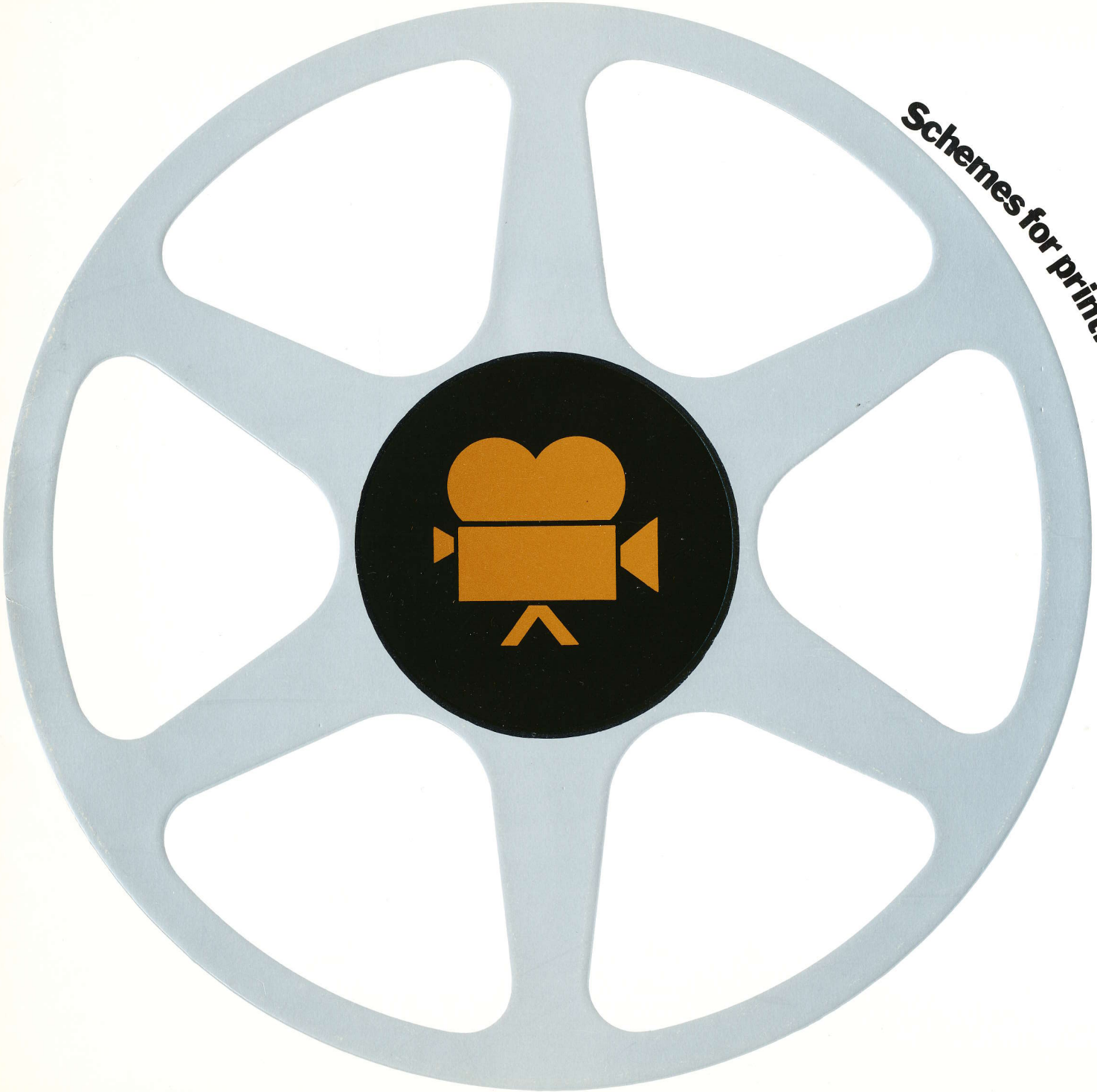


Schemes for printing Eastman Colour Films

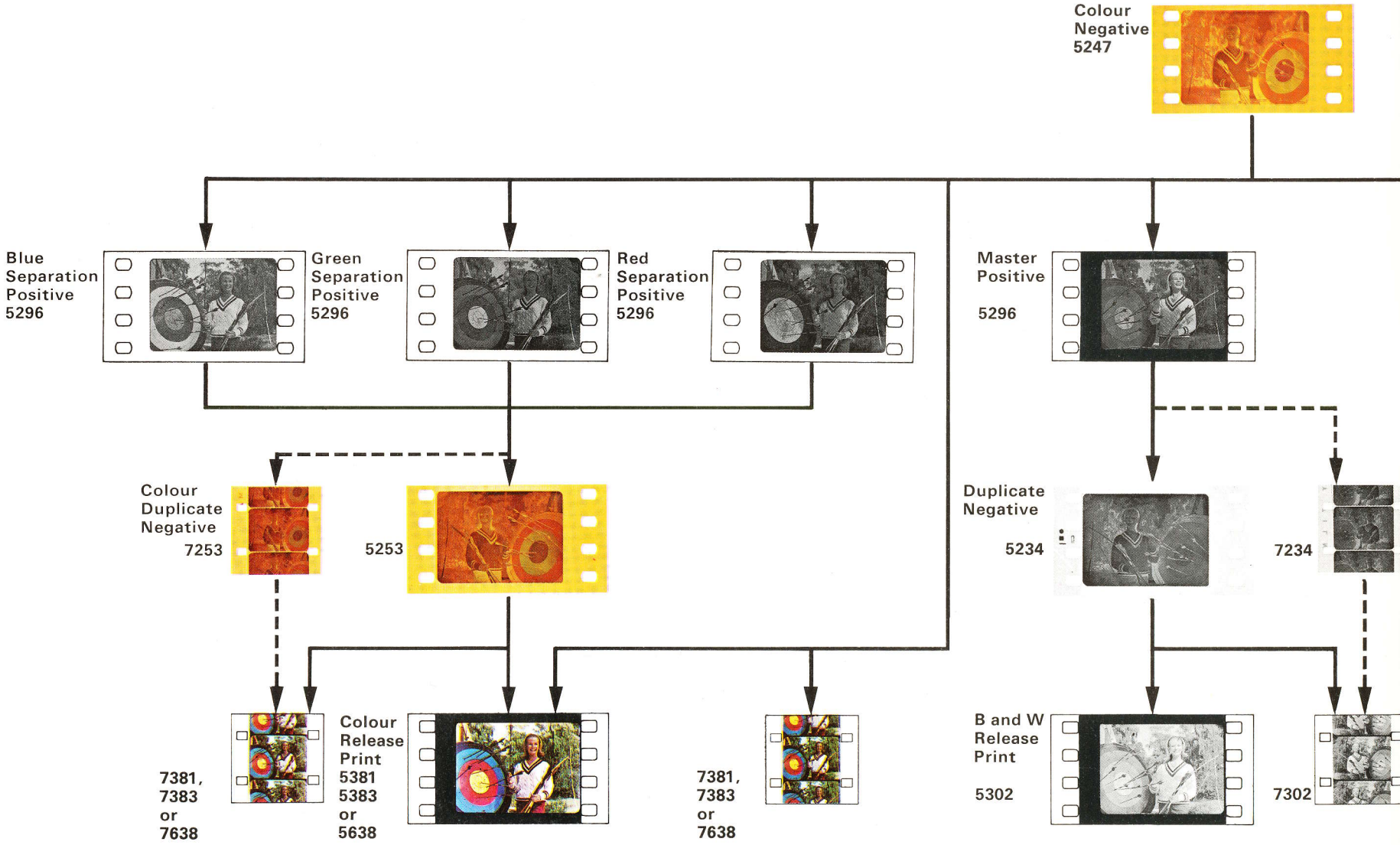
Introduction

The following charts have been prepared to indicate the procedures most generally used by commercial laboratories to make motion picture prints from original footage. Shown in the charts are methods for producing (1) 35mm, (2) 16mm, and (3) super 8 colour and black-and-white prints from 35mm and 16mm colour negative and colour reversal originals. The charts are meant to serve as a guide to the printing systems and are not intended for use in evaluating picture quality with respect to colour balance, saturation, contrast, sharpness, or graininess. The film samples used in the illustrations were taken from footage printed as shown, but the small sizes of the reproductions and the changes that may have been introduced in the graphic reproduction process make these illustrations meaningless for quality evaluations of the film process. The only suitable visual method for evaluating a film production system is to view a print under recommended projection conditions.

