

Processing  
and Duplicating  
Microforms

TRAINING *in*  
PRESERVATION  
MICROFILMING

**Module Seven of Ten**

# Processing and Duplicating Microforms

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National Library of Australia

2003



Published by the National Library of Australia  
Canberra ACT 2600

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Brown, Heather.

Training in preservation microfilming.

Bibliography.

Includes index.

ISBN 0 642 10783 1 (v. 7).

ISBN 0 642 10790 4 (set).

1. Preservation microfilming - Australia - Handbooks, manuals, etc. 2. Preservation microfilming - Australia - Problems, exercises, etc. 3. Preservation microfilming - Asia - Handbooks, manuals, etc. 4. Preservation microfilming - Asia - Problems, exercises, etc. 5. Preservation microfilming - Pacific Area - Handbooks, manuals, etc. 6. Preservation microfilming - Pacific Area - Problems, exercises, etc. I. Title.

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# Introduction

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Welcome to Processing and Duplicating Microforms.

The purpose of this module is to introduce you to the equipment and the processes involved in processing and duplicating microforms.

## Prerequisites

This is the seventh module in the training materials on preservation microfilming. In order to work through this module you need to have satisfactorily completed the module, **Preservation Microfilming—Basics**.

It will also help if you have completed modules 3, 4 and 5:

- I **Preparation for Microfilming**
- I **Maintaining Microfilming Equipment**
- I **Operating Microfilming Equipment—Cameras**.

These will give you related information which you will find useful before you start this module.

## Learning outcomes

When you have successfully completed this module, you will be able to:

- I list the requirements for processing to preservation standards
- I load and operate processing machines
- I maintain processing conditions
- I handle masters and other generations of microforms according to established guidelines
- I list the requirements for duplicating to preservation standards
- I load and operate duplicating machines
- I maintain duplicating conditions
- I keep appropriate records of processing/duplicating operations.

In competency-based training models, the **learning outcomes** closely relate to the term **elements of competency**.

## Recognition of current competencies (RCC)

You may already have knowledge, experience and skills which are relevant to this module.

This means that if you wish to complete a formal Preservation Microfilming course, you may not have to study all of it.

Please discuss this with your course coordinator, or lecturer. Evidence of your microfilming competence and/or an assessment, such as a practical test, will be required.

## Assessment

If you are formally studying the Preservation Microfilming course, you must meet certain **performance criteria** in order to demonstrate your competency in each unit or module. These criteria form the basis of your assessment. They are listed at the beginning and end of each topic.

As you work your way through the training materials, you will need to keep a record of the **performance criteria** and other learning **activities** that you have completed.

## Conditions

You will also need access to the following, either in your own workplace or by arrangement with another organisation:

- I one or more microfilm processors
- I relevant chemicals e.g. developer, fixer or ammonia
- I a duplicator
- I manuals for the processors and duplicator
- I a reel of previously exposed negative film for processing, plus a short reel of film for testing the processor
- I a reel of film or a fiche for duplicating
- I duplicating film or fiche materials e.g. direct duplicating film
- I equipment for checking the processed film e.g. a fiche reader, hand winder, light box and magnifying glass or eye loupe.

Cotton gloves for handling the film are supplied with this module.

Contact your lecturer or mentor immediately if you have any difficulty in accessing the equipment or other supplies, so that an alternative can be arranged.

## Activities

There are two types of learning activities in this module, which are indicated by the icons below.

### ■ Activity

Responses to these activities are written in this book. They are usually short tasks which keep you involved with the issues you are considering and may also require you to apply what you are learning.

Some of the activities in these training materials require you to perform certain tasks, such as loading a camera or operating a processor. A lecturer or assessor will observe you performing the tasks and then examine the results or the product (e.g. the newly processed microfilm) to check that it meets requirements. Major activities are marked with the symbol ★.

### ● Reflect

Here you will be asked to think about key issues, usually in consultation with workplace colleagues, and come to some conclusions. The purpose of these activities is to allow you to share your understanding with others, and benefit from wider experience than your own.

You will need to be prepared to discuss your findings or conclusions with your assessor or lecturer who will be signing off the relevant **performance criteria**.

### ▲ Submit

When this icon appears, you are ready to record in the **Log book** that you:

- I can meet the **performance criteria**
- I have satisfactorily completed the **activities** for a topic.

You can record these in the **Log book** simply by marking the boxes in the shaded columns with a ✓ **yes** or ✗ **no**.

You can then ask your lecturer or assessor to verify that you can meet the **performance criteria** and that you have satisfactorily completed the **activities**.

If you work through the various activities along the way, you will find the assessment activities relatively easy to complete.

## Resources



**There are a number of resources available on preservation and preservation microfilming. A librarian can help you find out where these resources are available.**

Below are a few:

### Printed materials

Adcock, Edward P. (ed. & comp.) 1998, *Principles for the Care and Handling of Library Material*, International Preservation Issues, number 1, IFLA-PAC, Paris.

Address: IFLA Core Programme for Preservation and Access (PAC) Bibliotheque Nationale de France, 2, rue Vivienne, 75084 Paris Cedex 02, France.

(Available online at IFLA website as *Principles for the care and handling of library material*, <<http://www.ifla.org/VII/4/news/pchlm.pdf>>, accessed 4 May 2003.)

AIIM (Association for Information and Image Management) 1992, *Micrographic Film Technology*, 4th edn, AIIM, Silver Spring, MD.

Afanis, Peter 2000, 'Meeting International Standards Effectively with Local Budgets and Resources', Proceedings of the International Meeting on Microform Preservation and Conservation Practices in Southeast Asia: Assessing current needs and evaluating past projects, February 21–24, 2000, Chiang Mai University, Chiang Mai, pp.41–43. (Available from the SEACAP website, <<http://www.seacap.chiangmai.ac.th>>, accessed 14 May 2003).

Canadian Cooperative Preservation Project 1993, *Guidelines for Preservation Microfilming in Canadian Libraries*, Prepared by the National Library of Canada for the Canadian Cooperative Preservation Project, Ottawa.

Elkington, Nancy E. (ed.) 1992, *RLG Preservation Microfilming Handbook*, Research Libraries Group, Mountain View, California.

Elkington, Nancy E. (ed.) 1994, *RLG Archives Microfilming Manual*, Research Libraries Group, Mountain View, California.

Fox, Lisa L. (ed.) 1996, *Preservation Microfilming: A Guide for Librarians and Archivists*, 2nd edn, ALA, Chicago.

Manuals for processing and duplicating equipment.

Meyer, Lars & Gertz, Janet 1993, *RLG Guidelines for microfilming to support digitization*, Research Libraries Group, Mountain View, California. Available online at <<http://www.rlg.org/preserv/microsuppl.pdf>>, accessed 12 May 2003.

*Microform and Imaging Review* 1972–, (journal), quarterly, K. G. Saur, Munich, Germany.

*Micrographics Year Book* 1981– 2001 (annual), G. G. Baker, Windlesham, Surrey, UK. (Last edition 2001).

National Library of Australia 1995, *Preservation Microfilming: Does It Have a Future?* Proceedings of the First National Conference of the National Preservation Office, at the State Library of South Australia, 4–6 May, 1994, National Library, Canberra.

National Library of Australia 1998, *Guidelines for Preservation Microfilming in Australia and New Zealand*, National Library, Canberra.

National Preservation Office 2000, *Guide to Preservation Microfilming*, The Office, London.

Saffady, William 1990, *Micrographic Systems*, 3rd edn, Association for Information and Image Management, Silver Spring, MD.

Saffady, William 2000, *Micrographics: Technology for the 21st Century*, Association of Records Managers and Administrators, Prairie Village, Kansas.

SEACAP (Southeast Asian Consortium for Access and Preservation) 2000, Proceedings of the International Meeting on Microform Preservation and Conservation Practices in Southeast Asia: Assessing Current Needs and Evaluating Past Projects, February 21–24, 2000, Chiang Mai University, Chiang Mai. (Available from the SEACAP website, <<http://www.seacap.chiangmai.ac.th>>, accessed 4 May 2003.)

## Standards (relevant):

ANSI/AIIM MS23-1998 Standard for Information and Image Management – Standard recommended practice for production, inspection and quality assurance of first-generation silver microfilm of documents.

ISO 10602: 1995 Photography – processed silver-gelatin type black and white film-specifications for stability. (Identical to ANSI/NAPM IT9.1)

ISO 8225: 1995 Photography – ammonia-processed diazo photographic film-specifications for stability. (Identical to ANSI/NAPM IT9.5)

ISO 9718: 1995 Photography – processed vesicular photographic film-specifications for stability.

ISO 18917 1999 Photography – determination of residual thiosulfate and other related chemicals in processed photographic materials – methods using iodine-amylose methylene blue and silver sulfide.

MP 25 – 2002 Basic Guide to microfilming – Miscellaneous Standard. Standards Australia.

See also the list of international standards in the **Learning Guide**.

## Internet sites

(As internet sites change frequently, you may need to use a search engine to identify the latest location)

AICCM (Australian Institute for the Conservation of Cultural Material Inc.), <<http://www.aiccm.org.au>>, accessed 15 May 2003. Address: GPO Box 1638, Canberra ACT 2601, Australia.

AIIM (Association for Information and Image Management), <<http://www.aiim.org>>, accessed 4 May 2003, and its sub group the Film-based Imaging Association, <<http://www.fbi.aiim.wegov2.com>>, accessed 14 May 2003. The film-based imaging association has a buyers guide of U.S. manufacturers and distributors of micrographic equipment and supplies. Address: 1100 Wayne Avenue, Suite 1100, Silver Spring MD 20910 USA

ANSI (American National Standards Institute) <<http://www.ansi.org>> accessed 15 May 2003. ANSI administers and coordinates the U.S. standardisation system. Address: Customer Service, American National Standards Institute, 25 West 43rd Street, New York, NY 10036.

BSI Group (British Standards Institution), <<http://www.bsi-global.com>>, accessed 13 May 2003. The source of information and supply of British microfilming standards. BSI Group 389 Chiswick High Road, London, W4 4AL, UK.

CLIR (Council on Library and Information Resources), <<http://www.clir.org/>>, accessed 3 May 2003. Address: 1755 Massachusetts Avenue, NW, Suite 500 Washington DC 20036, USA

G.G. Baker and Associates, <<http://www.ggbaker.com/>>, accessed 15 May 2003.

