

## DRAWINGS ON 35mm MICROFILM INSPECTION PROCEDURES—DUPLICATE MICROFILM



### 1. GENERAL

**1.01** This section covers the inspection procedures for 35mm duplicate master microfilm, mounted in apertured EAM cards or in reel form, used in the Bell System program for engineering drawings. The specific methods of test shall be followed in all cases except where a high level of production exists such as that at the Western Electric Hawthorne diazo shop. Under such conditions, other test methods and facilities which assure the same test results may be employed.

**1.02** Detailed reasons for reissue will be found at the end of this section. Since the reissue covers a general revision, the arrows ordinarily used to indicate changes have been omitted.

**1.03** Use care in handling microfilm to avoid scratching or otherwise damaging the film. The use of clean, soft gloves in handling microfilm is recommended. All surfaces on which the microfilm is placed should be wiped clean with a lint-free cloth.

### 2. EQUIPMENT AND MATERIALS

**2.01** The following equipment and materials are required for inspecting duplicate microfilm. For magnifiers and microscopes considered suitable for Bell System use, see Section 006-120-100.

#### *General*

Soft, White Gloves

Lint-Free, Soft Cloths

#### *General Quality*

Light Box and Rewind Unit

Measuring Magnifier

#### *Resolution Test*

Microscope

Resolution Test Cards

#### *Image Centering*

Ruler (1/32-inch gradations)

Centering Gauge, similar to Fig. 3

### 3. GENERAL QUALITY

**3.01 Requirement:** All processed duplicate microfilm shall be free of scratches, foreign material, stains, or defects which make drawing information illegible.

**3.02 Method of Test:** Inspect the duplicate microfilm for faulty processing. This can be recognized by such defects as stained or discolored areas, excessive curl of reel film edges, or buckling of film mounted in cards. Check the duplicate microfilm on a light box to determine that the film is free of scratches or foreign material which make drawing information illegible. Examine doubtful areas of the film in a reader.

### 4. RESOLUTION

**4.01 General:** Resolution is a measure of the sharpness of an image, and is expressed in the number of lines per millimeter which can be distinguished. Resolution of duplicate microfilm is measured by examining a duplicate copy of a microfilmed test chart (see Fig. 1) under a microscope to determine which of the patterns on the test chart is the smallest pattern in which lines can be distinguished both horizontally and vertically. The number adjacent to this pattern multiplied by the reduction ratio at which it was photographed indicates the resolution in number of lines per millimeter. Test frames for checking the resolution of duplicate microfilm produced on a reel-to-reel basis are the copies of the test frames on the duplicate reel. Test frames for checking the resolution of duplicate microfilm produced on a

card-to-card basis may be made from acceptable silver microfilm test frames mounted in KS-20560 L1 or L2 cards.

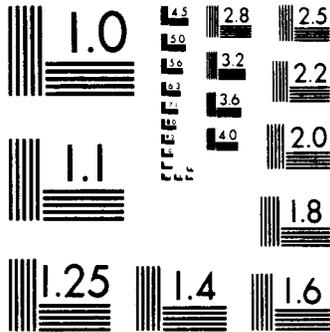


Fig. 1—Resolution Test Chart

**4.02 Requirement:** The resolution loss of duplicate microfilm made from silver original microfilm shall not exceed one pattern on the resolution test chart, nor shall the resolution in lines per millimeter of the duplicate microfilm be less than the following:

REDUCTION	×	TEST CHART PATTERN	=	RESOLUTION
16X		6.3		100.8
24X		4.5		108
30X		4.0		120

**4.03 Method of Test:** Using a microscope of approximately 60X magnification, check the resolution of each of the five resolution test charts which appear on the duplicate microfilm test frames. Place a test frame on the stage of the microscope and position it so that one of the five resolution test charts is centered in the stage. Adjust the microscope to obtain a clear, sharp image and determine the smallest pattern in which lines can be distinguished both horizontally and vertically. This test should be repeated on each of the other four resolution test charts in the test frame. The lowest resolution obtained from the five resolution test charts should meet the requirement specified in 4.02. For duplicate reel microfilm, the test should be made on each of the test frames on the reel. For duplicate microfilm produced on a card-to-card basis, duplicate copies of resolution

test cards should be produced periodically and checked to ensure that resolution requirements are being met.

**Note:** A device that can be added to the stage of a microscope to hold microfilm in position when checking resolution has been developed. Drawing MES-71510 covering the device is available from the WECO.

**5. LEGIBILITY**

**5.01 Requirement:** A nominal 15X enlarged print prepared from the file master duplicate microfilm shall be legible. (This applies only to duplicate microfilm furnished to the telephone companies.)

**5.02 Method of Test:** View a drawing image on a nominal 15X enlarged print made from the file master duplicate microfilm on an approved printer, which uses an electrochemical, photochemical, or dry silver process, to determine that the drawing information is legible. Prior to making the print, the printer should be adjusted to the optimum setting for focus and exposure. Information shall be considered legible if complete intelligence can be extracted without reference to other information. For example:

- (a) Characters illegible but included in a recognizable series such as AA, AB, AC or 101, 102, 103.
- (b) Letters illegible but the intended word is unmistakable such as the "E" in "KEY".
- (c) Piece part number in a stock list illegible but is repeated, legibly, in an equipment view or figure on the same sheet of the drawing.

**6. FILM BOW**

**6.01 Requirement:** Film bow (departure from physical flatness) shall not exceed 1/16 inch across width of exposed and developed duplicate reel film.

