V.3.3-SAC-PLOT SACRAMENTO TYPE MEAN DAILY FLOW PLOT OPERATION

Identifier: SAC-PLOT

Application: Calibration System programs only

Description: This Operation plots mean daily discharge time series on a monthly basis.

Three types of plot scales are available:

1. arithmetic - units are CMSD
2. semi-log - units are MM over the drainage area
3. modified arithmetic - units are (CMSD/KM2)*100.0

If hydrographs are plotted in English units the units are CFSD, inches and CFSD/MI2.

The user selects the plotting symbol to be used for each time series.

In addition to plotting mean daily discharge time series, the Operation tabulates other daily time series next to the plotted values. The time series tabulated are:

1. the first two daily discharge time series
2. rain melt or precipitation (optional)
3. soil-moisture contents from SAC-SMA Operations - 5 values/day (optional)
4. total runoff from SAC-SMA Operations and the breakdown of the runoff into components - 7 values/day (optional)

This Operation will also tabulate parameters, end of month values of carryover (state variables) and water balance components for the Sacramento soil-moisture accounting and snow model Operations. If requested, this information is tabulated for each month before the daily time series are tabulated and plotted.

At the end of each plot, the monthly runoff volume for each of the discharge time series is computed and tabulated.

Allowable Data Time Intervals: 24 hours

Time Series Used: Time series used in this Operation are as follows:

General Type	Dimn	Units	Use	Required	Data Time Interval	Missing Values Allowed
Mean Daily Discharge	L3	CMSD	I	yes 1/	24	yes
Precipitation (rain + melt)	L	MM	I	no	any	yes
Sacramento model soil moisture storages (data type code SMZC)	L	MM	I	no	24	no
Sacramento model runoff components (data type code ROCL)	L	MM	I	no	24	no

1/ At least one mean daily discharge time series must be input. There is no limit to the total number that can be plotted.

Input Summary: The card input for this Operation is as follows:

Card	Format	Columns	Contents
1	5A4	1-20	Name of flow point being plotted
	I5	21-25	Number of mean daily discharge time series to be plotted
	1X,A4	27-30	Plotting scale to be used (default is arithmetic scale): 'SLOG' = semi-log scale 'MODS' = modified arithmetic scale
	F10.0	31-40	Drainage area in KM2
	F5.0	41-45	Maximum plot ordinate. Arithmetic scale units are CMSD. Default value is 0.3 CMSD/KM2. Modified arithmetic scale units are (CMSD/KM2)*100. Default is 30.0. Maximum plot ordinate is automatically selected for the semi-log scale.
	2X,A3	48-50	Indicates if either rain + melt, soil-moisture storage of runoff component time series are to be tabulated Default is 'NO'. Enter 'YES' if any of these time series are to be tabulated.
	I5	51-55	Number of SAC-SMA Operations for which information is to be tabulated

Card	Format	Columns	Contents
	I5	56-60	Number of SNOW-17 Operations for which information is to be tabulated

Repeat Card 2 for each mean daily discharge time series to be plotted.

2	2X,2A4	3-10	Internal identifier for the mean daily discharge time series
	1X,A4	12-15	Data type code for the daily discharge time series
	8X,3A4	24-35	General information about the time series (e.g., OBSERVED, SIMULATED, ROUTED, etc.)
	4X,A1	40	Plotting symbol to use for the time series

Card 3 needed only if rain + melt, soil-moisture storage of runoff component time series are to be tabulated.

3	2X,2A4	3-10	Internal identifier for the rain + melt time series (blank if no rain + melt time series used)
	1X,A4	12-15	Data type code for the rain + melt time series
	3X,I2	19-20	Time interval in hours for the rain + melt time series
	12X,2A4	33-40	Internal identifier for the runoff component time series (leave blank if no runoff component time series used)
	12X,2A4	53-60	Internal identifier for the soil-moisture storage time series (leave blank if none used)

Card 4 needed only if SAC-SMA Operations are to be tabulated.

4	2X,2A4	3-10	Name of the SAC-SMA Operation for which information is to be tabulated

Repeat Card 4 for each SAC-SMA Operation for which information is to be tabulated.

Card 5 only needed if SNOW-17 Operations are to be tabulated.

5	2X,2A4	3-10	Name of the SNOW-17 Operation for which information is to be tabulated

Repeat Card 5 for each new snow model Operation for which

Card	Format	Columns	Contents

information is to be tabulated.

Sample Input and Output: Sample input is shown in Figure 1. Sample output from the parameter print routine is shown in Figure 2. Sample output from the execution routine is show in Figure 3.

