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NCS TIB 90-17

NATIONAL COMMUNICATIONS SYSTEM

TECHNICAL INFORMATION BULLETIN 90-17

STANDARD BI-LEVEL IMAGES

MAY 1991

OFFICE OF THE MANAGER
NATIONAL COMMUNICATIONS SYSTEM

WASHINGTON, D.C. 20305

May 1991 Final

Standard Bi-Level Images C-DCA100-83-C-0047

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The purpose of this project was to generate a new set of standard images that can be used by experimenters developing bi-level compression algorithms. The NCS sponsored the scanning of documents used by the International Telegraph and Telephone Consultative committee (CCITT) at resolutions of 200, 240, 300, 400 and 480 lines per inch and stored the resultant data on tape. This data has been used by many experimenters in the development of standard compression algorithms for digital facsimile. This work contributed significantly to the development of high resolution facsimile standards which will be of considerable value to the U.S. Government. The purpose of compiling a standard set of bi-level images is to make the results presented by various experimenters in the field directly comparable, without regard to differences in image content. As a result of this project, all experiments engaged in performing studies for the CCITT regarding bi-level transmission techniques will have access to magnetic tapes or DOS diskettes containing digitized versions of the standard images. In addition, the images will be useful in evaluating graphic printer quality and capability.

Facsimile
Bi-Level Images 60

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NCS TECHNICAL INFORMATION BULLETIN 90-17

STANDARD BI-LEVEL IMAGES

MAY 1991

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FOREWORD

Among the responsibilities assigned to the Office of the Manager, National Communications System, is the management of the Federal Telecommunication Standards Program. Under this program, the NCS, with the assistance of the Federal Telecommunication Standards Committee identified, develops, and coordinates proposed Federal Standards which either contribute to the interoperability of functionally similar Federal telecommunication systems or to the achievement of a compatible and efficient interface between computer and telecommunication systems. In developing and coordinating these standards, a considerable amount of effort is expended in initiating and pursuing joint standards development efforts with appropriate technical committees of the International Organization for Standardization, and the International Telegraph and Telephone Consultative Committee of the International Telecommunication Union. This Technical Information Bulletin presents and overview of an effort which is contributing to the development of compatible Federal, national, and international standards in the area of facsimile. It has been prepared to inform interested Federal activities of the progress of these efforts. Any comments, inputs or statements of requirements which could assist in the advancement of this work are welcome and should be addressed to:

Office of the Manager
National Communications System
ATTN: NCS-TS
Washington, DC 20305-2010

STANDARD BI-LEVEL IMAGES

May, 1991

FINAL REPORT (DRAFT)
AND USERS GUIDE
DCA100-83-C-0047

Submitted to:
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WASHINGTON, DC

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Table of Contents

1.0 INTRODUCTION

This document summarizes work performed by Delta Information Systems, Inc. (DIS) for the National Communications System (NCS), Office of Technology and Standards. This office is responsible for the management of the Federal Telecommunications Standards Program, which develops telecommunications standards, whose use is mandatory for all Federal departments and agencies. The purpose of this project, performed under contract number DCA100-83-C-0047, was to generate a new set of standard images that can be used by experimenters developing bi-level compression algorithms.

The NCS has been a leader in the development and promulgation of standardized imagery for facsimile. The NCS sponsored the scanning of documents used by the International Telegraph and Telephone Consultative Committee (CCITT) at resolutions of 200, 240, 300, 400 and 480 lines per inch and stored the resultant data on tape. This data has been used by many experimenters in the development of standard compression algorithms for digital facsimile. This work contributed significantly to the development of high resolution facsimile standards which will be of considerable value to the U. S. Government.

At the present time, a joint International Standards Organization (ISO)/CCITT Bi-level Image Group (JBIG) is engaged in an effort to define a new progressive compression/decompression algorithm for use with bi-level images. Critical to the evaluation and selection process needed to choose from a number of candidate algorithm submissions is a set of digitized test images against which the various candidate algorithms can be applied. The purpose of compiling a standard set of bi-level images is to make the results presented by various experimenters in the field directly comparable, without regard to differences in image content. As a result of this project, all experimenters engaged in performing studies for the CCITT regarding bi-level transmission techniques will have access to magnetic tapes or DOS diskettes containing digitized versions of the standard images. In addition, the images will be useful in evaluating graphic printer quality and capability.

This report is comprised of five sections plus an appendix. Section 1 provides a brief description of the objectives of the study and an outline of the contents of this report. Section 2 describes the selected set of standard bi-level images. Section 3 describes the desired bi-level image content generated primarily by participants in the JBIG work. Section 4 describes how the images were assembled, and Section 5 is a summary of the work performed. The appendix is a user's guide that contains copies of the images, some statistical information on their content, and the magnetic media format information required for their use.

2.0 SELECTED IMAGES

Each of the selected images is described below. Each image is categorized according to name, dimensions, pel density, and image content category number (CC#). Image content categories are described in more detail in the next section. Content categories (CC#'s) are defined as follows:

CC#	Category Description
1	Representative imagery from CCITT documents
2	Characters, legibility test
3	Engineering Drawing / Line Art
4	Halftones
5	Test Chart
6	High Resolution Imagery

The Appendix following this report is a User's Guide that includes copies of all of the images with the information necessary for accessing them from either magnetic tape or DOS diskette.

2.1 Facsimile Test Chart (Figure A-1)

Image#	Image Name	Dimension (W x H) in bits	Dimension (W x H) in inches	Pel Density in bpi	CC#
1	Facsimile Test Chart	3500 x 4700	8.75x11.75	400	5,2,4

This Facsimile Test Chart is being progressed as a U. S. standard by the Telecommunications Industry Association TR-29 Committee. It is also being progressed internationally by CCITT SG VIII. The complete page at a pel density of 400 pels per inch is included in this image set. The patterns that make up the chart are described below. Note that Figure A-1 has been reduced to fit into this report.

1. CCITT border of 4 scales with millimeter markings. The 5 and 10 mm lines are extended as shown. Top and bottom scales are 190 mm. The edge markings from the bottom extend up to 260 mm. The top border of the upper horizontal line is 279 mm above the corresponding bottom line. This line is 1/8 inch high and extends from edge to edge of the chart width (8 3/4 inches). The arrows near the ends of this line are 8 1/2 inches apart and centered on the edge.

2. Scale in inches across the top, starting from 0 in the middle of the page with .1 scale markings. The border at the left side of the chart is marked in inches, starting at the top of the chart.

3. Four patterns of truncated fan-type multiple-line pattern with low taper rate. The larger ones are calibrated in black plus white lines per inch, and the smaller ones are calibrated in microns.

4. Gurley type Pestrecov Star pattern with circles of 50, 100 & 200 LPI.

5. Alternating black and white lines. Upper pattern is 150 lines per inch, inclined at 3 degrees from vertical. The lower pattern is 200 lines per inch, inclined at 2 degrees from vertical. The angle is to allow the lines to drift through a match and a mismatch with the photosensor array elements.

6. B/W bar patterns of 100, 150, 200, 300, 400 and 600 LPI.

7. Isolated black and white lines. The vertical pattern is inclined at 5 degrees from vertical.

8. NBS type resolution pattern calibrated in line pairs (black plus white) per millimeter. Smallest patterns are near the center of the chart.

9. Tapered isolated black and white line patterns with the line width calibrated in microns or inches.

10. B/W bar pattern of 5 black plus white bars per inch.

11. Parallel lines inclined at 5 degrees from vertical.

12. NBS type resolution pattern calibrated in line pairs (black plus white) per millimeter. This pattern has been rearranged to place the smallest patterns near the center of the edge of the chart.

13. Diagonal line about .01 inches thickness. For checking irregularities in vertical pitch. Received lines with errors will show breaks or steps of this line.

14. ISO character hexagonal line patterns 1, 2, 3, & 4. For readability testing.

15. Halftone dot screens of 10, 50 and 90% black. The 65 and 120 are the number of dots per inch measured at a 45 degree angle.

16. Line crossing pattern. Pattern is about 3 inches long. Line thickness is about 0.007 inches. The center to center line separation is 0.15 inches on the left end and 0.05 inches on the right end. The number of scanning line crossings of both lines multiplied by 10 is the vertical line pitch.

17. Text in English, Arabic, Chinese, Russian, Spanish and French. English text is in 12, 10, 8, 6, 4 & 2 point sizes.

2.2 Business Letter (Figure A-2)

Image#	Image Name	Dimension (W x H) in bits	Dimension (W x H) in inches	Pel Density in pels per inch	CC#
2	Business Letter	3456 x 4416	8.6 x 11	400	1

DIS prepared the Business Letter image for the JBIG evaluation. This image is similar to the previously scanned French CCITT document #1. It is included in the set to provide a baseline for comparing new algorithms with existing ones on this class of imagery. In addition, it provides another set of data to that already available to experimenters.

2.3 Technical Paper (Figure A-3)

Image#	Image Name	Dimension (W x H) in bits	Dimension (W x H) in inches	Pel Density in pels per inch	CC#
3	Technical Paper	3456 x 4416	8.6 x 11	400	1

The Technical Paper image was also used by JBIG in their algorithm evaluation. This image is similar to the previously scanned French CCITT document #5.

2.4 Handwriting (Figure A-4)

Image#	Image Name	Dimension (W x H) in bits	Dimension (W x H) in inches	Pel Density in pels per inch	CC#
4	Handwriting	3072 x 4352	7.7 x 10.9	400	1

The Handwriting image also was originally part of the JBIG Evaluation Set. This image is representative of the previously scanned French CCITT document #2.

2.5 Japanese Newspaper (Figure A-5)

Image#	Image Name	Dimension (W x H) in bits	Dimension (W x H) in inches	Pel Density in pels per inch	CC#
5	Japanese News.	3072 x 4352	7.7 x 10.9	400	2

This document is an electronically scanned Japanese newspaper. This image demonstrates the effectiveness of candidate compression algorithms to compress Kanji text. It also can be used to evaluate printer quality.

2.6 Mixed Text and Screened Halftones (Figure A-6)

Image#	Image Name	Dimension (W x H) in bits	Dimension (W x H) in inches	Pel Density in pels per inch	CC#
6	Mixed Test and Screened Half-tones	3680 x 3578	4.6 x 4.5	800	2,4,5,6

This document consists of mixed text and screened halftones. The mixed text portion of the document includes text at 3 different point sizes, 10 point, 6 point and 3 point. The screened halftone portion of the document employs a photo-mechanical screening process and contains screened halftones at 2 different screen sizes - a 65 line screen and a 150 line screen.

2.7 Legibility Chart (Figure A-7)

Image#	Image Name	Dimension (W x H) in bits	Dimension (W x H) in inches	Pel Density in pels per inch	CC#
7	Legibility Chart			400	2

The Legibility Chart image was also used by JBIG in their algorithm evaluation. This image contains random alphanumeric and Kanji characters of various point sizes.

2.8 Sailboat #1 (Figure A-8)

Image#	Image Name	Dimension (W x H) in bits	Dimension (W x H) in inches	Pel Density in pels per inch	CC#
8	Sailboat #1 8x8 dither	3072 x 2048	7.7 x 5.1	400	4

The four sailboat images were also used by JBIG in their algorithm evaluation. They were all computer generated by different techniques to produce half-tones at a pel density of 400 pels per inch. These images were all created from the same original (sailboat), but the principal difference is the micro-structure of the dither pattern (i.e. pitch and angle).

2.9 Sailboat #2 (Figure A-9)

Image#	Image Name	Dimension (W x H) in bits	Dimension (W x H) in inches	Pel Density in pels per inch	CC#
9	Sailboat #2 ERR dif	3072 x 2048	7.7 x 5.1	400	4

2.10 Sailboat #3 (Figure A-10)

Image#	Image Name	Dimension (W x H) in bits	Dimension (W x H) in inches	Pel Density in pels per inch	CC#
10	Sailboat #3 4x4 dither	3072 x 2048	7.7 x 5.1	400	4

2.11 Sailboat #4 (Figure A-11)

Image#	Image Name	Dimension (W x H) in bits	Dimension (W x H) in inches	Pel Density in pels per inch	CC#
11	Sailboat #4 3x3 dither	3072 x 2048	7.7 x 5.1	400	4

2.12 Dithered Composite Image (Figure A-12)

Image#	Image Name	Dimension (W x H) in bits	Dimension (W x H) in inches	Pel Density in pels per inch	CC#
12	Dithered Composite	1904 x 1488	9.5 x 7.4	200	4

This dithered composite image is included because the pel density of 200 pels per inch combined with additional dithering techniques provides variations on the half-tone microstructure not provided by the sailboat images. Starting in clockwise order from the upper left, the dither patterns are: Ordered 4x4x4, Random dithering, Ordered 8x8 and Clump dithering.

Dither coding is a process in which multilevel gray scale images are quantized, or thresholded, to 1 bit/pixel. The 8-bit gray level of each input pixel is compared to a threshold. The color of the 1 bit output pixel is dependent upon whether the gray level value of the input pixel is greater than (black) or less than (white) the dithered threshold. Ordered dithering employs a matrix of fixed thresholds that is repeated throughout the image. The ordered matrices used in this document are the 4x4x4 matrix and the 8x8 matrix. Random dithering employs a pseudo-random number generator to vary the 8-bit gray level of each input pel before it is compared to a fixed threshold to determine its binary color (black or white). Clump dithering is an electronic approximation of the photo-mechanical screening process. It employs an irregularly shaped matrix of fixed thresholds. The thresholds are arranged so that a "dot" grows outward from the center as successively darker gray levels are encountered in low contrast regions of the image (an emulation of the photo-mechanical dot screen).

2.13 Computer Generated Engineering Drawing (Figure A-13)

Image#	Image Name	Dimension (W x H) in bits	Dimension (W x H) in inches	Pel Density in pels per inch	CC#
13	Computer Generated Engineering Drawing	1952 x 2796	4.9 x 7.0	400	3

This document is a computer generated engineering drawing of an "A" size schematic rasterized at 400 pels per inch. This document is representative of computer-generated drawings created by computer aided design (CAD) and document design programs.

2.14 Scanned Engineering Drawing (Figure A-14)

Image#	Image Name	Dimension (W x H) in bits	Dimension (W x H) in inches	Pel Density in pels per inch	CC#
14	Scanned Engineering Drawing	3456 x 4416	8.6 x 11	400	3

This document is an electronically scanned engineering drawing of an "A" size schematic.

2.15 House Design (Figure A-15)

Image#	Image Name	Dimension (W x H) in bits	Dimension (W x H) in inches	Pel Density in pels per inch	CC#
15	House Design	3072 x 3040	7.7 x 7.6	400	3

This simple computer-generated engineering drawing is inverted; i.e. it has white lines on a black background. This image is included to test compression algorithm bias towards white or black. For example, an algorithm might assume a white background to increase compression.

2.16 Magazine Text, Halftone (Figure A-16)

Image#	Image Name	Dimension (W x H) in bits	Dimension (W x H) in inches	Pel Density in pels per inch	CC#
16	Magazine Text, Half-tone	3456 x 4416	4.3 x 5.5	800	4

This document combines a screened halftone image and an electronically scanned text which has been inverted. Both the text and the image portion of the document have been extracted from a magazine.

2.17 Magazine Page Composite (Figure A-17)

Image#	Image Name	Dimension (W x H) in bits	Dimension (W x H) in inches	Pel Density in pels per inch	CC#
17	Magazine Page Composite	3072 x 4352	7.7 x 10.9	400	4,2

This image is a composite of electronically scanned segments of magazine pages. It includes a half-tone, text, and inverted text.

3.0 IMAGE CONTENT CATEGORIES

Through informal discussions with members of several organizations concerned with image compression, (e.g. JBIG, the NCS, the TR-29 committee of the TIA), the image content that would be most effective in testing bi-level compression techniques was defined. This content, listed below, was employed to gather a collection of bi-level images.

The set of eight images collectively known as the "CCITT Standard Images", were digitized by the French Administration at 200 pels per inch and recorded on magnetic tape. Although these images were never an official standard, they have been used extensively by experimenters. This image set lacks many features now required. For example, the defacto set did not contain screened halftones, electronically dithered images, computer generated images, or images at resolutions higher than 200 pels per inch. Three images from the defacto set together with a legibility test chart were digitized with resolutions up to 480 lines per inch and made available on magnetic tape by the NCS[1] in 1982. Although this NCS image set added higher resolutions and limited electronic dithering, it does not fully meet current requirements. The new set of images described in this report was designed to include these features.

3.1 Representative "CCITT" Imagery

Imagery similar to the "CCITT Standard Images" (scanned at 200 pels per inch) is included so that comparisons of new with existing compression algorithms can be made and related to previous work. The imagery is similar to the "CCITT Standard Images", but avoids duplication of the original images, which are still available. The three selected images (numbers 2, 3, and 4) correspond to the "CCITT" image numbers 1, 5, and 2 respectively. These represent examples of typical business use of facsimile.

Image No.	Resembling "CCITT" No.	Name	Figure No.
2	1	Business Letter	A-2
3	5	Technical Paper	A-3
4	2	Handwriting	A-4

3.2 Characters

Subjective testing of bi-level image quality can benefit from the use of an established technique that quantitatively measures the legibility of printed characters. Legibility testing has the following advantages:

- It is measurable with an objective, numerical performance number; percent legibility.

- It bounds the quality question in that the legibility of characters is a minimum requisite for many applications of bi-level image processing.

For these reasons legibility of character data is useful in analyses of compression algorithms of the non-image preserving type. The various characters that are included in the legibility document include: English, Arabic, Chinese, Russian, Spanish, French and Kanji characters. Among the types of characters, various parameters are exercised, including scanned and computer generated characters, point size and font variations. Character data is also useful in the evaluation of printers. The bi-level images illustrating alphanumeric and character data are listed below.

Image No.	Figure No.	Image Name
1	A-1	Facsimile Test Chart
2	A-2	English letter
5	A-5	Japanese newspaper
6	A-6	Mixed text and screened half-tones
7	A-7	Legibility

3.3 Engineering Drawings / Line Art

Manually generated engineering drawings are typically scanned and stored in bi-level formats in document storage and retrieval systems. In newer systems, engineering drawings are computer generated, and either stored as vector graphic images or as raster graphic images. The raster graphic images have similar properties, whether manually generated or computer generated. There are differences, of course, due to the noise and artifacts generated by the scanner used for manually generated drawings.

An image that is mostly black can be used to test an algorithm for color bias. That is, an algorithm may assume a white background to increase compression. Inverted engineering drawings (e.g. blueprints) test for such a case.

Inverted engineering drawings also can be used to test the ability of printers to reproduce thin white lines on a black background. The images illustrating engineering drawings and line art are listed below.

Image No.	Figure No.	Image Name
13	A-13	Computer Generated Engineering Drawing
14	A-14	Scanned Engineering Drawing
15	A-15	Inverted House Design

3.4 Halftones

Halftone images, both screened and dithered, are included in the standard bi-level image set to exercise the ability of the compression algorithms to process pictorial data. These halftone images can also be utilized to test the quality and capabilities of printers to reproduce halftones. Halftone imagery presents a much greater challenge to compression algorithms than printed characters or engineering drawings.

Dithered halftones are electronically produced and represented on a pixel basis, screened halftones are generated photographically and must then be scanned. Screened halftone images are characterized by artifacts that could affect compression algorithms. Depending on the type of dithering used, various regular pixel patterns with differing pitches are produced. All halftones, whether dithered or screened, exhibit very short black and white runs and low pel-to-pel correlation. To fully exercise compression algorithms and test the capabilities of printers, both types of halftones are included. The selected halftone images are listed below.

Image No.	Figure No.	Image Name
6	A-6	Mixed text and screened half-tones
8	A-8	Sailboat 1
9	A-9	Sailboat 2
10	A-10	Sailboat 3
11	A-11	Sailboat 4
12	A-12	Dithered Composite
16	A-16	Magazine text, halftone
17	A-17	Magazine page composite

3.5 Test Chart Imagery

In order to more fully exercise bi-level compression algorithms, computer generated information in the form of resolution targets and characters with various fonts is included in the standard set. Test chart imagery is also useful in evaluating printer quality. The selected test chart imagery is listed below.

