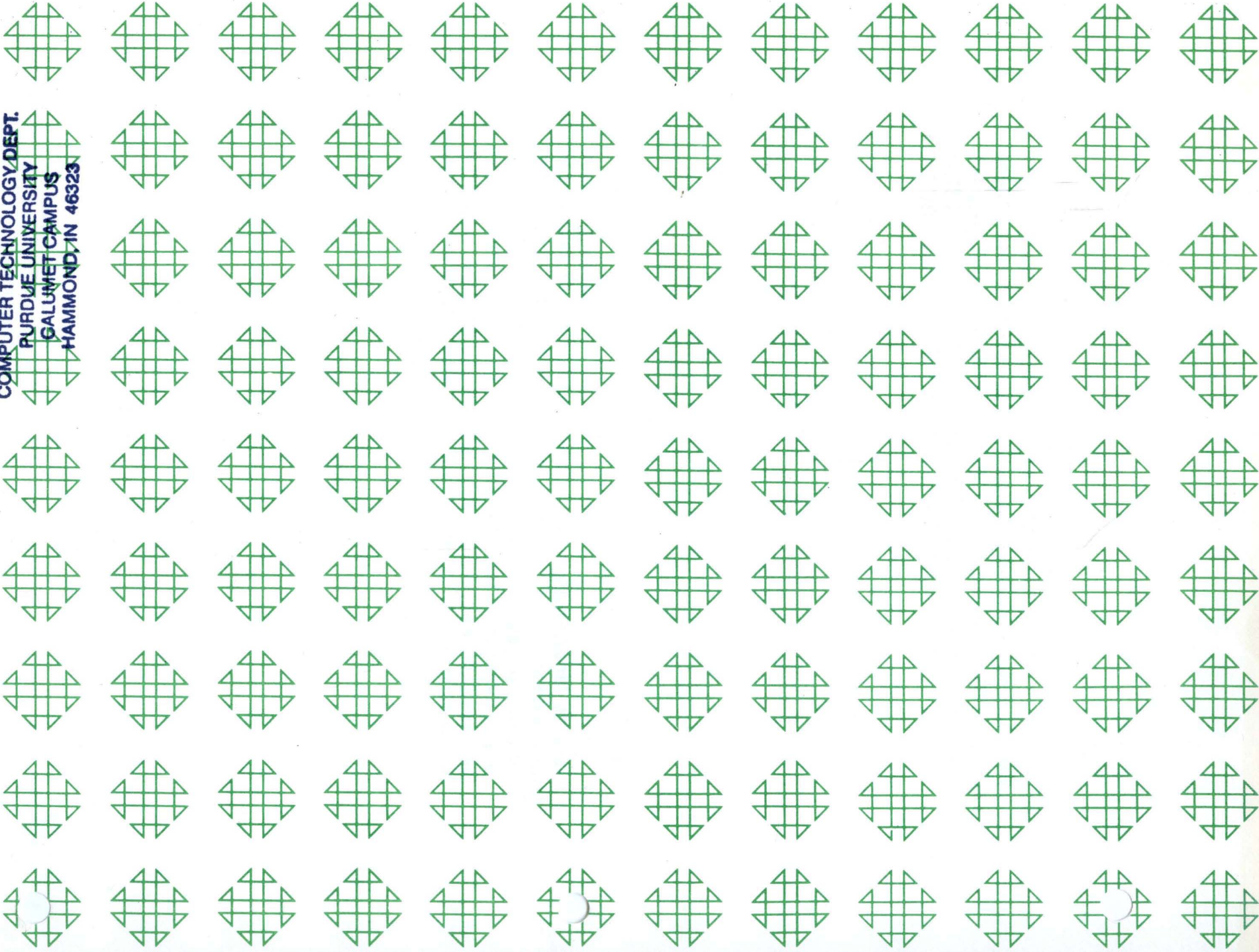


COMPUTER
TECHNOLOGY

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1620 USERS GROUP PROGRAM REVIEW AND EVALUATION

(fill out in typewriter or pencil, do not use ink)

