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AIDPRF/PRFAID USER'S MANUAL

By Carl H. Buck

M&S Computing, Inc.
Huntsville, Alabama, 35805

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16. ABSTRACT

This document presents the program documentation for the PRF ARTWORK/AIDS conversion program, which serves as the interface between the outputs of the PRF ARTWORK and AIDS programs. The design and implementation of this program was performed by M&S Computing, Inc., for Marshall Space Flight Center under Contract No. NAS8-25621.

This documentation assumes that the reader has a basic understanding of the PRF ARTWORK and AIDS programs. It is also assumed that the reader has a basic knowledge of I/O device arrangements and system control cards.

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1. INTRODUCTION

The document has a two-fold purpose, the first of which is a description of the software design including flowcharts of the design at the functional level. The second purpose is to provide the user with a detailed description of the input parameters and formats necessary to execute the program and a description of the output produced when the program is executed.

The second section of this document contains the software design information and the third section contains the user information.

2. PROGRAM DESIGN

The PRF ARTWORK/AIDS conversion package is a program written in XDS extended FORTRAN to convert graphic data between PRF ARTWORK format and the data base used by the AIDS graphic display system. The conversion is bi-directional and will faithfully reconstruct data sets which are converted to AIDS format and then are converted from one format to the other and back into the original.

2.1 PRF ARTWORK to AIDS Conversion

The conversion from PRF to AIDS, whose functional flow is described in Figure 2-1, is that of reading input from PRF ARTWORK and converting the data to AIDS format. After reading control cards (described in Section 3.1.1), the program begins to process the PRF input data by collecting all cell placement component data. The Cell Library, which is a file containing descriptions of the cells specified at various placements by the PRF input, is added to the AIDS design file. The cell placement data is then added to the AIDS file. After the cell component placement data has been added, the line set and shape set data from PRF is processed and added to the AIDS file. This continues until all the data has been processed.

2.2 AIDS to PRF ARTWORK Conversion

Conversion from AIDS to PRF (Figure 2-2) is the reverse of the previous procedure. Data is converted from the AIDS design file format to that of PRF ARTWORK.

Control cards described in Section 3.1.2 are read before processing of the AIDS file begins. The file is first searched for cell placement component data which is immediately added to the PRF output. Character, block, line set, and shape set data for each level whose output has been specified by the control cards is added to the PRF output sorted by increasing levels. After all the information for each level is recorded a record is written denoting the end of data for that level and after all the levels have been processed an end-of-file is written on the PRF output.

