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   Comment_____

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   Comment_____

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   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 COMMON? Yes____ No____
   Comment_____

9. Were all necessary parts of the program received? Yes____ No____
   Comment_____

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7500 Old Xenia Pike
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   Comment_____

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   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 COMMON? 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.

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2/2/67

GRAPH 2 - A Printer Plotting Algorithm

SUBJECT CLASSIFICATION-9.0 ENGINEERING APPLICATIONS

Juris Putnins
Richard A. Northouse
University of Wisconsin-Milwaukee
Milwaukee, Wisconsin

October 1967

Direct Inquiries to: Juris Putnins
Computing Center
University of
Wisconsin-Milwaukee
Milwaukee, Wis. 53201
Phone 414-228-4426
User Number 3285

"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."

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1620 PROGRAM ABSTRACT

TITLE - GRAPH 2 - A Printer Plotting Subroutine algorithm.

CLASSIFICATION - 9.0 Engineering Applications.

AUTHORS/ORGANIZATION -

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Milwaukee, Wisconsin 53201

RELEASED October 1966 User Group # 3285

DIRECT INQUIRES to

Juris Putnins (above)

DESCRIPTION/PURPOSE GRAPH 2 provides the user a means of graphing numerical data without the use of a Calcomp digital plotter. The routine is self scaling and has variable length axes. Output is made on the on-line printer.

SPECIFICATIONS

1620 Model I or II; Equipment required, 20K decimal digits, 1443 printer, 1311 disc file, and card reader. GRAPH 2 is a subroutine programmed in Fortran II d with FORMAT.

PROGRAM DESCRIPTION

GRAPH 2 is a Fortran subroutine which enables the user to display numerical data in graphical form. For installations without an incremental plotter it provides this graphical means. For installations with an incremental plotter it provides a means for a more rapid turnaround of graphica output.

GRAPH 2 provides the user with the capability of variable length axes and a scaling routine which attempts to utilize the maximum area of the graph.

METHOD

GRAPH 2 must be provided with two arrays: a X and a Y. These arrays are first scaled to maximize plotting area. A dummy single dimensioned array is now incorporated. The entire Y array is scanned for the highest scaled Y value (s). When found, the numeric equivalent of an asteric is put into the dummy array at the corresponding X position. When the scan is completed the dummy array is outputed on A format. The scan of the Y array is now repeated for the Y values that would appear on the next lower line, this line is then outputed, and the process repeated until completion.

USAGE

GRAPH 2 like all Fortran subroutines is executed with a CALL statement. This call must be made from a Fortran mainline and must have five parameters.

CALL GRAPH 2 (XL, YL, N, X, Y)

WHERE

XL is the length of the X axis (abscissa) in inches. XL is not to exceed (I-16)/10, where I is the number of print positions available.

YL is the length of the Y axis (ordinate) in inches.

N is the number of paired X and Y data points to be plotted.

X is the x array. This must be a dimensioned array in the calling mainline program

Y is the y array. This also must be a dimensioned array in the calling mainline program

All of the above variables are in floating point mode except the fixed point variable N.

LIMITATIONS

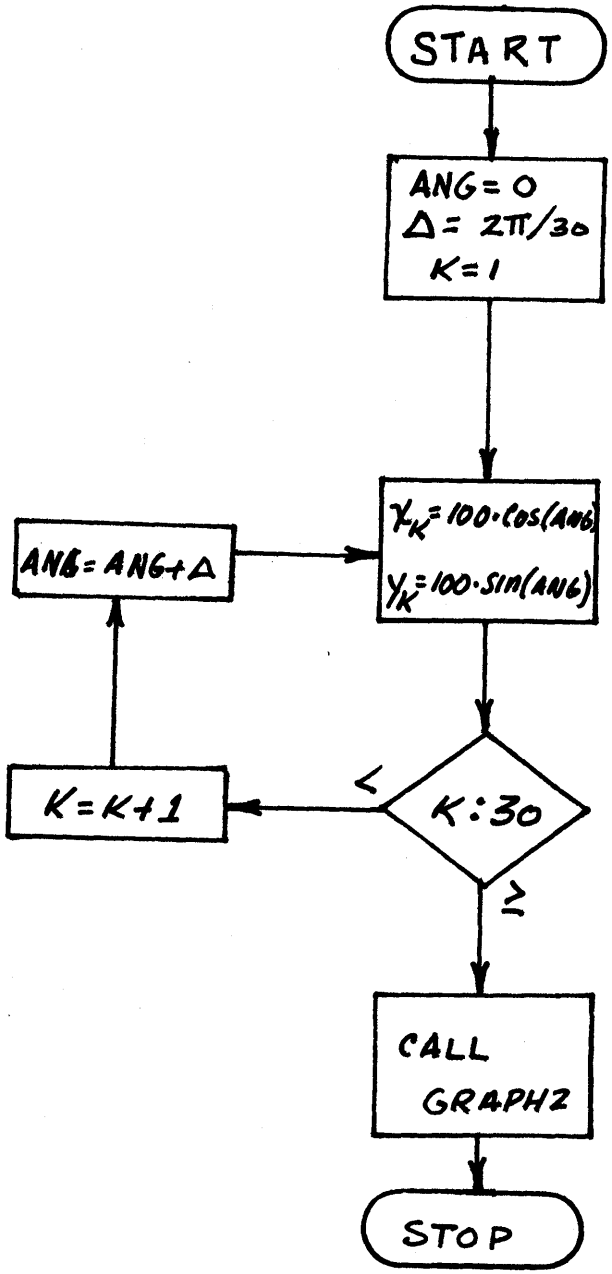
The number of data points to be plotted by GRAPH 2 is limited only by the dimension size of the X and Y arrays in the calling mainline.

