VIII.3.3-RES-J JOINT RESERVOIR REGULATION OPERATION

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Identifier: RES-J

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Operation Number: 58

Developed By: Riverside Technology, inc.

Parameter Array: The FORTRAN identifier used for the parameter array for this Operation is PO. The contents of the PO array are:

Position	Contents
1	Indicator whether permanent RES-J file exists: 0 = no 1 = yes
2	Number of time series used by RES-J Operation
3	Computational time interval in hours
4	Number of CO array elements used by the RES-J Operation
5+5*(I-1)	Identifier for time series I (8 characters) 1/ 2/
7+5*(I-1)	Data type for time series I (4 characters) 1/ 2/
8+5*(I-1)	Data time interval for time series I in hours (4 characters) 1/ 2/
9+5*(I-1)	Contains string 'IN' or 'OU' depending whether time series I is used for input or output respectively (4 characters, right justified) 2/

All data found after PO(4) are contained in character strings. RES-J parses these strings upon extraction from the PO array.

For example:

```
                - Position -
5   6   7   8   9  10  11  12  13  14  15  16
+---+---+---+---+---+---+---+---+---+---+---+
TRIB1   SQIN   6  INRDBPOOL SPEL   6  OU ...
```

where 'TRIB1' is the input time series identifier
'RDBPOOL' is the output time series

Notes:

1/ Time series used in RES-J are not required to be specified in a particular order in the P array.

2/ I denotes the number of the current time series. Time series numbers begin at 1.

Carryover Array: The FORTRAN identifier used for the carryover array is CO. Carryover data in RES-J are represented using a series of
string sets, each set representing the carryover data required for a component or method and an index to the beginning of the next set (if required) in the CO array.

To prepare carryover data, RES-J gathers the required names and values for a component or method and writes them to a character string. This string is appended to the RES-J system-wide carryover character string and indexing internal to carryover is updated. The process is repeated for each component and method requiring carryover until all carryover data is contained in one string.

Extraction of carryover data at the beginning of a model run requires parsing of this carryover string. Identifiers within the carryover data allow RES-J to assign data values to variables within the appropriate Component and Method objects.

Carryover data in the CO array are stored as follows.

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For each Reservoir Component

Position	Contents
I-(I+2)	Keyword 'RESERVOIR' (12 characters) 1/ 3/
(I+3)-(I+5)	Reservoir component identifier (12 characters)
(I+6)	Index (in terms of characters) of the beginning of the next carryover string set - if this is the last string set in the CO array a value of -999 is stored (4 characters) 6/
(I+7)-(I+8)	Reservoir release in units of CMS (8 characters) 4/
(I+9)-(I+10)	Reservoir pool elevation in units of M (8 characters) 4/
(I+11)-(I+12)	Reservoir withdrawal in units of CMS (8 characters) 4/
(I+13)-(I+14)	Total inflow to the reservoir in units of CMS (8 characters) 4/
(I+15)-(I+16)	Reservoir release at the end of the previous time step in units of CMS (8 characters) 4/
(I+17)-(I+18)	Reservoir pool elevation at the end of the previous time step in units of M (8 characters) 4/
(I+19)-(I+20)	Reservoir withdrawal at the end of the previous

Position	Contents
	time step in units of CMS (8 characters) 4/
(I+21)-(I+22)	Total inflow to the Reservoir at the end of the previous time step in units of CMS (8 characters) 4/
(I+23)-(I+42)	10 occurrences of the place holding string '*FUTURE*' 8/

For example:

```
                        - Position -
1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
RESERVOIR   RDBAILEY     17210.000001025.0002.50000012.00000 ...
9.9800001024.9902.51000012.02000*FUTURE**FUTURE* ...
```

where 'RDBAILEY' is the reservoir identifier
'172' is beginning of next string set
'10.00000' is the reservoir release in units of CMS
'1025.000' is the pool elevation in units of M
'2.500000' is the reservoir withdrawal in units of CMS
'12.00000' is the total inflow to the reservoir in units of CMS
'9.980000' is the previous reservoir release
'1024.990' is the previous pool elevation
'2.510000' is the previous withdrawal
'12.02000' is the previous total inflow
'*FUTURE*' is a place holder available for any future requirements

