary or moving patterns.

Velocity Error Evenly-spaced horizontal sections of a picture from a quad playback which exhibit hue shift from the top to bottom of each section. It may be described as a *color venetian-blind* effect. In helical recording it appears as a continuous hue shift from the top to bottom of the picture.

Vertical-Interval Time Code Time Code recorded in the vertical synchronizing pulse interval of the video signal.

Wrinkles A physical deformity of the video tape. Any crease or wrinkle in video tape, before or after recording, may produce dropouts or loss of picture information upon playback.

Business Practices

Industry custom

Because of the extraordinary nature of our industry, the motion picture and video laboratory offers a very special service. Its work begins with the receipt of film or video tape which has been exposed or recorded by a customer. The quality of the image is often unknown. Image quality cannot be determined until all the intricate processes have been completed and the final product evaluated. Despite the continuing improvement in lab techniques and procedures, results cannot be guaranteed, for the very nature of the industry places the lab at the mercy of very complicated mechanical, electrical and chemical devices and processes, as well as human frailties. The laboratory's charges for its services are based only on the fact that it is processing, printing or duplicating a particular type of film or tape and does not take into account the indeterminate intrinsic value of the image. In the interest of good customer relations, and understanding as to the laboratory's responsibility for loss, the following standard conditions have been established by custom and practice.

Limitation of laboratory liability

Since the intrinsic value of the Customer's film or video tape clearly exceeds and bears no relationship to laboratory charges for processing, printing, duplication, and other services, the Laboratory, in accord with general practice and custom in the industry, assumes no responsibility for loss or damage from any cause whatsoever, including loss resulting from the negligence of laboratory employees. Notwithstanding the aforegoing, in the event of loss, damage or destruction of any such films or tapes of the Customer as a result of negligence, the Laboratory will reimburse the Customer for the cost of the raw stock or tape and any laboratory charges incurred in connection with such film or tape, and this responsibility shall fix the limit of laboratory liability, there being no other warranty or liability.

Laboratory warranty

Should a print or video tape be found defective, or labeled or shipped in error, the laboratory will promptly replace or repair such defective print or tape and/or correct an error in shipment at its expense provided the defective print or tape is returned and written notice of such imperfection and/or the error in labeling or shipment is given the Laboratory within ten days after its arrival at destination. But in no event shall the Laboratory be liable for any consequential damages.

Customer's liability

The Customer assumes all liability under the copyright laws and under any and all other statutes arising out of the performance by all Laboratories of any services for the Customer and agrees to indemnify and hold the Laboratory free and harmless of all suits, claims for damages and other liability and expense which may arise either directly or indirectly of or by reason of services performed by the Laboratory for the Customer.

Storage of customer's material

It is advisable not to store the original and protection master film or tape in the same place. Laboratories normally store at no charge customer's active pre-print material for printing or duplication. Laboratories may charge for storing inactive materials. Many laboratories have limited storage capabilities and outside film and tape storage facilities are available. Check with your ACVL laboratory.

SMPTE Test Materials For Motion Pictures And Television

Society of Motion Picture and Television Engineers
862 Scarsdale Ave., Scarsdale, N.Y. 10583 (914) 472-6606

WHAT IS THE SMPTE?

The Society of Motion Picture and Television Engineers (SMPTE) is one of the world's foremost engineering societies in the fields of motion pictures and television. Since 1916 the SMPTE has played a major role in standardization, and has been a strong influence in encouraging good engineering practices in the industry. For its engineering work, the SMPTE has received an Oscar from the Academy of Motion Picture Arts and Sciences and two Citations from the Academy of Television Arts and Sciences.

SMPTE maintains an engineering staff at SMPTE Headquarters to oversee and coordinate engineering committee activities. SMPTE test films are produced under the supervision of the engineering staff.

SMPTE sponsors two National Standards Committees under the American National Standards Institute (ANSI) and operates the Secretariat of the International Standards Organization Technical Committee on Cinematography (ISO/TC36).

As a membership organization with over 8,000 individual members and 160 Sustaining (company) Members, SMPTE's activities include the publication of the monthly *SMPTE Journal,* and sponsorship of annual technical conferences and equipment exhibits. Additional information about the SMPTE may be obtained from SMPTE Headquarters, 862 Scarsdale Ave., Scarsdale, NY 10583.

SMPTE TEST MATERIALS

The test materials in this catalog were planned by technical committees of the SMPTE after considerable research and consultation. They have many uses in the motion-picture and television fields. SMPTE test films provide simple equipment performance checks without the use of expensive, complicated test equipment.

A FEW WORDS ABOUT FILM USE, CARE AND STORAGE

Test films are precision measuring tools. For their continued usefulness and reliability they should be given reasonable care in use and storage. The following specific recommendations and precautions applicable to all test films should be recognized:

1. Equipment should be checked for normal mechanical functioning and operation prior to running any test film, to insure that the film is not damaged during use.

2. Physical distortion, dirt, scratches, and similar defects, generally render any test film inaccurate. The film should be stored on good quality reels or cores in a protective enclosure, and should be inspected periodically.

3. When critical judgments are to be based upon test film performance, it is good practice to maintain two copies: one in active use and the other as a control. By periodically comparing the control with the working copy, changes in the film can be distinguished from changes in the equipment under test.

4. A statistical log should be kept of test film run results on a particular piece of equipment. This will be useful in determining the need and effectiveness of equipment maintenance.

5. All test films are on safety base stock.

6. Magnetic films should be kept away from power lines and magnetic sources.

7. All test films are fragile. They wear out with use and with age. Reliability must be carefully watched and films replaced when questionable. Color films lose their color balance after one or two years.

8. Attention should be given to a film's emulsion position. SMPTE Recommended Practice RP 39 gives specifications for maintaining an "emulsion-in" position. At present, 35-mm SMPTE picture-only and picture-with-sound test films, as well as the 35-mm Subjective Color Reference test films and the photographic 35-mm sound-only test films, are supplied to the user in the "tail-out, emulsion-in" position on 2-in cores. They should be rewound by the user "emulsion-in" on 3-in cores for storage. Some 16-mm and super 8-mm test films are supplied in "emulsion-out" configuration, others as "emulsion-in" items, as the case may be. Wherever the "emulsion-in" condition can be achieved and maintained, improved performance will result. *However, care should be taken that the equipment has been designed to allow the use of "emulsion-in" rolls, because otherwise the first run could damage the film permanently.*

9. More details on the care and handling of test films are available from SMPTE headquarters. Recommended Practices pertaining to all films are also available from SMPTE Headquarters. SMPTE Recommended Practices RP 39 and 45 give especially useful advice on the use and care of test films.

LIMITED WARRANTY

SMPTE Test Materials are made in accordance with SMPTE Recommended Practices.

If, for any reason, the purchaser is not satisfied with any test materials purchased from SMPTE, the materials may be returned, postage prepaid provided they are in good condition and are not damaged by mishandling, misuse, or alterations.

SMPTE warrants this product to the original purchaser to be free from defective materials and workmanship, and to furnish a new or equal part in exchange if any such defect is found.

The period of this warranty covers ninety (90) days from date of purchase. This warranty entitles the original purchaser to have the warranteed item rendered at no cost for the period of the warranty described above when delivered to SMPTE with proof of purchase.

This shall be the exclusive warranty and neither this warranty nor any other warranty expressed or implied shall extend beyond the period of time listed above. In no event shall SMPTE be liable for consequential economic damage or consequential damage to property.

HOW TO ORDER

Contact:

SMPTE Test Film Department
862 Scarsdale Avenue
Scarsdale, New York 10583

Now Available in ¾-inch and ½-inch Formats.

The SMPTE Video Tape Cassette For Receiver/Monitor Setup

SMPTE's test tape cassette is used for the subjective evaluation of receiver or monitor setup and for checking out the overall video and audio performance of magnetic helical-scan tape reproducers, having provisions for reproducing the NTSC signal.

Here's what this unique test cassette contains.

Video

(a) A recorded seven-step gray scale signal.

(b) A recorded color bar signal.

(c) Closeups of female and male models for skin tone evaluation and general definition.

(d) Selected indoor scenes showing samples of sky, architecture, and human models with outdoor illumination.

(e) Patterns for Safe Action and Safe Title Areas.

(f) A crosshatch pattern to check scanning linearity.

(g) A dot pattern to check picture tube convergence.

(h) A full red field to check picture tube purity having the same luminance and chrominance as the red bar in a 75 percent color bar signal.

Audio

(a) Commentary describing the scenes and calling attention to the reference material and its relationship to proper receiver/monitor setup.

(b) Orchestral music for evaluation of general audio reproduction.

No test instruments are required.

A commentator describes each scene and what it is intended to check.

Each cassette comes in a case and is accompanied by a Wratten 47B blue filter (or equivalent) and an instruction sheet on tape usage.

Made in accordance with SMPTE Recommended Practice RP 96

V3-RMS ..... **¾" Type E (U) Format**
V2-RMS-B1 ..... **½" Type G One Hour (Beta) Format**
V2-RMS-B2 ..... **½" Type G Two Hour (Beta) Format**
V2-RMS-V ..... **½" Type H Two Hour (VHS) Format**

Announcing SMPTE's Brand New 16-mm Color Jiffy Test Film.

THE JIFFY

SMPTE Jiffy Test Films contain a series of picture and sound samples to help you subjectively evaluate the performance of your projector. Titles appear in each section to indicate what is being tested and the purpose of the test. The film is easy to use. No special instruments are required. Each film is accompanied by an instruction sheet indicating the procedure to be used in checking out the projector's sound and picture characteristics.

All versions of the Jiffy test film are made as prints in accordance with SMPTE Recommended Practice RP 18.

P16-PP-C ..... **(160 ft, 16-mm color film, photographic sound)**

The films have 1R-3000 perforations.

The black-and-white Jiffy, for years SMPTE's most popular film, is still available in 16-mm photographic (optical) sound only. This Jiffy is a print with 1R-3000 perforation. It is made in accordance with SMPTE Recommended Practice RP 18.

The SMPTE Jiffy films check out these important functions:

For sound:

- Faithful Reproduction of Wide-Range Music
- Piano Sound for Checking Wow and Flutter
- Correct Soundtrack Guiding (buzz track for photographic sound version only)
- Compromise Sound Focus (photographic sound version only)
- Frequency Response at Normal Program Level
- Dialogue Intelligibility

M16-PP-C ..... **(150 ft, 16-mm color film, magnetic sound)**

For picture:

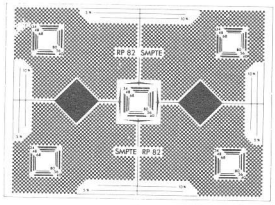
- General Image Steadiness (vertical and horizontal)
- Uniform Projected Picture Brightness
- General Picture Quality (sharpness and contrast)

P16-PP ..... **(135 ft, 16-mm black-and-white film, photographic sound)**

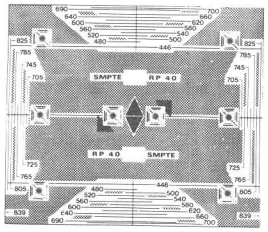
PROJECTOR PERFORMANCE TEST FILMS

SMPTE's projector performance test films help you get the best possible image on the screen. The films are used to measure and adjust your projector's optical and mechanical functions. Some of these films can also be used in the film laboratory to test printers. Registration films are available in super 8, regular 8 and 16-mm formats. Projector Alignment and Image Quality test films are available in 16-mm, 35-mm and 70-mm formats.

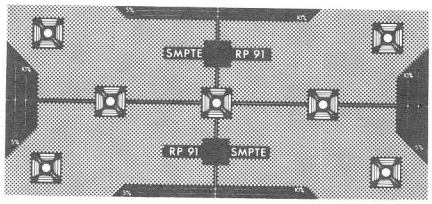
Projector Alignment & Image Quality Test Film



16 mm



35 mm



70 mm

These films are produced in the 70, 35, and 16-mm formats, and are three of SMPTE's most versatile films. Their purpose is the quantitative measurement of projector adjustments that affect the visual image. The 70-mm and 35-mm versions of the test pattern are supplied in two sections, printed on different film stocks to facilitate their use in different test situations. The first section is on black-and-white silver image stock. The second section is on color print film stock, utilizing the top magenta layer only. The two sections are spliced together. The 70-mm and 35-mm black-and-white sections can also be ordered separately. The 16-mm version is only supplied in black-and-white.

The 35-mm and 16-mm versions have short-pitch perforation and can thus be used also for the following motion-picture laboratory applications: (1) optical printer alignment; (2) focusing of the projector of an optical printer; (3) contact printer resolution checking; (4) contact printer weave checking; (5) contact printer double-exposure alignment; (6) step-contact printer image steadiness checking; (7) title stand alignment.

The three films are produced as prints. The 70-mm and 35-mm versions read correctly with the emulsion toward the observer. The 70-mm version has KS-1870 perforation and is made in accordance with RP 91. The 35-mm version has BH-1866 perforation and is made in accordance with RP 40. The 16-mm version reads correctly through the base. It has 2R-2994 perforation and is made in accordance with RP 82.

PROJECTOR ALIGNMENT AND IMAGE QUALITY TEST FILMS

70-IQ . . . . . **(200 ft, 70-mm film, color and black-and-white)**
70-PA . . . . . **(100 ft, 70-mm film black-and-white section only)**
35-IQ . . . . . **(200 ft, 35-mm film, color and black-and-white)**
35-PA-50 . . . . . **(50 ft, 35-mm film back-and-white section only)**
35-PA-200 . . . . . **(200 ft, 35-mm film, black-and-white section only)**
16-PA . . . . . **(100 ft, 16-mm film, black-and-white)**

Universal Jitter, Weave, and Travel Ghost Test Film

This test film has been designed to facilitate the day-to-day operational checking of jitter, weave, and travel ghost in 35 and 16-mm motion picture projectors for theatrical use or in preview rooms, as well as for television applications. It is produced as a camera original in two formats. The 35-mm version reads correctly with the emulsion side toward the observer and has KS-1870 perforation. The 16-mm version reads correctly through the base and has 2R-3000 perforation. Both are made in accordance with SMPTE Recommended Practice RP 27.4. See p. 58 for illustration.

