



**Technical Documentation Version 5.1**

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# **Run Control**

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**C A D S W E S**

**Center for Advanced Decision Support for Water and Environmental Systems**

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# Run Control

The **Run Control** dialog controls the execution of a run, as well as providing the interface for selecting the solution type, timestep, and run times.

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## 1. Controllers

There are three basic solution techniques, or controllers: Simulation, Rulebased Simulation, and Optimization. Rulebased Simulation and Optimization both require the construction of a Simulation model; therefore, all models need a basic simulation component. For this reason, the **Simulation** controller is the default selection when the **Run Control** dialog is first opened. To select a different controller, click on the controller option menu to view the other controller choices.

A large number of slots are associated with each controller. When an object is created, it is initialized with the slots belonging to the selected controller. When a new controller is selected after the objects have been constructed, the original slots remain in memory and new slots are allocated for the new controller. This situation may leave many unnecessary slots which affect memory and model size. When building the initial simulation model, the **Simulation** controller must be selected.

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## 2. Controller Specific Parameters

Each controller has specific parameters which are set through an extension of the **Run Control** dialog. The additional dialog is invoked by pressing the **View** ▸ <Controller> **Run Parameters** button.

### 2.1 Simulation Run Parameters

**Max Iterations(EngrObj Slots):** This value represents the maximum number of times a slot can be reset or recalculated on a given timestep.

**Series Extension Increment:** RiverWare allocates space for the entire run length of each series. If, during the run, timesteps beyond the run are given values, RiverWare has to extend the series and copy over all the existing values, because RiverWare requires that the series values be stored in contiguous memory. This is a time consuming operation, so it is in the users' interest to avoid this operation. Thus, this parameter allows the users to allocate a little extra space if they know that their models will be solving for timesteps beyond the end of the run. This is particularly important where reach routing causes timesteps beyond then end of the run to acquire values. For example, if a reach has a routing

coefficient vector of 40 elements, the series extension increment should be at least 40. A second example is if the model solves into the future throughout a defined forecast period. Set the Series Extension Increment equal to the forecast period as that many timestep will be required at the end of the run.

**Water Quality:** Also in this dialog, Water Quality calculations may be enabled and configured. This is described in the water quality documentation (contact [riverware-support@colorado.edu](mailto:riverware-support@colorado.edu) for assistance)

## 2.2 Rulebased Simulation Run Parameters

**Max Iterations(EngrObj Slots):** represents the maximum number of times a slot can be reset or recalculated on a given timestep.

**Series Extension Increment:** RiverWare allocates space for the entire run length of each series. If, during the run, timesteps beyond the run are given values, RiverWare has to extend the series and copy over all the existing values, because RiverWare requires that the series values be stored in contiguous memory. This is a time consuming operation, so it is in the users' interest to avoid this operation. Thus, this parameter allows the users to allocate a little extra space if they know that their models will be solving for timesteps beyond the end of the run. This is particularly important where reach routing causes timesteps beyond then end of the run to acquire values. For example, if a reach has a routing coefficient vector of 40 elements, the series extension increment should be at least 40. A second example is if the model solves into the future throughout a defined forecast period. Set the Series Extension Increment equal to the forecast period as that many timestep will be required at the end of the run.

**Water Quality:** Also in this dialog, Water Quality calculations may be enabled and configured. This is described in the water quality documentation [HERE \(WaterQuality.pdf, Section 1.\)](#)

**Enable Rules Model Run Analysis:** This checkmark allows the user to collect information for the Model Run Analysis dialog. It is recommended to leave this option checked.

## 2.3 Accounting

If Accounting is enabled, the following parameters are added to either the Simulation or Rulebased Simulation parameters described above:

**Max Iterations (Account Slots):** This parameters represents the maximum number of times an account slots can be reset or recalculated.

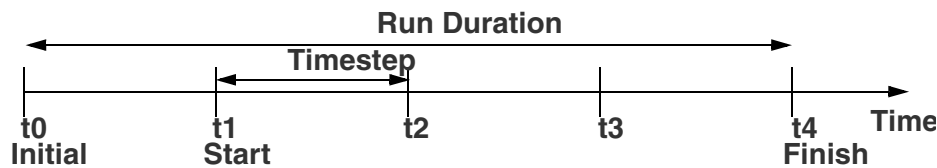
**No Supply Slot Convergence Checking:** This parameter indicates that supply slots should not check for convergence when setting values.