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For each Node

Position	Contents
J-(J+2)	Keyword 'NODE' (12 characters) 1/ 3/
(J+3)-(J+5)	Node component identifier (12 characters)
(J+6)	Index (in terms of characters) of the beginning of the next carryover string set - if this is the last string set in the CO array a value of -999 is stored (4 characters) 6/
(J+7)-(J+8)	Node discharge in units of CMS (8 characters) 4/
(J+9)-(J+10)	Previous node discharge in units of CMS (8 characters) 4/
(J+11)-(J+12)	Node inflow in units of CMS (8 characters) 4/
(J+13)-(J+14)	Previous node inflow in units of CMS (8

Position	Contents
	characters) 4/
(J+15)-(J+16)	Node diversion in units of CMS (8 characters) 4/
(J+17)-(J+18)	Previous node diversion in units of CMS (8 characters) 4/
(J+19)-(J+20)	1 occurrence of the place holding string '*FUTURE*' 9/

For example:

```
                          - Position -
   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19    +---+-
--+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---
   NODE        LOGANGAGE     5210.1000012.00000100.100092.0000090.0000080.00000 ...
   *FUTURE*
```

where 'LOGANGAGE' is the node identifier
'52' is beginning of next string set
'10.10000' is the discharge at the node in units of CMS
'12.00000' is the previous discharge at the node in units of CMS
'100.1000' is the inflow to the node in units of CMS
'92.00000' is the previous inflow to the node in units of CMS
'90.00000' is the diversion from the node in units of CMS
'80.00000' is the previous diversion from the node in units of CMS
'*FUTURE*' is a place holder available for any future requirements

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For each ADJUST method

Position	Contents
L-(L+2)	Keyword 'METHOD' (12 characters) 11/ 3/
(L+3)-(L+5)	Method identifier (12 characters)
(L+6)	Index (in terms of characters) of the beginning of the next carryover string set - if this is the last string set in the CO array a value of -999 is stored (4 characters) 6/
(L+7)-(L+9)	Method type 'ADJUST' padded with following blanks (12 characters)
(L+10)-(L+12)	Owning Reservoir identifier (12 characters)
(L+13)	Time step counter for the blend at the next time step for which blending is required (4 characters) 12/

(L+14)-(L+17)	2 occurrences of the place holding string '*FUTURE*' 14/

For example:

```
                  - Position -
1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---
METHOD      ADJUST_X      72ADJUST      RES_A          2*FUTURE**FUTURE*
```

where 'SETREL_X' is the method identifier
'72' is beginning of next string set
'ADJUST' is the method type
'RES_A' is the identifier for the reservoir owning the method
'2' is the next step of the time series blend to be calculated
'*FUTURE*' is a place holder available for any future requirements

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For each CALCINFLOW method

Position	Contents
L-(L+2)	Keyword 'METHOD' (12 characters) 11/ 3/
(L+3)-(L+5)	Method identifier (12 characters)
(L+6)	Index (in terms of characters) of the beginning of the next carryover string set - if this is the last string set in the CO array a value of -999 is stored (4 characters) 6/
(L+7)-(L+9)	Method type 'CALCINFLOW' padded with following blanks (12 characters)
(L+10)-(L+12)	Owning Reservoir identifier (12 characters)
(K+13)-(K+16)	Remaining volume to be applied to inflow calculation next time step, in units of CM (8 characters) 4/
(K+17)-(K+18)	Inflow to the owning reservoir, calculated by the method in units of CMS (8 characters) 4/
(K+19)-(K+20)	Observed pool elevation of the owning reservoir, taken from the method time series, in units of M (8 characters) 4/
(K+21)-(K+22)	Observed release from the owning reservoir, taken from the method time series (or -999.000 if one does not exist), in units of CMS (8 characters) 4/