This organisation provides detailed advice about micrographic systems. The web site includes links to suppliers and also provides background information about areas of microfilming from jacketing to linking with electronic document management systems.

Address: Saffron Hill, Chedworth, Glos. GL54 4AL UK.

IFLA (International Federation of Library Associations and Institutions) Preservation and Conservation (PAC) Core Programme, <<http://www.ifla.org/VI/4/admin/general.htm#1>>, accessed 15 May 2003.

IFLA-PAC Bibliotheque Nationale de France, Address: 2, rue Vivienne, 75084 Paris Cedex 02, France.

- See also *Principles for the care and handling of library material*, <<http://www.ifla.org/VI/4/news/pchlm.pdf>>, accessed 15 May 2003.
- A number of back issues of *International Preservation News* are available direct from the IFLA website, <<http://www.ifla.org/VI/4/pac.htm#4>>, accessed 15 May 2003.
- The IFLA-PAC Centre at the National Library of Australia maintains a *Documentary Heritage Preservation Register*. This provides information about preservation projects in the Southeast Asian and Pacific regions such as microfilming, training, basic conservation and collection surveys, <<http://www.nla.gov.au/dhpr/>> accessed 15 May 2003.

IPI (Image Permanence Institute) <<http://www.rit.edu/~661www1/>>, accessed 15 May 2003. The IPI is a university-based research laboratory devoted to image preservation. Address: Rochester Institute of Technology, 70 Lomb Memorial Drive Rochester NY 14623-5064, USA.

ISO (International Organisation for Standardisation), <<http://www.iso.ch/>>, accessed 15 May 2003. Address: ISO Central Secretariat PO Box 56 CH-1211 GENÈVE Switzerland.

Library Preservation and Conservation Tutorial – Southeast Asia. Designed for librarians and conservators in Southeast Asia, it has a range of information on preservation, including microfilming, <<http://www.librarypreservation.org/>>, accessed 15 May 2003.

The Microfilm Shop, <<http://www.microfilm.com/>>, accessed 15 May 2003. Provides product information, news and views with a focus on business applications.

MICROLINK-L is an email discussion list on preservation microfilming jointly owned by the National Library of Australia and the State Library of South Australia, <[http://www.nla.gov.au/nla/listserv/microlink\\_l.html](http://www.nla.gov.au/nla/listserv/microlink_l.html)>, accessed 15 May 2003.

Museums Australia, <<http://amol.org.au/>>, accessed 15 May 2003.

Address: PO Box K36 Haymarket NSW 1238.  
(The resource *ReCollections* is also available online from the Museums Australia website, <<http://amol.org.au/reollections/>>, accessed 15 May 2003.)

National Library of Australia <<http://www.nla.gov.au/>>, accessed 15 May 2003.

Address: Canberra, ACT 2600, Australia  
National Library of Australia. Policy on Preservation Copying of Collection Materials, <<http://www.nla.gov.au/policy/micro.html>>, accessed 15 May 2003.

National Library of Australia. Anica – Australian Network for Information on Cellulose Acetate, <<http://www.nla.gov.au/anica/index.html>>, accessed 15 May 2003.  
See also MICROLINK-L <[http://www.nla.gov.au/nla/listserv/microlink\\_l.html](http://www.nla.gov.au/nla/listserv/microlink_l.html)>, accessed 15 May 2003, and IFLA-PAC Documentary Heritage Preservation Register <<http://www.nla.gov.au/dhpr/>> accessed 15 May 2003.

The National Preservation Office (UK).  
Address: British Library, 96 Euston Road London, NW1 2DB, UK <<http://www.bl.uk/services/preservation/>>, accessed 15 May 2003.

NSSN: a National Resource for Global Standards, <<http://www.nssn.org>>, accessed 15 May 2003.  
Provides a fee-based information service which includes international standards and technical data. Address: Customer Service, American National Standards Institute, 25 West 43rd Street, New York, NY 10036.

PAMBU (Pacific Manuscripts Bureau), <<http://rspas.anu.edu.au/pambu/>>, accessed 15 May 2003. Based in the Research School of Pacific and Asian Studies, Australian National University, the aim of the Pacific Manuscripts Bureau is to locate and preserve archives, manuscripts and other unpublished or semi-published material through microfilm.  
Address: PAMBU, Research School of Pacific and Asian Studies, Australian National University, Canberra, ACT, 0200, Australia.

Preservation Resources is a division of OCLC. (Online Computer Library Center Inc.), <<http://www.oclc.org/oclc/presres/microfilm.htm>>, accessed 15 May 2003.

It offers services such as preservation microfilming to libraries, including duplicating, scanning and polysulfide treatment.

*RLG DigiNews* is a newsletter conceived by the members of the Research Libraries Group's PRESERV community. Funded in part by the Council on Library and Information Resources (CLIR) from 1998–2000, it is available internationally via the RLG PRESERV web site, <<http://www.rlg.org/preserv/>>, accessed 15 May 2003.  
Address: Research Libraries Group 1200 Villa Street Mountain View, CA 94041-1100 USA.

SEACAP (Southeast Asian Consortium for Access and Preservation), <<http://www.seacap.chiangmai.ac.th>>, accessed 14 May 2003.

The aim of SEACAP is to encourage and support collaboration amongst libraries, archives and other institutions and interested individuals in order to preserve and provide access to the published and documentary heritage of the region.

Spring Singapore, <<http://www.psb.gov.sg>>, accessed 15 May 2003.

The source for information and supply of Singapore Codes of Practice relating to microfilming.  
PSB Building, 2 Bukit Merah Central, Singapore 159835.

Standards Australia, <<http://www.standards.com.au>>, accessed 14 May 2003. Address: GPO Box 5420 Sydney NSW 2001, Australia.

UNESCO *Memory of the World Programme*, <<http://whc.unesco.org/nwhc/pages/home/pages/homepage.htm>>, accessed 15 May 2003.

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# Topics 1, 2, 3 & 4

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Processing to preservation standards

Loading and operating processors  
Maintaining processing conditions  
Correct handling procedures

## Performance criteria

You will have achieved the performance criteria for these topics when you can:

- I list the requirements for processing to preservation standards
- I list the relevant standards associated with processing
- I prepare film, processing equipment and chemicals
- I load film on and off the processor promptly and reliably
- I process exposed film promptly (within the guidelines for latent image fade)
- I maintain standard conditions for processing
- I process film to quality standards
- I keep appropriate records of processing operations
- I recall routine maintenance and trouble-shooting strategies for processing equipment
- I recall occupational health and safety issues relating to the use of chemicals
- I list and demonstrate appropriate film handling techniques to avoid damaging the film.

## Processing

Processing is the series of steps involved in treating exposed microfilm, to make the latent (invisible) images visible.

In preservation microfilming the film should be processed to give the highest results and maximum life expectancy. Careful control of the processing will ensure consistent results and a processing system that is efficient and of high quality.

In some cases filming may be done on site, but processing may be done at another location where the specialised equipment and chemicals are more readily available. (Arfanis 2000)

In these cases, the camera operator should carry out **step tests** and follow the **shortcuts to exposure levels** that are described in the module, **Operating Microfilming Equipment—Cameras**.

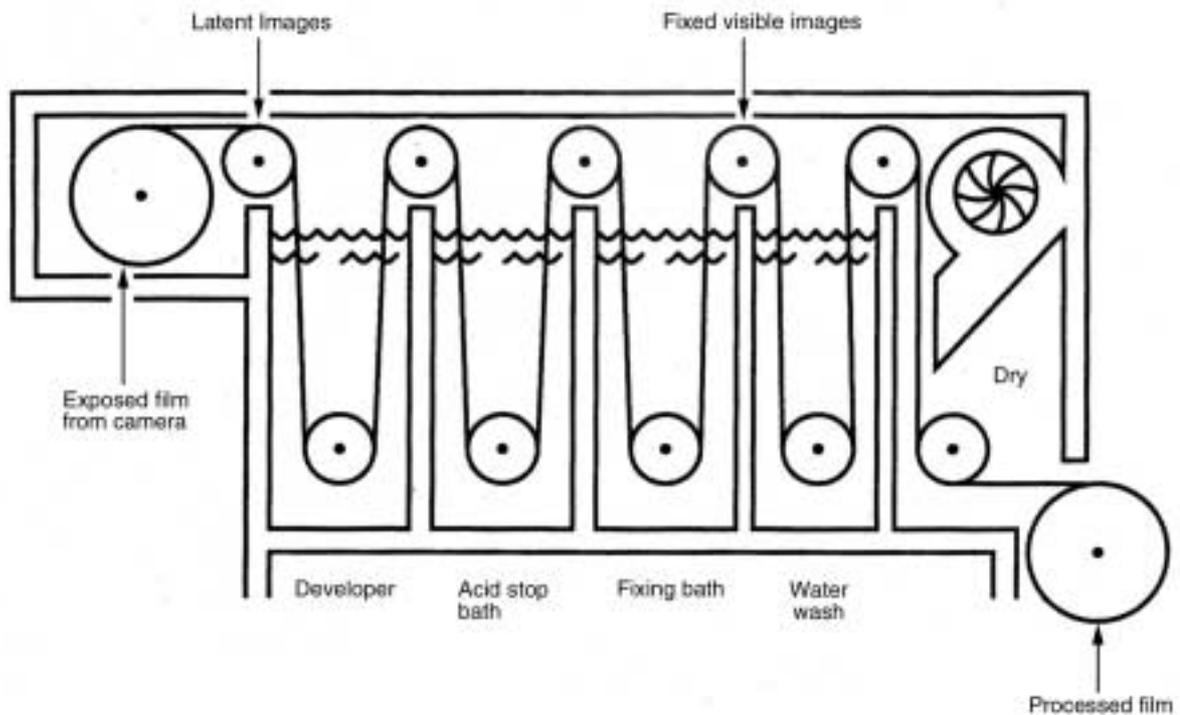
Even in cases where processing and duplicating are done at another location, it is important for microfilming staff to be aware of the steps involved, as this will help in identifying problems and in checking the quality of the final product.

## Processing steps

With silver halide film, the microfilm is developed in a processor that runs the film through a series of steps. These steps are typically:

- I developing
- I stop bath or rinse
- I fixing
- I washing
- I drying.

A simple processor operates like this.



### Processing steps

Reproduced by permission from *Preservation Microfilming: A Guide for Librarians and Archivists, Second Edition* edited by Lisa Fox and the Association of Research Libraries,

© 1995 by the American Library Association.