Error and Warning Messages: The error and warning messages generated by this Operation and the corrective action to take when they occur are as follows:

A. Messages that can occur during setup:

1. **ERROR** THE NUMBER OF TIME SERIES TO BE PLOTTED (XXXXX) IS INCORRECT. THIS OPERATION CAN NOT BE EXECUTED.

   Action: The number of time series to be plotted must be greater than zero.

2. **ERROR** THE AREA IS NOT DEFINED.

   Action: Define the drainage area on Card 1.

3. **ERROR** THE MAXIMUM PLOT ORDINATE IS NOT DEFINED AND CANNOT BE COMPUTED.

   Action: Specify the maximum plot ordinate or the drainage area on Card 1.

4. **ERROR** A SAC-SMA OPERATION (NAME=XXXXXXXX) NEEDED FOR THIS PLOT DOES NOT EXIST.

   Action: Check the name of the SAC-SMA Operations entered on Card 4.

5. **ERROR** A SNOW MODEL OPERATION (NAME=XXXXXXXX) NEEDED FOR THIS PLOT DOES NOT EXIST.

   Action: Check the name of the snow model Operations entered on Card 5.

B. Messages that occur during execution: None

Carryover Transfer Rules: This Operation has no carryover.

Punched Card Limitations: This Operation has no punch parameter subroutine because the Operation is for calibration use only.

Figure 1. Sample Card Input For Operation SAC-PLOT

```
                                    - Column -
    5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+
 FR. BROAD-BLANTYRE      2           767. 200.  YES    1    0
   BLANTYRE QME         OBSERVED        +
   BLANTYRE SQME        SIMULATED       *
   BLANTYRE RAIM    6            BLANTYRE
   BLANTYRE
```

Figure 2. Sample Output From Operation SAC-PLOT Print Parameter Routine

```
     PLOT MEAN DAILY FLOWS FOR FR. BROAD-BLANTYRE

          AREA ABOVE FLOW-POINT=    767. KM2

          PLOT SCALE IS ARITHMETIC     MAX. ORDINATE=  2. CMSD

      2 DAILY FLOW TIME SERIES ARE PLOTTED

          T.S. I.D.   DATE TYPE       NAME     PLOT SYMBOL
          BLANTYRE      QME       OBSERVED          +
          BLANTYRE      SQME      SIMULATED         *

     DAILY TOTALS OF THE FOLLOWING TIME SERIES ARE TABULATED ON THE PLOT.

          T.S. I.D.     DATA TYPE     TIME INTERVAL
          BLANTYRE        RAIM          6 HOURS
          BLANTYRE        ROCL         24 HOURS

     PARAMETERS AND CARRYOVERS FOR THE FOLLOWING OPERATIONS ARE TABULATED AT THE TOP OF EACH PLOT.

          OPERATION       NAME       SUMMATIONS INCLUDED
          SAC-SMA       BLANTYRE           YES
```

Figure 3. Sample Output From Operation SAC-PLOT Execution Routine

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SUMMARY OF SAC-SMA OPERATIONS AS OF  2/29/1960  HOUR 24      (STORAGES, CONTENTS, AND SUMS ARE IN MM.)

OP. NAME PXADJ PEADJ UZTWM UZFWM   UZK PCTIM ADIMP  RIVA ZPERC  REXP LZTWM LZFSM LZFPM  LZSK   LZPK PFREE RSERV  SIDE   EFC
BLANTYRE  1.00  1.00   85.   25. 0.300 0.035 0.100 0.100   6.0  1.50  180.  290. 1000. 0.100 0.0050  0.20  0.30  0.0   0.0

CONTENTS OF STORAGES--  UZTWC  UZFWC  LZTWC  LZFSC  LZFPC  ADIMC
           BLANTYRE      85.    0.0   180.   20.7   493.   265.

                          WATER BALANCE COMPONENTS                      BREAKDOWN OF RUNOFF      BREAKDOWN OF EVAPOTRANSPIRATION
          PRECIP    RUNOFF  RECHARGE    ACT-ET   DELTA S  RESIDUAL  IMP  DIR  SUR  INT  SUP  PRM    PE    UZ    LZ ADIMP  RIVA
BLANTYRE   246.7     189.5       0.0      18.9      38.1      -0.0   9.  23.   0.   8.  82.  60.  25.3  16.8   0.1   2.0   0.0