FLOWCHART TO PRF TO AIDS CONVERSION

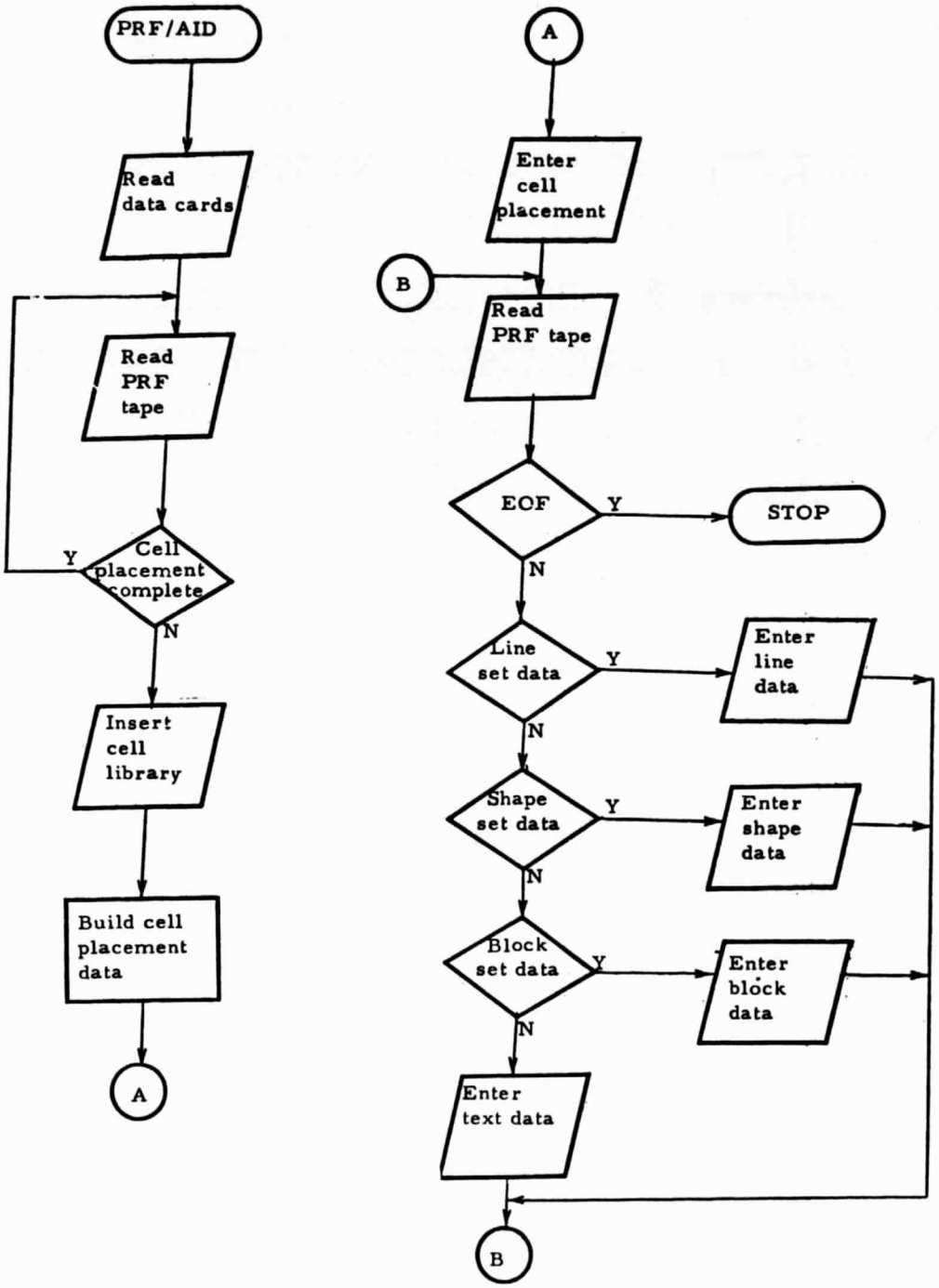


Figure 2-1

AIDS TO PRF

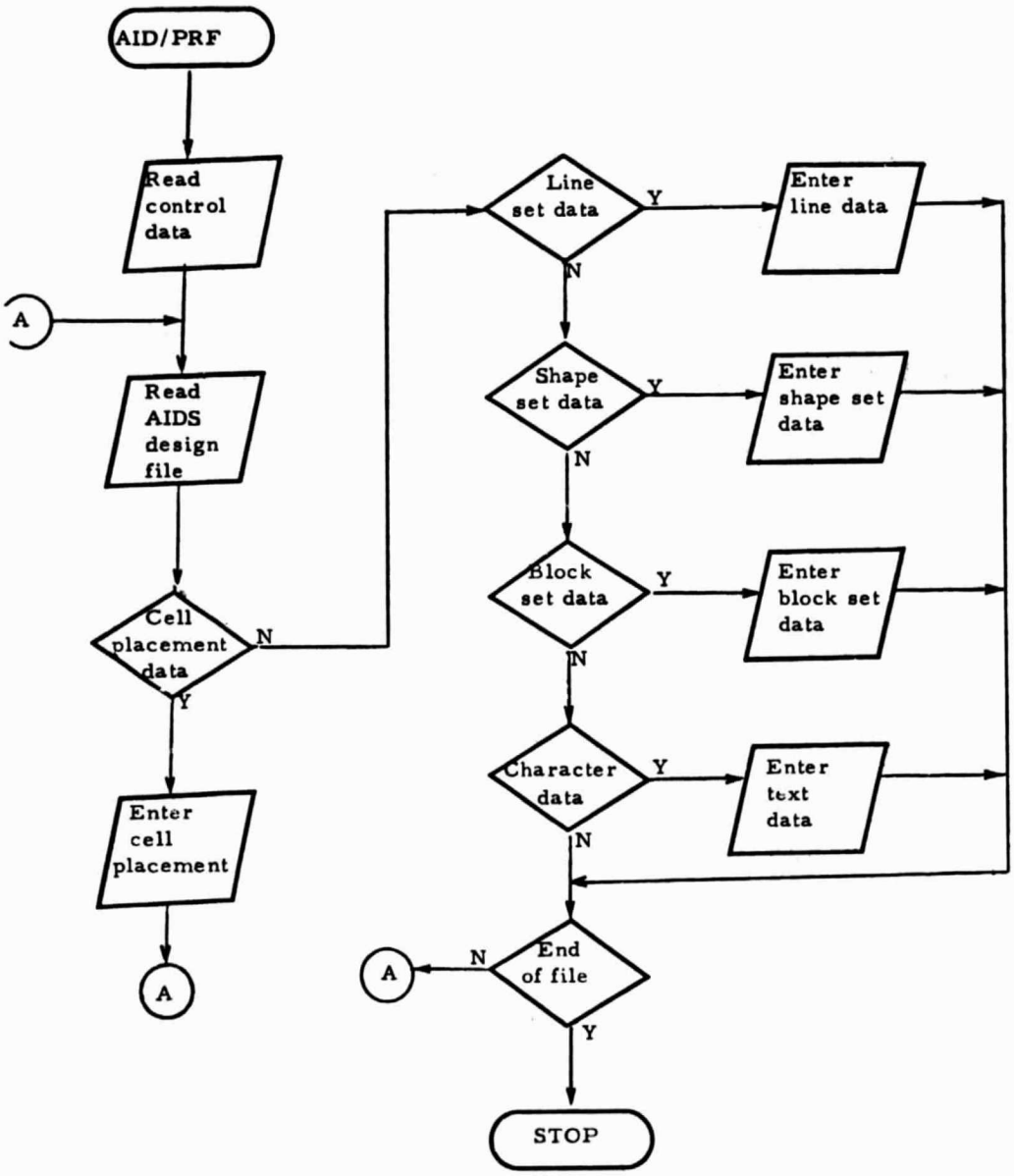


Figure 2-2

3. USER INFORMATION

The following information describes the user inputs required to control execution of the conversion program. Also described is the output produced by the program.

3.1 Input Card Requirements

Conversion of data from PRF to AIDS format requires a slightly different control card deck than that used to convert AIDS data to PRF format. Details of each of these control decks are provided in the following paragraphs.

3.1.1 PRF to AIDS Control Cards

When performing this conversion four control cards are required. The format of the cards is as follows:

CARD 1, Format I1 - The first control card must contain a zero or blank in column 1 to designate conversion from PRF to AIDS format.

CARD 2, Format 4A2 - The second card contains the name to be given to the AIDS file being created. The name should be left-justified within this field.

CARD 3, Format 2I7, E20.8, I7 - The third card contains the X and Y offset values, the conversion scale factor, and text character separation distance. All PRF ARTWORK data contains X and Y values associated with its placement. The X and Y offsets input from this card are added to each X and Y value when the conversion takes place. The scale factor is simply a number which is multiplied by each X and Y position before the offsets are added. When executing a reverse conversion (AIDS to PRF ARTWORK) and it is desired to return to the original X and Y positions without altering data, the card containing the X and Y offsets and scale factor (Section 3.1.2, input card two) should appear exactly as it appeared in the PRF ARTWORK to AIDS conversion. The text character separation distance is the distance in AIDS units of resolution which will separate successive characters of text string data.

CARD 4, Format E20.8 - The fourth data card contains the cell component placement scale factor. This scale factor will be multiplied by the cell placement X and Y coordinates when creating the AIDS file.

3.1.2 AIDS to PRF ARTWORK Control Cards

The control cards required to perform AIDS to PRF data conversion are as follows:

CARD 1, Format 3I1 - The first integer of this card must contain a one to specify conversion of data from AIDS to PRF format. The second integer entered on the card is used to specify the aperture set with which lines may be specified in PRF data. A blank or zero in this field indicates that apertures 7-24 (available on Gerber 2000 Series Plotters) will be used. A one in the field specifies that only apertures 1 to 6 (round apertures available on Gerber 1500 Series Plotters) are to be used. Other values entered in the field will permit any of the 24 defined apertures to be used. Table 3-1 contains the aperture widths which have been defined in the conversion program. For aperture selection purposes the conversion program equates line width in AIDS units of resolution with line width in mils. Thus, a line with a width of 20.00 units of resolution will be associated with aperture 12 whose defined width is 20 mils. If a line is specified with a width which does not correspond exactly to any of those defined, the closest aperture is associated with the line in PRF output.

The third integer of the first control card specifies the mode of processing AIDS block data. If this integer field is zero or blank, all blocks will be converted to PRF shape set data. A one entered in the field specifies that AIDS blocks are to be processed into PRF block set data.

CARD 2, Format 2I7, E20.8 - The second data card is similar to the third data card described in the previous section (Section 3.1.1) except the X and Y offsets are subtracted from the X and Y values in the AIDS file rather than added, and the data scale factor is divided into the X and Y values rather than being multiplied by them. The subtraction of the X and Y offsets occurs before the division by the scale factor when performing AIDS to PRF ARTWORK conversion.

CARD 3, Format F20.8 - The third data card, which is the cell component scale factor, is like the fourth data card in Section 3.1.1 except again it is divided into the X and Y positions rather than being multiplied by them.

APERTURE WIDTHS DEFINED IN THE PRF/AIDS CONVERSION PROGRAM

ROUND APERTURES	
D-Number	Diameter (mils)
D-01	25
D-02	36
D-03	62
D-04	75
D-05	10
D-06	15
D-07	20
D-08	5
D-09	1
D-10	5
D-11	10
D-12	20
D-13	30
D-14	40
D-15	60
D-16	80
D-17	100

Table 3-1

APERTURE WIDTHS DEFINED IN THE PRF/AIDS CONVERSION PROGRAM
(continued)

ROUND APERTURES	
D-Number	Diameter (mils)
D-18	110
D-19	3
D-20	4
D-21	8
D-22	50
D-23	150
D-24	200

Table 3-1
(continued)

CARD 4, Format 312 - The fourth data card contains the lower and upper level numbers, and a topo level flag. The lower and upper level numbers denote all level components to be included in the conversion from AIDS to PRF ARTWORK. If the third parameter on this card is set equal to zero the topo level will not be included in the conversion. If it is non-zero, the topo level components will be included in the conversion.