## Developing

The developer converts the exposed silver halide crystals in the film emulsion into metallic silver.

Developing is controlled by:

- I time
- I temperature
- I agitation (movement)
- I chemical activity.

Each of these activities is automatically controlled in an automatic processor.

## Stop bath or rinse

The stop bath or rinse is used to stop developing, prevent stains and to help preserve the life of the fixer.

## Fixing

The fixing removes the undeveloped silver halides from the emulsion. Without fixing, the images of most films will lack permanence.

### **Washing**

Proper washing is needed to remove residual fixer chemicals from the film.

### **Drying**

The drying process removes moisture from the film.

### **Replenishment units**

Many processors have replenishment units which steadily regulate the supply of chemicals according to the length of film being processed. (See photograph below of a replenishment unit with a table-top processor.)

## **Types of processors**

A variety of processors is available, ranging from small hand tanks and deep-tank processors to table-top models. The small hand tanks are generally not suited for preservation microfilming work. It is difficult to obtain precise, repeatable results with hand processing.

### **Deep-tank processors**

Deep-tank processors allow very precise control of the processing and drying temperatures and the rate at which chemicals move through the tanks. Some have two separate fixing baths and two or more water baths to ensure thorough washing.



*Deep tank processor*

© Photograph courtesy of State Library of South Australia

### Table-top processors

Table-top processors use high temperatures to make up for their lack of tank capacity. In table-top models, processing involves short immersions in hot solutions for development, fixing and washing, followed by high temperature drying.

Table-top processors do not allow operators to vary development times and the contrast of the film cannot be as readily controlled. Clear areas of the film may be less transparent than with deep tank processors

Lisa Fox comments that many preservation projects benefit from the ability to vary the contrast in film (Fox 1996, pp.198-199). This is more easily done in a deep-tank processor than a table-top model.



*Table top processor with replenishing unit*

© Photograph courtesy of State Library of South Australia

 Further information about various types of processors is available from sources such as:

- Saffady 1990, 2000
- the websites of G.G. Baker and the Film-based Imaging Association (U.S.).

### Latent image fade

It is desirable to give films a minimum rest period of 8 hours between the last exposure and processing. This is due to latent image fade. The latent image on the film loses density slightly between exposure and processing.

The following table summarises:

- steps that will cause latent image fade problems
- how to *avoid* latent image fade problems.

Steps which will cause latent image fade problems	Filming (example)	How to avoid latent image fade problems
	↓ taking nearly 7 hours to complete a roll ↓	complex filming,
↙	<b>processing</b>	↘
<b>immediate</b>		<b>wait 8 hours before processing</b>
the first images on the film will have experienced 7 hours of latent image fade		↓
the last images have experienced only a few minutes of latent image fade		↓
↓ <b>result</b> ↓		↓ <b>result</b> ↓
<b>latent image fade problems</b>		<b>no problems</b>
density difference between the frames at beginning and frames at end		

### Hints

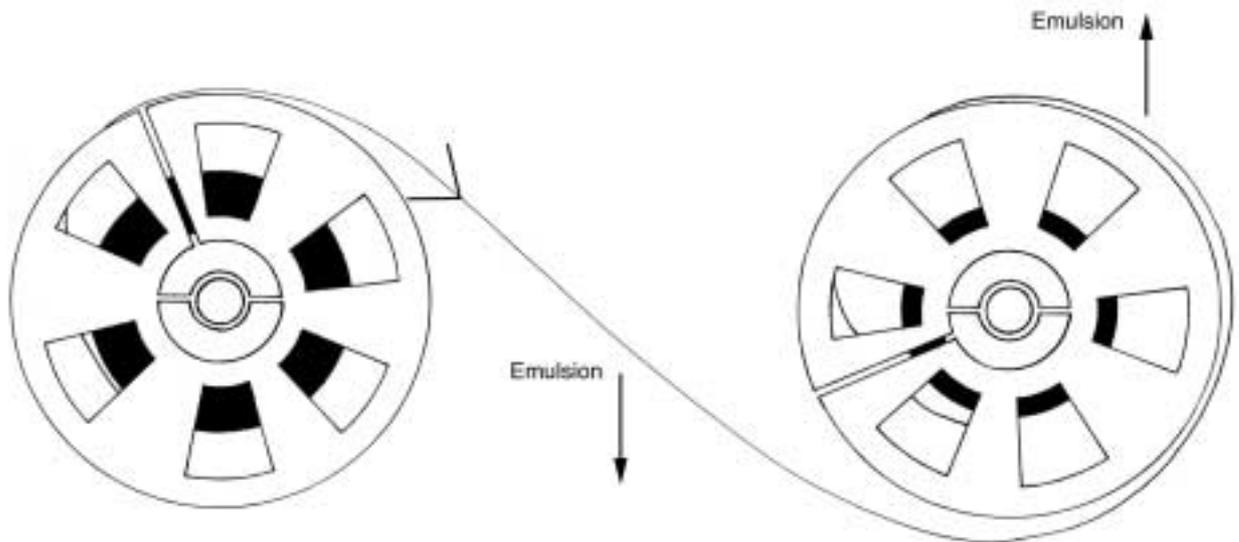
It is a useful to note the date and time of film removal from the camera on the film container before it is sent for developing. This alerts the operator to any potential problems with latent image fade.

## Preparing film for processing: rewinding and joining (splicing)

The three key steps in preparing film for processing are:

- I avoid latent image fade (leave film for at least 8 hours before processing)
- I rewind film, if necessary
- I join film, if necessary

Step	Comments
avoiding latent image fade	<ul style="list-style-type: none"> <li>• check the date and time when the film was last removed from the camera</li> <li>• leave film at least 8 hours to avoid effects of latent image fade</li> </ul>
rewinding film, if necessary	<ul style="list-style-type: none"> <li>• microfilm reels in cameras are wound emulsion in</li> <li>• with many deep-tank processors films must be rewound emulsion out</li> <li>• rewinding of unprocessed film should be done in total darkness with great care (see, <b>Film handling techniques</b> below)</li> </ul>
joining films, if necessary	<ul style="list-style-type: none"> <li>• with deep-tank processors, individual reels are often joined or spliced together to make one large reel for processing</li> </ul>



*Rewinding of master from emulsion in to emulsion out*

## Film handling techniques

At all times film should be handled carefully to avoid damage. The following are best practice suggestions for handling films:

- wear clean white cotton gloves all times when handling film, to avoid scratching (cotton gloves for handling film have been supplied with this module)
- only touch the edges of the film
- use winders to wind or rewind film
- wind or rewind film gently and slowly
- load unexposed film in complete darkness whenever this is required.



*Handle film carefully and wear clean white cotton gloves*

*© Photograph courtesy of National Library of Australia*

## Standards

Standards were discussed in the first module, **Preservation Microfilming—Basics**.

 From the list of international standards that appears in the **Learning Guide**, the ones listed below are especially relevant to processing.

As standards are continually being revised, it is important to check with a standards organisation such as the ISO (listed in the **Resources** list) for information about the latest versions. As an example of the revision process, ANSI standards are now being replaced by ISO standards.

ANSI/AIIM MS23—1998 American National Standards for Information and Image Management—practice for operational procedures/inspection and quality control of first-generation silver microfilm of documents.

ISO 10602: 1995 Photography—processed silver-gelatin type black and white film—specifications for stability. (Identical to ANSI/NAPM IT9.1)

ISO 8225: 1995 Photography—ammonia-processed diazo photographic film—specifications for stability. (Identical to ANSI/NAPM IT9.5)

ISO 9718: 1995 Photography—processed vesicular photographic film—specifications for stability.

ISO 18917 1999 Photography—determination of residual thiosulfate and other related chemicals in processed photographic materials—methods using iodine-amylose methylene blue and silver sulfide.

■ Activity 7.1

**Processing to preservation standards**

a) How can you avoid latent image fade?

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b) Briefly describe the *five main steps* involved in processing microfilms.

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c) Describe appropriate film handling techniques.

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## Topics 1, 2, 3 & 4

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d) Briefly list the *code numbers* and *titles* of 2 *standards* that are relevant to the processing of microfilms.

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e) What is the difference between a deep-tank processor and a table-top processor?

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f) How is film prepared for processing with a deep tank processor that uses long reels?

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## Preparing processor and chemicals



*Developer and fixer chemicals*

© Photograph courtesy of State Library of South Australia

All processors need to be carefully prepared before they can begin to operate effectively. The following are some typical stages of preparing the processor and chemicals. Note especially the need for *darkroom* conditions.

A darkroom is a room used for loading and unloading film and for developing exposed photographic film or paper. Darkroom conditions mean that the room is light-proof.

Ideally, the darkroom should have *safelights*. Safelights are lights with filters that provide a controlled light source that has little or no effect on exposed photographic materials.

Compare the steps below with the steps needed to prepare and operate other processors that you have seen or used. You will need to apply and adapt these steps to your own workplace.

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## Topics 1, 2, 3 & 4

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### Steps

1. first carry out processor cleaning and maintenance steps—check the manual for instructions
  2. add fixer and developer—follow directions and handle chemicals safely
- 



*Preparing the processor—filling it with chemicals*

- 
- some processors have an automatic replenisher
- 



*An automatic replenisher*

3. install processing racks, if necessary

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*Processing racks*

4. make sure rollers are turning freely manually— *before* power is turned on (stage 1)

5. install drying racks, if necessary

6. turn on water and power (check if water needs to be circulating *before* turning on power)

7. make sure rollers are turning freely *after* power is turned on (stage 2)

8. check temperature and adjust

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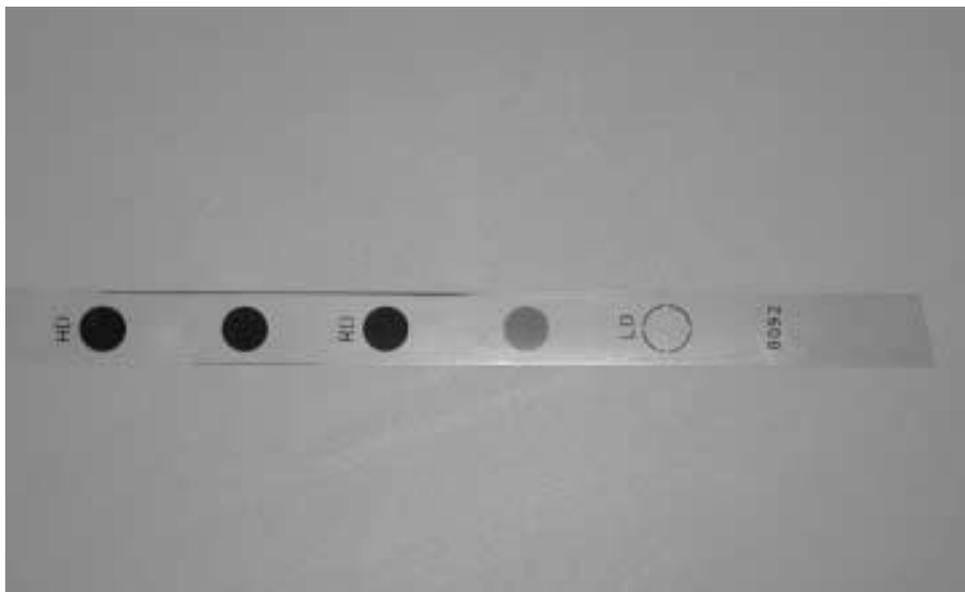
*Checking temperature with thermometer*

9. adjust processor speed, if required

10. test film transport with sample film under darkroom conditions

11. test chemical levels with control strips—see section below on control strips—and process control strips in *total darkness*

---



A control strip

## Advice on handling chemicals

Here is more information about handling chemicals safely.