(K+23)-(K+24)	Observed withdrawal from the owning reservoir, taken from the method time series (or -999.000 if one does not exist), in units of CMS (8 characters) 4/
(L+25)-(L+44)	10 occurrences of the place holding string '*FUTURE*' 17/

For example:

```
                    - Position -
1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---
METHOD      MASSBALINFL 1104CALCINFLOW  JORDAN          35149.00000
2200.000155.0000125.0000-999.000*FUTURE*
```

where 'MASSBALINFL' is the method identifier
'1104' is beginning of next string set
'CALCINFLOW' is the method type
'JORDAN' is the identifier for the reservoir owning the method
'35149.00000' is the remaining volume
'2200.000' is the calculated inflow
'155.0000' is the observed pool elevation
'125.0000' is the observed release
'-999.000' is the observed withdrawal (MISSING value)
'*FUTURE*' is a place holder available for any future requirements

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For each LAGK method

Position	Contents
K-(K+2)	Keyword 'REACH' (12 characters) 2/ 3/
(K+3)-(K+5)	Reach Component identifier with which the LAGK method is associated (12 characters)
(K+6)	Index (in terms of characters) of the beginning of the next carryover string set - if this is the last string set in the CO array a value of -999 is stored (4 characters) 6/
(K+7)-(K+9)	LAGK Method identifier (12 characters)
(L+10)-(L+12)	Method type 'LAGK' padded with following blanks (12 characters)
(K+13)-(K+14)	Inflow to the reach in units of CMS (8 characters) 4/ 5/
(K+14)-(K+15)	Inflow to the reach in units of CMS (8 characters)

4/ 5/

(K+16)-(K+17)	If necessary additional inflow to the reach - this may repeat for as many times as necessary (8 characters each) 4/ 5/
(K+13+2Y)-(K+14+2Y)	Outflow from the reach in units of CMS (8 characters) 4/ 7/
(K+15+2Y)-(K+16+2Y)	Storage in the reach, required for K calculations (8 characters) 4/ 7/
(K+17+2Y)-(K+18+2Y)	Lagged inflow value in units of CMS (8 characters) 4/ 7/
(K+19+2Y)-(K+21+2Y)	3 and 1/2 occurrences of the place holding string '*FUTURE*' 15/

For example:

```
                              - Position -
   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19   +---+-
--+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---
   REACH       LOGAN_REACH  104LOGAN_LAG   LAGK        12.0000010.0000011.00000 ...
   3333.00012.50000*FUTURE**FUTRESERVOIR ...
```

where 'LOGAN_REACH' is the reach identifier
'104' is beginning of next string set starting with 'RESERVOIR'
'12.00000' is the inflow to the reach Lag/simulation_timestep time steps ago in units of CMS
'10.00000' is the latest inflow to the reach in units of CMS
'11.00000' is the outflow from the reach in units of CMS
'3333.000' is the storage in the reach
'12.50000' is the lagged inflow in units of CMS
'*FUTURE*' is a place holder available for any future requirements
'RESERVOIR' is the beginning of the next string set

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For each LOOKUP3 method

Position	Contents
M-(M+2)	Keyword 'METHOD' (12 characters) 11/ 3/
(M+3)-(M+5)	Method identifier (12 characters)
(M+6)	Index (in terms of characters) of the beginning of the next carryover string set - if this is the last string set in the CO array a value of -999 is stored (4 characters) 6/

(M+7)-(M+9)	Method type 'LOOKUP3' padded (as necessary) with following blanks (12 characters)
(M+10)-(M+12)	Owning Reservoir identifier (12 characters)
(M+13)	Time step counter for the time series blend at the next time step for which blending is required (4 characters) 12/
(M+14)	Time step counter for the table blend at the next time step for which blending is required (4 characters) 13/
(M+15)	Column index for last lookup table access (4 characters) 13/
(M+16)	Row index for last lookup table access (4 characters) 13/
(M+17)-(M+18)	Last value defined by the method in units of CMS (8 characters) 4/ 5/
(M+19)-(M+18)	5 occurrences of the place holding string '*FUTURE*' 14/

