DRAWINGS ON 35mm MICROFILM
SILVER MICROFILM PRODUCTION

CONTENTS PAGE

1. GENERAL

SCOPE

1.01 This practice covers the basic requirements for production of 35mm silver microfilm of engineering drawings, and for the equipment and materials needed to produce the microfilm.

1.02 This practice is reissued primarily to reflect changes due to divestiture, which include:

(a) Reformatting for conversion from a Bell System Practice to an AT&T Practice.

(b) Name and number changes (of referenced specifications, organizations, etc).

(c) Deletion of obsolete terminology (eg, ***Electrical Accounting Machine***).

(d) Deletion of references to discontinued items (eg, list 1 aperture cards).

(e) Redesign of microfilm cards.

(f) Updating of Control Location tables, G and H.

(g) Redesignation and/or repositioning of some tables and figures for better juxtaposition with related text.

PRODUCTION

1.03 Production methods follow:

(a) The production of silver microfilm for AT&T use and for distribution to customers requires that engineering drawings be photographed with a precision microfilm camera on 35mm film, or generated directly on 35mm film by means of a computer-output microfilm (COM) device.

(b) Drawings are photographically reduced in proportions that, in most cases, permit each sheet to be accommodated on one frame of film. Large drawing sheets that cannot be photographed completely on one frame of film are photographed in sections.

(c) The exposed film is processed and then inspected in accordance with AT&T 006-110-500 to ensure that requirements have been met.

(d) Following the inspection, if the film is to be unitized, each frame of microfilm is mounted in the aperture of a tabulating size (3-1/4 by 7-3/8 inch "tab") card designed for microfilm use.

(e) Each tab card is keypunched and interpreted with information to identify the filmed drawing. Identification information includes control location, distribution, and status.

(f) Microfilm produced by a commercial supplier should be inspected to ensure that requirements of AT&T 006-110-500 are met.

1.04 Engineering drawing information generated directly on microfilm by means of a COM device (see paragraph 3.06) shall be inspected in accordance with AT&T 006-110-500 to ensure that requirements have been met. Size designations C1, C2, and C3 shall be assigned to COM. (See Tables A and B.) Microfilm format sizes shown in Table A are the maximum permissible.

TABLE A

SIZE DESIGNATIONS FOR COM

DRAWING SIZE DESIGNATION		FORMAT SIZE (INCHES)	
C1		0.6833	0.4916
C2	Book Print Form	0.6833	1.0416
	Loose Form	0.6833	1.0833
C3		1.0833	1.4000

1.05 Microfilm must be handled carefully to avoid scratching and other damage, particularly to the emulsion surface of the film.

1.06 For guidance on selection of equipment and materials considered suitable for producing silver microfilm, see Corporate Instruction (CI) 48.126, or contact AT&T Reproduction Engineering Control at the Customer Information Center in Indianapolis (P.O. Box 19901, Indianapolis, IN 46219).

1.07 The general plan for the production, distribution, and use of microfilm of AT&T engineering drawings is covered in AT&T 006-100-100.

1.08 Contracts negotiated with customers for AT&T products covered by engineering drawings in aperture cards may impact on some requirements covered in this practice, particularly with regard to card design. Variations will be tolerated only to the degree that they are required by contractual commitments. In these cases, the special card design shall be the result of agreements among the AT&T Product Manager, the microfilm provider within AT&T, and the customer.

2. PRODUCTION MATERIAL

MICROFILM

2.01 The film used for original microfilm shall be 35mm, nonperforated, safety-type, silver film approved for use in the AT&T microfilm program. The unexposed film shall have a maximum base plus fog density of 0.12 (measured in accordance with AT&T 006-100-500).

MICROFILM CARDS

2.02 Except as noted in paragraph 1.08, the cards used in the production of silver microfilm (3-1/4 by 7-3/8 inch "tab" size with or without apertures) are assigned AT&T KS and GN specification numbers as shown in Table C and Fig 1 through 4. They are inspected by AT&T Technology Systems for specification conformance.

3. PRODUCTION EQUIPMENT

3.01 The equipment required for the production of silver microfilm is as follows:

(a) Cameras

(b) Computer-Output Microfilmer

(c) Film Processors

(d) Mounters (for unitized microfilm)

(e) Tab Card Keypunch/Interpreters (for unitized microfilm).

3.02 All production equipment shall be capable of handling 35mm nonperforated film. The installation, operation, and maintenance instructions provided by the equipment manufacturers should be followed, except as modified in this section.

3.03 Silver microfilm of drawings photographed on a planetary camera shall meet the following resolution, density, and reduction requirements when inspected in accordance with AT&T 006-110-500.

(a) Processed silver microfilm shall have a minimum resolution of 113.6 lines per millimeter at 16X reduction, 120 lines per millimeter at 24X reduction, and 135 lines per millimeter at 30X reduction.

(b) The average transmission density of the microfilm drawing image background shall be minimum 1.00, maximum 1.20.

(c) The transmission density of the microfilm frame background shall be minimum 0.8.

(d) Reductions shall be accurate within +2, -0.4 percent.

3.04 Silver microfilm generated on a COM device shall meet the following resolution and density requirements when inspected in accordance with AT&T Specification X-76081:

(a) Resolution - minimum 80 lines per millimeter.

(b) Transmission density - minimum 1.80.

CAMERAS

3.05 A microfilm camera is a precision instrument used to photograph engineering drawings on 35mm film in reel form. It should have a means of adjusting for correct exposure and for reductions of 16X, 24X, and 30X, and should be capable of producing microfilm meeting the requirements of this practice. A microfilm camera requires care in maintenance and should be installed in an area as free of vibration and dust as possible. Installation and adjustment should be made by the manufacturer's representative.

COMPUTER-OUTPUT MICROFILMER

3.06 A computer-output microfilmer (COM) is a recorder that converts data from a computer into human readable form on microfilm. It should be capable of producing microfilm meeting the requirements of AT&T Specification X-76081.

FILM PROCESSORS

3.07 A film processor is a machine used to develop, fix, wash, and dry silver film. Office-type film processors are available for processing on premises when required.

MOUNTERS

3.08 A mounter is a machine used for mounting processed microfilm in apertured tab cards (microfilm cards). It should have a means of accurately positioning the film in the card aperture and shall be capable of meeting the requirements of **7. MOUNTING MICROFILM.**

KEYPUNCH/INTERPRETING EQUIPMENT

3.09 Standard equipment is used to keypunch, reproduce, and interpret Hollerith-coded drawing identification information in microfilm cards. These machines are suitable for use before film is mounted in the cards. After film is mounted, modified machines must be used to avoid damaging it. A keypunch machine is used to punch master data cards. A reproducer is used to punch decks of cards automatically from the master data cards. An interpreter is used to interpret the punched information and print it across the tops of the cards. A sorter is used to arrange cards in sequence by punchings in the cards. A collator is used to combine, match, or merge decks of cards. Combination machines are available to perform two or more of the above functions with a single machine.

4. MICROFILMING

GENERAL

4.01 ***COM***: Drawings generated directly on microfilm by means of a COM device shall be produced under strictly controlled conditions to ensure that the requirements of AT&T Specification X-76081 and paragraphs 4.04, 4.05, 4.07, and 4.08 of this practice are met. See paragraph 5.02 for specific requirements applicable to processing COM.

4.02 ***Planetary Camera***: Original drawings shall be photographed with a precision camera under controlled conditions in accordance with the requirements covered herein to assure the high quality of microfilm required for assured image legibility.

PROCEDURES

4.03 The procedures outlined below will be helpful in obtaining quality microfilm and in expediting the microfilming of original drawings.

(a) Sort drawings in groups based on the reductions at which they will be microfilmed. (See Table D.)

(b) Mark light, thin, horizontal and vertical center lines on the camera copyboard to ensure accurate positioning of drawings.

(c) Keep the camera copyboard clean to ensure consistent density results.

(d) In making reduction changes, always make sure that the camera head approaches the desired position from below to ensure consistent accuracy.