UNIVERSAL JITTER, WEAVE, AND TRAVEL GHOST TEST FILM

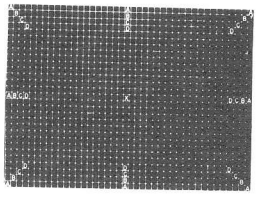
U35-JW-50 . . . . . **(50 ft, 35-mm film)**
U35-JW-100 . . . . . **(100 ft, 35-mm film)**
U16-JW-50 . . . . . **(50 ft, 16-mm film)**
U16-JW-100 . . . . . **(100 ft, 16-mm film)**

35-mm Visual Test Film for Theater Use

This test film contains four different target patterns. They permit the use of the film to (1) check focus and alignment, (2) check the presence or absence of travel ghost, (3) check for jump and weave of the image, (4) check for lens abberations. It is also used to assist in the installation of new projectors and screens, and in maintenance operations on existing equipment. Explanatory titles precede each of the four sections, and detailed instructions are furnished with the film. Because some users prefer loops or continuous lengths for adjusting their equipment, one projector at a time or also in pairs, the targets can also be ordered as separate sections. The film is produced as a print, and reads correctly with the emulsion side toward the observer. It has KS-1870 perforation.

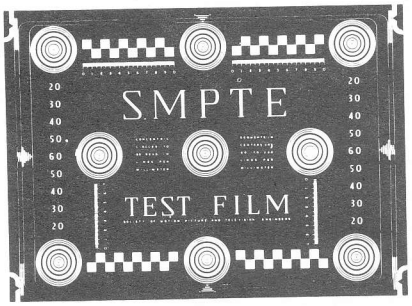
35-mm VISUAL TEST FILM FOR THEATER USE

35-VT . . . . . **(450 ft, 35-mm film, complete version)**
35-FA . . . . . **(100 ft, 35-mm film, section 1 only, Focus & Alignment)**

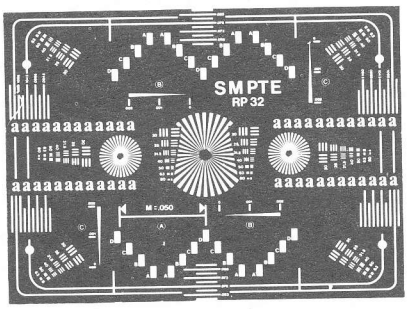


Focus and Alignment Section

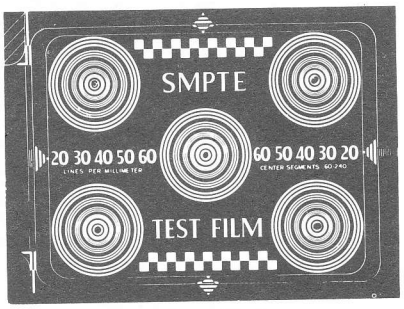
Registration Test Films



16 mm



Super 8



Regular 8

SMPTE's Registration Test Films are used to test and evaluate film projectors and printers. Here are the functions these films can test: For Projectors: Focus Control, Resolution, Shutter Adjustment (travel ghost), Field Flatness (focus distribution), Steadiness (Jump, Jitter, Weave), and Framing Accommodation.

For Optical Printers, these films can evaluate Focus Adjustment, Shutter Adjustment, Framing Accommodation, and Image Size and Adjustment.

For Contact Printers,* these films can check out Resolution, Aperture Alignment, Jump and Weave, Double Exposure Alignment, and Image Steadiness.

They can also be used for Title Stand Alignment.

*The perforation pitch of the super 8 registration test film (S8-RT) is not optimum for continuous contact printers and its value for that purpose is limited.

SPECIFICATIONS

The 16-mm Registration Test Film. This film is produced as a camera original on black-and-white high-resolution rawstock. It reads correctly through the base (i.e., with the emulsion side facing away from the observer). The film has a 2R-2994 perforation. It is made in accordance with SMPTE Recommended Practice RP 20.

The Super 8-mm Registration Test Film is produced as a camera original on color positive print stock. It reads correctly through the base and has 1R-1667 perforation. It is made in accordance with SMPTE Recommended Practice RP 32.

The Regular 8 Registration Test Film is produced as a camera original on black-and-white high-resolution rawstock. It reads correctly through the base and has 1R-1500 perforations. It is made in accordance with SMPTE Recommended Practice RP 19.

16-mm REGISTRATION TEST FILM

16-RT . . . . . **(100 ft, 16-mm film)**

SUPER 8-mm REGISTRATION TEST FILM

S8-RT-50 . . . . . **(50 ft, S8-mm color film)**

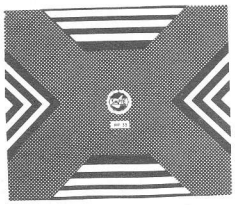
S8-RT-100 . . . . . **(100 ft, S8-mm color film)**

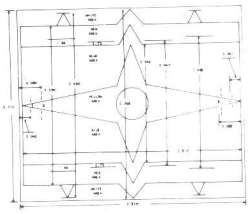
S8-RT-400 . . . . . **(400 ft, S8-mm color film**

8-mm REGISTRATION TEST FILM, TYPE R (REGULAR)

R8-RT-50 . . . . . **(50 ft, 8-mm film)**

R8-RT-100 **(100 ft, 8-mm film)**





35-mm Subjective Picture Test Film—a film for management or non-technical personnel

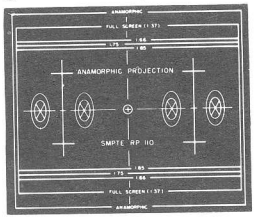
This test film has ben designed to allow non-technical personnel to evaluate projection conditions in a straitforward manner. A sound narration accompanies the visual text and describes the evaluation procedure. Its focus test target is designed to evaluate the optical and mechanical performance of the projection equipment. Its color-zone target is designed to indicate the amount of available film image projected on the screen. Its use is especially recommended for theater managers who wish to carry out a rapid check on projection quality. This film is produced as a print on color positive print film and reads correctly with the emulsion side toward the observer. It has KS-1870 perforation and is made in accordance with SMPTE Recommended Practice RP 33.

35-mm SUBJECTIVE PICTURE TEST FILM

P35-MR . . . . . **(800 ft, 35-mm film, color)**

35-mm Anamorphic Projector Alignment Test Film

This test film shows a target pattern composed of ellipses and perpendicular lines. When projected through a properly adjusted anamorphic projection lens with a horizontal magnification ratio of 2:1, the ellipses will appear on the screen as circles, the lines will appear at proper right angles, and the vertical lines will show the same width as their horizontal counterparts. The circle at the center will appear as an ellipse twice as wide as it is high. They are intended to aid in projector alignment and aperture size evaluation. The target is made to the original anamorphic projection specifications. Its vertical centerline is displaced by 50 mil toward the right with respect to the vertical centerline of the film. (It is displaced *away* from the sound track edge of the film.)



This test film is produced as a print and reads correctly with the emulsion side facing toward the observer. It has KS-1870 perforation, and is on black-and- white material. It is made in accordance with SMPTE Recommended Practice RP 110.

35-mm ANAMORPHIC PROJECTOR ALIGNMENT TEST FILM

35-AT-50 . . . . . **(50 ft, 35-mm film)**

35-AT-200 . . . . . **(200 ft, 35-mm film)**

MAGNETIC SOUND TEST FILMS

SMPTE's magnetic sound test films are used for setting up, testing, and adjusting magnetic sound reproducers designed to operate with perforated magnetic fullcoat or striped films. The test films are supplied in 35, 16, and S8-mm formats. The 35-mm four-track films are produced on triacetate stock with four magnetic stripes and CS-1870 perforation. The 35-mm films are produced on fullcoat film with a choice of triacetate or polyester base. The films on triacetate base have KS-1870 perforation, and those on polyester base have KS-1866 perforation. The 16-mm films are on fullcoat polyester-base material with 1R-2994 perforation. The super 8-mm films are on fullcoat polyester material with 1R-1667 perforation. Super 8-mm films are made in two different types: Type 24 designed for running at 24 frames/s; and Type 18 designed for running at 18 frames/s.

Multifrequency (Frequency Response) Test Films

These films are used to adjust and establish the audio frequency response of 35, 16, and super 8-mm motion-picture magnetic sound reproducers. They carry a series of frequencies over the usable range for each particular format (see table). These films are calibrated films and are supplied with appropriate calibration instructions. The 35-mm and 16-mm films are full-width recordings. The 35-mm films can be used with 2-, 4-, or 6-track studio reproducers; they are calibrated only for the three-track position in accordance with American National Standard ANSI PH22.86. The 16-mm film can be used with center-track reproducers; it is calibrated only for the 200-mil edgetrack position in accordance with American National Standard ANSI PH22.97.

The multifrequency magnetic test films are recorded according to the following characteristics: 35-mm films, 35 microseconds; 16-mm films, 70 microseconds; S8-mm films, a combined low and high frequency characteristic of 90 and 3180 microseconds. The 16-mm films are made in accordance with SMPTE Recommended Practice RP 90, and the S8-mm films are made in accordance with SMPTE Recommended Practice RP 92.

MAGNETIC MULTIFREQUENCY TEST FILM

M35-MF-4 . . . . . **(425 ft, 4-track, 35-mm film)**

M35-MF-T . . . . . **(320 ft, full-width recorded, 35-mm film, triacetate base)**

M35-MF-P . . . . . **(320 ft, full-width recorded, 35-mm film, polyester base)**

M16-MF-P . . . . . **(200 ft, full-width recording, 16-mm film, polyester base)**

MS8-MF-24-P . . . . . **(100 ft, single-track, 24 frames/s, Super 8-mm film, polyester base)**

MS8-MF-18-P . . . . . **(100 ft, single-track, 18 frames/s, Super 8-mm film, polyester base)**

Flutter Test Films

Flutter test films are used to measure the amount of flutter present in 35, 16, and super 8-mm motion-picture magnetic sound reproducers. They carry a signal frequency of 3150 Hz, originally recorded and having an extremely low flutter content. A flutter meter must be used in conjunction with these films. The 35-mm four-track film is made in accordance with SMPTE Recommended Practice RP 79, the 35-mm version in accordance with RP 75, the 16-mm film in accordance with RP 76, and the two types of super 8-mm films in accordance with RP 62.

MAGNETIC FLUTTER TEST FILMS

M35-FL-4-50 . . . . . **(50 ft, 4-track, 35-mm film)**

M35-FL-4-200 . . . . . **(200 ft, 4-track, 35-mm film)**

M35-FL-T-50 . . . . . **(50 ft, full-width recording, 35-mm film, triacetate base)**

M35-FL-P-50 . . . . . **(50 ft, full-width recording, 35-mm film, polyester base)**

M35-FL-T-200 . . . . . **(200 ft, full-width recording, 35-mm film, triacetate base)**

M35-FL-P-200 . . . . . **(200 ft, full-width recording, 35-mm film, polyester base)**

M16-FL-P . . . . . **(100 ft, full-width recording, 16-mm film, polyester base)**

MS8-FL-24-P . . . . . **(50 ft, single-track, 24 frames/s, Super 8-mm film, polyester base)**

MS8-FL-18-P . . . . . **(50 ft, single-track, 18 fames/s, Super 8-mm film, polyester base)**

Signal Level Test Films

Signal level films are used for measuring and balancing the respective power level outputs from two or more 35, 16, or super 8-mm motion-picture magnetic sound reproducers. They are recorded at a constant frequency and level. The recorded level does not in itself indicate a program level unless so specified. It provides a reproducible reference to which a program level can be related. An output meter is used to compare signal level output values from the test films with fixed calibration values.

MAGNETIC SIGNAL LEVEL TEST FILMS

M35-SL-4-50 . . . . . **(50 ft, 4-track, 1-kHz, 35-mm film)**

M35-SL-4-200 . . . . . **(200 ft, 4-track, 1-kHz, 35-mm film)**

M35-SL-T-50* . . . . . **(50 ft, full-width recording, 1-kHz, 35-mm film, triacetate base)**

M35-SL-P-50* . . . . . **(50 ft, full-width recording, 1-kHz, 35-mm film, polyester base)**

M35-SL-T-200* . . . . . **(200 ft, full-width recording, 1-kHz, 35-mm film, triacetate base)**

M35-SL-P-200* . . . . . **(200 ft, full-width recording, 1-kHz, 35-mm film, polyester base)**

M16-SL-P* . . . . . **(100 ft, full-width recording, 400-Hz, 16-mm film, polyester base)**

MS8-SL-24-P* . . . . . **(50 ft, single-track, 400-Hz, 24 frames/s, Super 8-mm film, polyester base)**

MS8-SL-18-P* . . . . . **(50 ft, single-track, 400-Hz, 18 frames/s, Super 8-mm film, polyester base)**

*Note: The films marked with an asterisk, have been recorded at a short-circuit flux of 185 nWb/m. This can be considered as a representative program level.

Channel-Four (Switching Channel) Test Film

This film is used to check the operation and adjustment of the 12-kHz switching circuit of the fourth channel (the surround sound effects channel) in a four-channel 35-mm motion-picture magnetic sound projector. It also permits volume adjustment of this channel. It is made as a 35-mm, four-track striped film with CS-1870 perforation. Its track No. 4 carries a 1-kHz frequency overlaid in parts with a 12-kHz cueing frequency. Track No. 2 carries a 12-kHz frequency throughout. The other two tracks carry no signal.

CHANNEL FOUR TEST FILM (MAGNETIC RELEASE PRINT TYPE)

M35-CH-4-50 . . . . . **(50 ft, 4-track 35-mm film)**
M35-CH-4-200 . . . . . **(200 ft, 4-track, 35-mm film)**

Azimuth Alignment Test Films

These films are used for determining the correct angular position of the magnetic head gap in 35, 16, and super 8-mm motion-picture magnetic sound reproducers. Correct azimuth at an angle of 90° with regard to the direction of travel of the film can be checked by means of a Standard Volume Indicator. The 35-mm four-track film is made in accordance with SMPTE Recommended Practice RP 80, the 35-mm version in accordance with RP 77, the 16-mm film in accordance with RP 78, and the two types of super 8-mm films in accordance with RP 61.

