

## DOCUMENT RESUME

ED 059 750

LI 003 247

AUTHOR McKee, Mark, Ed.  
TITLE A Guide to Microforms and Microform Retrieval Equipment.  
INSTITUTION Applied Library Resources, Inc., Washington, D.C.  
PUB DATE 72  
NOTE 68p.; (0 References)  
EDRS PRICE MF-\$0.65 HC-\$3.29  
DESCRIPTORS Computer Output Microfilm; Guides; \*Information Retrieval; \*Information Storage; Microform Reader Printers; Microform Readers; \*Microforms

## ABSTRACT

As used in this handbook, microform retrieval equipment is defined as any device that is used to locate, enlarge, and display microform images or that produces enlarged hard copy from the images. Only equipment widely available in the United States has been included. The first chapter provides information about the most widely and generally used microforms and describes considerations related to equipment requirements. In chapter II, those factors are discussed that affect equipment selection regardless of the type of microform. The next four chapters further describe the equipment available for reference to a given microform. Operational and functional information about the equipment available is compiled in tables in each chapter. Chapter VII briefly describes equipment that does not really fit the classifications used in chapters III through VI but provides types and levels of retrieval and reference that will be of interest to many. The appendix lists the manufacturers who supplied the information about the equipment included in the handbook. (Author)

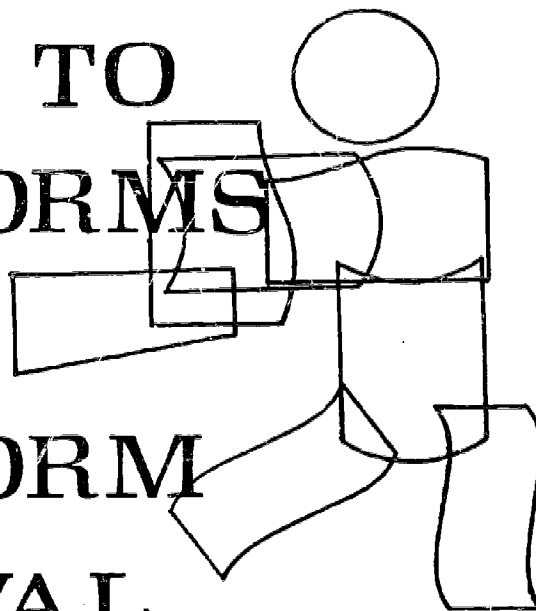
PERMISSION TO REPRODUCE THIS COPY-  
RIGHTED MATERIAL HAS BEEN GRANTED  
BY

Applied Library  
Resources, Inc.

TO ERIC AND ORGANIZATIONS OPERATING  
UNDER AGREEMENTS WITH THE U.S. OFFICE  
OF EDUCATION. FURTHER REPRODUCTION  
OUTSIDE THE ERIC SYSTEM REQUIRES PER-  
MISSION OF THE COPYRIGHT OWNER.

ED 059750

# A GUIDE TO MICROFORMS AND MICROFORM RETRIEVAL EQUIPMENT



LI 003.489

MARK McKAY, Editor

## FOREWORD

Since the advent of computer output microfilm, COM, the number of organizations using microforms as a means of information storage has grown enormously. The companies involved with microforms are truly in one of the nation's largest growth industries.

This book is meant to be a guide for those who are involved with either buying or using microforms and its related equipment.

**Mark McKay,  
editor**

Copyright 1972 by

APPLIED LIBRARY RESOURCES, Inc.  
3045 K St. NW  
P.O. Box 3779  
Washington, D.C. 20007

Library of Congress catalog card number: 74-160157

# CONTENTS

|   | Page |
|---|------|
| <b>I. MICROFORMS, FORMATS, AND GENERAL CONSIDERATIONS</b>             |      |
| Equipment Classifications.....  | 1    |
| Films .....   | 1    |
| Formats and Standards.....  | 2    |
| Types and Characteristics of Reader Printer Paper Copy....            | 8    |
| Guidelines on Equipment Requirements.....                             | 11   |
| <b>II. GENERAL FACTORS IN EQUIPMENT SELECTION</b>                     |      |
| Price .....   | 12   |
| Electrical Systems.....   | 12   |
| Screen .....  | 12   |
| Physical Features.....  | 13   |
| Human Factors Interface.....  | 14   |
| Optical Systems.....  | 14   |
| Maintenance .....   | 14   |
| Warranties and Service.....   | 15   |
| <b>III. CONVENTIONAL ROLL MICROFILM READERS AND READER PRINTERS</b>   |      |
| Physical and Operational Characteristics.....                         | 16   |
| Special Factors in Equipment Selection.....                           | 16   |
| <b>IV. MOTORIZED ROLL FILM READERS AND READER PRINTERS</b>            |      |
| Physical and Operational Characteristics.....                         | 23   |
| Special Factors in Equipment Selection.....                           | 24   |
| <b>V. MICROFICHE AND MICROFILM JACKET READERS AND READER PRINTERS</b> |      |
| Physical and Operational Characteristics.....                         | 34   |
| Special Factors in Equipment Selection.....                           | 34   |
| <b>VI. APERTURE CARD READERS AND READER PRINTERS</b>                  |      |
| Physical and Operational Characteristics.....                         | 49   |
| Special Factors in Equipment Selection.....                           | 50   |
| <b>VII. OTHER MICROFORM DISPLAY AND REFERENCE EQUIPMENT</b>           |      |
| Reference Equipment for Other Microforms.....                         | 56   |
| Special Equipment for Engineering Reference.....                      | 58   |
| Reader-Copier Combinatics.....  | 59   |
| High-Volume Enlarger Printers.....                                    | 59   |
| Microform Information Storage and Retrieval Systems.....              | 60   |
| Central Files with Remote Output.....                                 | 61   |
| <b>APPENDIX: EQUIPMENT MANUFACTURERS AND DISTRIBUTORS</b> .....       | 63   |

# I. MICROFORMS, FORMATS, AND GENERAL CONSIDERATIONS

As used in this handbook, microform retrieval equipment is defined as any device that is used to locate, enlarge, and display microform images or that produces enlarged hard copy from the images. Only equipment widely available in the United States has been included; however, inclusion of equipment now on the market has necessarily been limited to those items for which information was received prior to the publication date.

This first chapter provides information about the most widely and generally used microforms and describes considerations related to equipment requirements. In chapter II, those factors are discussed that affect equipment selection regardless of the type of microform. The next four chapters further describe the equipment available for reference to a given microform. Operational and functional information about the equipment available is compiled in tables in each chapter.

Chapter VII briefly describes equipment that does not readily fit the classifications used in chapters III through VI but provides types and levels of retrieval and reference that will be of interest to many.

The appendix lists the manufacturers who supplied the information about the equipment included in the handbook.

## Equipment Classifications

The microforms most widely used in the United States are:

- Conventional roll film, 16-mm. and 35-mm., stored and handled on standard reels.
- Roll film stored in magazines or cartridges to facilitate handling and retrieval.

- Multiple-image formats: microfiche, jackets, and jacket punched card hybrids.
- Aperture cards.

Each of the above microforms is described later in this chapter. A considerable number of retrieval devices, readers, and reader printers are available for each type. They offer a broad range of functional features. Accordingly, a chapter is devoted to equipment designed primarily for each of these classifications of microform. To the user's advantage, much of the equipment will handle one or more of these classes of microform. While this makes classification of microform retrieval equipment a little difficult, the prospective user should realize that there are few, if any, truly "universal" reference devices. In this handbook, equipment is listed under the microform for which the unit is primarily designed, and the availability of adaptors or ability to accept other microforms is shown. In a few cases, different models, as identified by the manufacturer, of a basic unit are listed in two sections.

## Films

The films used to microphotograph documents have the same basic chemistry and appearance as the black and white silver emulsion films that are used in hand-held candid cameras. There the similarity ends. Microfilm emulsions are much finer grained, thus slower, so that they can record fine detail with a high degree of sharpness or acuity. So that more of the film area is available for the image, microfilm has no perforations along the film edges. Accordingly, microfilm cameras, readers, and other equipment do not use sprocket wheels to transport the film.

Camera microfilm is supplied in 16-, 35-, and 105-mm. widths under well-established

specifications. Depending on the camera used, film is supplied on 100- or 200-foot reels with solid flanges to protect the film from undue exposure during camera loading and other handling. Film is also available in other lengths and in magazines or cartridges for use in COM (Computer Output Microfilm) units and other cameras designed around a cartridge concept. Depending on the application and the microfilm system, 16-mm. film is used in both rotary or flow cameras and in planetary or flatbed cameras. In most systems 35-mm. film is used for precision microrecording in planetary cameras. Cameras designed for the step and repeat filming of images in a microfiche format, several COM units, and some engineering drawing cameras use 105-mm. film.

Exposure of the film and processing of the exposed film are conducted under carefully controlled conditions to produce an optimum result in the master film. Some cameras are designed to expose two rolls of film simultaneously; one becomes an archival record, and the other a working master in the system.

The importance of microfilm in information systems derives from the fact that microfilm is self-reproducible, and under well-established and carefully controlled conditions, film-to-film copies of very high quality and fidelity can be made from the master microimages. Again, depending on the total system, the master film can be duplicated on a roll-to-roll basis to produce duplicate rolls for distribution on reels or in cartridges or magazines. In other systems, the master film may be unitized by mounting frames in aperture cards, placing strips of related images in jackets, or laying up strips cut from the master roll to form a microfiche master. These unit microforms can then be duplicated as such.

Equipment is available and the duplicating films used are packaged to match the requirements for information systems based on all the widely used microforms. In the duplication of the master microimages, three different types of film are used:

1. *Silver copy films*, like camera films, are sensitive to visible light, but the emul-

sions are balanced for optimum film-to-film copying. Most of the silver copy films reverse the image mode when processed, producing a positive copy from a negative master or a negative copy from a positive master. A direct duplicating film is available that produces negative from negative or positive from positive images.

2. *Diazo films* are sensitive to ultraviolet (U.V.) and near U.V. energy and can be handled in yellow or subdued light. The exposed copy film is developed either by placing the film under pressure of ammonia briefly or passing it through a chamber of warm ammonia vapor. Diazo films do not reverse the image mode and copy negative images as negative and positive images as positive. Recently a reversing diazo film has been introduced for use as a reproduction intermediate.
3. *Vesicular films* (most commonly known by the trade name, Kalvar) are also primarily U.V. sensitive and are developed thermally. Most vesicular films reverse the image mode, but nonreversing formulations are available.

While the recipient of microforms and the user of the retrieval equipment for whom this handbook is written will not normally be concerned with film duplication and types, it is important that they realize the versatility of the technology which might be used in the system.

## Formats and Standards

Formats and standards used in producing microforms have been developed from several sources. Microfilm standards have been issued by:

|      |  |
|------|--|
| ANSI | American National Standards Institute (formerly ASA and USASI). These microfilm standards generally carry designations such as PH5.1-1959. |
| DOD  | Department of Defense (e.g., MIL-M-9868).  |

### COMMON 35mm. ROLL MICROFILM FORMATS

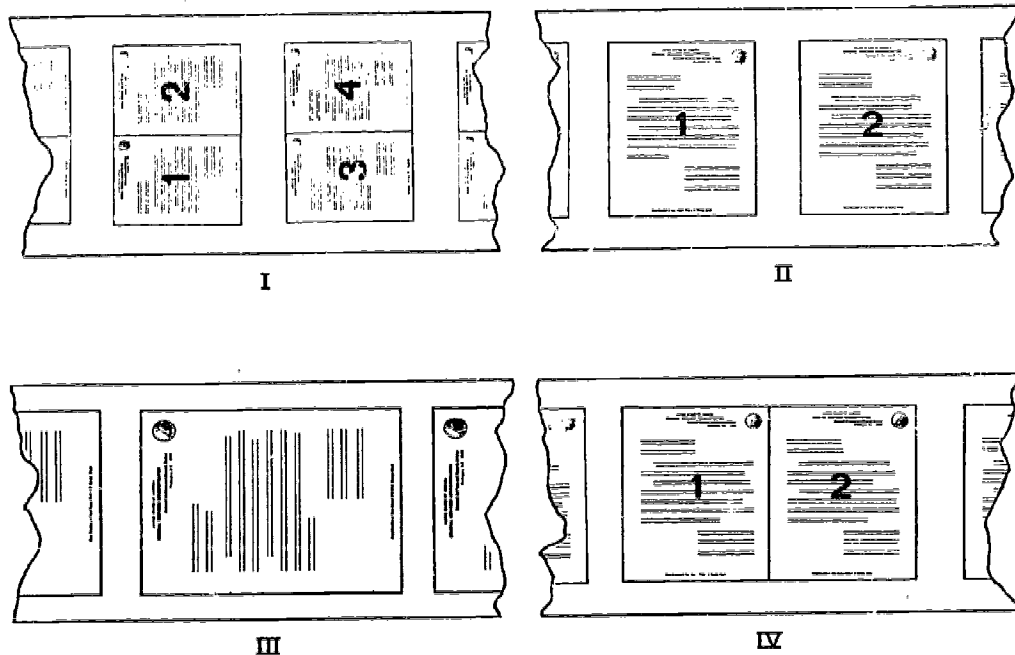


Figure 1

**NMA** National Microfilm Association  
(e.g., M-1-1967).

**COSATI** Committee on Scientific and  
Technical Information, Office  
of Science and Technology, Ex-  
ecutive Office of the President.

**ALA** American Library Association.

These standards are widely used. Nevertheless they do not define all the requirements for microfilm systems, and in many cases the volunteer standards committees are hard pressed to keep pace with the rapidly expanding technology. Many formats and practices in the field are the result of new systems demands, new hardware capabilities, and similar circumstances.

Where more than one format or film type is being used, the purchaser should try to

select hardware that will meet the principle demands of his system on a priority basis. Ideally he would find hardware capable of accepting all of the microform types and formats in his system. He should realize, however, that the more universal the hardware the less likely it is to perform any one film format-handling function as well as the reader or reader printer designed for a specific microform. The final evaluation of any microform retrieval equipment should include a test of the actual microforms which will be used in the system.

**35-mm. Formats.** Archivists and librarians have been using 35-mm. roll microfilm for many years to preserve and distribute important historical documents, books, magazines, and newspapers. The reduction most frequently used is 14 to 1 or 14X. Some over-size items, such as newspapers, are more often



filmed at 16X to 20X reductions. The user of 35-mm. roll microfilm may encounter four different image formats, as shown in figure 1.

Formats II or IV are the most common for letter-size documents and smaller, and III and IV for newspapers. To accommodate all of these formats, a reader or reader printer should have some means of rotating the image 90 degrees to appear right reading on the screen—normal position for reading from top to bottom.

**Microfiche and Film Jackets.** The NMA "Glossary of Terms for Microphotography and Reproduction Made from Microimages" defines microfiche as follows: "A sheet of microfilm containing multiple microimages in a grid pattern. It usually contains a title which can be read without magnification." A film jacket

is defined as "a transparent plastic carrier with a single or multiple sleeve or pocket made to hold microfilm in flat strips." A duplicate film-to-film copy reproduced from a microfiche master, or a microfiche copy, or a film jacket, may also be called a microfiche. A microfiche format is shown in figure 2.

When a document requires more than one microfiche, the second, third, and subsequent microfiche in the set are called trailer microfiche. In some systems microimages are recorded in the title area of the trailer microfiche. When this is done the eye-readable document number is usually found in the first or second frame of the trailer microfiche.

Any current standard microfiche reader will also accept a microfilm jacket of the same physical size and general format. In the newer thin-film jackets the additional layer of clear

#### DOD MICROFICHE FORMAT

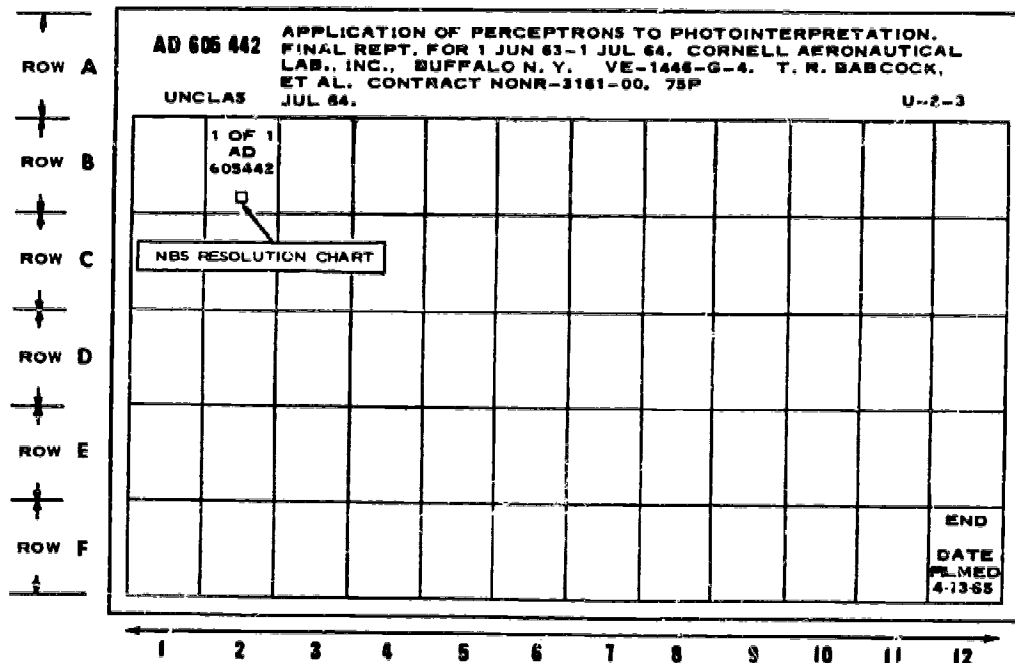


Figure 2

plastic on each side of the film in the jacket does not affect either the readability of the film or the ability to produce paper copy.

Two standards for microfiche are commonly used in the United States today. These are the COSATI Standard, widely used by the Federal Government for the distribution of report literature; and the NMA, M-1-1967. The NMA Standard encompasses two basic internal formats: one similar to the COSATI and the other at a higher reduction ratio. The NMA Standard also provides for three overall sizes of microfiche: 3- x 5-inch, 3.24- x 7.375-inch, and 105-mm. x 148.75-mm., as does the COSATI Standard. It is anticipated that similar ANSI standards will be published soon. The Department of Defense also has a specification, MIL-M-38748, similar to the COSATI. From the viewpoint of the user, the important standards criteria are:

#### COSATI

**Microfiche size:** 105-mm. x 148.75-mm. (4" x 6").

**Reduction ratio:** 18X to 20X.

**Image grid:**

**First sheet:** 60 frames, 5 rows of 12.

**Trailer sheet:** 72 frames, 6 rows of 12.

**Grid index and page sequence:** Row index begins at upper left and runs down; column begins at upper left and runs across. Page sequence from left to right.

**Image mode:** Clear lines on black background (some microfiche with black lines on clear background are being distributed on an experimental basis).

**Image positioning:** Rotating not required for right reading.

#### NMA

| <i>Microfiche Size</i>            | <i>Reduction</i> | <i>Image Grid</i>         |
|-----------------------------------|------------------|---------------------------|
| 75- x 125-mm.<br>(3" x 5")        | 20X              | 40 frames<br>4 rows of 10 |
|                                   | 24X              | 60 frames<br>5 rows of 12 |
| 105- x 148.75-mm.<br>(4" x 6")    | 20X              | 60 frames<br>5 rows of 12 |
|                                   | 24X              | 98 frames<br>7 rows of 14 |
| 3.25" x 7.375"<br>(EAM card size) | 20X              | 60 frames<br>4 rows of 15 |
|                                   | 24X              | 90 frames<br>5 rows of 18 |

**Grid index and page sequence:**

Row index begins at upper left and runs down; column begins at upper left and runs across. Page sequence from left to right.

**Image mode:**

Optional: clear lines on black background or black lines on clear background.

**Image positioning:**

Optional: rotating suggested for right reading.

#### ANSI (Proposed)

Essentially the same as the NMA standards except:

**Grid index and page sequence:**

Recommended row index begins in lower left corner and runs up; column index begins in lower left corner and runs across. Optional: row index begins in upper left corner and runs down; column begins in upper left corner and runs across.

In addition to those covered by the published standards, many other formats have been used, particularly in industry and various micropublishing ventures. Microfiche sheet sizes range from the nominal 3- x 5-inch to 6- x 9-inch sizes, and occasionally larger. However, the majority of microfiche used today in Government and industry are of the 105- x 148.75-mm. (4- x 6-inch) size.

Reduction ratios on microfiche range from 15X to 40X. The majority of the microfiche distributed by Federal Government agencies are at 18X to 20X. Several micropublishers also use this reduction ratio to insure that their publications will be compatible with Federal report literature. In industry, the 24X standard is widely used for catalogs and similar material.

COM units generate both roll film and microfiche. Depending on the unit, the microfiche reduction ratio can vary from 20X to 48X (equivalent reduction ratios since there is no original hardcopy document for comparison). In addition to the reduction ratio, the most important factor on reader selection for COM or other computer-generated data is that many of the images have 132 characters per line and 64 lines. This equates to a standard 14- x 11-inch (w x h) page. A reader or reader printer screen should be this size or larger to accommodate such information at an equivalent to original size.

**16-mm. Formats.** Film 16-mm. wide is used for business records, catalogs, and letter-size documents. The film may vary in thickness, however, and therefore a standard reel will accommodate from 100 feet of standard base film (5 mils thick) to over 200 feet of thin base film. Depending on the reduction ratio used, 100 feet of film may contain the images of 2,000-3,000 letter-size documents; 200 feet, 4,000-6,000 pages.