TABLE B

REDUCTIONS FOR AT&T DRAWINGS

SINGLE-FRAME DRAWINGS						MULTIPLE-FRAME DRAWINGS		
DRAWING SIZE DESIGNATION (SEE NOTE 1)		LINEAR REDUCTION	DRAWING SIZE DESIGNATION (SEE NOTE 1)		LINEAR REDUCTION	DRAWING SIZE DESIGNATION (SEE NOTE 1)		LINEAR REDUCTION (SEE NOTE 2)
1S	(8-1/2x11)	16X	M	(14x25)	16X	13S	(33x53)	24X(2)
2S	(11x17)	16X	M1	(14x33)	24X	16S	(34x66)	24X(3)
3C	(14x24)	16X	M2	(14x41)	30X	19S	(34x77)	24X(3)
3S	(17x22)	24X	M3	(14x49)	30X	21S	(34x88)	24X(4)
			MM	(14x33)	24X	24S	(34x99)	24X(4)
			O	(17x27)	24X	M4	(14x57)	24X(2)
4S	(17x27)	24X	O1	(17x41)	30X	O2	(17x53)	24X(2)
5S	(22x34)	24X	O5	(18-1/4x27-3/8)	24X	O3	(17x66)	24X(2)
6S	(22x34)		OR	(27x25)	24X	O4	(17x79)	24X(3)
	Job T	24X	P1	(9-1/8x11-5/8)	16X	R4	(27x57)	24X(2)
	All Other	30X						
			P2	(11-5/8x14-3/4)	16X	R5	(27x65)	24X(2)
7S	(27x33)	24X	P3	(13-3/4x18-1/4)	16X	R6	(27x73)	24X(2)
8S	(27x41)	30X	P4	(13-3/4x22-1/4)	16X	R7	(27x81)	24X(3)
10S	(27x49)	30X	P6	(13-3/4x26-3/4)	24X	R8	(27x89)	24X(3)
11S	(34x44)	30X	PP	(9x13-1/4)	16X	R9	(27x97)	24X(3)
12S	(33x49)	30X						
			R	(27x35)	24X	RR	(33x53)	24X(2)
A	(8-1/2x11)	16X	R1	(27x33)	24X	RR1	(33x66)	24X(3)
A2	(9x14)	16X	R2	(27x41)	30X	X1	(33x53)	24X(2)
AA	(11x24)	16X	R3	(27x49)	30X	X2	(33x66)	24X(3)
B	(11x17)	16X	RU	(27x41)	30X	X3	(33x79)	24X(3)
C	(17x22)	24X						
C1	(8-1/2x11)*	16X						
C2	(22x34)*	30X						
C3	(34x44)*	30X						
			S	(8x10)	16X	XX	(40x65)	30X(2)
D	(22x34)	24X	U	(27x49)	30X	XX1	(40x73)	30X(3)
E	(34x44)	30X	X	(33x40)	30X			
L	(14x17)	24X	X8S	(27x39)	24X			
L2	(11-5/8x16-1/2)	16X	XR	(32x48)	30X			

Note 1: The numbers in parentheses after the drawing size designation indicate the approximate drawing dimensions, in inches.

Note 2: The number in parentheses after the reduction indicates the number of frames for the complete drawing sheet.

*Size designations C1, C2, and C3 were originally established to identify microfilm generated on a COM device. (The drawing sizes and reductions shown are indicative of those that would apply if information had been prepared manually and then microfilmed.) The trend is toward eventual confinement of ***all*** drawings to these three sizes, with the C1, C2, and C3 designations applying to COM-generated (and, in some cases, plotter-generated) drawings, and the older 1S, 6S, and 11S designations applying to those few drawings still manually prepared. Some of the other sizes in the table remain in wide use (eg, 2S, X8S, 12S); others are in the process of being phased out. Variations of the C series designations may occasionally be encountered. Examples include MC3, EC3, and G3. Sizes, however, remain confined to those shown with asterisks in the table.

TABLE C

APERTURE CARDS AND OTHER TAB CARDS USED IN MICROFILM PRODUCTION

(See Fig 1 through 4)

CARD	FIG	CARD STOCK COLOR	CORNER CUT	APERTURE INSERT	USE
KS-20560 L2	1	Natural	Upper Right	Protection Sheet	For mounting original silver microfilm from reels.
GN-1861	2	Red	None	(No Aperture)	For file reference use when microfilm will not be provided (see paragraph 6.06).
GN-1865	3	Natural	Upper Left	(No Aperture)	Master data card. Drawing identification information may be keypunched in these cards and the cards then used to reproduce this information in KS-20560 and GN-1861 cards.
GN-1867	4	White	Upper Right	(No Aperture)	For file reference when microfilm of any sheet of a multisheet drawing is temporarily delayed (see paragraph 6.07).

TABLE D

REDUCTIONS

DRAWING TYPE	REDUCTION	DRAWING SIZE (OVERALL)	EXCEPTIONS
Single-Frame Drawings	16X	Up to and including 19 by 26 inches	17 by 22 inches (3S and C sizes) and 14 by 17 (L size), 24X reduction
	24X	Over 19 by 26 inches but not exceeding 29 by 39 inches	22 by 34 inches (6S size) other than Job T drawings, 30X reduction
	30X	Over 29 by 39 inches but not exceeding 36 by 49 inches	
Multiple-Frame Drawings (See paragraphs 4.12—4.14 and Table B)	24X	39 inches (or less) by over 49 inches	
	30X	Over 39 inches by over 49 inches	

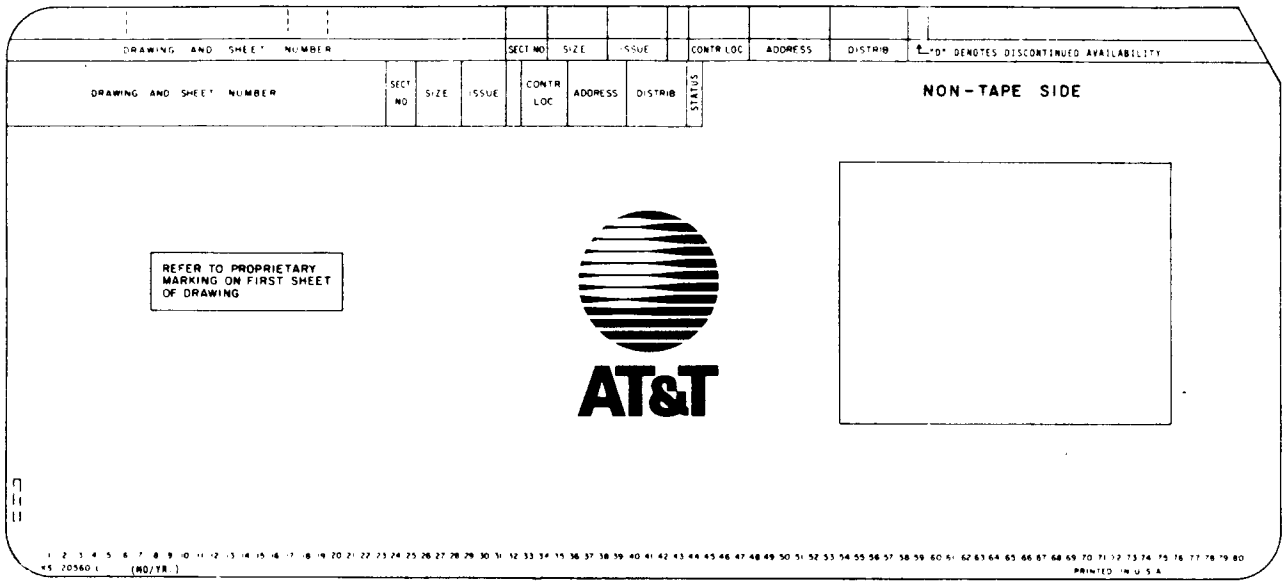


Fig 1—KS-20560 Aperture Card (Natural)

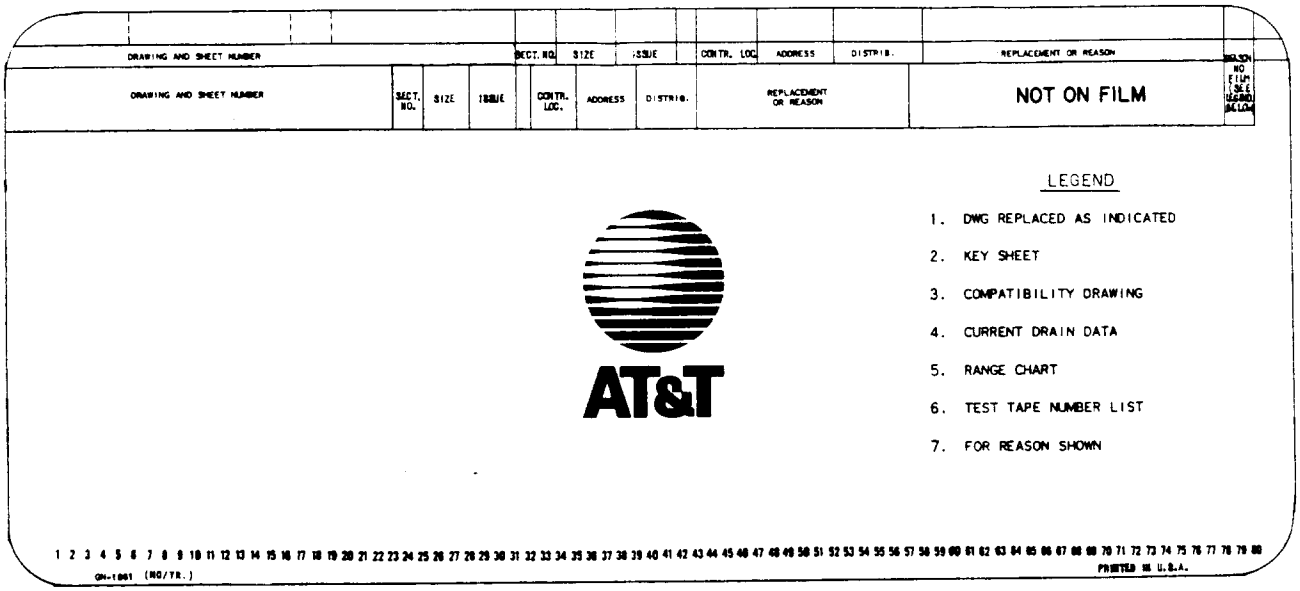


Fig 2—GN-1861 Record Card (Red)

See proprietary notice on cover page.

