PROGRAM DOCUMENTATION FOR SCIENCE EXPENDITURE AND MANPOWER DATA HISTOGRAMS

report no.
rapport n°. 111

Ministry of State
Science and Technology

Ministère d'État
Sciences et Technologie

Research and Information Services

Services de recherche et d'information

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MARCH 1976

Documentation for BASIC Language/RSTS-E programs used in the PDP11/45 computer system in connection with case number 2,471-2

prepared for
préparé pour

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General Description

These programs produce about 95 graphic summaries of the results of the Statistics Canada Survey of Federal Government Activities in the Natural and Human Sciences; the graphic display is compatible with the Tektronics GT4015 terminal. These graphic figures correspond to the table numbers and formats used in Report #100. A similar format is used to display manpower data. The titles and data are extracted from the same files used to produce the tables.

Program Description

Graphic Output Functions

To BASIC functions are used to transform output from BASIC language programs into data images. They occur in line numbers 29000 to 30000 and 30400 to 30900. These functions were written by Mike Francis.

Histogram Graphics Functions

10 other functions are used to perform operations specifically used for producting histograms, labels, titles, grid lines, etc. These functions are of a general nature with slight alterations made for each tabulation type.

Operations Procedures

The histogram display is directed by 1 of 5 programs, according to the tabulation type used for science expenditure and manpower data. A graph may be produced singly or with the use of the HISBAC.CTL batch control program.

The scale and positioning of the graph can be changed by changing the values of H (height), L (width), and XØ, YØ (origin point) within each program.

Other variants controlled by input data are: number of departments listed, number of categories, and grouping of category values and headings. The later facility is performed through use of the FNR function and applies only to manpower graphics.

Abbreviations and Data Structures

For department and agency abbreviations and for data format descriptions see report # 107 and 110.

Description of Graphic Output Functions

FNB (x, Y, H, W, T) - draws a box at point x, y

X - horizontal distance from point (Ø, Ø)
Y - vertical distance from point (Ø, Ø)
H - box height
W - box width
T - box type; Ø - empty; 1 - horizontal line;
2- vertical lines; 3 - more dense vertical lines
P, P1, P2 - distances between lines

FNCI(X,Y) - translates data for output to GT4Ø15

FNG - clears the GT4015 screen
FNI - opens the GT4015 screen for output

FNM(X,Y) - move to point x, y
FNV(X,Y) - draw vector from current position to point x,y,

FNC(A$) - causes output to file 12
FNT(A$,B$) - outputs title B$
B$ - "H" indicates horizontal; "V" indicates vertical
FNTI(N) - outputs formatted numerical values.

Description of Graphic Output Function Used Specifically to Produce Histograms

FNA(xØ,yØ,L,H,T) - draws histogram frame, horizontal grid, labels and vertical labels
xØ, yØ - starting point for frame
L - width of frame
H - height of frame
T - no. of tics between grid lines

FND(S%,I1%,I2%,K1%,D%) - writes x-axis labels
S% - size of lettering (o to 3)
I1% - index of first label
I2% - index of lost label
K1% - no. of lines of labels
D% - no. of characters in each sector of label strings
T1 - character width (assigned through FNS)
T2 - vertical character spacing (assigned through FNS)

FNS(A$,5%) - assigns values to T1, T2, and S
A$ - "H" or "V"
S% - letter size
S1$, S2$ - strings containing values of T1, T2

FNL (I1%, I2%, J1%, J2%, J3%) - draws horizontal grids, and a legend if required.
I1%, I2% - index of histogram bar sets
J1%, J2%, J3% - index and step variable for bars in each set
K% - index for divisions of each bar
T% - -1 if vector to be made, Ø if move to be made
V1( ) - represents "other" values when all departments are not drawn.

FNH (I1%, I2%, J1%, J2%, J3%) - draws the sets of bars for each department, performer or activity.
Y2 - box height
T - box line type

FNT3 (x,y) - labels year or category number on bar sets
M4% - year value, incrimented by K% of FNH

FNN (N$, I%, L%) - selects the I^{th} integer of length L% from the string N$

FNS1 (J1%, J2%, J3%, J4%) - determines which graph is to be produced - requires operator input.
J1%, J2% - index for reading number strings
J3% - number of digits in number
J4% - number of graphs in total
T$ - program graph number
G$ - publication graph number
E$, F$ - file name components

Common Variables for Histogram Program

B3 - Vertical distance between grid lines in dollars or man year.
B5 - number of grid lines (including top and bottom)
B7 - vertical distance between grid lines scaled to screen size.
C$( ) - title string file matrix
C1$( ) - Title string print matrix
D$ - print string for x-axis label.
D$( ) - department or agency abbreviation matrix
F2 - ratio of graph values to screen sizes
H - height of graph frame
L - width of graph frame
I1%, I2% - indexs for histogram bar sets
J1%, J2% - indexs for bars in each sets
J3% - step indicator for J loop
M% - upper limit of index for vertical divisions of bars
N% - graph number

W1,W2,W3 - divisions of x-axis used for drawing bar sets.
X1 - variable used for x-axis increments
Y1 - variable used for y-axis increments
T1$ - x-axis title
T2$ - y-axis title
P$ - message written at bottom of graph

PROGRAM TYPE Science Data Histogram

NAME SCHIS2.BAS SIZE 17K

PURPOSE To produce histogram derived from data formatted for tabulation type 2.

FILE DESCRIPTIONS

NAME	INPUT OUTPUT		CONTENT	VIRTUAL DIMENSIONS
RSUM10.COM	RSUM30.NAT	RSUM50.HUM	I	V2(9,8)
RSUM11.COM	RSUM31.NAT	RSUM51.HUM	I	
RSUM12.COM	RSUM32.NAT	RSUM52.HUM	I	
RSUM14.COM	RSUM33.NAT	RSUM53.HUM	I	
RSUM15.COM	RSUM34.NAT	RSUM54.HUM	I	
	RSUM35.NAT	RSUM55.HUM	I	
TITLE2.			I	C$(30) = 128
TITLE6.			I	C2$(15) = 128, H$(30) = 64

PROGRAM FUNCTIONS

FNS2 (I1%) - selects performer or activity headings from TITLE6 file

I1% = number of possible headings

M$( ) = string matrix of headings from TITL6 file

M1$( ) = string matrix of R&D activities and ranking

A1%( ) = data matrix which conveys grouping and ranking of activities and performers.

FNS3 (I1%) = reorders data as indicated by A1%( ) matrix

V( ) = working matrix for re-ordered values

V2( ) = input file of values.

FNS4 = function which reads A1%( ) and M1$ matrices

PROGRAM VARIABLES

R% = digit two of graph number - indicates data matrix format
o, 1, 2, = performer; 3, 4 = activity; 5 = performer by activity