From the equipment purchaser's viewpoint, there are three areas of formats and standards that are important:

#### 1. Film container

Microfilm 16-mm. wide is distributed on a plastic reel or in a special container called

a cartridge, magazine, or cassette. A no-rewind cartridge or cassette has two spools acting alternately as supply and take-up spools depending on the direction the film is transported. The film never leaves this type of cartridge. The rewind type of cartridge or magazine dispenses the film into the reader or reader printer for viewing. The film must then be rewound before removing the cartridge from the reader.

The cartridge serves two purposes: to protect the film when not in use and as a component of the film transport mechanism for automated film handling. Manufacturers produce at least six different cartridge systems. Many of the readers and reader printers, particularly the more sophisticated and highly automated units, will accept only one type of cartridge. A few manufacturers offer adaptors which allow the use of more than one type cartridge in the machine. No commercially available reader or reader printer accepts both standard reels and all cartridge types. The purchaser of readers or reader printers should carefully explore the matter of reel and cartridge compatibility before ordering equipment.

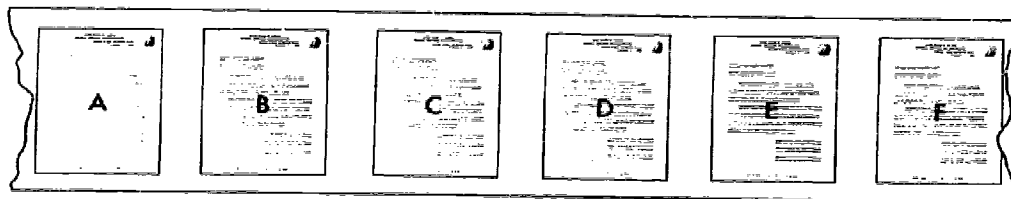
#### 2. Image orientation and film sequence

The microfilm images can be oriented in several ways, as shown in figure 3. These are:

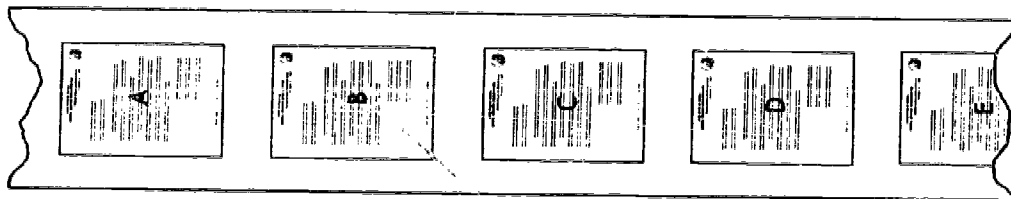
- *Simplex* with pages filmed in sequence using full film width. Page orientation can be "Comic," with pages right reading from edge to edge of the film, or "Cine," with pages right reading along the length of the film.
- *Duo*, with pages filmed in sequence using one-half the film width, reversing at end of roll to continue filming on the remaining half.
- *Duplex*, with front (F) and back (B) of documents filmed side by side.

Most 16-mm. readers and reader printers are designed to accept film with images

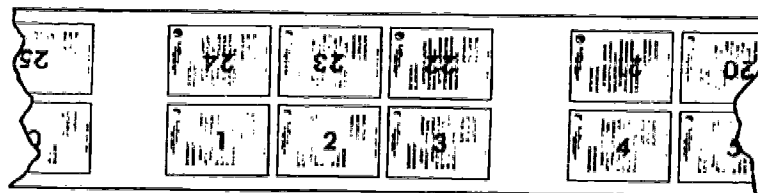
IMAGE FORMATS ON 16mm. ROLL MICROFILM



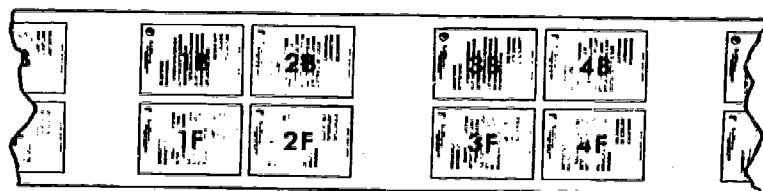
Simplex - Comic



Simplex - Cine



Duo



Duplex

Figure 3

in a comic orientation. To accept cine-oriented images and display a right reading image, the equipment should have a means of rotating the image.

Most 16-mm. simplex images have been reduced 20 to 28 times. Duo or duplex images are often reduced 35 to 45 times. Readers and reader printers should magnify these images accordingly for legible reading.

### 3. Film indexing

The microfilm often has code marks or index marks on the film to assist in retrieval and locating images. Some of the more common roll film index methods, shown in figure 4, are:

- Flash card or flash target: a distinctive image used to separate file segments or sets of pages.
- Film pull-down: a linear or sequential location of frames, closely related to an odometer on the machine which measures film length transported.
- Image count: marks (blips) below the frames are counted electronically and used by the machine to control image retrieval in a linear sequence.
- Bar or code line: bars or lines between the frames have positional value as related to a scale along the edge of the reader or reader printer screen.
- Photo-optical binary code: document numbers or index terms are recorded in optical binary code before each document; used with electronic logic systems for retrieval.

In each of these image finding systems, the microimage can be enlarged and read on any reader or reader printer of the proper magnification whether or not the coding or indexing system is utilized. However, for more efficient retrieval of film coded to a given page or groups of pages, the readers and reader printers need to be equipped to "read" the code

method used. Accordingly, the user will need to consider the coding or index method which will be used before making an equipment selection.

**Aperture Cards.** Aperture cards are punched (tabulating) cards with windows containing microfilm frames. Although there are several formats, including cards with multiple apertures and cards containing jacket-like envelopes over multiple apertures, the one most commonly used is the so-called MIL-D aperture card. This card has an aperture 2 x 1 3/4 inches specifically located in one end of the card as a carrier for a frame of 35-mm. film. These cards are widely used for engineering drawings and design support documents. The remainder of the card is normally used to record the document identity in keypunch code which is interpreted (printed) at the top of the card.

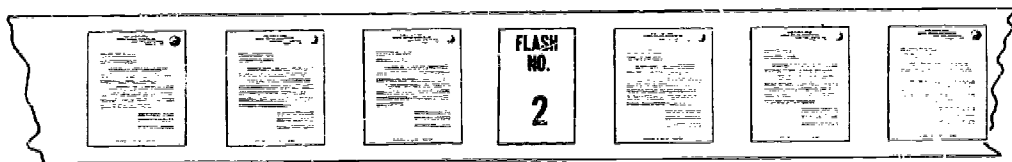
Within the mounted film frame, two formats are most commonly used as follows:

1. The entire frame is used for one document sheet or page, typically an engineering drawing. Drawings from 8 1/2 x 11 to 34 x 44 inches are reduced to the standard frame using reductions of 16X, 24X, and 30X. Many readers and reader printers used with this format have 18- x 24-inch screens for viewing the entire aperture at a nominal 15X magnification.
2. The standard frame is used to record up to eight lettersize documents; typically these would be design support documents or technical reports. Using reductions of 20X to 24X, a 2 x 4 image grid is recorded on the frame. Cards bearing these multiple image frames can be viewed on either engineering aperture card readers or on many of the readers designed for microfiche.

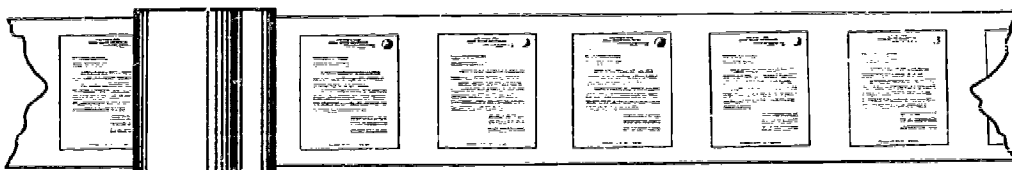
### Type and Characteristics of Reader Printer Paper Copy

Several processes are used by the manufacturers of reader printers to produce enlarged

INDEX METHODS USED ON 16mm. FILM



Flash Card



Film Pull-down

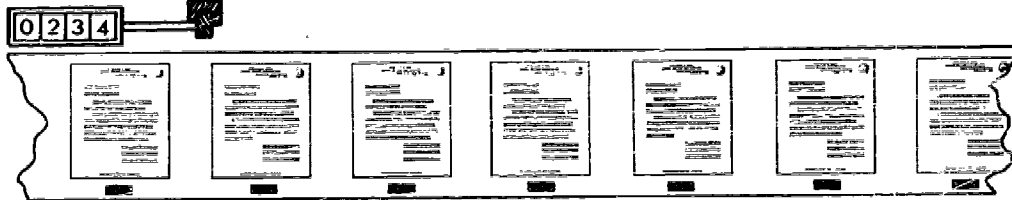
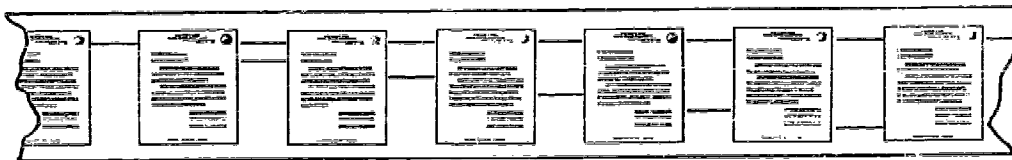


Image Count



Bar or Code Line

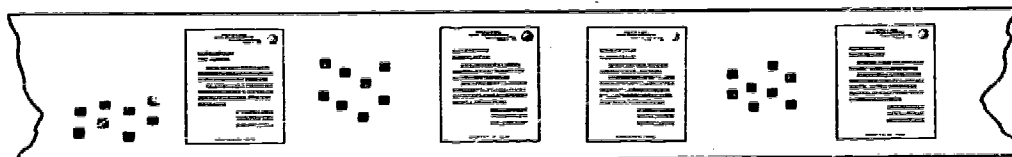


Photo-optical Code

Figure 4

paper copies of microimages. Many of them are familiar to the user, since they are also used in standard office copiers. While each of the processes produces a useful information print, they vary considerably as to cost, characteristics, and printing time. In evaluating the paper copy process, the purchaser should consider the following factors:

- Cost of supplies.
- Quality and feel of the print.
- Warm up time.
- Print cycle time.
- Convenience in operation.
- Convenience of routine maintenance.
- Shelf life of paper before exposure.
- Print life and image deterioration after exposure.

Some of these factors are obviously subjective, and the best way to evaluate the equipment is to operate each reader printer personally.

**Image Mode.** The user will encounter microfilm images in a negative mode, clear image, black background; and a positive mode, black image, clear background. The tones of negative images must be reversed in the hard copy process to produce black on white enlarged prints. Several of the processes used in reader printers do this; they are:

Silver halide papers, using either monobath or stabilization immersion processing.

3M Co.'s Filmac process, in which an image is deposited by surface treatment of the paper with a liquid activator.

The Itck "RS" process in which an image is formed when the exposed paper is surface treated with a liquid carrying the image forming chemicals.

3M Co.'s dry silver paper in which the image is thermally developed.

The above processes all reverse the image, producing a positive print from negative im-

ages or a negative print from positive microfilm images.

One process which has been used in a few enlarger printers, the diazo process, is non-reversing and will produce only positive prints from positive images (or negative prints from negative).

Another group of paper copy processes will produce black on white enlarged prints from either negative or positive mode microfilm images, but it is necessary to change the toner and make other adjustments in the machine before switching from one to another. If the need for changeover capability exists, the entire procedure should be explored before any purchase is made. The processes requiring changeover procedures are:

The transfer electrostatic or Xerographic process.

The direct electrostatic processes using coated papers and either dry or liquid toning systems.

Another process, the "OPC" electrostatic process, has the capability of changing from mode to mode by means of a switch on the reader printer.

The user should judge for himself how much flexibility he needs in the printing process.

With the exception of the transfer electrostatic process, which uses plain paper, all papers used in these processes are coated papers. The cost of supplies will vary with the manufacturer, usage volume, and the process. The cost of supplies is only one cost factor in finished print cost. The purchaser will also want to consider machine burden which is the cost per month to own or rent a machine, plus the cost for direct and preventive maintenance. Print cost is the sum of supplies cost per print, plus the machine burden, divided by the anticipated use in prints per month.

Reader printers and enlarger printers use either cut sheets or rolls of paper. Paper sup-



plies are usually packaged in the proper sizes for use in each type of equipment.

Each of the processes is capable of producing good prints from line work (text, drawings, etc.). Some are capable of reproducing acceptable prints of halftones and photo images as well. The enlarged paper copy can be of no better quality than the image on the film. Before it is purchased a reader printer should be tested by making copies from several microfilm samples of a quality and format typical of your system, including a few of the worst samples.

If it is planned to store and use prints for long periods of time, long-term print stability will be a critical factor. Coated papers will vary in their archival quality although manufacturers are constantly endeavoring to upgrade this and other paper qualities. If archival quality is an important consideration, ask to see prints that are 6 months to a year old and for information about the life expectancy of prints under conditions of storage and use.

Thus, the user will wish to consider a combination of factors — cost of supplies and other factors as well — in the light of his requirements when choosing reader printer equipment.

### **Guidelines on Equipment Requirements**

No amount of effort will make equipment selection, either by type or by model, a "yes or no" decision. Based on his needs, his work methods, the microforms available to him, their informational content, and the nature of his reference to the information in the microimages, the user is his own "fine screen" of selection. For example, a clerk may comfortably use a microform reader all day to retrieve information about the status of an inventory or a series of accounts — each retrieval being a lookup of an average of perhaps a hundred characters of information. On the other hand, a user who must annotate document pages will usually be best served

by having hard copies of pertinent information.

Nor is it possible in all cases to totally define the requirements of groups of users. Even in the engineering field, where microfilm has been used for 15 years for the interactive distribution of design documents, reference requirements range across the board. Some engineers' requirements are fully satisfied by reference to copy cards in desk top readers, while others require a print most of the time.

Accordingly, for the individual user the prime factor in equipment selection will be the kind of information contained in the microform collection and how it is used in his work. Then, guided by the information in this handbook, the economic situation, the need for a reader versus a reader printer, and, lastly, "hands-on" experience with that equipment which best meets his needs, one can make a proper decision.

Similarly, the individual responsible for the purchase of equipment for a number of users must have a knowledge of overall factors, including the following:

Whether the microform collection will contain one or several different microforms.

Whether the users will require readers only, or reader printers, or a high proportion of one to the other.

Whether the information in the collection will be made available through loans of the microform or by furnishing microform copies, thus indicating a possible need for portable reference equipment which the user may borrow.

One of the most persistent problems in the implementation of microfilm information systems has been determining the true needs of the ultimate user that the system will serve. Only when this has been done can the proper choice in equipment be made, using this handbook as a guide.



## II. GENERAL FACTORS IN EQUIPMENT SELECTION

Many of the functional and operational considerations which affect equipment selection pertain to all readers and reader printers regardless of the type of microform. These factors are considered in this chapter, and the appropriate information for individual equipment is entered in the tables in chapters III and IV.

### Price

Government prices for products are often established by bid and negotiation through the General Services Administration as well as individual agencies. Where applicable, prices shown are established Federal Government prices for hardware purchases, hardware rental, supplies, and maintenance. Commercial prices are shown where a Federal Government price has not been established. The purchaser should be mindful that while price may be important as far as total system costs are concerned, it is not necessarily a criterion for judging the quality or usefulness of a product. Through proper analysis and testing in the use environment, it may be found that the lower cost item will satisfy all requirements. Conversely, a higher-priced, more flexible unit may save time or be more satisfactory for other reasons.

### Electrical Systems

**Power.** The standard current in the United States is 115-volt 60-cycle. All U.S.-made readers and reader printers operate on this current. In many European and South American countries, 220-volt 50-cycle current is standard. Some manufacturers have models available which can easily be adapted to foreign and other special power service. Several portable readers can be battery operated or adapted to automotive or aircraft electrical systems.

**Lamps.** Standard projection bulbs are used in many reference units. Many manufacturers now use more expensive, specially designed lamps which maintain approximately the same light output during the life of the lamp. Bulb or lamp failure is the most frequent maintenance item in readers and reader printers. It is well to keep a spare on hand. The life of a lamp depends on both the lamp type and the electrical system in the unit. To determine the number of lamps needed per year, estimate the number of hours each reader will be in use during the year and divide by the rated lamp life. It is generally good practice to allow the lamp to cool before moving portable readers. Projection lamps run hot, and a burned out lamp should be allowed to cool before attempting to replace it.

**Cooling.** Because projection lamps generate both light and heat, the projection system and film plane must be cooled to protect the film. Larger readers usually have a motor-driven blower to do this. The design of smaller units is such that convection cooling is often sufficient. The film is also protected by heat-absorbing glass elements in the projection condenser system. Regardless of the cooling system, no external part of the reader normally touched by the user with the exception of hot air vents, should be more than warm to the touch.

### Screen

In most microdocument systems it is desirable to have the reader screen present an entire page of information at or near the original size. Half page or partial page images on a screen can be useful and are acceptable with some types of document systems, such as newspapers and engineering drawings. However, in making a decision about a reader or reader printer, the purchaser should be aware

of the following facts regarding reduction, enlargement, original document size, and reader screen size:

1. The original sheet sizes of common documents in inches are:

Federal Government  
letters 8 W x 10<sup>1</sup>/<sub>2</sub> H

Federal Government  
legal documents 8 W x 13 H

Commercial letters 8<sup>1</sup>/<sub>2</sub> W x 11 H

Commercial legal  
documents 8<sup>1</sup>/<sub>2</sub> W x 14 H

Computer printout,  
two sizes 14 W x 11 H  
8<sup>1</sup>/<sub>2</sub> W x 11 H

International  
(ISO), A-4 size 210 x 297 mm.  
(8<sup>3</sup>/<sub>4</sub> W x 11<sup>3</sup>/<sub>4</sub> H)

Engineering  
drawings A size 8<sup>1</sup>/<sub>2</sub> W x 11 H  
11 W x 8<sup>1</sup>/<sub>2</sub> H

B size 17 W x 11 H

C size 22 W x 17 H

D size 34 W x 22 H

E size 44 W x 34 H

2. The reader screen must be equal in size to the original document if it is necessary to present the entire document page at the original size. However, most documents have unused margins, and a screen slightly smaller than the original document may adequately display the information area of a document page at original size.
3. A smaller screen will also display a full page of text when the reader enlarges the image to less than original size. For example, an 8<sup>1</sup>/<sub>2</sub>- x 11-inch document, originally reduced 24X, can be accommodated on a 7<sup>3</sup>/<sub>4</sub>- x 9<sup>1</sup>/<sub>2</sub>-inch screen when enlarged 20X. The char-

acters in the text and illustrations will be proportionately smaller also.

4. A letter-size image that must be rotated 90 degrees to be right reading will require a screen 11 inches wide as well as some form of image rotation. Such images often contain tabulated data and charts or graphs.

**Color.** Screens can be of a neutral color, when lighted, or have a slight tint. The tinted screens are used by some manufacturers to reduce potential eye strain. Images photographed in color will show better color fidelity when projected on a neutral screen.

**Type.** Most readers and reader printers project images from the rear onto a translucent screen. These screens often have a matte surface on one side and a shiny surface on the other. The matte surface facing out will reduce glare and ambient reflections. The shiny surface facing out will give an apparent increase in image sharpness. A reflecting screen is an opaque one on which the images are projected for viewing.

### Physical Features

Readers and reader printers are available in a variety of forms to suit the environment in which they will be used, the user's need, the system, and the cost. The basic forms are:

1. *Lap readers.* Designed for portability and personal use, they are available at present only as microfiche readers.
2. *Portable readers.* These are readers which either fold into a case similar to a portable typewriter case or are compact and portable. They are available for 16-mm. film, aperture cards, and microfiche, and are generally used on an intermittent basis.
3. *Desk readers and reader printers.* These are usually intended for more continuous use and are placed on a desk, table, or stand.

4. *Free-standing units.* These self-contained readers and reader printers have integral bases and are designed to stand alone.

Many manufacturers offer a list of accessories as well, such as floor stands, combination stands and microform storage units, adaptors for other types of microfilm, and other capabilities. The number of operating features, controls, and accessories on any unit is directly related to its cost. As a minimum, nearly every reader has an on-off switch and a control for focusing. And all reader printers have some means for controlling print time.

### Human Factors Interface

A reader or reader printer should be comfortable to use. The controls should be located where they are easily accessible while the user is in the normal viewing position. The film loading operation should be simple and readily understandable after the first explanation and demonstration. The control of the film movement should be smooth, allowing for rapid movement to specific document areas and for fine adjustments to center pages on the screen. The unit should stay in focus moving from one page to the next. Any large-scale film movement should necessitate no more than a minimal focus adjustment. When indexing systems are part of the unit, they should be simple to comprehend and use. Human factors are largely subjective. They can be evaluated only by testing the equipment under actual operating conditions.

### Optical Systems

Manufacturers specify readers and reader printers by image magnification (24X means the image is magnified 24 times). Most units have fixed magnifications that cannot easily be changed in the field, even though the purchaser may select one from a choice of magnifications at the time of ordering. Nevertheless, the purchaser will find many units available with magnifications changeable in the field. These are generally one of three types:

units with lens systems that are interchangeable by removing one lens from the holder and dropping in another; dual magnification units, with magnification changed by means of a lever or mechanism; or systems that provide continuously variable magnification over a specified range using zoom lenses or mechanically varied optical paths. Variation in magnification is important to the user who will receive microforms from more than one source at very different image reductions. In this case, interchangeable lenses or continuously variable magnification can be considered. For the user who will need reference to images of documents over a broad size range, such as newspapers and smaller publications, continuously variable systems or dual magnification units should be considered.

**Image Rotation.** When the microforms used contain images which are not right reading in the normal orientation of the microform in the reader, some type of image rotation is needed. In the tables in chapters III-VI, the following notations are used:

1. *None.* The user must turn his head to view the screen image when it is not right reading or, in the case of microfiche and aperture cards, the microform must be removed from the machine, turned 90 degrees, and reinserted. One 16-mm. roll film reader can be used upright or turned on its side for reading.
2. *Optical rotation.* Images are rotated by a lever or knob that rotates a prism in the optical system.
3. *Mechanical rotation.* Rotation is accomplished by turning the film transport 90 degrees.

