R E P O R T R E S U M E S

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PROGRAMMING EXERCISES FOR COMPUTER AIDED DRAFTING (TITLE SUPPLIED).

MIAMI-DADE JUNIOR COLL., FLA.

PUB DATE 67

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DESCRIPTORS- *SUMMER INSTITUTES, *COMPUTER ASSISTED INSTRUCTION, COMPUTER PROGRAMS, *DRAFTING, *ENGINEERING DRAWING, PROGRAMING, TEACHER EDUCATION, *INSTRUCTIONAL MATERIALS, CURRICULUM GUIDES,

REFERENCE MATERIAL AND PROGRAMING EXERCISES USED FOR THE COMPUTER AIDED DRAFTING SUMMER INSTITUTE AT MIAMI-DADE JUNIOR COLLEGE, JULY 10-28, 1967, ARE PRESENTED. THE EXERCISES, TO BE PROGRAMED FOR EXECUTION ON THE IBM SYSTEM 1620 WITH AN ON-LINE 1627 PLOTTER, PROVIDE A MEDIUM FOR COVERING AND ENFORCING THE SUBJECT MATERIAL. ALSO INCLUDED ARE (1) THE SUMMER INSTITUTE SCHEDULE, (2) OUTLINES OF SUBJECT MATERIAL FOR LABORATORY LECTURES, DRAFTING LANGUAGE, NUMERIC CONTROL, AND COORDINATE GEOMETRY LANGUAGE, AND (3) A LIST OF 36 PARTICIPANTS. THE FINAL REPORT OF THE INSTITUTE IS VT 004 482. (PS)

1967 SUMMER INSTITUTE

MIAMI-DADE JUNIOR COLLEGE

PREFACE

This notebook contains the reference material and programming exercises used for the Computer Aided Drafting Summer Institute at Miami-Dade Junior College, July 10-28, 1967.

The exercises are to be programmed for execution on the IBM System 1620 with an on-line 1627 plotter. The exercises provide a medium for covering and enforcing the subject material.

Each participant in the Summer Institute will receive the programmed solutions for the 1620 and the output from the 1627 for the exercises in this notebook. The programs are not necessarily the most efficient and practical solutions to the exercises. These programs attempt to include only that portion of the subject material familiar to the participant and in sequence with the class lecture.

Bruce L. DeSautel

PARTICIPANTS

STATE	SCHOOL	CITY
ALABAMA		
Skinner	W. L. Yancey State Junior College	Bay Minette
CALIFORNIA		
Auerbach	Sacramento City College	Sacramento
Gerevas	Napa Junior College	Vallejo
Gonzalez	Glendale College	Glendale
James	Fullerton Junior College	Fullerton
McVicar	Laney College	Oakland
Peck	American River College	Sacramento
CONNECTICUT		
Bradshaw	Hartford State Technical Institute	Hartford
FLORIDA		
Feldman	Hialeah High School	Miami
Green	Monroe High School	Cocoa
Myers	Satellite High School	Satellite Beach
Sitz	New River High School	Ft. Lauderdale
GEORGIA		
Stewart	Upson County Area Vocational	Thomaston
ILLINOIS		
Marks	Highland Junior College	Freeport
IOWA		
Druart	Des Moines Technical High School	Des Moines
MAINE		
Libby	Portland High School	Portland
Vassar	Central Maine Vocational Technical Institute	Auburn
MASSACHUSETTS		
Levesque	Taunton High School	Taunton
MINNESOTA		
Steen	Duluth Area Institute of Technology	Duluth
NEW YORK		
Grossman	Alex Hamilton Voc & Tech High School	Queens
Mueller	New York City Community College	Brooklyn
OHIO		
Isbell	Lorraine County Community College	Elyria
OKLAHOMA		
Rutledge	Area Vocational-Technical Center	Duncan

PARTICIPANTS
(cont.)

STATE	SCHOOL	CITY
PENNSYLVANIA		
Graves	The Williamsport Area Community College	Williamsport
McQuay	The Williamsport Area Community College	Williamsport
RHODE ISLAND		
Anderson	Pilgrim High School	Warwick
Amend	Warwick Veterans High School	Warwick
Ross	Rhode Island Junior College	Providence
Stafford	Rhode Island Junior College	Providence
Zannini	Roger Williams Junior College	Providence
TEXAS		
Bennett	Kilgore College	Kilgore
Potter	Henderson County Junior College	Athens
UTAH		
Schnirel	Utah Technical College	Salt Lake City
VERMONT		
Given	Rutland Senior High School	Rutland
WASHINGTON		
Putas	Lower Columbia College	Longview
Steele	Spokane Community College	Spokane

1 9 6 7 S U M M E R I N S T I T U T E
S C H E D U L E

F I R S T W E E K

	TOPIC	LECTURER	ROOM
MONDAY JULY 10, 1967			
8.00- 9.00 A.M.	REGISTRATION		3101
9.00-10.30 A.M.	PRESIDING	DR. G. MEHALLIS DIRECTOR, DIV. OF TECH. VOC. AND SEMI- PROFESSIONAL STUDIES	3101
	WELCOME	MR. A GARNER VICE PRESIDENT	
	FACILITIES	MR. T. KOSCHLER VICE PRESIDENT	
	FLORIDA GREETING	MR. R. CALDWELL STATE DEPT. OF ED.	
	INSTITUTE FORMAT	MR. A. MORPHONIOS INSTITUTE COORDINATOR	
10.30-10.45 A.M.	COFFEE BREAK		
10.45-12.00 A.M.	TOUR OF MIAMI-DADE JUNIOR COLLEGE	MR. A. MORPHONIOS MR. W. TRAVERS	
12.00- 1.00 P.M.	LUNCH		
1.00- 4.30 P.M.	INTRO. DATA PROCESS.	MR. B. DESAUTEL	1155

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TUESDAY JULY 11, 1967			
8.00-10.00 A.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 2.00 P.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
2.00- 4.00 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164
4.00- 4.30 P.M.	OPEN LABORATORY	ASSISTANTS	1164

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	TOPIC	LECTURER	ROOM
WEDNESDAY JULY 12, 1967			
8.00-10.00 A.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 2.00 P.M.	AIDS PROJECT .	MR. C. SMITH IBM SYSTEMS ENGINFER MIAMI, FLORIDA	3101
2.00- 4.00 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164
4.00- 4.30 P.M.	OPEN LABORATORY	ASSISTANTS	1164
THURSDAY JULY 13, 1967			
8.00-10.00 A.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 4.30 P.M.	FIELD TRIP MILGO ELECTRONIC CORP. MIAMI, FLORIDA	MR. M. MC HUGH PERSONNEL MANAGER MR. H. THORSEN MARKETING MANAGER	
	AUTOMATED BUILDING COMP. MIAMI, FLORIDA	MR. O. KARSH COMPUTER SYSTEMS ENGR.	
FRIDAY JULY 14, 1967			
8.00- 9.00 A.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
9.00-10.30 A.M.	ENGR. DATA MANAGEMENT	MR. A. LEGO THE MARTIN COMPANY ORLANDO, FLORIDA	2151
10.30-12.00 P.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
12.00- 1.00 P.M.	LUNCH		

	TOPIC	LECTURER	ROOM
1.00- 4.00 P.M.	GRAPHIC SCIENCE	MR. N. MICHELSON SPECIAL REP. IBM CORPORATION POUGHKEEPSIE, N.Y.	2151
4.00- 4.30 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164

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S E C O N D W E E K

MONDAY JULY 17, 1967

8.00-10.00 A.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 2.00 P.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
2.00- 4.00 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164
4.00- 4.30 P.M.	OPEN LABORATORY	ASSISTANTS	1164

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TUESDAY JULY 18, 1967

8.00-10.00 A.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 2.00 P.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
2.00- 4.00 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164
4.00- 4.30 P.M.	OPEN LABORATORY	ASSISTANTS	1164

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WEDNESDAY JULY 19, 1967

8.00-10.00 A.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		

	TOPIC	LECTURER	ROOM
1.00- 2.30 P.M.	STROMBERG-CARLSON CORPORATION	MR. D. LANDRY DISTRICT MANAGER MR. J. PIRKLF SYSTEM REP.	3101
2.30- 4.30 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164

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THURSDAY JULY 20, 1967

8.00-10.00 A.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 2.00 P.M.	DRAFTING LANGUAGE	MR. B. DESAUTEL	1155
2.00- 4.00 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164
4.00- 4.30 P.M.	OPEN LABORATORY	ASSISTANTS	1164

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FRIDAY JULY 21, 1967

8.00-10.00 A.M.	REVIEW OF DRAFTING LANG.	MR. B. DESAUTEL	1155
10.00- 2.00 P.M.	OPEN LABORATORY	ASSISTANTS	1164
12.00- 1.00 P.M.	LUNCH		
1.00- 4.30 P.M.	FIELD TRIP INST. OF MARINE SCIENCE UNIVERSITY OF MIAMI	DR. F. SMITH DIRECTOR MR. D. SHAFFFR MANAGER COMP. CENTER	

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T H I R D W E E K

MONDAY JULY 24, 1967

8.00-11.00 A.M.	LECTURE NUMERIC CONTROL	MR. J. CORBIN	1155
11.00-12.00 A.M.	COMPUDYNE CORPORATION	MR. J. SMITH DIST. SALES ENGR. HATBORO, PA.	3101
12.00- 1.00 P.M.	LUNCH		

	TOPIC	LECTURER	ROOM
1.00- 4.30 P.M.	LABORATORY		3117

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TUESDAY JULY 25, 1967

8.00-12.00 A.M.	LECTURE NUMERIC CONTROL	MR. A. POH	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 4.30 A.M.	LECTURE COGO	MR. B. DESAUTEL	1155

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WEDNESDAY JULY 26, 1967

8.00-10.00 A.M.	LECTURE COGO	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 2.00 P.M.	LECTURE COGO	MR. B. DESAUTEL	1155
2.00- 4.00 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164
4.00- 4.30 P.M.	OPEN LABORATORY	ASSISTANTS	1164

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THURSDAY JULY 27, 1967

8.00-10.00 A.M.	LECTURE COGO	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	LABORATORY, GROUP A	ASSISTANTS	1164
	LABORATORY, GROUP B	ASSISTANTS	1155
12.00- 1.00 P.M.	LUNCH		
1.00- 2.00 P.M.	LECTURE COGO	MR. B. DESAUTEL	1155
2.00- 4.00 P.M.	LABORATORY, GROUP A	ASSISTANTS	1155
	LABORATORY, GROUP B	ASSISTANTS	1164
4.00- 4.30 P.M.	OPEN LABORATORY	ASSISTANTS	1164

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FRIDAY JULY 28, 1967

8.00-10.00 A.M.	LECTURE COGO	MR. B. DESAUTEL	1155
10.00-12.00 A.M.	OPEN LABORATORY	ASSISTANTS	1164
12.00- 1.30 P.M.	PRESIDENTS LUNCHEON	DR. P. MASIKO PRESIDENT	1324

	TOPIC	LECTURER	ROOM
1.30- 4.30 P.M.	SUMMER INSTITUTE REVIEW	MR. B. DESAUTEL	1155

NOTES,

1. ASSISTANTS MR. L. ROSE
   MR. R. MACFARLANE
   MR. W. THOMPSON

2. ROOM 1164-IBM SYSTEM 1620

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1967 SUMMER INSTITUTE
LABORATORY ASSIGNMENTS

NAME	GROUP	TEAM
AMEND	A	5
ANDERSON	B	6
AUERBACH	B	1
BENNETT	A	5
BRADSHAW	B	2
DRUART	B	3
FELDMAN	A	2
GEREVAS	B	1
GIVEN	A	6
GONZALEZ	A	1
GRAVES	A	4
GREEN	A	2
GROSSMAN	A	4
ISBELL	A	4
JAMES	A	1
LEVESQUE	A	3
LIBBY	A	3
MARKS	A	3
MC QUAY	B	4
MC VICAR	B	1
MUELLER	B	4
MYERS	B	2
PAPPAS	B	6
PECK	A	2
POTTER	B	5
PUTAS	A	6
ROSS	B	5
RUTLEDGE	B	4
SCHNIREL	A	6
SKINNER	A	6
STAFFORD	A	5
STEELE	B	6
STEEN	B	3
STEWART	B	2
VASSER	B	3
ZANNINI	B	5

1 9 6 7 S U M M E R I N S T I T U T E
LABORATORY ASSIGNMENTS

NAME	GROUP	TEAM
AMEND	A	5
ANDERSON	B	6
AUERBACH	B	1
BENNETT	A	5
BRADSHAW	B	2
DRUART	B	3
FELDMAN	A	2
GEREVAS	B	1
GIVEN	A	6
GONZALEZ	A	1
GRAVES	A	4
GREEN	A	2
GROSSMAN	A	4
ISBELL	A	4
JAMES	A	1
LEVESQUE	A	3
LIBBY	A	3
MARKS	A	3
MC QUAY	B	4
MC VICAR	B	1
MUELLER	B	4
MYERS	B	2
PAPPAS	B	6
PECK	A	2
POTTER	B	5
PUTAS	A	6
ROSS	B	5
RUTLEDGE	B	4
SCHNIREL	A	6
SKINNER	A	6
STAFFORD	A	5
STEELE	B	6
STEEN	B	3
STEWART	B	2
VASSER	B	3
ZANNINI	B	5

1967 SUMMER INSTITUTE
SUBJECT MATERIAL FOR LABORATORY LECTURES

I LABORATORY LECTURE 1

A. HARDWARE CONTAINED IN THE SYSTEM 1620 LABORATORY
   1. 1620 CENTRAL PROCESSING UNIT AND CONSOLE
   2. 1623 CORE STORAGE
   3. 1627 PLOTTER
   4. 1311 DISC STORAGE
   5. 1622 CARD READ PUNCH
   6. 1443 PRINTER
   7. 026 CARD PUNCH

B. PRINCIPLES OF STORED PROGRAM OPERATION
   1. STORAGE AND RETRIEVAL OF DATA
   2. PROGRAMS-A SPECIAL KIND OF DATA

C. LANGUAGES IN WHICH PROGRAMS ARE WRITTEN
   1. MACHINE OR OBJECT LANGUAGE
   2. ASSEMBLY LANGUAGE
   3. FORTRAN
   4. DRAFTING LANGUAGE
   5. COGO

D. DEMONSTRATION
   1. A MACHINE LANGUAGE DRAWING USING THE PLOTTER
   2. A FORTRAN-II PROGRAM
   3. A DRAFTING LANGUAGE PROGRAM

II LABORATORY LECTURE 2

A. OPERATION OF THE 026 PRINTING CARD PUNCH
   1. ALPHABETIC MODE
   2. NUMERIC MODE
   3. CARD CONTROL

B. OPERATION OF THE 1620 CONSOLE
   1. MANUAL AND AUTOMATIC MODES
   2. START AND STOP KEYS
   3. SIGNAL LIGHTS
   4. INPUT AND OUTPUT FROM THE CONSOLE TYPEWRITER

C. OPERATION OF THE 1622 READER
   1. INSERTION OF PUNCHED CARDS
   2. LOADING A PROGRAM
   3. USE OF THE START BUTTON
   4. NONPROCESS RUNOUT
   5. READER LIGHTS

D. OPERATION OF THE 1443 PRINTER
   1. START AND STOP KEYS
   2. CARRIAGE CONTROL

E. OPERATION OF THE 1627 PLOTTER
   1. RAISING AND LOWERING THE DRAWING PEN
   2. MOVEMENT OF THE PEN AND DRUM DURING DRAWING
   3. GROSS AND FINE ADJUSTMENT OF THE PEN POSITION
   4. PLACING AND REMOVAL OF PAPER FOR DRAWINGS

F. FUNCTION OF THE 1311 DISC UNIT
   1. RANDOM ACCESS STORAGE
   2. INTERMEDIATE STORAGE

1 9 6 7 S U M M E R I N S T I T U T E
SUBJECT MATERIAL FOR DRAFTING LANGUAGE

I INTRODUCTION

II ORIENTATION

- A. CLASS OUTLINE
- B. STUDENT NOTEBOOKS
- C. LABORATORIES

III INTRODUCTION TO DATA PROCESSING

- A. HISTORY
- B. EVOLUTION OF COMPUTERS
- C. 1620 MACHINE LANGUAGE
  - 1. INSTRUCTIONS
  - 2. ADDRESSES
  - 3. LOGIC
  - 4. ARITHMETIC
- D. PRODUCING A PROGRAM

IV PROCEDURE FOR PRODUCING A PROGRAM

V DRAFTING LANGUAGE PROCESSORS

- A. COMPILER
- B. PART PROCESSOR
- C. DRAWING PROCESSOR

VI PARTS OF A DRAFTING LANGUAGE PROGRAM

- A. GEOMETRIC GROUPS
  - 1. VIEW
  - 2. SHAPE
  - 3. END
- B. OBJECT LINES
- C. DRAWING STATEMENTS
  - 1. SCALE
  - 2. ORIGIN
  - 3. DRAW

VII LANGUAGE FORMAT AND CODING

- A. LANGUAGE WORDS
  - 1. MAJOR
  - 2. MODAL
- B. USER-CREATED WORDS
  - 1. NUMBERS
  - 2. LABELS
- C. PUNCTUATION
  - 1. COMMA
  - 2. EQUAL
  - 3. SLASH
  - 4. PLUS-MINUS

5. DOLLAR SIGN
6. BLANK

D. LINE CLASSIFICATION
1. MEDIUM
2. THICK

VIII POINTS

A. INTRODUCTION
1. RECTANGULAR COORDINATES
2. PPP

IX LINES

A. INTRODUCTION
1. POINT TO POINT
2. RELATIVE DISTANCE
3. DISTANCE FROM PPP

X CIRCLES

A. INTRODUCTION
1. CENTER POINT AND RADIUS

XI LINES

A. FROM A POINT AT AN ANGLE TO THE X-AXIS

XII LETTERING

A. INTRODUCTION
1. ALPHAP
2. TITLE
3. LITERALS

XIII ARC

A. INTRODUCTION
1. BETWEEN TWO POINTS

XIV MACRO

A. INTRODUCTION
1. MACRO/
2. TERMAC/
3. DEFINE PARAMETERS OF A MACRO
4. CALL

XV DIMENSIONING

A. INTRODUCTION
1. DIMST
2. DIMP
3. MASK

4. DIM

XVI LINES

A. DISTANCE FROM PPP
B. INTERSECTION OF A LINE AND A CIRCLE

XVII CIRCLES

A. CENTER AND RADIUS OF AN ARC
B. DEFINED BY THREE POINTS

XVIII ARC

A. FILLETING

XIX GEOMETRIC FUNCTIONS

A. DXOF
B. DYOF
C. DIST
D. ATAND
E. PARAM

XX HATCHING

XXI LOOPING

XXII ARITHMETIC FUCTIONS

A. INTRODUCTION
1. SIND
2. COSD
3. ATAND
4. SQRT
5. ABS
6. ALOG

1 9 6 7 S U M M E R I N S T I T U T E
SUBJECT MATERIAL-NUMERIC CONTROL

I HISTORY AND DEVELOPMENT

- A. CONCEPTION
- B. DEVELOPMENT
- C. SIMPLIFICATION

II PRESENT APPLICATIONS OF NUMERIC CONTROL

- A. PROCESS CONTROLS
- B. APPLICATION TO MACHINE TOOLS

III MANUAL PROGRAMMING

- A. CODE AND LANGUAGE
- B. POINT TO POINT PROGRAMMING
- C. CONTINUOUS PATH PROGRAMMING

IV LABORATORY WORK

- A. PROBLEM USING POINT TO POINT PROGRAMMING-PRATT AND WHITNEY TAPEOMATIC DRILL
- B. DEMONSTRATION OF CONTINUOUS PATH MILLING OPERATIONS-COMPUDYNE 3 AXIS CONTINUOUS PATH MILLING MACHINE

SUBJECT MATERIAL-THE COMPUTERS ROLE IN NUMERICAL CONTROL

V INTRODUCTION

- A. THE PART PROGRAMMER
- B. PROGRAMMING FOR POINT TO POINT POSITIONING
- C. PROGRAMMING FOR CONTOUR MACHINING
- D. PROGRAM CHECKING-TAPE VERIFICATION
- E. PROGRAMMING LANGUAGE
- F. DESIGN AUTOMATION

VI INFORMATION PROCESSING AND STORAGE

VII THE AUTOSPOT II SYSTEM

- A. GENERAL APPLICATION DESCRIPTION
  - 1. SAMPLE PROGRAM
  - 2. THE AUTOSPOT II LANGUAGE
  - 3. VOCABULARY AND STATEMENTS
  - 4. PROCESSOR ORGANIZATION
- B. POINT TO POINT AUTOSPOT II PROGRAMMING
  - 1. DEFINITION STATEMENTS
  - 2. MACHING STATEMENTS
  - 3. SPECIAL STATEMENTS
  - 4. PUNCTUATION
  - 5. OPERATIONS

6. PATTERNS
7. ROUTINES

C. NUMERIC CONTROL LABORATORY
1. PROCESSOR OPERATION
2. TOOL OPERATION

1967 SUMMER INSTITUTE
SUBJECT MATERIAL FOR THE COORDINATE GEOMETRY LANGUAGE

I PURPOSE

II COORDINATE TABLE

III ACCURACY

IV CODING INSTRUCTIONS

- A. COMMAND NAME
- B. DATA
- C. DITTO FEATURE
- D. COMMENTS

V LANGUAGE CONVENTIONS

- A. ANGLES AND AZIMUTHS
- B. BEARINGS
- C. MEASUREMENT OF ANGLES

VI NON-COMPUTATIONAL INSTRUCTIONS

- A. CLEAR
- B. STORE
- C. DUMP
- D. PAUSE

VII INSTRUCTIONS

- A. LOCATE
- B. INVERSE
- C. ANGLE
- D. DISTANCE
- E. PARALLEL/LINE
- F. INTERSECT
- G. AREA
  - 1. POLYGON
  - 2. SEGMENTS

VIII TRIANGULATION

IX TRAVERSE ADJUSTMENT

X ARC

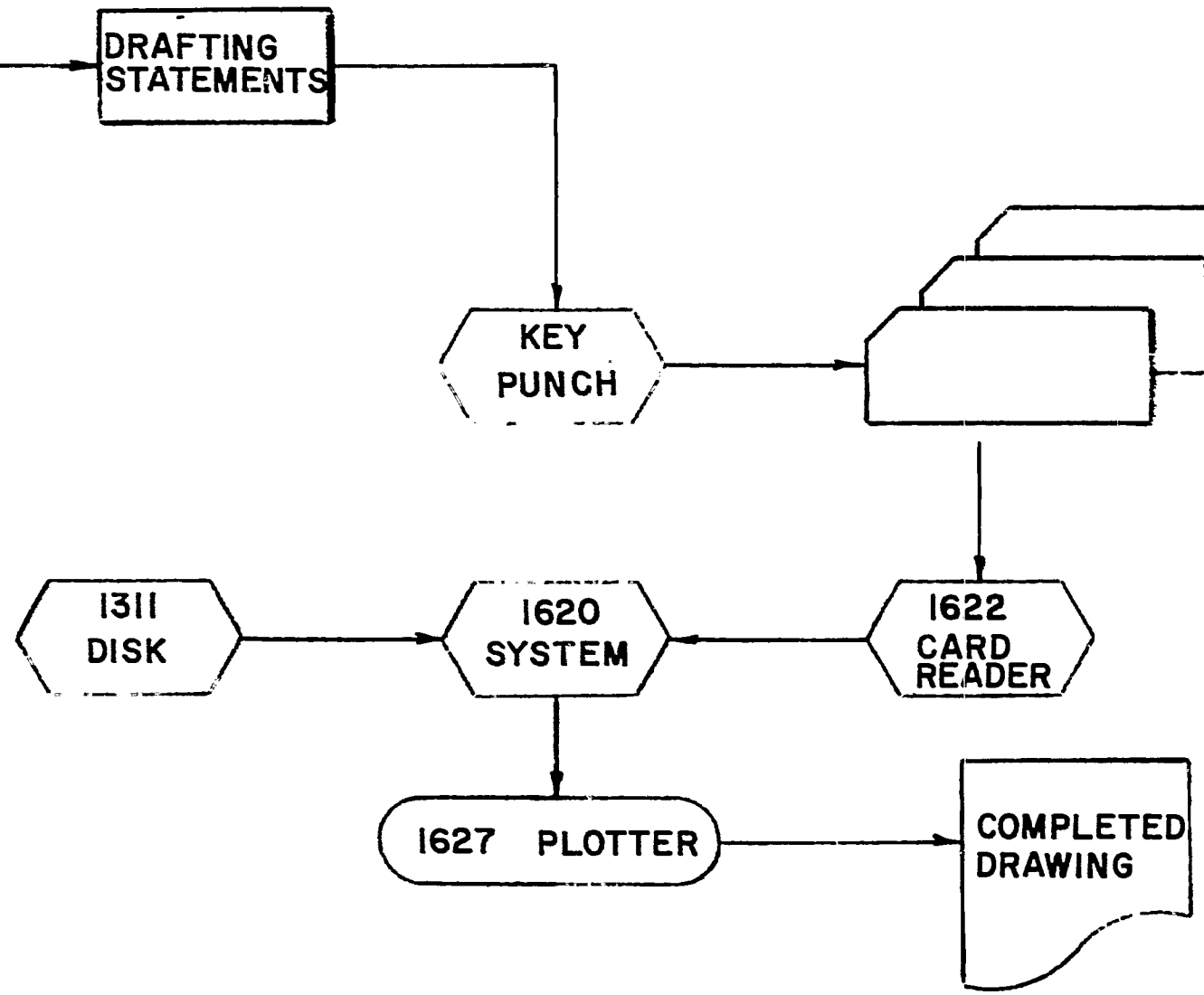
XI TANGENT

XII CURVES

- A. ALIGNMENT
- B. OFFSETS

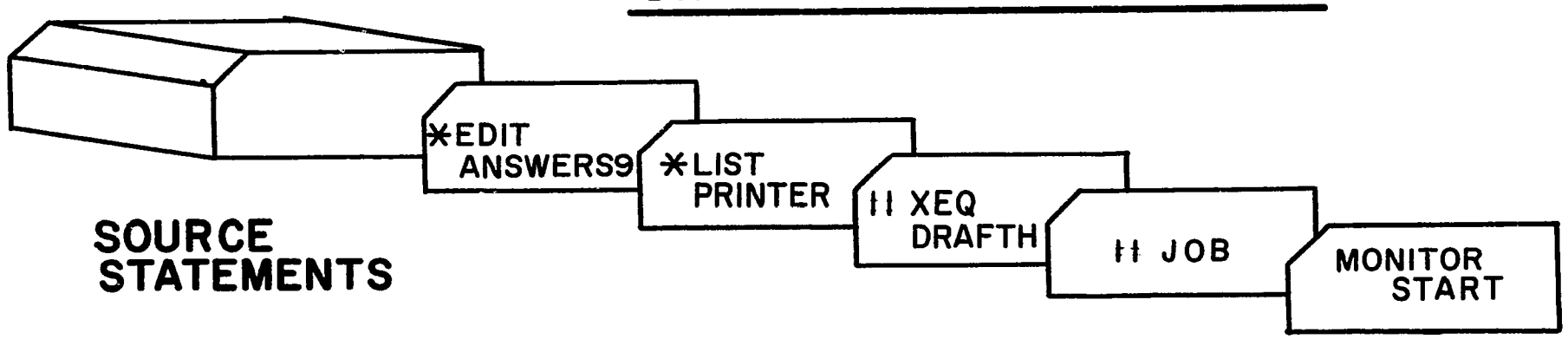
XIII DIVIDING LINE

XIV GIRDER LENGTHS



PROCEDURE FOR PRODUCING A DRAWING

DRAFTING CONTROL CARDS



MONITOR CONTROL CARDS

STACKED JOB INPUT

DRAFTING LANGUAGE

1967 SUMMER INSTITUTE
MIAMI-DADE JUNIOR COLLEGE
DRAFTING LANGUAGE

Exercise 1

Draw Sketch 1 using the following specifications:

1. Paper Size 8½ x 11,
2. Thick border ½ inch from the paper edge except on the left which shall have a 1½ inch border,
3. A 3/4 inch title block on the bottom with the note 'INTRODUCTION TO LINES',
4. Place the note, 'PLATE 1' in the lower right corner above the title block,
5. When writing the program use the mirror geometric function,
6. Place the Part Origin at 4.75 and 6.00.

Exercise 2

Draw Sketch 2 using the paper size and border as given in Exercise 1 and include the following specifications:

1. In the title block write the note, 'INTRODUCTION TO CIRCLES',
2. Write the note, 'PLATE 2'

Exercise 3

Exercise 3 is a demonstration of writing notes using the Drafting Language.

Exercise 4

Draw Sketch 4 using the paper size and border as given in Ex.rcise 1 and include the following specifications:

1. Scale = 2,
2. Title, 'PICTURE AND FRAME'.

Exercise 5

Draw Sketch 5 using the paper size and border as given in Exercise 1 and include the following specifications:

1. The paper and part origin are at the same point,
2. Draw the plate so that the part is along the X-axis,
3. Do not draw the slot,
4. Note that distance KA is unknown,
5. Title, 'SHEAR PLATE'.

Exercise 6

Draw Sketch 6 using the paper size and border as given in Exercise 1 and include the following specifications:

1. Scale = 3/4
2. Origin, 4.75, 6,
3. Draw the object lines of the base only,
4. Title, 'FIXTURE BASE'.

Exercise 7

Draw Sketch 7 as a Macro for a 8½ x 11 sheet of paper using the following specifications:

1. The title will always be on the bottom,
2. The X axis is either the short or long dimension of the paper,
3. The border is a thick line.

NOTE: ALL EXERCISES SHALL BE DRAWN USING THIS MACRO.

Exercise 8

Draw Sketch 8 using the Macro developed in Exercise 7 using the following specifications:

1. Scale = 2,
2. Origin, 2.5, 4, lower left corner of part;
3. Dimension all object lines and notice that one line has an unknown dimension.

Exercise 9

Use Plate 5 as a base and add the following specifications to draw Plate 9:

1. Draw the slot and center lines,
2. Dimension the arcs KJH, JHG, HGF and GFE.

Exercise 10

Use Plate 6 as a base and add the following specifications to draw Plate 10:

1. Draw the slot and center lines,
2. Draw the circles,
3. Dimension the slot width and height,
4. Dimension the base height and vertical dimension between large circles.

Exercise 11

Draw Sketch 11 using the following specifications:

1. Origin, 4.75, 6 at center of gasket,
2. Dimension one of the six holes, the 7/8" radius,
3. Dimension the angles between the three holes at the bottom.

Exercise 12

Draw Sketch 12 using the following specifications:

1. Use the EDIT ANSWERS9 control card to determine the unknown distance,
2. Use the COSD and SIND arithmetic functions for solving the unknown height,
3. Side view origin, 2.25, 2.25, lower left corner,
4. Front view origin 17., 2.25, lower left corner,
5. Draw the plate so that the part is along the X-axis,
6. Dimension the base of the side view,
7. Dimension the X-component of the slot and dove-tail slot of the front view.

Exercise 13

Draw Sketch 13 using the following specifications:

1. Top view origin, 2.312 + 11/8, 8., center of circle,
2. Front view origin, 4.687 + 11/8, 4.125, center of circle,
3. Dimension the X-component of the top arc and hidden lines,
4. Dimension the height in both views.

Exercise 14

Draw Sketch 14 using the following specifications:

1. Scale = .5,
2. Origin, 6.25, 5.5, center of large circle,
3. Dimension the object lines of the side view,
4. Dimension the distance between the circle centers in the front view.

Exercise 15

Draw Sketch 15 using the following specifications:

1. Scale = .5
2. Front view origin, 4.50, 3 11/16,
3. Dimension the following dimensions on the front view; 9/16" vertical, 1 3/8", 1 7/8", and 1 1/8",
4. NOTER Statement in top view Arcs in this slot are 3/8", and the distance between centers is 1.5".

Exercise 16

Draw Sketch 16 using the following specifications:

1. Top view origin, 3.00, 2.1875, low left corner,
2. Side view origin, 7 13/16, 3 3/4, center of circle,
3. Dimension 7/16" on side view,
4. NOTE Statement in top view, "9/32 Drill, CSK 82° x 1/2 DIA.", with the letters at an angle of -15°,
5. NOTER Statements in side view, "1/4 Drill, Bore 1/2 DIA. x 1 7/8 DP" and "5/8 R",
6. Note Statement for Finish Mark,
7. Draws part parallel to X-axis.

Exercise 17

Draw Sketch 17 using the following specifications:

1. Top view origin, 3.75, 5.875, center of cap, all views,
2. Draw cutting plane in top view and section view with hatching,
3. Dimension 2" and 11/16" in section view.

Exercise 18

Draw Sketch 18 using the following specifications:

1. Top view origin, 4.25, 3.75, center of shaft guide,
2. Draw cutting plans in top view and section view with hatching.

Exercise 19

Demonstration

Exercise 20

Draw Sketch 20 using the following specifications:

1. Write a macro to draw the coordinate axis with the following parameters;
   A. Length of X-axis,
   B. Length of Y-axis,
   C. Scale for the X-axis,
   D. Scale for the Y-axis,

2. Write a macro to draw a bar graph with the following parameters:
   A. Center of the bar on the X-axis,
   B. Bar width and height,
   C. Type of latching,
   D. Y value as a literal,
   E. Front of the literal,
   F. Number of letters in the literal.

