91604500

CONTROL DATA CORPORATION

OCR
MEDIA MANUAL

CONTROL DATA®
955/959
PAGE AND DOCUMENT READER

REVISION RECORD

REVISION	DESCRIPTION
A	Manual released. This manual supersedes all other editions.
9/30/74	
B	Manual includes latest media information and supersedes all other editions.
3/20/75	
C	Includes corrections to text and additions or corrections to several appendices
4/29/76	

Publication No.
91604500

Address comments concerning this manual to:

Control Data Corporation
Washington Area Operations
1455 Research Boulevard
Rockville, Maryland 20850

or use Comment Sheet in the back of this manual.

LIST OF EFFECTIVE PAGES

New features, as well as changes, deletions, and additions to information in this manual are indicated by bars in the margins or by a dot near the page number if the entire page is affected. A bar by the page number indicates a change in pagination rather than in content.

TITLE / PAGE NO.	REV	SFC†
Cover	-	
Title Page	-	
ii	C	
iii	C	
iv	C	
v/vi	C	
vii	C	
viii	C	
ix	C	
x	C	
1-1	A	
2-1	A	
2-2	A	
2-3	A	
2-4	B	
2-5	B	
2-6	A	
2-7	A	
2-8	A	
2-9	A	
2-10	B	
2-11	B	
2-12	A	
2-13	B	
2-14	A	
2-15	A	

TITLE/PAGE NO.	REV	SFC†
2-16	A	
2-17	A	
2-18	B	
2-19	A	
2-20	A	
2-21	A	
2-22	A	
3-1	A	
3-2	B	
3-3	A	
3-4	A	
3-5	B	
3-6	B	
3-7	C	
3-8	A	
3-9	A	
3-10	A	
3-11	A	
3-12	A	
3-13	B	
4-1	B	
4-2	B	
4-3	B	
4-4	B	
4-5	A	
4-6	B	

TITLE / PAGE NO.	REV	SFC†
5-1	A	
5-2	A	
5-3	B	
5-4	A	
5-5	A	
5-6	A	
5-7	B	
5-8	B	
5-9	A	
5-10	A	
5-11	B	
6-1	B	
6-2	B	
6-3	A	
7-1	A	
7-2	A	
7-3	B	
7-4	A	
7-5	A	
A-1	A	
B-1	C	
B-2	C	
C-1	C	
C-2	A	
D-1	A	
D-2	A	

TITLE/PAGE NO.	REV	SFC†
E-1	B	
E-2	B	
F-1	A	
F-2	B	
F-3	B	
G-1	A	
G-2	A	
G-3	A	
H-1	A	
H-2	A	
H-3	A	
H-4	A	
H-5	A	
H-6	A	
H-7	A	
H-8	A	
H-9	A	
H-10	A	
H-11	A	
H-12	A	
H-13	A	
H-14	A	
I-1	A	
I-1	A	
I-3	A	
I-4	A	

†SFC Software Feature Change

LIST OF EFFECTIVE PAGES (CONT'D)

TITLE/PAGE NO.	REV	SFC†	TITLE/PAGE NO.	REV	SFC†	TITLE/PAGE NO.	REV	SFC†	TITLE/PAGE NO.	REV	SFC†
I-5	A										
I-6	A										
I-7	A										
I-8	A										
I-9	A										
J-1	A										
K-1	C										
Index-1	A										
Index-2	B										
Index-3	A										
Cmt Sheet	-										
Return Env	-										
Back Cover	-										

†SFC Software Feature Change

PREFACE

Certain products mentioned in the 955/959 Media Manual are the trademark property of manufacturers other than Control Data Corporation. An acknowledgment is made in the following listing, and such products are not re-identified in the text by the trademark ® symbol.

Item Identification	Manufacturer
Mylar®	E. I. duPont de Nemours
Selectric ®	International Business Machines, Inc.
PMS®	Pantone Corporation
Wratten ®	Eastman Kodak Co.

Data presented in this manual is intended to provide guidance to users concerned with forms design and printing. Control Data assumes no liability for forms design errors resulting from misinterpretation of information in this manual. OCR personnel at this facility will evaluate samples of user forms and certify their applicability for use with specified readers. The service is available at no cost through the user's Control Data marketing representative.

The user of any Control Data media manual should contact the Control Data marketing representative to assure the latest released manual is being used. Updates are undertaken whenever it is determined a significant change is required.

DISCLAIMER

This product is intended for use only as described in this manual. Control Data cannot be responsible for the proper functioning of undefined parameters.

CONTENTS

APPENDIXES

FIGURES

TABLES

CONTENTS

SECTION 1

INTRODUCTION

This media manual includes all input media specifications pertinent to users of the Control Data® 955/959 OCR Page and Document Reader. The manual supersedes the 955 OCR Media Manual, Publication No. 60216102 A.

Detailed specifications are provided for all factors relating specifically to optimum utilization of the 955/959, including paper and print quality, evaluation of input media, and recommendation for design and use of documents.

NOTE

The specifications and guidelines in this manual are subject to change without notice. However, current revision levels of media manuals may be obtained from the OCR Systems Bulletin, published every two months, and sent to Control Data personnel and other users of Control Data OCR equipment.

This manual adheres, where applicable, to standards set forth in the "American National Standard Character Set for Optical Character Recognition", (American National Standards Institute, ANSI), ANSI X3.17-1974.

Mechanical devices, such as typewriters, high-speed line printers, and imprinters are regularly evaluated by qualified OCR personnel to establish acceptability as peripheral input/output devices. Results of the evaluations are contained in the appendices.

General procedures governing submission of a product for evaluation are defined in Appendix A. For information not provided, or answers to any media questions relating to the 955/959, contact a CDC Marketing representative or write to:

Control Data Corporation
Washington Area Operations
Manager, OCR Standard Products
1455 Research Boulevard
Rockville, Maryland 20850

SECTION 2

FORMS DESIGN

GENERAL DESIGN CONSIDERATIONS

Design and preparation of documents to be read by the 955/959 is simplified by:

- The use of media evaluation aids.
- A knowledge of general form design requirements.
- An analysis of all data required on a document and the data needed to be read into the 955/959.
- Realizing the best document layout for a given application considers both human factors and 955/959 machine capabilities.

In addition to the preceding requirements, the forms designer must consider paper and print specifications (defined in sections 4 and 5), costs, existing source document formats, practical storage capabilities, and interface between designer and user.

Forms costs include costs of training personnel, postal costs (consideration of weight and size factors if the form will be routinely involved in mailing), and costs incurred if nonstandard sized forms are selected. (Refer to Table 2-1 for standard form sizes.) Additional factors might include multicolor printing costs and requirements for customized forms design.

The design of a document so that it is similar to an existing source document (for customized design) is influenced by several factors:

- Document throughput, or processing rate.
- Reduced personnel retraining.
- Minimum time expended on the document design.

The user's ultimate selection of the document represents a compromise among general design considerations and forms specifications.

The storage of documents is dependent upon the available storage capacity, the method of storage, constraints imposed by the application, and environmental factors such as temperature, humidity, and cleanliness of the storage area.

Close communication between the forms designer and the user's programming personnel is essential, and increases the likelihood that proper formatting and sound programming procedures will be implemented. Control Data's OCR analysts should be consulted for any new OCR application development work. The OCR analysts will work closely with the user's personnel to develop an optimum application design.

MEDIA EVALUATION AIDS

Forms designers, OCR programmers, and analysts should have access to the following tools useful in the design of documents and diagnosis of media problems:

- Comparator
- Paper gauge micrometer
- Form Design Aid (ruler)
- Filters

COMPARATOR

A comparator is a hand-held magnifying device to which is affixed a graphic arts magnetic ink character recognition (MICR) or OCR reticle. Examples of features that can be viewed with a 6X or 12X comparator include: horizontal character spacing, character skew, presence of dirt and wood pulp, stroke widths, and, to some extent, print quality because the comparator allows character valleys, voids, peaks, and smudges to be more readily discerned.

FORM DESIGN AID

The Control Data form design aid, (see Figure 2-1) is constructed of clear plastic and features sharp, black calibrations in a variety of scales to simplify the design and examination of a form. The typical checks that can be performed consist of: spacing identifier or line locator, margin sizes, horizontal spacing of characters across the width of a form, vertical spacing and correct positioning of field separators (center of a character space), and line locators on a preprinted form. The callouts on Figure 2-1 enable the following determinations:

(1) The indicated scale measures vertical line spacing, at six lines per inch.

(2) The longest mark indicated is placed at the top edge of the document. Then the number of available lines on the document, or the location of a particular line, can be read from either the octal or decimal scale.

(3) The indicated scale measures read coordinates.

(4) The scale indicated measures character spacing (at 10 characters per inch).

(5) Indicates the center of standard width (8, 8.5, or 11-inch) form when the appropriate marking is placed at the edge of the form, facilitating reading of left and right coordinates.

The Form Design Aid, Publication No. 48402800, may be purchased through:

Control Data Corporation
Literature and Distribution Services
8100 34th Avenue South
Minneapolis, Minnesota 55440

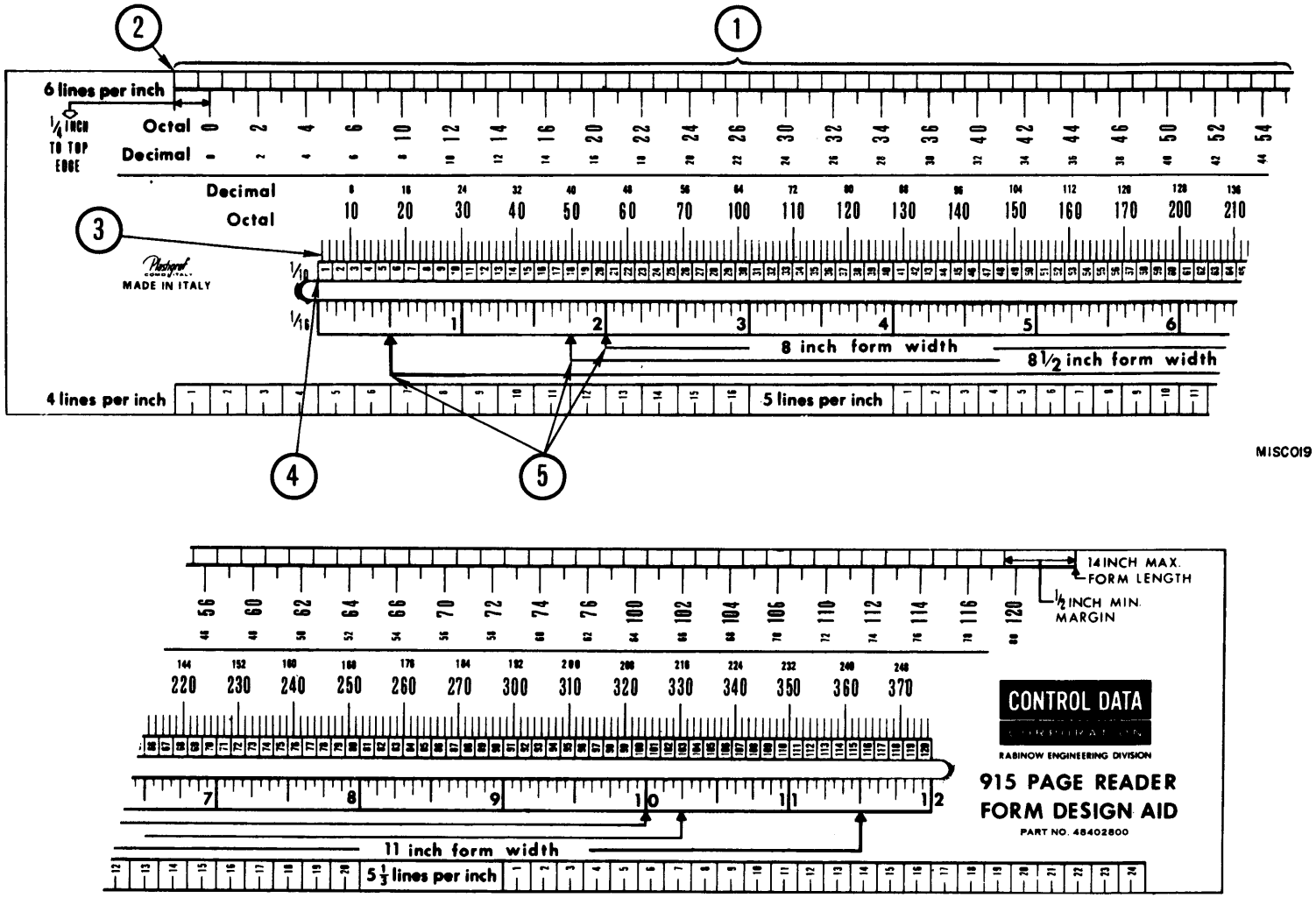


Figure 2-1. Form Design Aid (Reduced - Not to Scale)

PAPER GAUGE MICROMETER

A paper gauge micrometer is used to measure the thickness, or caliper, of paper. Relatively inexpensive micrometers, accurate to within 0.001 inch (0.02 mm) are readily available. A correlation can be made between the paper's thickness and its approximate weight. (See Caliper in section 4).

FILTERS

Wratten gelatin filters, manufactured by Kodak, have proved quite accurate in determining whether a nonread color will be invisible to the 955/959. The filter for checking PMS (Pantone Matching System) No. 304 (light blue) is No. 48 in the Wratten group. To determine if a nonread color is invisible, hold the filter about 1 foot (300 mm) from the document being evaluated. If the color is either invisible or barely visible when viewed through the filter, it is probably invisible to the 955/959.

GENERAL FORMS DESIGN REQUIREMENTS

The following factors must be considered when relating document design to the characteristics of the 955/959 and the printing devices used to produce input media:

- Dimensional requirements
- Standard form size
- Margins (with and without marginal punching)
- Doubles detection
- Line spacing considerations
- Line locating
- Fields and field separators
- Nonread colors
- Error corrections
- Input device limitations
- Other printing/writing on OCR documents

DIMENSIONAL REQUIREMENTS

Although the length of a document may range from 3.250 inches (82.55 mm) to 12.625 inches (325.68 mm) and the width from 4.875 inches (123.83 mm) to 12.000 inches (304.80 mm)*, the practical need of meeting the aspect ratio requirement prohibits the adoption of documents with lengths close to the minimum, and widths approaching the maximum. For example, applying the aspect ratio formula (L/W) to a document with a length (L) of 3.5 inches and a width (W) of 10 inches would yield an unacceptable 0.35 aspect ratio. Document dimensions indicated in Figure 2-2 would fall well within the acceptable range.

If the document fails to meet any of the following criteria, submit samples to CDC for evaluation, to verify readability.

- Aspect ratio greater than 0.64.
- Substance weight at least 18 pounds and not greater than 43 pounds.

*Readers installed before June, 1972 are restricted, in regard to document width, to a maximum of 11.125 inches (282.580 mm).

- Caliper at least 0.003 inches {0.07 mm} and not greater than 0.007 inches {0.17 mm}.
- Grain direction coinciding with feeding direction for documents greater than 6.5 inches {165.15 mm} long.

NOTE

Standard tab cards {3.250 x 7.375 inches} are an approved exception to the aspect ratio requirement.

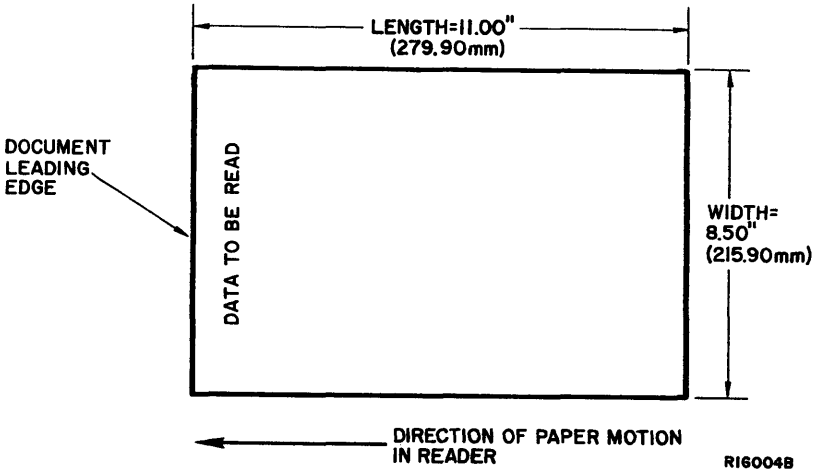


Figure 2-2. A Dimensionally Acceptable Document

STANDARD FORM SIZES

The use of standard form sizes reduces cost and delivery time and makes possible closer registration of OCR forms. Three standard size cylinders are generally used on rotary printing presses: 22 inches {558.80 mm}, 17 inches {431.80 mm} and 14 inches {355.60 mm}. Standard form sizes are the lengths, or any of the submultiples, as shown in Table 2-1. Selection of the form width should be within the limits established by the aspect ratio. Many document vendors can provide assistance on OCR form design and information regarding document procurement procedures.

TABLE 2-1. STANDARD PRESS CYLINDER/FORM SIZES

Press Cylinder Sizes		Standard Document Sizes {Length}		Incremental Line Spacing {Lines/inch}	
Inches	mm	Inches	mm	6	8
22	558.500				
		11.000	279.400	x	x
		7.333	186.267	x	
		5.500	139.700	x	x
		3.667	93.134	x	
17	431.800				
		8.500	215.900	x	x
		4.250	107.950		x
14	355.600				
		7.000	177.800	x	x
		3.500	88.900	x	x

A significant factor in the preparation and use of continuous forms is the size of the vertical spacing increment of the input generating device. For example, typewriters usually print six-lines-per-inch and line printer six- or eight-lines-per-inch. Therefore, if standard size documents are to be used, with data entered by typewriter or line printer, the user has the choices indicated in Table 2-1.

MARGINS

The OCR form margin (see dimensions in Table 2-2) prevents the last line from skewing in the typewriter, because of paper slipping, prevents reading form edge shadows, provides space for using the marking pen, and lends balance to the document.

TABLE 2-2. DOCUMENT MARGIN SPECIFICATIONS (NOMINAL AND ABSOLUTE)

Location on Document	Nominal Minimum
Left/right margin (without marking pen)	0.250 inch (6.35 mm)
Left margin (marking pen at read zone)	0.750 inch* (19.05 mm)
Top margin	0.250 inch** (6.35 mm)
Bottom margin	0.500 inch*** (12.70 mm)

*If marking pen in back of read area, 0.500 inch (12.70 mm) margin.

**If first line of characters is typed, margin should be 0.750 inch (19.05 mm).

***0.250 recommended for card stock.

Margins for perforated or continuous forms with marginal punching are measured from either the inside edge of the holes or from the perforations. A nonread line preprinted around each sheet of a continuous stock from helps maintain minimum margins. Refer to Figure 2-3 for margin specifications, which are shown as shaded areas

DOUBLES DETECTION

A photosensor, adjusted to the intensity of the light passing through a single document prior to the run, makes possible detection of a double document feed. The area sensed is 2.500 inches (63.50 mm) to the left of the document centerline.

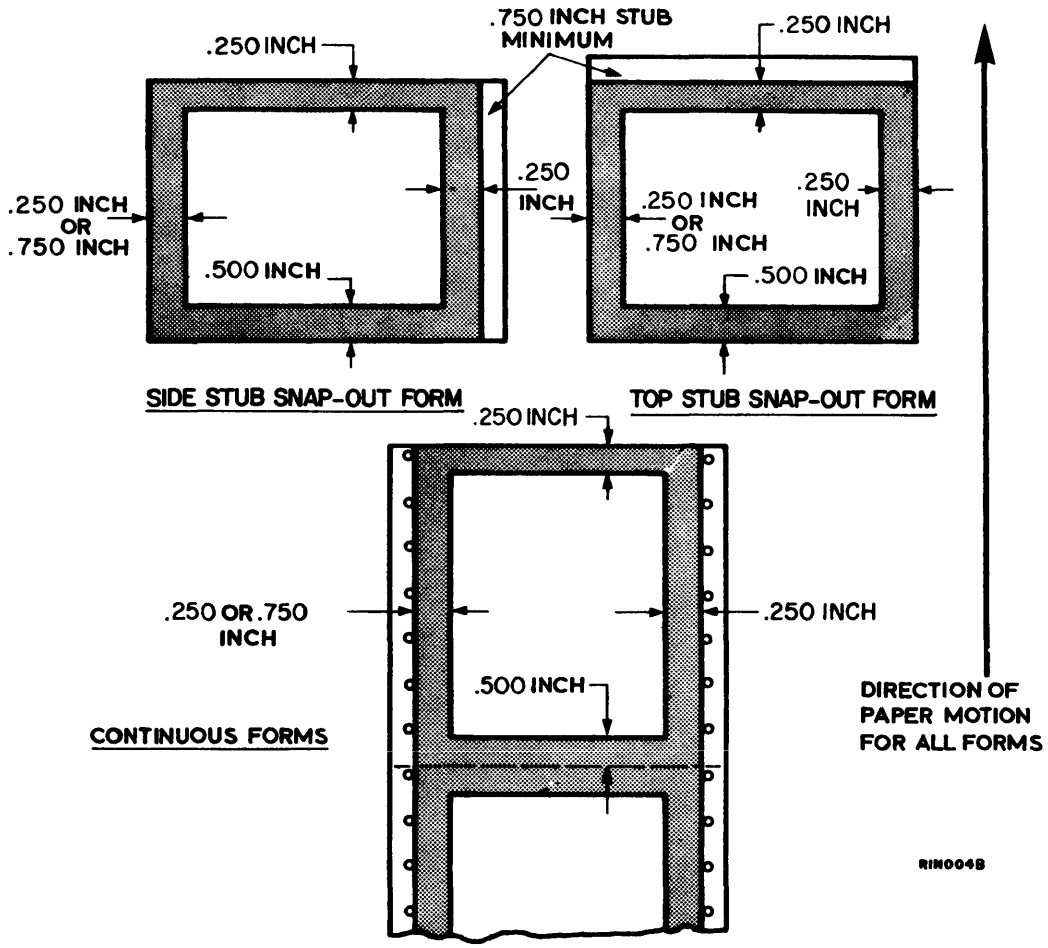


Figure 2-3. Form Margin Specifications

Figure 2-4 illustrates the proper and improper positioning of a document within the sense area. Although data fields can be positioned in this area, company logos or heavy block printing should be avoided.

LINE SPACING CONSIDERATIONS

The design of any form should take into account the mechanical restrictions imposed on line spacing by the 955/959 and the generating input device. These restrictions are a factor in proper programming of the 955/959 and include consideration of the stepping differences between the 955/959 and the generating input device.

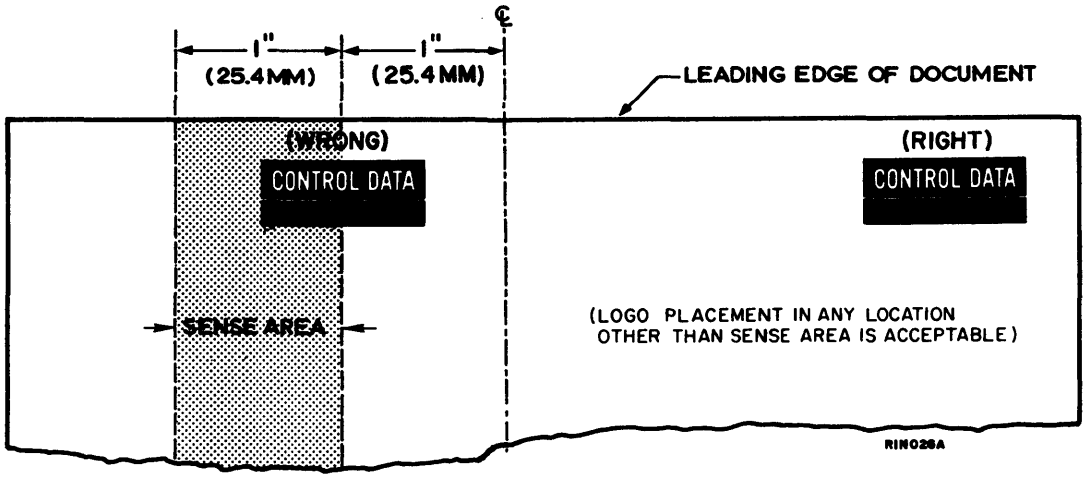


Figure 2-4. Logo Placement to Avoid False Doubles Detection

For reference in regard to line spacing, Table 2-3 lists spacing for 6, 5-1/3, 5, 4, and 3 lines per inch.

TABLE 2-3. LINE SPACING

Typewriter Spacing (lines/inch)	Distance Spaced (inch)
6	0.1667 (4.23 mm)
5-1/3	0.1875 (4.76 mm)
5	0.2000 (5.08 mm)
4	0.2500 (6.35 mm)
3	0.3334 (8.46 mm)

In Figure 2-5 the 955/959 reads the first line and then slews 2.5 inches (63.50 mm) before reading the second line. Slewing is the continuous advancement of a form and is accomplished by programmed instructions. By utilizing the slewing feature, the 955/959 can advance forms over large spaces in a single step which increases throughput. Lines are defined in the user program as equal increments of thirds, fourths, or sixths of an inch. Since the 955/959 slews in multiples of these increments, no stepping errors occur. Documents may be slewed a maximum of 7.5 inches (190.50 mm) with a line position accuracy of ±0.02 inch (±0.60 mm).

LINE LOCATING

Line locating may be accomplished without the aid of a physical line locator, if adequate program instructions are utilized. The document is slewed until the line to be read is centered within the scan zone by the 955/959.

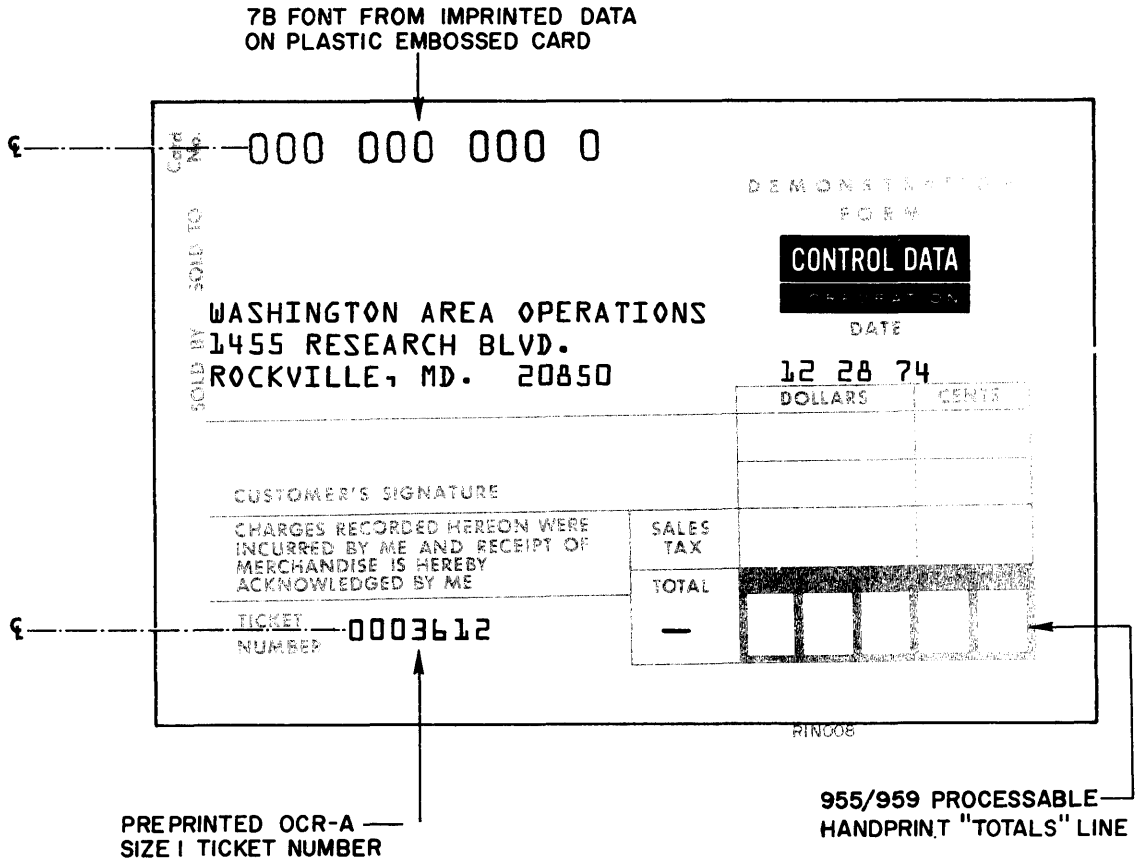


Figure 2-5. 955/959 Slewing to Eliminate Stepping Error

Since the use of a physical, or preprinted, line locator requires special program instructions, a larger amount of throughput is achieved when the initial data field to be read functions as a line locator. Refer to Table 2-3 for line locator specifications.

FIELDS AND FIELD SEPARATORS

A field is a portion of a document containing one or more characters. The field is treated as a single unit of information. Field separators, which are used to separate successive fields, are limited to the dimensions listed in Table 2-4. If the document is the tabular design type, as shown in Figure H-3 in Appendix H, field separators may run the length of the tabular areas on the document.

TABLE 2-4. FIELD SEPARATOR SPECIFICATIONS

Font Size	Strokewidth	Normal Height Ranges	Mark Read Height Ranges
I	Minimum 0.010 inch Nominal 0.016 inch* Maximum 0.022 inch*	Minimum 0.156 inch Nominal 0.174 inch** Maximum 0.192 inch**	Minimum 0.180 inch*** Maximum 0.192 inch

*Recommended for normal use.

**The field separator must not extend into data fields above or below, since it may interfere with the proper reading of those fields. The exception is field separators that extend the length of the document.

***The larger minimum mark field separator height is required so the penciled marks are not read by the 955/959 as field separators.

NOTE

For handprint, see comments on field marks in section 3.

NONREAD COLORS

Refer to NONREAD COLORS in section 5, page 5-1.

CLEAR BAND

Information not printed in a nonread color must be excluded from the clear band, which is the blank space above and below the data line being read. The dimensions of the clear band are shown in Table 2-5.

TABLE 2-5. CLEAR BAND DIMENSIONS

Font	Scan 2	Scan 3
Size I	0.210 inch (5.33 mm)	0.337 inch (8.55 mm)
Size IV	0.316 inch (8.02 mm)	--- Not Used ---
Handprint	--- Not Used ---	0.440 inch (11.11 mm)

For definitions of SCAN 2 and SCAN 3 see paragraph titled Vertical Character Displacement.