When image rotation is a factor, either of the last two methods can be quite satisfactory in a given case. The choice is mainly one of user preference.

### Maintenance

In general, the quality of the image displayed or the paper copy provided is directly related to the cleanliness of the optical system and the

printing mechanism. Microfilm's worst enemy is dust. Dust on reader screens, mirrors, and other optical elements decreases light and illumination levels, sometimes significantly. Dust particles on the film or film holding mechanism damage the film and, when enlarged 20 to 40 times, may look like confetti on the screen and impair readability.

Preventive maintenance will make a considerable difference in the long-term usability of the equipment. Use of a dust cover when the equipment is not in use is recommended. Following the manufacturer's recommendations, cleaning of the screen, lens, internal mirrors, and condenser elements should be done on a routine basis. As noted earlier, lamps should be replaced as burned out or when the lamp envelope has darkened, decreasing light output. (Take care not to touch the old lamp when it is still hot.) A spare lamp should be available. Most units provide easy access to the lamp. Some have a clip inside for storage of an extra lamp.

Glass flats or optical flats of plastic are often used to hold the film flat in the optical system. They should be easily removed for cleaning or should be easily accessible and cleaned in place. On reader printers, loading of the paper and imaging chemicals and removal or cleaning of the printing mechanism should be easy and convenient.

For maintenance problems should, of course, be referred to qualified maintenance personnel.

### Warranties and Service

Manufacturers' warranties and maintenance service vary considerably. Most will warrant their hardware against defective parts for periods of time ranging from 30 days to 1 year. The warranty does not normally include lamps. Some manufacturers include labor costs during the warranty period, and some do not. Some manufacturers have service contracts available after the initial warranty period. Rental equipment frequently includes maintenance service by the supplier. Some smaller manufacturers may request the return of the hardware to the factory for service if they do not have locally available service engineers.

In general, the simpler the device the less the purchaser need be concerned with length of warranty or availability of local service. Once the simplest microfiche reader has been received and installed in good repair, there is little to go wrong. If defective parts are discovered, replacements can often be obtained from the factory and installed by the user. Conversely, for reader printers and the more mechanized readers, length of warranty and the availability locally of trained service personnel and service contracts should be discussed prior to equipment selection or purchase.

### III. CONVENTIONAL ROLL MICROFILM READERS AND READER PRINTERS

The two most commonly used roll microfilms are 16-mm. and 35-mm. A typical reel contains up to 100 feet of standard base film or 200 feet of the new thin films. Roll film on reels can be used in some readers and reader printers having motorized drives, but most commonly rolls are used in machines that are manually operated. Accordingly, this chapter covers only units which are not motorized. Roll film stored and handled on conventional reels normally has only minimal indexing aids, such as flash cards or sequential frame numbers. In this category are:

1. Universal Readers which accept both 16-mm. and 35-mm. roll film. Many of these units can also be adapted to accept microfiche and film jackets as well.
2. Readers for 16-mm. roll microfilm.

In addition, this chapter covers reader printers which will accept 35-mm. or 16-mm. roll microfilm or both.

#### Physical and Operational Characteristics

A conventional roll microfilm reader normally is a simple device consisting of:

- A hand-cranked film transport mechanism.
- An optical projector and enlarging system.
- Controls: on-off, focus.
- Translucent screen. (One widely used reader projects the image on an opaque reflecting screen.)
- Housing.

In addition, the reader printers have:

- Paper transport and printing mechanism.
- Special printing controls.

The user normally performs the following functions in order to display an image on a reader:

Turn switch on.

Place reel on reader, thread film through film gate, and attach to take up reel.

Focus.

Wind to desired image.

To produce a print on a reader printer:

Set print timer to proper exposure.

Press print button.

Very little maintenance is needed for these units. The reader should be dusted at least once a week. The most critical parts are the film transport mechanism and the film gate. Glass flats at the film gate should be cleaned with glass cleaner. Manufacturer's instructions for cleaning and maintenance of the printing mechanism of reader printers should be followed carefully.

#### Special Factors in Equipment Selection

Conventional roll microfilm readers or reader printers employing either 16-mm. or 35-mm. film are typically used for newspapers, books, periodicals and other library reference ma-

terials. 16-mm. units are generally used for correspondence files, personnel files, security storage files, and business records for which there is a lower incidence of reference.

**Film Transport.** Roll film is manually transported in one of two ways on units of this equipment class. In the simplest case, identified in the equipment tables as "reel crank," a hand crank is attached to the spindles on which the film reels are mounted. In many units, film is driven forward or reversed through a mechanical linkage from the film spindles to a reversible crank. Though more costly, this method is more convenient.

A few of the units in this category can be adapted to or accept cartridges or magazines. Since many of the conventional roll film machines are intended for library use, their design enables them to accept microfiche, jackets, and aperture cards as well. In most of these units the unit microforms are positioned manually.

**Film Gate.** For optimum sharpness of the screen image, the film must be held flat in the film plane. Two types of film gates are used for this purpose; they are:

1. *Open throat.* The film rides in open air. Such units normally use edge guid-

ing or other methods to keep the film in the focal plane.

2. *Glass flats.* The film is held in the focal plane between two pieces of optically flat glass.

While the latter method will often provide the sharper image, the glass flats must be kept clean to minimize film damage. To further protect the film, these glass flats can be:

1. *Floating.* The flats pivot on a central axis so that they rotate with the film as it moves.
2. *Manual open (and close).* The flats must be separated manually each time the film is transported.
3. *Auto open (and close).* The flats open automatically when the film is moved.

Obviously each mechanization of a function contributes to cost and the purchaser can best weigh the above factors by his own experience.

The above factors and those noted in chapter II are compiled in the following tables. Table 1 covers the available readers in this equipment class; and table 2, the reader printers. To further assist the prospective purchaser or user, photographs of some of this equipment are shown in figure 5. The photographs were supplied through the courtesy of the manufacturers.

**MICROFILM READERS – CONVENTIONAL FOR ROLL MICROFILM**

| MANUFACTURER/<br>DISTRIBUTOR   | DASA   | DIETZGEN   | DUKANE  | DUKANE   | DUKANE  |
|--|--|--|---|--|---|
| MODEL<br>Number<br>Name  | Mark 1 model U   | 4308   | 27A5  | 27A25<br>Explorer 14   | 27A35<br>Explorer 12  |
| PHYSICAL<br>Type<br>Dimensions (HWD)<br>Weight (LBS)   | Desk<br>27" x 13" x 17"<br>27  | Desk<br>24" x 14" x 20"<br>28  | Portable<br>22" x 11" x 19"<br>22   | Desk<br>24" x 15" x 18"<br>45  | Desk<br>20" x 11" x 12"<br>15   |
| ELECTRICAL<br>Power (AC)<br>Cooling<br>Rated Lamp Life   | 115V<br>Blower<br>50 hours   | 115V<br>Convection<br>150 hours  | 115V<br>Convection<br>90-150 hours  | 115V<br>Blower<br>100-150 hours  | 115V<br>Convection<br>100 hours   |
| OPTICAL<br>Magnifications }<br>Available<br>Lens Changeable<br>Image Rotation                        | 15, 25, 35<br>Yes<br>Yes, mechanical   | 17, 24, 30, 43<br>No<br>Yes, mechanical  | 20<br>No<br>Yes, mechanical   | 18<br>Yes<br>Yes, mechanical   | 19<br>No<br>No  |
| SCREEN<br>Size (H x V)<br>Color<br>Type  | 11" x 11"<br>Green<br>Rear projection  | 12" x 12"<br>Green<br>Rear projection  | 13" x 9"<br>Gray<br>Rear projection   | 14" x 14"<br>Gray<br>Rear projection   | 11" x 11"<br>---<br>Rear projection   |
| FILM CARRIER<br>Transport }<br>Film Sizes<br>Film Forms }<br>Take Up<br>Film Gate }<br>Image Locator | Manual, crank<br>16mm, 35mm<br>Reel, jackets,<br>microfiche,<br>aperture cards<br>Reel<br>Glass flats,<br>floating<br>Visual | Manual, reel crank<br>16mm, 35mm<br>Reel,<br>microfiche<br>Reel<br>Open throat<br>Visual | Manual,<br>reel crank<br>16mm, 35mm<br>Reel, microfiche,<br>aperture cards,<br>jackets<br>Reel<br>Glass flats<br>Visual | Manual,<br>mechanical crank<br>16mm, 35mm<br>Reel,<br>aperture cards,<br>microfiche<br>Reel<br>Glass flats | Manual, reel crank<br>16mm, 35mm<br>Reel,<br>Microfiche<br>Reel<br>Glass flats<br>manual open<br>Visual |
| CONTROLS<br>Type }<br>Location   | Focus, rotation,<br>lateral scan,<br>on-off, brightness<br>All top   | On-off, focus<br>All front   | On-off, brightness<br>focus, rotation,<br>lateral scan<br>All front   | On-off, brightness<br>focus, rotation,<br>lateral scan<br>All front  | On-off, focus,<br>lateral scan<br>All front   |
| WARRANTY }   | 90 days  | 90 days  | 90 days   | 90 days  | 90 days   |
| SERVICE METHOD   | Direct, dealer   | Direct, dealer   | Dealer, factory   | Dealer, factory  | Dealer, factory   |
| FEATURES/<br>ACCESSORIES }   |  |  |   |  |   |
| FED. GOVT. PRICES<br>Reader }<br>Extra Lenses }<br>Lamps<br>Service                                  | \$455.00<br>commercial<br>\$75.00<br>commercial<br>\$1.71 commercial   | \$255.00-17X, 24X<br>\$267.75-30X, 43X   | \$207.50<br><br>\$1.50  | \$355.00<br><br>\$7.50   | \$150.00 (est)  |

Table 1



| KODAK<br>(Recordak)  | KODAK<br>(Recordak)   | REMINGTON<br>RAND   | UNIVERSITY<br>MICROFILM   | UNIVERSITY<br>MICROFILM                           | UNIVERSITY<br>MICROFILM   | WASHINGTON<br>SCIENTIFIC   |
|--|---|---|---|---|---|--|
| MPE-1  | 310 model PVA   | F420  | 1013  | 1212  | 1414  | RH   |
| Desk<br>39" x 21" x 21"<br>53  | Desk<br>19" x 16" x 11"<br>23   | Desk<br>27" x 13" x 17"<br>27   | Desk<br>24" x 12" x 18"<br>22   | Desk<br>18" x 14" x 8"<br>15                      | Desk<br>24" x 15" x 18"<br>45   | Portable<br>19" x 14" x 18"<br>(open)<br>18  |
| 117V<br>Convection   | 117V<br>Convection  | 115V<br>Blower<br>---   | 115V & 220V<br>Convection<br>100 hours  | 115V<br>Blower<br>---                             | 115V<br>Blower<br>100 hours   | Various AC, DC<br>Convection<br>200 hours  |
| 19<br>No<br>Yes, mechanical  | 20, 24, 32, 40<br>Yes<br>Yes, mechanical                              | 15, 24, 35<br>Yes<br>Yes, mechanical  | 20<br>No<br>Yes, mechanical   | 17, 22, 40<br>No<br>No                            | 18<br>No<br>Yes, mechanical   | 20, 24<br>No<br>No   |
| 20" x 20"<br>White<br>Reflecting   | 9" x 12"<br>Green<br>Rear projection                                  | 11" x 11"<br>Green<br>Rear projection   | 13" x 10"<br>Gray<br>Rear projection  | 12" x 12"<br>Neutral<br>Rear projection           | 14" x 14"<br>Gray<br>Rear projection  | 12" x 9"<br>Green, gray, blue<br>Rear projection                                     |
| Manual,<br>mechanical crank<br>16mm, 35mm<br>Reel<br><br>Reel<br>Glass flats<br>Codeline, visual | Manual<br>16mm<br>Reel<br><br>Reel<br>Glass flats<br>Codeline, visual | Manual<br>mech. crank<br>16mm, 35mm<br>Reel<br>microfiche<br>jackets<br>Reel<br>Glass flats<br>floating<br>Visual | Manual,<br>reel crank<br>16mm, 35mm<br>Reel<br>microfiche<br><br>Reel<br>Visual | Manual<br><br>35mm<br>microfiche<br>105mm x 148mm | Manual,<br>mechanical crank<br>16mm, 35mm<br>Reel<br>microfiche<br><br>Reel<br>Glass flats<br>manual open<br>Visual | Manual,<br>reel crank<br>16mm<br>Reel<br><br>Reel<br>Open throat<br>Codeline, visual |
| On-off, focus,<br>film crank,<br>rotation<br>Top & side  | On-off, focus,<br>lateral scan,<br>rotation, crank                    | On-off, focus<br>crank, lateral<br>scan, rotation<br>Top  | On-off, focus<br>rotation,<br>film crank  | On-off, focus                                     | On-off, focus<br>film crank<br><br>All front  | On-off, focus<br>manual crank<br><br>Sides   |
| Parts 1 year<br>Service 3 months   | Parts 1 year<br>Service 3 months                                      | 1 year  | 90 days   | 90 days   | 90 days   | 180 days   |
| Field on ceil  | Field on call   | Field offices   | Xerox branches  | Xerox branches                                    | Xerox branches  | Dealers  |
|  |   |   |   |   |   | Odometer option<br>battery option  |
| \$850.00 less 6%<br><br>\$30.00 less 2%  | \$495.00 less 6%<br><br>\$65.00 less 6%<br><br>\$30.00 less 2%        | \$430-\$455   | \$125.00<br><br>\$19.00<br><br>\$1.60<br>\$20.00 minimum                        | \$119.00<br>commercial                            | \$275.00<br><br>\$57.50<br><br>\$10.08  | \$239.00<br>commercial<br><br>\$2.25   |

Table 1 - (Continued)



**MICROFILM READER PRINTER – CONVENTIONAL FOR ROLL MICROFILM**

| MANUFACTURER/<br>DISTRIBUTOR   | DASA   | DASA  | 3M   |
|--|--|---|--|
| MODEL<br>Number<br>Name  | Mark II  | Mark 18   | 40CB model 75AA  |
| PHYSICAL<br>Type<br>Dimensions (HWD)<br>Weight (LBS)   | Desk<br>26"x13"x30"<br>68  | Stand or desk<br>33"x35"x36"<br>260   | Desk<br>28"x17"x23"<br>120   |
| ELECTRICAL<br>Power (AC)<br>Cooling<br>Rated Lamp Life   | 115V<br>Blower<br>50 hours   | 115V<br>Blower<br>25 hours  | 115V, 220V<br>Blower<br>---  |
| OPTICAL<br>Magnifications }<br>Available<br>Lens Changeable<br>Image Rotation                        | 10.5, 13.4, 15.4,<br>20.1, 27.9, 33.8<br>Yes<br>Yes, mechanical  | 12, 14, 16<br>Yes<br>Yes, mechanical  | Range 11 lenses<br>from 6.6 to 35<br>Yes<br>Yes, mechanical  |
| SCREEN<br>Size (H x W)<br>Color<br>Type  | 11" x 11"<br>Green<br>Rear projection  | 18" x 24"<br>Gray<br>Rear projection  | 11½" x 10"<br>Gray, green, blue<br>Rear projection   |
| FILM CARRIER<br>Transport }<br>Film Sizes<br>Film Forms }<br>Take Up<br>Film Gate }<br>Image Locator | Manual, mech. crank,<br>continuous scan<br>16mm, 35mm<br>Reel<br>aperture card<br>3" deep fiche<br>Reel<br>Glass flats,<br>floating<br>Image count | Manual,<br>continuous scan<br>16mm, 35mm<br>Reel<br>aperture card<br>microfiche<br>Reel<br>Glass flats,<br>floating<br>Visual | Manual, mechanical<br>crank<br>16mm, 35mm<br>Reel<br>aperture card<br>microfiche<br>Reel<br>Manual open<br>glass flats<br>Visual |
| CONTROLS<br>Type }<br>Location   | On-off, brightness<br>focus, rotation,<br>scan print, expose<br>manual transport<br>All top  | On-off, focus, film<br>transport, lateral<br>scan, rotation,<br>expose, print<br>All front                                    | On-off, focus,<br>film transport<br>print, expose<br>Side & front  |

Table 2

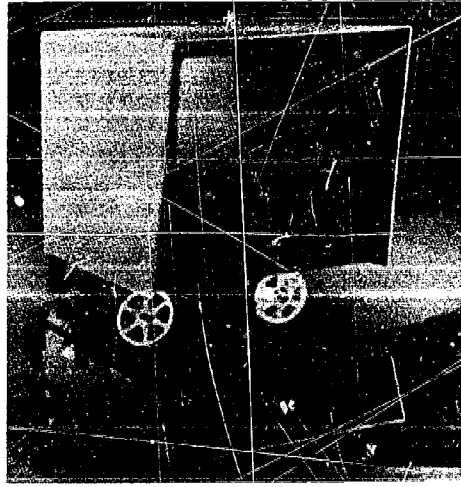
| MANUFACTURER/<br>DISTRIBUTOR       | DASA                    | DASA                                  | 3M  |
|------------------------------------|-------------------------|---------------------------------------|---|
| <b>IMAGING SYSTEM</b>              |                         |                                       |   |
| Process                            | Silver stabilize        | Silver stabilize                      | Electrochemical                                   |
| Prints                             | Neg to positive         | Neg to positive                       | Neg to positive                                   |
| Warm Up Time                       | None                    | None                                  | None  |
| Print Cycle Time                   | 25 seconds              | 25 seconds                            | 6 seconds   |
| Print Sizes }                      | 8½" x 11"               | 18" wide, variable<br>8½" to 24" long | 8½" x 12½"  |
| <b>SUPPLIES</b>                    |                         |                                       |   |
| Paper                              |                         |                                       |   |
| Roll Fed                           | 150' roll               | 350' roll                             | 300' roll   |
| Sheet Fed                          |                         |                                       |   |
| Cost/Print                         | \$.08                   | \$.20                                 | \$.07 to .09                                      |
| Shelf Life                         | 18 months               | 18 months                             |   |
| Chemicals                          |                         |                                       |   |
| Type                               | Silver stabilize        | Silver stabilize                      | 3M activator                                      |
| Prints/Package                     | 960                     | average 1500                          | 300 per quart                                     |
| <b>WARRANTY</b>                    | 90 days                 | 90 days                               | 180 days  |
| <b>SERVICE METHOD</b>              | Direct & dealer         | Direct & dealer                       | Agreement   |
| <b>FEATURES/<br/>ACCESSORIES }</b> |                         | Variable print<br>length              | Various, ½ sheet<br>kit, odometer,<br>stand, etc. |
| <b>FED. GOVT. PRICES</b>           |                         |                                       |   |
| Reader/Printer }                   | \$1245.00<br>commercial | \$3495.00<br>commercial               | \$872.20 w/o lens                                 |
| Extra Lenses }                     | \$125.00<br>commercial  | \$300.00<br>commercial                | \$99.75   |
| Lamps                              | \$1.71 commercial       | \$8.56 commercial                     |   |
| Service                            |                         |                                       | \$150/year  |

Table 2 (Continued)

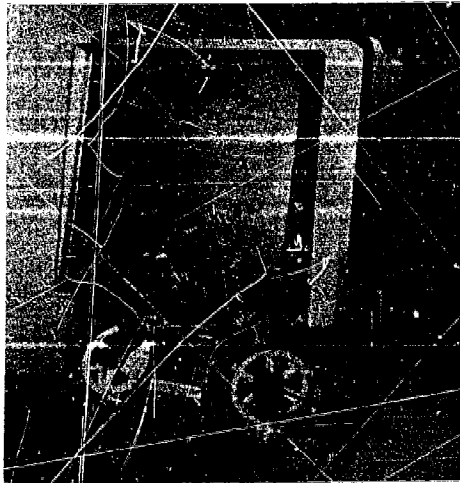
READERS AND READER PRINTERS FOR CONVENTIONAL ROLL MICROFILM



Washington Scientific Industries  
Model RH Portable Reader



University Microfilms Reader Model 1414



The University Microfilms  
Model 1212 Reader



DASA Corporation's Mark I Model U Reader

Figure 5

## IV. MOTORIZED ROLL FILM READERS AND READER PRINTERS

The majority of mechanized readers and reader printers use 16-mm. microfilm in containers called magazines, cartridges, or cassettes. Most of these units are designed to use one or more of the image-locating techniques described in chapter I under "Formats and Standards." At least one unit uses 16-mm. film with 8-mm. images in a duo (double row) sequence. These readers and reader printers vary greatly in their degree of sophistication and price. The degree of sophistication is related to the unit's retrieval capabilities.

In this category are:

1. A limited number of portable readers.
2. A number of desk model readers and reader printers.
3. One or more free-standing readers and reader printers.

### Physical and Operational Characteristics

A standard 100-foot length of 16-mm. microfilm can accommodate 2,000 to 3,000 letter-size images. Thin base film can be put into a cartridge, thus doubling its capacity in pages. However, the user should be aware that thin base films do not work equally well in all reader and reader printer models, and many models require modification for thin base films.

The most widely used motorized readers consist of:

- A screen, either neutral in color or tinted blue or green.
- A slot or holder to accommodate the magazine or spindle for the supply reel.
- A film transport mechanism that either automatically threads the film through

the machine and rewinds it into the magazine or transports manually threaded film.

- An optical projection and enlarging system.
- Controls: on-off, focus, and slow and fast motor drive for transporting film.
- On the manually controlled retrieval systems either an odometer indicator or an index scale along the screen. On automated retrieval systems, pushbutton control keyboards and logic circuitry for image location.
- A housing.

In addition, a reader printer has:

- A paper transport and printing mechanism.
- Additional controls for printing.

