Plot Subroutine for FORTRAN with Format 1.6.056
DISCLAIMER

Although each program has been tested by its contributor, no warranty, express or implied, is made by the contributor or 1620 USERS Group, as to the accuracy and functioning of the program and related program material, nor shall the fact of distribution constitute any such warranty, and no responsibility is assumed by the contributor or 1620 USERS Group, in connection therewith.

Modifications or revisions to this program, as they occur, will be announced in the appropriate Catalog of Programs for IBM Data Processing Systems. When such an announcement occurs, users should order a complete new program from the Program Information Department.
Program Name:

1. Does the abstract adequately describe what the program is and what it does?  
   Comment:__________________________________________  
   Yes____ No____

2. Does the program do what the abstract says?  
   Comment:__________________________________________  
   Yes____ No____

3. Is the Description clear, understandable, and adequate?  
   Comment:__________________________________________  
   Yes____ No____

4. Are the Operating Instructions understandable and in sufficient detail?  
   Comment:__________________________________________  
   Yes____ No____
   Are the Sense Switch options adequately described (if applicable)?  
   Comment:__________________________________________  
   Yes____ No____
   Are the mnemonic labels identified or sufficiently understandable?  
   Comment:__________________________________________  
   Yes____ No____

5. Does the source program compile satisfactorily (if applicable)?  
   Comment:__________________________________________  
   Yes____ No____

6. Does the object program run satisfactorily?  
   Comment:__________________________________________  
   Yes____ No____

7. Number of test cases run________. Are any restrictions as to data, size, range, etc. covered adequately in description?  
   Comment:__________________________________________  
   Yes____ No____

8. Does the Program Meet the minimal standards of the 1620 Users Group?  
   Comment:__________________________________________  
   Yes____ No____

9. Were all necessary parts of the program received?  
   Comment:__________________________________________  
   Yes____ No____

10. Please list on the back any suggestions to improve the usefulness of the program. These will be passed onto the author for his consideration.

Please return to:  

Mr. Richard L. Pratt  
Data Corporation  
7500 Old Xenia Pike  
Dayton, Ohio 45432

Your Name  
Company  
Address  
User Group Code

THIS REVIEW FORM IS PART OF THE 1620 USER GROUP ORGANIZATION'S PROGRAM REVIEW AND EVALUATION PROCEDURE. NONMEMBERS ARE CORDIALLY INVITED TO PARTICIPATE IN THIS EVALUATION.

11/09/64
Plot Subroutine
for FORTRAN W/Format

John H. Reynolds
Sprague Electric Company
Marshall Street
North Adams, Massachusetts

(Formerly Worcester Polytechnic Institute)

August 31, 1962

Direct Inquiries to:
Kurt V. Schoeni
Senior Mathematician
Sprague Electric Company
Marshall Street
North Adams, Massachusetts

DECK KEY.
1. Source Deck
2. Sample Problem Deck
TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>0</td>
</tr>
<tr>
<td>Description of Program</td>
<td>1-2</td>
</tr>
<tr>
<td>Operating Instructions</td>
<td>2</td>
</tr>
<tr>
<td>Plot Subroutine</td>
<td>3-4</td>
</tr>
<tr>
<td>Sample Problem</td>
<td>5-6</td>
</tr>
<tr>
<td>Program Listing</td>
<td>7-8</td>
</tr>
<tr>
<td>Core Layout</td>
<td>9</td>
</tr>
<tr>
<td>Adding the Subroutine to the System</td>
<td>9</td>
</tr>
</tbody>
</table>

Program Abstract

Title (If subroutine state in Title) Plot Subroutine for FORTRAN with Format

Subject Classification 1.6

Author; Organization: John H. Reynolds, Sprague Electric Company; formally, Worcester Polytechnic Institute

Direct Inquires to:
Name: Kurt Y. Schoenl, Senior Mathematician
Address: Sprague Electric Co.
4th Street, North Adams, Massachusetts
Phone Extension 237

Purpose/Description: This subroutine produces output on the on line typewriter rapidly and in graphical form. It plots up to six functions with an accuracy up to 0.7%.