Image No.	Figure No.	Image Name
1	A-1	Facsimile Test Chart

3.6 "Busy" Imagery

Highly detailed or "busy" imagery is required to fully exercise compression algorithms and test printer quality. The images that fulfill this requirement are listed below.

Image No.	Figure No.	Image Name
5	A-5	Japanese newspaper
17	A-17	Magazine page composite

Note that the quality and characteristics of optically scanned images are dependent upon the characteristics of the particular scanner being used. The quality and characteristics of computer generated images, however, can be precisely controlled. To more fully exercise the compression/decompression algorithms and further evaluate the qualities and capabilities of printers, both scanned and computer generated images are included.

4.0 IMAGE CONSTRUCTION

The final set of images generated on this task resulted largely from our work with the JBIG committee. As part of the JBIG algorithm testing, Delta assisted in preparing three sets of images, known as the "Training Set", the "Evaluation Set" and the "Stockholm Set". Some of these images were generated by Delta, some were contributed by committee members, and some were pieced together from the first two categories by Delta. The following paragraphs describe this process.

Training Image Set

The JBIG training image set was generated for those participants who were developing compression/decompression algorithms. This set was produced near the beginning of the JBIG work, and was meant to provide representative imagery to test and train candidate algorithms, before any official algorithm evaluation. Participants provided images to the JBIG committee, and the committee selected the set to be used for testing. Delta compiled and distributed the image set, providing a common format from the various formats received.

Evaluation Images

The JBIG evaluation images "(Evaluation Set" and "Stockholm set") were generated to evaluate candidate compression algorithm performance. Generic image requirements were agreed to by the JBIG group, but Delta chose the actual imagery to be included. The final imagery was unknown to algorithm participants until after all candidate compression/decompression algorithms were frozen (no further algorithm modifications).

Bi-level Image Set Construction

The construction of the images described above and the final bi-level image set involved several steps. These steps consisted of importing the image into Delta's computer system to be processed, piecing segments of images together, complementing (reversing the color of the pixels) images or complementing just portions of images, and windowing or expanding imagery to standard sizes.

The candidate bi-level images were received on both 1600 pels per inch magnetic tape and diskette in various formats, including UNIX TAR format, unlabeled format, and PC-DOS format. Computer software was written to transfer the images from their respective magnetic media to Delta's image data base.

The UNIX TAR format bi-level images were read from magnetic tape. The UNIX TAR format is composed of three parts: first, a header describing the structure of the image's width and length; second, a (possible empty) set of colormap values; and third, the pixel image, stored a line at a time, in increasing y order. The UNIX TAR formatted magnetic tape was read into Delta's computer at 128 words per record. The header was processed to determine the actual record length. Software was written to strip the header from the image and change the record width from 128 words per record to the image's actual record width.

Bi-level images received on tape in unlabeled format (raw data with no header information) were read into the computer and processed directly. The bi-level images received in DOS format were read into an IBM compatible PC and transported to the computer using Kermit.

Software was also written to merge sections of different images. For example, The assembly of Image #16 required software to separate the halftone information from the bi-level information. The bi-level information was then complemented and the image was reassembled.

Delta sent documents to Image Works to be scanned on an Eikonix scanner. The scanned images were returned in compressed run encoded format. Delta prepared software to convert these images to raster format. The rasterized scanned images were then read into the computer and processed.

5.0 SUMMARY

The selected set of bi-level images are representative of imagery typically stored, retrieved or transmitted by means of high resolution graphics systems. Candidate imagery was received from a number of sources associated with the JBIG standardization effort. The image content categories deemed most effective in testing bi-level image compression/decompression techniques (listed below) were determined and used as a basis for image selection.

- o Imagery similar to CCITT documents
- o Characters, legibility test
- o Engineering Drawing / Line Art
- o Halftones
- o Test Chart Targets
- o High Resolution

The 17 images selected for the final set are both representative of the categories listed above, and have not been published previously in this form. Delta has volunteered to maintain an image repository (under X3L3) for those participating in image standards work. Delta plans eventually to contribute this set to the image repository, and we expect that new images will be added from time to time as the need arises.

1. NCS-TIB-82-6 - Users Manual for NCS Facsimile test Document Tapes, October 1982.

APPENDIX
USERS GUIDE

Table A-1 contains the parameters of the selected images.

Figure Number	Image Name	Image Dimensions in inches	Image Dimensions in pixels	Pel Density dpi
A-1	Fax Test Chart	8.75 x 11.75	3500 x 4700	400
A-2	Business Letter	8.64 x 11.04	3456 x 4416	400
A-3	Technical Paper	8.64 x 11.04	3456 x 4416	400
A-4	Handwriting	7.68 x 10.88	3072 x 4352	400
A-5	Japanese News	7.68 x 10.88	3072 x 4352	400
A-6	Mixed Text and Screened Half-tones	4.60 x 4.47	3680 x 3578	800
A-7	Legibility Chart	8.64 x 16.16	3456 x 6464	400
A-8	Sailboat 1	7.68 x 5.12	3072 x 2048	400
A-9	Sailboat 2	7.68 x 5.12	3072 x 2048	400
A-10	Sailboat 3	7.68 x 5.12	3072 x 2048	400
A-11	Sailboat 4	7.68 x 5.12	3072 x 2048	400
A-12	Dithered Composite	9.52 x 7.44	1904 x 1488	200
A-13	Computer Generated Engineering Drawing	4.88 x 6.99	1952 x 2796	400
A-14	Scanned Engineering Drawing	9.12 x 11.60	3648 x 4640	400
A-15	House Design	7.68 x 7.6	3072 x 3040	400
A-16	Magazine Text, Half-Tone	4.32 x 5.52	3456 x 4416	800
A-17	Magazine Page Composite	7.68 x 10.88	3072 x 4352	400

Table A-1: Image Parameters

Figures A-1 through A-17 are copies of each of the images in the bi-level image set.

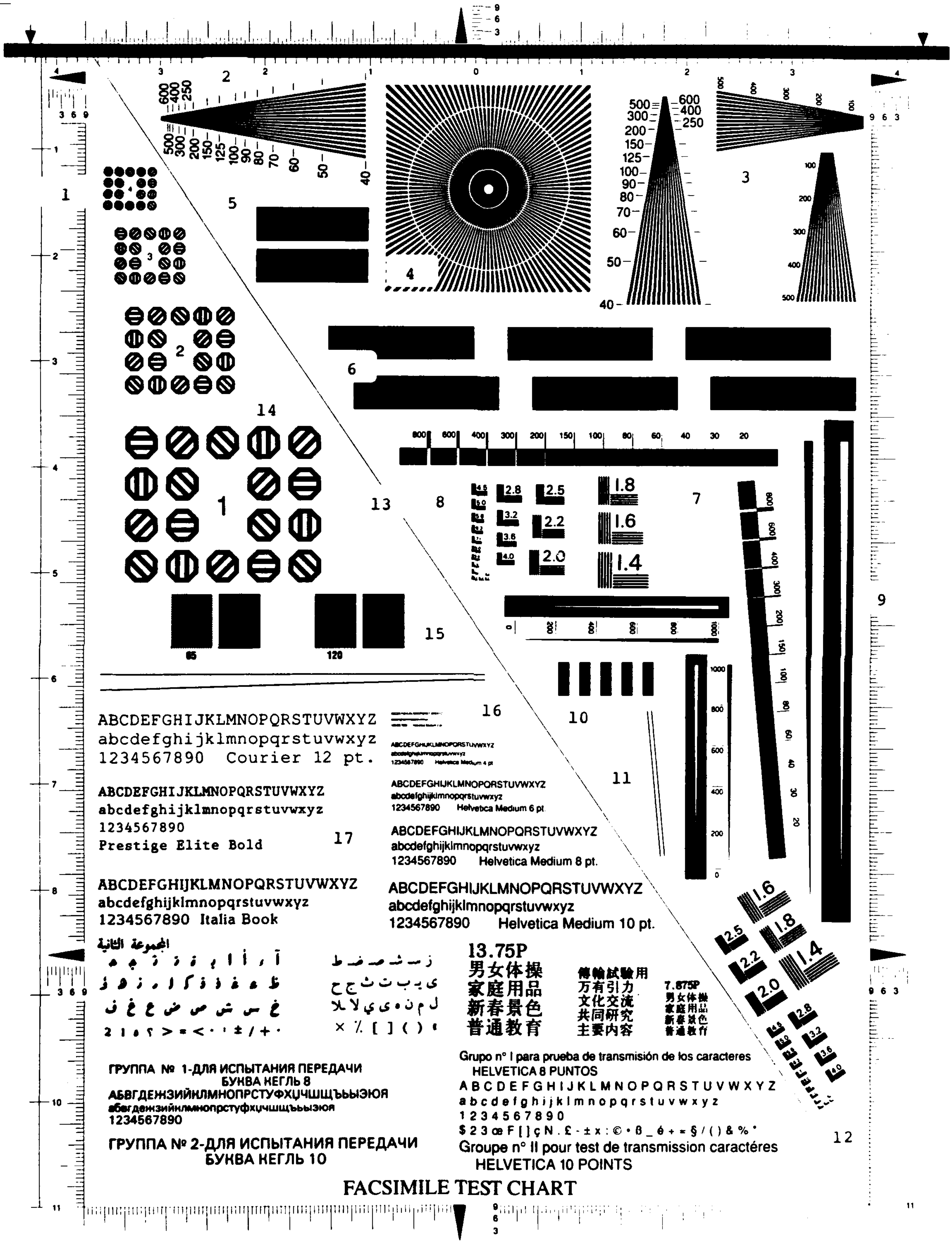

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890 Courier 12 pt.
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890
Prestige Elite Bold
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890 Italia Book
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890 Helvetica Medium 6 pt
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890 Helvetica Medium 8 pt.
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890 Helvetica Medium 10 pt.
13.75P
男女体操
家庭用品
新春景色
普通教育
傳輸試驗用
万有引力
文化交流
共同研究
主要内容
ГРУППА № 1-ДЛЯ ИСПЫТАНИЯ ПЕРЕДАЧИ
БУКВА КЕГЛЬ 8
АБВГДЕЖЗИЙКЛМНОПРСТУФХЦЧШЩЪЬЫЭЮЯ
абвгдежзийклмнопрстуфхцчшщъьыэюя
1234567890
ГРУППА № 2-ДЛЯ ИСПЫТАНИЯ ПЕРЕДАЧИ
БУКВА КЕГЛЬ 10
Grupo n° I para prueba de transmisión de los caracteres
HELVETICA 8 PUNTOS
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m n o p q r s t u v w x y z
1 2 3 4 5 6 7 8 9 0
Groupe n° II pour test de transmission caractéres
HELVETICA 10 POINTS
FACSIMILE TEST CHART

FIGURE A-1

DELTA INFORMATION SYSTEMS, INC.
HORSHAM BUSINESS CENTER, BUILDING 3
300 WELSH ROAD
HORSHAM, PA 19044

TEL: (215) 657-5270
FAX: (215) 657-5273

January 20, 1989

Dr. Yasuhiro Yamazaki
JBIG Chairman
Kamifukuoka R & D Laboratories
Kokusai Denshin Denwa Co., Ltd.
2-1-15, Ohara
Kamifukuoka-shi, Saitama 356
Japan

Dear Mr. Chairman,

Enclosed is a contribution submitted by Delta Information Systems Inc. to the ISO Joint Bi-level Image Group (JBIG). This contribution contains 11 (eleven) bi-level images to be used as evaluation images for the JBIG algorithm comparison. The algorithm comparison will be held starting February 15 in Morristown, New Jersey. The algorithm comparison will be based on several factors, including legibility, quality, and compression.

The evaluation image characteristics match those that were discussed in the JBIG meetings in London. I hope you will find that everything is in order. If you have any questions, please contact me by phone or FAX.

Sincerely,

John P. DiMaggio

John P. DiMaggio
Software Systems Analyst

JPD:mb

FIGURE A-2

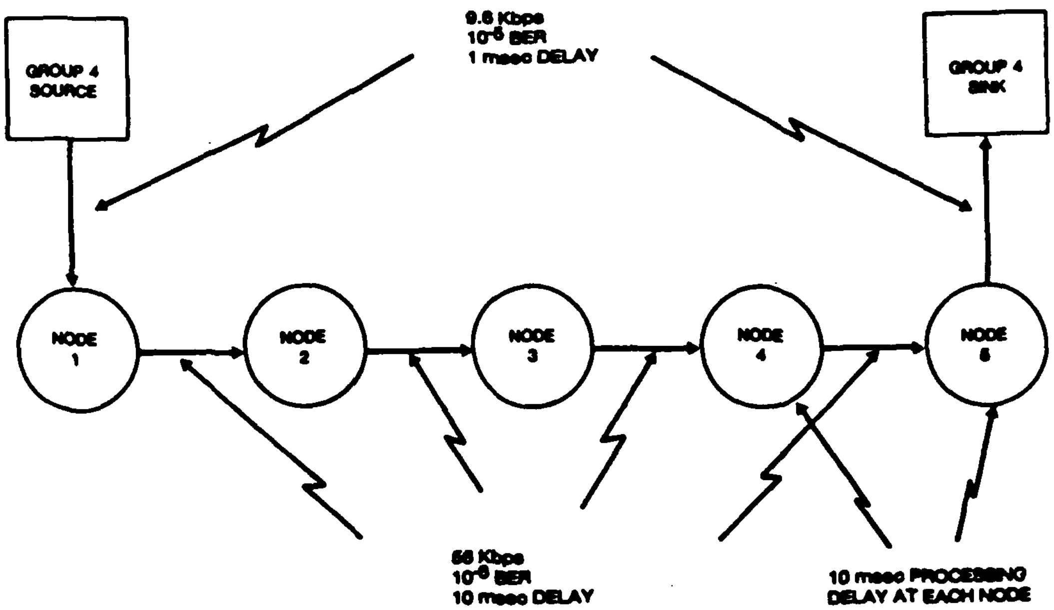


Fig. 1. PSDN baseline network.

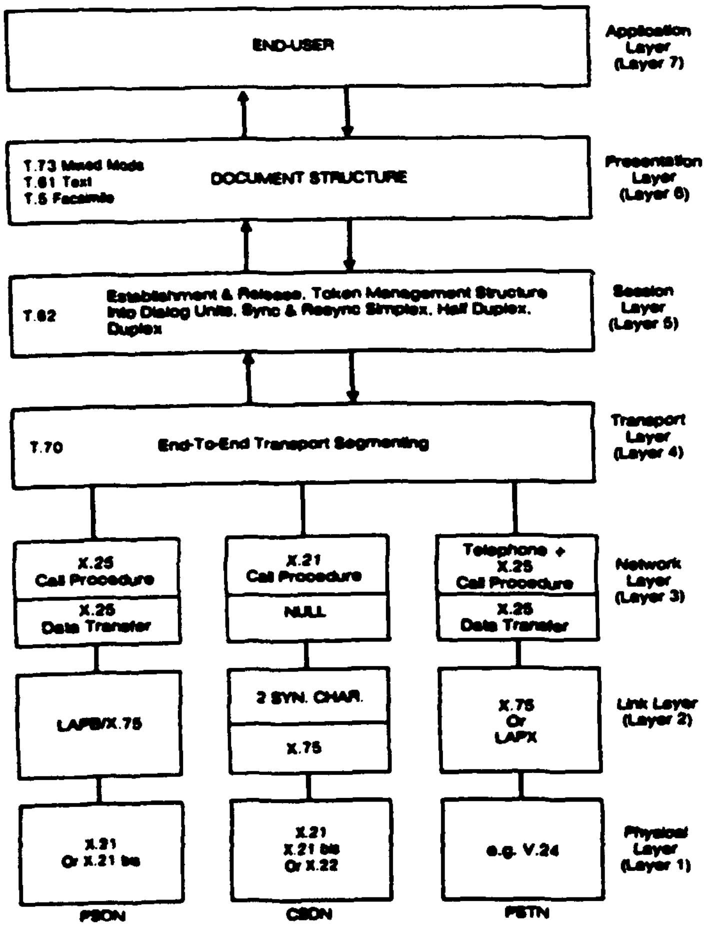
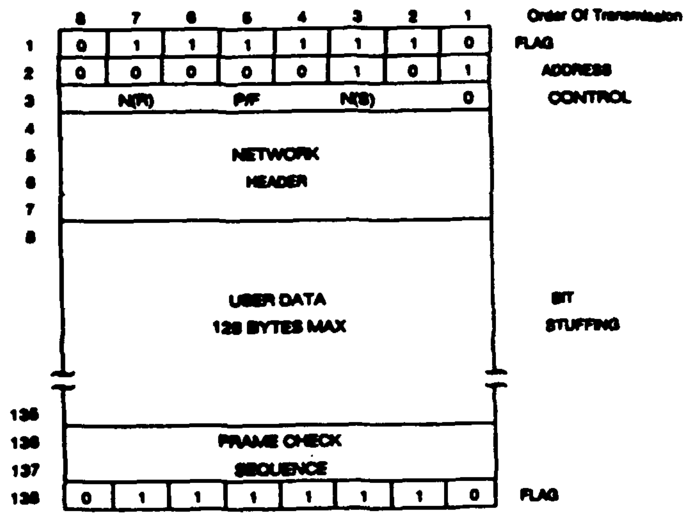


Fig. 2. Group 4 fax protocol structure.

not needed, since it is replaced by the first flag of the next packet. To preserve the uniqueness of the flag, the transmitter monitors the bits between the flags. If it detects five consecutive ones, it automatically stuffs a zero to avoid six consecutive ones. The receiver deletes a zero following five consecutive ones to recover the original data. For random data, the average number of stuffing bits is given by

$$\frac{L}{2^N-2}$$

TABLE II
LINK OVERHEAD



where L is the number of bits between flags ($L \gg N$), and ʼ is the number of successive ones in the flag. Here $N = 6$, s the average number of stuffing bits is $L/62$. For the full 12 byte data packet $L = 8(128 + 8) = 1088$, so $1088/62 = 1$ stuffing bits are used for each data packet. Since there ar $500\,000/(128 \times 8) = 489$ packets in the transmission, th stuffing bits add $(18 \times 489)/9600 = 0.92$ s to th transmission time.

Packets for which the FCS is in error are discarded by th receiver, without notifying the transmitter. However, whe the next packet is received, it will not have the correct seria number $N(S)$. This causes the receiver to issue a RE command to the sender, and indicates the serial number of th last packet received correctly. The transmitter must then g back and retransmit all packets after the last one acknowl edged, in their correct order. A data packet contains 13 bytes, or $8 \times 138 = 1104$ bits, plus 18 stuffing bits, for a tota of 1122 bits. With the assumed bit error rate of 10^{-5}, th probability of at least one error in a packet is approximatel

$$1122 \times 10^{-5} = 0.01122.$$

Neglecting higher order levels of protocol, the total number c

FIGURE A-3

March 16, 1989

弓野さん

いろいろと ありましたが
最終的には Ektachrome 135シリーズ (アマ用) を
取り寄せて. Yuminoさんへ 送ることになりました.
これは. 届いていないとはいえ 送り返されたことは 事実であるので
Director's Office に 承知してもらいましたので 安心して下さい.

この件で 電話をしていたら 石田さんが やって来て 説明してくれて
私には やっと 135シリーズ というのは アマチュア用のことである, のが
少し わかってきたところです.

他のことで 精神的に お疲れのところ おさわがせしましたが
これで 一件落着です.

ただし 入荷 (EKJ RAD に) するのが 週明け頃ですので
Pouch して Yuminoさんに 届くのは 10日後 (今日から) くらいに
なりそうです. 御了承下さい.

Blumen wiegen sich im Reigen,
zogen an ihr schönstes Kleid,
wollen sich der Sonne zeigen
nach der langen Winterszeit.

Und der Frühling küßt die Blüten,
sie erschauern leis vor Glück,
ihr Geheimnis, das sie hüten,
kehret nie im Traum zurück.