3.2 Line Printer Output

The following is an example of the line printer output which results from converting PRF ARTWORK data to AIDS data:

```
NAME OF FILE BEING CREATED IS AS FOLLOWS:  EDTA

BIAS INPUT FOR THIS FILE IS AS FOLLOWS:  X = 5,  Y = 2

SCALE FACTOR INPUT FOR THIS FILE IS AS FOLLOWS:  .100E + 01

SCALE FACTOR INPUT FOR CELL BIAS IS AS FOLLOWS:  .100 + 02
```

These messages describe the input from cards used to create the AIDS File (Section 3.1.1) and are self-explanatory.

The next example depicts the typical line printer output which occurs when converting AIDS data to PRF ARTWORK data:

```
BEGIN CONVERSION OF AIDS FILE INTO PRF FORMAT

        APERTURE SET = 1

        BLOCK FLAG = 1

BIAS INPUT FOR THIS FILE IS AS FOLLOWS:  X = 10,  Y = 0

SCALE FACTOR INPUT FOR THIS FILE IS AS FOLLOWS:  .100E + 01

SCALE FACTOR INPUT FOR CELL BIAS IS AS FOLLOWS:  .100E + 03

59020          241          90
41011         1102        1230
59020          500         780

                              END COMPONENTS
                              SHAPE DATA
```

```
4     0.10000000E + 01
 1    400              4900
 2    600              2570
 3    750              2150
 4    450              3170
                                   END LEVEL 1
                                   LINE SET

5
 1    200               450
 1    600               135
 2    635               135
 2    935               248
                                   END LINE SET
                                   END LEVEL 2
```

The first six lines describe the input used to create the PRF ARTWORK output (Section 3.1.2). The remaining output describes the cell component placement and the shape and line set data on each level. In this particular example, there have been three cells placed, one shape placed on level one, and one line placed on level two.

3.3 Error Messages

When converting from one data base to another certain conditions may arise within the data which cause an incomplete conversion to occur. These conditions are noted through the following error messages:

XXXX CELL NOT IN LIBRARY

This error message indicates that cell XXXX which is to be placed was not defined in the Cell Library. The cell placement is ignored and processing continues.

SHAPE WITH XX SIDES HAS BEEN IGNORED

This error indicates a shape to be placed has more sides than AIDS can handle. The shape is ignored and processing continues.

NO. OF CELLS EXCEEDS 200

This message indicates that more than 200 different types of cells have been placed. An array within the program has been filled causing processing to be terminated.

UNPROCESSED CARD

This message occurs if an unrecognizable record occurs when reading PRF ARTWORK data as input for conversion. Following the error message the unrecognizable record is printed and processing then continues.

LINE WIDTH IN ERROR

This message indicates that there is no direct correlation between a line width within the AIDS File and an aperture number for the PRF ARTWORK output. When no direct correlation exists the aperture number which is closest is chosen and processing continues. Table 3-1 contains a list of the aperture numbers and their associated line widths.

3.4 File Assignments

The basic function of the program is to produce a file of information which may be used by either the PRF ARTWORK or AIDS program. Under normal circumstances the AIDS to PRF ARTWORK conversion will produce a magnetic tape whose format is described in the BANNING ARTWORK USER'S MANUAL. The PRF ARTWORK to AIDS conversion produces a disk file whose format is described in the ARTWORK INTERACTIVE DESIGN SYSTEM, AIDS, PROGRAM DESCRIPTION.

The FORTRAN logical units which must be assigned in order to execute this program are as follows:

FORTRAN Logical Unit	File/Device Assignment
1	Cell Library (IN)
3	PRF ARTWORK Data (IN/OUT)
5	Card Reader
100	AIDS Data (IN/OUT)
105	Scratch File (IN/OUT)
108	Line Printer

In the above list the logical units 1, 100, and 105 must be assigned to random access disk files which have previously been allocated. The Cell

Library File (logical unit 1) should define each cell specified in the converted data. The PRF ARTWORK data assigned to logical unit 3 may be assigned to a disk file, however, it is usually assigned to a magnetic tape. The Scratch File assigned to unit 105 must be allocated large enough to contain one record for each cell placement.

3.5 Sample Run Deck Setups

The example of Figure 3-1 illustrates a deck setup required to convert the data from a PRF ARTWORK magnetic tape to that of an AIDS disk file. Figure 3-2 illustrates a deck setup used to convert an AIDS disk file to a PRF ARTWORK output tape. In both examples, the first card read is a system job card. The Assign Cards equate the files named with logical unit numbers. OV=PRFA is a command which informs the system that a file named PRFA contains the load module to be loaded into memory. Execution is initiated by the XEQ command. The assignments proceeding the OV assignment are discussed in Section 3.4.

