

V.3.2 FORECAST COMPONENT OPERATIONS

This Section summarizes the Operations available for use in the Forecast Component.

A detailed description of each Operation is in Section V.3.3.

Available Operations

The currently available Operations are:

<u>Identifier</u>	<u>Description</u>	<u>System</u> <u>1/</u>
ADD/SUB	Add or subtract time series	BOTH
ADJUST-H	Adjust stage	FCST
ADJUST-Q	Adjust simulated discharge	BOTH
ADJUST-T	Adjust tide	FCST
API-CIN	OHRFC API rainfall-runoff model	BOTH
API-CONT	Continuous API model	BOTH
API-HAR	MARFC API rainfall-runoff model	BOTH
API-HAR2	MARFC API rainfall-runoff model #2	BOTH
API-HFD	NERFC API rainfall-runoff model	BOTH
API-MKC	MBRFC API rainfall-runoff model	BOTH
API-SLC	CBRFC API rainfall-runoff model	BOTH
ASSIM	End of Operations to be re-executed by Assimilator Operation	FCST
BASEFLOW	Baseflow simulation	BOTH
BEGASSIM	Beginning of Operations to be re-executed by Assimilator Operation	FCST
CHANGE-T	Change time series data time interval	BOTH
CHANLEAK	Conceptual channel loss model	<u>2/</u>
CHANLOSS	Channel loss	BOTH
CLEAR-TS	Clear time series	BOTH
CONS_USE	Consumptive use model	BOTH
DELTA-TS	Rate of change of time series	BOTH
DHM-OP	Distributed hydrologic model	BOTH
DWOPER	Dynamic wave routing	BOTH
FFG	Flash Flood Guidance	FCST
FLDWAV	Generalized flood wave routing	BOTH
GLACIER	Glacier routing model	BOTH
INSQPLOT	Instantaneous discharge plot	BOTH
LAG/K	Lag and K routing	BOTH
LAY-COEF	Layered coefficient routing	BOTH
LIST-FTW	Fort Worth tabular time series display	BOTH
LIST-MSP	Minneapolis tabular runoff display	BOTH <u>2/</u>
LOOKUP	2 variable table lookup	BOTH
LOOKUP3	3 variable table lookup	BOTH
MEAN-Q	Mean discharge computation	BOTH
MERGE-TS	Merge time series	BOTH

MULT/DIV	Multiply or divide time series	BOTH	
MUSKROUT	Muskingum routing	BOTH	
NOMSNG	No missing value time series	BOTH	
PEAKFLOW	Peak flow comparison	CALB	
PLOT-TS	Plot time series	BOTH	
PLOT-TUL	Tulsa time series list and plot	BOTH	
REDO-UHG	Reduced order unit hydrograph		<u>3/</u>
RES-J	Joint reservoir regulation model	BOTH	
RES-SNGL	Single reservoir regulation model	BOTH	
RSNWELEV	Rain-snow elevation computation	BOTH	
SAC-PLOT	Sacramento type mean daily flow plot	CALB	
SAC-SMA	Sacramento soil moisture accounting model	BOTH	
SARROUTE	SSARR channel routing	BOTH	
SET-TS	Set time series values	BOTH	
SNOW-17	Snow accumulation and ablation model	BOTH	
SNOW-43	State-space snow accumulation and ablation model	BOTH	
SS_SAC	State-space Sacramento model	FCST	
SSARRESV	SSARR reservoir regulation	FCST	
STAGE-Q	Stage-discharge conversion	BOTH	
STAGEREV	Stage review	FCST	
STAT-QME	Mean daily discharges statistical summary	CALB	
SUMPOINT	Time series summing point	BOTH	
SWB-NILE	Simple water balance model	BOTH	
TATUM	Tatum routing	BOTH	
TIDEREV	Tide balance review	FCST	
UNIT-HG	Unit hydrograph	BOTH	
WATERBAL	Water balance summary	CALB	
WEIGH-TS	Weight time series	BOTH	
WY-PLOT	Water year mean daily flow plot	CALB	
XIN-SMA	Xinjiang soil-moisture accounting model	BOTH	

Notes:

1/ CALB = Calibration System only
FCST = Forecast System only
BOTH = Calibration and Forecast Systems

2/ under development

3/ not included in current programs

Description by Operation Type

<u>Identifier</u>	<u>Name</u>	<u>Description</u>
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Hydrometeorological Operations:

RSNWELEV	Rain-snow elevation	Computes the elevation that separates rain and snow using freezing level and/or air
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temperature data

Snow Accumulation and Ablation Operations:

SNOW-17	HYDRO-17 snow model	Snow accumulation and ablation model - uses air temperature as the only index to energy exchange
SNOW-43	NWS-43 snow model	State-space version of the SNOW-17 model

Rainfall-Runoff Operations:

API-CIN	OHRFC API model	Antecedent Precipitation Index (API) rainfall-runoff procedure used by the Ohio RFC
API-CONT	Continuous API model	Continuous, incremental Antecedent Precipitation Index (API) rainfall-runoff model - generates both surface and baseflow runoff
API-HAR	MARFC API model	Antecedent Precipitation Index (API) rainfall-runoff procedure used by the Middle Atlantic RFC
API-HAR2	MARFC API model	Revised version of the API rainfall-runoff procedure used by the Middle Atlantic RFC
API-HFD	NERFC API model	Antecedent Precipitation Index rainfall-runoff procedure used by the Northeast RFC
API-MKC	MBRFC API model	Antecedent Precipitation Index (API) rainfall-runoff procedure used by the Central Region
API-SLC	CBRFC API model	Antecedent Precipitation Index (API) rainfall-runoff procedure used in portions of the Colorado Basin RFC area
ASSIM/ BEGASSIM	Assimilator	Updates rainfall/runoff model states
SAC-SMA	Sacramento soil	Soil moisture accounting portion moisture accounting of the Sacramento Model
SS_SAC	Sacramento soil	State-space version of the soil

	moisture accounting	moisture accounting portion of the Sacramento Model
SWB-NILE	Simple Water Balance	Based on the Water Balance component of the Nile Forecast System developed by the Technology Transfer Center of OH
XIN-SMA	Xinjiang soil moisture accounting	Soil moisture accounting portion of the Xinjiang Model used in China

Temporal Distribution of Runoff (Convert Runoff to Discharge) Operations:

UNIT-HG	Unit hydrograph	Generates an instantaneous discharge hydrograph from runoff values by using a unit hydrograph
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Operations Accounting for Channel Losses or Gains:

CHANLOSS	Channel loss	Accounts for losses or gains of water as a result of flow through the channel bottom and evaporation from the stream surface - channel bottom losses or gains are specified as a constant or as a percentage of the discharge and can vary seasonally
CONS_USE	Consumptive Use	Accounts for the impact of surface water irrigation on streamflow

Baseflow Generation Operations:

BASEFLOW	Baseflow generation	Generates the baseflow contribution using a constant baseflow, baseflow that recesses at a constant rate or baseflow that recesses at a variable rate - for use with API-type rainfall-runoff models
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Operations that Perform Basic Arithmetic Manipulations of Time Series Data:

ADD/SUB	Add or subtract time	Adds or subtracts one time series series from another - data time intervals of the time series do not have to be the same
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CHANGE-T	Change time series data time interval	Changes a time series with a of a given data time interval to a time series with a larger or smaller data time interval - also converts a mean daily time series to an instantaneous time series with a smaller data time interval
CLEAR-TS	Clear time series	Sets all values in a given time series to zero
DELTA-TS	Rate of Change of series	Computes rate of change in time values in a time series (i.e., the difference between consecutive values) - used primarily to compute change in reservoir storage from a storage time series
LOOKUP	Table lookup - 2 variables	Generates a time series from another time series and a table that defines the relationship between the 2 variables
LOOKUP3	Table lookup - 3 variables	Generates a time series from other time series and a table that defines the relationship between the 3 variables
MEAN-Q	Computation of mean discharge	Computes mean discharge from instantaneous discharges for a specified data time interval (normal use is to compute mean daily discharge)
MERGE-TS	Merge time series	Merges data from multiple time series based on a priority order specified by the user
MULT/DIV	Multiply or divide time series	Multiplies two time series together or divides one time series by the other
NOMSNG	No missing value	Generates a time series with no time series missing values from a time series with missing values
SET-TS	Set time series values	Sets all of the values in a time series to the specified value
SUMPOINT	Summing point	Computes a summed or mean time

series at the beginning and end of the time increment

WEIGH-TS Weight time series Applies weighting factors to an unlimited number of input time series to produce a weighted output time series