The Y array should contain at least two numerically unequal values. If this condition does not exist the scaling is not performed correctly, resulting in a unacceptable graph. No error statement will be given.

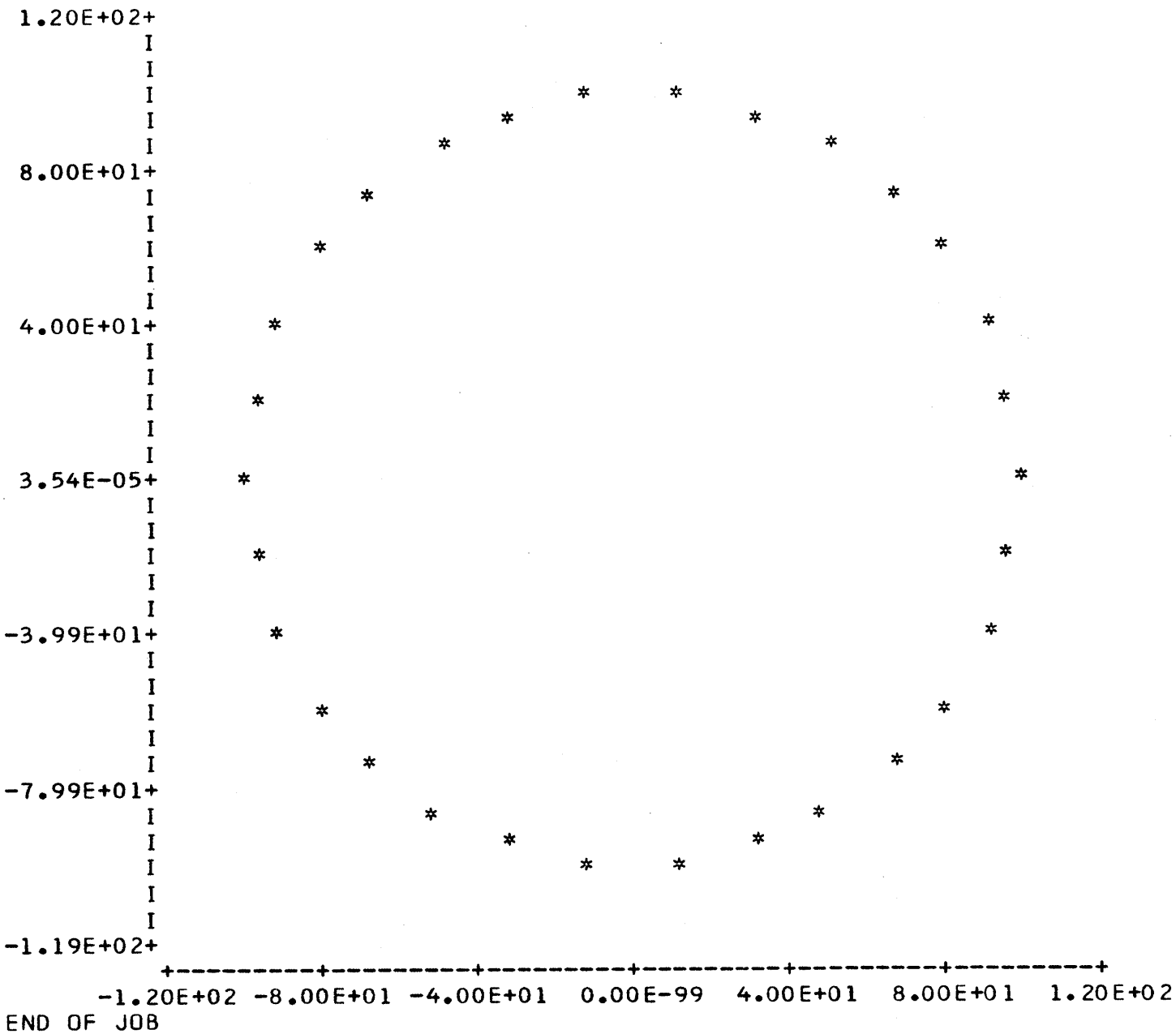
The printer must operate at 6 lines per inch and the FANDK must be 8 and 4.

EXAMPLE

For an illustrative example let us generate a circle and then have GRAPH 2 plot it.



The Fortran listing of this flowchart appears in the Appendix. The output generated is that of the next page.



