V.3.3-STAGE-Q STAGE-DISCHARGE CONVERSION OPERATION

Identifier: STAGE-Q

Application: Operational Forecast System programs

Description: This Operation converts stage to discharge or discharge to stage by interpolation within a single valued Rating Curve or extrapolating logarithmically or hydraulically as necessary. The conversions may also be made by employing a dynamic loop Rating Curve.
A complete description of this Operation is in Chapter II.4-STGQ.

The special provisions of this Operation include the following:

1. The Rating Curve to be used must have been defined using DEF-RC (see Chapter V.4.2).

2. The time intervals of the stage and discharge time series must be the same.

3. Missing values are allowed in the input time series.

4. Initial carryover values can be specified by the user. The carryover values consist of the following:

   a. The previous observed or simulated stage (M) prior to the start of the run.

   b. The previous observed or simulated discharge (CMS) prior to the start of the run.

   c. The rate of change (per time interval) in stage or discharge prior to the start of the run.

   d. The number of missing values prior to the start of the run.

The default values of carryover are zeros in which case steady state flow conditions will be assumed at the start of the run.

Allowable Data Time Intervals: 1, 2, 3, 4, 6, 8, 12 and 24 hours

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

General Type	Dimn	Units	Use	Required	Form of Output T.S.	Data Time Interval	Missing Values Allowed
Stage	L	M	I/O	Yes	Replace	Any 1/	Yes 2/
Discharge	L3/T	CMS	O/I	Yes	Replace	Any 1/	Yes 2/

1/ The stage and discharge time series time intervals must be equal.

2/ If the input time series allows missing values then the output time series must also allow missing values.

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

Card	Format	Columns	Contents
1	5A4	1-20	General user supplied heading information on gaging station or forecast point
	2X,2A4	23-30	8-character Rating Curve identifier
	9X,I1	40	Conversion indicator: 1 = convert stage to discharge 2 = convert discharge to stage
	1X,A4	42-45	Enter 'RDCO' to input initial carryover values - default is to set carryover to zero
2	2X,2A4	3-10	Internal identifier for the stage time series
	1X,A4	12-15	Stage time series data type code
	3X,I2	19-20	Data time interval of stage time series
	2X,2A4	23-30	Internal identifier for the discharge time series
	1X,A4	32-35	Discharge time series data type code
	3X,I2	39-40	Data time interval of discharge time series
Card should be used only if columns 42-45 of card 1 is 'RDCO'.			
3	F10.2	1-10	Previous stage (M) prior to start of run
	F10.2	11-20	Previous discharge(CMS) prior to start of run
	F10.2	21-30	Rate of change per time interval in stage (converting discharge to stage) or

Card	Format	Columns	Contents
			discharge (converting stage to discharge) prior to the start of the run
	I10	31-40	Number of missing values immediately prior to the start of the run

Sample Input and Output: Sample input is shown in Figure 1. Sample output from the parameter print and carryover print routines is shown in Figure 2. There is no output from the execution routine.

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** UNEQUAL TIME INTERVALS IN T.S. DATA FOR STAGE-Q OPERATION LOCATION NAME XXXXXXXXXXXXXXXXXXXX THE STAGE T.S. DELTA T IS ** HOURS WHILE THE DISCHARGE T.S. DELTA T IS ** HOURS.

   Action: Check columns 19-20 and 39-40 of card 2. Stage time series interval must equal discharge time series interval.

2. **ERROR** XXXXXXXX STAGE TIME SERIES (ID=XXXXXXXX) HAS DIMENSION OF XXXX WHEN IT MUST HAVE DIMENSION OF L.

   Action: Check columns 12-15 of card 2. Use data type code that has dimension of L.

3. **ERROR** XXXXXXXX STAGE TIME SERIES (ID=XXXXXXXX) HAS UNITS OF XXXX WHEN IT MUST HAVE UNITS OF M.

   Action: Use data type code that has units of M.