ERROR CORRECTIONS

Preprinted forms, designed for typewriter applications, should provide extra character spaces in each field to facilitate corrections. Generally, one extra space for each group of seven to 10 data characters should be provided.

Human factors should also be given consideration when it comes to errors. For example, the complexity of the data being used should be weighed when frequent errors occur.

In case of an error, a cancellation may be accomplished by overtyping the error character with a cancel character (*, or ■). An entire line or field can be deleted by drawing or typing a line delete symbol (————) through the first eight characters (minimum 0.5-inch length). Use this standard line delete symbol, rather than either of the cancel characters, to cancel a field separator.

Use of the hand-drawn line delete symbol is allowed if the line does not extend above and/or below the top and bottom boundaries of the full-height characters on the line being deleted.

Handprint error corrections may be found in Appendix H. Journal Tape error corrections may be referred to in section 6.

The first of the two examples below of hand-drawn line delete is acceptable. The second example, which violates the extension concept, is unacceptable.

ACCEPTABLE

~~ABCDEFGHI~~

NOT ACCEPTABLE

~~ABCDEFGHI~~

TABLE 2-6. LINE DELETE SPECIFICATION

Stroke Width	Length
Minimum - 0.012 inch (0.3048 mm) Nominal - 0.018 inch (0.4572 mm) Maximum - 0.024 inch (0.6096 mm)	Minimum - 0.500 inch (12.70 mm) Maximum - No Limit

INPUT DEVICE LIMITATIONS

Typewriter Limitations

Two built-in limitations, which restrict the position of data typed on a form, exist on most typewriters.

1. The distance from the print point on the platen (roller), to the point at which the paper bail rollers grip the paper, varies from 0.50 inch (12.70 mm) to 0.75 inch (19.05 mm). When designing a document, a provision should be made to locate the first dataline about six lines (1 inch) from the leading edge of the form.

2. Data should not be typed on the last 0.50 inch of a form because the final 0.50 inch is needed for a secure grip on the paper by the typewriter. Therefore, a nonread mark is placed 0.75 inch (19.05 mm) from the bottom of the form to indicate the location of the last read line. That procedure will aid in avoiding paper slippage and skewing of datalines.

Line Printer Limitations

Many EDP line printers generate turnaround documents which are later processed on OCR equipment. The line printers have limitations which include:

1. Line printers utilized for printing OCR documents require regular professional maintenance. This is because OCR devices require high print quality, and line printers normally operate at exceptionally high speeds that tend to degrade quality.

2. Printer ribbons, both fabric and film, are used with the line printers to produce OCR documents. However, printer ribbons must be replaced frequently to produce quality OCR print.

3. If drum printers are not properly maintained, they may produce lines of data characterized by a pronounced "wave" effect. Proper care is necessary to ensure that adjacent horizontal character misalignment does not exceed the print specifications in section 5.

4. Train, or chain, printers, if not properly maintained, may produce characters featuring faded segments or alternate very heavy and very light ink impressions. Additional errors may include ghosting and framing of characters.

OCR users may find discussions with the responsible line printer vendors helpful in preparing and maintaining line printer devices for OCR turnaround document applications.

Since large volumes of line printed documents are usually prepared in a single run, it is advisable to ensure that operations personnel periodically check alignment of the print lines on OCR documents and visually check print quality.

One method of providing a quick visual check of forms alignment is to preprint a character on the document to be read, outside the areas to be read by the 955/959. Then instruct the line printer routine that is in the user program to overstroke the preprinted character. The user then realigns the documents if the printed and preprinted characters do not exactly overlay. The character "H" is recommended for the test because it easily provides a check for both horizontal and vertical alignment.

Pencil Limitations

See information under MARK READ FORMS DESIGN, as well as HANDPRINT FORMS DESIGN in section 3.

Imprinter Limitations

Most imprinters used in conjunction with plastic embossed cards are limited in the document {format} sizes that can be accommodated. The equivalent of tabulating card sizes, both the 51-column {3.250 inches x 4.875 inches} and 80-column {3.255 inches x 7.375 inches} formats, are most frequently used in imprinting applications.

Variable amount printers normally print up to seven digits. The variable amount field is positioned and imprinted on the same horizontal centerline as the account or customer number imprinted from an embossed plastic card.

Although the OCR read line consists of a single dataline, imprinters are available that can accommodate multiple plastic embossed cards and which imprint two OCR datalines. The plastic embossed cards used in conjunction with OCR applications use OCR-A Size IV or 7B fonts.

Prior to changing formset thickness on imprinting applications, contact the imprinter vendor because roller adjustments on the device may be necessary to ensure compatability and good print quality. Normally, imprinters are preset to accommodate a particular formset thickness before shipment to the user's site.

Detailed imprinter information is available from the imprinter manufacturing facilities of Control Data Corporation.

TYPES OF FORMS

Five types of forms, printed on individual cut sheets or continuous rolls, may be utilized with the 955/959. They include free forms, custom, stock, shelf, and multicolor preprinted forms. The selection of a particular type of form is influenced by the amount of data required, the possibility of modifying existing input generating devices {for example, equipping typewriters with pin feed platens}, intended use of the forms {whether internal or external}, and the volume, frequency, and mode of input.

FREE FORM

A free, or stock, form is characterized by the capability of the user to arrange line spacing, margins, placement of header, and record data to suit his specific job requirements, as long as he remains within the limitations of the hardware.

CUSTOM FORM

The custom form is characterized by its detailed and complex preprinted areas, which are in nonread color. This form is most often used for specific customer needs.

STOCK FORM

The stock form is characterized by the minimum amount of preprinted areas.

SHELF FORM

The shelf form is characterized by general preprinted areas, including margins, base or typing lines, and registration marks.

MULTICOLORED PREPRINTED FORM

Multicolored preprinted forms may contain field separators and line locators, in addition to the nonread preprinted typing guides. Handprint and mark read applications require the use of preprinted forms. A special application of the preprinted forms is the snapout form.

SNAP-OUT FORMS

Preprinted snap-out forms, used in six-lines-per-inch applications, are usually separated at the top or side. However, top-stub forms with the grain direction of the paper across the feed path of the 955/959, may cause the documents to roll inside the output hoppers if the paper weight is less than 24 pounds (89 g/m^2). The minimum width of the stub should be 0.75 inch (19.05 mm), in addition to the usual margin requirements for the document.

The snap-out form selected must satisfy the margin requirements and needed distribution. Whenever possible, the original formset should be machine readable and the number of carbon copies limited to three. The perforations between stub and document for either top stub or side stub snap-out forms should permit a clean separation from the leading edge of the document. The left edge of a document is used to align the document in the transport. The same consideration applies to side perforations on continuous forms.

FORM LAYOUT

To determine form layout several points must be considered including the data required, the quantity of data, the expected locations of the various areas on the document and positioning the data to be read by the 955/959. Initially, a rough layout of the document is made, with the data in the general area desired. Most companies producing business forms, including Control Data's Business Products Group in Minneapolis, Minnesota, have form layout charts in sizes compatible with the 955/959. The documents include six or eight faint blue vertical graph lines and 10 horizontal graph lines per inch. Other considerations in form layout include:

- Confining information to be read to as few lines as possible to maximize throughput.
- Providing adequate space for vertical and horizontal character positioning of all fonts used in a dataline. Also ensuring a 0.300-inch (7.62 mm) margin exists between different fonts being read on a single line.

- Providing for the entry of all required information.
- Allowing at least a 0.25-inch (6.35 mm) margin between the leading edge of the document and the data to be read.
- Ensuring all horizontal data lines are parallel to the leading edge of the document and the centerline of the last dataline is at least 0.50 inch (12.70 mm) from the document's bottom edge.
- Respecting the limitations of the input device or devices used to enter data on the document.

FIELDS OF INFORMATION

Following the sketching of the rough layout of the document, the fields of information are drawn. Points to consider when laying out the fields include:

- Establishing optimum line spacing. Three lines per inch, (1) in Figure 2-6, provides flexibility in design and facilitates data entry preparation for typed or handprinted entries.
- Defining the maximum field size. When the 955/959 reads typing, line printing, or journal tape, it reads the input in ANSI OCR-A Size I font which has 10 characters per inch (25.40 mm). The 955/959 will also read other fonts that contain 10 characters per inch. In (2) of Figure 2-6, several fields are required for one example document. The document designer must regulate his fields to provide for all necessary information.
- Laying fields out in rough fashion with buffer (error correction or alignment) spaces provided. (See (3) in Figure 2-6.)
- Establishing buffer areas to ensure separation of typing between adjoining fields. If space permits, an additional buffer area ((6) in figure 2-6) facilitates corrections. The general rule for adding correction space is to include one extra space for each seven to 10 characters in the field.
- Placing a field title ((4) in Figure 2-6) in upper left portion of the field. For legibility, the title should be in six- or seven-point boldface type. The title provides a guide for the typist and user of the document.
- Placing the registration marks (typing guides, (5) in Figure 2-6) adjacent to the left and right fields, either inside or outside the field, on the document. The registration marks should be one character in height (0.10 inch or 2.54 mm) and positioned so the lower registration mark is 0.025 inch (0.635 mm) from the bottom of the field. If the form is properly aligned in the typewriter, the print point of the typewriter should be in exact position in each field every time the document is spaced up.

FIELD SEPARATOR PLACEMENT

After the field is drawn it is delineated by field separators. The field separator, when preprinted for Size I, ((7) in Figure 2-6) should be 0.174 ±0.018 inch (4.420 ±0.457 mm) from the top and bottom edges of the field. The exception is tabular documents, where the field separators extend the full

length of the field. If registration marks (8) in Figure 2-6 are used, the marks should be at the center of the field separator. Field separators are placed in the center of the 0.10-inch (2.54 mm) character space (9) in Figure 2-6. For specifications on field separators in handprint fields, refer to section 3.

Repeat the field design process throughout the document. When the document layout is completed, make a final check of the following points:

- Has all desired information been included?
- All information being scanned - is it arranged in one area on the document or in the fewest possible locations?
- Are field separators positioned properly as shown in (10) in Figure 2-6, or do the field separators conflict with data above or below the field?
- Does the field separator improperly extend into fields above and below, as in (11) in Figure 2-6?

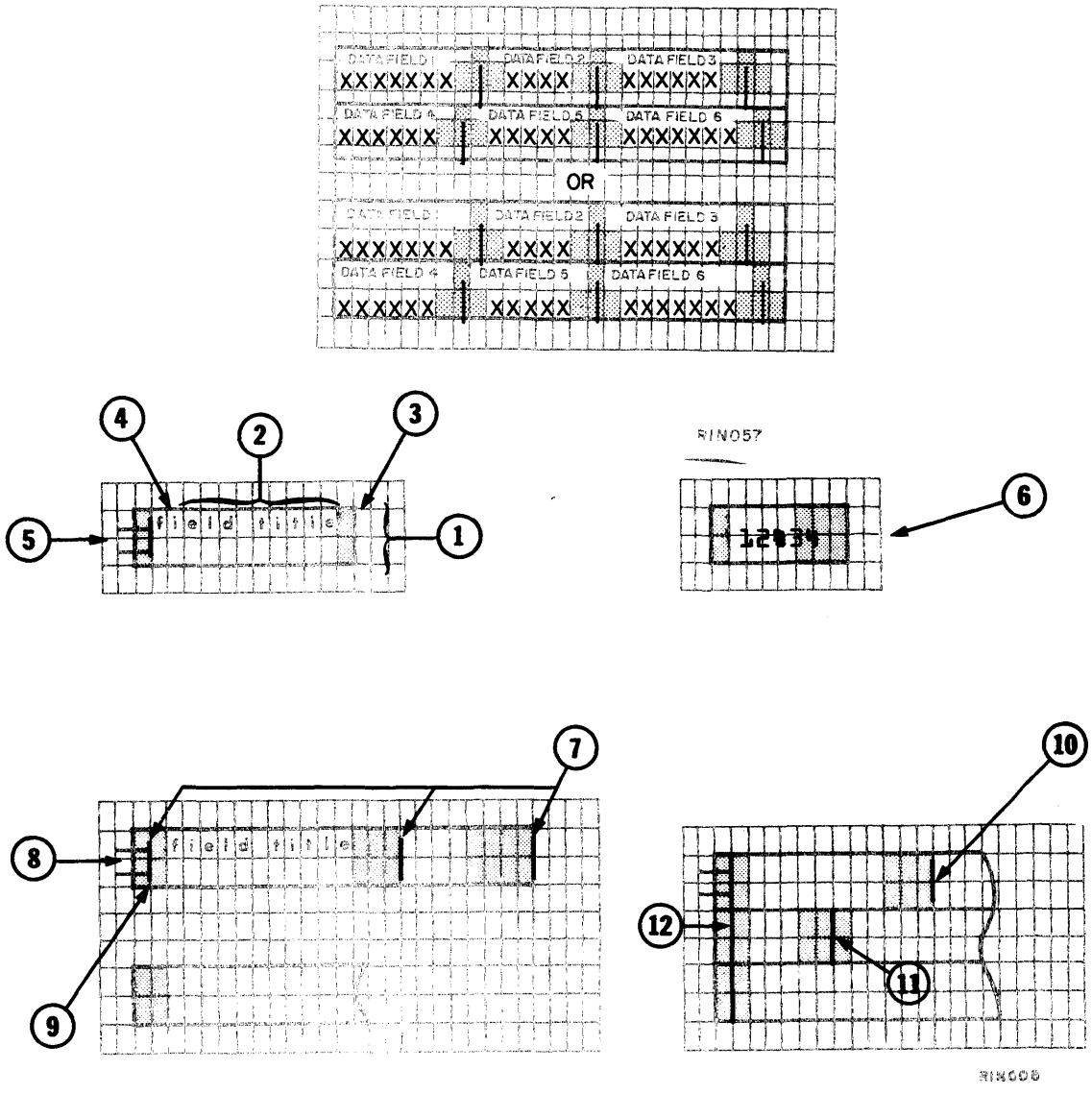


Figure 2-6. Field Separator Positioning as a Factor in Design

- Do field separators common to all fields extend the length of the document, as shown in (12) in Figure 2-6?

- If the positioning of field separators requires setting a great number of tab stops on the typewriter, try to realign the field separators to achieve the best possible field separator alignment and the least number of tab stops (see Figure 2-7).

FORMS ANALYSIS

LOCATION FACTOR IN FORMS PREPARATION

The physical environment in which a form is actually used is called the "point of use" location. The "point of use" is an important consideration for the forms analyst. Among other factors, the analyst must be concerned with whether the document is intended for internal or external use. Forms intended for internal use have been developed and stocked in a company or agency for the company's personal use. The internal documents present easier control problems, than the "external" forms, which are developed and stocked by a company or agency for eventual use by the public. The degree of design and utilization bears importantly on the total job capability of the form. With applied control generally eliminated or negligible as far as external forms are concerned, good form design becomes even more significant as a factor in improving the application results.

INTERNAL FORMS

Internal forms may be prepared by direct entry of data at the source, the retranscription of data from coding sheets, and through the use of other media which features previously prepared formats. Presumably, when the form is prepared at the source, capability, interest, and responsibility are the strongest, making for a better prepared form. The job analyst is accountable for the methods used to enter data and handle and forward the prepared forms. The procedure, ultimately determined by the analyst, is then subjected to review for compliance with OCR systems requirements.

EXTERNAL FORMS

Since many of the design problems relating to the preparation of external forms differ from the problems associated with internal forms, the design parameters also differ. Often a large volume of line printed documents is prepared during a brief time period and it is necessary to ensure that operations personnel have been instructed to periodically check the alignment of the print lines on OCR documents and perform frequent visual checks on print quality.

NOTE

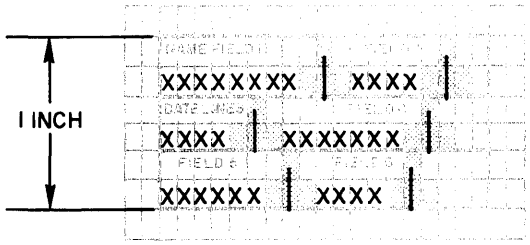
For handprint form design guidance, see section 3.

FORMS EVALUATION CHECKLIST

The checklist comprising Table 2-7 can be used as a guide in document evaluation.

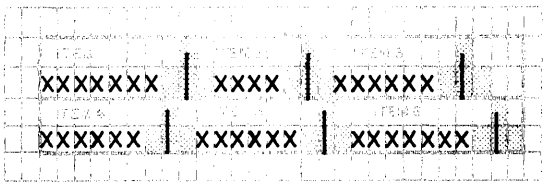
MARK READ FORMS DESIGN

The use of pencil marks to delete preprinted OCR characters is an effective and simple means of gathering source information. While using the form and



NECESSARY DATA FIELDS	MAXIMUM FIELD SIZE
ITEM 1	7 POSITIONS
ITEM 2	4 POSITIONS
ITEM 3	6 POSITIONS
ITEM 4	6 POSITIONS
ITEM 5	6 POSITIONS
ITEM 6	7 POSITIONS

FIRST DRAFT



SECOND DRAFT · ATTEMPT TO REPOSITION FIELDS · GROUP LOGICAL FIELDS TOGETHER

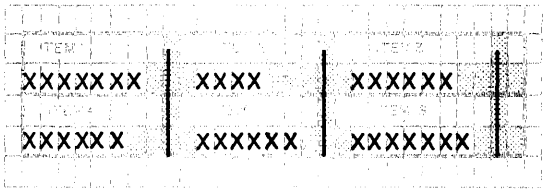


Figure 2-7. Example of Realignment of Field Separators

TABLE 2-7. 955/959 PAGE AND DOCUMENT READER FORMS EVALUATION CHECKLIST

Test	Made For
Form Name/Number	Form Size
Analyst	Date

Test Device	Test Performed	Results	Acceptable Range
Kidder	Opacity		At least 80% - dependent on weight
	Reflectance (specimens used)		At least 70% of $BaSO_4$
	Nonread color reflectance		≥80% of background; ≥85% for handprint
	PCSP (within character boundaries)		At least 0.5 PCSP
	Dirt count		Not over 10 ppm
	Excessive wood pulp or dirt areas		Not larger than 0.008 inch (0.2032 mm)
Compar	Line locators (average strokewidth)		18 ±6 mils (0.457 ±0.1524 mm)
	Field separators (average strokewidth)		16 ±6 mils (0.406 ±0.1524 mm) preprinted
	Field separators (length - normal)		Nominal: 0.174 inch (4.420 mm) ±0.018 inch (±0.457 mm)
	Field separators (length - mark read)		Minimum: 0.180 inch (4.572 mm) Maximum: 0.192 inch (4.877 mm)
	A/N Size I characters (average strokewidth)		14 ±6 mils (0.356 ±0.1524 mm)
	A/N Size IV characters (average strokewidth)		20 -10 +16 mils (0.508 -0.254, +0.406 mm)
Form Design Ruler	Top of form to first centerline		See Table 2-2
	Top and bottom typing margins		.50 inch (12.7 mm) nominal .25 inch (6.35 mm) minimum
	Left and right typing margins		.25 inch (6.35 mm)
	Left margin only (with marking pen)		.75 inch (19.05 mm)
	Vertical spacing		4 lines per inch or less (25.4 mm)
	Horizontal spacing		Dependent on font and input generating device
Other	Substance weight		18 - 43 lb (68 - 179.1 g/m^2)
	Caliper		0.0030 - 0.007 inch (0.0762 - 0.1778 mm)
	Aspect ratio		At least 0.64
	Grain direction		Parallel to paper motion

	Remarks

a pencil as an information collection system, information can be processed on the 955/959 without the need for retranscription. Requirements for mark read include:

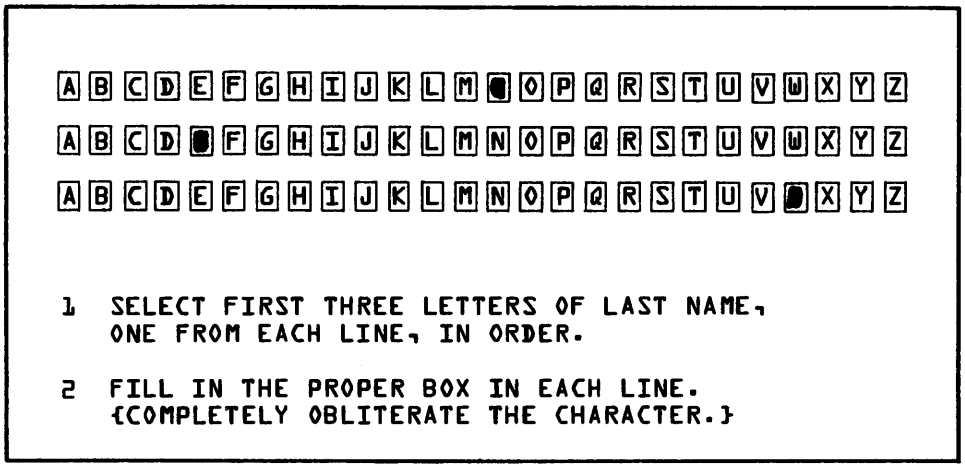
- Knowledge by the user on how to best fill in a zero or destroy a character. This can be covered by adequate instruction printed on the document.
- Access to the proper marking device, a No. 2 (or softer) pencil.
- Marking must be done on a hard, smooth surface.

Mark Read Forms Design Variations

The two approaches in the design of mark read forms include: preprinting readable characters on a document and filling in preprinted zeros of a machine readable font.

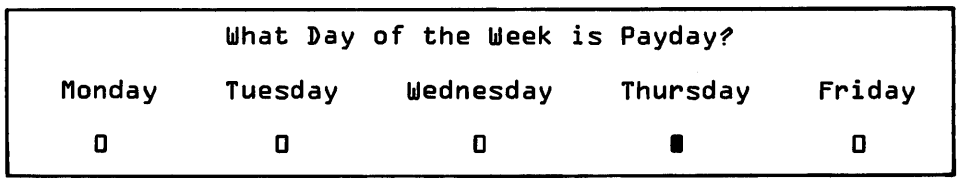
Preprinting Readable Characters on a Form

The user "fills in" or obliterates the desired character from the group of characters. Gathering data from one field may require reading multiple lines as in the following example: The data consists of the first three letters of the name "Newton", so the letters N-E-W are deleted.



Fill-in of Preprinted Zeros of Machine Readable Font

The fill-in method is suited to applications where a word or other multi-character response is indicated and a range of possible replies exists. As an example, the zero fill method is appropriate for data collection in the following situations:



or

	Yes	No	Indefinite
Do you like mechanical work?	■	□	□
Will you go to technical school?	□	□	■

or

H.O Use Only		
Partial Payment?	□ 123.45	■ 678.90

NOTE

Nonread colors are unnecessary in the preceding examples since the scanned data is sufficiently separated from the captions and questions.

The scope of mark read capabilities includes such diverse applications as interviews, polls, census forms, and student examinations. In addition, time and attendance reports, school and program registration, accounts receivable, marketing activity reports, and a variety of questionnaires are also applicable.

OCR forms with optional-entry data lines can be read efficiently with a minimum amount of administration by the user. Preprinted zeros at the left of each line are filled to initiate reading of that line. If the zeros are not filled the 955/959 goes to the next line. In the following example only line 23456 would be read:

□	12345	IF MARKED, READ THIS LINE
■	23456	IF MARKED, READ THIS LINE
□	34567	IF MARKED, READ THIS LINE
□	45678	IF MARKED, READ THIS LINE

BASIC MARK READ CRITERIA

Horizontal Spacing for Mark Read

The maximum horizontal spacing density for mark read applications is five characters per inch. However, if the user's operations with the form cannot be controlled, a limit of two or three characters per inch yields the most satisfactory results.

Vertical Spacing for Mark Read

The maximum density for mark read applications is three lines per inch but the degree of control over users of the form is the key to optimum density of vertical spacing. A density of one or two lines per inch allows field titles or appropriate captions to be entered in dark ink, as long as such entries are not in the defined read and clear zones.

Design Guidelines

When the "readable" characters are to be marked directly on a document, a non-read colored box should be placed around each allowable reply character to aid the user. Figure 2-8 is an example of the guideline box.

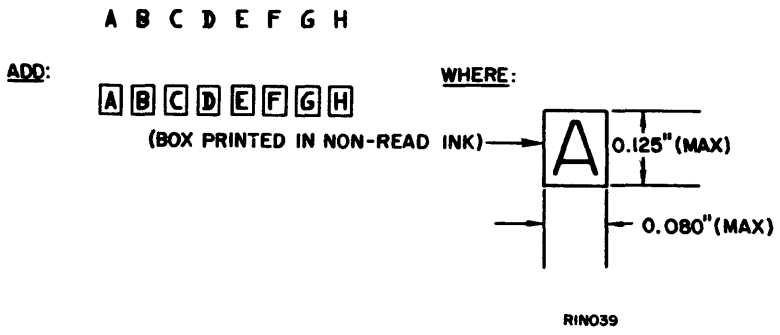
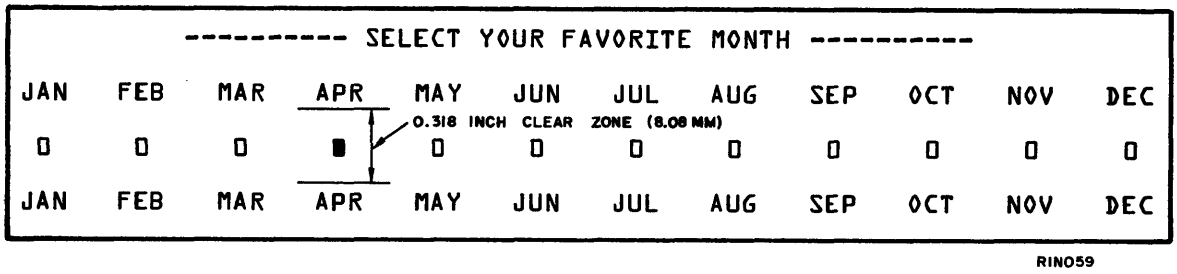


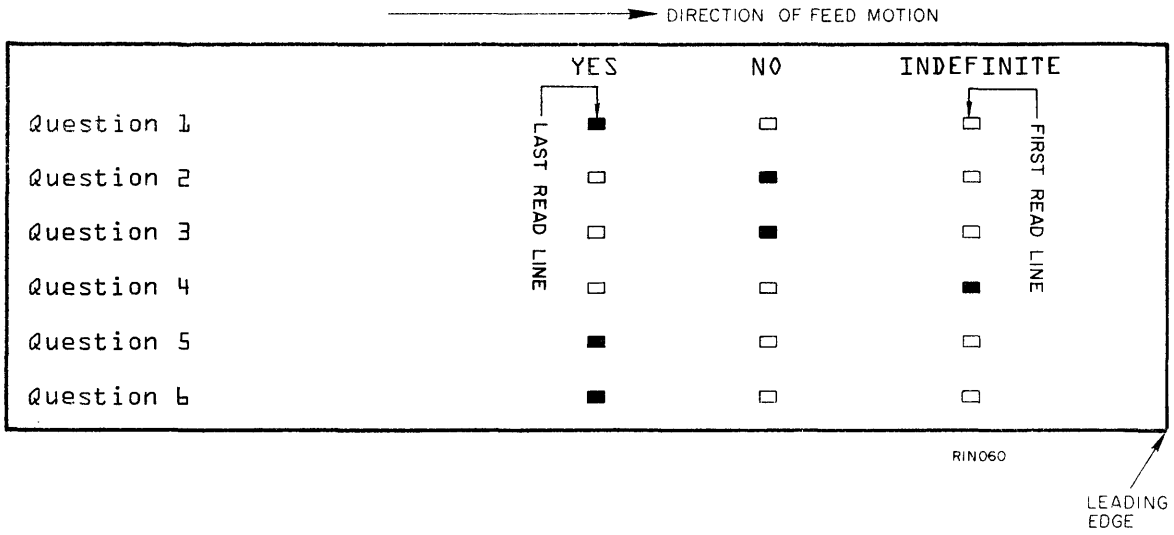
Figure 2-8. Guideline Box

The function of the guideline box is threefold. First, it constrains user marks within the box. Second, the vertical box dimension prevents high marks, which could be detected as a field mark. Third, the horizontal box dimension prevents wide marks, which generate "character too wide" rejects.

When designing forms utilizing preprinted zeros, it is often desirable to place response captions in nonread ink directly above and/or below the appropriate response position.



In the following survey example, it may be feasible to position zeros to the right of the questions, turned so only a few lines require reading, and throughput is therefore maximized. Instead of reading six rows of three characters, three rows of six characters are read. The result is a significant increase in throughput at a cost of very little additional programming effort.



Acceptable Marking Techniques

For applications involving "zero fill" and "character-destruct", Figure 2-9 illustrates the acceptable marking techniques that allow continuous accurate recognition and the unacceptable techniques that terminate recognition.

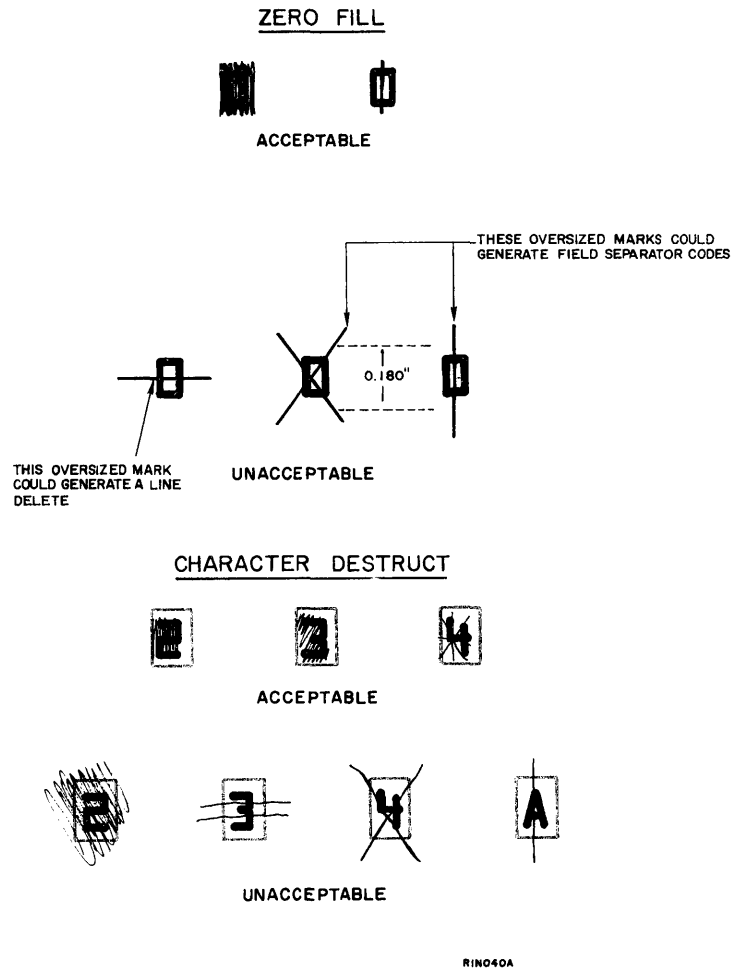


Figure 2-9. Marking Techniques

SECTION 3

HANDPRINT FORMS DESIGN

This section contains media and input data specifications for design and printing of handprint forms, used when the 955/959 is equipped with the handprint option. The 955/959 handprint character set consists of 10 numeric characters {0-9}, five alphabetic characters {C, S, T, X, Z} and three symbolic characters plus {+}, minus {-}, equals {=}. Preprinted field separators are also recognized by the handprint unit.