MAGNETIC AZIMUTH ALIGNMENT TEST FILMS

M35-AL-4-50 . . . . . **(50 ft, 4-track, 8-kHz, 35-mm film)**
M35-AL-4-200 . . . . . **(200 ft, 4-track, 8-kHz, 35-mm film)**
M35-ALT-50 . . . . . **(50 ft, full-width recording, 8-kHz, 35-mm film, triacetate base)**
M35-AL-T-50 . . . . . **(50 ft, full-width recording, 8-kHz, 35-mm film, polyester base)**
M35-AL-T-200 . . . . . **(200 ft, full-width recording, 8-kHz, 35-mm film, triacetate base)**
M35-AL-P-200 . . . . . **(200 ft, full-width recording, 8-kHz, 35-mm film, polyester base)**
M16-AL-P . . . . . **(100 ft, full-width recording, 7-kHz, 16-mm film, polyester base)**
MS8-AL-24-P . . . . . **(50 ft, single-track, 5-kHz, 24 frames/s, Super 8-mm film, polyester base)**
MS8-AL-18-P . . . . . **(50 ft, single-track, 5-kHz, 18 frames/s, Super 8-mm film, polyester base)**

PHOTOGRAPHIC (OPTICAL) SOUND TEST FILMS

SMPTE's photographic (optical) sound test films are used for setting up and checking optical sound reproducers and 35 and 16-mm projectors with optical sound readers. The films are produced on high-resolution, fine-grain, black-&-white film. The 35-mm films are prints from an original recording negative and have KS-1870 perforation. They are intended for projection with emulsion toward the lamphouse. The 16-mm films are direct original recordings on special low-shrink base stock and have 1R-3000 perforation. They are intended for projection with the emulsion toward the projection lens.

Multifrequency (Frequency Response) Test Films

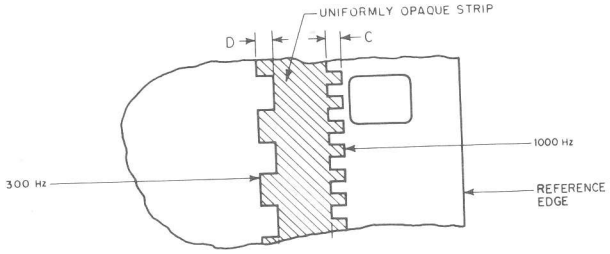
These films are used to check, adjust and establish the proper audio frequency response of optical sound systems of 35 and 16-mm sound motion-picture equipment. The films carry a series of frequencies distributed over the usable frequency range of each particular format (see table). A frequency tone for initial amplifier gain adjustment and for the range selection of the output meter is also provided. Each film is individually calibrated and accompanied by a sheet of correction values.

PHOTOGRAPHIC MULTIFREQUENCY TEST FILMS

P35-MF . . . . . **(250 ft, 35-mm film)**
P16-MF . . . . . **(150 ft, 16-mm film)**

Buzz Track Test Films

These films are used for determining the proper lateral positioning of the scanning beam slit in relation to film travel. The sound record area is opaque so that when the slit is correctly positioned no sound will be heard. On each side of the opaque center strip is a square-wave recording. The one next to the picture has a frequency of 300 Hz and the square wave next to the film edge has a frequency of 1 kHz.



By identifying the tone, the user can determine the lateral direction of slit misadjustment. The 35-mm film is made in accordance with SMPTE Recommended Practice RP 68, and the 16-mm film in accordance with SMPTE Recommended Practice RP 67.

PHOTOGRAPHIC BUZZ TRACK TEST FILM

P-35-BT-50 . . . . . **(50 ft, 35-mm film)**
P35-BT-200 . . . . . **(200 ft, 35-mm film)**
P16-BT . . . . . **(100 ft, 16-mm film)**

Test Frequencies on Photographic and Magnetic Multifrequency Test Films, in Hz

P35-MF	P16-MF	M35-MF-4	M35-MF	M16-MF	MS8-MF-24	MS8-MF-18
			1000 PR		6300 AZ	5000 AZ
1000 Ref	400 Ref	1000 Ref	Pink Noise	400 Ref	400 Ref	400 Ref
40	50	40	1000 Ref	15000	10000	7500
70	100	65	16000	12500	8000	6300
100	200	100	12000	10000	6300	5000
300	300	200	10000	8000	5000	3150
500	500	400	8000	6300	3150	2000
1000	1000	800	6000	5000	2000	1000
2000	2000	1600	4000	3150	1000	500
2500	3000	3200	2500	2000	500	315
3000	4000	6500	1000	1000	315	200
3500	5000	8000	400	500	200	100
4000	6000	10000	160	315	100	50
5000	7000	12000	100	200	50	400 PR
6000	400 PR		80	100	400 PR	
7000			50	50		
8000			40	400 PR		
			31.5			
			1000 Ref			

Legend: Ref = Reference Level; PR = Program Level; AZ = Frequency intended for azimuth alignment.

Sound Focus and Azimuth Alignment Films

These films are used for the focusing and angular alignment of the scanning beam slit of 35 and 16-mm motion-picture photographic sound reproducers. They are produced in two types. Type A is for use in manufacturing and laboratiries where high precision is required. Type B can be used when lower precision is adequate. The 35-mm film is made in accordance with SMPTE Recommended Practice RP 64, and the 16-mm film in accordance with SMPTE Recommended Practice RP 63.

PHOTOGRAPHIC SOUND FOCUS AND AZIMUTH ALIGNMENT TEST FILMS

P35-SF-A-50 . . . . . **(50 ft, 9-kHz 35-mm film, Type A)**
P35-SF-A-200 . . . . . **(200 ft, 9-kHz 35-mm film, Type A)**
P16-SF-A . . . . . **(100 ft, 7-kHz 16-mm film, Type A)**
P35-SF-B-50 . . . . . **(50 ft, 7-kHz 35-mm film, Type B)**
P35-SF-B-200 . . . . . **(200 ft, 7-kHz 35-mm film, Type B)**
P16-SF-B . . . . . **(100 ft, 5-kHz 16-mm film, Type B)**

Signal Level Test Films

These films are used for measuring and balancing the respective power level outputs from two or more 35 or 16-mm motion picture optical sound reproducers. The recorded level does not in itself indicate a program level. It provides a reproducible reference to which a program level can be related. The films are to be usd in conjunction with an output level meter to compare signal levels.

PHOTOGRAPHIC SIGNAL LEVEL TEST FILM

P35-SL-50 . . . . . **(50 ft, 1-kHz 35-mm film)**
P35-SL-200 . . . . . **(200 ft, 1-kHz 35-mm film)**
P16-SL . . . . . **(100 ft, 400-Hz 16-mm film)**

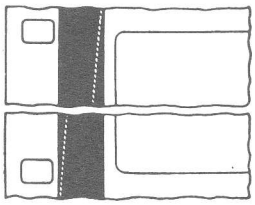
Flutter Test Films

These films are used to determine the amount of flutter present in 35 and 16-mm motion-picture photographic sound reproducers. They carry a variable-area record of 3150 Hz. A flutter meter must be used in conjunction with these films. The 35-mm version is made in accordance with SMPTE Recommended Practice RP 97 and the 16-mm version is made in accordance with RP 70.

PHOTOGRAPHIC FLUTTER TEST FILMS

P35-FL-50 . . . . . **(50 ft, 35-mm film)**
P35-FL-200 . . . . . **(200 ft, 35-mm film)**
P16-FL . . . . . **(100 ft, 16-mm film)**

Scanning Beam Test Films



These films are used to check the uniformity of illumination across the scanning slit. They have been commonly, though incorrectly, called snake tracks. The films have a 0.005 in wide variable-area track of 1 kHz frequency which travels at a uniform rate from one edge of the sound record to the other (see illustration). A suitable meter, such as the Standard Volume Indicator, is used in conjunction with the films. Before the use of a scanning beam test film, the correct placement of the scanning beam in relation to film edge and travel must be determined. Use the SMPTE Buzz Track Test Film for this purpose because the Scanning Beam Test Film is not intended for positioning the slit. The 35-mm Scanning Beam Test Film is made in accordance with SMPTE Recomemnded Practice RP 69, and the 16-mm film in accordance with SMPTE Recommended Practice RP 81.

PHOTOGRAPHIC SCANNING BEAM TEST FILMS

P35-SB . . . . . **(five 8-ft loops, 35-mm film)**
P16-SB . . . . . **(three 34-ft loops, 16-mm film)**

Subjective Color Reference Films and Slides for TV

The Color Television Subjective Reference films and the slide sets consist of a number of typical production scenes which were carefully staged and photographed specifically for subsequent color television broadcasting. The 35-mm prints are made from the original negative and the 16-mm from a 16-mm duplicate negative to simulate actual production routines. The individual prints are closely examined and color differences, reel-to-reel, are held to minimums well below those commonly accepted commercially.

The scenes are also available in a set of fifteen 2x2-inch slides which are printed from a special double frame negative, photographed concurrently with the motion-picture material.

These materials shoud not be considered as color standards, but as representative color prints intended as guides for laboratories and production personnel to evaluate and subjectively match color balance and density of final color prints to be used for color television transmission.

The subjective color reference test films and slides are produced on color print film rawstock. The 35-mm films have KS-1870 perforation and are for projection with the emulsion side toward the lamphouse. The 16-mm films have 1R-3000 perforation and they (as well as the 2x2-inch slides) are intended for projection with the emulsion toward the projection lens. These test films and slides are made in accordance with SMPTE Recommended Practice RP 46 "Density of Color Films and Slides for Television."

COLOR TELEVISION SUBJECTIVE REFERENCE FILMS AND SLIDES

TV35-CR . . . . . **(376 ft, 35-mm film)**
TV16-CR . . . . . **(153 ft, 16-mm film)**
TV2-CR . . . . . **(2x2-inch slides, set of 15)**

Universal Leaders for Motion-Picture Prints

These leaders and trailers are supplied as fine-grain black-and-white master positives in the 35 and 16-mm formats. The 35-mm leader master has BH-1870 perforation and the 16-mm leader master has 2R-3000 perforation. This enables the laboratory to achieve A- or B-wind negatives from the 16-mm master. Both masters are made in accordance with American National Standard, "Leaders and Cue Marks for 35- and 16-mm Sound Motion-Picture Release Prints," ANSI PH22.55.

Each package contains two sets of the complete leader and trailer sections.

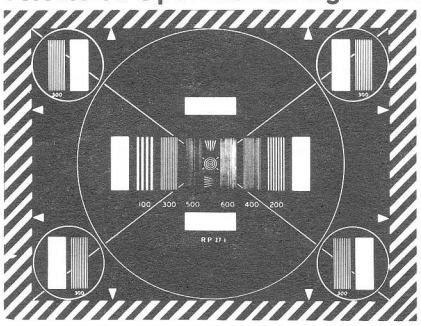
UNIVERSAL LEADERS

35-UL . . . . . **(2 sets, 35-mm film)**
16-UL . . . . . **(2 sets, 16-mm film)**

SMPTE's Monochrome Television Test Patterns

SMPTE's TV test patterns are designed for setting up and checking television studio cameras and telecine systems. They are manufactured under carefully controlled conditions to insure constant dimensions and densities. They are camera originals, produced on high-resolution, fine grain, black-and-white film. The 35-mm films have KS-1870 perforation and read correctly with the emulsion side toward the observer. The 16-mm films have 2R-3000 perforation and read correctly with the emulsion side away from the observer (that is, through the base).

Television Operational Alignment Test Pattern

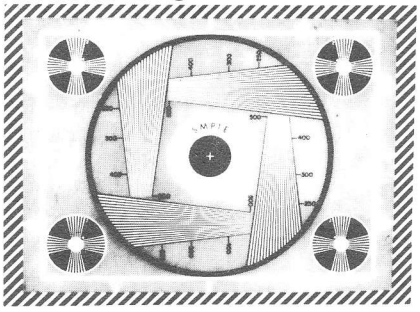


This test pattern is an operational alignment tool for television systems, facilitating day-to-day operational checks and adjustments of such critical functions as focus, resolution response, mid-band streaking, astigmatism, field uniformity, scanning size, linearity, and interlace in live and film television systems. It is made in accordance with SMPTE Recommended Practice RP 27.1.

TELEVISION OPERATIONAL ALIGNMENT TEST PATTERN

TV16-OA-50 . . . . . **(50 ft, 16-mm film)**
TV16-OA-100 . . . . **(100 ft, 16-mm film)**
TV2-OA . . . . . **(2x2-inch transparency)**

Television Alignment and Resolution Test Pattern

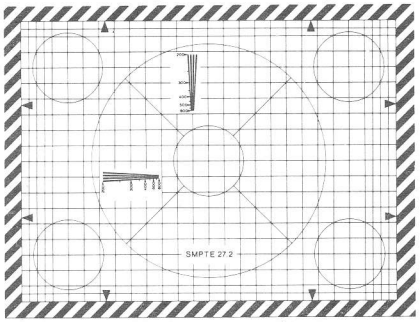


This classic test pattern consists of a target which defines the portion of the projected film frame to be reproduced by the telecine system and permits accurate alignment of the telecine projector with the telecine camera. It is primarily used for aligning multiplexing chains. Its resolution patterns are of the calibrated wedge design and range from 250 to 500 television lines.

TELEVISION ALIGNMENT AND RESOLUTION TEST PATTERN

TV35-AR-50 . . . . . **(50 ft, 35-mm film)**
TV35-AR-100 . . . . **(100 ft, 35-mm film)**
TV16-AR-50 . . . . . **(50 ft, 16-mm film)**
TV16-AR-100 . . . . **(100 ft, 16-mm film)**
TV2-AR . . . . . **(2x2-inch transparency)**

Television Operational Registration Test Pattern

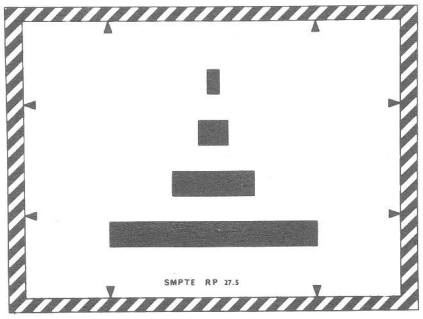


This test pattern is designed to provide a television signal suitable for aligning, adjusting and checking multiple-channel color cameras for combined optical, mechanical, and electrical registration. It is made in accordance with SMPTE Recommended Practice RP 27.2.