FIGURE A-4

by Gertrud Arnold

銀行の「300万円MMC」登場まで1ヵ月

資産集中狙い 獲得合戦し烈

（第1行判読困難）リットにわずかながら手が届く。この新型預金への都市銀行の命名は「スーパーMMC」。銀行にとっては、これまで複数の銀行、口座に小口に分散していた顧客の金融資産を、まとめて受け入れるチャンスだけに、獲得合戦はここへきてし烈さを増している。あとひと月足らず。「出遅れれば顧客が離れる」と、各行ともそれまで預金をつなぎとめるための「つなぎ商品」も開発、思い思いのネーミングで売り込みに力を入れている。

「つなぎ商品」も様々

「準備口座」や「金投資」など

都市銀行の主な小口MMC向け準備商品			
タイプ	銀行名	商品名	内容
準備口座型	三菱	スーパーMMC準備積立預金	期日指定定期預金と積立預金のセット
	太陽神戸	スーパー準備プラン	
	協和	スーパーMMCリレープラン	
	埼玉	ハイリターン準備プラン	
	北海道拓殖	マイウェイ	
金投資口座型	住友	スーパーMMC準備コース	1－5カ月物の5種類
	三井	ゴールデンブリッジ	6月満期と10月満期の2種
外貨預金型	大和	スイスフラン通知預金シグマ	金利は毎日変動
セット商品型	第一勧業	ベスト特別版	抵当証券と定期預金
予約型	三和	スーパーMMC予約サービス	6月5日以後スーパーMMC購入
準備口座型満期日なし	富士	トゥモロー（6月5日から取り扱い）	満期日なし。300万円で自動振り替え

都銀の「つなぎ商品」の中でいちばん多いのは、定期預金の預け替えと積立預金を組み合わせたタイプ。三菱、太陽神戸、協和、埼玉、北海道拓殖が扱っている。仕組みは、まずスーパーMMCの「準備口座」をつくり、預金者に満期がきた定期預金を、そのつど預け入れてもらう。同時に、別に毎月一定額を積み立て、合わせて「スーパーMMC」を利用できる三百万円になるのを目指す。あらかじめ満期日を設定し、予定通り三百万円以上になれば、「スーパーMMC」に振り替える。難点は、過程の金利が期日指定定期（一年物で税引き前三・三九%）のため、あまり高くない点だ。

これに対して、金投資や外貨預金など比較的利回りの高い商品を「スーパーMMC」に結びつけるところもある。

金投資口座では、三井銀行が「ゴールデンブリッジ」、住友銀行は「スーパーMMC準備コース」と命名し、販売を強化中。三井銀行では六月末満期、十月末満期の二種類を用意、利回りは年三・七一三・九八%とする。住友銀行では一－五カ月の五コースを用意、利回りは年三・三五四－四・二〇九%。どちらも「小口MMCを目指して資産形成を」というのがキャッチフレーズ。

一方、大和銀行ではスイスフラン通知預金に「シグマ」と命名、五月から取り扱いを始めた。利回りは八日現在で三カ月ものが年四・三〇五四%。九月三十日までの臨時商品。

また、第一勧業銀行では、定期預金と抵当証券を組み合わせた「ベスト」に新型を用意、預け入れが通常の一年間より（以下判読困難）

（判読困難）販売されるCD（譲渡性預金）の発行金利の変動に応じて、毎週預入金利の見直しを行う金融商品で、一九八五年三月に導入された。最低預入額は五千万円でスタートしたが、その後三千万円、二千万円と引き下げられ、八七年十月からは一千万円。今年六月五日からは三百万円。（判読困難）期間は六カ月、一年の二種類。金利は六カ月物CDマイナス一・二五%、一年物CDマイナス〇・七五%になる。十月には三カ月物、二年物、三年物もスタートする。

今後、最低預入額を三百万円からさらに引き下げることが検討される予定。

目玉をつ（判読困難）を広げて（判読困難）和銀行は（判読困難）して、（判読困難）すれば六月五日以降いつでも「スーパーMMC」に振り替える「予約サービス」のほか、（判読困難）備預金、外貨預金、金投資口を使った方法も扱う。富士銀行の準備預金口座「トゥモロー」は、満期日の指定無しで、（判読困難）いろいろ（判読困難）もある。（判読困難）期預金（判読困難）金額を（判読困難）

日米通信摩擦で郵政次官

改めて「譲歩せぬ」

市場分野別（MOSS）協議の日米合意違反だとして、米政府が対日制裁を決めた電気通信問題について、奥山郵政事務次官は八日の記者会見のなかで「すでに米側に示した回答以上に譲る考えはない」と、新たな譲歩はしない方針を改めて強調した。また、三塚通産相が同日、この問題について二十七日までに米政府に「中間回答」をする考えを示したことに対し、同次官は「今のところそういう予定はない。郵政省が責任をもって対処する」と述べた。

奥山次官らは同日、竹下首相に会い、同省の方針の説明や現状報告を行ったが、首相から特別の指示はなかったという。また、片岡郵政相は同日までに、三塚通産相から訪米の結果を電話で聞いたほか、自民党の幹事長とは電話で、渡辺政調会長には直接会い「日本はMOSS合意に違反していない」と説明し、同省の姿勢に対する理解を求めた。

さらに同省は、三塚通産相の訪米に同行した通産省幹部からも説明を聞く予定。これらの結果を通して同省は、（判読困難）分野は郵政省の所管（判読困難）日本はMOSS合意に違反していないことを政府の統一見解にしたうえで、対応策を検討する方針（判読困難）

対中鋼材輸出

価格据え置き

鉄鋼大手、（判読困難）

新日本製鉄など鉄鋼大手六社が進めていた中国への今年下期の鋼材輸出商談は八日、輸出価格を据え置く形で決着した。

国際市況の上昇を理由に値上げを主張して、（判読困難）側と、（判読困難）国内のインフレ（判読困難）のために値下げを求めて（判読困難）側が対立したわけだが、上期分の中国（判読困難）

A-6

民間設備投資

今年度は10.6%増

産構審の部会試算

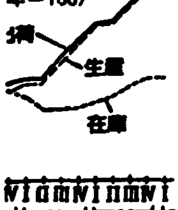
2年連続2ケタ台

拡大が新たな設備投資を生む「設備投資需要」②技術革新の進展③消費の多様化による高付加価値化促進④労働時間短縮への対応⑤各種規制緩和に向けた競争力確保——の五点を挙げて

（判読困難）、・は速報。通貨）（判読困難）CD、平均残高

（判読困難）3月の景気動向を（判読困難）す統計数字がおお（判読困難）たそろったが、単（判読困難）でみると爆発的と（判読困難）いえる景気上昇を（判読困難）している。消費税（判読困難）入前のかけこみ需（判読困難）のあった百貨店販（判読困難）額は史上最高を記（判読困難）、乗用車販売も（判読困難）とも絶好調。国内（判読困難）い。1、2月は昭（判読困難）去の影響で個人消（判読困難）りが見えたが、す

（判読困難）指数の推移（判読困難）年＝100）



（判読困難）と飛んだ。（判読困難）ゆ、鉱工業生産指（判読困難）は前月比4.2%の（判読困難）47年5月以来の記

FIGURE A-5

65 Line Screen

150 Line Screen

10 Point	dKfje giewo s1weo xcaqp cNvbm xiuyt rEdv2 dkfJe giewo slW3o xc xiuyt rEdv2 dkfJe rEdvj dkfj5 giewo sLweo xca4G cnvbm x8u s1weo xcaqp cNvbm xiuyt rEdv2 dkfJe Cnvbm xiuyt redvJ d45 giEwo slweo xCa7p cnvbm xi26t redvj KJfje giewo Slweo xc5Tp cnvb
6 Point	dKfje giewo s1weo xcaqp cNvbm xiuyt rEdv2 dkfJe giewo slW3o xcaQp c9vbm xiuy eikjk kjK56 defge 83 rEdvj dkfj5 giewo sLweo xca4G cnvbm x8uyt redVJ dkfje Gie6o slwXo xcaqp KL3er keich 3ksOd hckC Cnvbm xiuyt redvJ d45je giewo slBUo xc2Fp cnvbm xiWyt red0j dkfje giEwo 3kdoc kdKod 34Ker opu slweo xCa7p cnvbm xi26t redvj KJfje giewo Slweo xc5Tp cnvbm xiuyt Redvj dkfje gVew 3pajc kwmcJ elqmn ba
3 Point	

FIGURE A-6

AUBR8ZCS3Hovbuarehl UGE2KS8HOVjuvooxatha G53DAHKVZCnouejarbtl BES28NVD3Kbrvnkhueaj E3HDKXCNOAvxuehoiln 3OVNAB8XZUuaoibeace AUBR8ZCS3Hovbuarehl UGE2KS8HOVjuvooxatha G53DAHKVZCnouejarbtl BES28NVD3Kbrvnkhueaj E3HD
6RONUVACS8eeoenanvbc R2ZXGCU8HKaerejauvk 2DS858GKVAarsxinoouh OZCXUEKBSGooeabvalu ZS8BG3AEH5ejahvurcha SHKESOU3VRanrcuoxidl 6RONUVACS8eeoenanvbc R2ZXGCU8HKaerejauvk 2DS858GKVAarsxinoouh OZCXUEKBSGooeabvalu ZS8E

DNHERK5ACUbraaejeot NXV32ARU8Gcaxolinseb XBCODU2GK5koajcaersv HVA3RZGOC2rexkoeahbc VCUO2S5Z8Dxiahesotvk C8GZDHRSKNaaotsrjbuh DNHERK5ACUlxraaejeot NXV32ARU8Gcaxo
BE8ZNGD5ARhjonklixru E3KSX5NRU2tnjehcaaxo 3OAHBRK2GDbenitkloae 8K5SNV2HAXolibrxnvot 5K8HU3DGOBnukoieblha RAKVGON5ZEeohensvcto BE8ZNGD5ARhjonklixru E3KSX5NRU2tnjehc

OZUVE2BD5Nvieabhcjos ZSGC3DENRXuailvtknjr SH58ON3X2Bolacubhenx 2UAC5ZXRS3ietserukbj DGU8RSB2HOasbrixohvn N5G
HVRKZXOBDEeclkovtiea VC2ASBZEN3skcheubaio C8DUHES3XOrhktsovlaj XR5ADV3NCScxualosboi B2RUNCOX8Hkaoocirvea ED

8KNGV3HOBZxthbreucln KAX5COVZESabtvxsokce 3ND5BKSEACtjsnheaorc OXNREAH3U8bnretioe
AU2VB8NCGEnkeuaoiosv UGDCEKX853ehioojaeru SEBDOGCZ5Auiaavlnrot H3ENZ58SRUoaolucex

ECUSK2OH8Voovujthaxs KZ8SBEKD3Vknvrbeubag BRZCS38UAHberekihuvo VONSX8BAUZceaebiauol CXKD3HEONAllonxeuvht XZCG2R8UHKerjeaukvai 3OUSKEHSRVbeitoauece XZSBGKEUZObeesvoekli

XZCG2R8UHKerjeaukvm BRZCS38UAHberekihuvo VONSX8BAUZceaebiauol CXKD3HEONAllonxeuvht CBUHKXZR2Gveresjakvu 6HORAVUSBCeeecbvxaem CXKD3HEONAllonxeuvht ECUSK2OH8Voovujthaxs

ZDNG85RABNxilkurnhjo O2S8Z5DUCVsehaixtovk ESK3RX5NU2hejntxacao DHNERUCA5Kaaejtoerkl AO3G2KRBK7kywpi82zcl 921Q
AO3G2KRBK7kywpi82zcl TVB63PL19Ansktysazml 2NBN36NCX9jshwupyaqc O2S8Z5DUCVsehaixtovk 921QWXBLWSasdgtwpnvc OJCA

KAXOC5SEZVceespoidgq PTGD3N6MZUefhypaxmbt AUB2VGCIOMthseplaxvn 4S19DFCV
P8BGKJTQXPrypqlaksjd HF34ECTBUMplmnkoiuhb 8UHBVGY76Twsxedcrfvt CDE32WSX

TGBNHY68IKeuryfhcnsl OXHEARNU83kxetiorenb YXMBGS2INSpqajfuty
MJHD458SPVixecsfyrbc V7GJSTLJBKzxcvbnljgd 93GDERTYUIpknegzxw

AUBR8ZCS3Hovbuarehl UGE2KS8HOVjuvooxatha G53DAHKVZCnouejarbtl BES28NVD3Kbrvnkhueaj E3HDKXCNOAvxuehoiln 3OVNAB8XZUuaoibeace AUBR8ZCS3Hovbuarehl UGE2KS8HOVjuvooxatha G53DAHKVZCnouejarbtl BES28NVD3Kbrvnkhueaj E3HDK
6RONUVACS8eeoenanvbc R2ZXGCU8HKaerejauvk 2DS858GKVAarsxinoouh OZCXUEKBSGooeabvalu ZS8BG3AEH5ejahvurcha SHKESOU3VRanrcuoxidl 6RONUVACS8eeoenanvbc R2ZXGCU8HKaerejauvk 2DS858GKVAarsxinoouh OZCXUEKBSGooeabvalu ZS8E

DNHERK5ACUbraaejeot NXV32ARU8Gcaxolinseb XBCODU2GK5koajcaersv HVA3RZGOC2rexkoeahbc VCUO2S5Z8Dxiahesotvk C8GZDHRSKNaaotsrjbuh DNHERK5ACUbraaejeot NXV32ARU8Gcaxol
BE8ZNGD5ARhjonklixru E3KSX5NRU2tnjehcaaxo 3OAHBRK2GDbenitkloae 8K5SNV2HAXolibrxnvot 5K8HU3DGOBnukoieblha RAKVGON5ZEeohensvcto BE8ZNGD5ARhjonklixru E3KSX5NRU2tnjehca

OZUVE2BD5Nvieabhcjos ZSGC3DENRXuailvtknjr SH58ON3X2Bolacubhenx 2UAC5ZXRS3ietserukbj DGU8RSB2HOasbrixohvn N5GH
HVRKZXOBDEeclkovtiea VC2ASBZEN3skcheubaio C8DUHES3XOrhktsovlaj XR5ADV3NCScxualosboi B2RUNCOX8Hkaoocirvea ED2

8KNGV3HOBZxthbreucln KAX5COVZESabtvxsokce 3ND5BKSEACtjsnheaorc OXNREAH3U8bnretioe
AU2VB8NCGEnkeuaoiosv UGDCEKX853ehioojaeru SEBDOGCZ5Auiaavlnrot H3ENZ58SRUoaolucex

ECUSK2OH8Voovujthaxs KZ8SBEKD3Vknvrbeubag BRZCS38UAHberekihuvo VONSX8BAUZceaebiauol CXKD3HEONAllonxeuvht XZCG2R8UHKerjeaukvai 3OUSKEHSRVbeitoauece XZSBGKEUZObeesvoekli

XZCG2R8UHKerjeaukvm BRZCS38UAHberekihuvo VONSX8BAUZceaebiauol CXKD3HEONAllonxeuvht CBUHKXZR2Gveresjakvu 6HORAVUSBCeeecbvxaem CXKD3HEONAllonxeuvht ECUSK2OH8Voovujthaxs

ZDNG85RABNxilkurnhjo O2S8Z5DUCVsehaixtovk ESK3RX5NU2hejntxacao DHNERUCA5Kaaejtoerkl AO3G2KRBK7kywpi82zcl 921Q
AO3G2KRBK7kywpi82zcl TVB63PL19Ansktysazml 2NBN36NCX9jshwupyaqc O2S8Z5DUCVsehaixtovk 921QWXBLWSasdgtwpnvc OJCA

KAXOC5SEZVceespoidgq PTGD3N6MZUefhypaxmbt AUB2VGCIOMthseplaxvn 4S19DFCV
P8BGKJTQXPrypqlaksjd HF34ECTBUMplmnkoiuhb 8UHBVGY76Twsxedcrfvt CDE32WSX

TGBNHY68IKeuryfhcnsl OXHEARNU83kxetiorenb YXMBGS2INSpqajfuty
MJHD458SPVixecsfyrbc V7GJSTLJBKzxcvbnljgd 93GDERTYUIpknegzxw

動慰額轄溝運遺害館模扱奄逸綾絵顎玉通貧霜膨峠朗姫 庶汗熟茎怠匠間階決揮艦薩康七
怖泰魔豚軸扶胎摩悼浅声替殺断張熱亮辺鹿肝嬢屑耐芝 哀始喚限窮蝶冒艇昱幕待到盲演
冒券少再乾釧旗銚吉眼元形支殺断張閑宏仰苫恨神除遂族沢焼席折短注薩駆函
幅弔鳴胴勝浅声替湯醸副濁迷定貴作試節勢脱着害館結漁在壊歓画驚判授数賊

認布無勇浸疫剰扶胎摩為壊歓画霜膨峠朗姫乾釧旗副濁迷篤判項
栄局顔言商図生務油逸恨李姿尉由養鉛猿鑑穀千振報様哀始虐層

退団登認易吉眼元形宰抵叙宕犠洞控勝浅声替治待到
膨峠朗姫艦薩駆函絞署船設計響裁康軸扶胎摩悼滴礼

委威課管計響姿尉拾虐層酒痢洪薫像酸野預煙緩勧定貴呼弥床旭安圧醸副濁迷隔宕犠洞
彦僧揆豆漁卑鉛猿鑑錆熊偉爽閑宏仰苫恩授数賊滴礼闘問抑雲確晩祖耶秀亜寺打渡任父
床旭刃鬼言券少再確隔宕犠洞虐層桟抗族沢投署船設断画驚判項八指寺喫窓幌
犯福問抑幅弔鳴胴商図生炭打養鉛猿鑑漁在穀勧定貴作貧霜膨峠朗姫題洋泳鶉