N% = graph number

M1$( ) = type of funding titles

M$( ) = activity and performer titles

```
10        !       HISTOGRAMS CORRESPONDING TO TABLE TYPE 2
50        DIM A1%(20%,7%)
100       T$="10111213141530313233343550515253545 5"
110       G$="0409151000051722282329183237433844 33"
120       E$="COMCOMCOMCOMCOMCOMNATNATNATNATNATHUMHUMHUMHUMHUMHUM"
130       I$(2%)="0101010101010202020202020303030303"
140       I$(3%)="0405060506040405060506040405060506 0604"
150       I$(4%)="0707072009110707072009110707072001 11"
155       I$(5%)="1200050002500100005000100005"
160       I$(6%)="2001000500200100020 01"
170       I$(7%)="7666666"
180       I9$(0%)="LEGEND"
185       I9$(1%)="R&D"
190       I9$(2%)="RSA"
200       K=FNS1(1%,35%,2%,18%)
210       R%=FNN(T$,2%,1%)
250       K=FNS4
310   OPEN F$ AS FILE 1
315       DIM#1,V2(9%,8%)
330   OPEN "TITLE2[30,15]" AS FILE 2
335       DIM#2,C$(25%)=128%
340   OPEN "TITLE6[30,15]" AS FILE 3
345       DIM#3,C2$(15)=128%,H$(30%)=64%
350       G%=FNN(G$,N%,2%):C1$(1%)="GRAPH "+NUM$(G%)
360       FOR I%=2% TO 4%
370       J%=VAL(MID(I$(I%),N%*2%-1%,2%)):C1$(I%)=C$(J%)
375       C1$(I%)=CVT$$(C1$(I%),16%)
380       NEXT I%
390       K=FNS2(7%)
400       K=FNS3(7%)
500       !       INITIALIZE THE GRAPH
510       Y0=100
520       X0=100
530       L=809%
537       X0=(1023-L)/2%
540       H=500
545       B2=A1%(N%,7%)
550   IF R%=3% OR R%=4% THEN B2=B2-1
552       B1=0:B=L/(B2-1)
555       W1=L/(B2-1):W2=W1/4:W3=W2/2
560       B4=0
562       IF R%=5% THEN J%=8% ELSE J%=2%
563       IF R%=3% OR R%=4% THEN I1%=2% ELSE I1%=1%
565       I2%=I% IF V(I1%,J%)/1000<FNN(I$(5%),I%,4%)FOR I%=1% TO 7%
570       B3=FNN(I$(6%),I2%,3%)
575       B5=FNN(I$(7%),I2%,1%)
585       B7=H/(B5-1%)
587       Y5=(B5-1)*B3*1000:F2=H/Y5
590       IF R%=3% OR R%=4% THEN T1$="A C T I V I T Y" ELSE T1$="P E R F O R M E R"
595       T2$="$ MILLIONS $"
600       K=FNI
605       S=2
607       T5=8.5
610       Y1=H+125
620       FOR J%=1% TO 4%
625       K%=LEN(C1$(J%))
627       IF J%<3% THEN X1=0 ELSE X1=(L-K%*T5)/2%
630       K=FNM(X0+X1,Y0+Y1)
640       K=FNT("H",C1$(J%))
650       Y1=Y1-25
660       NEXT J%
680       M4%=75%
720       I1%=1%:I1%=2% IF R%=3% OR R%=4%
730       I2%=A1%(N%,7%)-1%
735       K=FNA(X0,Y0,L,H,0)
740       IF R%<>5% THEN K1%=0%:K=FNH(I1%,I2%,0%,2%,1%)
750       IF R%=5% THEN K1%=1%:K=FNH(I1%,I2%,1%,7%,3%)
780       B$="** INTRAMURAL EXPENDITURES DO NOT INCLUDE NON-PROGRAM COSTS"
785       K=FNM(X0,0)
790       K=FNT("H",B$)
800       A=23%
810       K=FNO1(A)
820       SLEEP 30
900       INPUT P:IF P<1 THEN 950 ELSE 1000
950       CLOSE 1,2,3:K=FNE:RESTORE:GOTO 10
1000      CLOSE 1,2,3:K=FNE:STOP
```

```
1100     DEF FNT3(X,Y)
1120     D$=CVT$$(NUM$(M4%),2%)
1130     X3=W2:Y3=10
1140     K=FNM(X0+X-X3,Y0+Y+Y3)
1150     K=FNT("H",D$)
1160     K=FNM(X0+X,Y0+Y)
1165     M4%=M4%+1%
1170     FNEND
1200 DEF FNN(N$,I%,L%)=VAL(MID(N$,I%*L%-L%+1%,L%))
2000     DEF FNS(A$,S%)   !        LETTER SPACING
2005             S=S%
2010             S%=S%+1%
2020             S%=S%+4% IF A$<>"H"
2030     S1$="1400127508500775220020501325 1200"
2040     S2$="252015122522171 5"
2050     T1=(FNN(S1$,S%,4%))/100
2060     T2=FNN(S2$,S%,2%)
2100     FNEND
2200     DEF FNS1(J1%,J2%,J3%,J4%)        ! SELECT GRAPH NO., FILE NAME
2205     PRINT"WHICH GRAPH ?"
2210     PRINT MID(T$,J%,J3%);"  ";FOR J%=J1% TO J2% STEP J3%
2220     PRINT CHR$(10)
2230     PRINT MID(G$,J%,J3%);"  ";FOR J%=J1% TO J2% STEP J3%
2240     PRINT CHR$(10)
2250     PRINT USING"##  ",J%;FOR J%=1% TO J4%
2260     PRINT
2270     INPUT"NUMBER",N%
2280     IF N%=5% OR N%>18% THEN 32000
2290     T$=MID(T$,N%*2%-1%,2%)
2300     E$=MID(E$,N%*3%-2%,3%)
2310     F$="RSUM"+T$+","+E$
2320     F$=F$+"[30,15]"
2330     FNEND
3000     DEF FNS2(I1%)    !   SELECT PERF/ACT HEADINGS FROM TITLE6 FILE
3010     FOR K%=0% TO I1%
3020     A2%=A1%(N%,K%)
3030     A3%=1%:A3%=10% IF N%=11%:A3%=17% IF N%=17%
3040             M$(A2%)=H$(A3%+K%) UNLESS R%=3%
3050             M$(A2%)=M1$(K%) IF R%=3%
3060     NEXT K%
3070     IF R%=3% OR R%=4% THEN 3110%
3080     IF A1%(N%,2%)=A1%(N%,3%) THEN A2%=A1%(N%,3%):M$(A2%)=H$(9%)
3090     IF A1%(N%,4%)=A1%(N%,5%) THEN A2%=A1%(N%,5%):M$(A2%)=H$(6%)
3100             M$(1%)="INTRAMURAL"
3110     FNEND
4000     DEF FNS3(I1%)             !GROUP PERF/ACT VALUES AS PER A1%(N%,I)
4010     J1%=2%:J1%=8% IF R%=5%
4015     V(I%,J%)=0 FOR J%=0% TO J1% FOR I%=0% TO I1%
4020             FOR I%=0% TO I1%
4030             K%=A1%(N%,I%)
4040             V(K%,J%)=V(K%,J%)+V2(I%+1%,J%)FORJ%=0% TO J1%
4050             NEXT I%
4060     FNEND
5000     DEF FNL(I1%,I2%,J1%,J2%,J3%)
5030     I1=W1*(I2%-2%)
5032     I2=W1*(I2%-1%)
5035     J1=B7*(B5-3):J2=B7*(B5-2)
5040     K1%=2%
5045     K=FNL1(I1,I2,J1,J2,K1%) IF R%=5%
5050     Y1=B7
5060     K1%=B5-2
5070     FOR K%=1% TO K1%
5080             K=FNM(X0,Y0+Y1)
5090             T%=-1%:X1=W3
5100             FOR I%=I1% TO I2%
5105     IF I%>I1%+2% THEN IF Y1>=J1 AND Y1<=J2 THEN IF R%=5% THEN K=FNL2(I1,I2):GOTO 5225
5110                      FOR J%=J1% TO J2% STEP J3%
5120                      IF J%=J2% THEN V2=0:GOTO 5150
5130                      V2=F2%V(I%,J%)
5150             IF T%=-1% AND V2>=Y1 THEN K=FNV(X0+X1,Y0+Y1):T%=0%
5160             IF T%=0% AND V2<Y1 THEN K=FNM(X0+X1,Y0+Y1):T%=-1%
5170             X1=X1+W2
5180                      NEXT J%
5215             NEXT I%
5217             X1=X1-W3
5220             K=FNV(X0+X1,Y0+Y1)
5225             Y1=Y1+B7
5230     NEXT K%
5250     FNEND
```

```
5500    DEF FND(S%,I1%,I2%,K1%,D%)      !  X-AXIS LABELS
5510    K=FNS("H",S%)
5520    T3=-T2*2
5530    FOR K%=1% TO K1%
5540    T4=0
5550            FOR I%=I1% TO I2%
5560            D$=M$(I%)
5580            D$=CVT$$(MID(D$,(K%-1%)*D%+1%,D%),128%)
5590            T5=LEN(D$)
5600            GOTO 5650 IF T5=0
5610            T6=(W1-T5*T1)/2
5620            K=FNM(X0+T4+T6,Y0+T3)
5630            K=FNT("H",D$)
5650            T4=T4+W1
5660            NEXT I%
5670    T3=T3-T2
5680    NEXT K%
5700    FNEND
6000    DEF FNH(I1%,I2%,J1%,J2%,J3%)    ! DRAW HISTOGRAMS
6030    FOR I%=I1% TO I2%
6040            X1=(I%-I1%)*W1+W3
6050            FOR J%=J1% TO J2% STEP J3%
6060            Y1=0
6065            FOR K%=K1% TO 0% STEP -1%
6070            K=FNM(X0+X1,Y0+Y1)
6080                    Y2=F2*V(I%,J%-K%)
6085    T=2
6090            IF R%=5% AND K%=0% THEN T=0
6095            IF Y2<5 AND Y2>0 THEN Y2=4:T=0
6100            K=FNB(X0+X1,Y0+Y1,Y2,W2,T) UNLESS Y2=0
6150            Y1=Y1+Y2
6160            NEXT K%
6200    X1=X1+W2
6210    K=FNT3(X1,Y1) IF I%=I1%
6220    NEXT J%:NEXT I%
6250    FNEND
8000    DEF FNL1(I1,I2,J1,J2,K1%)       !       .DRAW LEGEND BOX
8020    J3=B7/2
8025    H0=J2-J1+J3
8030    H1=H0/K1%:H2=H1/2:H3=H2/2%
8050    K=FNB(X0+I1,Y0+J1-J3/2,H0,I2-I1,0)
8060    X1=I1+H3
8065    S=3
8070    FOR K%=1% TO K1%
8090    Y1=J1+(K%-1%)*H2+H3
8095            T=K%+1%
8096    T=0 IF K%=2%
8100    K=FNB(X0+X1,Y0+Y1,H3,H3,T)
8110    K=FNM(X0+X1+H2,Y0+Y1)
8120            K=FNT("H",I9$(K%))
8130    NEXT K%
8132    K=FNS("H",2%)
8135    T3=T1*LEN(I9$(0%))
8140    X1=I1+(I2-I1-T3)/2
8145    Y1=J2-H3/2
8150    K=FNM(X0+X1,Y0+Y1)
8160    K=FNT("H",I9$(0%))
8180    FNEND
8200    DEF FNL2(X3,X4)
8220    K=FNV(X0+X3,Y0+Y1)
8230    K=FNM(X0+X4,Y0+Y1)
8240    K=FNV(X0+L,Y0+Y1)
8250    FNEND
9000 DEF FNS4
9010 READ A1%(I%,J%)FORJ%=0% TO7% FOR I%=0%TO18%
9020 READ M1$(J%) FORJ%=0% TO 7%
9050 FNEND

9999 DATA 0,0,0,0,0,0,0,0
10000 DATA 1,3,2,2,5,5,4,6
10010 DATA 1,2,3,3,5,5,4,6
10020 DATA 1,4,3,3,5,5,2,6
10030 DATA 1,2,4,3,5,6,7,8
10040 DATA 1,2,3,4,5,6,7,8
10050 DATA 1,3,2,2,5,5,4,6
10060 DATA 1,2,3,3,5,5,4,6
10070 DATA 1,2,3,3,5,5,4,6
10080 DATA 1,4,3,3,5,5,2,6
10090 DATA 1,2,4,3,5,6,7,8
10100 DATA 1,2,3,4,5,6,7,8
10110 DATA 1,2,3,3,5,5,4,6
10120 DATA 1,4,2,6,5,5,3,7
10130 DATA 1,4,2,6,5,5,3,7
10140 DATA 1,4,2,6,5,5,3,7
10150 DATA 1,2,4,3,5,6,7,8
10160 DATA 1,5,2,4,6,3,7,8
10170 DATA 1,4,2,6,5,5,3,7

10180 DATA CURRENT,"R&D          IN-HOUSE","R&D          CONTRACTS",
10185 DATA "R&D          GRANTS"
10190 DATA "RESEARCH     FELLOWSHIPS","ADMIN. OF    EXTRAMURAL  PROGRAMS"
10200 DATA "CAPITAL      EXPENDITURES",TOTAL
```

```
29000   DEF FNO(A$)
29010   P%=LEN(A$)
29020   FIELD #12,P% AS P$
29030   LSET P$=A$
29040   PUT #12,RECORD 1%,COUNT P%
29050   FNEND
29100   DEF FNO1(A)
29110   K=FNO(CHR$(27%)+CHR$(A))
29120   FNEND
29200   DEF FNI
29210 open"Kb5:" as file 12%
29220   K=FNO1(12)
29225   SLEEP 2
29230   FNEND
29300   DEF FNE
29310   K=FNO1(12)
29315   SLEEP 2
29320   CLOSE#12%
29330   FNEND
29400   DEF FNV(X,Y)
29410   K=FNC1(X,Y)
29420   K=FNO(CHR$(Y1%)+CHR$(Y2%)+CHR$(X1%)+CHR$(X2%))
29430   FNEND
29500   DEF FNM(X,Y)
29510   K=FNC1(X,Y)
29520   K=FNO(CHR$(29%)+CHR$(Y1%)+CHR$(Y2%)+CHR$(X1%)+CHR$(X2%))
29530   FNEND
29600   DEF FNC1(X,Y)
29610   X%=X/32%:Y%=Y/32%
29620   Y1%=32%+Y%
29630   Y2%=96%+Y-Y%*32%
29640   X1%=32%+X%
29650   X2%=64%+X-X%*32%
29660   FNEND
29700   DEF FNT(A$,B$)
29710   IF A$<>"H" THEN GOTO 29740
29720   K=FNT2(B$)
29730   GOTO 29770
29740   B1$=""
29750D1$=B1$+MID(B$,I%,1%)+CHR$(10%)+CHR$(8%) FORI%=1%TOLEN(B$)
29760   K=FNT2(B1$)
29770   FNEND
29800   DEF FNT2(A$)
29810   K=FNO1(31):K=FNO1(S+56):K=FNO1(Z+96)
29820   K=FNO(A$):K=FNO1(29)
29830   FNEND
29900   DEF FNT1(N):K=FNO1(31):PRINT #12,USING"#,#######",N:K=FNO1(29)
29910   FNEND
30000   !  BEFORE CALLING SET B,B1,B2,B3,B4,B5,B7,T1$,T2$
30020   DEF FNA(X0,Y0,L,H,T)
30030   K=FNB(X0,Y0,H,L,0)
30040   K=FND(3%,I1%-1%,I2%-1%,3%,12%) IF R%=4%
30050   K=FND(3%,I1%,I2%,3%,12%) IF R%<>4%
30100   K%=LEN(T1$)
30110   K=FNS("H",2%)
30130   T3=(L-T1*K%)/2%
30140   T4=-75
30150   K=FNM(X0+T3,Y0+T4)
30160   K=FNT("H",T1$)
30210   K=FNL(I1%,I2%,0%,3%,1%) IF R%<>5%
30220   K=FNL(I1%,I2%,2%,11%,3%) IF R%=5%
30300   !       PRINT Y=AXIS LABELS
30305   FOR T=-1 TO 0
30308   K=FNS("H",3)
30310   T3=0:B6=0
30315   T4=-10:T4=L+10 IF T=-1
30320   FOR I%=1% TO B5
30322   D$=CVT$$(NUM$(B6),2%)
30325   T5=T4:T5=T4+5-T1*LEN(D$) IF T=0
30330   K=FNM(X0+T5,Y0+T3)
30340   K=FNT("H",D$)
30350           B6=B6+B3
30360           T3=T3+B7
30365   NEXT I%
30371   K%=LEN(T2$)/2%
30372   K=FNS("V",2%)
30377   T4=-80:T4=L+75 IF T=-1
30380   K=FNM(X0+T4,Y0+H/2+T1*K%):K=FNT("V",T2$)
30385   NEXT T
30390   FNEND
```

```
30400   DEF FNB(X,Y,H,W,T)      !       DRAW THE BOXES
30402   P,P1=4
30403   P=H/INT(H/P+.5)
30405   P1=W/INT(W/P1+.5)
30406   P2=3:P2=W/INT(W/P2+.5)
30409   K=FNO1(104)
30410   K=FNM(X,Y)
30420   K=FNV(X,Y+H)
30430   K=FNV(X+W,Y+H)
30440   K=FNV(X+W,Y)
30450   K=FNV(X,Y)
30460   K=FNO1(96)
30470   IF T<=0 THEN 30900 ELSE 30490
30480   K=FNO1(104):T=T-4
30490   ON T GOTO 30500,30560,30700,30800,30480,30480,30480,30480
30500   X3=X+W
30510   FOR I=1 TO H/P
30520   Y3=Y+I*P
30530   K=FNM(X,Y3):K=FNV(X3,Y3)
30550   NEXT I:GOTO 30900
30560   Y3=Y+H
30570   FOR I=1 TO W/P1
30580   X3=X+I*P1
30590   K=FNM(X3,Y):K=FNV(X3,Y3)
30600   NEXT I:GOTO 30900
30700   Y3=Y+H
30710   FOR I=1 TO W/P2
30720   X3=X+I*P2
30730   K=FNM(X3,Y):K=FNV(X3,Y3)
30740   NEXT I
30900   FNEND
32000 END
```

PROGRAM TYPE Histogram graphics

NAME SCHIS5.BAS SIZE 14K

PURPOSE To produce histogram derived from data formatted for tabulation type 5.

FILE DESCRIPTIONS

NAME	INPUT OUTPUT	CONTENT		VIRTUAL DIMENSIONS
RSUM02.COM	RSUM36.NAT	RSUM56.HUM	I	V(9,8)
RSUM16.COM	RSUM37.NAT	RSUM57.HUM		
RSUM17.COM	RSUM38.NAT	RSUM58.HUM		
RSUM18.COM	RSUM42.NAT	RSUM62.HUM		
RSUM22.COM				
TITLE5.				