In order to display an image on the most widely used units, the user normally performs the following functions:

Turn switch on.

Insert cartridge.

Press lever or turn motor control knob to forward.

In manually controlled units, move film via control lever or knob to image location as indicated by the odometer or index strip on the screen. On automated units, press control buttons on panel for predetermined page location.

Focus.

To produce a print on a reader printer:

Set timer or exposure control.

Press print button.

The maintenance considerations discussed in chapters II and III pertain to this class of equipment as well. Because of the generally higher level of use of the motorized units however, it is even more important to perform preventive maintenance on the film gate and printing mechanism.

### Special Factors in Equipment Selection

Applications for the equipment in this class are those systems involving high levels of reference to COM-generated roll film, listings and directories, catalogs and parts lists, indexes, maintenance literature, military and other specifications, and account status reports.

**Film Transport.** The units in this class, with one exception, are designed either to handle roll film, cartridges, and magazines with manual threading or to automatically feed or transport film using the cartridge, magazine, or cassette for which the unit was designed. One unit will automatically feed film from standard reels and can be adapted to unit microforms.

Film transport is controlled in one of three ways:

1. Using a lever similar to a light switch in which motion of the lever to the

right makes the film go forward; and to the left, rewind.

2. Using a knob or dial which is turned clockwise for forward transport and counterclockwise for rewind.
3. Using a keyboard to step forward a predetermined number of images or to a predetermined image number.

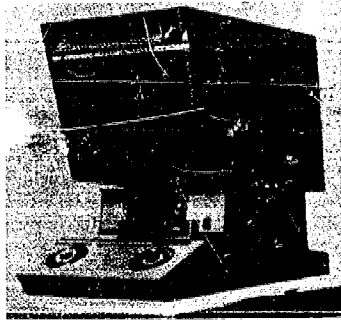
In addition, some units provide a manual control to assist in fine image positioning on the screen.

Since the method used to control film transport in the more automated units is often directly linked to the image finding method used on the film, the latter factor becomes a key one in equipment selection of the more automated type.

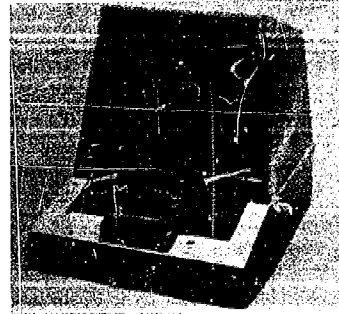
**Film Gate.** The methods described in chapter III for holding the film flat in the focal plane pertain here. In addition, a method identified in the equipment tables as "platen" is used. The platen is a floating-top glass flat in a holder that rides on edges designed to provide controlled glass-to-glass separation. In this method, care must be taken to be certain that the platen is the one designed for film of the thickness transported.

The general equipment selection factors referred to above and in chapter II are shown in tables 3 and 4 for readers and reader printers in this class. Photographs of typical units in this group are shown in figure 6.

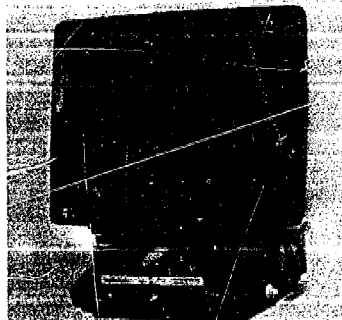
**MOTORIZED READERS AND READER PRINTERS FOR ROLL MICROFILM**



**The 3M 400C Reader Printer**



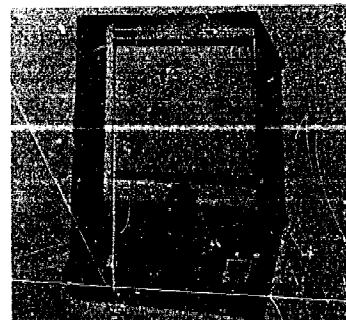
**The Recordak Motormatic Reader, Model MPG**



**The Information Handling Services Satellite IIW Reader**



**The Ednalite 1624 COM Reader**



**The Dietzgen 4317 Reader**

**Figure 6**

**MICROFILM READERS – MOTORIZED FOR ROLL MICROFILM**

| MANUFACTURER/<br>DISTRIBUTOR   | ATLANTIC<br>MICROFILM   | DIETZGEN   | DIETZGEN  |
|--|---|--|---|
| MODEL<br>Number<br>Name  | WM-24m WM-40<br>ATCOM   | 4317   | 4317-M  |
| PHYSICAL FEATURES<br>Type<br>Dimensions (HWD)<br>Weight (LBS)  | Desk<br>17"x15"x13"<br>15   | Desk<br>22"x15"x15"<br>30  | Desk<br>22"x15"x15"<br>30   |
| ELECTRICAL<br>Power (AC)<br>Cooling<br>Rated Lamp Life   | 115V<br>Blower<br>200 hours   | 115V<br>Blower<br>150 hours  | 115V<br>Blower<br>150 hours   |
| OPTICAL<br>Magnifications }<br>Available<br>Lens Changeable<br>Image Rotation                        | 24, 40<br>No<br>No  | 20<br>No<br>No   | 20<br>No<br>No  |
| SCREEN<br>Size HxW<br>Color<br>Type<br>Hood  | 11" x 14"<br>Gray<br>Rear projection<br>Yes   | 12" x 12"<br>Green<br>Rear projection  | 12" x 12"<br>Green<br>Rear projection   |
| FILM CARRIER<br>Transport }<br>Film Sizes<br>Film Forms }<br>Take Up<br>Film Gate }<br>Image Locator | Motorized, dial<br>control<br>16mm<br>No rewind<br>cassette<br>Cassette<br>Codeline | Motorized<br>continuous scan<br>16mm<br>Reel, 3M cartridge<br>Recordak magazine<br>microfiche<br>Reel<br>Open throat<br>Visual | Motorized<br>16mm<br>Reel, 3M cartridge<br>Recordak magazine<br>microfiche<br>Reel<br>Open throat<br>Odometer |
| CONTROLS<br>Type }<br>Location   | On-off, focus,<br>brightness,<br>film movement<br>All front                         | On-off, focus,<br>film movement<br>All front   | On-off, focus,<br>film movement<br>All front  |
| WARRANTY }   | 1 year, parts<br>No labor   | 90 days  | 90 days   |
| SERVICE METHOD   | ---   | Direct, dealers  | Direct, dealers   |
| FEATURES/<br>ACCESSORIES }   | Cassette<br>carousel  | Operates on side<br>for rotation   |   |
| FED. GOVT. PRICES<br>Reader }<br>Extra Lenses<br>Lamps<br>Service                                    | \$350.00<br>commercial  | \$313.75   | \$361.25  |

Table 3

| EDNALITE   | INFORM. HANDLING SERVICES   | INFORM. HANDLING SERVICES  | KODAK (RECORDAK)  | KODAK (RECORDAK)  |
|--|---|--|---|---|
| 1624   | Satellite II  | Satellite IIW  | MPG Motomatic   | 20/20   |
| Desk<br>22"x15"x20"<br>32  | Portable<br>17"x12"x16"<br>10½  | Portable<br>19"x16"x16"<br>11  | Desk<br>26"x23"x32"<br>70   | Portable<br>21"x12"x18"<br>20   |
| 115V<br>Blower<br>300 hours  | 115V & 220V<br>Blower<br>450 hours  | 115V & 220V<br>Blower<br>450 hours   | 120V<br>Blower<br>---   | 117V or 12VDC<br>Convection   |
| 24<br>No<br>No   | 24, 40<br>No<br>No  | 24, 40<br>No<br>Yes, optical   | 19 or 23<br>Yes<br>Yes, optical   | 20<br>No<br>No  |
| 11½" x 14¼"<br>Gray<br>Rear projection   | 11" x 9"<br>Gray<br>Rear projection   | 11" x 14"<br>Gray<br>Rear projection   | 15" x 15"<br>Neutral<br>Rear projection   | 12" x 9"<br>Green<br>Rear projection  |
| Motorized,<br>continuous scan<br>16mm<br>Reel<br>Recordak magazine<br>3M cartridge<br>Reel<br>open<br>Odometer | Manual or<br>motorized<br>16mm (8mm image)<br>Satellite 8/16<br>cassette<br>Cassette<br>Codeline, image | Manual or<br>motorized<br>16mm<br>Satellite 8/16<br>no rewind<br>cassette<br>Codeline, count | Motorized, dial<br>control<br>16mm, 35mm<br>Reel, Recordak<br>thread-easy<br>magazine<br>Self thread<br>Glass flats<br>automatic open<br>Codeline | Motorized<br>16mm<br>Reel<br>Recordak magazine<br>Reel<br>Open throat<br>Codeline |
| On-off, focus,<br>motor drive<br>Front & side  | On-off, brightness,<br>focus, film transport,<br>lateral scan<br>Front & side                           | On-off, brightness,<br>focus, film transport,<br>lateral scan<br>All front                   | On-off, focus, film<br>transport, lateral<br>scan, rotation<br>All front  | On-off, focus,<br>motor drive<br>All front  |
|  | 90 days   | 90 days  | Parts 1 year<br>Service 3 months  | Parts 3 months<br>Service 3 months  |
|  | Agreement   | Agreement  | Field, on call  | Field on call   |
|  | Pedestal,<br>cassette rack  | Pedestal,<br>cassette rack   | Unit record<br>adaptor  |   |
| \$625.00<br>commercial   | \$190.00 manual<br>\$265.00 motorized<br>less 10%<br><br>\$7.80 less 10%<br>\$7.50/year                 | \$275.00 manual<br>\$350.00 motorized<br>less 10%<br><br>\$7.80 less 10%<br>\$12.50/year     | \$1175. w/o lens<br>less 6%<br><br>\$120. less 6%<br><br>\$85.00 commercial   | \$485.00<br>reconditioned   |

Table 3 (Continued)



**MICROFILM READERS – MOTORIZED FOR ROLL MICROFILM**

| MANUFACTURER/<br>DISTRIBUTOR  | KODAK (Recordak)   | KODAK (Recordak)   | KODAK (Recordak)  |
|---|--|--|---|
| <b>MODEL</b><br>Number<br>Name  | PR-1<br>Microstar  | PS-1-K<br>Lodestar   | PTA<br>Starlet  |
| <b>PHYSICAL FEATURES</b><br>Type<br>Dimensions (HWD)<br>Weight (LBS)                                      | Desk<br>24" x 25" x 38"<br>140   | Desk<br>25" x 16" x 29"<br>90  | Desk<br>21" x 14" x 19"<br>32   |
| <b>ELECTRICAL</b><br>Power (AC)<br>Cooling<br>Rated Lamp Life   | 120V<br>Blower   | 120V<br>Blower   | 117V<br>Blower  |
| <b>OPTICAL</b><br>Magnifications Available }<br>Lens Changeable<br>Image Rotation                         | 18-24, 21-28,<br>27-36, 35, 45<br>Yes<br>Yes, mechanical   | 23<br>No<br>Yes, optical   | 20<br>No<br>No  |
| <b>SCREEN</b><br>Size (H x W)<br>Color<br>Type<br>Hood  | 14" x 14"<br>Neutral<br>Rear projection  | 13 1/2" x 13 1/2"<br>Green<br>Rear projection  | 10 7/8" x 12"<br>Green<br>Rear projection   |
| <b>FILM CARRIER</b><br>Transport }<br>Film Sizes<br>Film Forms }<br>Tape Up<br>Film Gate<br>Image Locator | Motorized,<br>continuous scan<br>16mm<br>Recordak magazine<br><br>Self thread<br>Open<br>Codeline<br>image count | Motorized,<br>continuous scan<br>16mm<br>Recordak magazine<br><br>Self thread<br>Open<br>Codeline<br>image count | Motorized, manual,<br>continuous scan<br>16mm<br>Reel and<br>Recordak magazine<br>Reel<br>Open throat<br>Codeline |
| <b>CONTROLS</b><br>Type }<br>Location   | Motor drive,<br>rotation,<br>focus<br>All front  | Rotation,<br>motor drive,<br>speed lock, focus<br>All front  | On-off, focus,<br>crank,<br>motor drive<br>All front  |
| <b>WARRANTY</b> }   | Parts 1 year<br>Service 3 months   | Parts 1 year<br>Service 3 months   | Parts 1 year<br>Service 3 months  |
| <b>SERVICE METHOD</b>   | Field on call  | Field on call  | Field on call   |
| <b>FEATURES/<br/>ACCESSORIES</b> }  | Zoom lens,<br>control keyboard   | Image control<br>keyboard  |   |
| <b>FED. GOVT. PRICES</b><br>Reader }<br>Extra Lenses }<br>Lamps<br>Service                                | \$1895.00 less 6%<br><br>\$95.00 less 6%<br><br>\$100/yr comm.   | \$1295.00 less 6%<br><br><br><br>\$108/yr less 2%  | \$575.00 less 6%<br><br><br><br>\$53/yr less 2%   |

| KODAK (Recordak)   | 3M  | STROMBERG<br>DATAGRAPHIX   | WASHINGTON<br>SCIENTIFIC  | WASHINGTON<br>SCIENTIFIC  |
|--|---|--|---|---|
| PVM<br>Starmatic   | 400CR   | 1700<br>Inquiry Station  | C-3M Cartridge, or<br>CR-Kodak Magazine   | RM  |
| Desk<br>19" x 20" x 12"<br>27  | Desk<br>28" x 17" x 23"<br>120  | Desk<br>21" x 18" x 18"<br>63  | Portable<br>19" x 14" x 16" (open)<br>18  | Portable<br>19" x 14" x 18" (open)<br>17                          |
| 117V<br>Convection   | 115V & 220V<br>Blower   | 115V<br>Blower<br>500 hours  | Various AC & DC<br>Convection<br>200 hours  | Various AC & DC<br>Convection<br>200 hours                        |
| 20, 24, 32, 40<br>No<br>Yes, mechanical  | 14.9, 18.3, 20.8,<br>23, 25, 29<br>Yes<br>Yes, mechanical   | 24, 40<br>No<br>No   | 20 or 24<br>No<br>No  | 20 or 24<br>No<br>No  |
| 9" x 12"<br>Green<br>Rear projection   | 11 1/2" x 10"<br>Gray, green, blue<br>Rear projection   | 11" x 14"<br>Green, blue, gray<br>Rear projection  | 12" x 9"<br>Green, blue, gray<br>Rear projection  | 12" x 9"<br>Green, blue, gray<br>Rear projection                  |
| Motorized,<br>continuous scan<br>16mm<br>Reel<br>Reel<br>Glass flats<br>Codeline | Motorized,<br>continuous scan<br>16mm<br>3M cartridge<br>Self thread<br>Platen<br>Codeline, odometer<br>optical codes | Motorized, stepped<br>and continuous<br>16mm<br>Datagraphix<br>cartridge<br>Self thread<br>Sequential<br>retrieval marks | Motor, continuous<br>scan<br>16mm<br>3M cartridge<br>Recordak magazine<br>Special hub<br>Open<br>Codeline<br>odometer | Motorized<br>16mm<br>Reel<br>Reel<br>Open<br>Codeline<br>odometer |
| On-off, focus,<br>motor drive,<br>rotation<br>All front                          | On-off, focus,<br>motor drive,<br>crank, rotation<br>Side & front   | On-off, focus,<br>motor drive<br>All front   | On-off, focus,<br>film transport<br>All front   | On-off, focus,<br>motor drive<br>All front                        |
| Parts 1 year<br>Service 3 months   | 180 days  | 30 days  | 180 days  | 180 days  |
| Field on call  | Agreement   | Agreement  | Dealers   | Dealers   |
| Lens kits  | Stand, large<br>screen kit  |  | Various power<br>options  | Various power<br>options  |
| \$685.00 less 6%   | \$926.10 w/o lens   | \$1350-\$1500<br>commercial  | \$389 (model C)<br>\$389 (model CR)<br>commercial   | \$349.50<br>commercial  |
| \$65.00 less 6%  | \$99.75   | \$104.00<br>commercial   | \$2.25 commercial   | \$2.25 commercial   |
| \$30/yr less 2%  | \$100   | \$14.50/mo comm.   |   |   |

Table 3 (Continued)

**MICROFILM READER PRINTERS – MOTORIZED FOR ROLL MICROFILM**

| MANUFACTURER/<br>DISTRIBUTOR   | BELL & HOWELL  | DASA   | KODAK<br>(Recordak)  |
|--|--|--|--|
| MODEL<br>Number<br>Name  | Autoload   | CRP-30   | PE-1A<br>Magnaprint  |
| PHYSICAL FEATURES<br>Type<br>Dimensions (HxVD)<br>Weight (LBS)   | Desk<br>29" x 22" x 34"<br>117   | Desk<br>37" x 27" x 25"<br>175   | Desk<br>29" x 17" x 27"<br>105   |
| ELECTRICAL<br>Power (AC)<br>Cooling<br>Rated Lamp Life   | 115V<br>Blower<br>500 hrs  | 115V<br>Blower<br>Not available  | 117V<br>Convection<br>---  |
| OPTICAL<br>Magnifications<br>Available }<br>Lens Changeable<br>Image Rotation                          | Zoom 20 to 40<br>---<br>Yes, optical   | 12, 16, 18, 20,<br>24, 30, 33, 40<br>Yes<br>Yes, mechanical  | 11.8, 13.7, 17.1, 19<br>22.5, 30, 38<br>Yes<br>Yes, mechanical   |
| SCREEN<br>Size (H x W)<br>Color<br>Type  | 14" x 14"<br>Blue<br>Rear projection   | 12" x 14"<br>Hi contrast gray<br>Rear projection   | 11" x 11"<br>Green<br>Rear projection  |
| FILM CARRIER<br>Transport }<br>Film Sizes<br>Film Forms }<br>Take Up<br>Film Gate }<br>Image Locator } | Motorized,<br>Continuous scan<br>16mm<br>B & H no rewind<br>cartridge<br>No rewind<br>Open<br>Codeline,<br>odometer,<br>visual | Motorized,<br>Continuous scan<br>16mm<br>Reel, cartridge,<br>microfiche<br>Reel<br>Open<br>Image count | Motorized,<br>Continuous scan<br>16mm, 35mm<br>Reel,<br>Recordak magazine<br>Reel<br>Glass flats,<br>Manual open/close<br>Codeline |
| CONTROLS<br>Type }<br>Location   | On-off, zoom,<br>brightness,<br>focus, scan, print,<br>expose, rotation<br>All front   | On-off, focus,<br>film transport,<br>print, expose<br>All front  | On-off, focus,<br>motor drive,<br>expose, print<br>All front   |

Table 4

| KODAK<br>(Recordak)   | 3M  | 3M  | STROMBERG  |
|---|---|---|--|
| PES-1<br>Lodestar   | 400C model 75AFYT   | 400M model 75AFB  | 1700-3500<br>Inquiry Station   |
| Desk<br>31" x 16" x 33"<br>143  | Desk<br>28" x 17" x 23"<br>120  | Desk<br>28" x 17" x 23"<br>120  | Console on stand<br>21" x 18" x 16"<br>346   |
| 117V<br>Blower<br>---   | 115V<br>Blower<br>---   | 115V, 220V<br>Blower<br>---   | 115V<br>Blower<br>500 hrs  |
| 23 (Reader)<br>21 (Printer)<br><br>No<br>No   | 14.9, 18.2, 20.8,<br>23, 25, 29<br><br>Yes<br>Yes, mechanical   | 6.6, 8, 10.6, 12<br>14.9, 18.3, 20.8,<br>23, 25, 29, 35<br><br>Yes<br>Yes, mechanical   | 20 or 40<br><br>No<br>No   |
| 13" x 13"<br>Green<br>Rear projection   | 11½" x 10"<br>Gray, green, blue<br>Rear projection  | 11½" x 10"<br>Gray, green, blue<br>Rear projection  | 11" x 14"<br>Blue, gray, green<br>Rear projection  |
| Motorized,<br>Continuous scan<br>16mm<br>Recordak magazine<br><br>Self threading<br>Open<br><br>Codeline<br>image count | Motorized, manual,<br>continuous scan<br>16mm<br>3M cartridge<br><br>Self thread<br>Platen<br><br>Codeline, visual,<br>odometer,<br>optical codes | Motorized, manual,<br>continuous scan<br>16mm, 35mm<br>Reel, microfiche,<br>Aperture card<br>Reel<br>Glass flats<br>Manual open<br>Visual, codeline<br>odometer | Motor, continuous<br>scan and steps<br>16mm<br>DatagraphiX<br>Cartridge<br>Self thread<br>---<br><br>Sequential<br>retrieval marks |
| On-off, focus,<br>motor drive,<br>speed lock,<br>expose, print<br>All front   | On-off, rotation,<br>film transport,<br>lateral scan,<br>expose, print<br>Side & front  | On-off, focus, film<br>transport, lateral<br>scan, rotation,<br>expose, print<br>All front  | On-off, focus,<br>motor drive,<br>print<br><br>All front   |

Table 4 (Continued)