END OF JOB

Sample Output of Graph 2

TIME AND CORE CONSUMED

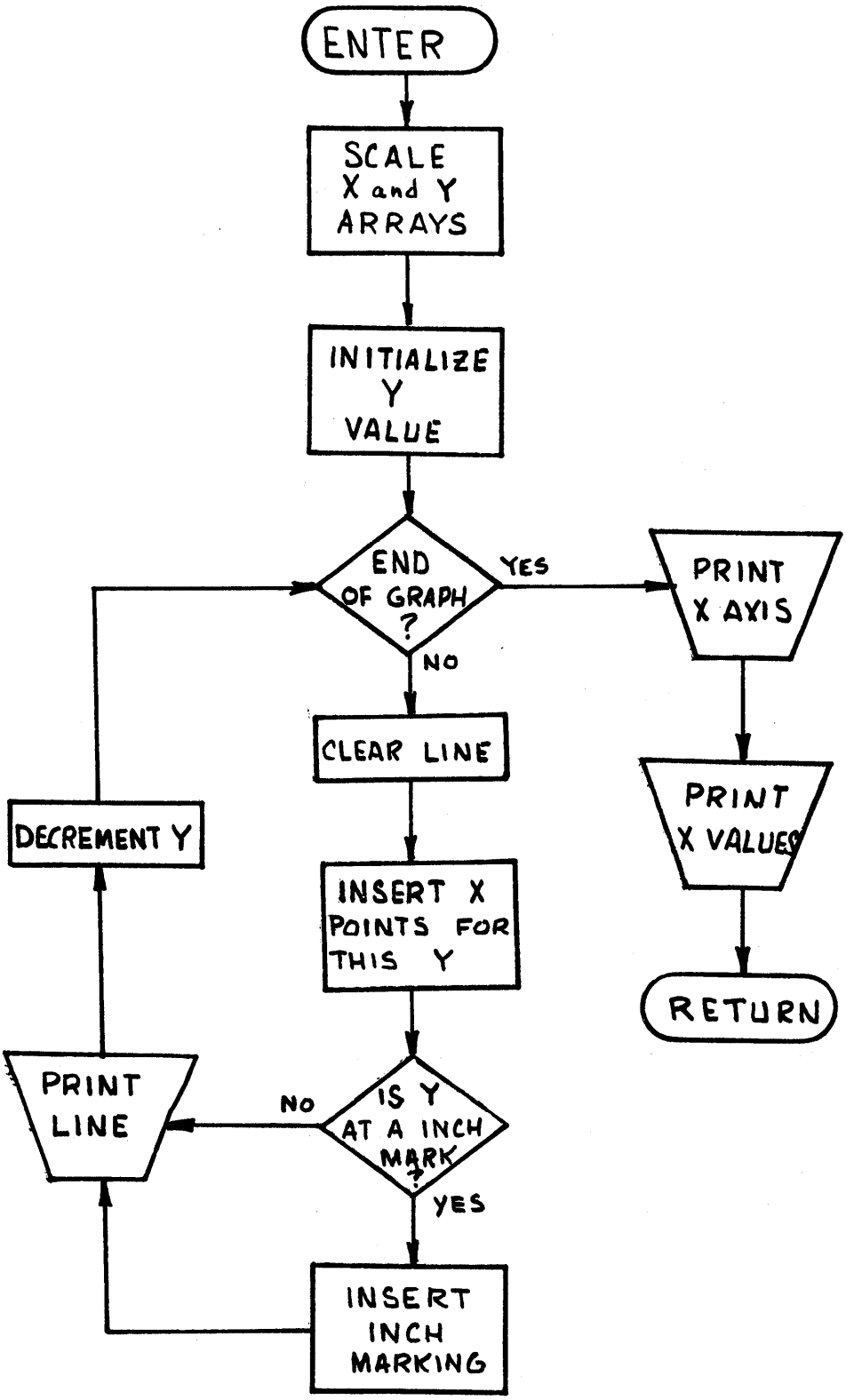
The above example required 8694 decimal digits of core (not counting the monitor system) and approximately 1.5 minutes to compile, load and execute.

CONCLUSIONS

GRAPH 2 has been released to the users at the University of Wisconsin Milwaukee for two semesters. It has proven to be much faster than the incremental plotter and in most cases quite satisfactory.