注堂派敷題湯醸副濁迷晩祖冒艇昱幕務油逸勧定貴作故
員為壊歓画道悲報様哀福問抑 A-8 隔眼元形秀亜寺喫窓

FIGURE A-7

賓誉委泳鶉暇埼牲幌痛鐘罰 裁康様哀宰抵叙彦媛艦薩

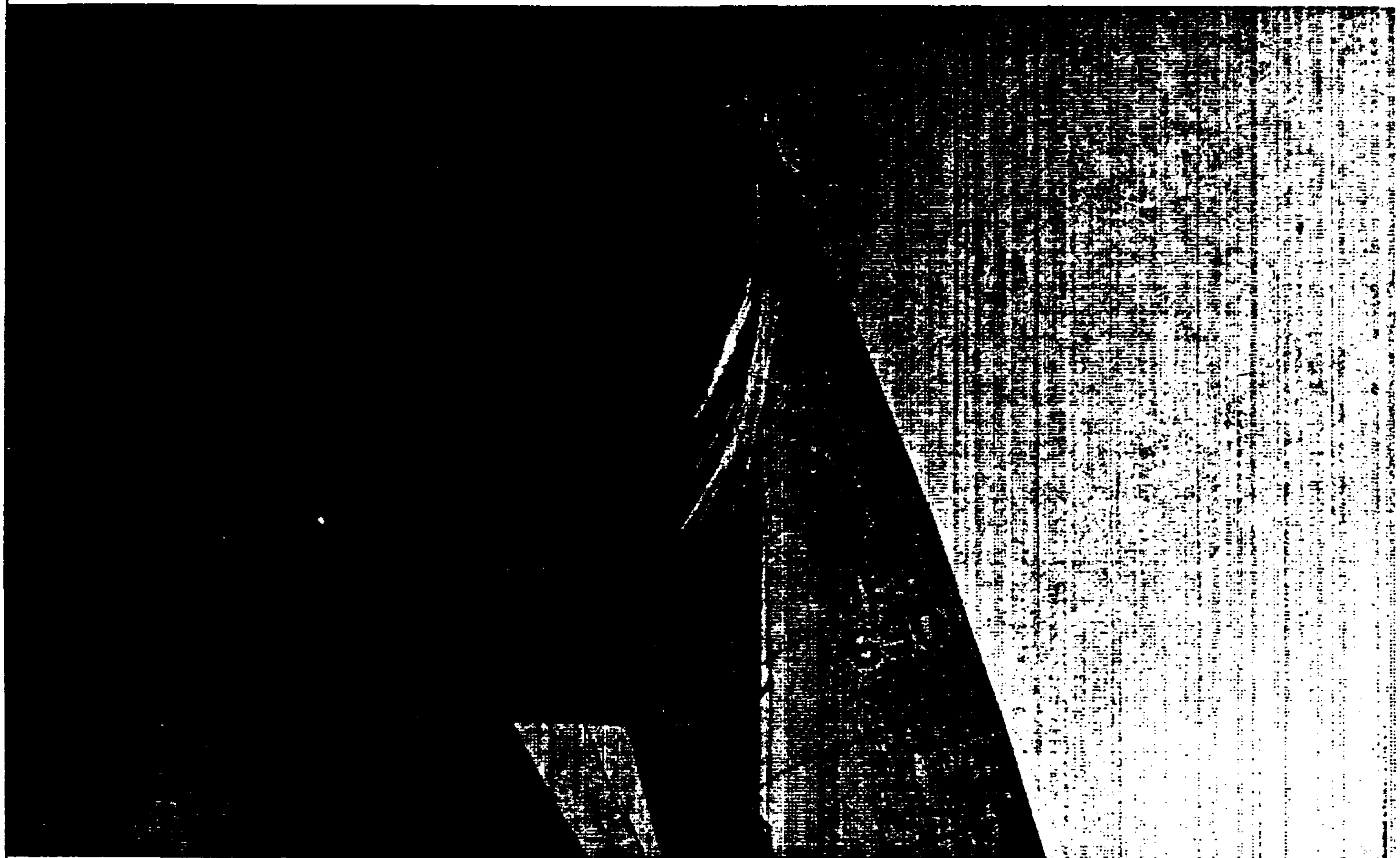


FIGURE A-8

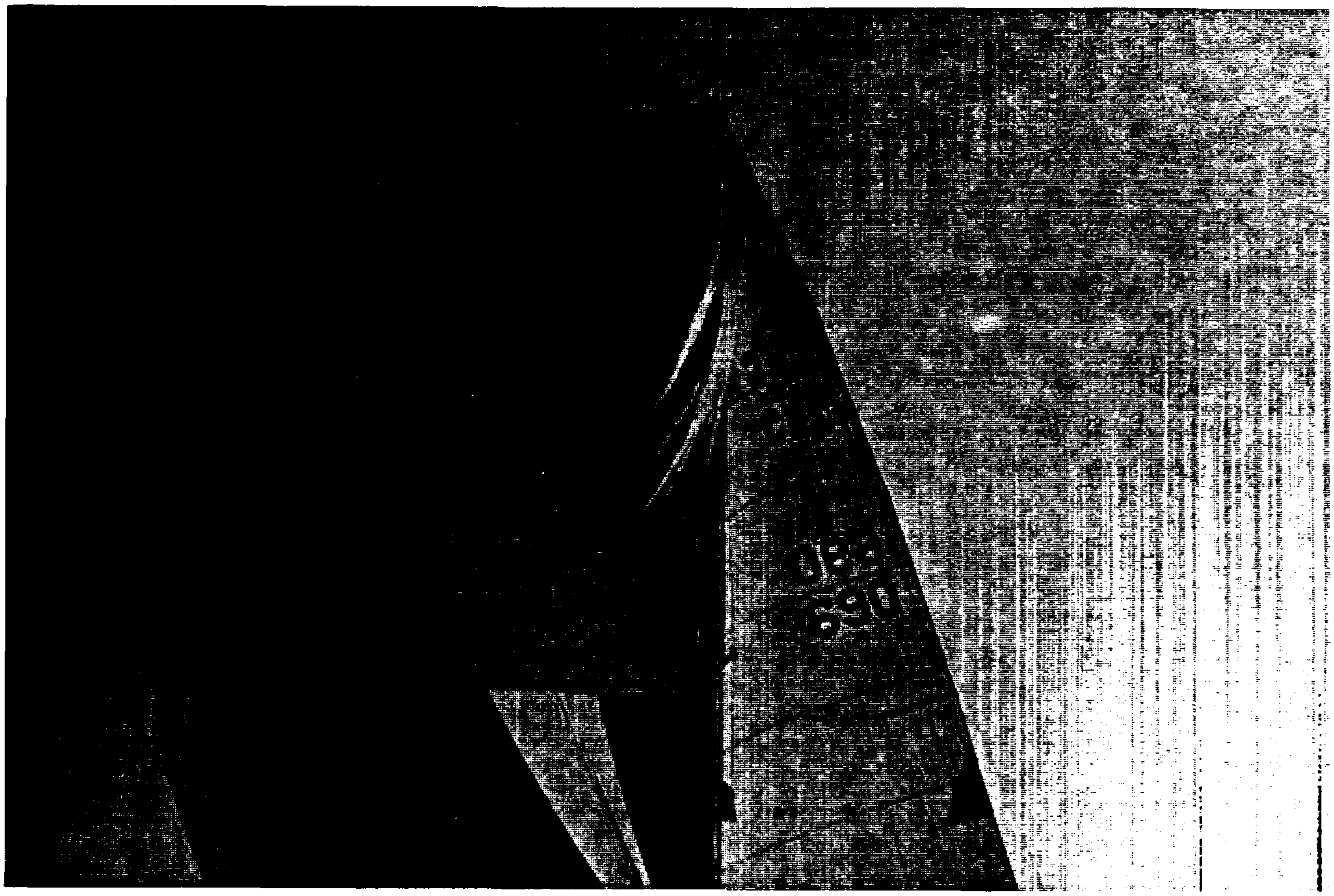


FIGURE A-9

FIGURE A-10

FIGURE A-11

FIGURE A-12

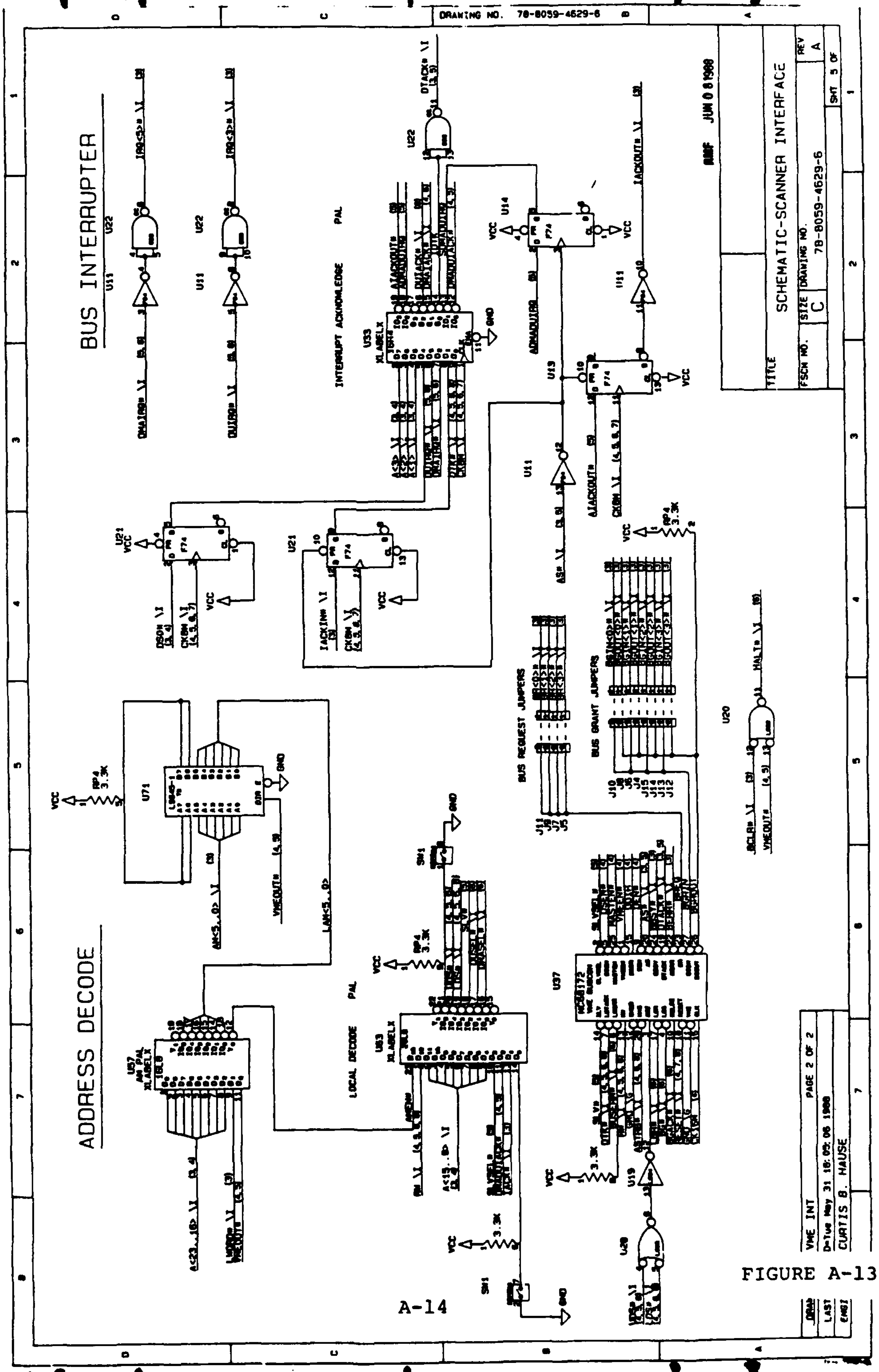
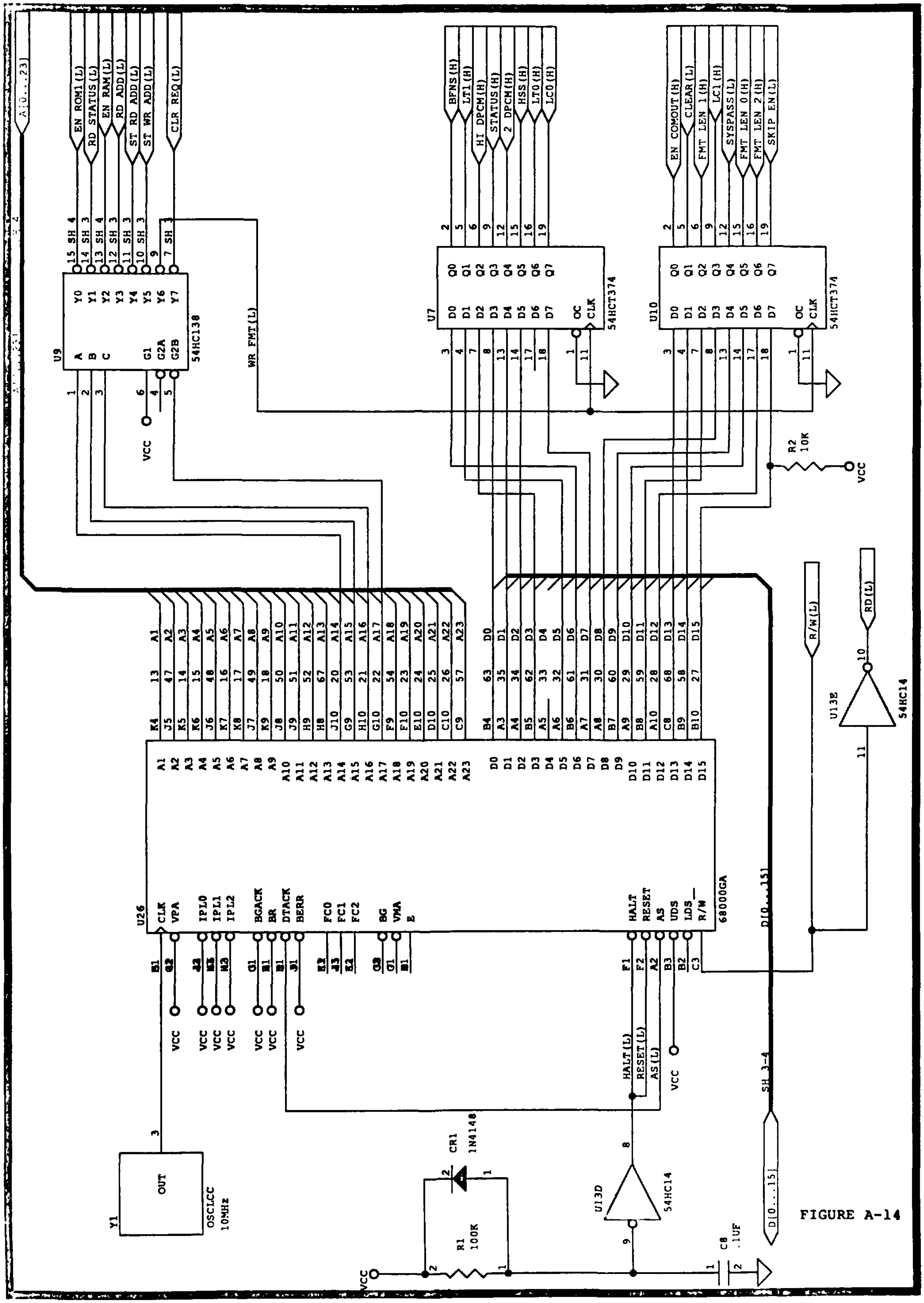

BUS INTERRUPTER
ADDRESS DECODE
INTERRUPT ACKNOWLEDGE
LOCAL DECODE
BUS REQUEST JUMPERS
BUS GRANT JUMPERS
DRAWING NO. 78-8059-4629-6
SCHEMATIC-SCANNER INTERFACE
TITLE
FSCM NO.
SIZE C
REV A
SHT 5 OF
JUN 0 8 1988
VME INT
PAGE 2 OF 2
CURTIS B. HAUSE

FIGURE A-13



U26
68000GA
U9
54HC138
U7
54HCT374
U10
54HCT374
U13D
54HC14
U13E
54HC14
Y1
OSCLCC
10MHz
CR1
1N4148
R1
100K
R2
10K
C8
.1UF
EN ROM1(L)
RD STATUS(L)
EN RAM(L)
RD ADD(L)
ST RD ADD(L)
ST WR ADD(L)
CLR REQ(L)
WR FMT(L)
BFNS(H)
LT1(H)
HI DPCM(H)
STATUS(H)
2 DPCM(H)
HSS(H)
LT0(H)
LC0(H)
EN COMOUT(H)
CLEAR(L)
FMT LEN 1(H)
LC1(H)
SYSPASS(L)
FMT LEN 0(H)
FMT LEN 2(H)
SKIP EN(L)
R/W(L)
RD(L)
HALT(L)
RESET(L)
AS(L)
D(0...15)
VCC

FIGURE A-14

FIGURE A-1

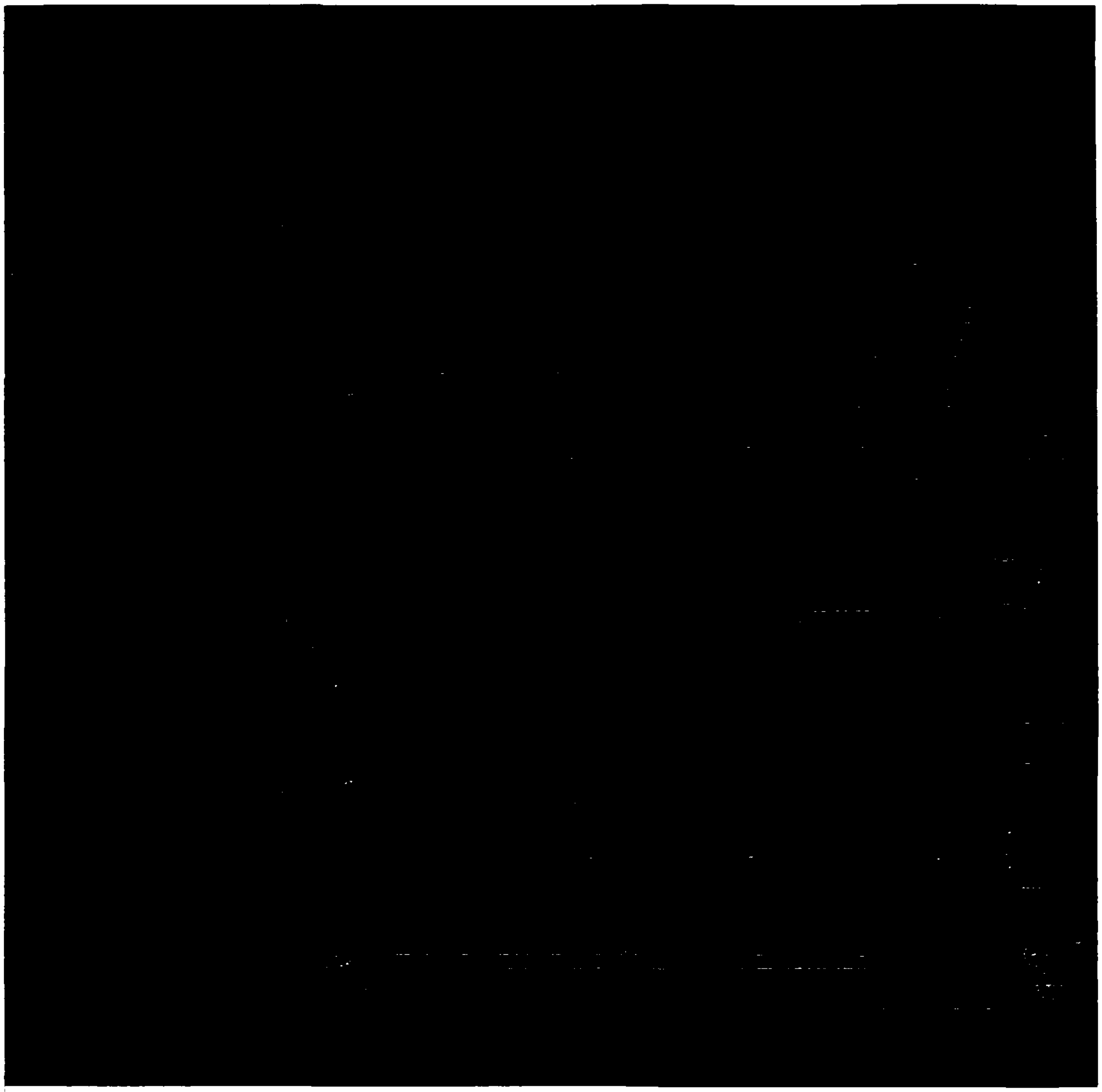


FIGURE A-15

fun and sport.

Famous for its International Filn
Cannes enjoys a dry, mild clima
for sunworshippers and sports
nightlife of casinos, cafés, and g
naries from around the world.

The Promenade de la Croisette
the city's broad, tree-lined boule
tween the grand, elegant hotels
Mediterranean seafront. The Pa
overlooking the yacht-filled harb
convention center, theater, bouti

Cannes can provide more than
An engaging variety of tourist a
Museum of Mediterranean Civi
ride to the observation tower at
its panoramic view; a boat trip t
explore the fortified fifth-centur
chapel, or to view the cell where
Mask" was kept in solitary confi
Louis XIV in 1687.