**MICROFILM READER PRINTERS — MOTORIZED FOR ROLL MICROFILM**

| MANUFACTURER/<br>DISTRIBUTOR       | BELL & HOWELL                                      | DASA   | KODAK<br>(Recordak)               |
|------------------------------------|--|--|-----------------------------------|
| <b>IMAGING SYSTEM</b>              |  |  |                                   |
| Process                            | Silver stabilize                                   | OPC Electrostatic  | Silver monobath                   |
| Prints }<br>Warm Up Time           | Neg. to positive                                   | Neg. to positive<br>Pos. to positive                               | Neg. to positive                  |
| Print Cycle Time                   | None   | None   | ---                               |
| Print Sizes }                      | 17 seconds   | 20 seconds   | 28 seconds                        |
|                                    | 8½" x 11"  | 8½" x 11"  | 8½" x 11¼"                        |
|                                    | 8½" x 5½" (op)                                     |  |                                   |
| <b>SUPPLIES</b>                    |  |  |                                   |
| Paper                              |  |  |                                   |
| Roll Fed                           | 150' roll  | 300' roll  | 150' roll                         |
| Sheet Fed                          |  |  |                                   |
| Cost/Print                         | \$.10 max  | \$.025 to .035   | ---                               |
| Shelf Life                         | 1 year   | Indefinite   | ---                               |
| <b>CHEMICALS</b>                   |  |  |                                   |
| Type }                             | Activator  | Toner,   | Monobath                          |
| Prints/Package                     | Stabilizer   | replenisher  |                                   |
|                                    | 500 per quart                                      | 1 qt. toner/roll   | 150                               |
| <b>WARRANTY }</b>                  | 90 days  | 90 days  | Parts 1 year<br>Service 3 months  |
| <b>SERVICE METHOD</b>              | Local  | Direct & Dealer  | Field on call                     |
| <b>FEATURES/<br/>ACCESSORIES }</b> | ½ size print kit,<br>foot switch,<br>roll film kit | 3 models-manual,<br>motorized,<br>microfiche                       | Magazine adaptor<br>Fiche adaptor |
| <b>FED. GOVT. PRICES</b>           |  |  |                                   |
| Reader/Printer }                   |  | Commercial \$1945.00<br>Motorized; \$1750.00<br>manual, Microfiche | \$1450.00 less 6%                 |
| Extra Lenses                       |  |  | \$105.00 less 6%                  |
| Lamps                              |  |  |                                   |
| Service                            |  |  | \$132 less 2%                     |

Table 4 (Continued)

| KODAK<br>(Recordak)  | 3M  | 3M   | STROMBERG   |
|--|---|--|---|
| Silver monobath<br>Neg. to positive<br><br>None<br>Less than 30 seconds<br>8½" x 11" | Electrochemical<br>Neg. to positive<br><br>None<br>6 seconds<br>8½" x 12½"<br>10½" x 8" | Electrochemical<br>Neg. to positive<br><br>None<br>6 seconds<br>8½" x 12½" | Electrostatic<br>Neg. to positive<br><br>5 seconds<br>10 seconds<br>8½" x 11" or<br>11" x 14" |
| 150' roll  | 300' roll<br>---<br>\$.07 to .09<br>---   | 300' roll<br>---<br>\$.07 to .09   | 250 sheets/pkg<br>\$.025 & \$.044   |
| Monobath<br><br>150  | 3M activator<br><br>300 per quart   | 3M activator<br><br>300 per quart  | Toner<br>intensifier<br>4200 (8½" x 11")  |
| Parts 1 year<br>Service 3 months   | 180 days  | 180 days   | 30 days   |
| Field on call  | Agreement   | Agreement  | Agreement   |
| Available only as<br>reconditioned<br>unit   | Various-stand,<br>½ sheet kit, etc.   | ¼ sheet kit, stand<br>large screen kit<br>various                          | Film annotate   |
| \$2100.00 less 6%<br><br><br><br>\$179 less 2%                                       | \$1318.10 w/o lens<br><br>\$99.75<br><br>\$200/year                                     | \$1053.50 w/o lens<br><br>\$99.75<br><br>\$200/year                        | \$2800.00 to<br>\$2950.00<br>commercial<br>\$104.00 commercial<br><br>\$27 to \$29/month      |

Table 4 (Continued)

## V. MICROFICHE AND MICROFILM JACKET READERS AND READER PRINTERS

This chapter describes only microfiche readers and reader printers in the 15X to approximately 40X magnification range, using microfiche as described in chapter I. Most of the hardware operates in the range designated for the COSATI format, 18X to 20X; or in the NMA format at 22X to 26X. Readers and reader printers designed for microfiche can be used as well for microfilm jackets; therefore, all equipment in this class has been given the single designation, "microfiche."

Microfiche readers and reader printers are available in lap, portable, desk, and free-standing units as described in chapter II under "Physical Features."

Most microfiche readers display the image at approximately original size. An increasing number of microfiche readers have some means of determining or indicating the row and column index coordinates of the image being projected on the screen. Thus, these readers and reader printers also have limited retrieval capabilities as well.

### Physical and Operational Characteristics

The microfiche reader is the simplest type of microfilm reader in current use. Accordingly, it is generally less expensive than a comparable roll film reader. Most microfiche readers are intended for desk use. Most of them consist of:

- A screen, either neutral color or tinted blue or green.
- Glass flats and a method to transport the microfiche from frame to frame.
- An optical projection and enlarging system.
- Controls: on-off, focus.
- Index grid or frame locator.

- A housing.

In addition, a reader printer has:

- A paper transport and printing mechanism.
- Additional controls for printing.

The user normally performs the following functions in order to display an image:

Turn switch on.

Open glass flats. (In some readers these open automatically when they are extended to a full forward position. Other units may require the flats to be opened manually.)

Insert microfiche (Readers differ. In some units, the microfiche must be inserted bottom edge first and right side up in order to project the image right reading on the screen. Another reader may require the microfiche to be inserted in a different position.)

Move film carrier to desired image as determined by index coordinates or by experiment.

Focus.

To produce a print on most reader printers:

- Set print timer to proper exposure.
- Actuate print mechanism.

### Special Factors in Equipment Selection

Microfiche and jacket reference units are widely used for technical, research, and management reports; personnel and other "people"

files; parts and industrial catalogs; maintenance literature; library reference documents; and COM-generated microfiche.

**Film Carrier.** Any film carrier will accommodate its stated maximum sheet size and anything smaller. Normally, it is easiest to use a film carrier with microfiche or jackets of the same size. Smaller-size microfiche may be difficult to orient properly in larger film holders.

Practically all microfiche units use glass flats in the film carrier to hold the microform flat, protect it, and assist in image positioning. Some glass flats are removable for cleaning; if not, it should be possible to clean them in place easily.

In many units the glass flats are opened manually by raising the top flat to insert the microfiche. In others the flats open automatically, usually when the carrier is moved to the full forward position. Either method is quite convenient, and the choice is one of personal preference.

**Image Location.** With the microfiche in the carrier, image position or location can be indicated in several ways; they include:

**X and Y coordinates.** As the fiche is moved, X (column) and Y (row) coordinates related to the microfiche grid format are indicated on dials or scales by letter and number designators.

**Grids.** Location is indicated by a pointer on a grid located in front of the user and

in the plane of the film carrier. Depending on the machine and the magnification, many manufacturers offer grids for COSATI, NMA, and special microfiche formats.

**Film Transport.** Motion of the film carrier to position images is provided in several ways:

- **Manual.** The film stage (in the absence of a carrier, the microfiche itself) is moved by hand in both the X and Y directions.
- **Dials.** The film carrier is moved by turning dials similar in appearance to the channel selector on a TV set.
- **Joystick.** The film stage is moved with a joystick or push-pull-rotate shaft.
- **Pointer.** Manual movement of the carrier is accomplished by holding the pointer which indicates location on the grid.
- **Automatic.** Motion is other than direct manual control, such as pushbuttons for X and Y coordinates on the microfiche.

With respect to film transport and image location, almost any combination of the above capabilities can be quite convenient. Hence the absence of some control of carrier motion and image location is almost totally unacceptable.

Table 5 lists the factors discussed here and in chapter II for microfiche readers. Reader printer information is provided in table 6. Several units are pictured in figure 7.



**MICROFICHE READERS**

| MANUFACTURER/<br>DISTRIBUTOR  | ATLANTIC  | ATLANTIC  | ATLANTIC  |
|---|---|---|---|
| <b>MODEL</b>  |   |   |   |
| Number  | F-66  | F-66A   | MJR   |
| Name  |   |   |   |
| <b>PHYSICAL</b>   |   |   |   |
| Type  | Desk  | Desk  | Portable  |
| Dimensions (HWD)  | 20"x10"x16"   | 20"x10"x16"   | 22"x13"x17"(open)   |
| Weight (LBS)  | 15  | 15  | 19  |
| <b>ELECTRICAL</b>   |   |   |   |
| Power (AC)  | 115V, 220V  | 115V, 220V  | 120V  |
| Cooling   | Convection  | Convection  | Convection  |
| Rated Lamp Life   | 100 hours   | 100 hours   | 100 hours   |
| <b>OPTICAL</b>  |   |   |   |
| Magnifications Available }<br>Lens Changeable<br>Image Rotation                                   | 11, 15, 19, 22,<br>24, 35, 70<br><br>Yes<br>No  | Any two 11, 15,<br>19, 22, 24, 35,<br>70<br><br>Yes<br>No   | 7, 11, 15, 17,<br>22, 35<br><br>Yes<br>No   |
| <b>SCREEN</b>   |   |   |   |
| Size(HxW) }<br>Color<br>Type<br>Hood  | 11" x 8½"<br><br>Gray<br>Rear projection<br>Yes   | 11" x 8½"<br><br>Gray<br>Rear projection<br>Yes   | 10" x 10"<br><br>Gray<br>Rear projection<br>No  |
| <b>FILM CARRIER</b>   |   |   |   |
| Fiche Sizes Accepted }<br>Holder<br>Image Locator<br>Formats Avail.<br>Glass Flats }<br>Transport | 3" x 5"<br>105mm x 148mm<br>3 1/4" x 7 3/8"<br>Glass flats<br>X-Y coordinates<br>COSATI, NMA, spec.<br>Automatic open<br><br>Manual, dial | 3" x 5"<br>105mm x 148mm<br>3 1/4" x 7 3/8"<br>Glass flats<br>X-Y coordinates<br>COSATI, NMA, spec.<br>Automatic open<br><br>Manual, dial | Up to 5" x 8"<br><br>Glass flats<br>None<br>---<br>Manual open<br><br>Manual, joy stick |
| <b>CONTROLS</b>   |   |   |   |
| Type }<br>Location  | On-off, brightness,<br>film movement,<br>focus<br><br>All front   | On-off, brightness,<br>film movement,<br>focus<br><br>All front   | On-off, focus,<br>film movement<br><br>Front and side                                   |
| <b>WARRANTY</b> }   | Parts 1 year<br>None on service   | Parts 1 year<br>None on service   | Parts 1 year<br>None on service   |
| <b>SERVICE METHOD</b>   | Factory return  | Factory return  | Factory return  |
| <b>FEATURES/<br/>ACCESSORIES</b> }  | Roll film attach<br>handle, cover   | Roll film attach<br>handle, cover   | Roll film attach  |
| <b>FED. GOVT. PRICES</b>  |   |   |   |
| Reader  | \$107.10  | \$143.10  | \$178.20  |
| Extra Lenses  | \$17.10   | \$17.10   | \$22.50   |
| Lamps   | \$1.31  | \$1.31  | \$3.15  |
| Service   | \$12.50/hr + parts  | \$12.50/hr + parts  | \$12.50/hr + parts  |

Table 5

| ATLANTIC  | BELL & HOWELL  | BELL & HOWELL  | BELL & HOWELL   | DIETZGEN  |
|---|--|--|---|---|
| P-50<br>Gypsy   | Duo  | Headliner  | Mascot  | 4315  |
| Portable<br>17"x13"x16" (open)<br>11  | Desk<br>24"x21"x17"<br>60  | Desk<br>24"x16"x19"<br>38  | Portable<br>7"x13"x20"<br>16  | Desk<br>24"x12"x15"<br>21   |
| 120/220V, 12VDC<br>Convection<br>100 hours  | 115V<br>Blower<br>Up to 1000 hours   | 115V<br>Blower<br>500 hours  | 115/220V, 12VDC<br>Convection<br>500 hours  | 115V<br>Convection<br>150 hours   |
| 22 (variable)   | 22 or 30   | 24   | 21  | 19,25   |
| Yes<br>Rotate reader  | No<br>No   | No<br>Yes, optical   | No<br>No  | No<br>No  |
| 14"x14" up to 4'x4'<br>wall projection<br>---<br>Reflecting<br>No   | 14"x20"<br><br>Gray<br>Rear projection<br>Yes  | 14"x14"<br><br>Blue<br>Rear projection<br>Yes  | 11"x11"<br><br>Blue<br>Rear projection<br>Yes   | 12"x9½"<br><br>Green<br>Rear projection<br>Yes                                    |
| 3"x5"<br>105mm x 148mm<br><br>Glass flats<br>Grid<br>COSATI, NMA, spec.<br>Automatic open<br><br>Manual, joystick | 3"x5"<br>105mm x 148mm<br>3 1/4" x 7-3/8"<br><br>Glass flats<br>Grid<br>COSATI, NMA, spec.<br>Removable<br>Manual open<br>Manual | 105mm x 148mm<br><br>Glass flats<br>X-Y coordinates<br>COSATI, NMA, spec.<br>Removable<br>Automatic open<br>Dial | 3"x5<br>105mm x 148mm<br><br>Glass flats<br>Grid<br>COSATI, NMA, spec.<br>Removable<br>Automatic open<br>Manual pointer | 3"x5"<br>105mm x 148mm<br><br>Glass flats<br>None<br>---<br>Manual open<br>Manual |
| On-off, focus,<br>film movement<br><br>Various  | On-off, brightness,<br>focus, film move-<br>ment<br>Front and sides  | On-off, focus,<br>film movement<br>rotation<br>Front and side  | On-off, focus,<br>film movement<br><br>Front and side   | On-off, focus   |
| Parts 1 year<br>None on service   | 90 days  | 90 days  | 90 days   | 90 days   |
| Factory return  | Local offices  | Local offices  | Local offices   | Local contract  |
| 12VDC adaptor<br>battery pack   |  |  | Foot for<br>projection  |   |
| \$54.00<br>\$17.10<br>\$1.31<br>\$12.50/hr + parts  | Not available  | Not available  | Not available   | \$137.70  |

Table 5 (Continued)

**MICROFICHE READERS**

| MANUFACTURER/<br>DISTRIBUTOR  | DIETZGEN  | DIETZGEN  | GAF CORR.   |
|---|---|---|---|
| <b>MODEL</b><br>Number<br>Name  | 4316  | 4319  | D7-09   |
| <b>PHYSICAL</b><br>Type<br>Dimensions (HWD)<br>Weight (LBS)   | Desk<br>25" x 21" x 19"<br>56   | Desk<br>24" x 12" x 16"<br>21   | Desk<br>18 1/2" x 9 1/2" x 16"<br>---   |
| <b>ELECTRICAL</b><br>Power (AC)<br>Cooling<br>Rated Lamp Life   | 115V<br>Blower<br>50 hrs  | 115V<br>Convection<br>150 hrs   | 115V or 220V<br>Blower<br>550 hrs   |
| <b>OPTICAL</b><br>Magnifications }<br>Available }<br>Lens Changeable<br>Image Rotation  | 22, 30, 42<br>No<br>No  | 19, 25<br>No<br>No  | 18, 24<br>Yes<br>No   |
| <b>SCREEN</b><br>Size (H x W)<br>Color<br>Type<br>Hood  | 14" x 20"<br>Gray<br>Rear projection<br>Yes   | 12" x 9 1/2"<br>Green<br>Rear projection<br>Yes   | 11" x 8 1/2"<br>Green, blue, gray<br>Rear projection<br>---                                     |
| <b>FILM CARRIER</b><br>Fiche Sizes }<br>Accepted }<br>Holder<br>Image Locator<br>Formats Avail.<br>Glass Flats }<br>Transport | 3" x 5"<br>105mm x 148mm<br>3 1/4" x 7 3/8"<br>Glass flats<br>Grids<br>COSATI, NMA, spec.<br>Automatic open<br>Manual | 3" x 5"<br>105mm x 148mm<br>3 1/4" x 7 3/8"<br>Glass flats<br>X-Y coordinates<br>COSATI, NMA<br>Manual open<br>Manual | Up to 5" x 8"<br>Glass flats<br>Grids<br>COSATI, NMA, DOD<br>Removable<br>Manual open<br>Manual |
| <b>CONTROLS</b><br>Type }<br>Location   | On-off, focus<br>All front  | On-off, focus<br>Front  | On-off, focus,<br>film movement<br>All front  |
| <b>WARRANTY</b> }   | 90 days   | 90 days   | 180 days  |
| <b>SERVICE METHOD</b>   | Local contract  | Not available   | Field service   |
| <b>FEATURES/<br/>ACCESSORIES</b> }  |   |   |   |
| <b>FED. GOVT. PRICES</b><br>Reader }<br>Extra Lenses }<br>Lamps<br>Service  | \$340.00  | \$176.80  | \$129.00<br>commercial<br><br>\$4.00 commercial   |

Table 5 (Continued)

| GAF CORP.  | KEUFFEL & ESSER   | KEUFFEL & ESSER   | KODAK (Recordak)  | KODAK (Recordak)  |
|--|---|---|---|---|
| D7502  | 52 9921   | 52 9922   | PFCS<br>Esamatic  | PFCD<br>Esamatic  |
| Desk<br>19" x 16" x 25"<br>---   | Desk<br>18" x 25" x 18"<br>70   | Desk<br>18" x 35" x 25"<br>75   | Desk<br>19" x 19" x 21"<br>20   | Desk<br>19" x 19" x 21"<br>20   |
| 115V or 220V<br>---  | 115V<br>Blower<br>2000 hours  | 115V<br>Blower<br>2000 hours  | 120V<br>Blower<br>Not available   | 120V<br>Blower<br>Not available   |
| 24, 42<br><br>Yes<br>No  | 24 and 30<br><br>No<br>Yes  | 24 and 30<br><br>No<br>No   | 18.5, 21.5, 23,<br>25.5, 31<br><br>Yes<br>No  | 18.5, 21.5, 23,<br>25.5, 31<br><br>Yes<br>No  |
| 11½" x 15½"<br>Gray, blue, green<br>Rear projection<br>---   | 15" x 14"<br>Gray<br>Rear projection<br>No  | 14" x 22"<br>Gray<br>Rear projection<br>No  | 11" x 11"<br>Neutral<br>Rear projection<br>No   | 11" x 16"<br>Neutral<br>Rear projection<br>No   |
| Up to 5" x 8"<br><br>Glass flats<br>Grid<br>NMA, COSATI, DOD<br>Removable<br>Manual open<br>Manual | Up to 6" x 8"<br><br>Glass flats<br>X-Y coordinates<br>COSATI, NMA<br>Removable<br><br>Manual dials | Up to 6" x 8"<br><br>Glass flats<br>X-Y coordinates<br>COSATI, NMA<br>Removable<br><br>Manual dials | 105mm x 148mm<br>3 1/4" x 7 3/8"<br><br>Glass flats<br>Grid<br>COSATI, NMA, DOD<br>Removable,<br>Manual open<br>Manual, pointer | 105mm x 148mm<br>3 1/4" x 7 3/8"<br><br>Glass flats<br>Grid<br>COSATI, NMA, DOD<br>Removable,<br>Manual open<br>Manual, pointer |
| On-off, focus,<br>All front  | On-off, focus,<br>film transport<br>All front   | On-off, focus,<br>film transport<br>All front   | On-off, focus,<br>film movement<br>All front  | On-off, focus<br>film movement<br>All front   |
| 180 days   | 90 days   | 90 days   | Parts - 1 year<br>Service - 3 months  | Parts - 1 year<br>Service - 3 months  |
| Field service  | Local offices   | Local offices   | Field, on call  | Field, on call  |
|  |   |   | Lens kits<br>special cover glass  | Lens kits<br>special cover glass  |
| \$265.00<br>commercial<br><br><br><br><br><br><br><br><br>\$8.50 commercial                        | \$300.00<br>commercial<br><br><br><br><br><br><br><br><br>\$10.00 commercial                        | \$400.00<br>commercial<br><br><br><br><br><br><br><br><br>\$10.00 commercial                        | \$180.00<br>31X\$225.00<br>Less 6%<br>\$20.00 31X\$65.00<br>Less 6%<br>Not available<br>\$30.00/yr, less 2%                     | \$205.00<br>31X\$250.00<br>Less 6%<br>\$20.00 31X\$65.00<br>Less 6%<br>---<br>\$30.00/yr, less 2%                               |

Table 5 (Continued)

**MICROFICHE READERS**

| MANUFACTURER/<br>DISTRIBUTOR  | KODAK (Recordak)  | MICRO DESIGN   | MICRO DESIGN  |
|---|---|--|---|
| <b>MODEL</b><br>Number<br>Name  | PK-1013   | 100  | COM 200   |
| <b>PHYSICAL</b><br>Type<br>Dimensions (HWD)<br>Weight (LBS)   | Desk<br>27" x 13" x 18"<br>39   | Desk<br>18" x 9" x 16"<br>17   | Desk<br>19" x 16" x 25"<br>33   |
| <b>ELECTRICAL</b><br>Pow. (AC)<br>Cooling<br>Rated Lamp Life  | 115V<br>Convection<br>40 hrs  | 115V<br>Not available<br>500 hrs   | 115V<br>Blower<br>700 hrs (low)   |
| <b>OPTICAL</b><br>Magnifications }<br>Available<br>Lens Changeable<br>Image Rotation  | 18 or 23<br>Yes<br>Yes-optical  | 18 & 24<br>No<br>No  | 24 & 42<br>No<br>No   |
| <b>SCREEN</b><br>Size (H x W)<br>Color<br>Type<br>Hood  | 13 1/4" x 10 1/2"<br>Green<br>Rear projection<br>No   | 11" x 8 1/2"<br>Green or gray<br>Rear projection<br>No   | 11 1/2" x 15 1/2"<br>Green or gray<br>Yes   |
| <b>FILM CARRIER</b><br>Fiche Sizes }<br>Accepted<br>Holder<br>Image Locator<br>Formats Avail.<br>Glass Flats }<br>Transport | 105mm x 148mm<br>3 1/4" x 7 3/8",<br>3" x 5", 5" x 8"<br>Glass flats<br>X-Y coordinates<br>COSATI, NMA<br>Removable<br>Manual open<br>Manual dial | 105mm x 148mm<br>3 1/4" x 7 3/8"<br>3" x 5"<br>Glass flats<br>Grid<br>COSATI, NMA, spec.<br>Removable<br>Manual open<br>Manual pointer | 105mm x 148mm<br>3 1/4" x 7 3/8"<br>3" x 5"<br>Glass flats<br>Grid<br>COSATI, NMA, spec.<br>Removable<br>Automatic open<br>Manual pointer |
| <b>CONTROLS</b><br>Type }<br>Location   | On-off, focus,<br>film movement,<br>rotation<br>All front   | On-off, focus,<br>film movement<br>Front and side  | On-off, brightness,<br>focus,<br>film movement<br>Front and side  |
| <b>WARRANTY</b> }   | Parts - 3 months<br>Service - 3 months  | 1 year   | 1 year  |
| <b>SERVICE METHOD</b>   | Field, on call  | Local dealer   | Local dealer  |
| <b>FEATURES/<br/>ACCESSORIES</b> }  |   | Wall projection<br>16mm roll attach,   | Wall projection<br>screen tilt  |
| <b>FED. GOVT. PRICES</b><br>Reader }<br>Extra Lenses }<br>Lamps<br>Service  | \$430.00<br>Less 6%<br><br>\$42.00/yr, less 2%  | \$116.10   | \$238.50  |