Feature	Comments
follow directions	<ul style="list-style-type: none"><li>carefully follow directions for mixing any chemicals</li></ul>
adding chemicals	<ul style="list-style-type: none"><li>always add chemicals in the order listed</li></ul>
handling	<ul style="list-style-type: none"><li>handle chemicals safely by following occupational health and safety guidelines</li><li>(see also the modules, <b>Preparation for Microfilming</b> and, <b>Maintaining Microfilming Equipment</b>)</li></ul>
avoid contamination	<ul style="list-style-type: none"><li>avoid contaminating solutions by cleaning all equipment immediately after use and mixing chemicals away from the processor</li></ul>
storage	<ul style="list-style-type: none"><li>store solutions in the containers provided</li><li><i>never</i> interchange the lid of one bottle with another</li></ul>
check lids	<ul style="list-style-type: none"><li>ensure that the lids of bottles are free from corrosion and foreign particles</li><li>make sure they fit tightly enough to prevent the entrance of air</li></ul>
water quality	<ul style="list-style-type: none"><li>use water that is filtered where possible (some organisations use de-ionised water)</li></ul>

Feature	Comments
storage time	<ul style="list-style-type: none"><li>do not use chemicals that have been stored longer than recommended</li></ul>
<div style="border: 1px solid black; padding: 2px; display: inline-block;">✗ USE BY: 4 June 2001</div>	
storage temperature	<ul style="list-style-type: none"><li>make sure chemicals are stored at recommended temperatures</li><li>for example, storing developers at temperatures that are too high can produce oxidation and a loss of activity</li><li>storing at temperatures that are too low can cause some solutions to crystallise</li></ul>

## Advice on preparing the processor

The following information explains the earlier procedures in more detail.

Feature	Comments
cleaning and maintenance	<ul style="list-style-type: none"><li>always clean processor before use</li><li>wipe to remove any dust or dirt</li><li>processing equipment must be free from rust or corrosion and chemical deposits</li><li>carry out the required steps for processor maintenance as described in the module, <b>Maintaining Microfilming Equipment</b></li></ul>
add fixer	<ul style="list-style-type: none"><li>fill the fixer tanks with fixer to the specified level</li></ul>
add developer	<ul style="list-style-type: none"><li>fill the developer tanks with developer to the specified level</li></ul>
install processing racks, if necessary	<ul style="list-style-type: none"><li>install any processing racks that have been removed</li><li>drain off any excess water</li></ul>
check rollers (stage 1)	<ul style="list-style-type: none"><li>make sure rollers are turning freely manually—before power is turned on install drying racks, if necessary</li><li>install a dryer rack, if applicable</li></ul>
turn on power and water	<ul style="list-style-type: none"><li>turn on the water supply and power</li><li>check that water is circulating through processor</li></ul>
check rollers (stage 2)	<ul style="list-style-type: none"><li>make sure rollers are turning freely—<i>after</i> power is turned on</li></ul>
check temperature	<ul style="list-style-type: none"><li>make sure the temperatures of the developer, film dryer and water are within the specified levels</li><li>adjust temperatures if necessary according to instructions</li></ul>
adjust processor speed	<ul style="list-style-type: none"><li>adjust processor speed, if required</li></ul>
test film transport	<ul style="list-style-type: none"><li>check the film transport by feeding a piece of test film through the processor—this helps to check that all racks and rollers are in place and working properly</li></ul>

## Control strips

Microfilming staff frequently use control strips to monitor processing operations. Major film suppliers manufacture the control strips. They contain a pre-exposed image of steps of increasing exposure. After processing, the strips turn into steps of increasing density. (See photograph of a control strip in the section, Preparing processor and chemicals).

Control strip chart

Copyright: ©Reproduced by permission from Kodak

## Using control strips

Control strips are used to check that the processor is working at an optimum level. They should be used:

- at beginning of the day
- at middle and end of a long work period
- whenever there is any trouble or change—such as the introduction of fresh chemicals.

After the control strips are processed and dried, density readings are taken to establish:

- reference density (RD)
- low density (LD)
- high density (HD).

These are plotted on the control strip chart (see above). The RD of each control strip is compared with previously established reference densities.

If a control strip reading is outside specified limits, another test is made. If this second test is consistent with the first test, then corrections need to be made.

The details of corrections are specified by the manufacturer. Relevant information is usually in equipment manuals. The corrections can include changing the developer time, developer temperature and/or replenisher rate.

Further details about control strips can be obtained from the manufacturers.

Control strips should be:

- stored in a refrigerator, or as recommended by the manufacturer
- handled with care to prevent contamination
- processed in total darkness.

## Loading and operating the processor

The following is a general guide to the typical steps in loading many types of silver halide film processors. All these steps need to be performed promptly and reliably.

You can apply and adapt these general steps to different types of processors. Remember that each processor is unique. Be alert to any special requirements. Processor manuals will describe the steps for loading and operating individual processors correctly.

---

### Step

---

1. switch off lights—change to darkroom conditions
  2. remove exposed film from box
  3. rewind film, if necessary
  4. join film to leader, if necessary
  5. open processor cover or loading box
  6. place roll correctly on supply spindle
  7. feed film leader or 'threader' into 'feed' chute
- 



*Loading a processor with self threader*

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---

### Step

---

8. close cover
  9. turn on light
  10. processed film comes out of processor
- 



Processed film comes out of processor © Photograph courtesy of State Library of South Australia

11. cut end of processed film, if necessary
  12. attach film to a take-up reel
  13. remove take-up reel when film is completely processed
- 

## Advice on loading and operating the processor

Some additional advice on loading and operating the processor is given below.

---

Step	Comments
darkroom conditions	<ul style="list-style-type: none"><li>• switch off lights—change to <i>darkroom</i> conditions</li><li>• load the processors in darkness (or in low light, as recommended) which avoids fogging the film</li></ul>
place roll correctly on supply spindle	<ul style="list-style-type: none"><li>• place the roll of film onto the supply spindle with the emulsion side positioned according to the instructions in the manual (emulsion side up or down)</li></ul>
feed film into feed chute	<ul style="list-style-type: none"><li>• feed film into the feed chute that leads to the first developer rack of rollers</li><li>• some processors require the film to be attached to a self-threader—a special leader that prevents jams</li></ul>

---

Step	Comments
	<ul style="list-style-type: none"><li>• the moving rollers will start to draw the film into the processor</li></ul>
processed film comes out	<ul style="list-style-type: none"><li>• wait for the processed film to come from the other side of the machine</li><li>• after the leader/trailer, the first section to come through will be the last part of the film that was exposed</li></ul>
cut leader and/or attach it to take-up reel, as necessary	<ul style="list-style-type: none"><li>• as the film emerges, cut the end of the film leader (or the self-threader) as necessary, and attach it to a take-up spool, as required</li><li>• there may be special ways of attaching the film to the take-up spool (e.g. making a loop of the film which is inserted in the take-up spool slot)</li><li>• the rest of the film(s) will continue to move through the processor</li></ul>
remove take-up spool	<ul style="list-style-type: none"><li>• remove the take-up spool with film when the film has finished being processed—and the whole process has been completed</li></ul>

Before you carry out **Activity 7.2**, you should practise loading and operating a processor.

Remember that each processor is unique.

Be alert to any special requirements such as the need to rewind the unexposed film with the emulsion out, or the need to attach a self-threader.

Ask your colleagues to comment on any special requirements of processors that they have used.

## First stage quality inspection

After processing, the film is checked for any obvious defects such as marks or scratches and for other features, such as the correct levels of density and resolution. This is the first stage of quality inspection that ensures that the film meets quality standards.

This is discussed more fully in the module, **Microform Quality Control Inspection**.

A quick visual check of the film by winding it over a light box highlights any immediate and obvious defects. You will need to do this at the end of **Activity 7.2**, which follows.

If the film passes the first stage of quick visual inspection using a winder, then it is ready for the next stages of testing for resolution, density and chemical testing. These tests are described in more detail in the module, **Microform Quality Control Inspection**.

It is important to ensure that these tests are carried out promptly, as they will show up any problems with the cameras and processors, and any operator errors. To help make sure tests are carried out promptly it is important to:

- keep accurate records
- follow procedures
- monitor results.

### ■ Activity 7.2\*

\* These are major activities which require the lecturer/assessor to observe and/or sign off performance details.

## Loading and operating a processor

In this activity you will:

- prepare the film, chemicals and processor including cleaning the processor
- load and operate a processor correctly with exposed film in the presence of your lecturer or assessor
- visually check the processed film for any obvious marks or scratches and to make sure it is not too dark or too light. Using winders, hand-wind the film slowly over a light box to check it. Use an eye loupe or magnifying glass if necessary.

For this activity:

- you do *not* need to use a densitometer
- you do *not* need to use control strips.

You will need to handle the processed film carefully, using cotton gloves which are supplied with this module.

Each step needs to be performed correctly and signed off on the **Activity 7.2** sheet before you are competent.