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FEB/1960   MEAN DAILY FLOW PLOT FOR FR. BROAD-BLANTYRE       AREA=    767.0 SQ.KM     UNITS ARE CMSD
                                                                                     PCN=PRECIP. OR RAIN+MELT (MM)
                                                                                     INFW=RUNOFF OR CHANNEL INFLOW (MM)
          NUM.   T.S. I.D.   TYPE      NAME      SYM
            1     BLANTYRE   QME   OBSERVED       +                                                                RUNOFF COMPONENTS
            2     BLANTYRE   SQME  SIMULATED      *                                                                  % OF TOTAL.
                                                                                                                    PRM   IMP   SUR
DAY  PCN   Q(1)   Q(2)          20.0      40.0      60.0      80.0     100.0     120.0     140.0     160.  INFW    SUP   DIR   INT
 1  .000   58.4   53.4  .         .         .      * +.         .         .         .         .         .  4.24  45 55  0  0  0  0
 2  .254   45.7   40.7  .         .         *  +      .         .         .         .         .         .  4.00  48 52  0  0  0  0
 3  .254   39.7   36.3  .         .       * +         .         .         .         .         .         .  3.78  50 50  0  0  0  0
 4  11.2   36.9   34.7  .         .      *+ .         .         .         .         .         .         .  4.88  39 35  8 15  0  3
 5  69.8   82.2   71.5  .         .         .         .     *   .+        .         .         .         .  23.0   9 12 11 30 25 13
 6  .000   120.   117.  .         .         .         .         .         .        *+         .         .  5.64  36 64  0  0  0  0
 7  .000   86.8   86.5  .         .         .         .         .  *      .         .         .         .  5.28  38 62  0  0  0  0
 8  .000   57.3   51.1  .         .         .      *  +.         .         .         .         .         .  4.94  41 59  0  0  0  0
 9  .254   49.6   44.3  .         .         . *  +    .         .         .         .         .         .  4.65  43 57  0  0  0  0
10  71.9   64.7   53.4  .         .         .      *  . +       .         .         .         .         .  18.5  11 16 14 36  8 15
11  .508   105.   110.  .         .         .         .         .         .  + *     .         .         .  6.78  31 62  0  0  0  6
12  .000   88.5   92.1  .         .         .         .         .   + *   .         .         .         .  6.03  35 65  0  0  0  0
13  9.10   65.8   59.5  .         .         .         *  +      .         .         .         .         .  6.83  31 52  5 10  0  2
14  .223   58.4   58.6  .         .         .        *.         .         .         .         .         .  5.55  38 61  0  0  0  0
15  1.05   51.0   49.6  .         .         .    *+   .         .         .         .         .         .  5.33  40 58  1  2  0  0
16  9.83   47.6   47.1  .         .         .   *     .         .         .         .         .         .  6.42  33 44  5 14  0  3
17  3.26   48.2   51.0  .         .         .   +*    .         .         .         .         .         .  5.34  40 53  2  5  0  0
18  27.8   68.6   55.5  .         .         .       * .   +     .         .         .         .         .  10.1  21 30 10 28  0 11
19  .664   73.7   69.5  .         .         .         .     * +   .         .         .         .         .  5.63  39 60  0  1  0  0
20  4.05   55.9   50.8  .         .         .    *  + .         .         .         .         .         .  5.71  38 53  2  6  0  0
21  5.94   51.0   47.6  .         .         .   * +    .         .         .         .         .         .  5.82  37 50  4 10  0  0
22  1.35   49.1   48.4  .         .         .   *+     .         .         .         .         .         .  5.08  42 55  1  1  0  0
23  1.64   45.7   43.4  .         .         . *+      .         .         .         .         .         .  4.84  44 53  1  2  0  0
24  5.54   43.4   41.4  .         .         .*+       .         .         .         .         .         .  5.12  42 45  4  9  0  0
25  18.7   54.2   53.8  .         .         .      *  .         .         .         .         .         .  8.03  27 32  8 23  0  9
26  .808   54.7   54.5  .         .         .      *  .         .         .         .         .         .  4.90  44 55  1  0  0  0
27  .552   48.5   45.0  .         .         . * +     .         .         .         .         .         .  4.61  47 53  0  0  0  0
28  1.15   45.1   41.0  .         .         *  +      .         .         .         .         .         .  4.42  49 50  1  1  0  0
29  .855   42.8   39.3  .         .         *+        .         .         .         .         .         .  4.16  52 48  1  0  0  0

RUNOFF VOLUMES FOR EACH TIME SERIES.
  NUM   T.S. I.D.   TYPE      NAME      VOL(MM)   DEPARTURE FROM NO.1
   1     BLANTYRE   QME   OBSERVED        196.
   2     BLANTYRE   SQME  SIMULATED       186.         -10. MM
```