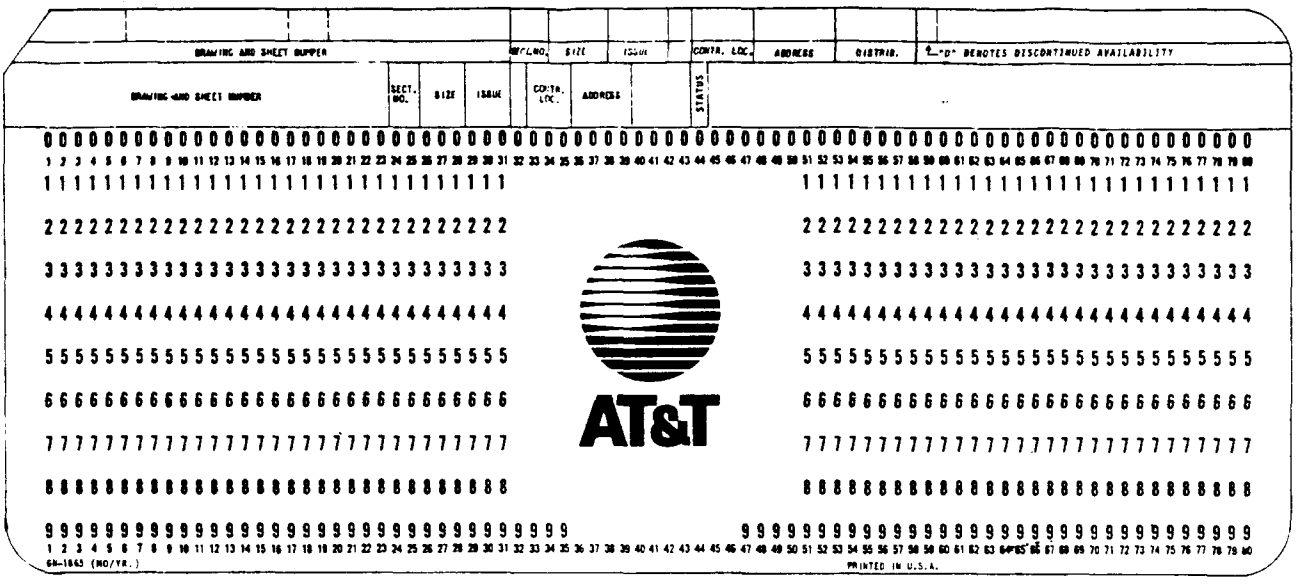


Fig 3—GN-1865 Master Data "Slave" Card (Natural)

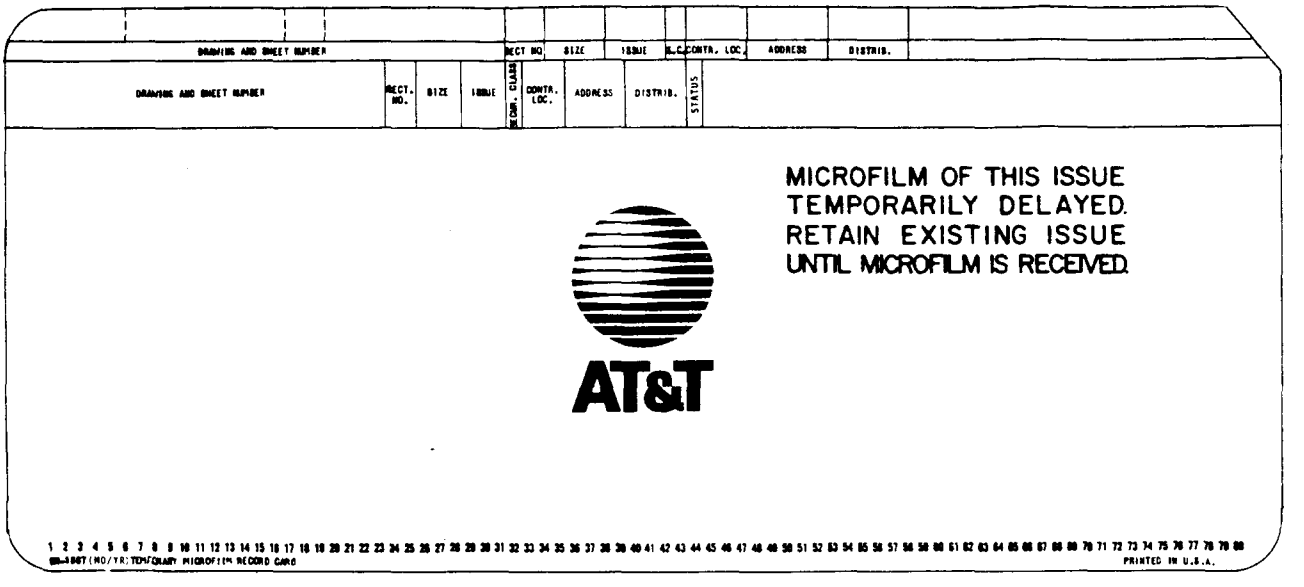


Fig 4—GN-1867 Temporary Microfilm Record Card (White)

(e) Keep reflections in the camera area to a minimum. This can be accomplished with drapes, or the camera room can be painted with a color and type of paint that minimizes reflection. (Instances have been reported of light reflected into the camera lens, or onto the copyboard, by portions of the camera operator's attire, such as white, shiny, or metallic fabrics, buckles, jewelry, buttons, and even eyeglasses.)

(f) Use substage illumination in conjunction with overhead illumination ***only with those drawings that contain engineering information on the rear of the drawing media***. (Table lines and headings, border lines, etc, do not constitute engineering information.)

(g) Determine the correct exposure setting for a camera by performing an exposure step test to ensure that film density requirements will be met. When substage illumination supplements overhead illumination [see paragraph 4.03(f)], an additional exposure step test to determine the correct exposure setting for this condition should be performed. An exposure step test is required when a camera is installed and is advisable when major changes are introduced in the microfilm operation, eg, changes in processing, brand of film, emulsion batch, or exposure control components. A step test consists of microfilming a set of sample drawings at a range of exposure settings. The sample drawings should be representative of the drawings to be microfilmed, and should be selected from existing drawings in file on the basis of varying degrees of cleanness, types of drawing material, and typical sizes for each reduction. (Samples that are representative of only a small portion of the drawings to be microfilmed should not be used.) Process the test strip with the same facilities and techniques to be used for production work. After the step test film has been processed, the background density of each drawing image should be read as covered in AT&T 006-110-500. The proper exposure setting for the camera is that which produces a drawing image background density between 1.00 and 1.20 for most sample drawings.

REQUIREMENTS

4.04 For light protection, the portion of film exposed in the camera shall be preceded and followed by unexposed portions (leader and trailer) each at least 36 inches long. A longer length may be provided where required for threading through the camera or processor.

4.05 Identification information shall be included at the beginning of each reel of film. A form containing reel number, date, and control location may be prepared for this purpose.

4.06 The size of the exposed microfilm frame shall be a minimum of 1.625 inches wide and a minimum of 1.207 inches high. (See Fig 5.)

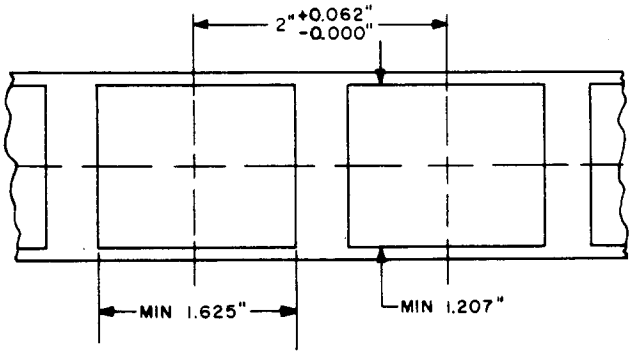


Fig 5—Microfilm Frames

4.07 The distance between the centers of adjacent frames on the processed reel (frame interval or pull-down) shall be 2.000 inches +0.062, -0.000 inch. (See Fig 5.)

4.08 Each frame of microfilm shall contain the image of only one sheet of a drawing or one section of a multiple-frame drawing.