Program No. _____

Date _____

Program Name: _____

1. Does the abstract adequately describe what the program is and what it does? Yes ___ No ___
Comment _____
2. Does the program do what the abstract says? Yes ___ No ___
Comment _____
3. Is the Description clear, understandable, and adequate? Yes ___ No ___
Comment _____
4. Are the Operating Instructions understandable and in sufficient detail? Yes ___ No ___
Comment _____
Are the Sense Switch options adequately described (if applicable)? Yes ___ No ___
Are the mnemonic labels identified or sufficiently understandable? Yes ___ No ___
Comment _____
5. Does the source program compile satisfactorily (if applicable)? Yes ___ No ___
Comment _____
6. Does the object program run satisfactorily? Yes ___ No ___
Comment _____
7. Number of test cases run _____. Are any restrictions as to data, size, range, etc. covered adequately in description? Yes ___ No ___
Comment _____
8. Does the Program Meet the minimal standards of the 1620 Users Group? Yes ___ No ___
Comment _____
9. Were all necessary parts of the program received? Yes ___ No ___
Comment _____
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 _____

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11/09/64



Plot Subroutine
for FORTRAN W/Format

John H. Reynolds
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Marshall Street
North Adams, Massachusetts

(Formerly Worcester Polytechnic Institute)

August 31, 1962

Direct Inquiries to:

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Sprague Electric Company
Marshall Street
North Adams, Massachusetts

DECK KEY

1. Source Deck
2. Sample Problem Deck

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Program Abstract

Title (If subroutine state in Title) <u>Plot Subroutine for FORTRAN with Format</u>	
Subject Classification <u>1.6</u>	
Author; Organization: <u>John H. Reynolds, Sprague Electric Company; formally, Worcester Polytechnic Institute</u>	
Direct Inquires to:	
Name <u>Kurt V. Schoeni, Senior Mathematician</u>	Address <u>Sprague Electric Co.</u>
<u>Marshall Street, North Adams, Massachusetts</u>	Phone <u>Extension 2327</u>
Purpose/Description: <u>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%.</u>	
Mathematical Method: <u>N A.</u>	
Restrictions, Range: <u>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.</u>	
Storage Requirements: <u>812 Digits</u>	
Equipment Specifications:	
Memory <u>20K</u> <input checked="" type="checkbox"/> <u>40K</u> <input type="checkbox"/> <u>60K</u> <input type="checkbox"/> <u>K</u> <input type="checkbox"/> Automatic Divide: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Indirect Addressing: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Other Special Features Required <input type="checkbox"/>	
Additional Remarks (Include at author's discretion: Language; Fixed/Float; Relocatability) (Optional: Running time; Approximate numbers of times run successfully; Programming Hours)	
Language: <u>SPS (Card)</u>	
Floating Point	
Relocatable	
Running Time: <u>Approximately 2/3 the time required for a similar FORTRAN print statement.</u>	

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 = FLT(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 N spaces to the right of margin of the plot area. N 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:

PRINT N,

will cause a carriage return.

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

n₁ M = J

n₂ FORMAT(jHS₁S₂S₃...S_j)

