MEMORANDUM REPORT ARBRL-MR-02818

INTERPOL: AN INTERACTIVE PLOTTING PACKAGE
FOR OFF-LINE CAL COMP SYSTEMS

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March 1978

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND
BALLISTIC RESEARCH LABORATORY
ABERDEEN PROVING GROUND, MARYLAND

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**INTERPOL: AN INTERACTIVE PLOTTING PACKAGE FOR OFF-LINE CAL COMP SYSTEMS.**

**R. M. Schwenk, J. W. Kinch, A. E. Rainis**

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**ATTN: DRDAR-BLV**

**Aberdeen Proving Ground, MD 21005**

**A program has been written to incorporate the necessary routines required for general purpose two-dimensional and three-dimensional (x,y) data plotting. The interactive format of the program reduces the typical three-step planning, writing, and debugging process to an efficient, single-step question and answer execution. The plotting routines employed are standard Cal Comp FORTRAN sub-programs for off-line Cal Comp pen plotters. Driver routines and miscellaneous I/O routines all use standard FORTRAN. This program may be used with TTY and CRT type terminals. Foreknowledge of computer plotting techniques is not necessary, although some experience may be helpful.**

**KEY WORDS**

PLOTTING, Cal Comp, INTERACTIVE I/O, TWO-DIMENSIONAL, THREE-DIMENSIONAL
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I. INTRODUCTION

A. Purpose

A program has been written to incorporate the necessary routines required to provide more expedient computer plotting capability for general purpose two dimensional and three dimensional (x, y) data plotting. The intent of this program, INTERPOL*, is to minimize programming effort. The interactive format of the program reduces the typical three-step planning, writing, and debugging process to an efficient, single-step question and answer execution. Foreknowledge of computer plotting techniques is not necessary, although some experience may be helpful.

B. Scope

INTERPOL was written for use on the UNIVAC 1108 computer. The plotting routines employed are standard Cal Comp1-3 FORTRAN subprograms. Driver routines and miscellaneous I/O routines all use standard FORTRAN. Conversion of INTERPOL to other machines employing off-line Cal Comp pen plotters can be accomplished with little effort.

Use of this program is most advantageous with CRT time-sharing terminals, but TTY type terminals may be used. Length of execution is dependent on time-sharing response, number of graphs generated, and amount of data processed per graph (the former of these being dominant).

INTERPOL requires ~30K of UNIVAC 1108 core.

II. PROGRAM STRUCTURE

A. Problem Flow

Figure 1 shows the basic flow structure for INTERPOL. The user is first asked for the logical unit number upon which the digital graphic commands will be written. The pen plotter is then initialized

*Interactive Plotting for Off-Line Systems
Figure 1. INTERPOL Flow Diagram
accordingly and problem execution begins. Each run is comprised of two loops; one controlling the general design of the graph (two dimensional or three-dimensional, title, axis labeling, scaling, and grid); and the other controlling the display of the data (type of line, type of symbol, or line/symbol combination). The user has the opportunity to change any, or all, input parameters within each loop, thereby changing the design of successive graphs or representation of the data sets at will. In this manner INTERPOL allows for multiple sets of data on one graph and multiple graphs during one execution.

B. Cal Comp Routines

Table I lists the Cal Comp routines employed by INTERPOL along with a brief description of the function they perform. The arguments used in the call to these routines are all set internally, based on the user's selection of the graphic design parameters. The routines provided are among the most generalized available from Cal Comp. Specialized sub-programs which draw specific figures or curves were intentionally omitted in order to keep INTERPOL as efficient as possible for plotting (x, y) data only. Thus, the user has available to him linear, semi-logarithmic, or log-log scaling, with smooth line fit, straight line point connection, dashed line point connection, symbols printed at points only, or line/symbol combinations. This is adequate for most graph applications (examples in Appendix A) and keeps the user-supplied input at a minimum.

C. INTERPOL Routines

Table II lists the routines used by INTERPOL to provide the interface between the user and the Cal Comp software. Brief descriptions are given in the table but several require further explanation.

TITLE -- This subroutine prints a title block if requested by the user. It provides up to five lines of script, 25 characters per line. The user may position the title block anywhere on the graph by specifying an upper left coordinate (i.e., where the first line is to begin)*. At its maximum, the title block size is approximately 3.5 inches horizontally by 1.5 inches vertically.

NUGRID -- This subroutine draws either a vertical, horizontal or vertical and horizontal grid pattern on the plot. The increment of each line along an axis is dictated by the scaling of the data (tick marks) for that axis. NUGRID is compatible with TITLE in that the lines drawn will not intersect the script of the title block.

*This coordinate is an (x, y) point, in inches, relative to the origin of the graph.
Table I. Standard Cal Comp Routines Used by INTERPOL

<table>
<thead>
<tr>
<th>NAME</th>
<th>FUNCTION</th>
</tr>
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<tbody>
<tr>
<td>PLOTS</td>
<td>Initializes the pen plotter.</td>
</tr>
<tr>
<td>PLOT</td>
<td>Establishes origin; draws a line.</td>
</tr>
<tr>
<td>FACTOR</td>
<td>Expands or reduces pen movements (plot size).</td>
</tr>
<tr>
<td>SCALE</td>
<td>Scales data linearly to fit pen plotter.</td>
</tr>
<tr>
<td>AXIS</td>
<td>Creates linearly scaled axis with Hollerith label.</td>
</tr>
<tr>
<td>LGAXIS</td>
<td>Creates logarithmically scaled axis with Hollerith label.</td>
</tr>
<tr>
<td>SYMBOL</td>
<td>Draws a symbol or string of symbols.</td>
</tr>
<tr>
<td>LINE</td>
<td>Draws a straight line connecting a set of linearly scaled points.</td>
</tr>
<tr>
<td>DASHLN,DASHPT</td>
<td>Draws a dashed line connecting a set of linearly scaled points.</td>
</tr>
<tr>
<td>FLINE</td>
<td>Draws a smooth fit connecting a set of linearly scaled points.</td>
</tr>
<tr>
<td>LGLIN</td>
<td>Draws a straight line connecting a set of logarithmically scaled points.</td>
</tr>
<tr>
<td>SCALOG</td>
<td>Scales data logarithmically to fit pen plotter.</td>
</tr>
</tbody>
</table>
Table II. INTERPOL Interface Routines

<table>
<thead>
<tr>
<th>NAME</th>
<th>FUNCTION</th>
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<tbody>
<tr>
<td>INIT</td>
<td>Initializes pen plotter and sets up graph origin.</td>
</tr>
<tr>
<td>TITLE</td>
<td>Writes graph title block.</td>
</tr>
<tr>
<td>FACTR</td>
<td>Reduces or enlarges size of plot.</td>
</tr>
<tr>
<td>NUGRID</td>
<td>Draws a grid.</td>
</tr>
<tr>
<td>PLOTTR</td>
<td>Plots all data and/or generates histograms.</td>
</tr>
<tr>
<td>AXES</td>
<td>Draws and labels axes.</td>
</tr>
<tr>
<td>MAIN</td>
<td>Main program control.</td>
</tr>
<tr>
<td>READR</td>
<td>Inputs all data, handles all interactive I/O.</td>
</tr>
<tr>
<td>FIXUP</td>
<td>Checks for zeros in logarithmically scaled data. (See Section III.A)</td>
</tr>
</tbody>
</table>
PLOTTR--This subroutine is the backbone of INTERPOL. All data is plotted from PLOTTR. An option available with INTERPOL which allows for histogram generation based on single sets of (x,y) data (i.e., a new set of data is calculated to enable a histogram style plot to be drawn) is handled via PLOTTR. Also, since the Cal Comp routines DASHLN and FLINE will not work with logarithmically scaled data, PLOTTR re-scales these values (if in logarithmic mode) so as to be compatible with the dash line or smooth fit options.

All routines are marked with comment cards to aid in following the programming or instituting changes. A complete FORTRAN listing can be found in Appendix B.

III. I/O HANDLING

A. Interactive I/O

Subroutine READR handles all program requests and user replies. Each question is self-explanatory and supplies the user with a choice of responses. INTERPOL precedes each question with a double arrow(">>") for clarity. Where a "YES" or "NO" response is applicable, a "Y" or "N" will suffice. Every input (except for Hollerith data) is checked for an error, and, if found, notifies the user accordingly and repeats the question. Warnings or general information not requiring user input are preceeded by a double asterisk ("**").

All data to be plotted must be presented in (x,y) pairs using free form (open) format. While entering any data which is to be scaled logarithmically, INTERPOL checks each (x,y) point for zeros. If a zero is encountered, the zero is reset to the lowest value of the data set (i.e., the lowest x or y value input). A warning is then printed telling the user this action was taken.

Several questions have default answers and the user is supplied this information as necessary. Entering a zero, or transmitting a blank line, will set the default value.

Upon problem completion, INTERPOL will write the number of graphs generated and compute the maximum height (y axis length) encountered. A message is printed notifying the user of any paper size restrictions. A final note reminds the user of the logical unit number upon which the plot records were written.

B. Plot-Record Tape

INTERPOL is written for off-line Cal Comp magnetic tape units. Therefore, the specific device or procedure for generating these tapes may vary with installation. The records written on the selected logical unit, however, are all that are necessary to drive the pen plotter. Whether written directly on tape or copied to tape from mass storage is strictly a matter of procedure as defined by the user's system. (The
current UNIVAC 1108 version of INTERPOL will dynamically assign a temporary mass-storage file "29", by default, if so requested. This may then be copied to magnetic tape as mentioned above, and/or copied to a permanent catalogued file upon problem completion.

IV. 3-D PLOTTING PACKAGE

A. Tracor Routines

A three-dimensional plotting routine developed by Tracor Computing Corporation was modified and incorporated for use with INTERPOL. Briefly, the 3-D package reads sets of (x,y) data and successively steps each set in a Z, or depth direction. Any portion of data which falls behind a previous set is either not plotted, or plotted with a dashed line (thus giving a "hidden" effect). Two subroutines govern the calculation of the maximum and/or minimum function (i.e., "seen" vs. "unseen" data), HIDE and LOOKUP. HIDE is the main routine and contains the Cal Comp software calls. Figure 2 is a representation of the 3-D option.

B. INTERPOL Interface

Due to the special nature of the Tracor routines the 3-D capabilities are a bit more restrictive than those previously described, but follow the same format. Only a single line title is permitted (placed above the plot). Linear, semi-log, and log-log scaling is available. Only the x and y axes have labels and tick marks, the depth axis does not. There is no grid capability. Dashed lines are reserved for "hidden" data only. Histogram generation is not provided. To maintain versatility, the user is capable of switching from 2-D to 3-D and back as successive graphs are generated.

V. SUMMARY

An interactive computer program for plotting on off-line Cal Comp systems has been developed. The program acts as an interface between user specified requests and standard Cal Comp software. Execution is designed primarily for generating graphs of \((x,y)\) data in typical two dimensional or three dimensional form. Input is handled via a question and answer conversation with the user. As such, an efficient, simple and versatile method of generating computer graphs, negating the need for writing special programs on a case by case basis, is provided. Little or no computer plotting experience is required to successfully execute this program. Written in standard FORTRAN, this program is compatible with most computing machines.
APPENDIX A

Contained in this appendix are five plots (Figures A1 - AS) depicting a cross-section of options available with INTERPOL. Also included (Table A1) is a list of integer equivalents of Cal Comp symbols.
Figure A2. Symbols Only, Log X-Linear Y Scaling, Horizontal Grid Lines.
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**Note:** The above table lists the integer equivalents of Cal Comp symbols, where each symbol corresponds to a specific integer value. This table is useful for ensuring compatibility and understanding the numeric representation of various symbols used in the Cal Comp system.
APPENDIX B

Contained in this appendix is a complete FORTRAN symbolic listing of all INTERPOLS subroutines.
I * N * T * E * R * P * O * L

A GENERAL PURPOSE 2-DIMENSIONAL/3-DIMENSIONAL PLOTTING ROUTINE

This is the Univac 1108 version.

Main routine for 'INTERPOL':

The arrays for the (X,Y) data are arbitrarily set to 900
in common data. The number of sets of data per graph
is arbitrarily set to 20 via common draw.
The dimension statement (ICHK), below, was arbitrarily set
to 100 -- i.e., an arbitrary number of graphs per run.
It is simply used to check vertical axis lengths for paper
size restrictions.

... the next card is for CDC machines.

PROGRAM MAIN(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE29)

COMMON /INPUT/ IXAXIS(5),IYAXIS(5),ITITL1(5),ITITL2(5),ITITL3(5),
                ITITL4(5),ITITL5(5),ITYPE,XAXIS,YAXIS,FACT,ITITLE,Y2,X1,IGRID,
                2YINC,XINC,NOU,NIN,ILINES,LDEV,NSETS,IHN,IHY,IHB,IHO

COMMON /DATA/ XARRAY(900),YARRAY(900),HISTOX(900),HISTOY(900),
                XPTS(900),YPTS(900),ANUX(900),ANUY(900),ANUXH(900),ANUYH(900)

COMMON /DRAW/ NPTS(20),IPLLOT(20),IHIST(20),LINTYP(20),INTEQ(20),
                LOGTYP(20),SKIP

DATA NOU,NIN/6,5/
DATA IHN,IHY,IHB,IHO/IHN,IHY,IH,IHO/

DIMENSION ICHK(100)
WRITE (NOU,5000)
SKIP=0.
NPASS=1

CALL READR (NPASS,MASK)
CALL AXES (MASK)
IF (MASK.EQ.IHY) GO TO 105
IF (IGRID.EQ.IHY) CALL NUGRID
IF (ITITLE.EQ.IHY) CALL TITLE
CALL PLOTR
GO TO 110

CALL HIDE (YSTEP)
YAXIS=YAXIS+YSTEP

ICHK(NPASS)=YAXIS*FACT
11811 WRITTEN ON UNIT 12,2H.

5040 FORMAT (/30H*** PLOT(S) WILL FIT ON NARROW PAPER.)
5050 FORMAT (/43H*** PLOT(S) WILL NOT FIT ON NARROW PAPER.,/4X, 116HUSE WIDE SIZE.)
5060 FORMAT (/20H*** END OF RUN...../)  

C END SUBROUTINE AXES (MASK)

C THIS SUBROUTINE SCALES ALL DATA AND DRAW THE APPROPRIATE AXES WITH LABELS AS WELL AS THE GRAPH’S BORDER.


C COMMON /DATA/ XARRAY(900), YARRAY(900), HISTOX(900), HISTOY(900), 1XPTS(900), YPTS(900), ANUX(900), ANUY(900), ANU1X(900), ANU1Y(900)

C COMMON /DRAW/ NPTS(20), IPILOT(20), IHIST(20), LINYP(20), INTEQ(20), LOGTYP(20), SKIP

C ITOT=0
DO 100 I=1, NSETS
   ITOT=ITOT+NPTS(I)
100 CONTINUE
GO TO (105, 110, 115, 120), ITYPE
C C... ITYPE=1 ---- LINEAR X, LINEAR Y SCALED AXES.
C
105 CALL SCALE (XARRAY, XAXIS, ITOT, 1)
CALL SCALE (YARRAY, YAXIS, ITOT, 1)
IF (MASK.EQ.IHY) GO TO 125
CALL AXIS (0.0, 0.0, IXAXIS, -25, XAXIS, 0.0, XARRAY(ITOT+1), XARRAY(ITOT+2))
CALL AXIS (0.0, 0.0, IYAXIS, 25, YAXIS, 90.0, YARRAY(ITOT+1), YARRAY(ITOT+2))
CALL PLOT (0.0, YAXIS, 3)
CALL PLOT (XAXIS, YAXIS, 2)
CALL PLOT (XAXIS, 0.0, 2)
GO TO 125
C C... ITYPE=2 ---- LINEAR X, LOG Y SCALED AXES.
C
110 CALL SCALE (XARRAY, XAXIS, ITOT, 1)
CALL SCALE (YARRAY, YAXIS, ITOT, 1)
IF (MASK.EQ.IHY) GO TO 125
CALL AXIS (0.0, 0.0, IXAXIS, -25, XAXIS, 0.0, XARRAY(ITOT+1),

29
EXTERNAL FACTR

SUBROUTINE FACTR

C THIS SUBROUTINE CHANGES THE LENGTH OF ALL PEN MOVEMENTS BY A
C USER SUPPLIED SCALING FACTOR (SUBR. READR). 1.0 IS FULL SCALE.