Table 5 (Continued)

| MICRO IMAGE  | NCR   | NCR  | NCR  | NCR  |
|--|---|--|--|--|
| MICRA 210  | 476-300   | 456-316  | 456-400  | 456-800  |
| Desk<br>16" x 13" x 9"<br>12   | Portable<br>21" x 12" x 8"<br>15  | Portable<br>16" x 8" x 11"<br>15   | Desk<br>21" x 16" x 18"<br>35  | Desk<br>24" x 19" x 20"<br>65  |
| 115V<br>Blower<br>1000 hrs   | 115/220V, 12VDC<br>Convection<br>Not available  | 115V<br>Convection<br>Not available  | 115V, 220V<br>Convection<br>Not available  | 115V<br>Blower<br>Not available  |
| 14, 18, 31<br>Yes<br>No  | 18, 21, 24, 26, 38<br>Yes<br>No   | Dual 16 & 22<br>No<br>No   | 18, 21, 24, 26<br>No<br>No   | 22, 26, 33, 38<br>No<br>No   |
| 9" x 11"<br>Blue<br>Rear projection<br>No  | 10 1/2" x 9 1/2"<br>Green, gray, bronze<br>Rear projection<br>No  | 8 3/4" x 6 3/4"<br>Green<br>Rear projection<br>Yes   | 11 7/8" x 11"<br>Green or gray<br>Rear projection<br>Yes   | 13 1/4" x 19 3/4"<br>Green<br>Rear projection<br>Yes   |
| 105mm x 148mm<br>3" x 5"<br>Glass flats<br>Grid<br>COSATI, NMA, COM<br>Removable<br>Automatic open<br>Manual pointer | 3" x 5"<br>105mm x 148mm<br>3 1/4" x 7 3/8"<br>Glass flats<br>Grid<br>COSATI, NMA, spec.<br>Removable<br>Automatic open<br>Manual pointer | 3" x 5"<br>105mm x 148mm<br>3 1/4" x 7 3/8"<br>Glass flats<br>None<br>None<br>Removable<br>Manual open<br>Manual | 105mm x 148mm<br>3" x 5", 6" x 8"<br>3 1/4" x 7 3/8"<br>Glass flats<br>Grid<br>COSATI, NMA, spec.<br>Removable<br>Automatic open<br>Manual pointer | 105mm x 148mm<br>3" x 5", 6" x 8"<br>3 1/4" x 7 3/8"<br>Glass flats<br>Grid<br>COSATI, NMA, spec.<br>Removable<br>Automatic open<br>Manual pointer |
| On-off, focus,<br>film movement<br>All front<br>180 days   | On-off, focus,<br>brightness<br>All front   | On-off, focus,<br>magnification<br>Top, front, side<br>1 yr on parts   | On-off, focus,<br>brightness<br>All front<br>90 days parts<br>and labor  | On-off, focus,<br>brightness,<br>film movement<br>All front<br>90 days parts<br>and labor  |
| Return to factory  |   | Return factory   | Local branches   | Local branches   |
| Swivel base<br>carrying case   | Carry case  |  |  |  |
| \$99.00 Comm,<br>with 14X lens<br>\$15.00 for<br>14X lens<br>\$5.00  | \$250.00<br>commercial<br>\$27.00/year  | \$125.00   | \$178.50 (18X, 24X)<br>\$204.25 (21X, 26X)<br>\$27.00/year   | \$361.00 (22X)<br>\$376.25 (26X, 33X)<br>\$403.75 (38X)<br>\$27.00/year  |

Table 5 (Continued)

**MICROFICHE READERS**

| MANUFACTURER/<br>DISTRIBUTOR  | NCR  | POST  | READEX  |
|---|--|---|---|
| MODEL<br>Number<br>Name   | 456-942  | 640   | Universal Micro-viewer  |
| PHYSICAL<br>Type<br>Dimensions (HWD)<br>Weight (LBS)  | Desk<br>22"x19"x21"<br>65  | Desk<br>17½"x14"x15"<br>40  | Desk<br>23"x11"x20"<br>24                                       |
| ELECTRICAL<br>Power (AC)<br>Cooling<br>Rated Lamp Life  | 115V, 220V<br>Blower<br>Not available  | 115V, 220V<br>Blower<br>40 hrs  | 115V<br>Convection<br>100 hrs                                   |
| OPTICAL<br>Magnifications Available }<br>Lens Changeable<br>Image Rotation  | 42<br>Yes<br>No  | 18 & 24<br>No<br>No   | 23<br>No<br>Yes   |
| SCREEN<br>Size HxW<br>Color<br>Type<br>Hood   | 12" x 18½"<br>Green<br>Rear projection<br>Yes  | 11" x 14"<br>Green, blue, gray<br>Rear projection<br>Yes  | 12 3/8" x 9 3/4"<br>Green<br>Rear projection<br>Yes             |
| FILM CARRIER<br>Fiche Sizes Accepted }<br>Holder<br>Image Locator<br>Formats Avail.<br>Glass Flats }<br>Transport | 105mm x 148mm<br>3" x 5", 6" x 8"<br>3 1/4" x 7 3/8"<br>Glass flats<br>Grid<br>COSATI, NMA, COM<br>Removable<br>Automatic open<br>Manual pointer | 7 7/16" x 7 7/16"<br>or under<br>Glass flats<br>X-Y coordinates<br>COSATI, special<br>Manual open<br>Manual | 6" x 9"<br>Glass flats<br>None<br>None<br>Manual open<br>Manual |
| CONTROLS<br>Type }<br>Location  | On-off, focus<br>brightness<br>film movement   | On-off, focus<br>brightness<br>All front  | On-off, focus<br>rotation,<br>film movement<br>Front, top, side |
| WARRANTY }  | 90 days parts<br>and labor   | 6 months  | 1 year  |
| SERVICE METHOD  | Local branch   | Field, on call  |   |
| FEATURES/<br>ACCESSORIES }  |  |   | Accepts opaques<br>also   |
| FED. GOVT. PRICES<br>Reader }<br>Extra Lenses<br>Lamps<br>Service   | \$296.00<br>commercial<br><br>\$27.00/year   | \$201.65  | \$295.00<br>commercial<br><br>\$1.00                            |

Table 5 (Continued)

| REALIST  | REALIST   | REALIST  | REALIST   | REALIST  |
|--|---|--|---|--|
| 3320   | 3330  | 3332   | 3333  | 3334   |
| Desk<br>22"x19"x21"<br>55  | Desk<br>22"x19"x21"<br>55   | Desk<br>22"x19"x21"<br>55  | Desk<br>22"x19"x21"<br>55   | Desk<br>22"x19"x21"<br>55  |
| 115V<br>Blower<br>380 or 500 hrs   | 115V<br>Blower<br>500 hrs   | 115V<br>Blower<br>380 hrs  | 115V<br>Blower<br>380 hrs   | 115V<br>Blower<br>250 hrs  |
| 22, 24, 30, 40<br>No<br>No   | 24<br>No<br>No  | 24, 30, 43<br>No<br>No   | 26, 27, 50<br>No<br>No  | Dual lens 11.5<br>and 24<br>No<br>No   |
| 12" x 16"<br>Gray or green<br>Rear projection<br>No  | 12" x 11"<br>Gray, green<br>Rear projection<br>No   | 13" x 19"<br>Gray, green<br>Rear projection<br>No  | 13" x 19"<br>Not available<br>Rear projection<br>No   | 13" x 19"<br>Not available<br>Rear projection<br>No  |
| 105mm x 148mm<br>6" x 8"<br>Glass flats<br>Grid<br>COSATI, NMA, spec.<br>Removable<br>Automatic open<br>Manual | 105mm x 148mm<br>6" x 8"<br>Glass flats<br>Grid<br>COSATI, NMA<br>Removable<br>Automatic open<br>Manual | 105mm x 148mm<br>6" x 8"<br>Glass flats<br>Grid<br>COSATI, NMA, spec.<br>Removable<br>Automatic open<br>Manual | 105mm x 148mm<br>6" x 8"<br>Glass flats<br>Grid,<br>COSATI, NMA, spec.<br>Removable<br>Automatic open<br>Manual | 6" x 8"<br>Glass flats<br>Grid, X-Y coords.<br>COSATI, NMA, spec.<br>Removable<br>Automatic open<br>Manual |
| On-off, focus,<br>brightness<br>film movement<br>All front   | On-off, focus<br>brightness<br>film movement<br>All front   | On-off, focus<br>brightness<br>film movement<br>All front  | On-off, focus<br>brightness<br>film movement<br>All front   | On-off, focus<br>brightness<br>film movement<br>All front  |
| 1 year on parts<br>except lamp   | 1 year on parts<br>except lamp  | 1 year on parts<br>except lamp   | 1 year on parts<br>except lamp  | 1 year on parts<br>except lamp   |
| Dealers, factory   | Dealers, factory  | Dealers, factory   | Dealers, factory  | Dealers, factory   |
| Fiche storage<br>turntable, stand  | Fiche storage<br>turntable, stand   | Fiche storage,<br>turntables, stand  | Fiche storage<br>turntable, stand   | Stand, cover<br>turntable  |
| \$291.00   | \$220.00  | \$334.00   | \$353.00  | \$400.00   |
| \$5.75 or \$3.75   | \$3.75  | \$5.75   | \$5.75  | \$5.90   |

Table 5 (Continued)



**MICROFICHE READERS**

| MANUFACTURER/<br>DISTRIBUTOR  | REMINGTON RAND   | REMINGTON RAND   | STROMBERG  |
|---|--|--|--|
| <b>MODEL</b><br>Number<br>Name  | F400<br>Mini Reader  | F450<br>Kard-A-Film  | 1325<br>Inquiry Station  |
| <b>PHYSICAL</b><br>Type<br>Dimensions (HWD)<br>Weight (LBS)   | Portable<br>8" x 9" x 7"<br>2½                                   | Desk<br>17" x 16" x 15"<br>35  | Desk<br>21" x 18" x 21"<br>60  |
| <b>ELECTRICAL</b><br>Power (AC)<br>Cooling<br>Rated Lamp Life   | 115V<br>Convection   | 115V<br>Blower<br>Not available  | 115V<br>Blower<br>130 hrs.   |
| <b>OPTICAL</b><br>Magnifications }<br>Available }<br>Lens Changeable<br>Image Rotation  | 15, 17, 23;<br>Dual 15/19, 17/21<br>23/33<br>No<br>No            | 18, 24<br><br>No<br>No   | 24 & 40<br><br>Yes<br>No   |
| <b>SCREEN</b><br>Size (H x W) }<br>Color<br>Type<br>Hood  | 5½ x 7¼<br>Gray<br>Rear projection<br>No                         | 11" x 14"<br>Blue<br>Rear projection<br>Yes  | 11" x 14"<br>Green, blue, gray<br>Rear projection<br>Optional  |
| <b>FILM CARRIER</b><br>Fiche Sizes }<br>Accepted }<br>Holder<br>Image Locator<br>Formats Avail.<br>Glass Flats }<br>Transport | Up to 5" x 8"<br><br>Open throat<br>None<br>---<br>---<br>Manual | Up to<br>7 3/8" x 7 3/8"<br><br>Glass flats<br>X-Y coordinates<br>CASATI, NMA<br>Removable<br>Automatic open<br>Manual | 3" x 5"<br>105mm x 148mm<br>3 1/4" x 7 3/8"<br>Glass flats<br>Grid<br>DatagraphiX<br>Removable<br>Manual open<br>Manual, pointer |
| <b>CONTROLS</b><br>Type }<br>Location   | On-off, focus<br>Rear & front                                    | On-off, focus,<br>brightness<br>All front  | On-off, focus,<br>film movement<br>All front   |
| <b>WARRANTY</b>   | 1 year   | 1 year   | 30 days  |
| <b>SERVICE METHOD</b>   | Local  | Local  | Contract   |
| <b>FEATURES/<br/>ACCESSORIES</b> }  | Carry case<br>Battery pack                                       |  | Combines with<br>3500 printer unit   |
| <b>FED. GOVT. PRICES</b><br>Reader }<br>Extra Lenses }<br>Lamps<br>Service  | \$69.50 to \$90.00<br>Commercial                                 | \$249.00<br>Commercial   | \$330.00<br>Commercial<br>\$104.00<br>Commercial<br>Not available<br>\$3.45/month, comm.   |

Table 5 (Continued)

| TAYLOR-MERCHANT  | TAYLOR-MERCHANT   | TAYLOR-MERCHANT   | WASHINGTON SCIENTIFIC   |
|--|---|---|---|
| 300  | 16 & 12<br>Microviewer  | 12AMB; 16AMB<br>Microviewer   | MF  |
| Portable<br>6" x 3" x 8"<br>3  | Hand held<br>2" x 3" x 5"<br>7 oz   | Hand held<br>2" x 2" x 6"<br>7 oz   | Portable<br>19" x 14" x 18" (open)<br>16  |
| 115V<br>Blower<br>Not available  | Battery<br>---<br>---   | Ambient light<br>---<br>---   | 115/220V, DC, spec.<br>Conversion<br>200 hrs  |
| Variable by<br>projection<br><br>No<br>No  | 16 & 12<br><br>No<br>No   | 12 (12 AMB)<br>16 (16 AMB)<br><br>No<br>No                                    | 20 & 24<br><br>No<br>No   |
| Uses any available<br>screen<br>---<br>Reflecting<br>No                                    | No screen<br>Monocular reader<br>---<br>---<br>---                                      | No screen<br>Monocular reader<br>---<br>---<br>---                            | 12" x 9"<br><br>Green, blue, gray<br>Rear projection<br>Yes   |
| 3" x 5"<br>105mm x 148mm<br>3 1/4" x 7 3/8"<br>Open throat<br>None<br>---<br>---<br>Manual | 3" x 5"<br>105mm x 148mm<br>3 1/4" x 7 3/8"<br>Open throat<br>None<br>---<br>---<br>--- | All sizes up to<br>6" x 9"<br><br>Open throat<br>None<br>---<br>---<br>Manual | 3" x 5"<br>105mm x 148mm<br><br>Glass flats<br>Grid<br>COSATI, NMA, spec.<br>Removable<br>Automatic open<br>Manual, joy stick |
| On-off, focus<br><br>On cord, front  | On-off, focus<br><br>Rear & front   | Focus<br><br>Front  | On-off, focus,<br>film movement<br>All front  |
| 90 days  | 90 days   | 90 days   | 180 days  |
| Return factory   | Return factory  | Return factory  | Dealers   |
|  |   |   | Battery option,<br>Automobile kit   |
| \$59.50  | \$17.95 (12X)<br>\$19.95 (16X)  | \$15.95   | \$199.00<br>commercial<br>On request  |
| \$2.75   | \$1.60 plus parts   | \$1.00 plus parts   | \$2.45 commercial<br>Not available  |

Table 5 (Continued)

MICROFICHE READER PRINTERS

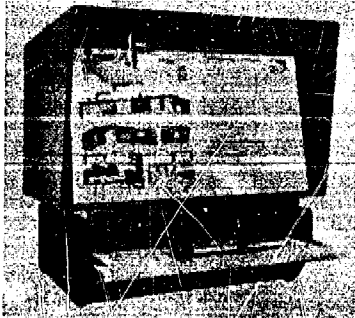
| MANUFACTURER/<br>DISTRIBUTOR  | BELL &<br>HOWELL   | DASA  | KODAK<br>(Recordak)  | 3M  | 3M   | STROMBERG   |
|---|--|---|--|---|--|---|
| MODEL<br>Number }<br>Name   | Reporter   | Mark II   | PFC-1A   | Executive I   | 400F model<br>75AAM  | 1325/3500<br>Inquiry Station  |
| PHYSICAL<br>Type }<br>Dimensions (HWD)<br>Weight (LBS)  | Desk<br>29"x18"x25"<br>145   | Desk<br>26"x14"x30"<br>68   | Desk<br>29"x17"x27"<br>100   | Desk<br>24"x18"x25"<br>40   | Desk<br>28"x17"x23"<br>120   | Console on<br>stand<br>21"x18"x21"<br>346   |
| ELECTRICAL<br>Power (AC)<br>Cooling<br>Rated Lamp Life  | 115V<br>Blower<br>500 hours  | 115V<br>Blower<br>50 hours  | 117V<br>Convection   | 115V<br>Convection  | 115V & 220V<br>Blower  | 115V<br>Blower<br>130 hours   |
| OPTICAL<br>Magnifications<br>Available }<br>Lens Changeable<br>Image Rotation   | 18, 21, 24<br>Yes<br>No  | 10.5, 13.4, 15.4,<br>20.1, 27.9, 33.8<br>Yes<br>No  | 11.8, 13.7, 17.1,<br>19, 22.5, 30, 38<br>Yes<br>Yes, mechanical  | 20, 24<br>Yes<br>No   | 6.6, 8.1, 10.6,<br>12.1, 14.9,<br>18.3, 20.8, 23,<br>25, 29, 35<br>Yes<br>Yes, mechanical                      | 24, 40<br>Yes<br>No   |
| SCREEN<br>Size (H x W)<br>Color }<br>Type<br>Hood   | 11" x 11"<br>Gray<br>Rear projection<br>Yes  | 11" x 11"<br>Green<br>Rear projection<br>No   | 11" x 11"<br>Green<br>Rear projection<br>Yes   | 12" x 12"<br>White<br>Rear projection<br>No   | 11½" x 10"<br>Gray, green,<br>blue<br>Rear projection<br>Yes   | 11" x 14"<br>Green, blue,<br>gray<br>Rear projection<br>---   |
| FILM CARRIER<br>Fiche Sizes<br>Accepted }<br>Holder<br>Image Locator<br>Grids Available }<br>Glass Flats }<br>Transport | 3" x 5"<br>105mm x 148mm<br>Glass flats<br>Grid<br>COSATI, NMA,<br>spec.<br>Removable,<br>automatic open<br>Manual pointer | 3" x 5"<br>105mm x 148mm<br>Glass flats<br>X-Y coordinates<br>---<br>Manual open<br>Manual dial | 105mm x 148mm<br>3 1/4" x 7 3/8"<br>Glass flats<br>X-Y coordinates<br>---<br>Removable,<br>manual open<br>Manual | Up to 4" x 8"<br>Glass flats<br>Grid<br>COSATI, NMA,<br>spec.<br>Removable,<br>automatic open<br>Manual pointer | Up to 6" x 8"<br>Glass flats<br>X-Y coordinates<br>COSATI, NMA,<br>ANSI<br>Removable,<br>manual open<br>Manual | 3" x 5"<br>105mm x<br>148mm<br>3 1/4" x 7 3/8"<br>Glass flats<br>Grid<br>Datagraphix<br>Removable,<br>manual open<br>Manual pointer |
| CONTROLS<br>Type }<br>Location  | Film movement,<br>expose, print,<br>On-off, focus<br>All front   | On-off, focus,<br>film movement,<br>expose, print<br>Side & top                                 | On-off, focus,<br>expose, print, film<br>movement,<br>rotation<br>All front                                      | On-off, focus,<br>film movement,<br>expose, print<br>All front  | On-off, focus,<br>film movement,<br>rotation,<br>expose, print<br>Front and side                               | On-off, focus,<br>print<br>All front  |

