


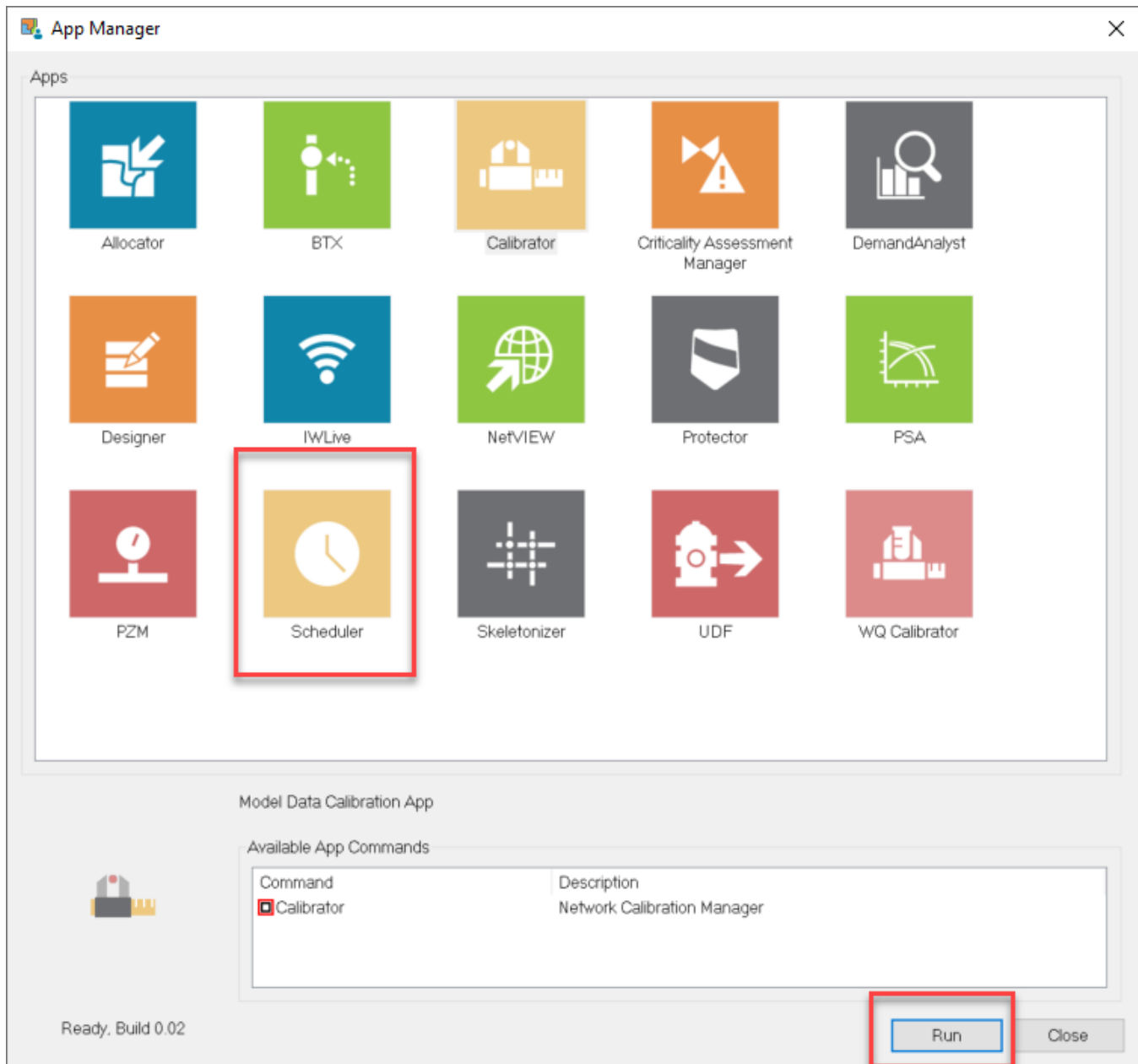
# Scheduler Interface

The Scheduler provides very sophisticated energy management capabilities for use in the optimal control of water distribution systems. It casts the optimal control scheduling problem as an implicit nonlinear mathematical optimization problem that is solved efficiently using the latest in Genetic Algorithms technology. The optimization problem consists of determining the least-cost pump, valve and pipe operation policies that will best meet the target hydraulic operational requirements of the system for a given time horizon (normally 24 hours).