### 3. Timestep

Many different timesteps are available for simulation. The currently selected timestep is shown on the timestep option menu which is directly beneath the controller option menu. When the **Run Control** dialog is invoked on an empty workspace, it has the default timestep value of **6 Hour**. You must select the desired timestep before building a model. This facilitates data entry by initializing new objects to the desired run times.

### 4. Run Times

The initial time, end time, and duration of the run are set through text fields on the **Run Control** panel. RiverWare's time management system requires that times for data and for the run be given in actual time (hour, day, month and year), rather than relative time, as is seen in many other modeling systems. The runtime terms are defined by the following diagram:





The **Initial** time is the time at which the simulation begins and the beginning of the first timestep. Initial condition data are required at this timestep. Solutions are reported at the end of each timestep. The **Start** time is the end of the first timestep and is the first time at which output is given. The **Finish** time is the end of the last timestep of the run. The **Timesteps** field contains the number of timesteps in the run. For 1, 6, or 12 hour timesteps, the time of day is displayed. RiverWare denotes midnight as 24:00 hours instead of 0:00 in the next day. For all other timesteps, the time of day is not displayed.

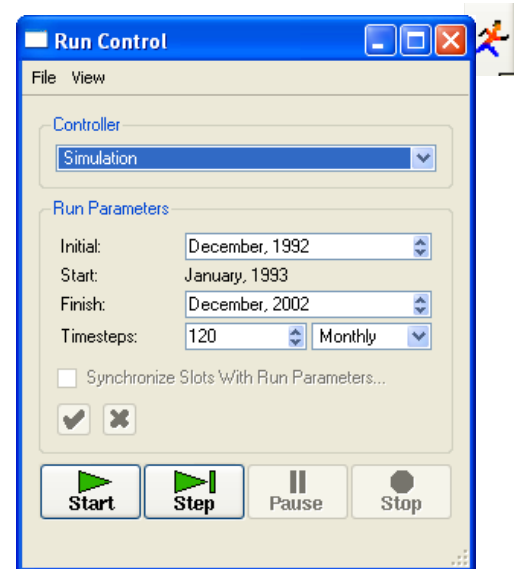
Changing the **Initial** time changes the **Finish** time accordingly; run **Timesteps** remain the same.


## 5. Making a Run

The dialog is invoked by selecting **Control** → **Run Control Panel** from the workspace menu bar or by clicking on the Run Control toolbar button.

The buttons along the bottom of the **Run Control** dialog are used to control the execution of a model. They are defined as:

-  Confirm run control changes (i.e., changes to number of timesteps, run parameters, or simulation type).
-  Reject run control changes.
- Start** Execute a run.
- Step** Execute initialization or the next timestep only. (If no run is in progress, execute initialization. The second click of the Step button executes the first timestep)
- Pause** Interrupt execution after the current timestep.
- Continue** Continue execution from the current timestep. (When the run is started the start button becomes the continue button)
- Resume** Resume a stopped or aborted run from a given timestep (When the run is aborted, the Pause button becomes the Resume button)
- Stop** Abort execution after the current timestep.



When a run is not in progress, only the **Start** and **Step** buttons are available. If changes are made to the run dates, the timesteps, or other Run Control parameters, the **Check** button  must be clicked to enable all the other **Run Control** buttons. The **Continue**, **Step** and **Pause** buttons are then enabled after the **Initializing** period has ended.

When a run is started, a **Run Status** window appears. If a **Diagnostics Output Window** also appears, close it by selecting **Close Window** in its **File** menu.

The indicator bar moves from left (start) to right (finish), indicating the progress of the run. The **Execution State**: also indicates the state of the run with a status description. The possible **Execution States** are: **Initializing**, **Running**, **Finished**, **Stopped**, **Waiting**, **Paused**, and **Aborted**.



The Controller Clock (date and time of the currently executing timestep expressed in units of the selected timestep size) is displayed under the **Execution State**. Due to time horizon dispatching,

discussed [HERE \(SimHowItWorks.pdf, Section 5.2\)](#), the Controller Clock may not represent the timesteps of all objects being solved.