Exercise 21

Draw Sketch 21 using the following specifications:

1. Origin, 8.70, 6.5, same origin as shown on the sketch,
2. Dimension the arc centers of the depressions and the length of the part.

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NUMERICAL CONTROL

Exercise 1

Write a program in machine language for the Pratt-Whitney Tape-o-matic Drilling and Boring Machine to drill the holes as shown in the Autospot Sketch.

Exercise 2

Create the paper tape for the program written in Exercise 1 and execute the program on the Pratt-Whitney Tape-o-matic Drilling and Boring Machine.

Exercise 3

Write a program in Autospot II Language and create the paper tape to drill the holes shown in the Autospot Sketch.

CODED BY B.L.P. DATE July 1967 SHEET 1 OF 1

11/01/68

1620 DRAFTING SYSTEM

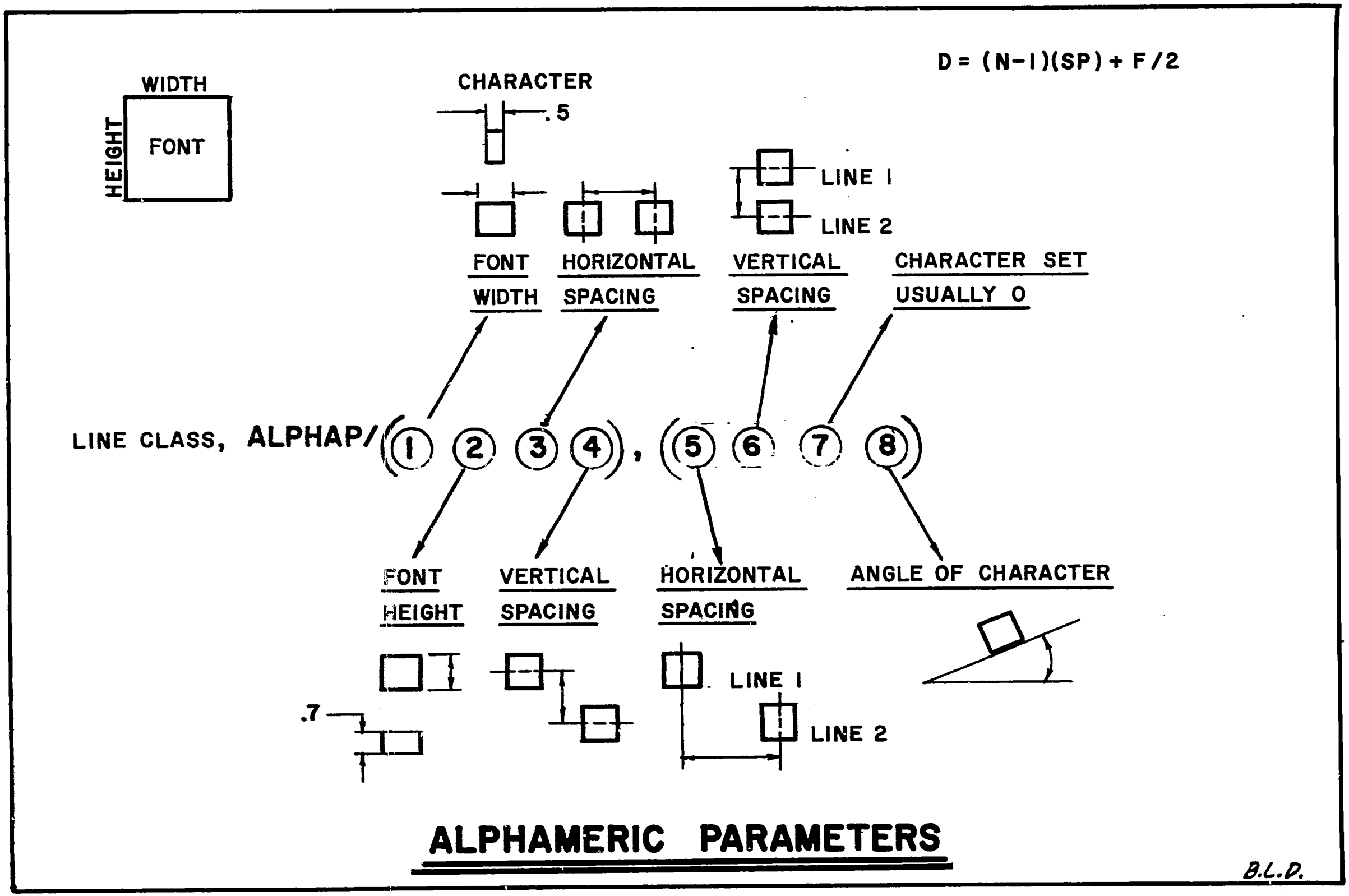
MIAMI-DADE JUNIOR COLLEGE

77 80
IDENTIFICATION

$/$ FOR COMMENT

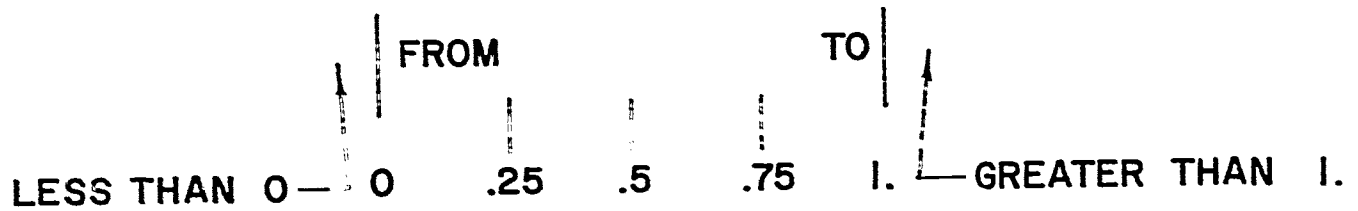
STA. NO.	LABEL	=	LINE CLASS	,	MAJOR WORD	PHRASE	SEQ.
	ALABEL	=				AN EXAMPLE OF A LABEL	
	A12345	=				FIRST LETTER MUST BE A LETTER (A-Z)	
	A	=				LABELS ARE 1-6 CHARACTERS IN LENGTH	
			CTRLN	,		AN EXAMPLE OF A LINE CLASS	
					LINE	/AN EXAMPLE OF A MAJOR WORD	
					POINT	/-123456.78,1 AN EXAMPLE OF NUMBERS NUMBERS CAN BE UP TO 8 DIGITS THE DECIMAL POINT IS OPTIONAL NEGATIVE NUMBERS MUST BE SIGNED	
						@A LITERAL@ 1-48 CHARACTERS @ NOT PART OF LITERAL	
$$						USED TO PLACE COMMENTS AMONG THE PROGRAM STATEMENTS	
1)						AN EXAMPLE OF A NUMBERED STATEMENT	
						A R C / BLANKS ARE IGNORED BY THE PROCESSOR	

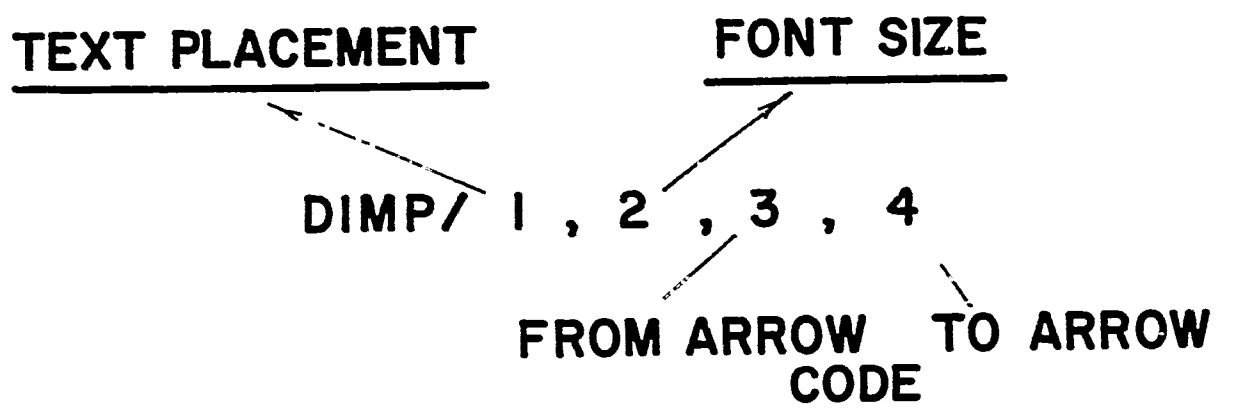
THIS FORM IS FOR PROGRAMMING CONVENIENCE - THE DRAFTING LANGUAGE MAY BE WRITTEN IN FREE FORMAT.

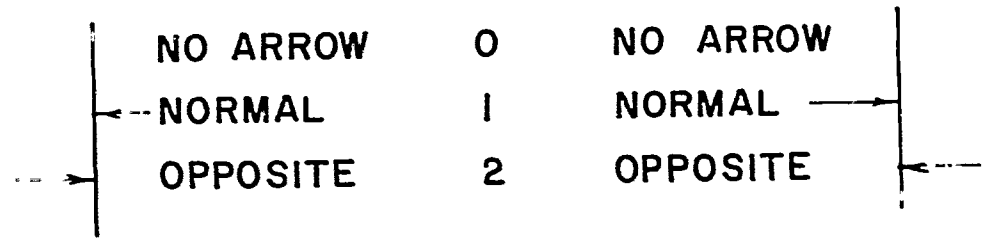


ALPHAMERIC PARAMETERS

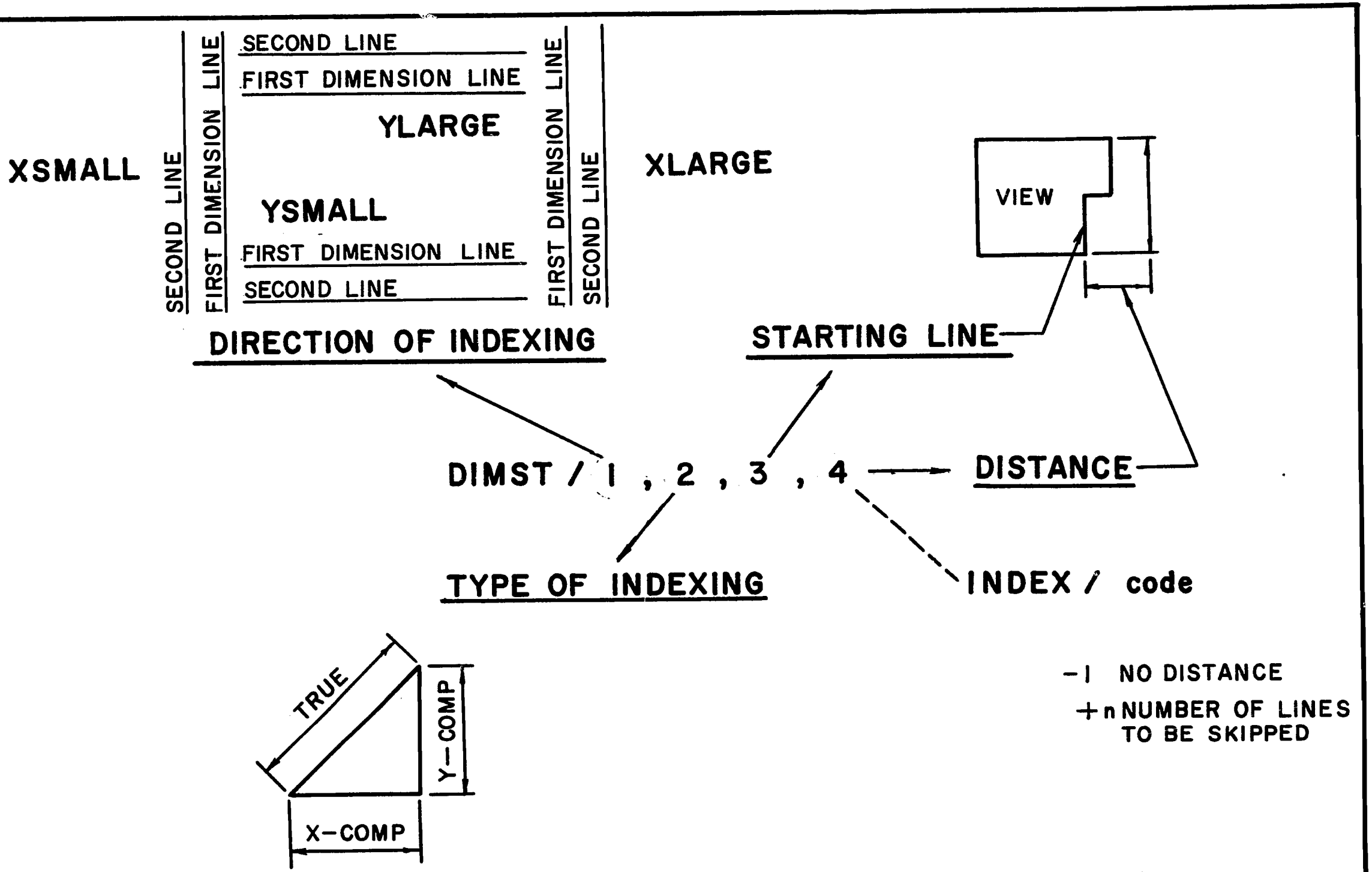
B.L.D.



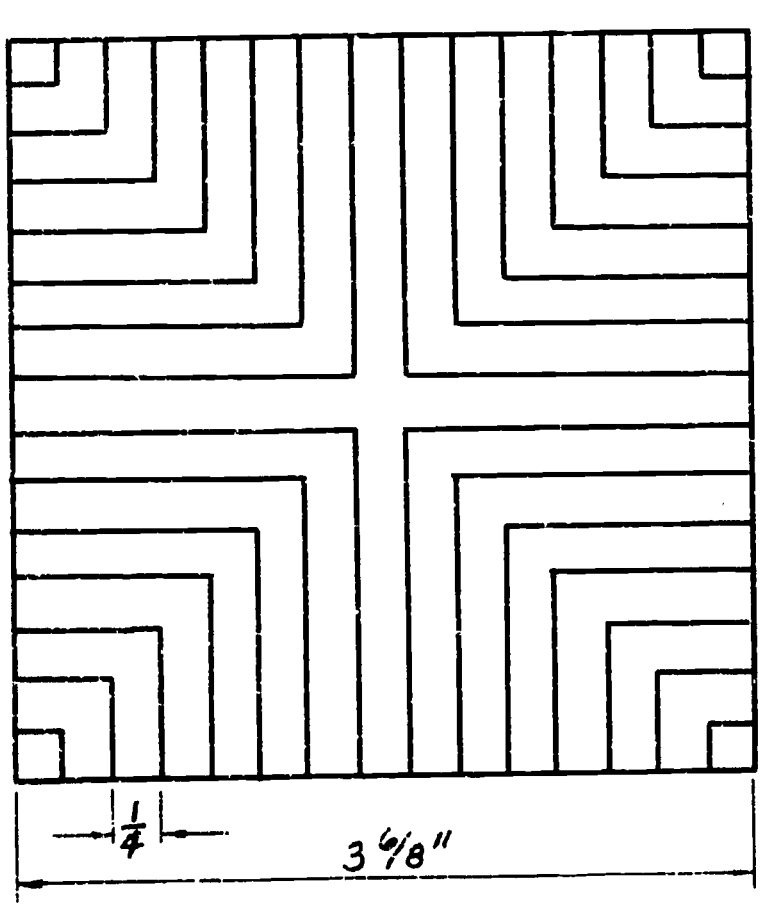




DIMP STATEMENT



DIMST AND INDEX STATEMENTS



SKETCH 1

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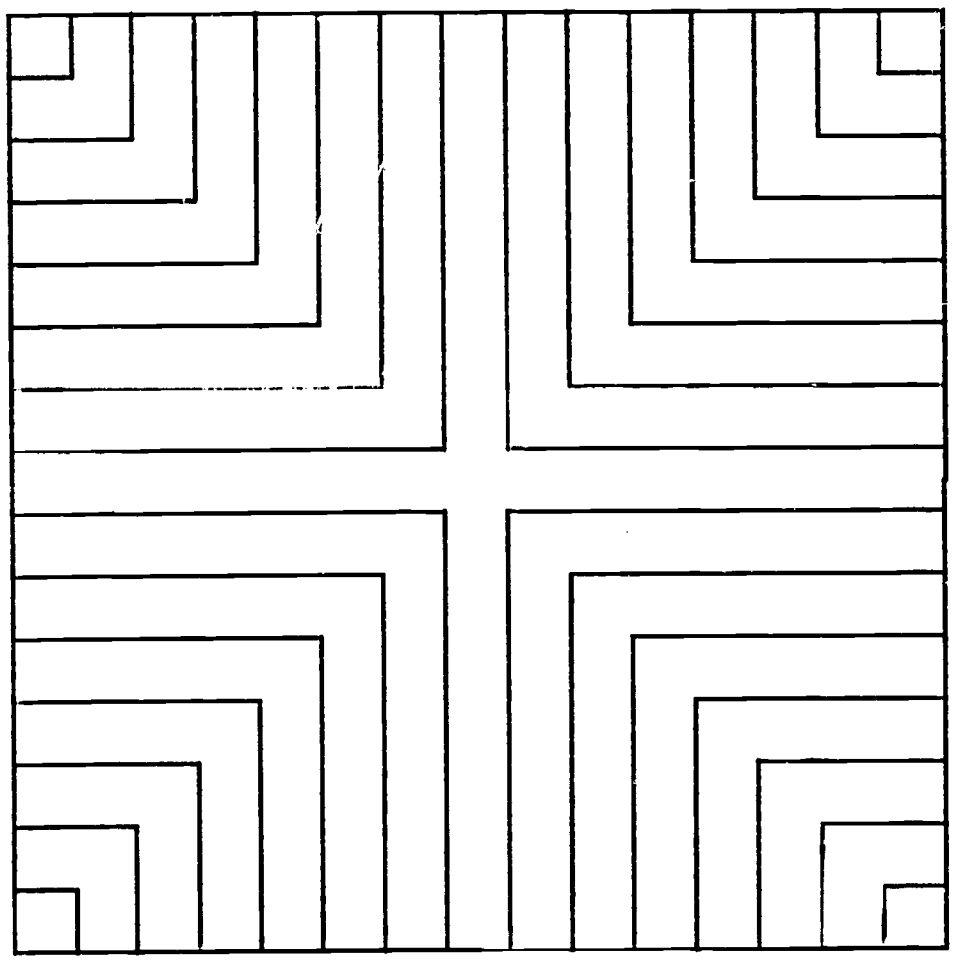

PLATE 1

INTRODUCTION TO LINES

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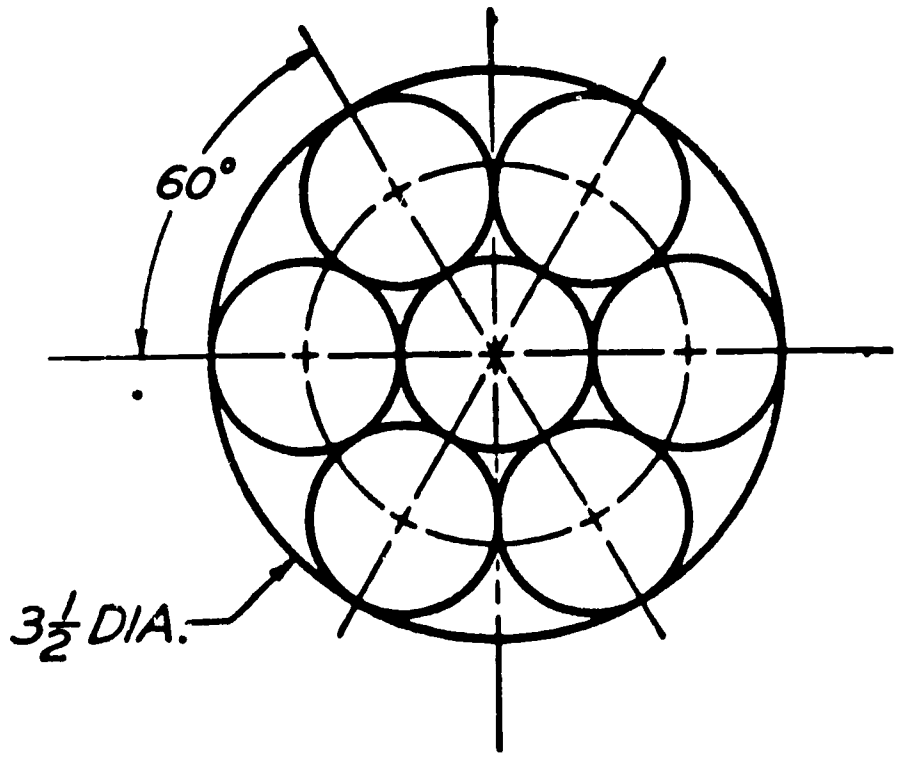
```
$$  PLATE 1          INTRODUCTION TO LINES
  BOX      =THICK ,VIEW  /
                  LINE  /1.5,.5,DX,6.5
                  LINE  /DY,10
                  LINE  /DX,-6.5
                  LINE  /DY,-10
                  LINE  /1.5,1.25,DX,6.5
                  END   /BOX
                  DRAW  /BOX
                  ALPHAP/(.2,.3,.282,0),(0,0,0,0)
                  TITLE/1.6,.875,@ INTRODUCTION TO LINES@
                  TITLE /6,1.5,@PLATE  1@
  SQUARE =        VIEW  /
                  ORIGIN/4.75,6
                  LINE  /1+7/8,0,DY,1+7/8
                  LINE  /DX,-1-7/8
                  LINE  /1/8,1+7/8,DY,-1-3/4
                  LINE  /DX,1+3/4
                  LINE  /1+7/8,3/8,DX,-1-1/2
                  LINE  /DY,1+1/2
                  LINE  /5/8,1+7/8,DY,-1-1/4
                  LINE  /DX,1+1/4
                  LINE  /1+7/8,7/8,DX,-1
                  LINE  /DY,1
                  LINE  /1+1/8,1+7/8,DY,-3/4
                  LINE  /DX,3/4
                  LINE  /1+7/8,1+3/8,DX,-1/2
                  LINE  /DY,1/2
                  LINE  /1+5/8,1+7/8,DY,-1/4
                  LINE  /DX,1/4
                  END   /SQUARE
                  DRAW  /SQUARE
                  DRAW  /MIRX(SQUARE)
                  DRAW  /MIRY(SQUARE)
                  DRAW  /MIRXY(SQUARE)
                  FINI  /
```



SKETCH 2

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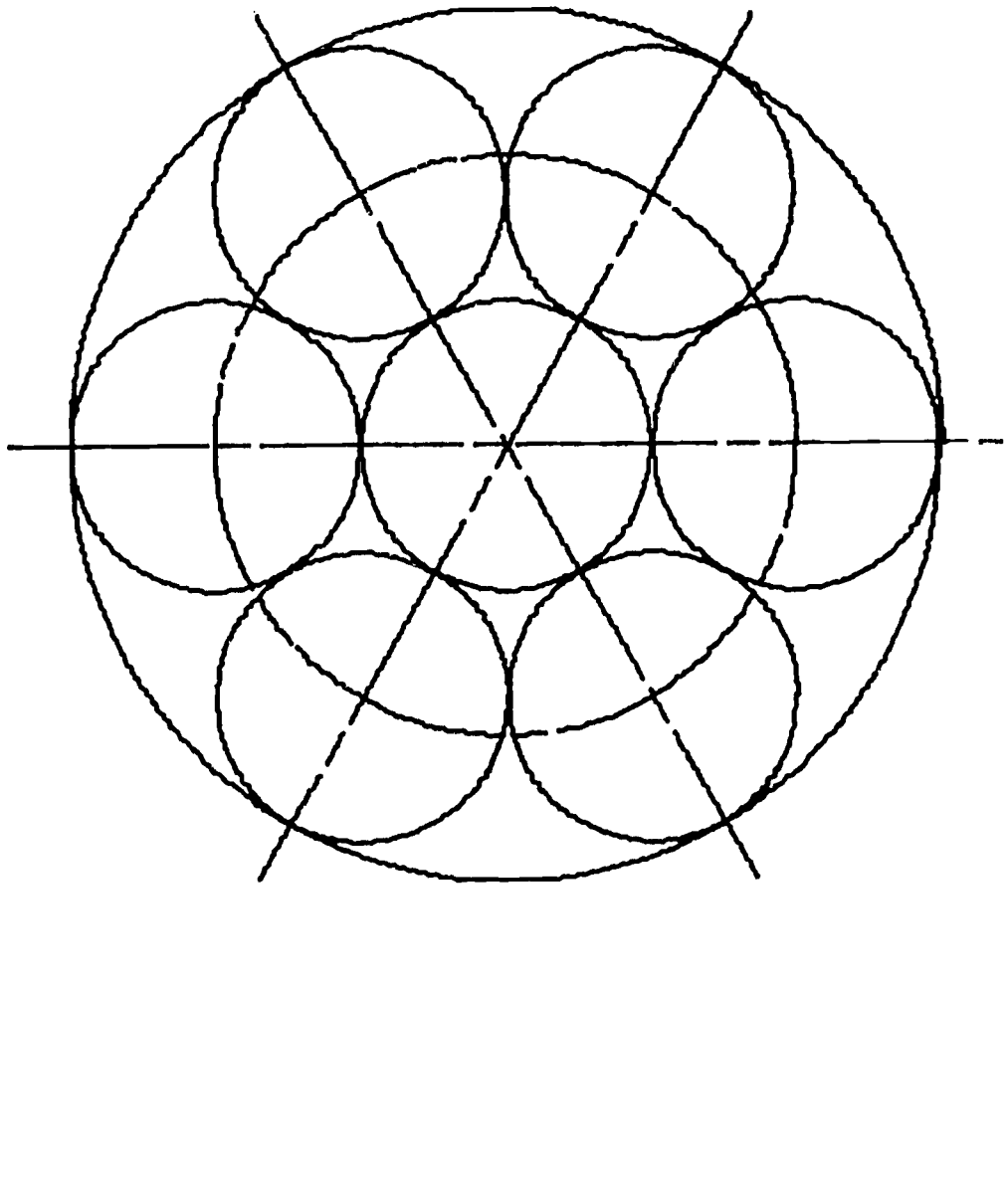


PLATE 2

INTRODUCTION TO CIRCLES

```
$$  PLATE 2          INTRODUCTION TO CIRCLES
  BOX      =THICK ,VIEW   /
                  LINE   /1.5,.5,DX,6.5
                  LINE   /DY,10
                  LINE   /DX,-6.5
                  LINE   /DY,-10
                  LINE   /1.5,1.25,DX,6.5
                  END    /BOX
                  DRAW   /BOX
                  ALPHAP/(.2,.3,.26,0),(0,0,0,0)
                  TITLE/1.6,.875,@ INTRODUCTION TO CIRCLES@
                  ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                  TITLE /6,1.5,@PLATE  2@
  DESIGN   =      VIEW   /
                  ORIGIN/4.75,6
                  CIRCLE/0,0,1.75
  C1       =CTRLN ,CIRCLE/0,0,1.166
  L1       =CTRLN ,LINE   /-2,0,DX,4
            CONSTR,LINE   /0,0,ATANGL,120,LENGTH,2
  L2       =CTRLN ,LINE   /PPP,ATANGL,300,LENGTH,4
            CONSTR,LINE   /0,0,ATANGL,60,LENGTH,2
  L3       =CTRLN ,LINE   /PPP,ATANGL,240,LENGTH,4
                  CIRCLE/(POINT/XSMALL,INTOF,L1,C1),1.166/2
                  CIRCLE/(POINT/YLARGE,INTOF,L2,C1),1.166/2
                  CIRCLE/(POINT/YLARGE,INTOF,L3,C1),1.166/2
                  CIRCLE/1.166,0,1.166/2
                  CIRCLE/(POINT/YSMALL,INTOF,L2,C1),1.166/2
                  CIRCLE/(POINT/YSMALL,INTOF,L3,C1),1.166/2
                  CIRCLE/0,0,1.166/2
                  END    /DESIGN
                  DRAW   /DESIGN
                  FINI   /
```

A B C D E F G

(.3,.3,.3,0),(0,0,0,0)

A B C D E F G

(.3,.3,.5,0),(0,0,0,0)

ABCDEFG

(.3,.3,.10,0),(0,0,0,0)

A B C D E F G F E D C B A

(.3,.3,.3,.2),(0,0,0,0)

(.3,.3,.3,-.2),(0,0,0,0)

ABCDEFG

(.1,.3,.1,0),
(0,0,0,0)

A B C D E F G

(.3,.1,.3,0),(0,0,0,0)

A B C D E F

(.6,.6,.6,0),(0,0,0,0)

A B C D E
F G H I J
K L M N O

(.3,.3,.3,0),(.3,-.3,0,0)

A B C D E

F G H I J

(.3,.3,.3,0),(0,-.6,0,0)

NOTES CAN BE DRAWN WITH AN ARROW ON THE RIGHT

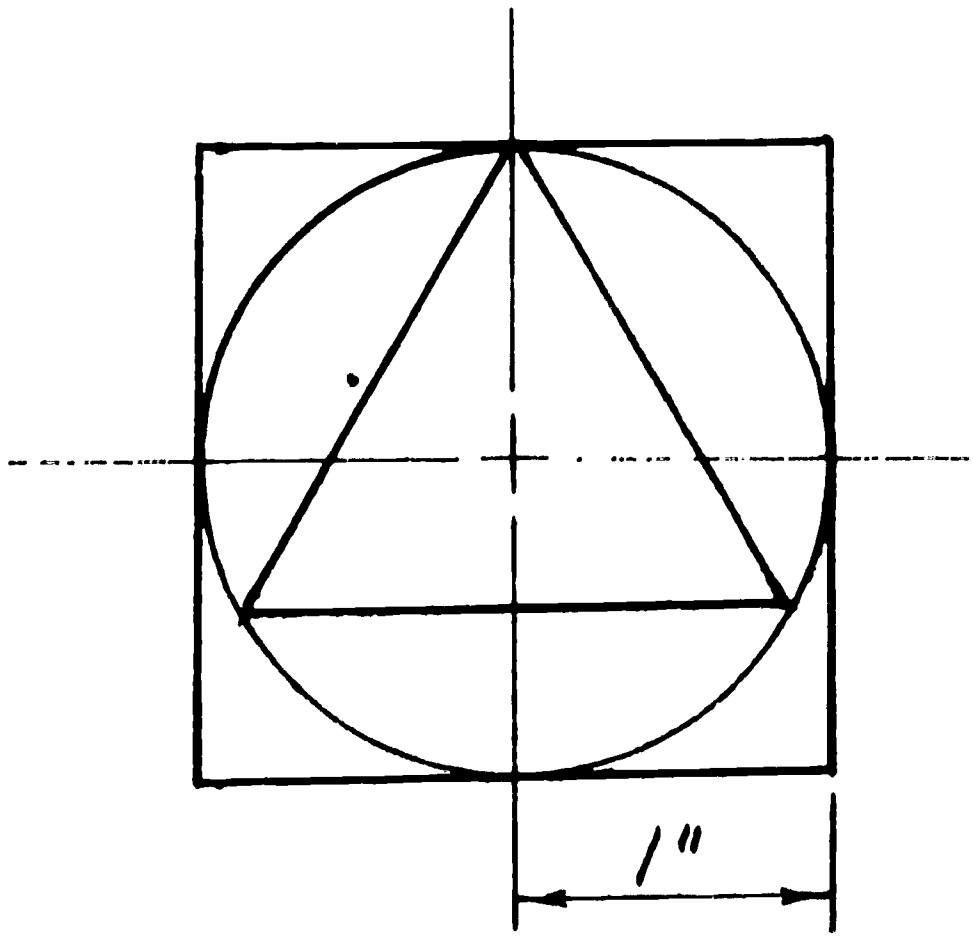
OR THEY CAN BE DRAWN WITH AN ARROW ON THE LEFT

(.2,.2,.2,0),(0,0,0,0)