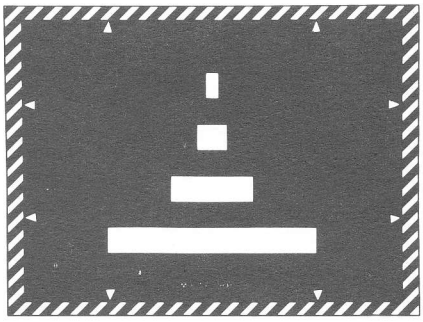
TELEVISION OPERATIONAL REGISTRATION TEST PATTERN

TV35-OR-50 . . . . . **(50 ft, 35-mm film)**
TV35-OR-100 . . . . **(100 ft, 35-mm film)**
TV16-OR-50 . . . . . **(50 ft, 16-mm film)**
TV16-OR-100 . . . . **(100 ft, 16-mm film)**
TV2-OR . . . . . **(2x2-inch transparency)**

Television Mid-Frequency Response Test Pattern



Type A



Type B

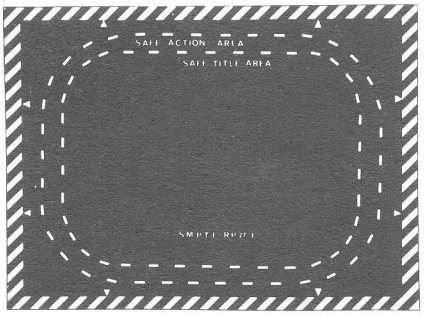
This test patern is produced in two types: Type A, black bars on a white background and Type B, white bars on a black background. It is made in accordance with SMPTE Recommended Practice RP 27.5.

This test pattern is used as an operational check of the mid-frequency response of a television system and is suitable for the following operational checks: **(a)** Performance of video amplifier circuitry under conditions that can occur at average signal levels corresponding to predominantly light and predominantly dark scenes; **(b)** Operational setup and adjustment of video amplifier mid-frequency amplitude and/or delay distortion (phase response) controls.

TELEVISION MID-FREQUENCY RESPONSE TEST PATTERN
Note: when ordering please specify *Type A, Black Bars,* or *Type B, White Bars.*

TV35-FR-50	**(50 ft, 35-mm film)**
TV35-FR-100	**(100 ft, 35-mm film)**
TV16-FR-50	**(50 ft, 16-mm film)**
TV16-FR-100	**(100 ft, 16-mm film)**
TV2-FR	**(2x2-inch transparency)**

Television Safe Action and Safe Title Area Test Pattern

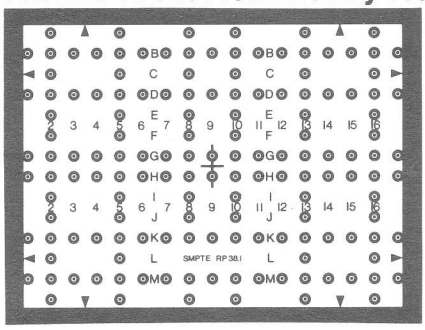


This test pattern indicates the safe action image area within which all significant action must take place and the safe title image area within which the more important title information must be confined to insure visibility of the information on the majority of home television receivers. It is a valuable tool for comparison of program material with available image area, and for checking of edge maskings of monitors. It is made in accordance with SMPTE Recommended Practice RP-27.3.

TELEVISION SAFE ACTION AND SAFE TITLE AREAS TEST PATTERN

TV35-SA-50	**(50 ft, 35-mm film)**
TV35-SA-100	**(100 ft, 35-mm film)**
TV16-SA-50	**(50 ft, 16-mm film)**
TV16-SA-100	**(100 ft, 16-mm film)**
TV2-SA	**(2x2-inch transparency)**

Television Deflection Linearity Test Pattern

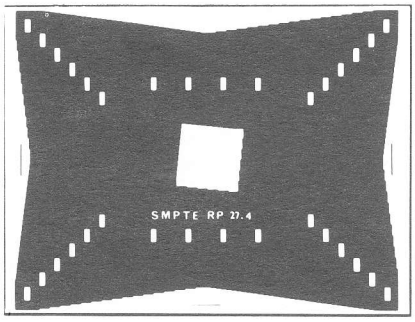


This test pattern is to be used in conjunction with an electronically generated grating signal, as specified in IEEE Standard 20, to facilitate the adjustment of deflection linearity and the measurement of geometric distortion of television cameras and picture display devices. This test pattern is made in accordance with SMPTE Recommended Practice RP 38-1.

TELEVISION DEFLECTION LINEARITY TEST PATTERN

TV35-DL-50	**(50 ft, 35-mm film)**
TV35-DL-100	**(100 ft, 35-mm film)**
TV16-DL-50	**(50 ft, 16-mm film)**
TV16-DL-100	**(100 ft, 16-mm film)**
TV2-DL	**(2x2-inch transparency)**

Universal Jitter, Weave, and Travel Ghost Test Pattern



This test pattern has been designed to facilitate the day-to-day operational checking of jitter, weave, and travel ghost in 35-mm and 16-mm projectors for television use. It is equally appropriate for the operational checking of motion-picture theatrical and preview-room projectors in the same formats. It is made in accordance with SMPTE Recommended Practice RP 27.4.

UNIVERSAL JITTER, WEAVE AND TRAVEL GHOST TEST PATTERN

U35-JW-50	**(50 ft, 35-mm film)**
U35-JW-100	**(100 ft, 35-mm film)**
U16-JW-50	**(50 ft, 16-mm film)**
U16-JW-100	**(100 ft, 16-mm film)**

Index to SMPTE-Sponsored American National Standards, Society Recommended Practices, and Engineering Guidelines

January 1982

Standards Subscription Service: The service supplies all approved standards, practices, and guidelines which are sponsored by the SMPTE and which are validated during the calendar year. Proposals are published in the *JOURNAL* and are not included in the subscription service. Write to SMPTE for detailed information regarding this service.

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Subject	No.	Journal
Film Dimensions		
8mm, Perforated super 8, 1R	**PH22.149-1981**	Dec. 1981
16mm, Perforated regular 8, 2R-1500	**PH22.17-1974**	Apr. 1975 Jan. 1981[1]
16mm, Perforated super 8, (1-3)	**PH22.151-1981**	Dec. 1981
(1-4)	**PH22.168-1973 R1980**	Aug. 1973
16mm, 1R	**PH22.109-1980**	May 1981
16mm, 2R	**PH22.110-1980**	May 1981
35mm, Perforated super 8, 2R-1664 (1-0)	**PH22.169-1980**	May 1981
5R	**PH22.165-1981**	Oct. 1981
35mm, Perforated 16mm, 3R (1-3-0)	**PH22.171-1980**	May 1981
35mm, Perforated 32mm, 2R	**PH22.73-1981**	Oct. 1981
35mm, BH	**PH22.93-1980**	Apr. 1981
35mm, CS-1870	**PH22.102-1980**	Apr. 1981
35mm, DH-1870	**PH22.1-1981**	Dec. 1981
35mm, KS	**PH22.139-1980**	Apr. 1981
65mm, KS	**PH22.145-1981**	Dec. 1981
70mm, Perforated 65mm, KS-1870	**PH22.119-1981**	Dec. 1981
Film Usage, Camera		
regular 8	**PH22.21-1975**	Apr. 1976
super 8	**PH22.156-1976**	Dec. 1976
16mm	**PH22.9-1976**	Feb. 1977
35mm	**PH22.2-1979**	Sept. 1979
Film Usage, Projector		
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16mm	**PH22.7-1976**	Oct. 1976
super 16	**PH22.201M-1981**	Nov. 1981
35mm	**PH22.59-1974 R1981**	June 1974
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(1-4)	**PH22.153-1979**	Sept. 1979
super 8 on 35mm	**PH22.179-1980**	Nov. 1980
16mm Contact (positive from negative and reversal)	**PH22.48-1976**	Oct. 1976
16mm to 35mm Enlargement Ratio	**RP 66-1976**	Jan. 1977
super 16 to 35 Enlargement Ratio	**PH22.201M-1981**	Nov. 1981
35mm to 16mm Prints and Dupe Negatives	**RP 65-1976**	Jan. 1977
35mm Release Picture-Sound Continuous Contact	**PH22.111-1965 R1975**	Dec. 1965
Image Areas, Projectable		
8mm Release Prints	**RP 56-1974 R1979**	Jan. 1975
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super 8	**PH22.154-1976**	Dec. 1976
16mm	**PH22.8-1969 R1975**	Dec. 1969
16 & 35mm TV Review Room	**PH22.148-1967 R1978**	Dec. 1967
35mm	**PH22.195-1977**	Sept. 1977
70mm	**PH22.152-1969 R1976**	Dec. 1969
Sound		
Photographic Record super 8	**PH22.182-1978**	Nov. 1978
16mm	**PH22.41-1975**	Mar. 1976
2-track	**PH22.204**	Apr. 1979[1]
35mm	**PH22.40-1978**	Aug. 1978
2-track	**PH22.203**	Apr. 1979[1]
Magnetic Record regular 8	**PH22.135-1975**	Oct. 1975

R — Reaffirmed.
[1] Proposed standard, practice or guideline.

Society of Motion Picture and Television Engineers

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Scarsdale, NY 10583
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[2] Withdrawal notice.

ANSI PH22.56-1978
Revision of PH22.56-1971

American National Standard nomenclature for motion-picture film used in studios and processing laboratories

Approved July 17, 1978

Secretariat: Society of Motion Picture and Television Engineers

1. General

1.1 *Motion Picture.* A series of images presented in rapid succession with objects represented in successive positions either unchanged or changed and producing, because of the persistence of vision, the optical effect of a continuous picture.

1.2 *Motion-Picture Film.* A thin flexible strip of plastic, complying with a dimensional standard as defined herein, whose use is specific to the process of manufacturing a motion picture.

NOTE: Motion-picture film, perforated or unperforated, is usually described by a name relating to or designating that part of the system for which it was designed, i.e., the terms color negative, release positive, separation master positive, sound recording, electronic video recording, etc.

1.2.1 *Raw Stock.* Raw stock is film which has not been exposed or processed.

1.2.2 *Film Base.* Film base is the plastic material upon which a photographic emulsion or other material may be coated.

NOTE: All film base manufactured in the United States for motion-picture use since 1952 has been safety base.

1.2.2.1 *Safety Base.* Safety base is the slow-burning film support used for motion-picture films which complies with American National Standard Specifications for Motion-Picture Safety Film, PH22.31-1967 (R1973).

1.3 *Magnetic Sound Film.* Magnetic sound film is a film base having film perforations along one or both edges and bearing a magnetic coating, either completely across the film or in stripes, the coating being capable of accepting and reproducing sound records.

NOTE: Unperforated materials usually are referred to as magnetic tape.

1.4 *Perforations.* Perforations are the regularly and accurately spaced holes that are punched throughout the length of motion-picture film. These holes are engaged by the teeth of various sprockets and pins by which the film is transported and positioned as it travels through cameras, processing machines, projectors and other film-handling machinery.

1.4.1 *Perforation Pitch.* The perforation pitch is the distance from the bottom edge of one perforation to the bottom edge of the next perforation, measured along the length of the film.

NOTE: Perforations are being identified currently by two-letter designations such as BH (Bell & Howell), KS (Kodak Standard), DH (Dubray-Howell) or CS (CinemaScope). A numeral, such as 1866, designates the pitch in ten thousandths of an inch. A designation, 1R, 2R, etc., used with films having 16-mm, regular 8 or super 8 perforations, refers to the number of rows of perforations across the narrow dimension of the film. The recommended designators for 8-mm films are "8-mm Type S" for super 8 film and "8-mm Type R" for regular 8 film.

1.4.2 *35-mm Perforation, BH-1866.* The 35-mm negative perforation has sharp corners, curved sides, a nominal width of 0.110 in (2.79 mm) and a height of 0.073 in (1.85 mm) (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated BH, PH22.93-1974).

NOTE: This perforation and pitch are used for negative and some special-purpose 35-mm films.

1.4.3 *35-mm Perforation, BH-1870.* The 35-mm negative perforation has sharp corners, curved sides, a nominal width of 0.110 in (2.79 mm) and a height of 0.073 in (1.85 mm) (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated BH, PH22.93-1974).

NOTE: This perforation and pitch are normally used for films for special effects such as background plates. (See 3.1.4.)

1.4.4 *35-mm Perforation, KS-1866.* The 35-mm positive perforation is rectangular in shape with a width of 0.110 in (2.79 mm), a height of 0.078 in (1.98 mm), a fillet in each corner with a radius of 0.020 in (0.51 mm) and a pitch of 0.1866 in (4.740 mm) (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated KS, PH22.139-1974).

NOTE: This perforation and pitch are used largely for 35-mm photographic sound recording purposes and for 65-mm camera negative film.

1.4.5 *35-mm Perforations, KS-1870.* The 35-mm positive perforation is rectangular in shape with a width of 0.110 in (2.79 mm), a height of 0.078 in (1.98 mm), a fillet in each corner with a radius of 0.020 in (0.51 mm) and a pitch of 0.1870 in (4.750 mm) (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated KS, PH22.139-1974).

1.4.6 *35-mm Perforation, DH-1870.* This perforation is rectangular in shape with a height of 0.073 in (1.85 mm), a width of 0.110 in (2.79 mm), a fillet in each corner with a radius of 0.013 in (0.33 mm) and a pitch of 0.1870 in (4.750 mm) (American National Standard Dimensions for 35-mm Motion-Picture Film, DH-1870, PH22.1-1975).

1.4.7 *35-mm Perforation, CS-1870.* This perforation is rectangular in shape with a height of 0.073 in (1.85 mm), a width of 0.078 in (1.98 mm), a fillet in each corner with a radius of 0.013 in (0.33 mm) and a pitch of 0.1870 in (4.750 mm) (American National Standard Dimensions for 35-mm Motion-Picture Film, CS-1870, PH22.102-1974). The outer edge of this perforation is at a different distance from the edge of the film than the other 35-mm film perforations listed above.

NOTE: This perforation is used on 35-mm release prints having four magnetic sound stripes; one on each side of the perforations.