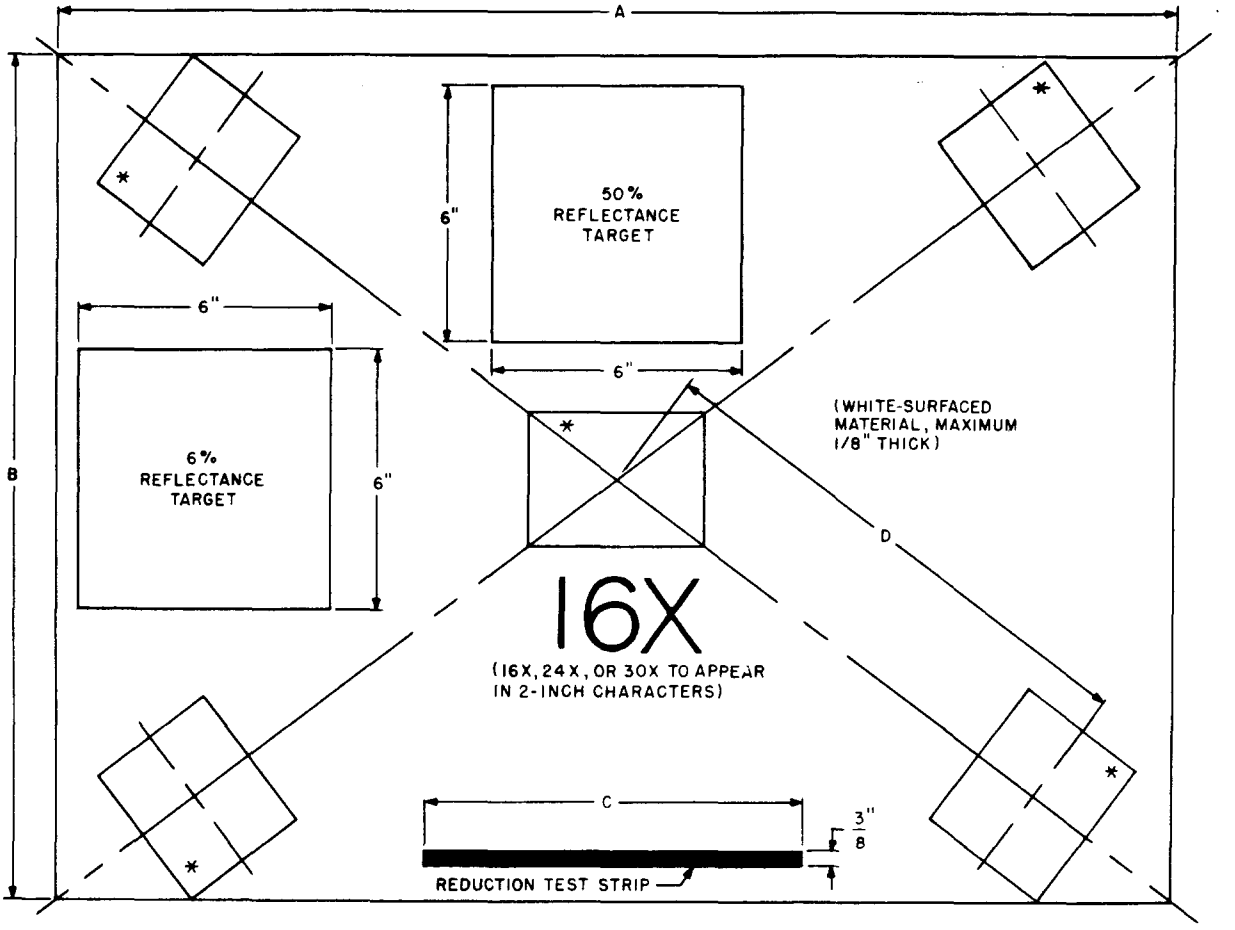
Note: A composite, consisting of a number of pages, shall be handled as one drawing sheet for microfilming purposes. (See paragraph 4.15.)

4.09 Test frames of test targets (see Fig 6) shall be included in each reel of film for use in checking microfilm quality. Two test frames shall be microfilmed at the beginning of each reel using test targets of the first reduction used on the reel. In addition, one test frame shall be microfilmed at the end of each reel for each reduction used on the reel.

Note: When camera reduction selection is manually controlled, it is suggested, but not mandatory, that a test frame also be microfilmed each time the reduction is changed.

4.10 Test targets shall conform to Fig 6 and shall contain the following:

(a) Five resolution test charts (National Bureau of Standards, Microcopy Resolution Test Chart No. 1010A).



* RESOLUTION TEST CHARTS.
(PLACE SO THAT NUMERICAL INFORMATION IS
RIGHT READING WHEN VIEWED FROM THE
CENTER OF THE TARGET)

DIMENSION	DIMENSION IN INCHES		
	REDUCTION		
	16X	24X	30X
A	26	39	$48\frac{3}{4}$
B	$19\frac{1}{4}$	$28\frac{15}{16}$	$36\frac{3}{16}$
C	8 ± 0.005	12 ± 0.005	15 ± 0.005
D†	$12\frac{7}{8} \pm \frac{1}{8}$	$19\frac{13}{32} \pm \frac{1}{8}$	$24\frac{9}{32} \pm \frac{1}{8}$

† *FOR MEASURING THE DISTANCE "D", USE THE PERIOD IN THE*
PATTERN NUMBER "10.0" AS THE CENTER OF THE RESOLUTION TEST CHART.
(IF RESOLUTION TEST CHARTS ISSUED PRIOR TO 1963 ARE USED, THE
PERIOD IN PATTERN NUMBER "4.0" SHOULD BE USED AS THE CENTER.)

Fig 6—Test Target

(b) Two reflectance targets, one 6 percent ±0.4 percent and one 50 percent ±3 percent. (May be obtained from the Munsell Color Company, Inc, 2441 North Calvert Street, Baltimore, MD 21218.)

(c) A reduction test strip (dark colored steel or plastic bar).

(d) A reduction designation.

Note: Complete test targets for 16X, 24X, 30X, and other reductions may be obtained from the Eastman Kodak Company, or test targets may be made up locally, if desired. Catalog ordering numbers for the Kodak products ("Recordak Reference Targets") are as follows:

TARGET DESCRIPTION	CAT. NO.
16X (complete)	199 0019
20X (complete)	199 0035
24X (complete)	199 0050
30X (complete)	199 0076
36X (complete)	199 0092
NBS Resolution Test Charts (sets of 5)	199 0936

4.11 Reductions used in microfilming drawings are determined by the size of the drawing as shown in Table D. Table B lists reductions used for specific drawing sizes.

MULTIPLE-FRAME DRAWINGS

4.12 Drawings larger than 36 by 49 inches are referred to as multiple-frame drawings. (See Fig 7.) Such drawings shall be microfilmed in sections as indicated below.

(a) Drawings 29 inches in height or less, and over 49 inches in length shall be microfilmed in 39-inch sections at 24X reduction. (See Fig 8.)

(b) Drawings over 29 inches but not over 39 inches in height, and over 49 inches in length shall be microfilmed in 29-inch sections at 24X reduction. (See Fig 8.)

(c) Drawings over 39 inches but not over 49 inches in height, and over 49 inches in length shall be microfilmed in 36-inch sections at 30X reduction. (See Fig 8.)

Note: A guide such as shown in Fig 9 may be used to center and align multiple-frame drawings microfilmed at a reduction of 24X. An outline 36-3/16 by 48-3/4 inches may be drawn on the camera copyboard to center and align multiple-frame drawings microfilmed at a reduction of 30X.

4.13 Each section other than the first shall include a 4-inch overlap of the previous section microfilmed. The last section must be a full frame and may include an overlap greater than 4 inches. (See Fig 7.)

4.14 Each section shall contain: the drawing number; sheet number, if any; issue number; and section identification. (See Notes 1 and 2.) This information shall be shown in black characters, minimum 1/2 inch high and minimum 1/16 inch line weight, on a white background outside the bottom or right-hand border of the drawing. (See Fig 8.) If necessary, it may appear within the border of the drawing, but shall not obscure any drawing information. In such cases, the information must be prefixed by the words **FILM NOTE**, and characters 1/4 inch high are permissible.

Note 1: Sections shall be identified by a combination of a letter followed by a number. The letter indicates the section, and the number indicates the number of sections making up the entire sheet. (See Fig 7.) The following is an example of the complete identification of the first section of a 3-section drawing.

ED-25431-014 ISS 13 SECT A3

or

FILM NOTE	
J23137AA-1	SH 2
ISS 4	SECT A3

Note 2: In any case where a right-reading drawing number will appear within a drawing section image, the drawing number need not be included in the above information.