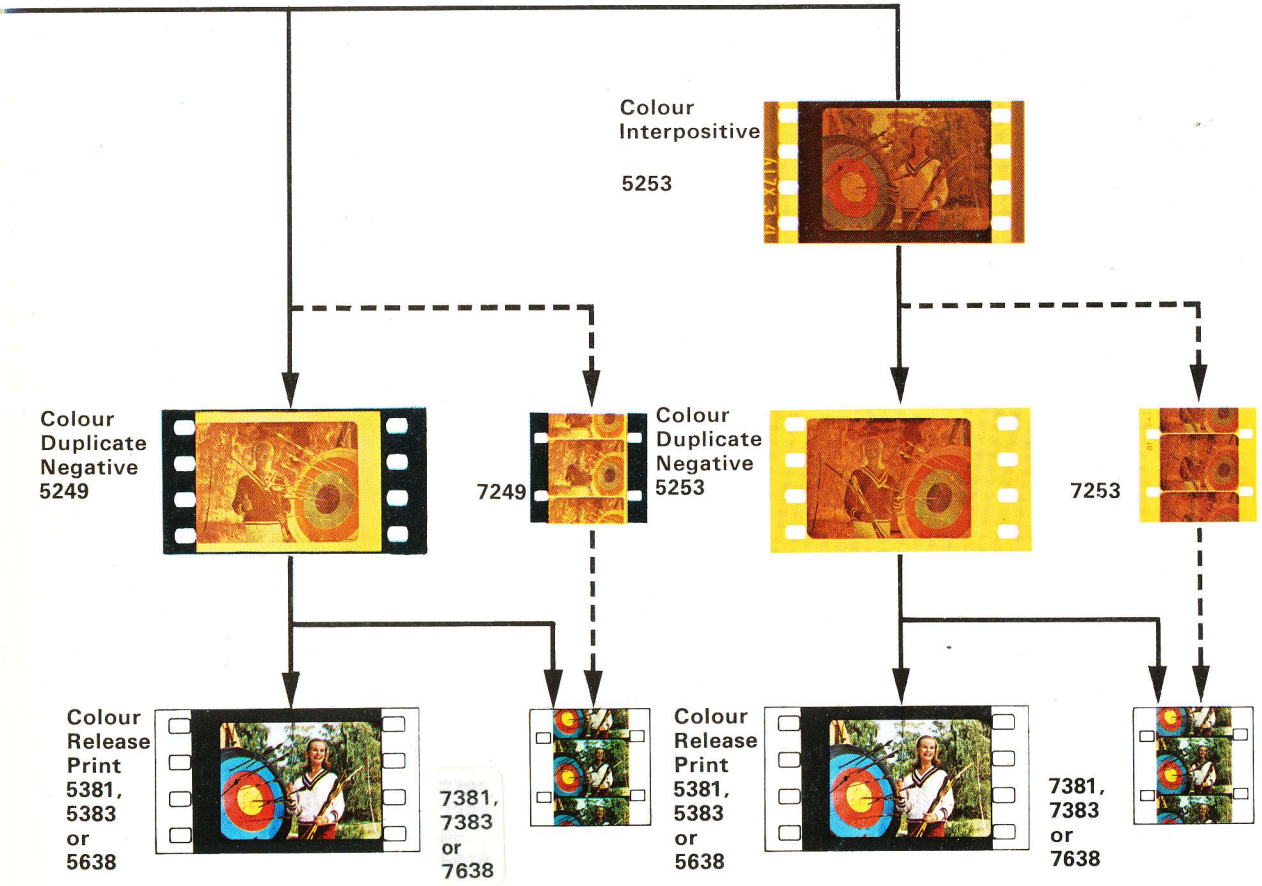
The charts can be used as guides for producers or for laboratory managers in discussions with producers. They are also useful for explaining printing systems to new personnel, students, and other interested persons.

A close examination of the printing systems may raise in your mind a number of questions relating to the reasons for certain of the steps taken, the choice of materials, and the preference of one system over another. To answer these questions requires a thorough knowledge of the films and the chemical processes involved, plus information about equipment availability, how the final print is to be used, and the quality of the end result with respect to the costs involved. The text of this publication will discuss some of these matters, interpret the charts, and provide guidance for further discussions and final decisions.