PLATE 3

INTRODUCTION TO NOTES

```
$$  PLATE 3          INTRODUCTION TO NOTES
  BOX      =THICK ,VIEW  /
                   LN     /1.5,.5,DX,6.5
                   LN     /DY,10
                   LN     /DX,-6.5
                   LN     /DY,-10
                   LN     /1.5,1.25,DX,6.5
                   END    /BOX
                   DRAW   /BOX
                   ALPHAP/(.2,.3,.282,0),(0,0,0,0)
                   TITLE /1.5,.875,@ INTRODUCTION TO NOTES@
                   ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                   TITLE/6,1.5,@PLATE  3@
                   ORIGIN/.39,-.225
                   ALPHAP/(.3,.3,.3,0),(0,0,0,0)
                   NOTE   /1.65,10,@ABCDEFG@
                   ALPHAP/(.3,.3,.5,0),(0,0,0,0)
                   NOTE   /4.2,10,@ABCDEFG@
                   NOTE   /2.05,8.8,@ABCDEFG@
                   ALPHAP/(.3,.3,.3,.2),(0,0,0,0)
                   NOTE   /3.3,7.6,@ABCDEFG@
                   ALPHAP/(.3,.3,.3,-.2),(0,0,0,0)
                   NOTE   /5.4,8.8,@GFEDCBA@
                   ALPHAP/(.1,.3,.1,0),(0,0,0,0)
                   NOTE   /1.65,7.6,@ABCDEFG@
                   ALPHAP/(.3,.1,.3,0),(0,0,0,0)
                   NOTE   /1.65,6.4,@ABCDEFG@
                   ALPHAP/(.6,.6,.6,0),(0,0,0,0)
                   NOTE   /4.2,6.4,@ABCDEF@
                   ALPHAP/(.3,.3,.3,0),(.3,-.3,0,0)
                   NOTE   /1.65,5.2,@ABCDE@,@FGHIJ@,@KLMNO@
                   ALPHAP/(.3,.3,.3,0),(0,-.6,0,0)
                   NOTE   /5.0,5.2,@ABCDE@,@FGHIJ@
                   ALPHAP/(.2,.2,.2,0),(0,-.2,0,0)
                   NOTER /4.25,2.8,-.35,.55,@NOTES CAN BE@,$
                   NOTE   /4.25,2.8,.45,.55,@OR THEY CAN@,$
                   @BE DRAWN WITH@,@AN ARROW ON@,@THE LEFT@
                   ALPHAP/(.1,.1,.1,0),(0,0,0,0)
                   NOTE   /1.49,9.75,@(.3,.3,.3,0),(0,0,0,0)@
                   NOTE   /4.65,9.75,@(.3,.3,.5,0),(0,0,0,0)@
                   NOTE   /1.5,8.55,@(.3,.3,.18,0),(0,0,0,0)@
                   NOTE   /4.15,7.8,@(.3,.3,.3,.2),(0,0,0,0)@
                   NOTE   /4.15,7.55,@(.3,.3,.3,-.2),(0,0,0,0)@
                   NOTE   /1.5,7.35,@(.1,.3,.1,0),@
                   NOTE   /1.5,7.25,@(0,0,0,0)@
                   NOTE   /4.7,6.15,@(.6,.6,.6,0),(0,0,0,0)@
                   NOTE   /1.5,6.15,@(.3,.1,.3,0),(0,0,0,0)@
                   NOTE   /1.5,4.35,@(.3,.3,.3,0),(.3,-.3,0,0)@
                   NOTE   /4.5,4.35,@(.3,.3,.3,0),(0,-.6,0,0)@
                   NOTE   /3.15,2.55,@(.2,.2,.2,0),(0,0,0,0)
                   FINI   /
```



SKETCH 4

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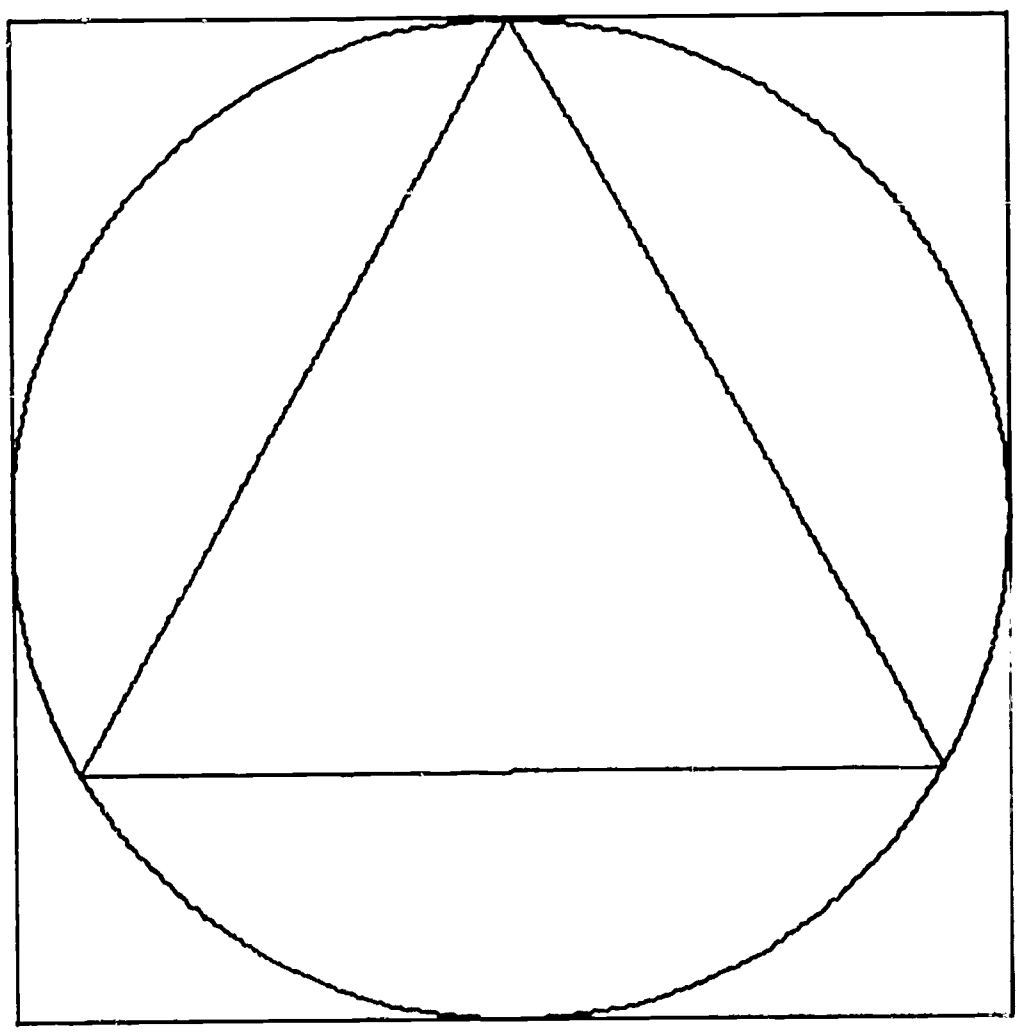

PLATE 4

PICTURE AND FRAME

```
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$$  PLATE 4          SQUARE INSCRIBED IN A CIRCLE
  BOX      =THICK ,VIEW  /
                    LN    /1.5,.5,DX,6.5
                    LN    /DY,10
                    LN    /DX,-6.5
                    LN    /DY,-10
                    LN    /1.5,1.25,DX,6.5
                    END   /BOX
                    DRAW  /BOX
                    ALPHAP/(.3,.3,.3,0),(0,0,0,0)
                    TITLE/2.05,.875,@ PICTURE AND FRAME@
                    ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                    TITLE /6,1.5,@PLATE  4@
  PICT     =        VIEW  /
                    ORIGIN/4.75,6
                    SCALE /2
                    LN    /-1,-1,DX,2
                    LN    /DY,2
                    LN    /DX,-2
                    LN    /DY,-2
                    CIRCLE/0,0,1
  P1       =        PT    /0,0,ATANGL,90,LENGTH,1
  P2       =        PT    /0,0,ATANGL,210,LENGTH,1
  P3       =        PT    /0,0,ATANGL,330,LENGTH,1
                    LN    /P1,P2
                    LN    /P2,P3
                    LN    /P3,P1
                    END   /PICT
                    DRAW  /PICT
                    FINI  /
```

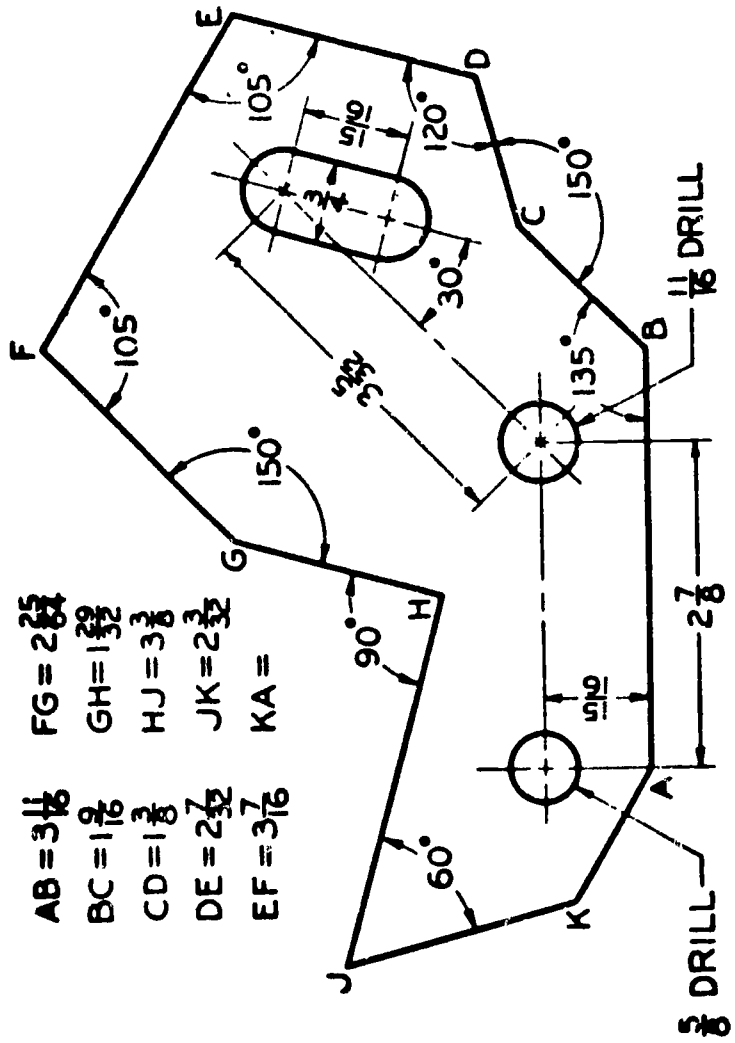

SKETCH 5

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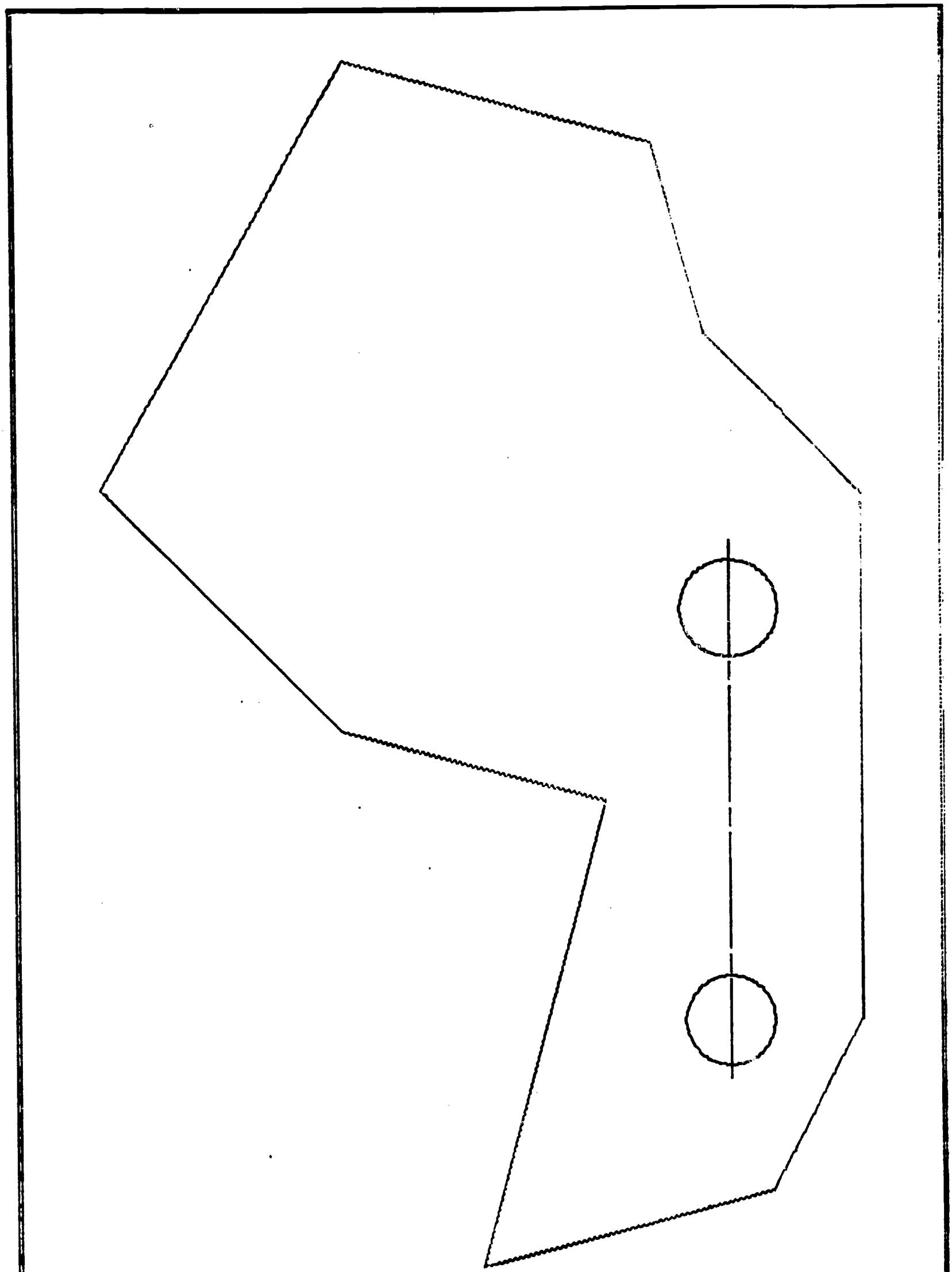
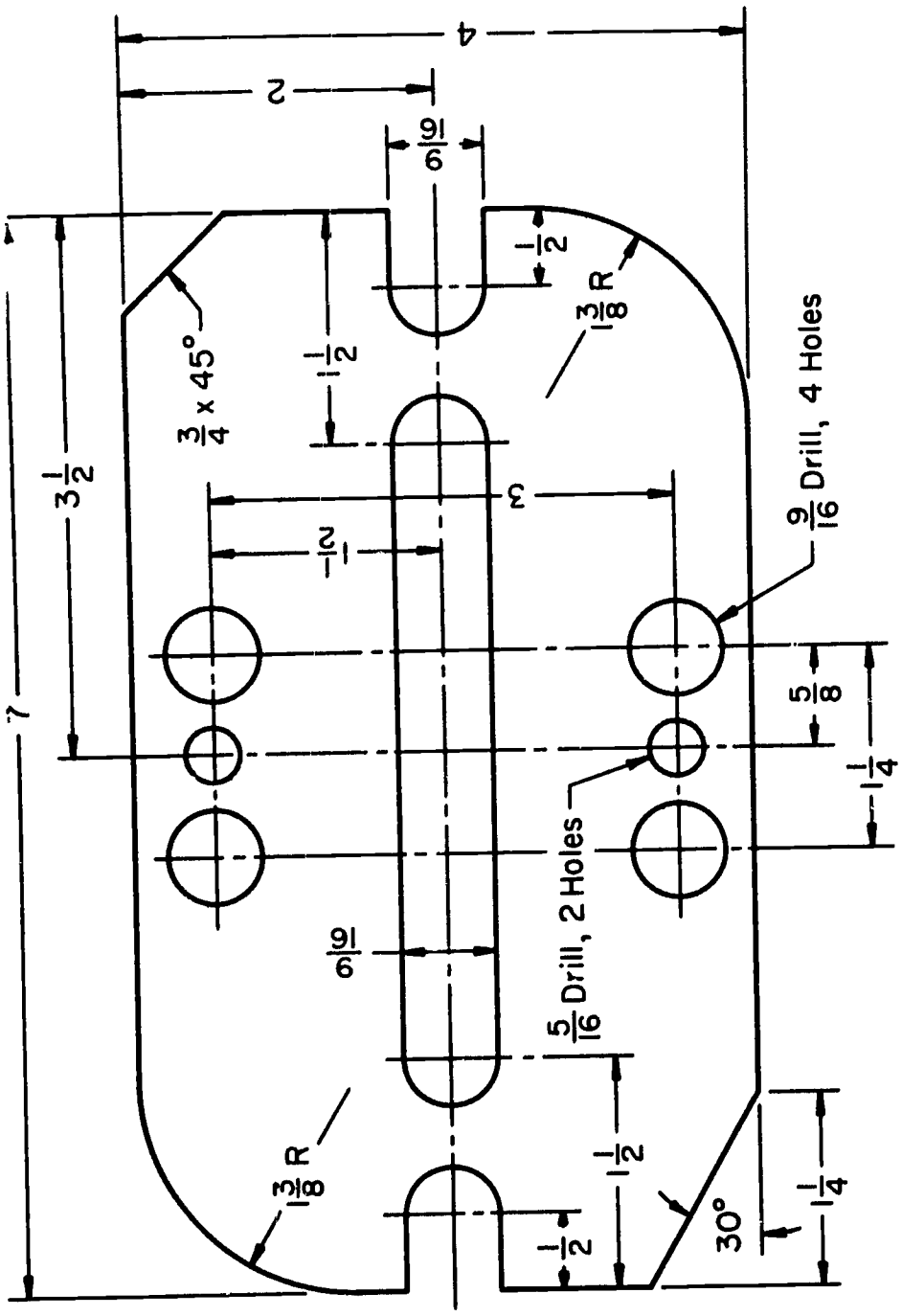


PLATE 5

SHEAR PLATE

```
$$  PLATE 5          LINES AT ANGLES TO PART AXIS-SHEAR PLATE  LONG X
  BOX  =THICK,      VIEW/
                    LN      /.5,.5,DX,10
                    LN      /DY,6.5
                    LN      /DX,-10
                    LN      /DY,-6.5
                    LN      /1.25,.5,DY,6.5
                    END/BOX
                    DRAW/BOX
                    ALPHAP/(.5,.5,0,-.5),(0,0,0,270)
                    TITLE /.875,6.8,@ SHEAR PLATE@
                    ALPHAP/(.2,.2,0,-.2),(0,0,0,270)
                    TITLE /1.5,2.5,@PLATE  5@
  PLATE    =        VIEW  /
  A        =        POINT /3.45,1.08
                    LINE  /A,DX,3+11/16
                    LINE  /PPP,ATANGL,45,LENGTH,1+9/16
                    LINE  /PPP,ATANGL,15,LENGTH,1+3/8
                    LINE  /PPP,ATANGL,75,LENGTH,2+7/32
                    LINE  /PPP,ATANGL,150,LENGTH,3+7/16
                    LINE  /PPP,ATANGL,225,LENGTH,2+25/64
                    LINE  /PPP,ATANGL,255,LENGTH,1+29/32
                    LINE  /PPP,ATANGL,165,LENGTH,3+3/8
                    LINE  /PPP,ATANGL,285,LENGTH,2+3/32
  P1       =        LINE  /PPP,A
                          DIST((POINT/P1),A)
  KA       =
  P2       =        PT    /A,DY,15/16
                    CR    /P2,5/16
  P3       =        PT    /P2,DX,2+7/8
                    CR    /P3,11/32
                    PT    /DX,.125
                CTRLN,LN    /DX,-3.75
                    END   /PLATE
                    DRAW  /PLATE
                    FINI/
```



SKETCH 6

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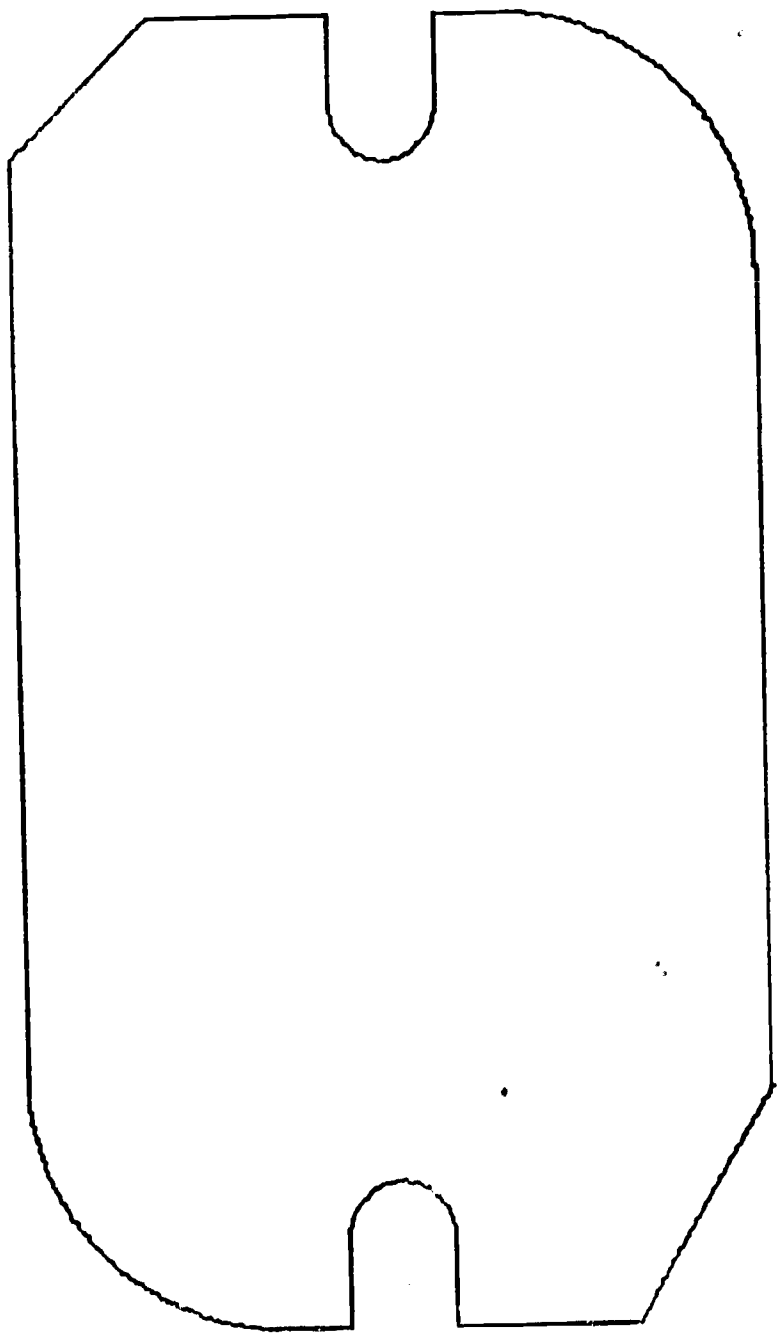

PLATE 6

FIXTURE BASE

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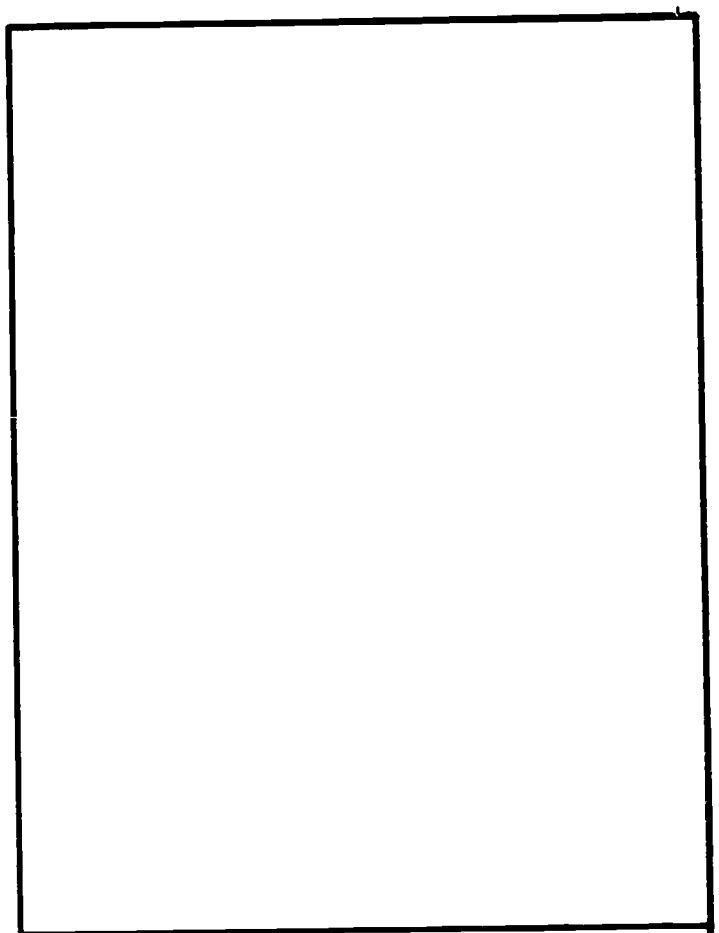
```
$$  PLATE 6          COMBINING ARCS AND LINES-FIXTURE BASE
  BOX      =THICK ,VIEW  /
                  LN     /1.5,.5,DX,6.5
                  LN     /DY,10
                  LN     /DX,-6.5
                  LN     /DY,-10
                  LN     /1.5,1.25,DX,6.5
                  END    /BOX
                  DRAW   /BOX
                  ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                  TITLE/5.5,1.5,@PLATE  6@
                  ALPHAP/(.4,.3,.4,0),(0,0,0,0)
                  TITLE /2.15,.875,@ FIXTURE BASE@
  BASE     =      VIEW  /
                  SCALE /3/4
                  ORIGIN/4.75,6
                  LINE   /2,-2.25,ATANGL,240,TILLY,-3.5
                  LINE   /PPP,ATANGL,180,TILLX,9/32
                  LINE   /DY,.5
                  ARC    /0,-3,9/32,0,180
                  LINE   /PPP,DY,-.5
                  LINE   /DX,-(2-9/32)
                  ARC    /1.375
                  LINE   /DY,6.25
                  LINE   /DX,3/4,DY,3/4
                  LINE   /DX,2-(3/4+9/32)
                  LINE   /DY,-.5
                  ARC    /0,3,9/32,180,180
                  LINE   /DY,.5
                  LINE   /DX,2-9/32
                  ARC    /1.375
                  LINE   /DY,-5.75
                  END    /BASE
                  DRAW   /BASE
                  FINI/
```



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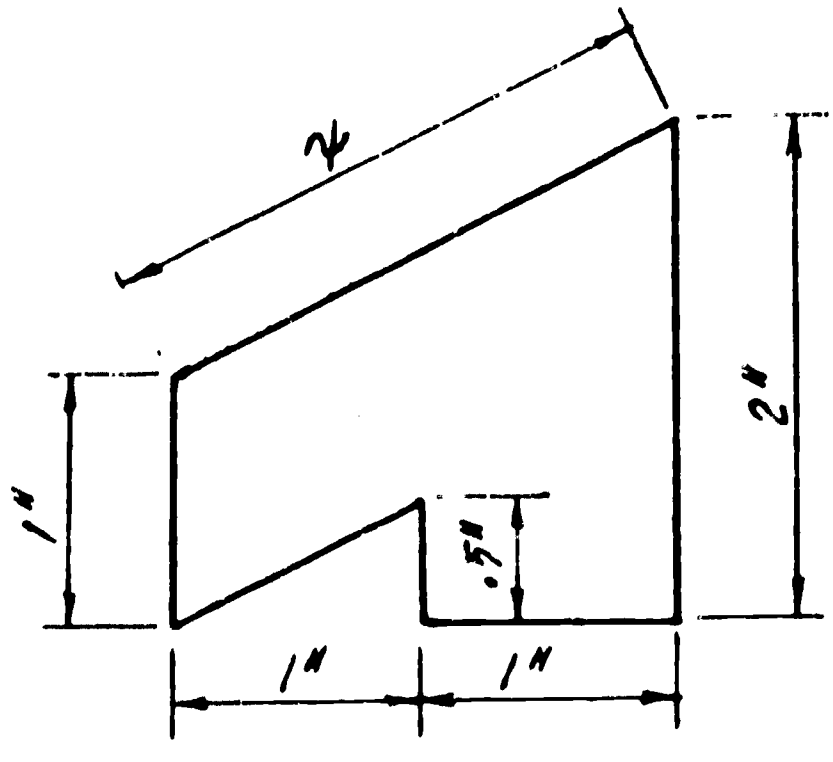

SKETCH 8

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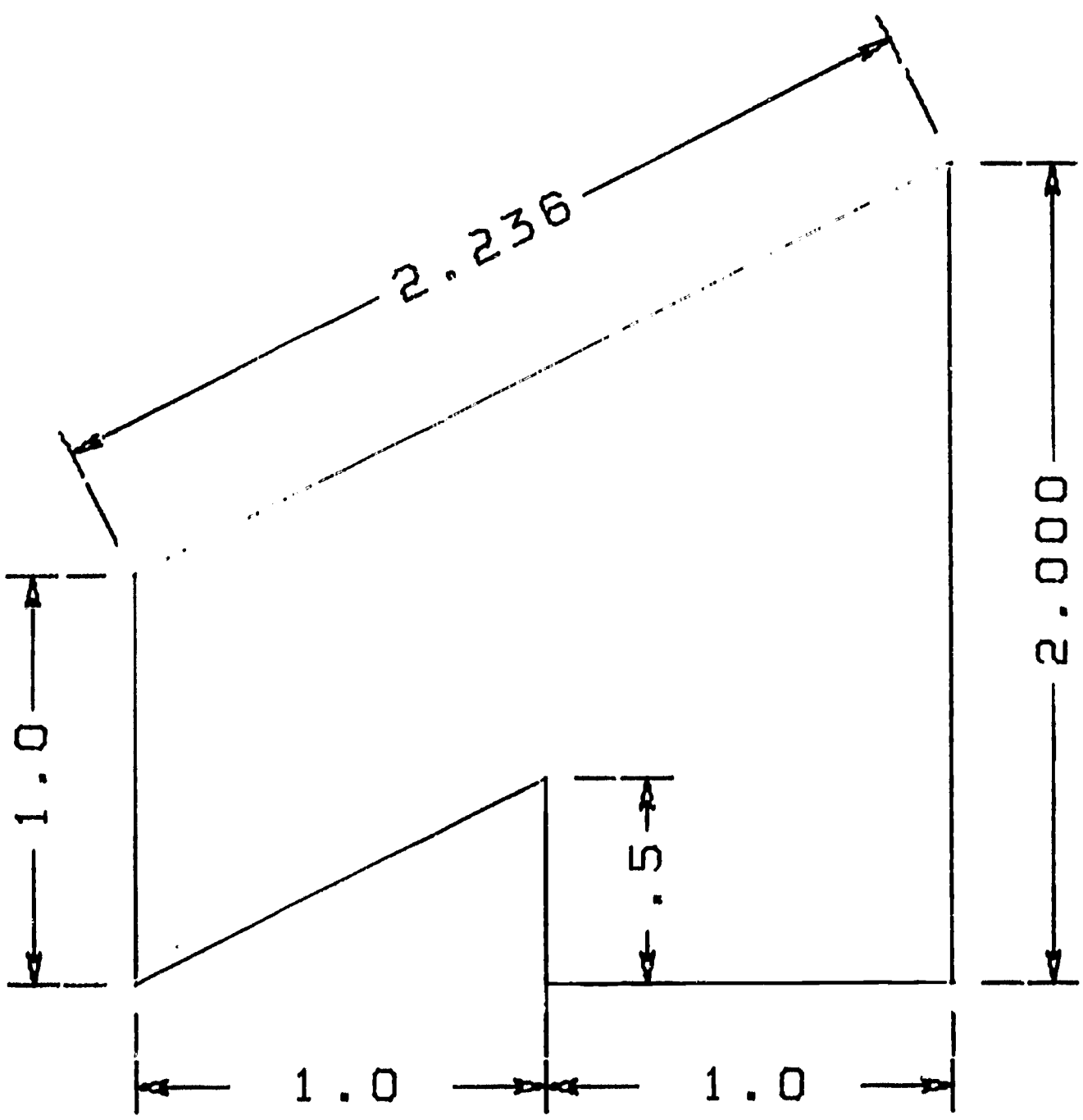

PLATE 8

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DIMENSIONING A PART

```
$$  PLATE 8
  BOX       =     VIEW /
                  CALL  /FRAME1,,X=6.5,,Y=10,,ORX=1.5,,ORY=.5
                  END   /BOX
                  DRAW  /BOX
  ABC       =     VIEW  /
                  SCALE /2
                  ORIGIN/2.5,4
  L1        =     LINE  /DY,1
  L2        =     LINE  /DX,2,DY,1
  L3        =     LINE  /DY,-2
  L4        =     LINE  /DX,-1
  L5        =     LINE  /DY,.5
  L6        =     LINE  /DX,-1,DY,-.5
                  END   /ABC
                  DRAW  /ABC
                  DIMST /XSMALL,YCOMP,L1,.5
                  MASK  /DP,D10
                  DIM   /L1
                  DIMST /YLARGE,TRUE,L2,.5
                  MASK  /DP,D30
                  DIMP  /.5,.2,1,1
                  DIM   /L2
                  DIMST /XLARGE,YCOMP,L3,.5
                  DIM   /L3
                  DIMST /YSMALL,XCOMP,L4,.5
                  MASK  /DH,D10
                  DIM   /L4
                  INDEX /-1
                  DIM   /L6
                  DIMST /XLARGE,YCOMP,L5,.5
                  MASK  /DP,D10
                  DIM   /L5
                  ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                  FINI  /
```