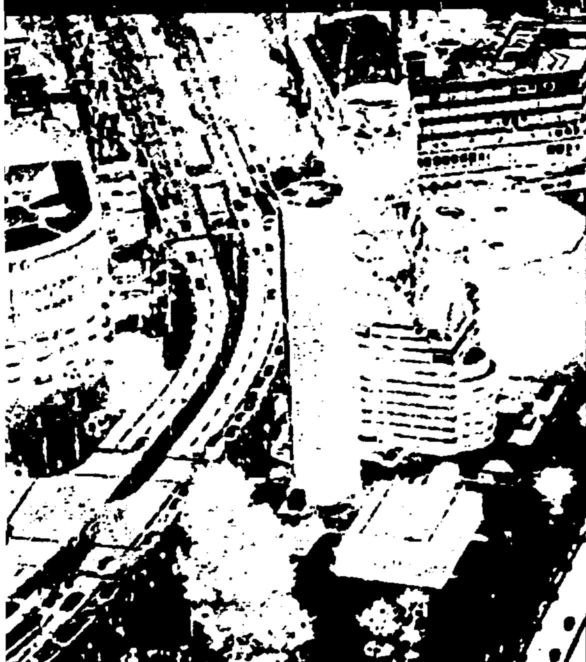
Shopping is a must on rue d'An
the finest quality, as it is distilled
urious flowers which grow along

The superb cuisine for which Fr
well-represented in numerous r
an exciting range of dining expe
extreme pleasures of *haute cuis*
lights of local fish dishes prepar

r geht ja in der Wäsche noch ein, Tante", erwiderte Jossie
ft und wandte sich um, denn die Tür zum Lokal wurde
ffnet, und der erste Gast dieses Tages trat ein. Sie war
en Augenblick so verblüfft, daß sie nicht einmal guten
sagen konnte. Dafür sagte Taubert es, und sie erkannte
ort die Stimme, die sie am Telefon gehört hatte. Eines
r allerdings komisch: Sie hatte ein gutes Gedächtnis für
sichter, aber seins war noch nie hier im Sonnebachhöf-
en aufgetaucht. Aber anderswo, dachte sie, - anderswo.
och es fiel ihr nicht so schnell ein, wo es gewesen sein
önnte.
ie kommen um Ihre Mappe?" sagte sie.
raten! Und Sie sind Fräulein Jossie Sonnebach und waren
liebenswürdig, mich anzurufen."
a - Ihr Niersteiner ist kalt gestellt, Herr Doktor!"
r lachte hellauf, und Mathilde Sonnebach, die sich in der
ischenzeit ebenfalls umgestellt hatte, weil nämlich die-
Doktor durchaus kein alter Herr war, glaubte bemerken
müssen, daß man im Sonnebachhöfchen sehr wohl wisse,
welcher Temperatur man den Weißwein zu kredenzen
be. "Zu kalt ist nämlich auch bei Weißwein von Übel",
lärte sie.
Wie überhaupt bei allem", erwiderte er mit einem ver-
eckten Lächeln. "Am schlimmsten aber ist es, wenn man
n mit Sprudel mischt."
Jetzt wußte Jossie mit einemmal, woher sie ihn kannte: Er
atte, als sie damals mit Geheimrat Hettmann in der Wein-
ube in München saß, an einem der Nebentische saure Leber
egessen, nein, gebackene, korrigierte sie ihr Erinnern. Es gab
einen Zweifel, daß er es gewesen war. Es gab auch keinen
weifel, daß er hier im Sonnebachhöfchen zum ersten Mal
nkehrte. Wie das mit der Mappe zusammenhing, mußte
ch erst herauskristallisieren. Auf jeden Fall stand sein

Berlin feiert in beiden
dung. Im Schoneberger
heitsglocke lauten, wen
beth II. von Großbritan
Reagan und der franzo
nach Berlin kommen. B
scheidplatz an der Berl
damm.

"Er geht ja in der Wäsche noch ein, Tante", erwiderte Jossie sanft und wandte sich um, denn die Tür zum Lokal wurde geöffnet, und der erste Gast dieses Tages trat ein. Sie war einen Augenblick so verblüfft, daß sie nicht einmal guten Tag sagen konnte. Dafür sagte Taubert es, und sie erkannte sofort die Stimme, die sie am Telefon gehört hatte. Eines war allerdings komisch: Sie hatte ein gutes Gedächtnis für Gesichter, aber seins war noch nie hier im Sonnebachhöf-



achte sie - anderswo.
o es gewesen sein
nnebach und waren
Doktor!"
ich, die sich in der
weil nämlich die-
glaubte bemerken
en sehr wohl wisse,
wein zu kredenzen
ißwein von Übel",
er mit einem ver-
r ist es, wenn man
sie ihn kannte. Er
mann in der Wein-
ntische saure Leber
ihr Erinnern. Es gab
Es gab auch keinen
en zum ersten Mal
ammenhing, mußte
sich erst herauskristallisieren. Auf jeden Fall stand sein
Name darin. Demnach gehörte sie ihm oder ha
gehört, war ihm entwendet oder von ihm selber ve

n. Es konnte auch sein, d
den und nicht mehr zuru
llen wurde schon stimmen
überließ den Gast der Nichte
hm den bestellten Niersteine
n selber an den Fenstertisc
so erfrischendes Lüftchen
dünnen Strohgläser daneben
genheiten benutzt wurden.
anstoßen?" fragte Dr. Taub
n schmeckt er mir nicht -
etwas gefährlich, wenn ma
n muß.
ich zu zieren, ein zweites G
e voll und stieß mit ihm an
ut, daß ich Ihren Namen in
"Ich hatte sonst gar nich

immer praktisch", erwidert
nicht meine Sache. Aber
nan leicht sein Eigentum ver
ie. Sie konnte der Lust, ih
er noch nie hier gewesen
te ihn entrüstet an, als er
ch so!" sagte sie ärgerlich
r meine Mappe hierher?"
Sie strafen sich selber Lüg

n sie. "Darauf trinke ich
Ihnen an, wenn Sie gestehe

te", sagte er, sein Weinglas
ämlich wirklich nicht, wie
Ich kann mir nur denken,
meiner Bruder einmal hier im Sonnebachhöfche
über den Durst getrunken hat und dann in se
seligkeit vergaß, die Mappe an sich zu nehmen.
Verdienst bin ich nun der Nutznießer dieser Ver
Sie soll gesegnet sein! Prost, Fräulein Jossie!"

"Prosit!" sagte sie belustigt, stieß mit ihm an
dann die Mappe aus dem Einbauschrank heru
Sie, hier steht Ihr Name eingezeichnet - cand.med.

"Selige Zeiten!" lachte Taubert. "Das Leder ha
ausgehalten."

Jossie nickte, spielte mit dem Verschluß der
das etwas verrostete Schloß auf- und zuspringe
dann von neuem an.

Taubert nahm sie ihr behutsam aus den Hände
sie neben sich auf das Fensterbrett. "Sie werden
denken können, wieso ich am Telefon gesagt ha
Niersteiner ohne Sprudel möchte. - Ich habe
einer Weinstube in München gesessen, als Sie m
teren Herrn hereinkamen. Und der bestellte so
mit' und Sie haben ihn deswegen getadelt und 'brr

"Ich erinnere mich", sagte Jossie.

"Erinnern Sie sich auch meiner?"

"Auch Ihrer, ja! - Sie saßen an einem der Nebe
aßen gebackene Leber."

"Und bis ich auf- und mich umsah, waren Sie
Taubert. "Aber der Himmel hat mir diesen reize
mit der Mappe geschickt, und auf den trinken wi
Gott, ob ich Sie sonst so schnell gefunden hätte."

Jossie wollte fragen "haben Sie mich denn gesu
ließ es am besten sein. Er war n
bestimmt auch nicht der letzte
Flämmchen der Zuneigung aufglimmen
ebenso schnell wieder herunter und erlosch, ehe e
geben vermochte. Das war weder etwas Neues

A-18

FIGURE A-17

Figures A-18 through A-34 are histograms of the black and white run lengths of each of the images. Note that the number of occurrences of all run lengths are plotted up to 63, and then the occurrences are plotted in groups of 64 run lengths. In other words there are two scales on the horizontal axis; the numbers on the right-hand part of the scale must be multiplied by 64 to determine the actual run length. Note also that the vertical scale varies greatly from image to image, illustrating the diverse content of the images.