PROGRAM VARIABLES

N% = graph number

N1% = number of departments

N2% = index for totals row

M%( ) = #rows, # 13x7 matrices, # departments, highest year value

M4% = year number

```
10       !**THIS PRODUCES HISTOGRAMS (BOXES) FOR TABLE TYPE 5***
100      T$="02161718223637304256575862"
110      G$="0107111606202430193539453 4"
120      E$="COMCOMCOMCOMCOMNATNATNATNATHUMHUMHUMHUM"
130      I2$="030303030316161616171717 17"
140      I3$="200518192005181920051819 20"
145      I4$="220606062106060621060606 21"
150      I$(5%)="300200150100050025005"
160      I$(6%)="50252520100501"
170      I$(7%)="7976666"
180      I9$(0%)="LEGEND"
185      I9$(1)="INTRAMURAL"
195      I9$(2)="EXTRAMURAL"
200      K=FNS1(1%,25%,2%,13%)
310 OPEN F$ AS FILE 1
315      DIM#1%,V(65%,8%),D$(64%),M%(3%)
330 OPEN"TITLE5[30,15]" AS FILE 2
335      DIM#2%,C$(30%)=128%
350      C1$(1%)="GRAPH "+MID(G$,N%*2%-1%,2%)
360      J%=FNN(I2$,N%,2%):C1$(2%)=CVT$$(C$(J%),16%)
370      J%=FNN(I3$,N%,2%):C1$(3%)=CVT$$(C$(J%),16%)
380      J%=FNN(I4$,N%,2%):C1$(4%)=CVT$$(C$(J%),16%)
384 IF RIGHT(T$,2)="2" THEN I9$(1)="R&D":I9$(2)="RSA"
385      IF T$="02" THEN I9$(1)="NATURAL":I9$(2)="HUMAN"
400      INPUT"HOW MANY DEPARTMENTS",N1%
500      !***INITIALIZE THE GRAPH****
510      Y0=100
520      X0=100
530      L=809%
535      L=(N1%+1%)*L/11% IF N1%<10%
537      X0=(1023-L)/2
540      H=500
550      B2=N1%+2%
555      W1=L/(N1%+1%):W2=W1/4:W3=W2/2
560      M2%=M%(2%)+1%:I1%=1%
562      I3%=3%:I4%=7%
565      I2%=I% IF V(1%,8%)/1000<FNN(I$(5%),I%,I3%) FOR I%=1% TO I4%
570      B3=FNN(I$(6%),I2%,2%)
575      B5=FNN(I$(7%),I2%,1%)
585      B7=H/(B5-1)
587      Y5=(B5-1)*B3*1000:F2=H/Y5
590      T1$="DEPARTMENT OR AGENCY":T2$="$ MILLIONS $"
595      I2%=N1%+1%
600      K=FNI
610      Y1=H+150
615      K=FNS("H",2%)
620      FOR J%=1% TO 4%
622      X1=0
625      IF J%=3% OR J%=4% THEN X1=(L-T1*LEN(C1$(J%)))/2%
630      K=FNM(X0+X1,Y0+Y1)
640      K=FNT("H",C1$(J%))
650      Y1=Y1-25
655      Y1=Y1-25 IF J%=4%
660      NEXT J%
700      M4%=M%(3%)-2%
710      K=FNA(X0,Y0,L,H,1)
720      K=FNH(I1%,I2%,2%,8%,3%)
740      A$="** INTRAMURAL EXPENDITURES DO NOT INCLUDE NON-PROGRAM COSTS"
750      K=FNM(X0,0)
760      K=FNT("H",A$)
800      A=23%
810      K=FNO1(A)
820      SLEEP 30
900      INPUT P:IF P<1 THEN 950 ELSE 1000
950      CLOSE 1,2:K=FNE:GOTO 100
1000  CLOSE 1,2:K=FNE:STOP
1100     DEF FNT3(X,Y)
1120     D$=CVT$$(NUM$(M4%),2%)
1125     D$="7"+D$ IF LEN(D$)<2%
1130     X3=W2:Y3=10
1135     X3=W2+W3 IF N1%>12%
1140     K=FNM(X0+X-X3,Y0+Y+Y3)
1150     K=FNT("H",D$)
1160     K=FNM(X0+X,Y0+Y)
1165     M4%=M4%+1%
1170     FNEND
1200 DEF FNN(N$,I%,L%)=VAL(MID(N$,I%*L%-L%+1%,L%))
```

```
2000    DEF FNS(A$,S%)  !       LETTER SPACING
2005            S=S%
2010            S%=S%+1%
2020            S%=S%+4% IF A$<>"H"
2030    S1$="1400127508500775220020501325120O"
2040    S2$="252015225221715"
2050    T1=(FNN(S1$,S%,4%))/100
2060    T2=FNN(S2$,S%,2%)
2100    FNEND
2200    DEF FNS1(J1%,J2%,J3%,J4%)       ! SELECT GRAPH NO., FILE NAME
2205    PRINT"WHICH GRAPH ?"
2210    PRINT MID(T$,J%,J3%);"  ";FOR J%=J1% TO J2% STEP J3%
2220    PRINT CHR$(10)
2230    PRINT MID(G$,J%,J3%);"  ";FOR J%=J1% TO J2% STEP J3%
2240    PRINT CHR$(10)
2250    PRINT USING"##  ",J%;FOR J%=1% TO J4%
2260    PRINT
2270    INPUT"NUMBER",N%
2280    IF N%>13% THEN 32000
2290    T$=MID(T$,N%*2%-1%,2%)
2300    E$=MID(E$,N%*3%-2%,3%)
2310    F$="RSUM"+T$+","+E$
2320    F$=F$+"[30,15]"
2330    FNEND
5000    DEF FNL(I1%,I2%,J1%,J2%,J3%)
5010    V1(J%)=V(M2%,J%) FOR J%=0% TO 8%
5020    V1(J%)=V1(J%)-V(I%,J%) FOR J%=J1%TOJ2% FOR I%=I1%TOI2%-1%
5030    I1=W1*(I2%-5%)
5032    I2=W1*(I2%-2%)
5035    J1=B7*(B5-3):J2=B7*(B5-2)
5040    K1%=2%
5045    K=FNL1(I1,I2,J1,J2,K1%)
5050    Y1=B7
5060    K1%=B5-2
5070    FOR K%=1% TO K1%
5080            K=FNM(X0,Y0+Y1)
5090            T%=-1%:X1=W3
5100            FOR I%=I1% TO I2%
5105    IF I%>I1%+2% THEN IF Y1>=J1 AND Y1<=J2 THEN K=FNL2(I1,I2);GOTO 5225
5110                    FOR J%=J1% TO J2%+J3% STEP J3%
5120                    IF J%=J2%+J3% THEN V2=0:GOTO 5150
5130                    V2=F2*V(I%,J%)
5140                    V2=F2*V1(J%) IF I%=I2%
5150            IF T%=-1% AND V2>=Y1 THEN K=FNV(X0+X1,Y0+Y1):T%=0%
5160            IF T%=0% AND V2<Y1 THEN K=FNM(X0+X1,Y0+Y1):T%=-1%
5170            X1=X1+W2
5180                    NEXT J%
5215            NEXT I%
5217            X1=X1-W3
5220            K=FNV(X0+X1,Y0+Y1)
5225            Y1=Y1+B7
5230    NEXT K%
5250    FNEND
5500    DEF FND(S%,I1%,I2%,K1%,D%)      !  X-AXIS LABELS
5510    K=FNS("H",S%)
5520    T3=-T2*2
5530    FOR K%=1% TO K1%
5540    T4=0
5550            FOR I%=I1% TO I2%
5560            D$=D$(I%)
5580    D$="O"+CHR$(116%)+CHR$(104%)+CHR$(101%)+CHR$(114%) IF I%=I2%
5590            T5=LEN(D$)
5600            GOTO 5650 IF T5=0
5610            T6=(W1-T5*T1)/2
5620            K=FNM(X0+T4+T6,Y0+T3)
5630            K=FNT("H",D$)
5650            T4=T4+W1
5660            NEXT I%
5670    T3=T3-T2
5680    NEXT K%
5700    FNEND
```

```
6000    DEF FNH(I1%,I2%,J1%,J2%,J3%)     ! DRAW HISTOGRAMS
6010    V1(J%)=V(M2%,J%) FOR J%=0% TO 8%
6030    FOR I%=I1% TO I2%
6040            X1=(I%-I1%)*W1+W3
6050            FOR J%=J1% TO J2% STEP J3%
6060            Y1=0
6065            FOR K%=2% TO 1% STEP -1%
6070            K=FNM(X0+X1,Y0+Y1)
6075            V1(J%-K%)=V1(J%-K%)-V(I%,J%-K%) IF I%<I2%
6080                    Y2=F2*V(I%,J%-K%)
6085                    Y2=F2*V1(J%-K%) IF I%=I2%
6090                    IF K%=1% THEN T=0 ELSE T=3
6095                    IF Y2<5 AND Y2>0 THEN Y2=3:T=0
6100            K=FNB(X0+X1,Y0+Y1,Y2,W2,T) UNLESS Y2=0
6150            Y1=Y1+Y2
6160            NEXT K%
6200    X1=X1+W2
6210    K=FNT3(X1,Y1) IF I%=I1%
6220    NEXT J%:NEXT I%
6250    FNEND
8000    DEF FNL1(I1,I2,J1,J2,K1%)        !       DRAW LEGEND BOX
8020    J3=B7/2
8025    H0=J2-J1+J3
8030    H1=H0/K1%:H2=H1/2:H3=H2/2%
8050    K=FNB(X0+I1,Y0+J1-J3/2,H0,I2-I1,0)
8060    X1=I1+H3
8065    S=3
8070    FOR K%=1% TO K1%
8090    Y1=J1+(K%-1%)*H2+H3
8095            T=K%+1%
8096    T=0 IF K%=2%
8100    K=FNB(X0+X1,Y0+Y1,H3,H3,T)
8110    K=FNM(X0+X1+H2,Y0+Y1)
8120            K=FNT("H",I9$(K%))
8130    NEXT K%
8132    K=FNS("H",2%)
8135    T3=T1*LEN(I9$(0%))
8140    X1=I1+(I2-I1-T3)/2
8145    Y1=J2-H3/2
8150    K=FNM(X0+X1,Y0+Y1)
8160    K=FNT("H",I9$(0%))
8180    FNEND
8200    DEF FNL2(X3,X4)
8220    K=FNV(X0+X3,Y0+Y1)
8230    K=FNM(X0+X4,Y0+Y1)
8240    K=FNV(X0+L,Y0+Y1)
8250    FNEND
29000   DEF FNO(A$)
29010   P%=LEN(A$)
29020   FIELD #12,P% AS P$
29030   LSET P$=A$
29040   PUT #12,RECORD 1%,COUNT P%
29050   FNEND
29100   DEF FNO1(A)
29110   K=FNO(CHR$(27%)+CHR$(A))
29120   FNEND
29200   DEF FNI
29210 open"kb5:" as file 12%
29220   K=FNO1(12)
29225   SLEEP 2
29230   FNEND
29300   DEF FNE
29310   K=FNO1(12)
29315   SLEEP 2
29320   CLOSE#12%
29330   FNEND
29400   DEF FNV(X,Y)
29410   K=FNC1(X,Y)
29420   K=FNO(CHR$(Y1%)+CHR$(Y2%)+CHR$(X1%)+CHR$(X2%))
29430   FNEND
29500   DEF FNM(X,Y)
29510   K=FNC1(X,Y)
29520   K=FNO(CHR$(29%)+CHR$(Y1%)+CHR$(Y2%)+CHR$(X1%)+CHR$(X2%))
29530   FNEND
29600   DEF FNC1(X,Y)
29610   X%=X/32%:Y%=Y/32%
29620   Y1%=32%+Y%
29630   Y2%=96%+Y-Y%*32%
29640   X1%=32%+X%
29650   X2%=64%+X-X%*32%
29660   FNEND
```

```
29700    DEF FNT(A$,B$)
29710    IF A$<>"H" THEN GOTO 29740
29720    K=FNT2(B$)
29730    GOTO 29770
29740    B1$=""
29750B1$=B1$+MID(B$,I%,1%)+CHR$(10%)+CHR$(8%) FORI%=1%TOLEN(B$)
29760    K=FNT2(B1$)
29770    FNEND
29800    DEF FNT2(A$)
29810    K=FNO1(31):K=FNO1(S+56):K=FNO1(Z+96)
29820    K=FNO(A$):K=FNO1(29)
29830    FNEND
29900    DEF FNT1(N):K=FNO1(31):PRINT #12,USING"#,######",N:K=FNO1(29)
29910    FNEND
30000    !  BEFORE CALLING SET B,B1,B2,B3,B4,B5,B7,T1$,T2$
30020    DEF FNA(X0,Y0,L,H,T)
30030    K=FNB(X0,Y0,H,L,0)
30040    K=FND(3%,I1%,I2%,1%,5%)
30100    K%=LEN(T1$)
30110    K=FNS("H",2%)
30120    S=2%
30130    T3=(L-T1*K%)/2%
30140    T4=-75
30150    K=FNM(X0+T3,Y0+T4)
30160    K=FNT("H",T1$)
30210    K=FNL(I1%,I2%,2%,8%,3%)
30300    !        PRINT Y=AXIS LABELS
30305    FOR T=-1 TO 0
30308    K=FNS("H",2%)
30310    T3=0:B6=0
30315    T4=-10:T4=L+10 IF T=-1
30320    FOR I%=1% TO B5
30322    D$=CVT$$(NUM$(B6),2%)
30325    T5=T4:T5=T4+5-T1*LEN(D$) IF T=0
30330    K=FNM(X0+T5,Y0+T3)
30340    K=FNT("H",D$)
30350             B6=B6+B3
30360             T3=T3+B7
30365    NEXT I%
30371    K%=LEN(T2$)/2%
30372    K=FNS("V",2%)
30377    T4=-80:T4=L+75 IF T=-1
30380    K=FNM(X0+T4,Y0+H/2+T1*K%):K=FNT("V",T2$)
30365    NEXT T
30390    FNEND
30400    DEF FNB(X,Y,H,W,T)       !        DRAW THE BOXES
30402    L1=3:L2=2.5
30405    P1=W/(L1+1)
30406    P2=W/(L2+1)
30409    K=FNO1(104)
30410    K=FNM(X,Y)
30420    K=FNV(X,Y+H)
30430    K=FNV(X+W,Y+H)
30440    K=FNV(X+W,Y)
30450    K=FNV(X,Y)
30460    K=FNO1(96)
30470    IF T<=0 THEN 30900 ELSE 30490
30480    K=FNO1(104):T=T-4
30490    ON T GOTO 30500,30560,30700,30800,30480,30480,30480,30480
30500    X3=X+W
30510    FOR I=1 TO H/P
30520    Y3=Y+I*P
30530    K=FNM(X,Y3):K=FNV(X3,Y3)
30550    NEXT I:GOTO 30900
30560    Y3=Y+H
30570    FOR I=1 TO W/P1
30580    X3=X+I*P1
30590    K=FNM(X3,Y):K=FNV(X3,Y3)
30600    NEXT I:GOTO 30900
30700    Y3=Y+H
30710    FOR I=1 TO W/P2
30720    X3=X+I*P2
30730    K=FNM(X3,Y):K=FNV(X3,Y3)
30740    NEXT I
30900    FNEND
32000 END
```