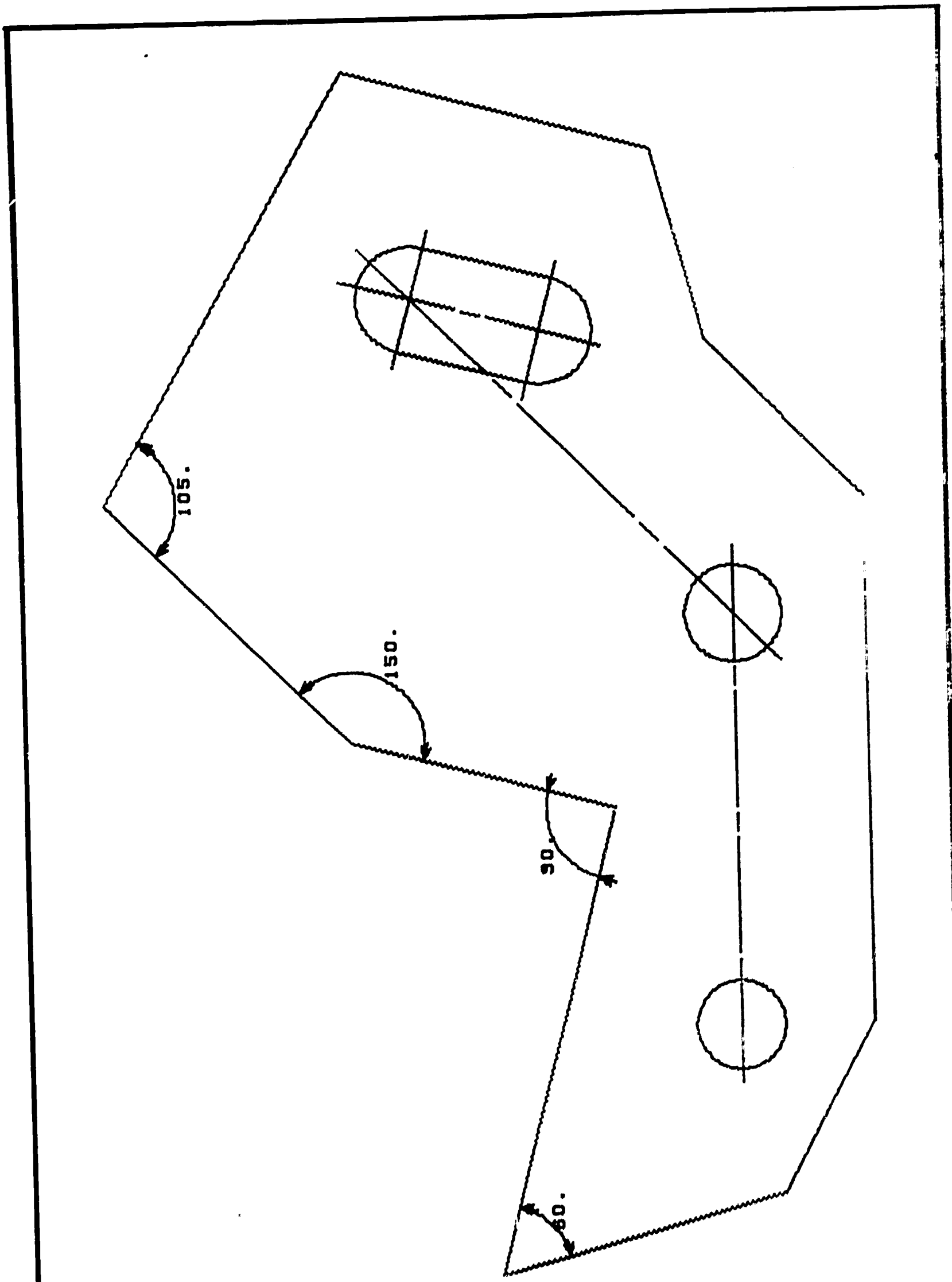

PLATE 9

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```
$$  PLATE 9          SHEAR PLATE WITH DIMENSIONS   LONG X
  BOX       =       VIEW  /
                    CALL  /FRAME1,,X=10,,Y=6.5,,ORX=.5,,ORY=.5
                    END/BOX
                    DRAW/BOX
                    ALPHAP/(.2,.2,0,-.2),(0,0,0,270)
                    TITLE /1.5,2.5,@PLATE  9@
  PLATE     =       VIEW  /
                    ORIGIN/NOMORE
  A         =       POINT /3.45,1.08
                    LINE  /A,DX,3+11/16
                    LINE  /PPP,ATANGL,45,LENGTH,1+9/16
                    LINE  /PPP,ATANGL,15,LENGTH,1+3/8
  D         =       POINT /PPP
                    LINE  /PPP,ATANGL,75,LENGTH,2+7/32
  E         =       POINT /PPP
                    LINE  /PPP,ATANGL,150,LENGTH,3+7/16
  F         =       POINT /PPP
                    LINE  /PPP,ATANGL,225,LENGTH,2+25/64
  G         =       POINT /PPP
                    LINE  /PPP,ATANGL,255,LENGTH,1+29/32
  H         =       POINT /PPP
                    LINE  /PPP,ATANGL,165,LENGTH,3+3/8
  I         =       POINT /PPP
  J         =       POINT /PPP
  P1        =       LINE  /PPP,ATANGL,285,LENGTH,2+3/32
                    LINE  /PPP,A
  P2        =       PT    /A,DY,15/16
                    CR    /P2,5/16
  P3        =       PT    /P2,DX,2+7/8
                    CR    /P3,11/32
                    PT    /DX,.125
            CTRLN,LN      /DX,-3.75
  P4        =       PT    /P3,ATANGL,225,LENGTH,15/32
  LCL       =CTRLN ,LN    /P4,ATANGL,45,LENGTH,3+20/32
             CTRLN ,LN    /(PT/LCL),ATANGL,45,LENGTH,1/2
  P5        =       PT    /(PT/LCL),ATANGL,75,LENGTH,1/2
  P6        =       PT    /(PT/LCL),ATANGL,255,LENGTH,15/16
  P7        =       PT    /P6,ATANGL,255,LENGTH,1/2
  P8        =       PT    /(PT/LCL),ATANGL,165,LENGTH,1/2
  LXL       =CTRLN ,LN    /P5,P7
  L12       =CTRLN ,LN    /P8,PERPTO,LXL
             CTRLN ,LN    /PPP,ATANGL,345,LENGTH,1/2
  P9        =       PT    /(PT/LCL),ATANGL,165,LENGTH,3/8
  P10       =       PT    /P6,ATANGL,165,LENGTH,3/8
                    LN    /P10,P9
                    ARC   /(PT/LCL),3/8,165,180,CLW
                    LN    /PPP,ATANGL,255,LENGTH,15/16
                    ARC   /P6,3/8,345,180 ,CLW
            CTRLN ,LN     /P6,ATANGL,165,LENGTH,1/2
            CTRLN ,LN     /P6,ATANGL,345,LENGTH,1/2
                    END   /PLATE
                    DRAW  /PLATE
```

```
DIMP   /.5,.1,1,1
DIM    /J,.5,285,60
DIM    /M,.5,165,-90
DIM    /G,.5,255,150
DIM    /F,.5,225,105
FINI/
```

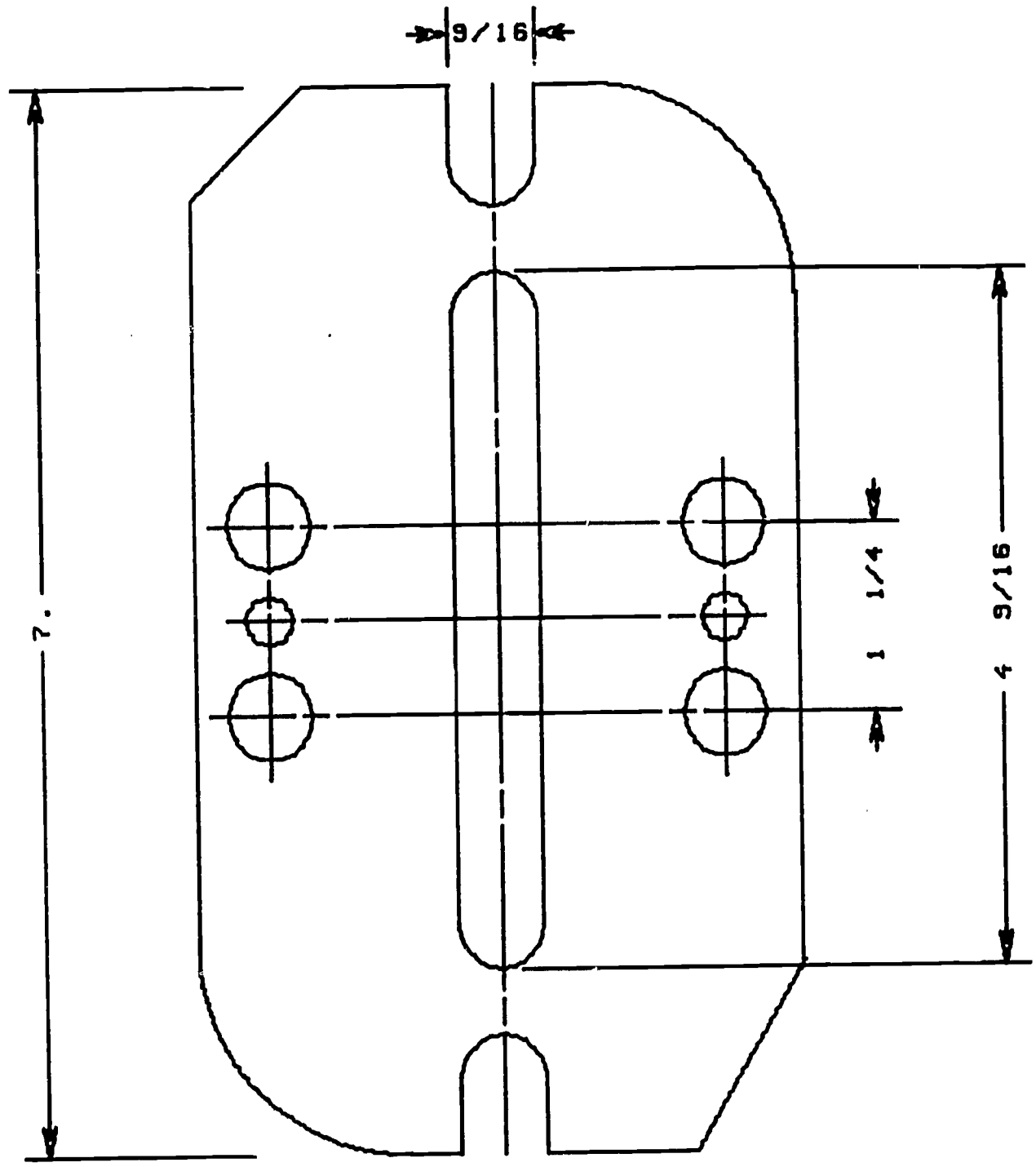

PLATE 10

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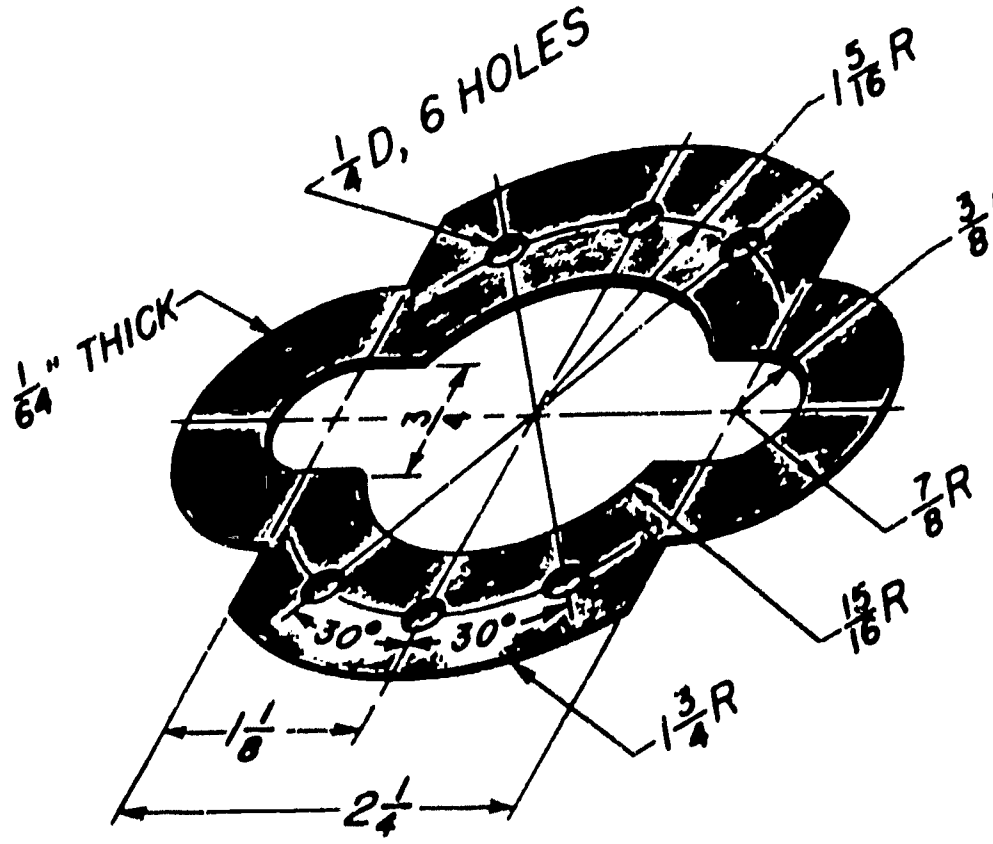
```
$$  PLATE 10          FIXTURE BASE WITH DIMENSIONS
  BOX       =         VIEW/
                      CALL   /FRAME1,,X=6.5,,Y=10,,ORX=1.5,,ORY=.5
                      END    /BOX
                      DRAW   /BOX
                      ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                      TITLE/5.5,1.5,@PLATE 10@
  BASE      =         VIEW   /
                      SCALE  /3/4
                      ORIGIN/4.75,6
                      LINE   /2,-2.25,ATANGL,240,TILLY,-3.5
                      LINE   /PPP,ATANGL,180,TILLX,9/32
                      LINE   /DY,.5
                      ARC    /0,-3,9/32,0,180
                      LINE   /PPP,DY,-.5
                      LINE   /DX,-(2-9/32)
                      ARC    /1.375
                      LINE   /DY,6.25
                      LINE   /DX,3/4,DY,3/4
                      LINE   /DX,2-(3/4+9/32)
  P1        =         PT     /PPP
                      LINE   /DY,-.5
                      ARC    /0,3,9/32,180,180
                      LINE   /DY,.5
  P2        =         PT     /PPP
                      LINE   /DX,2-9/32
                      ARC    /1.375
                      LINE   /DY,-5.75
  P3        =         PT     /-1.5,-3.5
  P4        =         PT     /-1.5,3.5
                      END    /BASE
                      DRAW   /BASE
                      MASK   /@P,F16@
                      DIMP   /.25,.1,2,2
                      DIMST  /YLARGE,XCOMP,P1,P2,.25
                      DIM    /P1,P2
                      DIMP   /.5,.1,1,1
                      DIMST  /XSMALL,YCOMP,-2,-1,-2,1,.75
                      DIM    /P3,P4
  SLOT      =         VIEW   /
  P5        =         PT     /0,-(2+9/32)
  P6        =         PT     /0,2+9/32
                      LN     /9/32,0,DY,2
                      ARC    /0,2,9/32,0,180
                      LN     /DY,-2
               CTRLN,LN     /0,0,DY,3.5
                      END    /SLOT
                      DRAW   /SLOT
                      DRAW   /MIRY(SLOT)
                      DIMST  /XLARGE,YCOMP,P5,P6,2.5
                      DIM    /P5,P6
  CIR       =         VIEW   /
```

```
P7      =       PT      /1.5,-5/8
P8      =       PT      /1.5,5/8
          CTRLN,LN      /0,-5/8,DX,1+29/32
          CTRLN,LN      /0,0,DX,1+25/32
          CTRLN,LN      /0,5/8,DX,1+29/32
          CTRLN,LN      /1.5,-(1+1/32),DY,2+1/16
                CR      /1.5,-5/8,9/32
                CR      /1.5,0,5/32
                CR      /1.5,5/8,9/32
                END     /CIR
                DRAW    /CIR
                DRAW    /MIRX(CIR)
                DIMST   /XLARGE,YCOMP,P7,P8,.75
                DIMP    /.6,.1,2,2
                DIM     /P7,P8
 FINI /
```



SKETCH II

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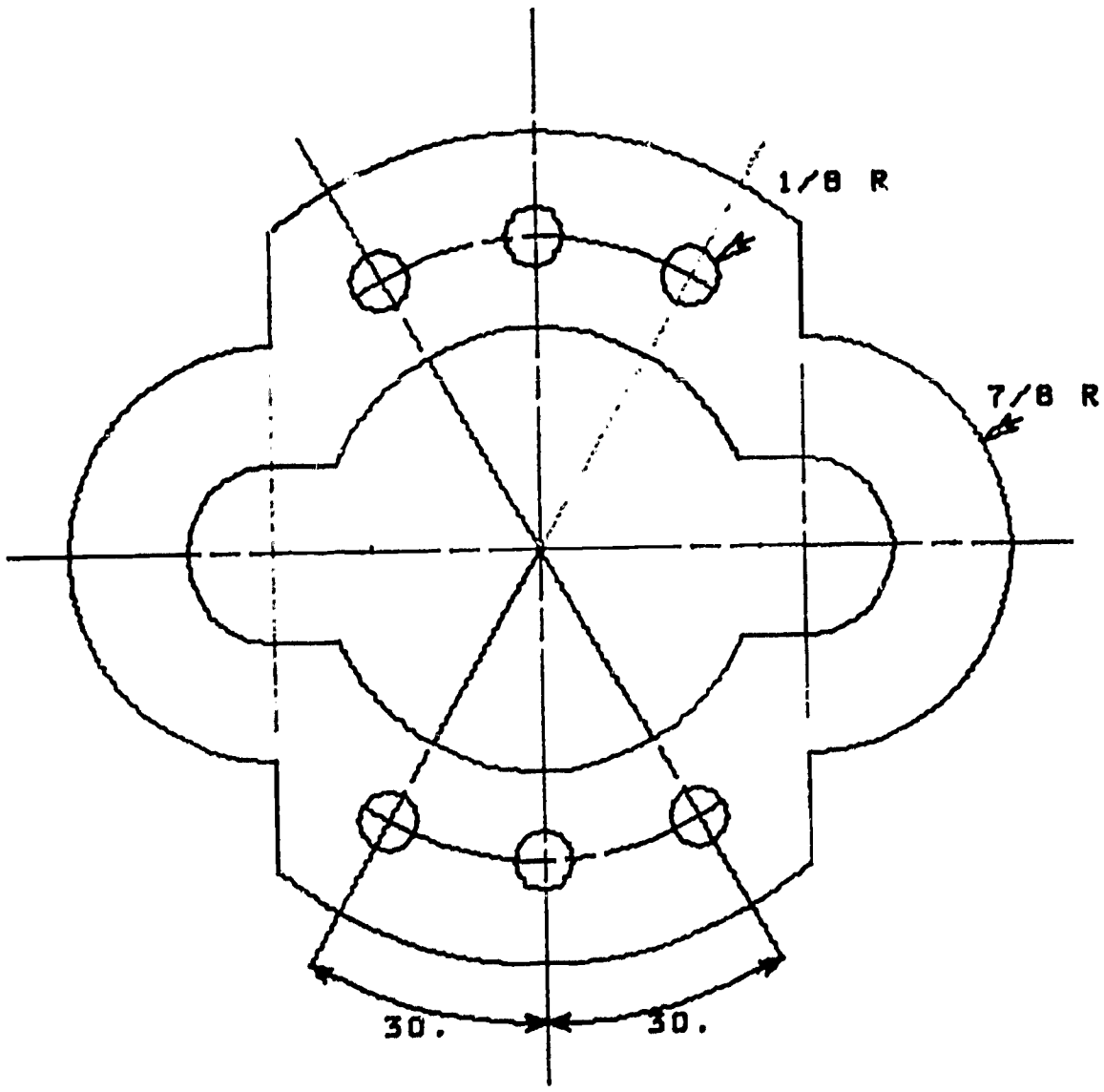

PLATE 11

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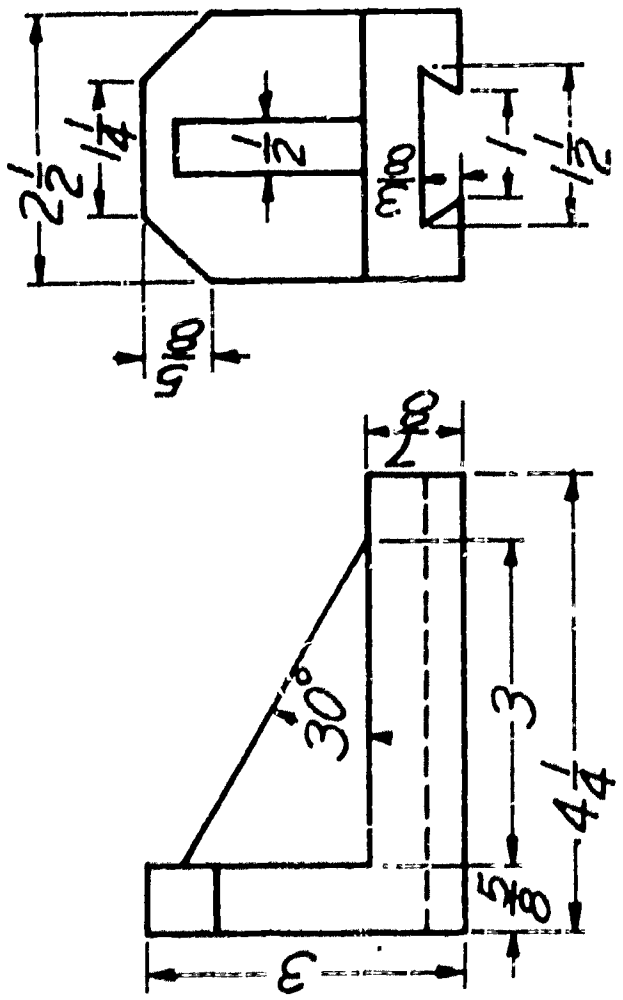
```
$$  PLATE 11          INTERSECTION OF ARCS-GASKET
                      ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                      TITLE /6,1.5,@PLATE 11@
    GASKET=           VIEW/
    L1      =CONSTR,LINE   /1.125,-3,DY,.01
    L2      =CONSTR,LINE   /-1.125,-3,DY,.01
    L3      =CONSTR,LINE   /-2,-3/8,DX,.01
    L4      =CONSTR,LINE   /-2,3/8,DX,.01
    C1      =CONSTR,CIRCLE/0,0,1.75
    P1      =         POINT /YLARGE,INTOF,L2,C1
    P2      =         POINT /YLARGE,INTOF,L1,C1
    P3      =         POINT /YSMALL,INTOF,L1,C1
    P4      =         POINT /YSMALL,INTOF,L2,C1
    C2      =CONSTR,CIRCLE/1.125,0,7/8
    C3      =CONSTR,CIRCLE/-1.125,0,7/8
    P5      =         POINT /YLARGE,INTOF,L1,C2
    P6      =         POINT /YSMALL,INTOF,L1,C2
    P8      =         POINT /YLARGE,INTOF,L2,C3
    P7      =         POINT /YSMALL,INTOF,L2,C3
                      ARC   /P1,P2,YSMALL,RADIUS,1.75,CLW
                      LINE  /PPP,P5
                      ARC   /P5,P6,XSMALL,RADIUS,7/8,CLW
                      LINE  /PPP,P3
                      ARC   /P3,P4,YLARGE,RADIUS,1.75,CLW
                      LINE  /PPP,P7
                      ARC   /P7,P8,XLARGE,RADIUS,7/8,CLW
                      LINE  /PPP,P1
    C4      =CONSTR,CIRCLE/0,0,15/16
    C5      =CONSTR,CIRCLE/-1.125,0,3/8
    C6      =CONSTR,CIRCLE/1.125,0,3/8
    P20     =         POINT /YLARGE,INTOF,L1,C6
    P21     =         POINT /YSMALL,INTOF,L1,C6
    P22     =         POINT /YSMALL,INTOF,L2,C5
    P23     =         POINT /YLARGE,INTOF,L2,C5
    P24     =         POINT /XSMALL,INTOF,L4,C4
    P25     =         POINT /XLARGE,INTOF,L4,C4
    P26     =         POINT /XLARGE,INTOF,L3,C4
    P27     =         POINT /XSMALL,INTOF,L3,C4
                      ARC   /P24,P25,YSMALL,RADIUS,15/16,CLW
                      LINE  /PPP,P20
                      ARC   /P20,P21,XSMALL,RADIUS,3/8,CLW
                      LINE  /PPP,P26
                      ARC   /P26,P27,YLARGE,RADIUS,15/16,CLW
                      LINE  /P27,P22
                      ARC   /P22,P23,XLARGE,RADIUS,3/8,CLW
                      LINE  /P23,P24
    CLACIR=CTRLN  ,SHAPE /
                      LN    /-2.25,0,2.25,0
                      LN    /0,-2.25,0,2.25
                      LN    /-1.125,-.75,-1.125,.75
                      LN    /1.125,-.75,1.125,.75
                      LN    /0,0,ATANGL,60,LENGTH,2
```

```
                    LN      /0,0,ATANGL,120,LENGTH,2
                    LN      /0,0,ATANGL,240,LENGTH,2
                    LN      /0,0,ATANGL,300,LENGTH,2
                    ARC     /0,0,1+5/16,55,70
                    ARC     /0,0,1+5/16,235,70
                    END     /CLACIR
    L101 =CONSTR,LN     /0,0,ATANGL,60,LENGTH,1+5/16
C7      =       CIRCLE/(PT/L101),1/8
    L111 =CONSTR,LN     /0,0,ATANGL,120,LENGTH,1+5/16
                    CIRCLE/(PT/L111),1/8
    L112 =CONSTR,LN     /0,0,ATANGL,240,LENGTH,1+5/16
                    CIRCLE/(PT/L112),1/8
                    CIRCLE/0,1+5/16,1/8
    L113 =CONSTR,LN     /0,0,ATANGL,300,LENGTH,1+5/16
                    CIRCLE/(PT/L113),1/8
                    CIRCLE/0,-1-5/16,1/8
                    END     /GASKET
                    ORIGIN/4.75,6
                    DRAW    /GASKET
                    MASK    /@H,F8@
                    DIMP    /.5,.2,1,1
                    DIM     /0,0,2,240,30
                    DIM     /0,0,2,270,30
                    DIMP    /1.2,.2,0,2
                    DIMCR   /C7,30,@1/8 R@
                    DIMP    /3.5,.2,0,2
                    DIMCR   /C2,30,@7/8 R@
                    FINI    /
```



SKETCH 12

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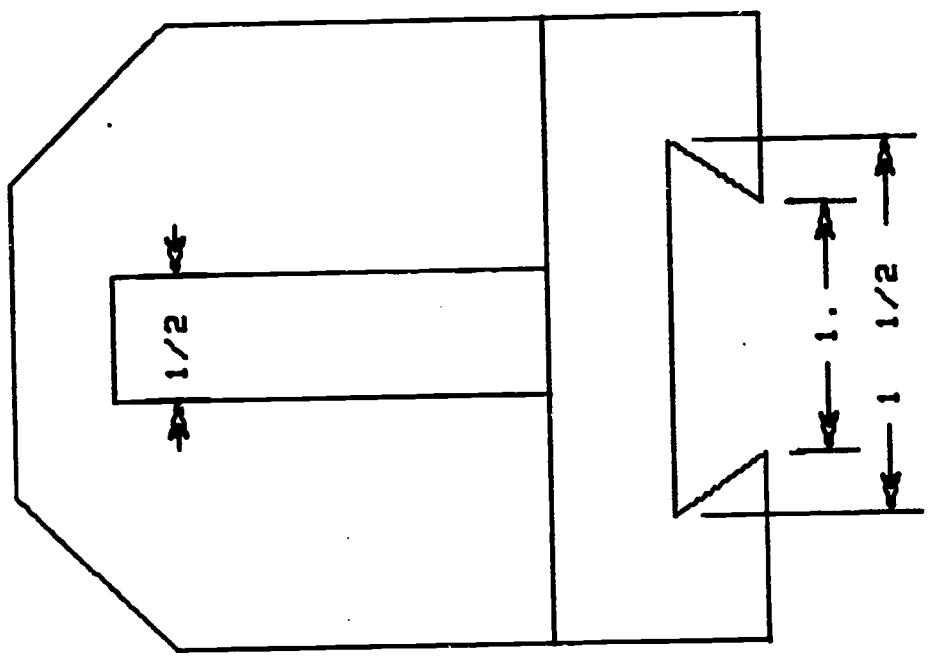

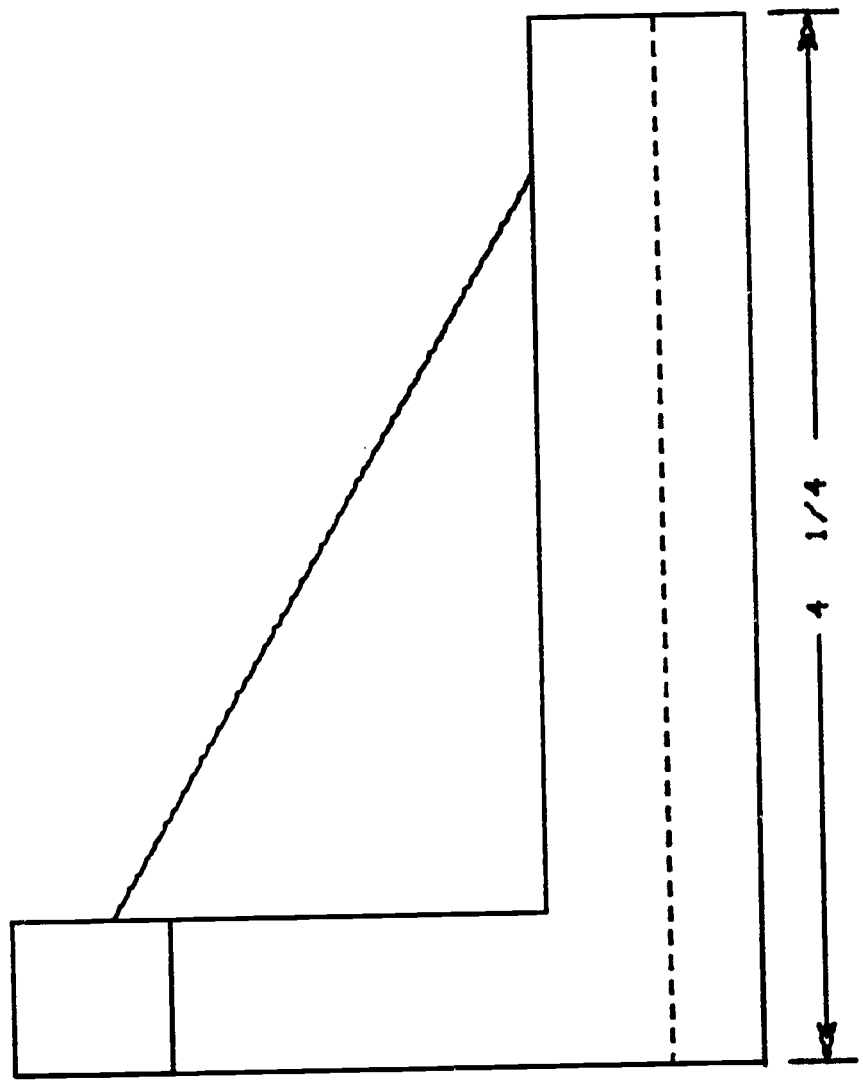

PLATE 12

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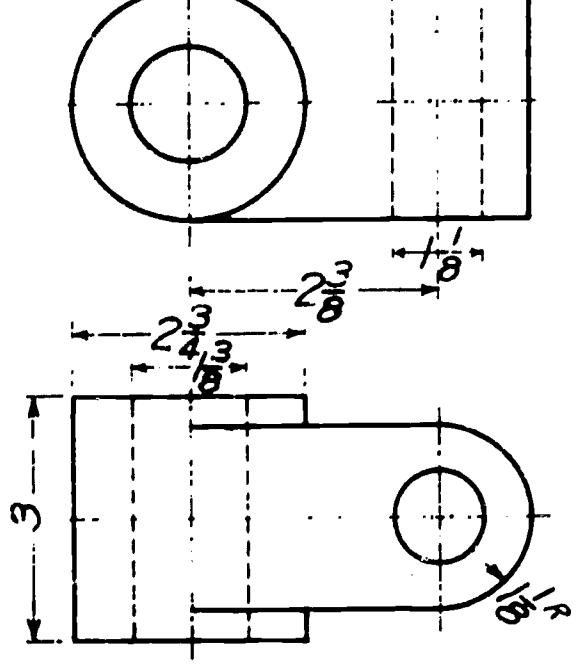
```
                    *****  1967 SUMMER INSTITUTE

$$  PLATE 12          TWO VIEW DRAWING WITH UNKNOWN DISTANCE-DOVETAIL STOP
                      (LONG -X-)
                    ALPHAP/(.2,.2,0,-.2),(0,0,0,270)
                    TITLE /1.5,2.5,@PLATE 12@
  SIDE      =       VIEW  /
                    LN    /DX,4.25
  P2        =       PT    /PPP
                    LN    /DY,7/8
                    LN    /DX,-(4.25-5/8)
                    LN    /DY,2.125
                    LN    /DX,-5/8
                    LN    /DY,-3
  P1        =       PT    /PPP
                    LN    /0,2.375,DX,5/8
                    LN    /3.625,7/8,ATANGL,150,TILLX,5/8
            DOTTED,LN     /0,3/8,DX,4.25
                    END   /SIDE
                    ORIGIN/2.25,2.25
                    DRAW  /SIDE
                    MASK  /@P,F16@
                    DIMP  /.5,.1,1,1
                    DIMST /YSMALL,XCOMP,P1,P2,.25
                    DIM   /P1,P2
FRONT       =       VIEW  /
                    LN    /DX,3/4
P3          =       PT    /PPP
                    LN    /DX,-.25,DY,3/8
P4          =       PT    /PPP
                    LN    /DX,1.5
P5          =       PT    /PPP
                    LN    /DX,-.25,DY,-3/8
P6          =       PT    /PPP
                    LN    /DX,3/4
                    LN    /DY,2.375
                    LN    /DX,-5/8,DY,5/8
                    LN    /DX,-1.25
                    LN    /DX,-5/8,DY,-5/8
                    LN    /DY,-2.375
                    LN    /1,.875,DY,3/COSD(30)*SIND(30)
P7          =       PT    /PPP
                    LN    /DX,.5
P8          =       PT    /PPP
                    LN    /PPP,ATANGL,270,TILLY,7/8
             CONSTR,LN     /DX,1
                    LN    /DX,-2.5
                    END   /FRONT
                    ORIGIN/7,2.25
                    DRAW  /FRONT
                    DIMST /YSMALL,XCOMP,P3,P6,.25
                    DIM   /P3,P6
                    DIM   /P4,P5
                    DIMP  /.3,.1,2,2
```