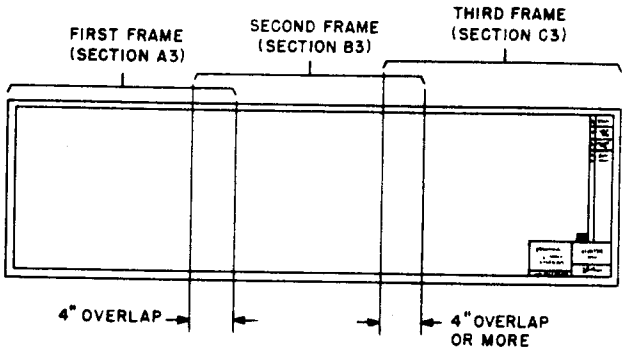


Fig 7—Multiple-Frame Drawing

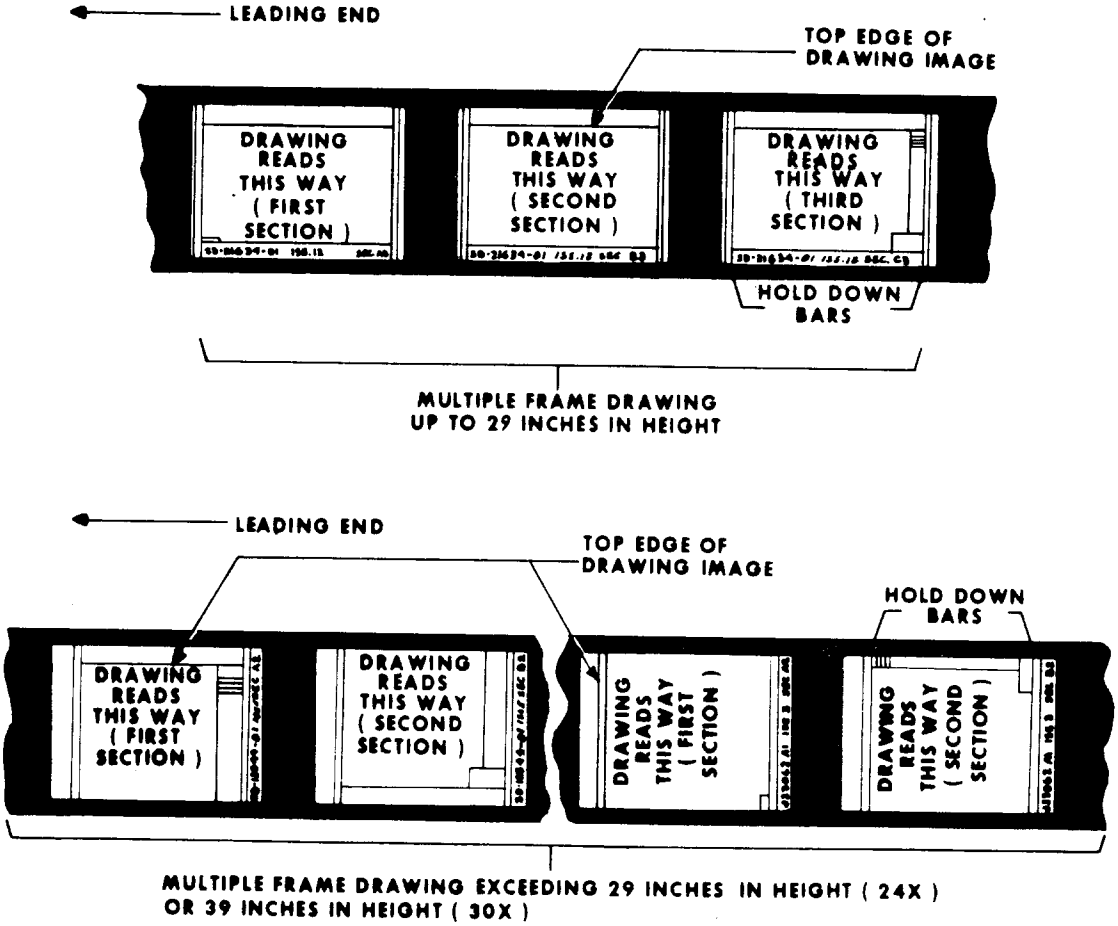


Fig 8—Multiple-Frame Drawing Section Image Orientation

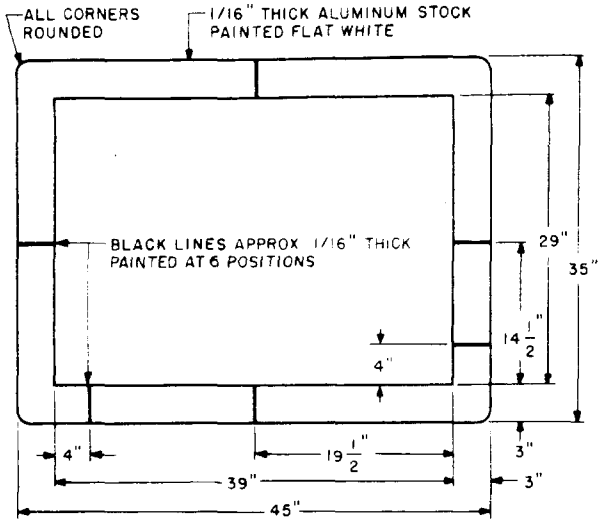


Fig 9—Guide for Microfilming Multiple-Frame Drawings at 24X Reduction

COMPOSITE DRAWINGS

4.15 A composite drawing, comprising a number of pages of information, shall be assembled for microfilming in accordance with Engineering Drawing Standards (CI 97 series) or local production layout requirements. These requirements should be based on the following:

(a) Composites of 14-inch wide by 11-inch high and 17-inch wide by 11-inch high pages, per Fig 10. The outside dimensions shown in Fig 10 are the same as those of a 6S drawing.

(b) Composites of 8-1/2 inch wide by 11-inch high pages, per Fig 11 or Fig 12. Fig 11 yields the same grid configuration as eight pages on a microfiche. The outside dimensions shown in Fig 12 are the same as those of a 6S drawing.

(c) Composites of 9-3/8 inch wide by 17-inch high pages, where the total printout data does not exceed a width of 26 inches, per Fig 13. The outside dimensions shown in Fig 13 are comparable to those of a 4S drawing.

DRAWING IMAGE ORIENTATION

4.16 ***Single-Frame Drawings***: The long edges of the drawing image shall be parallel to the long edges of the microfilm frame except for drawing sizes 1S, A (8-1/2 by 11 inches), and P1 (9-1/8 by 11-5/8 inches), in which case the short edges of the drawing image shall be parallel to the long edges of the microfilm frame. In addition, the top edge of the drawing image shall be oriented either with the top edge or the leading edge of the microfilm frame. (See Fig 14.)

> ***Note:*** The top edge of the drawing image is the edge appearing uppermost when the main information on the drawing is read from left to right.

In all cases, the drawing image shall be centered within the microfilm frame. (See paragraph 4.18 and Fig 14.)

4.17 ***Multiple-Frame Drawings:*** Where the height of a multiple-frame drawing is less than 29 inches (24X reduction) or 36 inches (30X reduction), the drawing image shall be oriented so that the long edges of the drawing are parallel to the long edges of the microfilm frame and the top drawing edge shall appear near the top of the film frame. (See Fig 8.) Where the drawing height exceeds these dimensions, the drawing image shall be oriented so that the short edges of the drawing are parallel to the long edges of the microfilm frame, and the main information on the drawing reads from bottom to top. (See Fig 8.)

4.18 The drawing image shall be centered in the microfilm frame with the edges parallel to the edges of the microfilm frame. To ensure this, drawings shall be centered on the camera copyboard within 1/8 inch. [See paragraph 7.01(b).]

HOLD-DOWN BARS

4.19 To keep drawings flat on the camera copyboard during microfilming, a hold-down bar (a sheet metal or plastic strip approximately 1 inch wide with a flat white finish) may be placed along the right and left edges of the drawing or section being microfilmed.

5. CHEMICAL PROCESSING

GENERAL

5.01 Chemical processing is one of the critical factors affecting the quality of microfilm. Particular care should be taken to follow the manufacturer's specifications with regard to water supply, chemical solutions, temperature, wash cycles, etc, to ensure the production of acceptable microfilm.

