TIMESHARING RESPONSE TIME EXPERIMENT
AND
PLOTTING ROUTINES

by

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The PERFORM is a program written in B which collects data on
the response time of a timesharing installation. The PLOT
is a FORTRAN program which does the plotting based on the
data accumulated and collected from the PERFORM. Currently,
the PLOT will plot graphs for real waiting time of 10 in-
teractions, 10 secs of cpu and 100 random file I/O and 1
FORTRAN Y compilation vs the number of users, the time of
the day and the date of the month. There is another graph
intentionally put up under real time vs the time of the day;
that is the number of users vs the time of the day. Other
plots will be implemented in the near future if there is any
demand.

Introduction

The PERFORM Program

This is a B program, 4k in size, which is used to collect
data on the real waiting times for doing:

1. 10 interactions.
2. 10 secs cpu loop.
3. 1 FORTRAN Y compilation.
4. 100 times of random file I/O.

The PLOT Program

This is another FORTRAN program, 12k in size, which is used
for plotting graphs based on the data accumulated and col-
lected from the PERFORM program. Currently, 13 graphs will
be plotted based on the information collected from the
PERFORM program.

How to use PERFORM Program (Not avaliable to the public)

Before the PERFORM program is called and executed, the
master users must know:
1) the current number of users who are currently signed on.
2) the terminal speed he is on.

When the PERFORM program is executed, the master user will
be asked to enter the above information. Acceptable ter-
minal speeds in bits/sec are 134 (IBM 2741) or multiples of
150 not greater than 9600 bits/sec. Then, a line "PAUSE
READY ??" is typed out. this means that the PERFORM program
is waiting for your order to start doing the timing for 10
interactions. A carriage is the required response. Ten
lines of "#. PLEASE DEPRESS CARRIAGE RETURN IMMEDIATELY."
will be printed out and so depress carriage return 10 times

How to use the PLOT Program

When PLOT is called and executed, program will ask for starting and ending dates of the data collected that you want it to plot. Respond with mm/dd/yy as input. Users are recommended to choose 01/01/74 to the last data collected so that more data points are plotted on the graph and hence gives users a better and more accurate picture of what they should look like. Owing to the possibility of having different terminals with different terminal speeds doing the collection of data using the PERFORM program, the users of PLOT will be asked what terminal speed they would like the data to have been collected. A null response (carriage return) means all the data between the beginning and ending dates entered regardless of terminal types. Then "REAL TIME VS" will be printed out and input ask for. Acceptable responses are "user", "time" and "date". a carriage return is an acceptable response which means vs all three; 1. the number of user 2. time of the day 3. date of selection. Hence all 13 graphs will be printed out according to the order as listed above. Whenever "PAUSE READY ??" is printed out, means 'Have you positioned the paper the way you want for the next graph?'. A carriage return is the required response if ready.

Explanations

All the graphs plotted are based on the actual data col-
lected from the University of Waterloo H6050. They are three
dimensional distribution histograms. An "8" on a particular
co-ordinates means it occured eight times at that particular
real waiting time with respect to whatever the graph is
plotted against. The following is the equivalent table. An
"*" represents anything greater than 36.

```
0 --" "    11 -- A    21 -- K    31 -- U
1 -- 1     12 -- B    22 -- L    32 -- V
2 -- 2     13 -- C    23 -- M    33 -- W
3 -- 3     14 -- D    24 -- N    34 -- X
4 -- 4     15 -- E    25 -- O    35 -- Y
5 -- 5     16 -- F    26 -- P    36 -- Z
6 -- 6     17 -- G    27 -- Q
7 -- 7     18 -- H    28 -- R
8 -- 8     19 -- @    29 -- S
9 -- 9     20 -- J    30 -- T
```

The following explanation is for the graphes plotted based
on the data collected from 01/01/74 to 02/25/74 and a null
response to "REAL TIME VS".

The first graph is the real waiting time vs the number of
users for 10 interactions. This graph is plotted regardless
of terminal speeds Note there are three horizontal distribu-
tions. There are two "1"s way up on the top are probably, in
fact, due to human error (i.e. forgetting to depress car-
riage return). The horizontal distribution on the top most
represents the real waiting time for 10 interactions
response time vs the number of users using IBM 2741. The
middle represents the response time when using 300 bits/sec
terminals and the one closest to the x-axis represents the
response time when using 1200 bits/sec terminals.

The second graph is the real waiting time vs the number of
users for doing ten secs of cpu loop. Obviously, this graph
shows a greater gradient of distribution than the rest.