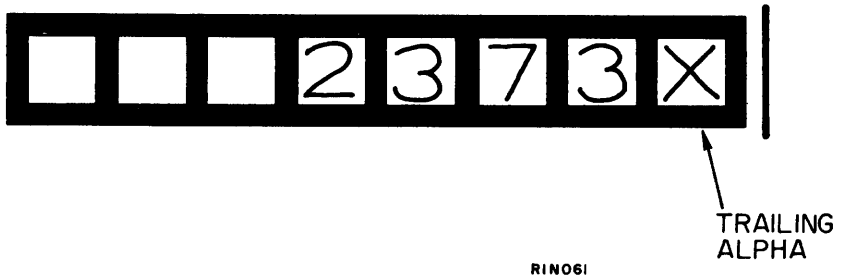
With the exception of the examples in Figure 3-1, the alphabetic, numeric, and symbolic character shapes cannot be read if they are intermixed. However, numerics and X can be read intermixed. The user program is written to look for only numeric, alpha, or symbolic characters on a field-by-field basis.

LINE SPACING

The 955/959 is capable of reading handprinted data at a maximum density of three lines per vertical inch. Using the three-lines-per-inch density, data lines should be spaced as shown in Figure 3-2. The centerline of each handprint box is an accurate step of the three-lines-per-inch mode.

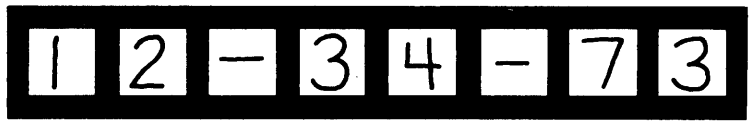
If black inked field titles are placed above a handprint field the maximum vertical line spacing is 1.50 lines per inch {38.10 mm}. Spacing densities of less than three lines per inch are allowable. Forms for applications in which handprint information fields are not repetitive {line after line} are designed as illustrated in Figure 3-3.

1. One trailing alpha character within a numeric field is permitted.

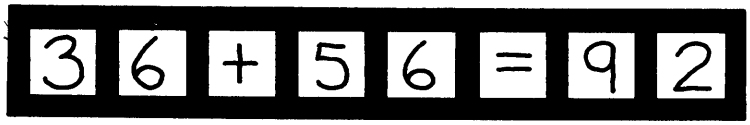


RIN061

2. Symbolic characters {+, -, =} may be read and intermixed with numeric fields.



OR



RIN062

3. Numeric, alpha and symbolic characters may be intermixed if the box position of each is known. The technique, however, does not allow rescan, buffer build, or on-line character correction, and the use of each character must be evaluated on an individual application basis.

Figure 3-1. Intermixed Character Exceptions

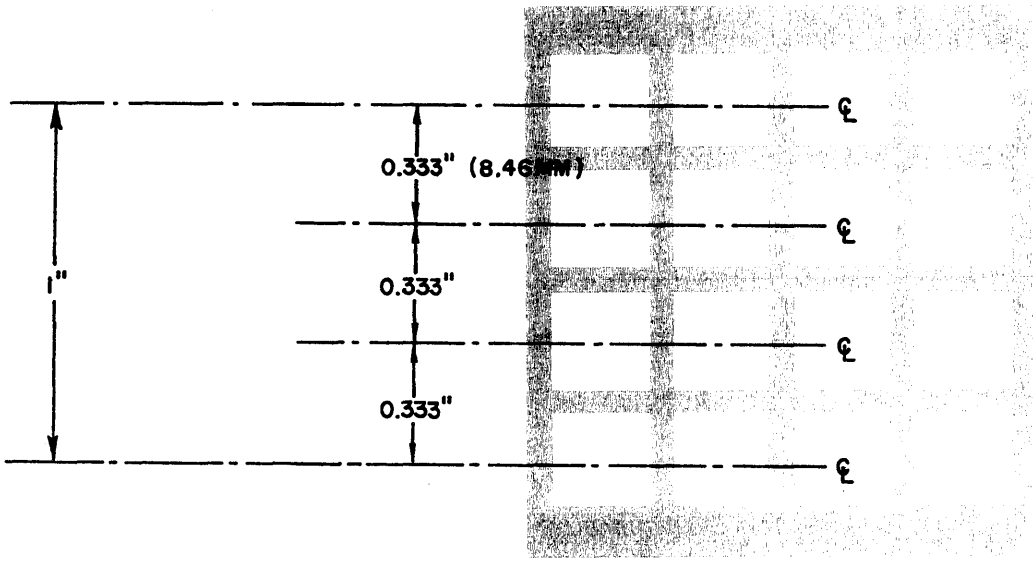


Figure 3-2. Maximum Vertical Line Spacing Density - Handprint

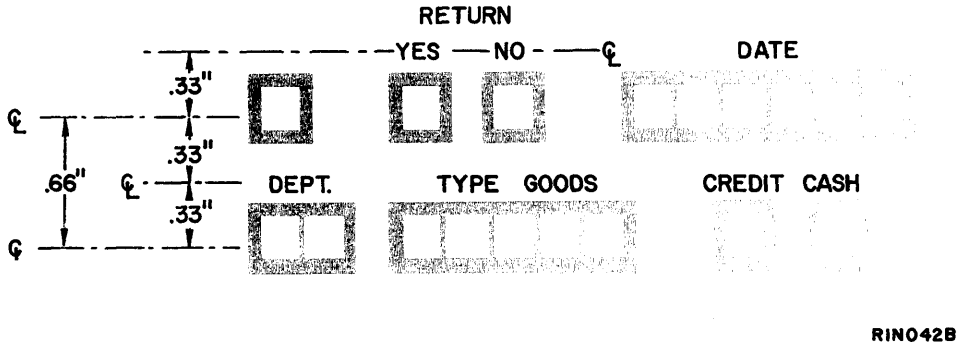


Figure 3-3. Maximum Vertical Line Density with Insertion of Black Inked Field Titles

HORIZONTAL SPACING CONSIDERATIONS (CHARACTER PITCH)

The 955/959 recognizes characters printed at three, four, or five characters per inch. The generation of space requires the box spacings (dimension E) specified in Table 3-1. If space generation is not utilized, dimension E may be varied at the discretion of the user.

GUIDEBOX DIMENSIONS

The five guidebox components are identified in Figure 3-4. The suggested dimensions for each of these components, when using any of the three character pitches, are shown in Table 3-1. The 955/959 does not "see" the guideboxes, so their exact dimensions are of indirect significance. However, dimension E is critical in those applications involving space generation.

Guidebox dimensions in Table 3-1 aid in constraining handprint to more readily meet the recognition requirements with respect to character size, pitch, and location. The guidebox dimension and positioning information included in this section is intended to control the formation of characters by persons entering data on the form.

The additional information on handprint forms design guidelines include:

- Dimensions A, C, and D in Figure 3-4 are recommended, based on a review of present OCR handprint installations and the proposed ANSI Handprint Standards. The user's selection of handprint constraint boxes is based primarily on the amount of control exercised over personnel preparing OCR readable handprint data. For applications in which training of personnel and feedback is utilized to improve handprinting, the inside box size dimensions may be made less rigid. However, for those applications in which minimal control is exercised, less constraint, meaning a smaller box, serves as a better "target" for the user generating handprint data.

- Dimension A (interior box height) may vary downward from 0.24 inch (6.09 mm) with a corresponding variance in dimension C.

- Dimension E (horizontal spacing guidebox centerlines) is critical only for applications that utilize space generation. The condition occurs because the 955/959 timing techniques generate space codes based on an absolute measurement of clear space, related to a fixed reference on a document. Dimension E equals an exact multiple of the horizontal timing increment.

BLANK SPACE RECOGNITION

The handprint option for the 955/959 has the capability to generate a blank code when no handprint character is printed in a box. This is a valuable capability when spaces or exact positions of characters in the input record have significance.

Figures 3-5 and 3-6 best illustrate what space generation features can accomplish.

For correct operation of the space recognition feature, a preprinted full-width Size I OCR character must precede the line of handprint to be read. The OCR character serves as the measurement reference (starting) point from which the 955/959 can obtain positional information.

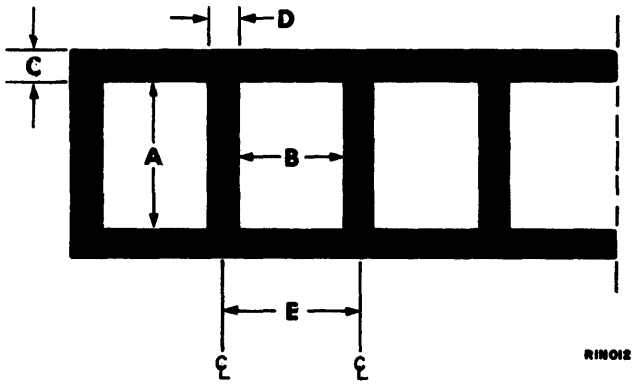


Figure 3-4. Guidebox Components as Described in Table 3-1.

TABLE 3-1. HANDPRINT GUIDEBOX DIMENSIONS

Horizontal Pitch (Nominal)	Dimensions*				
	A	B	C	D	E
3 per inch	0.220 inch (5.588 mm)	0.286 inch (7.264 mm)	0.113 inch (2.870 mm)	0.050 inch (1.270 mm)	0.336 inch (8.534 mm)
4 per inch	0.220 inch (5.588 mm)	0.200 inch (5.080 mm)	0.113 inch (2.870 mm)	0.040 inch (1.016 mm)	0.240 inch (6.096 mm)
5 per inch	0.220 inch (5.588 mm)	0.175 inch (4.445 mm)	0.113 inch (2.870 mm)	0.017 inch (0.431 mm)	0.192 inch (4.876 mm)
*Tolerance of dimensions is ±0.005 inch (±0.12 mm), nonaccumulative.					

- Space Generation Feature Not Utilized

Output record appears as: 1234567890

- Space Generation Feature Utilized

RIN043

Output record appears as: ␣1␣2␣3␣␣4␣5␣␣␣6␣␣7␣␣8␣␣␣␣9␣␣␣␣0

Figure 3-5. Space Generation Feature

REFERENCE CHARACTERS

If space generation is utilized, single full-width* Size I OCR reference character must precede each handprint line to be read. A reference character is recommended for all handprint lines. The location of the OCR characters centered vertically in relation to the guidebox is shown in Figure 3-6.

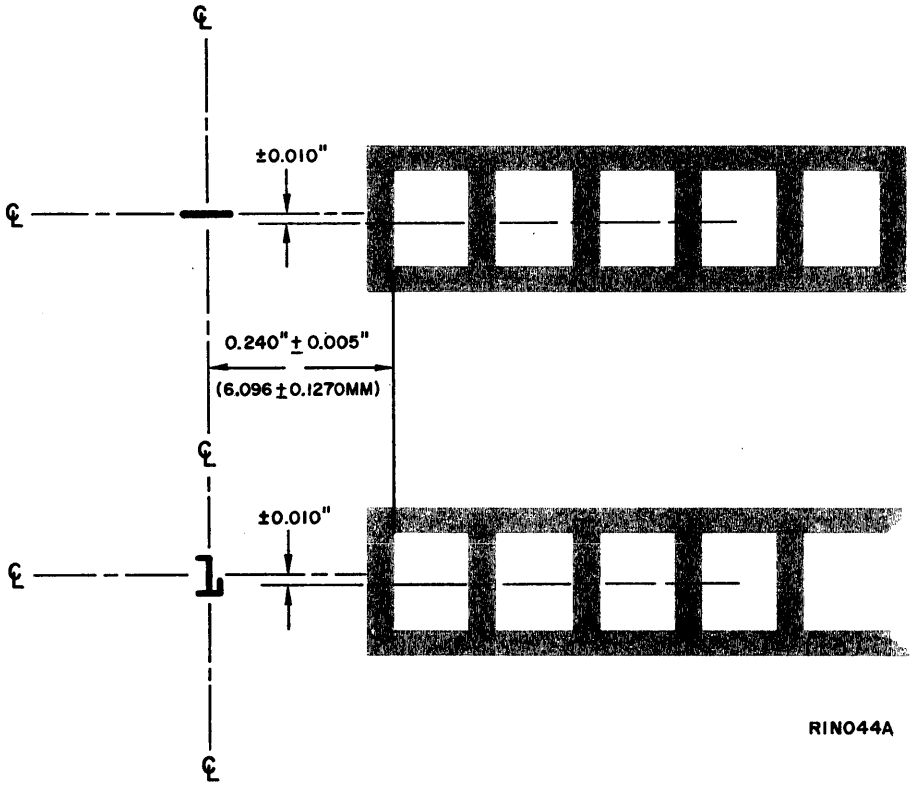


Figure 3-6. Reference Character Placement Dimensions

The document designer may utilize the preprinted reference character for line identification. However, the 955/959 utilizes the reference character for accurate vertical positioning of the scan band in relation to the handprint boxes, and as a horizontal reference for space generation. The user specifies in his software package if the reference character will be written into the output record.

When the read line length exceeds 6.50 inches (165.10 mm), an additional reference character is required between fields as shown in Figure 3-7.

HANDPRINT FIELD SEPARATION

When multiple fields of data are positioned on a single line, field separators may be used for data field separation. The field marks must be preprinted.

The use of preprinted field separators is illustrated in Figure 3-8 for vertical spacing density of two lines per inch or less, and Figure 3-9 for a vertical spacing density greater than two lines per inch.

*Full-width Size I characters recommended include: Numerics (1-9), Alphas (A-Z), and the following symbols: OCR-A: ¢ ¥ - & $ = ; OCR-B: - $ & < > =. Font selected must be the basic font for the reader.

Field marks may also be used to separate handprint fields in a three-lines-per-inch format if the fields are aligned as shown in Figure 3-9. The field mark is also illustrated in the sample handprint Journal Entry Input, Appendix H, Figure H-12.

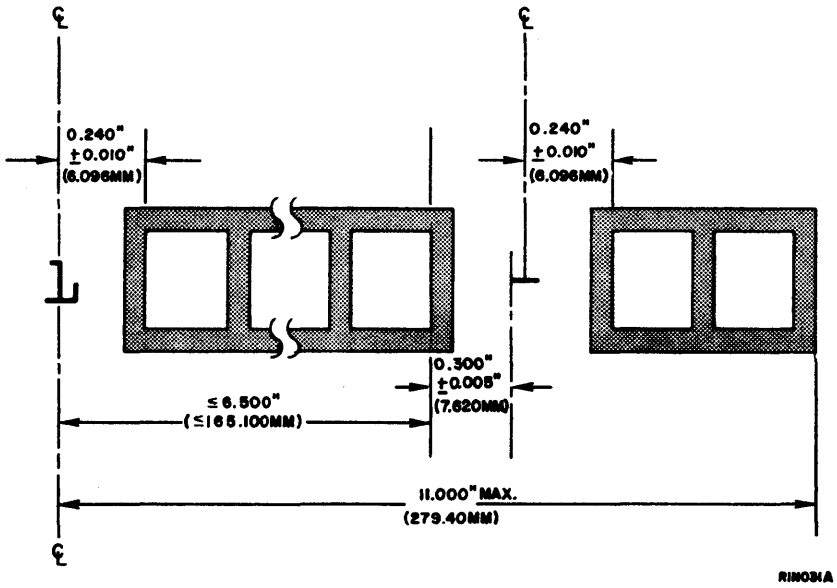


Figure 3-7. Reference Character Positioning for Line Longer than 6.5 Inches (165.1 mm)

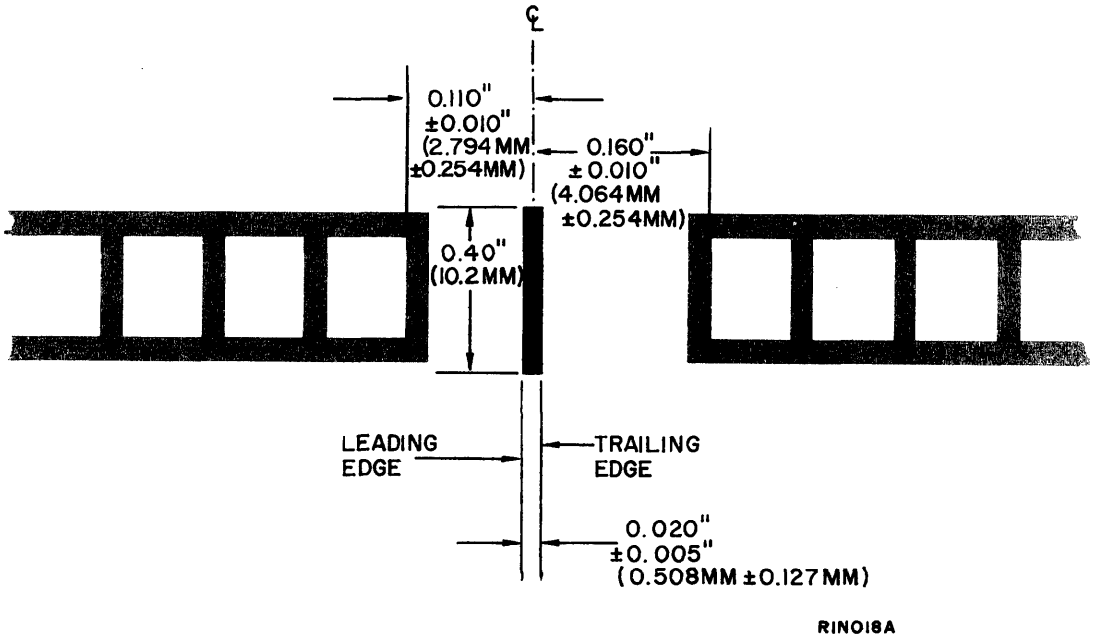


Figure 3-8. Field Mark Dimensions (for Vertical Line Spacing Densities of Two Lines per Inch or Less)

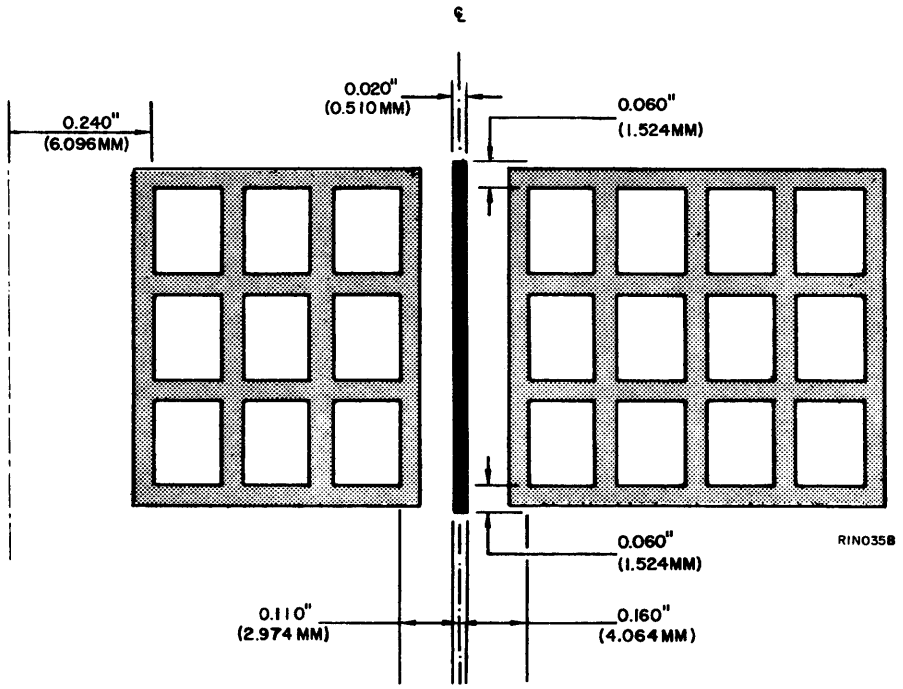


Figure 3-9. Multiple Line Handprint and Spacing Requirements (for Data Line Densities Greater Than Two Lines per Inch)

FIELD MARK PLACEMENT

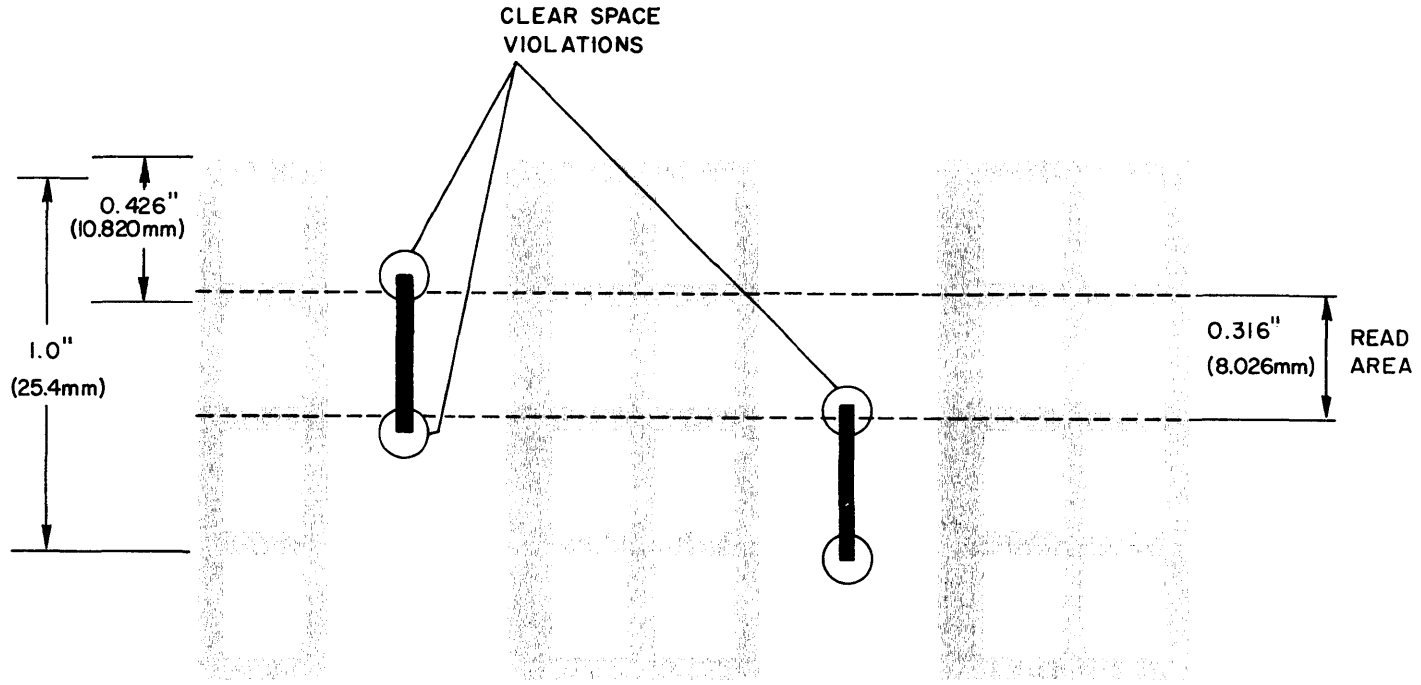
It is prohibited to have random placement of field marks on documents having a vertical line density greater than two lines per inch. A field mark having the minimum height of 0.400 inch (10.16 mm) protrudes into the vertical clear area of the two adjacent lines as shown in Example A of Figure 3-10. The field mark will thus interfere with the proper reading of data on those lines.

In the instances where, because of form size constraints or other user requirements, it is necessary to retain a three-lines-per-inch format and random field separation is required (see Example B of Figure 3-10), use additional OCR characters rather than field separators (as in Figure 3-11).

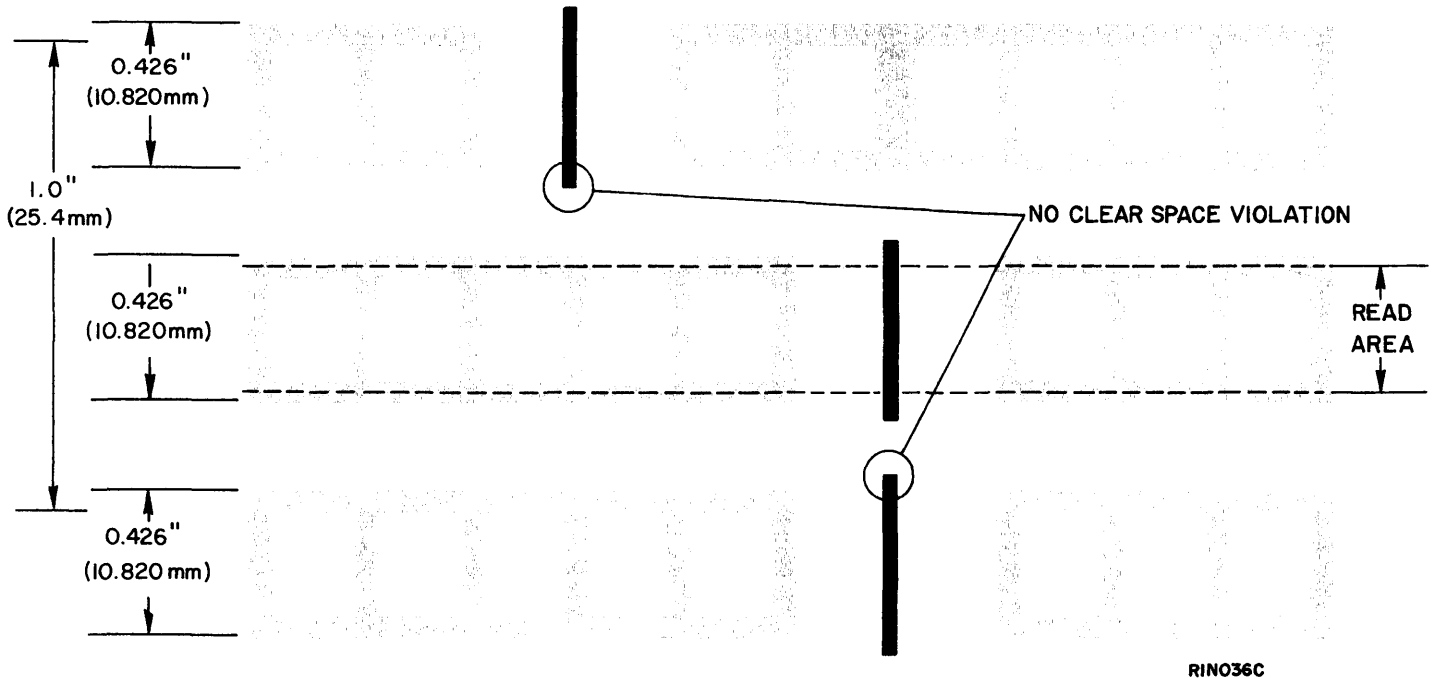
When substituting full-width OCR characters for field separators, it is necessary to provide the same clear space and placement requirements as the reference characters. For example, there should be 0.300 inch (7.62 mm) clear space to the left of the character and 0.240 inch (6.10 mm) from the centerline of the OCR character, that is, to the inside left edge of the next handprint box. (See Figure 3-12 for illustration.)

When reading up to three consecutive lines and space determination is not required, neither a field mark nor a reference character is necessary. However, a reference character is required for more than three lines and is recommended for three lines or less.

If other machine generated and processed information appears on the same line as handprint data, some of the machine generated data must be processed prior to reading the handprint data. The machine-generated data must have the same horizontal centerline as the handprint fields and should be to the left of those handprint fields.



A. IMPROPER PLACEMENT OF FIELD MARKS



B. PROPER PLACEMENT OF FIELD MARKS

Figure 3-10. Placement of Field Marks

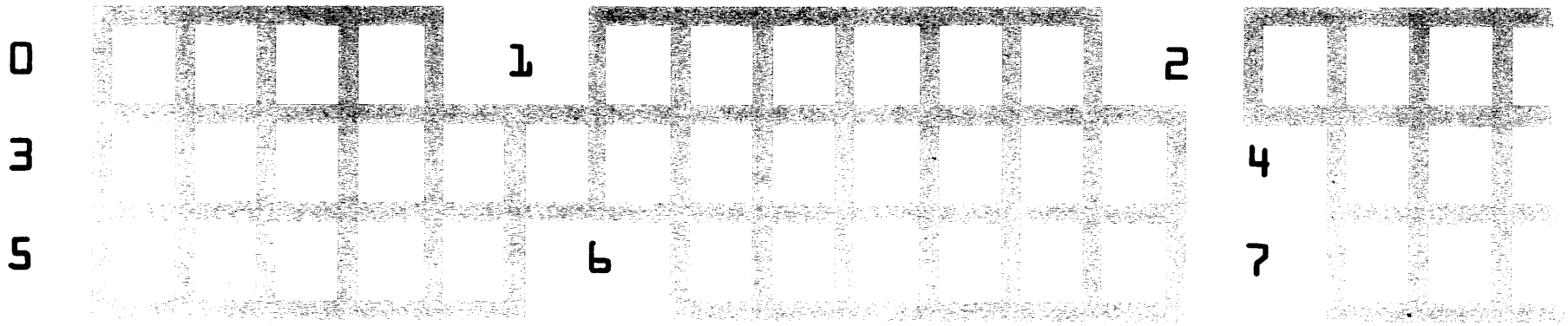


Figure 3-11. Random Field Separation with OCR Characters

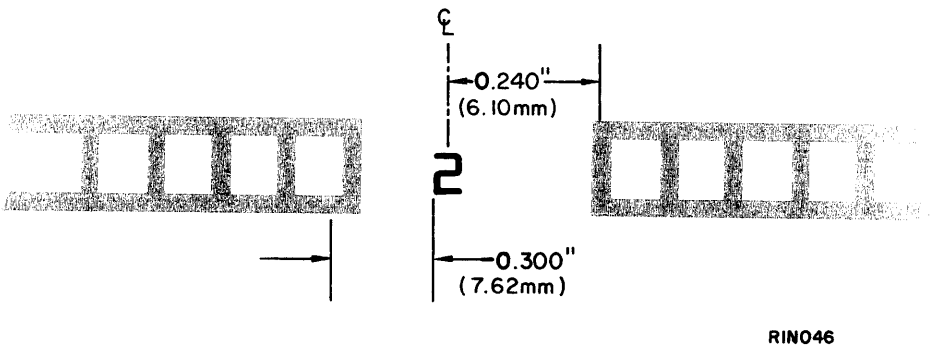


Figure 3-12. Positioning of Reference Character Serving as Field Separator

CLEAR AREAS

The vertical clear area is a horizontal strip centered around and including the read area as shown in Figure 3-14. The clear area extends a minimum of 0.065 inch (1.65 mm) above and below the read area. The clear area must contain only data to be read and must not have extraneous printing or dirt smudges (see specification limit in section 4). The recommended minimum vertical clear area of 0.446 inch (11.33 mm), shown in Figure 3-13, must also be met when using the maximum vertical line density of three lines per inch as shown in Figure 3-14.

