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# APPENDIX A

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## FORTRAN PROGRAMS

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program diversifier
*
*****
*   This program makes 100 random draws, that when averaged, equal the   *
*   desired average weekday draw. The file "drawint.txt" has 2 rows and   *
*   144 columns, for the draw (gph) and the integer(# of cases) for a 24   *
*   time period in 10 minute time steps. A new file is written containing  *
*   102 rows and 144 columns, the first two being the draw, integer, and   *
*   next 100, being the statistical draws (all values not set, being zero)  *
*****
*
dimension x(2,144), value(100,144)
real draws, ndraws, rn,irn
*
open(unit=12,file='drawint.txt',status='old')
open(unit=13,file='draws.out',status='unknown')
*
do 10 i=1,2
  read(12,*) (x(i,j),j=1,144)
10  continue
*
do 30 i=1,100
  value(i,j) = 0.0
30  continue
do 60 j=1,144
  draw=x(1,j)
  ndraws=nint(x(2,j))
  do 50 i=1,ndraws
55    continue
    rn=rand()
    rn=rn*100.0
    write(*,*) rn
    irn=nint(rn)
    if (irn.lt.1) go to 55
    value(irn,j) = value(irn,j) + ((draw*100)/ndraws)
50    continue
60  continue
*  write out x(i,j)
  do 70 i=1,2
70    write(13,101) (x(i,j), j=1,144)
*  write out value(i,j)
  do 80 i=1,100
80    write(13,102) (value(i,j), j=1,144)
  stop
101 format (1x,143(f8.3,Tr2),f8.3)

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```
102 format (1x,143(f8.3,Tr2),f8.3)
    end
```

```

program steady periodic loads
*
* *****
* This is a program to read in the water draws (gph) at ten minute
* intervals for a 24 hour period. The data needs to be run three days
* in a row to achieve steady periodic in TRNSYS so of the 100 customer
* loads (100 columns by 144 rows(10 minute water draws)), each column
* needs to be read in three times followed by the next one three times.
* Therefore, this two dimensional array needs to be made into one column
* with 43200 entries (100 customers*144 draws*3 identical days of draws)
* Actually there are more than that, because the actual 10 minute
* draw profile and the integer draw profile, that the 100 random
* customers were made from are the first two columns, so in total,
* there are (102*3*144=) 44064 entries that are being read in.
* (row, column)
* *****
*
dimension x(102,144)
*
open(unit=12,file='draws.out',status='old')
open(unit=13,file='draw1.dat',status='unknown')
do 10 i=1,102
  read(12,*) (x(i,j), j=1,144)
10  continue
  do 15 i=1,2
    do 15 k=1,3
      do 15 j=1,144
        write(13,*) x(i,j)
15    continue
    do 20 i=3,102
      do 20 j=1,144
        write (13,*) x(i,j)
20    continue
  stop
end

```

```

program load91
*
* *****
* This is a program to read in the water draws (gpm) at ten minute
* intervals for a 24 hour period. The data needs to be run three days
* in a row to achieve steady periodic in TRNSYS if working with the peak
* three days. In this case, dynamic annual is 365 for 1991 with 5 weekday
* days then 2 weekend days read in in 10 minute intervals, thus 8760*6=
* 52560 data values being read in. (1991 starts and ends on Tuesday)
* Remember to add one at the top of output
* file for time zero!!
* (row, column)
* *****
*
dimension x(144,1), y(144,1), z(1,52560)
*
open(unit=12,file='weekend.txt',status='old')
open(unit=13,file='weekday.txt',status='old')
open(unit=14,file='91draws.dat',status='unknown')
* Read in 10 minute water draw files
read(12,*) (x(i,1), i=1,144)
read(13,*) (y(i,1), i=1,144)
* Write days, in sequence to datafile
* Write 1/1/91=Tuesday, etc (4 weekdays)
do 10 k=1,4
    write (14,1) (y(i,1), i=1,144)
10    continue
* Write 1/5/91=Saturday, etc (2 weekend days)
do 20 k=1,2
    write (14,1) (x(i,1), i=1,144)
20    continue
* Write the next 51 weeks=> 5 weekdays followed by a weekend
do 50 k=1,51
* 5 Weekdays
    do 30 m=1,5
        write (14,1) (y(i,1), i=1,144)
30        continue
* 2 Weekend Days
    do 40 n=1,2
        write (14,1) (x(i,1), i=1,144)
40        continue
50        continue
* Write December 30th=Monday. Decemeber 31st=Tuesday (2 weekdays)
write (14,1) (y(i,1), i=1,144)
write (14,1) (y(i,1), i=1,144)

```

```
1  format(1x,f6.4)
   stop
   end
```

```

program demand
*
* *****
* This is a program to read in the electric demands from TRNSYS of the
* 100 statistically different customers for the same three days (w/ 2
* extra days at the beginning for the average water draw used to create
* the 100 individual water draws. A zip heater and 4.5 kW element SDHW
* system are compared to test the accuracy of the zip (ERC) heater for
* demand representation using an average hot water draw load. Therefore,
* 44064 rows are read in and are rewritten into 101 columns in which the
* 1-100 columns (of 144 rows 10minute demands for 24 hours) are the
* third of three identical weather days (for steady periodic) and the
* 101 st column the average electrical demand. In the ouput format the electrical
* demands can be read into Kaleidograph and compared graphically.
* (row, column)
* *****
*
dimension x(44064,3),rsum(144)
*
open(unit=12,file='milk3n.txt',status='old')
open(unit=13,file='milk3n.dmd',status='unknown')
do 10 i=1,44064
  read(12,*) (x(i,j), j=1,3)
10  continue
c
do 15 j=1,144
c
  sum = 0.0
c
  do 17 i=3,102
17    sum = sum + x(((3*i-1)*144+j),3)
    rsum(j) = sum/100.0
c
15  continue
    do 20 j=1,144
      write(13,101) (x(((3*i-1)*144+j),3),i=1,102),rsum(j)
20    continue
    stop
101 format (1x,102(f8.3,Tr2),f8.3)
end

```