1.4.8 *65-mm Motion-Picture Film, KS-1866.* The 65-mm negative perforation is rectangular in shape with a width of 0.110 in (2.79 mm), a height of 0.078 in (1.98 mm), a fillet in each corner with a radius of 0.020 in (0.51 mm) and a pitch of 0.1866 in (4.740 mm) (American National Standard Dimensions for 65-mm Motion-Picture Film Perforated KS, PH22.145-1975).

NOTE: The perforation for this film is the same as for 35-mm motion-picture film, KS-1866, but the margin and lateral distance between perforations are different.

1.4.9 *65-mm Motion-Picture Film, KS-1870.* This 65-mm negative perforation is the same as for 65-mm motion-picture film, KS-1866, except for the perforation pitch (American National Standard Dimensions for 65-mm Motion-Picture Film Perforated KS, PH22.145-1975).

1.4.10 *70-mm Motion-Picture Film Perforated 65-mm, KS-1870.* The 70-mm positive perforation is rectangular in shape with a width of 0.110 in (2.79 mm), a height of 0.078 in (1.98 mm), a fillet in each corner with a radius of 0.020 in (0.51 mm) and a pitch of 0.1870 in (4.750 mm). This film is intended to be printed from 65-mm motion-picture film, KS-1866, or from an optically enlarged 35-mm anamorphic negative image. The additional margin width is designed to accommodate magnetic sound records (American National Standard Dimensions for 70-mm Motion-Picture Film Perforated 65-mm, KS-1870, PH22.119-1975).

NOTE: This 70-mm film perforated 65-mm, is used for motion pictures. It should be distinguished from two other types of perforated 70-mm film which are used for still pictures. These are described in American National Standard Dimensions for Unperforated and Perforated Photographic Film in Rolls, Including Leaders and Trailers, for Aerial and Related Uses, PH1.10-1976.

1.4.11 *16-mm Perforation.* The 16-mm perforation is rectangular in shape with a height of 0.050 in (1.27 mm), a width of 0.072 in (1.83 mm) and a fillet in each corner with a radius of 0.010 in (0.25 mm). It is used on the following films:

1.4.11.1 *35-mm Motion-Picture Film Perforated 32-mm, 2R-2994.* This is a 35-mm film with 16-mm perforations so arranged that if 1½ mm are slit from each edge of the film and the film were slit down the middle, two 16-mm films would result, each having one row of perforations. The perforation pitch, 0.2994 in (7.605 mm), is normally used for negative film and some special-purpose films (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated 32-mm, 2R, PH22.73-1974).

1.4.11.2 *35-mm Motion-Picture Film Perforated 32-mm, 2R-3000.* This is a 35-mm film with 16-mm perforations so arranged that when 1½ mm are slit from each edge of the film and the film is slit down the middle, two 16-mm films result, each with one row of perforations. The perforation pitch specified is normally used for positive film and some special-purpose films (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated 32-mm, 2R, PH22.73-1974).

1.4.11.3 *35-mm Motion-Picture Film Perforated 16-mm, 3R-2994 (1-3-0).* This is a 35-mm film with 16-mm perforations (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated 16-mm, 3R (1-3-0), PH22.171-1974). The principal use of this film stock is as an intermediate film in the production of prints by the double-rank printing system.

NOTE: Numerals (e.g., 1-3-0) are added to the title of some standards to specify how the rows of perforations are placed on the film. The perforation rows are numbered starting at the reference edge. The reference edge is the edge nearest to that row of perforations which is retained in one of the 16-mm strips that may be generated by appropriate slitting of the parent 35-mm film. A row of perforations which is discarded is always given the number 0.

1.4.11.4 *35-mm Motion-Picture Film Perforated 16-mm, 3R-3000 (1-3-0).* This is a 35-mm film with 16-mm perforations so arranged that if 3 mm are slit from the selvage edge of the film and the film were slit down the middle, two 16-mm films would result, each having one row of perforations (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated 16-mm, 3R (1-3-0), PH22.171-1974). The perforation pitch, 0.3000 in (7.620 mm), is normally used for positive film.

1.4.11.5 *16-mm Motion-Picture Film, 1R-2994.* This film is 16 mm in width, perforated along one edge only (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated 1R, PH22.109-1974). This perforation pitch is normally used on camera film.

NOTE: The formats referred to as "super 16" as well as regular 16 may be exposed on this film (American National Standard Dimensions of 16-mm Motion-Picture Camera Aperture Image, PH22.7-1976).

1.4.11.6 *16-mm Motion-Picture Film, 1R-3000.* This flim is 16 mm in width, perforated along one edge only (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated 1R, PH22.109-1974). This perforation pitch is normally used on sound positive film.

1.4.11.7 *16-mm Motion-Picture Film, 2R-2994.* This film is 16 mm in width, perforated along both edges (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated 2R, PH22.110-1974). This perforation pitch is normally used on both black-and-white and color camera films.

1.4.11.8 *16-mm Motion-Picture Film, 2R-3000.* This film is 16 mm in width, perforated along both edges (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated 2R, PH22.110-1974). This perforation pitch is normally used on silent positive film.

1.4.12 *8-mm Type R (Regular 8) Perforation.* The 8-mm Type R (regular 8) perforation is rectangular in shape with a height of 0.050 in (1.27 mm), a width of 0.072 in (1.83 mm) and a fillet in each corner with a radius of 0.010 in (0.25 mm). This perforation is identical to the 16-mm perforation described in 1.4.11 above but for 8-mm use has a pitch of 0.1500 or 0.1497 in (3.810 or 3.802 mm). It is used on the following films:

1.4.12.1 *35-mm Motion-Picture Film Perforated 8-mm Type R (Regular 8), 5R-1500.* This is a 35-mm film with 8-mm perforations so arranged that if 3 mm are slit from the selvage edge (identified by circular holes between perforations) and the film slit three times more, four 8-mm Type R (regular 8) films would result, each having one row of perforations. The perforation pitch specified is normally used for positive film.

1.4.12.2 *35-mm Motion-Picture Film Perforated 8-mm Type R (Regular 8), 2R-1497.* This is a 35-mm film with 8-mm Type R (regular 8) perforations along each edge. The perforation pitch (0.1497 in or 3.802 mm) is normally used for negative film and some special purpose films which usually remain unslit.

1.4.12.3 *35-mm Motion-Picture Film Perforated 8-mm Type R (Regular 8), 4R-1500.* This is a 35-mm film with 8-mm perforations so arranged that when 1½ mm are slit from each edge and the film slit down the middle, two 16-mm films result which, when slit down the middle, produce four 8-mm Type R (regular 8) films, each having one row of perforations. The perforation pitch (0.1500 in or 3.810 mm) is normally used for positive film.

1.4.12.4 *16-mm Motion-Picture Film Perforated 8-mm Type R (Regular 8), 2R-1500.* This is a film 16-mm in width which when slit down the middle results in two 8-mm Type R (regular 8) films, each having one row of perforations (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated 8-mm Type R (Regular 8), 2R-1500, PH22.17-1974).

1.4.13 *8-mm Type S (Super 8) Perforation.* The 8-mm Type S (super 8) perforation is rectangular in shape, with a height of 0.045 in (1.14 mm), a width of 0.036 in (0.91 mm) and a fillet in each corner with a radius of 0.005 in (0.13 mm). It is used in the following films:

1.4.13.1 *35-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 2R-1664 (1-0).* This is a 35-mm film with 8-mm Type S (super 8) perforations on each edge (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 2R-1664 (1-0), PH22.169-1974). This film is normally used for preprint material.

1.4.13.2 *35-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 5R-1667 (1-3-5-7-0).* This is a 35-mm film with 8-mm Type S (super 8) perforations so arranged that when 0.030 in (0.76 mm) is slit from one edge and 0.091 in (2.31 mm) is slit from the factory-marked selvage (discard) edge of the film and slit three more times, four 8-mm Type S (super 8) films would result, each having one row of perforations (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated Super 8, 5R-1667 (1-3-5-7-0), PH22.165-1973). The perforation pitch (0.1667 in or 4.234 mm) is normally used for positive films.

1.4.13.3 *16-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 2R-1664 (1-4).* This is a 16-mm film with 8-mm Type S (super 8) perforations on each edge of the film (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated Super 8, (1-4), PH22.-168-1973). The principal use of this film is as an intermediate film in the production of prints by contact printing methods.

1.4.13.4 *16-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 2R-1667 (1-4).* This is a 16-mm film with 8-mm Type S (super 8) perforations on each edge of the film so arranged that when the film is slit down the middle, two 8-mm Type S (super 8) films result, each having one row of perforations (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated Super 8, (1-4), PH22.168-1973). The perforation pitch (0.1667 in or 4.234 mm) is normally used for positive films.

1.4.13.5 *16-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 2R-1664 (1-3).* (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), (1-3), PH22.151-1975). The principal use of this film stock is as an intermediate film in the production of prints by the double-rank printing system.

1.4.13.6 *16-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 2R-1667 (1-3).* This is a film 16 mm in width which when slit down the middle results in two 8-mm Type S (super 8) films (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), (1-3), PH22.151-1975). The principal use of this film stock is for the production of prints by the double-rank printing system.

1.4.13.7 *8-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 1R-1664.* (American National Standard Dimensions for 8-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 1R, PH22.149-1975). This film is generally used as a camera negative.

1.4.13.8 *8-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 1R-1667.* This film is 8 mm in width with a single row of 8-mm Type S (super 8) perforations (American National Standard Dimensions for 8-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 1R, PH22.149-1975). The principal use of this film stock is for camera original film of the reversal type.

1.4.13.9 *35-mm Motion-Picture Film Perforated 35-mm and 8-mm Type S (Super 8), KS 2R-1866/S8 3R-1664.* This is a 35-mm film with 35-mm perforations down each edge and three rows of 8-mm Type S (super 8) perforations arranged to produce three like 8-mm Type S (super 8) images. This film, with 35-mm pitch (0.1866 in or 4.740 mm) and 8-mm Type S (super 8) pitch (0.1664 in or 4.227 mm) is normally used as preprint material for the following film:

1.4.13.10 *35-mm Motion-Picture Film Perforated 35-mm and 8-mm Type S (Super 8), KS 2R-1870/S8 3R-1667.* This is a 35-mm film with 35-mm perforations down each edge and three rows of 8-mm Type S (super 8) perforations arranged so that when 0.218 in (5.54 mm) is slit from each edge and the remaining film slit twice more, three 8-mm Type S (super 8) films would result, each having one row of perforations. The 35-mm pitch (0.1870 in or 4.750 mm) and the 8-mm Type S (super 8) pitch (0.1667 in or 4.234 mm) are normally used for positive film.

1.5 *Photographic Emulsion.* A photographic emulsion consists of dispersions of light-sensitive materials in a colloidal medium, usually gelatin, carried as a thin layer on film base.

NOTE: Photographic materials are usually designated as negative or positive types according to their light sensitivity (speed), or usage; negative emulsions, in general, being more sensitive than positive emulsions.

1.5.1 *Black-and-White Film.* Black-and-white film carries an emulsion in which, after processing, brightness values of a scene are reproduced only in tones of the gray scale.

NOTE: Color prints may also be made on black-and-white film by such methods as iron toning, color development or imbibition (dye transfer).

1.5.2 *Color Film.* Color film carries one or more emulsions in which, after processing, brightness values of a scene are reproduced in terms of color scales.

1.5.3 *Reversal Film.* A reversal film is one which, after chemical reversal processing, produces an image having a scale of brightness values directly corresponding to that of the original exposure. Chemical reversal includes first development, bleaching and redevelopment.

1.5.4 *Direct Reversal Film.* A direct reversal film is one which, processed in a developer and fixing bath, produces an image having a scale of brightness values directly corresponding to that of the original exposure. In this case, reversal is due to the emulsion rather than to the use of a chemical reversal process subsequent to exposure.

1.6 *Image (Photographic).* An image is any photographically obtained likeness in a processed photosensitive material.

1.6.1 *Latent Image.* A latent image is the invisible image registered on a photographic emulsion due to the reaction produced in the emulsion by exposure to radiant energy.

NOTE: This image becomes visible after development.

1.6.2 *Picture Image.* A picture image is a photographically obtained likeness of any object on photographic material.

1.6.3 *Sound Image.* A sound image is a photographically obtained sound record.

1.6.4 *Negative Image.* A negative image is a photographic image in which the brightness scale is approximately inverted with respect to the brightness scale of the original subject. In color negatives, the hue scale is usually, but not necessarily, complementary to the hue scale of the original subject and the brightness scale is inverted.

1.6.5 *Positive Image.* A positive image is a photographic replica in which the tones of the gray scale or color values of the originally photographed subject are represented in their natural order.

1.6.6 *Black-and-White Image.* A black-and-white image is an image produced on a black-and-white film.

1.6.7 *Color Image.* A color image is an image produced on a color film.

1.6.8 *Anamorphic Image.* An anamorphic image is an image which has been produced by an optical system having different horizontal and vertical magnifications.

NOTE: Equal horizontal and vertical magnification is assumed unless the term anamorphic is applied specifically.

1.7 *Aspect Ratio.* Aspect ratio is the ratio of width to height of a projected picture image.

NOTE: This is the more common usage, although the term is also applied to photographic images and to camera, printer and projector apertures.

1.8 *Synchronism.* Synchronism is the relation between the picture and sound with respect either to the physical location on the film or films or to the time at which corresponding picture and sound are seen and heard.

1.8.1 *Projection Synchronism.* Projection synchronism is the time relation between picture and corresponding sound in a projection print.

NOTE: The sound record on a projection print is, in most cases, in advance of the corresponding picture. The displacement is specified in picture frames in the following American National Standards:

Sound Record	Standard
70-mm Magnetic*	PH22.185-1974
35-mm Photographic	PH22.40-1978
35-mm Magnetic*	PH22.137-1974
16-mm Photographic	PH22.41-1975
16-mm Magnetic	PH22.112-1977
Regular 8 Magnetic	PH22.135-1975
Super 8 Photographic	PH22.182-1978
Super 8 Magnetic	PH22.164-1975

*In this case, the sound is behind the corresponding picture.