The third and the rest should be self-explanatory by now.
When you come to the graphs of real time vs the time of the
day, the x-axis will have values from 0 - 24. For graphs
plotted vs the selected dates, the selected starting date is
used as the min value. The ending date is the max value.
Please note for the sake of having uniform layout, a month
is taken as having 30 days and a year, 365 days. Also note
that real time vs 1 FORTRAN Y complilation is newly im-
plemented. Hence data on that were only collected since
02/20/74. therefore, min real waiting time for 1 complila-
tion is not zero as indicated on the graph heading. A
sample listing of the data file can be obtained via "TLIST
TTAN/PER.DATA". The third, fourth , fifth and sixth columns
of the data file are real waiting times in secs and the last
is the terminal speeds in bits/sec.

```
SYSTEM ?perform
READY?

9. PLEASE DEPRESS CARRIAGE RETURN IMMEDIATELY.
8. PLEASE DEPRESS CARRIAGE RETURN IMMEDIATELY.
7. PLEASE DEPRESS CARRIAGE RETURN IMMEDIATELY.
6. PLEASE DEPRESS CARRIAGE RETURN IMMEDIATELY.
5. PLEASE DEPRESS CARRIAGE RETURN IMMEDIATELY.
4. PLEASE DEPRESS CARRIAGE RETURN IMMEDIATELY.
3. PLEASE DEPRESS CARRIAGE RETURN IMMEDIATELY.
2. PLEASE DEPRESS CARRIAGE RETURN IMMEDIATELY.
1. PLEASE DEPRESS CARRIAGE RETURN IMMEDIATELY.
0. PLEASE DEPRESS CARRIAGE RETURN IMMEDIATELY.

02/26/74   1:41:20  # OF USERS = 11,   10 INTERACTIONS = 42 SECS REAL.
10 SECS CPU = 12 SECS REAL, 100 RANDOM FILE I/O = 3 SECS REAL.

   B708T    02/26/74  01:42:27 01:42:33
SYSTEM ?plot
009-SYSTEM UNKNOWN
SYSTEM ?plot
MM/DD/YY <- ENTER STARTING AND ENDING DATES.
=01/01/74 02/25/74
DATA COLLECTED FROM WHICH TERMINAL SPEED?
=
# OF DATA READ 257
REAL TIME VS
=

    PAUSE    READY
??
```

```
                        # OF DATA 257
                 FROM 01/01/74 TO 02/25/74
            REAL TIME FOR 10 INTERACTIONS VS # OF USERS.

                    AXIS      MAX       MIN      SCALE
                      X       52         2       1.39
                      Y       92         6       0.24


  92  +                                            1                      1
      I
      I
      I
      I
  71  +
      I
      I
      I
      I
      I
  50  +                      11 1          2                            2       1
      I                    1      1     11 11     1              1     2   1   1
      I                   1 1                           1   1  11      1     1    1
      I                                                                          11
      I
  29  + 1                          1    2   1   1             111      21    1
      I 1 1      3 1 3 2  212 43 324 13 333  31 1   113 1  213 2          1
      I                                                              11
      I