## 6. Aborted Run

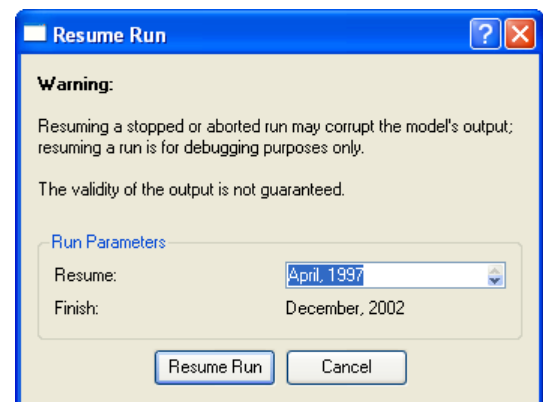
If a run cannot continue because of errors, a RiverWare Notice window will be shown and error messages will be posted to the diagnostic output window [HERE \(Diagnostics.pdf, Section 1.4\)](#). The user has the following options from the confirmation window:

- **Time Scroll:** Scroll all time-scrollable windows to the context time. The user can select to scroll all time windows, like the Open Slot dialog, SCT's and the Plot window to this date. This saves the user time when debugging the model.
- **Cancel:** Close the dialog, but do not "Time Scroll."
- **Do not show this notice again:** Request that the dialog not be shown again. If this box is selected, then subsequent aborts will use the same selection (Time Scroll or Cancel) and the dialog will not be shown. This applies only to the current RiverWare session.



## 7. Resume

The **Resume** functionality is only used for debugging large models (usually Rulebased Simulation models). Most often, it is used after a model run aborts because of an error situation. The error can be fixed, and the run can be resumed from the timestep at which the error occurred. Since the run was aborted, the validity of the output is not guaranteed. Because of this, a resumed run should always be re-run from the beginning, after the debugging is complete.



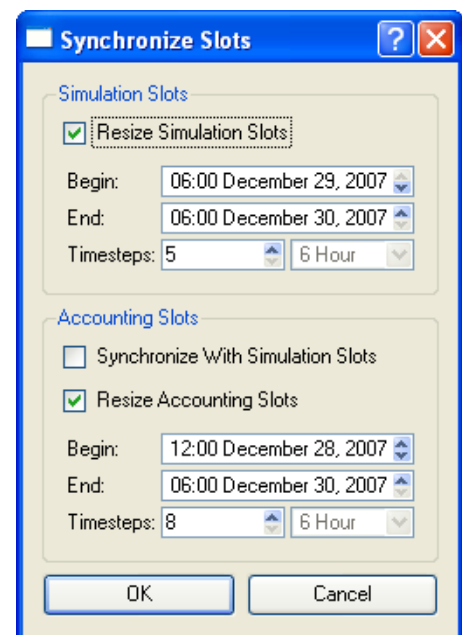
## 8. Synchronization

There are two ways to synchronize all or selected objects to the either the run control or a specified period: by changing the run control and checking the **Synchronize Slots with Run Parameters** toggle or through the **Synchronization Control** dialog. These two utilities are described below

### 8.1 Synchronize Slots with Run Parameters

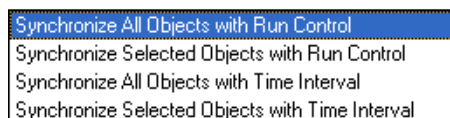
On the **Run Control**, after making changes to the Initial timestep, Finish Timestep, or number of Timesteps, the user is presented with the green check and red X to either apply the changes or cancel the changes. Also, the **Synchronize Slots with Run Parameters** toggle is enabled. If checked, when the green check is clicked, the **Synchronize Slots** dialog is opened, shown to the right. This dialog allows the user to configure how the slots should be resized. The default Begin, End and number of Timesteps is taken from the Run Control. The user can optionally synchronize accounting slots with the simulations slots or enter a different time range.

If changes are made to the timestep size, the **Synchronize Slots with Run Parameters** toggle is not available. Synchronization must be made from the Synchronization Control Dialog described below. The intention here is to allow the user to make simple changes in run start and end date and then synchronize all the slots from the Run Control. More complex changes, like the timestep length, may require more options in synchronizing and must be done from the **Synchronization Control** dialog.



### 8.2 Synchronization Control Dialog

The **Synchronization Control** dialog allows the user to synchronize slots without changing the run control. To access this dialog, use the **Workspace** → **Objects** → **Synchronize Objects**. The user is able to synchronize all or selected objects to be synchronized to the Run Control or a separate specified time interval as follows



The new time interval must encompass the run control time interval. A toggle button allows users to **Include**



**Accounting Object** in the synchronization action. A second toggle allows the user to **Exclude Slots with Different Timestep** from the synchronization. This option may be useful, in particular, to retain data stored in data objects.