```
DIMST /YSMALL,XCOMP,P7,P8,.25
DIMNN /P7,P8
FINI  /
```



SKETCH 13

1967 SUMMER INSTITUTE

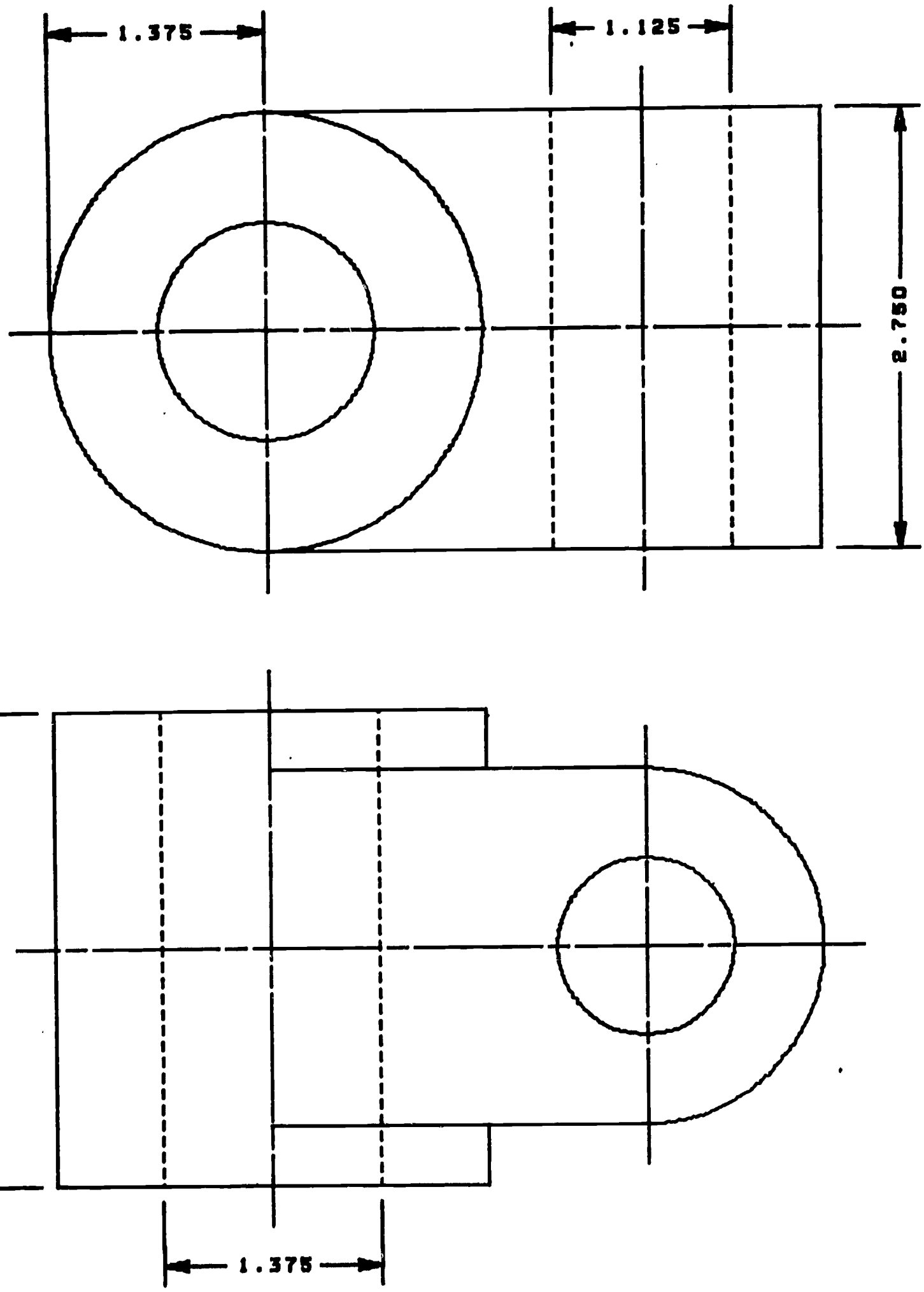


PLATE 13

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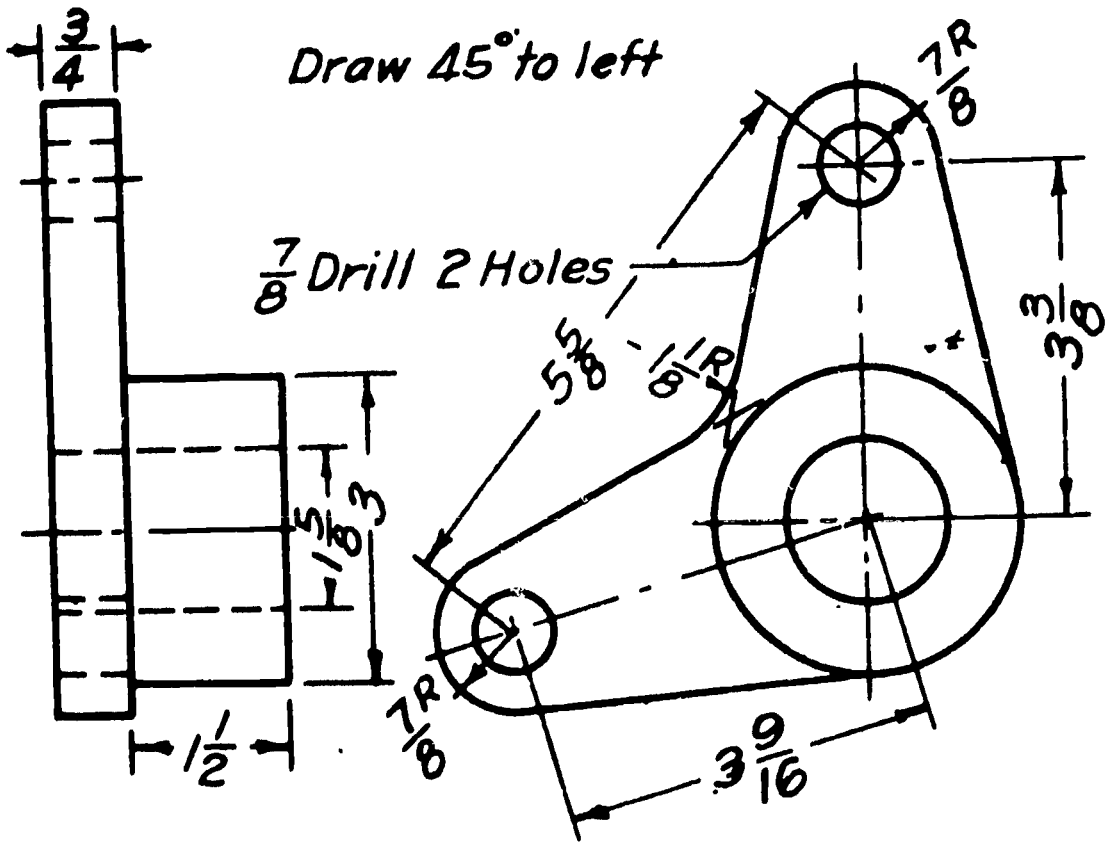
```
$$  PLATE 13          TWO VIEW DRAWING-CROSS LINK
                      ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                      TITLE /6,1.5,@PLATE 13@
  TOP       =         VIEW  /
  L1        =CTRLN ,LN      /-1.625,0,DX,1.625+2.375+1.125+.25
             CTRLN ,LN      /2.375,1.625,DY,-1.625*2
             CTRLN ,LN      /0,-1.625,DY,1.625*2
                    CR      /0,0,1.375/2
  C1        =       CR      /0,0,2.75/2
                    LN      /0,1.375,DX,3.5
  P1        =       PT      /PPP
                    LN      /DY,-2.75
  P2        =       PT      /PPP
                    LN      /PPP,LEFT,TANTO,C1
             DOTTED,LN      /2.375-1.125/2,1.375,DY,-2.75
             CONSTR,LN      /DX,1.125
             DOTTED,LN      /DY,2.75
  P4        =       PT      /PPP
  P3        =       PT      /2.375-1.125/2,1.375
  P5        =       PT      /0,1.375
  P6        =       PT      /XSMALL,INTOF,L1,C1
                    END     /TOP
                    ORIGIN/2.312+11/8,8.0
                    DRAW    /TOP
                    MASK    /@P,D3@
                    DIMP    /.5,.1,1,1
                    DIMST   /YLARGE,XCOMP,P3,P4
                    DIM     /P3,P4
                    INDEX   /-1
                    DIM     /P6,P5
                    DIMP    /.5,.1,1,1
                    DIMST   /XLARGE,YCOMP,P1,P2
                    DIM     /P1,P2
BOTTOM    =         VIEW    /
            CTRLN ,LN       /0,1.375,DY,-(1.125*2+.5)
            CTRLN ,LN       /1.375,0,DX,-(1.125+2.375+2.75/2+.5)
            CTRLN ,LN       /-2.375,1.75,DY,-3.5
                    LN      /-(2.375-2.75/2),1.125,DY,1.5-1.125
                    LN      /DX,-2.75
P7          =       PT      /PPP
                    LN      /DY,-3
P8          =       PT      /PPP
                    LN      /DX,2.75
                    LN      /DY,1.5-1.125
             CONSTR,LN      /DX,-(2.75/2)
                    LN      /DX,2.375
                    ARC     /0,0,1.125,270,180
                    LN      /DX,-2.375
                    CR      /0,0,1.125/2
             DOTTED,LN      /-(2.375+1.375/2),1.5,DY,-3
P9          =       PT      /PPP
             CONSTR,LN      /DX,1.375
```

```
P10     =       PT      /PPP
         DOTTED,LN      /DY,3
                END     /BOTTOM
                ORIGIN/4.687+11/8,4.125
                DRAW    /BOTTOM
                MASK    /@P,D3@
                DIMP    /.5,.1,1,1
                DIMST   /XSMALL,YCOMP,P8,P7
                DIM     /P8,P7
                DIMST   /YSMALL,XCOMP,P9,P10
                DIM     /P9,P10
                FINI    /
```



SKETCH 14

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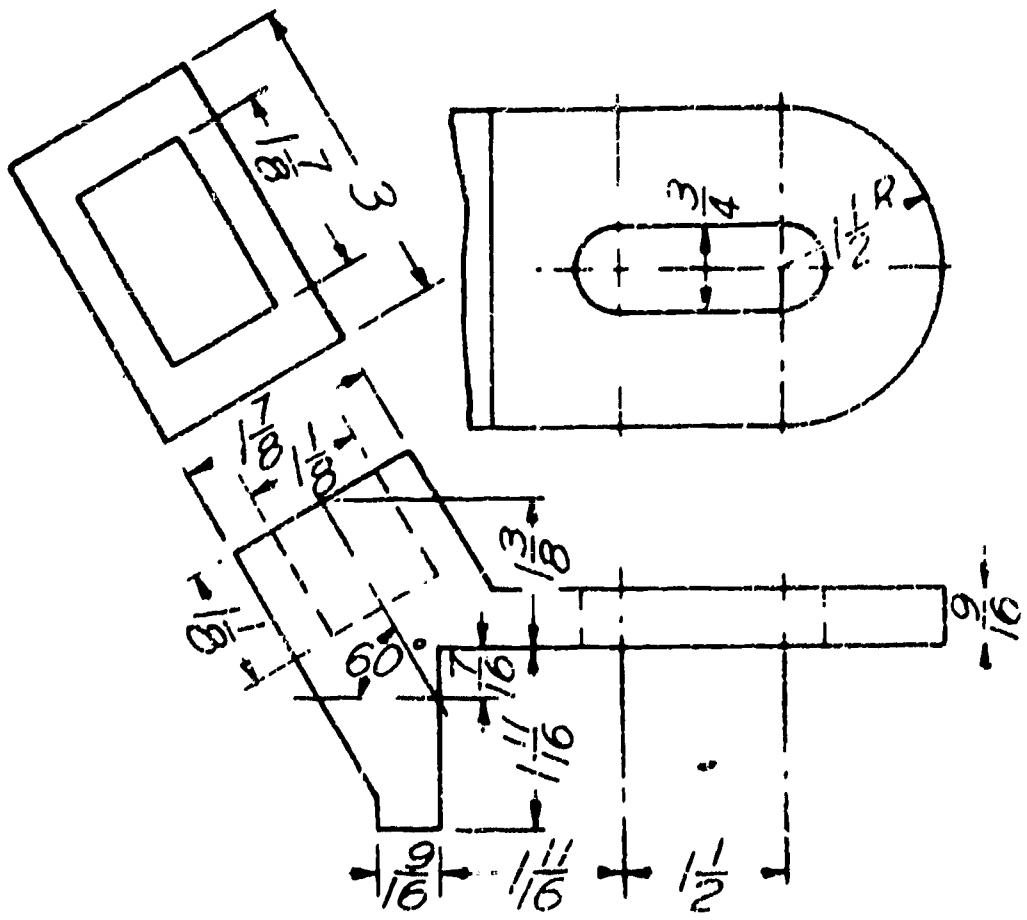
```
$$  PLATE 14          TWO VIEW DRAWING-BELL CRANK
                      ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                      TITLE /6,1.5,@PLATE 14@
                      SCALE /.5
  CRANK     =         VIEW  /
                      CIRCLE/0,0,1.625/2
  C1        =         CIRCLE/0,0,1.5
  C2        =CONSTR,CR      /0,0,3.562
  C3        =CONSTR,CR      /0,3.375,5.625
             CONSTR,LN      /0,0,DY,4.25
  L7        =CONSTR,LN      /PPP,DX,-.1
             CONSTR,LN      /PPP,DY,-(.875-.875/2)
  L6        =CONSTR,LN      /PPP,DX,-.1
  P1        =         PT    /XSMALL,INTOF,C2,C3
  C4        =CONSTR,CR      /P1,.875
  C5        =CONSTR,CR      /0,3.375,.875
  L1        =CONSTR,LN      /LEFT,TANTO,C1,LEFT,TANTO,C5
  L2        =CONSTR,LN      /RIGHT,TANTO,C1,RIGHT,TANTO,C4
  P2        =         PT    /INTOF,L1,L2
  P3        =         LN    /RIGHT,TANTO,C1,RIGHT,TANTO,C5
  P4        =CONSTR,LN      /P2,LEFT,TANTO,C5
                      ARC   /(PT/P3),(PT/P4),YSMALL,RADIUS,.875
                      LN    /PPP,P2
                      ARC   /1.125
  P5        =         LN    /P2,RIGHT,TANTO,C4
  P6        =CONSTR,LN      /LEFT,TANTO,C1,LEFT,TANTO,C4
                      ARC   /(PT/P5),(PT/P6),XLARGE,RADIUS,.875
                      LN    /(PT/P6),RIGHT,TANTO,C1
  L3        =CONSTR,LN      /0,0,P1
             CTRLN ,LN      /ANGOF(L3),LENGTH,4.687
             CTRLN ,LN      /-1.75,0,DX,3.5
             CTRLN ,LN      /0,-1.75,DY,6.25
             CTRLN ,LN      /-1.125,3.375,DX,2.25
                      CR    /0,3.375,.875/2
  P7        =CONSTR,LN      /ANGOF(L3),LENGTH,3.562
  A1        =                ATAND(L3)
             CONSTR,LN      /PPP,ATANGL,A1-90,LENGTH,1.125
             CTRLN ,LN      /PPP,ATANGL,A1+90,LENGTH,2.25
                      CR    /(PT/P7),.875/2
  L4        =CONSTR,LN      /0,0,0,3.375
  L5        =CONSTR,LN      /P1,(PT/L4)
  P8        =         PT    /INTOF,P6,C4
  L8        =CONSTR,LN      /P8,DX,-4.25
                      LN    /PPP,DX,.75
  P99       =         PT    /PPP
  L10       =CONSTR,LN      /PPP,DY,.1
  P9        =         PT    /INTOF,L7,L10
  L9        =         LN    /P99,P9
                      LN    /PPP,DX,-.75
  P1212     =         PT    /PPP
  L12       =CONSTR,LN      /PPP,DY,-.1
  P12       =         PT    /INTOF,L12,L8
```

```
                    LN      /P1212,P12
P10       =         PT      /INTOF,P6,C1
L11       =CONSTR,LN        /PPP,DX,-.1
P11       =         PT      /INTOF,L9,L11
                    LN      /P11,DX,1.5
P15       =         PT      /PPP
                    LN      /PPP,DY,3
P16       =         PT      /PPP
                    LN      /PPP,DX,-1.5
           CONSTR,LN        /PPP,DX,-.75
           CONSTR,LN        /PPP,DY,-.6875
           DOTTED,LN        /PPP,DX,2.25
           CONSTR,LN        /PPP,DY,-1.625
           DOTTED,LN        /PPP,DX,-2.25
           CONSTR,LN        /PPP,DY,1.625/2
           CONSTR,LN        /PPP,DX,-.125
           CTRLN ,LN        /PPP,DX,2.5
           CONSTR,LN        /P1,DY,.875/2
L13       =CONSTR,LN        /PPP,DX,-.1
P13       =         PT      /INTOF,L13,L10
           DOTTED,LN        /P13,DX,-.75
           CONSTR,LN        /PPP,DY,-.875
           DOTTED,LN        /PPP,DX,.75
P14       =         PT      /INTOF,L6,L10
           DOTTED,LN        /P14,DX,-.75
           CONSTR,LN        /PPP,DY,-.875
           DOTTED,LN        /PPP,DX,.75
           CONSTR,LN        /PPP,DY,.875/2
           CONSTR,LN        /PPP,DX,.125
           CTRLN ,LN        /PPP,DX,-1
                  END       /CRANK
                  ORIGIN/6.25,5.5
                  DRAW      /CRANK
                  MASK      /@P F32 TN@
                  DIMP      /.5,.1,1,1
                  DIMST     /XSMALL,YCOMP,P12,P1212,.25
                  DIM       /P12,P1212
                  DIMST     /XLARGE,YCOMP,P15,P16,.25
                  DIM       /P15,P16
                  DIMST     /YLARGE,TRUE,L5,.75/2
                  DIM       /L5
                  DIMST     /YSMALL,TRUE,L3,.75
                  DIM       /L3
                  DIMP      /2.2,.1,2,2
                  DIMST     /YSMALL,XCOMP,P12,P99,.25
                  DIM       /P12,P99
                  FINI      /
```



SKETCH 15

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ARCS IN THIS SLOT
ARE 3/8. AND DISTANCES
FROM ARC CENTERS IS 1.5

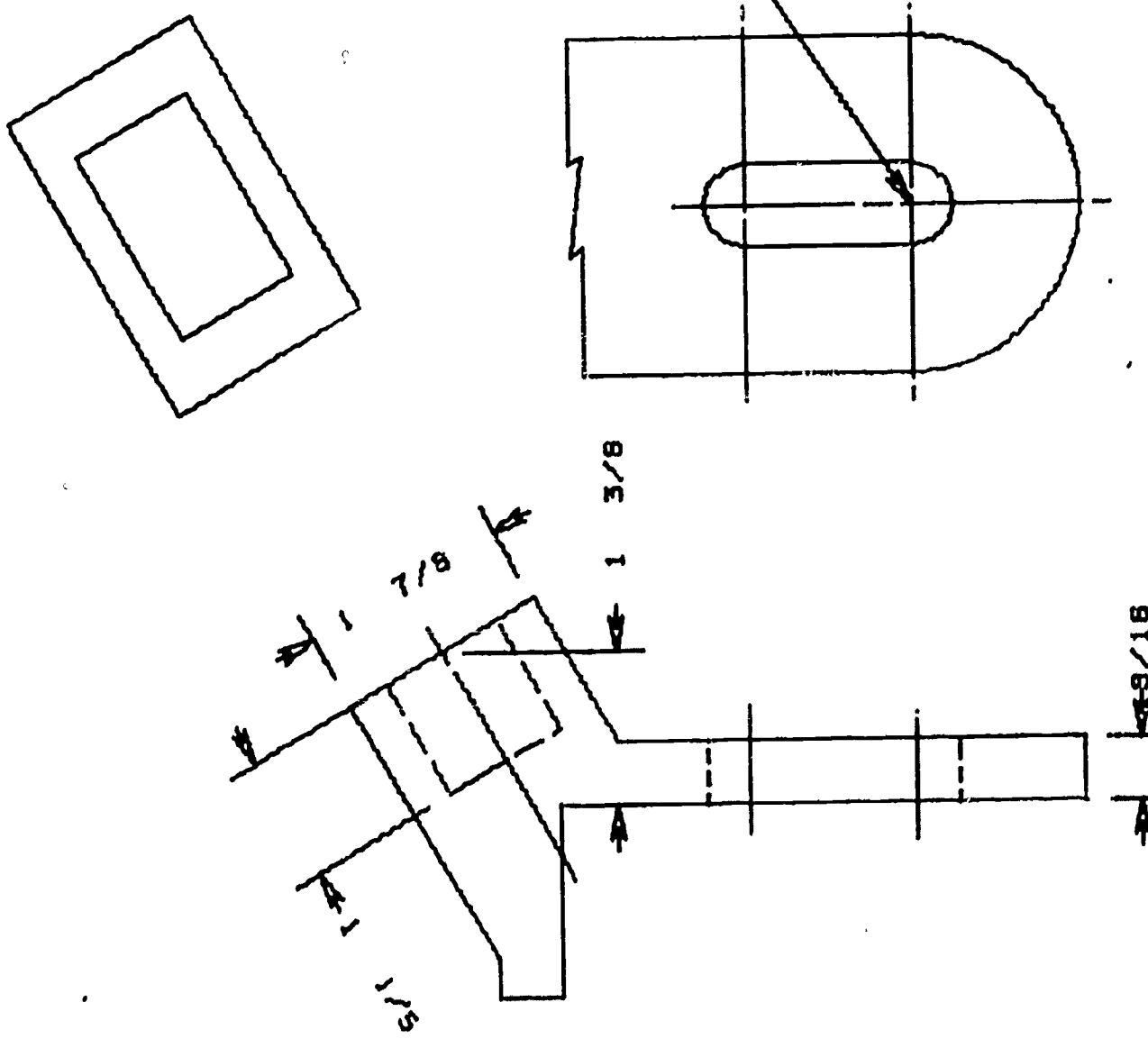

PLATE 15

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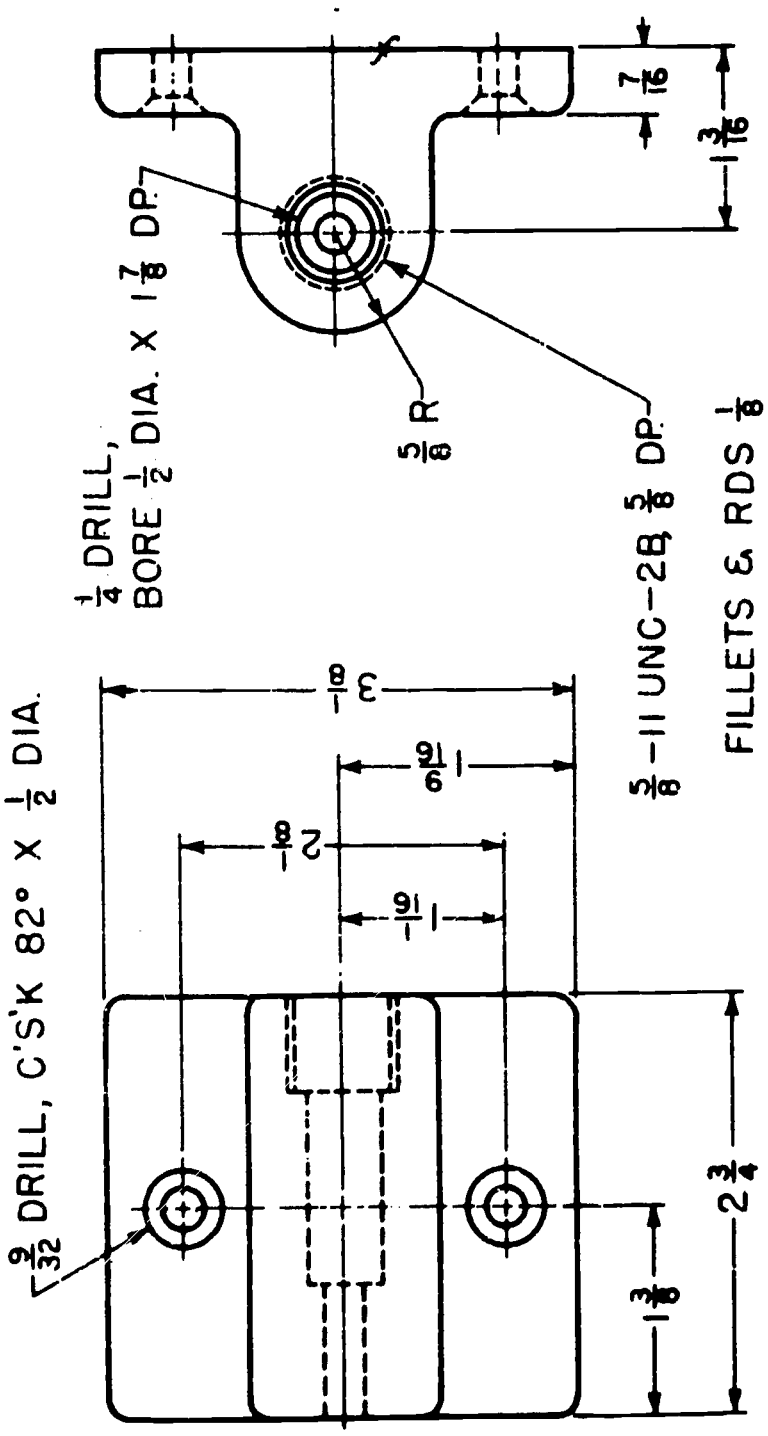
```
$$  PLATE 15          DRAWING AN AUXILIARY VIEW-STRUT ANCHOR
                      ALPHAP/(.2,.2,.2,0);(0,0,0,0)
                      TITLE /6,1.5,@PLATE 15@
                      SCALE /1/2
  FRONT    =          VIEW  /
                      ORIGIN/4.5,2+1+11/16
                      LN    /DX,9/16
  LXX      =          LN    /DY,1+11/16
  PX5      =          PT    /PPP
  P1       =          POINT /9/16,1+11/16-7/16
            CONSTR,LN    /P1,ATANGL,120,TILLY,1+11/16+1+3/8
  P2       =          PT    /PPP
            CONSTR,LN    /(POINT/P2),ATANGL,30,LENGTH,1.875/2
  P3       =          PT    /PPP
                      LN    /.562,1.687,DX,1.687+1.5+1.5
  PX1      =          PT    /PPP
  P4       =          LN    /DY,.562
  P5       =CONSTR,LN    /(POINT/P3),ATANGL,300,TILLY,2.25
                      LN    /(POINT/P4),(POINT/P5)
                      LN    /(POINT/P5),(POINT/P3)
                      LN    /(POINT/P3),ATANGL,210,LENGTH,1.875
  PX       =          PT    /PPP
            CONSTR,LN    /PX,ATANGL,120,LENGTH,3
  P11      =          PT    /PPP
            CONSTR,LN    /P11,ATANGL,300,LENGTH,3
                      LN    /PPP,ATANGL,300,TILLX,0
                      LN    /PPP,ATANGL,270,TILLY,0
            CONSTR,LN      /(PT/P2),ATANGL,210,LENGTH,.562
  PY       =          PT    /PPP
            DASHED,LN    /PPP,ATANGL,300,LENGTH,1.125
  PX2      =          PT    /PPP
            DASHED,LN    /PPP,ATANGL,30,LENGTH,1.125
            DASHED,LN    /PPP,ATANGL,120,LENGTH,1.125
  P6       =CONSTR,LN    /(PT/P2),ATANGL,120,LENGTH,.25
  P7       =CONSTR,LN    /(PT/P1),ATANGL,300,LENGTH,.25
            CTRLN ,LN    /(PT/P7),(PT/P6)
            CTRLN ,LN    /2.25,1.687-.25,DY,1.125
            CTRLN ,LN    /3.75,2.5,DY,-1.125
  PX3      =          PT    /1.875,1.687
            DOTTED,LN    /1.875,1.687,DY,.562
            CONSTR,LN    /DX,2.25
            DOTTED,LN    /DY,-.562
  PX4      =          PT    /PPP
                      END   /FRONT
                      DRAW  /FRONT
                      MASK  /@P,F16@
                      DIMP  /2,.1,2,2
                      DIMST /XLARGE,YCOMP,PX1,(PT/P4),.25
                      DIM   /PX1,(PT/P4)
                      DIMST /XLARGE,YCOMP,LXX
                      DIMNE ,PX5,P2
                      DIMP  /.5,.1,2,2
```