PROGRAM TYPE Science Data Histograms

NAME SCHIS6.BAS SIZE 15K

PURPOSE To produce histograms derived from data formatted for tabulation type 6

FILE DESCRIPTIONS

NAME	INPUT OUTPUT	CONTENT	VIRTUAL DIMENSIONS
RSUM19.COM RSUM20.COM	RSUM39.NAT RSUM40.NAT RSUM41.NAT	RSUM59.HUM RSUM60.HUM RSUM61.HUM	I	M%(3), A1%(10), D$(8,65), V(520,2)
TITLE6				C$(15) = 128, H$(30) = 64

PROGRAM VARIABLES

N% = graph number

P1% = performer or activity number (refer to ordering used in appropriate table)

N1% = number of departments to be listed

A1%( ) = data matrix which conveys grouping of activities or performer

M2% = index for totals row

M%( ) = #vows, #13x7 matrices, # departments, highest year value

M4% = year value

I1%, I2% = indices for 1st department for requested performer or activity

C$( ) = list of titles

H$( ) = list of activity and performer labels

```
100     T$="1920213940415960 61"
110     G$="0812002125313640 46"
120     E$="COMCOMCOMNATNATNATHUMHUMHUM"
130     I$(2%)="13131314141415151 5"
140     I$(3%)="0102030102030102 03"
150     I$(4%)="0404050404050404 05"
155     I$(5%)="3002001501000500250 05"
160     I$(6%)="50252520100501"
170     I$(7%)="7966666"
180     I$(8%)="1111111"
200     K=FNS1(1%,17%,2%,9%)
310 OPEN F$ AS FILE 1
315     DIM#1,M%(3%),A1%(10%),D$(8%,65%),V(520%,2%)
330     OPEN"TITLEG[30,15]" AS FILE 2
335     DIM#2,C$(15%)=128%,H$(30%)=64%
360     FOR I%=2% TO 4%
370     J%=VAL(MID(I$(I%),N%*2%-1%,2%)):C1$(I%)=C$(J%)
375     C1$(I%)=CVT$$(C1$(I%),16%)
380     NEXT I%
400!    ***DETERMINE WHICH PERFORMER OR ACTIVITY***
410     Q$="PERFORMER":IF N%=6% OR N%=9% THEN Q$="ACTIVITY"
420     PRINT:PRINT"WHICH ":Q$;:INPUT P1%
430             A2%=J% IF A1%(J%)=P1% FORJ%=0% TO 7%
440             A3%=1%:A3%=10% IF N%=6%:A3%=17% IF N%=9%
445             M$=H$(A3%+A2%)
447             IF A3%+A2%=12% THEN M$="TESTING & STANDARDIZATION"
450     IF N%=6% OR N%=9% THEN 465
455             IF A1%(2%)=A1%(3%) THEN IF A2%=2% OR A2%=3%
                        THEN M$="UNIVERSITIES & NON-PROFIT INSTITUTIONS"
460             IF A1%(4%)=A1%(5%) THEN IF A2%=4% OR A2%=5%THEN M$=H$(6)
462             M$="INTRAMURAL" IF P1%=1%
465     PRINT "HOW MANY DEPARTMENTS FOR ";M$;:INPUT N1%
470     C1$(1%)="GRAPH # "+MID(G$,N%*2%-1%,2%)+"-"+CVT$$(NUM$(P1%),2%)
475     C1$(5%)=CVT$$(M$,16%)
480             M2%=(M%(2%)+1%)*P1%
485             I1%=M2%-M%(2%)
500     !***INITIALIZE THE GRAPH****
510     Y0=100
520     X0=100
530     L=809%
535     L=(N1%+1%)*L/11% IF N1%<10%
540     H=500
550     B2=N1%+2%
555     W1=L/(N1%+1%):W2=W1/4:W3=W2/2
560     M2%=P1%*(M%(2%)+1%):I1%=M2%-M%(2%)
562     I3%=3%:I4%=7%
565     I2%=I% IF V(I1%,2%)/1000<FNN(I$(5%),I%,I3%) FOR I%=1% TO I4%
570     B3=FNN(I$(6%),I2%,2%)
575     B5=FNN(I$(7%),I2%,1%)
585     B7=H/(B5-1)
587     Y5=(B5-1)*B3*1000:F2=H/Y5
590     T1$="DEPARTMENT OR AGENCY":T2$="$ MILLIONS $"
595     I2%=I1%+N1%
600     K=FNI
610     Y1=H+150
615     K=FNS("H",2%)
620     FOR J%=1% TO 5%
622     X1=0
625     IF J%=3% OR J%=4% THEN X1=(L-T1*LEN(C1$(J%)))/2%
630     K=FNM(X0+X1,Y0+Y1)
640     K=FNT("H",C1$(J%))
650     Y1=Y1-25
655     Y1=Y1-25 IF J%=4%
660     NEXT J%
700     M4%=M%(3%)-2%
710     K=FNA(X0,Y0,L,H,1)
720     K=FNH(I1%,I2%,0%,2%,1%)
900     INPUT P:IF P<1 THEN 1000 ELSE 100
1000  CLOSE 1,2:K=FNE:STOP
1100    DEF FNT3(X,Y)
1120    D$=CVT$$(NUM$(M4%),2%)
1125    D$="7"+D$ IF LEN(D$)<2%
1130    X3=W2:Y3=10
1135    X3=W2+W3 IF N1%>12%
1140    K=FNM(X0+X-X3,Y0+Y+Y3)
1150    K=FNT("H",D$)
1160    K=FNM(X0+X,Y0+Y)
1165    M4%=M4%+1%
1170    FNEND
1200 DEF FNN(N$,I%,L%)=VAL(MID(N$,I%*L%-L%+1%,L%))
```

```
2000    DEF FNS(A$,S%)  !       LETTER SPACING
2005            S=S%
2010            S%=S%+1%
2020            S%=S%+4% IF A$<>"H"
2030    S1$="1400127508500775220020501325120O"
2040    S2$="252015122522171 5"
2050    T1=(FNN(S1$,S%,4%))/100
2060    T2=FNN(S2$,S%,2%)
2100    FNEND
2200    DEF FNS1(J1%,J2%,J3%,J4%)       ! SELECT GRAPH NO., FILE NAME
2205    PRINT"WHICH GRAPH ?"
2210    PRINT MID(T$,J%,J3%);"  ";FOR J%=J1% TO J2% STEP J3%
2220    PRINT CHR$(10)
2230    PRINT MID(G$,J%,J3%);"  ";FOR J%=J1% TO J2% STEP J3%
2240    PRINT CHR$(10)
2250    PRINT USING"##  ",J%;FOR J%=1% TO J4%
2260    PRINT
2270    INPUT"NUMBER",N%
2280    IF N%=3% OR N%>9% THEN 1000
2290    T$=MID(T$,N%*2%-1%,2%)
2300    E$=MID(E$,N%*3%-2%,3%)
2310    F$="RSUM"+T$+","+E$
2320    F$=F$+"[30,15]"
2330    FNEND
5000    DEF FNL(I1%,I2%,J1%,J2%,J3%)
5010    V1(J%)=V(M2%,J%) FOR J%=J1% TO J2%
5020    V1(J%)=V1(J%)-V(I%,J%) FOR J%=J1%TOJ2% FOR I%=I1%TOI2%-1%
5050    Y1=B7
5060    K1%=B5-2
5070    FOR K%=1% TO K1%
5080            K=FNM(X0,Y0+Y1)
5090            T%=-1%:X1=W3
5100            FOR I%=I1% TO I2%
5110                    FOR J%=J1% TO J2% STEP J3%
5120                    IF J%=J2% THEN V2=0:GOTO 5150
5130                    V2=F2*V(I%,J%)
5140                    V2=F2*V1(J%) IF I%=I2%
5150            IF T%=-1% AND V2>=Y1 THEN K=FNV(X0+X1,Y0+Y1):T%=0%
5160            IF T%=0% AND V2<Y1 THEN K=FNM(X0+X1,Y0+Y1):T%=-1%
5170            X1=X1+W2
5180                    NEXT J%
5215            NEXT I%
5217            X1=X1-W3
5220            K=FNV(X0+X1,Y0+Y1)
5225            Y1=Y1+B7
5230    NEXT K%
5250    FNEND
5500    DEF FND(S%,I1%,I2%,K1%,D%)      !  X-AXIS LABELS
5510    K=FNS("H",S%)
5520    T3=-T2*2
5530    FOR K%=1% TO K1%
5540    T4=0
5550            FOR I%=I1% TO I2%
5560            D$=D$(P1%,I%-I1%+1%)
5580    D$="O"+CHR$(116%)+CHR$(104%)+CHR$(101%)+CHR$(114%) IF I%=I2%
5590            T5=LEN(D$)
5600            GOTO 5650 IF T5=0
5610            T6=(W1-T5*T1)/2
5620            K=FNM(X0+T4+T6,Y0+T3)
5630            K=FNT("H",D$)
5650            T4=T4+W1
5660            NEXT I%
5670    T3=T3-T2
5680    NEXT K%
5700    FNEND
```

```
6000    DEF FNH(I1%,I2%,J1%,J2%,J3%)     ! DRAW HISTOGRAMS
6010    V1(J%)=V(M2%,J%) FOR J%=J1% TO J2% STEP J3%
6020    K1%=0%
6030    FOR I%=I1% TO I2%
6040            X1=(I%-I1%)*W1+W3
6050            FOR J%=J1% TO J2% STEP J3%
6060            Y1=0
6065            FOR K%=0% TO K1%
6070            K=FNM(X0+X1,Y0+Y1)
6075            V1(J%-K%)=V1(J%-K%)-V(I%,J%-K%) IF I%<I2%
6080                    Y2=F2*V(I%,J%-K%)
6085                    Y2=F2*V1(J%-K%) IF I%=I2%
6090                    T=K%+2%
6095                    IF Y2<5 AND Y2>0 THEN Y2=3:T=0
6100            K=FNB(X0+X1,Y0+Y1,Y2,W2,T) UNLESS Y2=0
6150            Y1=Y1+Y2
6160            NEXT K%
6200    X1=X1+W2
6210    K=FNT3(X1,Y1) IF I%=I1%
6220    NEXT J%:NEXT I%
6250    FNEND
29000   DEF FNO(A$)
29010   P%=LEN(A$)
29020   FIELD #12,P% AS P$
29030   LSET P$=A$
29040   PUT #12,RECORD 1%,COUNT P%
29050   FNEND
29100   DEF FNO1(A)
29110   K=FNO(CHR$(27%)+CHR$(A))
29120   FNEND
29200   DEF FNI
29210 open"kb5:" as file 12%
29220   K=FNO1(12)
29225   SLEEP 2
29230   FNEND
29300   DEF FNE
29310   K=FNO1(12)
29315   SLEEP 2
29320   CLOSE#12%
29330   FNEND
29400   DEF FNV(X,Y)
29410   K=FNC1(X,Y)
29420   K=FNO(CHR$(Y1%)+CHR$(Y2%)+CHR$(X1%)+CHR$(X2%))
29430   FNEND
29500   DEF FNM(X,Y)
29510   K=FNC1(X,Y)
29520   K=FNO(CHR$(29%)+CHR$(Y1%)+CHR$(Y2%)+CHR$(X1%)+CHR$(X2%))
29530   FNEND
29600   DEF FNC1(X,Y)
29610   X%=X/32%:Y%=Y/32%
29620   Y1%=32%+Y%
29630   Y2%=96%+Y-Y%*32%
29640   X1%=32%+X%
29650   X2%=64%+X-X%*32%
29660   FNEND
29700   DEF FNT(A$,B$)
29710   IF A$<>"H" THEN GOTO 29740
29720   K=FNT2(B$)
29730   GOTO 29770
29740   B1$=""
29750B1$=B1$+MID(B$,I%,1%)+CHR$(10%)+CHR$(8%) FORI%=1%TOLEN(B$)
29760   K=FNT2(B1$)
29770   FNEND
29800   DEF FNT2(A$)
29810   K=FNO1(31):K=FNO1(S+56):K=FNO1(Z+96)
29820   K=FNO(A$):K=FNO1(29)
29830   FNEND
29900   DEF FNT1(N):K=FNO1(31):PRINT #12,USING"#,######",N:K=FNO1(29)
29910   FNEND
```

```
30000    !  BEFORE CALLING SET B,B1,B2,B3,B4,B5,B7,T1$,T2$
30020    DEF FNA(X0,Y0,L,H,T)
30030    K=FNB(X0,Y0,H,L,0)
30040    K=FND(3%,I1%,I2%,1%,5%)
30100    K%=LEN(T1$)
30110    K=FNS("H",2%)
30120    S=2%
30130    T3=(L-T1*K%)/2%
30140    T4=-75
30150    K=FNM(X0+T3,Y0+T4)
30160    K=FNT("H",T1$)
30210    K=FNL(I1%,I2%,0%,3%,1%)
30300    !        PRINT Y=AXIS LABELS
30305    FOR T=-1 TO 0
30308    K=FNS("H",3%)
30310    T3=0:B6=0
30315    T4=-10:T4=L+10 IF T=-1
30320    FOR I%=1% TO B5
30322    D$=CVT$$(NUM$(B6),2%)
30325    T5=T4:T5=T4+5-T1*LEN(D$) IF T=0
30330    K=FNM(X0+T5,Y0+T3)
30340    K=FNT("H",D$)
30350             B6=B6+B3
30360             T3=T3+B7
30365    NEXT I%
30371    K%=LEN(T2$)/2%
30372    K=FNS("H",2%)
30377    T4=-80:T4=L+75 IF T=-1
30380    K=FNM(X0+T4,Y0+H/2+T1*K%):K=FNT("V",T2$)
30385    NEXT T
30390    FNEND
30400    DEF FNB(X,Y,H,W,T)       !        DRAW THE BOXES
30402    P,P1=4
30403    P=H/INT(H/P+.5)
30405    P1=W/INT(W/P1+.5)
30406    P2=3:P2=W/INT(W/P2+.5)
30409    K=FNO1(104)
30410    K=FNM(X,Y)
30420    K=FNV(X,Y+H)
30430    K=FNV(X+W,Y+H)
30440    K=FNV(X+W,Y)
30450    K=FNV(X,Y)
30460    K=FNO1(96)
30470    IF T<=0 THEN 30900 ELSE 30490
30480    K=FNO1(104):T=T-4
30490    ON T GOTO 30500,30560,30700,30800,30480,30480,30480,30480
30500    X3=X+W
30510    FOR I=1 TO H/P
30520    Y3=Y+I*P
30530    K=FNM(X,Y3):K=FNV(X3,Y3)
30550    NEXT I:GOTO 30900
30560    Y3=Y+H
30570    FOR I=1 TO W/P1
30580    X3=X+I*P1
30590    K=FNM(X3,Y):K=FNV(X3,Y3)
30600    NEXT I:GOTO 30900
30700    Y3=Y+H
30710    FOR I=1 TO W/P2
30720    X3=X+I*P2
30730    K=FNM(X3,Y):K=FNV(X3,Y3)
30740    NEXT I
30900    FNEND
32000 END
```