APPENDIX

FLOWCHART OF GRAPH2



Source Listing of Graph 2

```
$$FOR
*POBJP4
*LDISK                                                                  GRAF  10
*LISTPRINTER                                                            GRAF  20
C                                                                       GRAF  30
C                                                                       GRAF  40
C     ***************************************************************GRAF  50
C     *                                                              *GRAF  60
      SUBROUTINE GRAPH2(XL,YL,N ,X,Y)                                   GRAF  70
C     *                                                              *GRAF  80
C     *                                                              *GRAF  90
C     *                                                              *GRAF 100
C     *  JURIS PUTNINS-COMPUTING CENTER,RICHARD NORTHOUSE-ELECT ENG  *GRAF 110
C     *      UNIVERSITY OF WISCONSIN MILWAUKEE,MILWAUKEE,WIS 52301   *GRAF 120
C     *                                                              *GRAF 130
C     ***************************************************************GRAF 140
C                                                                       GRAF 150
C                                                                       GRAF 160
C      WHERE XL IS THE X AXIS LENGTH IN INCHES, YL IS THE LENGTH        GRAF 170
C      OF THE Y AXIS IN INCHES , N IS THE NUMBER OF POINTS TO BE PLOTTEDGRAF 180
C                                                                       GRAF 190
C                                                                       GRAF 200
C                                                                       GRAF 210
C                                                                       GRAF 220
      DIMENSION X(1),Y(1),LINE(131),XV(14)                              GRAF 230
C                                                                       GRAF 240
C     ****************  SCALE BOTH X AND Y ARRAYS   *******************GRAF 250
      CALLSCALE(X,N,XL,XMIN,DX)                                         GRAF 260
      CALLSCALE(Y,N,YL,YMIN,DY)                                         GRAF 270
C                                                                       GRAF 280
C     ************  DEFINE THE APLHA EQUIVALENT OF ONE   ***************GRAF 290
      IT=7100                                                           GRAF 300
C                                                                       GRAF 310
C     ********     DEL  IS THE INCHES PER CHARACTER   ******************GRAF 320
      DEL=DY/12.                                                        GRAF 330
C                                                                       GRAF 340
C     *****   SET Y VALUE EQUAL TO THAT OF THE GRAPH TOP     ***********GRAF 350
      YV=YMIN+DY*YL                                                     GRAF 360
      NL=0                                                              GRAF 370
C                                                                       GRAF 380
C     *******    NLTO IS THE NUMBER OF LINES NEEDED    ****************GRAF 390
      NLTO=YL*6.                                                        GRAF 400
C                                                                       GRAF 410
C     ********   NC IS THE NUMBER OF CHARACTERS NEEDED   ***************GRAF 420
      NC=XL*10.+1.                                                      GRAF 430
C                                                                       GRAF 440
C     ******************  CLEAR THE DUMMY ARRAY    ********************GRAF 450
4     DO 1  I=1,NC                                                      GRAF 460
1     LINE(I)=0                                                         GRAF 470
```

```
C                                                                       GRAF 480
C     *******     CHECK FOR END POINT OF GRAPH     **********************GRAF 490
      IF(NL-NLTO)5,5,6                                                  GRAF 500
C                                                                       GRAF 510
C     *************   FIND POINTS ON THIS LINE     **********************GRAF 520
5     DO 7 I=1,N                                                        GRAF 530
      IF(ABSF(Y(I)-YV)-DEL)8,8,7                                        GRAF 540
8     NX=(X(I)-XMIN)*10./DX+1.5                                         GRAF 550
      LINE(NX)=1400                                                     GRAF 560
7     CONTINUE                                                          GRAF 570
C                                                                       GRAF 580
C     **********    CHECK FOR INCH MARK ON Y AXIS    ********************GRAF 590
20    IF(NL/6*6-NL)22,21,21                                             GRAF 600
21    PRINT 23,IT,YV,(LINE(I),I=1,NC)                                   GRAF 610
23    FORMAT(A1,E9.2,1H+,14(10A1))                                      GRAF 620
      IT=0                                                              GRAF 630
      GOTO 25                                                           GRAF 640
22    PRINT 24,(LINE(I),I=1,NC)                                         GRAF 650
24    FORMAT(10X,1HI,14(10A1))                                          GRAF 660
C                                                                       GRAF 670
C     ***********   DECREMENT THE Y VALUE      ***************************GRAF 680
25    YV=YV-DY/6.                                                       GRAF 690
      NL=NL+1                                                           GRAF 700
      GOTO 4                                                            GRAF 710
6     MINUS=2000                                                        GRAF 720
      PLUS=1000                                                         GRAF 730
      J=XL                                                              GRAF 740
      PRINT 17,PLUS,((MINUS,K=1,9),PLUS,L=1,J)                          GRAF 750
17    FORMAT(11X,14(10A1))                                              GRAF 760
      XV(1)=XMIN                                                        GRAF 770
      I=XL+1.                                                           GRAF 780
C                                                                       GRAF 790
C     *************   CALCULATE X VALUES         **************************GRAF 800
      DO 32 J=2,I                                                       GRAF 810
32    XV(J)=XV(J-1)+DX                                                  GRAF 820
      PRINT 33,(XV(J),J=1,I)                                            GRAF 830
33    FORMAT(7X,13(E9.2,1X))                                            GRAF 840
      RETURN                                                            GRAF 850
C                                                                       GRAF 860
C     *************   END OF SUBROUTINE GRAPH2    ***********************GRAF 870
      END                                                               GRAF 880
```