Table 6

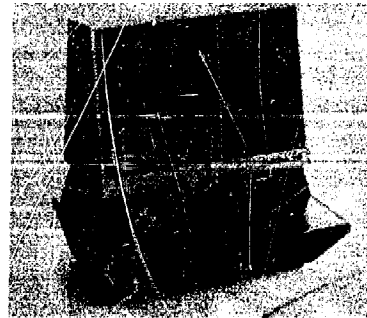
| MANUFACTURER/<br>DISTRIBUTOR  | BELL &<br>HOWELL   | DASA   | KODAK<br>(Recordak)   | 3M  | 3M   | STROMBERG  |
|---|--|--|---|---|--|--|
| <b>IMAGING SYSTEM</b>   |  |  |   |   |  |  |
| Process<br>Prints }<br>Warm Up Time<br>Print Cycle Time<br>Print Sizes }                              | Electrostatic<br>Neg to pos, pos<br>to pos (change<br>toner)<br>None<br>8 seconds<br>8½" x 11" | Silver stabilize<br>Neg to positive<br>None<br>25 seconds<br>8½" x 11" | Silver monobath<br>Neg to positive<br>pos to negative<br>None<br>28 seconds<br>4" x 11",<br>5½" x 11",<br>8½" x 11" | Dry silver<br>Neg to positive<br>2 to 3 mins<br>30 seconds<br>8½" x 11" | Electrochemical<br>Neg to positive<br>None<br>6 seconds<br>8½" x 12½"<br>8" x 10½" | Electrostatic<br>Neg to positive<br>5 seconds<br>10 seconds<br>8½" x 11" or<br>11" x 14" |
| <b>SUPPLIES</b>   |  |  |   |   |  |  |
| Paper<br>Roll Fed<br>Sheet Fed<br>Cost/Print }<br>Shelf Life<br>Chemicals<br>Type }<br>Prints/Package | 250 sheets/pkg<br>\$.05 max<br>1 year<br>Positive or<br>reversal toner<br>Avg. 800/pint        | 150' roll<br>\$.08<br>18 months<br>Silver stabilize<br>960             | 150' roll<br>Monobath<br>150  | 100 sheets/pkg<br>\$.10<br>6 months<br>None                             | 300' roll<br>\$.07 to .09<br>Activator<br>150/pint                                 | 250 sheets/pkg<br>\$.025<br>(8½" x 11")<br>Indefinite<br>Toner<br>intensifier<br>4200    |
| <b>WARRANTY</b> }   | 90 days  | 90 days  | Parts 1 year<br>Service 3 months  | 180 days  |  | 30 days  |
| <b>SERVICE METHOD</b>   | Local offices  | Direct, dealer   | Field on call   | Agreement   | Agreement  | Agreement  |
| <b>FEATURES/<br/>ACCESSORIES</b> }  |  |  | Magazine adapter,<br>paper width<br>adaptors, etc.  |   | ½ sheet kit,<br>stand, etc.  | Hood   |
| <b>FED. GOVT. PRICE</b>   |  |  |   |   |  |  |
| Reader/Printer }<br>Extra Lenses }<br>Lamps<br>Service  | \$1442.90 w/o<br>lens<br>\$56.40<br>\$3.75<br>\$155 to \$840/yr                                | \$1245.00<br>commercial<br>\$125.00<br>commercial<br>\$1.71            | \$1350.00 less 6%<br>\$105.00 less 6%   | \$325.00<br>commercial  | \$852.60 w/o<br>lens<br>\$99.75<br>\$150/year                                      | \$1780.00<br>commercial<br>\$104.00<br>commercial  |

Table 6 (Continued)

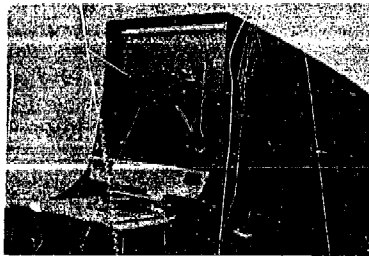
**MICROFICHE RETRIEVAL UNITS**



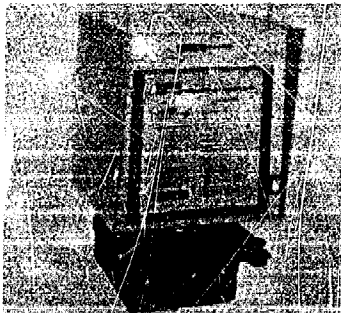
**N.C.R. Model 456-800 Reader Series**



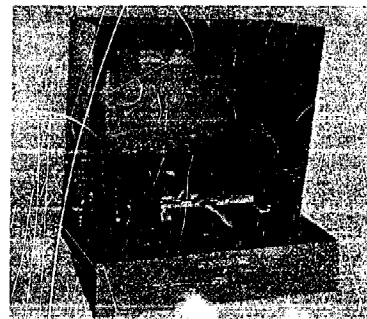
**The Micra 210 Reader  
Micro Image Corp.**



**The COM 200 Reader  
Micro Design, Inc.**



**The Dietzgen 4315 Reader**



**The Realist Model 3334**

**Figure 7**

## VI. APERTURE CARD READERS AND READER PRINTERS

The microfilm aperture card is widely used for engineering drawings and related design documents. Except for a very few special formats, the MIL-D card format containing a frame of 35-mm. film up to 1.9 inches in length mounted in an aperture in the right end of the card is used. Reductions of 16, 24, and 30 diameters are used to record drawing sheets up to 36 x 48 inches or sections this large of 36-inch roll drawings. At these reductions, up to 4, 8, and 15 letter-size pages of support documents can also be microfilmed on one frame. In some systems, a reduction of 36X is used to record drawings up to 42 inches wide.

Units in this class include those that have large screens or film transports designed primarily for scanning aperture cards. In this category are:

1. A limited number of portable readers, including an aperture card projector.
2. Desk top readers for individual and small group use.
3. Desk model and free-standing reader printers.

### Physical and Operational Characteristics

In general terms, the 18- x 24-inch screen readers and reader printers use a nominal magnification of 15X to display all of the image in the MIL-D aperture. Accordingly, a reduced image is displayed or printed for larger documents. Reduced-size images are convenient to use and perfectly adequate when today's drafting and document preparation standards are followed.

Most of the smaller screen readers for aperture cards also provide a nominal enlargement of 15X, and the user views pertinent sections of larger document images by scanning the

aperture. Scanning is manual on one unit. In the others, the card is held between glass flats, and the image scanned using a joystick, lever, or knob. Two of the units provide a two-lens projection system to enable the user to view all of the image in the aperture at a lower magnification and selected portions at 15X.

Several of the desk top readers for microfiche noted in the previous chapter can also be used for aperture card reference. Thus, the user may wish to consider those that handle microforms to tab card size (3.25 x 7.375 inches), provide enlargement in the range 15 to 24X, and provide scanning.

Aperture card readers are fairly simple devices consisting of:

- The aperture card holder.
- An optical projection and enlarging system.
- Translucent screen.
- Controls: on-off, focus, scan.
- A housing.

In addition, the reader printers have:

- Paper transport and printing mechanism.
- Print exposure, size, and other controls.

The user normally performs the following functions:

Turn switch on.

Place card in holder and position the image or portion of the image desired.

Focus.

When a print is desired:

Set control for proper exposure.

On units so equipped, set control for optimum paper usage.

Actuate print mechanism.

On most units very little maintenance will be necessary, but preventive maintenance, as described in chapter II, will pay dividends.

### Special Factors in Equipment Selection

Applications for the units in this class include reference to aperture cards of engineering drawings; design support documents such as specifications, bills of material, and change notices; and test data and other technical reports.

**Screen Size.** Depending on the nature of the user's reference to the information, screen size will be an important consideration. For users who need reference only to part numbers, details, or sections of documents, a small-screen, desk top viewer may be perfect. For

others, an 18- x 24-inch screen may be necessary to allow them to view an entire image. All the smaller printers have screens which will handle magnification of the full aperture card frame.

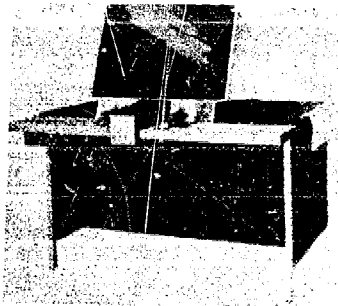
**Film Carrier.** Several of the units in this category will handle other unitized microforms, and several will also accept roll film. For some users, this added flexibility may be important.

In almost all the readers in this class, the aperture card and film are held between glass flats. In one exception, the card is held in a very similar holder.

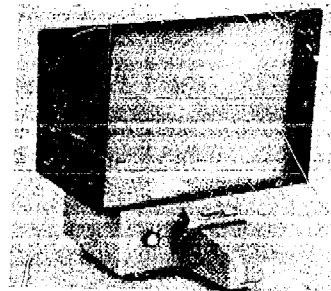
Film transport in all of the large screen units in this class is manual by positioning the card in the film carrier. In the smaller screen, desk top and portable readers, scanning may be done either manually or by means of a joystick or lever. The choice is one of personal preference.

Figure 8 shows equipment typical of this class of readers and reader printers. Equipment selection factors are tabulated in table 7 for readers and table 8 for reader printers.

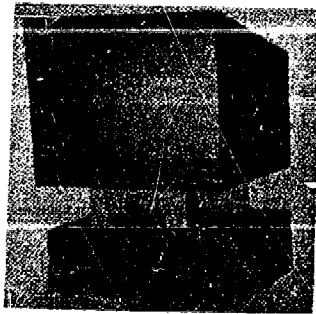
READERS AND READER PRINTERS FOR APERTURE CARDS



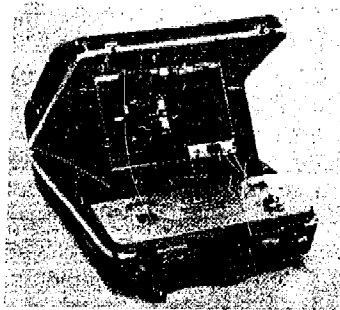
The Itek 18.24 Reader Printer



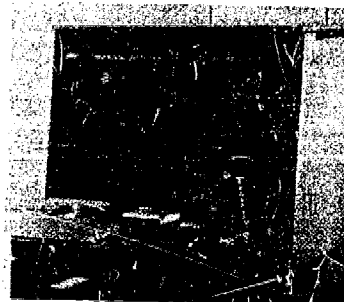
The Normandale Reader  
Washington Scientific Industries



The Dietzgen Model 4314 Reader



Washington Scientific Industries  
Quadriplan Portable Reader



3M Filmac 200R Reader Printer

Figure 8



**APERTURE CARD READERS**

| MANUFACTURER/<br>DISTRIBUTOR   | DASA  | DIETZGEN  | DIETZGEN   | DIETZGEN  | B. K. ELLIOTT   |
|--|---|---|--|---|---|
| MODEL<br>Number<br>Name  | Draftsman   | 4305  | 4313-A   | 4314  | Project 1   |
| PHYSICAL<br>Type<br>Dimensions (HWD) }<br>Weight (LBS)                           | Desk<br>31" x 26" x 30"<br>120  | Desk<br>24" x 16" x 19"<br>22                                   | Desk<br>25" x 25" x 29"<br>---   | Desk<br>22" x 13" x 13"<br>22                                   | Desk<br>24" x 22" x 22"<br>30                         |
| ELECTRICAL<br>Power (AC) }<br>Cooling<br>Rated Lamp Life                         | 115V<br>Blower<br>200 hours   | 115V<br>Convection<br>150 hours                                 | 115V<br>Blower<br>50 hours   | 115V<br>Convection<br>150 hours                                 | 115V<br>Blower<br>50 hours                            |
| OPTICAL<br>Magnifications }<br>Available<br>Lens Changeable<br>Image Rotation    | 15<br>No<br>No  | 15 or 20<br>No<br>No  | 14.75<br>No<br>No  | 15 and 20<br>No<br>No   | 15<br>No<br>No  |
| VIEWER<br>Size }<br>Color<br>Type<br>Hood  | 18" x 24"<br>Gray<br>Rear projection<br>No                            | 12" x 10 1/2"<br>Green<br>Rear projection<br>Yes                | 18" x 24"<br>Green<br>Rear projection<br>Yes                             | 10 1/2" x 12"<br>Green<br>Rear projection<br>---                | 15" x 22"<br>Gray<br>Rear projection<br>No            |
| FILM CARRIER<br>Card Sizes }<br>Accepted<br>Holder<br>Glass Flats }<br>Transport | Aperture card<br>Open throat<br>Manual                                | Aperture card<br>Glass flats<br>Manual open<br>Manual, joystick | Aperture card,<br>roll film (adapt)<br>Glass flats<br>Manual open<br>--- | Aperture card<br>Glass flats<br>Manual open<br>Joystick, manual | Aperture card<br>Glass flats<br>Manual open<br>Manual |
| CONTROLS<br>Type }<br>Location   | On-off, focus,<br>film movement<br>All front                          | On-off, focus<br>Top & slide                                    | On-off, focus<br>Front & side  | On-off, focus,<br>film scan<br>All front                        | On-off, focus   |
| WARRANTY   | 90 days   | 90 days   | 90 days  | 90 days   | 30 days   |
| SERVICE METHOD   | Direct & dealers  | Direct, dealers   | Direct, dealers  | Local contract  | ---   |
| FEATURES/<br>ACCESSORIES }   | Roll film<br>adaptor, legs  |   | Roll film<br>adaptor   |   |   |
| FED. GOVT. PRICES<br>Reader }<br>Extra Lenses }<br>Lamps<br>Service              | \$595.00<br>commercial<br>\$120.00<br>commercial<br>\$8.75 commercial | \$168.73 (15X)<br>\$201.03 (20X)                                | \$607.75 (4313A)<br>\$637.50 (4313AR)                                    | \$168.73 (15X)<br>\$201.03 (20X)                                | \$475.00<br>commercial                                |

Table 7

| KEUFFEL & ESSER  | REMINGTON RAND                           | REMINGTON RAND  | TAYLOR MERCHANT                            | WASHINGTON SCIENTIFIC                              | WASHINGTON SCIENTIFIC                                       |
|--|--|---|--|--|---|
| 52 9949<br>Micro Viewer                                | F440                                     | F478  | Master 400                                 | QS<br>Quadra Scan                                  | 1518<br>The Normandale                                      |
| Desk<br>15" x 13" x 10"                                | Desk<br>21" x 13" x 13"                  | Desk<br>25" x 25" x 29"   | Portable<br>6" x 3" x 8"                   | Portable<br>17" x 14" x 18"<br>(open)              | Desk<br>23" x 19" x 20"                                     |
| 19   | 22                                       | 80  | 3  | 18   | 36  |
| 115V<br>---<br>100 hours                               | 115V<br>Blower<br>---                    | 115V<br>Blower<br>---   | 115V<br>Blower<br>---                      | 115V/220V,<br>DC, spec.<br>Convection<br>200 hours | 115V<br>Blower<br>200 hours                                 |
| 6, 15 and 15   | 15                                       | 14, 75  | Variable by<br>projection                  | 6.5, 15, 20  | 12.5  |
| No<br>No   | No<br>No                                 | No<br>No  | No<br>No                                   | No<br>No   | No<br>No  |
| 10" x 8"   | 10½" x 12"                               | 18" x 24"   | Projected, image<br>size variable          | 10" x 11"  | 15" x 18"   |
| Blue<br>Rear projection<br>No                          | Gray<br>Rear projection<br>Yes           | Blue<br>Rear projection   | ---<br>---<br>---                          | Green, blue, gray<br>Rear projection<br>yes        | Green<br>Rear projection<br>Yes                             |
| Aperture card  | Aperture card                            | Aperture card,<br>35mm roll film<br>microfiche                    | Aperture card                              | Aperture card                                      | Aperture card,<br>tab size<br>microfiche                    |
| Open throat  | Glass flats<br>Removable<br>Manual open  | Glass flats<br>Floating   | Open throat                                | Glass flats<br>Removable,<br>Manual open           | Glass flats<br>Removable,<br>Manual open                    |
| Manual   | Manual, joystick                         | Manual  |  | Joystick, manual                                   | Manual  |
| On-off, focus,<br>joystick;<br>image scan<br>All front | On-off, focus,<br>film scan<br>All front | On-off, focus,<br>film transport,<br>lateral scan<br>Front & side | On-off, focus                              | On-off, focus,<br>film movement                    | On off, focus,<br>brightness,<br>film movement<br>All front |
| 90 days  | 1 year                                   | 1 year  | 90 days                                    | 180 days   | 180 days  |
| Local offices  | Local offices                            | Local offices   | Return to factory                          | Dealers  |   |
|  |  |   | Projects 35mm<br>slides                    | Voltage, battery<br>options                        |   |
| \$240.00<br>commercial                                 | \$208.00<br>commercial                   | \$750.00<br>commercial  | \$79.50<br>commercial<br>\$2.75 commercial | \$289.50<br>commercial                             |   |
| \$1.75 commercial                                      |  |   |  | \$2.25 commercial                                  |   |

Table 7 (Continued)

**APERTURE CARD READER PRINTERS**

| MANUFACTURER/<br>DISTRIBUTOR   | ADVANCED<br>TECHNOLOGY<br>CORP.   | DASA   | ITEK   | ITEK  | 3M  | 3M   |
|--|---|--|--|---|---|--|
| MODEL<br>Number }<br>Name  | ATC M-35  | 800 SB   | 1824 model F   | RS  | 200 model<br>29CA   | 200R model<br>29CR   |
| PHYSICAL<br>Type<br>Dimensions }<br>Weight (LBS)                                 | Desk<br><br>185   | Stand<br>34"x33"x33"<br>225  | Stand<br>51"x46"x36"<br>350  | Stand<br>51"x69"x37"<br>480   | Desk<br>33"x32"x36"<br>315  | Desk<br>33"x32"x36"<br>315   |
| ELECTRICAL<br>Power (AC)<br>Cooling<br>Rated Lamp Life                           | 115V<br>Blower<br>500 hours   | 115V<br>Blower<br>25 hours   | 115V<br>Blower<br>25 hours   | 115V<br>Blower<br>50 hours  | 115V or 220V<br>Blower<br>---   | 115V or 220V<br>Blower<br>---  |
| OPTICAL<br>Magnifications }<br>Available<br>Lens Changeable<br>Image Rotation    | 15<br>No<br>No  | 13.5<br>No<br>No   | 14.7, 16, 17, 18<br>No<br>No   | 14.5<br>No<br>No  | 14.5, 15, 12<br>No<br>No  | 14.5, 15, 12<br>No<br>No   |
| SCREEN<br>Size (H x W)<br>Color<br>Type  | 18" x 24"<br>Black daylight<br>Rear projection                                  | 17" x 23"<br>Gray<br>Rear projection   | 18" x 24"<br>Gray<br>Rear projection   | 18" x 24"<br>Gray<br>Rear projection                                      | 18" x 24"<br>Gray<br>Rear projection  | 18" x 24"<br>Gray<br>Rear projection   |
| FILM CARRIER<br>Card Sizes }<br>Accepted<br>Holder<br>Glass Flats }<br>Transport | Standard aperture<br>card<br>Glass flats<br>Removable,<br>manual open<br>Manual | Aperture card,<br>35mm roll film,<br>70mm roll film,<br>Glass flats<br>Manual open<br>Manual | Aperture card,<br>all microfiche,<br>35mm rolls<br>Glass flats<br>Removable,<br>automatic open<br>Manual | Aperture card,<br>35mm roll<br>Glass flats<br>Automatic<br>open<br>Manual | Aperture card,<br>microfiche up<br>to 5" x 8"<br>Glass flats<br>Manual open<br>Manual | Aperture card,<br>fiche up to<br>5" x 8", rolls<br>16mm & 35mm<br>Glass flats<br>Manual open<br>Manual |
| CONTROLS<br>Type }<br>Location   | On-off, focus,<br>expose, print<br>All front                                    | On-off, focus,<br>film movement,<br>expose, print<br>All front                               | On-off, focus,<br>film movement,<br>brightness, print<br>All front                                       | On-off, focus,<br>expose, print,<br>multiple print<br>All front           | On-off, focus,<br>film movement,<br>expose, print,<br>sheet size<br>All front         | On-off, focus,<br>film movement,<br>expose, print,<br>sheet size<br>All front                          |

Table 8

| MANUFACTURER/<br>DISTRIBUTOR     | ADVANCED<br>TECHNOLOGY<br>CORP. | DASA                              | ITEK                            | ITEK  | 3M  | 3M  |
|----------------------------------|---------------------------------|-----------------------------------|---------------------------------|---|---|---|
| <b>IMAGING SYSTEM</b>            |                                 |                                   |                                 |   |   |   |
| Process                          | Electrofax                      | Silver stabilize                  | Silver stabilize                | Itek RS                                     | Electrochemical                                 | Electrochemical                                 |
| Prints                           | Neg to positive                 | Neg to positive                   | Neg to positive                 | Neg to positive                             | Neg to positive                                 | Neg to positive                                 |
| Warm Up Time                     | None                            | None                              | None                            | 2 to 5 minutes                              | None  | None  |
| Print Cycle Time                 | 30 seconds                      | 35 seconds                        | 50 seconds                      | 15 sec to<br>25 sec                         | 6 seconds                                       | 6 seconds                                       |
| Print Sizes                      | 18" x 24"                       | 18" x 24"                         | 18" high<br>8" to 24" wide      | 18" w x 10"<br>to 24" h and<br>other widths | 18" x 26"<br>(Full)<br>18" x 13"<br>(1/2 sheet) | 18" x 26"<br>full size<br>18" x 13"<br>1/2 size |
| <b>SUPPLIES</b>                  |                                 |                                   |                                 |   |   |   |
| Paper                            |                                 |                                   |                                 |   |   |   |
| Roll Fed                         |                                 | 350' roll                         | 220' roll                       | 440' roll                                   | 237' or 300'                                    | 237' or 300'                                    |
| Sheet Fed                        | 200 sheets/pkg                  |                                   |                                 |   |   |   |
| Cost/Print                       | \$.11 approx.                   | \$.20                             | varies w/volume                 | \$.11 to .08                                | \$.19 to .24                                    | \$.19 to .24                                    |
| Shelf Life                       | over 1 year                     | 18 months                         | 1 year                          | 1 year                                      | ---   | ---   |
| Chemicals                        |                                 |                                   |                                 |   |   |   |
| Type                             | Dry toner                       | Silver stabilize                  | Activator/stabl.                | RS chemicals                                | 3M activator                                    | 3M activator                                    |
| Prints/Package                   | 1000                            | Avg. 1500                         | 660 sq ft/pkg                   | 440 (18"x24")                               |   |   |
| <b>WARRANTY</b>                  | 90 days                         | 90 days                           | 180 days parts<br>30 days labor | 180 days parts<br>30 days labor             | 180 days  | 180 days  |
| <b>SERVICE METHOD</b>            | Dealers                         | Direct                            | Field offices                   | Field offices                               | Agreement                                       | Agreement                                       |
| <b>FEATURES/<br/>ACCESSORIES</b> |                                 | Meets mil spec<br>for shock, etc. | Stack module<br>(dryer)         |   | Stand, various<br>others                        | Stand, various<br>others                        |
| <b>FED. GOVT. PRICE</b>          |                                 |                                   |                                 |   |   |   |
| Reader/Printer                   | \$1858.00                       | \$4850.00                         | \$3382.00                       | \$3880.00                                   | \$1574.50                                       | \$1675.00                                       |
| Extra Lenses                     |                                 | \$232.10                          |                                 |   | \$142.50  | \$142.50  |
| Lamps                            |                                 | \$9.85                            | \$4.00                          | \$5.57                                      |   |   |
| Service                          | \$200 per year                  |                                   | Hourly rates                    | Hourly rates                                | \$135/year                                      |   |

Table 8 (Continued)

## VII. OTHER MICROFORM DISPLAY AND REFERENCE EQUIPMENT

In addition to the classes of readers and reader printers for the more commonly used microforms discussed in the earlier chapters, there are a great number of other highly useful and special equipments for reference to information stored in microform. Several examples are shown in figure 9. The equipment discussed here will include:

- Readers and reader printers for filmstrips and high-reduction microforms.
- Equipment that satisfies special requirements for reference to drawings and design documents in microform.
- Multi-input readers coupled to office copiers.
- Enlarger printers for volume printout from various microforms.
- Microform information storage and retrieval equipment, both free-standing and computer-linked.
- Automated and semi-automated microform files with remote display and output.