Schemes for producing 35mm and 16mm Prints from 35mm Colou



Negatives

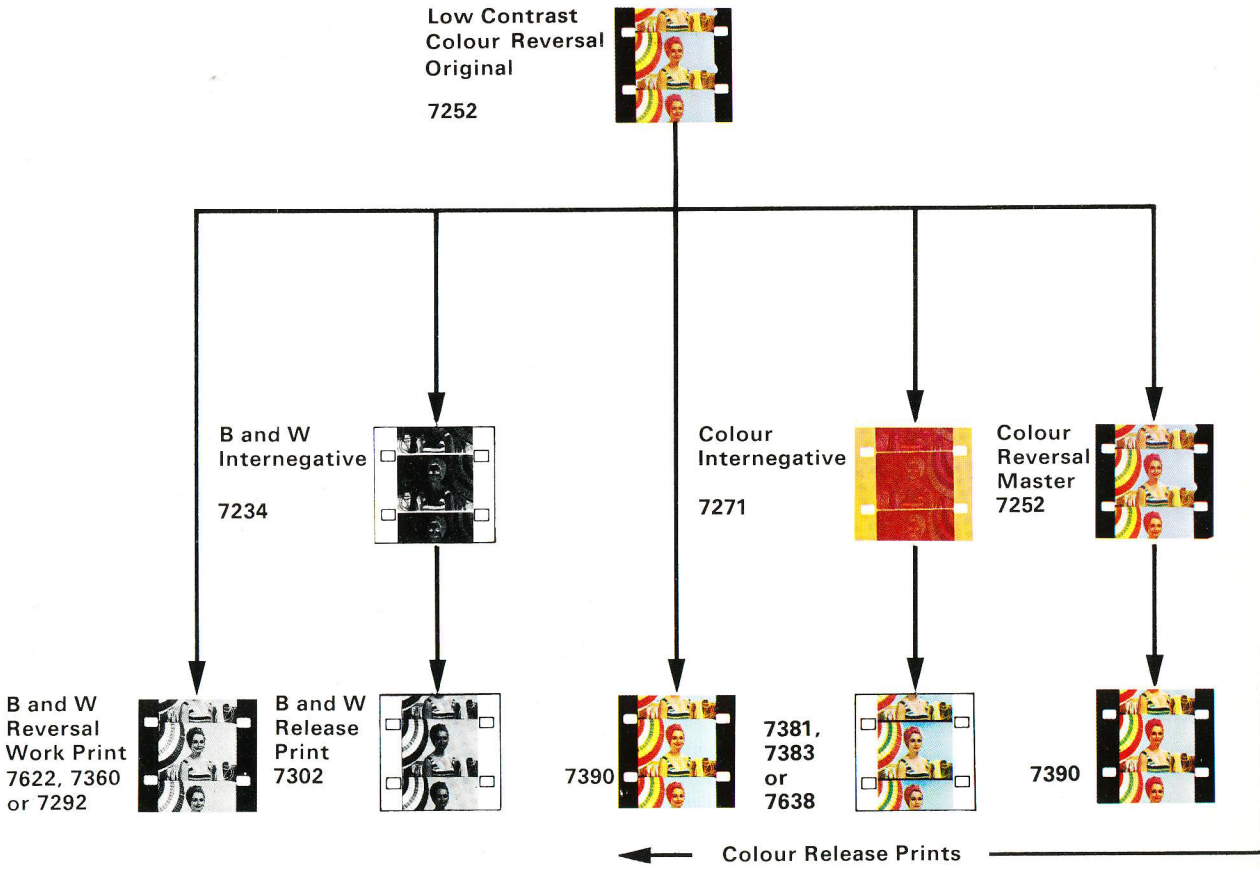


1 The edited negative generally consists of both original camera negative and duplicate negative in which special effects have been incorporated. The original and duplicate negative footage may also be edited, in some instances, in "A" and "B" rolls in order to introduce special effects.

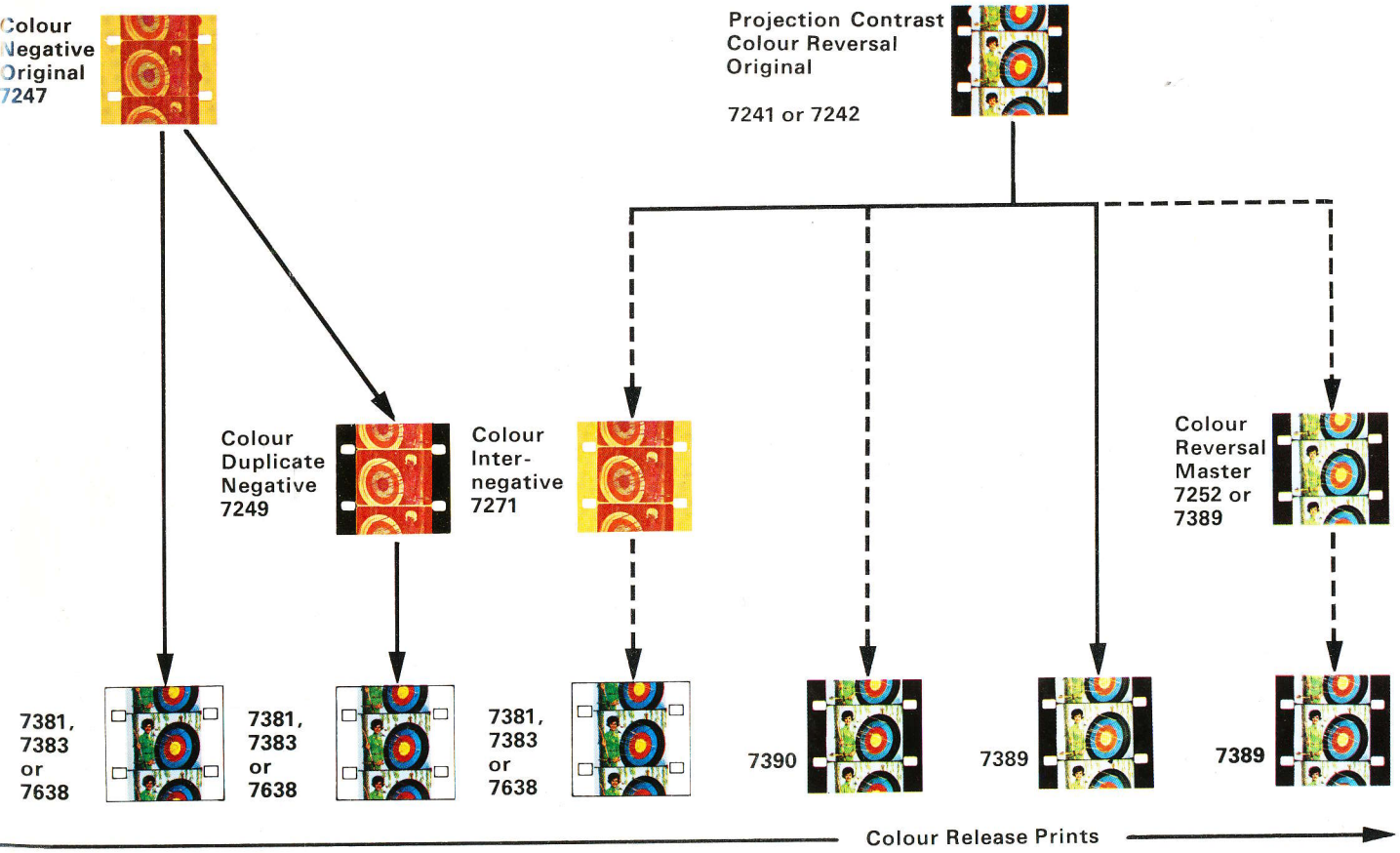
2 The choice of printing system depends on a number of factors, including the types of printing and processing equipment available, the physical and chemical processing requirements for a given type of film, and certain economic considerations. On this account, certain compromises may have to be accepted.