COMMON /INPUT/ IXAXIS(5), IYAXIS(5), ITITL1(5), ITITL2(5),
IITITL3(5), IITITL4(5), IITITL5(5), ITYPE, XAXIS, YAXIS, FACT, ITITLE, Y2, X1,
2GRID, YINC, XINC, NOU, NIN, LINES, LDEV, NSETS, IHN, IHY, IHB, IHO

COMMON /DATA/ XARRAY(900), YARRAY(900), HISTOX(900), HISTOY(900),
1XPTS(900), YPTS(900), ANUX(900), ANUY(900), ANUX(900), ANUY(900)

COMMON /DRAW/ NPTS(20), IPILOT(20), IHIST(20), LINTYP(20), INTEQ(20),
LOGTYP(20), SKIP

1XARRAY (ITOT+2))
1YARRAY (ITOT+2))
CALL LGAEX (0.0, 0.0, IYAXIS, 25, YAXIS, 90.0, YARRAY (ITOT+1),
CALL PLOT (0.0, YAXIS, 3)
CALL PLOT (XAXIS, YAXIS, 2)
CALL PLOT (XAXIS, 0.0, 2)
GO TO 125

C... ITYPE=3 ---- LOG X, LINEAR Y SCALED AXES.

C
115 CALL SCALG (XARRAY, XAXIS, ITOT, 1)
CALL SCALE (YARRAY, YAXIS, ITOT, 1)
IF (MASK.EQ. IIIY) GO TO 125
CALL LGAXS (0.0, 0.0, IYAXIS, 25, YAXIS, 90.0, YARRAY (ITOT+1),
1YARRAY (ITOT+2))
CALL AXIS (0.0, 0.0, IXAXIS, -25, XAXIS, 0.0, XARRAY (ITOT+1),
1XARRAY (ITOT+2))
CALL PLOT (0.0, YAXIS, 3)
CALL PLOT (XAXIS, YAXIS, 2)
CALL PLOT (XAXIS, 0.0, 2)
GO TO 125

C... ITYPE=4 ---- LOG X, LOG Y SCALED AXES.

C
120 CALL SCALG (XARRAY, XAXIS, ITOT, 1)
CALL SCALG (YARRAY, YAXIS, ITOT, 1)
IF (MASK.EQ. IIIY) GO TO 125
CALL LGAXS (0.0, 0.0, IXAXIS, 25, XAXIS, 0.0, XARRAY (ITOT+1),
1XARRAY (ITOT+2))
CALL LGAXS (0.0, 0.0, IYAXIS, 25, YAXIS, 90.0, YARRAY (ITOT+1),
1YARRAY (ITOT+2))
CALL PLOT (0.0, YAXIS, 3)
CALL PLOT (XAXIS, YAXIS, 2)
CALL PLOT (XAXIS, 0.0, 2)
125 RETURN
END
CALL FACTOR (FACT)
RETURN
END

SUBROUTINE FIXUP

C
C THIS ROUTINE SETS ANY DATA WHICH IS TO BE LOGARITHMICALLY SCALED
C AND WAS FOUND TO BE EQUAL TO ZERO TO THE MINIMUM OF THE RESPECTIVE
C X OR Y ARRAY. THIS PREVENTS AN ABORTED RUN. THE USER IS TOLD.
C
COMMON /INPUT/ IXAXIS(5),IYAXIS(5),ITITL(5),ITITL2(5),ITITL3(5),
ITITL4(5),ITITL5(5),ITYPE,XAXIS,YAXIS,FACT,ITITLE,Y2,X1,IGRID,
2YINC,XINC,NOU,NIN,ILINES,LDEV,NSETS,IINH,IHY,IHB,IIO
C
COMMON /DATA/ XARRAY(900),YARRAY(900),HISTOX(900),HISTOY(900),
1XPTS(900),YPTS(900),ANUX(900),ANUY(900),ANUIX(900),ANUIY(900)
C
COMMON /DRAW/ NPTS(20),IPLT(20),IHIST(20),LINTYP(20),INTEQ(20),
1LOCTYP(20),SKIP
C
DO 1 I=1,NSETS
ITOT=ITOT+NPTS(I)
1 CONTINUE
XMIN=1.0E+29
YMIN=1.0E+29
DO 2 I=1,ITOT
XMIN=AMIN1(XMIN,XARRAY(I))
YMIN=AMIN1(YMIN,YARRAY(I))
2 CONTINUE
IF (XMIN.EQ.0.) XMIN=XMIN+.0001
IF (YMIN.EQ.0.) YMIN=YMIN+.0001
L=ITYPE-1
GO TO (3,5,7), L
3 DO 4 I=1,ITOT
IF (YARRAY(I).EQ.0.) YARRAY(I)=YMIN
4 CONTINUE
GO TO 9
5 DO 6 I=1,ITOT
IF (XARRAY(I).EQ.0.) XARRAY(I)=XMIN
6 CONTINUE
GO TO 9
7 DO 8 I=1,ITOT
IF (XARRAY(I).EQ.0.) XARRAY(I)=XMIN
IF (YARRAY(I).EQ.0.) YARRAY(I)=YMIN
8 CONTINUE
9 CONTINUE
WRITE (NOU,10)
RETURN
C
C
*****FORMAT STATEMENTS*****
FORMAT (/51H*** INPUT WARNING: ZERO'S ENCOUNTERED ON LOGARITHM,. 
119ICALLY SCALED DATA--/, 36H VALUES WERE RE-SET TO MINIMUM OF, 
233H RESPECTIVE ARRAY (XMIN OR YMIN).)
C
END
SUBROUTINE HIDE (YSTEP)
C
THIS ROUTINE PLOTS THE 3-DIMENSIONAL GRAPH.
C
COMMON /INPUT/ IXAXIS(5),IYAXIS(5),ITITL1(5),ITITL2(5),ITITL3(5),
1ITITL4(5),ITITL5(5),ITYPE,XAXIS,YAXIS,FACT,ITITLE,Y2,X1,1GRID,
2YINC,XINC,NOU,NIN,ILINES,LDEV,NSETS,IIN,IIY,IIH,II0
C
COMMON /DATA/ XARRAY(900),YARRAY (900),HISTOX(900),HISTOY(900),
1XPTS (900),YPTS (900),ANUX(900),ANUY (900),ANUXX (900),ANUXY(900)
C
COMMON /DRAW/ NPTS(20),IPLLOT(20),IHIST(20),LINTYP(20),INTEQ(20),
1LOGTYP(20),SKIP
C
 DIMENSION X(900),Y (900),XG(900),G(900),XI(900),H(900)
 EQUIVALENCE (K1,WHICH), (K2,SLOPE), (FNSTM1,21), (1GCP1,K1), (K1,
1N2)
 DATA EPS 1,MAXDIM,XSTART,YSTART/ 1.E-9,900,4.,3./
 F(XX,XI,Y1,YIP1) =Y1+(XX_1)*(YIP1_Y1)/(XIP1-X1)
 WRITE (NOU,5000)
 READ (NIN,5030) IDASH
 YSTEP=YSTART
 SKIP=XAXIS+4.0
 JN=1
 JO=0
 NG=0
 ITOT=0
 DO 100 I=1,NSETS
 ITOT=ITOT+NPTS(I)
 100 CONTINUE
C
 DO 355 JM=1,NSETS
 N1=NPTS(JM)
 JO=JO+N1
 IK=1
 DO 130 IJ=JN,JO
 ITOT=ITOT
 130 CONTINUE
 GO TO (120,105,110,115), ITYPE
 105 Y (IK)=(LOG10(YARRAY (IJ))-LOG10(YARRAY (ITOT+1)))/YARRAY (ITOT+ 
 1 )
 (IK)=XARRAY(IJ)
 GO TO 125
 110 X(IK)=(LOG10(XARRAY (IJ))-LOG10(XARRAY (ITOT+1)))/XARRAY (ITOT+ 
 1 2)
Y(IK) = YARRAY(IJ)
GO TO 125
115  X(IK) = (LOG10(XARRAY(IJ)) - LOG10(XARRAY(ITOT+1))) / XARRAY(ITOT+2)
Y(IK) = (LOG10(YARRAY(IJ)) - LOG10(YARRAY(ITOT+1))) / YARRAY(ITOT+2)
GO TO 125
120  X(IK) = XARRAY(IJ)
Y(IK) = YARRAY(IJ)
125  IK = IK + 1
130  CONTINUE

JN = JN + N1
DO 135 I = 2, N1
IF (X(I-1).LT.X(I)) GO TO 135
WRITE (NOU, 5010) X(I-1), X(I)
RETURN
135  CONTINUE
IF (JM.GT.1) GO TO 205
NFNS = NSETS
XMIN = XARRAY(ITOT+1)
YMIN = YARRAY(ITOT+1)
DELTAX = XARRAY(ITOT+2)
DELTAY = YARRAY(ITOT+2)
IF (N1+4.LE.MAXDIM) GO TO 140
GO TO 360
140  SIGN = 1.
IF (NG.LT.-1) SIGN = -1.
IF (NG.EQ.-1.OR.NG.EQ.-3) GO TO 145
CALL PLOT (0., YSTART+YAXIS, 3)
CALL DASHP (XAXIS, YSTART+YAXIS, 0.03)
CALL DASHP (XAXIS, YSTART,.03)
CALL DASHP (0., YSTART,.03)
CALL PLOT (XAXIS, YSTART, 3)
CALL DASHP (XAXIS+XSTART, 0., 0.03)
CALL SYMBOL (2.0, YAXIS+YSTART+.10, .14, ITITL1, 0., 25)
GO TO (150, 155, 160, 165), ITYPE
150  CALL AXIS (XSTART, 0., IXAXIS, -25, XAXIS, 0., XMIN, DELTAX)
CALL PLOT (XSTART, 0., 3)
CALL PLOT (0., YSTART, 2)
CALL AXIS (0., YSTART, IXAXIS, 25, YAXIS, 90., YMIN, DELTAY)
GO TO 170
155  CALL AXIS (XSTART, 0., IXAXIS, -25, XAXIS, 0., XMIN, DELTAX)
CALL PLOT (XSTART, 0., 3)
CALL PLOT (0., YSTART, 2)
CALL LGAXS (0., YSTART, IXAXIS, 25, YAXIS, 90., YMIN, DELTAY)
GO TO 170
160  CALL LGAXS (XSTART, 0., IXAXIS, -25, XAXIS, 0., XMIN, DELTAX)
CALL PLOT (XSTART, 0., 3)
CALL PLOT (0., YSTART, 2)
CALL AXIS (0., YSTART, IXAXIS, 25, YAXIS, 90., YMIN, DELTAY)
GO TO 170
CALL LGAXS (XSTART,0.,IXAXIS,-25,XAXIS,0.,XMIN,DELTAX)
CALL PLOT (XSTART,0.,3)
CALL PLOT (0.,YSTART,2)
CALL LGAXS (0.,YSTART,IXAXIS,25,YAXIS,90.,YMIN,DELTAY)

INDEX=3
GO TO (190,175,180,185), ITYPE

170
YMIN=0.
DELTAY=1.
GO TO 190

180
XMIN=0.
DELTAX=1.
GO TO 190

185
XMIN=0.
DELTAX=1.
YMIN=0.
DELTAY=1.

190
CONTINUE
IF (NFNS.LE.0) GO TO 195
NFNSM1=NFNS-1
DXIN=XSTART*DELTAX/NFNSM1
DYIN=YSTART*DELTAY/NFNSM1

195
DO 200 J=1,N1
XG(INDEXT)=X(J)
G(INDEXT)=SIGN*Y(J)
INDEX=INDEX+1

200
CONTINUE
EPS=EPS1*(ABS(XMIN)+ABS(DELTAX))
NG=N1+4
XG(1)=-NFNSM1*DXIN+XMIN-ABS(XMIN)-ABS(XG(3))-1.
XG(2)=XG(3)-EPS
XG(N1+3)=XG(N1+2)+EPS
ZZ=YMIN
IF (SIGN.LT.0.) ZZ=-YMIN-50.*DELTAY
G(1)=ZZ
G(2)=ZZ
G(N1+3)=ZZ
G(NG)=ZZ
CALL PLOT (XSTART,0.,-3)
X(N1+1)=XMIN
X(N1+2)=DELTAX
Y(N1+1)=YMIN
Y(N1+2)=DELTAY
CALL LINE (X,Y,N1,1,0,0)
DXKK=0.
DYKK=0.
RELINC=DELTAX/DELTAY
XG(NG)=SIGN
GO TO 355

205 SIGN=XG(NG)
XG(NG) = X(N1)
IF (NFNS) 225, 215, 210
DXKK = DXKK + DXIN
DYKK = DYKK + DYIN
215
DO 220 J = 1, N1
Y(J) = SIGN*(Y(J) + DYKK)
X(J) = X(J) - DXKK
CONTINUE
220
CALL LOOKUP (X(1), XG(1), JJ)
IF (JJ .GE. MAXDIM) GO TO 360
DO 230 J = 1, JJ
X1(J) = XG(J)
H(J) = G(J)
230
CONTINUE
IG = JJ + 1
X1(IG) = X(1)
H(IG) = F(X(1), XG(JJ), G(JJ), XG(IG), G(IG))
INDEXG = JJ
INDEXT = 1
Z1 = X(1)
F1 = H(IG) - Y(1)
IT = 2
JJ = IG
IF (H(IG) .GE. Y(1)) GO TO 235
IF (JJ .GE. MAXDIM) GO TO 360
JJ = IG + 1
H(JJ) = Y(1)
X1(JJ) = Z1 + EPS
235
LAST = 0
X1 = Z1
240
IF (XG(IG) .LT. X(IT)) GO TO 245
IWHICH = 0
X2 = X(IT)
F2 = F(X2, XG(IG - 1), G(IG - 1), XG(IG), G(IG)) - Y(IT)
IT = IT + 1
GO TO 250
245
X2 = XG(IG)
IWHICH = 1
F2 = G(IG) - F(X2, X(IT - 1), Y(IT - 1), X(IT), Y(IT))
IG = IG + 1
250
IF (F1 * F2 .GT. 0.) GO TO 260
DENOM = X2 - X1
IF (DENOM .EQ. 0.) DENOM = .00001
SLOPE = (F2 - F1) / DENOM
IGG = IG - 1 - IWHICH
ITT = IT - 2 + IWHICH
IF (ABS(SLOPE * RELINC) .GT. 1.0E-6) GO TO 255
Z2 = X2
GO TO 270
2
255 \( \text{Z2} = \text{X1} - \text{F1}/\text{SLOPE} \)

GO TO 270

260 \( \text{X1} = \text{X2} \)