      I                                             1           1              1    1
   9  366-2-2-41+-13-44-496-68-135-22-645-37--24-24--83-+32-3-----+----1--1-+

        2        9        16       23       30       37       45       52

            REAL TIME FOR 10 INTERACTIONS VS # OF USERS.

  PAUSE    READY
?
```
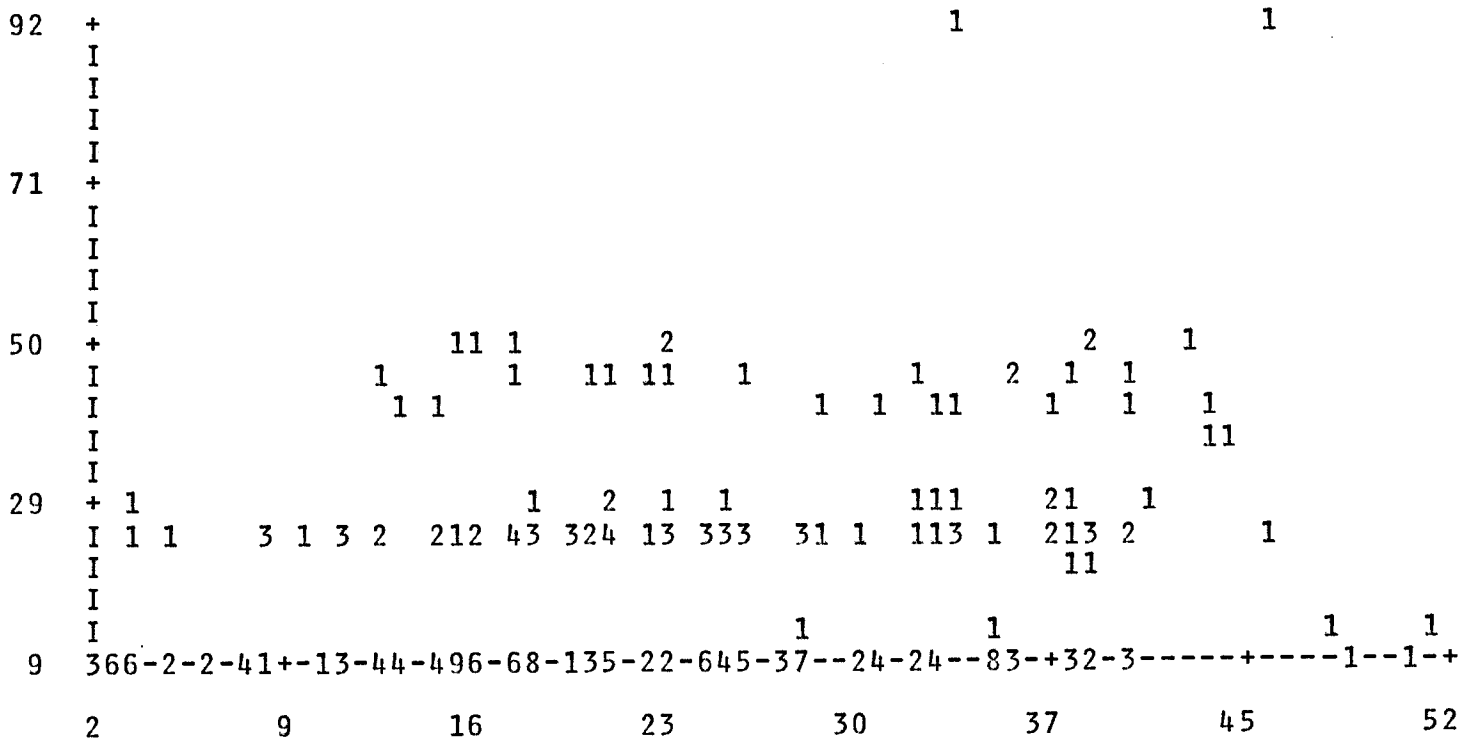
```
                        # OF DATA 257
                  FROM 01/01/74 TO 02/25/74
            REAL TIME FOR  10 SECS OF CPU VS # OF USERS.

                  AXIS      MAX      MIN      SCALE
                   X        52        2       1.39
                   Y       180        9       0.12


  180  +                                                    1
       I
       I
       I
       I
  139  +
       I     .
       I                                              1
       I
       I
       I                                                      1
   98  +
       I                                           1 1
       I                                      1    1 1
       I                                 1  1      1
       I                            2       1    1    1 1   1   1
   57  +              1        2   1 1 1 1        1 1  1
       I          1      1   11  1        1  11            1   1
       I         111   1    3 1     1 1 1 3  132
       I      2  1  12  2 11    1       1 1  12  1   1
       I   1 21 443 44   3 12   14   41 12 112 3  112 1
   16  368-3-2-44+1-6-54-374-86-346-23-851-231-21-221-12-+12-1-----+---------+

       2         9         16        23        30        37        45        52

              REAL TIME FOR  10 SECS OF CPU VS # OF USERS.

  PAUSE    READY
?
```

```
                    # OF DATA 257
              FROM 01/01/74 TO 02/25/74
         REAL TIME FOR  100 OF FILE IO VS # OF USERS.

              AXIS     MAX      MIN     SCALE
               X        52        2      1.39
               Y        18        3      1.00


 18  +                                              1
     I
     I
     I
     I                                           1
 13  +                                           1
     I                                             1                 1
     I                       1           1 1 1       1          1
     I             1                 1           1 1
     I                 1                 1      11  1      1
  8  +           1 1    2 1 1 1   1       1   2    14 11
     I           1          1   3       2 1 1  2
     I 1             2  1 2 12 1 2       2    2 1  121 2    1
     333       1      1 1 2  4 121  4  21 11   1 121  1  31 3      1  1     1
     I           1 4    53 56  13 12 452 182 31 121 31   1    1           1
  3  +34-3-2-44+-15-34-662-41-224-1+-21--1---+---1---1-+-------1-+---------+