```
                    DIMST /YLARGE,TRUE,PX,P3,.25
                    DIM   /PX,P3
                    DIMP  /2,.1,2,2
                    DIMST /YSMALL,TRUE,PY,PX2,.50
                    DIM   /PY,PX2
TOP      =          VIEW  /
DIST1    =                 DIST((PT/P4),(PT/P5))
P8       =          PT    /-(DIST1+.25),-1.5
                    LN    /P8,DX,DIST1+.25-1.5
                    ARC   /-1.5,0,1.5,270,180
P9       =          LN    /PPP,DX,-(DIST1+.375-1.5)
                    LN    /(PT/P9),DY,-1.125
P10      =          LN    /PPP,ATANGL,30,LENGTH,.125
                    LN    /P8,DY,1.125
                    LN    /PPP,ATANGL,210,LENGTH,.125
                    LN    /PPP,(PT/P10)
L1       =CTRLN ,LN    /-3.625,0,DX,3.875
          CTRLN ,LN    /-3,-1.75,DY,3.5
L2       =CTRLN ,LN    /-1.5,1.75,DY,-3.5
                    LN    /-1.5,-.375,DX,-1.5
                    ARC   /-3,0,.375,270,-180
                    LN    /DX,1.5
                    ARC   /-1.5,0,.375,90,-180
PX6      =          PT    /XLARGE,INTOF,L1,L2
                    END   /TOP
                    ORIGIN/7.125,5.5+1+11/16
                    DRAW  /TOP
                    ALPHAP/(.1,.1,.1,0),(0,.1,0,-5)
                    NOTER /PX6,-1,1.5,@FROM ARC CENTERS IS 1.5@,$
@ARE 3/8, AND DISTANCES@,@    ARCS IN THIS SLOT@
SIDE     =          VIEW  /
                    REFSYS/P11,ATANGL,30
                    LN    /0,0,DX,1+7/8
                    LN    /PPP,DY,3
                    LN    /PPP,DX,-1-7/8
                    LN    /PPP,DY,-3
                    LN    /6/16,9/16,DX,1+1/8
                    LN    /PPP,DY,1+7/8
                    LN    /PPP,DX,-1-1/8
                    LN    /PPP,DY,-1-7/8
                    END   /SIDE
                    ORIGIN/4.5,2+1+11/16
                    DRAW  /SIDE
```



SKETCH 16

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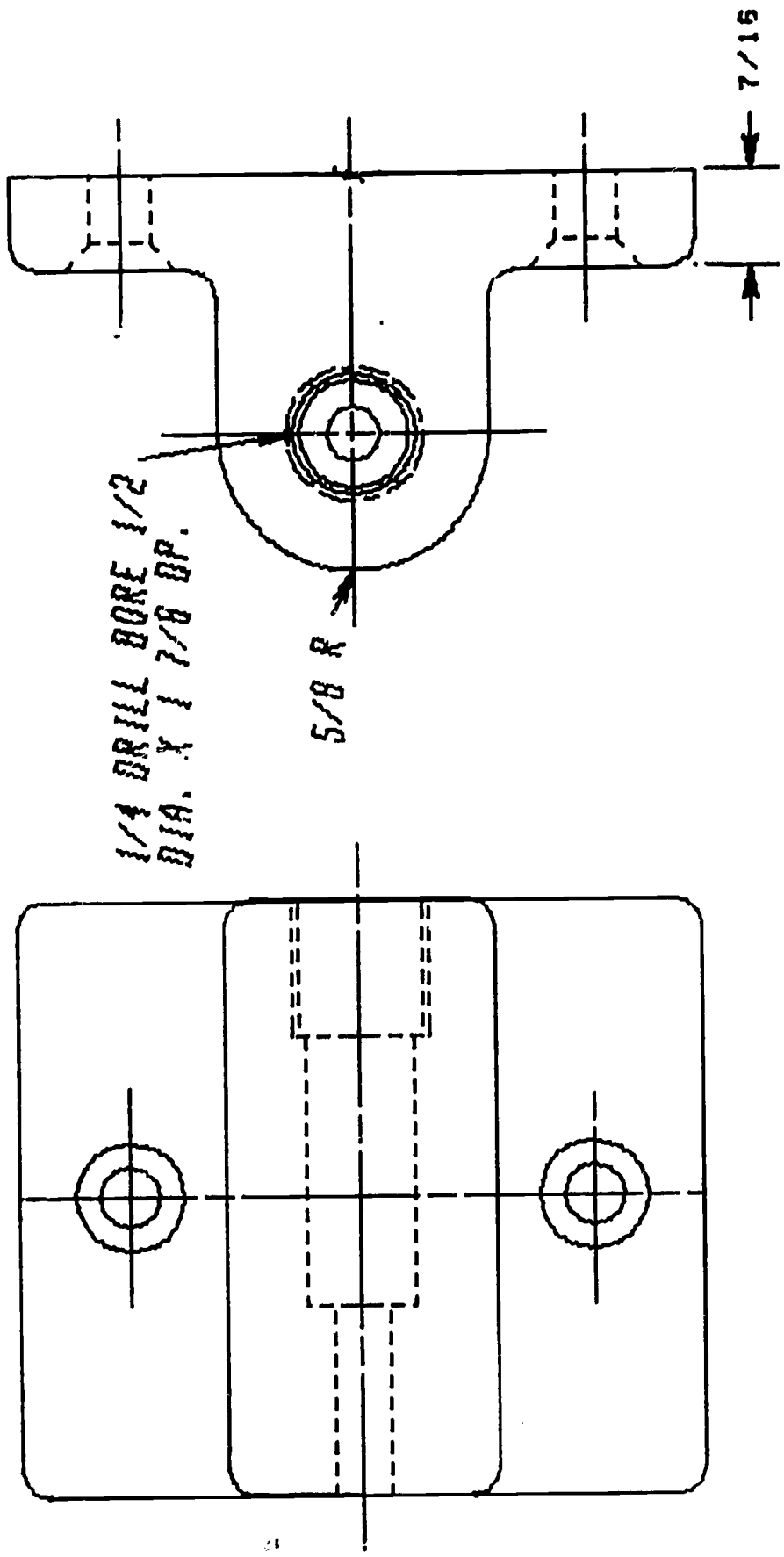

PLATE 16

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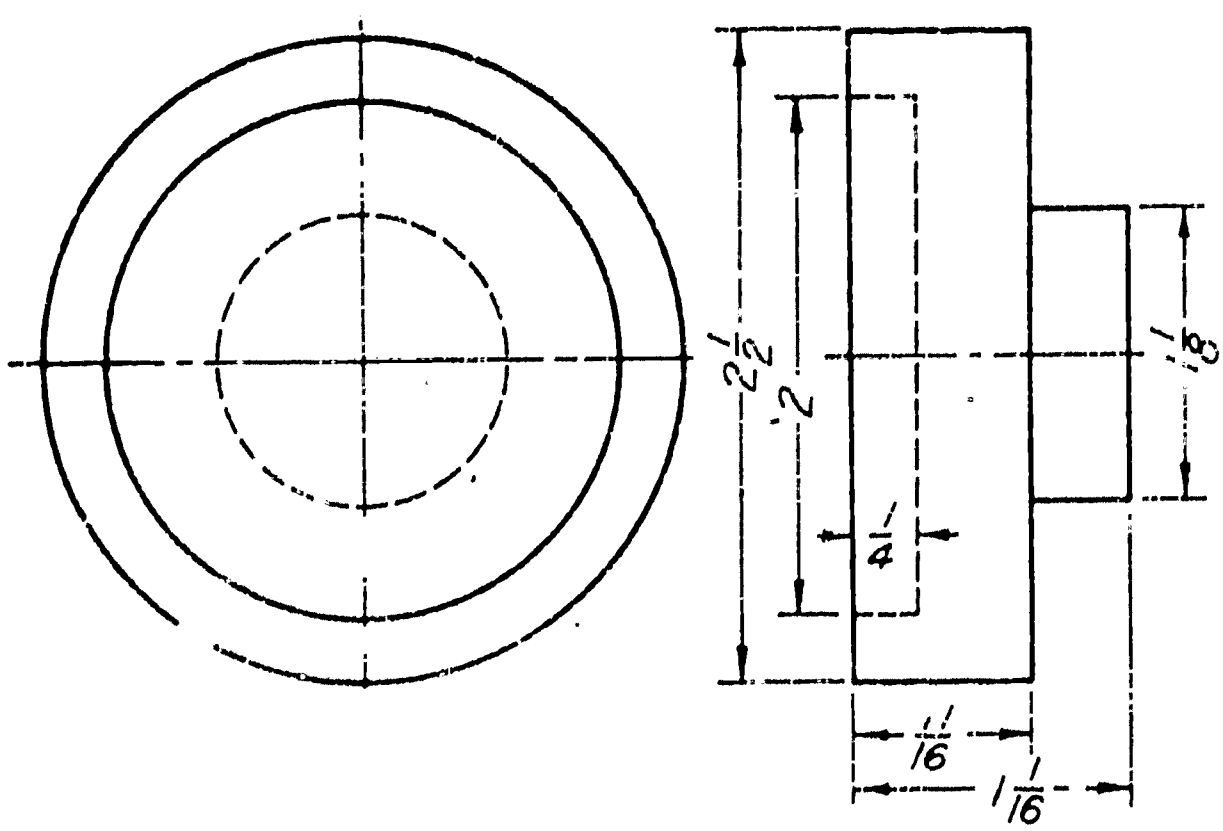
```
                    ***   1967 SUMMER INSTITUTE

$$  PLATE 16          TWO VIEW DRAWING USING FILLETS  (LONG -X-)
  TOP      =         VIEW  /
                     LN    /0,3,DY,-3
                     ARC   /.125
                     LN    /DX,2.75
                     ARC   /.125
                     LN    /DY,3.125
                     ARC   /.125
                     LN    /DX,-2.75
                     ARC   /.125
                     LN    /DY,-.125
                     LN    /0,1.562,DY,.625
                     ARC   /.125
                     LN    /DX,2.75
                     ARC   /.125
                     LN    /DY,-1.25
                     ARC   /.125
                     LN    /DX,-2.75
                     ARC   /.125
                     LN    /DY,.125
             CTRLN ,LN     /-.25,1.562,DX,2.75+.5
  L1        =CTRLN ,LN     /1.375,2.625+.5,DY,-3.125
  L2        =CTRLN ,LN     /1.375-.5,.5,DX,1
  L3        =CTRLN ,LN     /1.375-.5,2.625,DX,1
  P1        =       PT     /INTOF,L1,L2,,P2=PT/INTOF,L1,L3
                    CR     /P1,9/64
                    CR     /P1,.25
                    CR     /P2,9/64
  CO        =       CR     /P2,.25
  PW        =       PT     /YLARGE,INTOF,L1,CO
                    END    /TOP
                    ORIGIN/3,2.188
                    DRAW   /TOP
                    ALPHAP/(.1,.2,.1,0),(0,-.2,0,-15)
                           @ 82$DG$ X 1/2 DIA.@
  HOLE     =DOTTED,VIEW   /
                    LN     /0,.125,DX,2.75-1.875
                    LN     /2.75-1.875,0,DY,.25
                    LN     /DX,1.875-.625
                    LN     /2.75-.625,0,DY,5/16
                    LN     /DX,.625
              CONSTR,LN     /DY,-1/32
                    LN     /DX,-.625
                    END    /HOLE
                    ORIGIN/3,3.75
                    DRAW   /HOLE
                    DRAW   /MIRY(HOLE)
  SIDE      =       VIEW   /
  L4        =CTRLN ,LN     /-(.625+.25),0,DX,.625+1.187+.5
  L5        =CTRLN ,LN     /0,.625+.25,DY,-(.625*2+.5)
  P3        =       PT     /INTOF,L4,L5
                    CR     /P3,.125
```

```
                    CR      /P3,.25
C1          =       CR      /P3,.312-1/32
             DOTTED,CR      /P3,.312
                    ARC     /P3,.625,90,180
                    LN      /DX,1.187-.437
                    ARC     /.125
                    LN      /DY,-(1.562-.625)
P6          =       PT      /PPP
                    ARC     /.125
                    LN      /DX,.437
P7          =       PT      /PPP
                    LN      /DY,3.125/2
PFN         =       PT      /PPP,,PX=PT/YLARGE,INTOF,L5,C1
                    LN      /PFN,DY,3.125/2
                    LN      /DX,-.437
                    ARC     /.125
                    LN      /DY,-(1.562-.625)
                    ARC     /.125
                    LN      /DX,-(1.187-.437)
                    END     /SIDE
                    ORIGIN/7.875,3.75
                    DRAW    /SIDE
                    NOTER   /PX,-.125,.75,@1/4 DRILL BORE 1/2@,$
                             @DIA. X 1 7/8 DP.@
                    NOTER   /-5/8,0,-.25,.125,@5/8 R@
                    NOTE    /PFN,@$FN$@
                    MASK    /@P,F16@
                    DIMP    /2,.1,2,2
                    DIMST   /YSMALL,XCOMP,P6,P7,.25
                    DIM     /P6,P7
CSINK       =DOTTED,VIEW    /
             CTRLN ,LN      /1.187-(.437+.25),1.062,DX,.437+.5
P5          =       LN      /1.187-.437,1.062+.25,ATANGL,139,$
                             TILLY,1.062+9/64
                    LN      /PPP,ATANGL,0,TILLX,1.187
                    LN      /1.187-.437,1.062-.25,ATANGL,221,$
                             TILLY,1.062-9/64
                    LN      /PPP,ATANGL,0,TILLX,1.187
                    LN      /(POINT/P5),DY,-9/32
                    END     /CSINK
                    ORIGIN/7.875,3.75
                    DRAW    /CSINK
                    DRAW    /MIRY(CSINK)
                    FINI    /
```



SKETCH 17

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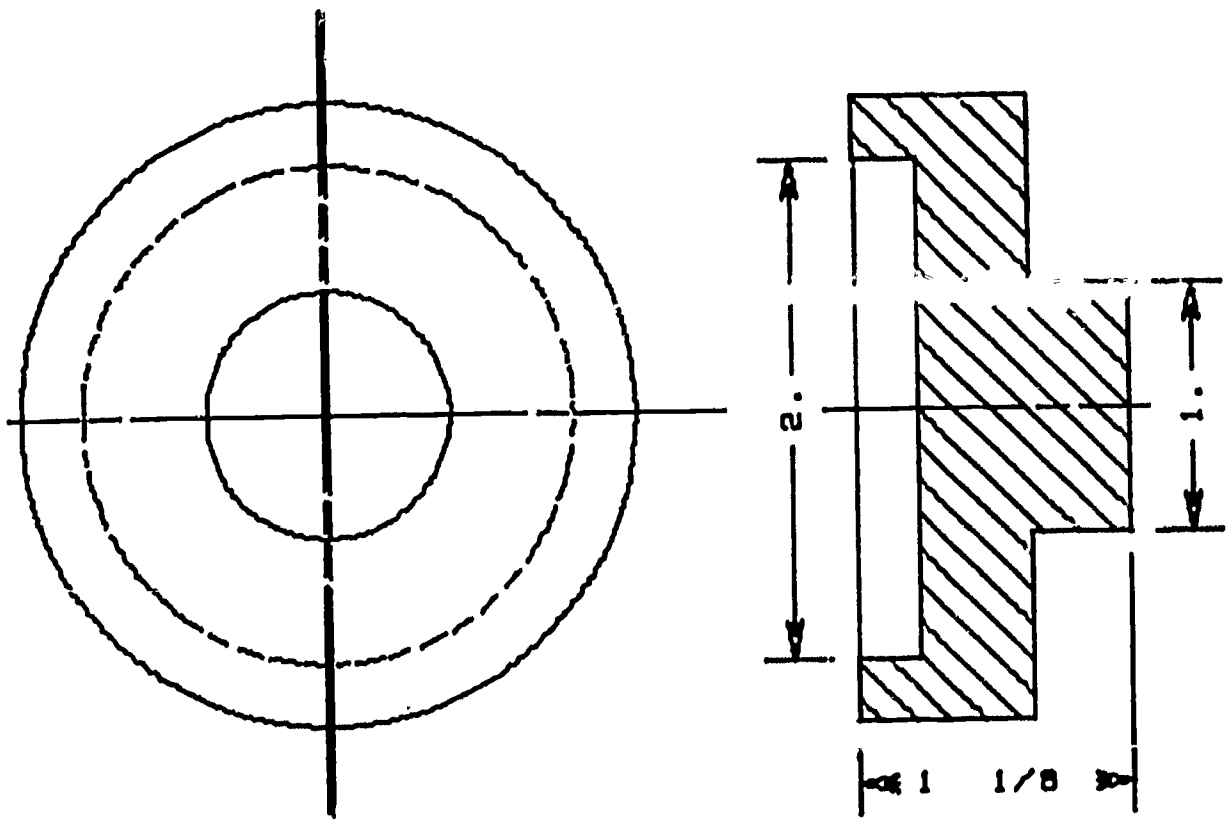

PLATE 17

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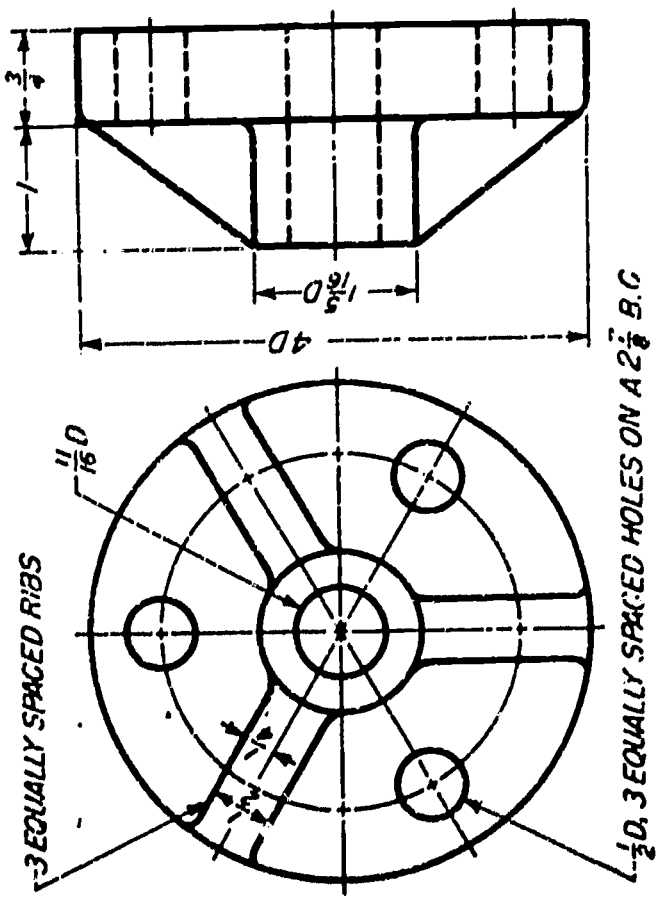
```
$$  PLATE 17          INTODUCTION TO CROSS HATCHING
  V1TOP    =          VIEW  /
                      ORIGIN/3.75,5.875
             CUTPL ,LINE  /0,-1.6,DY,3.2
             CTRLN ,LINE  /0,0,DX,-1.3
             CTRLN ,LINE  /0,0,DX,1.6
             CTRLN ,LINE  /2,0,DX,1.3
                    CIRCLE/0,0,.5
             DOTTED,CIRCLE/0,0,1
                    CIRCLE/0,0,1.25
                    END   /V1TOP
                    DRAW  /V1TOP
  V1SEC      =       VIEW  /
  P1         =       PT    /2.125,1
                     LINE  /P1 ,DY,.25
  P2         =       PT    /PPP
                     LINE  /PPP,DX,.7
  P3         =       PT    /PPP
                     LINE  /PPP,DY,-.75
                     LINE  /PPP,DX,.4
  P4         =       PT    /PPP
  L1         =       LINE  /PPP,DY,-1
  P5         =       PT    /PPP
                     LINE  /PPP,DX,-.4
                     LINE  /PPP,DY,-.75
  P6         =       PT    /PPP
  L3         =       LINE  /PPP,DX,-.7
  P7         =       PT    /PPP
                     LINE  /PPP,DY,.25
  P8         =       PT    /PPP
                     LINE  /PPP,DX,.25
  P9         =       PT    /PPP
                     LINE  /PPP,DY,2
  P10        =       PT    /PPP
  L4         =       LINE  /PPP,P1
                     END   /V1SEC
                     DRAW  /V1SEC
                     HATCHP/135,.1,0,0
                     HATCH /V1SEC
                     MASK  /@PF08TN@
                     DIMST /XLARGE,YCOMP,L1,.25
                     DIMP  /.5,.1,1,1
                     DIM   /P5,P4
                     MASK  /@PF00TN@
                     DIMST /XSMALL,YCOMP,P1,P8,.25
                     DIM   /P1,P8
                     MASK  /@PF16TN@
                     DIMST /YSMALL,XCOMP,L3,.25
                     DIMP  /L3
                     DIMP  /.5,.1,1,1
                     DIM   /P7,P5
   V         =       VIEW  /
```

```
LINE   /P1,DY,-2
END    /V
DRAW   /V
FINI   /
```



SKETCH 18

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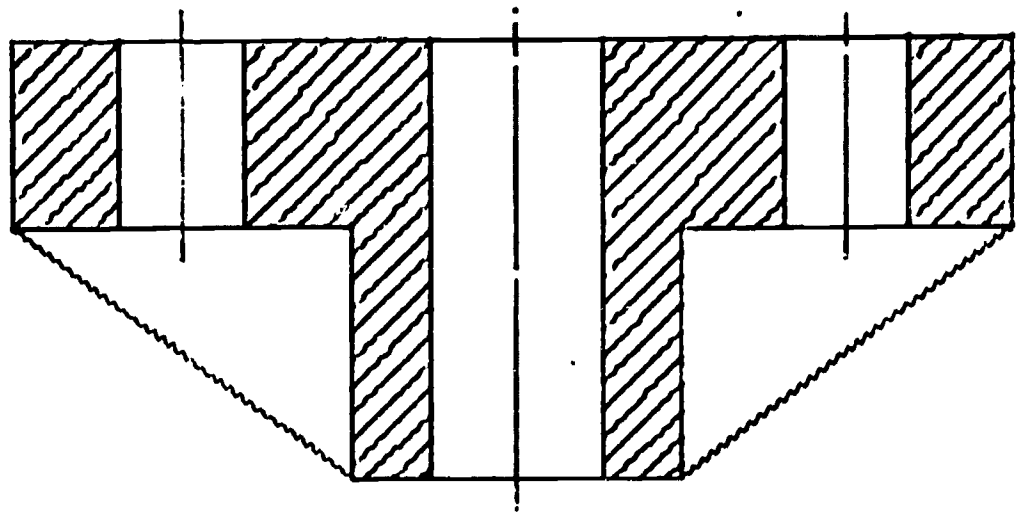

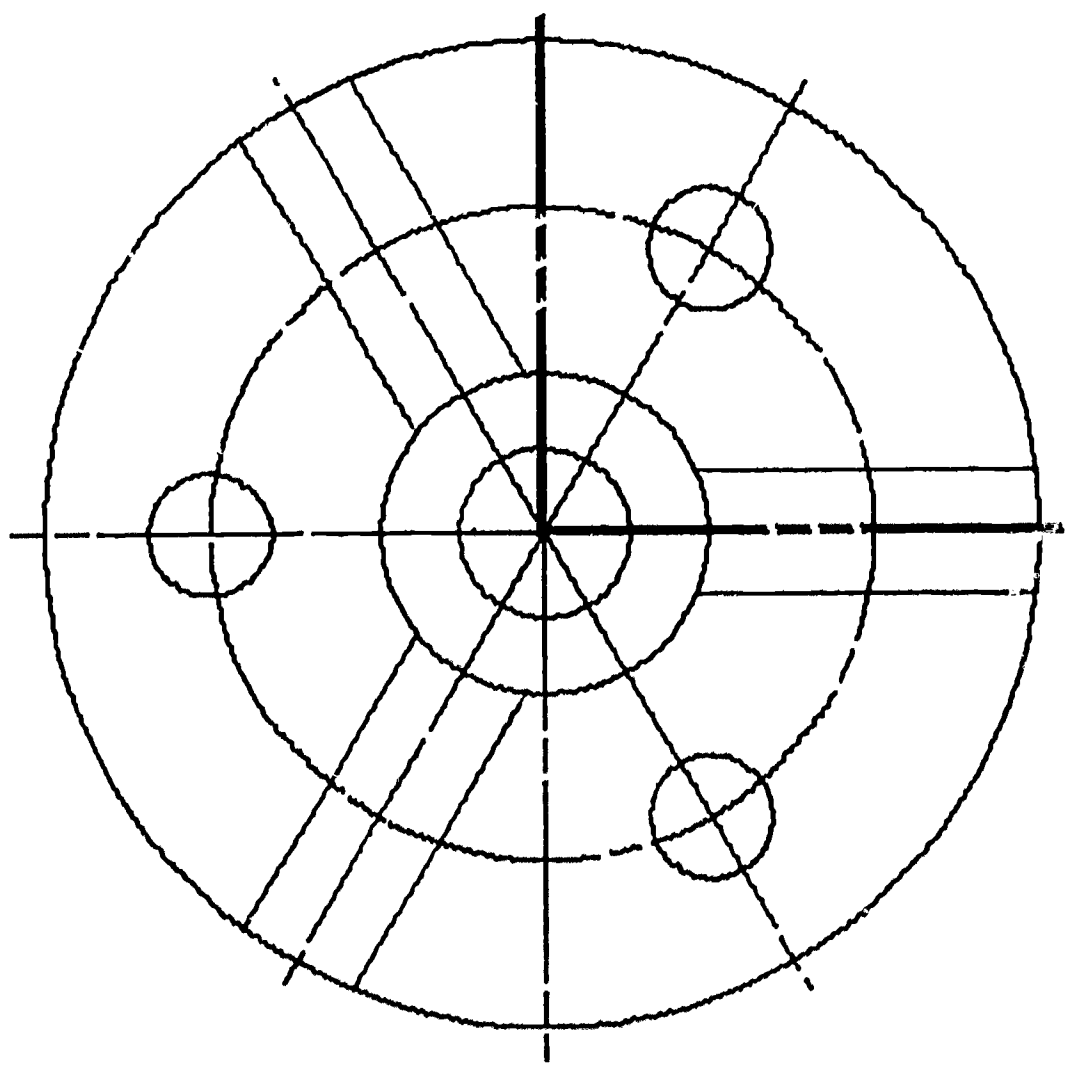

PLATE 18

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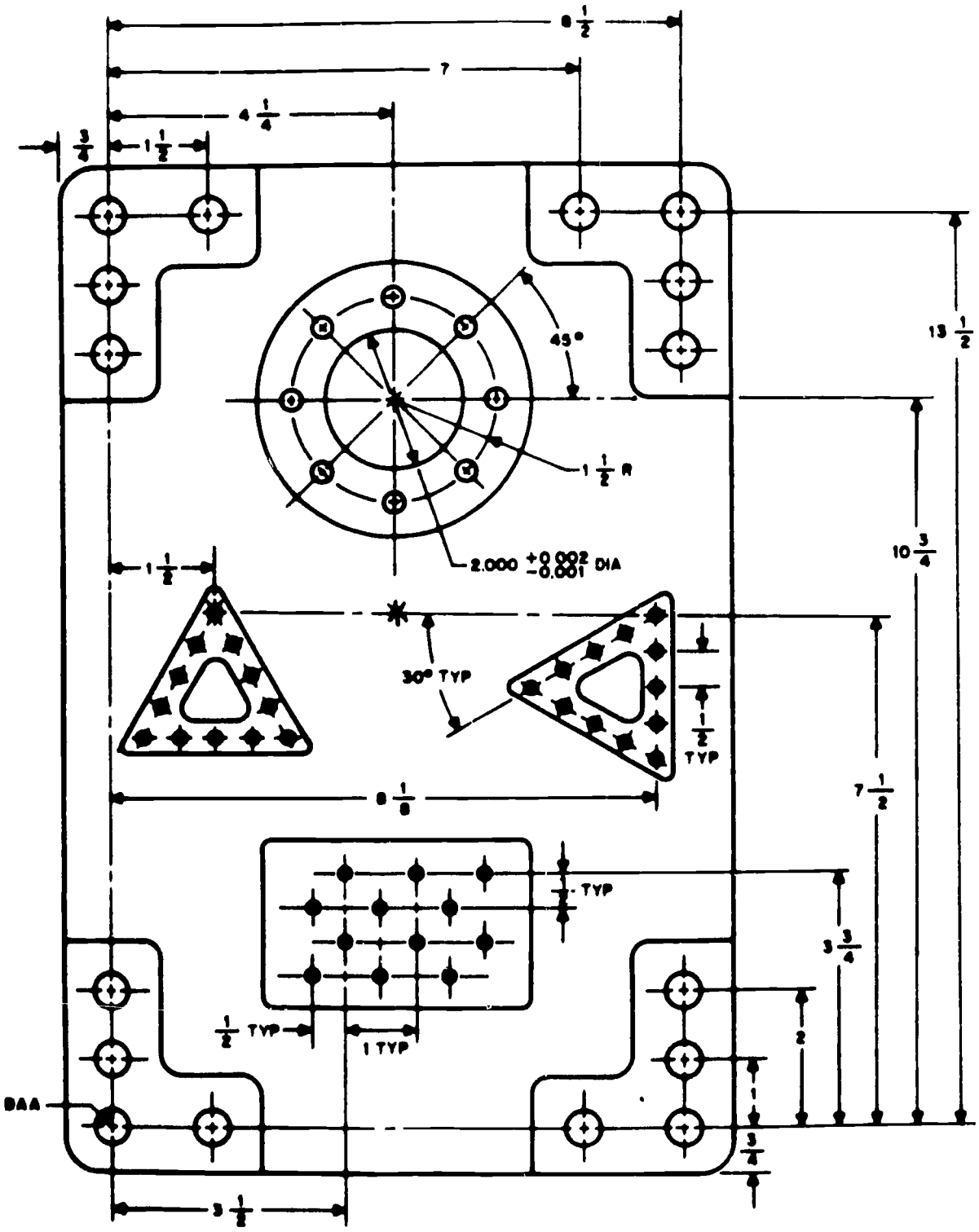
```
$$  PLATE 18                    HATCHING A SHAFT GUIDE     (LONG -X-)
                          ALPHAP/(.2,.2,0,-.2),(0,0,0,270)
                          TITLE /1.5,2.5,@PLATE 18@
  SHAFT     =             VIEW  /
                          ORIGIN/4.25,3.75
  C1        =             CR    /0,0,11/32
  C2        =             CR    /0,0,21/32
  C3        =             CR    /0,0,2
  C4        =CTRLN ,CR    /0,0,1+21/64
  CNTERY    =CUTPL ,LN    /0,0,ATANGL,270,LENGTH,2.125
  LNR       =CONSTR,LN    /XLARGE,PARLEL,CNTERY,.25
  LNL       =CONSTR,LN    /XSMALL,PARLEL,CNTERY,.25
  PRR1      =             PT    /YSMALL,INTOF,LNR,C2
  PRR2      =             PT    /YSMALL,INTOF,LNR,C3
  PRL1      =             PT    /YSMALL,INTOF,LNL,C2
  PRL2      =             PT    /YSMALL,INTOF,LNL,C3
                          LN    /PRR1,PRR2
                          LN    /PRL2,PRL1
                          LOOPST/
  N=30
1)CNTER1    =CTRLN ,LN    /0,0,ATANGL,N,LENGTH,2.125
  LNRIGT    =CONSTR,LN    /XLARGE,PARLEL,CNTER1,.25
  PRGT1     =             PT    /YLARGE,INTOF,LNRIGT,C2
  PRGT2     =             PT    /YLARGE,INTOF,LNRIGT,C3
                          LN    /PRGT1,PRGT2
  N=N+120
  IF(N-150)1,1,2
  2)                      LOOPND/
                          LOOPST/
  N=30
1)CNTERX    =CONSTR,LN    /0,0,ATANGL,N,LENGTH,2.125
  LNLEFT    =CONSTR,LN    /XSMALL,PARLEL,CNTERX,.25
  PLFT1     =             PT    /YLARGE,INTOF,LNLEFT,C2
  PLFT2     =             PT    /YLARGE,INTOF,LNLEFT,C3
                          LN    /PLFT1,PLFT2
  N=N+120
  IF(N-150)1,1,2
  2)                      LOOPND/
                          LOOPST/
  N=210
1)L3        =CTRLN ,LN    /0,0,ATANGL,N,LENGTH,2.125
  P5        =             PT    /YSMALL,INTOF,L3,C4
                          CR    /P5,.25
  N=N+120
  IF(N-330)1,1,2
  2)                      LOOPND/
  LX4       =CTRLN ,LN    /0,0,ATANGL,90,LENGTH,2.125
  PX6       =             PT    /YLARGE,INTOF,LX4,C4
                          CR    /PX6,.25
            CTRLN ,LN     /0,0,DX,-2.125
            CUTPL ,LN     /0,0,DX,2.125
                          END   /SHAFT
```

```
                    DRAW   /SHAFT
SHAFT1   =          VIEW   /
                    LN     /3.5,21/32,DY,-21/16
P1       =          PT     /PPP
                    LN     /PPP,DX,1
P2       =          PT     /PPP
                    LN     /PPP,DY,-(2-21/32)
P3       =          PT     /PPP
                    LN     /PPP,DX,3/4
P4       =          PT     /PPP
                    LN     /PPP,DY,4
P5       =          PT     /PPP
                    LN     /PPP,DX,-3/4
P6       =          PT     /PPP
                    LN     /PPP,DY,-(2-21/32)
P7       =          PT     /PPP
                    LN     /PPP,DX,-1
P8       =          PT     /PPP
P9       =          PT     /3.5,11/32
                    LN     /P9,DX,1.75
P10      =          PT     /PPP
          CONSTR,LN        /PPP,DY,-11/16
P11      =          PT     /PPP
                    LN     /P11,DX,-1.75
P12      =          PT     /PPP
                    LN     /P1,P3
P13      =          PT     /4.5,-(1.75-43/64)
                    LN     /P13,DX,.75
P14      =          PT     /PPP
          CONSTR,LN        /P14,DY,-.5
P15      =          PT     /PPP
                    LN     /P15,DX,-.75
P16      =          PT     /PPP
P17      =          PT     /4.5,(1.75-43/64)
                    LN     /P17,DX,.75
P18      =          PT     /PPP
          CONSTR,LN        /P18,DY,.5
P19      =          PT     /PPP
                    LN     /P19,DX,-.75
P20      =          PT     /PPP
                    LN     /P6,P8
          CTRLN ,LN        /3.375,0,DX,2.0
          CTRLN ,LN        /4.375,-(2-43/64),DX,1.0
          CTRLN ,LN        /4.375,(2-43/64),DX,1.0
                    END    /SHAFT1
                    DRAW   /SHAFT1
SHAFT2   =          VIEW   /
          CONSTR,LN        /P15,P16
          CONSTR,LN        /P16,P3
          CONSTR,LN        /P3,P4
          CONSTR,LN        /P4,P15
          CONSTR,LN        /P10,P18
          CONSTR,LN        /P18,P17
          CONSTR,LN        /P17,P7
          CONSTR,LN        /P7,P8
```