The horizontal clear area is the area between the fields of data being read and any printed information to the left and right of these fields. The minimum horizontal clear area is 0.300 inch (7.62 mm), as shown in Figure 3-15.

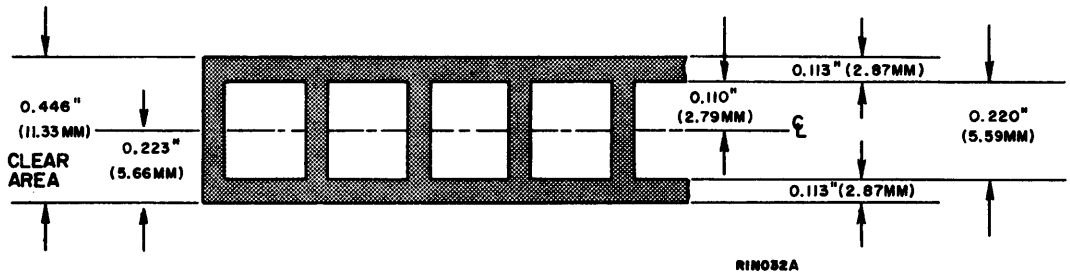


Figure 3-13. Vertical Clear Area for Single Line

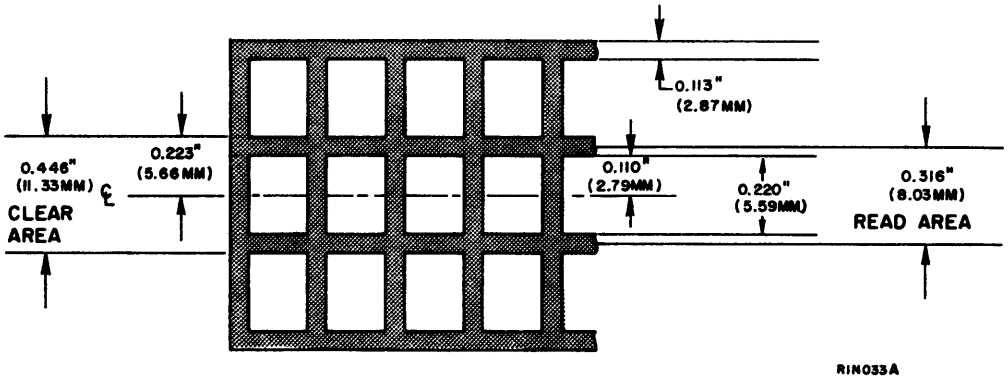


Figure 3-14. Vertical Clear Area for Multiple Lines

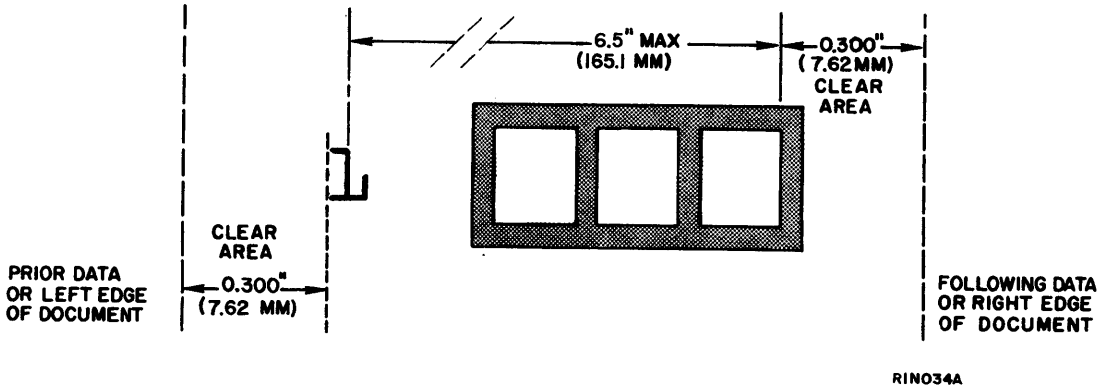


Figure 3-15. Minimum Horizontal Clear Area between Fields of Data

DOCUMENT FORMAT RESTRICTIONS

If repeated passages of a document through the 955/959 are required, it is not recommended to use handprint data in the shaded area of a document, as shown in Figure 3-16. This caution is advised because of the possible smearing of pencil images by the hand-feed rollers.

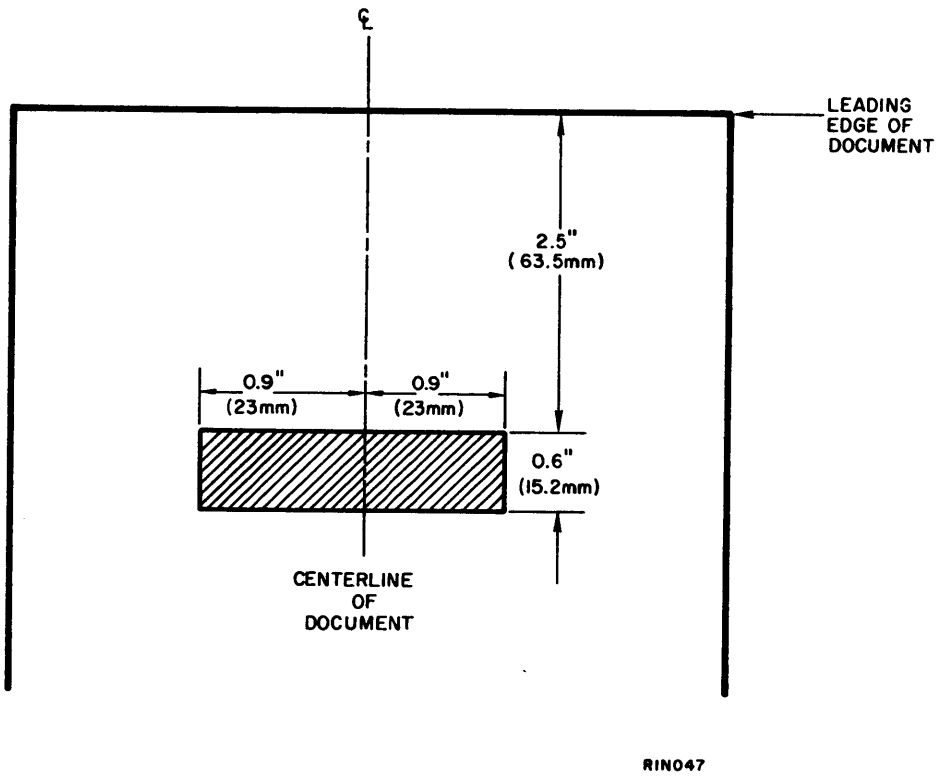


Figure 3-16. Area Not Recommended for Handprint Data if Forms Are Subject to Repeated Passes through the 955/959

HANDPRINT FORMS PRINTING NOTES

- Handprint guideboxes must be printed in a highly reflective nonread ink. The inks must retain 85 percent of background paper reflectance. Any other information printed within the handprint vertical clear zones, such as field titles, must also be printed in a nonread ink and meet the same reflectance specification.

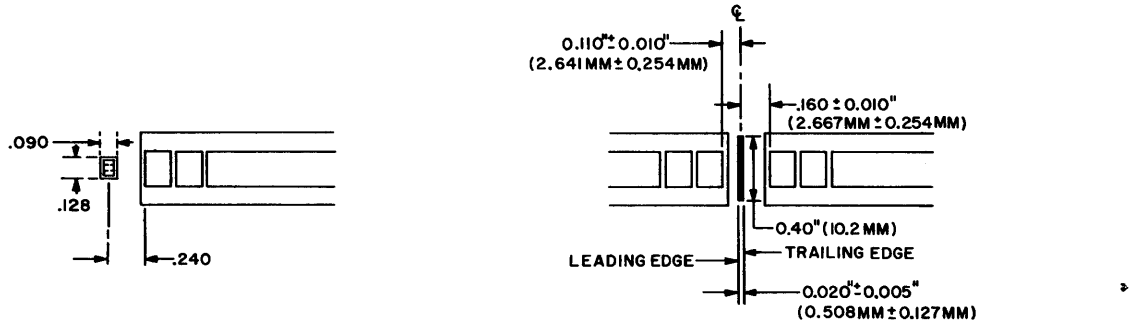
- Reference characters and field separators must be printed with nonreflective dark inks, which are less than 30 percent reflective (greater than 0.7 PCS (Print Contrast Signal)).

- Evaluation gauges (Pub. No. 48299733) which are used to check vertical spacing, horizontal spacing, color-to-color registration, positioning of reference characters to guideboxes, and vertical and horizontal clear areas, are available from:

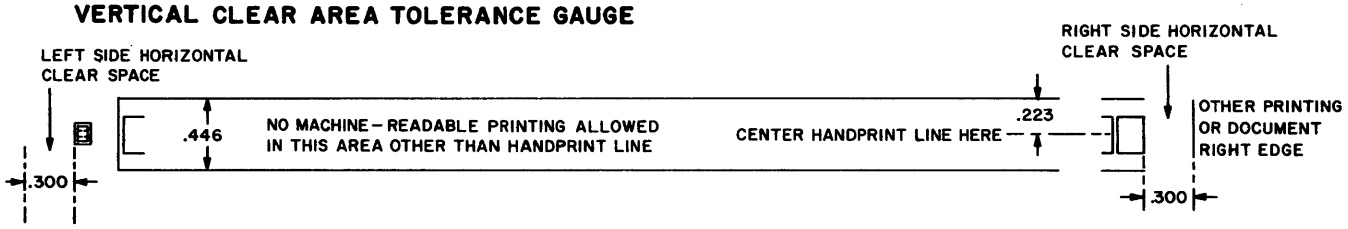
  Control Data Corporation
  Washington Area Operations
  Publications Department
  1455 Research Boulevard
  Rockville, Maryland 20850

The gauge illustrated in Figure 3-17 is valuable for performing quick checks of forms and assisting in the initial design of forms.

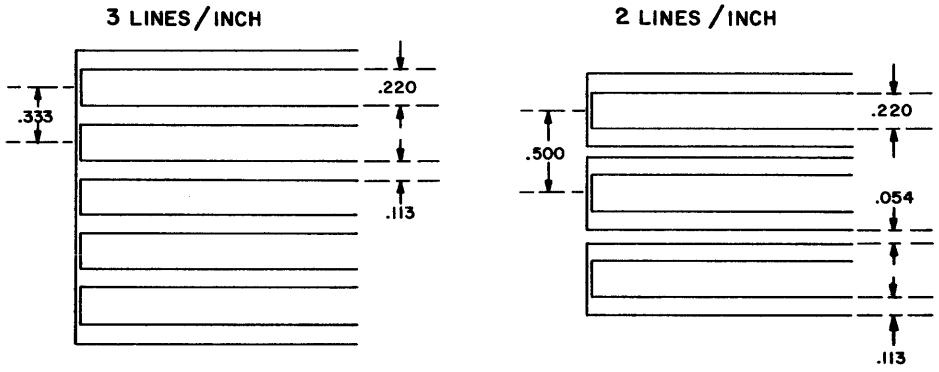
LEADING ANSI CHARACTER POSITIONING TOLERANCE CHECK GAUGE



VERTICAL CLEAR AREA TOLERANCE GAUGE



VERTICAL SPACING GAUGE



HORIZONTAL SPACING GAUGE (WHEN SPACE GENERATION UTILIZED)

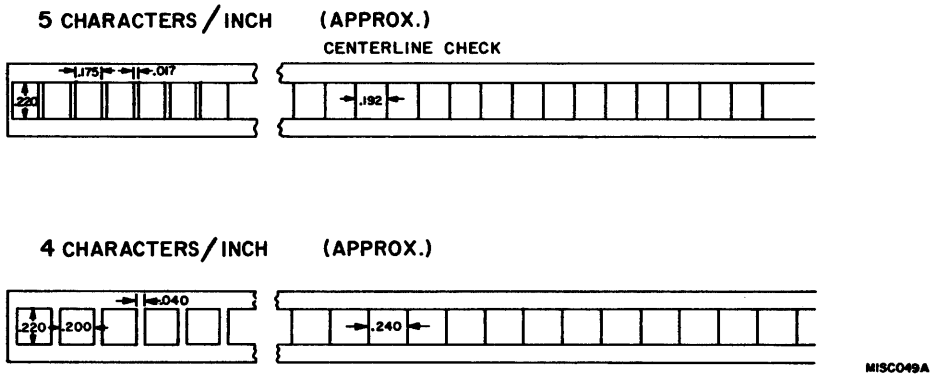


Figure 3-17. Evaluation Gauge

SECTION 4

PAPER SPECIFICATIONS

Paper used in the 955/959 must conform to the specifications contained in this section to ensure compatibility with the paper motion and character recognition systems of the 955/959. Most of the paper testing methods listed are TAPPI (Technical Association of the Pulp and Paper Industry) standard testing procedures.

WEIGHT

The commercial standard for paper weight is either substance or basis weight, measured in pounds. Substance weight (also called paper weight), which is the dominant standard for commercial use, is defined as the weight of a ream (500 sheets) of paper cut to 17 by 22 inches. Papers of substance weights falling within the range indicated below may be successfully used on the 955/959.

Minimum paper weight: 18 pounds (68.00 g/m^2)
Maximum paper (card) weight: 43 pounds (159.96 g/m^2)

Basis weight is ordinarily defined as the weight of a ream of paper cut to basic size. The basis weight of paper will vary among types and grades of paper. Basis size, therefore, is determined by the use of a particular grade.

There will be instances in which paper is specified by basis weight rather than substance weight. Table 4-1 lists some common papers with their basic sizes. Where basis weight is provided, multiplying by the appropriate conversion factor permits computation of substance weight.

TABLE 4-1. PAPER WEIGHT CONVERSION FACTORS

Type of Paper	Basic Size (Inches)	Basis Weight	Conversion Factor	Substance Weight
Bond	8.5 x 11	_____lb.	4.000	_____lb.
Cover	20 x 26	_____lb.	0.719	_____lb.
Bristol	22.5 x 28.5	_____lb.	0.623	_____lb.
Index	25.5 x 30.5	_____lb.	0.481	_____lb.
Tag	24 x 36	_____lb.	0.433	_____lb.
Book	25 x 38	_____lb.	0.394	_____lb.

CALIPER

The thickness of a given paper is the thickness of a single sheet between a pair of planed surfaces in a specific area when subjected to a specified pressure. The single sheet thickness, in 955/959 applications, would lie between the following limits:

Minimum paper caliper: 0.0030 inch (0.0762 mm)
Maximum paper caliper: 0.0070 inch (0.1778 mm)

Some correlation can be established between the thickness of a paper and its approximate weight. However, the type of finish and content of any paper affect the reliability of such correlations. The testing of numerous brands and grades of smooth finish bond papers for OCR applications has generally validated the caliper-to-weight correlations as shown in Table 4-2.

TABLE 4-2. CALIPER-TO-WEIGHT CORRELATIONS

Caliper		Substance Weight	
0.0030 inch	(0.0762 mm)	16 - 20 lb	(60 - 75 g/m^2)
0.0040 inch	(0.1016 mm)	20 - 24 lb	(75 - 89 g/m^2)
0.0050 inch	(0.1270 mm)	24 - 28 lb	(89 - 105 g/m^2)
0.0060 inch	(0.1524 mm)	28 - 32 lb	(105 - 120 g/m^2)
0.0070 inch	(0.1778 mm)	32 - 36 lb	(120 - 134 g/m^2)
0.0069 inch ±0.0004 inch	[0.1753 mm ±0.0102 mm]	41 - 45 lb	(179.1 g/m^2)

REFLECTANCE

The optical spot size for measuring reflectance of a paper surface is 0.00585 in diameter for OCR-A Size I. The presence of ink is detected as a change in the paper reflectance within the input area. Fiber structure, surface characteristics, and type and amount of filler used also affect paper reflectance.

> The minimum average reflectance is: 70 percent from a 0.10-inch square area (6.45 square mm) of paper, as compared with barium sulfate, the industry standard for 100 percent white. (Refer to PRINT CONTRAST in section 5, page 5-1.)

OPACITY

The opacity of paper is its capability to resist the passage of light. Opacity is related to the caliper (thickness) of the paper and to the percentage and type of chemical fillers, if any, in the content of the paper. Paper opacity, which affects reflectivity, is measured as the ratio of the reflectance of a document backed with a black surface having 0.5 percent or less reflectance, to the diffuse (scattered) reflectance of the same document backed with a white surface of 89 percent absolute reflectance. Papers used in the 955/959 should have an opacity of 80 percent or higher. Recommended minimum opacity readings for some standard weights are shown in Table 4-3.

TABLE 4-3. OPACITY-TO-WEIGHT CORRELATIONS

Substance Weight	Minimum Opacity
20 lb (75 g/m^2)	80
24 lb (89 g/m^2)	83
28 lb (105 g/m^2)	86
32 lb (120 g/m^2)	90
36 lb (134 g/m^2)	92
43 lb (179.1 g/m^2)	93

SMOOTHNESS

The smoothness of paper is measured by the flow of air between the surface of a sheet and the surface of a plane. The readings for paper or tab card stock, measured by the Sheffield Smoothness Tester or Gurley Tester are as follows:

Minimum smoothness: 90 (Sheffield) or 85/50 cc (Gurley)
Maximum smoothness: 210 (Sheffield) or 22.5/50 cc (Gurley)

The smoothness of the paper used is an important consideration in OCR applications, because it significantly affects feeding performance. Paper with a variance greater than 40 Sheffield points between felt and wire sides is not recommended in "free form" applications, where either side of a sheet may be typed and read.

POROSITY

The porosity is the measure of the ease with which ink flows through the paper under the influence of a pressure gradient. Effective measurement of the flow can be made by the Gurley Porosity Tester. The documents used in the 955/959 should have a minimum Gurley reading of 10.

COTTON (RAG) CONTENT

Paper which contains 25 percent or more cotton fibers is not recommended because of poor handling properties under conditions of very low or high humidity. Zero rag content is desirable.

DIRT

Dirt on a document is any foreign matter whose color contrasts with the paper color when viewed from an angle. Dirt count on paper should not exceed 10 parts per million or 150 marks per 1000 square inches. A mark is any foreign matter 0.004 inch (0.10 mm) in diameter or larger. Any material which affects the print contrast ratio, which is the ratio of reflectance of print to reflectance of paper, within a 0.008-inch (0.2032 mm) diameter area is detected by the 955/959 and is undesirable. (See detailed information on PRINT CONTRAST in section 5.) Because of high dirt count, paper made of ground wood pulp is not recommended.

Maximum dirt particle size: Is equal to 0.008 inch (0.2032 mm) diameter within read zones on paper, or a particle which produces a print contrast signal reading in excess of 0.20.

GLOSS

Gloss is defined as the lustrous appearance or finish of paper. Glossy paper reflects more incident light specularly than it does diffusely. Avoid the use of coated, super-calendered paper or other high-gloss paper.

SURFACE PROPERTIES

Paper that is highly resistant to oil or grease is not recommended for use with carbon base inks.

MECHANICAL PROPERTIES

Properties of paper such as tear resistance, bursting strength, folding endurance, and stiffness may be of particular value for specific applications. In such cases, OCR Operations provides technical assistance upon request.

DOCUMENT DIMENSIONS

Document length is defined as the dimension perpendicular to the line of characters to be read and in the direction of travel of the document in the 955/959. Document width is the dimension parallel to the line of characters being read. The paper used in the 955/959 is defined in two ranges with specific dimensions, including:

Light weight papers - From 18 to 24 pounds (68 g/m^2 to 89 g/m^2) the document must be within the following dimensions:

Length: 3.25 to 12.625 inches (82.55 to 320.68 mm)
Width*: 4.875 to 12.00 inches (123.83 to 304.80 mm)

Heavy weight papers - From 24 to 43 pounds (89 g/m^2 to 179.1 g/m^2) the documents must be within the following dimensions:

Length: 3.25 to 5.25 inches (82.55 to 133.35 mm)
Width: 4.875 to 8.50 inches (123.83 to 215.90 mm)

ASPECT RATIO

The aspect ratio of a document is defined as the ratio of length to width, expressed by the formula A=L/W. Documents with an aspect ratio less than 0.64 have a tendency to skew and must be evaluated utilizing the 955/959. OCR personnel will provide evaluation assistance, if requested.

GRAIN

The grain (fiber) of all paper is predominantly aligned in a particular direction. Paper cut with the grain is called "grain direction" or "grain long" while paper cut against the grain is called "cross direction" or "grain short".

Recommended cut: Grain direction (direction parallel to paper movement in the 955/959), especially for documents exceeding length of 6.0 inches (152.40 mm).

USE OF INTERMIXED PAPER

The use of intermixed paper from various suppliers is discouraged. The practice may adversely affect system handling performance because of variation in paper characteristics.

CORNER CUTS

Document corner cuts are limited to a maximum of 0.5 inch (12.7 mm) by 45 degrees. Only one cut per document is permissible.

---

*Readers installed before June, 1972 are restricted to a maximum width of 11.125 inches (282.58 mm).

HOLES IN DOCUMENT

No holes of any type in paper to be used in 955/959 applications can be punched in a band 4 inches wide in the center of the document, as illustrated in Figure 4-1.

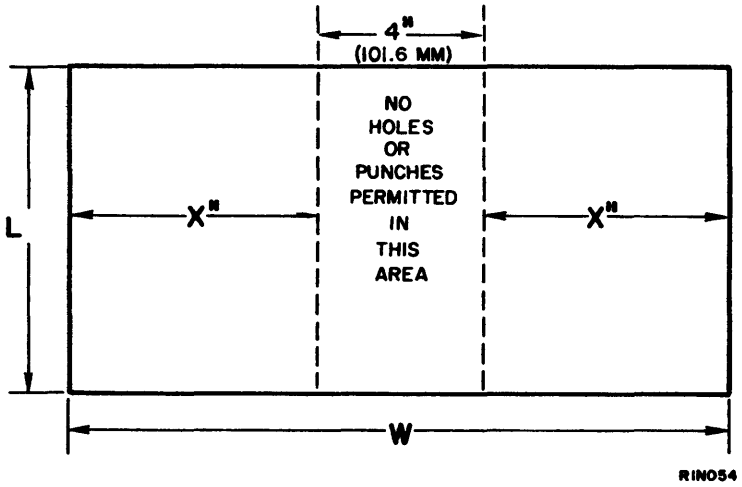


Figure 4-1. Document Punch Restricted Area

ACCEPTED PAPERS

Appendix B lists all papers tested and approved for use in the 955/959.

FLUORESCENCE

Fluorescence is defined as the use of optical brightness added to paper to enhance its brightness under normal lighting. Because the fluorescent material absorbs and emits light energy at different wave lengths, it can cause erratic reflectance values and should be avoided.

SUMMARY OF SPECIFICATIONS

A summary of paper characteristics and specifications, with the standards used to verify those specifications, is contained in Table 4-4.

TABLE 4-4. SUMMARY OF PAPER SPECIFICATIONS

Paper Characteristic	Specification or Recommendation	Standard Test Method
Weight	Substance weight between 18 and 43 pounds (68 to 179.1 g/m^2)	TAPPI T410-os-61
Caliper	0.003 inch to 0.007 inch (0.076 mm to 0.177 mm)	TAPPI T411-m-44
Reflectance	Average reflectance of not less than 70 percent from 0.1 sq. inch (6.45 sq. mm) area compared with barium sulfate, the industry standard for 100 percent	TAPPI T452-os-58
Opacity	80 percent, minimum	TAPPI T425-m-60
Smoothness	Sheffield reading between 90 and 210 (Gurley between 22.5 and 85)	TAPPI T479-sm-48
Porosity	Minimum Gurley reading of 10	TAPPI T460-m-49
Cotton (rag) content	Under 25 percent (preferably 0 percent)	None
Dirt	No particles larger than 0.008 inch (0.203 mm) in diameter	TAPPI T437-ts-63
Gloss	Avoid using supercalendered or high gloss paper	None
Surface properties	Avoid oil- and grease-resistant papers	None
Document dimensions		None
18 to 24 pounds (68 to 89 g/m^2)	Length: 3.25 to 12.625 inches (82.55 to 320.68 mm) Width:* 4.875 to 12.000 inches (123.83 to 304.80 mm)	
24 to 43 pounds (89 to 179.1 g/m^2)	Length: 3.25 to 5.25 inches (82.55 to 133.35 mm) Width: 4.875 to 8.50 inches (123.83 to 215.90 mm)	
Aspect ratio	Minimum: 0.64	None
Fluorescence	None desired. Traces permissible	None
Grain	Grain direction cut, especially for documents greater than 6.0 inches long	None
Corner cuts	0.50-inch (12.70 mm) by 45 degrees, and limited to one per document	None
Holes	Prohibited from a band 4 inches wide centered in the width of the document	None

*Readers installed before June, 1972 are restricted to a maximum width of 11.125 inches (282.58 mm).

SECTION 5

PRINT SPECIFICATIONS

Defined in this section are the acceptable ranges of print characteristics which affect various functions. Acceptable media for the 955/959 are displayed in Appendices B, C, D, and E.

PRINT CONTRAST

Print contrast is defined as the difference in diffuse reflectance (based on barium sulfate as the 100 percent standard) between a printed character and the paper on which the character is printed. Reflected light used for measurement will be diffused, and all reflected light, from an angle within 10 degrees of the specularly reflected light, shall be excluded.

Print contrast must be at least 50 percent. The average reflectance of the character stroke is calculated by the formula:

$$PCSp = \frac{RW - Rp}{RW}$$

where:

PCSp = Print contrast signals, measured from area (p).

p = A circular area with a diameter of 0.008 inch (0.203 mm)

RW = Maximum reflectance measured within 0.25 inch (6.35 mm) of p. RW is generally the average reflectance of the paper used.

Rp = Maximum reflectance from p. Rp is generally the average reflectance of the print.

Example:

If the paper used has an RW of 0.9 (reflectance of 90 percent), and since PCSp must be at least 0.5 (50 percent), the formula yields:

Rp = RW (1 minus PCSp)
Rp = RW (1 minus 0.5)
Rp = 0.9 (0.5) or 0.45

Therefore, the maximum reflectance from the printed character cannot exceed 45 percent.

If any of the characters on the data line are printed over a nonread color, PCS must be determined using nonread color reflectance as the background reference, rather than document reflectance. Printing over a non-white background is not recommended. If the user desires a non-white background there must be at least one inch of non-white color prior to the first readable character to allow the reader to adjust for the background.

DENSITY

The density of a character is defined as the ink coverage on the paper or the "blackness" of the character. Black inks with densities that do not provide a print contrast of 50 percent or greater are unacceptable. Generally

flat black inks provide the total character coverage needed to meet the density standard.

NONREAD COLOR

Densities of nonread colors used in non-handprint areas cannot produce a PCS (print contrast signal) greater than 0.2. Nonread colors used within handprint areas cannot produce a PCS greater than 0.15. Nonread colors must have a diffuse reflectance of 80 percent or higher (85 percent or higher for handprint) relative to the paper on which the nonread colors are printed. Measurements of both readable and nonreadable inks should be made utilizing an S4 spectral response. (See detailed specifications in Appendix E.)

BACKPRINTING

Documents may be backprinted (printing on the reverse side of the document) if the reflectance on the side to be read varies by no more than 20 percent (15 percent for handprint areas) from the average reflectance of the paper.

As the opacity of a page increases, darker backprinting is usually acceptable.

RIBBONS

The ribbon most often recommended for use in the 955/959 is the polyethylene carbon ribbon, which is composed of a carbon pigment wax compound coated onto a thermoplastic polymer of ethylene. Mylar ribbons, which are "one time" polyethylene carbon, generally provide a dependable means of obtaining quality printed characters from type slugs.

Fabric ribbons consist of various ink-saturated woven fabrics such as silk, nylon, and cotton and generally yield less acceptable characters.

To test a ribbon, generate a document containing a complete character set throughout the entire pressure setting range available on the print media to be used in the particular project.

Figure 5-1 illustrates the contrasting images obtained from the two different types of ribbon.

Figure 5-1. Comparison of Fabric and Polyethylene Carbon Ribbon Impressions

Appendix C lists ribbons that have been tested and found acceptable for use with the 955/959.

INPUT GENERATING DEVICES AND PRINT QUALITY DETERMINATION

Typewriters, line printers, calculating equipment, imprinters, and pencils are the five most commonly used devices for generating OCR input.

Print quality generated by an OCR input device is judged by the adequacy of the print contrast signal and the capability of the device to maintain required stroke width. The print quality of the data produced by the OCR input devices can be measured and checked against hardware specifications and user systems specifications.

The nominal stroke width variations and print contrast signals of the five preceding OCR input devices are listed in Table 5-1.

TABLE 5-1. PRINT CHARACTERISTICS OF OCR INPUT GENERATING DEVICES*

Input Device	Nominal Stroke Width Variation**	Nominal print Contrast Signal
Typewriter	±0.002 inch (0.050 mm)	0.80
Line Printer	±0.004 inch (0.012 mm)	0.75
Calculating equipment	±0.003 inch (0.076 mm)	0.72
Imprinter	±0.010 inch (0.254 mm)	0.67
Pencil	±0.006 inch (0.152 mm)	0.63

*Based on averaging samples produced from devices tested for OCR print quality. Paper background reflectance averaged 82 percent ±2 percent for all samples.