3 In the chart, an image size change indicates optical reduction printing. Where reduction stages are called for, it is best in the interest of obtaining the highest definition in the final print, to postpone reduction until the latest practicable stage. The dotted lines shown therefore indicate the less preferable method.

Schemes for producing 16mm Prints from 1



m Colour Originals



1 Where special effects are to be included, originals may be edited in "A" and "B" rolls. Where a colour internegative or colour reversal master is employed, the special effects can be introduced at this stage.

2 The choice of printing system depends on a number of factors, including the types of printing and processing equipment available, the physical and chemical processing requirements for a given type of film, and certain economic considerations. On this account, certain compromises may have to be accepted.

3 The dotted lines in the chart indicate, in general, a less preferable method from the standpoints of excessive contrast build-up or reduced definition.

Schemes for producing Super 8 Colour Prints from 16mm and 35m

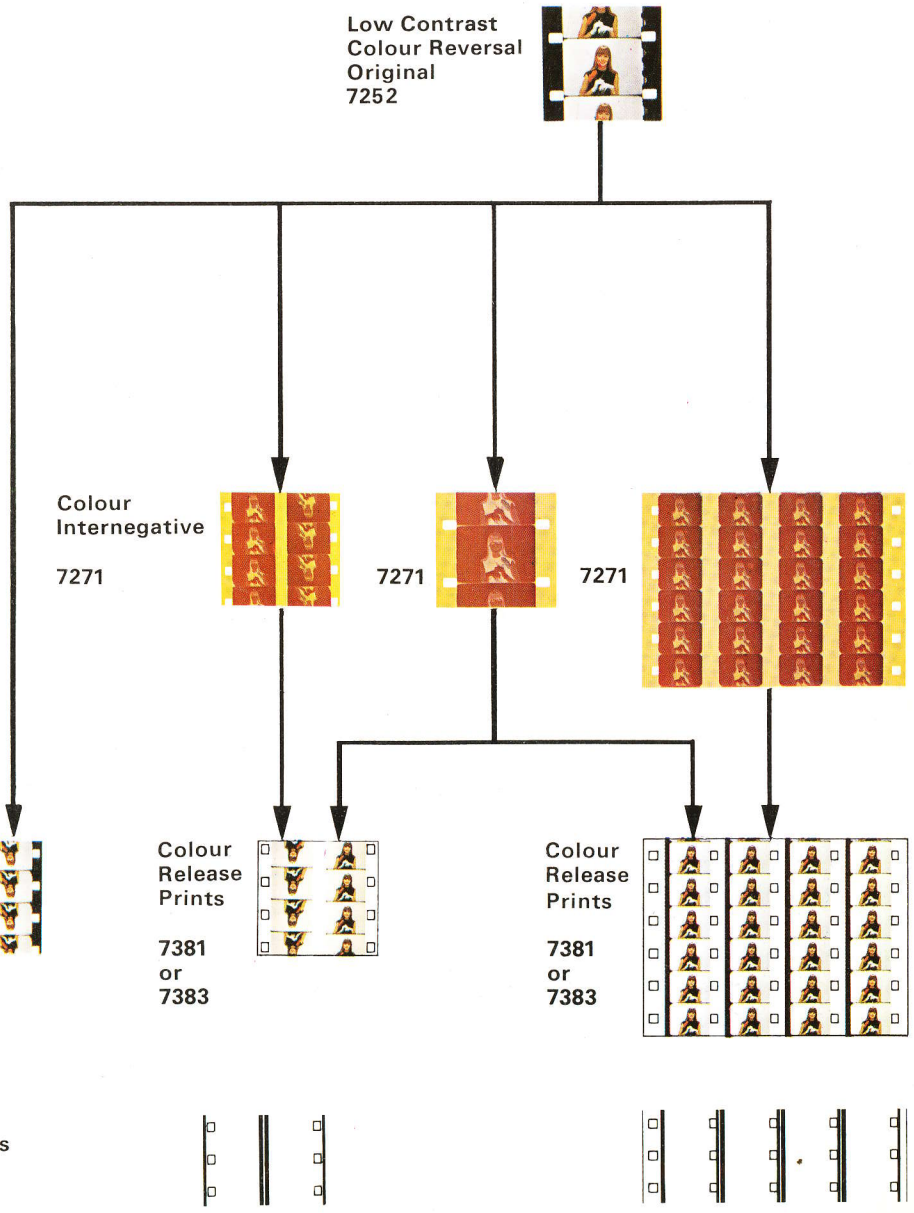
1 Where special effects are to be included, originals may be edited in "A" and "B" rolls. Where a colour internegative or colour duplicate negative is employed, the special effects can be introduced at this stage.