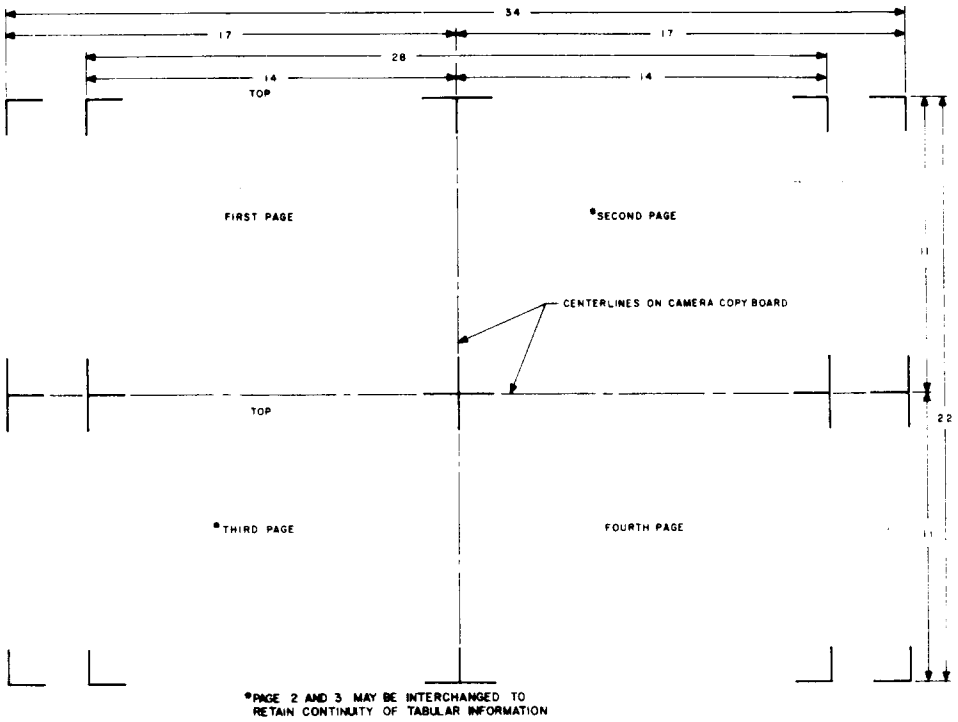


Fig 10—Layout for 14 by 11-Inch and 17- by 11-Inch Pages

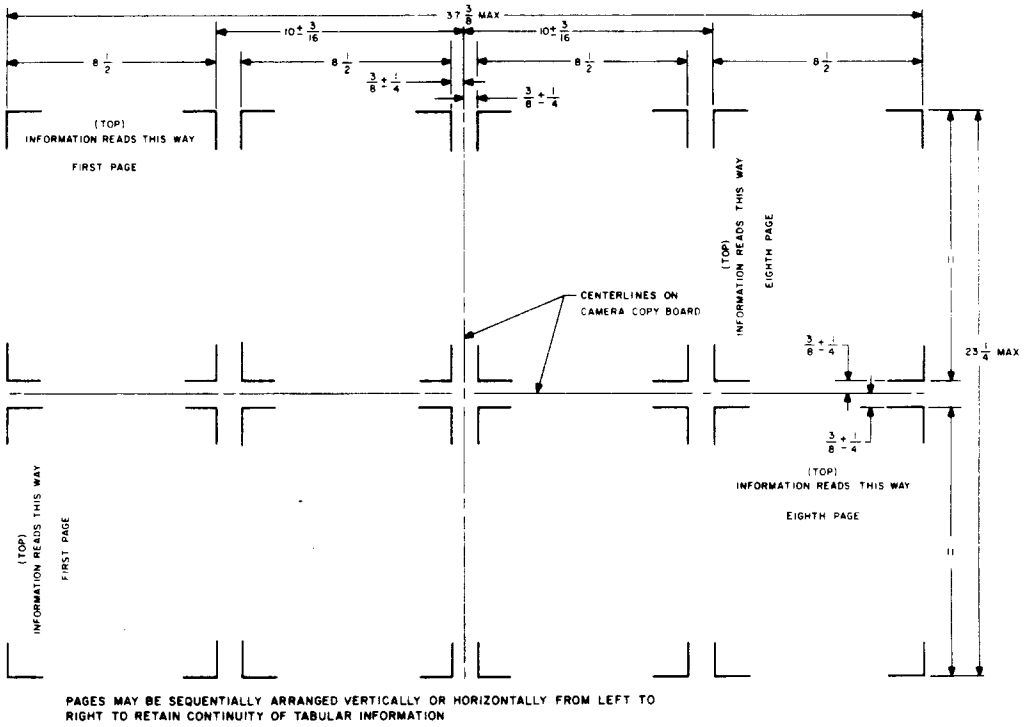


Fig 11—Layout for 8-1/2 by 11-Inch pages (24X Reduction Format)

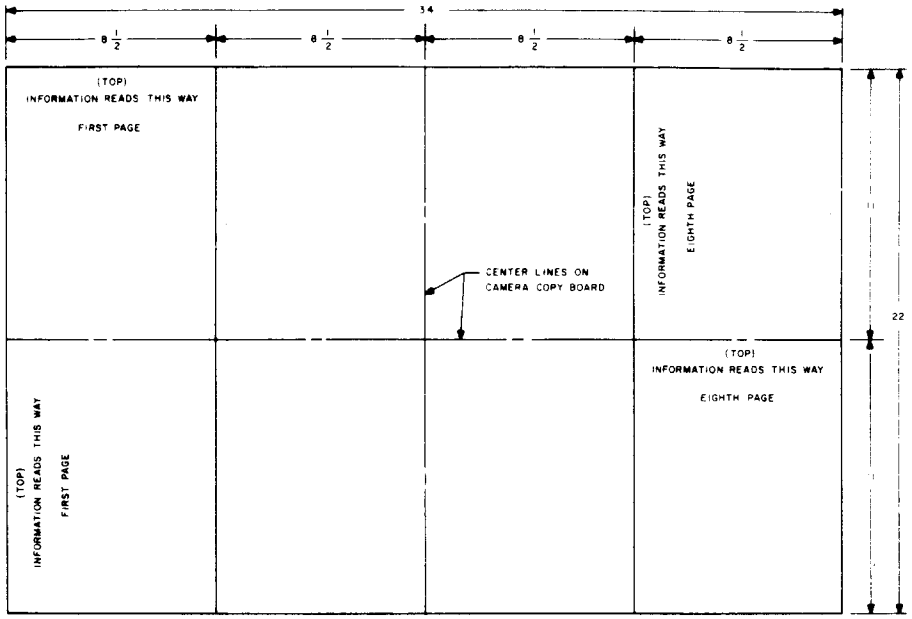


Fig 12—Layout for 8-1/2 by 11-Inch Pages (30X Reduction Format)