      2         9         16        23        30        37        45       52

         REAL TIME FOR  100 OF FILE IO VS # OF USERS.

 PAUSE    READY
?
```

```
                          # OF DATA   22
                   FROM 01/01/74 TO 02/25/74
              REAL TIME FOR  1 COMPILATION  VS # OF USERS.

                    AXIS      MAX      MIN      SCALE
                     X        52        2       1.39
                     Y        67        0       0.31


  67  +                                                    1
      I
      I
      I
      I
  50  +                                         1     1     1
      I
      I                                         1
      I                               1
      I
  34  +
      I              1
      I                                   1
      I         1                                          1
      I                            1          1  1
  18  +                                    1          1
      I         1            1             11 1
      I         1                                1
      I
      I
   2  +1--------+--------+--------+--------+--------+--------+--------+--------+
        2        9       16       23       30       37       45       52

              REAL TIME FOR  1 COMPILATION  VS # OF USERS.

  PAUSE    READY
?
```

```
                        # ØF DATA 257
                   FRØM 01/01/74 TØ 02/25/74
             REAL TIME FØR 10 INTERACTIØNS VS TIME ØF DAY.

                  AXIS      MAX       MIN       SCALE
                   X        24         0        2.84
                   Y        92         6        0.24


 92   +                                          1              1
      I
      I
      I
      I
 71   +
      I
      I
      I
      I
      I
 50   +                      2       1 2       1 2
      I                    1 1       1 1   1   2   1   1       1       2
      I         1          1       1   1               1   1           2   1
      I                                    2
      I
 29   +                      1       2     2   3   3   2
      I 1                    4   8   2 B   6   A   C   3               1   3   4
      I                                               1   1
      I
      I                             2           2
  9   4-4--C--1-+----------+-------5-+A--D-7--J+-J--9--C-+5----8--3+-3--3--3-+

      0           3        7          10         14         17         21        24

                REAL TIME FØR 10 INTERACTIØNS VS TIME ØF DAY.

   PAUSE    READY
 ?
```

```
                        # OF DATA 257
                  FROM 01/01/74 TO 02/25/74
            REAL TIME FOR  10 SECS OF CPU VS TIME OF DAY.

                AXIS     MAX      MIN      SCALE
                  X       24        0       2.84
                  Y      180        9       0.12