PROGRAM TYPE Histogram graphics

NAME SCHIS9.BAS SIZE 14K

PURPOSE To produce histograms derived from data formatted for tabulation type 9

FILE DESCRIPTIONS

NAME	INPUT OUTPUT	CONTENT		VIRTUAL DIMENSIONS
RSUM23.COM RSUM24.COM	RSUM43.NAT RSUM44.NAT	RSUM63.HUM RSUM64.HUM	I	V(65,8), D$(64), M%(3)
TITLE9			I	

PROGRAM VARIABLES

N% = graph number

N1% = number of departments

M2% = index for totals row

M%( ) = # rows, # 13x7 matrices, # departments, highest year value

M4% = year value

```
100 T$="232443446364"
110 G$="131426274142"
120 E$="COMCOMNATNATHUMHUM"
130 I$(2)="131314141515"
140 I$(3%)="020702070207"
150 I$(5%)="150120100008000500010005"
160 I$(6%)="252020201002O1"
170 I$(7%)="7765666"
180     I9$(0%)="LEGEND"
185     I9$(1%)="GRANTS"
190     I9$(2%)="CONTRACTS"
200     K=FNS1(1%,11%,2%,6%)
310 OPEN F$ AS FILE 1
315     DIM#1,V(65%,8%),D$(64%),M%(3%)
330 OPEN"TITLE9[30,15]" AS FILE 2
335     DIM#2%,C$(20%)=128%
350     C1$(1%)="GRAPH "+MID(G$,N%*2%-1%,2%)
360     I%=FNN(I$(2%),N%,2%):C1$(2%)=CVT$$(C$(I%),8%)
365     C1$(3%)=CVT$$(C$(1%),8%)
370     I%=FNN(I$(3%),N%,2%):C1$(4%)=CVT$$(C$(I%),8%)
375     C1$(5%)=CVT$$(C$(3%),8%)
400 INPUT"HOW MANY DEPARTMENTS",N1%
500     !***INITIALIZE THE GRAPH****
510     Y0=100
520     X0=100
530     L=809
535     L=(N1%+1%)*L/11% IF N1%<10%
537     X0=(1023-L)/2%
540     H=500
555     W1=L/(N1%+1%):W2=W1/4:W3=W2/2
560     I3%=3%:I4%=7%
565     I5%=I% IF (V(1%,4%)+V(1%,5%))/1000<FNN(I$(5%),I%,I3%)FORI%=1TOI4%
570     B3=FNN(I$(6%),I5%,2%)
575     B5=FNN(I$(7%),I5%,1%)
585     B7=H/(B5-1)
587     Y5=(B5-1)*B3*1000:F2=H/Y5
590     T1$="DEPARTMENT OR AGENCY":T2$="$ MILLIONS $"
600     K=FNI
610     Y1=H+125
615     K=FNS("H",2%)
620     FOR J%=1% TO 5%
622     X1=0
625     IF J%>2% THEN K%=LEN(C1$(J%)):X1=(L-K%*T1)/2
630     K=FNM(X0+X1,Y0+Y1)
640     K=FNT("H",C1$(J%))
650     Y1=Y1-25
660     NEXT J%
700     I1%=1%:I2%=N1%+1%
705     M2%=M%(2%)+1%
710     K=FNA(X0,Y0,L,H,0)
720     K=FNM(X0,Y0)
730     M4%=M%(3%)-2%
750     K=FNH(I1%,I2%,1%,5%,2%)
800     A=23%
810     K=FNO1(A)
820     SLEEP 30
900     INPUT P:IF P<1 THEN 950 ELSE 1000
950     CLOSE 1,2:K=FNE:GOTO 100
1000  CLOSE 1,2:K=FNE:STOP
1100    DEF FNT3(X,Y)
1120    D$=CVT$$(NUM$(M4%),2%)
1130    X3=W2:Y3=10
1135    X3=W2+W3 IF N1%>12%
1140    K=FNM(X0+X-X3,Y0+Y+Y3)
1150    K=FNT("H",D$)
1160    K=FNM(X0+X,Y0+Y)
1165    M4%=M4%+1%
1170    FNEND
1175    M4%=M4%+1%
1200 DEF FNN(N$,I%,L%)=VAL(MID(N$,I%*L%-L%+1%,L%))
```

```
2000     DEF FNS(A$,S%)   !        LETTER SPACING
2005              S=S%
2010              S%=S%+1%
2020              S%=S%+4% IF A$<>"H"
2030     S1$="1400127508500775220020501325120O"
2040     S2$="2520151225221715"
2050     T1=(FNN(S1$,S%,4%))/100
2060     T2=FNN(S2$,S%,2%)
2100     FNEND
2200     DEF FNS1(J1%,J2%,J3%,J4%)        ! SELECT GRAPH NO., FILE NAME
2205     PRINT"WHICH GRAPH ?"
2210     PRINT MID(T$,J%,J3%);"  ";FOR J%=J1% TO J2% STEP J3%
2220     PRINT CHR$(10)
2230     PRINT MID(G$,J%,J3%);"  ";FOR J%=J1% TO J2% STEP J3%
2240     PRINT CHR$(10)
2250     PRINT USING"##  ",J%;FOR J%=1% TO J4%
2260     PRINT
2270     INPUT"NUMBER",N%
2280     IF N%>6% THEN 32000
2290     T$=MID(T$,N%*2%-1%,2%)
2300     E$=MID(E$,N%*3%-2%,3%)
2310     F$="RSUM"+T$+","+E$
2320     F$=F$+"[30,15]"
2330     FNEND
5000     DEF FNL(I1%,I2%,J1%,J2%,J3%)
5010     V1(J%)=V(M2%,J%)+V(M2%,J%-1%)FORJ%=J1%TOJ2%STEP J3%
5020     V1(J%)=V1(J%)-V(I%,J%)-V(I%,J%-1%)FORJ%=J1% TO J2%STEP J3% FOR I%=I1% TO I2%-1%
5030     I1=W1*(I2%-3%)
5032     I2=W1*(I2%-1%)
5035     J1=B7*(B5-3):J2=B7*(B5-2)
5040     K1%=2%
5045     K=FNL1(I1,I2,J1,J2,K1%)
5050     Y1=B7
5060     K1%=B5-2
5070     FOR K%=1% TO K1%
5080              K=FNM(X0,Y0+Y1)
5090              T%=-1%:X1=W3
5100              FOR I%=I1% TO I2%
5105 IF I%>I1%+2% THEN IF Y1>=J1 AND Y1<=J2 THEN K=FNL2(I1,I2):GOTO 5225
5110                        FOR J%=J1% TO J2%+J3% STEP J3%
5120                        IF J%=J2%+J3% THEN V2=0:GOTO 5150
5130                        V2=F2*(V(I%,J%)+V(I%,J%-1%))
5140                        V2=F2*V1(J%)  IF I%=I2%
5150              IF T%=-1% AND V2>=Y1 THEN K=FNV(X0+X1,Y0+Y1):T%=0%
5160              IF T%=0% AND V2<Y1 THEN K=FNM(X0+X1,Y0+Y1):T%=-1%
5170              X1=X1+W2
5180                        NEXT J%
5215              NEXT I%
5217              X1=X1-W3
5220              K=FNV(X0+X1,Y0+Y1)
5225              Y1=Y1+B7
5230     NEXT K%
5250     FNEND
5500     DEF FND(S%,I1%,I2%,K1%,D%)       !  X-AXIS LABELS
5510     K=FNS("H",S%)
5520     T3=-T2*2
5530     FOR K%=1% TO K1%
5540     T4=0
5550              FOR I%=I1% TO I2%
5560              D$=D$(I%)
5580     D$="O"+CHR$(116%)+CHR$(104%)+CHR$(101%)+CHR$(114%)  IF I%=I2%
5590              T5=LEN(D$)
5600              GOTO 5650 IF T5=0
5610              T6=(W1-T5*T1)/2
5620              K=FNM(X0+T4+T6,Y0+T3)
5630              K=FNT("H",D$)
5650              T4=T4+W1
5660              NEXT I%
5670     T3=T3-T2
5680     NEXT K%
5700     FNEND
```

```
6000    DEF FNH(I1%,I2%,J1%,J2%,J3%)     ! DRAW HISTOGRAMS
6010    V1(J%)=V(M2%,J%) FOR J%=0% TO 5%
6030    FOR I%=I1% TO I2%
6040            X1=(I%-I1%)*W1+W3
6050            FOR J%=J1% TO J2% STEP J3%
6060            Y1=0
6065            FOR K%=1% TO 0% STEP -1%
6070            K=FNM(X0+X1,Y0+Y1)
6075            V1(J%-K%)=V1(J%-K%)-V(I%,J%-K%) IF I%<I2%
6080                    Y2=F2*V(I%,J%-K%)
6085                    Y2=F2*V1(J%-K%) IF I%=I2%
6090                    IF K%=0% THEN T=0 ELSE T=2
6095                    IF Y2<5 AND Y2>0 THEN Y2=3:T=0
6100            K=FNB(X0+X1,Y0+Y1,Y2,W2,T) UNLESS Y2=0
6150            Y1=Y1+Y2
6160            NEXT K%
6200    X1=X1+W2
6210    K=FNT3(X1,Y1) IF I%=I1%
6220    NEXT J%:NEXT I%
6250    FNEND
8000    DEF FNL1(I1,I2,J1,J2,K1%)        !       DRAW LEGEND BOX
8020    J3=B7/2
8025    H0=J2-J1+J3
8030    H1=H0/K1%:H2=H1/2:H3=H2/2%
8050    K=FNB(X0+I1,Y0+J1-J3/2,H0,I2-I1,0)
8060    X1=I1+H3
8065    S=3
8070    FOR K%=1% TO K1%
8090    Y1=J1+(K%-1%)*H2+H3
8095            T=K%+1%
8096    T=0 IF K%=2%
8100    K=FNB(X0+X1,Y0+Y1,H3,H3,T)
8110    K=FNM(X0+X1+H2,Y0+Y1)
8120            K=FNT("H",I9$(K%))
8130    NEXT K%
8132    K=FNS("H",2%)
8135    T3=T1*LEN(I9$(0%))
8140    X1=I1+(I2-I1-T3)/2
8145    Y1=J2-H3/2
8150    K=FNM(Y0+X1,Y0+Y1)
8160    K=FNT("H",I9$(0%))
8180    FNEND
8200    DEF FNL2(X3,X4)
8220    K=FNV(X0+X3,Y0+Y1)
8230    K=FNM(X0+X4,Y0+Y1)
8240    K=FNV(X0+L,Y0+Y1)
8250    FNEND
29000   DEF FNO(A$)