\( \text{F1} = \text{F2} \)

IF (IT.LE.N1) GO TO 240

265 LAST=1

\( \text{Z2} = \text{X}(\text{N1}) \)

CALL LOOKUP (\( \text{Z2}, \text{XG(INDEXG)} \), IGG)

IGG=INDEXG+1GG-1

ITT=N1-1

270 \( \text{ZZ} = 0.99*\text{Z1} + 0.01*\text{Z2} \)

CALL LOOKUP (\( \text{ZZ}, \text{X(INDEXT)} \), K1)

CALL LOOKUP (\( \text{ZZ}, \text{XG(INDEXG)} \), K2)

K1=K1+INDEXT-1

K2=K2+INDEXG-1

IF (\( \text{F}(\text{ZZ}, \text{X(K1)}, \text{Y(K1)}, \text{X(K1+1)}, \text{Y(K1+1)}) > \text{F}(\text{ZZ}, \text{XG(K2)}, \text{G(K2)}, \text{XG(K2+1)}, \text{G(K2+1)}) \)) GO TO 300

IF (\( \text{JJ} + \text{IGG} - \text{INDEXG} \GE \text{MAXDH4} \)) GO TO 360

NGR=ITT-INDEXT+2

NN2=JJ

NJJ=JJ

\( \text{ANUX(NJJ)} = \text{XH}(\text{NJJ}) \)

\( \text{ANUY(NJJ)} = \text{YH}(\text{NJJ}) \)

IF (NGR.EQ.2) GO TO 280

NJ1=INDEXT-1

DO 275 I=NJ1,ITT

NJJ=NJJ+1

\( \text{ANUX(NJJ)} = \text{X}(\text{I}) \)

\( \text{ANUY(NJJ)} = \text{Y}(\text{I}) \)

CONTINUE

275

NJJ=NJJ+1

\( \text{ANUX(NJJ)} = \text{Z2} \)

\( \text{ANUY(NJJ)} = \text{F}(\text{ZZ}, \text{X(ITT)}, \text{Y(ITT)}, \text{X(ITT+1)}, \text{Y(ITT+1)}) \)

NM=NN2+NGR-1

NL=0

DO 285 I=NN2,NM

NL=NL+1

\( \text{ANUX(NL)} = \text{ANUX(I)} \)

\( \text{ANUY(NL)} = \text{ANUY(I)} \)

CONTINUE

285

\( \text{ANUX(NL+1)} = \text{XMIN} \)

\( \text{ANUY(NL+1)} = \text{YMIN} \)

\( \text{ANUY(NL+2)} = \text{DELTAY} \)

\( \text{ANUX(NL+2)} = \text{DELTAX} \)

IF (IDASH.EQ.IHY) CALL DASHL (ANUHX, ANUHY, NL, 1)

IF (INDEXG.EQ.1GG) GO TO 295

J1=INDEXG+1

DO 290 I=J1,IGG

JJ=JJ+1

\( \text{XH(JJ)} = \text{XG(I)} \)

\( \text{YH(JJ)} = \text{G(I)} \)

CONTINUE

290
295 J J=J J+1
X H(J J)=Z 2
H(J J)=F (Z 2 , X G(IG G), G(IG G), X G(IG G+1), G(IG G+1))
INDEXG=IG G
INDEXT=ITT
GO TO 320
300 NGRAPH=ITT-INDEXT+2
IF (J J*NGRAPH-1.GT.MAXDIM) GO TO 360
N2=J J
IF (N GRAPH.EQ.2) GO TO 310
J 1=INDEXT+1
   DO 305 I=J 1,ITT
   JJ=JJ+1
   X H(J J)=X (I)
   H(J J)=Y (I)
305 CONTINUE
310 JJ=JJ+1
X H(J J)=Z 2
H(J J)=F (Z 2 , X (ITT), Y(ITT), X(ITT+1), Y(ITT+1))
NM=N2+NGRAPH-1
L=0
   DO 315 I =N2 ,NM
   L=L+1
   XPTS(L)=X 1 I (I)
   YPTS(L)=H(I)
315 CONTINUE
XPTS(L+1)=XM IN
XPTS(L+2)=DELTAX
YPTS(L+1)=SIGN*XM IN
YPTS(L+2)=SIGN*DELTAY
CALL LINE (XPTS,YPTS,L,1,0,0)
INDEXT=ITT
INDEXG=IG G
320 IF (LAST.EQ.1) GO TO 325
X 1=X 2
F 1=F 2
Z 1=Z 2
IF (IT.LE.N1) GO TO 240
GO TO 265
325 IF (XG(NG).LE.XG(NG-1)) NG=NG-1
IF (XG(NG).LE.X(N1)) GO TO 335
IF (J J+3+NG-IG G.GT.MAXDIM) GO TO 360
X H(J J+1)=X H(J J)+EPS
J J=J J+1
H(J J)=F (X(N1),XG(IG G),G(IG G),XG(IG G+1),G(IG G+1))
IG GP 1=IG G+1
   DO 330 J=1IG GP 1,NG
   JJ=JJ+1
   X H(J J)=X G(J)
   H(J J)=G(J)
37
CONTINUE
NG=JJ+2
IF (NG.GE.MAXDIM) GO TO 360
   DO 340 I=1,JJ
      G(I)=H(I)
      XG(I)=XI(I)
   CONTINUE
   XG(JJ+1)=XG(JJ)+EPS
   G(JJ+1)=YMIN+DYKK
   IF (SIGN.LT.0.) G(JJ+1)=-YMIN-50.*DELTAY+DYKK
   G(NG)=G(JJ+1)
   IF (NFNS.LT.0) GO TO 350
   DO 345 I=1,N1
      X(I)=X(I)+DXKK
      Y(I)=SIGN*Y(I)+DYKK
   CONTINUE
   XG(NG)=SIGN
   CALL PLOT (XAXIS,0.0,3)
   CALL PLOT (SKIP,0.0,-3)
   RETURN
360 WRITE (6,5020) MAXDIM
   RETURN

C
****FORMAT STATEMENTS****

C 5000 FORMAT (/37H DO YOU WANT ANY HIDDEN
3-D data ,/4X,
140HPLOTTED WITH A DASHED LINE -- YES OR NO?)
5010 FORMAT (/33H*** INPUT ERROR (HIDE) : X(I-1) = ,1PE10.4,5X,6HX(I) = ,
11X,1PE10.4,/,35H X(I-1) MUST BE LESS THAN X(I) )
5020 FORMAT (/48H*** ERROR IN DIMENSIONED ARRAYS (HIDE): MAXDIM =,I4,/
135H INCREASE MAXDIM TO RUN PROBLEM.)
5030 FORMAT (A1)
C
END
SUBROUTINE INIT
C
THIS SUBROUTINE Initializes THE PLOTTER. THE (X,Y) COORDINATES
IN THE DATA STATEMENT SET THE POSITION OF THE GRAPH'S ORIGIN
ON THE PAPER (I.E., LOWER LEFT HAND CORNER).
C
COMMON /INPUT/ IXAXIS(5),IYAXIS(5),ITITL1(5),ITITL2(5),ITITL3(5),
IITITL4(5),IITITL5(5),ITYPE,XAXIS,YAXIS,FACT,ITITLE,Y2,X1,IGRID,
2YINC,XINC,NOU,NIN,ILINES,DEV,NSETS,IN,YH,IPH,1H0
C
COMMON /DATA/ XARRAY (900),YARRAY (900),HISTOX (900),HISTOY (900),
1XPTS (900),YPTS (900),ANUX (900),ANUY (900),ANUHX (900),ANUY (900)
C
common /DRAW/ NPTS(20),IPLOT(20),IHIST(20),LINTYP(20),INTEQ(20),
  ILOGTYP(20),SKIP
C
  DATA X,Y/3.0,2.0/
C
  CALL PLOTS (IBUFF,NLOC,LDEV)
CALL PLOT (0.0,-36.0,-3)
CALL PLOT (X,Y,-3)
RETURN
END
SUBROUTINE LOOKUP (X,XTBL,J)
C
C THIS SUBROUTINE IS CALLED FROM HIDE AS AN EFFICIENT METHOD
C OF TABLE LOOKUP (STOLEN FROM TRACOR 3-D PLOT PACKAGE).
C
DIMENSION XTBL(1)
J=2
1 IF (XTBL(J)-X) 2,3,4
2 J=J+1
GO TO 1
3 RETURN
4 J=J-1
RETURN
END
SUBROUTINE NUGRID
C
C THIS SUBROUTINE DRAWS GRID LINES AS REQUESTED BY THE USER. IT
C WILL NOT DRAW THROUGH THE TITLE. ZINC IS THE INCREMENT BY WHICH
C THE PLOT PEN CHECKS TO SEE IF IT IS WITHIN THE TITLE BOUNDARIES
C SET UP BY SUBROUTINE TITLE.
C
COMMON /INPUT/ IXAXIS(5),IYAXIS(5),ITITL1(5),ITITL2(5),ITITL3(5),
  ITITL4(5),ITITL5(5),ITYPE,XAXIS,YAXIS,FACT,ITITLE,Y2,X1,GRID,
  2YINC,XINC,NOUN,NIN,ILINES,LDEV,NSETS,INH,INY,NH,NB,TH
C
COMMON /DATA/ XARRAY (900),YARRAY (900),HISTOX(900),HISTOY(900),
  1XPTS(900),YPTS(900),ANUX(900),ANUY (900),ANUHX(900),ANUHY (900)
C
COMMON /DRAW/ NPTS(20),IPLOT(20),IHIST(20),LINTYP(20),INTEQ(20),
  ILOGTYP(20),SKIP
C
  DATA ZINC/0.1/
C
  IF (ILINES.EQ.0) GO TO 125
  GO TO (100,105,110,115,120), ILINES
100 Y1=Y2-.3
  GO TO 125
105 Y1=Y2-.6
  GO TO 125
110 Y1=Y2-.9
GO TO 125
115 Y1=Y2-1.2
GO TO 125
120 Y1=Y2-1.5
125 CONTINUE
X2=X1+3.75
C
C... DRAWS VERTICAL GRID LINES.
C
ITOT=0
DO 130 I=1,NSETS
ITOT=ITOT+NPTS(I)
130 CONTINUE
IF (XINC.EQ.0.0) GO TO 160
IF (ITYPE.EQ.1.OR.ITYPE.EQ.2) XINC=1.
IF (ITYPE.EQ.3.OR.ITYPE.EQ.4) XINC=1./XARRAY(ITOT+2)
X=XINC
ICOUNT=XAXIS/XINC
JCOUNT=YAXIS/ZINC
DO 155 I=1,ICOUNT
Y=0.0
CALL PLOT (X,Y,3)
DO 150 J=1,JCOUNT
Y=Y+ZINC
IF (X.GE.X1.AND.X.LE.X2) GO TO 135
GO TO 140
135 IF (Y.GE.Y1.AND.Y.LE.Y2) GO TO 145
140 CALL PLOT (X,Y,2)
GO TO 150
145 CALL PLOT (X,Y,3)
150 CONTINUE
X=X+XINC
155 CONTINUE
C
C... DRAWS HORIZONTAL GRID LINES.
C
IF (YINC.EQ.0.0) GO TO 190
160 IF (ITYPE.EQ.1.OR.ITYPE.EQ.3) YINC=1.
IF (ITYPE.EQ.2.OR.ITYPE.EQ.4) YINC=1./YARRAY(ITOT+2)
Y=YINC
KCOUNT=YAXIS/YINC
LCOUNT=XAXIS/ZINC
DO 185 K=1,KCOUNT
X=0.0
CALL PLOT (X,Y,3)
DO 180 L=1,LCOUNT
X=X+ZINC
IF(Y.GE.Y1.AND.Y.LE.Y2) GO TO 165

40
GO TO 170
165 IF (X.GE.X1.AND.X.LE.X2) GO TO 175
170 CALL PLOT (X,Y,2)
GO TO 180
175 CALL PLOT (X,Y,3)
180 CONTINUE
Y=Y+YINC
185 CONTINUE
190 RETURN
END

SUBROUTINE PLOTR

C THIS SUBROUTINE SETS UP THE DATA ARRAYS WITH APPROPRIATE SCALING
C FACTORS (COMPUTED IN SUBR. AXES), GENERATES HISTOGRAMS IF REQUESTED
C AND THEN PLOTS ALL DATA AS INPUT IN SUBROUTINE READR.
C
C THIS ROUTINE IS ALSO NEXT TO IMPOSSIBLE TO EXPLAIN OR FOLLOW

COMMON /INPUT/ IXAXIS(5),IYAXIS(5),ITITL1(5),ITITL2(5),ITITL3(5),
ITITL4(5),ITITL5(5),ITYPE,XAXIS,YAXIS,FACT,ITITLE,Y2,X1,IGRID,
YINC,XINC,NOU,NIN,ILINES,LDEV,LSETS,IHN,Hy,1HB,1HO

COMMON /DATA/ XARRAY (900),YARRAY (900),HISTOX(900),HISTOY(900),
1XPTS (900),YPTS (900),ANUX(900),ANUY (900),ANUXH(900),ANUYH (900)

COMMON /DRAW/ NPTS(20),IPLOT(20),IHIST(20),LINTYP(20),INTEQ(20),
1LOGTYP(20),SKIP

SKIP=XAXIS+4.0
JN=1
JO=0
ITOT=0
DO 100 I=1,NSETS
ITOT=ITOT+NPTS(I)
100 CONTINUE

DO 255 JM=1,NSETS
L=IPLOT(JM)
JO=JO+NPTS(JM)
IK=1
DO 130 IJ=JN,JO
XPTS (IK)=XARRAY(IJ)
YPTS (IK)=YARRAY(IJ)
IF (IPLOT(JM).GE.5) GO TO 105
ITOT=ITOT
GO TO 125
105 IF (LOGTYP(JM)) 120,115,110
110 ANUX (IK)=XARRAY (IJ)
ANUY (IK)=(LOG10(YARRAY (IJ)) - LOG10(YARRAY (ITOT+1)))/
1YARRAY (ITOT+2)

41
GO TO 125

115  \text{ANUX(IK)} = \frac{\log_{10}(XARRAY(IJ)) - \log_{10}(XARRAY(ITOT+1))}{XARRAY(ITOT+2)}

1    \text{ANYU(IK)} = \frac{\log_{10}(YARRAY(IJ)) - \log_{10}(YARRAY(ITOT+1))}{YARRAY(ITOT+2)}

GO TO 125

120  \text{ANUX(IK)} = \frac{\log_{10}(XARRAY(IJ)) - \log_{10}(XARRAY(ITOT+1))}{XARRAY(ITOT+2)}

1    \text{ANYU(IK)} = YARRAY(IJ)

GO TO 125

125  IK = IK + 1

130  CONTINUE

XPTS(IK) = XARRAY(ITOT+1)

XPTS(IK+1) = XARRAY(ITOT+2)

YPTS(IK) = YARRAY(ITOT+1)

YPTS(IK+1) = YARRAY(ITOT+2)

IF \text{(IPLLOT(JM)) GE 5} GO TO 135

GO TO 155

135  IF \text{(LOGTYP(JM))} \text{GO TO 155}

140  \text{ANUX(IK)} = XARRAY(ITOT+1)

\text{ANUX(IK+1)} = XARRAY(ITOT+2)

\text{ANYU(IK)} = 0.0

\text{ANYU(IK+1)} = 1.0

GO TO 155

145  \text{ANUX(IK)} = 0.

\text{ANUX(IK+1)} = 1.

\text{ANYU(IK)} = 0.