 180    +                                         1
        I
        I
        I
        I
 139    +
        I
        I                                     1
        I
        I                                         1
  98    +
        I                                 2
        I                         1       1   1
        I                                 1                     2
        I                                 4   3
  57    +                     1           1   1             2   2
        1                     1   2       1   1
        I                     1   2   1   2       1             2
        I                     4   2   2   2   4   4   2
        I 1   1   1           1   3   1   1   2   2   4     1
        I     7               2   3   4   4   3   5   9   7 1 1 2   2   2   2
  16    3-4--5----+----------+----2--B-+8--7-F--H+-K--9--5-+4----5--3+-1--5--3-+

        0         3         7        10        14        17        21        24

              REAL TIME FOR  10 SECS OF CPU VS TIME OF DAY.

     PAUSE    READY
 ?
```

```
                        # OF DATA 257
                  FROM 01/01/74 TO 02/25/74
            REAL TIME FOR  100 OF FILE IO VS TIME OF DAY.

                     AXIS      MAX       MIN       SCALE
                      X        24         0        2.84
                      Y        18         3        1.00


    18  +                                         1
        I
        I
        I
        I                                  1
    13  +                                  1
        I                                         1  1
        I                                  3      2              1
        I     1                          1   1                      1
        I                                2     3                  1
     8  +                             1  5   5 1  2  3           1
        I                               3  1 2  1  2                1  1
        I                             1 4 4 4  2  4  2      1  1      1
        I     4                  6      2 5 3  D  B                 1  2
     3  1 2   2                1 5 A  5 4 8  4  A  8  2            2  2  2
     3  3-3--6--1-+---------+----1--2-+2--2-6--6+-B--1--4-+3----4--4+-1--5--3-+

        0         3         7         10        14        17        21       24

                  REAL TIME FOR  100 OF FILE IO VS TIME OF DAY.

   PAUSE    READY
  ?
```

```
                    #  OF  DATA   22
              FROM 01/01/74 TO 02/25/74
        REAL TIME FOR    1 COMPILATION VS TIME OF DAY.

                AXIS      MAX      MIN      SCALE
                  X       24        0       2.84
                  Y       67        0       0.31


  67  +                                        1
      I
      I
      I
      I