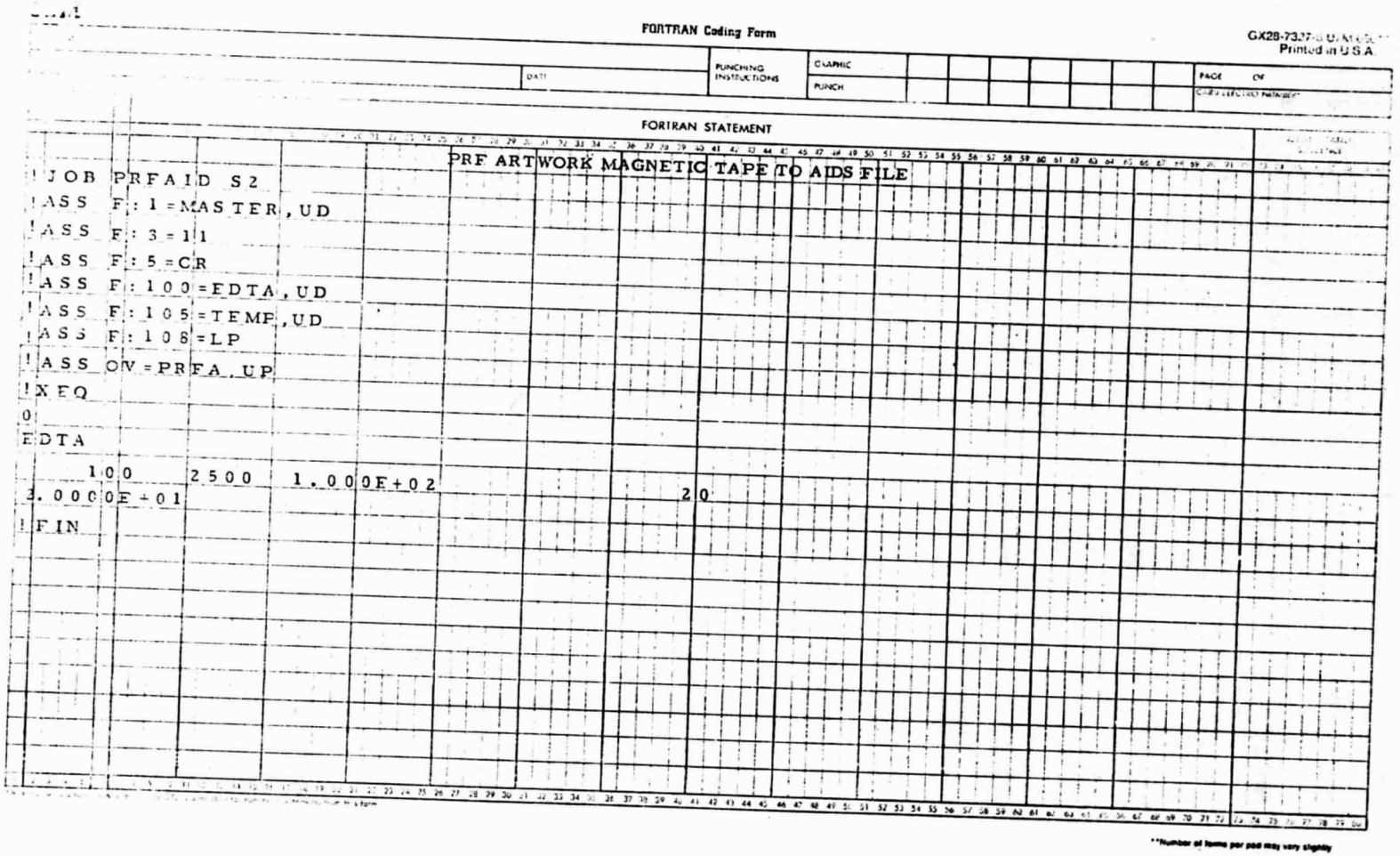


Figure 3-1

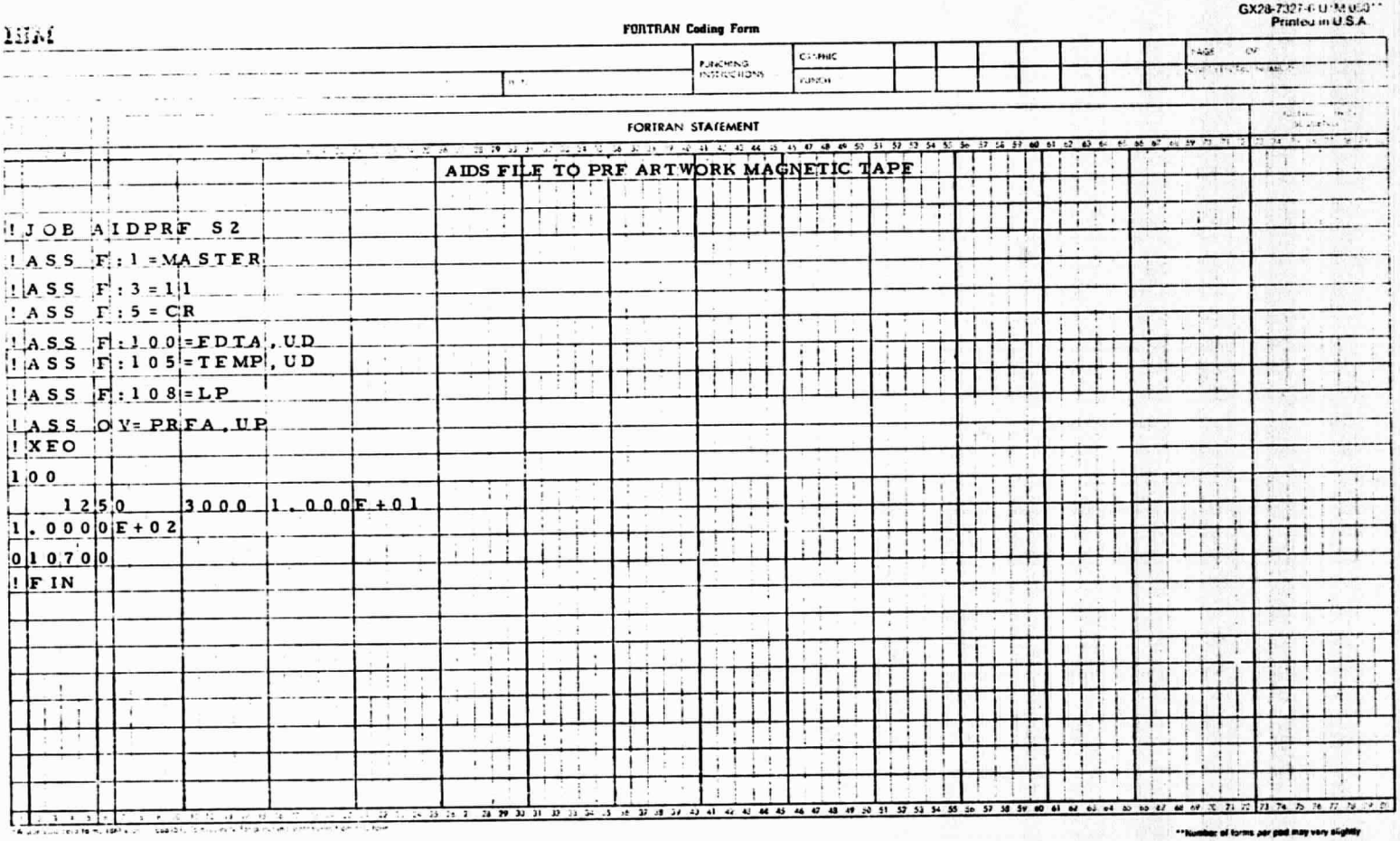


Figure 3-2

APPENDIX A

PRF DATA FORMATS

APPENDIX A

A1. INTRODUCTION

This appendix contains a detailed definition of the data format commonly referred to as PRF Format. Data in this form is used by the PRF, PR2D, PWB, ARTWORK, MANART, and AIDS/PRF computer aided design programs to describe graphic data. Its widespread use in programs producing or processing graphic data can be largely attributed to its simple card image structure. All PRF Format data is contained in short records of alphanumeric characters. No more than one coordinate pair is contained on any one record. Thus, the PRF Format is not compact, but does lend itself to convenient review and editing by the user.

The graphic information defined by PRF Format data can consist of one or more levels of 2-dimensional components such as lines and shapes. Level delimiter records indicate the artwork level on which components described by subsequent records are to be plotted. Component delimiter records are used similarly to indicate the type of component described by the records which follow. In addition to simple components, PRF data may specify locations at which complex library cells are to be constructed. Programs which process this PRF data must be provided with appropriate cell libraries so that the simple components of each specified cell can be constructed at the required location. The levels on which cell components are constructed are specified in these libraries; cell specifications in PRF Format data are not associated with any particular level of artwork.

Sections 2 and 3 of this appendix define the specific format of each type of PRF data. They do not attempt to itemize the various restrictions which may be placed on this data by the various programs which process it. The Banning ARTWORK Program, for example, requires that cell data precede component data, that the number of placed cells not exceed 1000, that component data be presented in consecutive levels, and that components be restricted to lines and shapes. The user should consult the documentation for the programs processing his PRF data to determine their specific requirements.