Object Listing of Graph 2

```
3WP.....          3WPHHHHHHHHHHHHHHHHHHPW3          3WP.CCCCCCCCCCCCCCCC
-010-207R87898M75941574872-3590-8-4-0912N99980000000000000010000000000100-0001
-0000KJ701234567891234567‡-00002M100000000-1J0000000-1-001J5000000-1-009P10-0002
-00412M50J2000000-2-000J0000000-2J400-006K000J000-002‡-01212-1‡‡00000000000-0003
-09121J217-238L-0001‡-09181L6J0-1008-0096J1-1008000-4J1-0917000-5‡000000000-0004
-0954100K0-0989-091PMM-1002-0989L3-0989-0000K0-0989-098RK0-0096-0989‡000000-0005
-1014100J1-1008000-1MN-0930-100QJ1-0917000-2L1-0901-037017-238L-0002‡000000-0006
-10741J2JP-090--10853K5-011N-011--010--0795-0805‡-11121J217-238L-0003‡00000-0007
-11241J2JP-090--11353K5-012--011--010N-0815-0873‡-11621J217-238L-0004‡00000-0008
-1174100-0-0819-004117-238L-000500-2492-08730R-2492-0051-6-0829-2492‡000000-0009
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-1546100KM-0851-0847M7-1474-110017-238L-001100-2492-08432K-2492-0877‡000000-0016
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-17963-5-1822‡-18221M817-238L-00802Q-0098-085111-0099-001-05-1870---R9‡0000-0022
-1870100P--1893-011500-2492--JJ50K-2492-07950L-2492-00650R-2492-0805‡000000-0023
-19301000J-2492-003317-3854-2492-6-0855-249217-238L-0081J3-0855000-4‡000000-0024
-19901M811-0099-000M05-2014---99-0--J25-006917-238L-0082‡-18043-5-2026‡0000-0025
-202610017-238L-0070J1-0851000-1KM-0851-011-M7-1674-110017-238L-0071‡000000-0026
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-30592-5-379Q3-5-30432-2J42-5-382Q3-5-3038‡-30263-5-3082‡00000000000000000-0051
-308210017-238L-0171-0-0655-079517-238L-017200-2492-010-0J-2492-0019‡000000-0052
-314210017-3854-2492-6-0851-249217-238L-0173K0-0859-008517-238L-0174‡000000-0053
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-0000‡00000000000000000000000000000000000000000000000000000000000000000000-0063
-0000‡00000000000000000000000000000000000000000000000000000000000000000000-0064
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R9999‡00000000000000000000000000000000000000000000000000000000000000000000-0066
```
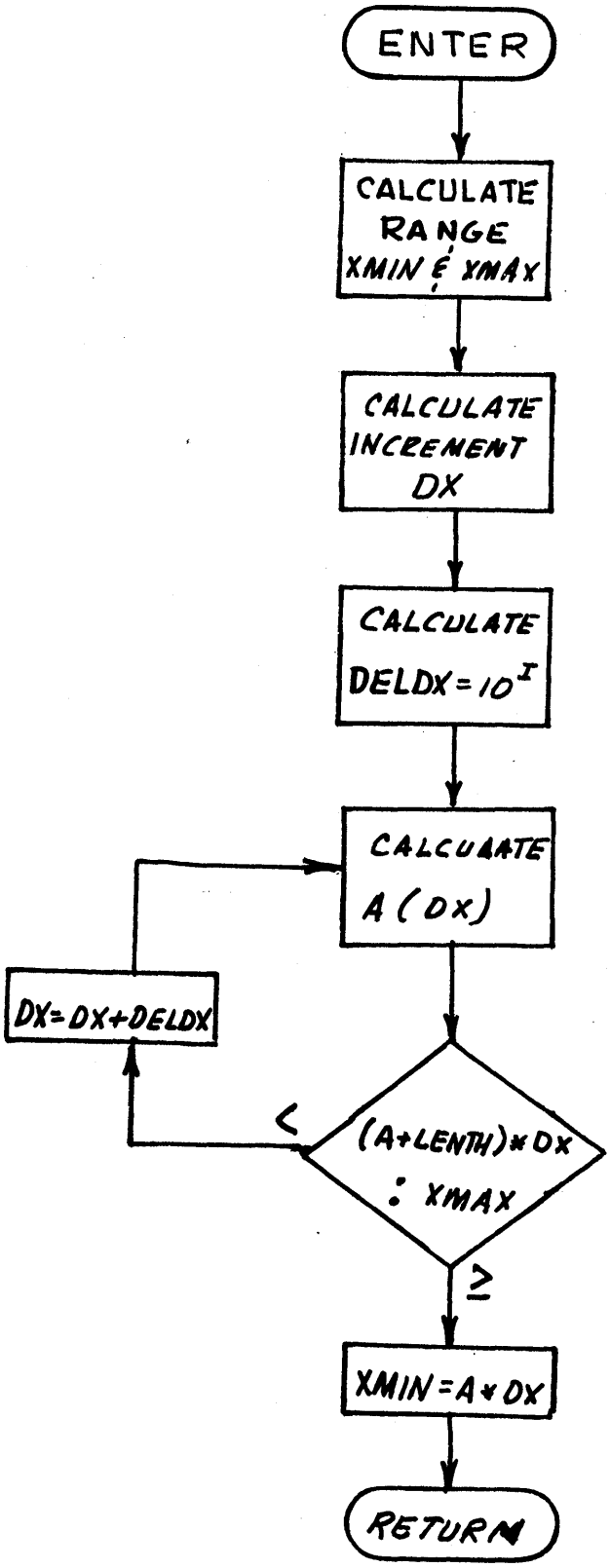