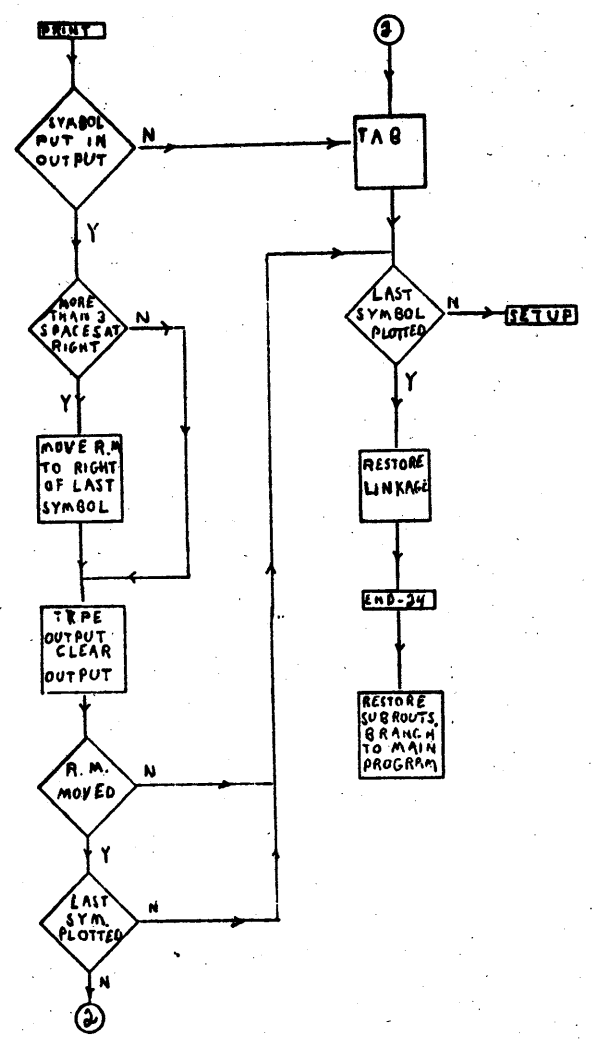
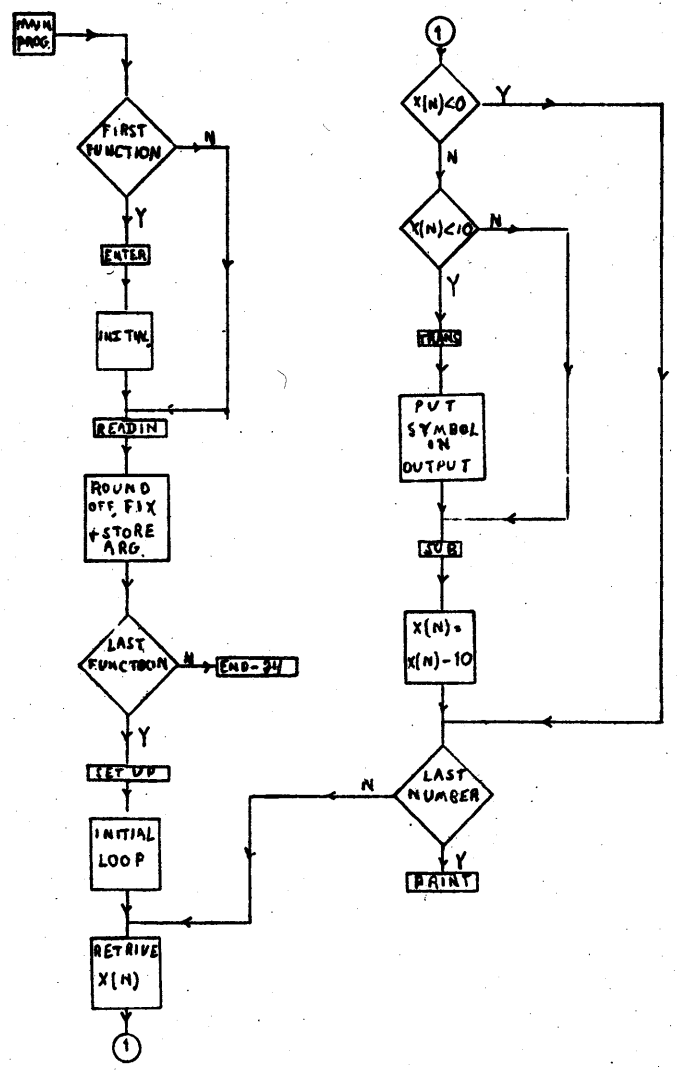
where n₁ and n₂ are statement numbers. M is a fixed point variable which is set equal to the number of function to be plotted. M may be modified later in the program but, this may not be done within any group of plot statements.

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.