29010   P%=LEN(A$)
29020   FIELD #12,P% AS P$
29030   LSET P$=A$
29040   PUT #12,RECORD 1%,COUNT P%
29050   FNEND
29100   DEF FNO1(A)
29110   K=FNO(CHR$(27%)+CHR$(A))
29120   FNEND
29200   DEF FNI
29210 open"kb5:" as file 12%
29220   K=FNO1(12)
29225   SLEEP 2
29230   FNEND
29300   DEF FNE
29310   K=FNO1(12)
29315   SLEEP 2
29320   CLOSE#12%
29330   FNEND
29400   DEF FNV(X,Y)
29410   K=FNC1(X,Y)
29420   K=FNO(CHR$(Y1%)+CHR$(Y2%)+CHR$(X1%)+CHR$(X2%))
29430   FNEND
29500   DEF FNM(X,Y)
29510   K=FNC1(X,Y)
29520   K=FNO(CHR$(29%)+CHR$(Y1%)+CHR$(Y2%)+CHR$(X1%)+CHR$(X2%))
29530   FNEND
29600   DEF FNC1(X,Y)
29610   X%=X/32%:Y%=Y/32%
29620   Y1%=32%+Y%
29630   Y2%=96%+Y-Y%*32%
29640   X1%=32%+X%
29650   X2%=64%+X-X%*32%
29660   FNEND
```

```
29700   DEF FNT(A$,B$)
29710   IF A$<>"H" THEN GOTO 29740
29720   K=FNT2(B$)
29730   GOTO 29770
29740   B1$=""
29750B1$=B1$+MID(B$,I%,1%)+CHR$(10%)+CHR$(8%) FORI%=1%TOLEN(B$)
29760   K=FNT2(B1$)
29770   FNEND
29800   DEF FNT2(A$)
29810   K=FNO1(31):K=FNO1(S+56):K=FNO1(Z+96)
29820   K=FNO(A$):K=FNO1(29)
29830   FNEND
29900   DEF FNT1(N):K=FNO1(31):PRINT #12,USING"#,######",N:K=FNO1(29)
29910   FNEND
30000   !  BEFORE CALLING SET B,B1,B2,B3,B4,B5,B7,T1$,T2$
30020   DEF FNA(X0,Y0,L,H,T)
30030   K=FNB(X0,Y0,H,L,0)
30040   K=FND(3%,I1%,I2%,1%,5%)
30100   K%=LEN(T1$)
30110   K=FNS("H",2%)
30120   S=2%
30130   T3=(L-T1*K%)/2%
30140   T4=-75
30150   K=FNM(X0+T3,Y0+T4)
30160   K=FNT("H",T1$)
30210   K=FNL(1%,N1%+1%,1%,5%,2%)
30300   !       PRINT Y=AXIS LABELS
30305   FOR T=-1 TO 0
30308   K=FNS("H",2%)
30310   T3=0:B6=0
30315   T4=-10:T4=L+10 IF T=-1
30320   FOR I%=1% TO B5
30322   D$=CV$$(NUM$(B6),2%)
30325   T5=T4:T5=T4+5-T1*LEN(D$) IF T=0
30330   K=FNM(X0+T5,Y0+T3)
30340   K=FNT("H",D$)
30350           B6=B6+B3
30360           T3=T3+B7
30365   NEXT I%
30371   K%=LEN(T2$)/2%
30372   K=FNS("V",2%)
30377   T4=-80:T4=L+75 IF T=-1
30380   K=FNM(X0+T4,Y0+H/2+T1*K%):K=FNT("V",T2$)
30385   NEXT T
30390   FNEND
30400   DEF FNB(X,Y,H,W,T)      !       DRAW THE BOXES
30402   L1=5:L2=3
30405   P1=W/(L1+1)
30406   P2=W/(L2+1)
30409   K=FNO1(104)
30410   K=FNM(X,Y)
30420   K=FNV(X,Y+H)
30430   K=FNV(X+W,Y+H)
30440   K=FNV(X+W,Y)
30450   K=FNV(X,Y)
30460   K=FNO1(96)
30470   IF T<=0 THEN 30900 ELSE 30490
30480   K=FNO1(104):T=T-4
30490   ON T GOTO 30500,30560,30700,30800,30480,30480,30480,30480
30500   X3=X+W
30510   FOR I=1 TO H/P
30520   Y3=Y+I*P
30530   K=FNM(X,Y3):K=FNV(X3,Y3)
30550   NEXT I:GOTO 30900
30560   Y3=Y+H
30570   FOR I=1 TO W/P1
30580   X3=X+I*P1
30590   K=FNM(X3,Y):K=FNV(X3,Y3)
30600   NEXT I:GOTO 30900
30700   Y3=Y+H
30710   FOR I=1 TO W/P2
30720   X3=X+I*P2
30730   K=FNM(X3,Y):K=FNV(X3,Y3)
30740   NEXT I
30900   FNEND
32000 END
```

PROGRAM TYPE Manpower Histograms
NAME SCHISM.BAS SIZE 14K
PURPOSE To produce histograms derived from data formatted to display manpower data

FILE DESCRIPTIONS

NAME	INPUT OUTPUT	CONTENT	VIRTUAL DIMENSIONS
MPCATA.COM MPCATA.NAT MPCATA.HUM	I	Data listed by Category	M3%(3), D%(8) V3(8,3)
MPDEPT.COM MPDEPT.NAT MPDEPT.HUM	I	Data listed by Department	M4%(3), D$(50), V4(50,7)
MPTITL.DAT	I	Titles	T$(30) = 128

PROGRAM VARIABLES

N% = graph number

R% = -1%, true (indicates by department); = 0%, false (indicates by category)

N1% = # departments or # categories

N2% = # categories or no. of columns (R&D, RSA, Admin. Total)

M2% = index of totals row

M4$, M4% = year valve

D%( ) = matrix which conveys ranking of categories, Notes: the FNR function re-groups and re-ranks if necessary.

PROGRAM FUNCTION

FNR(K%) = Regroups the categories into K% groups
G%( ) = matrix which carries regrouping order
J2% = number of categories included in each group
G$ = new group title
M$( ) = matrix used to store new titles

FNR1 Regroups category columns of data listed by department.

FNR2 Regroups category rows of data listed by category.

```
10        !       HISTOGRAMS FOR MANPOWER DATA
50 DIM V(65%,6%)
100       I$(5%)="99998000600040003000400001000"
110       I$(6%)="1000100010000500050002500250"
115       I9$(0%)="LEGEND"
120       I9$(1%)="INTRAMURAL R&D"
130       I9$(2%)="INTRAMURAL RSA"
140       I9$(3%)="ADMIN. OF EXTRAMURAL PROG."
200       PRINT "WHICH GRAPH"
210       PRINT USING"  #",J%;FOR J%=1% TO 6%
220       PRINT
230       INPUT"NUMBER",N%
240       GOTO 32000 IF N%>6%
250       J1=N%:J1=J1/2%:J2=INT(J1)
260       IF J1=J2 THEN R%=-1% ELSE R%=0%
270       IF NOT R% THEN I1%=12%:I2%=18%
280       IF R% THEN I1%=3%:I2%=9%
290       OPEN"MP."+N$ AS FILE 1 IF Q%=1%
300       OPEN"MPTITL.DAT" AS FILE 2
310       DIM#2,T$(30%)=128%
320       IF N%<3% THEN P$=T$(I1%-1%):P1$=".COM"
330       IF N%>2% THEN P$="NATURAL SCIENCES":P1$=".NAT"
340       IF N%>4% THEN P$="HUMAN SCIENCES":P1$=".HUM"
350       OPEN"MPCATA"+P1$+"[30,15]" AS FILE 3 IF NOT R%
360       OPEN"MPDEPT"+P1$+"[30,15]" AS FILE 4 IF R%
370       DIM#3,M3%(3%),D%(7%),V3(8%,3%)
380       DIM#4,M4%(3%),D$(65%),V4(65%,6%)
390       K=FNS1(Y%)
400       C1$(1%)="GRAPH"+NUM$(N%)          !   SELECT GRAPH TITLES
410       C1$(2%)=P$
420       C1$(3%)=CVT$$(T$(I1%),8%)
430       C1$(4%)=CVT$$(T$(I1%+1%),8%)
450       INPUT"NO. OF DEPARTMENTS",N1% IF R%
460       INPUT"NO. OF CATA. GROUPS"N2% IF R%
470       INPUT"NO. OF CATA. GROUPS",N1% IF NOT R%
480       N2%=3% IF NOT R%
485       M2%=M4%(2%)+1% IF R%
490       K=FNR(7%)
500       !       SET GRAPH CHARACTARISTICS
510       Y0=100
520       X0=100
525       H=500
530       L=809%
537       X0=(1023-L)/2
540       I1%=1%:IF R% THEN I2%=N1%+1% ELSE I2%=N1%
545       IF R% THEN I2%=N1%+1% ELSE I2%=N1%
550       W1=L/I2%:W2=W1/2:W3=W2/2
560       I3%=4%:I4%=7%
565       I5%=I% IF V(1%,N2%)<FNN(I$(5%),I%,I3%) FOR I%=1% TO I4%
570       B3=FNN(I$(6%),I5%,4%)
575       B5=INT((FNN(I$(5%),I5%,I3%))/B3)+2
585       B7=H/(B5-1)
587       Y5=(B5-1)*B3:F2=H/Y5
590       IF R% THEN T1$="DEPARTMENT OR AGENCY" ELSE T1$="CATAGORY"
595       T2$="F T E MAN YEARS"
600       K=FNI
610       Y1=H+150
615       K=FNS("H",2%)
620       FOR J%=1% TO 4%
622       X1=0
625       IF J%=3% OR J%=4% THEN X1=(L-T1*LEN(C1$(J%)))/2%
630       K=FNM(X0+X1,Y0+Y1)
640       K=FNT("H",C1$(J%))
650       Y1=Y1-25
655       Y1=Y1-25 IF J%=4%
660       NEXT J%
710       K=FNA(X0,Y0,L,H,0)
720       K=FNH(I1%,I2%,N2%,N2%,1%)
890       V(I%,J%)=0 FOR J%=0% TO N2% FOR I%=0% TO N1%+1%
900       INPUT P:IF P<1 THEN 950 ELSE 1000
950       CLOSE 1,2,3:K=FNE:GOTO 10
1000      CLOSE 1,2,3:K=FNE:STOP
```