\text{ANYU(IK+1)} = 1.

GO TO 155

150  \text{ANUX(IK)} = 0.

\text{ANUX(IK+1)} = 1.

\text{ANYU(IK)} = YARRAY(ITOT+1)

\text{ANYU(IK+1)} = YARRAY(ITOT+2)

GO TO 155

155  JN = JN + NPTS(JM)

C

C... SECTION TO GENERATE/ PLOT NEW ARRAYS

42
IF (IPL0T(JM).EQ.3.OR.IPL0T(JM).EQ.6.OR.IHIST(JM).EQ.1)N
12
GO TO 220
IF (IPL0T(JM).EQ.5) GO TO 160
GO TO 185
160
JZ=3
ANU1X(l)=ANU1X(l)
ANU1Y(l)=ANU1Y(l)
ANU1X(2)=ANU1X(2)
ANU1Y(2)=ANU1Y(2)
KZ=NPTS(JM)-1
DO 165 12=2,KZ
ANU1X(12)=ANU1X(l2)
ANU1Y(12)=ANU1Y(l2+1)
JZ=JZ+1
ANU1X(JZ)=ANU1X(l2+1)
ANU1Y(JZ)=ANU1Y(l2+1)
JZ=JZ+1
CONTINUE
IF (LOGYPR(JM)) 180, 175, 170
170
ANU1X(JZ)=XARRAY(ITOT+l)
ANU1X(JZ+1)=XARRAY(ITOT+2)
ANU1Y(JZ)=0.0
ANU1Y(JZ+1)=1.0
GO TO 195
175
ANU1X(JZ)=0.0
ANU1X(JZ+1)=1.0
ANU1Y(JZ)=0.0
ANU1Y(JZ+1)=1.0
GO TO 195
180
ANU1X(JZ)=0.0
ANU1X(JZ+1)=1.0
ANU1Y(JZ)=YARRAY(ITOT+l)
ANU1Y(JZ+1)=YARRAY(ITOT+2)
GO TO 195
185
J=3
HISTOX(l)=XPTS(1)
HISTOY(1)=YPTS(1)
HISTOX(2)=XPTS(2)
HISTOY(2)=YPTS(2)
KK=NPTS(JM)-1
DO 190 I=2,KK
HISTOX(J)=XPTS(I)
HISTOY(J)=YPTS(I)
J=J+1
HISTOX(J)=XPTS(I+1)
HISTOY(J)=YPTS(I+1)
J=J+1
190 CONTINUE
HISTOX(J)=XARRAY(ITOT+1)
HISTOY(J)=YARRAY(ITOT+1)
HISTOX(J+1)=XARRAY(ITOT+2)
HISTOY(J+1)=YARRAY(ITOT+2)

195 NPT=(NPTS(JM)*2)-2
GO TO (200,205,255,210,215,255), L

200 CALL LINE (HISTOX,HISTOY,NPT,1,LINTYP(JM),INTEQ(JM))
GO TO 255

205 CALL DASHL (HISTOX,HISTOY,NPT,1)
GO TO 255

210 CALL LGLIN (HISTOX,HISTOY,NPT,1,LINTYP(JM),INTEQ(JM),LOGTYP(JM))

1 GO TO 255

215 CALL DASHL (ANUX,ANUY,NPT,1)
GO TO 255

C... SECTION FOR PLOTTING REGULAR DATA (NO HISTOGRAMS).

C C IPLOT=1 ---- STRAIGHT LINE:LINEAR AXES
C C IPLOT=2 ---- DASH LINE:LINEAR AXES ONLY
C C IPLOT=3 ---- SMOOTH LINE:LINEAR AXES
C C IPLOT=4 ---- STRAIGHT LINE:LOG-LOG,SEMI-LOG AXES
C C IPLOT=5 ---- DASH LINE:LOG-LOG,SEMI-LOG AXES
C C IPLOT=6 ---- SMOOTH LINE:LOG-LOG,SEMI-LOG AXES
C

220 GO TO (225,230,235,240,245,250), L

225 CALL LINE (XPTS,YPTS,NPTS(JM),1,LINTYP(JM),INTEQ(JM))
GO TO 255

230 CALL DASHL (XPTS,YPTS,NPTS(JM),1)
GO TO 255

235 CALL FLINE (XPTS,YPTS,-NPTS(JM),1,LINTYP(JM),INTEQ(JM))
GO TO 255

240 CALL LGLIN (XPTS,YPTS,NPTS(JM),1,LINTYP(JM),INTEQ(JM),
1 LOGTYP(JM))
GO TO 255

245 CALL DASHL (ANUX,ANUY,NPTS(JM),1)
GO TO 255

250 CALL FLINE (ANUX,ANUY,-NPTS(JM),1,LINTYP(JM),INTEQ(JM))
GO TO 255

255 CONTINUE

CALL PLOT (XAXIS,0.0,3)
CALL PLOT (SKIP,0.0,-3)
RETURN
END

SUBROUTINE READR (NPASS, MASK)

C C THIS SUBROUTINE HANDLES THE INTERACTIVE I/O - READS IN PLOT
C INSTRUCTIONS AS WELL AS THE DATA.
C
COMMON /INPUT/ IXAXIS(5), IYAXIS(5), ITITL1(5), ITITL2(5), ITITL3(5),
1 ITITL4(5), ITITL5(5), ITYPE, XAXIS,YAXIS,FACT, ITITLE,Y2,X1, IGRID,
COMMON /DATA/ XARRAY (900), YARRAY (900), HISTOX (900), HISTOY (900),
1XPTS (900), YPTS (900), ANUX (900), ANUY (900), ANUX (900), ANUHY (900)

COMMON /DRAW/ NPTS (20), I PLOT (20), IHIIST (20), LINTYP (20), INTEQ (20),
1LOGTYP (20), SKIP

THE FOLLOWING 3 CARDS ARE FOR UNIVAC MACHINES.

DIMENSION IA (2)
IA (1) = 618 ASG, T
IA (2) = 611 29.

IF ((NPASS).GT.1) GO TO 125
100 WRITE (NOU, 5060)
READ (NIN, 5030, ERR = 105) LDEV
GO TO 110
105 WRITE (NOU, 5020)
GO TO 100

THE FOLLOWING 4 CARDS ARE FOR UNIVAC MACHINES.

IF (LDEV .EQ. 0) GO TO 115
GO TO 120
115 CALL ERTRAN (U, IA)
LDEV = 29

THE FOLLOWING CARD WOULD BE USED FOR CDC MACHINES.

1110 IF (LDEV .EQ. 0) LDEV = 29
C
120 CALL INIT
125 WRITE (NOU, 5070) NPASS
WRITE (NOU, 5080)
READ (NIN, 5050) MASK
130 WRITE (NOU, 5090)
READ (NIN, 5030, ERR = 135) XAXIS
GO TO 140
135 WRITE (NOU, 5020)
GO TO 130
140 IF (XAXIS .EQ. 0) XAXIS = 9
145 WRITE (NOU, 5100)
READ (NIN, 5030, ERR = 150) YAXIS
GO TO 155
150 WRITE (NOU, 5020)
GO TO 145
155 IF (YAXIS .EQ. 0) YAXIS = 7
160 WRITE (NOU, 5110)
READ(NIN,5030,ERR=165) FACT
IF (FACT.EQ.0.) FACT=1.
IF (FACT.GT.0.) GO TO 170
WRITE (NOU,5120)
GO TO 160
165 WRITE (NOU,5020)
GO TO 160
170 CALL FACTR
IF (MASK.NE.IHY) GO TO 175
WRITE (NOU,5010)
READ (NIN,5040) ITITL1
GO TO 235
175 WRITE (NOU,5130)
READ (NIN,5050) ITITLE
IF (ITITLE.EQ.IHN.OR. ITITLE.EQ.IHB.OR. ITITLE.EQ.IHO) GO TO 235
180 WRITE (NOU,5140)
READ (NIN,5030,ERR=185) X1,Y2
GO TO 190
185 WRITE (NOU,5020)
GO TO 180
190 WRITE (NOU,5150)
READ (NIN,5030,ERR=195) ILINES
GO TO 200
195 WRITE (NOU,5020)
GO TO 190
200 WRITE (NOU,5160) ILINES
DO 230 I=1,ILINES
   GO TO (205,210,215,220,225), I
205 READ (NIN,5040) ITITL1
   GO TO 230
210 READ (NIN,5040) ITITL2
   GO TO 230
215 READ (NIN,5040) ITITL3
   GO TO 230
220 READ (NIN,5040) ITITL4
   GO TO 230
225 READ (NIN,5040) ITITL5
230 CONTINUE
235 WRITE (NOU,5170)
READ (NIN,5040) IXAXIS
WRITE (NOU,5180)
READ (NIN,5040) IYAXIS
IF (MASK.EQ.IHY) GO TO 255
WRITE (NOU,5190)
READ (NIN,5050) IGRID
IF (IGRID.EQ.IHN.OR. IGRID.EQ.IHB.OR. IGRID.EQ.IHO) GO TO 255
240 WRITE (NOU,5200)
READ (NIN,5030,ERR=245) LGRID
GO TO 250
245 WRITE (NOU,5020) 
GO TO 240
250 XINC=10.
YINC=10.
IF (LGRID.LT.0) XINC=0.
IF (LGRID.GT.0) YINC=0.
255 WRITE (NOU,5210)
READ (NIN,5030,ERR=260) ITYPE
GO TO 265
260 WRITE (NOU,5020)
GO TO 255
265 WRITE (NOU,5220) NPASS
READ (NIN,5030,ERR=270) NSETS
GO TO 275
270 WRITE (NOU,5020)
GO TO 265
275 I=0
DO 375 K=1,NSETS
IF (MASK.EQ.1YH.AND.K.EQ.1) WRITE (NOU,5000)
IF (MASK.EQ.1HY) GO TO 360
280 WRITE (NOU,5230) K
READ (NIN,5030,ERR=285) LINTYP(K)
GO TO 290
285 WRITE (NOU,5020)
GO TO 280
290 IF (LINTYP(K).GE.0) GO TO 295
IF (ITYPE.EQ.1) IPRINT(K)=1
IF (ITYPE.EQ.1) IPRINT(K)=4
IF (ITYPE.EQ.2) LOGIN(K)=1
IF (ITYPE.EQ.3) LOGIM(K)=-1
IF (ITYPE.EQ.4) LOGIM(K)=0
GO TO 330
295 IF (LINTYP(K).GT.0) GO TO 315
300 WRITE (NOU,5240) K
READ (NIN,5030,ERR=305) IPRINT(K)
GO TO 310
305 WRITE (NOU,5020)
GO TO 300
310 IF (ITYPE.EQ.1) IPRINT(K)=IPRINT(K)+1
IF (ITYPE.EQ.2) LOGIM(K)=1
IF (ITYPE.EQ.3) LOGIM(K)=-1
IF (ITYPE.EQ.4) LOGIM(K)=0
GO TO 340
315 WRITE (NOU,5250) K
READ (NIN,5030,ERR=320) IPRINT(K)
GO TO 325
320 WRITE (NOU,5020)
GO TO 315
325 IF (IPLOT(K).EQ.2) IPLOT(K)=3
    IF (ITYPE.GT.1) IPLOT(K)=IPLOT(K)+3
    IF (ITYPE.EQ.2) LOGTYP(K)=1
    IF (ITYPE.EQ.3) LOGTYP(K)=-1
    IF (ITYPE.EQ.4) LOGTYP(K)=0
330 WRITE (NOU,5260)
    READ (NIN,5030,ERR=335) INTEQ(K)
    GO TO 340
335 WRITE (NOU,5020)
    GO TO 330
340 IF (IPLOT(K).EQ.3.OR.IPLOT(K).EQ.4) GO TO 360
345 WRITE (NOU,5270) K
    READ (NIN,5050,ERR=350) IHIST(K)
    GO TO 355
350 WRITE (NOU,5020)
    GO TO 345
355 IF (IHIST(K).EQ.11Y) WRITE (NOU,5280)
360 WRITE (NOU,5290) K
    KFIX=0
C C... THE FOLLOWING LOOP READS THE (X,Y) DATA.
C DO 365 II=1,100000
    II=II+1
C C... UNIVAC FORMATTED READ.
C READ (NIN,5030,END=370) XARRAY(II),YARRAY(II)
C C... CDC READ WITH 2-BRANCH EOF CHECK.
C C READ(NIN,5030)XARRAY(II),YARRAY(II)
C IF(EOF(NIN))370,100
C100 IF(ITYPE.EQ.3.AND.XARRAY(II).EQ.0.)KFIX=1
C IF (ITYPE.EQ.3.AND.XARRAY(II).EQ.0.) KFIX=1
C IF (ITYPE.EQ.2.AND.YARRAY(II).EQ.0.) KFIX=1
C IF (ITYPE.EQ.4.AND.XARRAY(II).EQ.0.OR.ITYPE.EQ.4.AND.YARRAY(III).EQ.0.) KFIX=1
365 CONTINUE
370 II=II-1
375 CONTINUE
    IF (KFIX.EQ.1) CALL FIXUP
RETURN
C C *****FORMAT STATEMENTS*****
C 5000 FORMAT (/51H*** NOTE: FOR A 3-D PLOT ONLY A SOLID-Straight Line,/,
141H IS AVAILABLE FOR ALL DATA SETS.)
5010 FORMAT (/43H PLOT TITLE (ONE LINE, 25 CHARACTERS) ?,/,
125H ------- 25 CHAR ------- )
5020 FORMAT (/36H*** INPUT ERROR: RE-ENTER LAST LINE.)
5030 FORMAT ()
5040 FORMAT (5A6)
5050 FORMAT (A1)
5060 FORMAT (/38H LOGICAL UNIT NUMBER FOR PLOT TAPE? ,/,
124H DEFAULT = UNIT 29 )
5070 FORMAT (/38H*** THE FOLLOWING PERTAIN TO GRAPH NO.,12,/) 5080 FORMAT (49H DO YOU WANT A 3-DIMENSIONAL PLOT -- YES OR NO,
117H (DEFAULT = 2-D) ? )
5090 FORMAT (/43H X AXIS LENGTH (INCHES) -- DEFAULT = 9 ,/)
5100 FORMAT (/43H Y AXIS LENGTH (INCHES) -- DEFAULT = 7 ,/)
5110 FORMAT (/39H PLOT SIZE SCALING FACTOR -- DEFAULT, 14H = FULL SCALE.
11L )
5120 FORMAT (/43H*** INPUT ERROR: SCALING FACTOR MUST BE NON-
110H-NEGATIVE,/, 23H RE-ENTER LAST LINE.)
5130 FORMAT (/51H DO YOU WANT A TITLE BLOCK -- YES OR NO (DEFAULT,
113H = NO TITLE)?)
5140 FORMAT (/51H GIVE X, Y COORDINATE (INCHES) FOR PLACEMENT OF,/, 
14X, 37TH THE UPPER LEFT CORNER OF TITLE BLOCK.)
5150 FORMAT (/43H YOU NOW HAVE ROOM FOR 5 LINES OF PRINT,, 
124H 25 CHARACTERS PER LINE,/, 4X, 27H HOW MANY LINES DO YOU NEED?)
5160 FORMAT (/24H ENTER SCRIPT FOR THE, 12, 9H LINE(S):/, 
125H ------- 25 CHAR ------- )
5170 FORMAT (/38H X AXIS LABEL (25 CHARACTER LIMIT)? ,/,
125H ------- 25 CHAR ------- )
5180 FORMAT (/38H Y AXIS LABEL (25 CHARACTER LIMIT)? ,/,
125H ------- 25 CHAR ------- )
5190 FORMAT (/44H DO YOU WANT A GRID -- YES OR NO (DEFAULT,
112H = NO GRID) ?)
5200 FORMAT (/46H SELECT ONE OF THE FOLLOWING FOR YOUR GRID:,/, 4X,
125H 1= HORIZONTAL GRID LINES ONLY,/, 4X, 40H 0= HORIZONTAL AND V 
2ERTICAL GRID LINES,/, 4X, 50H +1= VERTICAL GRID LINES ONLY)
5210 FORMAT (/34H HOW ARE THE AXES TO BE SCALLED?,/, 6X, 22H1 = LINEAR 
1X, LINEAR Y,/, 6X, 19H2 = LINEAR X, LOG Y,/, 6X, 19H3 = LOG X, LINEAR 
2Y,/, 6X, 16H4 = LOG X, LOG Y)
5220 FORMAT (/38H HOW MANY SETS OF DATA ON GRAPH NO., 12, 1H?)
5230 FORMAT (/39H LINE/SYMBOL COMBINATION FOR SET NO., 12, 1H,/, 4X,
147H 0= POINTS CONNECTED BY LINE, NO SYMBOLS PRINTED,/, 4X,
248H+ N= POINTS CONNECTED BY LINE, SYMBOLS PRINTED AT,/, 4X,
325H EVERY N-TH DATA POINT,/, 4X, 37H-N= NO LINE DRAWN, SYMBOLS PR 
4INTEED AT,/, 4X, 25H EVERY N-TH DATA POINT)
5240 FORMAT (/33H WHAT TYPE OF LINE FOR SET NO., 12, 1H?,/, 6X,
119H1 = SOLID, STRAIGHT,/, 6X, 20H2 = DASHED, STRAIGHT,/, 6X,
216H3 = SOLID, SMOOTH)
5250 FORMAT (/33H WHAT TYPE OF LINE FOR SET NO., 12, 1H?,/, 6X,
119H1 = SOLID, STRAIGHT,/, 6X, 17H2 = SOLID, SMOOTH )
5260 FORMAT (/46H INTEGER EQUIVALENT OF CALCOMP SYMBOL TO BE,/, 4X,
PRINTED AT EACH N-TH DATA POINT?)
5270 FORMAT (/39H DO YOU WANT A HISTOGRAM FOR SET NO.,I2,1H,,/,4X,
110IYES OR NO?)
5280 FORMAT (/50H*** CAUTION: FOR A HISTOGRAM, YOU NEED ONLY SPECIFY,/,14X,57H (1) A LOWER AND UPPER LIMIT FOR THE FIRST BIN, THEN,/,24X,54H (2) AN UPPER LIMIT ONLY FOR EACH BIN THEREAFTER.)
5290 FORMAT (/35H ADD YOUR (X,Y) DATA FOR SET NO.,I2,1H:,/,4X,
117HEND WITH #EOF .