A2. COMPONENT DATA

PRF component data describes the plot of particular geometric shapes on particular levels of artwork. The end level record illustrated in Figure A-1 identifies the artwork level on which components described by the preceeding data are to be plotted. All component data must be followed by an

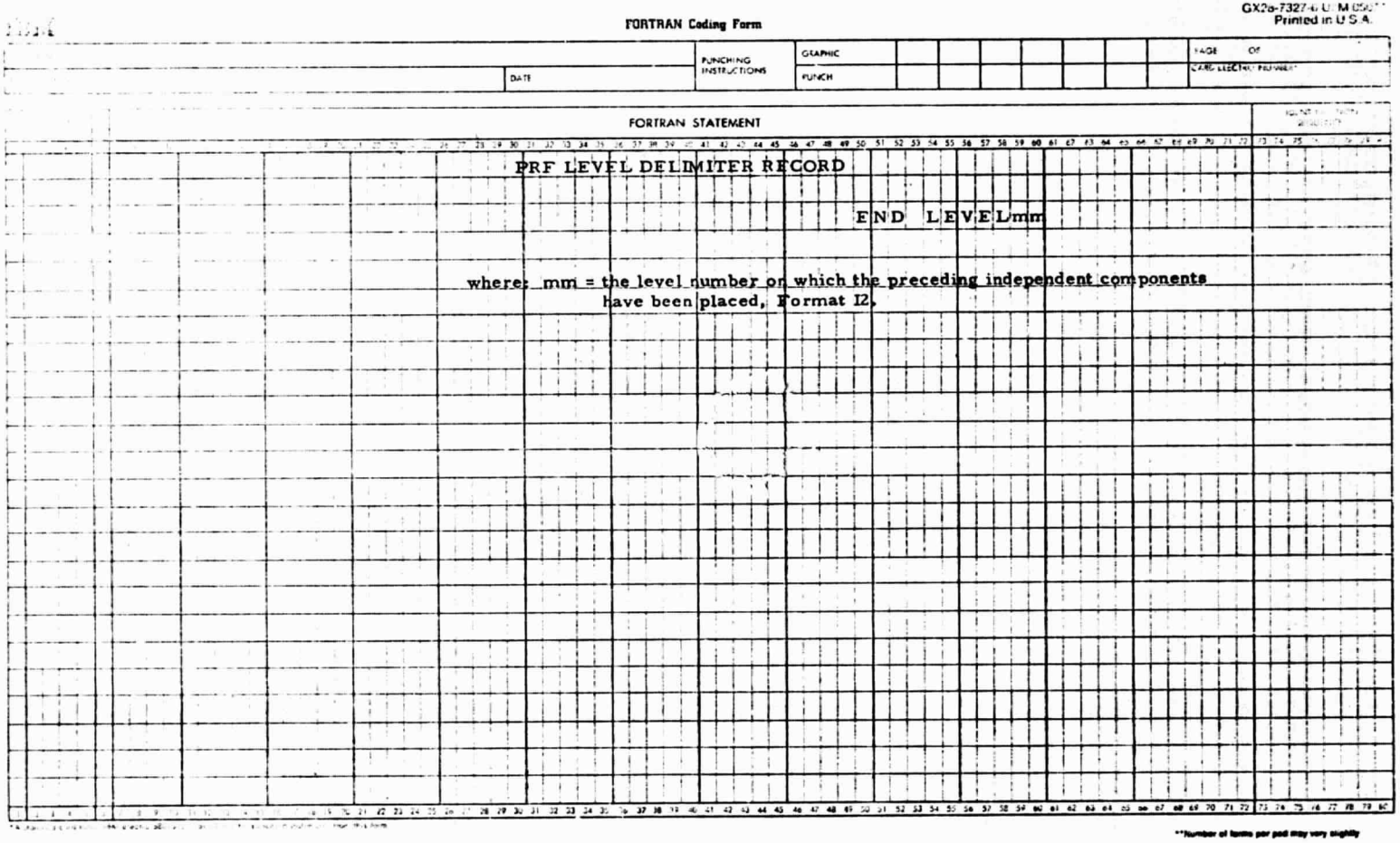


Figure A-1

END LEVEL card. The type component described of component data records is defined by the component type card. The following paragraphs describe the exact format of these cards for each component type as well as that of the data which must be included to define particular components. The X and Y coordinate fields of all PRF data utilize a common format: 6-digit right-justified integer with an implied decimal point between the second and third digits. The units in which coordinates are expressed are inches. It should be noted that character fields which are not defined in these formats are free for other uses such as sequencing.

A2.1 Line Set Data

Figure A-2 illustrates the five record types associated with line components. One and only one Aperture/Scale record must follow the Line Set record. If lines of more than one aperture are to be plotted, the first line set must be terminated with an End Line Set record followed by a second pair of Line Set and Aperture/Scale records. The aperture number is a 2-digit key specifying the width of the lines to be drawn by subsequent commands. Table 3-1 of this document shows the line widths which have been associated with these apertures by convention.

A2.2 Block Data

Rectangular blocks are defined in PRF Format by the end points of their diagonal. As Figure A-3 illustrates, the diagonal specification for block data is identical to the specification of line set data.

A2.3 Text Data

Strings of characters beginning at some specific point are specified in PRF Format as Text Data. The number of characters in the string must be limited to 51. Figure A-4 illustrates the specific format of Text Data records.

A2.4 Shape Set Data

A solid shape is described in PRF Format by the ordered set of points defining the line segments which trace around its perimeter. Each shape must begin with a Scale record which indicates the number of sides of the shape, as well as the scale. Figure A-5 illustrates Shape Set Data format. The user should be aware of limitations placed on the number of sides of a shape in the various programs processing PRF data.