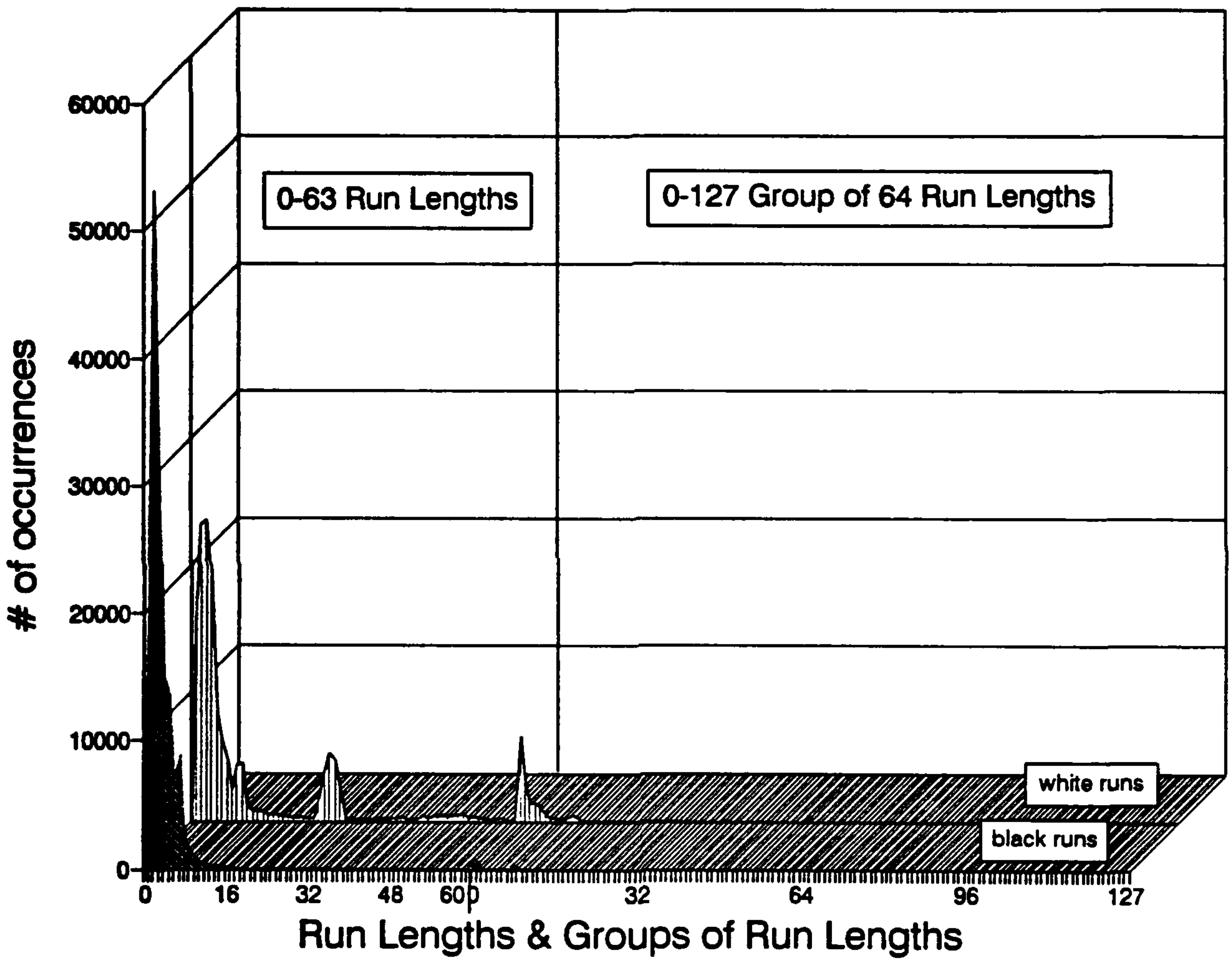


Figure A-18. Fax Test Chart Histogram

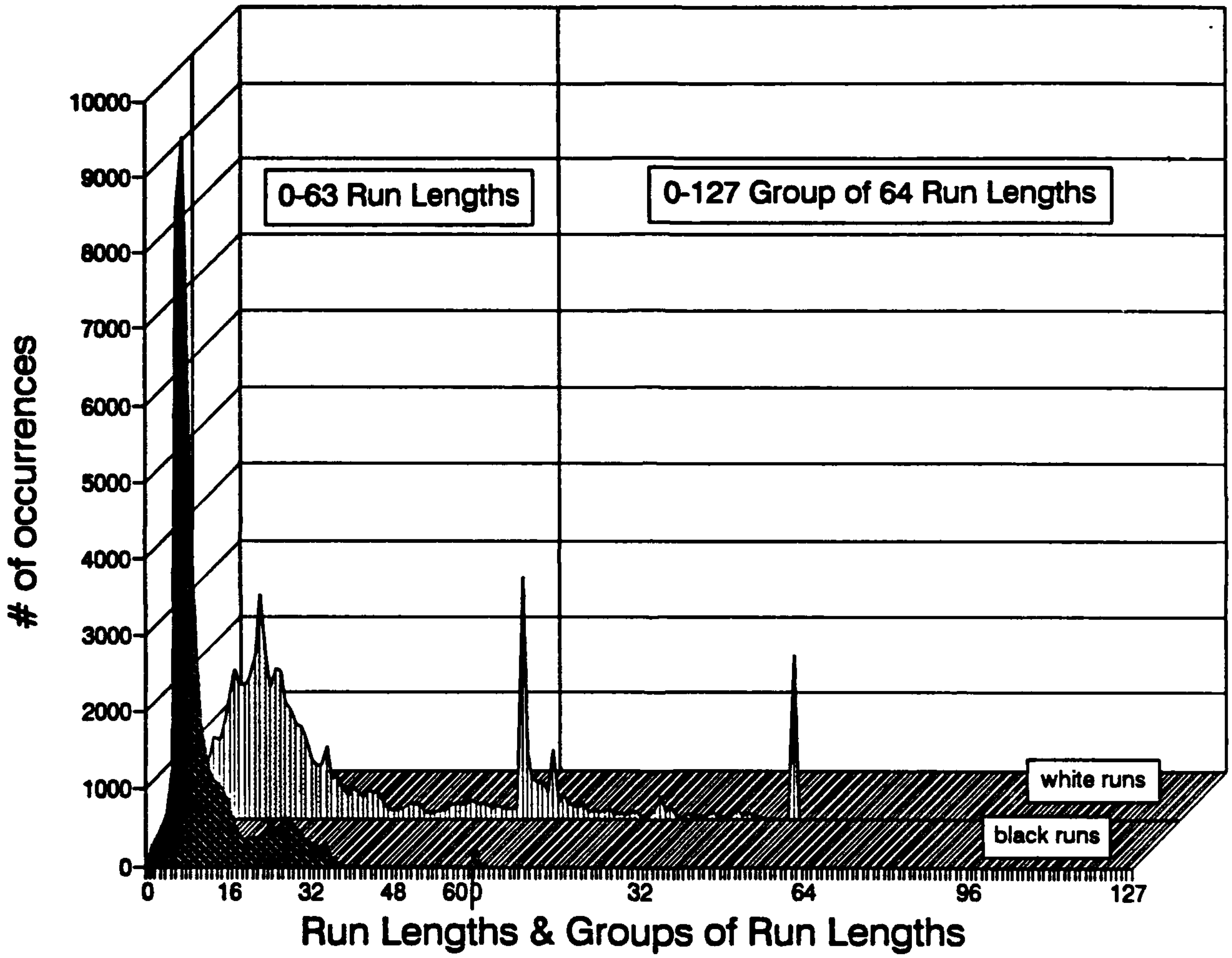


Figure A-19. Business Letter Histogram

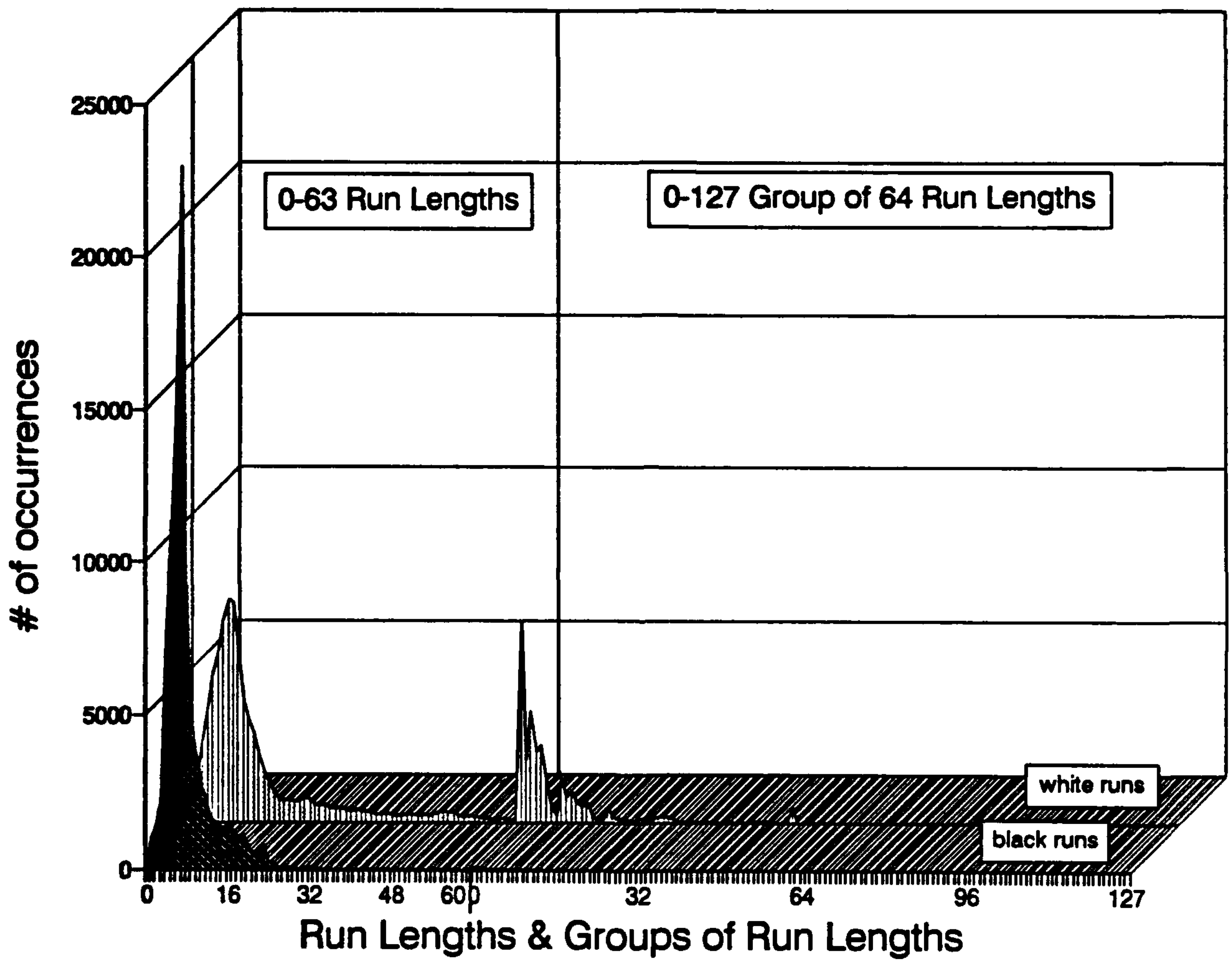


Figure A-20. Technical Paper Histogram

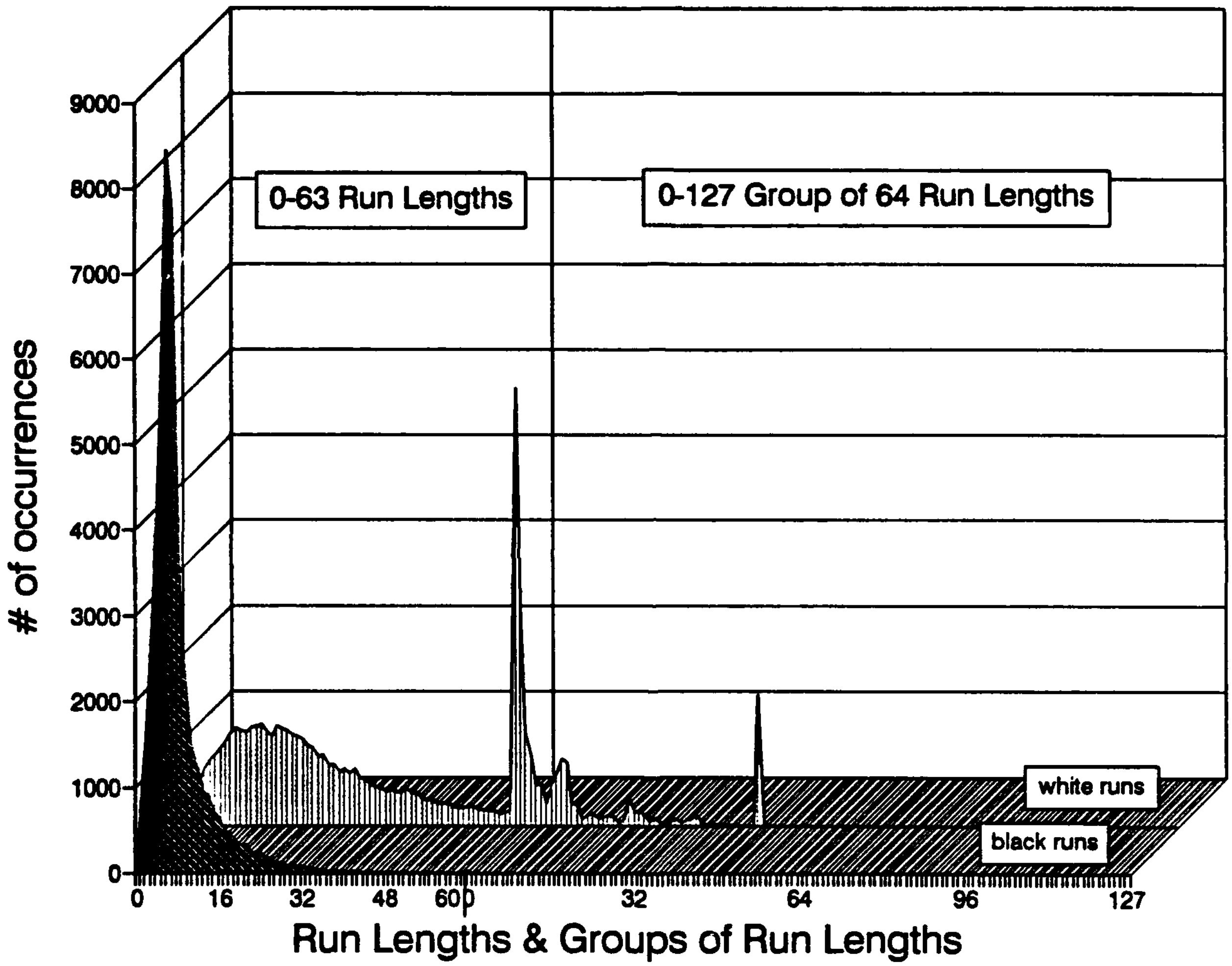


Figure A-21. Handwriting Histogram

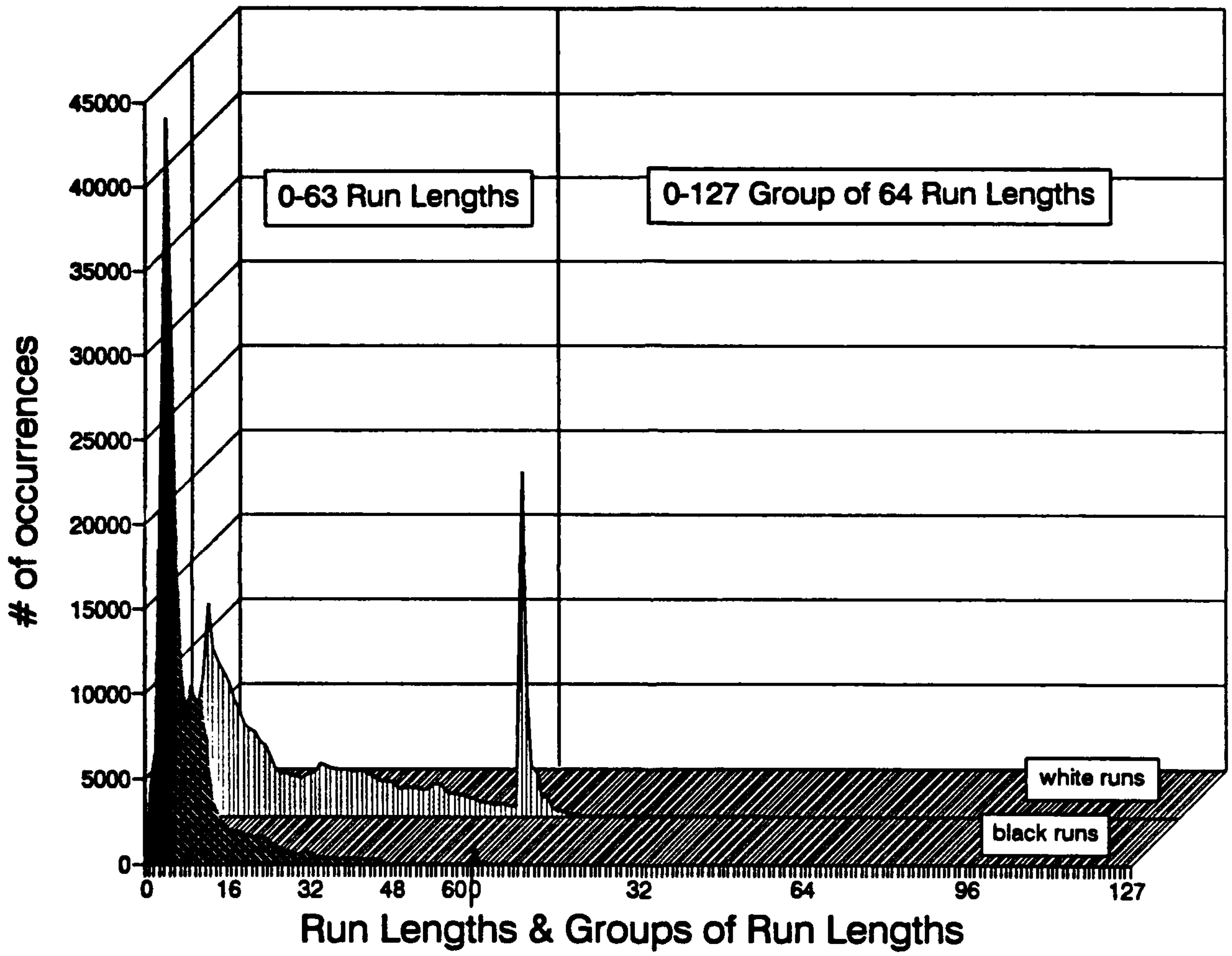


Figure A-22. Japanese News Histogram

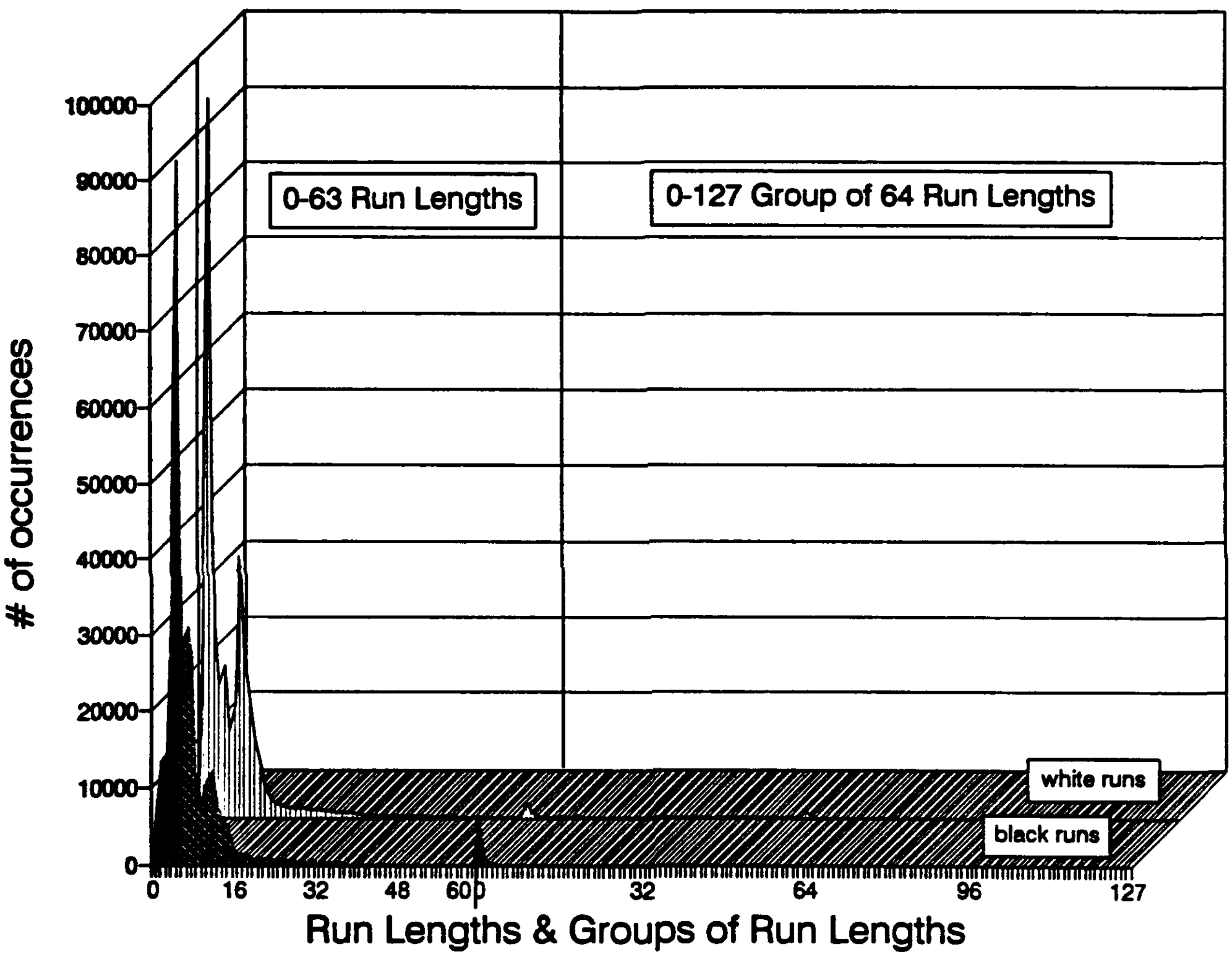


Figure A-23. Mixed Text and Screened Half-Tones Histogram

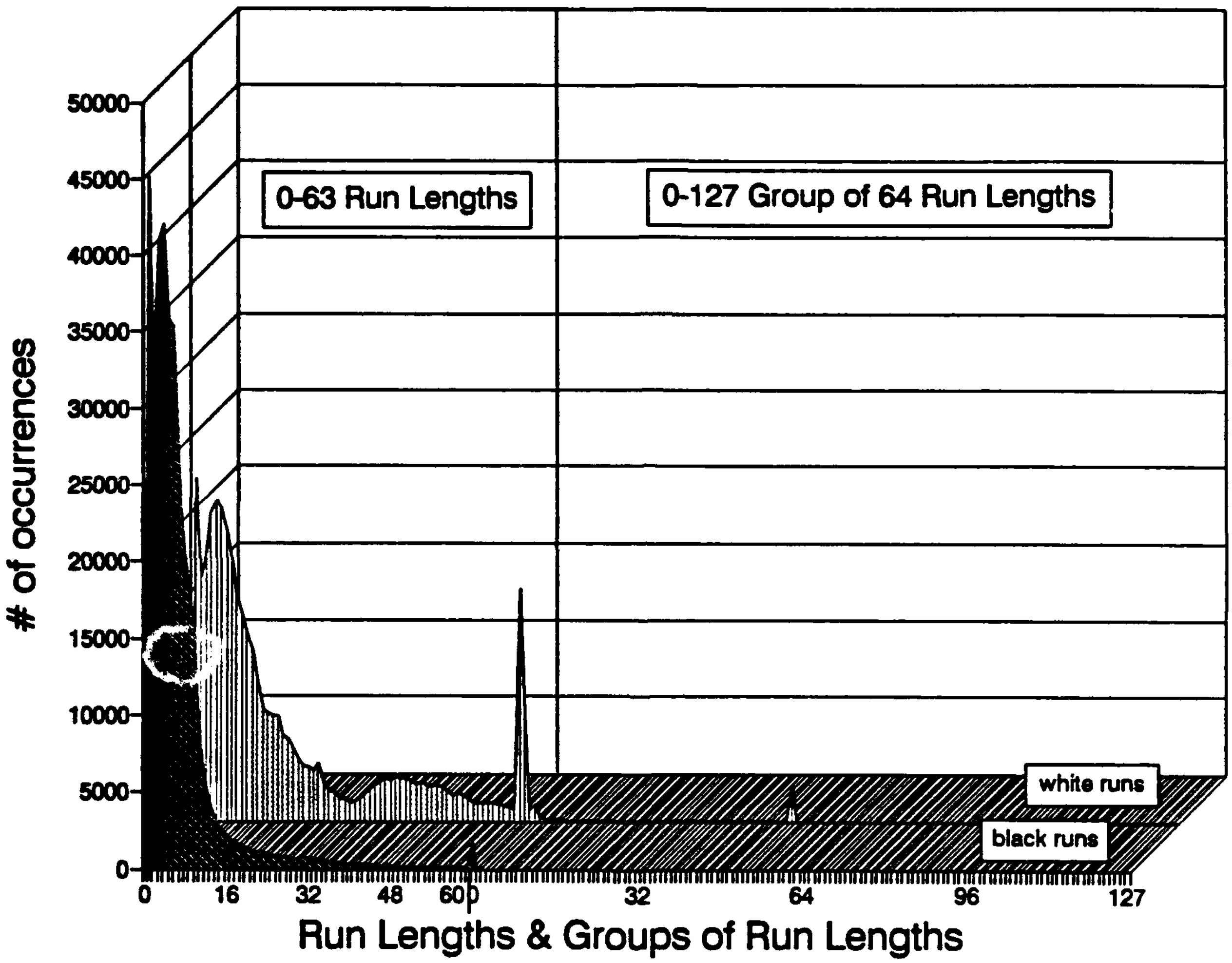


Figure A-24. Legibility Chart Histogram

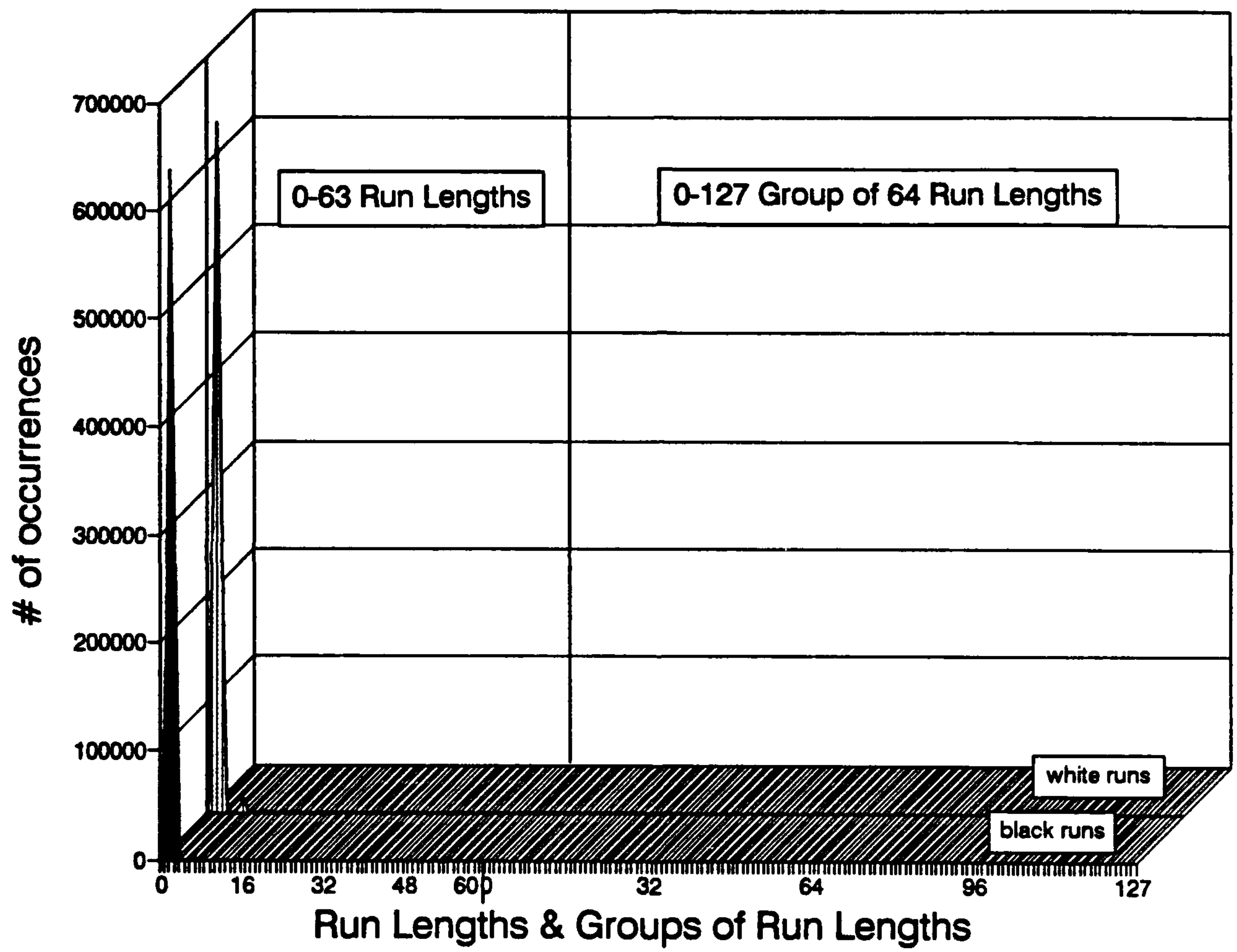


Figure A-25. Sailboat 1 Histogram

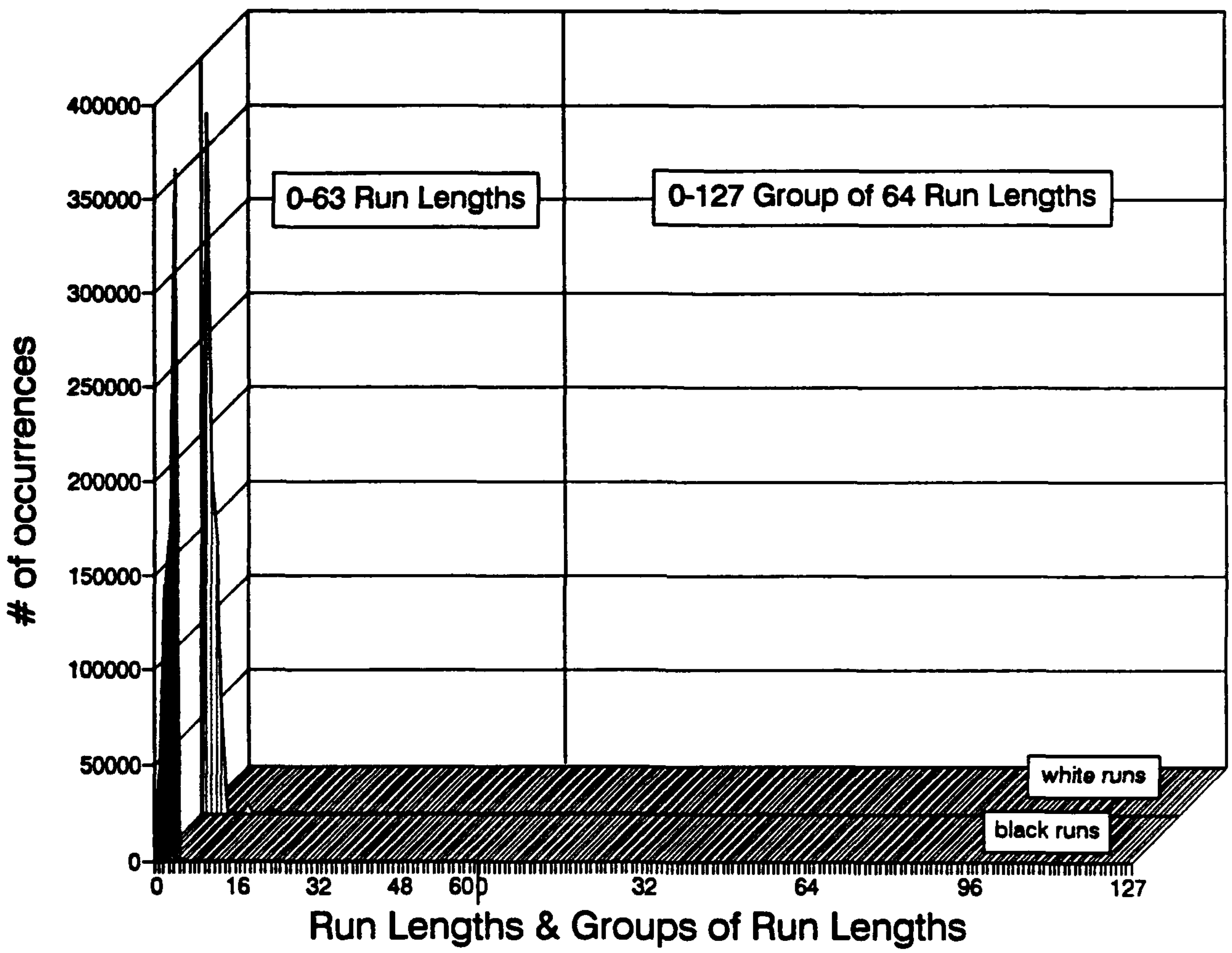


Figure A-26. Sailboat 2 Histogram

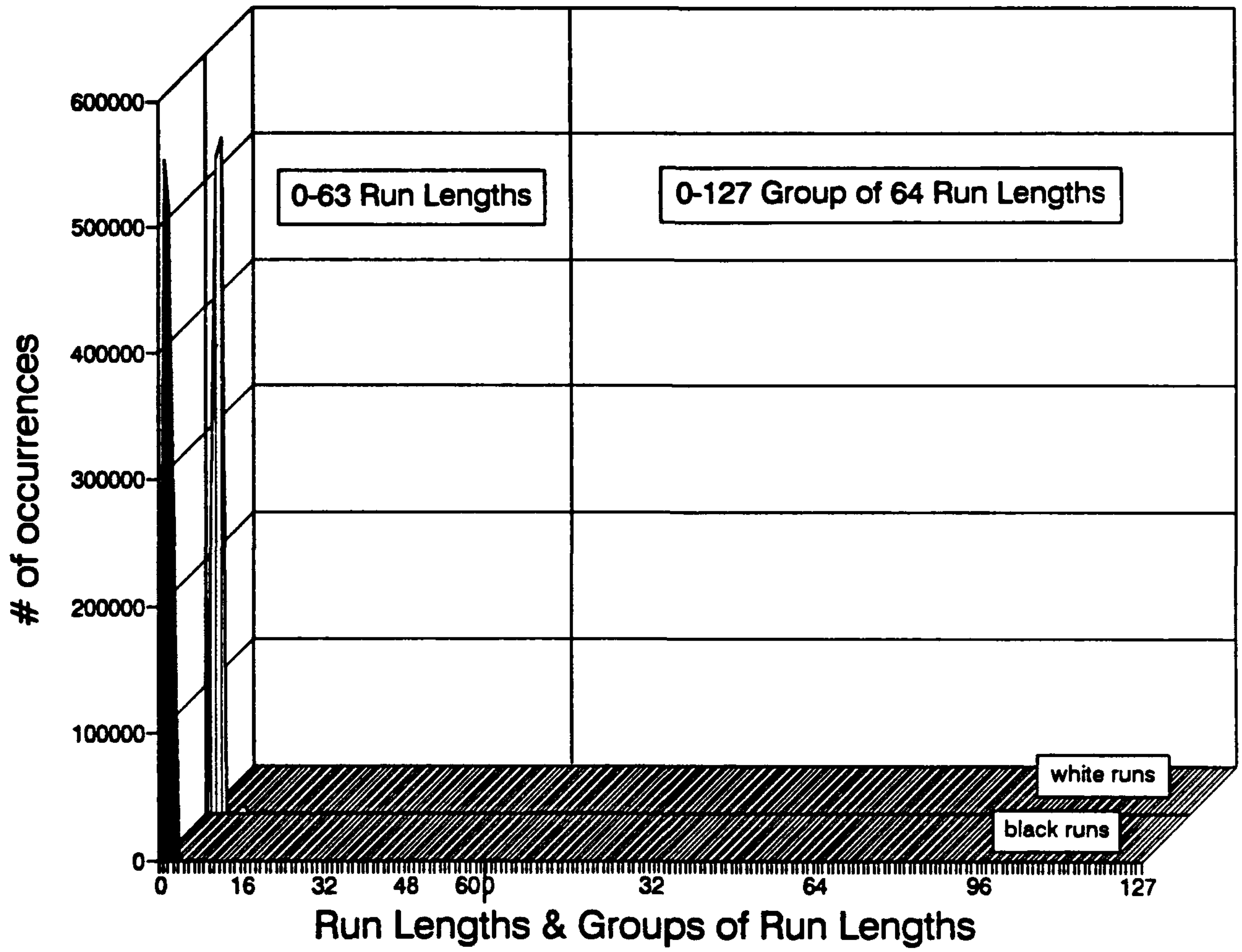


Figure A-27. Sailboat 3 Histogram

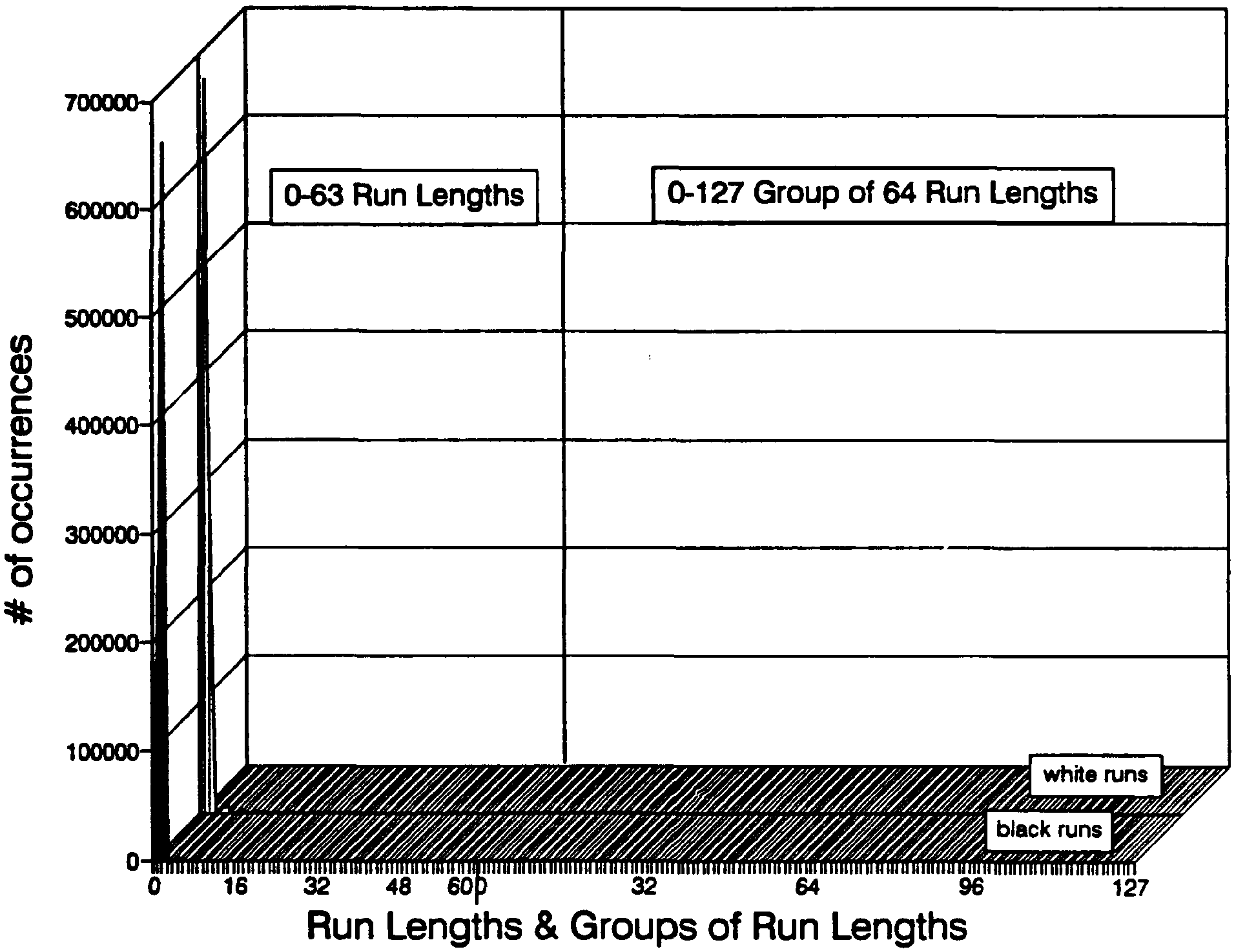


Figure A-28. Sailboat 4 Histogram

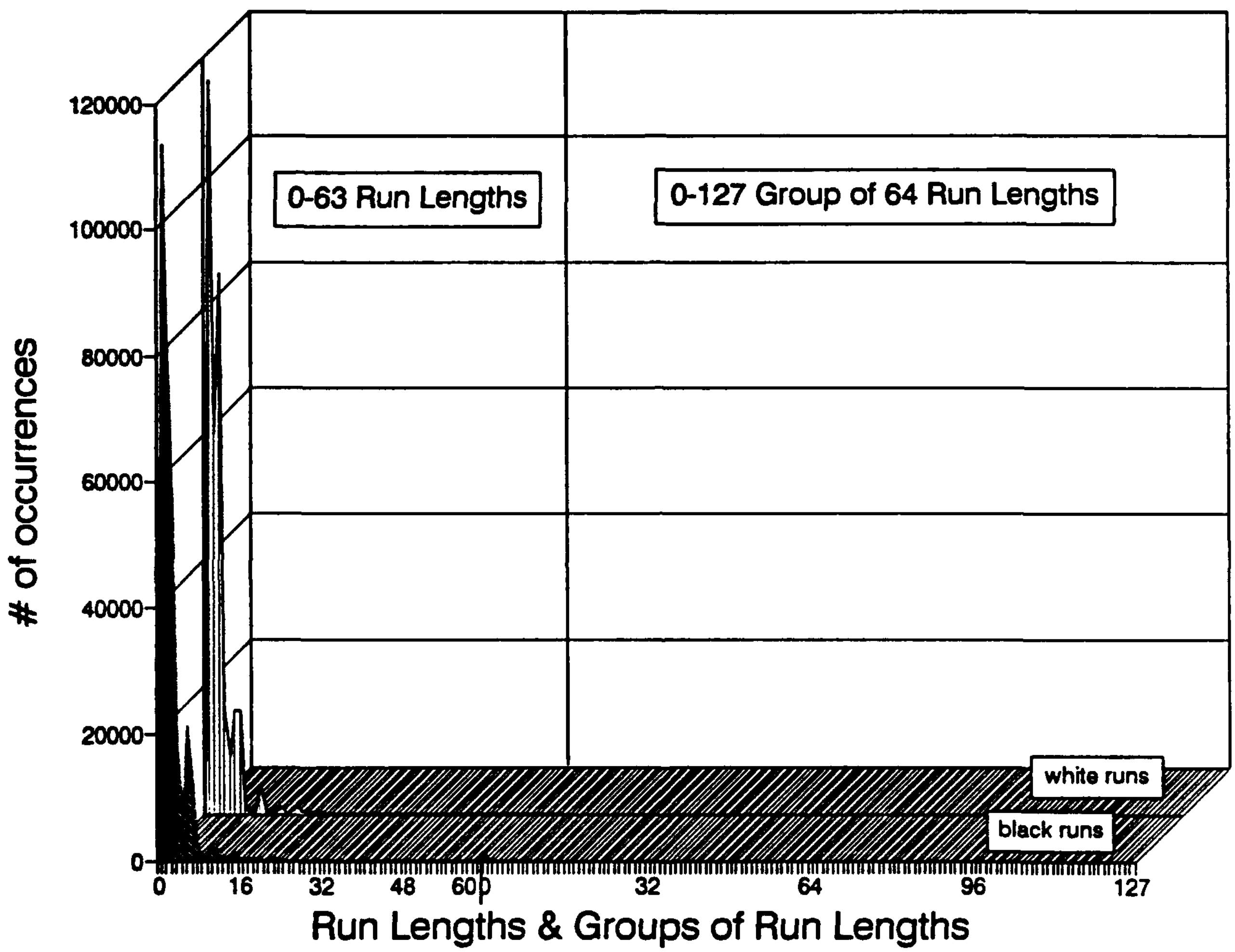


Figure A-29. Dithered Composite Histogram

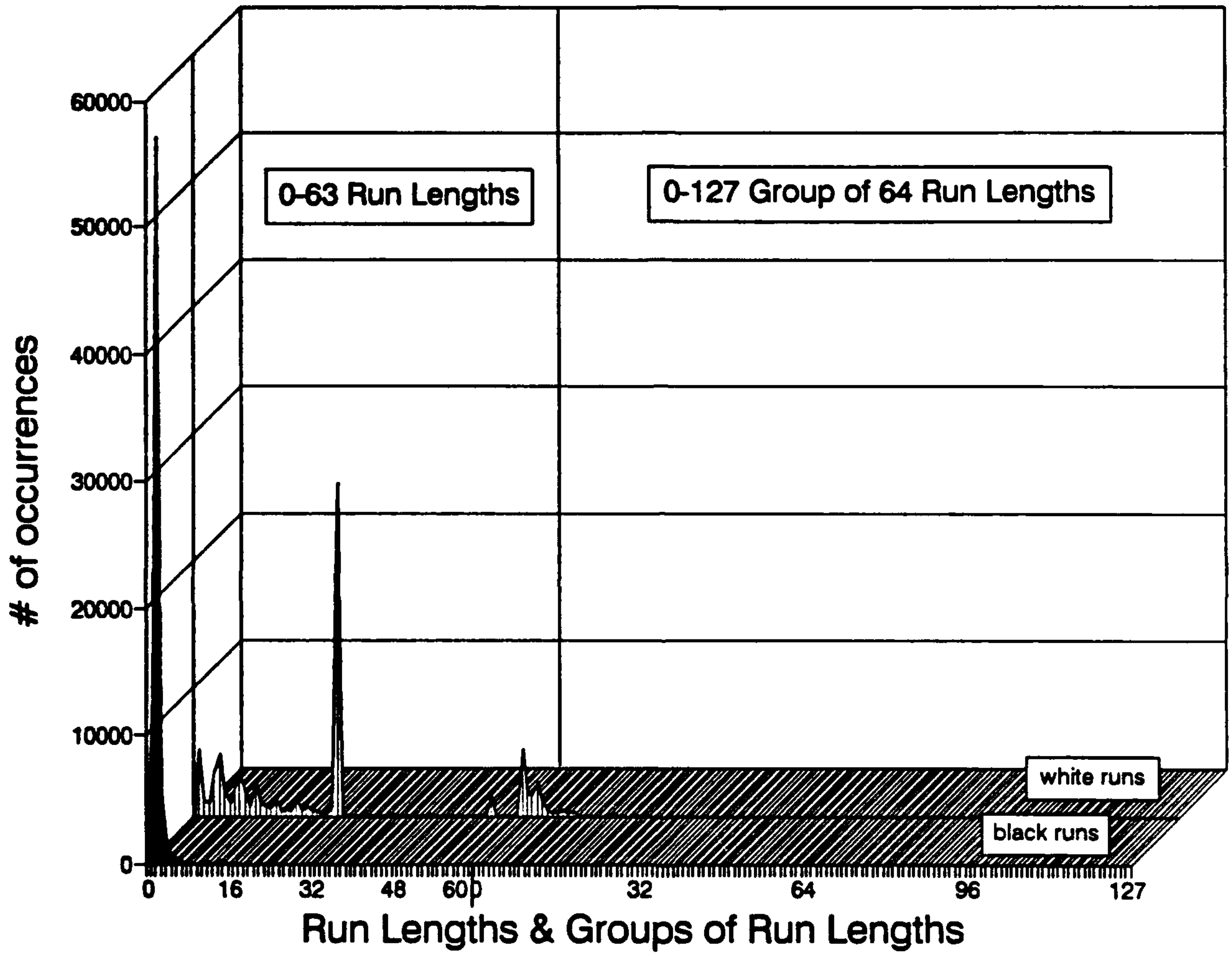


Figure A-30. Computer Generated Engineering Drawing Histogram

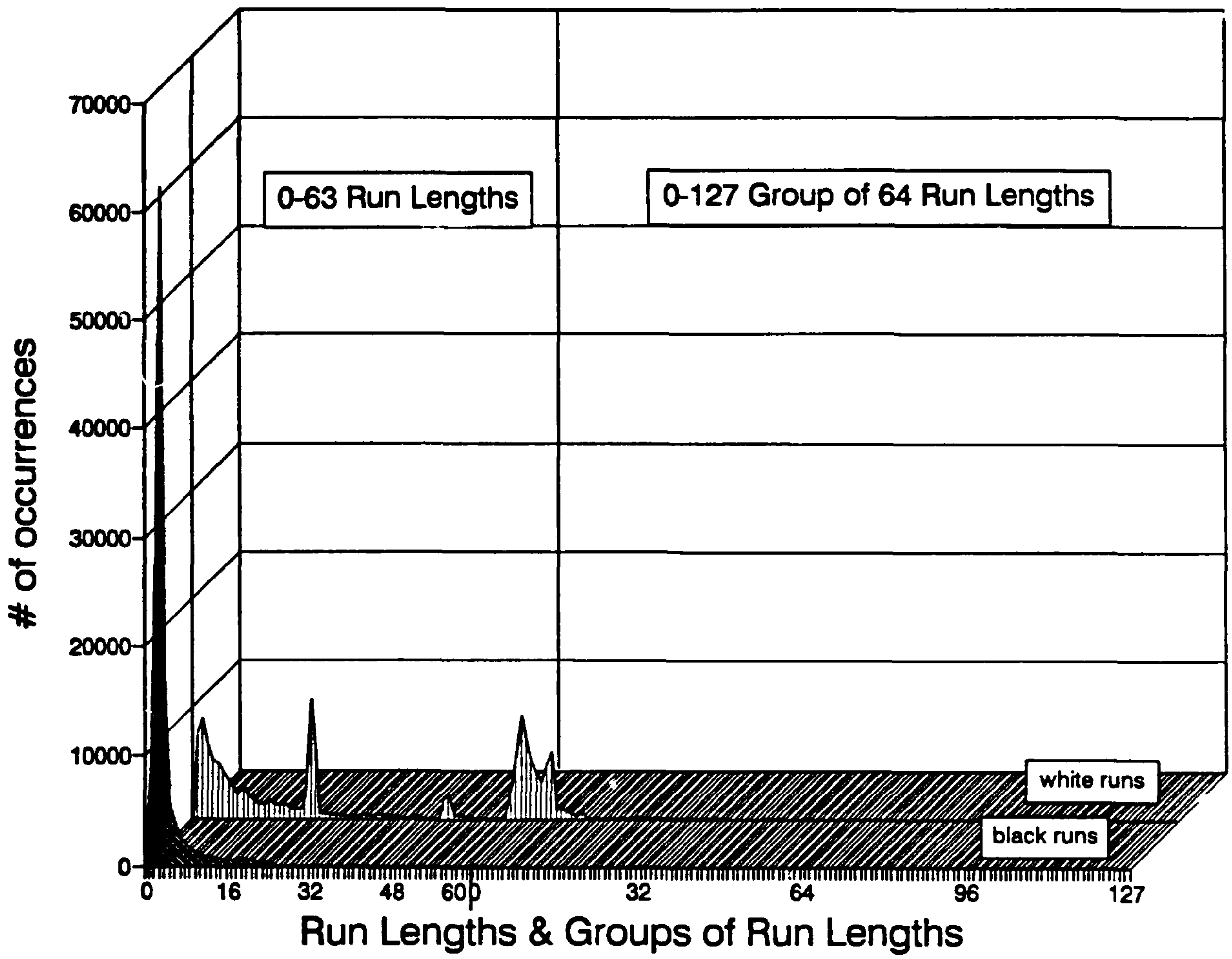


Figure A-31. Scanned Engineering Drawing Histogram

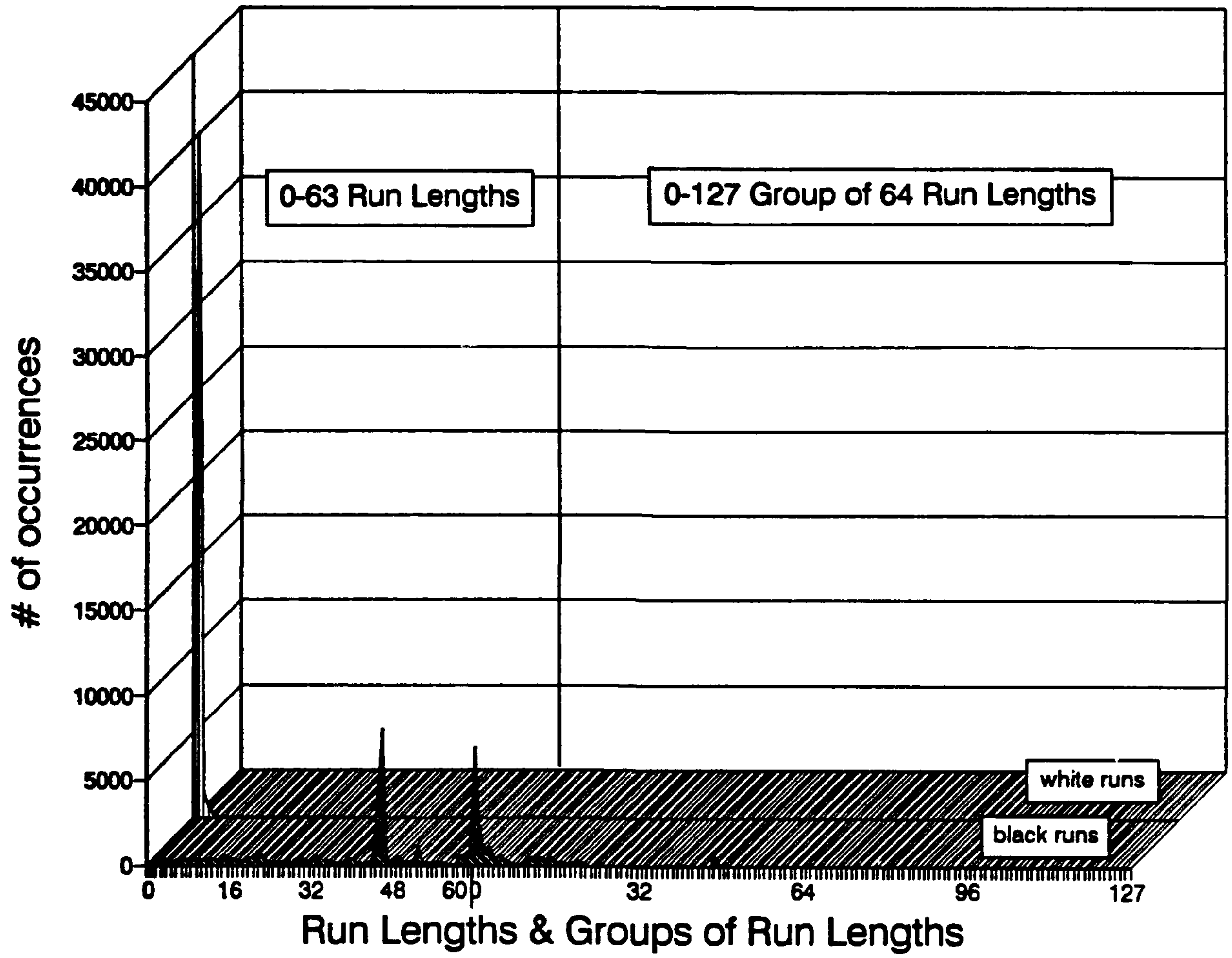


Figure A-32. House Design Histogram

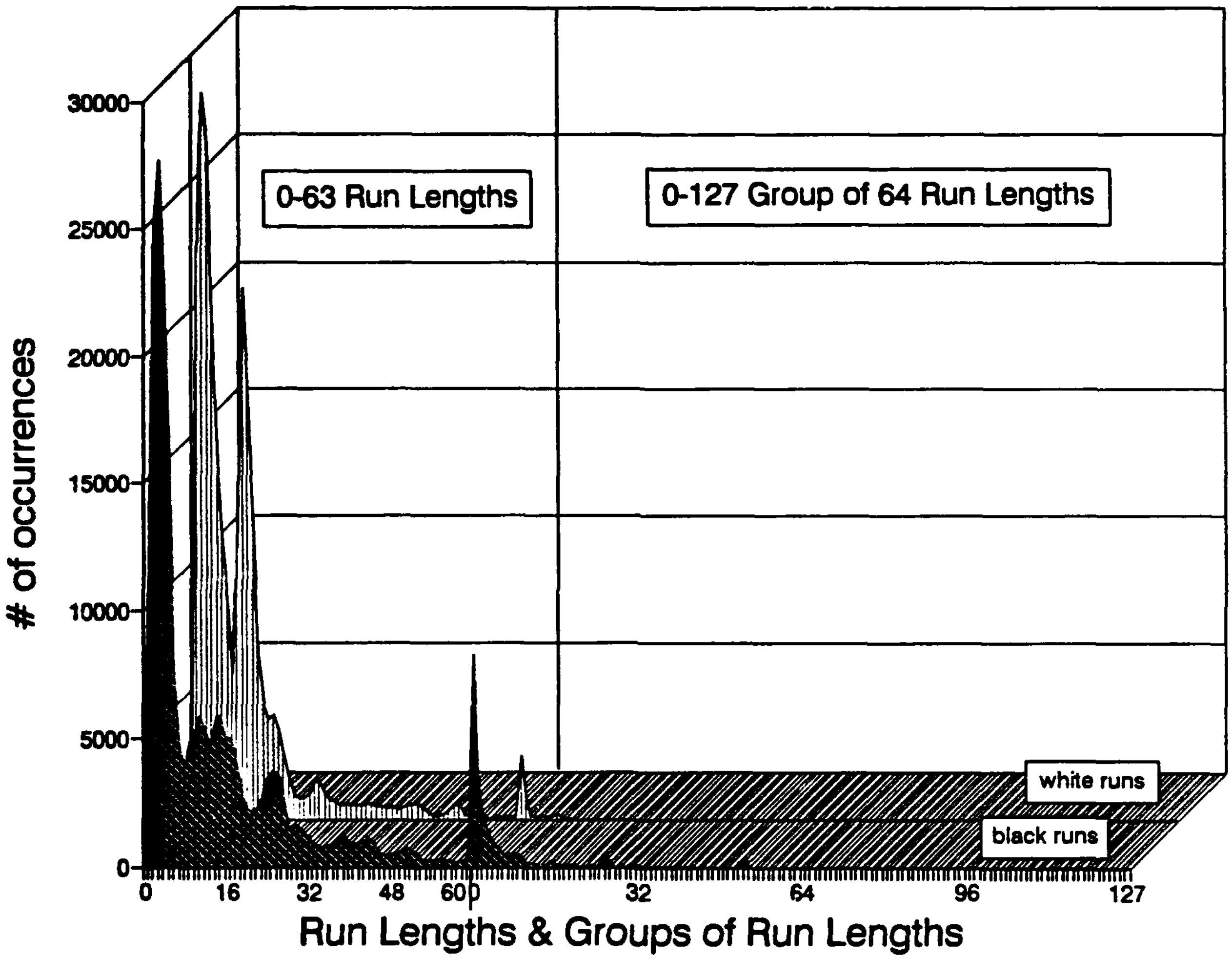


Figure A-33. Magazine Text, Half-Tone Histogram

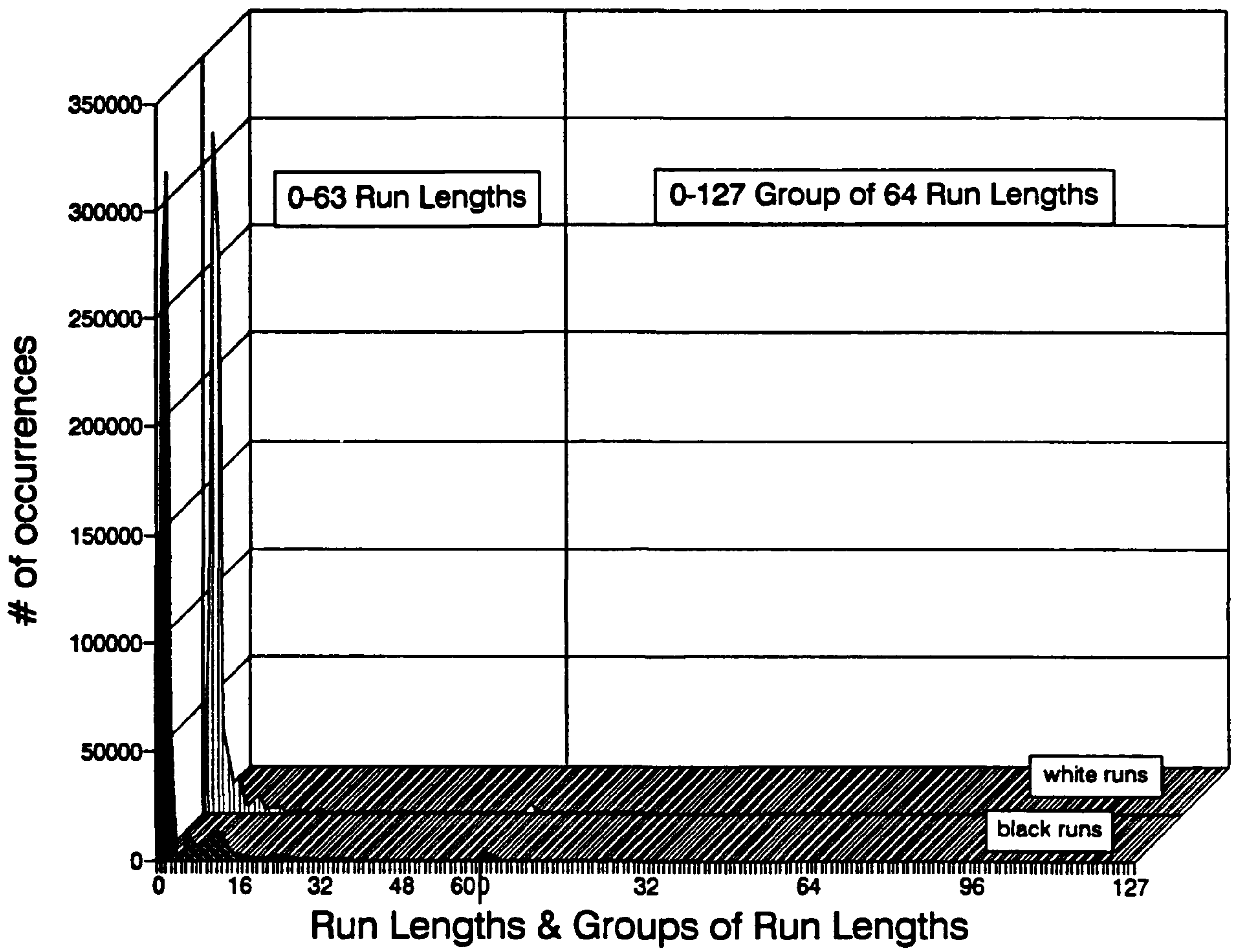


Figure A-34. Magazine Page Composite Histogram

MAGNETIC MEDIA DATA FORMAT

9-Track Magnetic Tape

The seventeen images are recorded sequentially on 1/2" 9-track 1600 bpi magnetic tape. The images are written to magnetic tape in ANSI X3.27 format. Figure A-35 shows an example of the ANSI standard tape format. The Volume Header Label (VOL1) identifies the tape and is followed by Header Labels (HDR1 & HDR2), image data, and Trailer Labels (EOF1 & EOF2) groups for each image data file recorded on the tape.