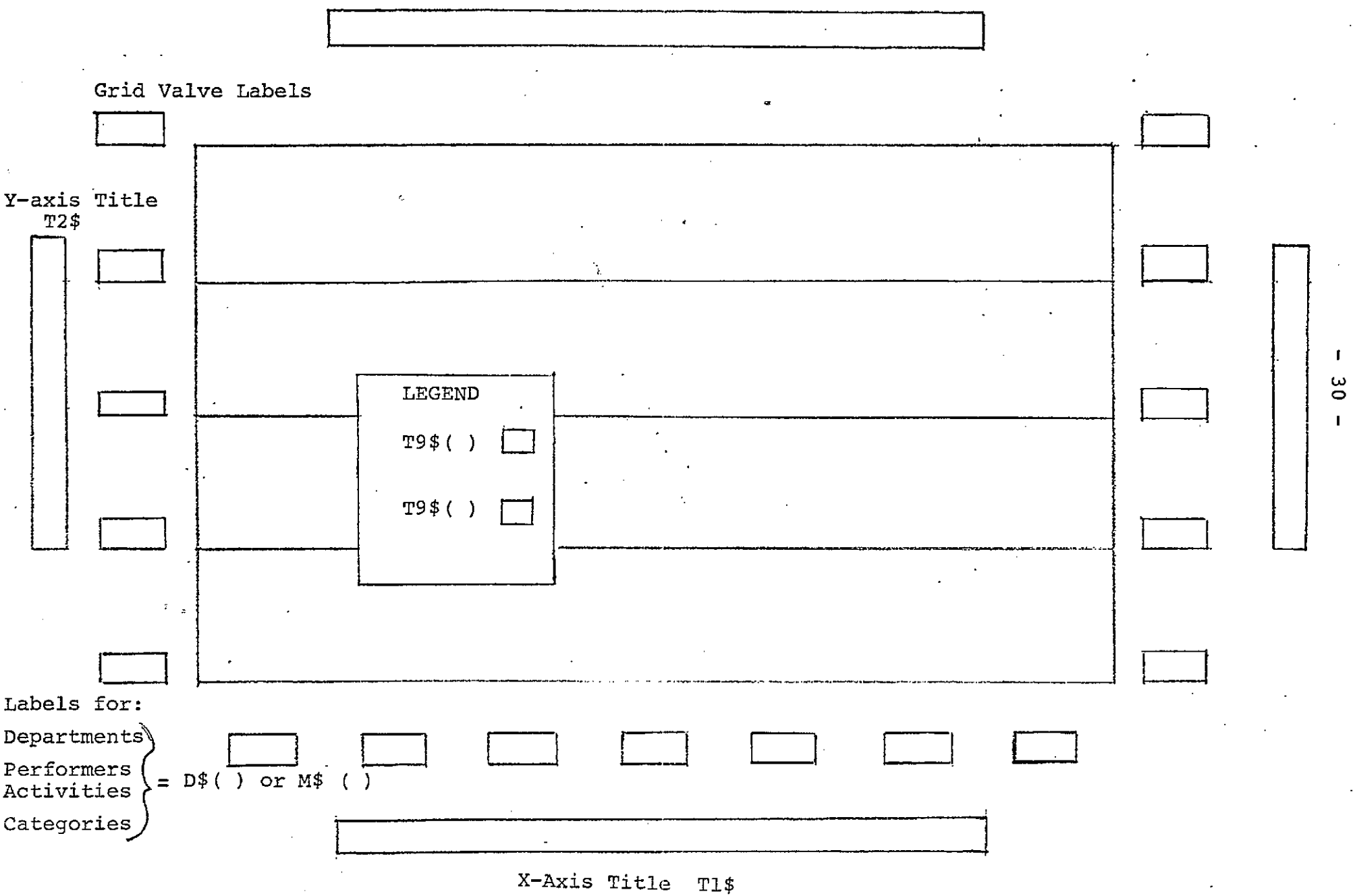
```
1100     DEF FNT3(X,Y)
1120     D$=CVT$$(NUM$(M4%),2%)
1130     X3=W2:Y3=10
1135     X3=W2+W3 IF N1%>12%
1140     K=FNM(X0+X-X3,Y0+Y+Y3)
1150     K=FNT("H",D$)
1160     K=FNM(X0+X,Y0+Y)
1165     M4%=M4%+1%
1170     FNEND
1200 DEF FNN(N$,I%,L%)=VAL(MID(N$,I%*L%-L%+1%,L%))
2000     DEF FNS(A$,S%)   !        LETTER SPACING
2005              S=S%
2010              S%=S%+1%
2020              S%=S%+4% IF A$<>"H"
2030     S1$="1400127508500775220020501325 1200"
2040     S2$="252015122522 1715"
2050     T1=(FNN(S1$,S%,4%))/100
2060     T2=FNN(S2$,S%,2%)
2100     FNEND
2300 DEF FNS1(Y%)
2310 IF R% THEN Y%=M4%(3%) ELSE Y%=M3%(3%)
2320 Y1$=CVT$$(NUM$(Y%-1%),8%)
2330 Y2$=CVT$$(NUM$(Y%),8%)
2340 L%=LEN(T$(I1%+1%))
2350 Y$="19"+Y1$+"-"+Y2$:Y$=CVT$$(Y$,2%)
2360 T$(I1%+1%)=LEFT(T$(I1%+1%),L%-7%)+Y$
2370 FNEND
5000     DEF FNL(I1%,I2%,J1%,J2%,J3%)
5010     V1(J%)=V(M2%,J%) FOR J%=J1% TO J2% IF R%
5020     V1(J%)=V1(J%)-V(I%,J%) FOR J%=J1%TOJ2% FOR I%=I1%TOI2%-1% IF R%
5030     I1=W1*(I2%-3%)
5031     I1=W1*(I2%-7%) IF R%
5032     I2=W1*(I2%-1%)
5035     J1=B7*(B5-5):J2=B7*(B5-2)
5045     K=FNL1(I1,I2,J1,J2,N2%)
5050     Y1=B7
5060     K1%=B5-2
5070     FOR K%=1% TO K1%
5080              K=FNM(X0,Y0+Y1)
5090              T%=-1%:X1=W3
5100              FOR I%=I1% TO I2%
5105     IF I%>I1%+2% THEN IF Y1>=J1 AND Y1<=J2+5 THEN K=FNL2(I1,I2):     GOTO 5225
5110                       FOR J%=J1% TO J2%+J3% STEP J3%
5120                       IF J%=J2%+J3% THEN V2=0:GOTO 5150
5130                       V2=F2*V(I%,J%)
5140                       V2=F2*V1(J%) IF I%=I2% IF R%
5150              IF T%=-1% AND V2>=Y1 THEN K=FNV(X0+X1,Y0+Y1):T%=0%
5160              IF T%=0% AND V2<Y1 THEN K=FNM(X0+X1,Y0+Y1):T%=-1%
5170              X1=X1+W2
5180                       NEXT J%
5215              NEXT I%
5217              X1=X1-W3
5220              K=FNV(X0+X1,Y0+Y1)
5225              Y1=Y1+B7
5230     NEXT K%
5250     FNEND
5500     DEF FND(S%,I1%,I2%,K1%,D%)       !  X-AXIS LABELS
5510     K=FNS("H",S%)
5520     T3=-T2*2
5530     FOR K%=1% TO K1%
5540     T4=0
5550              FOR I%=I1% TO I2%
5560     D$=M$(I%) IF NOT R%
5580              D$=CVT$$(MID(D$,(K%-1%)*D%+1%,D%),128%)
5585              D$=D$(I%) IF R%
5587     D$="O"+CHR$(116)+CHR$(104)+CHR$(101)+CHR$(114) IF R% IF I%=I2%
5590              T5=LEN(D$)
5600              GOTO 5650 IF T5=0
5610              T6=(W1-T5*T1)/2
5620              K=FNM(X0+T4+T6,Y0+T3)
5630              K=FNT("H",D$)
5650              T4=T4+W1
5660              NEXT I%
5670     T3=T3-T2
5680     NEXT K%
5700     FNEND
```

```
6000    DEF FNH(I1%,I2%,J1%,J2%,J3%)     ! DRAW HISTOGRAMS
6010    V1(J%)=V(M2%,J%) FOR J%=0% TO 6%
6030    FOR I%=I1% TO I2%
6040            X1=(I%-I1%)*W1+W3
6050            FOR J%=J1% TO J2% STEP J3%
6060            Y1=0:T%=0%
6065            FOR K%=N2% TO 1% STEP -1%
6070            K=FNM(X0+X1,Y0+Y1)
6075            V1(J%-K%)=V1(J%-K%)-V(I%,J%-K%) IF I%<I2%
6080                    Y2=F2*V(I%,J%-K%)
6085                    Y2=F2*V1(J%-K%) IF I%=I2% IF R%
6090            T%=ABS(T%)-1%:IF T% THEN T=3 ELSE T=0
6095                    IF Y2<4 AND Y2>0 THEN Y2=3
6100            K=FNB(X0+X1,Y0+Y1,Y2,W2,T) UNLESS Y2=0
6150            Y1=Y1+Y2
6160            NEXT K%
6200    X1=X1+W2
6220    NEXT J%:NEXT I%
6250    FNEND
8000    DEF FNL1(I1,I2,J1,J2,K1%)        !        DRAW LEGEND BOX
8020    J3=B7/2
8025    H0=J2-J1+J3
8030    H1=H0/K1%:H2=H1/2:H3=H2/2%
8050    K=FNB(X0+I1,Y0+J1-J3/2,H0,I2-I1,0)
8060    X1=I1+H3
8065    S=3
8067    T%=0%
8070    FOR K%=1% TO K1%
8090    Y1=J1+(K%-1%)*H2+H2
8096    T%=ABS(T%)-1%:IF T% THEN T=2 ELSE T=0
8100    K=FNB(X0+X1,Y0+Y1,H3,H3,T)
8110    K=FNM(X0+X1+H2,Y0+Y1)
8120            K=FNT("H",I9$(K%))
8130    NEXT K%
8132    K=FNS("H",2%)
8135    T3=T1*LEN(I9$(0%))
8140    X1=I1+(I2-I1-T3)/2
8145    Y1=J2-H3/2
8150    K=FNM(X0+X1,Y0+Y1)
8160    K=FNT("H",I9$(0%))
8180    FNEND
8200    DEF FNL2(X3,X4)
8220    K=FNV(X0+X3,Y0+Y1)
8230    K=FNM(X0+X4,Y0+Y1)
8240    K=FNV(X0+L,Y0+Y1)
8250    FNEND
9000    DEF FNR(K%)
9010    IF N2%>5% AND R% THEN K=FNR3:GOTO 9240
9020    IF NOT R% AND N1%>5% THEN K=FNR3:GOTO 9240
9050    FOR I%=1% TO 7%
9060            G%(I%)=I%
9070            G$(I%)=T$(I%+19%)
9080            PRINT I%;G$(I%)
9090    NEXT I%
9100    FOR I%=1% TO K%
9120    PRINT"FOR GROUP ";I%;"HOW MANY CATAGORIES";
9130    INPUT J2%
9140            FOR J%=1% TO J2%
9150            PRINT J%;:INPUT J3%
9160            G%(J3%)=I%
9170            PRINT G$(J3%) IF J%=J2%
9180            NEXT J%
9200    INPUT"GROUP TITLE ('S' IF AS ABOVE)" G$
9210    IF G$="S" THEN M$(I%)=G$(J3%) ELSE M$(I%)=G$
9220    NEXT I%
9240    IF R% THEN K=FNR1(K%) ELSE K=FNR2(K%)
9250    FNEND
9300    DEF FNR1(K%)
9320    FOR I%=1% TO M2%
9330            FOR J%=1% TO K%
9340            J1%=G%(J%)
9350    V(I%,J1%-1%)=V(I%,J1%-1%)+V4(I%,J%-1%)
9360    NEXT J%:NEXT I%
9370    FNEND
9400    DEF FNR2(K%)
9420    FOR I%=1% TO K%
9430            I1%=G%(I%)
9435            I1%=I% IF N1%>5%
9440    V(I1%,J%)=V(I1%,J%)+V3(I%,J%) FOR J%=0% TO 3%
9450    NEXT I%
9460    FNEND
9500    DEF FNR3
9520            FOR I%=1% TO K%
9530            IF R% THEN I9$(I%)=CVT$$(T$(I%+19),16):G%(I%)=I%
9540    IF NOT R% THEN I1%=D%(I%):G%(I%)=I1%:M$(I%)=T$(I1%+19%)
9550            NEXT I%
9560    FNEND
```

```
29000   DEF FNO(A$)
29010   P%=LEN(A$)
29020   FIELD #12,P% AS P$
29030   LSET P$=A$
29040   PUT #12,RECORD 1%,COUNT P%
29050   FNEND
29100   DEF FNO1(A)
29110   K=FNO(CHR$(27%)+CHR$(A))
29120   FNEND
29200   DEF FNI
29210 open"kb5:" as file 12%
29220   K=FNO1(12)
29225   SLEEP 2
29230   FNEND
29300   DEF FNE
29310   K=FNO1(12)
29315   SLEEP 2
29320   CLOSE#12%
29330   FNEND
29400   DEF FNV(X,Y)
29410   K=FNC1(X,Y)
29420   K=FNO(CHR$(Y1%)+CHR$(Y2%)+CHR$(X1%)+CHR$(X2%))
29430   FNEND
29500   DEF FNM(X,Y)
29510   K=FNC1(X,Y)
29520   K=FNO(CHR$(29%)+CHR$(Y1%)+CHR$(Y2%)+CHR$(X1%)+CHR$(X2%))
29530   FNEND
29600   DEF FNC1(X,Y)
29610   X%=X/32%:Y%=Y/32%
29620   Y1%=32%+Y%
29630   Y2%=96%+Y-Y%*32%
29640   X1%=32%+X%
29650   X2%=64%+X-X%*32%
29660   FNEND
29700   DEF FNT(A$,B$)
29710   IF A$<>"H" THEN GOTO 29740
29720   K=FNT2(B$)
29730   GOTO 29770
29740   B1$=""
29750B1$=B1$:MID(B$,I%,1%)+CHR$(10%)+CHR$(8%) FORI%=1%TOLEN(B$)
29760   K=FNT2(B1$)
29770   FNEND
29800   DEF FNT2(A$)
29810   K=FNO1(31):K=FNO1(S+56):K=FNO1(Z+96)
29820   K=FNO(A$):K=FNO1(29)
29830   FNEND
29900   DEF FNT1(N):K=FNO1(31):PRINT #12,USING"#,######",N:K=FNO1(29)
29910   FNEND
30000   !  BEFORE CALLING SET B,B1,B2,B3,B4,B5,B7,T1$,T2$
30020   DEF FNA(X0,Y0,L,H,T)
30030   K=FNB(X0,Y0,H,L,0)
30040   K=FND(3%,I1%,I2%,1%,5%) IF R%
30050   K=FND(3%,I1%,I2%,3%,16%) IF NOT R%
30100   K%=LEN(T1$)
30110   K=FNS("H",2%)
30120   S=2%
30130   T3=(L-T1*K%)/2%
30140   T4=-75
30150   K=FNM(X0+T3,Y0+T4)
30160   K=FNT("H",T1$)
30210   K=FNL(I1%,I2%,N2%,N2%,1%)
30300   !       PRINT Y=AXIS LABELS
30305   FOR T=-1 TO 0
30308   K=FNS("H",2%)
30310   T3=0:B6=0
30315   T4=-10:T4=L+10 IF T=-1
30320   FOR I%=1% TO B5
30322   D$=CVT$$(NUM$(B6),2%)
30325   T5=T4:T5=T4+5-T1*LEN(D$) IF T=0
30330   K=FNM(X0+T5,Y0+T3)
30340   K=FNT("H",D$)
30350           B6=B6+B3
30360           T3=T3+B7
30365   NEXT I%
30371   K%=LEN(T2$)/2%
30372   K=FNS("V",2%)
30377   T4=-80:T4=L+75 IF T=-1
30380   K=FNM(X0+T4,Y0+H/2+T1*K%):K=FNT("V",T2$)
30385   NEXT T
30390   FNEND
```

```
30400   DEF FNB(X,Y,H,W,T)      !       DRAW THE BOXES
30402   L1=2
30403   L2=6
30405   P1=W/(L1+1)
30406   P2=W/(L2+1)
30409   K=FNO1(104)
30410   K=FNM(X,Y)
30420   K=FNV(X,Y+H)
30430   K=FNV(X+W,Y+H)
30440   K=FNV(X+W,Y)
30450   K=FNV(X,Y)
30460   K=FNO1(96)
30470   IF T<=0 THEN 30900 ELSE 30490
30480   K=FNO1(104):T=T-4
30490   ON T GOTO 30500,30560,30700,30800,30480,30480,30480,30480
30500   X3=X+W
30510   FOR I=1 TO H/P
30520   Y3=Y+I*P
30530   K=FNM(X,Y3):K=FNV(X3,Y3)
30550   NEXT I:GOTO 30900
30560   Y3=Y+H
30570   FOR I=1 TO W/P1
30580   X3=X+I*P1
30590   K=FNM(X3,Y):K=FNV(X3,Y3)
30600   NEXT I:GOTO 30900
30700   Y3=Y+H
30710   FOR I=1 TO W/P2
30720   X3=X+I*P2
30730   K=FNM(X3,Y):K=FNV(X3,Y3)
30740   NEXT I
30900   FNEND
32000 END
```