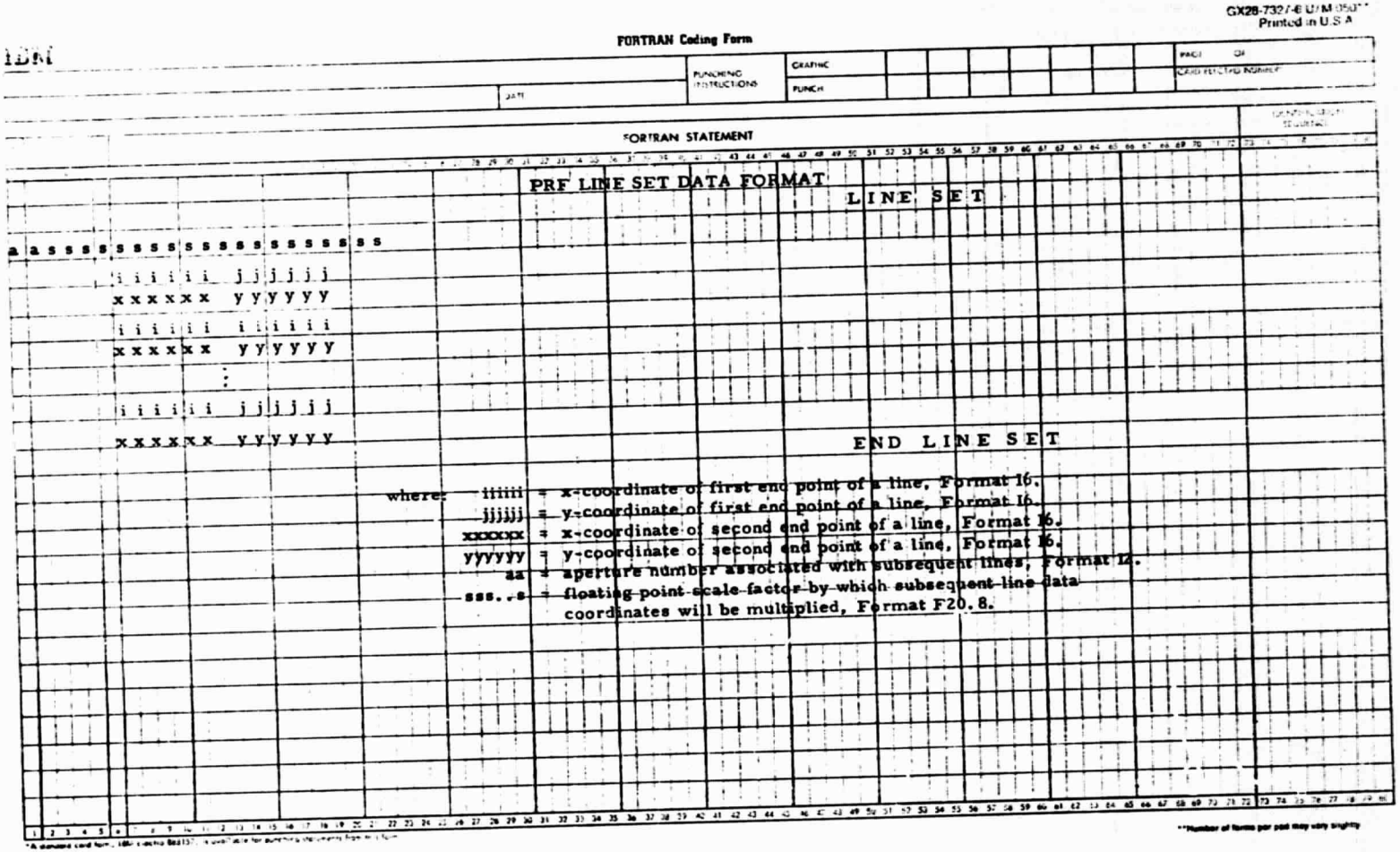

FORTRAN Coding Form
FORTRAN STATEMENT
PRF LINE SET DATA FORMAT
LINE SET
a a s s s s s s s s s s s s s s s s s s
i i i i i i j j j j j j
x x x x x x y y y y y y
i i i i i i i i i i i i
x x x x x x y y y y y y
i i i i i i j j j j j j
x x x x x x y y y y y y
END LINE SET
where: iiiiii = x-coordinate of first end point of a line, Format I6.
jjjjjj = y-coordinate of first end point of a line, Format I6.
xxxxxx = x-coordinate of second end point of a line, Format I6.
yyyyyy = y-coordinate of second end point of a line, Format I6.
aa = aperture number associated with subsequent lines, Format I2.
sss.s = floating point scale factor by which subsequent line data coordinates will be multiplied, Format F20.8.

Figure A-2

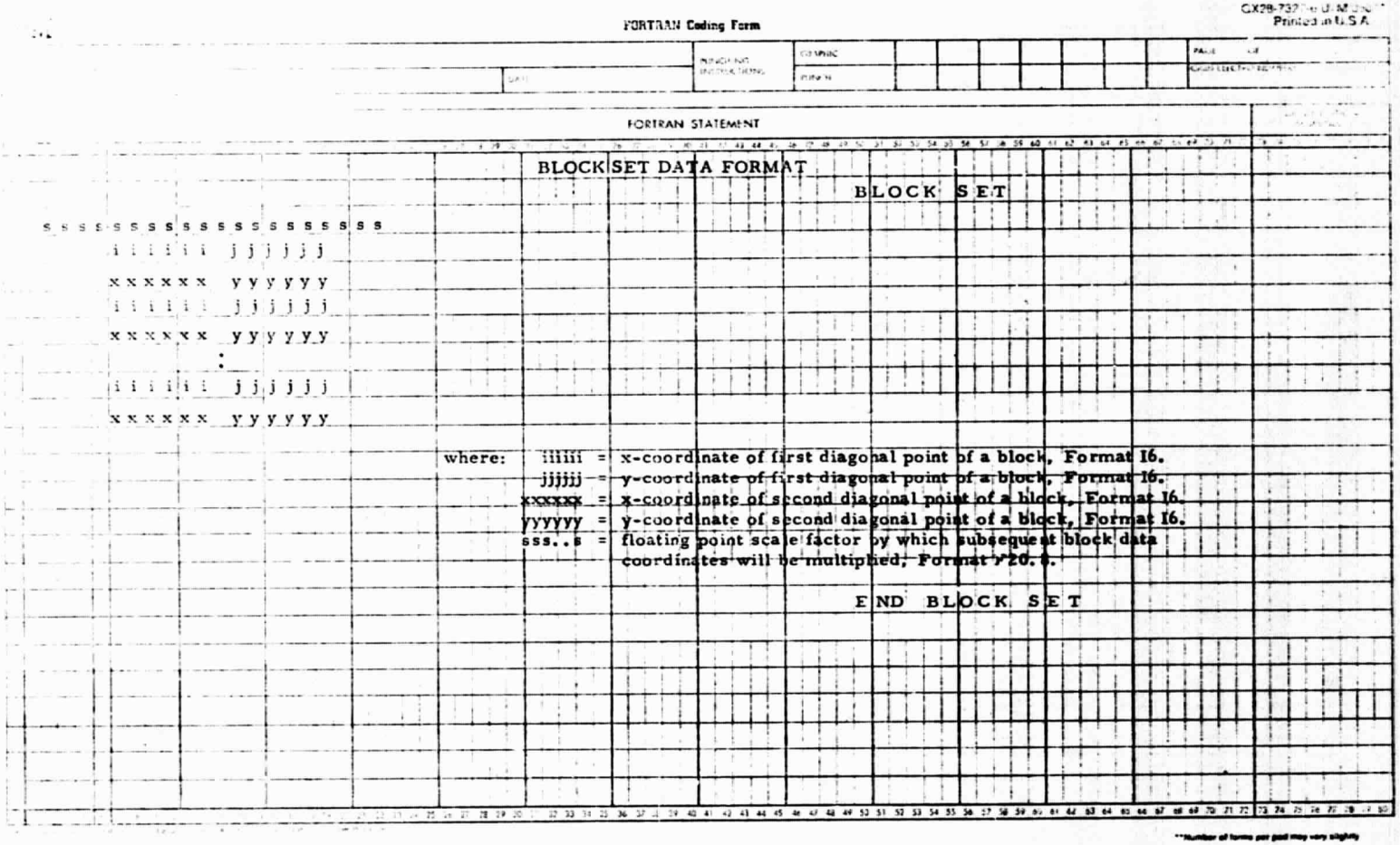
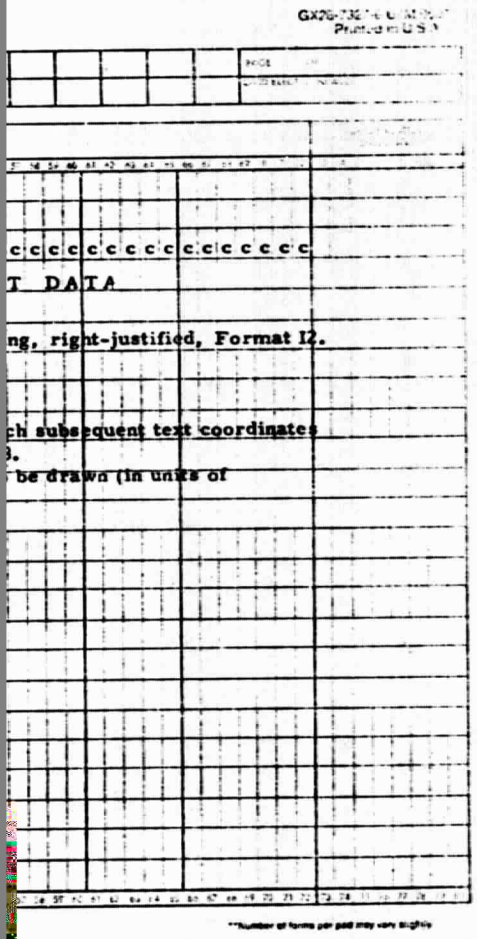