The Volume Tape Label contains volume identification, accessibility and owner identification and is the first record on the tape. The Volume Label is followed by image files which are delimited by header and trailer labels and end of file marks (TM). The first header label contains the file identifier (file name), any file set information for the image, generation data, block length and record length information. The trailer labels mirror the header labels, but also contain the tape block count for the image file. After the last image file on the tape the two end of file trailer labels (EOF1 & EOF2) are replaced with end of volume labels (EOV1 & EOV2) and two file marks (TM) denoting end of tape. The volume labels, header labels and trailer labels are fully defined in ANSI Standard X3.27.

The image files were created by scanning the image from left to right and top to bottom. The upper left pel of each image is represented by the most significant bit (MSB) of the first byte of the image file. One (1) represents black, and zero (0) represents white. The images are written to tape in blocks. The tape block size is a compromise: large blocks use the tape more efficiently but require larger buffers. Also, some computers can not handle large tape blocks. Table A-2 contains the order of the images and all the necessary information to extract and use the images from the tape.

Floppy Diskettes

Seventeen images are recorded on the floppy diskette set. The floppy diskettes are formatted for a 1.2 Megabyte high density diskette drive for use on an IBM or compatible PC under the MS-DOS or PC-DOS operating systems. Images are stored one image per diskette. The larger images that do not fit on one diskette are stored on multiple diskettes in DOS Backup format. The format of the files on diskettes is similar to that of magnetic tape. That is, the upper left pel of each image is represented by the MSB of the first byte of the image file. One (1) represents black, and zero (0) represents white. Again, since the image is stored on the diskette as a byte stream, the parameters in Table A-2 must be used to retrieve the image.