**6.02 Method of Test:** On each reel of film, cut a 2-inch piece of film straight across the 35mm width, perpendicular to the edges. Place cut end on Fig. 2. The bow in the film shall not exceed the bow indicated in Fig. 2.

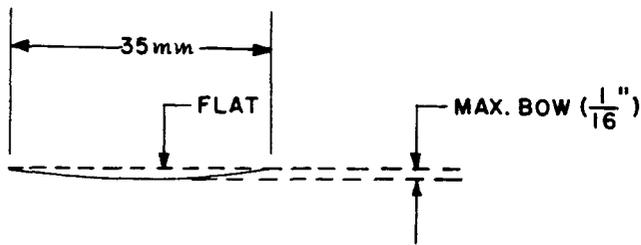


Fig. 2—Checking Reel Film for Bow

## 7. IMAGE CENTERING

### 7.01 Requirement

(a) **Duplicate Reel Microfilm:** The drawing image shall be centered across the 35 mm width of the film within 1/32 inch.

(b) **Duplicate Card Mounted Microfilm (KS-20560 L3 and KS-20563 Cards)**

(1) **Single Frame Drawings:** Microfilm shall be mounted completely within the card aperture. No portion of the drawing image shall be under the mounting tape, and the center of the drawing image shall be located minimum 1.563 inches, maximum 1.593 inches, from the right-hand edge of the card.

(2) **Multiple Frame Drawings:** Microfilm shall be mounted completely within the card aperture. No portion of the drawing image, except the unnecessary portion beyond the hold-down bar, shall be under the mounting tape.

### 7.02 Method of Test

(a) **Duplicate Reel Microfilm:** Position a frame of film on the light box and using the ruler measure the distance between the film edge and the centering arrow in the leading or trailing border of the drawing image in the frame. This distance shall be equal within 1/32 inch to half of the film width. This check shall be made on three frames, one from the beginning, middle, and end of each reel of film.

(b) **Duplicate Card Mounted Microfilm (KS-20560 L3 and KS-20563 Cards)**

(1) **Single Frame Drawings:** Examine the card to determine that the requirement specified in 7.01(b)(1) has been met. Conformance to the centering requirement shall be checked by placing the card, tape side up, on a gauge similar to that shown in Fig. 3, with the edges of the card against the card stops. The centering arrow in the lower border of the drawing image must fall between or under the two hairlines on the gauge.

(2) **Multiple Frame Drawings:** Examine the card to determine that the requirement specified in 7.01(b)(2) has been met.

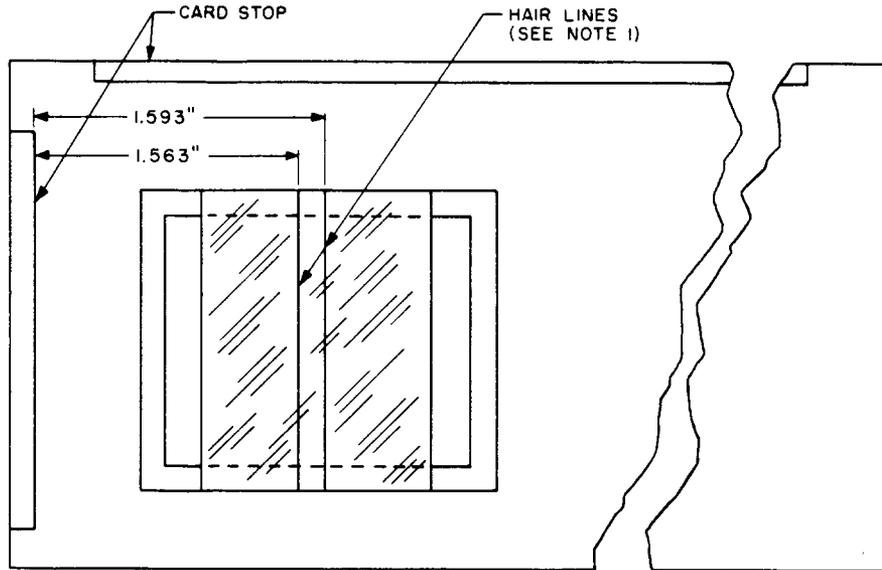
## 8. DRAWING IDENTIFICATION (KS-20560 L3 and KS-20563 Cards)

**8.01 Requirement:** The interpreted (printed) information on a card must be in agreement with the drawing, sheet, section (if any) size, issue number, and illegibility designation that appear on the microfilm image. Except for cards retained for local use, no information shall be keypunched or interpreted in columns 45 through 52.

**8.02 Method of Test:** Using a microfilm reader, determine by comparing the information on the screen image with the interpreted information on the card, that the requirement specified in 8.01 has been met. On KS-20560 L3 cards this examination should be made when mounting, using the viewing screen on the mounter. Also, visually inspect cards to ensure that no information has been keypunched or interpreted in columns 45 through 52.

## REASONS FOR REISSUE

1. To clarify list of equipment and materials (2.01).
2. To specify KS specification numbers (4.01, 7.01, 7.02, and 8.).
3. To add information pertaining to optimum adjustment of printer (5.02).
4. To revise centering image method of test (7.02).



NOTES:

1. 1.563" DIMENSION APPLIES TO THE LEFT EDGE OF LINE.  
1.593" DIMENSION APPLIES TO THE RIGHT EDGE OF LINE.
2. FOR DETAILS SEE SECTION 006-110-500.

Fig. 3—Typical Centering Gauge