**All Size I print except imprinter, which is Size IV.

STROKE

A stroke is defined as a horizontal, vertical, curved, or slanted segment of a character.

STROKE WIDTH

The stroke width, illustrated in Figure 5-2, is defined as the distance between the average edges of a character.

AVERAGE EDGE

The average edge of a printed character, illustrated in Figure 5-2, is an imaginary line bisecting the irregularities of the character edge.

STROKE CENTERLINE

The stroke centerline, illustrated in Figure 5-2, is a line drawn equidistant between the two average edges and following the character configuration.

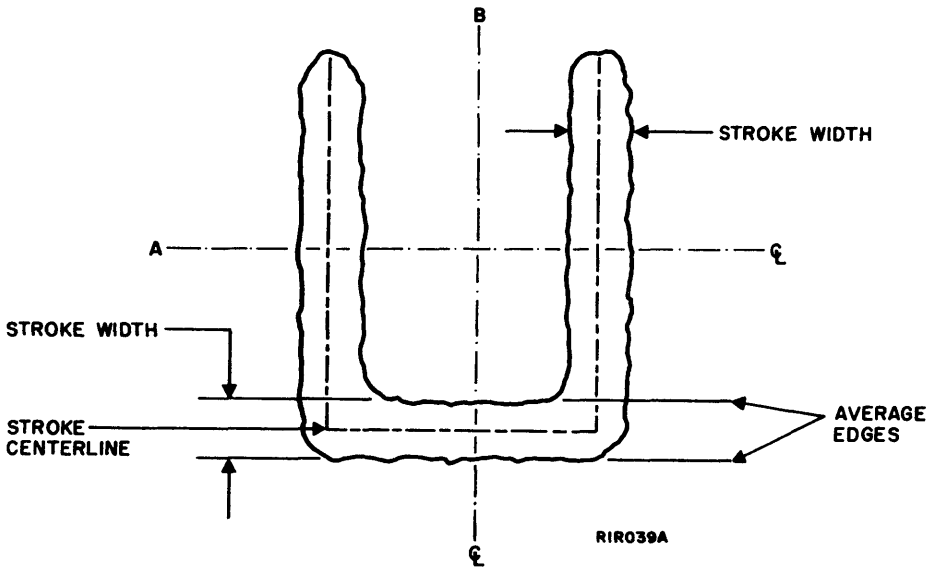


Figure 5-2. Stroke Width

MECHANICAL FAULTS AFFECTING STROKE DIMENSIONING

The various characteristics of printing ribbons, type slugs, typewriter slugs, and platens may cause mechanical faults. After considerable use, a printing ribbon tends to produce a character that does not consistently meet the minimum stroke requirements. This is because a heavily inked ribbon exaggerates the stroke, while the thickness of a polyethylene or fabric ribbon may also exaggerate the stroke. If the printer type slug is not impacting squarely, the density of the printed character may vary from top to bottom. The striking force of a damaged typewriter slug or the condition of the platen used, whether too soft, cracked, or having other imperfections, can have a negative effect on print quality.

FAULTS AFFECTING CHARACTER READABILITY

A character may contain faults which reduce the capability of the 955/959 to read the character accurately, or even preclude the reading of the character. The most common faults consist of voids, peaks, valleys, smudges, and extraneous marks. The magnified character in Figure 5-3 shows typical character faults.

VOIDS

A void is a light spot within the stroke line of a character surrounded by ink. Any void of 0.005 inch (0.127 mm) or greater is unacceptable to the 955/959.

PEAKS

A peak is a mark extending outwards without interruption, from the character, past the average edge of the character. Peaks can be caused by the splattering of ink or by paper fiber distortion. If the peak fills a circular spot 0.005 inch (0.127 mm) in diameter, the character is unacceptable.

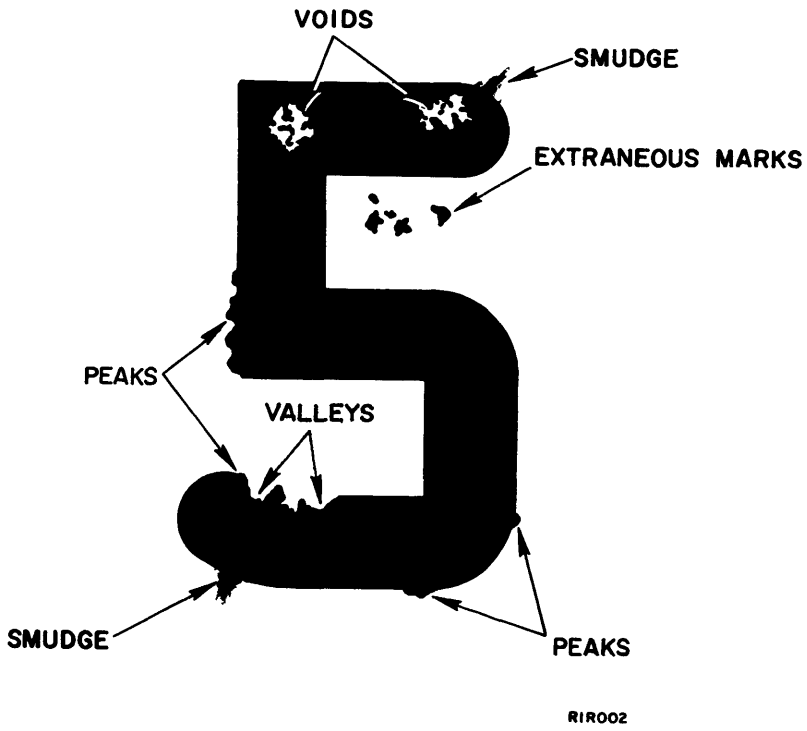


Figure 5-3. Typical Character Faults

VALLEYS

A valley is an indentation in the stroke width of the character. If the depth of the valley exceeds one-half of the stroke width, the character is unacceptable.

SMUDGES

Smudges are extraneous marks, which may or may not be contiguous with a character, caused by the transfer of carbon ink onto a document. If the diameter of a smudge is greater than 0.005 inch (0.127 mm) and the smudge occurs inside a read area, the character may be unacceptable.

EXTRANEOUS MARKS

Extraneous marks are dark spots (splatters) appearing in the space between characters and not connected to any segment of a character. If an extraneous mark exceeds 0.005 inch (0.127 mm) in diameter, the character is unacceptable.

SKEWS

CHARACTER SKEW

Character skew is the angular rotation of a character, relative to its ideal position. A character skew must be no greater than 2 degrees from a line parallel to the direction of paper motion. An exaggerated skew is illustrated in Figure 5-4.

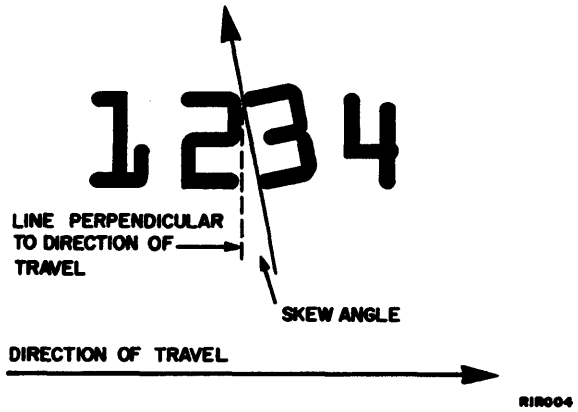


Figure 5-4. Character Skew

LINE SKEW

Line skew is the gradual departure of a line of characters from a line parallel to the direction of travel of the mirror, as illustrated in Figure 5-5. Line skew is acceptable within a range of 10 to 17 mils per inch, however, total skew cannot exceed 0.05 inch. The skew angle must not be large enough to allow the line of characters to fall outside the read band at any point across the page.

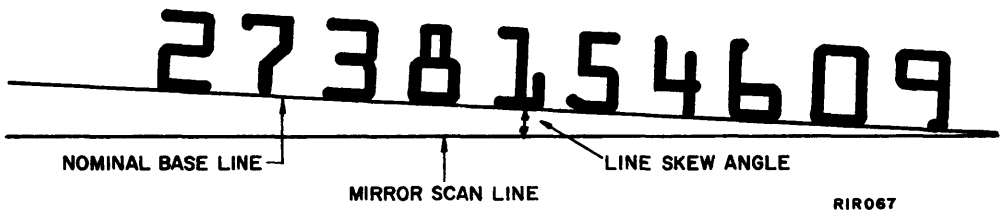


Figure 5-5. Line Skew

CHARACTER AND LINE SPACING

The vertical character displacement and horizontal line spacing, required to assure optimum performance of the 955/959, are explained in the following paragraphs.

HORIZONTAL LINE SPACING

Horizontal line spacing is measured from the nominal centerline of one line of characters to the nominal centerline of the next line of characters. Horizontal line spacing is defined as the number of lines per vertical inch on the document. Scan 3 mode is used to read data at three or less lines per inch. Scan 2 mode, because of its narrower read zone, is normally used to read printed data at densities of four and five lines per inch, and for reading Size IV characters. {See line spacing considerations in section 2 for additional information.}

VERTICAL CHARACTER DISPLACEMENT

Vertical character displacement is the vertical displacement of characters from the intended centerline of the data as illustrated in Figure 5-6. The nominal centerline (Figure 5-6) is defined as the line followed by the 955/959 mirror during document scanning. The 955/959 can operate in either Scan 2 or Scan 3 mode, depending on the software selection.

In Scan 3 mode, a Size I read zone of 0.304 inch (7.72 mm) is used. The Scan 3 mode allows considerable character misplacement because of the wide spacing of vertical lines as illustrated in Figure 5-6.

In Scan 2 mode, the read zone is narrowed to 0.198 inch as illustrated in Figure 5-7. The read zone is approximately two character heights and allows the user to read denser line spacing or data close to other preprinted data on the page.

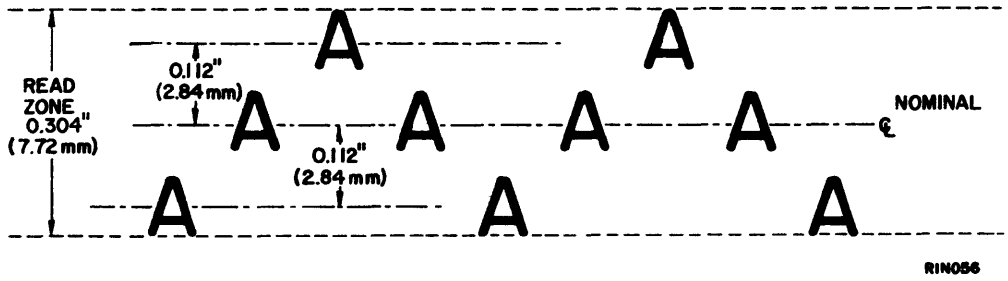


Figure 5-6. Scan 3 Read Zone (Size I)

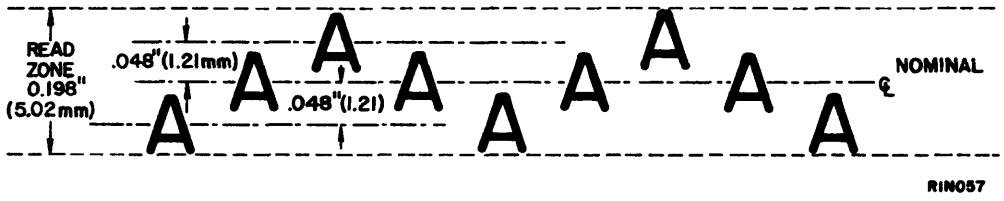


Figure 5-7. Scan 2 Read Zone (Size I)

Scan 2 also selects the six-lines-per-inch option, if that option is installed (see section 7). If the six-lines-per-inch option is installed, the option will override regular Scan 2 operation (See Figures 5-8 and 5-9) when Scan 2 is selected.

CLEAR AREAS

The clear area is the horizontal strip centered on the read area. This area must contain only data to be read. No extraneous printing or dirt is allowed. (See specification limit in section 4.)

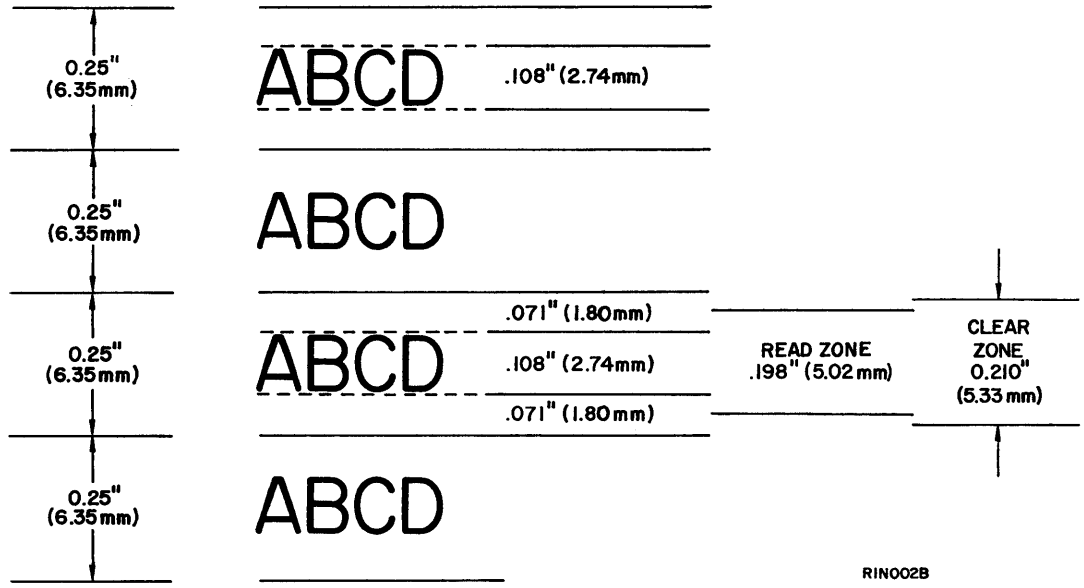


Figure 5-8. Scan 2. Maximum Line Density (Four Lines per Inch)

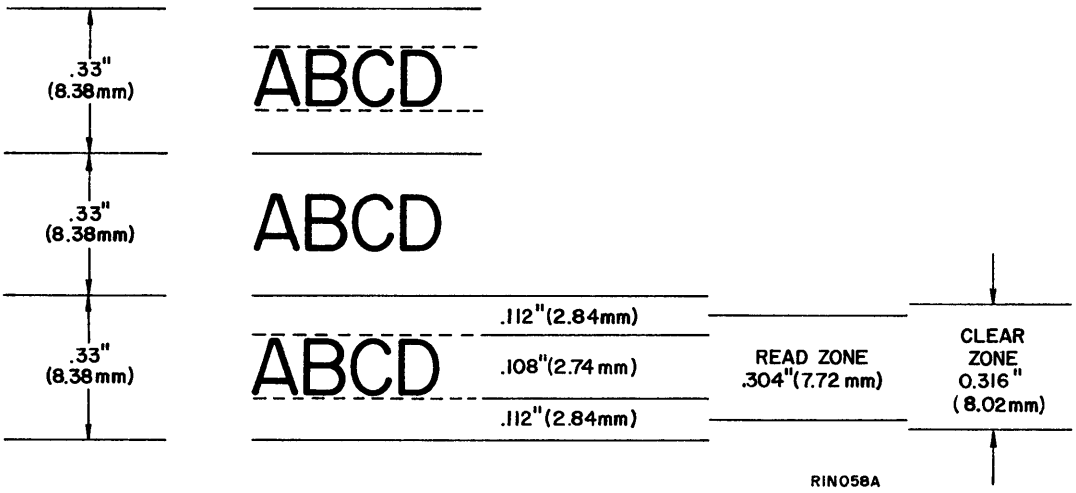


Figure 5-9. Scan 3. Maximum Line Density (Three Lines per Inch)

Line Finding

The 955/959 carries out line finding in one of three ways: (1) By incremental measurement from the leading edge of the document; (2) By line search under program control; and (3) By the recognition of line locating symbols. Line finding techniques for handprint are discussed in section 3.

Line Locator

The line locator is a horizontal bar printed or typed on a form to aid servoing or centering a line of data in the read zone. Table 5-2 contains line locator specifications.

TABLE 5-2. LINE LOCATOR SPECIFICATIONS

Stroke Width	Stroke Length
Minimum - 0.012 inch (0.305 mm) Preprinted nominal - 0.020 inch (0.508 mm) Maximum - 0.024 inch (0.610 mm)	Minimum - 0.50 inch (12.70 mm) Maximum - None but normally not longer than 0.750 inch (19.050 mm)

The line locate instruction as utilized by the 955/959 user programs requires a minimum 0.50 inch (12.70 mm) separation between the right edge of a preprinted line locate bar and the first data character on a line, as illustrated in Figure 5-10. It is acceptable, when sufficient margin area is not available for this purpose, to place the line locate bar on the line above the dataline as shown in Figure 5-11.

For edit and control purposes a line locator, followed by up to four OCR characters, can be used to:

1. Ensure the correct forms are being read.
2. Direct the program to the correct processing routines for each form depending on the form identification.

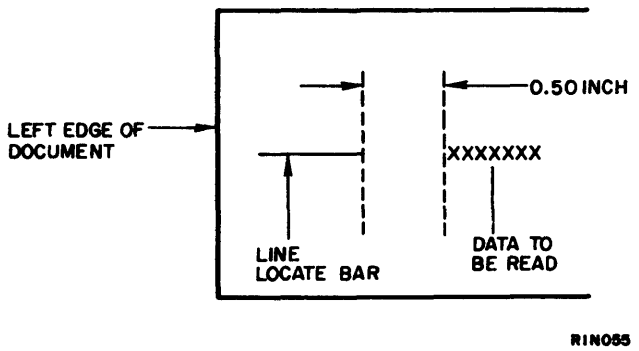


Figure 5-10. Minimum Horizontal Separation Between Line Locate Bar and Dataline

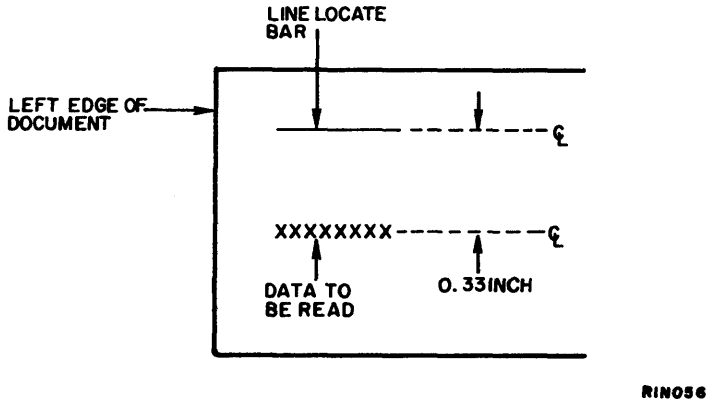


Figure 5-11. Minimum Vertical Separation Between Line Locate Bar and Data Line

HORIZONTAL CHARACTER SPACING (PITCH)

Horizontal character spacing is the space between the vertical centerlines of two adjacent characters. Character pitch is stated in characters per horizontal inch. The character pitch specified by the user program is determined by the font being read and the pitch of the characters that is printed by the input generating device. Table 5-3 lists the various OCR fonts available and the pitch applicable to each. Table 5-4 lists the horizontal character spacing specifications relating to each pitch of the OCR fonts.

More than one font can be read on the same horizontal centerline provided 0.300 inch (7.62 mm) of clear space is maintained between any two fonts.*

The space is required because the fields of individual fonts are selectable by program control and cannot be intermixed. The user-selected handprint spacing increments can be specified as either 3, 4, or 5 characters per inch, as shown in Table 3-1.

NOTE

Twenty spaces is the maximum number of consecutive spaces accurately generated at the nominal character pitch.

TABLE 5-3. NORMAL CHARACTER PITCH OF OCR FONTS

Pitch	Font
10	OCR-A Size I upper and lower case, 1403, 1428, 12F, and OCR-B
8	E13B
7	7B, OCR-A Size IV

*A space of 3.00 inches (76.20 mm) is required when changing from Size I to Size IV, or from Size IV to Size I fonts. The spacing gives the 955/959 time to switch its optical scaling.

TABLE 5-4. HORIZONTAL CHARACTER SPACING

Spacing	Pitch		
	Ten/Inch	Eight/Inch	Seven/Inch
Nominal character spacing	0.100 inch (2.540 mm)	0.125 inch (3.175 mm)	0.143 inch (3.632 mm)
Minimum character spacing	0.080 inch (2.032 mm)	(See Note)*	(See Note)*
Nominal clear space between adjacent characters	0.030 inch (0.762 mm)	0.035 inch (0.890 mm)	0.043 inch (1.092 mm)
Minimum clear space between adjacent characters	0.010 inch (0.254 mm)	0.010 inch (0.254 mm)	0.015 inch** (0.381 mm)
Maximum clear space that may not generate blank spaces	0.105 inch (2.667 mm)	0.130 inch (3.302 mm)	0.148 inch (3.759 mm)
Minimum clear space that may generate blank spaces	0.091 inch (2.31 mm)	0.116 inch (2.946 mm)	0.134 inch (3.403 mm)

*Only applicable for two adjacent characters. Minimum character pitch is 10 per inch.

**Size IV optical scaling. If Size I is selected, a pitch of 0.010 inch (0.25 mm) is required.

SECTION 6

JOURNAL TAPE OPTION

Media specifications relating to the use of the journal tape option are contained in this section. Also in this section is a description of data placement on OCR journal tapes to be processed by the 955/959 and restrictions on journal tape splicing. All 955/959 media specifications apply to the journal tape option, unless otherwise specified. Restrictions that apply during preparation of OCR data include:

1. Leading and trailing edges of tape cannot be folded or creased.

2. Tape rolls must be spooled, with the printing on the outside.

Journal tape error correction can be carried out by use of the marking pen, or on-line character correction options.

JOURNAL TAPE SPECIFICATION

Journal tape media specifications are listed in Table 6-1 and tape dimensions are shown in Figure 6-1.

TABLE 6-1. MEDIA SPECIFICATIONS

Item	Specifications
Margins	Left and Right: Preferred - 0.250 inch (6.350 mm) Minimum - 0.100 inch (2.540 mm) Top and Trailing Edges from Leader Splices: Preferred - 0.500 inch (12.70 mm) Minimum - 0.250 inch (6.350 mm)
Paper	Weight - 15 to 20 lb. (56 to 75 g/m^2) Caliper - 0.002 inch (0.051 mm) to 0.0045 inch (0.114 mm)
Width	3.00 inches (76.20 mm) to 4.50 inches (114.30 mm) - Self-threading
Roll diameter	4.00 inches (101.600 mm) maximum
Roll center hole	0.50 inch (12.70 mm)
Type font	Refer to READER CHARACTER SETS in Appendix G.
Leaders	Leading and trailing leader of 30 inches (762 mm) required on tapes of all widths.

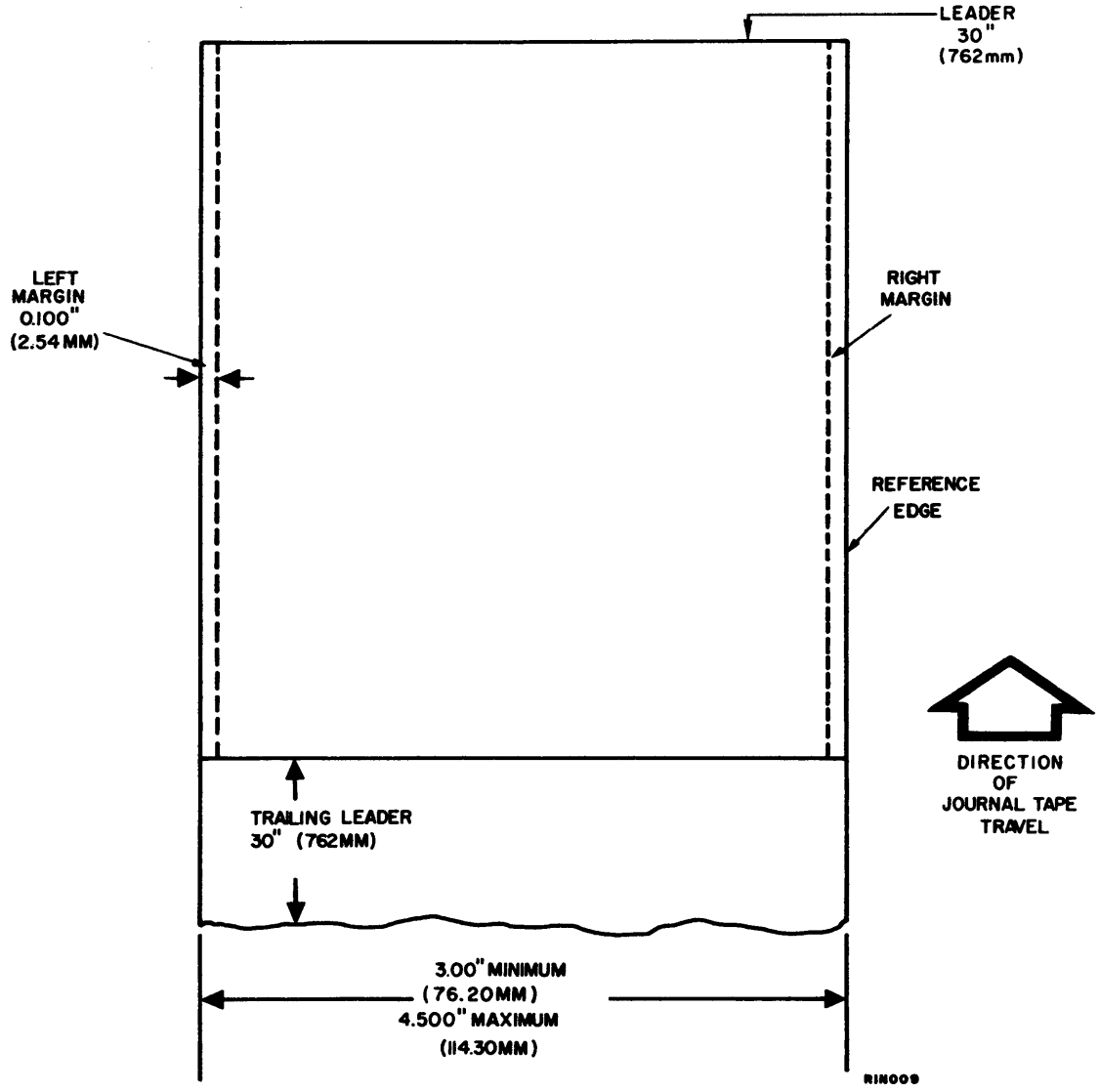


Figure 6-1. Journal Tape Dimensions

TAPE SPLICING

Restrictions that apply to journal tape splicing include:

1. Not extending transparent tape beyond the edges of journal tape, as in A of Figure 6-2. Using transparent tape on nonprint side of journal tape, as in B of Figure 6-2.

2. Maintaining clear space, at least 0.50 inch (12.70 mm), on either side of the splice as in B of Figure 6-2.

3. Spliced tapes must be the same width, with misalignment not greater than 0.031 inch (0.787 mm), as in C of Figure 6-2.

4. Splices may be butted {fitted together}, provided the spliced ends of both journal tapes are butted together as in A of Figure 6-2.

5. Splices may overlap if the overlap does not extend more than 0.125 inch {3.175 mm}. Place trailing edge of the leading tape over leading edge of trailing tape as in D of Figure 6-2.

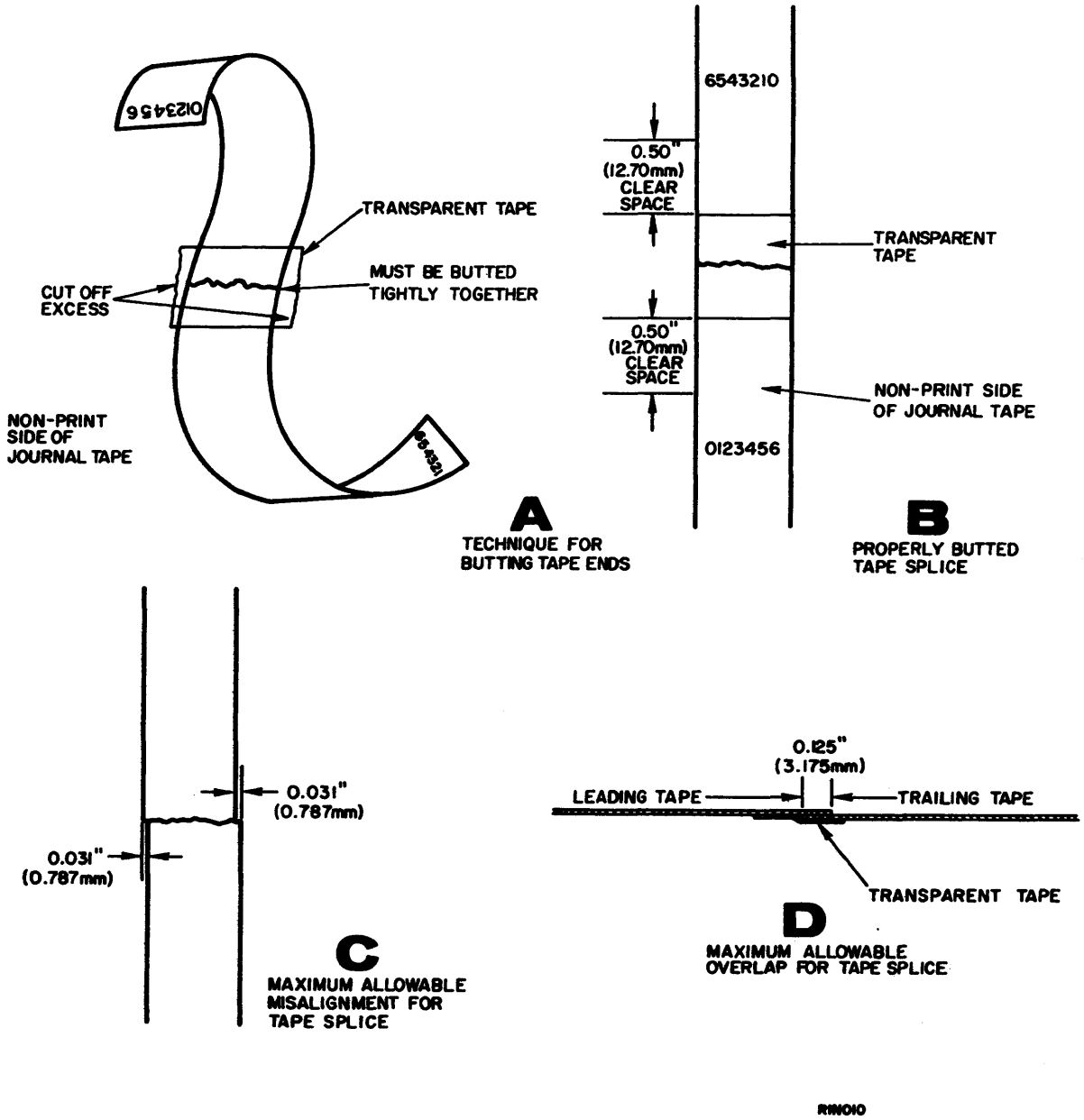


Figure 6-2. Correct Journal Tape Splicing Technique

SECTION 7

SIX-LINES-PER-INCH OPTION

The six-lines-per-inch option allows the 955/959 to read documents which contain single-spaced typed lines or line printed data or preprinted lines at five or six lines to the inch. When installed, the six-lines-per-inch option is selected by user program instructions. All 955/959 media specifications apply to this option, unless otherwise specified.