```
            CONSTR,LN     /P8,P9
            CONSTR,LN     /P9,P10
                   END    /SHAFT2
                   DRAW   /SHAFT2
                   HATCHP/135,.075,0,0
                   HATCH  /SHAFT2
SHAFT3   =         VIEW   /
            CONSTR,LN     /P20,P19
            CONSTR,LN     /P19,P5
            CONSTR,LN     /P5,P6
            CONSTR,LN     /P6,P20
            CONSTR,LN     /P12,P11
            CONSTR,LN     /P11,P14
            CONSTR,LN     /P14,P13
            CONSTR,LN     /P13,P2
            CONSTR,LN     /P2,P1
            CONSTR,LN     /P1,P12
                   END    /SHAFT3
                   DRAW   /SHAFT3
                   HATCHP/135,.075,0,0
                   HATCH  /SHAFT3
                   FINI   /
```



SKETCH 19

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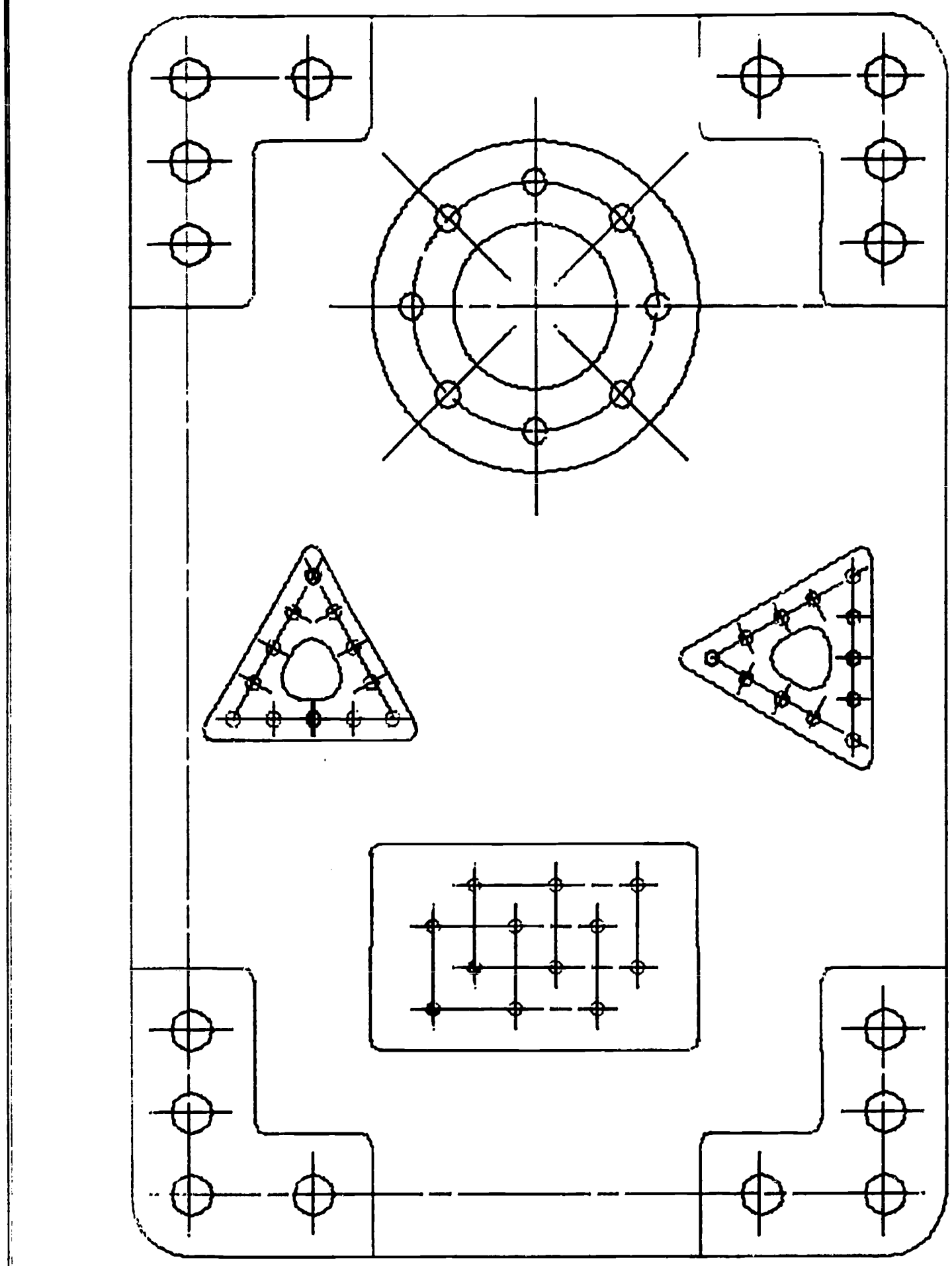

PLATE 19

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MIAMI-DADE JUNIOR COLLEGE

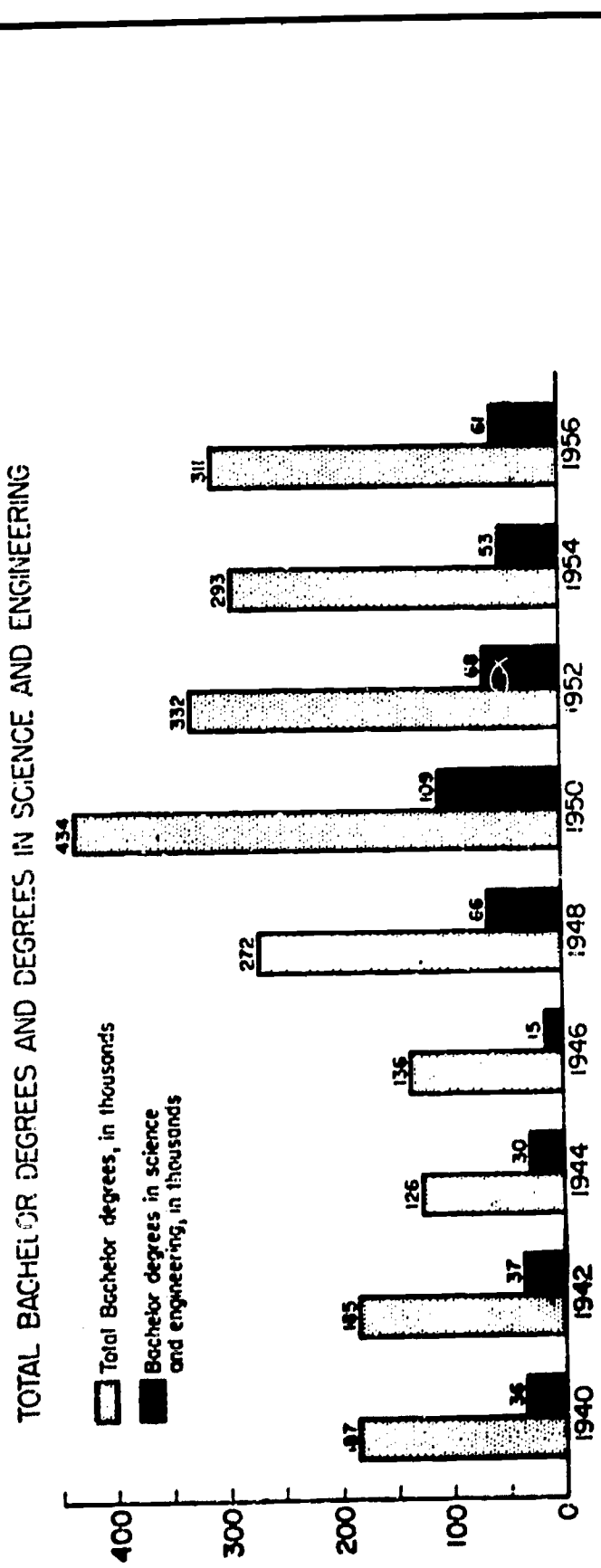
```
                    *****  1967 SUMMER INSTITUTE

$$  PLATE 19                MOUNTING PLATE
                    ALPHAP/(.2,.2,.2,0),(0,0,0,0)
                    TITLE /6,1.5,@PLATE 19@
                    SCALE /.5
  FRAMEX  =         VIEW  /
                    LINE  /01,0,DX,9
                    ARC   /0.75
                    LINE  /DY,15
                    ARC   /0.75
                    LINE  /DX,-10
                    ARC   /0.75
                    LINE  /DY,-15
                    ARC   /0.75
                    LINE  /DX,1
                    END   /FRAMEX
                    ORIGIN/2.25,2.125
                    DRAW  /FRAMEX
  CORNER  =         VIEW  /
                    LINE  /2,7.5,DY,-1.50
                    ARC   /5/32
                    LINE  /DX,1.5
                    ARC   /5/32
                    LINE  /DY,-2
                    ARC   /5/32
                    LINE  /DX,1.5
                    END   /CORNER
                    ORIGIN/4.75,5.875
                    DRAW  /CORNER
                    DRAW  /MIRX(CORNER)
                    DRAW  /MIRY(CORNER)
                    DRAW  /MIRXY(CORNER)
CHOLE    =CTRLN ,VIEW  /
                    LINE  /0,-.5,DY,14.5
                    LINE  /-.5,13.5,DX,2.5
                    LINE  /7-1/2,13.5,DX,2.5
                    LINE  /9,12.5,DX,-1
                    LN    /1/2,12.5,DX,-1
                    LN    /-1/2,11.5,DX,1
                    LN    /8,11.5,DX,1
                    LN    /9,2,DX,-1
                    LN    /1/2,2,DX,-1
                    LN    /-1/2,1,DX,1
                    LN    /8,1,DX,1
                    LN    /9,0,DX,-9.5
                    LN    /1.5,-1/2,DY,1
                    LN    /7,1/2,DY,-1
                    LN    /8.5,-1/2,DY,3
                    LN    /8.5,11,DY,3
                    LN    /7,14,DY,-1
                    LN    /1.5,13,DY,1
                    END   /CHOLE
                    ORIGIN/2.615,2.5
```

```
                    DRAW   /CHOLE
SMLCIR   =          VIEW   /
                    ORIGIN/4.75,5.875
                    CIRCLE/4.25,6.75,.25
                    CIRCLE/4.25,5.75,.25
                    CIRCLE/4.25,4.75,.25
                    CIRCLE/2.75,6.75,.25
                    END    /SMLCIR
                    DRAW   /SMLCIR
                    DRAW   /MIRX(SMLCIR)
                    DRAW   /MIRY(SMLCIR)
                    DRAW   /MIRXY(SMLCIR)
LGCIR    =          VIEW   /
                    ORIGIN/4.75,7.875
                    CIRCLE/0,0,1.
                    CIRCLE/0,0,2.
  C1     =CTRLN ,CIRCLE/0,0,1.5
          CTRLN ,LN     /0,-2.5,DY,5.
          CTRLN ,LN     /-2.5,0,DX,6.
                    END    /LGCIR
                    DRAW   /LGCIR
LGCIRL   =          VIEW   /
                    ORIGIN/4.75,7.875
  L1     =CTRLN ,LN     /.25,.25,ATANGL,45,LENGTH,2.25
                    END    /LGCIRL
                    DRAW   /LGCIRL
                    DRAW   /MIRX(LGCIRL)
                    DRAW   /MIRY(LGCIRL)
                    DRAW   /MIRXY(LGCIRL)
CIRMIR=             VIEW   /
                    ORIGIN/4.75,7.875
                    CIRCLE/(POINT/XLARGE,INTOF,L1,C1),.3125/2
                    END    /CIRMIR
                    DRAW   /CIRMIR
                    DRAW   /MIRX(CIRMIR)
                    DRAW   /MIRY(CIRMIR)
                    DRAW   /MIRXY(CIRMIR)
CIRTOP=             VIEW   /
                    ORIGIN/3.75,7.875
                    CIRCLE/2,1.5,.3125/2
                    END    /CIRTOP
                    DRAW   /CIRTOP
                    DRAW   /MIRY(CIRTOP)
CIRSID=             VIEW   /
                    ORIGIN/4.75,6.875
                    CIRCLE/1.5,2,.3125/2
                    END    /CIRSID
                    DRAW   /CIRSID
                    DRAW   /MIRX(CIRSID)
BOX      =          VIEW   /
                    ORIGIN/2.615,2.5
                    LN     /2.375,1.750,DX,3.875
                    ARC    /.125
                    LN     /DY,2.5
                    ARC    /.125
```

```
                LN      /DX,-4.
                ARC     /.125
                LN      /DY,-2.5
                ARC     /.125
                LN      /DX,.125
        CTRLN ,LN       /2.75,2.25,DX,2.5
        CTRLN ,LN       /2.75,3.25,DX,2.5
        CTRLN ,LN       /3.25,2.75,DX,2.5
        CTRLN ,LN       /3.25,3.75,DX,2.5
                END     /BOX
                DRAW    /BOX
BOXCIR=         VIEW    /
                ORIGIN/3.75,4.125
                CIRCLE/1.25,.5,.152/2
                CIRCLE/2.25,.5,.152/2
                CIRCLE/3.25,.5,.152/2
                LN      /1.25,.75,DY,-.75
                LN      /2.25,.75,DY,-.75
                LN      /3.25,.75,DY,-.75
                END     /BOXCIR
                DRAW    /BOXCIR
                DRAW    /MIRY(BOXCIR)
BIXSIR=         VIEW    /
                ORIGIN/3.75,3.875
                CIRCLE/.75,.5,.152/2
                CIRCLE/1.75,.5,.152/2
                CIRCLE/2.75,.5,.152/2
                LN      /.75,.75,DY,-.75
                LN      /1.75,.75,DY,-.75
                LN      /2.75,.75,DY,-.75
                END     /BIXSIR
                DRAW    /BIXSIR
                DRAW    /MIRY(BIXSIR)
LFTRI =         VIEW    /
                ORIGIN/3.375,5.3845
L2      =CTRLN ,LN      /0,0,DX,1.2
L3      =CTRLN ,LN      /1,0,ATANGL,120,TILLX,-.173
         CONSTR,LN      /1,0,ATANGL,320,TILLY,-.1
                LN      /0,-.2,DY,.4
                LN      /.5,-.2,DY,.4
                CR      /0,0,.164/2
                CR      /.5,0,.164/2
                CR      /1,0,.164/2
L4      =CONSTR,LN      /-.5,0,ATANGL,60,TILLY,7.5
L5      =CONSTR,LN      /0,0,ATANGL,60,TILLY,7.5
L6      =CONSTR,LN      /.5,0,ATANGL,60,TILLY,7.5
                CR      /(POINT/XLARGE,INTOF,L3,L4),.164/2
                CR      /(POINT/XLARGE,INTOF,L3,L5),.164/2
                CR      /(POINT/XLARGE,INTOF,L3,L6),.164/2
                CR      /0,SQRT(3),.164/2
         CONSTR,LN      /(POINT/XLARGE,INTOF,L3,L4),ATANGL,$
                         30,TILLX,.423
                LN      /PPP,ATANGL,210,TILLX,.047
         CONSTR,LN      /(POINT/XLARGE,INTOF,L3,L5),ATANGL,$
                         30,TILLX,.673
```

```
                    LN      /PPP,ATANGL,210,TILLX,.327
              CONSTR,LN     /(POINT/XLARGE,INTOF,L3,L6),ATANGL,$
                             30,TILLX,.923
                    LN      /PPP,ATANGL,210,TILLX,.547
                    END     /LFTRI
                    DRAW    /LFTRI
                    DRAW    /MIRX(LFTRI)
LFFIN=              VIEW    /
                    ORIGIN/2.615,2.5
                    LN      /.5,5.517,DX,2.4325
                    ARC     /.125
                    LN      /PPP,ATANGL,120,TILLX,1.5
                    ARC     /.125
                    LN      /PPP,ATANGL,240,TILLY,5.517
                    ARC     /.125
                    LN      /DX,.55
                    LN      /1.333,6.017,DX,.7345
                    ARC     /.25
                    LN      /PPP,ATANGL,120,TILLX,1.5
                    ARC     /.25
                    LN      /PPP,ATANGL,240,TILLY,6.017
                    ARC     /.25
                    LN      /DX,.4005
                    END     /LFFIN
                    DRAW    /LFFIN
RGTRI =             VIEW    /
                    ORIGIN/5.82135,5.75
L7      =CTRLN      ,LN     /0,0,ATANGL,30,TILLY,1.1
L8      =CTRLN      ,LN     /SQRT(3),1.2,DY,-1.2
                    CR      /0,0,.082
L9      =           LN      /.3325,.423,ATANGL,300,TILLX,.5325
                    CR      /(POINT/XLARGE,INTOF,L7,L9),.082
L10     =           LN      /.765,.673,ATANGL,300,TILLX,.965
                    CR      /(POINT/XLARGE,INTOF,L7,L10),.082
L11     =           LN      /1.1975,.823,ATANGL,300,TILLX,1.3975
                    CR      /(POINT/XLARGE,INTOF,L7,L11),.082
                    CR      /(POINT/XLARGE,INTOF,L7,L8),.082
L12     =           LN      /SQRT(3)-.2,.5,DX,.4
                    CR      /(POINT/XLARGE,INTOF,L8,L12),.082
L13     =           LN      /SQRT(3)-.2,0,DX,.4
                    CR      /(POINT/XLARGE,INTOF,L8,L13),.082
                    END     /RGTRI
                    DRAW    /RGTRI
                    DRAW    /MIRY(RGTRI)
RGFIN =             VIEW    /
                    ORIGIN/2.615,2.5
                    LN      /6.3927,6.5+.25/SIND(60),ATANGL,30,$
                             TILLX,8.375
                    ARC     /.125
                    LN      /DY,-2.865
                    ARC     /.125
                    LN      /PPP,ATANGL,150,TILLY,6.5
                    ARC     /.125
                    LN      /PPP,ATANGL,30,TILLX,6.3927
                    LN      /7.25,.3575*SIND(30)/COSD(30)+6.5,$
```

```
          ATANGL,30,TILLX,7.875
ARC       /.25
LN        /PPP,ATANGL,270,TILLY,$
          .25*COSD(30)/SIND(30)+5.5
ARC       /.25
LN        /PPP,ATANGL,150,TILLX,6.8927
ARC       /.25
LN        /PPP,ATANGL,30,TILLX,7.2500
END       /RGFIN
DRAW      /RGFIN
FINI/
```



SKETCH 20

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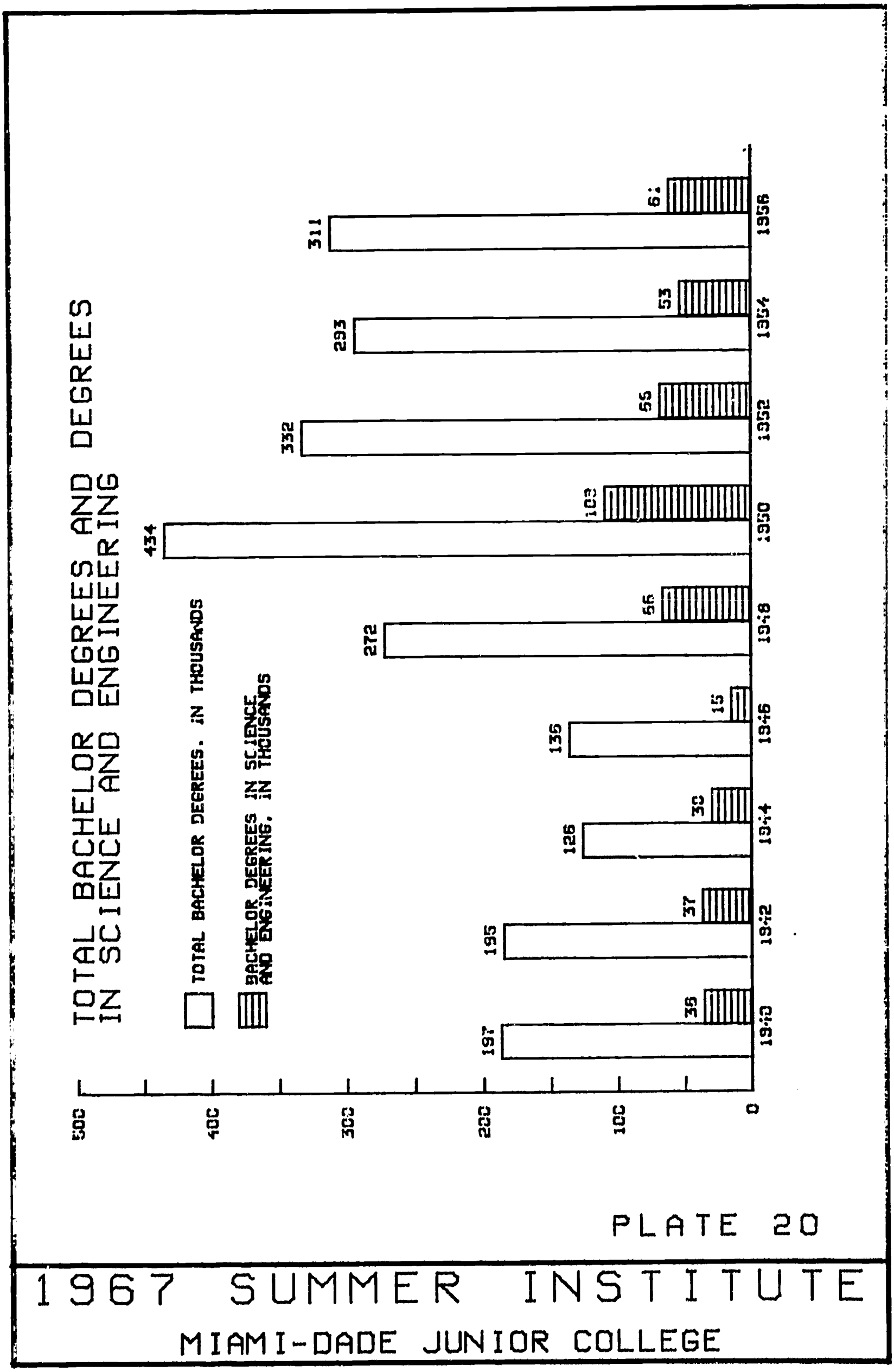

PLATE 20

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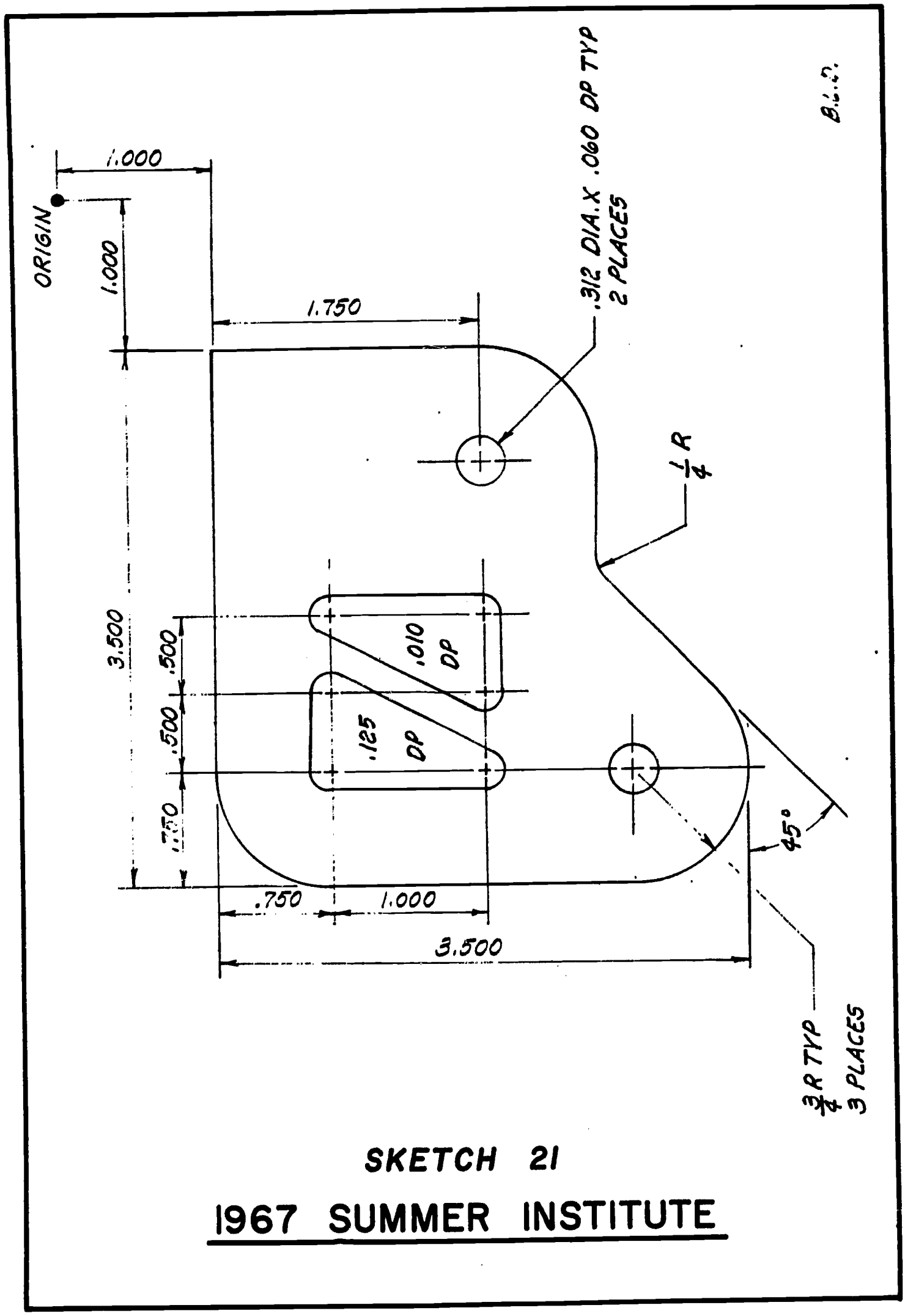
```
$$PLATE 20          BAR GRAPH USING TWO MACROS
CALL/REFAX,,XLEN=7,,YLEN=5,,XUN=0,,YUN=.5,,OR=PT/2.5,1.5
ALPHAP/(.2,.2,.16,0),(0,-.2,0,0)
NOTE/.55,4.95,@TOTAL BACHELOR DEGREES AND DEGREES@,$
@IN SCIENCE AND ENGINEERING@
CALL/RECT,,X=.25,,Y=1.87,,ORX=.375,,OPT=0,,F=.1,,N=3,,LIT=@187@
CALL/RECT,,Y=1.85,,ORX=1.125,,LIT=@185@
CALL/RECT,,Y=1.26,,ORX=1.875,,LIT=@126@
CALL/RECT,,Y=1.36,,ORX=2.625,,LIT=@136@
CALL/RECT,,Y=2.72,,ORX=3.375,,LIT=@272@
CALL/RECT,,Y=4.34,,ORX=4.125,,LIT=@434@
CALL/RECT,,Y=3.32,,ORX=4.875,,LIT=@332@
CALL/RECT,,Y=2.93,,ORX=5.625,,LIT=@293@
CALL/RECT,,Y=3.11,,ORX=6.375,,LIT=@311@
CALL/RECT,,Y=.61,,ORX=6.625,,OPT=1,,N=2,,LIT=@61@
CALL/RECT,,Y=.53,,ORX=5.875,,LIT=@53@
CALL/RECT,,Y=.68,,ORX=5.125,,LIT=@68@
CALL/RECT,,Y=1.09,,ORX=4.375,,N=3,,LIT=@109@
CALL/RECT,,Y=.66,,ORX=3.625,,N=2,,LIT=@66@
CALL/RECT,,Y=.15,,ORX=2.875,,LIT=@15@
CALL/RECT,,Y=.3,,ORX=2.125,,LIT=@30@
CALL/RECT,,Y=.37,,ORX=1.375,,LIT=@37@
CALL/RECT,,Y=.36,,ORX=.625,,LIT=@36@
ALPHAP/(.1,.1,.08,0),(0,0,0,0)
NOTE/-.3,0,@  0@
NOTE/-.3,1,@100@
NOTE/-.3,2,@200@
NOTE/-.3,3,@300@
NOTE/-.3,4,@400@
NOTE/-.3,5,@500@
NOTE/.35,-.1,@1940@
NOTE/1.1,-.1,@1942@
NOTE/1.85,-.1,@1944@
NOTE/2.6,-.1,@1946@
NOTE/3.35,-.1,@1948@
NOTE/4.1,-.1,@1950@
NOTE/4.85,-.1,@1952
NOTE/5.6,-.1,@1954@
NOTE/6.35,-.1,@1956@
ORIGIN/2.5,5.1
CALL/RECT,,Y=.2,,ORX=.625,,N=0
ALPHAP/(.1,.1,.08,0),(0,-.1,0,0)
NOTE/.85,.1,@BACHELOR DEGREES IN SCIENCE@,$
@AND ENGINEERING, IN THOUSANDS@
ORIGIN/2.5,5.5
CALL/RECT,,OPT=0
NOTE/.85,.1,@TOTAL BACHELOR DEGREES, IN THOUSANDS@
FINI/
```

```
REFAX=MACRO/XLEN,YLEN,XUN,YUN
DEFPT/OR
XYZ=VIEW/
ORIGIN/OR
XNOTCH=0
YNOTCH=0
LN/DY,YLEN
LN/DY,-YLEN
LN/DX,XLEN
LN/DX,-XLEN
LOOPST/
IF(YUN)2,2,1
1) YNOTCH=YNOTCH+YUN
LN/0,YNOTCH,DX,YUN/5
IF(YNOTCH-YLEN)1,2,2
2) IF(XUN)4,4,3
3) XNOTCH=XNOTCH+XUN
LN/XNOTCH,0,DY,-XUN/5
IF(XNOTCH-XLEN)3,4,4
4) LOOPND
END/XYZ
DRAW/XYZ
TERMAC/
```