1.8.2 *Editorial Synchronism.* Editorial synchronism is the relationship between the picture and sound film during the editorial process.

NOTE: During the editorial process, the sound record and corresponding picture, whether on the same or separate films, are kept in alignment and not offset as for projection. Many composite release negatives are supplied in editorial synchronism.

1.8.3 *Camera Synchronism.* Camera synchronism is the relation between picture and sound record in a composite camera original.

NOTE: Camera synchronism is generally not the same as editorial synchronism. In 16-mm single systems, the two are normally in projection synchronism but this is not the case for most 35-mm single systems (i.e., where picture and sound are recorded on the same film).

1.9 *Exposure.* Exposure is the process of subjecting a photographic film to suitable intensity of radiant energy for a given time in such manner that it may produce a latent image on an emulsion.

NOTE: Exposure = intensity × time.

1.10 *Processing.* Processing is the generic term applied to the total operation necessary to produce a permanent visible image on exposed film.

1.10.1 *Development.* Development is that part of processing which makes visible the latent image of an exposed photographic emulsion.

1.10.2 *Fixing (Fixation).* Fixing (Fixation) is that part of processing which removes the residual sensitive silver salts from a developed film to render the developed image permanent.

NOTE: During the process of fixation, films are customarily treated to preserve and harden the developed image. Adequate washing or neutralizing treatment is necessary following fixation for image permanence.

1.10.3 *Bleaching.* Bleaching is that part of processing which converts a developed silver image into a soluble silver salt.

1.11 *Printing.* Printing is the operation of exposing raw stock by using the processed image of another film as the light modulator.

1.11.1 *Contact Printing.* Contact printing is that method of printing in which the raw stock is held in intimate contact with the film bearing the image to be copied. This printing is normally emulsion to emulsion.

1.11.1.1 *Step Contact Printing.* Step contact printing is that method of contact printing in which the film being copied and the raw stock are advanced intermittently frame by frame, being exposed to the printer light only when stationary.

1.11.1.2 *Continuous Contact Printing.* Continuous contact printing is that method of contact printing by which the light-modulating film and the raw stock move at the same constant speed past the printing aperture.

1.11.2 *Projection Printing (Optical Printing).* Projection printing (Optical printing) is printing by projecting the image to be copied through an optical system onto the raw stock.

NOTE: The printed image with respect to the projected image may be identical, an enlargement or a reduction, or an anamorphic image; or additional anamorphosis may be added or removed.

1.11.2.1 *Step Projection Printing.* Step projection printing is that method of optical printing in which the film being copied and the raw stock are advanced intermittently frame by frame, being exposed to the printer light only when stationary.

1.11.2.2 *Continuous Projection Printing.* Continuous projection printing is that method of optical printing in which the light-modulating film and the raw stock move at a continuous rate at each end of the optical system. The film rate will be the same in 1:1 printing and will differ in reduction or enlargement processes.

1.11.3 *A and B Printing.* A and B printing is a method of making composite images, such as fades, dissolves or effects, in a release printer without requiring a duplicating process.

NOTE: The name comes from the fact that the films are edited into two separate rolls called A and B rolls. The sequences of pictures originally in one roll are in synchronization with the opaque leader in the other roll. When the two are printed in a separate operation onto a single roll of raw stock, an opportunity is afforded for the introduction of effects and for eliminating visible splices on the screen.

1.11.4 *Double-Rank Printing.* Double-rank printing is a method of producing prints on a wide film, two at a time, oriented so that both run in the same direction on the parent film before slitting.

1.12 *Projection.* Projection is the presentation of an enlarged image of the film on a screen for visual review. In addition the sound may be reproduced for aural review.

1.13 *Production.* Production is the general term used to describe the processes involved in making all the original material that is the basis for the finished motion picture.

1.14 *Editorial Process.* Editorial process is the term used to describe the combining, cutting, editing and other preparation of material obtained from the original material to make the finished motion picture.

1.15 *Re-recording.* Re-recording is the electrical process of transferring sound records from one or more films, magnetic tapes or discs to other films, tapes or discs.

NOTE: Re-recording may be used to combine different sound records into a single record to adjust the frequency-response characteristic or to adjust the relative levels between different scenes and sequences.

1.16 *Release.* Release is a generic term used to designate films used for or intended for general distribution and exhibition.

1.16.1 *Release Negative.* A release negative is a complete negative prepared specifically for printing release prints.

NOTE: A release negative may consist of separate picture and sound negatives and may be in either projection or editorial synchronism, depending upon the film printing technique to be employed in making release prints.

1.16.2 *Release Print.* A release print is a print made for general distribution and exhibition. It may be on films of 8, 16, 35 or 70 mm width. Some release prints are composed of two or more 35-mm-width films which are projected simultaneously in lateral alignment.

2. Picture Negative Film, Black-and-White and Color

2.1 *Picture Negative.* A picture negative is any processed film that possesses a negative picture image of the subject or film image to which it was exposed. This term is sometimes erroneously used to refer to the raw film before processing, either with or without exposure.

2.1.1 *Original Picture Negative.* The original picture negative is the negative film that is exposed in a camera and processed to produce a negative image of the original subject.

2.1.2 *Background Plate Negative.* A background plate negative is a picture negative which is used for printing background plates.

2.1.3 *Picture Library Negative.* A picture library negative is a picture negative that is usually held in a film library for use in reproducing scenes which would otherwise have to be made as original material for each production.

2.1.4 *Title Negative.* A title negative is a negative that is exposed to a title card or to both a title card and background.

2.1.5 *Picture Duplicate Negative.* A picture duplicate ("dupe") negative is a picture negative made from black-and-white, color or separation master positive films or directly from a picture negative by a reversal process (see 1.5.3 Reversal Film).

NOTE: It may be used for making additional prints or it may be cut and edited to form a part of the picture release negative.

2.1.5.1 *Internegative.* An internegative film is a negative derived directly from a reversal original film.

NOTE: All other duplicating negatives derived from other than reversal film are known as duplicate negatives regardless of the generation.

2.1.6 *Picture Release Negative.* A picture release negative is a cut and edited picture negative used for printing the picture portion of release prints.

NOTE: It may consist of intercut original picture negatives, picture dupe negatives, etc., depending upon the choice of available material or the intended use of the release print.

2.1.7 *Foreign-Picture Release Negative.* A foreign-picture release negative is a picture release negative prepared specifically for printing foreign-version release prints.

NOTE: It is almost invariably a duplicate negative.

2.1.8 *16-mm-Picture Release Negative.* A 16-mm-picture release negative is a picture release negative on 16-mm film prepared specifically for printing 16-mm release prints.

3. Picture Positive Film, Black-and-White and Color

3.1 *Picture Print.* A picture print is a processed film that possesses a positive picture image of the subject or film image to which it was exposed.

3.1.1 *Picture Daily Print.* A picture daily print is the first picture print made from the original picture negative for use in checking photographic quality, camera technique, actions, etc.

3.1.2 *Picture Work Print.* A picture work print is a positive print which usually consists of intercut picture daily prints, picture library prints, prints of dissolves, montages, titles, etc., and has synchronism constantly maintained with the corresponding sound work print.

3.1.3 *Picture Library Print.* A picture library print is a picture print made from a picture library negative.

3.1.4 *Background Plate (Background Print Film).* A background plate (background print film) is a picture print made specifically for use in projection background or similar process work, and is a print of a background plate negative.

3.1.5 *Picture Master Positive.* A picture master positive is a print usually made on a special film, for the purpose of producing picture duplicate negatives.

3.1.5.1 *35-mm Separation Positive.* A 35-mm separation positive is a black-and-white film with a positive image of the red, green or blue image component of a color negative. It is usually made by printing through suitable filters from a color negative onto a panchromatic black-and-white film.

3.1.5.2 *35-mm Protection Master Positive.* A 35-mm protection master positive film is a positive film made from the final cut and edited black-and-white or color release negative. In case of damage to the release negative, a duplicate negative could be made from this protection master positive. In the case of color, this protection master positive may be a set of three black-and-white separation master positives or a color master positive.

3.1.5.3 *35-mm Panchromatic Master Positive.* A 35-mm panchromatic master positive is a black-and-white print made on a panchromatic film from a color negative for the purpose of making a black-and-white duplicate negative.

3.2 *Composite Print.* A composite print is a positive film having both picture and corresponding sound on the same film, which may be in editorial or projection synchronism.

3.2.1 *Composite Daily Print.* A composite daily print is made from an original composite negative or original sound and picture negatives, and is used for checking photography, sound quality, action, etc. It is in projection synchronism.

3.2.2 *First Trial Composite Print.* The first trial composite is the first composite print made from the picture and sound-release negatives for the purpose of checking and correcting picture and sound quality, negative cutting and assembly, etc. It is in projection synchronism.

3.2.3 *Second, Third, Etc., Trial Composite Print.* The second, third, etc., trial composite print is similar to the first trial composite print, but has successive corrections incorporated as a result of viewing the previous trial composite prints.

3.2.4 *Final Trial Composite.* A final trial composite is a composite print, approved for release, in which all corrections found necessary in previous trial composite prints have been incorporated.

NOTE: The final trial composite may be any one of the various trial composite prints, depending upon the type and extent of corrections required.

3.2.5 *Composite Master Positive.* A composite master positive is a composite print usually made for the purpose of producing composite or picture and sound duplicate negatives which would be used for printing release prints.

NOTE: It is usually made on duplicating positive film and may be in either editorial or projection synchronism.

3.2.6 *Foreign-Version Release Print.* A foreign-version release print is a composite print in projection synchronism with dialogue made specifically for the particular language involved.

NOTE: Sometimes superimposed titles in a different language are used on the print. A superimposed title consists of printed words (usually transparent) overlaying the picture image.

3.2.7 *Foreign-Version Trial Composite Prints.* Foreign-version trial composite prints are similar to trial composite prints made during release, except that they are made for checking the release of the particular language version involved.

4. Reversal Film, Black-and-White and Color

4.1 *Reversal Original.* A reversal original is the film that is originally exposed in a camera or recorder and is processed by reversal to produce a positive image.

NOTE: The positive image obtained by the reversal process is not the same as a print from a negative. When viewed by projection on an opaque screen, the emulsion side of the print from a negative must face the light source and the emulsion side of a reversal original must face the lens in order for the screen image to have the same lateral orientation as the original scene.

4.1.1 *Composite Reversal Original.* A composite reversal original is a reversal original which has both picture and corresponding sound on the same film.

4.1.2 *Reversal Duplicate Negative.* A reversal duplicate negative is reversal-type film that has been exposed to a negative film image, usually an original picture negative, and developed by the reversal process.

4.2 *Reversal Print.* A reversal print is a reversal-type film that has been exposed to a positive film image, usually a reversal original film, and developed by the reversal process.

4.2.1 *Reversal Master Print, 16-mm.* A reversal master print is a 16-mm reversal print made specifically for use in producing other prints.

NOTE: It is sometimes referred to as a first-generation duplicate; prints from it are referred to as second-generation duplicates.

4.2.2 *Reduction Reversal Print, 16-mm.* A reduction reversal print is a reversal print made on 16-mm reversal film from a 35-mm positive by reduction printing and development by the reversal process.

5. Photographic Sound

NOTE: All definitions in this section are understood to be "photographic" unless the term "magnetic" is used. The term "photographic" replaced the term "optical" because the latter describes the method of reproduction and not the sound record itself.

5.1 *Photographic Sound.* Photographic sound is a sound record in the form of a photographic image.

5.2 *Sound Negative.* A sound negative is any film that, after exposure and subsequent processing, produces a negative sound record on the film. This sound record requires the printing and processing of a second film in order to obtain a reasonably faithful reproduction of the original sound, by the conventional scanning system. The negative image may be obtained by direct recording, by exposure through a positive sound image or by the reversal process from another sound negative.

5.2.1 *Original Sound Negative.* The original sound negative is the sound negative that is exposed in a film recorder and, after processing, yields a negative sound image on the film.

5.2.2 *Sound-Effects Negative.* A sound-effects negative is a sound negative upon which sound effects have been recorded. It is ordinarily held in library stock.

5.2.3 *Music Negative.* A music negative is a sound negative upon which music has been recorded. It is usually an original sound negative but may be a library negative.

5.2.4 *Sound Cut Negative.* A sound cut negative is a sound negative that is composed of sections of original sound negatives spliced in sequence.

NOTE: The sound cut negative is generally in exact conformity with the sound work print and produces a single sequentially spliced negative. The print of the sound cut negative provides all, or portions of, the re-recording print.

5.2.5 *Re-recorded Negative.* A re-recorded negative is a sound negative which is exposed by re-recording and, when processed, yields a negative sound record image on the film.

5.2.6 *Sound Release Negative.* A sound release negative is a photographic sound negative in the form required for the final printing operation onto the release print raw stock.

NOTE: The sound release negative may consist of re-recorded negatives, intercut original sound negatives, duplicate negatives of sound records, etc., depending upon the choice of available material or the intended use of the print.

5.2.7 *Special Sound Release Negative.* A special sound release negative is a sound release negative made for the purpose of obtaining a sound record which has characteristics other than those obtained from the sound release negative.

NOTE: Three common forms of special sound release negatives are those listed under 5.2.7.1, 5.2.7.2 and 5.2.7.3.

5.2.7.1 *Special Sound Release Negative for Use in 16-mm Release of 35-mm Preprint Material.* The special sound release negative for 16-mm release of 35-mm original material is a photographic sound negative, either 35- or 16-mm, recorded with specific characteristics for reasonably faithful reproduction of the original sound on 16-mm reproduction equipment. It may be re-recorded from a print of the 35-mm sound release negative or from the 35-mm re-recording print.

5.2.7.2 *Special Sound Release Negative, Foreign Release in English.* The special sound release negative for use in English version for foreign release is re-recorded from the re-recording print, except that the dialogue track is modified to remove American colloquialisms.

5.2.7.3 *Special Sound Release Negative, Foreign-Language Version.* The special sound release negative for use in foreign-language version release is usually re-recorded using all the re-recording tracks, except the dialogue track, for which is substituted a special synchronized dialogue track in the foreign language for which the release is being made.

5.2.8 *Sound Release Dupe Negative.* A sound release dupe negative is a duplicate negative of the sound record prepared specifically for printing the sound track of release prints.