FONTS READABLE AT SIX LINES PER INCH

When the six-lines-per-inch option is installed, character sets that may be read include:

- OCR-A Size I upper case
- 1428 Numeric/1428 alphameric
- 12F Numeric
- OCR-B Size I upper case
- 407 - 1 numerics
- Rabinow symbols

NOTE

Information on the preceding fonts may be found in Appendix F. Lower case ANSI OCR-A, 7B, OCR-A, E13B Size IV characters cannot be read at six lines per inch.

HORIZONTAL CHARACTER RECOGNITION

All lines must be either left or right justified. Lines, which must be measured from the justified edge of the adjacent line to the trailing edge of the character initiating the indented line, may be indented up to 1 inch.

Example indentations:

```
Acceptable     XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                   XXXXXXXXXXXX
               XXXXXXXXXXXXXXXXXXXXXXXX
               XXXXXXXXXX

Unacceptable   XXXXXXXXXXXXXXXXXXXXXXX
(exceeds                     XXXXXXXXXXXXXXXXXXXX
1 inch)        XXXXXXXXXXXXXXXXXX
               XXXXXXXXXXXX
```

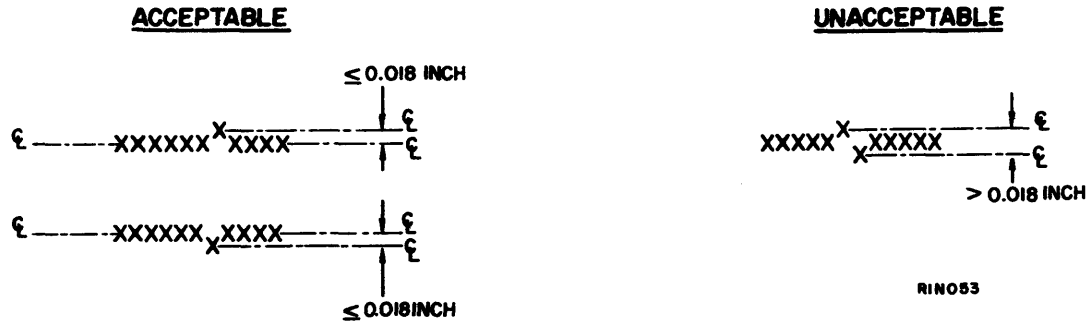
HORIZONTAL CHARACTER SPACING

The six-lines-per-inch option is designed to read characters printed with a horizontal pitch of 10 characters per inch. The fonts listed on page 7-1 are normally printed at 10 characters per inch. Reading seven or eight characters per inch is allowed only if the first character of each line generates a

full-height profile. {See paragraph entitled Line Tracking Requirements at Beginning of Dataline for example of characters with less than full-height profiles.}

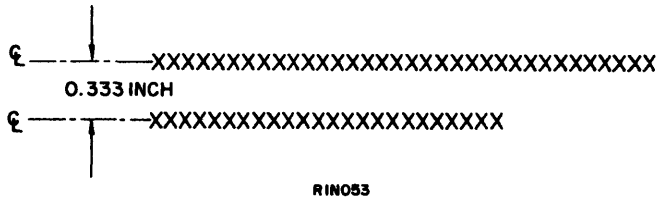
CHARACTER MISREGISTRATION TOLERANCE

The vertical misregistration between adjacent characters cannot exceed 0.010 inch {0.254 mm}. The maximum vertical misregistration from the nominal data centerline cannot exceed 0.01 inch {0.25 mm}.



BLANK LINE RECOGNITION

When two vertically adjacent lines are separated by a nominal centerline distance of 0.333 inch {8.45 mm}, a blank line is assured. The following is an example of blank line recognition.



Embedded Blank Zones

An embedded blank zone is a blank space within a line of data preceded and followed by data characters. The allowable limit on the acceptable length of a blank zone is 1.50 inches {38.10 mm}. The limit is imposed because a blank zone affords no line positioning information to the 955/959.

The embedded blank zone in A is acceptable because the zone is not greater than 1.50 inches {38.10 mm}. However, B is unacceptable because the blank zone measures more than 1.50 inches.

When a line containing an embedded blank zone is preceded or followed by an indented line, the embedded blank zone must not begin prior to the beginning of data on the indented line. In C the embedded blank zone is incorrectly positioned.

Acceptable

A - Embedded blank zone {≤1.5 inches}

```
XXXXXXXXXXXXXXXXXXXXX
XXXXXX          XXXXXXX
XXXXXXXXXXXXXXXXXXXXX
```

Unacceptable

B - Embedded blank zone {>1.5 inches}

```
XXXXXXXXXXXXXXXXXXXXX
XX              XXXXXXX
XXXXXXXXXXXXXXXXXXXXX
```

C - Embedded blank zone begins prior to data on a preceding indented line.

```
XXXXXXXXXXXXXXXXXXXXX
                XXXXXXXXX
XXXX    XXXXXXXXXXXXX
```

Indented Line

An indented line is defined as a line on which data begins to the right of data on a line preceding or following the line to be indented. The indentation, however, must not be greater than 1.50 inches {38.10 mm}. In D the indentation of line is greater than 1.50 inches {38.10 mm}.

Unacceptable

D -
```
XXXXXXXXXXXXXXXXXXXXX
                XXXXXXX
XXXXXXXXXXXXXXXXXXXXX
```

INVERTED READING

The mirror image option, which allows inverted reading, may not be used when reading lines at six to the inch. Reading reverse images is allowed while scanning from either left to right or right to left.

LINE TRACKING REQUIREMENTS {SIX-LINES-PER-INCH OPTION}

Lines of data are tracked on the basis of "full-height" character information. Characters with centerline heights less than 0.09 inch {2.28 mm} do not generate full-height profiles and therefore do not give line positioning information. The number of consecutive, less than "full-height", characters causes the data-line to be subject to the Embedded Blank Zone restrictions. Therefore, the number of consecutive, less than "full-height" characters, must not exceed 1.50 inches {38.10 mm}. In E the line with the string of consecutive less than "full-height" characters is permitted, since the characters extend less than 1.50 inches {38.10 mm}.

Acceptable

E -
```
XXXXXXXXXXX     LEGAL
           |<-------->|
XXXXXXXXXXX.,;°.,;:#$-^°XXXXXXXXXXX
```

The OCR-A or B characters period, comma, hyphen, colon, semicolon, quote, apostrophe, plus and equals, and the Rabinow characters, inverted delta and the number sign character set, are not full-height character profile symbols.

Line Tracking Requirements at Beginning of Dataline

To obtain the tracking that will be needed at the beginning of a read line, one of the first two characters on each read line must have a full-height character profile. Acceptable and unacceptable formats are shown in F and G.

Acceptable

F - X,XXXXXXXXXX or ΔXXXXXXXXXXX

Unacceptable

G - .,XXXXXXXXXXXX

In F the first character is full-height. In G the first two characters are less than full-height.

NOTE

A field separator does not qualify as a full-height character.

Nominal Line Spacing

The nominal line spacings for typewriters, line printers, and calculators, equipped with six-lines-per-inch vertical spacing increments are 0.167 inch (4.24 mm) (see Figure 7-1). The permitted line-to-line variation, for the six-lines-per-inch option accepted by the 955/959, is 0.167 inch +0.025 inch, -0.018 inch (4.24 mm, +0.635 mm, -0.457 mm).

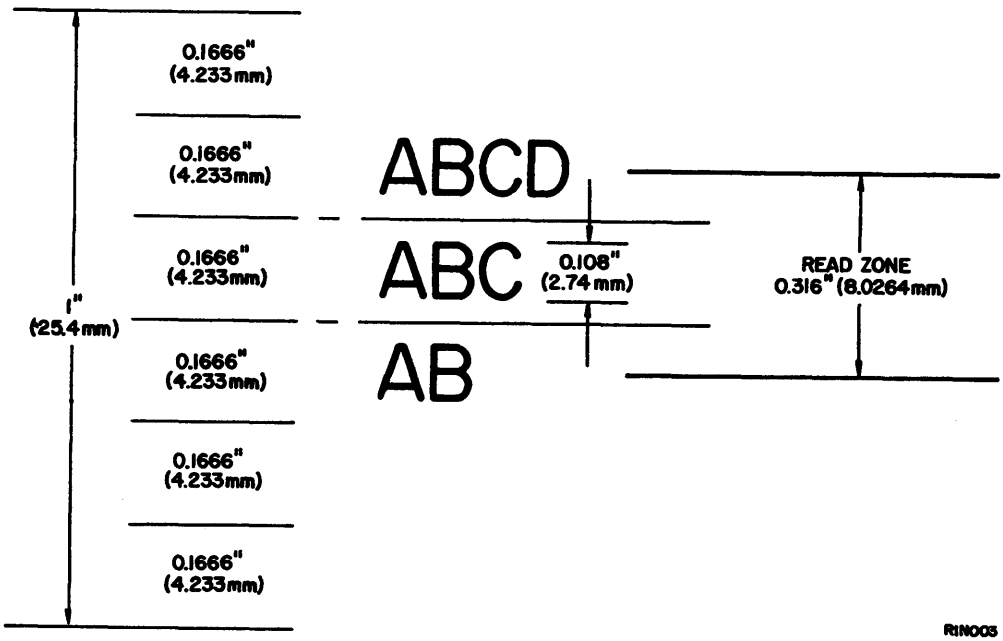


Figure 7-1. Scan 2. Maximum Line Density (Six-Lines-per-Vertical-Inch) Option

Allowable Skew

Total skew {resulting from both document skew and dataline misregistration} may not exceed one-half the permitted line skew for three-lines-per-inch scanning.

APPENDIX A

EVALUATION OF OCR MEDIA PRODUCTS

Products may be submitted to OCR personnel to be evaluated for their suitability for use with Control Data's OCR readers.

All products submitted for evaluation must include certification that they are of the same standard as the products that will be made regularly available to OCR users. All pertinent products will be thoroughly tested according to the criteria in the 955/959 Media Manual. When approval of a product by Control Data has been made, the product is thereby judged to be satisfactory for use with OCR readers. No other affirmation regarding the capability or suitability of the product is expressed or implied.

MEDIA

PAPERS

Submit one ream of each type and grade of paper to be evaluated. Include manufacturing specifications for average dirt count, opacity, porosity, and smoothness. All other tests will be conducted by OCR personnel.

RIBBONS

For each different type ribbon to be evaluated, submit print samples on white paper from the ribbon's entire span. Three randomly selected ribbon samples from six lots (18 in all) must also be submitted.

PRINT DEVICES

LINE PRINTERS

Type slugs and sample printouts should first be submitted for preliminary evaluation. If the initial samples are acceptable, print samples will be requested. If subsequent samples are needed, 10,000-line printouts, taken weekly over a 3-month period, will be required.

IMPRINTERS, TYPEWRITERS, CALCULATORS, PENCILS

All devices found to be malfunctioning should be submitted for evaluation by OCR personnel.

APPENDIX B
ACCEPTED PAPERS

The following papers meet OCR paper specificatinos (section 2) and have passed 955/959 feed tests.

Abitibi Provincial Paper Ltd.	
OCR Bond (Register & Rough)	24 lb
Aussedat Pont De Claix	
OCR Bond	24 lb
Aussedat Rey	
OCR Bond	20 and 24 lb
Boise-Cascade	
White OCR Bond	24 lb
Borregaard	
OCR Bond	90 g/m^2
Champion	
White OCR Bond	24 lb
Carnival Offset	24 lb
White Register Bond	24 lb
Crown-Zellerbach	
White OCR Bond	24 lb
Eastern Fine Paper Inc.	
OCR Bond	20 and 24 lb
Edward Collins & Sons, Ltd.	
OCR Bond	85 and 96 g/m^2
Finch, Pruyne & Co.	
OCR Bond	24 lb
George Drewson	
Gedrela Bond	24 lb
Hammermill Paper Co.	
White OCR Scanmate	24 lb
International Paper Co.	
Envelope Paper	24 lb
Kimberly-Clark Corporation	
Energy Ledger	20 lb

Mead Corporation	
Moistrite OCR Bond {Regular Finish}	24 lb
OCR Bond	24 lb
OCR Ledger	24 lb
OCR Code 5 Moisture Resistant OCR Bond	24 lb
Nekoosa-Edwards Paper Company	
OCR Bond	24 lb
OCR Bond {Hibulk}	24 lb
OCR Ledger	24 lb
Papeteries de Clairefontaine	
OCR Bond	80 and 90 g/m^2
Papeteries de Virginal {Mead}	
White OCR Bond	80 g/m^2
Papeteries de Viron	
OCR Bond	80 g/m^2
P. H. Glatfelter Co.	
OCR Bond	24 lb
Rolland Paper Company, Ltd.	
OCR Bond {No. 4}	20 lb
Sorg Paper Company	
OCR Bond	24 lb
Tullis Russell & Co. Ltd	
Ocaread Document White	85 g/m^2
Union Camp Corporation	
OCR Bond	24 lb
Wausau Paper Company	
Exact Ledger	20 lb
West Virginia Paper & Pulp Company	
Clearspring Bond	20 lb
Clearspring Ledger	24 lb
Weyerhaeuser Company, Paper Division	
OCR Bond	20 and 24 lb
Wiggins-Teape Ltd.	
Data Speed OCR Bond	20 and 24 lb
Readaspeed OCR Bond	85 g/m^2
Williamsburg	
Offset	24 lb

APPENDIX C

ACCEPTED RIBBONS

The following ribbons meet the print specifications in section 4.

Buckeye

Ribbon 373-093 (1) with IBM Selectric typewriter

CDC

Ribbon 94879100/OCR Film with Olivetti-Underwood Forum 702, Royal 665, Remington 25, Editor II 410 typewriters.*

Columbia

Ribbon No. 2 Polyethylene with IBM Selectric typewriter
Ribbon M-50 Mylar

Curtis-Young

0.31 - inch ribbon

Howmet

Ribbon 2151 with IBM Selectric typewriter
Ribbon OPX 1011 Thin Film Selectric, metallized .25-mil, polyester base, 9/16 inch by 500 feet.

IBM

Ribbon 3121; 5121; with IBM Selectric typewriter
Techne 3: with IBM Selectric II typewriter

Inter-Chemical

Ribbon Foremost/polyethylene

Olivetti-Underwood

Ribbon 7432 with IBM Selectric typewriter

Quest

Ribbon OCR-Poly

Remington Rand

Ribbon 4035750 with IBM Selectric typewriter
Ribbon 4027750/polyethylene

*Typewriter ribbons for the Olivetti-Underwood Forum 702, Royal 665, and Remington 25 must be on a 4-inch diameter, 0.33-inch wide reel. The Editor II 410 requires a 0.50-inch duplex spool, No. 7432 ABM, or equivalent. Olivetti, Royal Columbia and Kee-Lox make acceptable polyethylene or Mylar carbon ribbons for these typewriters.

Roy-Type

Ribbon P-900 with IBM Selectric typewriter
Ribbon 20403004/polyethylene

Stam Co.

DriRite 800/34 Selectric poly ribbon

HIGH SPEED LINE PRINTER RIBBONS

Buckeye

3- or 4-mil nylon with OCR inking density of 44 to 48.

Columbia

Ribbon SF100 with IBM 1403 train/chain printers, CDC 512 train printer, and CDC 3254-2, 1742, and 8156-2 line printers.

Kee-Lox

Ribbon Key Lectra

Olivetti

3-mil nylon

Roy-Type

Formula B, Formula D, and Intense No. 319 Multipass Mylar with IBM 1403 train/chain printer, CDC 512 train printer, and CDC 3254-2, 1742, and 8156-2 line printers.

APPENDIX D

ACCEPTED PRINT DEVICES

All of the print devices listed meet the specifications shown in section 5, provided the appropriate OCR option package is installed on the print device and regular preventive maintenance programs are implemented.

LINE PRINTERS

CDC

- 512 Line Printer
- 1742 Line Printer
- 3254-2 Line Printer
- 8156-2 Line Printer

IBM

- 3211 High-Speed Line Printer
- 1403 High-Speed Line Printer

Mohawk

- NCR C-640-205/215

IMPRINTERS

Addressograph/Multigraph

- 12-50 Imprinter
- 12-55 Imprinter
- 12-70-1A Imprinter
- 14-55 Imprinter

CDC

- 912 Imprinter
- 913 Imprinter
- 918 Imprinter

Farrington

- 867 Imprinter
- 875 Imprinter
- 888 Imprinter
- 889 Imprinter

TYPEWRITERS

Adler

- Model 21 C

Dura Corporation

- Electronic paper tape typewriter

IBM

- Selectric
- MT/ST
- Selectric II (10 pitch)

TYPEWRITERS (CONT'D)

Olivetti-Underwood

- Techne 4 (Europe)
- Editor II
- Editor IVC

Olympia

- Model 50 DR
- Model 35

Paillard, Inc.

- Hermes/Ambassador

Remington

- Model 25

Royal

- Model 665
- Model 568

SCM

- Model 410
- Model 415

CALCULATORS

The following manufacturers produce electronic calculating equipment capable of printing journal tape rolls with one or more of the 955/959 compatible fonts.

Kienzle NCR Olivetti Olympia Sweda Adler

Line spacing and pitch will vary. See section 6 for detailed information on the journal tape option specifications.

PENCILS

First quality No. 2 pencils made by several manufacturers have been successfully used in handprint applications on the 955/959.

APPENDIX E

NONREAD COLORS

Nonread inks used on forms printed for the 955/959 must retain 80 percent of the reflectance of the paper used.* Generally, blue, blue-green, green, and some yellows have proved the most successful as nonread colors. Assistance in the evaluation of nonread colors is available from OCR personnel.

Forms printed with nonread colors should be checked for ink reflectance throughout the production run to ensure adequate reflectance is maintained. The following equipment can measure the reflectance of nonread inks:

Equipment	Manufacturer
Kidder 081 Optical Character Tester	Kidder Press, Inc. Dover, New Hampshire 03820
Kidder 082 Optical Character Tester	Kidder Press, Inc. Dover, New Hampshire 03820
ICL Optical Print Quality Monitor	International Computers, Ltd. 839 Stewart Avenue Garden City, New York 11530
Macbeth PCM II	Macbeth Color & Photometry Division of Kollmorgen Corp. Little Britain Road Newburgh, New York 12550

KIDDER 081

Following is the nonread ink evaluation procedure:

1. After a 20- to 30-minute period to allow the machine to warm up, set the visible infrared switch to visible and calibrate background OCR paper to 100 percent reflectance (average of 10 sample character areas surveyed).

2. Position nonread ink portion of document under the 8-mil viewing aperture.

3. Use reflectance meter to obtain the reflectance of a nonread color. The reflectance reading must be a minimum of 80 percent, (85 percent for handprint nonread areas).

4. Repeat reflectance readings for all nonread ink portions of the document because inking density may vary over the width or length of a document.

KIDDER 082

Following is the nonread ink evaluation procedure:

1. If the filter wheel option is installed, set the filter wheel to clear. Then set the PCS (Print Contrast Signal) reflectance switch to reflectance.

2. Proceed as in the Kidder 081 procedure.

*For handprint guideboxes and other data in handprint read zones, 85 percent reflectance must be maintained.

MACBETH PCM II

Following is the nonread ink evaluation procedure:

1. After a 5-minute period to allow the machine to warm up, set the specified reflectance calibration values.

2. Position background OCR paper and press the Rp STORED pushbutton to store the percent reflectance of the sample paper.

3. Position the nonread ink portion of the sample paper under the 8-mil viewing aperture.

4. When the %R/PCS pushbutton is pressed the reading displayed on the digital scale is the PCS of the nonread color.

5. Repeat reflectance readings for all nonread ink portions of the document because inking density may vary over the width or length of a document.

APPENDIX F

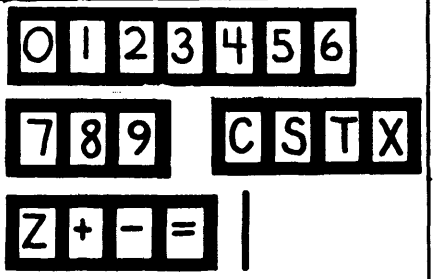
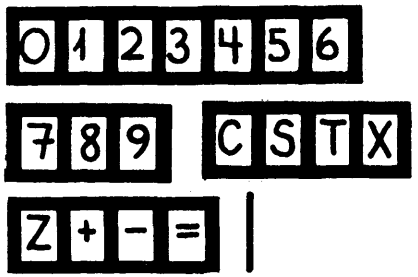
FONT OPTIONS

Table F-1 lists the various font options that may be used in the 955/959 Page and Document Reader. Also listed are the character sets and the stroke width, spacing, height, and width for the various characters.

TABLE F-1. FONT OPTIONS

FONT OPTIONS		CHARACTER SET READ	STROKE WIDTH (DIMENSION C FIG. 5-2)	NOMINAL SPACING	MINIMUM SPACING	NOM. CLEAR SPACE BTWN ADJC. CHAR.	MIN. PITCH TO YIELD A SPACE CODE	HEIGHT-CENTERLINE (DIM. B, F 5-2)	WIDTH-CENTERLINE (DIM. B, F 5-2)
ANSI OCR-A NUMERIC	SIZE I	0123456789 | ⑆⑇⑈	.014" ±.006" .35mm ±.15mm	.100" 2.54mm	.070" 1.77mm	.030" .76mm	.171" 4.34mm	.094" 2.38 mm	.055" 1.39mm
	SIZE IV	0123456789⑆⑇⑈	.020" .50mm +.016" +.40mm −.010" −.25mm	.143" 3.63mm	.130" 3.30mm	.043" 1.09mm	.246" 6.24mm	.150" 3.81mm	.080" 2.03mm
ANSI OCR-A ALPHA-NUMERIC	SIZE I	ABCDEFGHIJKLMNOPQRSTUVWXYZ ⑂⑃⑄⑅⑆⑇⑈⑉⑊⑋⑌⑍ 0123456789⑆⑇⑈	.014" ±.006" .35mm ±.15mm	.100" 2.54mm	.090" 2.28mm	.030" .76mm	.171" 4.34mm	.094" 2.38mm	.055" 1.39 mm
	SIZE IV	ABCDEFGHIJKLMNOPQRST UVWXYZ 0123456789⑆⑇⑈	.020" .50mm +.016" +.40mm −.010" −.25mm	.143" 3.63mm	.130" 3.30mm	.043" 1.09mm	.246" 6.24mm	.150" 3.81mm	.080" 2.03mm
ANSI OCR-A LOWER CASE		abcdefghijklmnopqrstuvwxyz	.014" ±.006" .35mm ±.15mm	.100" 2.54mm	.090" 2.28mm	.030" .76mm	.171" 4.34mm	.094" 2.38mm	.055" 1.39mm
OCR-B NUMERIC SIZE I	1965	0123456789 − + ¤ *	.014" ±.006" .35mm ±.15mm	.100" 2.54mm	.090" 2.28mm	.030" .76mm	.169" 4.29 mm	.094" 2.38mm	.055" 1.39mm
	1971	0123456789 − + ¤ *	.014" ±.006" .35mm ±.15mm	.100" 2.54mm	.090" 2.28mm	.030" .76mm	.169" 4.29mm	.094" 2.38mm	.055" 1.39 mm
OCR-B ALPHANUMERIC SIZE I 1971		0123456789 +<>,=;-'*. ABCDEFGHIJKLMNOPQRSTUVWXYZ ?$:¤()&/%@#	.014" ±.006" .35mm ±.15mm	.100" 2.54 mm	.090" 2.28mm	.030" .76mm	.169" 4.29mm	.094" 2.38mm	.055" 1.39mm
SELFCHEK 7B NUMERIC		0123456789	.020" ±.005" .50mm ±.127mm	.143" 3.63mm	.130" 3.30mm	.043" 1.09mm	.246" 6.24mm	.150" 3.81mm	.080" 2.03mm
SELFCHEK 12F NUMERIC		0123456789 H-	.012" ±.003" .30mm ±.076mm	.100" 2.54mm	.090" 2.28mm	.030" .76mm	.171" 4.34mm	.096" 2.43mm	.048" 1.21 mm
407-I NUMERIC		0123456789 ¤-	.013" .33mm +.005" +.127mm −.003" −.076mm	.100" 2.54mm	.090" 2.28mm	.030" .76mm	.171" 4.34mm	.096" 2.43mm	VARIES
E13B NUMERIC		0⑆⑇⑈⑉⑊⑋⑌⑍	.013" ±.002" .33mm ±.05mm	.125" 3.17mm	.115" 2.92mm	.034" .86mm	.214" 5.43mm	.104" 2.64mm	.039" .99mm .052" 1.32mm .065" 1.65mm
1428 NUMERIC		0123456789 H-	.013" .33mm +.005" +.127mm −.003" −.076mm	.100" 2.54mm	.090" 2.28mm	.030" .76mm	.171" 4.34mm	.090" 2.28mm	.060" 1.52mm
1428 ALPHAMERIC		0123456789CNSTXZ⑇	.013" .33mm +.005" +.127mm −.003" −.076mm	.100" 2.54mm	.090" 2.28mm	.030" .76mm	.171" 4.34mm	.090" 2.28mm	.060" 1.52mm

TABLE F-1. FONT OPTIONS (CONT'D)

Font Options	Character Set Read	Stroke Width (Dim.C Fig.5-2)	Nominal Spacing	Minimum Spacing	Nom. Clr Spc.Btwn Adjc.Chr	Min. Pitch to Produce a "Space" Code	Hght - Cntrln (Dim.B Fig.5-2)	Width Cntrln (Dim.B Fig.5-2)
Handprint		(See section 3)						
European Handprint		(See section 3)						
Gothic* Option Numeric	0123456789	(See section 3)						
OCRB Symbols	⑆⑈⑇	.01" ±.006" .25mm±.15mm	.10" 2.54mm	.09" 2.43mm	.03" .76mm	.16" 4.06mm	.09" 2.29mm	.05" 1.27mm
Rabinow Character Set	⑊⑋⑌⑍⑎⑏⑐⑑⑒⑓	.01" ±.006" .25mm±.15mm	.10" 2.54mm	.09" 2.29mm	.03" .76mm	.17" 4.32mm	.09" 2.29mm	.05" 1.27mm

*Preprinted Gothic option may be obtained with either the standard or European version of the Handprint Option.

APPENDIX G

HANDPRINTING REQUIREMENTS

HANDPRINT TRAINING NOTES

For personnel using OCR forms containing handprint fields, handprint training classes are necessary for successful implementation of handprint applications. Training booklets and visual aids are useful in such training. Sample data should be filled in on handprint forms for testing on the 955/959. Periodic handling of handprint data and forms will help the handprint personnel maintain proper OCR handprinting skills.

Aid in providing training and materials is available from the user's Control Data representative.

PENCILS

A No. 2 pencil or a thin-lead mechanical pencil with HB or equivalent lead produces the most reliable image quality. The use of a ball point or felt-tip pen, or other type of pencil is not recommended. {See Appendix D.}

WRITING SURFACES

When handprinting on OCR forms the printing should be done on a hard surface such as a desk or clip-board. Writing on a hard surface reduces the chances of creating embossed character images on paper. Multiple parts forms are not recommended due to the likelihood of embossing the original.

CHARACTER SHAPES

When handprinting, the print should be simple, avoiding serifs, curls, and loops. Adherence to the following examples helps ensure successful handprint recognition.

Correct

RIN048-1

Incorrect

RIN048-2

Full, rounded loops should be maintained.

Correct

RIN050-1

Incorrect

Loops should not be added to twos, threes, or other characters.

Correct

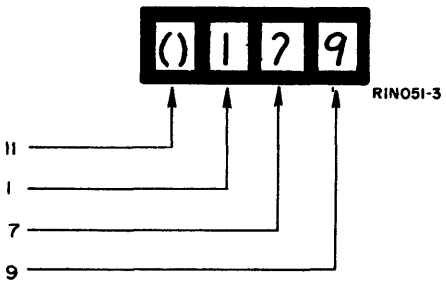
Incorrect

Equal and continuous pressure should be used when printing. If the pressure is too light the character may not be readable to the 955/959.

Correct

Incorrect

If lines are not connected or improper pressure is applied when printing, characters may be misidentified.



The proper lines should be connected when printing characters such as 0, 5, 6, 8, 9, T.

Correct

RIN049-1

Incorrect

RIN049-2

Characters should be printed large enough to make them distinctive, but the characters must stay within the guideboxes.

Correct

RIN049-3

Incorrect

RIN049-4

The figure four is printed with an open top.

Correct

RIN049-5

Incorrect

RIN049-6

HANDPRINT INSTRUCTIONS

1. Print naturally and at a moderate pace. Quick, erratic printing is more likely to produce faded areas and poor shapes. Varying the pace markedly tends to result in variant shapes for the same character.

2. Erase cleanly and completely. Do not use "white out" or "tape" products in place of erasers.

3. A line delete symbol may not be used in handprint applications. However, one means of deleting a line is to insert an "X" in a handprint guidebox. The guidebox must be to the right of the data field to be deleted.