For this activity you will need access to:

- a processor
- relevant chemicals e.g. developer and fixer
- a reel of previously exposed film for processing, plus a short reel of film for testing
- the processor manual
- equipment for checking the processed film e.g. a hand winder, light box and magnifying glass or eye loupe.

You will need to make advance arrangements so that your lecturer or assessor can be present to observe you loading and operating the processor and also doing **Activity 7.5**.

(**Activity 7.4** and **Activity 7.5** are best completed together.)

In the table below you should:

- *add* any extra steps in the blank spaces provided
- *change* the steps listed to make the table relevant to your processor.

## Topics 1, 2, 3 & 4

<b>Steps</b> (add to or change these according to the steps listed in your processor manual) Lecturer/assessor	<b>Lecturer/assessor to verify that each step has been performed correctly</b>		
	<b>Correct ✓ yes X no</b>	<b>Assessor signature</b>	<b>Date</b>
<b>Preparation</b>			
operator checks film to allow a minimum of 8 hours rest after film is removed from camera	<input type="checkbox"/>		
operator prepares film for loading	<input type="checkbox"/>		
operator prepares chemicals accurately and carefully to avoid contamination	<input type="checkbox"/>		
operator cleans and prepares processing equipment	<input type="checkbox"/>		
operator turns on water supply	<input type="checkbox"/>		
operator checks and adjusts temperatures of developer, film dryer and water	<input type="checkbox"/>		
operator checks film transport by feeding a piece of test film through the processor	<input type="checkbox"/>		
<b>Loading and operating processor</b>			
the processor is loaded in darkness (or as recommended in manual)	<input type="checkbox"/>		
operator opens the processor cover or loading box, as necessary	<input type="checkbox"/>		
operator places the roll of film onto the supply spindle with the emulsion side correctly positioned	<input type="checkbox"/>		
operator feeds film into the feed chute	<input type="checkbox"/>		
the processed film comes out of other side of the machine	<input type="checkbox"/>		
as the film emerges, the operator: <ul style="list-style-type: none"> <li>• cuts the end of the film leader (or the self-threader), if required</li> <li>• ensures that it is attached promptly and reliably to a take-up reel</li> </ul>	<input type="checkbox"/>		
operator removes the take-up spool with the film promptly and reliably when the film has finished being processed	<input type="checkbox"/>		
operator checks that the standard conditions of the machine are maintained during processing by checking speed, temperature and chemical levels and water circulation	<input type="checkbox"/>		
<b>Handling</b>			
the operator handles the film carefully	<input type="checkbox"/>		
the operator handles the processed film using cotton gloves	<input type="checkbox"/>		
the operator winds film gently and slowly	<input type="checkbox"/>		

Steps	Lecturer/assessor to verify that each step has been performed correctly		
	Correct ✓ yes X no	Assessor signature	Date
<b>Checking</b>			
the operator visually quality checks the processed film <ul style="list-style-type: none"> <li>• for any obvious marks or scratches</li> <li>• to make sure the density level is not too dark or too light</li> </ul>	<input type="checkbox"/>		

Keep the processor operating if it is needed for **Activity 7.5** below.

## Records of processing operations

It is helpful to keep a record of how each processor is being used. These records can provide the data for overall production statistics. The records are also used to track problems, such as what films were processed on a particular day and by whom.

As with camera records, tracking can be done very simply by asking operators to record certain details each time the processor is used. These details can be recorded manually on a **Processor Daily Use Sheet**, or as part of a computerised job tracking system.

As highlighted in the module, **Maintaining Microfilming Equipment**, typical details in a Processor Daily Use Sheet include:

- I processor model details
- I date
- I what was processed—the title
- I the generation of film being processed—first generation master, duplicate negative, or use copy
- I number of reels/fiche
- I name of operator
- I other comments, such a settings, chemical levels
- I equipment cleaning details.

An example of a Processor Daily Use Sheet follows.

Control strip readings are yet another set of processing records that can be kept by microfilming organisations—see the section, **Control strips**.

**Processor Daily Use Sheet**

Processor model: ABC										
Date	Title	16mm master neg	35mm master neg	Duplicate neg	Positive	No. Reels	Comments	Cleaning details On = overnight clean Sc = clean with systems cleaner	Staff member	
12/4/01	Asian Sun Jan - June 1990		✓			1	New chemicals	SC 9/4 (Friday)	LH	
	The Star 1954		✓			1			LH	
	Asian Sun July - Dec 1990		✓			1			LH	
	Times East 1893		✓			1			LH	
	The Morning Post May - Aug 1996		✓			1		On	LH	
13/4/01	Southern Review Jan - June 1995				✓	15	Sales		DM	
	Southern Review July - Dec 1995				✓	15	Sales		DM	
	J. Smith Pacific Islands Diary 1890				✓	2	Sales		DM	

## ■ Activity 7.3

### **Processor Daily Use Sheet**

- In the space below, design your own version of a Processor Daily Use Sheet for your own organisation.
- Discuss its use with other colleagues who may have suggestions for you to include.
- If your organisation already has its own processor records, now is your chance to discuss how they can be improved, and to make any revisions.

### Polysulfide treatment

Polysulfide treatment may be applied to the master during film processing, or afterwards as an additional step. Polysulfide treatment is a process in which silver compounds are used to convert the silver in silver gelatin film into silver sulfide. The silver sulfide resists oxidation caused by high temperature, high humidity and atmospheric pollutants.

This is discussed further in the module, **Physical Management and Storage of Microforms**.

#### ● Reflect 7A

##### Routine maintenance

Check back to Topic 2 of the module, **Maintaining Microfilming Equipment**.

Revise the steps for routine maintenance of processors and **Activity 4.7**, in which you drew up a table for a system of routine equipment maintenance in your organisation.

Make any additions, based on your recent experiences in operating a processor.

Check out the table in, **Maintaining Microfilming Equipment, Activity 4.5**, which includes troubleshooting of processor problems.

Add any additional problems and solutions to this table.

#### ● Reflect 7B

##### Occupational health and safety and chemicals

Revise the occupational health and safety issues relating to the use of chemicals, and information on Material Safety Data Sheets. These are discussed in Topic 3 of the module, **Preparation for Microfilming**.

Can you suggest one small change in your workplace that could improve health and safety when using microfilming chemicals?

Discuss your ideas with your colleagues and supervisor.

### Summary

- I In preservation microfilming, film should be processed carefully according to specifications to give the highest possible standards and maximum life expectancy.
- I To avoid the effects of latent image fade it is desirable to give films a minimum rest time of 8 hours between the last exposure and processing.
- I At all times film should be handled carefully, including winding it gently and slowly to avoid damage.
- I The chemicals and the processing equipment need careful preparation before they can both operate efficiently.
- I Follow the recommended steps in the manual to load and operate a processor. This will result in processed film of high quality.

## Checklist

In order to test your understanding of this material, work through the checklist below.

If you can answer 'yes' to each question, and you have completed the activities for this topic, you are now ready for your lecturer or assessor to verify that you:

- I can meet the **performance criteria**
- I have satisfactorily completed the **activities**.

If you are in any doubt about any of the content, you should read through the material again, consult some of the references mentioned in the section entitled **Resources**, talk to your work colleagues or contact your lecturer or mentor.

### I can:

- I list the requirements for processing to preservation standards
- I list the relevant standards associated with processing
- I prepare film, processing equipment and chemicals
- I load film on and off the processor promptly and reliably
- I process exposed film promptly (within the guidelines for latent image fade)
- I maintain standard conditions for processing
- I process film to quality standards
- I keep appropriate records of processing operations
- I recall routine maintenance and trouble-shooting strategies for processing equipment
- I recall occupational health and safety issues relating to the use of chemicals
- I list and demonstrate appropriate film handling techniques to avoid damaging the film.

## ▲ Submit

You are now ready to record in your **Log book** that you:

- I can meet the **performance criteria**
- I have satisfactorily completed the **activities** for this topic.

You can record these by marking off the boxes in the shaded columns with a ✓ **yes** or ✗ **no**.

You can then ask your lecturer or assessor to verify this information.

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# Topics 5 & 6

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## Loading and operating duplicators

### Performance criteria

You will have achieved the performance criteria for this topic when you can:

- I prepare films for duplicating
- I select the correct duplicating film stock
- I prepare duplicating equipment efficiently
- I load film on and off duplicating equipment promptly and reliably
- I safely maintain standard conditions for duplicating
- I keep appropriate records of duplicating operations.

### Duplicating

Duplicating is a key part of preservation microfilming. The purpose of duplicating is to create additional copies of microfilm after the master has been produced. This enables the master copies to be preserved for the future.

The duplicate copies are created as follows:

Generation of duplicate copies	Generation created from
printing masters (second generation)	1st generation master film
use (service) copies (third generation)	2nd generation printing masters

Duplicating also makes it possible for the information in the original materials to be made widely available to readers around the world.

### Contact printing

One of the most common ways of duplicating is through contact printing. During this process the master film and the unexposed duplicating film stock are brought into direct emulsion-to-emulsion contact with one another.

A wide range of duplicating equipment is available to make contact prints for different types and formats of microforms. The equipment ranges from high-volume production duplicators to simple 'convenience-type' duplicators that are used for low volume duplication, such as the production of one or several copies of a fiche.

Most duplicators make copies in the same format as the master—roll to roll, microfiche to microfiche. However, there are also some specialised duplicating machines that are capable of changing the format, such as creating 35mm rolls from aperture cards.

 Further information about various types of duplicators is available from:

- I Saffady 1990, 2000
- I the websites of G.G. Baker and the Film-based Imaging Association (U.S.).



*Roll film duplicator*

© Photograph courtesy of State Library of South Australia



*Fiche duplicator*

© Photograph courtesy of State Library of South Australia

## ● Reflect 7C

### Generations of microfilm and duplicate copies

Revise the information on **generations of microfilms, film types** and **Activity 1.7** in the module, **Preservation Microfilming—Basics**.

Reflect on the types of duplicate copies you have handled, or even produced yourself.

- I Why were the duplicate copies produced?
- I Were they printing masters or use (service) copies?
- I What type of film was used to create the duplicate copies—silver halide, diazo or vesicular?
- I What type of duplicating equipment was used—a roll film duplicator, a fiche duplicator?
- I Were there any problems with the duplicates? If yes, what caused the problems?

### Selecting duplicating film stock

Before you select the duplicating film stock you need to be clear about what is required as the end product. For example, you will need to know the polarity (negative or positive) and the film type (silver halide, diazo or vesicular). The film stock will need to match the end product.