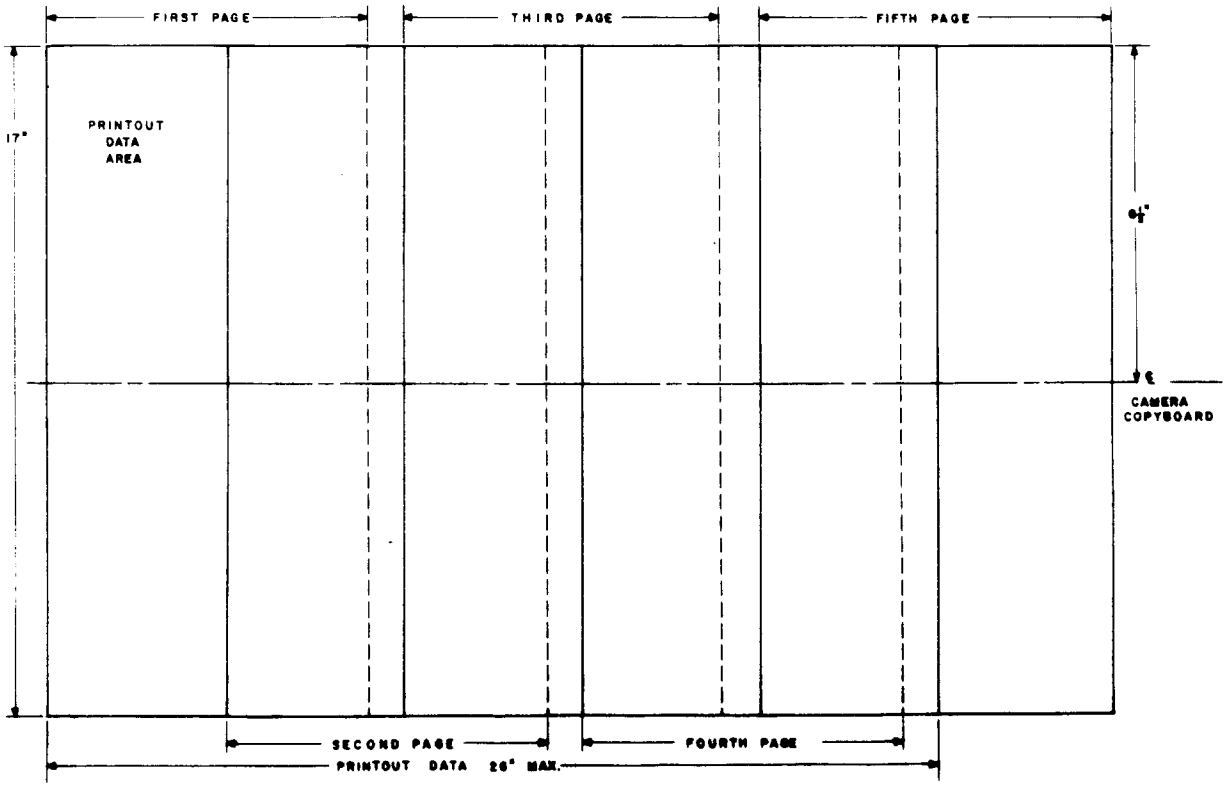


Fig 13—Layout for up to Five 9-3/8 by 17-Inch Computer-Generated Pages

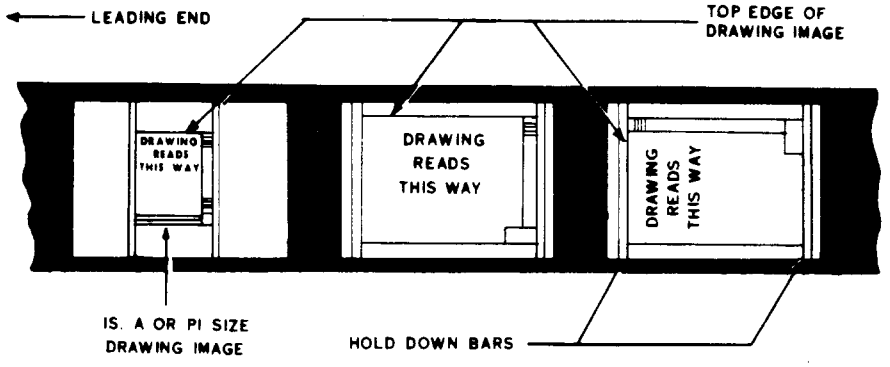


Fig 14—Single-Frame Drawing Image Orientation

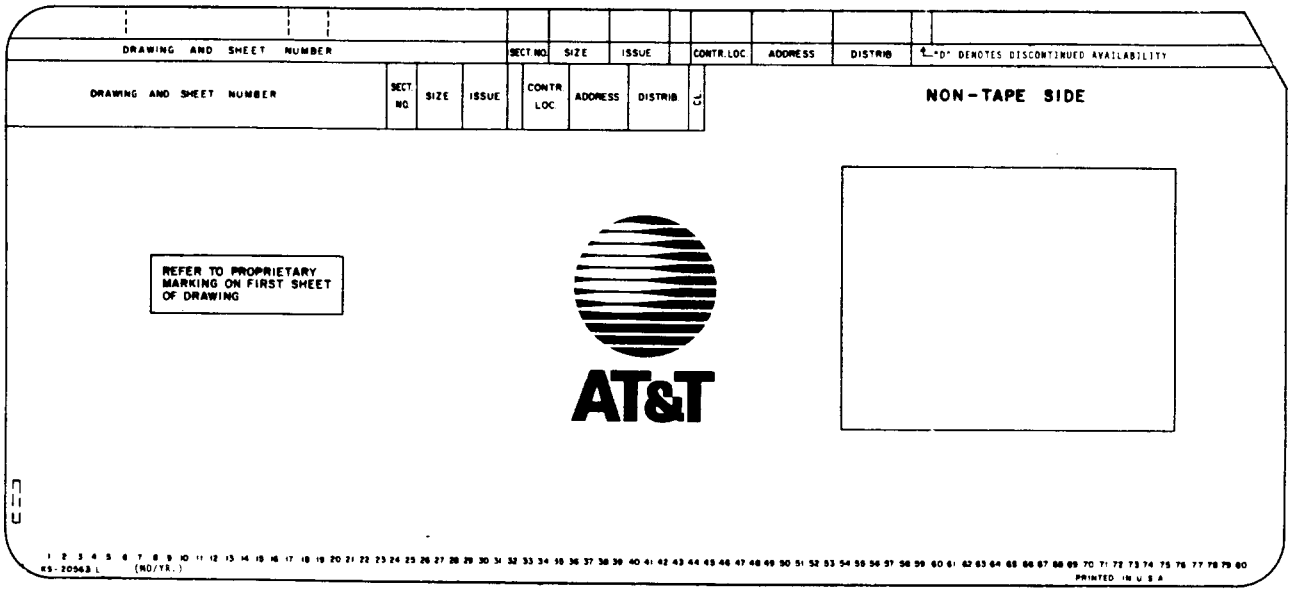


Fig 15—KS-20563 Aperture Card (Green)

REQUIREMENTS

5.02 All original silver microfilm shall have negative or "negative-appearing" images (light lines on a dark background) and shall be free of scratches, foreign material, stains, or defects which make drawing information illegible. To ensure the permanence of the microfilm image, the residual thiosulphate content of the exposed and processed silver microfilm shall not exceed 0.775 microgram per square centimeter of film. The processed microfilm shall be inspected in accordance with AT&T 006-110-500. When outside processing is used, periodic checks should be made to ensure that requirements are met.

Note: Silver microfilm generated on a COM device requires full reversal processing in order to obtain the negative-appearing metallic silver image required. A tandem pair of Recordak Prostar processors and strictly controlled processing cycles are one way to produce microfilm of the high quality required.

6. KEYPUNCHING MICROFILM CARDS

GENERAL

6.01 KS-20560 cards (intended for mounting reel microfilm), GN-1861 cards (used when microfilm cannot be provided), and KS-20563 cards (furnished with premounted diazo film) are punched and interpreted with drawing identification information using standard equipment for the purpose. This information may be keypunched and interpreted in master data cards, GN-1865, which are then used to reproduce the information on as many KS-20560, GN-1861, or KS-20563 cards as are needed for distribution. The KS-20563 card is shown in Fig 15.

6.02 Drawing identification information may be obtained from a list prepared from the drawing or from the microfilm image using a reader. When a list is used, the drawings should be listed in the sequence in which they are filmed. If cards with film mounted are machine handled, the equipment should be modified to handle aperture cards without damaging the film. In addition, images should be duplicated before putting KS-20563 cards through punching/interpreting equipment, since dust and prolonged exposure to light may cause damage to unexposed diazo film.

DRAWING IDENTIFICATION INFORMATION

6.03 The information required in columns 1 through 23 to identify each Job T-drawing shall be punched as indicated in Table E; for other than Job T-drawings, it shall be punched as indicated in Table F. The information to be punched in columns 24 through 80 for all drawings is shown below. The referenced subparagraphs (which follow) detail the various information components.

INFORMATION	CARD FIELD COLUMNS	REFERENCE SUBPARAGRAPH
Section Number	24-25	(a)
Size	26-28	(b)
Issue	29-31	(c)
Control Location	33-35	(d)
Address Code	36-39	(e)
Distribution Code	40-43	(f)
Availability Status	44	(g)
For Local Use	45-52	(h)
Aperture	54-77	(i)
For Local Use	78-80	(h)

Where information is not applicable, the fields shall remain blank. Zeros shall be punched only when they are a significant part of the information. Information not requiring all columns of the field allotted for it shall be punched in the right-hand columns, and unused columns shall be to the left of the punched columns for each particular field.

(a) ***Section Number*** (Columns 24 and 25): These columns contain the alphabetic and numeric information identifying the particular section of a multiple-frame drawing. (See paragraph 4.14, Note 1. For exception applying to GN-1861 cards, see paragraph 6.06.)

(b) ***Size*** (Columns 26 through 28): These columns contain the alphabetic and/or numeric information shown on the drawing to indicate size. GN-1861 cards shall not contain drawing size information. (See paragraph 6.06.)

(c) ***Issue*** (Columns 29 through 31): These columns contain the number indicating the issue of the drawing. Suffix letters need not be punched, except where the suffix is L, in which case both the number and letter shall be punched. For drawings refurbished without raising the

TABLE E

KEYPUNCHING DRAWING NUMBER ON JOB T-DRAWINGS AND RECORDS

NUMBER AS SHOWN ON DRAWING OR RECORD	APERTURE CARD COLUMNS																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
T-1234-01				T					1	2	3	4					0	1					
T-1234-257A				T					1	2	3	4				2	5	7				A	
T-1234-01-5870R				T					1	2	3	4	0	1	5	8	7	0				R	
T-1234-01-5870				T					1	2	3	4	0	1	5	8	7	0					
T-1234-01-5870-01 Sh 2				T					1	2	3	4	0	1	5	8	7	0	0	1			2
T-1234-01-5870-01-N Sh 3				T					1	2	3	4	0	1	5	8	7	0	0	1		N	3
T-1234-01-5870-01-NA Sh 2				T					1	2	3	4	0	1	5	8	7	0	0	1	N	A	2
T-1234-01-5870-01-WB Sh 6				T					1	2	3	4	0	1	5	8	7	0	0	1	W	B	6
T-1234-600B-01				T					1	2	3	4			6	0	0	B	0	1			
T-1234-A0-3230				T					1	2	3	4	A	0	3	2	3	0					
T-1234-ORI-A2 Sh 2				T					1	2	3	4				O	R	I	A	2			2
T-1234-OM-619A				T					1	2	3	4	O	M	6	1	9	A					
T-1235-C1-460-03 Sh 4				T					1	2	3	5	C	1		4	6	0	0	3			4

PREFIX — BASE — FLOOR, FRAME MEZZANINE INDICATOR, OR MIDDLE FIX — DASH OR RECORD NAME — EXPANDED DASH OR SERIAL NUMBER — SUFFIX — SHEET