C END
SUBROUTINE TITLE
C
C THIS SUBROUTINE WILL DRAW A TITLE IN A 3.5 IN. WIDE BY 1.5 IN. HIGH
C AREA ANYWHERE ON THE GRAPH (AS DEFINED BY THE USER). THERE IS
C SPACE AVAILABLE FOR 5 LINES OF CHARACTERS, 25 CHARACTERS/LINE.
C IF SWITCH IN DATA STATEMENT IS SET TO 1, SYMBOLS WILL BE PRINTED
C AT THE BEGINNING OF EACH TITLE LINE CORRESPONDING TO THOSE
C REQUESTED FOR PLOTTING YOUR DATA IN SUBROUTINE READR (INTEQ).
C
COMMON /INPUT/ IXAXIS(5),IYAXIS(5),ITITL1(5),ITITL2(5),
ITITL3(5),ITITL4(5),ITITL5(5),ITYPE,XAXIS,YAXIS,FACT,ITITLE,Y2,X1,
21GRID,YINC,XINC,NOU,NIN,I_LINES,LDEV,NSETS,1HN,1HY,1HB,1HO

COMMON /DATA/ XARRAY(900),YARRAY(900),HISTOX(900),HISTOY(900),
1XPTS(900),YPTS(900),ANUX(900),ANUY(900),ANUXH(900),ANUHY(900)

COMMON /DRAW/ NPTS(20),I_PLOT(20),IHIST(20),LINTYP(20),INTEQ(20),
1LOGTYP(20),SK1P

DATA SWITCH/U.
C
SY=Y2-.25
SX=X1+.25
IF (SWITCH.EQ.1.) CALL SYMBOL (SX,SY+.05,0.14,INTEQ(1),0.0,-1)
CALL SYMBOL (SX,SY,0.14,ITITL1,0.0,25)
IF (I_LINES.LT.2) GO TO 1
SY=SY-.25
IF (SWITCH.EQ.1.) CALL SYMBOL (SX,SY+.05,0.14,INTEQ(2),0.0,-1)
CALL SYMBOL (SX,SY,0.14,ITITL2,0.0,25)
IF (I_LINES.LT.3) GO TO 1
SY=SY-.25
IF (SWITCH.EQ.1.) CALL SYMBOL (SX,SY+.05,0.14,INTEQ(3),0.0,-1)
CALL SYMBOL (SX,SY,0.14,ITITL3,0.0,25)
IF (I_LINES.LT.4) GO TO 1
SY=SY-.25
IF (SWITCH.EQ.1.) CALL SYMBOL (SX,SY+.05,0.14,INTEQ(4),0.0,-1)
CALL SYMBOL (SX,SY,0.14,ITITL4,0.0,25)
IF (I_LINES.LT.5) GO TO 1
SY=SY-.25
IF (SWITCH.EQ.1.) CALL SYMBOL (SX,SY+.05,0.14,INTEQ(5),0.0,-1)
CALL SYMBOL (SX,SY,0.14,ITITL5,0.0,25)
1 RETURN
END
SUPPLEMENTARY

INFORMATION
SUBJECT: Corrected Pages to Memorandum Report ARBRL-MR-02818

Commander
Defense Documentation Center
ATTN: DDC-TCA
Cameron Station
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2. Copy(s) of subject document were forwarded to your organization on/or about 9 May 1978.

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FOR THE COMMANDER:

VERNON J. WYATT
Chief
Technical Support Division
APPENDIX B

Contained in this appendix is a complete FORTRAN symbolic listing of all INTERPOL subroutines.
INTERPOL

A GENERAL PURPOSE 2-DIMENSIONAL/3-DIMENSIONAL PLOTTING ROUTINE

R.M. SCHWENK
BRL - APG, MD

THIS IS THE UNIVAC 1108 VERSION / 27 JAN 78 /

MAIN ROUTINE FOR 'INTERPOL'

THE ARRAYS FOR THE (X,Y) DATA ARE ARBITRARILY SET TO 900
IN COMMON DATA. THE NUMBER OF SETS OF DATA PER GRAPH
IS ARBITRARILY SET TO 20 VIA COMMON DRAW.
THE DIMENSION STATEMENT (ICHK) BELOW WAS ARBITRARILY SET
TO 100 -- I.E., AN ARBITRARY NUMBER OF GRAPHS PER RUN.
IT IS SIMPLY USED TO CHECK VERTICAL AXIS LENGTHS FOR PAPER
SIZE RESTRICTIONS.
THE NEXT CARD IS FOR CDC MACHINES.

PROGRAM MAIN(INPUT,OUTPUT,TAPE5 INPUT,TAE6 OUTPUT,TAE29)

COMMON /INPUT/ IXAXIS(5),IYAXIS(5),ITITL1(5),ITITL2(5),ITITL3(5),
ITITL4(5),ITITL5(5),ITYPE,XAXIS,YAXIS,FACT,ITITLE,Y2,X1,GRID,
2YINC,XINC,NOUN,NILINES,LDEV,NSETS,INH,INH,INH,INH

COMMON /DATA/ XARRAY(900),YARRAY(900),HISTOX(900),HISTOY(900),
1XPTS(900),YPTS(900),ANLIX(900),ANUY(900),ANULX(900),ANUHY(900)

COMMON /DRAW/ NPTS(20),IPLOT(20),IHIST(20),LINTYP(20),INTEQ(20),
2LINTYP(20),SKIP

DATA NOU,NIN/6,5/
DATA INH,INH,INH,INH,INH,INH,INH,INH

DIMENSION ICHK(100)
WRITE (NOU,5000)
SKIP=0
100 CALL READR (NPASS,MASK)
CALL AXES (MASK)
IF (MASK.EQ.IHY) GO TO 105
IF (ITITLE.EQ.IHY) CALL TITLE
CALL PLOTR
GO TO 110
105 CALL HIDE (YSTEP)
YAXIS=YAXIS*YSTEP
ICHK(NPASS) = YAXIS*FACT
WRITE (NOU,5010) NPASS
READ (NIN,5020) IASK
IF (IASK.EQ.IHN) GO TO 115
NPASS = NPASS + 1
GO TO 100
115 CALL PLOT (SKIP,0.0,999)
WRITE (NOU,5030) NPASS, LDEV
IPRINT = 0
DO 125 I = 1, NPASS
IF (ICHK(I) .LE. I11) 125, 125, 120
120 IPRINT = 1
125 CONTINUE
IF (IPRINT .EQ. 1) WRITE (NOU,5050)
IF (IPRINT .EQ. 0) WRITE (NOU,5040)
WRITE (NOU,5060)

C ******FORMAT STATEMENTS ******
C
5000 FORMAT (/47H ** INTERPOL: UNIVAC 1108 VERSION = 1 / 27 JAN 78,/
135H FOLLOW PRINTED INSTRUCTIONS. )
5010 FORMAT (/23H ** PLOT FOR GRAPH NO., I2, 11H COMPLETED, */
135H >> DO YOU WANT TO MAKE ANOTHER GRAPH -- , 10HYES OR NO<)
5020 FORMAT (A1)
5030 FORMAT (/3H **, I2, 22H GRAPH(S) COMPLETED -- , /4X, 9HPLOT FILE,
135H WRITTEN ON UNIT "", I2, 2H")
5040 FORMAT (/39H ** PLOT(S) WILL FIT ON "NARROW" PAPER.,)
5050 FORMAT (/43H ** PLOT(S) WILL NOT FIT ON "NARROW" PAPER., /*4X,
135H USE "WIDE" SIZE.)
5060 FORMAT (/20H ** END OF RUN........./
C
END
SUBROUTINE LOOKUP (X, XTBLS, J)
C
C THIS SUBROUTINE IS CALLED FROM HIDE AS AN EFFICIENT METHOD
C OF TABLE LOOKUP (STOLEN FROM TRACOR 3-D PLOT PACKAGE).
C
DIMENSION XTBLS(1)
J = 2
1 IF (XTBL(J) .LT. X) 2, 3, 4
2 J = J + 1
GO TO 1
3 RETURN
4 J = J - 1
RETURN
END
SUBROUTINE FIXUP
C
C THIS ROUTINE SETS ANY DATA WHICH IS TO BE LOGARITHMICALLY SCALED

29
C and was found to be equal to zero to the minimum of the respective C X or Y array. This prevents an aborted run. The user is told.

C

COMMON /INPUT/ IXAXIS(5), IYAXIS(5), ITITL1(5), ITITL2(5), ITITL3(5),
  ITITL4(5), ITITL5(5), ITYPE, XAXIS, YAXIS, FACT, ITITLE, Y2, X1, IGRID,
  2YINC, XINC, NOU, NIN, ILINES, LDEV, NSETS, IHN, IHY, IH8, IH0

C

COMMON /DATA/ XARRAY(900), YARRAY(900), HISTOX(900), HISTOY(900),
  IXPTS(900), YPTS(900), ANUX(900), ANUY(900), ANUXH(900), ANUHY(900)

C

COMMON /DRAW/ NPTS(20), IPLOT(20), IHIST(20), LINTYP(20), INTEQ(20),
  ILOGTYP(20), SKIP

C

DO 1 I=1, NSETS
  ITOT=ITOT+NPTS(I)
  CONTINUE

  XMIN=1.0E+29
  YMIN=1.0E+29
  DO 2 I=1, ITOT
     XMIN=AMIN1(XMIN, XARRAY(I))
     YMIN=AMIN1(YMIN, YARRAY(I))
     CONTINUE

  IF (XMIN.EQ.0.) XMIN=XMIN+.0001
  IF (YMIN.EQ.0.) YMIN=YMIN+.0001
  L=ITYPE-1
  GO TO (3, 5, 7), L

  DO 4 I=1, ITOT
     IF (YARRAY(I).EQ.0.) YARRAY(I)=YMIN
     CONTINUE

  GO TO 9

  DO 6 I=1, ITOT
     IF (XARRAY(I).EQ.0.) XARRAY(I)=XMIN
     CONTINUE

  GO TO 9

  DO 8 I=1, ITOT
     IF (XARRAY(I).EQ.0.) XARRAY(I)=XMIN
     IF (YARRAY(I).EQ.0.) YARRAY(I)=YMIN
     CONTINUE

  CONTINUE
  WRITE (NOUS, 10)
  RETURN

C

*****FORMAT STATEMENTS*****

C

10 FORMAT (/51H ** INPUT WARNING: ZEROS ENCOUNTERED ON LOGARITHMI,
  119H CALLY SCALED DATA==,/36H VALUES WERE RE-SET TO MINIMUM OF,
  233H RESPECTIVE ARRAY (XMIN OR YMIN).)

C

END
SUBROUTINE INIT

This subroutine initializes the plotter. The (x,y) coordinates in the data statement set the position of the graph's origin on the paper (i.e., lower left hand corner).


COMMON /DATA/ XARRAY(900), YARRAY(900), HISTOX(900), HISTOY(900), 1XPTS(900), YPTS(900), ANUX(900), ANUY(900), ANUXH(900), ANUHY(900)

COMMON /DRAW/ NPTS(20), IPLOT(20), IHIST(20), LINTYP(20), INEQ(20), 1LOGTYP(20), SKIP

DATA X,Y/3.0,2.0/

CALL PLOTS (IBUFF, NLOC, LDEV)
CALL PLOT (0.0,—36.0,—3)
CALL PLOT (X,Y,—3)
RETURN
END

SUBROUTINE FACT

This subroutine changes the length of all pen movements by a user supplied scaling factor (SUBR. READR). 1.0 is full scale.


COMMON /DATA/ XARRAY(900), YARRAY(900), HISTOX(900), HISTOY(900), 1XPTS(900), YPTS(900), ANUX(900), ANUY(900), ANUXH(900), ANUHY(900)

COMMON /DRAW/ NPTS(20), IPLOT(20), IHIST(20), LINTYP(20), INEQ(20), 1LOGTYP(20), SKIP

CALL FACTOR (FACT)
RETURN
END

SUBROUTINE NUGRID

This subroutine draws grid lines as requested by the user. It will not draw through the title. ZINC is the increment by which the plot pen checks to see if it is within the title boundaries set up by subroutine TITLE.

COMMON /INPUT/ IXAXIS(5), IYAXIS(5), ITITL1(5), ITITL2(5), ITITL3(5),
COMMON /DATA/ XARRAY(900),YARRAY(900),HISTOX(900),HISTOY(900),
 1XPTS(900),YPTS(900),ANUX(900),ANUY(900),ANUXH(900),ANUHY(900)

COMMON /DRAW/ NPTS(20),IPLOT(20),IHIST(20),LINTYP(20),INTEQ(20),
 1LOGTYP(20),SKIP

DATA ZINC/0.1/

IF (ILINES.EQ.0) GO TO 125
GO TO (100,105,110,115,120), ILINES

100 Y1=Y2=.3
GO TO 125

105 Y1=Y2=.6
GO TO 125

110 Y1=Y2=.9
GO TO 125

115 Y1=Y2=1.2
GO TO 125

120 Y1=Y2=1.5
GO TO 125

125 CONTINUE

X2=X1+3.75

C DRAWS VERTICAL GRID LINES.