2 The choice of printing system depends on a number of factors, including the types of printing and processing equipment available, the physical and chemical processing requirements for a given type of film, and certain economic considerations. On this account, certain compromises may have to be accepted.

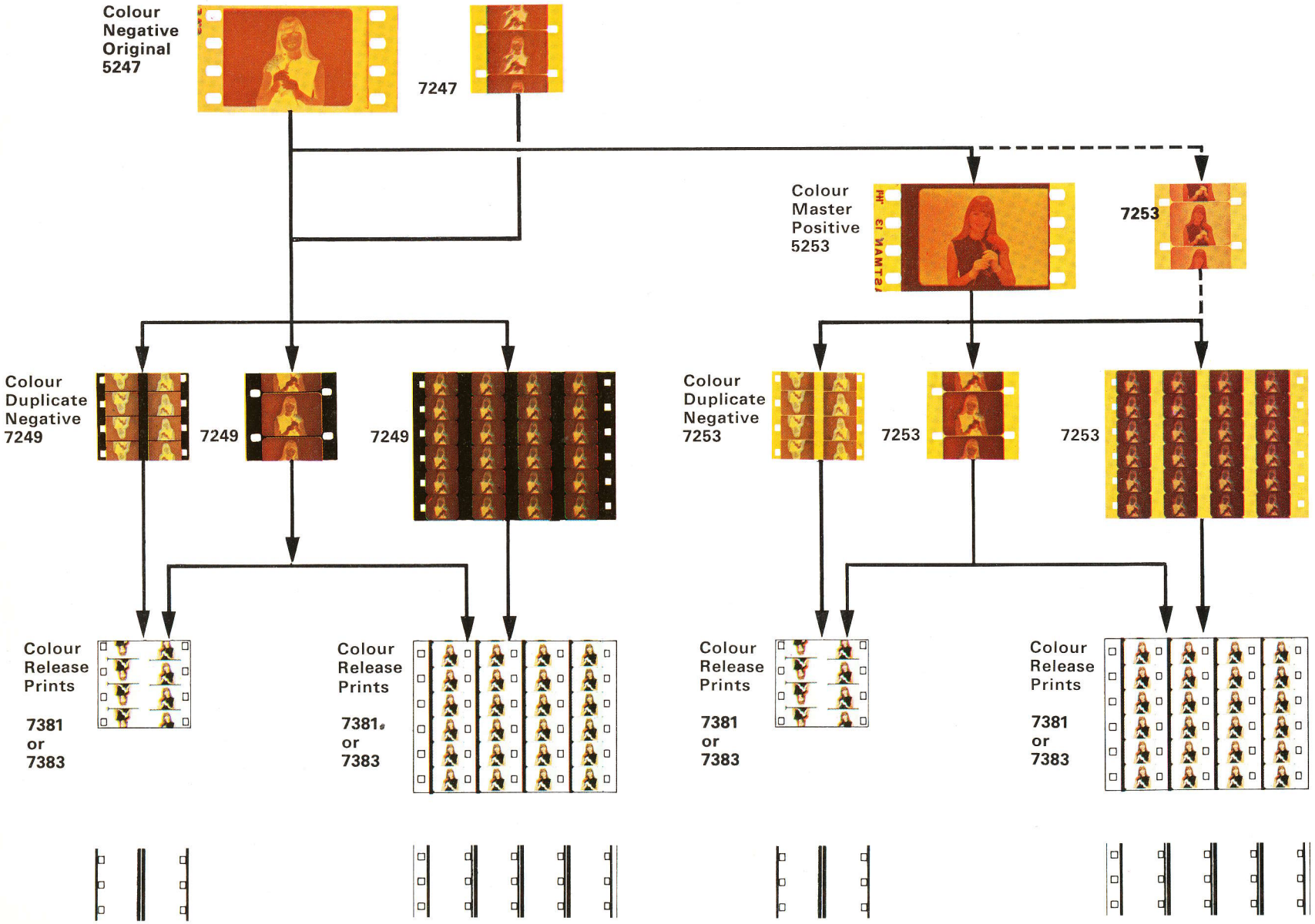
3 In the chart, where reduction stages are called for, it is best, in the interest of obtaining the highest definition in the final print, to postpone reduction until the latest practicable stage. The dotted lines shown therefore indicate, in general, a less preferable method.