  50  +                                    2              1
      I
      I                                                      1
      I                           1
      I
  34  +
      I     1
      I                                                1
      I     1                 1
      I                                            1   2
  18  +                      1   1
      I     1                              1      1      2
      I     1
      I                                1
      I
   2  +---------+---------+---------+---------+-1-------+---------+---------+
      0         3         7        10        14        17        21        24

            REAL TIME FOR    1 COMPILATION VS TIME OF DAY.

  PAUSE    READY
?
```
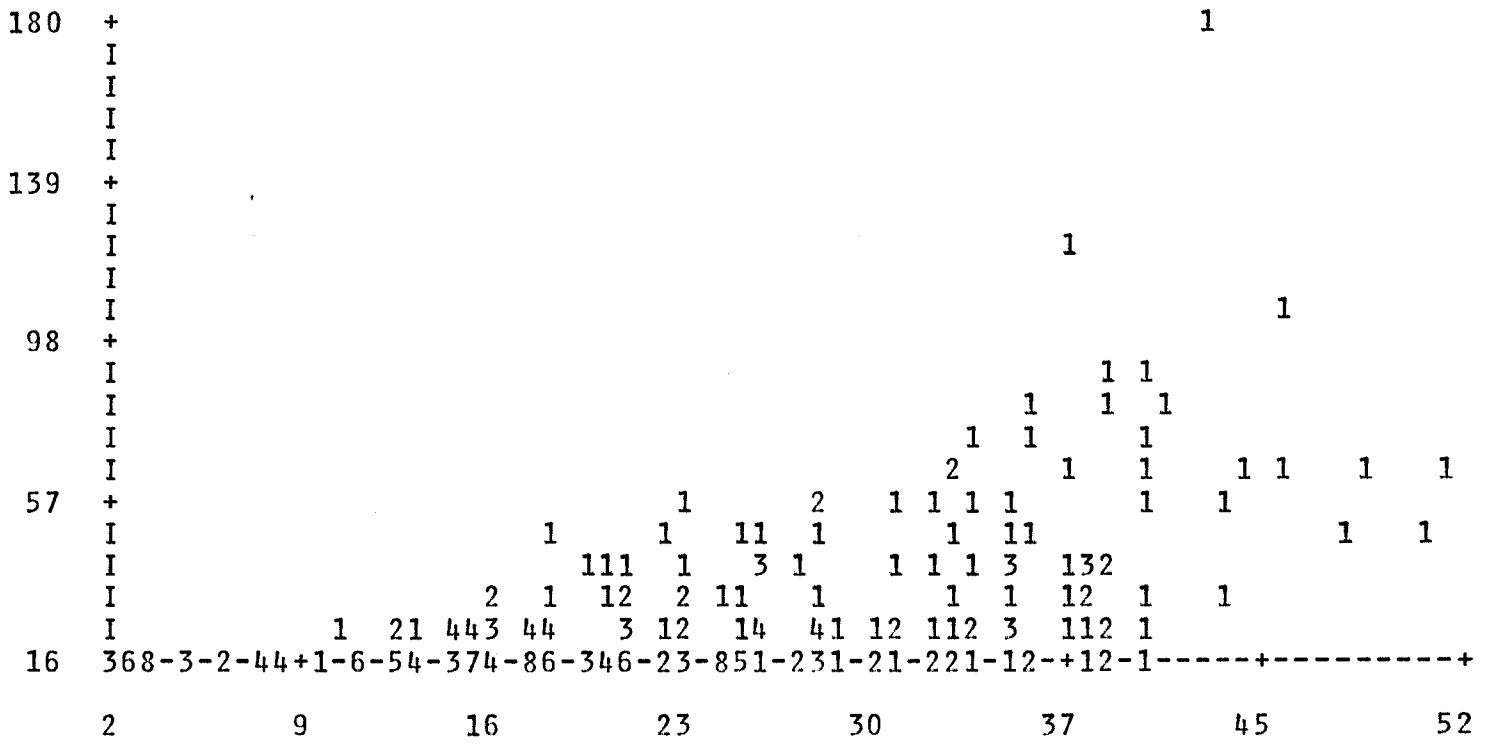
```
                        # OF DATA 257
                   FROM 01/01/74 TO 02/25/74
              REAL TIME FOR  # OF USERS    VS TIME OF DAY.

                   AXIS       MAX        MIN       SCALE
                    X         24          0        2.84
                    Y         52          2        0.41


    52  +                                      2
        I                                      1
        I                                      2  1
        I                                      2  1
        I                        1  1   3      1  3
    39  +                     1   1  1   2      4  5              1
        I                     5   2  2   2      3  1  1          1   1   2  .
        I                     1   2  1   2         2             1   2   2
        I                     2      1   5                       2
        I                  3  5   2  1   2      1  1  1
    27  +                  1  1   1  1   1      2  3  1           1
        I                  2  2   3  2   5      9  2  1
        I  1               1      1  1   1      1  1  8                  1
        1                  3      1  5   2         6  4
        I     3   1           1   3  4   2      1  2  1     1          1   1
    15  +     5                  4  1          4     1              2   1
        1 1                2        1          2     1  5          2       3
        I     1                 1
        I                    1  1          1               2           2   3
        1 1   1
     3  1-2--3----+---------+-------1-+---------+-5--2----+-----2---+----1----+
        0         3         7        10        14        17        21        24

              REAL TIME FOR  # OF USERS    VS TIME OF DAY.

  PAUSE    READY
?
```
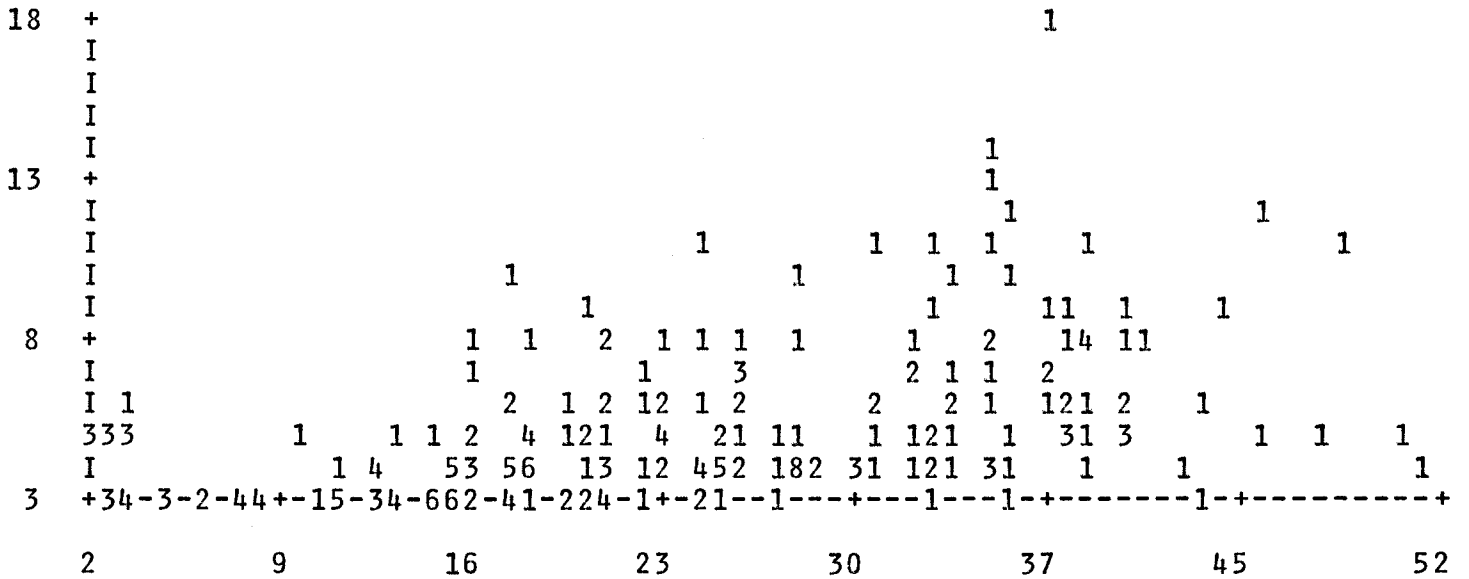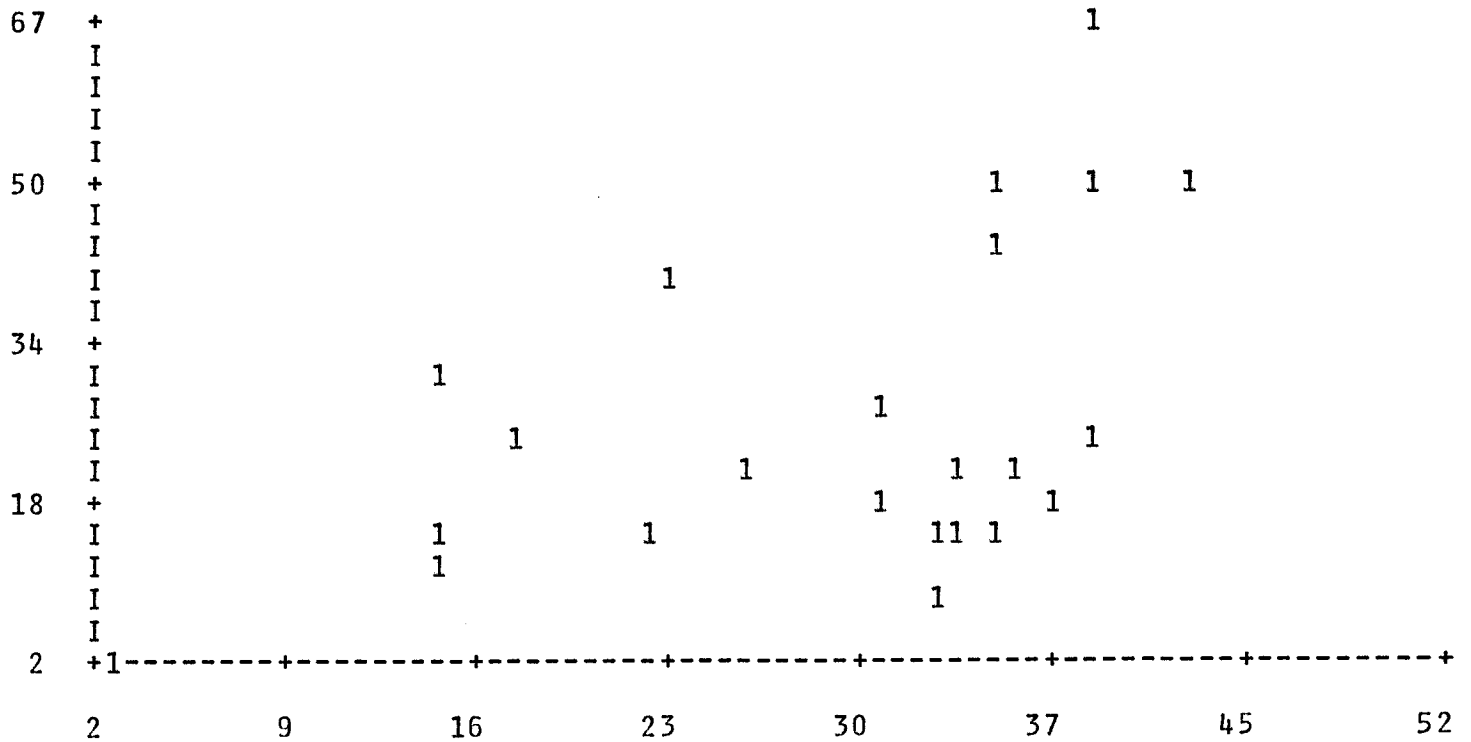
```
                        # OF DATA 257
                  FROM 01/01/74 TO 02/25/74
            REAL TIME FOR 10 INTERACTIONS VS SELECTED DATES.