*Duplicating print and direct duplicating film*

© Photograph courtesy of State Library of South Australia

You will also need to be aware of which types of films are image-reversing and image-maintaining. (This is covered in, **Preservation Microfilming—Basics**, Topics 4 and 5.)

- I **Silver halide** duplicating films are available in two forms: print (image-reversing) and direct duplicating (image-maintaining).
- I **Vesicular** film is only available in image-reversing form.
- I **Diazo** film is only available as image-maintaining—if the original is negative, the copy will also be negative, if the original is positive, the copy will also be positive.

## Processing

Silver halide film will need processing after duplicating. It is kept in a light-proof container until it is processed. It is a good idea to process the duplicated film promptly. This will enable an operator to:

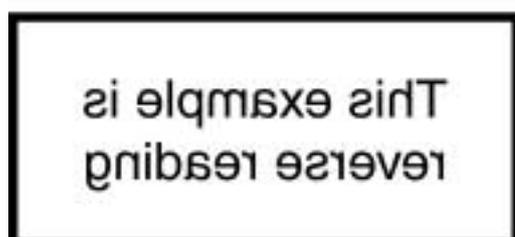
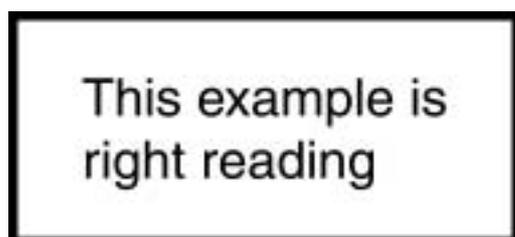
- I check on the quality of the duplicated film
- I make any adjustments to settings to make the copies darker or lighter.

## Correct identification of emulsion sides

Correct identification of emulsion sides is critical when several generations of films are produced, because proper duplication is only possible with emulsion-to-emulsion contact

With each generation of silver halide film, the side of the film through which the emulsion can be properly read (right-reading) alternates, regardless of the polarity.

Generation	Side that image can be read through
first generation image	film base side (shiny)
second generation image	emulsion side (dull)
third generation image	film base side (shiny)



*Examples of right reading and reverse reading*

## Preparing, loading and operating duplicators

As with other microfilming equipment, the duplicator will need to be first prepared before it can operate effectively.

The following examples have been selected to illustrate two different techniques of duplicating. The first is simple and the second is more complex:

- I duplicating microfiche, using a diazo duplicator
- I duplicating 35mm film, using a roll film duplicator.

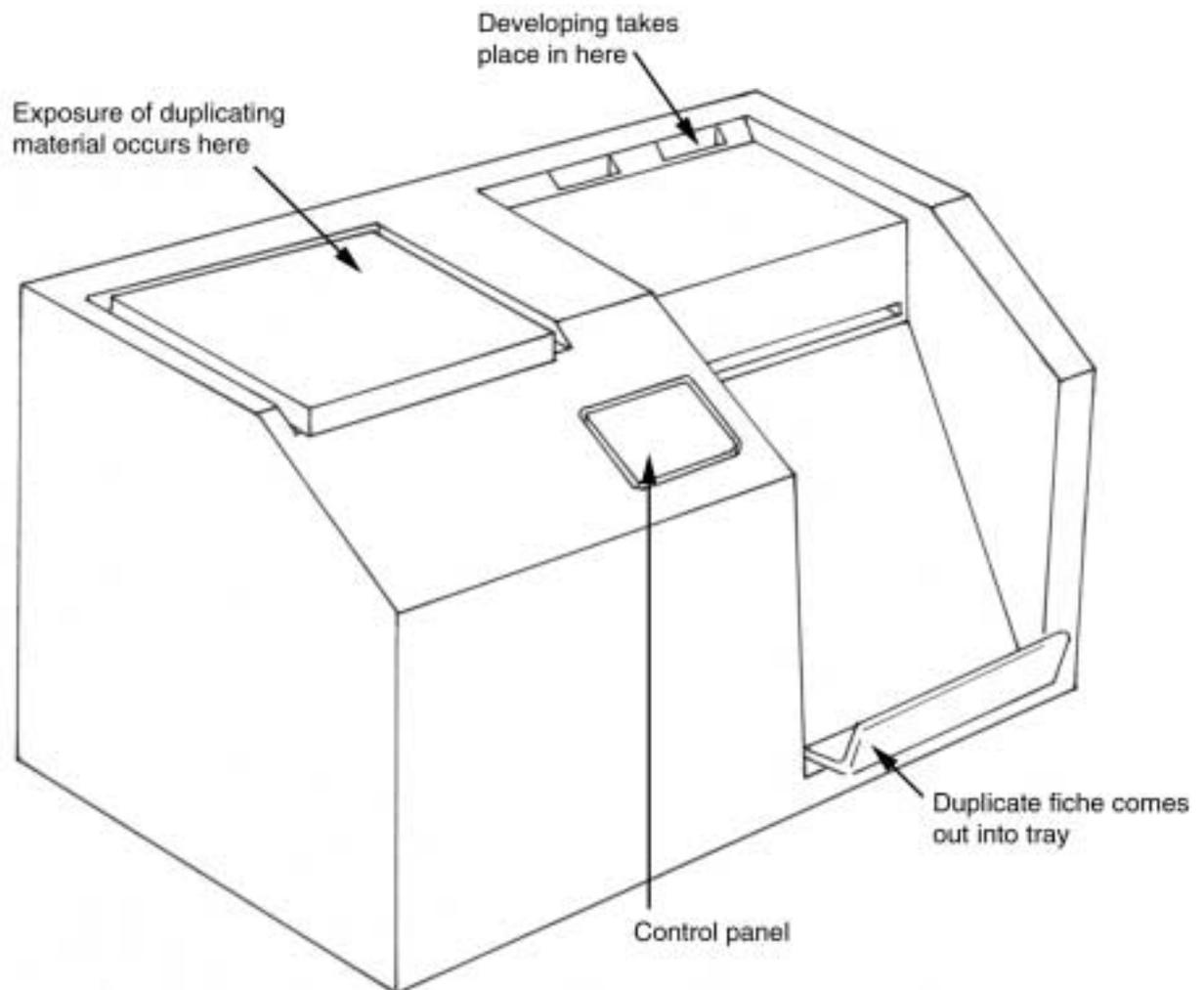
## Duplicating microfiche, using a diazo duplicator

The following are typical steps for preparing and operating a simple diazo microfiche duplicator.

The task is to use the duplicator to create a 16mm diazo microfiche copy from a 16mm silver halide microfiche jacket.

Compare these steps with the steps needed to prepare and operate other types of fiche duplicators that you have seen or used. In this case, there is no need for *darkroom conditions*.

This type of duplicator can carry out the tasks of duplicating and processing/developing in the same machine.



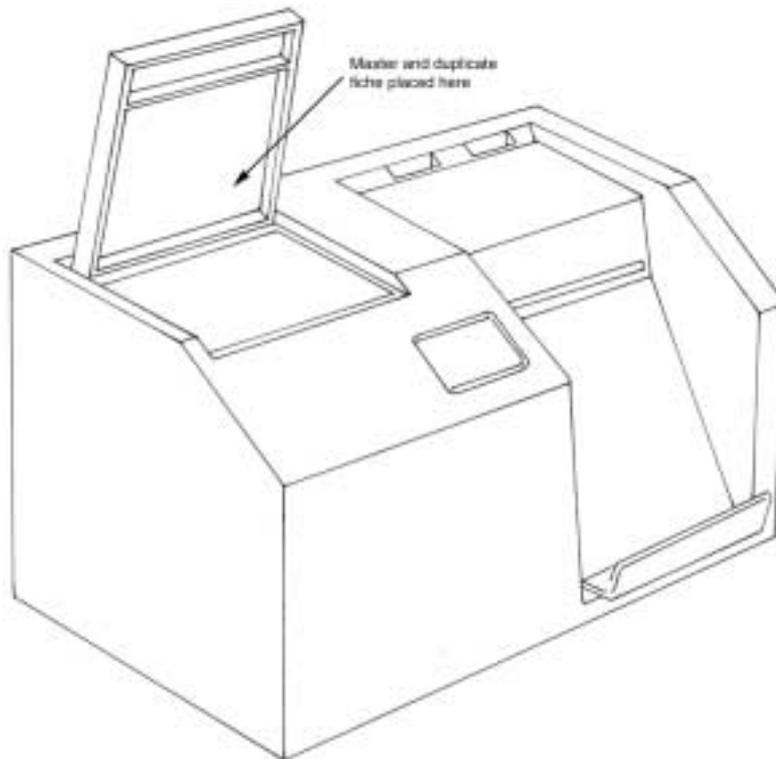
*A typical simple fiche duplicator (diazo)*

### Preparing the duplicator

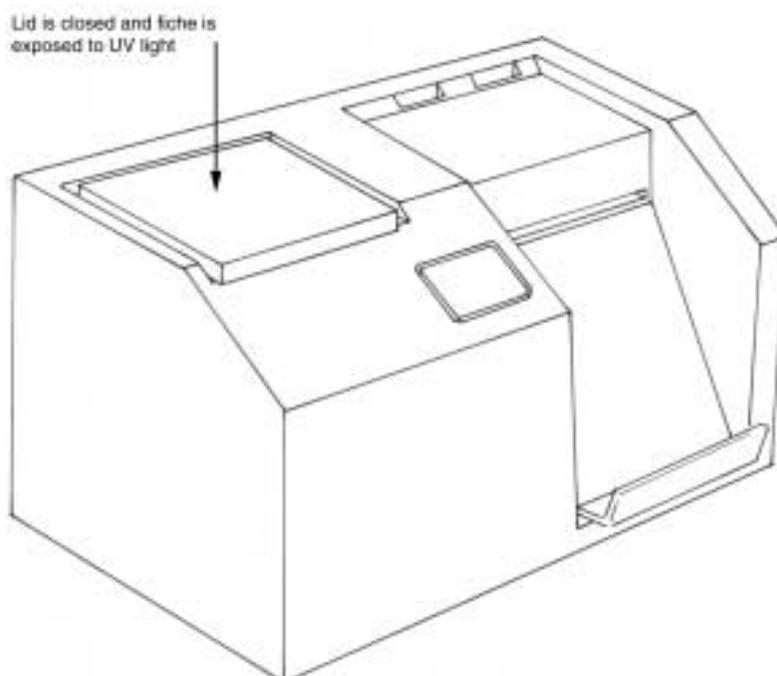
Step	Comments
1. clean exposure glass	<ul style="list-style-type: none"> <li>• always clean the exposure glass before use—clean exposure window with a damp cloth to remove lint and dust</li> <li>• repeat as often as needed—the quality of the duplicate fiche depends on the quality of the exposure glass</li> </ul>
2. select diazo duplicating fiche	<ul style="list-style-type: none"> <li>• remove diazo duplicating fiche from cool light-proof storage</li> <li>• select master fiche for duplicating</li> </ul>
3. check the chemicals	<ul style="list-style-type: none"> <li>• replenish supply of ammonia, as required</li> <li>• how long the ammonia lasts will depend upon the number of fiche duplicated. (the level of ammonia in the container should <b>not</b> be used as a guide)</li> <li>• <i>caution</i>—always handle ammonia containers with care</li> <li>• follow the recommended procedures for handling and storing ammonia as listed on the Materials Safety Data Sheet</li> <li>• these procedures include the use of protective clothing, gloves and a mask</li> </ul>
4. turn duplicator on	<ul style="list-style-type: none"> <li>• turn duplicator on</li> </ul>
5. warm up	<ul style="list-style-type: none"> <li>• wait for machine to warm up</li> </ul>
6. set exposure time	<ul style="list-style-type: none"> <li>• set exposure time in control panel to recommended level</li> </ul>