For example:

```
                    - Position -
1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+— ...
METHOD      TESTDIVERS   106LOOKUP3     RES_A          2   5   6   345.30
000*FUTURE**FUTURE**FUTURE**FUTURE**FUTURE*
```

where	'TESTDIVERS'	is the method identifier
	'106'	is beginning of next string set
	'LOOKUP3'	is the method type
	'RES_A'	is the identifier for the reservoir owning the method
	'2'	is the next step of the time series blend to be calculated
	'5'	is the next step of the table blend to be calculated
	'6'	is the column from which the last value from the lookup table was found
	'3'	is the row from which the last value from the lookup table was found
	'45.30000'	is the last value calculated by the method
	'*FUTURE*'	is a place holder available for any future requirements

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For each SETRELEASE and SETELEVATION method

Position	Contents
L-(L+2)	Keyword 'METHOD' (12 characters) 11/ 3/
(L+3)-(L+5)	Method identifier (12 characters)
(L+6)	Index (in terms of characters) of the beginning of the next carryover string set - if this is the last string set in the CO array a value of -999 is stored (4 characters) 6/
(L+7)-(L+9)	Method type 'SETRELEASE' or 'SETELEVATION' padded (as necessary) with following blanks (12 characters)
(L+10)-(L+12)	Owning Reservoir identifier (12 characters)
(L+13)	Time step counter for the time series blend at the next time step for which blending is required (4 characters) 12/
(L+14)	Time step counter for the table blend at the next time step for which blending is required (4 characters) 13/
(L+15)-(L+18)	2 occurrences of the place holding string '*FUTURE*' 14/

For example:

```
                    - Position -
1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---
METHOD      SETREL_X      76SETRELEASE  RES_A          2   5*FUTURE**FUTURE*
```

where 'SETREL_X' is the method identifier
'76' is beginning of next string set
'SETRELEASE' is the method type
'RES_A' is the identifier for the reservoir owning the method
'2' is the next step of the time series blend to be calculated
'5' is the next step of the table blend to be calculated
'*FUTURE*' is a place holder available for any future requirements

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For each SETWITHDRAW method

Position	Contents
L-(L+2)	Keyword 'METHOD' (12 characters) 11/ 3/

Position	Contents
(L+3)-(L+5)	Method identifier (12 characters)
(L+6)	Index (in terms of characters) of the beginning of the next carryover string set - if this is the last string set in the CO array a value of -999 is stored (4 characters) 6/
(L+7)-(L+9)	Method type 'SETRELEASE' padded with following blanks (12 characters)
(L+10)-(L+12)	Owning Reservoir identifier (12 characters)
(L+13)	Time step counter for the time series blend at the next time step for which blending is required (4 characters) 12/
(L+14)	Time step counter for the table blend at the next time step for which blending is required (4 characters) 13/
(L+15)-(L+16)	Value to be used as INITIALTRANSFER. 4/
(L+17)-(L+18)	1 occurrences of the place holding string '*FUTURE*' 16/

For example:

```
                    - Position -
1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---
METHOD      SETREL_X      76SETWITHDRAW RES_A          2   512.50000*FUTURE*
```

where 'SETREL_X' is the method identifier
'76' is beginning of next string set
'SETRELEASE' is the method type
'RES_A' is the identifier for the reservoir owning the method
'2' is the next step of the time series blend to be calculated
'5' is the next step of the table blend to be calculated
'12.00000' The INITIALTRANSFER value
'*FUTURE*' is a place holder available for any future requirements