-3-
Plot Subroutine



Sample Problem

ENTER SOURCE PROGRAM, PUSH START

```

08300 1 N=1
08324 9 FCRMAT(3HISC)
08354 2 ACCEPT 8,X
08378 8 FCRMAT(F10.1)
08400 DUM=PLT(X)
08424 IF(SENSE SWITCH 1)2,3
08444 3 N=3
08468 DC 4 M=1,361,10
08480 AXIS=PLT(25.)
08504 X=M-1
08552 S=PLT(25.*SIN(X*.01745)+25.)
08636 MPR=M-1
08672 PRINT 7,MPR
08696 7 FCRMAT(15,5X)
08736 4 C=PLT(25.*COS(X*.01745)+25.)
08856 STCP
08904 END

```

PRG SW 1 CNFOR SYMBOL TABLE, PUSH START
 SW 1 OFF TO IGNORE SUBROUTINES, PUSH START
 1620 FORTRAN SUBR. 9/30/61

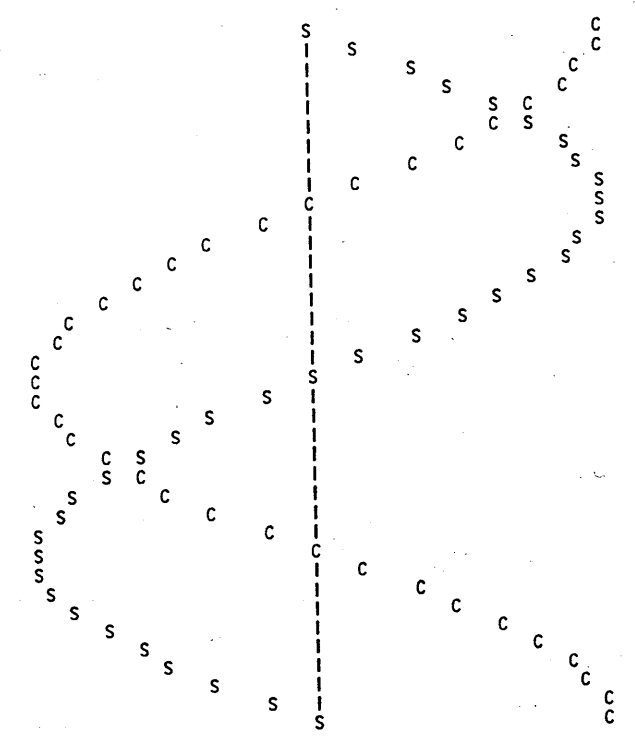
PROCESSING COMPLETE

```

25.00#RS
20.00#RS
19.55#RS
19.45#RS
50.00#RS
10.00#RS
-10.00#RS
25.00#RS

+0
+10
+20
+30
+40
+50
+60
+70
+80
+90
+100
+110
+120
+130
+140
+150
+160
+170
+180
+190
+200
+210
+220
+230
+240
+250
+260
+270
+280
+290
+300
+310
+320
+330
+340
+350
+360
STCP

```



Flot Subroutine W/Format

01010 DCRG 5000
01020ENTER AM X+7,3*12,10
01030 TF DCLCCP,N,0
01040 TF LCCP,N,0
01070READIN SM DCLCCP,1,010
01080 TF TCFAC1-1,X
01090 TFM TCFACC+6,*+5*12,17
01100 TDM TC FACCP+1,9
01110 TDM FADCUT+1,9
01111 TFM FADCUT+6,*+6*12,17
01130 B TCFAC1
01131 TFM FADIN-1,CCNST,17
01131 BNF FADIN,FAC-2
01132 SM LCCP,1,010
01140 SF FAC-3,,10
01141 TD *-1,FAC-2,0
01142 CM *-13,5,010
01143 BL *+24,,0
01144 AM FAC-3,1,10
01150 SF FAC-4
01160 SM *+18,2,010
01170 TF XSAVE,FAC-3
01180 BD END-24,DCLCCP,01
01190 TFM *-18,XSAVE,07
01200 TR CUTPUT-2,CLEAR-2,1
02010SETUP TF DC,N,0
02020 TFM *+3*12+11,XSAVE,07
02030 SM DC,1,010
02040 SM *+23,2,010
02050 TF XTEMP,XSAVE,07
02051 BNF *+24,XTEMP,01
02052 B PRINT-12,,0
02060 BD SUB,XTEMP-1,01
02070TRANS SM LCCP,1,010
02100 SF X+4,7,210
02110 TFM SUB-6,CUTPUT,07
02120 TFM SUB-1,SYMBCL+XSAVE-2,07
02130 S SUB-1,TRANS-3*12-1,01
02140 A *+24+6,XTEMP,01
02150 A *+18,XTEMP,01
02160 TF CUTPUT,SYMBCL+XSAVE-2
03060SUB SM XTEMP,10,010
03070 TF *+18,TRANS-3*12-1,01
03071 TF XSAVE,XTEMP,1
03080 BD SETUP+24,DC,01