FLOWCHART OF SCALE



Source Listing of Scale

```
##FOR
*POBJP4
*LISTPRINTER                                                          SCAL  10
*LDISK                                                                SCAL  20
C                                                                     SCAL  30
C                                                                     SCAL  40
C     ***************************************************************SCAL  50
C     *                                                              *SCAL  60
      SUBROUTINE SCALE (X,N,XL,XMIN,DX)                               SCAL  70
C     *                                                              *SCAL  80
C     *                                                              *SCAL  90
C     *  JURIS PUTNINS-COMPUTING CENTER,RICHARD NORTHOUSE-ELECT ENG  *SCAL 100
C     *      UNIVERSITY OF WISCONSIN MILWAUKEE,MILWAUKEE,WIS 52301   *SCAL 110
C     *                                                              *SCAL 120
C     ***************************************************************SCAL 130
C                                                                     SCAL 140
C                                                                     SCAL 150
      DIMENSION X(1000)                                               SCAL 160
      XMIN=X(1)                                                       SCAL 170
      XMAX=X(1)                                                       SCAL 180
C                                                                     SCAL 190
C     *****************  CALCULATE RANGE OF VARIABLES     **************SCAL 200
C                                                                     SCAL 210
      DO1I=1,N                                                        SCAL 220
      IF(X(I)-XMIN)2,3,3                                              SCAL 230
    2 XMIN=X(I)                                                       SCAL 240
    3 IF(XMAX-X(I))4,1,1                                              SCAL 250
    4 XMAX=X(I)                                                       SCAL 260
    1 CONTINUE                                                        SCAL 270
C                                                                     SCAL 280
C     ***************      DX = INCREMENT PER INCH     ******************SCAL 290
      DX=(XMAX-XMIN)/XL                                               SCAL 300
C     *********   CHECK FOR NON VARYING DATA   **************************SCAL 310
      IF(DX)9998,9999,9998                                            SCAL 320
C     **********       TRUNCATE TO ONE SIGNIFICANT DIGIT   **************SCAL 330
9998  DX=DX+DX*10000000.-DX*10000000.                                 SCAL 340
C                                                                     SCAL 350
C     ************   FIND MAGNITUDE OF INCREMENT     ******************SCAL 360
C     * TO INCREASE SPEED THERE IS TWO SECTIONS MAGN.GT.10 AND .LT.1*  *SCAL 370
CC    **********       SET DELDX AS 1.*(EXPONENT OF DX)    **************SCAL 380
C                                                                     SCAL 390
      IF(DX-10.)20,21,21                                              SCAL 400
```

```
20      DO 22 I=1,101                                                          SCAL 410
        IF(10.**(1-I)-DX)23,23,22                                              SCAL 420
22      CONTINUE                                                               SCAL 430
23      DELDX=10.**(1-I)                                                       SCAL 440
        GOTO 30                                                                SCAL 450
21      DO 24 I=1,99                                                           SCAL 460
        IF(DX-10.**I)25,24,24                                                  SCAL 470
24      CONTINUE                                                               SCAL 480
25      DELDX=10.**(I-1)                                                       SCAL 490
30      A=-1.                                                                  SCAL 500
C       ********    FIND MINIMUM VALUE THAT IS A MULTIPLE OF DX  *********SCAL 510
        IF(XMIN)31,35,35                                                       SCAL 520
31      IF(XMIN-A* DX)33,40,40                                                 SCAL 530
33      A=A-1.                                                                 SCAL 540
        GOTO 31                                                                SCAL 550
35      IF(XMIN-(A+1.)*DX)40,37,37                                             SCAL 560
37      A=A+1.                                                                 SCAL 570
        GOTO 35                                                                SCAL 580
C       ******  CHECK,DO ALL POINTS FIT USING THIS MIN AND DX...   *******SCAL 590
40      IF(XMAX-(A+XL)*DX)42,42,41                                             SCAL 600
C       *******  NO FIT.. INCREMENT DX BY DELDX AND TRY AGAIN   **********SCAL 610
41      DX=DX+DELDX                                                            SCAL 620
        GOTO 30                                                                SCAL 630
C       *********   YES WE HAVE A FIT..... DEFINE XMIN AND RETURN  *******SCAL 640
42      XMIN=A*DX                                                              SCAL 650
9999    RETURN                                                                 SCAL 660
C       ***************  END OF SUBROUTINE SCALE   ************************SCAL 670
        END                                                                    SCAL 680
```