APPENDIX H

SAMPLE FORMS

The sample documents illustrated in this appendix have been successfully used in various business applications. The documents are representative of OCR forms designed by Control Data analysts or customer personnel.

Figure H-1, which is interrelated with Figure H-2, is an order form which is mailed to a central processing section following execution. Figure H-2 is a sample free form of the data entered from the document shown in Figure H-1. The first record in Figure H-2 comprises the data in Figure H-1.

Tabular forms are most suited to data that lends itself to display by columns. Figure H-3, a form designed to best read tabulated data, features:

1. Preprinted registration marks (① of Figure H-3) that establish the exact position of the first line of data.
2. End-Of-Page line countdown guide for typists, (② of Figure H-3).
3. Buffer areas (③ of Figure H-3) are preprinted in a nonread color on each side of the field separator. The buffer area prevents typing too close to the field separator, which extends the length of the document, and provides space for corrections.

In Figure H-4, the source document (assembly shortage control coding sheet) might contain data records used to generate punched cards. Figure H-5 is a sample OCR preprinted assembly shortage control form which replaces the coding sheet in Figure H-4 and provides direct input to the 955/959. The flexible design of this OCR form allows inclusion of information not available on the original source document and also provides a form suited to the use of the typist and nontypist. The features of the form include:

1. Large buffer areas (① of Figure H-5) for correction and typing guides.
2. Field separators (② of Figure H-5) extending to the bottom of the fields, where the typed data is located.
3. The field separator (③ of Example H-5), ending below the upper limit of the field to avoid conflict with data in the field above.
4. Uniformity of blocks to permit extending field separators through several fields. Field separators are extended to the top of any field that does not contain data, (④ of Figure H-5).
5. Use of pinfeed platens (⑤ of Figure H-5) to gain the following advantages:
   A. Virtual impossibility of horizontal and vertical misregistration.
   B. Bottom of document data entry without skew.
   C. Less likelihood of typing a character too close to a field separator because of horizontal misregistration.

An effective OCR form, by design, may often be nearly identical to the source document. The OCR form in Figure H-7 is almost identical to the source document in Figure H-6. Some of the fields were expanded and others contracted to achieve better field separator alignment. The OCR form features:

1. Registration marks (① of Figure H-7) are placed an inch from the top edge of the document to assure accurate alignment in the typewriter. The first line is spaced at least one line below the registration mark a secure grip for typing.

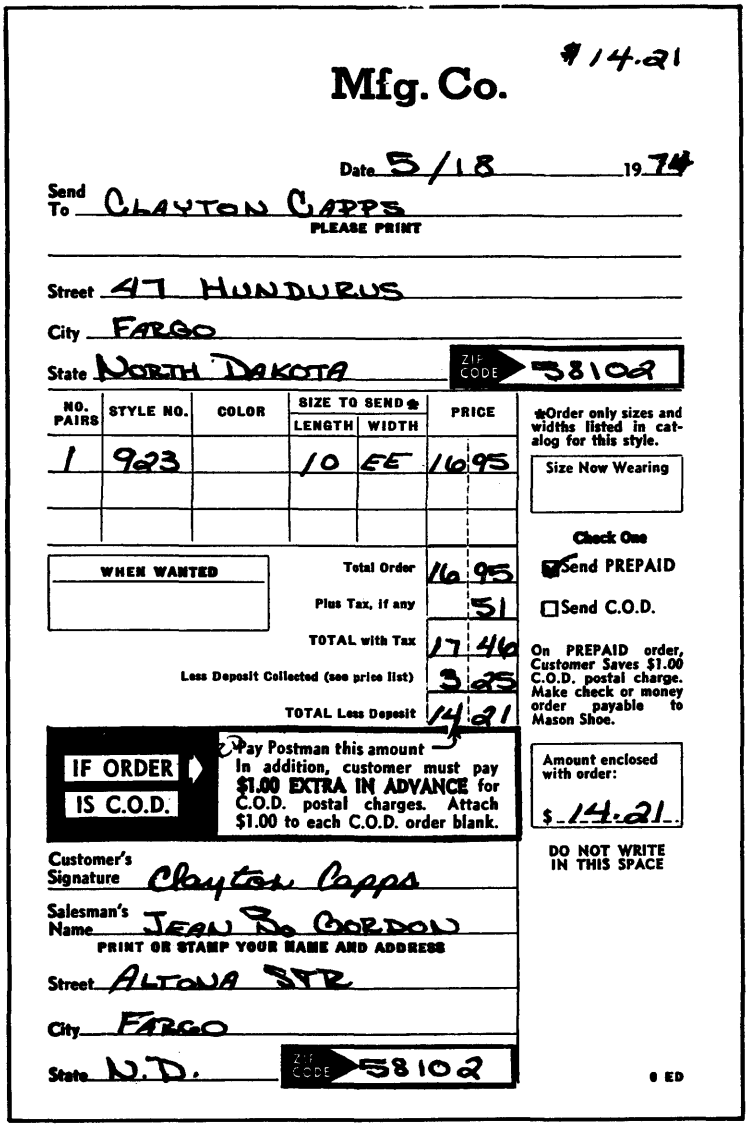
2. A design of field separators, (② of Figure H-7), to avoid interference with data in the preceding fields.

3. An example of field separators passing through several fields, (③ of Figure H-7).

4. Adequate edge margins (④ of Figure H-7).

Figure H-8 displays the smallest size document usually read by the 955/959. The document contains only two data lines. The top line is 7B font and the bottom line consists of a preprinted ANSI OCR-A font and handprint. The horizontal gap between the two fonts must be at least 0.250 inch (6.35 mm).

Form samples H-9, H-10, H-11, and H-12 include notations concerning the "strong points" of several other types of forms.



Mfg. Co.

$14.21

Date 5/18 19 74

Send To CLAYTON CAPPS
PLEASE PRINT

Street 47 HUNDURUS

City FARGO

State NORTH DAKOTA ZIP CODE 58102

NO. PAIRS	STYLE NO.	COLOR	SIZE TO SEND* LENGTH	SIZE TO SEND* WIDTH	PRICE
1	923		10	EE	16 95

*Order only sizes and widths listed in catalog for this style.

Size Now Wearing

WHEN WANTED

Total Order	16 95
Plus Tax, if any	51
TOTAL with Tax	17 46
Less Deposit Collected (see price list)	3 25
TOTAL Less Deposit	14 21

Check One
☑ Send PREPAID
☐ Send C.O.D.

On PREPAID order, Customer Saves $1.00 C.O.D. postal charge. Make check or money order payable to Mason Shoe.

IF ORDER IS C.O.D. → Pay Postman this amount 5
In addition, customer must pay $1.00 EXTRA IN ADVANCE for C.O.D. postal charges. Attach $1.00 to each C.O.D. order blank.

Amount enclosed with order: $ 14.21

DO NOT WRITE IN THIS SPACE

Customer's Signature Clayton Capps

Salesman's Name JEAN B. GORDON
PRINT OR STAMP YOUR NAME AND ADDRESS

Street ALTONA STR

City FARGO

State N.D. ZIP CODE 58102

8 ED

RIN028

Figure H-1. Sample Order Form
(Not to Scale)

```
1421|325|CLAYTON CAPPS|47 HUNDURUS|$ 02|
|1 923 10EE 1695||P T%
2 19 MARK RUTTEN|RR 3|ALEXANDRIA MINN 08|
100|250|RANDALL KNUDSON|ROUTE 3|$ 08|
| 1 906 75D 1295||E N 1045%
2 19 FRANK PARISH||CAMDENTON MO 20|
0|0|JIM CATTON|||
|1 116 7B 895|1 947 9EE 1795|C T 2#800%
&2-1495|100|OLE SEWNSON|1616 N SIXTH ST|$ 20|
H|1 8331 6D 1595||P N%
&1SAM YOUNG|A STREET|CHIPPEWA FALLS WIS 39|
3645|0||||
|1 301 125EE 2495 0S||P N%
ISADORE MALONE|302 MAIN ST|BAXTER KY 06|
100|0|ISADORE ??BAPTIST GEORGE|BOX 904|BERRY KY 06|
|1 947 9EE 1795 D1|1 116 7B 895 UPSIZED|E N 2690%
JOE JOHNSON|2424 16TH ST|OMAHA NEBRASKA|
3495|0||||
H|1 301 10D 3495||P N%
DAVE HARDIE||CHIPPEWA FALLS WIS 29|
1120|275||||
1120|275
|1 752 NO SIZE 1395||P N%
SAM CALKINS|3030 N FOLK|LORETTO MI 52|
0|0|M HODGE C/O GEO S REID|802 WARREN|LAKE CITY MI 51|
|1 95 75C 995|1 151 85C 1295|C N 2390 AM NC-POSTAGE%
```

Figure H-2. Sample Free Form {Not to Scale}

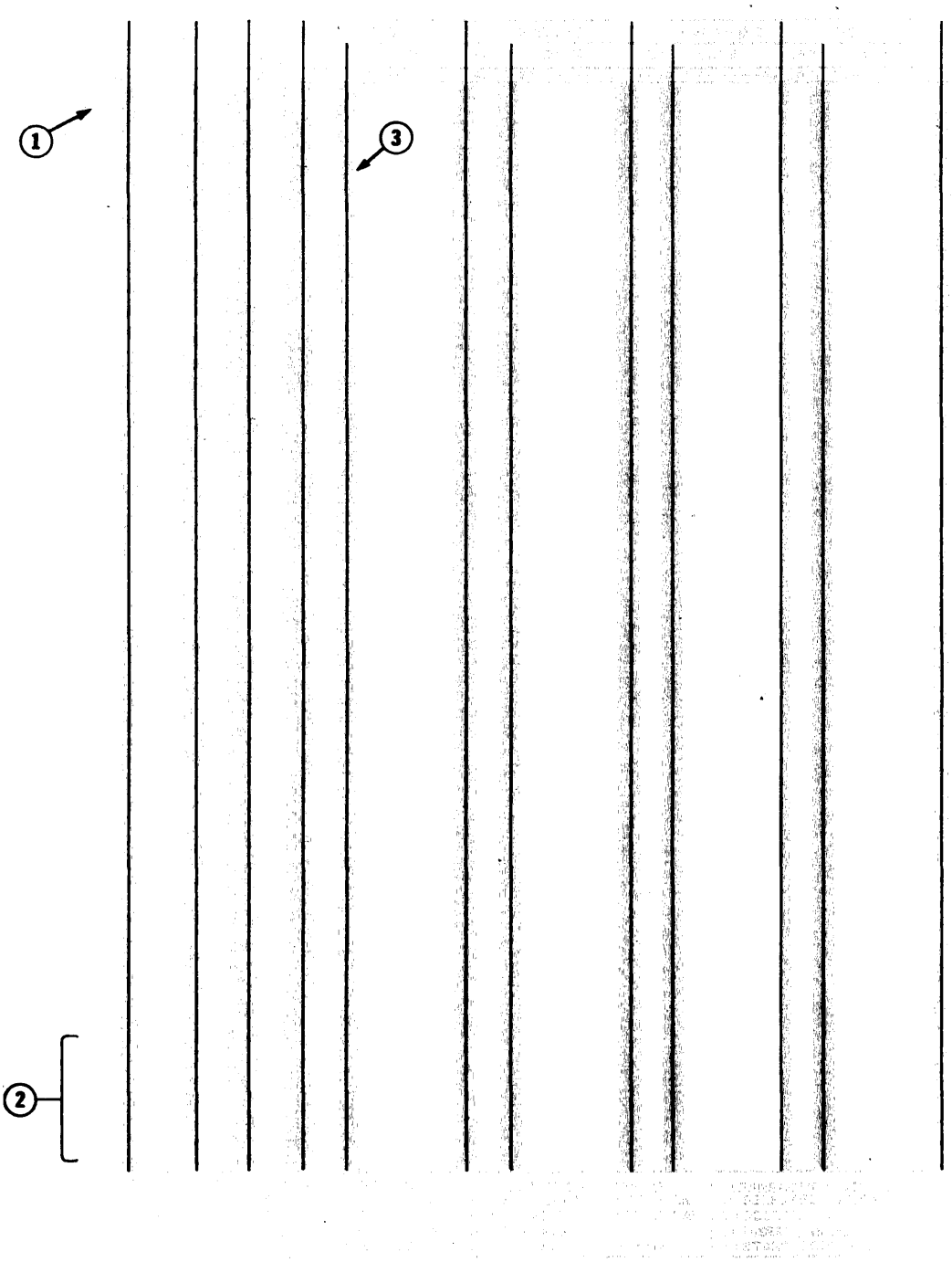


Figure H-3. Sample Tabular Form
(Not to Scale)

FORM 29-1015 (9-67)

ASC LIST & OLC FORECAST INPUT LOG

SHADED AREA - INDICATES OLC

Report For Control Booth _____ Date _____

Authorizing Signature _____

F	T/C	F.O. SERIAL (OR ASC LOG NUMBER)	Model	SHIP SHORT	PART NUMBER	CHANGE LETTER	Position	Am't. Per Ship	Amount Required	Ass'y. Sched Must Date	P R I	I M P	T/C	Part Code	ASSEMBLY OR JOB NUMBER	B or C	TERM. POINT	Cb. List Dsg.	

T/C	PART NAME	ASC LOG NUMBER	F.O. QUANTITY	T/C	Current Fab. Stat.	M.I. NUMBER	ECP NEG. OR TEST	T/C	SHIPS SHORT IN FORECAST SPAN	#	#	#	#	#	#	#	#	#	#	#
										#	#	#	#	#	#	#	#	#	#	#

F	T/C	F.O. SERIAL (OR ASC LOG NUMBER)	Model	SHIP SHORT	PART NUMBER	CHANGE LETTER	Position	Am't Per Ship	Amount Required	Ass'y Sched Must Date	P R I	I M P	T/C	Part Code	ASSEMBLY OR JOB NUMBERS	B or C	TERM. POINT	Cb List Dsg.	

T/C	PART NAME	ASC LOG NUMBER	F.O. QUANTITY	T/C	Current Fab. Stat.	M.I. NUMBER	ECP. NEG. OR TEST	T/C	SHIPS SHORT IN FORECAST SPAN	#	#	#	#	#	#	#	#	#	#	#
										#	#	#	#	#	#	#	#	#	#	#

F	T/C	F.O. SERIAL (OR ASC LOG NUMBER)	Model	SHIP SHORT	PART NUMBER	CHANGE LETTER	Position	Am'Y Per Ship	Amount Required	Assy. Sched Must Date	P R I	I M P	T/C	Part Code	ASSEMBLY OR JOB NUMBER	B or C	TERM. POINT.	Cb List Dsg.	

T/C	PART NAME	ASC LOG NUMBER	F.O. QUANTITY	T/C	Current Fab. Stat.	M.I. NUMBER	ECP. NEG. OR TEST	T/C	SHIPS SHORT IN FORECAST SPAN	#	#	#	#	#	#	#	#	#	#	#
										#	#	#	#	#	#	#	#	#	#	#

F	T/C	F.O. SERIAL (OR ASC LOG NUMBER)	Model	SHIP SHORT	PART NUMBER	CHANGE LETTER	Position	Am't. Per Ship	Amount Required	Ass'y. Sched Must Date	P R I	I M P	T/C	Part Code	ASSEMBLY OR JOB NUMBER	B or C	TERM. POINT	Cb. List Dsg.	

T/C	PART NAME	ASC. LOG NUMBER	F.O. QUANTITY	T/C	Current Fab. Stat.	M.I. NUMBER	ECP. NEG. OR TEST	T/C	SHIPS SHORT IN FORECAST SPAN	#	#	#	#	#	#	#	#	#	#	#
										#	#	#	#	#	#	#	#	#	#	#

F	T/C	F.O SERIAL (OR ASC LOG NUMBER)	Model	SHIP SHORT	PART NUMBER	CHANGE LETTER	Position	Am't. Per Ship	Amount Required	Ass'y. Sched Must Date	P R I	I M P	T/C	Part Code	ASSEMBLY OR JOB NUMBER	B or C	TERM. POINT	Cb List Dsg.	

T/C	PART NAME	ASC LOG NUMBER	F.O. QUANITY	T/C	Current Fab. Stat.	M.I. NUMBER	ECP. NET. OR TEST	T/C	SHIPS SHORT IN FORCAST SPAN	#	#	#	#	#	#	#	#	#	#	#
										#	#	#	#	#	#	#	#	#	#	#

RINO27

Figure H-4. Assembly Shortage Control Coding Sheet for Keypunch

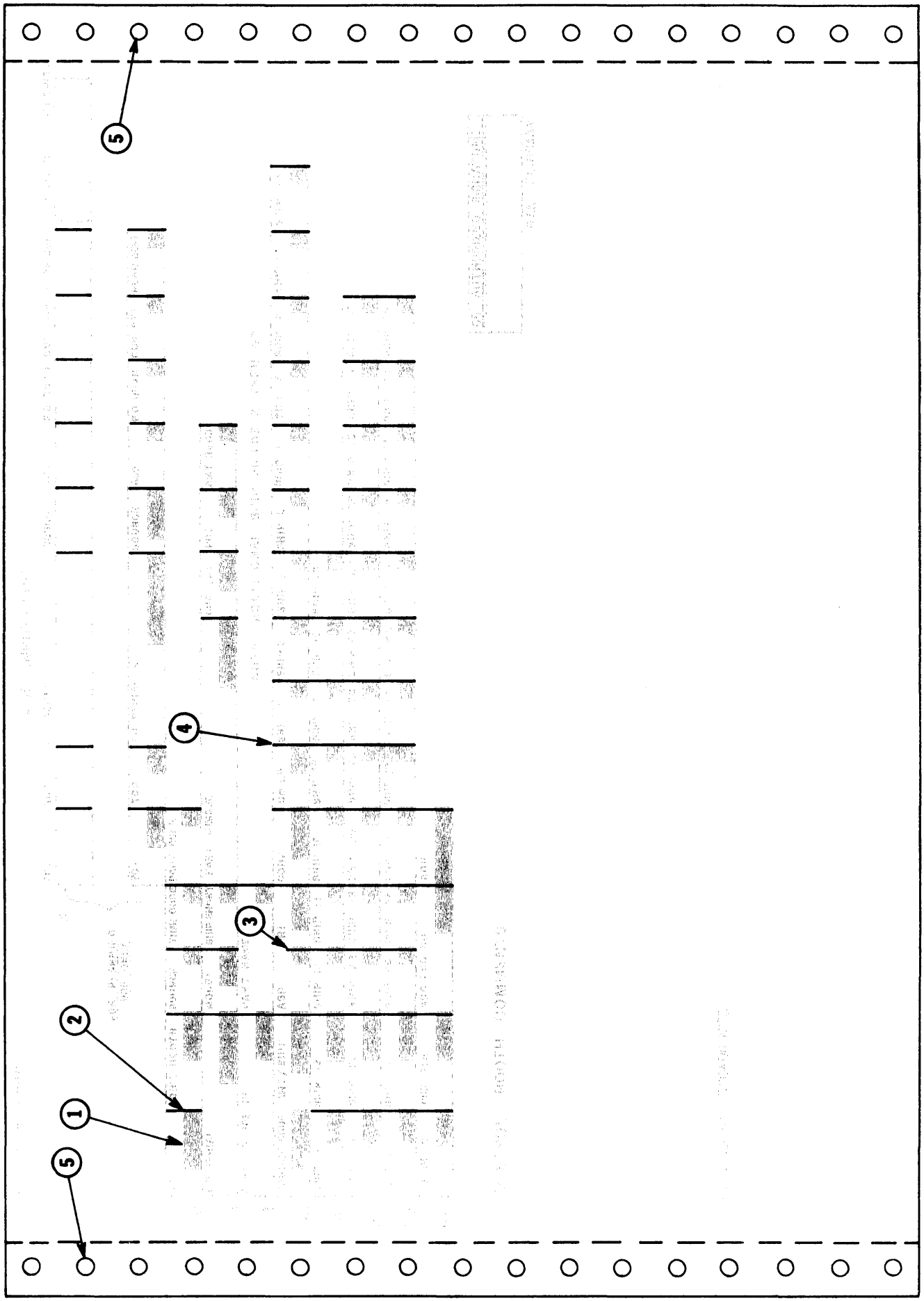


Figure H-5. Sample OCR Preprinted Form (Not to Scale)

LIFE INSURANCE COMPANY

NEW APPLICATION CODE SHEET

A	POLICY NO. 12345	TYPE OF ISSUE 1 (1) ORIG. (2) OPT. (3) ADD. (4) SUB.		APPLICANT Mr | John Baxter			SURNAME (8) Baxter
	BIRTHDAY 12|20|46	AGE 26.		DATE PROCESSED 1/5/73	STATE OF BIRTH VA	OCCUPATION Salesman	UND. NO. 105
B	PROPOSER OR WIFE Mrs. Beth Baxter			PRO'S/WIFE'S BIRTHDAY 10/12/50	F.P. CHILD'S BIRTHDAY 01/05/70	NO. OF UNITS | 6	
C	SEND MAIL TO 10318 Globe Court						ADDR. CODE 06
D	Sandusky Ohio 10211					COUNTY (7) Washington	COUNTY CODE 11
E	BASIC PLAN 10000	A.D.B. YES	DISABILITY YES	RIDER	G.I.R.	BASIC AMT./MO. INC. 50,000	RIDER AMT/MO. INC.
	ANN. OR SING. PREM. YES	HOW PAID CHECK					
	I.T. FROM	IRREG. TO	CUT MONTHS				
F	OWNER-IF OTHER THAN APPLICANT						
	MED. OR NON-MED. 2 (1) Med. (2) Non-Med.	C.W.A. AMT	C.W.A. DATE	AGENT PAYER 0 (0) NO (1) YES	APPRECIATION LETTER 0 (0) NO. (1) YES	OTHER INS. 0 (0) NO (1) APP. (2) FAM.	

	AGENT'S CODE	COMMISSION	AGENT OR BROKER	SPEC.	AUDIT	TERRITORY
G	210 –	5 %	Kelly Agency		Y	Cleveland
	–	%				
H	–	%				
	–	%				

	P.A.C. CONTROL NO.	PREM. PAYER & ACCT. NO.															
I																	
Z	POLICY DATE 10|10|72	NOTES	REIN.	BILLING	TRANSIT	BANK OR	GROUP NO. 205	LTD. A.D.B. AMT.	A.D.B %	P.B.%	P.B.O.%	P.W. %	TABLE	EXTRA	YRS.	CODE	RERUN
					03	100											

ISSUE NOTES:

MEMOS: approved 10/8/74

Clarke Wheeler

C.L.U.

RIN030

94L04500 A

Figure H-6. Sample Source Document Coding Sheet - To Be Keypunched

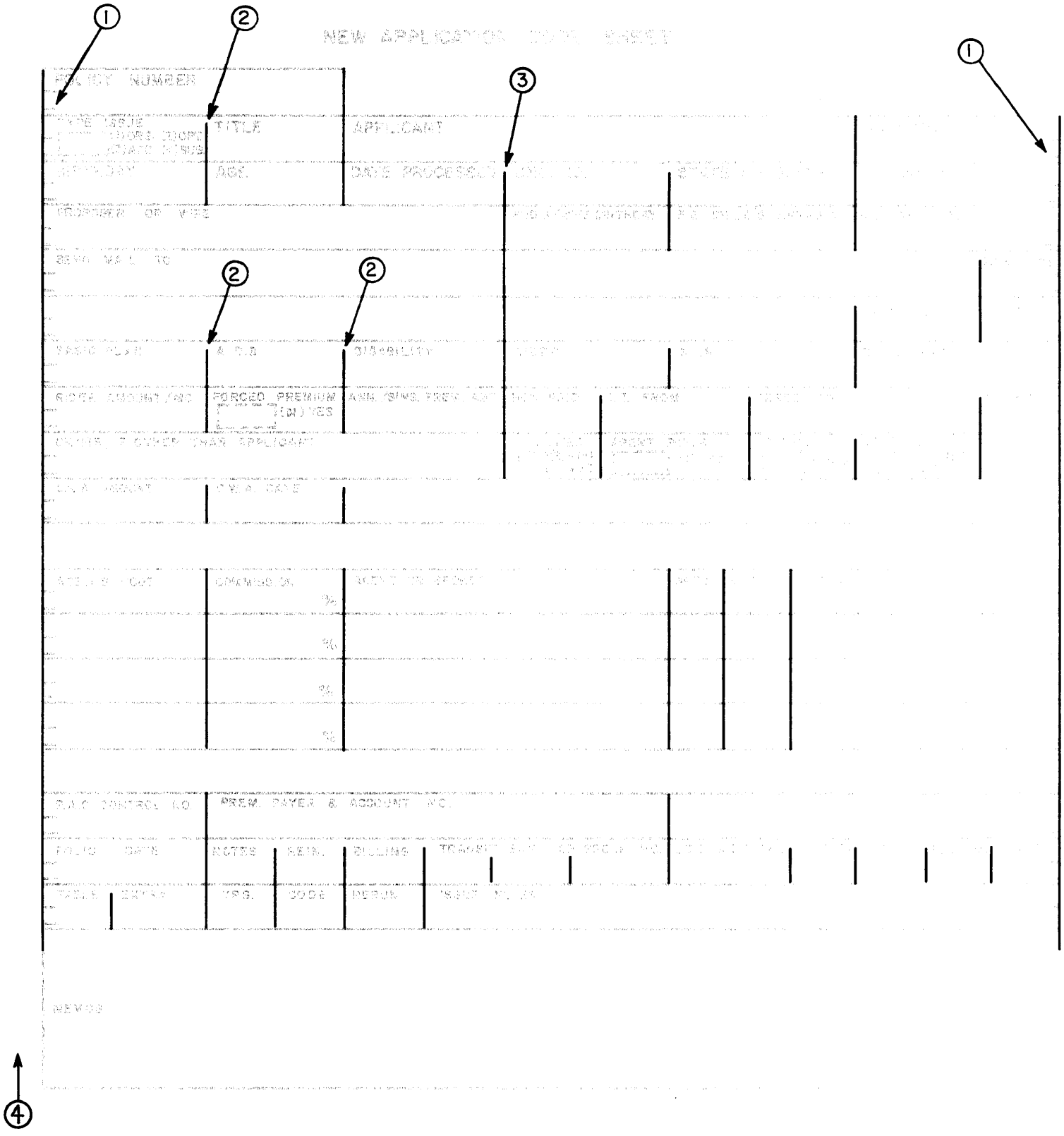


Figure H-7. OCR Form Identical to the Source Document Now Typed at the Source (Not to Scale)

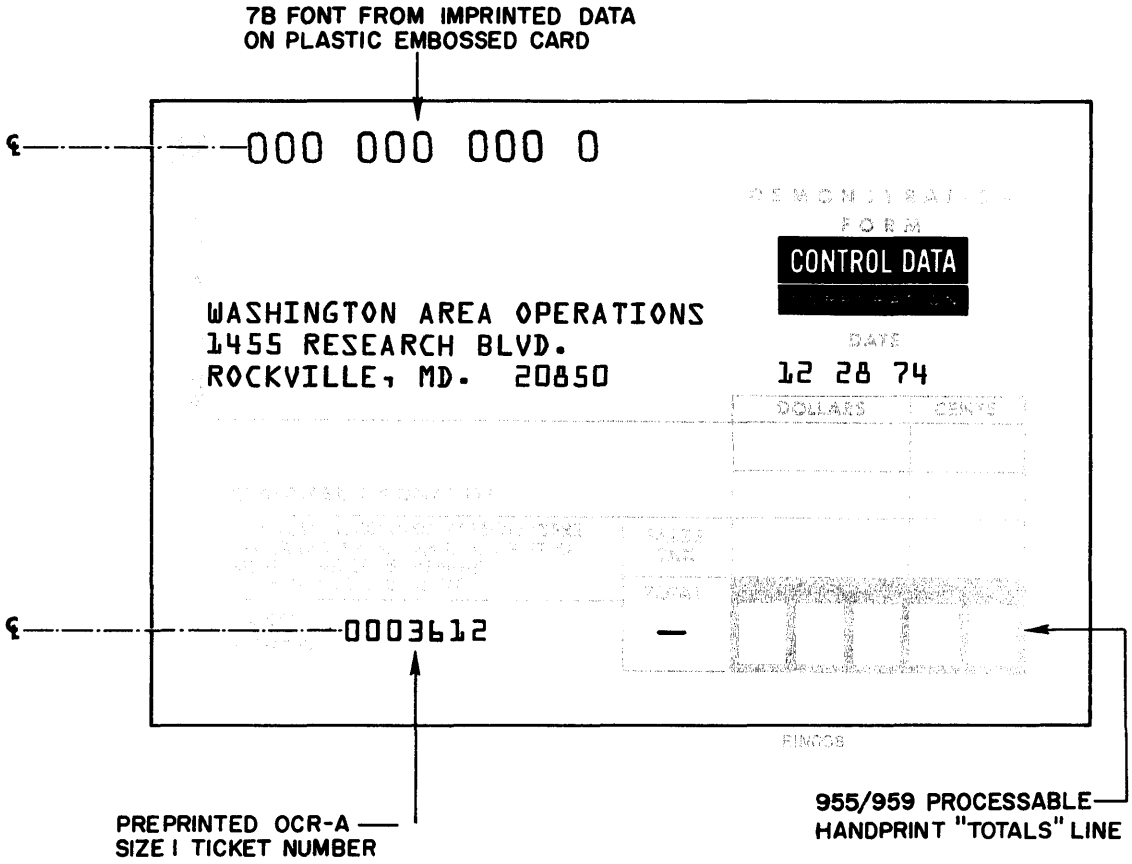


Figure H-8. Billing Application
(Not to Scale)