Guidance on equipment selection in these special classes of equipment cannot be given since the decision must be based more on the overall system requirements rather than the comparative features of individual pieces of equipment. In many cases, the basis for the decision is associated with the conversion of the documentation to a given microform for use in the total system. In other cases, the decision is based more on the ability of the equipment to provide a given volume or type of output than on any other consideration. Accordingly, the hardware available in each class will be described only in sufficient detail to inform the reader of the various capabilities

available. The user is therefore urged to consider these capabilities in terms of the requirements in the total information processing system and discuss details of cost and capabilities of specific configurations with the supplier.

### Reference Equipment for Other Microforms

**Strip Microform.** One method of unitization for reference involves the placement of relatively short strips of 16-mm. film in plastic holders that serve both to store the film and transport it into the reader. This unitized microform has been found to be useful for looking up account numbers, account status, catalog items, and other directory-type reference operations. An example is the Recordak Microstrip Reader, Model PGR, which uses filmstrips up to 12 inches long that are stored in sticklike holders. Various system accessories are available, including a special holder that can hold 10 filmstrips.

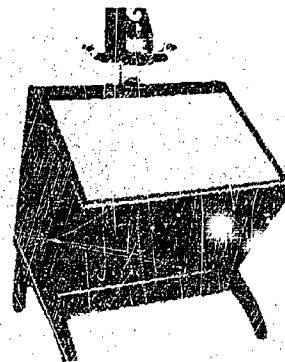
**High-Reduction Microforms.** Higher reductions in the range 50X to 100X are currently under development for micropublishing programs. Little definitive information has thus far been released about the new services or the equipment in this range. However, anyone considering a new microfilm system, especially for micropublishing, may find it desirable to explore the developments in this area.

Using controlled two-step microreproduction techniques, reductions greater than 100X are being used for micropublication and controlled high-access files. These are commonly referred to as superminiaturized ultrafilm, and ultrafiche systems. Two organizations are now offering services and reference equipment for high-reduction microforms, as follows:

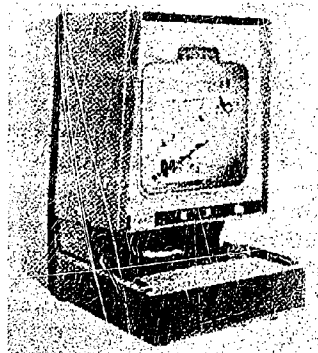
OTHER MICROFILM DISPLAY AND REFERENCE EQUIPMENT



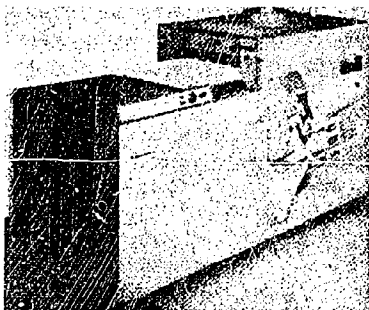
The Dennison-Readex Enlarger Printer



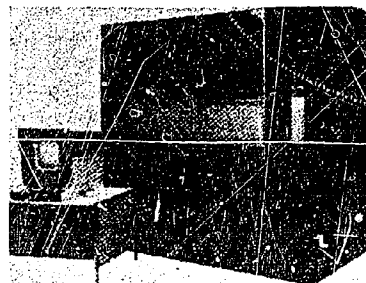
The Pantek 900 Reader



PCMI 155-2 Reader  
The National Cash Register Company



Bruning 1200 Enlarger Printer



The Sanders-Diebold SD-500  
Automatic Microimage Storage,  
Retrieval and Transmission System

Figure 9

### *PCMI System*

The National Cash Register Co. uses a photochromic film for the preparation of a PCMI (Photo-Chromic Micro-Image) master by first filming the documents on 35-mm. film and then making a reduced film copy of these images. This results in a final reduction of 150X. This master is then used to prepare distribution transparencies containing up to 3,000 letter-size images on a 4- x 6-inch ultrafiche.

The NCR 455-2 PCMI Reader uses an X-Y positioned film holder and 150X optical system to provide reference to the images on an 11- x 11-inch screen. A reader printer, the NCR Model 455-21, using an electrostatic process for paper copies, is also available.

### *MINDEX System*

Microform Data Systems, Inc., uses high resolution photographic materials to produce 35-mm. ultrafilm masters by second step reduction from 35-mm. images of the original documents. Working at reductions of up to 210 diameters, ultrastrip distribution copies contain up to 2,000 letter-size pages on a 6-inch by 35-mm. filmstrip.

Currently three readers are offered. The Mindex/330 uses manual strip insertion, field selection, and X-Y positioning to provide reference at enlargements up to 190X to the ultramicroimages. The model 350 uses keyboard input and magnifications up to 230X for automated image selection and display. The Mindex/370 provides strip, field, and image selection via keyboard from a cartridge of 10 ultrastrips. For the latter two units integrated video display units are available for retrieval of index information from the computer.

### **Special Equipment for Engineering Reference**

Expanded use of microfilm for engineering drawings has resulted in the development of

special equipment for more efficient or useful reference.

The Graphic Comparator, made by the DASA Corp., permits the simultaneous examination of microimages representing successive levels of revision of an architectural plan or hardware design, with the changes clearly delineated. Using a unique dual projection system (one with fixed blowback and alinement, the other with compensating alinement and blowback), the unit projects the superimposed images from two similar aperture cards on an 18- x 24-inch screen. Lines common to both images appear white on the screen, while lines that represent additions or deletions are shown in green and red, respectively.

In some programs, and particularly in the architectural and construction fields, there is a need to enlarge microimages of design drawings to full size for "take off" cost calculations or near full size for other reference purposes. Two lines of equipment are available for this purpose, as follows:

A series of large screen (24 x 36 inches) readers and reader enlargers are offered by Pamtek Manufacturing, Inc. The units handle all engineering microfilm formats and project the image on a screen that can be oriented to the user either at desk height or at drafting table height. The Model 900 provides a 22X blowback; and the Model 902, interchangeable blowbacks of 22X and 38X. Other magnifications from 16X to 40X are available. The Models 900-P and 902-P provide for the exposure of a photographic paper which is processed in an accessory stabilization processor.

The Charles Bruning Co. offers a unit called the Multifocus. Continuously variable enlargement from 10 to 40X makes it possible to view all of the image on most engineering microforms on the desk height, 15- x 21-inch screen. Blowback variability also makes it possible to view B size drawings or 14- x 20-inch sections of larger drawings at full size from most engineering microforms. Provision is made for the exposure of photographic enlarging papers to be processed in stabilization processors.

## Reader-Copier Combinations

For many libraries and information centers, the capabilities offered by combination reader-enlarger-copiers may warrant consideration. At present, two such equipment combinations designed for volume copying are available:

The Readex Microprint Corp. offers the Dennison-Readex Enlarger Printer. This unit couples a Readex Universal Reader capable of displaying images from both opaque and transparent unitized microforms with the Dennison Electrostatic Copier. Paper copies at 15X enlargement provide either 8½- x 11- or 8½- x 14-inch prints. The combination is normally used to prepare positive enlarged copies of positive microimages; however, positive enlargements can be made from negative microforms by changing to reversal toner and intensifiers for the electrostatic process. The installation includes a microform reference table adjacent to the copier for the reader's use.

The Xerox Microprinter combines a reader, designed especially for this purpose, with a 914 copier. The reader has adapters for roll film, microfiche, and aperture cards. Magnifications of 12, 15, 20, or 24X are available for the preparation of 8½- x 11-inch enlarged paper copies. On the positive mode model which makes positive prints from positive microfilm, the unit can also be used as a standard office copier by sliding the reader to the rear and off the document copy table.

## High-Volume Enlarger Printers

Units are available for the preparation of enlarged hard copy in quantity from microfiche, roll film, and aperture cards. Depending on the microform and output speed, purchase cost ranges from about \$7,000 to \$180,000. Most of the equipment in this class is also available on lease or a rental basis.

**Microfiche.** The NCR Microfiche Enlarger Printer is available in two models: Model 458-401 for 4- x 6-inch microfiche, and the 458-402

for punched card sized microfiche. The units use a programmed step and repeat film transport and exposure cycle and a 16X enlarging system to provide 8½- x 11-inch copies at a speed of 10-12 copies per minute. A dry developed, roll-fed, silver enlarging paper is used.

**Roll Film.** For the continuous high-speed enlargement of microimages from 16- and 35-mm. roll film, a series of four models of the Copyflo 11 are available from the Xerox Corp. Fifteen magnifications ranging from 7X to 24X provide enlargement up to 11-inch-wide images on continuous, roll-fed, 12-inch paper. Model 1-20, 1C-20, and 3 all operate at an output of 20 feet a minute, the model 1-40 at 40 feet a minute. Output from all models except the 1C-20 is rolled print output. The 1C-20 incorporates a mark-sensing automatic cutter and receiving tray on the output. In addition to making enlarged copy from microfilm, the model 3 incorporates a belt-fed throat and optical system for 1 to 1 and 2 to 1 reduction copying of documents manually fed into the unit.

**Aperture Cards.** While the enlarger printers described below have been primarily designed for enlargement of the images in aperture cards, some of them, as will be noted, offer enlargement and adaptability to roll film. Available units include:

1. The Bruning 1200 enlarger printer uses a direct electrostatic process and a combination roll paper feed to produce prints in up to six sizes from 8½ x 11 to 18 x 24 inches. Print output is four prints per minute. Aperture cards are manually inserted in an optical system that provides variable enlargement from 14X to 16X for printing and a reduced image display on a locator screen. From 1 to 20 prints can be programmed. A roll film adapter is available, and flexibility is increased through the use of lenses that provide magnification ranges of 7¼X to 8¾X and 11¾X to 13¾X.

Using the proper toner, either negative to positive or positive to positive, dry



electrostatic prints can be made. The 1200 will also produce offset masters and diazo intermediates when the appropriate paper is used.

2. The 3M 333 enlarger printer uses 3M Co.'s dry silver paper to produce enlarged prints from aperture cards in manual, semiautomatic, or automatic mode. Cards may be fed manually or automatically from the card feeder which will hold up to 200 aperture cards. The unit can be programmed to produce from one to 25 prints of each card. Under full automated operation, prints are produced at rates up to 15 per minute.

Standard enlargement is 14.5X, but 15X and 16X lenses are available. From an 18-inch stock roll, print length can be controlled from 10 to 25 inches in 2½-inch increments by adjusting the mask on the small verification screen on the card transport.

3. The Xerox 1824 uses the transfer electrostatic process and hand-fed cut sheets to produce 8½- x 11-, 11- x 17-, and 18- x 24-inch prints. Magnification is fixed at 14.5X. A manual roll film transport is provided along with a small viewing screen for positioning images to be printed from rolls. Depending on operator dexterity and whether single or multiple prints are being made, output is up to four prints per minute. By feeding the appropriate paper stock, offset masters or translucent intermediates may also be made.
4. The Xerox Copyflo 600 is an automated enlarger printer for aperture cards. Cards can be fed manually or automatically from a card feeder with a capacity for 200 cards. The unit can be programmed for from 1 to 99 prints. Paper feed is automatic under operator control from feeders for sizes 8½ x 11, 11 x 17, and 17 x 22 (or 18 x 24) inches.

Magnifications of 12X, 14.5X, 15X, and 16X are available. Output is up to 600 prints per hour or 10 per minute. Using

an override to slipfeed the appropriate stock, the unit will also produce offset masters or translucent prints.

5. The Xerox Copyflo 24C is a roll-fed, continuous-enlarger printer designed for automatic preparation of paper copies from aperture cards (up to 400 prints per card) or roll film. Enlargement may be either 15X or 20X. Roll stock from 11 to 24 inches wide may be used as input. Output is 20 lineal feet of prints per minute (or about six 24- x 36-inch prints per minute) which are cut to size by an automatic cutter. The unit can be set up to provide positive printout from either positive or negative images, but not intermixed. Offset master and translucent paper stock may be used to produce prints as well.

## Microform Information Storage and Retrieval Systems

While several of the more automated readers and reader printers described earlier in this handbook may be incorporated into information storage and retrieval (ISR) stations or centers, there are several "closed" systems in which the ISR equipment hardware is matched to the file organization or indexing used to control the document collection at the time of conversion to the microform used. As most widely used, two of these systems, Kodak's MIRACODE and Image Systems' CARD, use varied levels of file organization to produce free-standing ISR stations. The third, AIL Information System's FILESEARCH IV, uses a random file organization (which can be structured as needed) for the document collection in microform.

The more automated Mindex units from Microform Data Systems, described in the section on high reduction microforms, can also be used in ISR installations of this type.

### MIRACODE

This system uses photo-optically binary coded 16-mm. film in magazines to build

the ISR file. The file may be updated daily or at any required frequency by splicing strips of new film into the film magazines in the file. Before a document is recorded its conceptual identity or file identity is recorded on the film in optical binary code either by the operator at the camera, by using a punched card and a keypunch coupled to the code camera, or using COM to place the code on the film.

The MIRACODE retrieval station consists of a file of 16-mm. film magazines, a Lodestar reader printer containing the code sensing and logic electronics required to make a search and a keyboard for the input of the search codes.

#### CARD

The CARD unit is a desk top, automated file and display device for up to 73,500 document pages filed on microfiche. Keyboards matched to standard 4- x 6-inch microfiche formats are available, and keyboards matched to various file organizations have been designed.

Within the unit, up to 750 microfiche are filed in a horizontal rotary wheel. Each microfiche is uniquely identified in binary code in a metal strip affixed to the edge of the fiche in the microfilm conversion process. Entry of the required fiche identity into the keyboard actuates the mechanism which selects the desired microfiche and places it in the optical system of the unit. In many applications, an index page is first displayed. From it, the operator selects and keys the X and Y grid location of the desired image.

#### FILESEARCH IV

The Filesearch IV retrieval unit consists of an input keyboard, a small computer to provide search logic, a film transport for 1,000-foot rolls of perforated 35-mm. film, and several output modes. At the operator's option, output can be either a screen display, a paper copy, or a film-to-film copy of pertinent images. The 1,000-foot roll

of film contains 32,000 frames; each frame will accommodate a document up to 8½ x 14 inches and up to 56 alphanumeric characters of index information in optical binary form. Using the film-to-film output, documents can be copied from the random total file to provide a roll film file of documents on a particular subject or combination of index codes.

The system includes a recording unit or camera that records both the document and the index information simultaneously. The document is placed on the copyboard of the camera, and the index codes are read from punched cards. The recorder produces 100-foot rolls of film that, when processed, are spliced onto the larger rolls for use in the retrieval unit.

These systems indicate the limitless ways that automated microfilm files can be used for reference to voluminous collections which need be updated at no more than daily frequency, or where these mass memories can be coupled with time-sharing computer systems for "real time" access to both historic or status and updating information.

#### Central Files With Remote Output

Semiautomated and automated files with remote output display for unitized microforms are available in two systems lines; one from Sanders Associates, Inc., and Diebold, Inc.; the other from the Mosler Co. Both lines provide a building block approach to the system configuration, resulting in:

Note TV display of information stored in a manually accessed or operated central file.

An automated central file with hard copy output or film-to-film output; or remote-controlled, remote TV display with optional hard copy output at the remote terminal.

A computer-controlled system in which the computer is used to provide index access to and file control of the automated mass

memory file in microform, the system having all the output flexibility outlined above.

#### *SANDERS-DIEBOLD Systems*

The basic system is the SD-550 Information Retrieval System. It consists of a console TV image transmitter (controlled by the file clerk or by a remote terminal) and one or several remote display terminals. Typically, the transmitter is installed adjacent to a Diebold power file in which are stored the various unitized microforms. The transmitter accepts manual input of aperture cards, microfiche or jackets up to 6 x 8 inches (or, on modification, 8-, 16-, and 35-mm filmstrips) at image reductions from 12/1 to 24/1 and provides magnification to full size and a 5/1 power zoom for enlargement of detail. The system is distributed by Diebold, Inc.

The SD-500 Automatic Microimage Storage, Retrieval and Transmission System is distributed by Sanders Associates to the Federal Government and to others by Diebold, Inc. The heart of this system is a closed file containing automatic retrieval, transmission, and scanning capabilities. Unitized microforms of any type, mounted in plastic holders are stored in the file in dedicated positions. The standard file has a capacity of 49,000 microforms; an optional larger file stores 68,600. The transmitter provides full blowback of documents reduced from 12 to 24 diameters and a 5 to 1 power zoom. File operations are under control of the SD-500 remote display terminals. Optional building block features

include those noted in the introduction to this section.

#### *MOSLER Systems*

The Mosler 20/20 consists of a TV transmitter console for microfilm aperture cards and one to six remote display terminals. On telephone request, the file clerk selects the desired aperture card, places it in the transmitter, and switches transmission to the requestor's display terminal. At the terminal, the requestor controls image scan and enlargement via zoom lens up to 250X (or about eight times original size for a drawing reduced 30X). Remote printers for 8½ x 11-inch prints of the display are available.

The basic building block of the Mosler 410 series of information systems is an automated file for 200,000 items, either punched cards, aperture cards, or punched card size microfiche. Items are edge-notched with a file identity and filed randomly, 100 items to a cartridge. One thousand cartridges are filed in each of two banks served by a common cartridge retrieval mechanism, which delivers the cartridge to the card retrieval station in the control console. The basic 410/05 can be used to retrieve information which would then be reproduced by operators to satisfy requests. Using a human link it could be tied into the Mosler 20/20 transmission system. Again, in building block fashion, automated film-to-film output, remote display and printout, computer control and the other capabilities outlined in the introduction can be added as needed.

## APPENDIX

### EQUIPMENT MANUFACTURERS AND DISTRIBUTORS

Advanced Technology Corp.  
P.O. Box 246  
Chambersburg, Pa. 17201

Atlantic Microfilm Corp.  
700 South Main Street  
Spring Valley, N. Y. 10977

Bell and Howell Co.  
Business Equipment Group  
6800 McCormick Road  
Chicago, Ill. 60645

Charles Bruning Co.  
1800 West Central Road  
Mount Prospect, Ill. 60056

DASA Corp.  
15 Stevens Street  
Andover, Mass. 01810

Dennison Manufacturing Co.  
300 Howard Street  
Framingham, Mass. 01701

Eugene Dietzgen Co., Inc.  
2425 N. Sheffield Avenue  
Chicago, Ill. 60614

Dukane Corp.  
103 North 11th Avenue  
St. Charles, Ill. 60174

Eastman Kodak Co.  
Business Systems Markets Div.  
343 State Street  
Rochester, N. Y. 14650

The Ednalite Corp.  
200 North Water Street  
Peekskill, N. Y. 10566

B. K. Elliott Co.  
P.O. Box 3240  
Pittsburgh, Pa. 15230

CAF—Reprographic Products  
140 West 51st St.  
New York, N. Y. 10020

Image Systems, Inc.  
11244 Playa Court  
Culver City, Calif. 90230

Information Handling Services, Inc.  
Denver Technological Center  
Englewood, Colo. 80110

Itek Business Products  
1001 Jefferson Road  
Rochester, N. Y. 14603

Keuffel & Esser Co.  
30 Whippany Rd.  
Morristown, N. J. 07960

Micro Design, Inc.  
235 S. Johnson St.  
Hartford, Wis. 53027

Micro Image Corp.  
10469 Roselle St.  
San Diego, Calif. 92121

Microform Data Systems, Inc.  
Suite 1507—Palo Alto Office Center  
Palo Alto, Calif. 94301

Mosler Co.  
561 Grand Blvd.  
Hamilton, Ohio 45012

NCR—Industrial Products Div.  
3100 Valleywood Drive  
Dayton, Ohio 45429

Pamtek Manufacturing Co.  
4221 Hollis St.  
Oakland, Calif. 94608

Frederick Post Co.  
P.O. Box 803  
Chicago, Ill. 60690

Readex Microprint Corp.  
5 Union Square  
New York, N. Y. 10003

Realist, Inc.  
N93 W16288 Megal Drive  
Menomonee Falls, Wis. 53051

Remington Rand Office Systems  
P.O. Box 171  
Marietta, Ohio 45750

Sanders Associates, Inc.  
95 Canal St.  
Nashua, N. H. 03060

Stromberg  
P.O. Box  
San Diego

The Taylor-Merchant Corp.  
25 West 45th St.  
New York, N. Y. 10036

3M Company  
Microfilm Products Div.  
3M Center—226-10  
St. Paul, Minn. 55191

University Microfilms/Xerox  
300 North Zeeb Rd.  
Ann Arbor, Mich. 48106

Washington Scientific Industries, Inc.  
13111 Wayzata Blvd.  
Minnetonka, Minn. 55343

Xerox Corp.  
Xerox Square  
Rochester, N. Y. 14603