ITOT=0
DO 130 I=1,NSETS
  ITOT=ITOT+NPlS(I)
130 CONTINUE
IF (XINC.EQ.0.0) GO TO 160
IF (ITYPE.EQ.1.OR.ITYPE.EQ.2) XINC=1.
IF (ITYPE.EQ.3.OR.ITYPE.EQ.4) XINC=1./XARRAY(ITOT+2)
X=XINC
ICOUNT=XAXIS/XINC
JCOUNT=YAXIS/ZINC
DO 155 I=1,ICOUNT
  Y=0.0
  CALL PLOT (X,Y,3)
  DO 150 J=1,JCOUNT
    Y=Y+ZINC
    IF (X.GE.X1.AND.X.LE.X2) GO TO 135
    GO TO 140
 135 IF (Y.GE.Y1.AND.Y.LE.Y2) GO TO 145
 140 CALL PLOT (X,Y,2)
  GO TO 150
145 CALL PLOT (X,Y,3)
150 CONTINUE
X = X + XINC

CONTINUE

C

C... DRAWS HORIZONTAL GRID LINES.
C

IF (YINC .EQ. 0.0) GO TO 190
160 IF (ITYPE .EQ. 1 .OR. ITYPE .EQ. 3) YINC = 1.
   IF (ITYPE .EQ. 2 .OR. ITYPE .EQ. 4) YINC = 1./YARRAY(ITOT+2)
   Y = YINC
   KCOUNT = YAXIS/YINC
   LCOUNT = XAXIS/ZINC
   DO 185 K = 1, KCOUNT
       X = 0.0
       CALL PLOT (X, Y, 3)
       DO 180 L = 1, LCOUNT
           X = X + ZINC
           IF (Y .GE. Y1 .AND. Y .LE. Y2) GO TO 165
           GO TO 170
       165 IF (X .GE. X1 .AND. X .LE. X2) GO TO 175
       170 CALL PLOT (X, Y, 2)
           GO TO 180
       175 CALL PLOT (X, Y, 3)
       180 CONTINUE
   Y = Y + YINC
   CONTINUE
190 RETURN

END

SUBROUTINE TITLE

C

C THIS SUBROUTINE WILL DRAW A TITLE IN A 3.5 IN. WIDE BY 1.5 IN. HIGH
C AREA ANYWHERE ON THE GRAPH (AS DEFINED BY THE USER). THERE IS
C SPACE AVAILABLE FOR 5 LINES OF CHARACTERS, 25 CHARACTERS/LINE.
C IF SWITCH IN DATA STATEMENT IS SET TO 1, SYMBOLS WILL BE PRINTED
C AT THE BEGINNING OF EACH TITLE LINE CORRESPONDING TO THOSE
C REQUESTED FOR PLOTTING YOUR DATA IN SUBROUTINE READR (INTEQ).
C
COMMON /INPUT/ IXAXIS(5), IYAXIS(5), ITITLE1(5), ITITLE2(5),
   ITITLE3(5), ITITLE4(5), ITITLE5(5), ITYPE, XAXIS, YAXIS, FACT, ITITLE, Y2*X1,
   2GRID, YINC, XINC, NOUN, NIN, I_LINES, LDEV, NSETS, IHN, IHY, IHG, IH0
C
COMMON /DATA/ XARRAY(900), YARRAY(900), HISTOX(900), HISTOY(900),
   1XPTS(900), YPTS(900), ANUX(900), ANUY(900), ANUHX(900), ANUHY(900)
C
COMMON /DRAW/ NPTS(20), IPLOT(20), IHIST(20), LINTYP(20), INTEQ(20),
   1LOGTYP(20)+SKIP
C
DATA SWITCH/0./
C
SY = Y2-.25
SX=1+.25
IF (SWITCH.EQ.1.) CALL SYMBOL (SX,SY+.05+.14*INTEQ(1),0.0,-1)
CALL SYMBOL (SX,SY+.14*ITITL1,0.0,-25)
IF (ILINES.LT.2) GO TO 1
SY=SY-.25
IF (SWITCH.EQ.1.) CALL SYMBOL (SX,SY+.05+.14*INTEQ(2),0.0,-1)
CALL SYMBOL (SX,SY+.14*ITITL2,0.0,-25)
IF (ILINES.LT.3) GO TO 1
SY=SY-.25
IF (SWITCH.EQ.1.) CALL SYMBOL (SX,SY+.05+.14*INTEQ(3),0.0,-1)
CALL SYMBOL (SX,SY+.14*ITITL3,0.0,-25)
IF (ILINES.LT.4) GO TO 1
SY=SY-.25
IF (SWITCH.EQ.1.) CALL SYMBOL (SX,SY+.05+.14*INTEQ(4),0.0,-1)
CALL SYMBOL (SX,SY+.14*ITITL4,0.0,-25)
IF (ILINES.LT.5) GO TO 1
SY=SY-.25
IF (SWITCH.EQ.1.) CALL SYMBOL (SX,SY+.05+.14*INTEQ(5),0.0,-1)
CALL SYMBOL (SX,SY+.14*ITITL5,0.0,-25)
1 RETURN
END
SUBROUTINE AXES (MASK)

C THIS SUBROUTINE SCALES ALL DATA AND DRAWS THE APPROPRIATE AXES WITH LABELS AS WELL AS THE GRAPH'S BORDER.
C
COMMON /INPUT/ IXAXIS(5),IYAXIS(5),ITITL1(5),ITITL2(5),ITITL3(5),
ITITL4(5),ITITL5(5),ITYPE,XAXIS,YAXIS,FACT,ITITLE,Y2,X1,IGRID,
2YINC,XINC,NOUX,NIN,ILINES,LDEV,NSETS,INH,INH1,INH2,INH3
C
COMMON /DATA/ XARRAY(900),YARRAY(900),HISTOX(900),HISTOY(900),
1XPTS(900),YPTS(900),ANUX(900),ANUY(900),ANUHX(900),ANUHY(900)
C
COMMON /DRAW/ NPTS(20),IPLOT(20),IHIST(20),LINTYP(20),INTEQ(20),
LLOGTYP(20),SKIP
C
ITOT=0
DO 100 I=1,NSETS
ITOT=ITOT+NPTS(I)
100 CONTINUE
GO TO (105,110,115,120), ITYPE
C
C... ITYPE=1 ---> LINEAR X,LINEAR Y SCALED AXES.
C
105 CALL SCALE (XARRAY,XAXIS,ITOT+1)
CALL SCALE (YARRAY,YAXIS,ITOT+1)
IF (MASK.EQ.1) GO TO 125
CALL AXIS (0.0,0.0,0.0,IXAXIS=-25,XAXIS,0.0,XARRAY(ITOT+1),
1XARRAY(ITOT+2))
CALL AXIS (0.0,0.0,1YAXIS,25,YAXIS,90.0,YARRAY(ITOT+1),
1YARRAY(ITOT+2))
CALL PLOT (0.0,YAXIS,3)
CALL PLOT (XAXIS,YAXIS,2)
CALL PLOT (XAXIS,0.0,2)
GO TO 125

C... ITYPE=2 ----> LINEAR X, LOG Y SCALED AXES.

110 CALL SCALE (XARRAY,XAXIS,ITOT+1)
CALL SCALG (YARRAY,YAXIS,ITOT+1)
IF (MASK.EQ.IHY) GO TO 125
CALL AXIS (0.0,0.0,IXAXIS,-25,XAXIS,0.0,XARRAY(ITOT+1),
1XARRAY(ITOT+2))
CALL LGAXS (0.0,0.0,1YAXIS,25,YAXIS,90.0,YARRAY(ITOT+1),
1YARRAY(ITOT+2))
CALL PLOT (0.0,YAXIS,3)
CALL PLOT (XAXIS,YAXIS,2)
CALL PLOT (XAXIS,0.0,2)
GO TO 125

C... ITYPE=3 ----> LOG X, LINEAR Y SCALED AXES.

115 CALL SCALG (XARRAY,XAXIS,ITOT+1)
CALL SCALE (YARRAY,YAXIS,ITOT+1)
IF (MASK.EQ.IHY) GO TO 125
CALL LGAXS (0.0,0.0,IXAXIS,-25,XAXIS,0.0,XARRAY(ITOT+1),
1XARRAY(ITOT+2))
CALL AXIS (0.0,0.0,1YAXIS,25,YAXIS,90.0,YARRAY(ITOT+1),
1YARRAY(ITOT+2))
CALL PLOT (0.0,YAXIS,3)
CALL PLOT (XAXIS,YAXIS,2)
CALL PLOT (XAXIS,0.0,2)
GO TO 125

C... ITYPE=4 ----> LOG X, LOG Y SCALED AXES.

120 CALL SCALG (XARRAY,XAXIS,ITOT+1)
CALL SCALE (YARRAY,YAXIS,ITOT+1)
IF (MASK.EQ.IHY) GO TO 125
CALL LGAXS (0.0,0.0,IXAXIS,-25,XAXIS,0.0,XARRAY(ITOT+1),
1XARRAY(ITOT+2))
CALL LGAXS (0.0,0.0,1YAXIS,25,YAXIS,90.0,YARRAY(ITOT+1),
1YARRAY(ITOT+2))
CALL PLOT (0.0,YAXIS,3)
CALL PLOT (XAXIS,YAXIS,2)
CALL PLOT (XAXIS,0.0,2)
GO TO 125

125 RETURN
END
SUBROUTINE PLOTR

C THIS SUBROUTINE SETS UP THE DATA ARRAYS WITH APPROPRIATE SCALING
C FACTORS (COMPUTED IN SUBR, AXES), GENERATES HISTOGRAMS IF REQUESTED
C AND THEN PLOTS ALL DATA AS INPUT IN SUBROUTINE READR.
C
C THIS ROUTINE IS ALSO NEXT TO IMPOSSIBLE TO EXPLAIN OR FOLLOW!
C
COMMON /INPUT/ IXAXIS(5), IYAXIS(5), ITITL1(5), ITITL2(5), ITITL3(5),
1 ITITL4(5), ITITL5(5), ITYPE, XAXIS, YAXIS, FACT, ITITLE, Y2*X1, IGRID,
2 YINC, XINC, NOU, NIN, IILINES, LDEV, NSETS, IHN, IHY, IHE, IH0
C
COMMON /DATA/ XARRAY(900), YARRAY(900), HISTOX(900), HISTOY(900),
1 XPTS(900), YPTS(900), ANUX(900), ANUY(900), ANUHX(900), ANUHY(900)
C
COMMON /DRAW/ NPTS(20), IPLOT(20), IHIST(20), LINTYP(20), INTEQ(20),
1 LOGTYP(20), SKIP
C
SKIP= XAXIS*4.0
JN= 1
JO= 0
ITOT= 0

DO 100 I= 1, NSETS
   ITOT= ITOT+ NPTS(I)
100 CONTINUE
C
DO 255 JM= 1, NSETS
   L= IPLOT(JM)
   JO= JO+ NPTS(JM)
   IK= 1
   DO 130 IJ= JN, JO
      XPTS(IK)= XARRAY(IJ)
      YPTS(IK)= YARRAY(IJ)
      IF (IPLOT(JM).GE.5) GO TO 105
      ITOT= ITOT+ 1
      GO TO 125
   105 IF (LOGTYP(JM)) 120, 115, 110
   110 ANUX(IK)= XARRAY(IJ)
      ANUY(IK)= (LOG10(YARRAY(IJ))- LOG10(YARRAY(ITOT+1)))/
   1 YARRAY(ITOT+2)
      GO TO 125
   115 ANUX(IK)= (LOG10(XARRAY(IJ))- LOG10(XARRAY(ITOT+1)))/
   1 XARRAY(ITOT+2)
      ANUY(IK)= (LOG10(YARRAY(IJ))- LOG10(YARRAY(ITOT+1)))/
   1 YARRAY(ITOT+2)
      GO TO 125
   120 ANUX(IK)= (LOG10(XARRAY(IJ))- LOG10(XARRAY(ITOT+1)))/
   1 XARRAY(ITOT+2)
      ANUY(IK)= YARRAY(IJ)

36
GO TO 125
IK=IK+1
CONTINUE
XPTS(1K)=XARRAY(ITOT+1)
XPTS(1K+1)=XARRAY(ITOT+2)
YPTS(1K)=YARRAY(ITOT+1)
YPTS(1K+1)=YARRAY(ITOT+2)
IF (IPL0T(JM).GE.5) GO TO 135
GO TO 155
135 IF (LOGTYP(JM)) 150,145,140
140 ANUX(IK)=XARRAY(ITOT+1)
ANUX(IK+1)=XARRAY(ITOT+2)
ANUY(IK)=0.0
ANUY(IK+1)=1.0
GO TO 155
145 ANUX(IK)=0.0
ANUX(IK+1)=1.0
ANUY(IK)=0.0
ANUY(IK+1)=1.0
GO TO 155
150 ANUX(IK)=0.0
ANUX(IK+1)=1.0
ANUY(IK)=YARRAY(ITOT+1)
ANUY(IK+1)=YARRAY(ITOT+2)
GO TO 155
155 JN=JN+NPTS(JM)
C... SECTION TO GENERATE/ PLOT NEW ARRAYS FOR HISTOGRAM.
C
1
IF (IPL0T(JM).EQ.3.OR.IPL0T(JM).EQ.6.OR.IMIST(JM).EQ.IHN)
GO TO 220
IF (IPL0T(JM).EQ.5) GO TO 160
GO TO 185
160 JZ=3
ANUHX(1)=ANUX(1)
ANUHY(1)=ANUY(1)
ANUHX(2)=ANUX(2)
ANUHY(2)=ANUY(2)
KZ=NPTS(JM)+1
DO 165 IZ=2,KZ
ANUHX(JZ)=ANUX(IZ)
ANUHY(JZ)=ANUY(IZ+1)
JZ=JZ+1
ANUHX(JZ)=ANUX(IZ+1)
ANUHY(JZ)=ANUY(IZ+1)
JZ=JZ+1
CONTINUE
IF (LOGTYP(JM)) 180,175,170
170 ANUHX(JZ)=XARRAY(ITOT+1)
ANUHX(JZ+1)=XARRAY(ITOT+2)
ANUHY(JZ)=0.0
ANUHY(JZ+1)=1.0
GO TO 195
175  ANUHX(JZ)=0.0
      ANUHX(JZ+1)=1.0
      ANUHY(JZ)=0.0
      ANUHY(JZ+1)=1.0
      GO TO 195
180  ANUHX(JZ)=0.0
      ANUHX(JZ+1)=1.0
      ANUHY(JZ)=YARRAY(ITOT+1)
      ANUHY(JZ+1)=YARRAY(ITOT+2)
      GO TO 195
185  J=3
      HISTOX(1)=XPTS(1)
      HISTOY(1)=YPTS(1)
      HISTOX(2)=XPTS(2)
      HISTOY(2)=YPTS(2)
      KK=NPTS(JM)-1
      DO 190 I=2, KK
         HISTOX(J)=XPTS(I)
         HISTOY(J)=YPTS(I+1)
         J=J+1
      END
      HISTOX(J)=XARRAY(ITOT+1)
      HISTOY(J)=YARRAY(ITOT+2)
190  NPT=(NPTS(JM)+2)*2
      GO TO (200, 205, 215, 210, 210, 255), L
200  CALL LINE (HISTOX, HISTOY, NPT, 1, LINTYP(JM), INTEQ(JM))
      GO TO 255
205  CALL DASHL (HISTOX, HISTOY, NPT, 1)
      GO TO 255
210  CALL LGLIN (HISTOX, HISTOY, NPT, 1, LINTYP(JM), INTEQ(JM), LOGTYP(JM))
      GO TO 255
215  CALL DASHL (ANUHX, ANUHY, NPT, 1)
      GO TO 255
C
C... SECTION FOR PLOTTING REGULAR DATA (NO HISTOGrams).
C
C I=PL0T=1 ----> STRAIGHT LINE:LINEAR AXES
C I=PL0T=2 ----> DASH LINE:LINEAR AXES ONLY
C I=PL0T=3 ----> SMOOTH LINE:LINEAR AXES
C  I P L O T = 4  ----> STRAIGHT LINE: LOG-LOG, SEMI-LOG AXES
C  I P L O T = 5  ----> DASH LINE: LOG-LOG, SEMI-LOG AXES
C  I P L O T = 6  ----> SMOOTH LINE: LOG-LOG, SEMI-LOG AXES