4 In all systems shown, the final print stock may be perforated in either the regular 8 or super 8 format and may be magnetically prestriped or unstriped.

5 It is possible to use 7638 in all positions where 7381 is listed. This is not a recommended route as the lower contrast of 7638 will give a subjective impression of lower definition.



Originals


Colour Negative Original 5247
7247
Colour Master Positive 5253
7253
Colour Duplicate Negative 7249
7249
7249
Colour Duplicate Negative 7253
7253
7253
Colour Release Prints 7381 or 7383
Colour Release Prints 7381 or 7383
Colour Release Prints 7381 or 7383
Colour Release Prints 7381 or 7383

Film Processing

In choosing a printing system, it is important to know whether facilities are available for processing those films that will be used in the system. Required black-and-white or colour processes for the films shown in the charts are listed in the table overleaf.
Most laboratories are equipped to handle only certain processes, and the number handling all processes is extremely limited.
For those laboratories that wish to do their own processing, detailed information about continuous machine processing of any of the films discussed in this publication is available from the Motion Picture Division.

Printing Equipment

The printing systems shown call for highly specialized printing equipment. Certain methods require a continuous or step-type contact printer with provision for scene-to-scene density and colour-balance changes. To make reductions or enlargements, an optical printer is needed. If the system involves the use of separati negatives or positives for archival keeping purposes, a registering- type optical printer is required. Some kinds of special effects may require optical and/or registration printers. Systems for producing multiple super-8 prints on 16mm and 35mm width raw stock, require the use of very specialized printing equipment. In the final release print stage, provision must be made for printing the photographic sound track or for transferring and monitoring magnetic tracks. This work may be done on separate equipment, o the laboratory may have equipment combining the picture and sound printing or transfer into one operation.
Printers having either subtractive or additive systems for controllin the colour and intensity of the printing illumination can be used, b there is a definite trend toward adoption of the additive system because of its greater versatility and precision.

Printing System Quality Considerations

The appraisal of print involves consideration of a number of attributes, some objective and others subjective. Once the economic considerations are satisfied in the choice of a given system, the quality of prints from this system will depend on the film, and the degree of care exercised in printing and processing. In evaluating quality, the following characteristics will carry different weight, depending on the intended use of the final print :

1) Steadiness.
2) Physical blemishes – scratches, streaks, blotches, dirt particles, black specks, and white specks.
3) Graininess.
4) Definition.
5) Colour reproduction.
6) Tone reproduction.
7) Edge effects.

Quality is best judged by viewing prints projected under the conditions for which they are intended. Where the prints are to be used for normal projection before groups of people, the review room should simulate average viewing conditions with respect to projection distance, screen size, screen type, ambient light level, and viewing distance. The projector should be capable of producing uniform screen illumination and steady pictures. Prints intended for television transmission are best projected through a carefully standardized closed-circuit television system and viewed on a properly adjusted monitor. Prints for television can also be viewed in a film preview room – detailed information regarding such a room is contained in Kodak Pamphlet No. S-1, *The Television Film Preview Room.*

A comparison of the quality of prints produced by two different systems can be made by using a single projector or two matched projectors. If only one projector is used, a scene-by-scene check can be made by cutting and splicing the scenes in order. In the assembled print, Scene 1 from Print A will be followed by Scene 1 from Print B, and so on. A more critical evaluation is possible through the use of two carefully matched projectors. This method also avoids the necessity of cutting and splicing the separate scenes of the two prints. The projectors should be adjusted to provide equal sharpness and uniform screen illumination. They should also give equal screen luminance and colour temperature when no film is in the gate. (This is often difficult.) If it becomes necessary to check the steadiness or weave of a print, procure a projector performance test film in the appropriate format from the Society of Motion Picture and Television Engineers, 862 Scarsdale Avenue, Scarsdale N.Y. 10583

If a print made with a particular method is judged to be poor in quality, do not immediately blame the printing method. In many instances, the system may be unjustly condemned when the inferior print could be the result of poorly designed or maintained equipment, or inadequate control of printing or processing. These factors should be investigated and corrections made, before the printing procedure can be truly evaluated.