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For each SPILLWAY method

Position	Contents
L-(L+2)	Keyword 'METHOD' (12 characters) 11/ 3/

Position	Contents
(L+3)-(L+5)	Method identifier (12 characters)
(L+6)	Index (in terms of characters) of the beginning of the next carryover string set - if this is the last string set in the CO array a value of -999 is stored (4 characters) 6/
(L+7)-(L+9)	Method type 'SPILLWAY' padded with following blanks (12 characters)
(L+10)-(L+12)	Owning Reservoir identifier (12 characters)
(L+13)-(L+14)	Value to be used as INITIALSPILL. 4/
(L+15)-(L+34)	10 occurrences of the place holding string '*FUTURE*' 17/

For example:

```
                      - Position -
1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---
METHOD      SPILL_X       76SPILLWAY    RES_A       45.03000*FUTURE**FUTURE*...
```

where	'SPILL_X'	is the method identifier
	'76'	is beginning of next string set
	'SPILLWAY'	is the method type
	'RES_A'	is the identifier for the reservoir owning the method
	'45.03000'	the INITIALSPILL value
	'*FUTURE*'	is a place holder available for any future requirements

Notes:

1/ I is the position within the CO array of the beginning of the keyword 'RESERVOIR'.

2/ K is the position within the CO array of the beginning of the keyword 'REACH'.

3/ String sets for components and methods can be stored in any order.

4/ Values are double precision variables (8-byte), written as strings of 8 characters

5/ There are (reach_lag/computational_time_interval)+1 inflow values. At least 2 values stored in CO array locations (J+10)-(J-13) are required. The first value in CO array locations (J+10)-(J+11) represents inflow to the reach (reach_lag/computational_time_interval) time steps ago. The last value represents the inflow to the reach at the time of carryover save. Intermediate values (if required) represent inflow to the reach at each time step between those described above.

6/ The index value begins with 0 at the first keyword in the CO array and counts characters within the entire string.

7/ Y represents the number of flows required.

8/ 20 words (80 characters).

9/ 10 words (40 characters).

10/ J is the position within the CO array of the beginning of the keyword 'NODE'.

11/ L is the position within the CO array of the beginning of the keyword 'METHOD' (for the current string set).

12/ If no blend is defined, the value will be '1'. If no blend has begun, the value will be '1'. If the time series blend has completed, the value will be one more than the parameterized blend value (right justified).

13/ If no blend is defined, the value will be '1'. If no blend has begun, the value will also be '1' (right justified).

14/ 4 words (16 characters).

15/ 7 words (28 characters).

16/ 2 words (8 characters).

17/ 10 words (80 characters).

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Subroutines Names and Functions: Subroutines associated with this Operation are:

Routine	Function
PIN58	Input and store values in the PO and CO arrays
PRP58	Print information in PO array
PRC58	Print information in CO array
EX58	Execute the Operation
COX58	Transfer carryover as necessary during a segment redefinition
PUC58	Write card images that can be read by PIN58
TAB58	Make entries into the Operation Table

Routine	Function

Routines PIN58, PRP58, PRC58, COX58 and PUC58 have the standard argument lists for these routines as given in Section VIII.4.3.

SUBROUTINE EX58 (P0,C0,D,TO)

Function: This is the execution routine for Operation RES-J.

Argument List

Variable	Input/ Output	Type	Dimension	Description
PO	Input	R*4	Variable	Contains parameters and other information
CO	Both	R*4	Variable	Contains carryover values
D	Both	R*4	Variable	Contains time series data
TO	Input	R*4	Variable	Contains Operation Table data

Type 'R*4' indicates 4-byte REAL.

SUBROUTINE TAB58 (T,LEFT,IUSET,NXT,LPO,PO,LCO,TS,MTS,LWORK,IDT)

Function: This is the Operations Table entry routine Operation RES-J.

Argument List: The arguments for this routine are similar to the arguments for the Operations Table entry routine for other Operations. A description of the arguments is contained in Section VIII.4.2-TAB.

Operations Table Array: The contents of the TO array are:

Position	Contents
1	The number of this Operation
2	The location in the T array of the next Operation to be executed
3	The location of the parameter array for this Operation in the P array
4	The location of the carryover array for this Operation in the C array
5+I	Location of time series I data in the D array corresponds to I time series in P array

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