### Loading and operating

Step	Comments
1. raise cover	<ul style="list-style-type: none"> <li>• raise document cover flap</li> </ul>
2. place original	<ul style="list-style-type: none"> <li>• place original on glass, sensitive side up</li> </ul>
3. place diazo fiche on top	<ul style="list-style-type: none"> <li>• place diazo fiche on top</li> </ul>
4. push down cover	<ul style="list-style-type: none"> <li>• push down cover, pressing on the middle part</li> <li>• keep the cover closed throughout the exposure</li> </ul>
5. exposure	<ul style="list-style-type: none"> <li>• fiche will now be exposed for the set exposure time</li> </ul>
6. adjusting density levels	<ul style="list-style-type: none"> <li>• if duplicate fiche is too light, decrease exposure time</li> <li>• if duplicate fiche is too dark, increase exposure time</li> </ul>



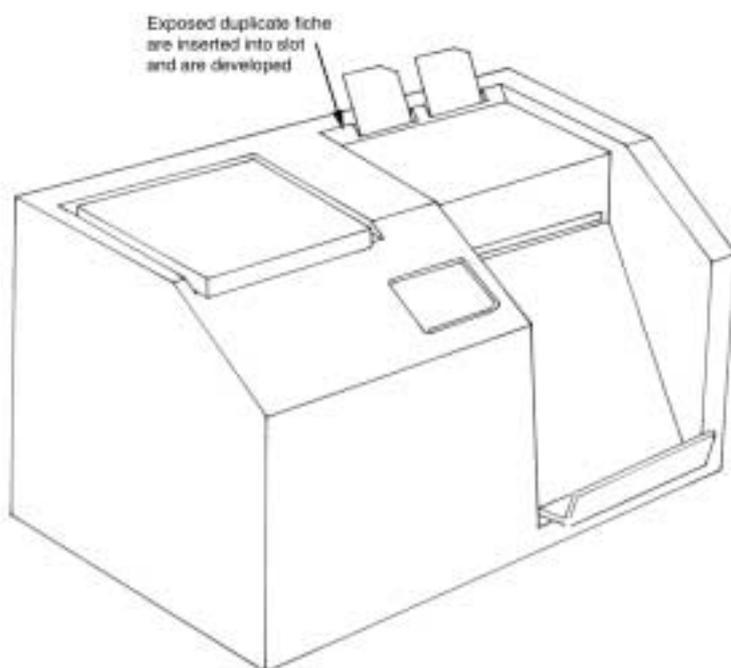
*Placing fiche on top*



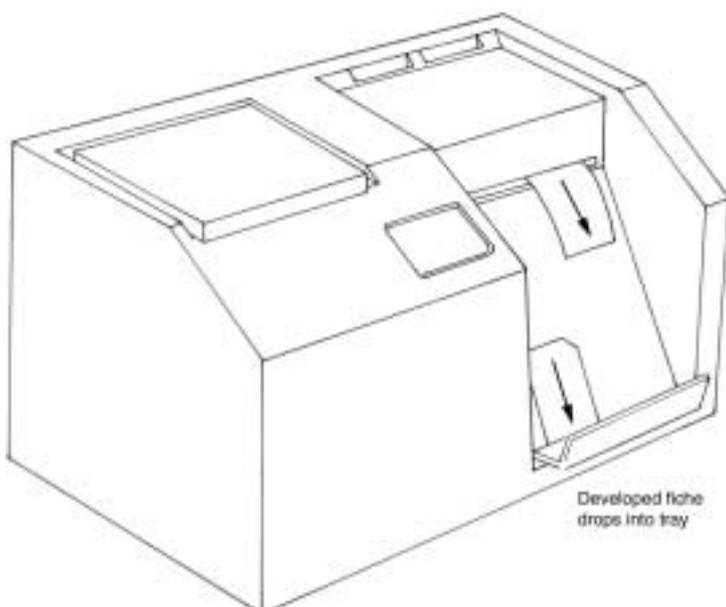
*Closing cover*

## Developing fiche

Step	Comments
1. insert fiche into slot	<ul style="list-style-type: none"> <li>• insert exposed microfiche into the slot</li> <li>• wait for fiche to come out onto tray</li> </ul>
2. developed fiche will fall into the tray	<ul style="list-style-type: none"> <li>• the developed fiche will fall into the tray</li> </ul>
3. return diazo fiche	<ul style="list-style-type: none"> <li>• return duplicating fiche to cool light-proof storage</li> </ul>



*Inserting duplicated fiche into slot for developing*



*Developed fiche dropping into tray*

## Duplicating 35mm film, using a roll film duplicator

The steps below describe the task of making a positive silver halide copy from a 16mm or 35mm roll of silver halide master negative film.

Compare these steps with the steps needed to prepare and operate other roll film duplicators that you have seen or used.

This type of roll film duplicator carries out the task of duplicating only. The duplicated film still needs to be processed as the next stage.

### Preparing the film

Two steps are commonly followed in preparing 16mm or 35mm silver halide roll microfilms for duplicating.

Step	Comments
1. check lengths of leader and trailer	<ul style="list-style-type: none"> <li>• check that the master film has the required length of leader and trailer to allow it to be threaded through the duplicator</li> <li>• the minimum length will be specified in the manual</li> <li>• add on a temporary extra leader if one is needed</li> </ul>
2. check density of master or printing master	<ul style="list-style-type: none"> <li>• the density level is needed to determine the correct settings of the duplicating equipment</li> </ul>



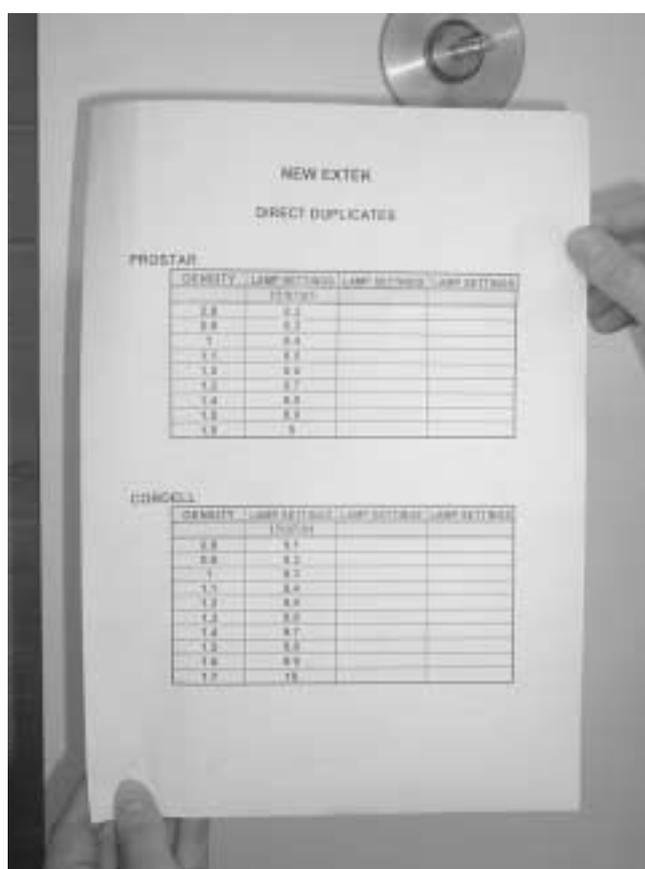
*Using densitometer*

## Preparing the duplicator

Step	Comments
1. first carry out cleaning and maintenance steps	<ul style="list-style-type: none"> <li>check manual for instructions</li> </ul>
2. determine settings on duplicator	<ul style="list-style-type: none"> <li>check the tension on take-up and supply spools to make sure that it is at recommended levels</li> <li>check the exposure chart to determine the <i>exposure lamp settings</i> and/or <i>speed control settings</i> which best match the particular density</li> </ul>



Lamp and speed dials

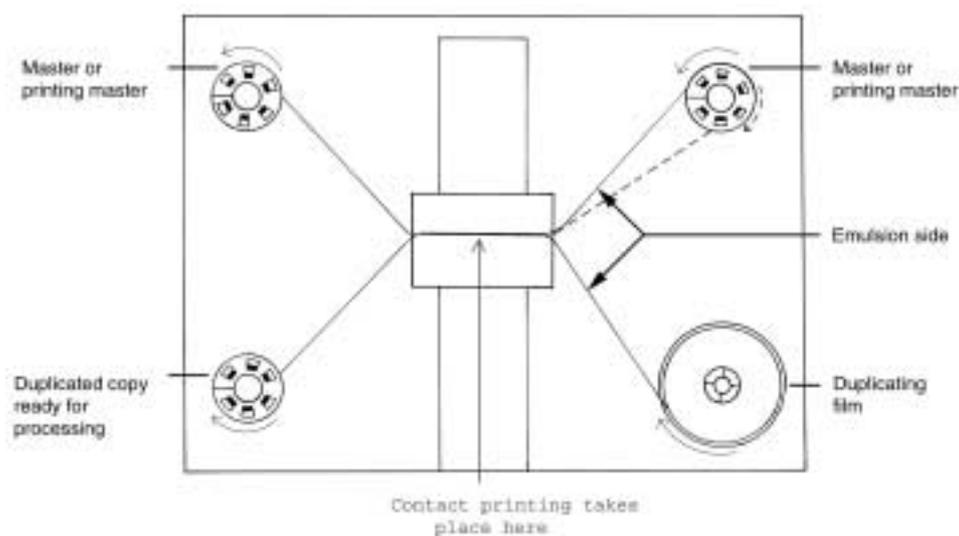


Exposure lamp settings

© Photographs courtesy of State Library of South Australia

3. load take-up spools	<ul style="list-style-type: none"> <li>load take-up spools onto the take-up spindles</li> </ul>
4. identify correct duplicating film	<ul style="list-style-type: none"> <li>see photograph under, <b>Selecting duplicating film stock</b></li> </ul>