Other considerations include :

Original footage should be thoroughly cleaned and inspected for emulsion or base scratches. Typical frames should be checked with a magnifier or microscope to be sure that the images are in sharp focus. A printing system cannot produce good definition if the original is unsharp.

Edited original footage should be timed scene-to-scene for both density and colour to obtain the highest quality print, regardless of the printing system used. Even where the original photography has been carried out in the most professional manner, scene-to-scene colour-balance adjustment during printing is needed, since the adaptive properties of the human eye cause the appearance of a scene to be influenced by the composition and colour attributes of the preceding scene. Where scene-to-scene colour timing cannot be done for economic or other reasons, some compromise in quality must be expected. Colour balance can be judged by evaluating flesh tones or "memory" colours such as green grass, blue sky, etc.

Processing Requirements for Various Films

	Film Number	Process	Solution Acc. to Formula	Preparation Packaged Chemicals
Camera Films	7241, 7242	ME-4	Yes[1]	Yes[2]
	7252	ECO-3	Yes[1]	Yes[2]
	5247, 7247	ECN-2	Yes[1]	No
DuplicatingFilms	5234, 7234, 5366, 7366, 5296,7296	KODAK Developer D-96 or D-76 (for black-and-white negative films)	Yes[3]	No
	5249, 7249	CRI-1	Yes[1]	No
	5253, 7253	ECN-1	Yes[1]	No
	7271	EASTMAN Colour Print	Yes[1]	No
Print Films	5302, 7302	KODAK Developer D-97 or D-16 (for black-and-white positive films)	Yes[3]	No
	7622	Suggested Kodak Formulae	Yes[3]	No
	5360, 7360	KODAK Developer D-97 or D-16	Yes[3]	No
	5381, 7381, 5638, 7638	EASTMAN Colour Print	Yes[1]	No
	5383, 7383	ECP-2	Yes[1]	No
	7390, 7389	ME-4	Yes[1]	Yes[2]
	7292	B&W Reversal	Yes[3]	No

Notes:
1) Detailed processing manual (Price £48.50)
available from Kodak Limited, Motion Picture Division
2) Condensed processing manual (Price £4.85)
available from Kodak Limited, Motion Picture Division
3) Processing information contained in Eastman
Motion Picture Film Reference books.
volumes 1 and 2.

Films used in printing systems differ in graininess and modulation-transfer functions. (The modulation-transfer functions indicate the efficiency with which films reproduce details of the image that fall upon them. Factors such as diffusion of light within the emulsions and adjacency effects in development influence the quality of reproduction.) Optical systems also have specific modulation-transfer characteristics that can affect the graininess and sharpness observed in the final print. Therefore, one cannot expect that the definition and graininess pattern shown in the print will be identical for all printing systems. Uniform middle density areas in a projected print provide the best indication of graininess. In general, each printing stage introduces some loss in definition and increases the difficulty of maintaining colour fidelity. In the case of reduction printing, it is preferable, where economically feasible, to postpone reduction to the last printing step to obtain the best definition.
One important criterion for choosing a printing system is the number of prints against which the costs can be amortized. For example, reversal release prints made directly from a reversal original might be the most economical approach where only a few prints are desired, but not so where large quantities are involved.
This publication has not covered the problems inherent in the printing of photographic sound tracks, transfer of magnetic recordings to prestriped print stocks, and edge-printing of footage numbers or special identification marks. Such aspects should also be considered when choosing a printing system. It is necessary to investigate the types of tracks that can be used on certain films, the processes associated with these films, the availability of prestriped print stocks, etc.

Summary

The printing systems shown in the charts represent those in general use at commercial laboratories and certainly do not include all systems. Also, there are some systems in use, such as those with many duplication stages, that admittedly may be required under special circumstances but which entail quality losses.
It can be seen that the choice of a printing system is governed not only by the equipment and facilities available at a laboratory, but by economic considerations such as the cost of materials and labour for printing and processing, the number of prints desired, etc.
The final print quality is dependent on a number of factors, including the quality of the original footage, the characteristics of the sensitized materials involved, the kind of equipment used and how well it is adjusted and maintained, the degree of control exercised in film processing, projection circumstances, and the manner in which the film is handled.

Kodak Limited Motion Picture Division

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