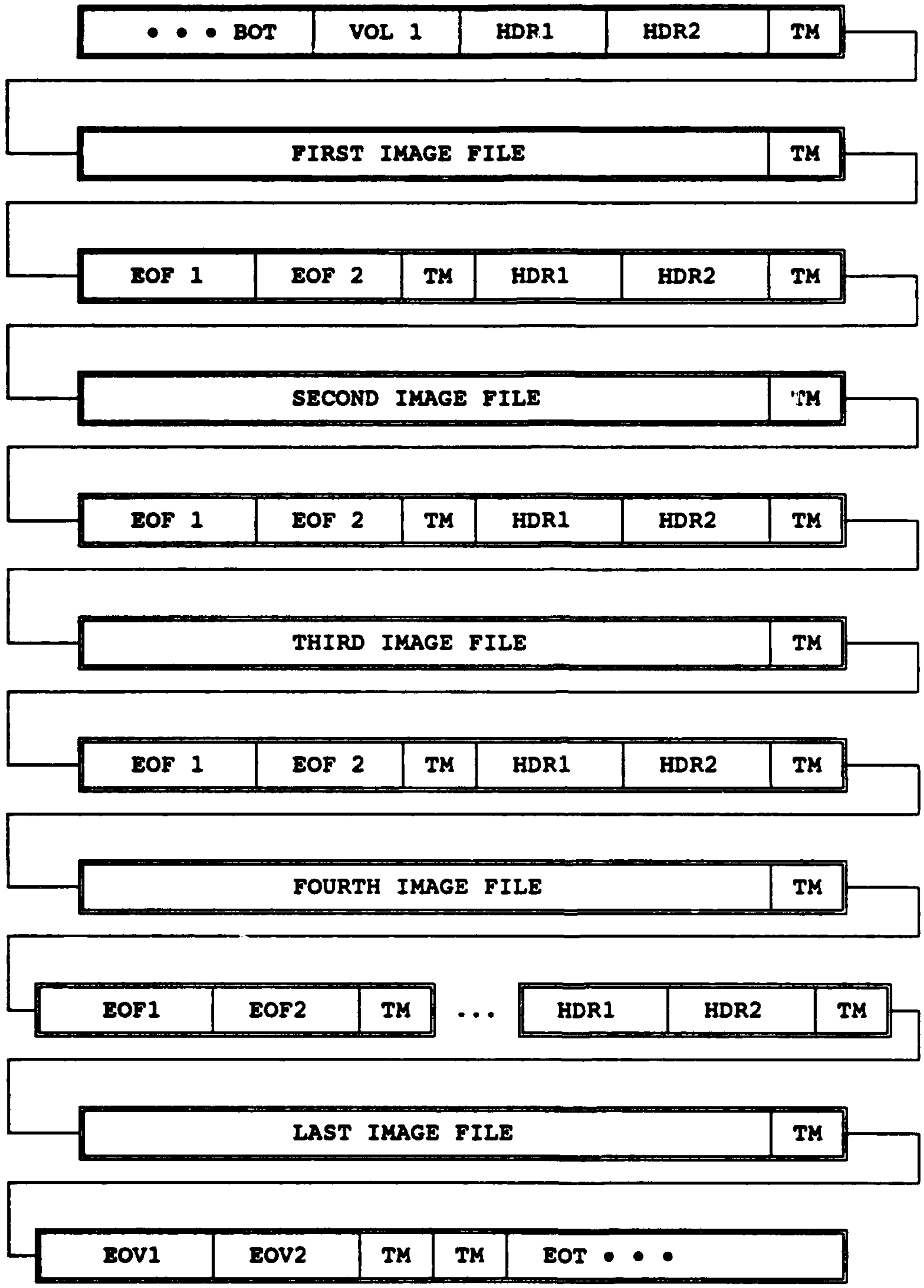


Figure A-35. X3.27 Magnetic Tape Format

TABLE A-2. MAGNETIC TAPE FORMAT DATA

TAPE IR GAP 0.6 inches
TAPE DENSITY 1600 BPI

NO.	IMAGE NAME	WDTH IN.	HGHT IN.	PELS/ LINE	SCAN LINES	BYTES/ LINE	PEL DENSITY	LINES PER BLOCK	BYTES PER BLOCK	TOTAL BYTES	TOTAL BLOCKS	INCHES PER BLOCK	FEET OF TAPE	NUMB. OF DISKS
1	Test chart	8.76	11.75	3504	4700	438	400	8	3504	2058600	588	2.79	137	2
2	Bus. letter	8.64	11.04	3456	4416	432	400	8	3456	1907712	553	2.76	127	2
3	Tech. paper	8.64	11.04	3456	4416	432	400	8	3456	1907712	553	2.76	127	2
4	Handwriting	7.68	10.88	3072	4352	384	400	8	3072	1671168	545	2.52	114	2
5	Japan. news	7.68	10.88	3072	4352	384	400	8	3072	1671168	545	2.52	114	2
6	Mixed	4.60	4.47	3680	3578	460	800	8	3680	1645880	448	2.9	108	2
7	Legibility	8.64	16.16	3456	6464	432	400	8	3456	2792448	809	2.76	186	3
8	Sailboat 1	7.68	5.12	3072	2048	384	400	8	3072	786432	257	2.52	54	1
9	Sailboat 2	7.68	5.12	3072	2048	384	400	8	3072	786432	257	2.52	54	1
10	Sailboat 3	7.68	5.12	3072	2048	384	400	8	3072	786432	257	2.52	54	1
11	Sailboat 4	7.68	5.12	3072	2048	384	400	8	3072	786432	257	2.52	54	1
12	Dith. comp.	9.52	7.44	1904	1488	238	200	8	1904	354144	187	1.79	28	1
13	Eng. Draw.	4.88	6.99	1952	2796	244	400	8	1952	682224	350	1.82	53	1
14	Scanned ED	9.12	11.60	3648	4640	456	400	8	3648	2115840	581	2.88	139	2
15	House Desig	7.68	7.60	3072	3040	384	400	8	3072	1167360	381	2.52	80	1
16	Mag. text HT	4.32	5.52	3456	4416	432	800	8	3456	1907712	553	2.76	127	2
17	Mag. comp.	7.68	10.88	3072	4352	384	400	8	3072	1671168	545	2.52	114	2
TOTALS										24698864	7665		1672	28

Number of 1.2M diskettes 28

Feet of tape = 1672