220  GO TO (225,230,235,240,245,250), L
225  CALL LINE (XPTS,YPTS,NPTS(JM)+1,LINTYP(JM),INTEQ(JM))
   GO TO 255
230  CALL DASHL (XPTS,YPTS,NPTS(JM)+1)
   GO TO 255
235  CALL FLHNE (XPTS,YPTS,-NPTS(JM)+1,LINTYP(JM),INTEQ(JM))
   GO TO 255
240  CALL LGLIN (XPTS,YPTS,NPTS(JM)+1,LINTYP(JM),INTEQ(JM),
   LOGTYP(JM))
   GO TO 255
245  CALL DASHL (ANUX,ANUY,NPTS(JM)+1)
   GO TO 255
250  CALL FLHI'E (ANUX,ANUY,-NPTS(JM)+1,LINTYP(JM),INTEQ(JM))
255  CONTINUE

C  GO TO (225,230,235,240,245,250), L
C  CALL LINE (XPTS,YPTS,NPTS(JM)+1,LINTYP(JM),INTEQ(JM))
C  GO TO 255
C  CALL DASHL (XPTS,YPTS,NPTS(JM)+1)
C  GO TO 255
C  CALL FLHNE (XPTS,YPTS,-NPTS(JM)+1,LINTYP(JM),INTEQ(JM))
C  GO TO 255
C  CALL LGLIN (XPTS,YPTS,NPTS(JM)+1,LINTYP(JM),INTEQ(JM),
C   LOGTYP(JM))
C  GO TO 255
C  CALL DASHL (ANUX,ANUY,NPTS(JM)+1)
C  GO TO 255
C  CALL FLHNE (ANUX,ANUY,-NPTS(JM)+1,LINTYP(JM),INTEQ(JM))

C  END

SUBROUTINE HIDE (YSTEP)

C  THIS ROUTINE PLOTS THE 3-DIMENSIONAL GRAPH.

C  COMMON /INPUT/ IXAXIS(5),IYAXIS(5),ITITL1(5),ITITL2(5),ITITL3(5),
C   ITITL4(5),ITITL5(5),ITYPE,XAXIS,YAXIS,FACT,ITITLE,Y2,X1,IGRID,
C   2YINC,XINC,NOU,NIN,ILINES,LDEV,NSETS,IMN,IMY,IMX,IM0

C  COMMON /DATA/ XARRAY(900),YARRAY(900),HISTOX(900),HISTOY(900),
C   1XPTS(900),YPTS(900),ANUX(900),ANUY(900),ANUXH(900),ANUHY(900)

C  COMMON /DRAW/ NPTS(20),IPL0T(20),IHIST(20),LINTYP(20),INTEQ(20),
C   LOGTYP(20),SKIP

C  DIMENSION X(900),Y(900),XG(900),G(900),XH(900),H(900)
C  EQUIVALENCE (K1,WHICH), (K2,SLOPE), (FNST1,Z1), (IGMP1,K1), (K1,
C   IN2)
C  DATA EPS1,MAXDIM,XSTART,YSTART/1.E-9,900.4•3•
C  F(X,X1,Y1,XIP1,YIP1)=Y1*(XX-XI)*(X1PI-YI)/(XIP1-XI)
C  WRITE (NOU,5000)
C  READ (NIN,5030) IDASH
C  YSTEP=YSTART
C  SKIP=XAXIS*0.0
C  JN=1
C  J0=0
C  NG=0
C  ITOT=0

39
DO 100 I=1*NSETS
   ITOT=ITOT+NPTS(I)
100 CONTINUE
C
DO 355 JM=1*NSETS
   N1=NPTS(JM)
   JO=JO+N1
   IK=1
      DO 130 IJ=JN*JO
         ITOT=ITOT
         GO TO (120,105,110,115), ITYPE
      105 Y(IK)=(LOG10(YARRAY(IJ))-LOG10(YARRAY(ITOT+1)))/YARRAY(ITOT+2)
         X(IK)=XARRAY(IJ)
         GO TO 125
      110 Y(IK)=YARRAY(IJ)
         GO TO 125
      115 X(IK)=(LOG10(XARRAY(IJ))-LOG10(XARRAY(ITOT+1)))/XARRAY(ITOT+2)
         Y(IK)=(LOG10(YARRAY(IJ))-LOG10(YARRAY(ITOT+1)))/YARRAY(ITOT+2)
         GO TO 125
5   120 X(IK)=XARRAY(IJ)
         Y(IK)=YARRAY(IJ)
5   125 IK=IK+1
5   130 CONTINUE
JN=JN+N1
      DO 135 I=2,N1
         IF (X(I-1).LT.X(I)) GO TO 135
         WRITE (NOU,5010) X(I-1),X(I)
5      RETURN
5   135 CONTINUE
      IF (JM.GT.1) GO TO 205
NFNS=NSETS
   XMIN=XARRAY(ITOT+1)
   YMIN=YARRAY(ITOT+1)
   DELTAX=XARRAY(ITOT+2)
   DELTAY=YARRAY(ITOT+2)
      IF (N1+4.LE.MAXDIM) GO TO 140
      GO TO 360
140 SIGN=1.
      IF (NG.LT.-1) SIGN=-1.
      IF (NG.EQ.-1.OR. NG.EQ.-3) GO TO 145
      CALL PLOT (0.,YSTART+YAXIS*.3)
      CALL DASHP (XAXIS,YSTART+YAXIS*.03)
      CALL DASHP (XAXIS,YSTAPT*.03)
      CALL DASHP (0.,YSTART*.03)
CALL PLOT (XAXIS, YSTART, 3)
CALL DASHP (XAXIS, XSTART, 0, 0.03)
145 CALL SYMBOL (2.0, YAXIS, YSTART, 10.0, 14.0, ITITL1, 0.0, 25)
GO TO (150, 155, 160, 165, ITYPE)
150 CALL AXIS (XSTART, 0.0, IXAXIS, -25, XAXIS, 0.0, XMIN, DELTAX)
CALL PLOT (XSTART, 0.0, 3)
CALL PLOT (0.0, YSTART, 2)
CALL AXIS (0.0, YSTART, IYAXIS, 25, YAXIS, 90.0, YMIN, DELTAY)
GO TO 170
155 CALL AXIS (XSTART, 0.0, IXAXIS, -25, XAXIS, 0.0, XMIN, DELTAX)
CALL PLOT (XSTART, 0.0, 3)
CALL PLOT (0.0, YSTART, 2)
CALL LGAXS (0.0, YSTART, IYAXIS, 25, YAXIS, 90.0, YMIN, DELTAY)
GO TO 170
160 CALL LGAXS (XSTART, 0.0, IXAXIS, -25, XAXIS, 0.0, XMIN, DELTAX)
CALL PLOT (XSTART, 0.0, 3)
CALL PLOT (0.0, YSTART, 2)
CALL LGAXS (0.0, YSTART, IYAXIS, 25, YAXIS, 90.0, YMIN, DELTAY)
GO TO 170
165 CALL LGAXS (XSTART, 0.0, IXAXIS, -25, XAXIS, 0.0, XMIN, DELTAX)
CALL PLOT (XSTART, 0.0, 3)
CALL PLOT (0.0, YSTART, 2)
CALL LGAXS (0.0, YSTART, IYAXIS, 25, YAXIS, 90.0, YMIN, DELTAY)
170 INDEX=3
GO TO (190, 175, 180, 185, ITYPE)
175 YMIN=0.
DELTAY=1.
GO TO 190
180 XMIN=0.
DELTAX=1.
GO TO 190
185 XMIN=0.
DELTAX=1.
YMIN=0.
DELTAY=1.
190 CONTINUE
IF (NFNS .LE. 0) GO TO 195
FNSM1=NFNS-1
DXIN=XSTART*DELTAX/FNSM1
DYIN=YSTART*DELTAY/FNSM1
195 DO 200 J=1+N1
   XG(INDEX) = X(J)
   G(INDEX) = SIGN*Y(J)
   INDEX=INDEX+1
200 CONTINUE
EPS=EPS1*(ABS(XMIN)*ABS(DELTAX))
NG=N1+4
XG(1)=-FNSM1*DXIN*XMIN-ABS(XMIN)-ABS(XG(3))-1.
XG(2)=XG(3)-EPS
41
XG(N1+3)=XG(N1+2)+EPS
ZZ=YMIN
IF (SIGN.LT.0.) ZZ=-YMIN-50.*DELTAY
G(1)=ZZ
G(2)=ZZ
G(N1+3)=ZZ
G(NG)=ZZ
CALL PLOT (XSTART+0.,0.-3)
X(N1+1)=XMIN
X(N1+2)=DELTAX
Y(N1+1)=YMIN
Y(N1+2)=DELTAY
CALL LINE (X,Y,N1+1,0,0)
DXKK=0.
DYKK=0.
RELINC=DELTAX/DELTAY
XG(NG)=SIGN
GO TO 355
205 SIGN=XG(NG)
XG(NG)=X(N1)
IF (NFNS) 225,215,210
210 DXKK=DXKK+DXIN
DYKK=DYKK+DYIN
215 DO 220 J=1,N1
Y(J)=SIGN*(Y(J)+DYKK)
X(J)=X(J)-DXKK
220 CONTINUE
225 CALL Lookup (X(1),XG(1),JJ)
IF (JJ.XE.MAXDIM) GO TO 360
230 CONTINUE
230 IG=JJ+1
XH(IG)=X(1)
H(IG)=F(X(1),XG(JJ),G(JJ),XG(IG),G(IG))
INDEXG=JJ
INDEXT=1
Z1=X(1)
F1=H(IG)-Y(1)
IT=2
JJ=IG
IF (H(IG).GE.Y(1)) GO TO 235
IF (JJ.XE.MAXDIM) GO TO 360
JJ=IG+1
H(JJ)=Y(1)
XH(JJ)=Z1+EPS
235 LAST=0
X1=Z1
240 IF (XG(IG).LT.X(IT)) GO TO 245
   IWHICH=0
   X2=X(IT)
   F2=F(X2,XG(IG-1),G(IG-1),XG(IG),G(IG))-Y(IT)
   IT=IT+1
   GO TO 250
245 X2=XG(IG)
   IWHICH=1
   F2=G(IG)-F(X2,X(IT-1),Y(IT-1),X(IT),Y(IT))
   IG=IG+1
250 IF (F1*F2.GT.0.) GO TO 260
   DENOM=X2-X1
   IF (DENOM.EQ.0.) DENOM=.00001
   SLOPE=(F2-F1)/DENOM
   IGG=IG-1-IWHICH
   ITT=IT-2-IWHICH
   IF (ABS(SLOPE*RELINC).GT.1.E-6) GO TO 255
   Z2=X2
   GO TO 270
255 Z2=X1-F1/SLOPE
   GO TO 270
260 X1=X2
   F1=F2
   IF (IT.LE.N1) GO TO 240
265 LAST=1
   Z2=X(N1)
   CALL LOOKUP (Z2,XG(INDEXG),IGG)
   IGG=INDEXG+IGG-1
   ITT=N1-1
270 Z2=.99*Z1+.01*Z2
   CALL LOOKUP (Z2,X(INDEXT),K1)
   CALL LOOKUP (Z2,XG(INDEXG),K2)
   K1=K1+INDEXT-1
   K2=K2+INDEXG-1
   IF (F(Z2*X(K1),Y(K1),X(K1+1),Y(K1+1)).GT.F(Z2*XG(K2),G(K2),
        XG(K2+1),G(K2+1))) GO TO 300
   IF (JJ+IGG=INDEXG,GE.,MAXDIM) GO TO 360
   NGR=ITT-INDEXT+2
   NN2=JJ
   NJJ=JJ
   ANUX(NJJ)=XH(NJJ)
   ANUY(NJJ)=YH(NJJ)
   IF (NGR.EQ.2) GO TO 280
   NJ1=INDEXT+1
   DO 275 I=NJ1,ITT
      NJJ=NJJ+1
      ANUX(NJJ)=X(I)
      ANUY(NJJ)=Y(I)
275 CONTINUE
NJJ=NJJ+1
ANUX(NJJ)=Z2
ANUY(NJJ)=F(Z2*X(ITT)*Y(ITT)*X(ITT+1)*Y(ITT+1))
NM=NM2+NGP-1
NL=0
DO 285 I=NN2,NM
   NL=NL+1
   ANUX(NL)=ANUX(I)
   ANUY(NL)=ANUY(I)
CONTINUE
ANUX(NL+1)=XMIN
ANUY(NL+1)=YMIN
ANUX(NL+2)=DELTAY
ANUY(NL+2)=DELTAX
IF (IDASH.EQ.IHY) CALL DASHL (ANUX, ANUY, NL, 1)
IF (INDEXG.EQ.IGG) GO TO 295
J1=INDEXG+1
DO 290 I=J1, IGG
   JJ=JJ+1
   XH(JJ)=XG(I)
   H(JJ)=G(I)
CONTINUE
290
J1=J1+1
XH(J1)=Z2
H(J1)=F(Z2*XG(IGG)*G(IGG)*XG(IGG+1)*G(IGG+1))
INDEXG=IGG
INDEXT=ITT
GO TO 320
300
NGRAPH=ITT-INDEXT+2
IF (JJ+NGRAPH-1.GT.MAXDIM) GO TO 360
N2=JJ
IF (NGRAPH.EQ.2) GO TO 310
J1=INDEXT+1
DO 305 I=J1, ITT
   JJ=JJ+1
   XH(JJ)=X(I)
   H(JJ)=Y(I)
CONTINUE
305
J1=J1+1
XH(J1)=Z2
H(J1)=F(Z2*X(ITT)*Y(ITT)*X(ITT+1)*Y(ITT+1))
NM=N2+NGRAPH-1
L=0
DO 315 I=N2,NM
   L=L+1
   XPTS(L)=XH(I)
   YPTS(L)=H(I)
CONTINUE
XPTS(L+1)=XMIN

44
XPTS(L+2)=DELTAX
YPTS(L+1)=SIGN*YMIN
YPTS(L+2)=SIGN*DELTAY
CALL LINE (XPTS, YPTS, L, 1, 0, 0)
INDEX=ITT
INDEXG=IGG

320 IF (LAST.EQ.1) GO TO 325
   X1=X2
   F1=F2
   Z1=Z2
   IF (IT.LE.N1) GO TO 240
   GO TO 265
325 IF (XG(NG).LE.XG(NG-1)) NG=NG-1
   IF (XG(NG).LE.XG(N1)) GO TO 335
   IF (JJ+3+NG-IGG.GT.MAXDIM) GO TO 360
   XH(JJ+1)=XH(JJ)+EPS
   JJ=JJ+1
   M(JJ)=F(X(N1),XG(IGG),G(IGG),XG(IGG+1),G(IGG+1))
   IGGP1=IGG+1
   DO 330 J=IGGPI,NG
      JJ=JJ+1
      XH(JJ)=XG(J)
      M(JJ)=G(J)
   CONTINUE
330 NG=JJ+2
   IF (NG.GE.MAXDIM) GO TO 360
   DO 340 I=1,JJ
      G(I)=M(I)
      XG(I)=XH(I)
   CONTINUE
   XG(JJ+1)=XG(JJ)+EPS
   G(JJ+1)=YMIN=DYKK
   IF (SIGN.LT.0.) G(JJ+1)=-YMIN=50.*DELTA+DYKK
   G(NG)=G(JJ+1)
   IF (NFNS.LT.0.) GO TO 350
   DO 345 I=1,N1
      X(I)=X(I)+DXKK
      Y(I)=SIGN*Y(I)+DYKK
   CONTINUE
345 CONTINUE
350 XG(NG)=SIGN
355 CONTINUE
CALL PLOT (XAXIS, 0.0, 3)
CALL PLOT (SKIP, 0.0, -3)
RETURN
360 WRITE (6,5020) MAXDIM
RETURN

C
C
****FORMAT STATEMENTS****
END SUBROUTINE READR (NPASS,MASK)

C THIS SUBROUTINE HANDLES THE INTERACTIVE I/O -- READS IN PLOT INSTRUCTIONS AS WELL AS THE DATA.

