

VIII.3.3-API-CONT CONTINUOUS INCREMENTAL API OPERATION

Identifier: API-CONT

Operation Number: 24

Parameter Array: The FORTRAN identifier used for the parameter array for this Operation is PO. Parameter values that are unit dependent are stored in English units. The contents of the PO array are:

<u>Position</u>	<u>Contents</u>
1	Operation version number (integer)
2-6	Description of location where the Operation is applied
7	Computational time interval in hours (integer) - time interval of precipitation and runoff time series
8-9	Rain+melt time series identifier
10	Rain+melt time series data type code
11-12	Total runoff time series identifier: blank = not output
13	Total runoff time series data type code: blank = not output
14	First quadrant variability option (integer): 0 = use week number 1 = use AEI 2 = use ATI
15	Location of potential evaporation (PE) time series information in the PO array: <u>1</u> / 0 = no PE data (when PO(14).NE.1)
16	Location of areal extent of snow cover time series information in the PO array: <u>2</u> / 0 = no areal extent of snow data
17	Location of water-equivalent time series information in the PO array: <u>2</u> / 0 = no water-equivalent data
18	Location of air temperature time series information in the PO array: <u>3</u> / 0 = no air temperature data (when PO(14).NE.2 and PO(24).EQ.0)
19	Location of storm runoff time series information in the PO array: <u>4</u> /

<u>Position</u>	<u>Contents</u>
	0 = storm runoff time series not generated
20	Location of groundwater runoff or discharge time series information in the PO array: <u>5</u> / 0 = groundwater runoff or discharge time series not generated
21	Location of Antecedent Index time series information in the PO array: <u>2</u> / 0 = Antecedent Index time series not generated
22	Location of API time series information in the PO array: <u>2</u> / 0 = API time series not generated
23	Control for printing detailed output: <u>6</u> / 0 = do not print >0 = operational program - print output calibration programs - location in PO array of when to print detailed output
24	Location in PO array of frozen ground information: <u>7</u> / 0 = frozen ground not considered
25	Antecedent Index adjustment (zero for calibration)
26	Location of surface runoff parameters in the PO array <u>8</u> /
27	Location of groundwater runoff parameters in the PO array <u>9</u> /
28	Number of values in the PO array (integer)
29	Location of API contents time series information in the PO array: <u>2</u> / 0 = API contents time series not generated
30	Location of AEI (PO(14).EQ.1) or ATI (PO(14).EQ.2) time series information in the PO array: <u>2</u> / 0 = AEI or ATI time series not generated
31	Location of percent surface runoff time series information in the PO array: <u>4</u> / 0 = percent surface runoff time series not generated
32	Location of water balance sums in the PO array: <u>10</u> / 0 = sums not stored
33-35	Unused

Notes:

- 1/ The following 4 array positions are used for the PE time series information are:
 - o identifier (2 values)
 - o data type code
 - o PEADJ

- 2/ The following 4 array positions are used for areal extent of snow cover, water-equivalent, Antecedent Index, API, API contents, AEI and ATI time series information:
 - o identifier (2 values)
 - o data type code
 - o data time interval

- 3/ The following 7 array positions are used for Air temperature information:
 - o air temperature time series identifier (2 values)
 - o data type code
 - o time interval
 - o elevation difference
 - o maximum lapse rate
 - o minimum lapse rate

- 4/ The following 3 array positions are used for storm runoff and percent surface runoff:
 - o identifier (2 values)
 - o data type code

- 5/ The following 4 array positions are used for the groundwater runoff and drainage area information:
 - o identifier (2 values)
 - o data type code)
 - o drainage area (only used if data type code has discharge units)

- 6/ The following 7 array positions are used for print control:
 - o period currently being checked (maximum of 3)
 - o for each period:
 - month since December 1899 to start
 - month since December 1899 to stop

- 7/ The following 11 array positions are used for Frozen ground information:

<u>Position</u>	<u>Contents</u>
1-2	FI time series identifier (blank if not output)
3	FI data type code (blank if not output)
4	FI time interval (zero if not output)
5-6	FEI time series identifier (blank if not output)
7	FEI data type code (blank if not output)
8	FEI time interval (zero if not output)
9	FICR
10	CF
11	CP
12	CSOIL
13	CSNOW
14	GHC

15 CT
16 EFA

8/ The order of surface runoff parameters is:

1. PXADJ
2. APIK
3. AIXW
4. AIXD
5. CW
6. CD
7. SMIX
8. CS
9. FRSX
10. APIX
11. PEX
12. PEN
13. EFC
14. PIMPV
15. RIVA
16. RVAI
17. APIKS (if the Operation version number is 2)

If PO(14)=0:

18. WKW
19. WKD

If PO(14)=1:

18. AEIK
19. AEIX
20. AEIN

If PO(14)=2:

18. ATIR
19. ATIX
20. ATIN

Values in positions 18-20 are located in positions 17-19 if the Operation version number is 1.