                  AXIS      MAX      MIN      SCALE
                   X        55        1       1.29
                   Y        92        6       0.24


   92   +                            1                            1
        I
        I
        I
        I
   71   +
        I
        I
        I
        I
        I
   50   + 12                 2                                        21
        I 1         1        1              2        1          12  1      2
        I                                                       13  31     1
        I                              1        1
        I
   29   +  1 1 3 1           3  11                 1              1
        1161 2 L 7  1 121 11       122   2   11    2        2 1 2   1  2
        I                                                    2
        I
        I            1                    2              1
    9   8JDE--5---+49-----E413-1-1-251+-1-----3-+--1-1-1--12--1---1-+5-A35-1--+

        1         8        16        24        31        39        47        55

            REAL TIME FOR 10 INTERACTIONS VS SELECTED DATES.

  PAUSE    READY
```
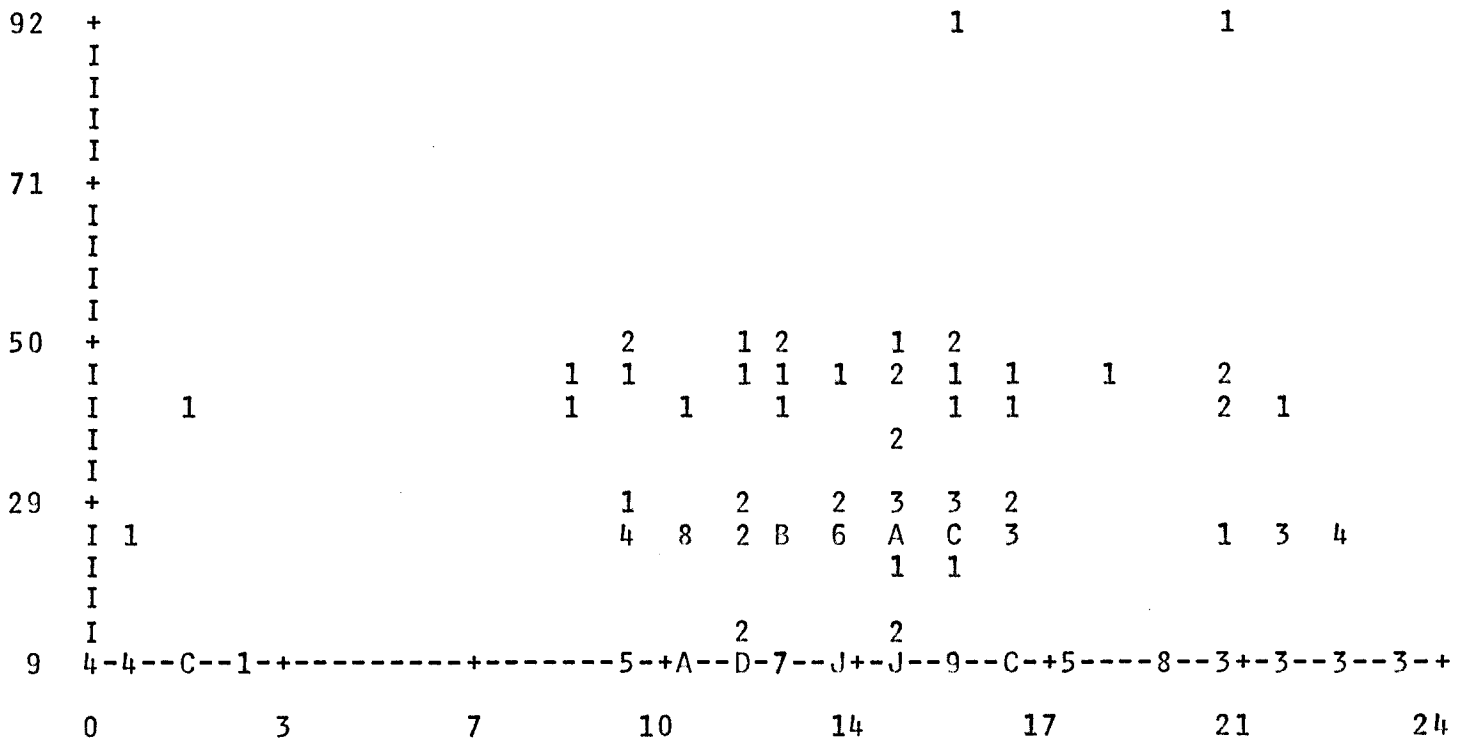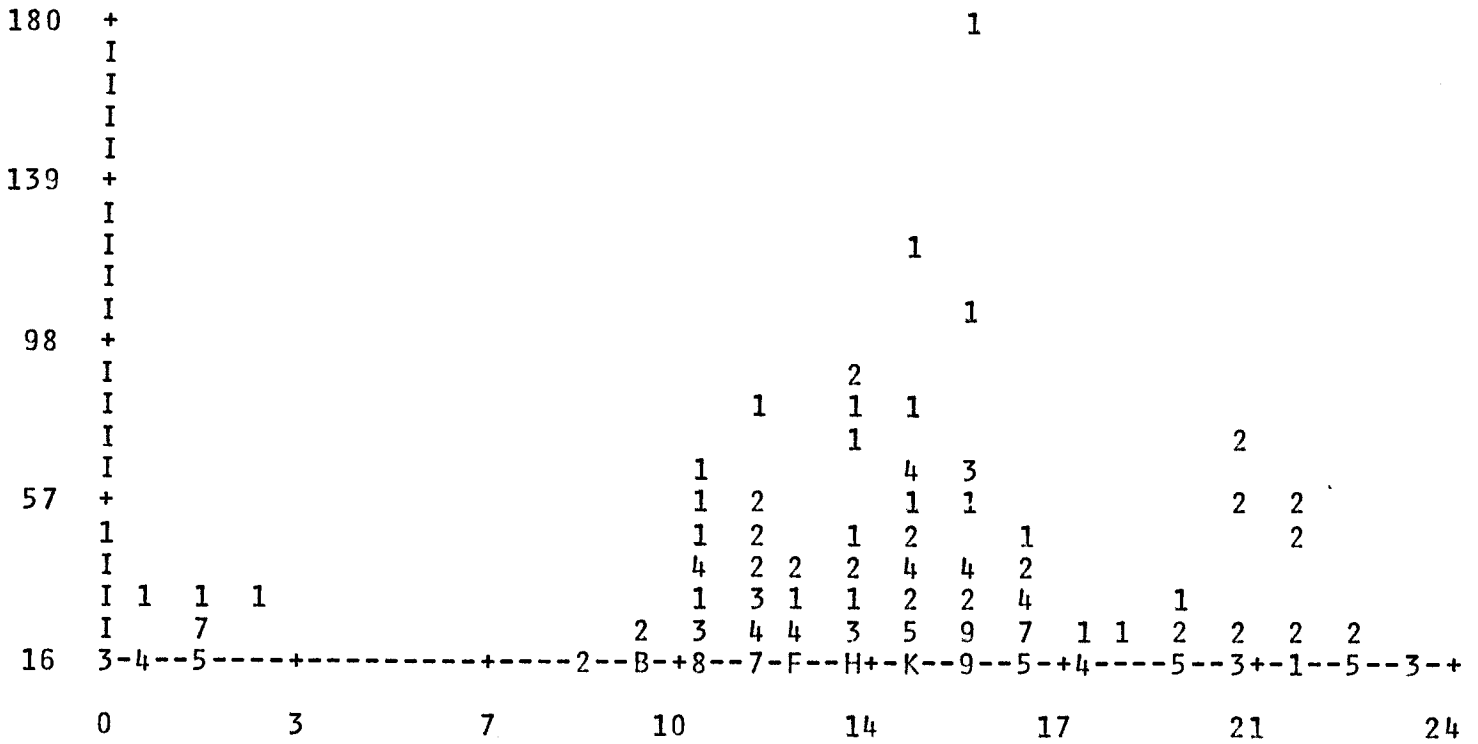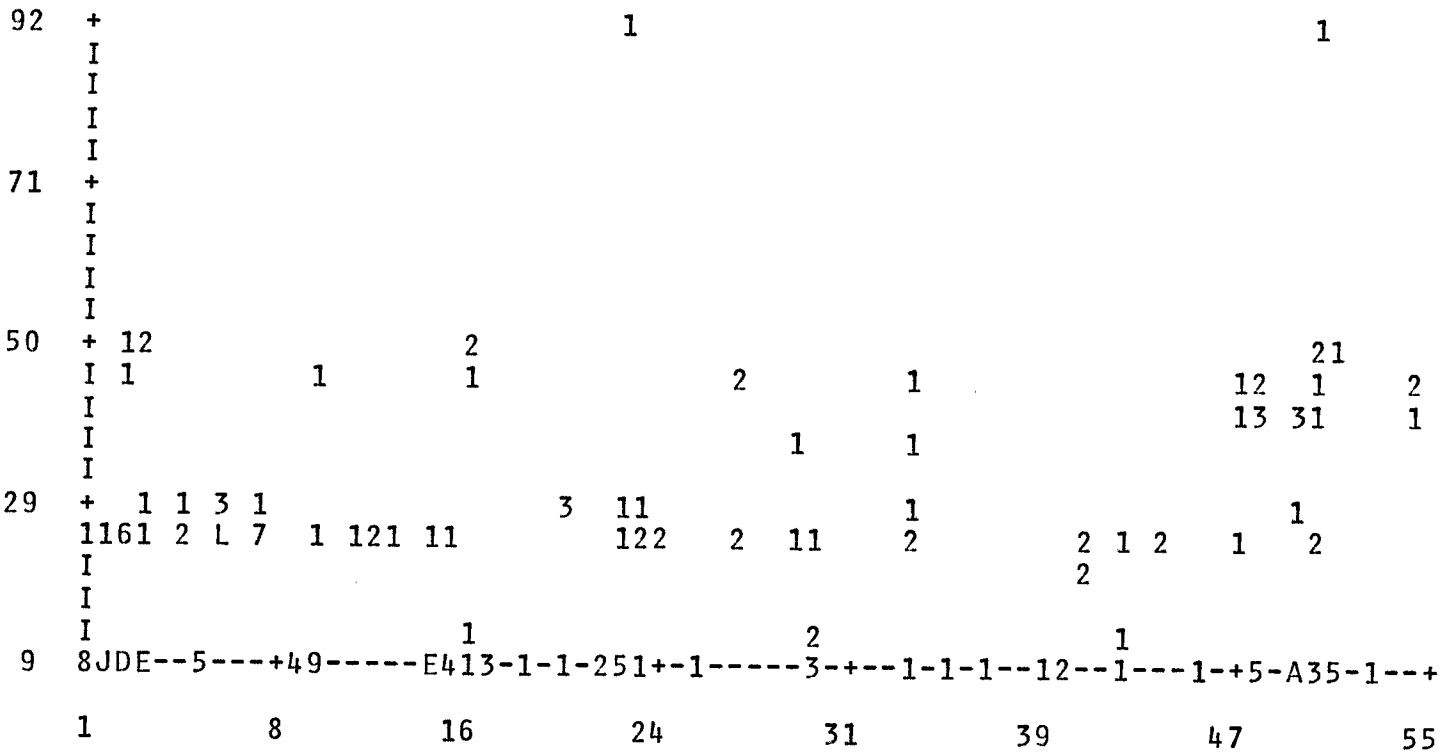
```
                        # OF DATA 257
                  FROM 01/01/74 TO 02/25/74
            REAL TIME FOR  10 SECS OF CPU VS SELECTED DATES.

                  AXIS      MAX      MIN      SCALE
                   X        55        1       1.29
                   Y       180        9       0.12


180    +                                                              1
       I
       I
       I
       I
139    +
       I
       I                         1
       I
       I                         1                         ,
 98    +
       I                                        1                   1
       I                              1                            11
       I                          1                                2
       I                  1          3    3              1
 57    +        1         1 1         1                     2  1 1      1
       I        1 1        1        1    2    2                     1
       I 2      2     1    3  2    2 1 1      2            2         1       1
       I12    1 1  1     11        12              1             1 5
       I326 113 1 12  1  4111      1 1    1  1            3   1 14 543     1
 16    9GFC-24K-2+37--11-623--1-1--311-1-------+----1----122---1---+5-21--1--+

       1           8           16          24          31          39          47          55

              REAL TIME FOR  10 SECS OF CPU VS SELECTED DATES.

   PAUSE    READY
 ?
```
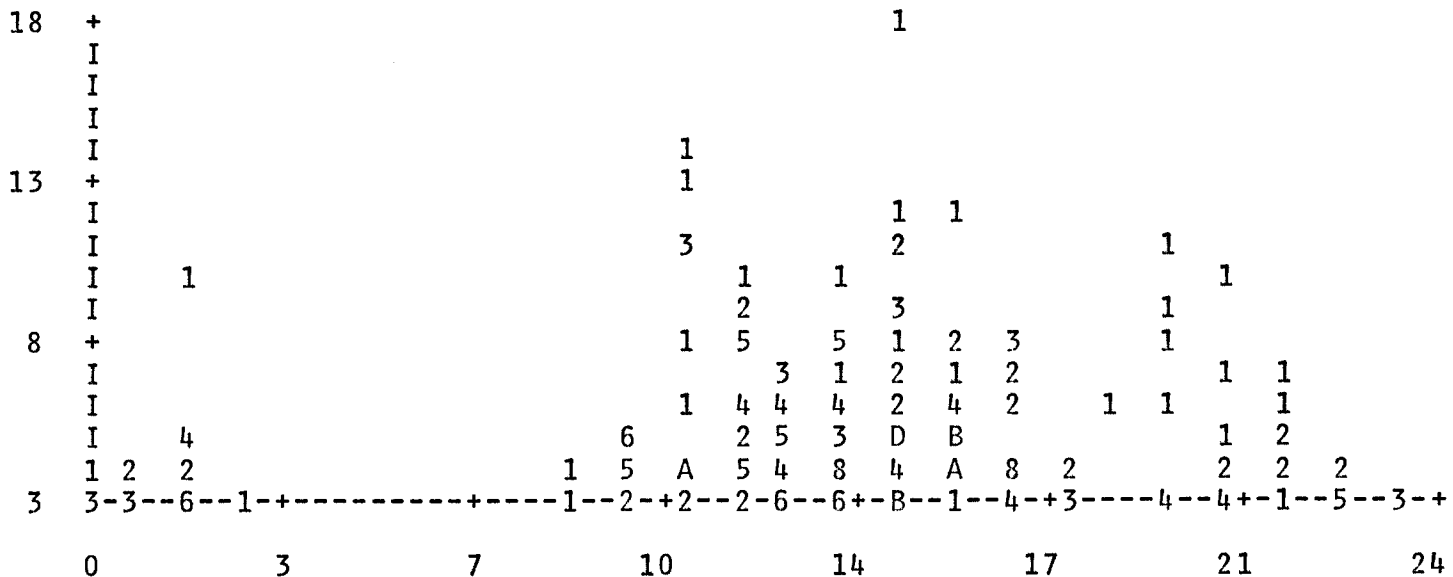
```
                    # ØF DATA 257
              FROM 01/01/74 TØ 02/25/74