05000
05000 11 19876 00036
05012 26 05119 19849
05024 26 05371 19849
05036 12 05119 00001
05048 26 01237 19869
05060 18 01304 05120
05072 15 01299 00009
05084 15 01195 00009
05096 16 01200 05168
05108 49 01238 00000
05120 16 00517 05407
05132 44 00518 00058
05144 12 05371 00001
05156 32 00057 00000
05168 25 05167 00058
05180 14 05167 00005
05192 47 05216 01300
05204 11 00057 00001
05216 32 00056 00000
05228 12 05246 00002
05240 26 08344 00057
05252 43 05756 05119
05264 16 05246 08344
05276 31 00077 05787
05288 26 05587 19849
05300 16 05347 08344
05312 12 05587 00001
05324 12 05347 00002
05336 26 05671 08344
05348 44 05372 05671
05360 49 05516 00000
05372 43 05480 05670
05384 12 05371 00001
05396 32 19873 00007
05408 16 05474 00079
05420 16 05479 16686
05432 22 05479 05347
05444 21 05474 05671
05456 21 05474 05671
05468 26 00079 16686
05480 12 05671 00010
05492 26 05510 05347
05504 26 08344 05671
05516 43 05312 05587

03090PRINT BNF *+15*12,X+4,0
03091 TFM *+23,CUTPUT+17,07
03092 BD *+36,CUTPUT+17,07
03093 SM *-1,2,010
03094 B *-24,,0
03095 CM *-25,92,07
03095 BNL *+5*12,,0
03096 AM *-4*12-1,3,010
03097 TF *+18,*-5*12-1,01
03098 TR CUTPUT+17,CUTPUT+20
03099 BD *+24,LCCP,01
03010 CF X+4
03115 WATY CUTPUT
03120 TR CUTPUT-2,CLEAR-2,1
03130 BNF *+36,X+4,0
03140 TBTY
03141 CF X+4
03150 BD SETUP,LCCP,01
03151 SM X+7,3*12,10
03160 TDM TCFACC+1,2
03161 TDM FADCUT+1,2
03170END B TCFAC1
03180CLEAR DAC 11, @,*-2
03190DCLCCP DS ,READIN+6*12+11
03200LCCP DS ,TRANS-13
04010DC DS ,PRINT+5*12-1
04020CCNST DS ,TRANS+23
04030X DS ,19869
04050N DS ,19849
04140XTEMP DS ,PRINT+12*12-1
04060XSAVE DS ,8344
04070CUTPUT DS ,79
04080TCFACI DS ,1238
04090TCFACC DS ,1298
04100FADIN DS ,518
04110FADCUT DS ,1194
04120FAC DS ,60
04130SYMBCL DS ,8344
04150 DEND 5000

05528 44 05708 19873
05540 16 05563 00096
05552 43 05588 00096
05564 12 05563 00002
05576 49 05552 00000
05588 14 05563 00092
05600 46 05660 01300
05612 11 05563 00003
05624 26 05642 05563
05636 31 00096 00099
05648 43 05672 05371
05660 33 19873 00000
05672 39 00079 00100
05684 31 00077 05787
05696 44 05732 19873
05708 34 00000 00108
05720 33 19873 00000
05732 43 05288 05371
05744 12 19876 00036
05756 15 01299 00002
05768 15 01195 00002
05780 49 01238 00000
05789 00011X2
05119 00000
05371 00000
05587 00000
05407 00000
19869 00000
19849 00000
05671 00000
08344 00000
00079 00000
01238 00000
01298 00000
00518 00000
01194 00000
00060 00000
08344 00000
05000

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 users 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.

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