FORTRAN Coding Form
FORTRAN STATEMENT
BLOCK SET DATA FORMAT
BLOCK SET
s s s s s s s s s s s s s s s s s s s s
i i i i i i j j j j j j
x x x x x x y y y y y y
i i i i i i j j j j j j
x x x x x x y y y y y y
:
i i i i i i j j j j j j
x x x x x x y y y y y y
where: iiiiii = x-coordinate of first diagonal point of a block, Format I6.
jjjjjj = y-coordinate of first diagonal point of a block, Format I6.
xxxxxx = x-coordinate of second diagonal point of a block, Format I6.
yyyyyy = y-coordinate of second diagonal point of a block, Format I6.
sss..s = floating point scale factor by which subsequent block data coordinates will be multiplied, Format F20.6.
END BLOCK SET

Figure A-3


c c c c c c c c c c c c c c c c c c
T DATA
ng, right-justified, Format I2.
ch subsequent text coordinates
3.
be drawn (in units of

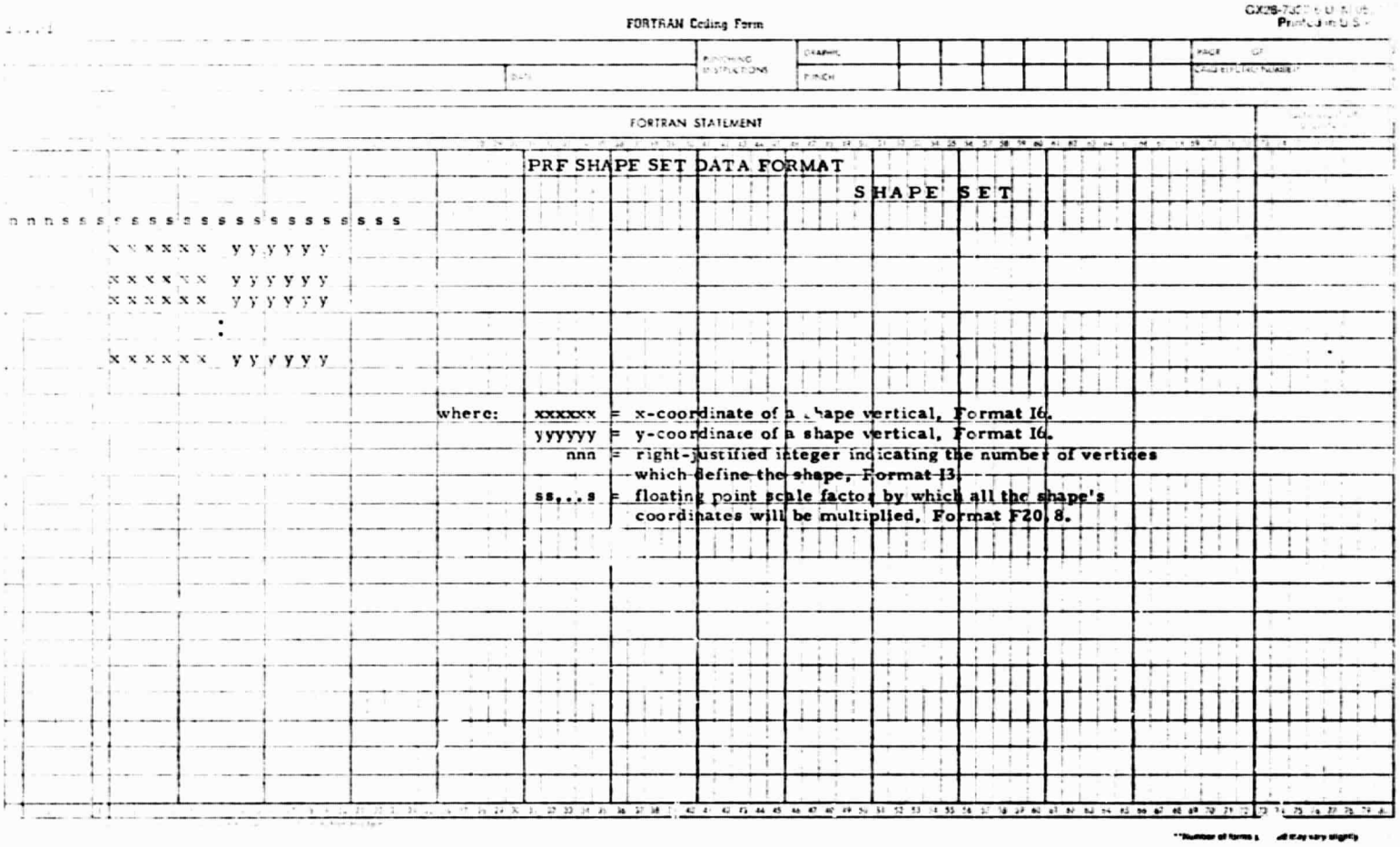


Figure A-5

A3. CELL COMPONENTS

Cell Component Data in PRF Format is used to specify a point and orientation with which data corresponding with the cell name is to be associated. Figure A-6 defines the relation between graphic cell data and the reference point for difference orientation specifications. Figure A-7 illustrates the exact format of Cell Component Data records. Note that there is no record which indicates the start of Cell Component Data. Programs using PRF data normally assume that all records specify cell component placements until an END COMPONENTS record is encountered.