        REAL TIME FØR  100 ØF FILE IØ VS SELECTED DATES.

              AXIS      MAX      MIN      SCALE
               X        55        1       1.29
               Y        18        3       1.00


 18    +                            1
       I
       I
       I
       I                     1
 13    +                           1
       I                        1     1
       I                  1         2              1                1        1
       I               1                                                      2
       I               1       1  1                   1        1           1
  8    +12       1 11     2                           1        2 2 1        22
       I       1         2           2               1                  1    21    1
       111     3   1     12        2  1   1   2          1      1 1    2 1 2
       54 4   13 1 12 1 1 213    2       1 1   2     2 1              2  311     2
       I536 1 5 6 16   1  611 1 1  51    1  11    1        1         16 4 2
  3    39F8-24C--+----1--21+---------+------1--+---------+2--------+2-23--1--+

       1         8        16          24          31          39          47          55

            REAL TIME FØR  100 ØF FILE IØ VS SELECTED DATES.

   PAUSE    READY
 ?
```
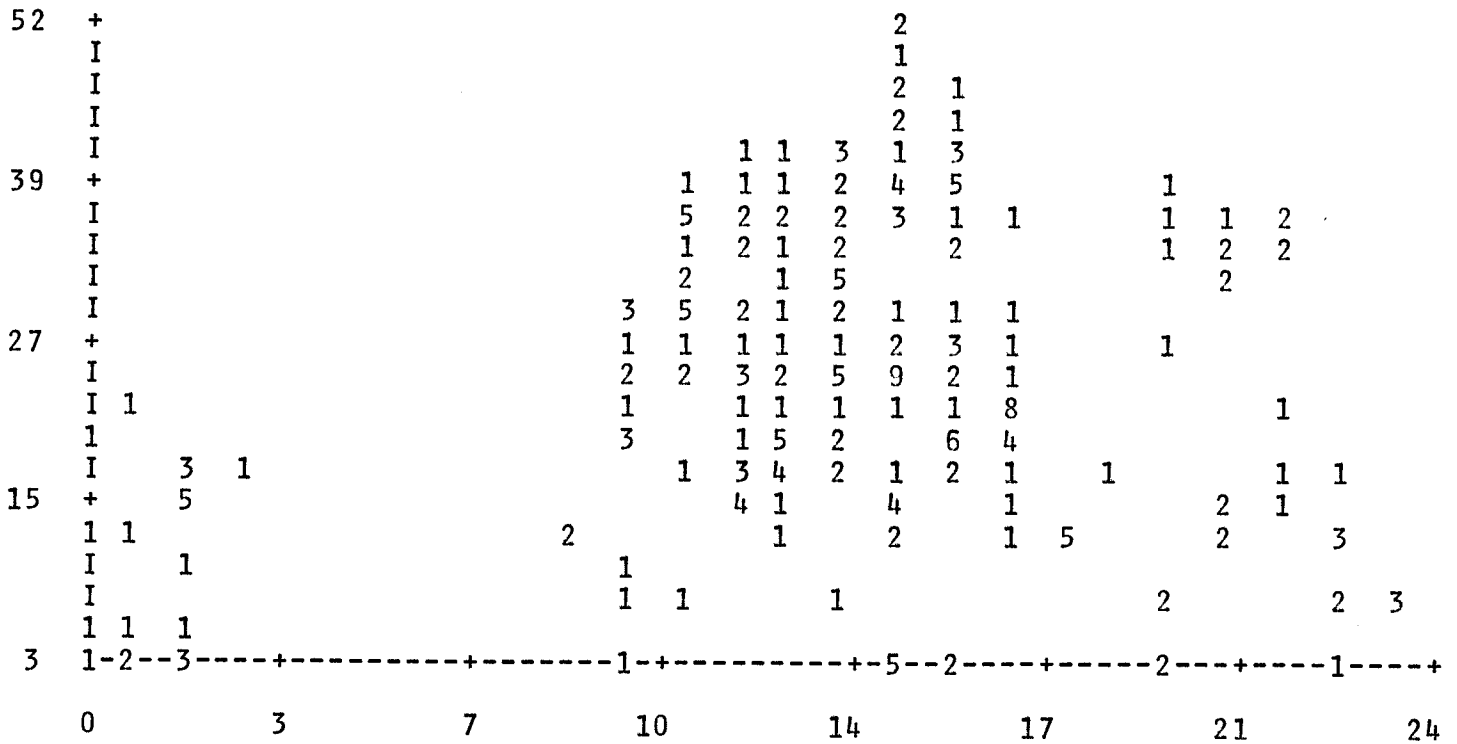
```
                        #  ØF  DATA    22
                  FROM  01/01/74  TØ  02/25/74
            REAL  TIME  FØR    1  COMPILATION  VS  SELECTED  DATES.

                    AXIS       MAX       MIN       SCALE
                      X         55         1        1.29
                      Y         67         0        0.31


   67   +                                                          1
        I
        I
        I
        I
   50   +                                                         12
        I
        I                                                          1
        I                                                                 1
        I
   34   +
        I                                                          1
        I                                                         1
        I                                                          2
        I                                                         21
   18   +                                                         11
        I                                                        111    2
        I                                                          1
        I                                                            1
        I
    2   +---------+---------+---------+-1-------+---------+---------+---------+
        1         8        16        24        31        39        47        55

              REAL  TIME  FØR    1  COMPILATION  VS  SELECTED  DATES.

YSTEM ?
```