Object Listing of Scale

```
-010-207R87898024341534500-2394-8-4-0118N99980000000000000000000000000100-0001
-0000KJ701234567891234567‡-00002M1-001-101-099J0000000-1J0000000-8J0000000--0002
-00412-12‡-00772-1‡‡000000000000000000000000000000000000000000000000000000000-0003
-01181J217-238L-0001‡-01241L6J0-0214-0052J1-0214000-4J1-0123000-5‡000000000-0004
-0160100K0-0195-012LMM-0208-0195L3-0195-0000K0-0195-019NK0-0052-0195‡000000-0005
-0220100J1-0214000-1MN-0136-021MJ1-0123000-2L1-0112-037517-238L-0002‡000000-0006
-0280100J6-0315-0000KJ-0315-005606-2492-0000-6-007J-249217-238L-0003‡000000-0007
-0340100J6-0375-0000KJ-0375-005606-2492-0000-6-0087-249217-238L-0004‡000000-0008
-0400100K0-0091-000317-238L-00052Q-0098-009111-0099-001-05-0460---R9‡000000-0009
-0460100P--0483-005600-2492---N60K-2492-007JM3-0516-2483M9-0000-0000‡000000-0010
-05161K4M4-051M-2490M9-0000-0000‡-05361J217-238L-0006‡-05303-5-0536‡0000000-0011
-053610017-238L-00202Q-0098-009111-0099-001-05-0584---R9P--0607-0056‡000000-0012
-05961L600-2492---N6-6-007J-249217-238L-0021‡-05103-5-0620‡0000000000000000-0013
-062010017-238L-00302Q-0098-009111-0099-001-05-0668---R900-2492-0087‡000000-0014
-06801M8P--0703-00560K-2492---N6M3-0724-2483M9-0000-0000‡00000000000000000-0015
-07241K4M4-072K-2490M9-0000-0000‡-07441J217-238L-0031‡-07383-5-0744‡0000000-0016
-074410017-238L-00402Q-0098-009111-0099-001-05-0792---R9P--0815-0056‡000000-0017
-08041L600-2492---N6-6-0087-249217-238L-0041‡-07183-5-0828‡0000000000000000-0018
-082810017-238L-0010J1-0091000-1KM-0091-006JM7-0412-110017-238L-0011‡000000-0019
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-09481L600-2492-0070M3-0980-2483M9-0000-0000‡-09801J2M4-0000-2490‡000000000-0021
-09921J2M9-0980-0000‡-10001J217-238L-0013‡-09823-5-1000‡0000000000000000000-0022
-100010017-238LR998000-2492-00700L-2492-00310J-2492-0070-6-1077-2492‡000000-0023
-10601J2M9-1078-0000‡-10781L600-2492-00700L-2492-00311P-4022-1077‡000000000-0024
-1114100-6-0070-249217-238LR998100-2492-00700K-2492-0041M3-1182-2483‡000000-0025
-11741J2M9-0000-0000‡-11821K4M4-118--2490M9-0000-0000‡-12021J217-238LR9982‡-0026
-11963-5-1202‡-12021M817-238L-0200K0-0091-000317-238L-020100-2492-0003‡0000-0027
-12501002K-2492-0091-6-1077-249200-2492-00411P-4094-10770K-2492-0070‡000000-0028
-13101K4M3-1330-2483M9-0000-0000‡-13301K4M4-0000-2490M9-132Q-0000‡000000000-0029
-13501J217-238L-0202‡-13323-5-1350‡-13501K417-238L-0220J1-0091000-1‡0000000-0030
-13741L6KM-0091-0007M7-1226-110017-238L-0221‡-13243-5-1398‡0000000000000000-0031
-139810017-238L-023000-2492-00032K-2492-0091-6-1077-249200-2492-0041‡000000-0032
-14581L61P-4094-1077-6-0101-249217-238L-0231‡-14821J2M9-0000-0000‡000000000-0033
-14901J217-238L-0232‡-11763-5-1490‡-14901K417-238L-0210K0-0091-0003‡0000000-0034
-151410017-238L-021100-2492-00411P-4094-00912P-4022-0076M3-1582-2483‡000000-0035
-15741J2M9-0000-0000‡-15821K4M4-158--2490M9-0000-0000‡-16021J217-238L-0212‡-0036
-15763-5-1602‡-16021M817-238L-0240J1-0091000-1KM-0091-0011M7-1514-1100‡0000-0037
-16501J217-238L-0241‡-15963-5-1650‡-16501K417-238L-025000-2492-0091‡0000000-0038
-16741002K-2492-0003-6-1077-249200-2492-00411P-4094-1077-6-0101-2492‡000000-0039
-17341J217-238L-0251‡-14843-5-1734‡-17341K417-238L-03001P-3974-0021‡0000000-0040
-1758100-6-0111-249217-238L-030100-2492-007JM3-1814-2483M9-0000-0000‡000000-0041
-18141K4M4-181K-2490M9-0000-0000‡-18341J217-238L-0302‡-18283-5-1834‡0000000-0042
-183410017-238L-031000-2492-01110L-2492-00702P-4022-0071M3-1902-2483‡000000-0043
-18941J2M9-0000-0000‡-19021K4M4-190--2490M9-0000-0000‡-19221J217-238L-0311‡-0044
-19163-5-1922‡-19221M817-238L-033000-2492-01110K-2492-0021-6-0111-2492‡0000-0045
-19701J217-238L-0331‡-19701J2M9-1834-0000‡-19781J217-238L-0332‡000000000000-0046
-18083-5-1978‡-19781M817-238L-035000-2492-01110J-2492-00210L-2492-0070‡0000-0047
-20261L62P-4022-0071M3-2058-2483M9-0000-0000‡-20581J2M4-2050-2490‡000000000-0048
```

```
-20701J2M9-190--0000‡-20781J217-238L-0351‡-20523-5-2078‡0000000000000000000-0049
-207810017-238L-037000-2492-01110J-2492-0021-6-0111-249217-238L-0371‡000000-0050
-21261J2M9-1978-0000‡-21341J217-238L-0372‡-18963-5-2134‡0000000000000000000-0051
-213410017-238L-040000-2492-01110J-2492-00600L-2492-00701P-4022-0087‡000000-0052
-21941K4M3-2214-2483M9-0000-0000‡-22141K4M4-0000-2490M9-221K-0000‡000000000-0053
-22341J217-238L-0401‡-22163-5-2234‡-22341K417-238L-041000-2492-0070‡0000000-0054
-22581L60J-2492-0101-6-0070-249217-238L-0411‡-22821J2M9-1734-0000‡000000000-0055
-22901J217-238L-0412‡-22083-5-2290‡-22901K417-238L-042000-2492-0111‡0000000-0056
-23141L60L-2492-0070-6-007J-249217-238L-0421‡-09743-5-2338‡0000000000000000-0057
-233810017-238L-00003J-0375-0112M9-012L-000017-238L-000049-0796-0000‡000000-0058
-0000‡000000000000000000000000000000000000000000000000000000000000000000000-0059
-0000‡000000000000000000000000000000000000000000000000000000000000000000000-0060
-23942-1‡600000000000000000000000000000000000000000000000000000000000000000-0061
R9999‡000000000000000000000000000000000000000000000000000000000000000000000-0062
```