COMMON /INPUT/ IXAXIS(5),IYAXIS(5),ITITL1(5),ITITL2(5),ITITL3(5),
   1ITITL4(5),ITITL5(5),IYAXIS,YAXIS,FACT,ITITLE,Y2,X1,IGRID,
   2YINC,XINC,NOU,NIN,ILINES,LDEV,NSETS,IMN,IMY,IMB,IMO

COMMON /DATA/ XARRAY(900),YARRAY(900),HISTOX(900),HISTOY(900),
   1XPTS(900),YPTS(900),ANUX(900),ANUY(900),ANUXH(900),ANUHY(900)

COMMON /OPAW/ NPTS(20),IPLOT(20),IHIST(20),LINTYP(20),INTEQ(20),
   1LOGTYP(20),SKIP

C... THE FOLLOWING 3 CARDS ARE FOR UNIVAC MACHINES.

DIMENSION IA(2)
IA(1)=6H9ASG,T
IA(2)=6H29.

IF ((NPASS).GT.1) GO TO 125
100 WRITE (NOU,5060)
   READ (NIN,5030,ERR=105) LDEV
   GO TO 110
105 WRITE (NOU,5020)
   GO TO 100

C... THE FOLLOWING 4 CARDS ARE FOR UNIVAC MACHINES.

110 IF (LDEV.EQ.0) GO TO 115
   GO TO 120
115 CALL EPTRAN (6,IA)
   LDEV=29

C... THE FOLLOWING CARD WOULD BE USED FOR CDC MACHINES.

C3 IF (LDEV.EQ.0) LDEV=29

C120 CALL INIT
125 WRITE (NOU,5070) NPASS
126 WRITE (NOU,5080)
127 READ (NIN,5050) MASK
128 WRITE (NOU,5090)
129 READ (NIN,5030,ERR=135) XAXIS
130 GO TO 140
131 WRITE (NOU,5020)
132 GO TO 130
133 IF (XAXIS.EQ.0) XAXIS=9
134 WRITE (NOU,5100)
135 READ (NIN,5030,ERR=150) YAXIS
136 GO TO 155
137 WRITE (NOU,5020)
138 GO TO 145
139 IF (YAXIS.EQ.0) YAXIS=7
140 WRITE (NOU,5110)
141 READ (NIN,5030,ERR=165) FACT
142 IF (FACT.EQ.0.) FACT=1.
143 IF (FACT.GT.0.) GO TO 170
144 WRITE (NOU,5120)
145 GO TO 160
146 WRITE (NOU,5020)
147 GO TO 160
148 CALL FACTR
149 IF (MASK.NE.IMY) GO TO 175
150 WRITE (NOU,5010)
151 READ (NIN,5040) ITITL1
152 GO TO 235
153 WRITE (NOU,5130)
154 READ (NIN,5050) ITITLE
155 IF (ITITLE.EQ.IMN.OR.ITITLE.EQ.IMH.OR.ITITLE.EQ.IM0) GO TO 235
156 WRITE (NOU,5140)
157 READ (NIN,5030,ERR=185) X1,Y2
158 GO TO 190
159 WRITE (NOU,5020)
160 GO TO 180
161 WRITE (NOU,5150)
162 READ (NIN,5030,ERR=195) ILINES
163 GO TO 200
164 WRITE (NOU,5020)
165 GO TO 190
166 WRITE (NOU,5160) ILINES
167 DO 230 I=1,ILINES
168 GO TO (205,210,215,220,225), I
169 READ (NIN,5040) ITITL1
170 GO TO 230
171 READ (NIN,5040) ITITL2
172 GO TO 230
173 READ (NIN,5040) ITITL3

47
GO TO 230
READ (NIN,5040) ITITL4
GO TO 230
READ (NIN,5040) ITITL5
CONTINUE
WRITE (NOU,5170)
READ (NIN,5040) IXAXIS
WRITE (NOU,5180)
READ (NIN,5040) IYAXIS
IF (MASK.EQ.IHY) GO TO 255
WRITE (NOU,5190)
READ (NIN,5050) IGRID
IF (IGRID.EQ.IHN.OR.IGRID.EQ.IHB.OR.IGRID.EQ.IHO) GO TO 255
WRITE (NOU,5200)
READ (NIN,5030,ERR=245) LGRID
GO TO 250
WRITE (NOU,5020)
GO TO 240
XINC=10.
YINC=10.
IF (LGRID.LT.0) XINC=0.
IF (LGRID.GT.0) YINC=0.
WRITE (NOU,5210)
READ (NIN,5030,ERR=260) ITYPE
GO TO 265
WRITE (NOU,5020)
GO TO 255
WRITE (NOU,5220) NPASS
READ (NIN,5030,ERR=270) NSETS
GO TO 275
WRITE (NOU,5020)
GO TO 265
II=0
DO 375 K=1,NSETS
IF (MASK.EQ.IHY) AND K.EQ.1) WRITE (NOU,5000)
IF (MASK.EQ.IHY) GO TO 360
WRITE (NOU,5230) K
READ (NIN,5030,ERR=285) LINTYP(K)
GO TO 290
WRITE (NOU,5020)
GO TO 280
IF (LINTYP(K).GE.0) GO TO 295
IF (ITYPE.EQ.1) ILOT(K)=1
IF (ITYPE.GT.1) ILOT(K)=4
IF (ITYPE.EQ.2) LOGTP(K)=1
IF (ITYPE.EQ.3) LOGTP(K)=0
GO TO 330
IF (LINTYP(K).GT.0) GO TO 315
300 WRITE (NOU,5240) K
   READ (NIN,5030,ERR=305) IPlot(K)
   GO TO 310
305 WRITE (NOU,5020)
   GO TO 300
310 IF (ITYPE.GT.1) IPlot(K)=IPlot(K)+3
   IF (ITYPE.EQ.2) LOGTYP(K)=1
   IF (ITYPE.EQ.3) LOGTYP(K)=-1
   IF (ITYPE.EQ.4) LOGTYP(K)=0
   GO TO 340
315 WRITE (NOU,5250) K
   READ (NIN,5030,ERR=320) IPlot(K)
   GO TO 325
320 WRITE (NOU,5020)
   GO TO 315
325 IF (IPLOT(K).EQ.2) IPLOT(K)=3
   IF (ITYPE.GT.1) IPLOT(K)=IPLOT(K)+3
   IF (ITYPE.EQ.2) LOGTYP(K)=1
   IF (ITYPE.EQ.3) LOGTYP(K)=-1
   IF (ITYPE.EQ.4) LOGTYP(K)=0
330 WRITE (NOU,5260)
   READ (NIN,5030,ERR=335) INTEQ(K)
   GO TO 340
335 WRITE (NOU,5020)
   GO TO 330
340 IF (IPLOT(K).EQ.3.OR.IPlot(K).EQ.6) GO TO 360
345 WRITE (NOU,9270) K
   READ (NIN,5050,ERR=350) IHIST(K)
   GO TO 355
350 WRITE (NOU,5020)
   GO TO 345
355 IF (IHIST(K).NE.IHY) IHIST(K)=IH
   IF (IHIST(K).EQ.IHY) WRITE (NOU,5280)
360 WRITE (NOU,5290) K
   KFIX=0
C... THE FOLLOWING LOOP READS THE (X,Y) DATA.
C   DO 365 II=1,100000
   II=II+1
C... UNIVAC FORMATTED READ.
C   READ (NIN,5030,END=370) XARRAY(II),YARRAY(II)
C... CDC READ WITH 2-BRANCH EOF CHECK.
C   READ(NIN,1000)XARRAY(II),YARRAY(II)
C   IF(EOF(NIN))54,100
C100 IF (ITYPE.EQ.3 .AND. XARRAY(II).EQ.0.) KFIX=1
  
C IF (ITYPE.EQ.3 .AND. XARRAY(II).EQ.0.) KFIX=1
IF (ITYPE.EQ.2 .AND. YARRAY(II).EQ.0.) KFIX=1
IF (ITYPE.EQ.4 .AND. XARRAY(II).EQ.0 .OR. ITYPE.EQ.4 .AND. YARRAY(II).EQ.0.) KFIX=1
  
365 CONTINUE
370 I=I+1
II=II-1
NPTS(K)=I
  
375 CONTINUE
IF (KFIX.EQ.1) CALL FIXUP
RETURN

C C

****FORMAT STATEMENTS*****

C

5000 FORMAT (/51H ** NOTE: FOR A 3-D PLOT ONLY A SOLID-Straight LINE**/,
141H IS AVAILABLE FOR ALL DATA SETS.)
5010 FORMAT (/43H ** PLOT TITLE ( ONE LINE* 25 CHARACTERS )**/,
125H --------- 25 CHAR ---------)
5020 FORMAT (/36H ** INPUT ERROR: RE-ENTER LAST LINE.**)
5030 FORMAT ( )
5040 FORMAT (5A6)
5050 FORMAT (A1)
5060 FORMAT (/38H ** LOGICAL UNIT NUMBER FOR PLOT TAPE**/,
124H DEFAULT = UNIT "29".)
5070 FORMAT (/38H ** THE FOLLOWING PERTAIN TO GRAPH NO.**/,
117H (DEFAULT = 2-D))
5080 FORMAT (/49H ** DO YOU WANT A 3-DIMENSIONAL PLOT -- YES OR NO,**
117H (DEFAULT = 2-D))
5090 FORMAT (/43H ** X AXIS LENGTH (INCHES) -- DEFAULT = 9"**)
5100 FORMAT (/43H ** Y AXIS LENGTH (INCHES) -- DEFAULT = 7")
5110 FORMAT (/39H ** PLOT SIZE SCALING FACTOR -- DEFAULT, 14H = FULL SCALE**)
5120 FORMAT (/43H ** INPUT ERROR: SCALING FACTOR MUST BE NON-NEGATIVE, 23H RE-ENTER LAST LINE.**)
5130 FORMAT (/51H ** DOE YOU WANT A TITLE BLOCK -- YES OR NO (DEFAULT, 113H = NO TITLE))
5140 FORMAT (/51H ** GIVE X,Y COORDINATE (INCHES) FOR PLACEMENT OF**/,
14X,37H THE UPPER LEFT CORNER OF TITLE BLOCK.)
5150 FORMAT (/43H ** YOU NOW HAVE ROOM FOR 5 LINES OF PRINT**/,
124H 25 CHARACTERS PER LINE**/,/4X,27H HOW MANY LINES DO YOU NEED**)
5160 FORMAT (/24H ** ENTER SCRIPT FOR THE 12,9 LINE(S)**/,
125H --------- 25 CHAR ---------)
5170 FORMAT (/38H ** X AXIS LABEL (25 CHARACTER LIMIT)**/,
125H --------- 25 CHAR ---------)
5180 FORMAT (/38H ** Y AXIS LABEL (25 CHARACTER LIMIT)**/,
125H --------- 25 CHAR ---------)
5190 FORMAT (/44H ** DO YOU WANT A GRID -- YES OR NO (DEFAULT, 112H = NO GRID))

5200 FORMAT (/46H >> SELECT ONE OF THE FOLLOWING FOR YOUR GRID: */4X,
13H -1= HORIZONTAL GRID LINES ONLY, */4X, 40H 0= HORIZONTAL AND V
2ERTICAL GRID LINES, */4X, 30H 1= VERTICAL GRID LINES ONLY)
5210 FORMAT (/34H >> HOW ARE THE AXES TO BE SCALED< */6X, 22H1 = LINEAR
1X, LINEAR Y, */6X, 19H2 = LINEAR X, LOG Y, */6X, 19H3 = LOG X, LINEAR
2Y, */6X, 16H4 = LOG X, LOG Y)
5220 FORMAT (/38H >> HOW MANY SETS OF DATA ON GRAPH NO., I2, 1H<)
5230 FORMAT (/39H >> LINE/SYMBOL COMBINATION FOR SET NO., I2, 1H: */4X,
14H0 = POINTS CONNECTED BY LINE, NO SYMBOLS PRINTED, */4X,
24H N = POINTS CONNECTED BY LINE, SYMBOLS PRINTED AT, */4X,
32H EVERY N-TH DATA POINT, */4X, 37H N = NO LINE DRAWN, SYMBOLS PR
4INTED AT, */4X, 25H EVERY N-TH DATA POINT)
5240 FORMAT (/33H >> WHAT TYPE OF LINE FOR SET NO., I2, 1H<, */6X,
119H1 = SOLID, STRAIGHT, */6X, 20H2 = DASHED, STRAIGHT, */6X,
216H3 = SOLID, SMOOTH)
5250 FORMAT (/33H >> WHAT TYPE OF LINE FOR SET NO., I2, 1H<, */6X,
119H1 = SOLID, STRAIGHT, */6X, 17H2 = SOLID, SMOOTH)
5260 FORMAT (/46H >> INTEGER EQUIVALENT OF CALCOMP SYMBOL TO BE, */4X,
132H PRINTED AT EACH N-TH DATA POINT<)
5270 FORMAT (/39H >> DO YOU WANT A HISTOGRAM FOR SET NO., I2, 1H<, */4X,
135H YES OR NO (DEFAULT = NO HISTOGRAM<)
5280 FORMAT (/50H ** CAUTION: FOR A HISTOGRAM, YOU NEED ONLY SPECIFY, */
14X, 57H (1) A LOWER AND UPPER LIMIT FOR THE FIRST BIN, THEN, */
24X, 54H (2) AN UPPER LIMIT ONLY FOR EACH BIN THEREAFTER.)
5290 FORMAT (/35H >> ADD YOUR (X, Y) DATA FOR SET NO., I2, 1H<, */4X,
117H END WITH "@EOF".)

C END
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