9/ The order of the groundwater runoff parameters is:

1. BFPK
2. BFIK
3. BFIM
4. AICR
5. CG

10/ The following 5 array positions are used for Water balance sums:

- o Precipitation or rain + melt (IN)
- o Total runoff (IN)
- o Impervious runoff (IN)
- o Surface runoff (IN)
- o Baseflow runoff (IN)

Carryover Array: The FORTRAN identifier for the carryover array is CO. The contents of the CO array are:

<u>Position</u>	<u>Contents</u>
1	API
2	SMI
3	BFSC
4	BFI
5	First quadrant index: = 0.0 if PO(14)=0 = AEI if PO(14)=1 = ATI if PO(14)=2
6	Frost index (FI): = 32.0 if PO(24)=0
7	Frost efficiency index (FEI): = 0.0 if PO(24)=0

Subroutine Names and Functions:

<u>Routine</u>	<u>Function</u>
PIN24	Read values, makes checks and stores values in the PO and CO arrays
TAB24	Make entries into the Operations Table
PRP24	Print information stored in the PO array
PRC24	Print information stored in the CO array
EX24	Executes the Operation
APIC24	Execute the surface runoff portion of the Operation for one time interval
WEEK24	Compute distance of current week between wet and dry weeks
INDX24	Update API and SMI values
FRZE24	Compute the frost index
BASF24	Execute the baseflow portion of the Operation for one time interval
PUC24	Generate card images based on the contents of the PO and CO arrays
TSV24	Obtain time series identifiers and time intervals for the PUC24 subroutine
COX24	Perform carryover transfer

Routines PIN24, PRP24, PRC24, PUC24 and COX24 have the standard argument lists as described in Section VIII.4.3.

SUBROUTINE EX24 (PO,CO,PTS,RTS,PETS,SCTS,WETS,TATS,RSTS,RGTS,AITS,
APITS,FITS,APICTS,AEITS,ATITS,FEITS,FRSTS)

Function: This is the execution control subroutine for the API-CONT Operation.

Argument List:

<u>Argument</u>	<u>Input/ Output</u>	<u>Type</u>	<u>Dimension</u>	<u>Description</u>
PO	Input	R*4	Variable	Contains parameters, options and time series information
CO	Input	R*4	6	Contains carryover
PTS	Input	R*4	Variable	Precipitation data (MM)
RTS	Output	R*4	Variable	Total runoff values (MM)
PETS	Input	R*4	Variable	Potential Evaporation data (MM)
SCTS	Input	R*4	Variable	Areal snow cover data (decimal fraction)
WETS	Input	R*4	Variable	Water-equivalent data (MM)
TATS	Input	R*4	Variable	Air temperature data (DEGC)
RSTS	Output	R*4	Variable	Storm runoff values (MM)
RGTS	Output	R*4	Variable	Ground water runoff values (MM) or groundwater discharge (CMS)
AITS	Output	R*4	Variable	Antecedent Index values (MM)
APITS	Output	R*4	Variable	API values (MM)
FITS	Output	R*4	Variable	Frost index values (DEGC)
APICTS	Output	R*4	Variable	API contents (MM)
AEITS	Output	R*4	Variable	AEI (MM)
ATITS	Output	R*4	Variable	ATI (DEGC)
FEITS	Output	R*4	Variable	FEI (decimal fraction)
FRSTS	Output	R*4	Variable	Percent surface runoff (decimal fraction)

SUBROUTINE APIC24 (P,STORM,PFRS,AI,GWRO,R,PE,AESC,TA,TAVG,WE, AIADJ
 KHR,IMO,IDA,IHR,IVOPT,IFRZE,LWE,LSC,IPRINT,IOUT,
 ITP,IBUG)

Function: Executes the surface runoff portion of the API-CONT
 Operation for one time interval. Also calls the groundwater portion
 of the model.