Mathematical Method: N.A.

Restrictions, Range: First two statements of source program are specified. The function must be normalized so that its range is within the number of spaces available on the typewriter. Negative numbers are accepted but are not plotted.

Storage Requirements: 512 Digits

Equipment Specifications:
Memory 20K X 40K 60K K Automatic Divide: Yes No X
Indirect Addressing: Yes No X Other Special Features Required

Additional Remarks (Include at author's discretion: Language; Fixed/Float; Relocatability) (Optional: Running time; Approximate numbers of times run successfully; Programming Hours)
Language: SBS (Card)
Floating Point
Relocatable
Running Time: Approximately 2/3 the time required for a similar FORTRAN print statement.
Description of Program

The plot subroutine will plot up to six functions of a single independent variable on the on-line typewriter. The independent variable must be changed by constant increments. The function must be normalized so that its range does not exceed the number of spaces in the plot area. This places an upper limit of 86 on the normalized function. The function may be any negative number. But, in this case it will not be plotted.

The subroutine is called by a statement in the FORTRAN source program which has the form:

\[ Y = \text{PLT}(X) \]

The argument, \( X \), may be any floating point constant, variable, or expression. The subroutine rounds off the argument to its integral value. The symbol associated with this statement is typed \( X \) spaces to the right of margin of the plot area. \( M \) is the rounded off value of the argument. The symbol is chosen by the programmer. \( Y \) is also set equal to \( X \).

Several functions may be plotted by the use of multiple plot statements. Each statement is independent of the others. They may be placed anywhere in the program and need not be consecutive. The arguments do not need to be ordered.

The subroutine will round off the argument and store it. If there are further functions to be plotted, it will return to the next statement. If there are no further functions, the subroutine will plot the entire group in one continuous operation.

The subroutine does not produce a carriage return. Therefore, the last plot statement must be preceded by a print statement. The format of the print statement must produce blank spaces to the right of any numerical output. If no numerical output is required, a statement of the form:

\[ \text{PRINT } M, \]

will cause a carriage return.

The first two statements in the source program have the form:

\[ n_1 \text{ M = j} \]

\[ n_2 \text{ FORMAT}(\text{ jue, o, o, ... o}) \]

where \( n_1 \) and \( n_2 \) are statement numbers. \( M \) is a fixed point variable which is set equal to the number of function to be plotted. \( M \) may be modified later in the program but, this may not be done within any group of plot statements.

The format statement defines the symbols to be plotted. They may be any alphanumeric symbols except the period and close parenthesis. The symbols may be changed after the object program is loaded by using this format in an input statement. However, this must be done before the first plot statement is executed.

Operating Instructions

Tab stops must be set every ten spaces to the right of the margin of the plot area.
Sample Problem

ENTER SOURCE PROGRAM, PUSH START

PRG SW 1 CNFCR SYMBCAL TABLE, PUSH START

PRG SW 1 GFF TC IGNORE SubROUTINES, PUSH START

PROCESSING COMPLETE
Core Layout

The location of the subroutine is determined by the FORTRAN compiler. The symbols start at location 8343 and continue to higher order locations. The numbers to be plotted are stored in two digit fields starting at location 8342 and continuing to lower order locations.

Adding the Subroutine to the System

The symbols, TOFACI and TOFACO, in the program list refer respectively to the locations of first executable statement and the exit statement of the TOFAC subroutine. FADIN and FADOUT are the locations of the corresponding statements of the FAD subroutine. The location of these statements in user system should be determined.

X is the location of the address of the argument. It is found from the formula:

\[ X = 19989 - 20(NN - 1) \]

where NN is the plot subroutine number.

N is the address of the second item in the symbol table following the subroutine linkages. It is found from the formula:

\[ N = 19989 - 20 \cdot MM \]

where MM is the subroutine number of the last subroutine in the system.