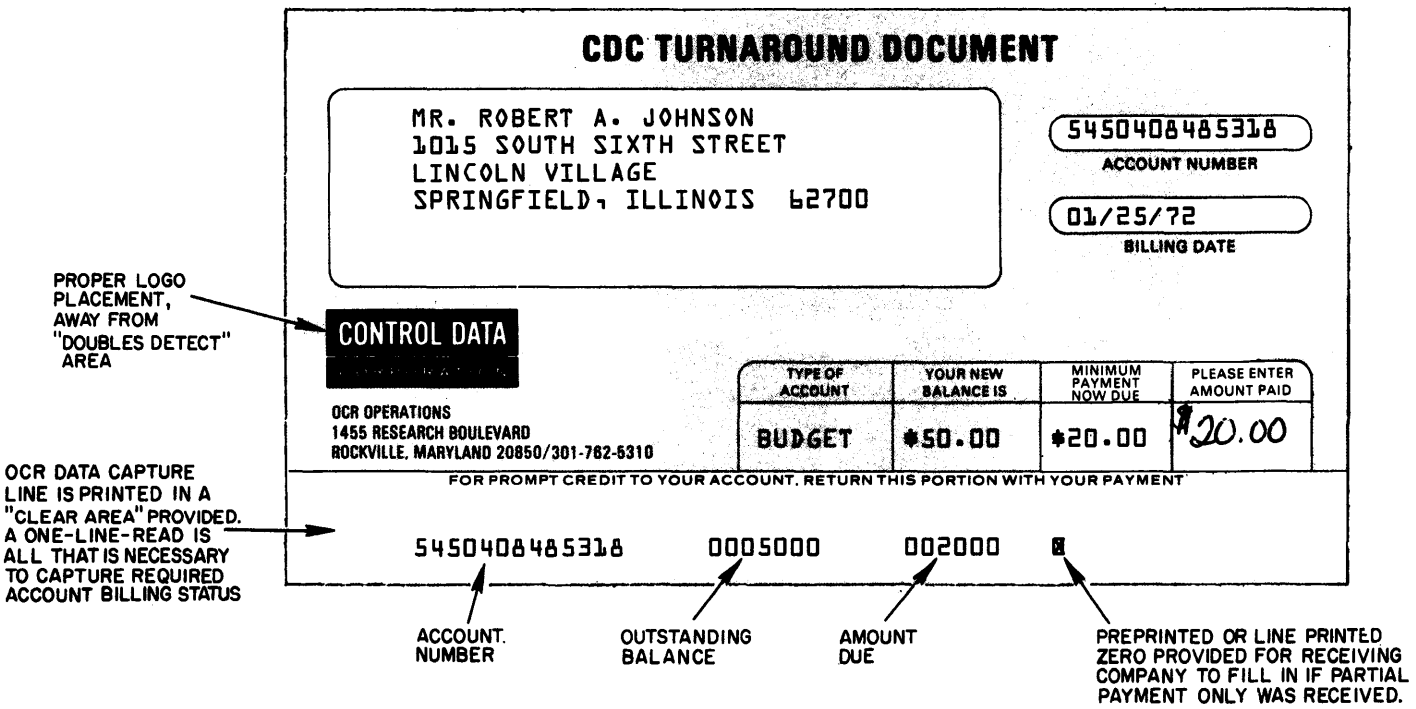


Figure H-9. Billing Application Form (Not to Scale)

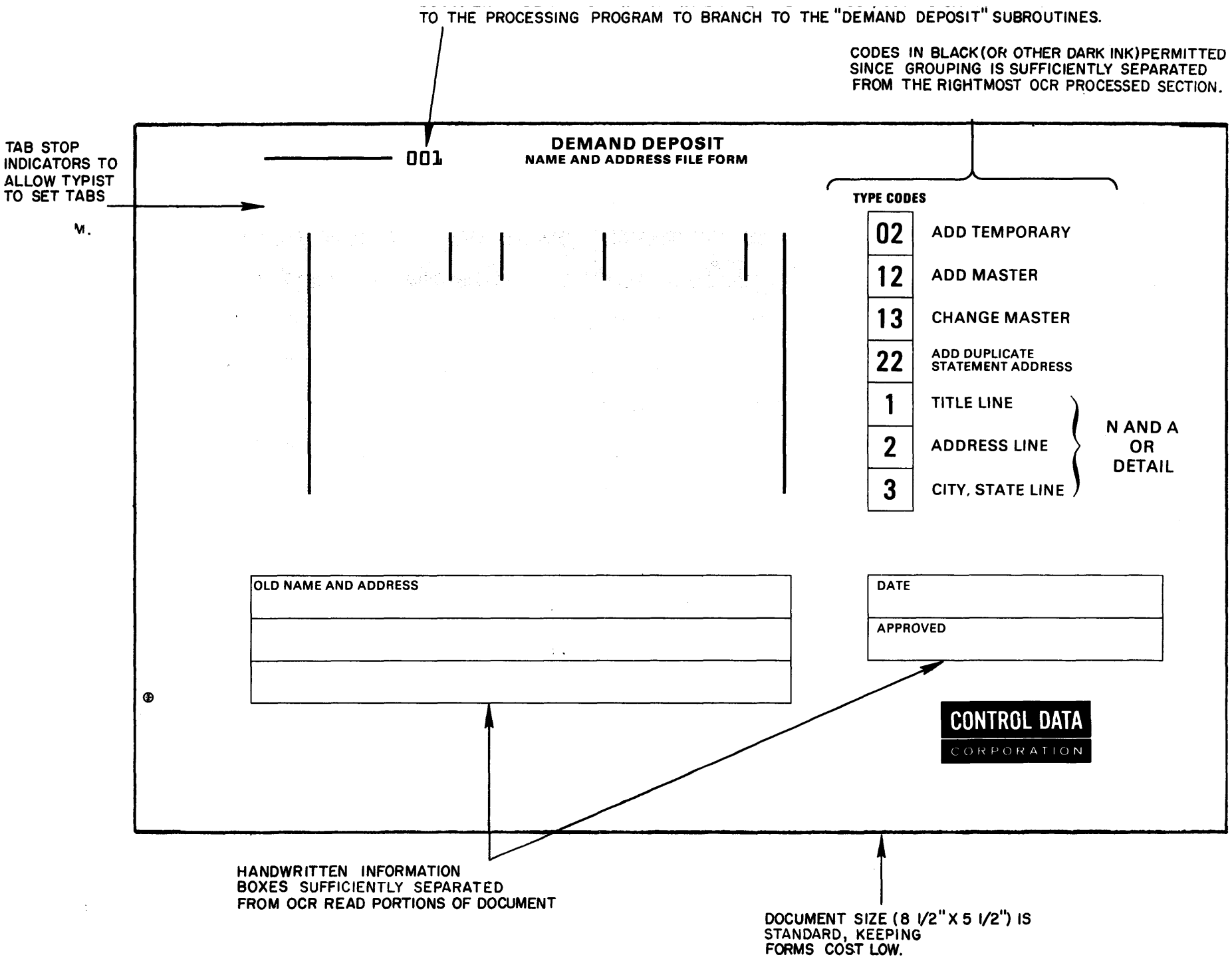


Figure H-10. Demand Deposit Form with Features Detailed (Not to Scale)

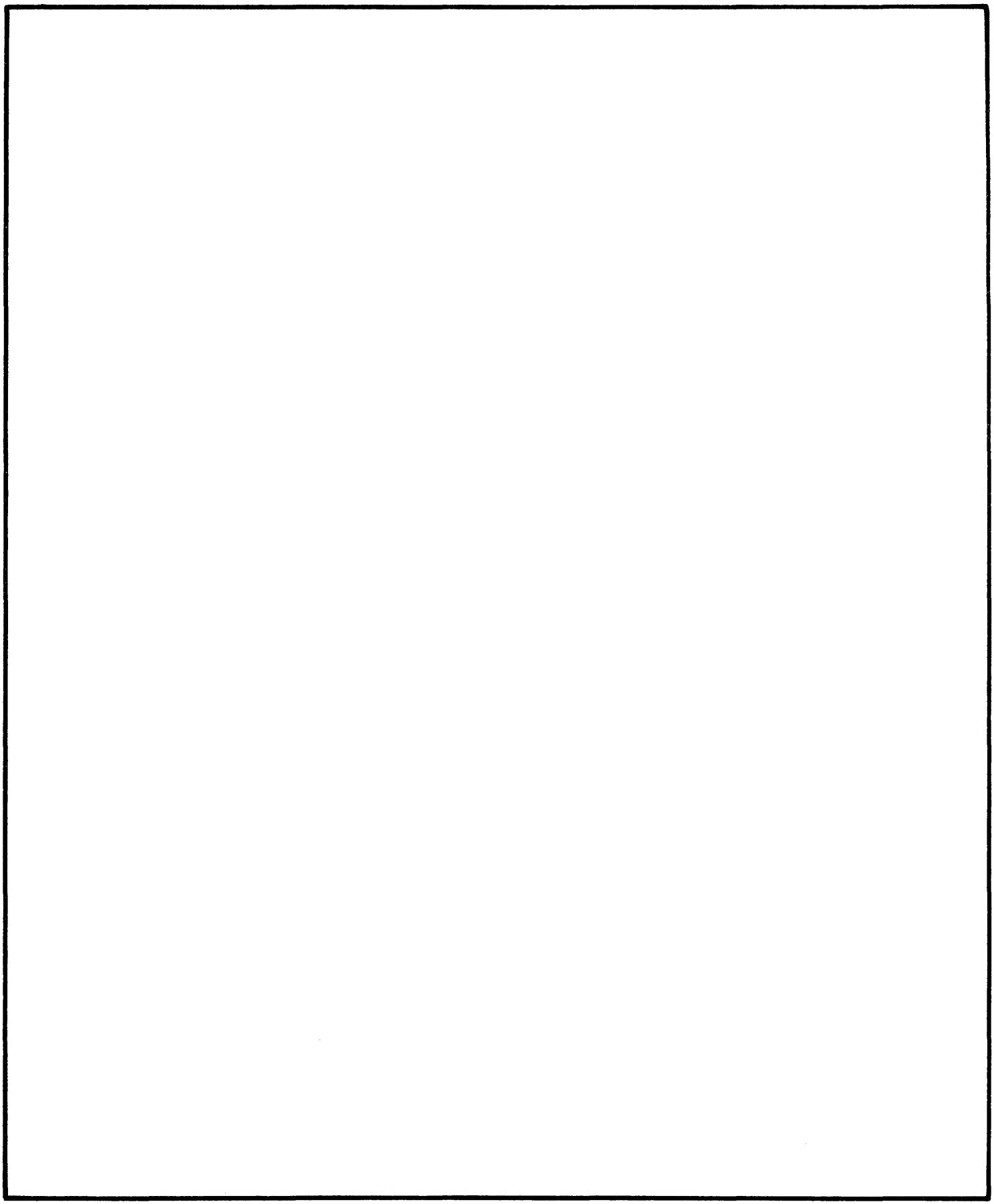


Figure H-11. Free Form With Typing Guides
(Not to Scale)

JOURNAL ENTRY INPUT

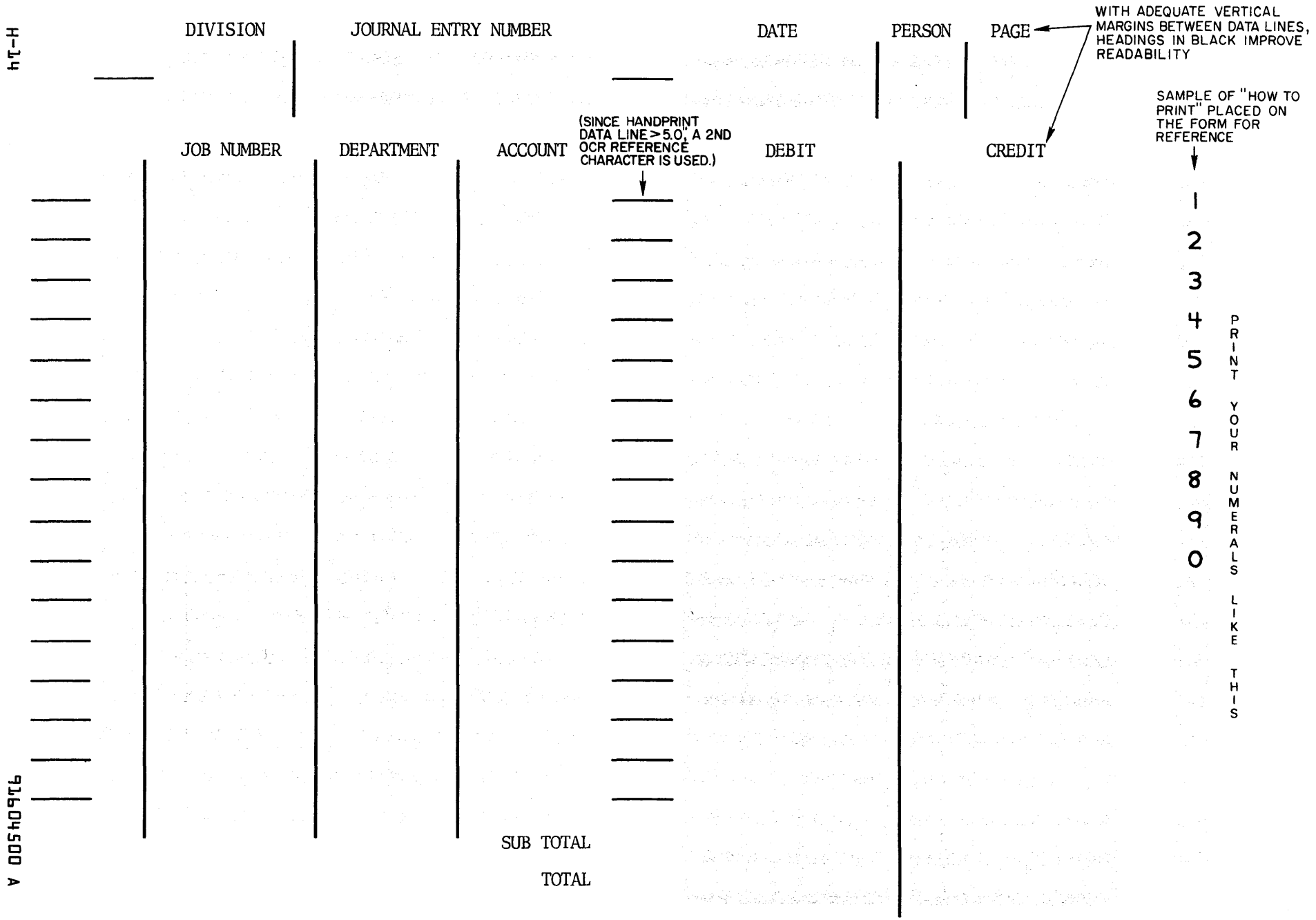


Figure H-12. Journal Entry Input (Not to Scale)

APPENDIX I

THROUGHPUT DETERMINATIONS

The variables affecting document throughput include the number and length of lines, line pitch, and document size. The variables, which are obtained from the user document, are substituted in the equations under "THROUGHPUT EQUATIONS" to compute document reading time and throughput rate.

The maximum throughput rate for the 955/959 is five documents per second, with a minimum line length of 0.10 inch (2.54 mm). If the calculated throughput rate for a document with short data lines exceeds five documents per second, delays must be inserted in the user program.

Also contained in this appendix are throughput equations, throughput calculation aids, an example calculation of document throughput rate, and a document throughput worksheet. A formula using the preceding factors, which affect journal tape, is presented, as well as a worksheet and sample calculation, which is provided to aid the user in determining realistic journal tape throughput rates.

THROUGHPUT EQUATIONS

The throughput rate is calculated by using the equations listed on the document throughput worksheet in Figures I-1 and I-3. The document reading time is determined by the following equations:

$$T_D = T_S + S_T (n-1) + T_F + R_E + F_{tE} + P_E + O_E$$

$$TA = T_D + P_D$$

where:

- S = Slew distance, used to compute the required slew time (T_S).
- T_S = Slew time or document ready time, which is measured from the centerline of the last line on a document to the centerline on line 0 of the next document.
- S_T = Step time, which is dependent on the step distance from line-to-line (line pitch). The factor to be used is given on the worksheet for each value of the line pitch of the user document.
- T_F = The total line reading time per page, in seconds.
- F_T = Flyback time of the scanning mirror, in seconds.
- P_Q = The print quality or possible reject percentage of data from the input generating devices. The P_Q is based on print contrast, stroke width, and stroke centerline tolerance.
- R_E = The rescan efficiency, which is computed by multiplying the reject percentage (P_Q) by the total line reading time per page, then adding flyback time.
- F_{tE} = The flyback time in excess of step time (S) in seconds. Mirror flyback occurs simultaneously with document stepping, but for a range of line length vs. step time the flyback time can exceed the step time.

T_D = The average reading time per document, in seconds. To determine throughput rate in documents per hour divide T_D into 3,600 (3600/T_D).

T_{JT} = The average reading time per line in seconds for 955/959's equipped with journal tape option. The journal tape throughput in lines per minute rate is determined by dividing T_{JT} into 60 (60/T_{JT}).

n = The number of consecutive lines per document.

P_E = The program efficiency is the average time in seconds per document that the 955/959 is awaiting command signals from the user program. Normally P_E is equal to zero. For example, programming considerations may require the mirror stop at the end of a data record is for editing. The mirror halt time must be included in the program efficiency to determine document throughput.

O_E = The operator efficiency is a highly variable factor equalling 0 for the maximum system throughput rate represented by zero system stoppage for operator intervention, no utilization of the character correction feature, no delays for the teletype system interplay, document loading, etc. Factors greater than 0 represent departures from this unattainable maximum. A factor greater than 0 would result in a reduction of throughput due to machine "waiting time" for one or more of the previous reasons.

P_D = A program delay is used if the average reading time per document, in seconds, T_D exceeds 0.2 seconds. The program delay must be inserted into the program to delay document throughput so as not to exceed five documents per second.

T_A = The adjusted average reading time per document, in seconds. If T_D is equal to or greater than 0.2 seconds per document, P_D equals zero. If T_D is less than 0.2 seconds per document, P_D=0.2 - T_D. The document throughput rate is determined by dividing 3600 (seconds per hour) by T_A.

A sample throughput calculation using variables is shown in Figures I-2 and I-4.

THROUGHPUT CALCULATION AIDS

Tables I-1, I-2, I-3, I-4 and I-5 contain parameter rates useful for solving throughput equations.

{Intentionally Blank}

TABLE I-1. VALUE OF T_F IN SECONDS

L \ n	1	10	20	30	40	50	60
0.1	0.0203	0.203	0.406	0.609	0.812	1.015	1.218
1.0	0.0323	0.323	0.646	0.969	1.292	1.615	1.938
2.0	0.0456	0.456	0.912	1.368	1.824	2.280	2.736
3.0	0.0590	0.590	1.180	1.770	2.360	2.950	3.540
4.0	0.0723	0.723	1.446	2.169	2.892	3.615	4.338
5.0	0.0856	0.856	1.712	2.568	3.424	4.280	5.136
6.0	0.0990	0.990	1.980	2.970	3.960	4.950	5.940
7.0	0.1123	1.123	2.246	3.369	4.492	5.615	6.738
8.0	0.1256	1.256	2.512	3.768	5.024	6.280	7.536
9.0	0.1390	1.390	2.780	4.170	5.560	6.950	8.340
10.0	0.1520	1.520	3.040	4.560	6.080	7.600	9.120
10.5	0.1590	1.590	3.180	4.770	6.360	7.950	9.540

TABLE I-2. VALUES OF $S_T(n-1)$ IN SECONDS

P \ n	1	10	20	30	40	50	60
1	0	0.513	1.083				
2	0	0.387	0.817	1.247			
3	0	0.324	0.684	1.044	1.404		
4	0	0.297	0.627	0.957	1.287	1.617	
5	0	0.261	0.551	0.841	1.131	1.421	1.711
6	0	0.243	0.513	0.783	1.053	1.323	1.593

TABLE I-3. VALUES OF T_S

S (Inches)	T_S (Seconds)	S (Inches)	T_S (Seconds)	S (Inches)	T_S (Seconds)
0.336	0.036	3.5	0.120	7.5	0.220
0.5	0.044	4.0	0.132	8.0	0.232
0.992	0.068	4.5	0.145	8.5	0.245
1.0	0.057	5.0	0.157	9.0	0.257
1.5	0.070	5.5	0.170	9.5	0.270
2.0	0.082	6.0	0.182	10.0	0.282
2.5	0.095	6.5	0.195	10.5	0.295
3.0	0.107	7.0	0.207	11.0	0.307

TABLE I-4. VALUES OF F_{tE} IN SECONDS WHEN $F_t - S_t > 0$

P \ L	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	10.5
1											
2											
3									0.0015	0.0036	0.0046
4							0.0004	0.0025	0.0045	0.0066	0.0076
5					0.0005	0.0024	0.0044	0.0065	0.0085	0.0106	0.0116
6				0.0002	0.0023	0.0044	0.0064	0.0085	0.0105	0.0126	0.0136

TABLE I-5. VALUES OF F_T

L (Inches)	F_T (Seconds)	L (Inches)	F_T (Seconds)
1.0	0.0210	7.0	0.0334
2.0	0.0231	8.0	0.0355
3.0	0.0252	9.0	0.0375
4.0	0.0272	10.0	0.0396
5.0	0.0293	10.5	0.0406
6.0	0.0314		

DOCUMENT THROUGHPUT CALCULATIONS FOR THE 955/959

Perform the following functions:

Measure average line length (L) in inches _____
Measure length of document (L_D) in inches _____
Count number of consecutive lines (n) _____
Count vertical lines/inch (line pitch) (P) _____

Solve the following equations:

1) $S = (1.075 \times L_D) - \left[\frac{n-1}{P}\right]$ S = _____ inches

2) If S is greater than or equal to 1.00 inch, use

$$T_S = 0.057 + \left[\frac{S-1.00}{40}\right]$$

If S is greater than or equal to 0.336 inch but less than 1.000 inch use

$$T_S = 0.036 + \left[\frac{S-0.336}{20.5}\right]$$ T_S = _____ second

3) Determine S_T from the following table.

P	S_T (Second)
1	0.057
2	0.043
3	0.036
4	0.033
5	0.029
6	0.027

S_T = _____ second

4) $T_F = n\left[0.019 + \frac{L}{75}\right]$ T_F = _____ second

5) $F_T = 0.0173 + 0.00206\ (L + 0.8)$ F_T = _____ second

6) Typewriter with plastic ribbon, $P_Q = 0.03$
High speed printer, $P_Q = 0.10$
Imprinter, $P_Q = 0.15$
Handprint (trained) $P_Q = 0.35$ P_Q = _____

7) $R_E = P_Q n\ (.019 + \frac{L}{75} + F_T)$ R_E = _____ second

Note: For journal tape, set n = 1

8) If $S_T > F_T$, $F_{tE} = 0$

If $S_T < F_T$, $F_{tE} = F_T - S_T$ F_{tE} = _____ second

9) $T_D = T_S + S_T\ (n-1) + T_F + R_E + F_{tE} + P_E + O_E$ T_D = _____ second

10) $T_A = T_D + P_D$

If $T_D \geq 0.2$ second, $P_D = 0$

If $T_D < 0.2$ second, $P_D = 0.2 - T_D$ T_A = _____ second

11) Documents/Hour, $D_H = \frac{3600}{T_A}$ D_H = _____

NOTE

The equations for computing document throughput rates, given above, are general in nature and DO NOT include read field search and document position servoing time. Maximum throughput rate: 5 documents/second; minimum line length: 0.1 inch.

I-6

Figure I-1. Document Throughput Worksheet for the 955/959

DOCUMENT THROUGHPUT CALCULATIONS FOR THE 955/959

Perform the following functions:

Measure average line length {L} in inches ___5.5___
Measure length of document {L_D} in inches ___11___
Count number of consecutive lines {n} ___22___
Count vertical lines/inch {line pitch} {P} ___3___

Solve the following equations:

1} $S = \{1.075 \times L_D\} - \left[\frac{n-1}{P}\right]$ $S = 4.825$ inches

$S = (1.075 \times 11) - \left[\frac{22-1}{3}\right]$

2} If S is greater than or equal to 1.00 inch, use

$T_S = 0.057 + \left[\frac{S-1.00}{40}\right]$

$T_S = 0.057 + \left[\frac{4.825-1.00}{40}\right]$

If S is greater than or equal to 0.336 inch but less than 1.000 inch use

$T_S = 0.036 + \left[\frac{S-0.336}{20.5}\right]$ $T_S = 0.153$ second

3} Determine S_T from the following table.

P	S_T {Second}
1	0.057
2	0.043
3	0.036
4	0.033
5	0.029
6	0.027

S_T = 0.036 second

4} $T_F = n\left[0.019 + \frac{L}{75}\right]$ T_F = 2.024 second

5} $F_T = 0.0173 + 0.00206\{L + 0.8\}$ F_T = 0.006 second

6} Typewriter with plastic ribbon, $P_Q = 0.03$
High speed printer, $P_Q = 0.10$
Imprinter, $P_Q = 0.15$
Handprint {trained} $P_Q = 0.35$ P_Q = 0.03

7} $R_E = P_Q n\{.019 + \frac{L}{75} + F_T\}$ $RE = 0.03 \times 22(0.19 + \frac{5.5}{75} + .006)$ R_E = 0.062 second

Note: For journal tape, set n = 1

8} If $S_T > F_T$, $F_{tE} = 0$

If $S_T < F_T$, $F_{tE} = F_T - S_T$ F_{tE} = 0 second

9} $T_D = T_S + S_T\{n-1\} + T_F + R_E + F_{tE} + P_E + 0_E$ T_D = 2.995 second

$T_D = 0.153 + 0.036(22-1) + 2.024 + 0.062 + 0 + 0$

10} $T_A = T_D + P_D$ D_H = 1202

If $T_D \geq 0.2$ second, $P_D = 0$

If $T_D < 0.2$ second, $P_D = 0.2 - T_D$ T_A = 2.995 second

11} Documents/Hour, $D_H = \frac{3600}{T_A}$

$D_H = \frac{3600}{2.995} = 1202$ D_H = 1202

NOTE

The equations for computing document throughput rates, given above, are general in nature and DO NOT include read field search and document position servoing time. Maximum throughput rate: 5 documents/second; minimum line length: 0.1 inch.

Figure I-2. Document Throughput Calculations for the 955/959

JOURNAL TAPE THROUGHPUT WORKSHEET - 955/959

Enter the following:

Line length (L) in inches _____

Vertical lines/inch (line pitch) (P) _____

Solve the following equation:

$T_{JT}^{*} = 0.019 + \frac{L}{75} + S_T + R_E + P_E + F_{TE} + O_E$ T_{JT} = _____

*where T_{JT} = average time/line

Lines/minute (L_M) = $\frac{60}{T_{JT}}$ L_M = _____

- -

CALCULATIONS:

Figure I-3. Journal Tape Throughput Worksheet for the 955/959

JOURNAL TAPE THROUGHPUT CALCULATIONS - 955/959

Enter the following:

Line length {L} in inches 3.0

Vertical lines/inch {line pitch} {P} 5

Solve the following equation:

$T_{JT}^{*} = 0.019 + \frac{L}{75} + S_T + R_E + P_E + F_{TE} + O_E$ $T_{JT} = .1035$

*where T_{JT} = average time/line

Lines/minute $\{L_M\} = \frac{60}{T_{JT}}$ $L_M = 580$

CALCULATIONS:

$$T_{JT} = 0.019 + \frac{3}{75} + 0.029 + \left[.10\left(.019 + \frac{3}{75} + .0252\right)\right] + 0 + 0$$

$$T_{JT} = 0.019 + .04 + 0.029 + \left[.10\,(.1552)\right]$$

$$T_{JT} = 0.019 + 0.069 + 0.0155 = .1035$$

$$L_M = \frac{60}{.1035} = 580$$

Figure I-4. Journal Tape Throughput Calculations for the 955/959

APPENDIX J

ASPECT RATIO

Documents which fail to meet the acceptability requirements of the aspect ratio guide {see ASPECT RATIO in section 2 and DIMENSIONAL REQUIREMENTS in section 4} may be submitted to OCR personnel for testing. Table J-1 contains form exceptions to the aspect ratio requirements.

TABLE J-1. APPROVED EXCEPTIONS TO ASPECT RATIO REQUIREMENTS

Document Width	Document Length	Paper Weight
7.375 inches {187.33 mm}	3.250 inches {82.55 mm}	Tabcard 43 lb {370 g/m^2}
6.666 inches {169.32 mm}	3.500 inches {88.90 mm}	24 lb {89.5 g/m^2}
6.500 inches {165.10 mm}	3.500 inches {88.90 mm}	24 lb {89.5 g/m^2}
6 inches {152.40 mm}	3.500 inches {88.90 mm}	24 lb {89.5 g/m^2}

APPENDIX K

SUGGESTED REFERENCES

Guide to Forms Management, NAVINST 5213.31

Forms Analysis, 7610-655-8220N*

Forms Design, 7610-753-4771*

American National Standard Character Set and Print Quality for Optical Character Recognition, X3-17-1974, American National Standards Institute, 1430 Broadway, New York, New York, 10018

American National Standard Character Set for Handprint, X3.45-1974, American National Standards Institute, 1430 Broadway, New York, New York 10018

Facts and Views of Papermaking, S. D. Warren Company, Boston, Mass. 02101, July, 1965

Pocket Pal, International Paper Company, 220 East 42nd Street, New York, New York, 10017, Feb. 1966

Optical Character Recognition and the Years Ahead, The Business Press, Elmhurst, Illinois, IBFI, 1969

Business Forms Reporter Magazine, Dec., 1968 and successive issues, 134 North 13th Street, Philadelphia, Pa. 19107

Paper....From Pulp to Print, William Bureau, Graphic Arts Press, 7373 North Lincoln Avenue, Chicago, Illinois, 60646, 1969

Forms Design and Control, Julius B. Kaiser, American Management Association, Inc., 135 West 50th Street, New York, New York, 10020, 1969

TAPPI Standards, Technical Association of the Pulp and Paper Industry, 1 Dunwoody Park, Atlanta, Georgia, 30341

*Available from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402

INDEX

COMMENT SHEET

MANUAL TITLE 955/959 OCR Media Manual

PUBLICATION NO 91604500 REVISION C

FROM: NAME:
BUSINESS
ADDRESS:

COMMENTS:

This form is not intended to be used as an order blank. Your evaluation of this manual will be welcomed by Control Data Corporation. Any errors, suggested additions or deletions or general comments may be made below. Please include page number references.

CUT ALONG LINE

NO POSTAGE STAMP NECESSARY IF MAILED IN U. S. A.

FOLD ON DOTTED LINES AND STAPLE

AA2666

STAPLE

FOLD

FIRST CLASS
PERMIT NO. 8241
MINNEAPOLIS, MINN.

BUSINESS REPLY MAIL
NO POSTAGE STAMP NECESSARY IF MAILED IN U.S.A.

POSTAGE WILL BE PAID BY

CONTROL DATA CORPORATION
WASHINGTON AREA OPERATIONS
1455 RESEARCH BLVD.
ROCKVILLE, MARYLAND 20850

ATTN: TECHNICAL PUBLICATIONS

CUT ALONG LINE

FOLD