Argument List:

<u>Argument</u>	<u>Input/ Output</u>	<u>Type</u>	<u>Dimension</u>	<u>Description</u>
P	Input	R*4	1	Precipitation/rain+melt (IN)
STORM	Output	R*4	1	Storm runoff (IN)
PFRS	Output	R*4	1	Percent surface runoff (decimal fraction)
AI	Output	R*4	1	Antecedent Index (IN)
GWRO	Output	R*4	1	Groundwater runoff (IN)
R	Output	R*4	1	Total runoff (IN)
PE	Input	R*4	1	Daily potential evaporation (IN)
AESC	Input	R*4	1	Areal extent of snow cover (decimal fraction)
TA	Input	R*4	1	Air temperature (DEGF)
TAVG	Input	R*4	1	Daily average air temperature (DEGF)
WE	Input	R*4	1	Water-equivalent (IN)
AIADJ	Input	R*4	1	Antecedent Index adjustment (IN)
KHR	Input	I*4	1	Current hour within the hydrologic day (internal clock - hydrologic day runs from 1 to 24 hours internally)
IMO	Input	I*4	1	Month - external clock
IDA	Input	I*4	1	Day - external clock
IHR	Input	I*4	1	Hour - external clock
IVOPT	Input	I*4	1	First quadrant variation option: 0 = use week of year 1 = use AEI (potential

<u>Argument</u>	<u>Input/ Output</u>	<u>Type</u>	<u>Dimension</u>	<u>Description</u>
				evaporation data available) 2 = use ATI (average daily air temperature data available)
IFRZE	Input	I*4	1	Frozen ground control: 0 = do not consider frozen ground 1 = do frozen ground computations (air temperature data available)
LWE	Input	I*4	1	Water-equivalent data indicator: 0 = data not available > 0 = data are available
LSC	Input	I*4	1	Areal snow cover data indicator: 0 = data not available > 0 = data are available
IPRINT	Input	I*4	1	Print indicator: 0 = no detailed display 1 = print detailed display values (header printed outside APIC24)
IOUT	Input	I*4	1	Unit number for printer output
ITP	Input	I*4	1	Time interval (hours)
IBUG	Input	I*4	1	Debug flag: 0 = no debug output 1 = print debug output

SUBROUTINE BASF24 (P,SMR,AI,RS,RG,GWIN,DT)

Function: Executes the groundwater runoff portion of the API-CONT Operation for one time interval.

Argument List:

<u>Argument</u>	<u>Input/ Output</u>	<u>Type</u>	<u>Dimension</u>	<u>Description</u>
P	Input	R*4	1	Precipitation (IN)
SMR	Input	R*4	1	Surface moisture ratio (i.e., contents divided by capacity)
AI	Input	R*4	1	Final antecedent Index (IN)
RS	Input	R*4	1	Surface runoff (IN)
RG	Output	R*4	1	Groundwater runoff (IN)
GWIN	Output	R*4	1	Groundwater inflow (IN)
DT	Input	R*4	1	Time interval (decimal fraction of a day)

Subroutine TAB24 (TO,LEFT,IUSET,NXT,LPO,PO,LCO,TS MTS,LWORK,IDT)

Function: This is the Operations table entry subroutine for the API-CONT Operation.

Argument List: The arguments for this subroutine are similar to the arguments for the Operations Table entry subroutines 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:

<u>Position</u>	<u>Contents</u>
1	Operation number
2	Location in the T array of the next Operation to be executed
3	Location of the PO array within the P array
4	Location of the CO array within the C array
5	Location of precipitation data in the D array
6	Location to put total runoff values in the D array
7	Location of potential evaporation data in the D array (zero if not used)
8	Location of areal snow cover data in the D array (zero if not used)
9	Location of water-equivalent data in the D array (zero if not used)
10	Location of air temperature data in the D array (zero if not used)
11	Location to put storm runoff values in the D array (zero if not used)
12	Location to put groundwater runoff or discharge values in the D array (zero if not used)
13	Location to put Antecedent Index values in the D array (zero if not used)
14	Location to put API values in the D array (zero if not used)
15	Location to put frost index values in the D array (zero if not used)

<u>Position</u>	<u>Contents</u>
16	Location to put API contents values in the D array (zero if not used)
17	Location to put AEI values in the D array (zero if not used)
18	Location to put ATI values in the D array (zero if not used)
19	Location to put FEI values in the D array (zero if not used)
20	Location to put percent surface runoff values in the D array (zero if not used)