5.3 *Sound Print.* A sound print is a positive sound record that provides a reasonably faithful reproduction of the original sound when running through the conventional scanning system. It is any positive obtained by printing from a sound negative or direct positive recording or, by the reversal process, from another sound positive.

5.3.1 *Sound Daily Print.* A sound daily print is the first sound print made from the original sound negative for checking sound quality, technique, etc.

5.3.2 *Sound Work Print.* A sound work print is a sound print that usually consists of intercut sound daily prints, but may also include other sound tracks of sound effects or music, or both, on the same or separate films, with synchronism constantly maintained with the corresponding picture work print.

5.3.3 *Sound-Effects Print.* A sound-effects print is a sound print made from a sound-effects negative, or from another sound-effects print by reversal processing.

5.3.4 *Music Print.* A music print is a sound print made from a music negative.

5.3.5 *Re-recording Print.* A re-recording print is a sound print prepared specifically for use in re-recording to produce a re-recorded negative.

NOTE: A re-recording print may be a print from a sound cut negative, a specially intercut print, or a combination of both. It usually consists of several sound records on separate films that include dialogue, sound effects, music, or any other required material. The term is used interchangeably to designate the entire group of associated films or any individual film that is part of the group.

5.3.6 *Re-recorded Print.* A re-recorded print is a sound print from a re-recorded sound track negative.

5.3.7 *Sound Check Print.* A sound check print is a sound print made from the sound release negative for the purpose of checking negative cutting, printing lights, sound quality, etc.

NOTE: When a sound check print is required, it is usually made prior to the first trial composite print.

5.3.8 *Sound Master Positive.* A sound master positive is a sound print on special film stock that is usually made from a sound release negative for the purpose of producing duplicate negatives of the sound record for release printing.

5.4 *Composite Print*

[**3.2** *Composite Print.* A composite print is a positive film having both picture and corresponding sound on the same film, which may be in editorial or projection synchronism.]

5.4.1 *Composite Daily Print*

[**3.2.1** *Composite Daily Print.* A composite daily print is made from an original composite negative or original sound and picture negatives, and is used for checking photography, sound quality, action, etc. It is in projection synchronism.]

6. Magnetic Sound

6.1 *Magnetic Sound Film*

[**1.3** *Magnetic Sound Film.* Magnetic sound film is a film base having film perforations along one or both edges and bearing a magnetic coating, either completely across the film or in stripes, the coating capable of accepting and reproducing sound records. Note: Unperforated materials usually are referred to as magnetic tape.]

6.2 *Full-Coat Magnetic Film.* Full-coat magnetic film has the magnetic-coating compound applied across the film from edge to edge.

6.2.1 *Full-Coat-Between-Perforations Magnetic Film.* Full-coat-between-perforations magnetic film has the magnetic-coating compound across the film from perforation to perforation.

6.3 *Magnetic Striping.* Magnetic striping is a process by which a magnetic-coating compound is applied in the form of single or multiple stripes, having specific widths and placements, to either surface of a film base which may or may not have a photographic emulsion.

6.4 *Balance Stripe.* A balance stripe is a magnetic coating or coating of another material that is equal in thickness to, but may be narrower than, the stripe used for recording. It is applied along the edge of the film, opposite the stripe used for recording. Its primary purpose is to equalize the effective thickness of the two edges of the striped film in order to obtain uniform winding. The stripe is sometimes used for the recording of additional sound or control records.

6.5 *Magnetic Original.* A magnetic original is the original or first sound record on a magnetic film.

6.6 *Magnetic Transfer.* A magnetic transfer is a magnetic sound record obtained by electrical re-recording of a magnetic original onto another magnetic film.

6.7 *Magnetic Master.* A magnetic master is a final edited or re-recorded magnetic sound record used for transfer to a magnetic release print or for transfer to a photographic sound negative to be used for manufacturing prints with photographic sound records.

6.8 *Magoptical Release Print.* (See 7.4.)

7. Release Prints

7.1 *Release Print.*

[**1.16.2** *Release Print.* A release print is a print made for general distribution and exhibition. It may be on films of 8-, 16-, 35- or 70-mm width. Some release prints are composed of two or more 35-mm-width films which are projected simultaneously in lateral alignment.]

7.1.1 *Composite Release Print.* A composite release print is a print having both picture and sound records in projection synchronism on the same film.

NOTE: The sound record may be photographic, magnetic or both.

7.1.2 *Domestic Release Print.* A domestic release print is a release print intended for distribution within the country where the print was manufactured and having dialogue in the language of that country. It may be a composite print or have a magnetic sound record or records on a separate film.

7.1.3 *Foreign-Version Release Print.*

[**3.2.6** *Foreign-Version Release Print.* A foreign-version release print is a composite print in projection synchronism with dialogue made specifically for the particular language involved. Note: Sometimes superimposed titles in a different language are used on the print. A superimposed title consists of printed words (usually transparent) overlaying the picture image.]

7.2 *Anamorphic Release Print.* An anamorphic release print is a release print in which the picture image is compressed laterally, requiring a deanamorphosing lens on the projector to cause objects in the projected picture to have correct proportions.

7.3 *Wide-Screen Release Print.* A wide-screen release print is a print which has no anamorphosis but, when projected, produces a screen image having an aspect ratio greater than 1.33:1.

NOTE: Some prints are made from negatives exposed in a camera aperture having an aspect ratio of 1.33:1, but which have been composed for projection to yield a projected picture having an aspect ratio greater than 1.33:1. A wide screen print may also be obtained from an anamorphic negative by deanamorphosing in the printing process.

7.4 *Magoptical Release Print.* A magoptical release print is a composite release print which has both magnetic and photographic (optical) sound records.

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ANSI PH22.55—1975
Revision of PH22.55-1966

American National Standard
leaders and cue marks for 35- and 16-mm sound motion-picture release prints

Approved November 26, 1975 Secretariat: Society of Motion Picture and Television Engineers, Inc.

1. Scope

This standard specifies the make-up or assembly of leaders and cue marks for 35- and 16-mm sound motion-picture release prints for use in both motion-picture theaters and television studios.

2. Reduction Ratio

The reduction ratio in the production of the head and foot leaders from 35-mm motion-picture film shall be in accordance with American National Standard 16-Millimeter Positive Aperture Dimensions and Image Size for Positive Prints Made from 35-Millimeter Negatives, PH22.46-1946 (R1969).

3. Orientation of Words and Numerals

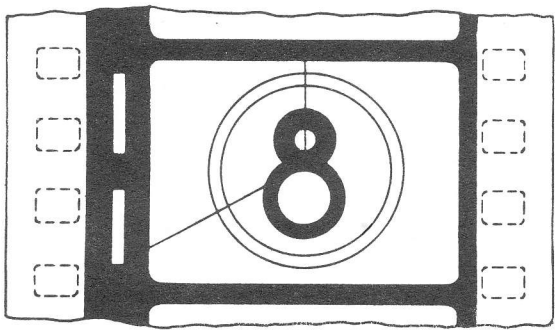
3.1 Orientation and dimensions of letters and numerals in this standard are with respect to 35-mm motion-picture film and are modified proportionally for 16-mm prints in accordance with Section 2.

3.2 The third, fourth and fifth frames of the identification sections containing the title of the film and reel number shall be printed in white letters on a black background so that they can be read normally when the reel is uppermost and the leading end or head of the film hangs down ready for threading.

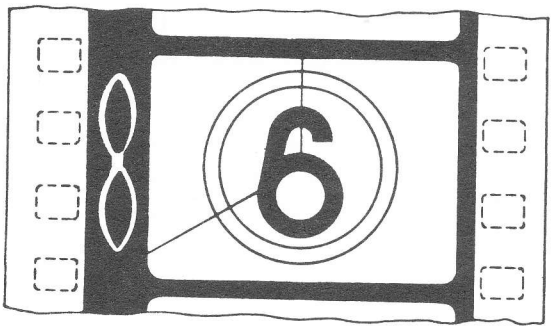
3.3 The words "Type of Sound," "Aspect Ratio," "Picture Title," "Company," "Series," "Reel No.," "Prod. No.," and "Play Date" shall be printed lengthwise with the film in white letters on a black background.

3.4 A footage count-down number is placed in the sound track area of the Synchronizing Section (4.3) in Frames 27, 43, 59, 75, 91 and 107. The number shall fill a space no less than ¾ of frame height and be bold white figures on a black background so that it is read normally as in Sec. 3.2 (see Fig. 1).

3.5 In sections where information is to be printed lengthwise with the film, light framelines shall be included and all such printing must be placed within the outlined areas so that it can be read on 16-mm reduction prints.



FOOTAGE NUMBER II IN FRAME 43



FOOTAGE NUMBER 8 IN FRAME 91

Figure 1
Footage Numbers in Sound Track Area

3.6 In the trailer (foot leader), the title of the film and the reel number shall be printed so that they appear inverted when the remainder of the reel is uppermost and the film hangs downward.

4. Head Leader (See Figure 2)

4.1 Protective Section. The protective section of the 35-mm leader shall consist of 8 feet (2.44 m) of transparent or raw stock; for 16-mm leader, 3.25 feet (99 cm). When the protective leader has been reduced to a length of 6 feet (1.83 m) for 35-mm film or 2.5 feet (76 cm) for 16-mm film, it is to be restored to its original length.

The last frame of this section contains the words "Splice Here" and an arrow pointing to the frameline between this frame and Frame 1 of the identification section. The letters should be at least 0.125 inch (3.18 mm) high.

4.2 Identification Section. The identification section of the leader shall be 42 frames in length. The frames may be of the 4 x 3 format or of a reduced height.

4.2.1 Since many types of film may be used for leaders, exact neutral densities have not been specified. For the purpose of this standard, the following approximate neutral densities are referred to:

White	(low neutral density of 0.35)
Gray	(medium neutral density of 0.65)
Black	(high neutral density of 1.95)

4.2.2 The identification section, when viewed as specified in 3.2, shall be made up as follows:

Frames 1-2—Black.

Frame 3—The printed word "Subject" with letters 1/16 inch (1.6 mm) high at top of frame in upright position, white on black background (4 x 3 format).

Frame 4—The printed word "Length" at top left side of frame and the printed word "Roll" at center of frame on left side. Lettering to be comparable to that in Frame 3 (4 x 3 format).

Frame 5—The printed words "Reel No." at top left side of frame and printed word "Color" at center of frame on left side. Lettering, read upright, to be comparable to that in Frame 3. At bottom of frame printed word "Picture" 1/8 inch (3.2 mm) high.

Frames 6-10—Five frames of black with white framelines on which the words "Aspect Ratio" and "Type of Sound" are plainly printed lengthwise with the film in 1/8 inch (3.2 mm) high white letters. Each group of words starting in the 10th frame and in two separate lengthwise lines reading through base of film from left to right with head end of film at right.

Frame 10—Four letter Os vertically in line and opposite the sound track area approximately 5/16 inch (7.9 mm) from the 35-mm camera aperture centerline opposite the sound area. Letters to be 1/8 inch (3.2 mm) high and 1/8 inch wide, white on black background (4 x 3 format).

Frame 11—The printed word "Head" not less than 3/8 inch (9.5 mm) high in inverted black letters on white background.

Frame 12—A 1/8-inch (3.2 mm) diameter black dot in center of 4 x 3 format. White background with narrow black framelines.

Frame 13—The printed word "Picture" not less than 3/8 inch (9.5 mm) high in inverted black letters on white background.

Frames 14-15—Two frames in which the words "SMPTE Universal Leader" shall be printed. Letters to be not less than 1/8 inch (3.2 mm) high. Inverted white letters on a black background (4 x 3 format).

Frame 16—Four letter Xs vertically in line adjacent to sound track area approximately 5/16 inch (7.9 mm) from the 35-mm camera aperture centerline toward sound area. Letters to be 1/8 inch (3.2 mm) high and 1/8 inch wide, white in black background (4 x 3 format).

Frames 17-18—Same as Frames 14-15.

Frames 19-26—Eight frames of black with white framelines on which the words "Reel No.," "Prod. No." and "Play Date" are printed lengthwise with the film in 1/8 inch (3.2 mm) high white letters in Frame 20. In Frame 26, on three lines lengthwise, reading left to right through film base with head of leader to right, the words "Picture," "Company" and "Series," using the same format as that in Frame 20.

Frames 27-42—Sixteen frames of part titles are to be inserted here. In each frame (1) the reel number (Arabic numeral not less than 1/4 of frame height) and (2) the picture title shall be printed in black letters on a white background. If part titles are not available, these frames should be black with narrow framelines.