TABLE F

KEYPUNCHING DRAWING NUMBER ON OTHER THAN JOB T-DRAWINGS

NUMBER AS SHOWN ON DRAWING	APERTURE CARD COLUMNS																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CCED-12345-01 Sh 5	C	C	E	D				1	2	3	4	5				0	1					5	
CPSM-LC408 Sh 1	C	P	S	M					L	C	4	0		B								1	
ED-12346-01-2			E	D				1	2	3	4	6				0	1					2	
ED-12345-11			E	D				1	2	3	4	5				1	1						
ED-12345-108 Sh 2			E	D				1	2	3	4	5			1	0	8					2	
H-816-042 Sh 2				H						8	1	6			0	4	2					2	
J61563AA-2 Sh 2				J				6	1	5	6	3	A	A			2					2	
LA-553740-2			L	A			5	5	3	7	4	0										2	
840101018 to 840101125 (COMCODE)				8	4	0	1	0	1	0	1	8		1	1	2	5						
L-9XX55-01								9	X	X	5	5				0	1						
P-12B515 to 518				P			1	2	B	5	1	5			5	1	8						
PF-1H123-01-A12			P	F				1	H	1	2	3				0	1	A			1	2	
SAM-30000CNSH		S	A	M				3	0	0	0	0	C	N		S	H						
SDM-12345-01		S	D	M				1	2	3	4	5				0	1						
SD-12345-01-1			S	D				1	2	3	4	5				0	1					1	
SD-12345-01 Sh A			S	D				1	2	3	4	5				0	1					A	
SD-1G057-01-A1			S	D				1	G	0	5	7				0	1	A				1	
SD-1A123-01-A128			S	D				1	A	1	2	3				0	1	A		1	2	8	
SD-1A123-01-A128B			S	D				1	A	1	2	3				0	1	A		1	2	8	B
SD-12345-0101			S	D				1	2	3	4	5				0	1					1	
SD-1A579-01-B123AA			S	D				1	A	5	7	9				0	1	B	1	2	3	A	A
SD-1E332-01-GA101			S	D				1	E	3	3	2				0	1	G	A	1	0	1	
SD-1A468-01-J124A			S	D				1	A	4	6	8				0	1	J		1	2	4	A
T-1A123-108 Sh A123				T				1	A	1	2	3			1	0	8	A		1	2	3	
T-12345-09A Sh 1				T				1	2	3	4	5			0	9	A					1	
T-12345-30 Sh A3				T				1	2	3	4	5				3	0	A				3	
T-123456				T			1	2	3	4	5	6											
T-12345-11 Sh A1 (See Note.)				T	*			1	2	3	4	5				1	1	A				1	

PREFIX — BASE — SUBCODE OR FAMILY — SUFFIX OR CATEGORY — SECTION — SHEET — INSERTED SHEET

Note: The asterisk is punched in column 5 to indicate a computer-generated wiring drawing.

TABLE G
CONTROL LOCATIONS AND SYMBOLS

LOCATION	SYMBOL
Allentown	AL
Atlanta	AK
Baltimore	BA
Burlington	BU
Chester	CH
Clark	CK
Columbus	CB
Dallas	DJ
Denver	DR
Engineering Centers:	
Central (Chicago)	CE
Eastern (Cockeysville)	EA
Mountain-Northwestern (Aurora)	MR
Northeastern (Newark)	NE
Pacific (Sunnyvale)	PC
Southern (Atlanta)	SO
Southwestern (Ballwin, MO)	SW
Freehold	FJ
Guilford Center	GC
Hawthorne	HW
Holmdel	HO
Indianapolis	IN
Indian Hill	IH
Kansas City	KC
Lincroft	LZ
Lisle	LE
Merrimack Valley	MV
Middletown	MT
Montgomery	MG
Nashville	NV
Newark	NK
New River	NR
North Carolina	NC
Northwestern	NW
Oklahoma City	OC
Omaha	OH
Parsippany	PK
Phoenix	PH, PX
Reading	RD
Red Hill	HR
Richmond	RG
Shreveport	SP
Springfield	SI
Union	PS
Whippany	WH
White Sands	WS
Winston Salem, Lexington Rd.	WL
Winston Salem, Reynolda Rd.	WR
Teletype Corporation	TT

issue, the issue number shall be preceded by an X, which will appear in column 29 or 30, depending upon whether the current issue has one or two digits. Microfilm cards of certain Job T-drawings will have the letters RTN in columns 29 through 31 to identify the cards that should be retained at customer (user) sites on a permanent basis. GN-1861 cards, used to indicate the unavailability of microfilm due to the replacement of the drawing, will have the letters RPL in columns 29 through 31. (See paragraph 6.06.)

(d) ***Control Location*** (Columns 33 through 35): The control location for a drawing is indicated by a combination of alphabetic and numeric characters. Table G shows the alphabetic characters, which denote manufacturing and design control locations. Table H shows the numeric characters, which denote the particular organization involved. For example, HO7 would indicate that the drawing is controlled by the Consumer Products organization in Holmdel, New Jersey.

(e) ***Address Code*** (Columns 36 through 39): These columns are reserved for address code. On Job T-drawings, the address code will be punched using a 3-digit numeric code in columns 36 through 38.

(f) ***Distribution Code*** (Columns 40 through 43): These columns contain the alphabetic and numeric information indicating the distribution of a particular standard drawing.

TABLE H

ORGANIZATION SYMBOLS

ORGANIZATION	SYMBOL
Engineer of Manufacture (E of M) or equivalent	1
Machine & Tool Design	2
Test Set Design	3
Equipment Engineering	4
Local File Locations	5
Information Systems	6
Consumer Products	7
Bell Laboratories	9

The information punched in these columns shall appear only on the first card of each drawing. These columns may also be used for address code information on Job T-drawings.

(g) ***Status Designation*** (Column 44): When a product is rerated Discontinued Availability (DA), a character D shall be punched in column 44.

(h) ***For Local Use***

(1) (Columns 45 through 52): These columns may be used for punching information required locally. The information punched in these columns shall appear only on the microfilm cards produced for local use and shall not appear on microfilm or master data cards furnished to other locations. This will permit receiving locations to use these columns for their own local use information.

(2) (Columns 78 through 80): These columns, which are reserved for use by locations ***producing*** microfilm cards, may be used for punching information required locally. Since these columns are not intended for use by locations receiving cards, this information may appear on microfilm cards and master data cards furnished to other locations. (See paragraph 6.06 for exceptions applying to GN-1861 cards.)

(i) ***Aperture*** (Columns 54 through 77): These columns shall not be used for keypunching. (See paragraph 6.06 for exceptions applying to GN-1861 cards.)

REPRODUCING

6.04 Keypunching on master microfilm cards and those intended for distribution shall be reproduced on a direct relationship basis (80 for 80), except for local use information, which should be suppressed as noted in paragraph 6.03(h)..

INTERPRETING

6.05 Cards shall be interpreted on an 80/60 basis (printed on a 60-character-per-line interpreter on line number one, top of card) as follows:

PUNCHING COLUMNS	INTERPRETER BARS
1-52	1-52
*53-57	*53-57
78	58
79	59
80	60

*Applicable to GN-1861 cards only.

GN-1861 CARD

6.06 The red microfilm record card (GN-1861) is used to indicate that microfilm of a drawing is not available. Only one GN-1861 card need be prepared for multisheet drawings. The reason microfilm is not available is punched in columns 79 and 80 using the numerical code on the face of the card. (See Fig 2.) Where the drawing is replaced, the following supplementary information should be punched and interpreted on the GN-1861 card:

(a) The letters RPL (meaning ***replaced***) should be punched in columns 29 through 31 rather than the drawing issue.

(b) The number(s) of the replacing drawing(s) should be punched in columns 44 through 57 beginning with column 44 and proceeding towards the right. For example, a drawing replaced by J12345A, B, C, and D should have J12345A entered in columns 44 through 50 and the B, C, D subcodes entered in columns 52, 54, and 56.

(c) If the allotted card field columns on one card are not sufficient to accommodate all necessary replacement information, additional GN-1861 cards should be used. When more than one card is used, each should be identified by punching a combination of a letter followed by a number in columns 24 and 25. The letter indicates the card, and the number indicates the quantity of cards furnished for complete information. For example, D5 designates the fourth card in a set of five required for complete replacement information.

Where code 7 "**FOR REASON SHOWN**" applies to a drawing, the reason should be punched in columns 44 through 57. If the reason cannot be accommodated on one card, additional GN-1861 cards should be used and identified as specified in (c) above.

GN-1867 CARD

6.07 A temporary record card (GN-1867) should be distributed in place of a microfilm card to avoid delaying the distribution of a standard drawing or Job T-drawing when microfilm of one or more sheets of the drawing is temporarily delayed. One GN-1867 card should be distributed for each sheet that is delayed and the issue number on the card should be the issue that applies to the delayed microfilm.

7. MOUNTING MICROFILM

7.01 ***Requirements***: Processed silver microfilm shall be mounted in KS-20560 aperture cards as follows:

(a) Film must hang straight before mounting. (See Fig 16.) Rewind the film with the curl reversed if any curl is present.

(b) 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 a minimum of 1.568 inches and a maximum of 1.588 inches from the right-hand edge of the card. (AT&T 006-110-500 covers the inspection for this requirement.)

(c) Microfilm mounted in aperture cards shall be right-reading, and the top or left edge of the drawing image shall be nearest the top or left edge of the aperture when the printed side of the card is viewed. (See paragraph 4.16.)

(d) The drawing identification information that appears on a card shall agree with the drawing identification of the image mounted in the aperture.

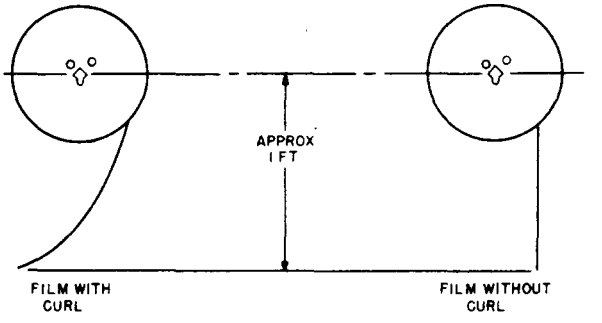


Fig 16—Checking Reel Film for Curl