4. **ERROR** XXXXXXXX DISCHARGE TIME SERIES (ID=XXXXXXXX) HAS DIMENSION OF XXXX WHEN IT MUST HAVE DIMENSION OF L3/T.

   Action: Check columns 32-35 of card 2. Use data type code that has dimension of L3/T.

5. **ERROR** XXXXXXXX DISCHARGE TIME SERIES (ID=XXXXXXXX) HAS UNITS OF XXXX WHEN IT MUST HAVE UNITS OF CMS.

   Action: Use data type code that has units of CMS.

6. *WARNING* CARRYOVER VALUE FOR PREVIOUS DISCHARGE READ IN BY STAGE-Q OP. FOR LOCATION NAME XXXXXXXXXXXXXXXXXXXXXXX IS .LT. ZERO (=-XXXX.XX). THIS IS NOT ALLOWED. VALUE WILL BE SET TO ZERO.

   Action: Check columns 11-20 of card 3. Make sure zero

previous discharge is acceptable.

7. *WARNING* CARRYOVER VALUE READ IN BY STAGE-Q OP. (LOCATION NAME=XXXXXXXXXXXXXXXXXXX) FOR NUMBER OF MISSING VALUES (=-XXX) IMMEDIATELY PRIOR TO START OF RUN IS .LT. 0. THIS IS NOT ALLOWED. VALUE WILL BE SET TO ZERO.

   Action: Check columns 31-40 of card 3. Make sure carryover data was read in properly.

8. *WARNING* CARRYOVER VALUES READ IN BY STAGE-Q OP. FOR LOCATION NAME XXXXXXXXXXXXXXXXXXX ARE OUT OF ORDER. I.E. THE RATE OF CHANGE IN XXXXXXXX (= XXXXX.XX) IS GREATER THAN THE PREVIOUS XXXXXXXX (= XXXXX.XX). RATE OF CHANGE WILL BE SET TO ZERO.

   Action: Check sequencing of input data for carryover.

Carryover Transfer Rules: The following rules apply to the Operation during the carryover transfer process.

1. If the old carryover values are for stage to discharge conversion and the new carryover values are for discharge to stage conversion, the rate of change in stage per time interval will be set to zero.

2. If the new time series time interval (△Tnew) is not equal to the old time series time interval (△Told):

   a. the new rate of change per time interval is adjusted by multiplying by (△tnew/△Told)

   b the new number of missing values prior to the run start is adjusted by multiplying by (△told/△Tnew)

3. Otherwise carryover transfer does not change the carryover values.

Punched Card Limitations: The punched card formats for this Operation are as follows. The variables shown are all carryover values. No checks are made to determine if quantities are greater or less than the maximum and minimum values.

Parameters or Variables	Punch Format	Maximum Value	Minimum Value	Precision After Decimal Point
Previous Stage	F10.2	9999999.99	-999999.99	hundredths
Previous Discharge	F10.0	999999999.	0.	-
Rate of Change per time interval	F10.2	9999999.99	-999999.99	hundredths

No missing values prior to run start	I10	9999999999	0	-

Figure 1. Sample Card Input For Operation STAGE-Q

```
                                        - Column -
    5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80
----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+
CHARITON              CHTNC            1 RDCO
  CHTNC    STG     1  CHTNC    QIN     1
      4.72       75.     23.77         0
```

Figure 2. Sample Output From Operation STAGE-Q Print Parameter And Print Carryover Routines

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        STAGE TO DISCHARGE CONVERSION FOR CHARITON

                  USING RATING CURVE CHTNC

                       TIME SERIES USED

           CONTENTS     I.D.     TYPE    TIME INTERVAL

             STAGE     CHTNC      STG        1 HOURS
          DISCHARGE    CHTNC      QIN        1 HOURS


          STAGE-Q OPERATION CARRYOVER FOR CHARITON

    PREVIOUS STAGE (M):      4.72   PREVIOUS DISCHARGE (CMS):     75.00
                 RATE OF CHANGE IN DISCHARG:     23.77
        NUMBER OF MISSING VALUES PRIOR TO RUN START:   0.
```