Source Listing of Mainline Program

```
##FORX
*LISTPRINTER                                                          TEST  10
*POBJP4                                                               TEST  20
C                                                                     TEST  30
C                                                                     TEST  40
C     ***************************************************************TEST  50
C     *                                                              *TEST  60
C     *      T E S T    M A I N L I N E    F O R    G R A P H 2      *TEST  70
C     *                                                              *TEST  80
C     ****                                                          ****TEST  90
C     *                                                              *TEST 100
C     *                  J. PUTNIS AND R.A. NORTHOUSE                *TEST 110
C     *                UNIVERSITY OF WISCONSIN MILWAUKEE             *TEST 120
C     *                          APRIL  1967                         *TEST 130
C     *                                                              *TEST 140
C     ***************************************************************TEST 150
C                                                                     TEST 160
C                                                                     TEST 170
      DIMENSION X(30),Y(30)                                           TEST 180
C                                                                     TEST 190
C     *********************    DEFINE CONSTANTS    ********************TEST 200
C                                                                     TEST 210
      TWOPI=8.*ATAN(1.)                                               TEST 220
      ANG=0.                                                          TEST 230
      DELTA=TWOPI/30.                                                 TEST 240
C                                                                     TEST 250
C     ******************    CONSTRUCT THE CIRCLE    ******************TEST 260
C                                                                     TEST 270
      DO 2 K=1,30                                                     TEST 280
      X(K)=100.*COS(ANG)                                              TEST 290
      Y(K)=100.*SIN(ANG)                                              TEST 300
    2 ANG=ANG+DELTA                                                   TEST 310
C                                                                     TEST 320
C     *********************    GRAPH THE CIRCLE    ********************TEST 330
C                                                                     TEST 340
      CALL GRAPH2(6.,6.,30,X,Y)                                       TEST 350
      CALL EXIT                                                       TEST 360
C                                                                     TEST 370
C     ************************    END OF TEST    ***********************TEST 380
C                                                                     TEST 390
      END                                                             TEST 400
```

Object Listing of Mainline Program

```
-010-207R87898-0-0000J0-00-1158-8-4-0708N999800000000000111000000000000100-0001
-0000KJ70123456789123456 7≠-00002M1Q0000000-1J0000000-1-0000000RR-001J000000-0002
-00412K70-300000000-1L0000000-2-030≠000000000000000000000000000000000000000-0003
-070810017-238L-00011P-231L-00190L-2492-0009-6-0377-249217-238L-0002≠000000-0004
-0768100-0-0387-002917-238L-000300-2492-03770R-2492-0063-6-0397-2492≠000000-0005
-082810017-238L-0004K0-0701-003317-238L-00052Q-0098-070111-0099-001-≠000000-0006
-088810005-0900---R91P-230L-03870L-2492-0043-6---P7-249217-238L-0006≠000000-0007
-09481M81P-230Q-03870L-2492-0043-6--M-7-249217-238L-0007≠000000000000000000-0008
-098410017-238L-002000-2492-03870J-2492-0397-6-0387-2492J1-0701000-1≠000000-0009
-10441M8KM-0701-0067M7-0852-110017-238L-0021JP-0700-10913J5-0053-0053-0067≠-0010
-11073J0-0077-0407≠-11181K417-238L-002249-0796-0000≠-11381J217-238L-0000≠00-0011
-11501J249-0796-0000≠000000000000000000000000000000000000000000000000000000-0012
-11582J9M75941574872-0706-≠600000000000000000000000000000000000000000000000-0013
R9999≠000000000000000000000000000000000000000000000000000000000000000000-0014
```

OPERATING INSTRUCTIONS

To use GRAPH 2 the user must load both SCALE and GRAPH 2 on to the disk before an execution is attempted. This can be accomplished by,

1) CLEAR CORE
2) COLD START
3) COMPILE AND LOAD GRAPH 2 SOURCE DECK
4) COMPILE AND LOAD SCALE SOURCE DECK
5) EXECUTE MAINLINE SOURCE DECK

DECK LABELING SHEET

Deck No.	Name	Cards
1	Test Mainline - Source	42
2	Test Mainline - Object	14
3	Graph 2 - Source	91
4	Graph 2 - Object	66
5	Scale - Source	71
6	Scale - Object	62

COMPUTER
TECHNOLOGY