GRAPH NOMENCLATURE



TABULATION INDEX

Type of Tabulation	A	NAT & HUM B	NAT & HUM C	NATURAL B	NATURAL C	HUMAN B	HUMAN C
0.							
Totals, Human and Natural	SA	1	1				
Totals, Human and Natural, by Dept.	SA	2	2*				
Totals, by Activity	SA	3	3				
Totals, by Activity, by Dept.	SA	22	6*	42	19	62	34
2.							
Performer, % of Total	SA	10	4	30	17	50	32
Performer, % of Total	R&D	11	9	31	22	51	37
Performer, % of Total	RSA	12	15	32	28	52	43
Activity, % of Total	R&D	13	10	33	23	53	38
Activity, % of Total	RSA	14	-	34	29	54	44
Activity, % of Total	SA	15	5	35	18	55	33
5.							
Intramural & Extramural							
Performers by Department	SA	16	7	36	20	56	35
Performers by Department	R&D	17	11	37	24	57	39
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6.							
Performers by Department	SA	19	8	39	21	59	36
Performers by Department	R&D	20	12	40	25	60	40
Activity by Department	RSA	21	-	41	31	61	46
9.							
Performers (U&N-PI), by Type of Funding, by Department	R&D	23	13	43	26	63	41
Performers (Industry), by Type of Funding, by Department	R&D	24	14	44	27	64	42

A - Type of Activity
SA - Scientific Activities = R&D + RSA
R&D - Research and Development
RSA - Related Scientific Activities

B - Number system used by system programs

C - Numbers used in Report 100 (mini Green Book)

\- - Not Available

* - Type 0 for RSUM file, Type 5 for print out

1	Agr	AGR ADM	Agriculture-Administration
2	Agr	AGR RES	Agriculture-research
3	Agr	AGR PMB	Agriculture-Production & Marketing Board
4	Agr	AGR HOA	Agriculture-Health of Animals
5	Agr	AGR CGC	Agriculture-Canadian Grains Group
6	CDC	CDC	Canadian Dairy Commission
7	CLFB	CLFB	Canadian Livestock Feed Board
8	DOC	COMM	Communications
9	CRTC	CRTC	Canadian Radio Television Commission
10	CCA		Consumer and Corporate Affairs-Administration
11	CCA	CCA CNS	Consumer and Corporate Affairs-Consumer Affairs
12	CCA	CCA CRF	Consumer and Corporate Affairs-Corporate Affairs
13	CCA	CCA CI	Consumer and Corporate Affairs - Combines Investigations
14	CCA	CCA IP	Consumer and Corporate Affairs-Intellectual Property
15	BofC	BC	Bank of Canada
16	CDC	CDC	Canadian Dairy Commision
17	EMR	EMR MER	Energy, Mines and Resources-Mineral Economics Research
18	EMR	EMR ES	Energy, Mines and Resources-Earth Sciences
19	AECB		Atomic Energy Control Board
20	AECL	AECL	Atomic Energy of Canada Limited
21	FPRB	FPRB	Food Prices Review Board
22	CAL	CAL	Canadian Arsenals
23	DOE	ENV FRD	Environment-Fisheries and Marine Service
24	DOE	ENV EPS	Environment-Environmental Protection Service
25	DOE	ENV AES	Environment-Atmospheric Environment Service
26	DOE	ENV EMS	Environment-Environmental Management Service
27	EA	EA	External Affairs
28	CIDA	CIDA	Canadian International Development Agency
29	Fin	FIN	Finance
30	IDRC	IDRC	International Developement Research Centre
31	INA	IAND ND	Indian and Northern Affairs-Indian & Eskimo Affairs
32	INA	IAND NA	Indian and Northern Affairs-Northern Affairs
33	INA	IANDPC	Indian and Northern Affairs- Parks Canada
34	ITC	ITC TI	Industry, Trade and Commerce-Trade and Industry
35	ITC	ITC TOU	Industry, Trade and Commerce-Tourism
36	ITC	ITC GOM	Industry, Trade and Commerce-Grain and Oil Seeds
37	SC	STC	Statistics Canada
38	Jus	JUS ADM	Justice-Administration
39	Jus	JUS LRC	Justice-LRC
40	Lab	LAB	Labour
41	IC	IC	Information Canada
42	M&I	M&I	Manpower and Immigration-Policy & Res.
43	DND	NDEFDS	National Defence-Defence Service
44	DND		National Defence-Defence Research
45	NHW	NHW ADM	National Health & Welfare-Administration
46			
47	NHW	NHW HC	National Health & Welfare-Health Care
48	NHW	NHW MS	National Health & Welfare-Medical Services
49	NHW	NHW HP	National Health & Welfare-Health Protection
50	NHW	NHW ISS	National Health & Welfare-Income Security and Social Assistance
51	NHW	NHW FAS	National Health & Welfare-Fitness and Amateur Sport
52	MRC	MRC	Medical Research Council
53	CPDL	CPDL	Canada Patent Development Corporation
54	NR	NREV TAX	National Revenue-Taxation
55	PO	PO	Post Office
56	PCO	PCO	Privy Council Office
57	COL	COL	Commissioner of Official Languages
58	ECC	EC	Economics Council of Canada
59	M&I		Manpower and Immigration-Administration
60	M&I		Manpower and Immigration-Manpower Utilization
61	DPW	PW	Public Works-Professional and Technical Services
62	DOE	ENV MS	Environment-Marine Service
63			
64	DREE	REE	Regional & Economic Expansion
65	MSST	MOSST	Ministry of State for Science and Technology
66	ScC	SC	Science Council
67	SofS	SS TRA	Secretary of State-Translation
68	SofS	SS BIL	Secretary of State-Bilingualism
69	SofS	SS CIT	Secretary of State-Citizenship
70	SofS	SS AC	Secretary of State-Arts and Culture
71	SofS	SS EPB	Secretary of State-Policy Div.
72			
73	CC	CC	Canada Council
74	CBC	CBC	Canadian Broadcasting Corporation
75	NFB	NFB PDF	National Film Board
76	NL	NLIB	National Library
77	NM	NMUS	National Museum
78	PA	PA	Public Archives
79	PSC	PSC	Public Service Commission

80	SG	SGEN	Solicitor General
81			
82			
83	DSS	S&S	Supply and Services
84			
85			
86	MOT	TPT MAR	Ministry of Transport-Marine
87	MOT	TPT AT	Ministry of Transport-Air
88	MOT	TPT ST	Ministry of Transport-Surface
89	MOT	TDA	Ministry of Transport-TDA
90	CTC	CTC	Ministry of Transport-CTC
91	NHB	NHB	Ministry of Transport-National Harbours
92	SLSA		St. Lawrence Seaway Authority
93	TBS	TRE APS	Treasury Board Secretariate
94	UIC	UIC	Unemployment Insurance Commission
95	MUA	UA	Ministry of State for Urban Affairs
96	CMHC	CMHC	Central Mortgage and Housing Corporation
97	NCC	NCC	National Capital Commission
98	DVA	VA	Veterans Affairs
99	FIRA		
100	NRC	NRC ENS	NRC-Engineering and National Science
101	NRC	NRC STI	NRC-Scientific and Technical Information
102	NRC	NRC SGR	NRC-Universities
103	EOF		**e o f **

```
$JOB/NAME=HIS2BA/NOLIMIT
$BASIC/RUN SCHIS2[30,15]
$DATA
1
0
2
0
3
0
4
0
6
0
7
0
8
0
9
0
10
0
11
0
12
0
13
0
14
0
15
0
16
0
17
0
18
0
99
$EOD
$BASIC/RUN SCHIS5[30,15]
$DATA
1
15
0
2
15
0
3
15
0
4
15
0
5
15
0
6
15
0
7
15
0
8
15
0
9
15
0
10
15
0
11
15
0
12
15
0
13
15
0
99
$EOD
```

```
$BASIC/RUN SCHIS9.BAS[30,1]
$DATA
1
10
0
2
10
0
3
10
0
4
10
0
5
10
0
6
10
0
99
$EOD
$EOJ
```