Channel Routing Operations:

ADJUST-T Tide Adjustment Applies maximum and minimum tide balances to a predicted time series

DWOPER Dynamic wave routing Routes flow using a dynamic wave model based on the complete one-dimensional St. Venant equations - features are included to handle a variety of conditions found on natural river systems

FLDWAV Flood wave routing Generalized flood routine model

GLACIER AKRFC Glacier Routing Routes runoff through a glacial system

LAG/K Lag and K routing Routes flow using the Lag K method - Lag and K values can be constant or variable

LAY-COEF Layered coefficient routing Routes flow using the layered coefficient method - this is the method used in the Sacramento Model

MUSKROUT Muskingum routing Routes flow using the Muskingum method with constant values for the routing coefficients

SARROUTE SSARR routing Routes flows using the SSARR method

TATUM Tatum routing Routes flow using the Tatum coefficient routing procedure

TIDEREV Tide Balance Review Creates and displays maximum and minimum tide balances for the period between STARTRUN and ENDRUN

Stage-Discharge Conversion Operations:

STAGE-Q	Stage-discharge conversion	Converts stage to discharge and vice-versa using a single valued rating curve with either a log-log or hydraulic extension - also can use a dynamic model when there is a loop rating caused by changing discharge
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Reservoir Operations:

RES-J	Joint reservoir regulation	Simulates the operation of a single or a system of reservoirs
RES-SNGL	Single reservoir regulation	Simulates the operation of a single reservoir under various modes of regulation
SSARRESV	SSARR reservoir regulation	Routes streamflows through lake storage and reservoirs under free flow or controlled flow modes

Operations to Plot Daily Discharge for Calibration Programs:

SAC-PLOT	Sacramento-type mean daily flow plot	Similar to the WY-PLOT Operation except plots on a monthly basis - tabulates information from the SAC-SMA and SNOW-17 Operations
WY-PLOT	Water year mean daily flow plot	Plots an unlimited number of daily discharge time series on a water year basis - different plot scales can be used and Sacramento soil moisture accounting variables can be tabulated on the plot

Statistical Summary Operations for Calibration Programs:

PEAKFLOW	Peak Flow Display	Produces a table and summary statistics of the observed and corresponding simulated instantaneous peak discharges
STAT-QME	Statistical summary - mean daily discharge	Computes a variety of statistics to compare simulated and observed mean daily discharge on a yearly and total run basis

Flow Adjustment Operations:

ADJUST-Q	Adjust simulated discharge	Adjusts simulated flow to match observed values and blends
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between last observed value and future simulated discharges

General Plot Operations:

PLOT-TS	Plot time series	Generates up to 6 plots which all use the same time scale - a variable number of time series can be included on each plot
PLOT-TUL	ABRFC operational plot	Plots an unlimited number of time series all with the same units and data time interval - also tabulates values for up to 8 time series

Instantaneous Discharge Plot Operations:

INSQPLOT	Instantaneous discharge plot	Plots an unlimited number of instantaneous discharge time series - runoff and rain+melt can be tabulated along the time scale
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Tabular Displays:

LIST-FTW	WGRFC tabular operational display	Tabulates data from a variety of time series - the data time interval and the portion of the run which is tabulated can vary from one time series to another
LIST-MSP	NCRFC tabulation API display	Tabulates time series and other information associated with an API type rainfall-runoff Operation
WATERBAL	Water balance summary	Tabulates moisture states, runoff components and water balance components for subareas and watersheds

Forecast Guidance Information:

FFG	Flash flood guidance	Computes points defining the current rainfall-runoff relationship given snow and soil moisture conditions - used to compute the amount of rain needed to cause flash flooding on small streams
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