```
RECT=MACRO/ORX,X,Y,OPT,N,F
DEFLT/LIT
ABC=VIEW/
REFSYS/ORX-X/2,0
LN/DY,Y
LN/,DX,X
LN/DY,-Y
LN/DX,-X
END/ABC
DRAW/ABC
ALPHAP/(F,F,.8*F,0),(0,0,0,0)
LOOPST/
IF(N)9,9,0
0) NOTE/X/2-.8*F*(N-1)/2,Y+F,LIT
9) IF(OPT)4,4,1
1) IF(OPT-1)4,2,3
2) HATCHP/0,.05,0,0
HATCH/ABC
JUMPTO/4
3) IF(OPT-2) 4,5,6
5) HATCHP/45,.05,0,0
HATCH/ABC
JUMPTO/4
6) IF(OPT-3)4,7,4
7) HATCHP/90,.05,0,0
HATCH/ABC
4) LOOPND
   REFSYS/NOMORE
TERMAC/
```



SKETCH 21

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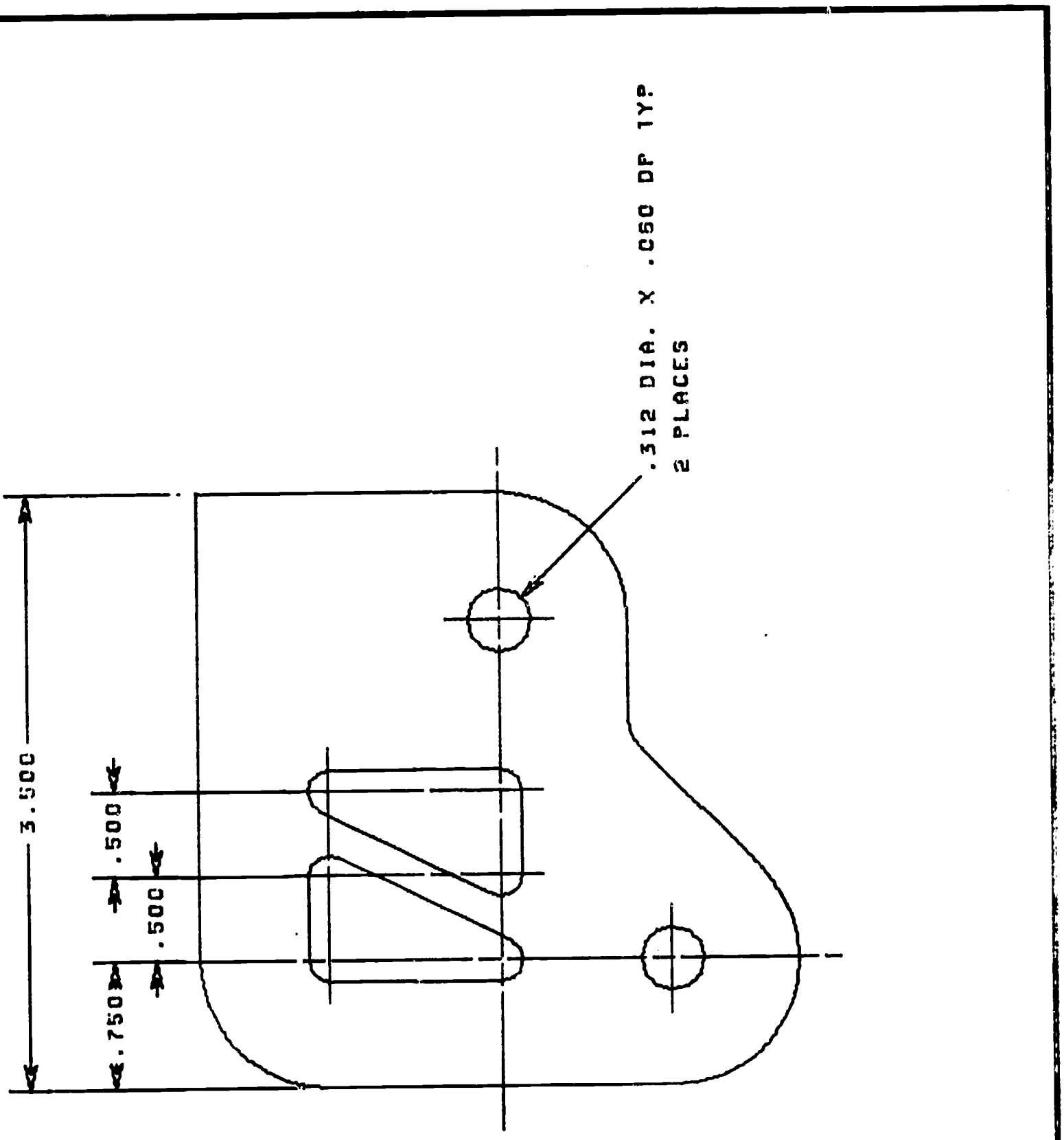

PLATE 21

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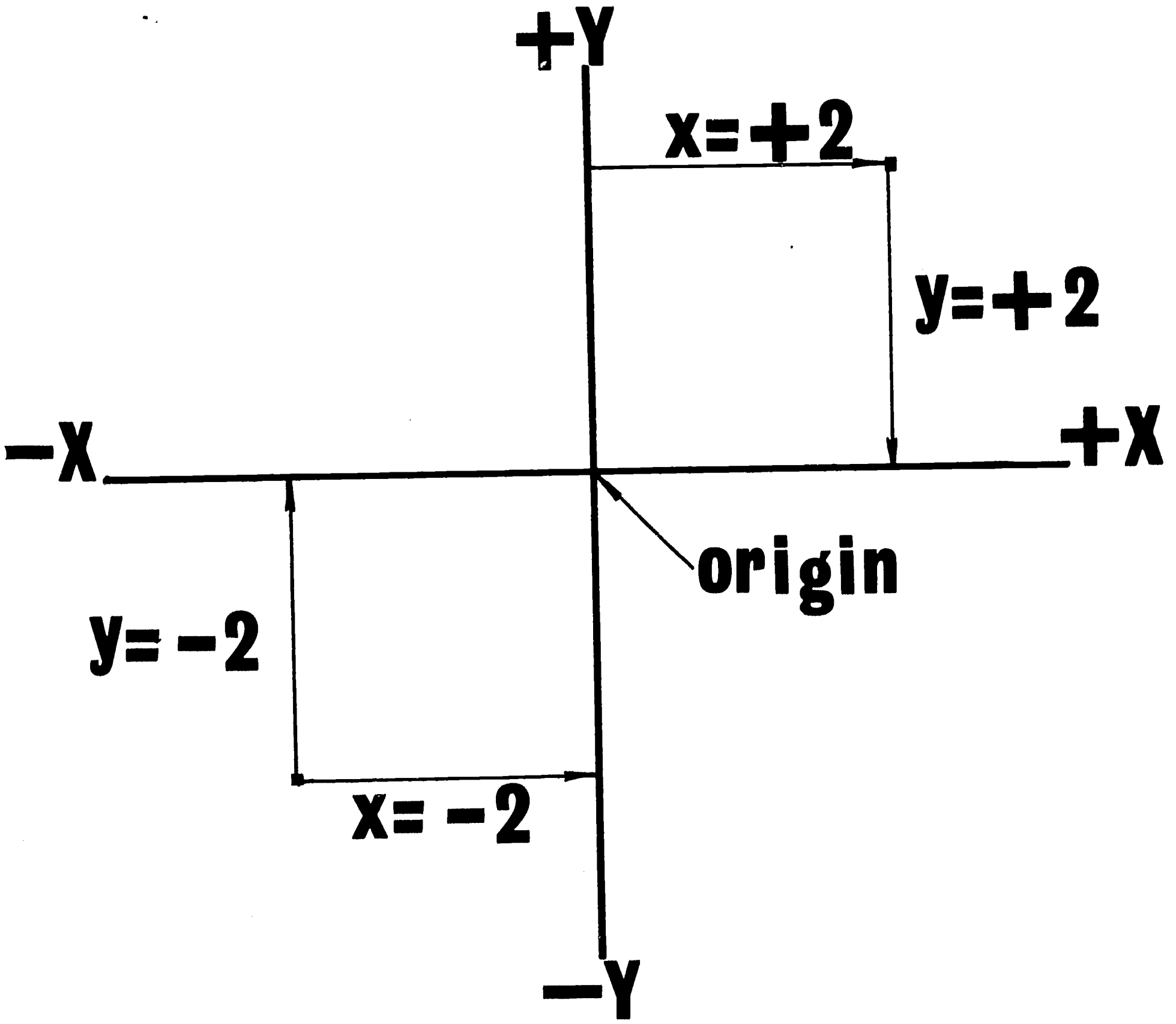
```
$$  PLATE 21          CONTINUOUS PATH MILLING
  BOX       =         VIEW  /
CALL/FRAME1,,X=10,,Y=6.5,,ORX=.5,,ORY=.5
                      END   /BOX
                      DRAW  /BOX
                      ALPHAP/(.2,.2,0,-.2),(0,0,0,270)
                      TITLE /1.5,2.5,@PLATE 21@
                      ORIGIN/8.69,6.5
  FRAME1  =           VIEW  /
  P17     =           PT    /-4.5,-1.69
  P18     =           PT    /-3.75,-1
  P19     =           PT    /-3.25,-1.625
  P20     =           PT    /-2.75,-1.625
  P0      =           PT    /-1,-1
  L3      =           LN    /P0,DX,-3.5
                      ARC   /.75
                      LN    /DY,-2.75
                      ARC   /-3.75,-3.75,.75,180,135
  P1      =           PT    /PPP
                      LN    /P0,DY,-1.75
  P4      =           PT    /PPP
                      ARC   /-1.75,-2.75,.75,0,-90
  P2      =           PT    /PPP
  L1      =CONSTR,    LN    /P2,DX,-1
  L2      =CONSTR,    LN    /P1,ATANGL,45,LENGTH,2
  P3      =           PT    /INTOF,L1,L2
                      LN    /P1,P3
                      ARC   /.25
                      LN    /P3,P2
                      END   /FRAME1
                      DRAW  /FRAME1
                      ORIGIN/8.69,6.5
CONCIR    =           VIEW  /
C5        =CONSTR,    CIRCLE/-3.75,-1.75,.125
C6        =CONSTR,    CIRCLE/-3.75,-2.75,.125
C7        =CONSTR,    CIRCLE/-3.25,-1.75,.125
C8        =CONSTR,    CIRCLE/-3.25,-2.75,.125
C9        =CONSTR,    CIRCLE/-2.75,-2.75,.125
C10       =CONSTR,    CIRCLE/-2.75,-1.75,.125
P5        =           PT    /-3.875,-2.25
P6        =           PT    /-2.625,-2.25
                      LN    /P5,RIGHT,TANTO,C6
                      ARC   /.125
                      LN    /RIGHT,TANTO,C6,RIGHT,TANTO,C7
                      ARC   /.125
                      LN    /RIGHT,TANTO,C7,RIGHT,TANTO,C5
                      ARC   /.125
                      LN    /-3.875,-1.75,P5
                      LN    /P6,LEFT,TANTO,C9
                      ARC   /.125
                      LN    /LEFT,TANTO,C9,LEFT,TANTO,C8
                      ARC   /.125
```

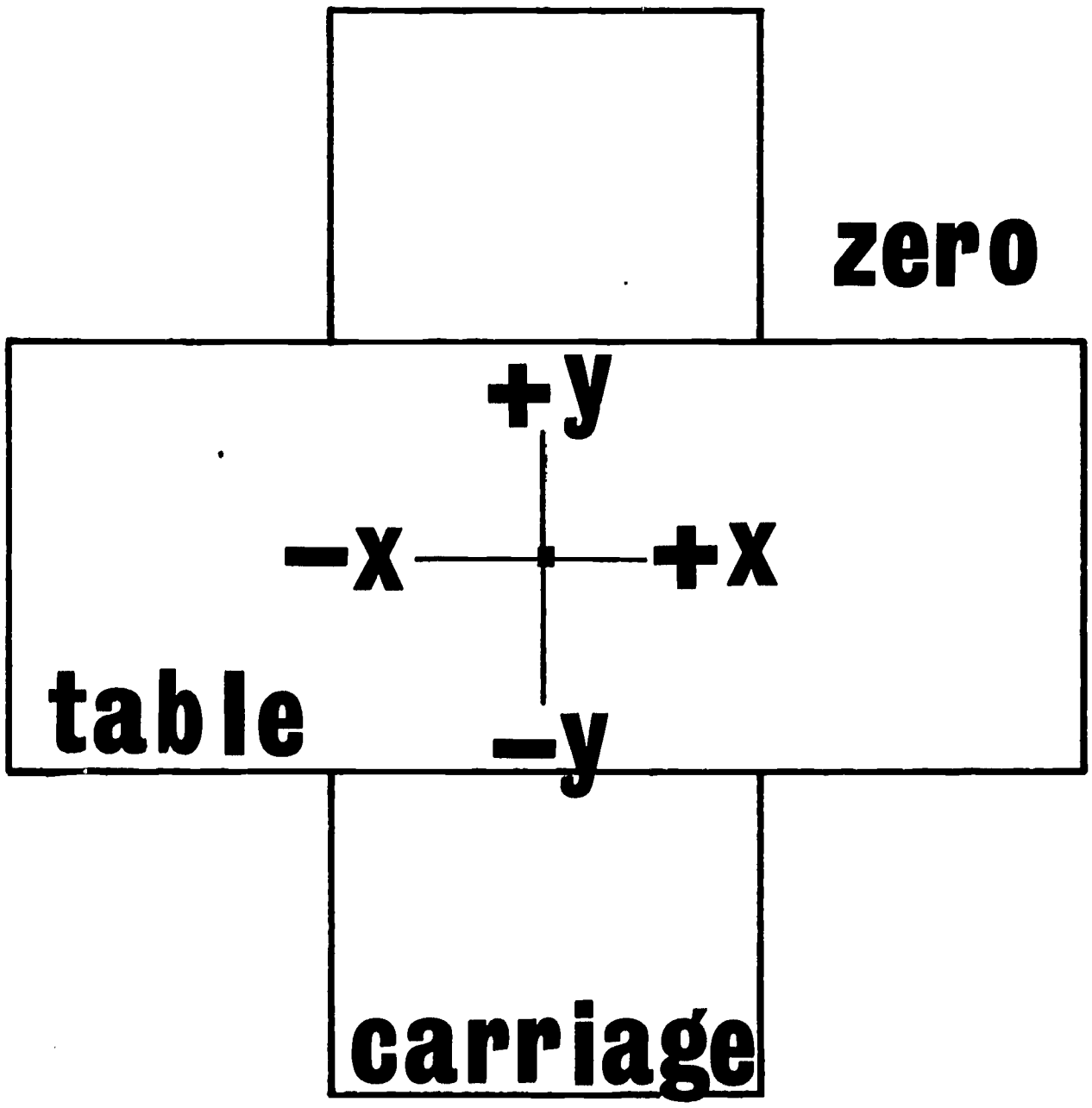
```
                    LN      /LEFT,TANTO,C8,LEFT,TANTO,C10
                    ARC     /.125
                    LN      /-2.625,-1.75,P6
                    CIRCLE/-1.75,-2.75,.187
                    CIRCLE/-3.75,-3.75,.187
P11         =       PT      /-4.75,-2.75
            CTRLN ,LN       /P11,DX,4
P12         =       PT      /-4.062,-3.75
            CTRLN ,LN       /P12,DX,.624
P13         =       PT      /-4,-1.75
            CTRLN ,LN       /P13,DX,1.5
P14         =       PT      /-3.75,-.75
            CTRLN ,LN       /P14,DY,-4
P15         =       PT      /-2.75,-1.5
            CTRLN ,LN       /P15,DY,-1.5
P16         =       PT      /-1.75,-2.438
            CTRLN ,LN       /P16,DY,-.624
            CTRLN,LN        /-3.25,-1.5,DY,-1.5
                    END     /CONCIR
                    DRAW    /CONCIR
                    DIMST   /YLARGE,XCOMP,L3,.5
                    DIMP    /.5,.1,1,1
                    MASK    /@PD3TN@
                    DIM     /P17,P18
                    DIMST   /YLARGE,XCOMP,L3,.5
                    DIMP    /.5,.1,2,2
                    DIM     /P19,P20
                    DIMST   /YLARGE,XCOMP,L3,.25
                    DIMNN   /P18,P19
                    DIMST   /YLARGE,XCOMP,L3,1
                    DIMP    /.5,.1,1,1
                    DIM     /L3
                    ALPHAP/(.1,.1,.1,0),(0,-.2,0,0)
                    NOTE    /-1.75+(SQRT(2)/2)*.187,-2.75-(SQRT(2)/2)*.187,$
                    .75,-.75,@.312 DIA. X .060 DP TYP@,@2 PLACES@
                    FINI    /
```

NUMERICAL CONTROL

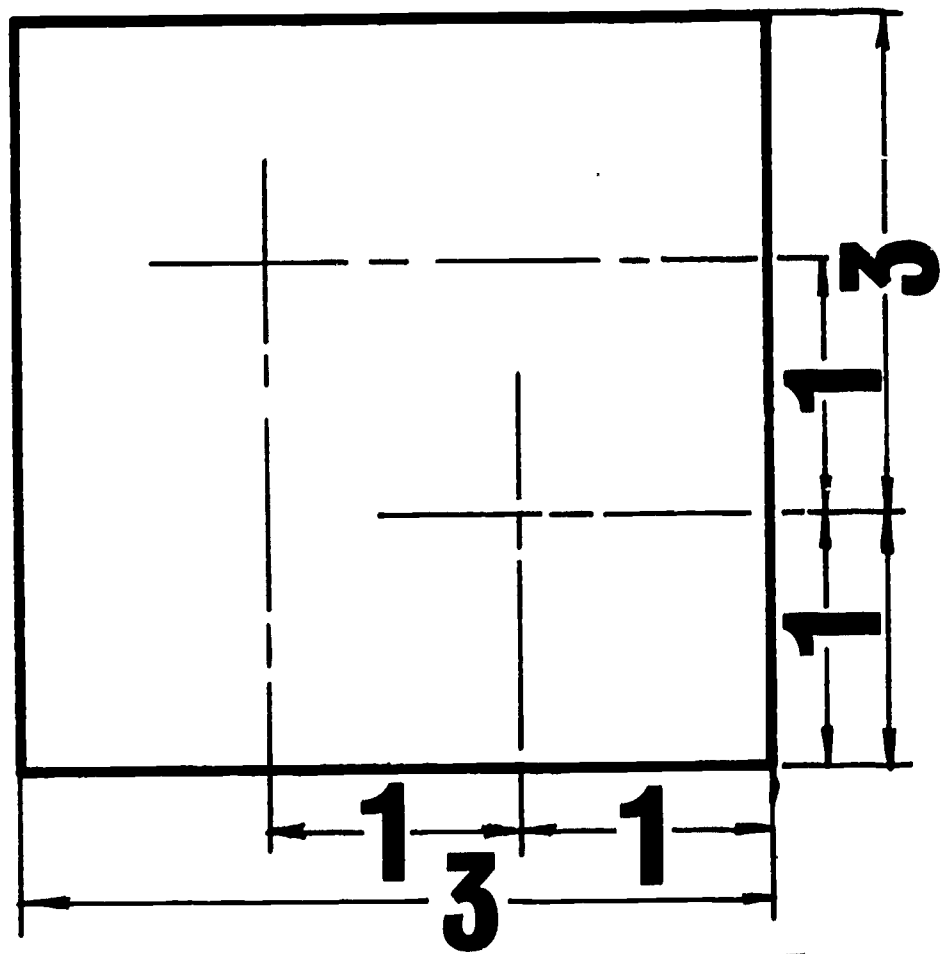
Coordinate System



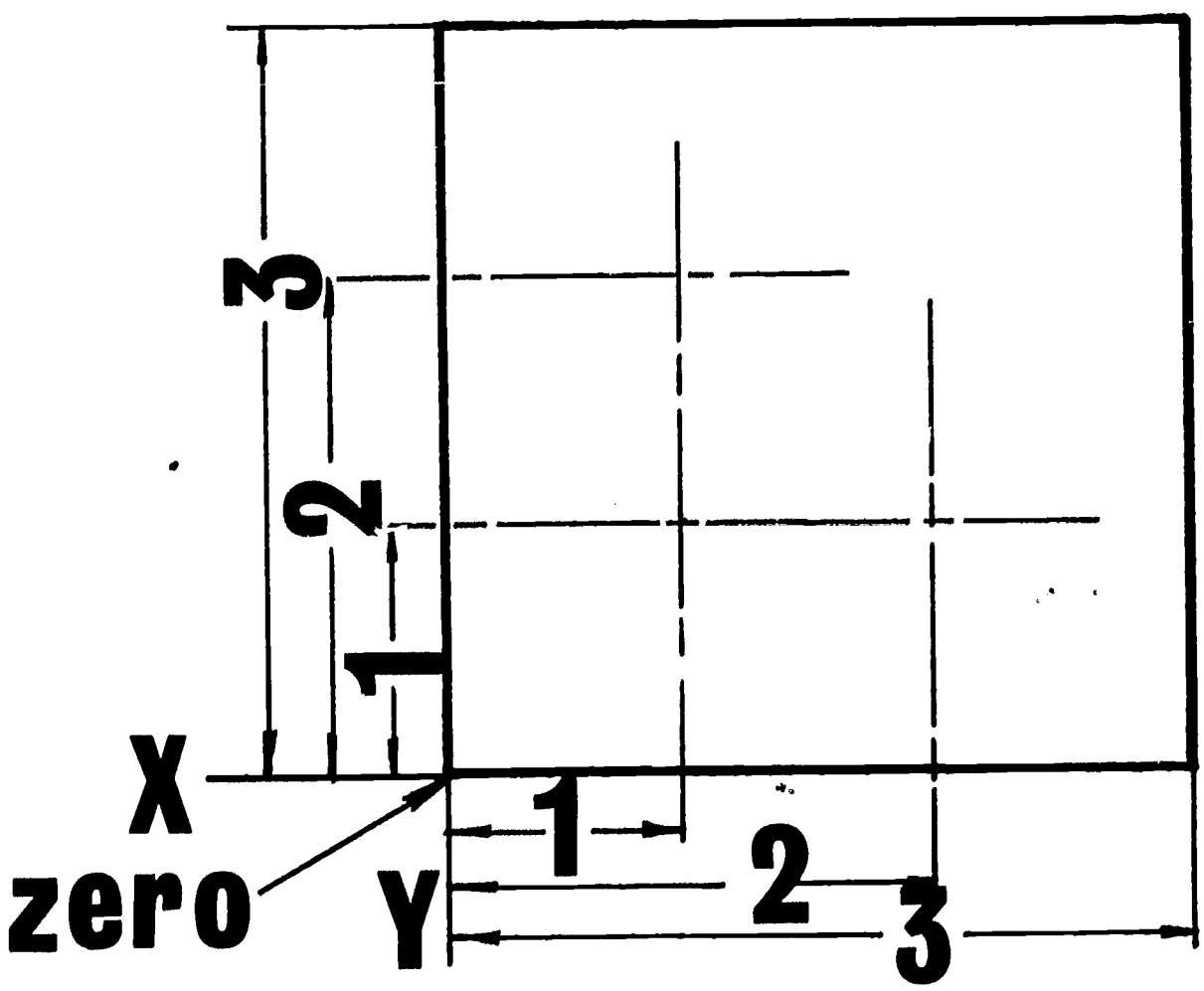
Coordinates of N.C. Machines



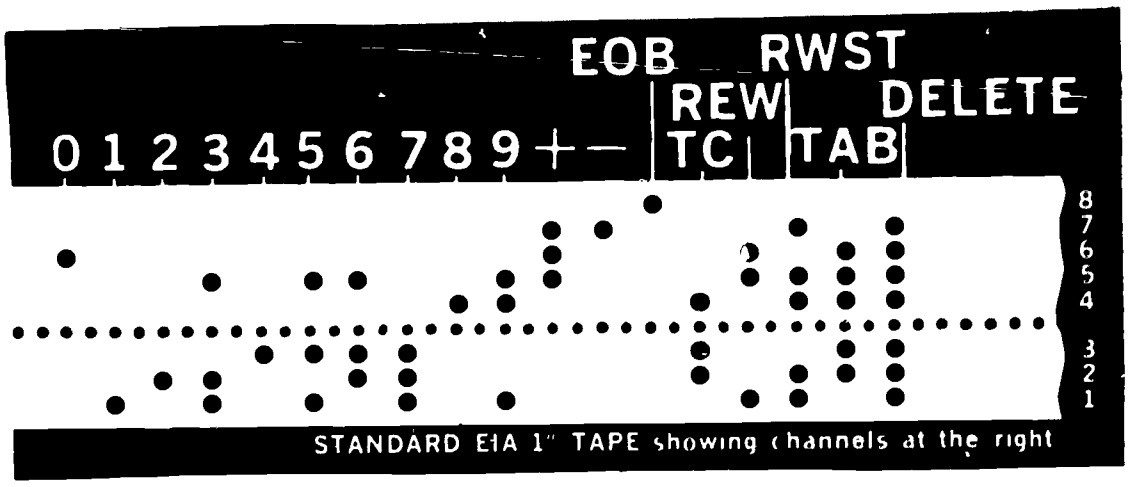
Conventional Drawing



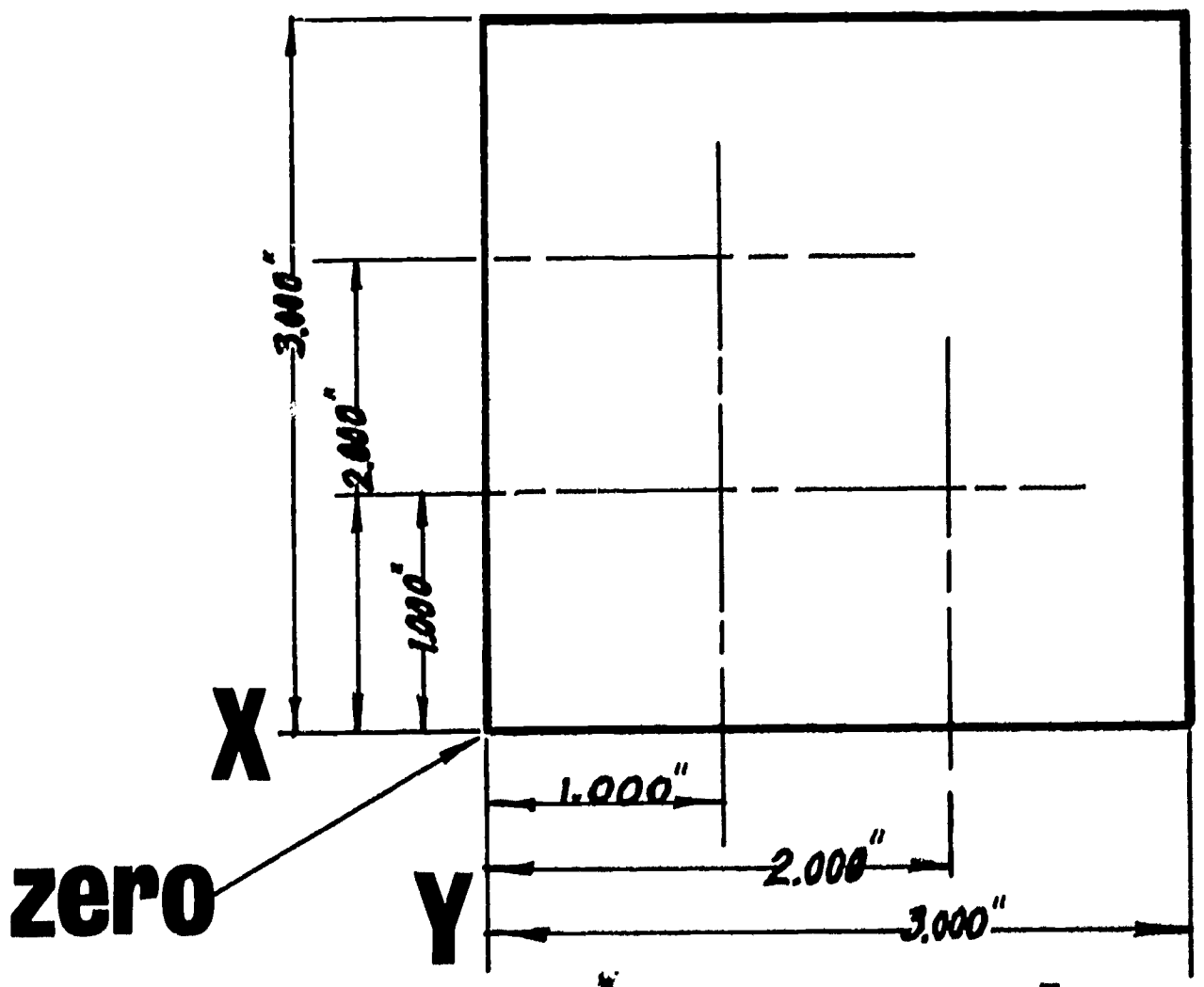
N.C. Dimensioning



N.C. Code

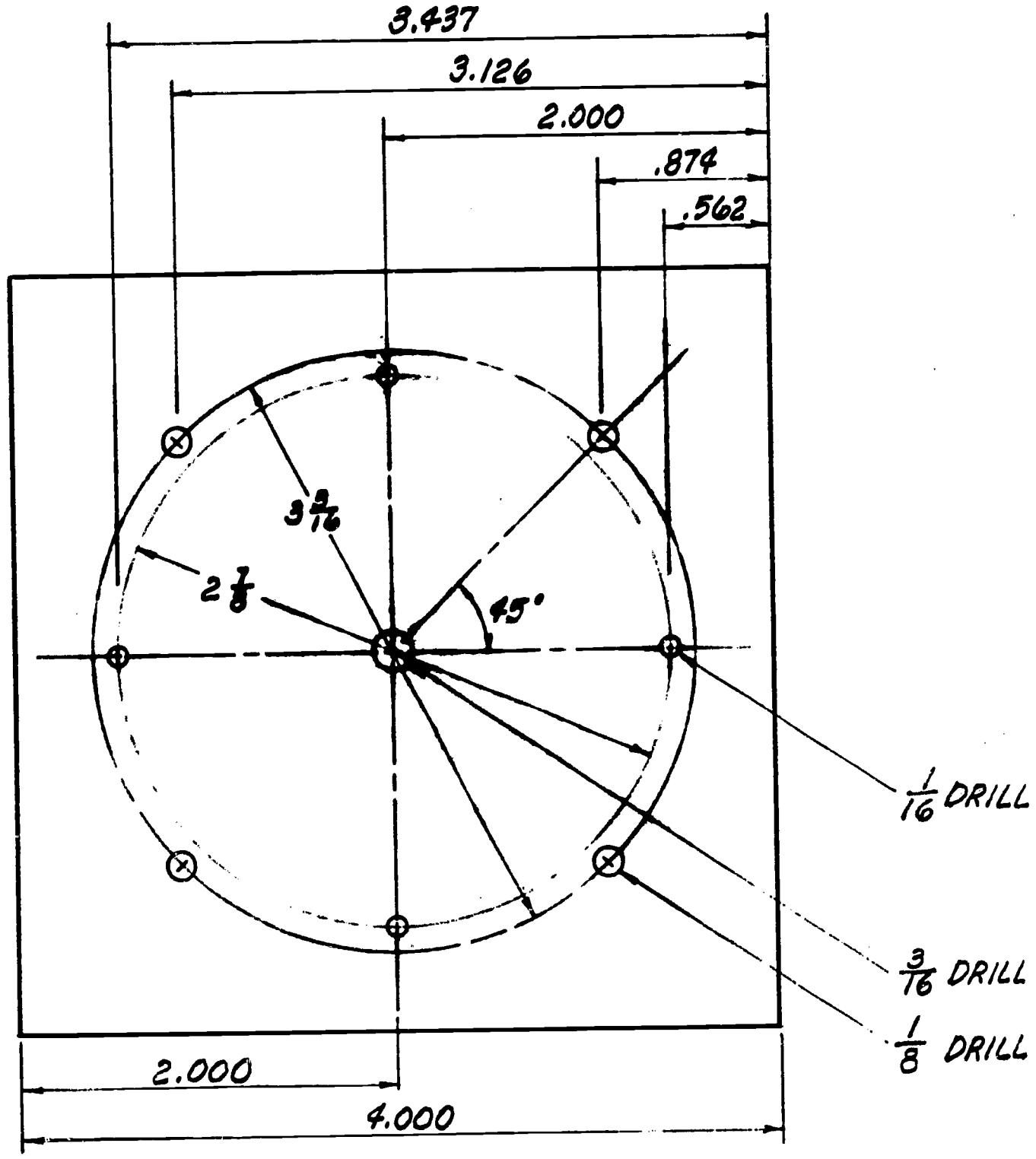


STANDARD EIA 1" TAPE showing channels at the right



Process sheet

SEC. UNC.	SEQ. NO.	TAB OR EOB	+ OR −	"X" COORDINATE	TAB OR EOB	+ OR −	"Y" COORDINATE	TAB OR EOB	INSTRUCTIONS	EOB
	000	T		0	T		0	E	Set up Zero from lower left corner	
WS	001	T	+	1.000	T	+	2.000	E	Bore hole # 1	



B.L.D.

AUTOSPOT SKETCH

MIAMI-DADE JUNIOR COLLEGE

AUTOSPOT II PRELIST

```
1 REMARK/FLANGE PLATE      $ MIAMI-DADE JUNIOR COLLEGE 1967 SUMMER INSTITUTE
2 REMARK/TP(4.575,-5.077) $ MAXIMUM TABLE POSITION REFERRED TO SET UP POINT
3 DASH A    (0.575,-1.077) $ DATUM SURFACE OR HOLE (REFERENCE SYSTEM) ID - A
4 START                    $ GENERATES A SEQUENCE NO. AND A REWIND STOP CODE
5 DRILL,0625/DAA,AT(2.0,-2.0)R(1.4375)SA(00.0)IA(90.0)NH(4)/DP(0.5)FR(5.0)$
6 DRILL,1250/DAA,AT(2.0,-2.0)R(1.5938)SA(45.0)IA(90.0)NH(4)/DP(0.5)FR(5.0)$
7 DRILL,1875/DAA    (2.0,-2.0)                                 /DP(0.5)FR(5.0)$
8 FINI                     $ GENERATES A TOOL CHANGE AND AN AUTO REWIND CODE
```

```
END PREPROCESSOR
SPECIFICATION SECTION

MACHINE SECTION
END PHASE 1
PHASE2 SECTION

END PHASE2

AUTOSPOT-TAPE-O-MATIC POST PROCESSOR

PART NUMBER-       ,NAME
FLANGE PLATE      $ MIAMI-DADE JUNIO
TP(4.575,-5.077) $ MAXIMUM TABLE PO
001%-00575%+01077                          SET POINT          0001
$002      START                                               0002
          FEED RATE 05.0 IN/MIN
           DRILL CHANGE TOOL,TOOL NO. 0625
004%+03437%-02000                          DEPTH 0.5000       0004
005%+02000%-00562                                             0005
006%+00562%-02000                                             0006
007%+02000%-03437                                             0007
          FEED RATE 05.0 IN/MIN
%008       DRILL CHANGE TOOL,TOOL NO. 1250
009%+03126%-00873                          DEPTH 0.5000       0009
010%+00873%-00873                                             0010
011%+00873%-03126                                             0011
012%+03126%-03126                                             0012
          FEED RATE 05.0 IN/MIN
%013       DRILL CHANGE TOOL,TOOL NO. 1875
014%+02000%-02000                          DEPTH 0.5000       0014
%/015     STOP                                                0015
FINI POST PROCESSOR

 TOTAL PRODUCTION TIME 001.2
```

001ЖЂ00575ЖЂ01077‡

=002‡

004ЖЂ03437ЖЂ02000‡

005ЖЂ02000ЖЂ00562‡

006ЖЂ00562ЖЂ02000‡

007ЖЂ02000ЖЂ03437‡

Ж008‡

009ЖЂ03126ЖЂ00873‡

010ЖЂ00873ЖЂ00873‡

011ЖЂ00873ЖЂ03126‡

012ЖЂ03126ЖЂ03126‡

Ж013‡

014ЖЂ02000ЖЂ02000‡

Ж1015‡

TAPE OUTPUT FROM AUTOSPOT II ACCORDING TO 1620 CHARACTERS

```
001          -00575          &01077
%002
004          &03437          -02000
005          &02000          -00562
006          &00562          -02000
007          &02000          -03437
008
009          &03126          -00873
010          &00873          -00873
011          &00873          -03126
012          &03126          -03126
013
014          &02000          -02000
/015
```

FRIDEN FLEXOWRITER INTERPRETATION OF TAPE
OUTPUT FROM AUTOSPOT II OUTPUT

COGO

1967 SUMMER INSTITUTE
MIAMI-DADE JUNIOR COLLEGE
COGO

Exercise 1

Write a COGO program using Sketch 21 to determine the following:

1. Find the coordinates, relative to the origin, of the centers of the arcs and circles,
2. Plot the centers found in '1'.

Exercise 2

Write a COGO program using the COGO Sketch to determine the following:

1. The distance from the nose of the median to the intersection of the center lines of Road A and Street 1,
2. The distance and offset measured along and from the center line of Road A of the PC, PRC and PT of the median,
3. The center coordinates of the reverse curve and the area of the median from the nose to the PT,
4. The coordinates of:
   A. PC and PT of all R/W arcs,
   B. The center of all R/W arcs.

Exercise 3

Write a COGO program using the COGO Sketch and any data from Exercise 2 to determine the following:

1. The distance from the NW corner of the traffic island in Street 1 to the intersection of the center lines of Street 1 and Road A,
2. Center coordinates of the arc of the traffic island,
3. The tangent and deflection angle of the curve that forms the S. R/N line of Road A,
4. Assume the P.C. of the median is at Station 9 + 00.00; find the Station at the PRC and PT of the median.

Exercise 4

Write a COGO program to plot the COGO sketch.

B.L.O.

COGO SKETCH