POSSIBLE PATTERN ORIENTATIONS

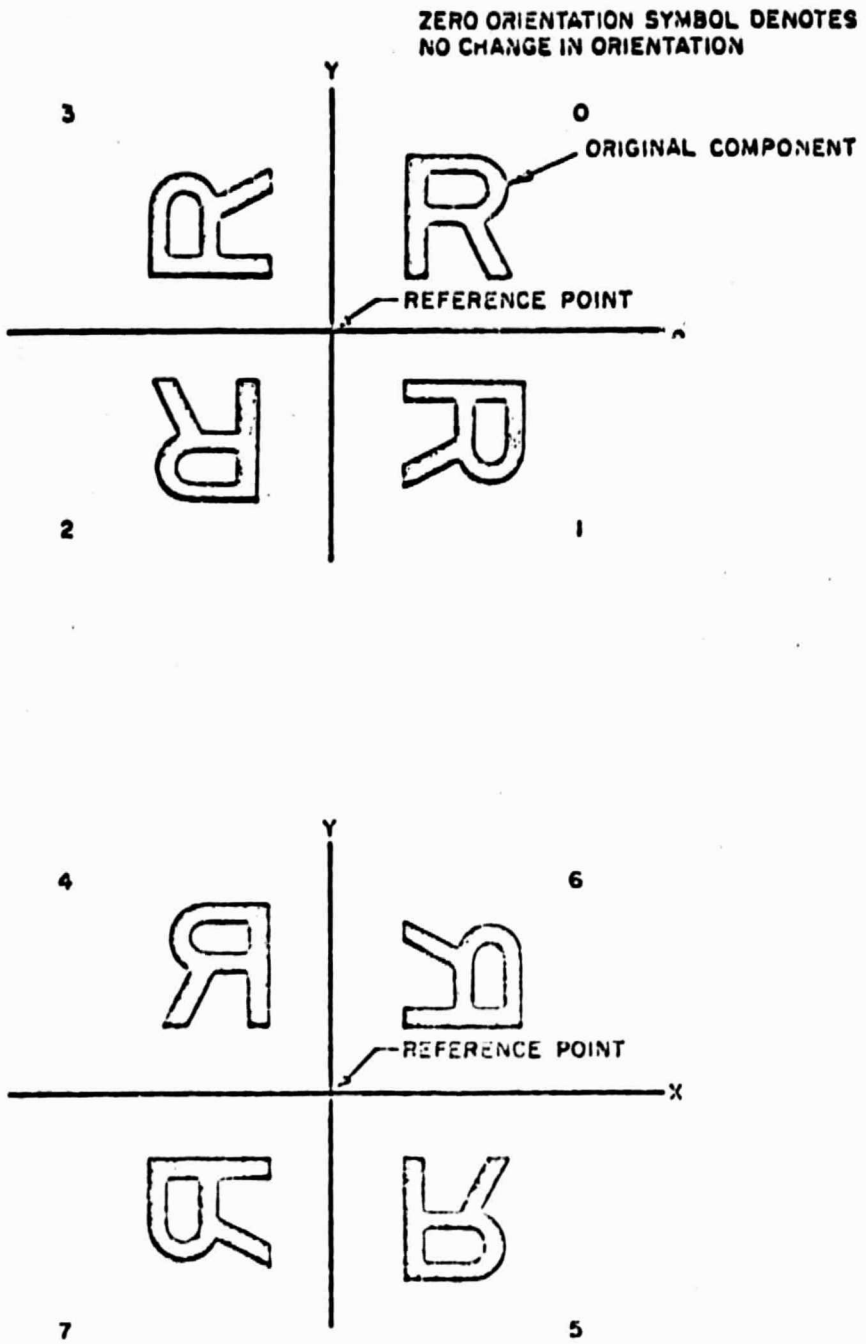


Figure A-6

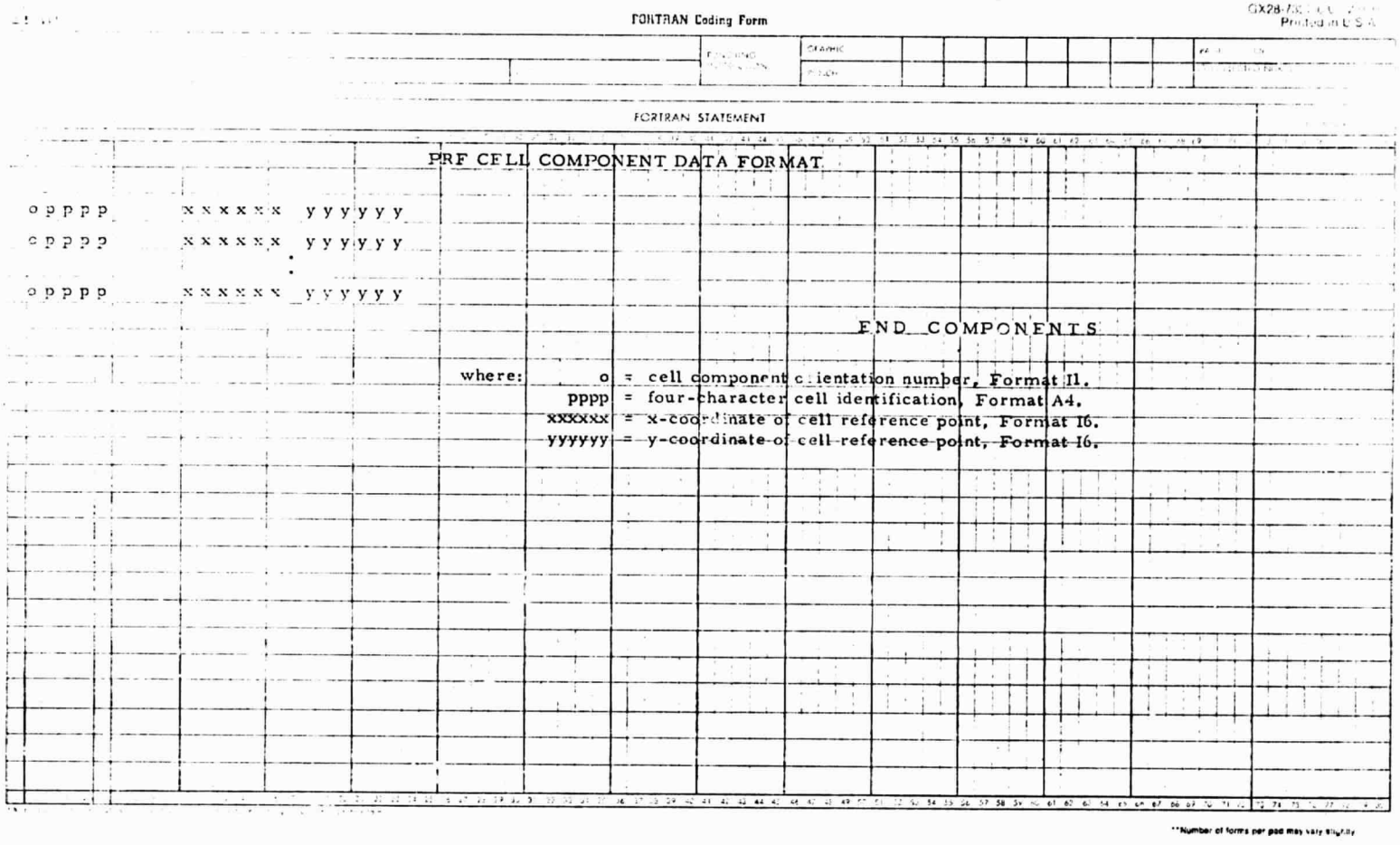


Figure A-7

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