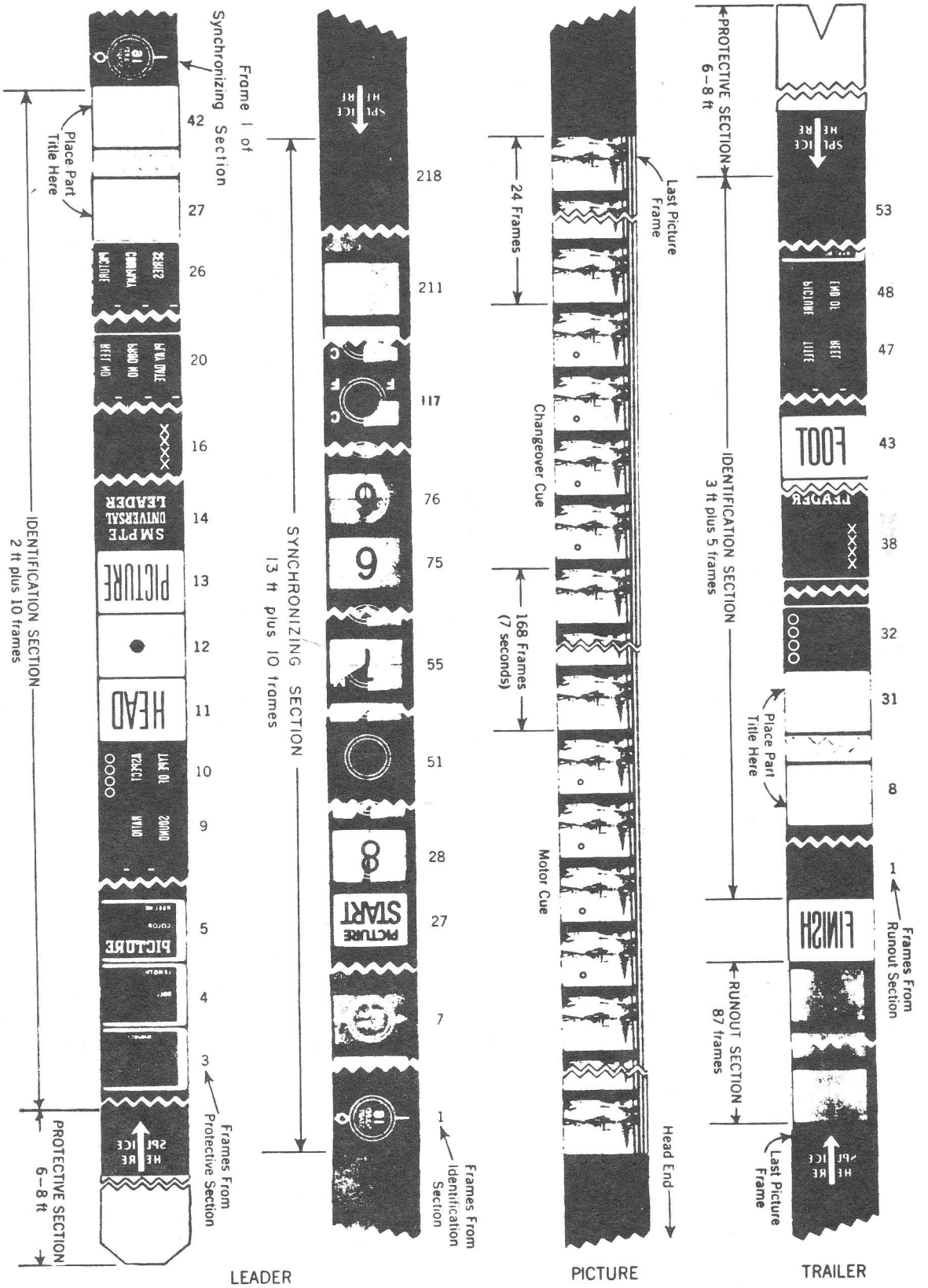


Figure 2

Figure shows 35-mm film with sound track on right edge as seen from the light source in the projector. The sound track is on the left edge of 16-mm film.

4.3 Synchronizing Section. The synchronizing section of the leader shall be 218 frames in length.

4.3.1 The cross hairlines shall be black and the two large concentric circles used throughout the visual count-down section shall be white. Seconds count-down numerals shall project right side up.

4.3.2 The synchronizing section, when viewed as specified in 3.2, shall be made up as follows:

Frame 1—The 16-mm sound start indication shall be printed in white letters on a neutral gray background as shown in Fig. 3.

Frames 2-6—Five frames of neutral gray.

Frame 7—The 35-mm sound start indication shall be printed in white letters on a neutral gray background as shown in Fig. 4.

Frames 8-26—Nineteen frames of neutral gray.

Frame 27—The words "Picture Start" shall be printed in black on a white background, the letters in the word "Picture" to be not less than ⅛ inch (3.2 mm) high and in "Start" not less than ¼ inch (6.4 mm) high. Visual count-down begins with this frame.

The footage number "12" shall be printed in the sound track area (see Sec. 3.4 and Fig. 1).

Frame 28—The visual count-down continues with the figure "8" in black within a circle of white on an overall neutral gray background with a 15-degree wedge of darker neutral gray on the right of top center, as projected. In each succeeding frame, the wedge increases in 15-degree steps, moving clockwise when projected (see Fig. 5).

Frame 43—The footage number "11" shall be printed in the sound track area (see Sec. 3.4 and Fig. 1).

Frame 50—All background, except for a 15-degree wedge at the top left center, is of neutral gray.

Frame 51—The numeral changes to "7" in black on a white background.

Frame 52—The wedge again appears.

Frame 55—On each side of the "7," there shall be letters ⅛ inch (3.2 mm) high, white on a neutral gray background, "M" and "35" vertically to indicate 35-mm magnetic sound start (see Fig. 6).

Frames 56-117—The sequence of numerals marking the seconds of film running time at 24 frames per second continues to Frame 117.

Frame 59—The footage number "10" shall be printed in the sound track area (see Sec. 3.4 and Fig. 1).

Frame 75—The footage number "9" shall be printed in the sound track area (see Sec. 3.4 and Fig. 1).

Frame 91—The footage number "8" shall be printed in the sound track area (see Sec. 3.4 and Fig. 1).

Frame 107—The footage number "7" shall be printed in the sound track area (see Sec. 3.4 and Fig. 1).

Frames 117-122—The moving wedge and numeral appear on Frames 117-122 but with the addition of the Gothic letters "C" and "F" on the left- and right-hand side of the circle, respectively, to indicate the position in the leader where one to six frames may be removed and a similar number of control frames spliced in.

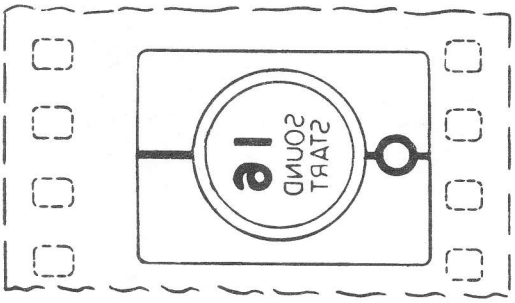


Figure 3
16-mm Sound Start Identification Frame

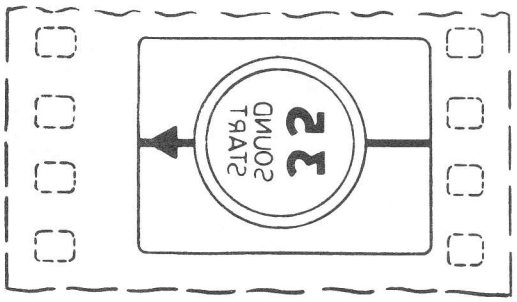


Figure 4
35-mm Sound Start Identification Frame

Frames 123-170—The sequence of numerals and moving wedge marking the seconds of film running time continues through Frame 170.

Frame 171—The numeral "2" in black on a white background appears ending the visual count-down.

Frames 172-210—Thirty-nine frames of black density.

Frame 211—A single white dot shall be located as specified in 5.2.

Frames 212-218—Seven frames of black density.

4.3.3 One additional frame follows with the words "Splice Here" and an arrow pointing to the frameline between Frame 218 and this frame. The letters should be at least 1/8 inch (3.2 mm) high.

5. Picture Section (See Figure 2)

5.1 Picture. It is recommended that picture action start and finish on fades wherever possible. Otherwise, significant sound should be kept at least five feet (1.52 m) for 35-mm prints and two feet (61 cm) for 16-mm prints from the start and finish of the picture.

5.2 Motor Cue. The motor cue shall consist of a black circular dot with a white outline or a white circular dot with a black outline, printed from a 35-mm negative which has had four consecutive frames punched with a die 0.094 inch (2.39 mm) in diameter. The position of this cue mark for release prints with aspect ratios up to 1.85:1 shall be as shown in Fig. 7. The position of the cue mark for release prints with aspect ratios from 2.35:1 to 2:1 shall be as shown in Fig. 8.

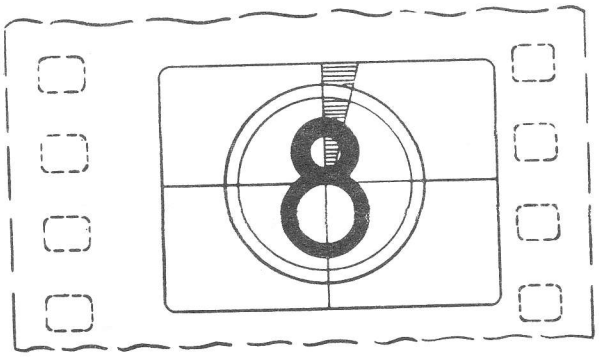


Figure 5
Example of Visual Count-down

Following the four frames containing the motor cue, there shall be 168 frames, or seven seconds running time, to the beginning of the changeover cue.

5.3 Changeover Cue. The changeover cue shall consist of four frames containing circular dots of the same dimensions and position on the frame as those in the motor cue.

Following the four frames of the changeover cue, there shall be 24 frames, or one second running time, to the beginning of the runout section of the trailer.

6. Trailer (Foot Leader) (See Figure 2)

6.1 Additional Frame. One additional frame follows with the words "Splice Here" and an arrow pointing to the frameline between the picture section and the trailer. The letters should be at least 1/8 inch (3.2 mm) high.

6.2 Runout Section. The runout section of the trailer shall consist of 88 frames, 87 of which are to be black. Frame 88 shall have the printed word "Finish" not less than 3/8 inch (9.5 mm) high in upright black letters on white background.

6.3 Identification Section. The identification section of the trailer shall consist of 53 frames.

6.3.1 The identification section shall be made up as follows:

Frames 1-7—Seven frames of black without framelines.

Frames 8-31—Twenty-four frames of part titles are to be inserted here. In each frame (1) the end of reel, (2) the reel number (Arabic numeral not less than 1/4 of frame height), and (3) the picture title shall be printed in black let-

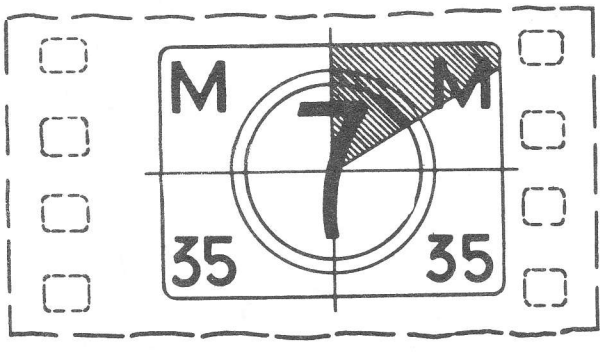


Figure 6
35-mm Magnetic Sound Start

ters on a white background. If part titles are not available, these frames shall be blank of medium neutral density with narrow framelines.

Frame 32—Four letter Os vertically in line and opposite the sound track area approximately 5/16 inch (7.9 mm) from the 35-mm camera aperture centerline opposite the sound area. Letters to be 1/8 inch (3.2 mm) high and 1/8 inch wide, white on black background (4 x 3 format).

Frames 33-37—Five black frames with light framelines for reproduction of information written on the negative.

Frame 38—Black with four Xs adjacent to the sound track, similar to Frame 16 of the head leader identification section.

Frames 39-40—Similar to Frames 14-15 of head leader identification section with words "SMPTE Universal Leader," except that the words are upright.

Frame 41—Similar to Frame 13 of head leader identification section, except that the word "Picture" is upright (not inverted).

Frame 42—Dot similar to that in Frame 12 of head leader identification section.

Frame 43—Similar to Frame 11 of head leader identification section, except printed word is "Foot" which is upright (not inverted).

Frames 44-48—Five blank frames of black with light framelines upon which the words (1) "Picture Title" and (2) "End of Reel" are printed lengthwise with the film in 1/8 inch (3.2 mm) high white letters on black background.

Frames 49-51—Three frames identical to Frames 5, 4 and 3, respectively, of head leader identification section, except that the letters are inverted.

Frames 52-53—Two black frames.

6.3.2 One additional frame follows with the words "Splice Here" and an arrow pointing to the frameline between this frame and Frame 53 to indicate where the protective section joins the trailer.

6.4 Protective Section. The protective section of the trailer shall consist of 8 feet (2.44 m) of transparent or raw stock for 35-mm prints and 3.25 feet (99 cm) for 16-mm prints.

Note: The Society of Motion Picture and Television Engineers makes available leaders in accordance with this standard. Supplied on master positive motion-picture stock in 16-mm and 35-mm sizes, intended for reproduction as negatives, they are identified as SMPTE Universal Leaders.

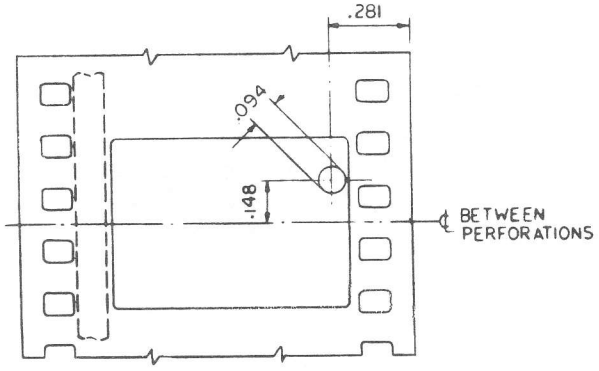


Figure 7
Position of Cue Marks for Nonanamorphic Release Prints
Image as seen on the Screen

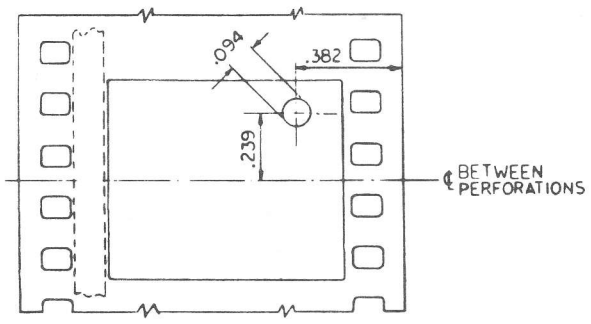


Figure 8
Position of Cue Marks for Anamorphic Release Prints
Image as seen on the Screen

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Appendix

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

A1. The difference between projection rates of 24 and 25 frames per second is negligible in the normal usage of the leader.

A2. Logos, trademarks or other extraneous material, if absolutely necessary, should be inserted in the leader prior to the 16-mm sound start cue or just preceding Frame 32 of the trailer identification section or both.

A3. The outside diameter of the larger white circle, referred to in Sec. 4.3.1, indicates the height of the television safe action area specified in SMPTE Recommended Practice RP 27.3-1972, Specifications for Safe Action and Safe Title Areas Test Pattern for Television Systems.

A4. The outside diameter of the smaller white circle, referred to in Sec. 4.3.1, is equivalent to the height of a projector aperture having an aspect ratio of 1.85:1.