## Loading and operating the duplicator



### Loading a roll duplicator

Step	Comments
1. load the master film correctly	<ul style="list-style-type: none"> <li>• master film must be loaded so that emulsion side makes contact with duplicating film</li> </ul>
2. thread master	<ul style="list-style-type: none"> <li>• insert master film into vacuum head</li> <li>• press transport switch on</li> <li>• slowly adjust speed control so that film moves slowly through the vacuum head</li> </ul>
3. darkroom conditions	<ul style="list-style-type: none"> <li>• switch off lights—change to darkroom conditions</li> </ul>
4. select duplicating film	<ul style="list-style-type: none"> <li>• remove duplicating film from light-proof storage place</li> </ul>
5. load duplicating film	
6. thread duplicating film	<ul style="list-style-type: none"> <li>• insert into vacuum head</li> <li>• press transport switch on</li> <li>• adjust speed control so that film moves slowly through the vacuum head</li> <li>• after adequate lengths of duplicating and master films have emerged from the vacuum head, turn transport switch off</li> <li>• first image on master film should be at least 15cm from vacuum head— if it is too close it will not duplicate clearly</li> </ul>



*Duplicating film and master emerging from*

7. attach duplicating and master films onto take-up reels

- attach duplicating and master films firmly onto the take-up spools
- remove all slack from each of the films by manually rotating each spindle



*Attaching duplicating and master films to takeup reels*

8. check lamp arm

- check that lamp arm is fully extended

9. set exposure lamp and speed setting

10. switch on lamp, vacuum, transport

- master and duplicating film will now move rapidly through the vacuum head onto the supply reels

11. switch off transport and vacuum

- Immediately after the end of the master film has passed through the vacuum head:
- turn off transport switch
  - turn off vacuum switch
  - rotate speed dial back to zero

12. cut off duplicate copy

- cut off end of duplicate film on take-up spool and place in light-proof container for processing

13. repeat

- repeat process if more duplicate copies are needed

## ■ Activity 7.4

### Duplicator and film details

Select a duplicator for **Activity 7.5** in which you will be creating a duplicate copy.

a) Give details of the type of duplicator (e.g. fiche or roll film).

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b) Give details of the polarity and type of film that you will be using as the master (e.g. silver halide master negative roll film, silver halide negative fiche).

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c) Describe the polarity and type of film that you will be creating as the duplicate (e.g. diazo fiche negative).

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d) Now revise the steps needed to **prepare, load** and **operate** the duplicator (use the duplicator manual and above examples as guides).

You will need to list these steps in the table below under **Activity 7.5**. (An example of a first step has been included.)

## ■ Activity 7.5★

★ *These are major activities which require the lecturer/assessor to observe and/or sign off performance details.*

### Preparing, loading and operating a duplicator

Your tasks are:

- I to create a duplicate copy from a master film or fiche
- I to prepare, load and operate a duplicator correctly in the presence of your lecturer or assessor
- I to check the duplicated film for any obvious marks or scratches and to make sure that it is not too dark or too light.

You have already revised the steps for this task as part of **Activity 7.4**.

Each step needs to be performed correctly and signed off on the **Activity 7.5** sheets before you are competent. You will need to make advance arrangements so that your lecturer or assessor can be present to observe you preparing, loading and operating the duplicator.



For this activity you will need access to:

- a duplicator
- a manual for the duplicator
- a reel of previously exposed master film or fiche for duplicating  
(with roll film you will need to check the density before this activity)
- duplicating film or fiche materials e.g. direct duplicating film
- relevant chemicals e.g. developer, fixer or ammonia
- equipment for checking the processed film e.g. a fiche reader, or hand winder, light box and magnifying glass or eye loupe.

With silver halide roll film you will also need a microfilm processor.

Contact your lecturer or mentor immediately if you have any difficulty in accessing the equipment or other supplies, so that an alternative can be arranged.

Steps	Lecturer/assessor to verify that each step has been performed correctly		
	Correct ✓ yes X no	Assessor signature	Date
Have all the steps been listed correctly according to the manual?	<input type="checkbox"/>		
<b>Preparing and loading</b>			
(Example) • clean rollers with a damp cloth to remove lint and dust	<input type="checkbox"/>		
	<input type="checkbox"/>		

## Topics 5 & 6

Steps	Lecturer/assessor to verify that each step has been performed correctly		
	Correct ✓ yes X no	Assessor signature	Date
Have all the steps been listed correctly according to the manual?	<input type="checkbox"/>		
Preparing and loading (continued)	<input type="checkbox"/>		
	<input type="checkbox"/>		
	<input type="checkbox"/>		
<b>Operating</b>			
	<input type="checkbox"/>		
<b>Checking</b>			
	<input type="checkbox"/>		
	<input type="checkbox"/>		
	<input type="checkbox"/>		

## Adjusting density

If the density of the duplicated film is too dark or too light, it is possible to adjust it.

- I With diazo film, increasing the exposure time will make the density lighter (see table under, **Duplicating microfiche, using a diazo duplicator**, step 6).
- I With silver halide roll film duplicators, the density is adjusted by changing settings of the lamp (and in some models also by changing the settings of the speed).

The following table is a guide to adjusting lamp settings to increase or decrease the density with silver halide duplicating film.

Duplicating film type	Polarity of master (to be copied)	Polarity of duplicate copy	Density adjustment needed	Lamp settings
print (image reversing)	negative	positive	need to increase density—copy is too light	increase
	negative	positive	need to decrease density—copy is too dark	decrease
(less common)	positive	negative	need to increase density—copy is too light	increase
(less common)	positive	negative	need to decrease density—copy is too dark	decrease
direct duplicate (image maintaining)	negative	negative	need to increase density—copy is too light	decrease
	negative	negative	need to decrease density—copy is too dark	increase
(less common)	positive	positive	need to increase density—copy is too light	decrease
(less common)	positive	positive	need to decrease density—copy is too dark	increase

Despite every effort to produce a high quality duplicate copy, ultimately the quality of the duplicates will depend on the quality of the master films.

*The golden rule of duplication is: good originals give good copy.*

(AIIM [Association for Information and Image Management] 1992, p. 56)

## ■ Activity 7.6

### Duplicating and processing quiz

Answer the questions below ✓ **yes** or ✗ **no**.

- a) If the original film is negative, a **diazo** copy will also be negative. Yes  No
- b) The original is negative, and a copy is duplicated using silver halide print duplicating film. Will the copy be negative? Yes  No

- c) If the first copy in b) above is too light, should the operator increase the lamp exposure to increase the density? Yes  No
- d) Vesicular film is only available in image-maintaining form. Yes  No
- e) Control strips are used to test the duplicator before the main duplicating starts. Yes  No

## Records of duplicating operations

As with processors, cameras and other equipment it is helpful to keep a record of how each duplicator is being used. These records can provide the data for overall production statistics. They are also used to track problems, such as what films or fiche were duplicated on a particular day and by whom.

Typical details that can help monitor duplicator use include the following:

- I duplicator details
- I date
- I what was duplicated (title) and polarity (negative or positive)
- I type of duplicating material used e.g. direct duplicating film
- I number of reels/fiche
- I name of operator
- I other comments e.g. settings.

### ● Reflect 7D

#### Duplicator records

What examples have you seen of duplicator records?

What details do these records include?

How could they be improved?

What could the records be used for?

## Summary

- I Duplicating creates additional copies of the microfilm after the master film has been produced. This enables master copies to be preserved for the future.
- I Duplicate copies are created as printing masters (second generation) from the master, and third generation (use or service copies) from the printing masters.
- I Contact printing is one of the most common ways of duplicating film.
- I Before you choose duplicating film stock you need to be clear about what is required as the end product. This means the polarity (positive or negative) and the film type (silver halide, diazo or vesicular).
- I After duplicating, check the quality of the copy by examining it, between winders, over a light box. If necessary, the density can be adjusted in the next copy by changing the settings of the duplicator.
- I Records of duplicators help keep track of equipment use and problems.

## Checklist

In order to test your understanding of this material, work through the checklist below.

If you can answer 'yes' to each question, and you have completed the activities for this topic, you are now ready for your lecturer or assessor to verify that you:

- I can meet the **performance criteria**
- I have satisfactorily completed the **activities**.

If you are in any doubt about any of the content, you should read through the material again, consult some of the references mentioned in the section entitled **Resources**, talk to your work colleagues or contact your lecturer or mentor.

**I can:**

- I prepare films for duplicating
- I select the correct duplicating film stock
- I prepare duplicating equipment efficiently
- I load film on and off duplicating equipment promptly and reliably
- I safely maintain standard conditions for duplicating
- I keep appropriate records of duplicating operations.

## ▲ Submit

You are now ready to record in your Log book that you:

- I can meet the performance criteria
- I have satisfactorily completed the activities for this topic.

You can record these by marking off the boxes in the shaded columns with a ✓ **yes** or ✗ **no**.

You can then ask your lecturer or assessor to verify this information.

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## Background

The training materials have been developed by the National Library of Australia, in collaboration with the State Library of South Australia and under the auspices of IFLA PAC, and will be provided to people within the Asia and Pacific regions as a training resource. The materials will also be used within Australia as part of an accredited TAFE training course.

The training materials consist of 10 modules, 6 wall charts, a Log Book, a Learning Guide and a Glossary/Index. We expect that users will both read a printed version of the materials and download them as PDF files from the National Library of Australia's website – [www.nla.gov.au](http://www.nla.gov.au)