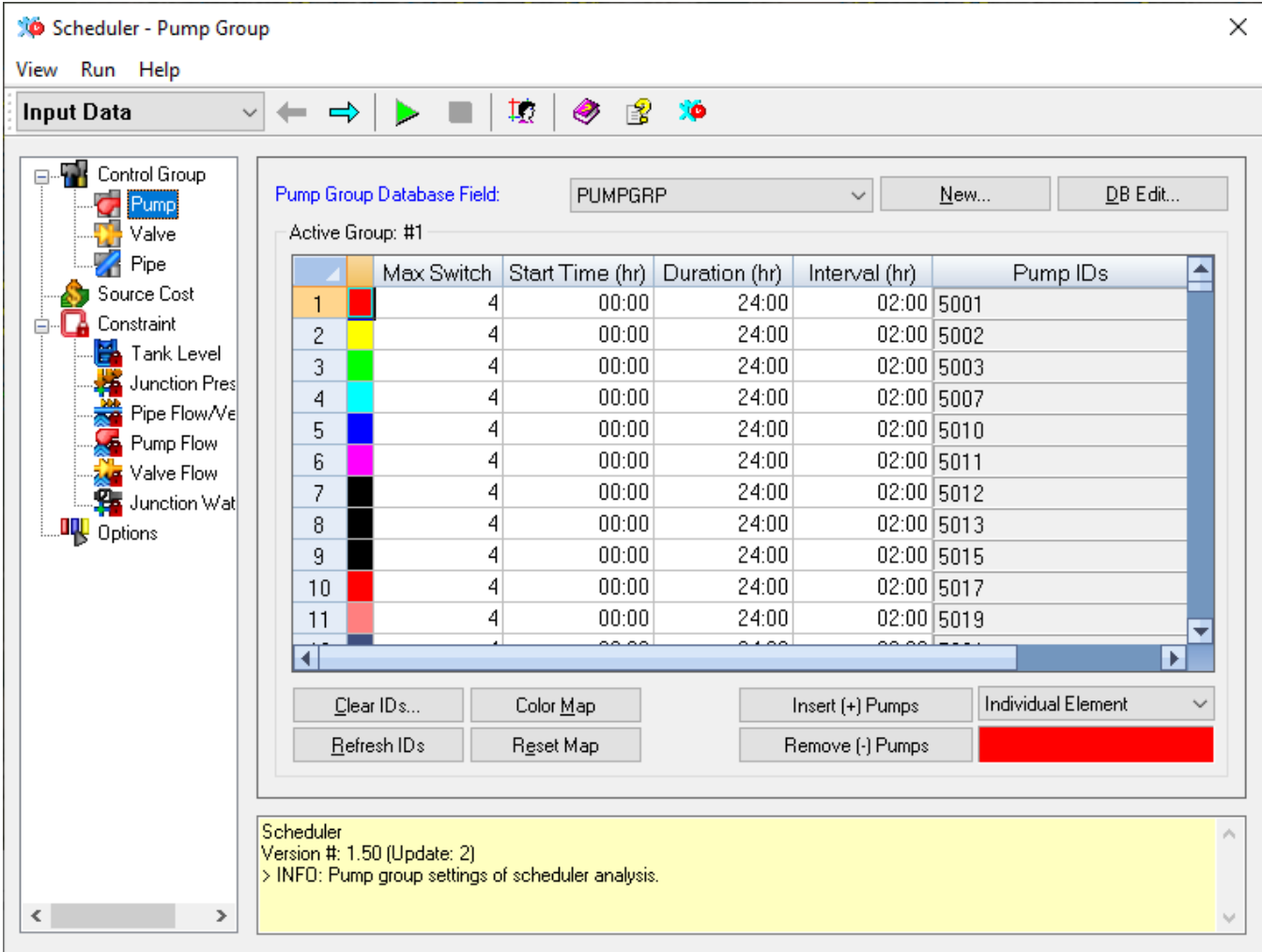
System constraints include the maximum and minimum junction pressures, maximum pipe velocities, maximum pump, pipe and valve flows, maximum junction water age, as well as maximum, minimum and ending tank levels. The decision variables include pump, valve, and pipe operating controls. Multiple pumps, valves and pipes can be grouped where each component in a group will operate in an identical fashion, having similar operating schedules and switching times. A maximum of 100 groups per variable type can be selected with this version of the Scheduler. Following the completion of a successful Scheduler run, you are presented with the best scheduling policy identified for the input parameters specified. The output results are the operational time-based control rules that indicate when a particular group of pumps, valves or pipes should be turned on or off over the specified period of time along with the total cost.

Finally, the Scheduler can automatically update the active Control Set with the computed control rules or you can define a new Control Set and populate it with the resulting operation policy.

The Scheduler is initialized by selecting the **Apps**  **Apps** command from the **InfoWater Pro** ribbon. With the Apps Manager dialog box open, select **Scheduler** and click on the **Run** button as shown below.



The **Scheduler - Pump Group** dialog box appears.



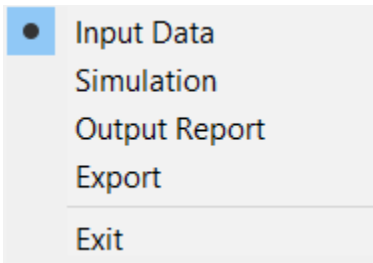
## Main Menu

The Main Menu is displayed at the top of all the main Scheduler dialog boxes and consists of the following sub-menus:

### View Run Help

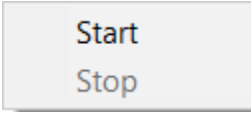
#### View

The View pull-down menu provides access to Input Data, Simulation, Output Report, and Export dialog boxes as well as Exits the Scheduler module.



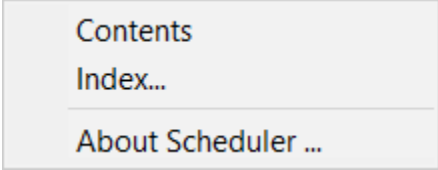
#### Run

This menu will Start/Stop the optimization routine.

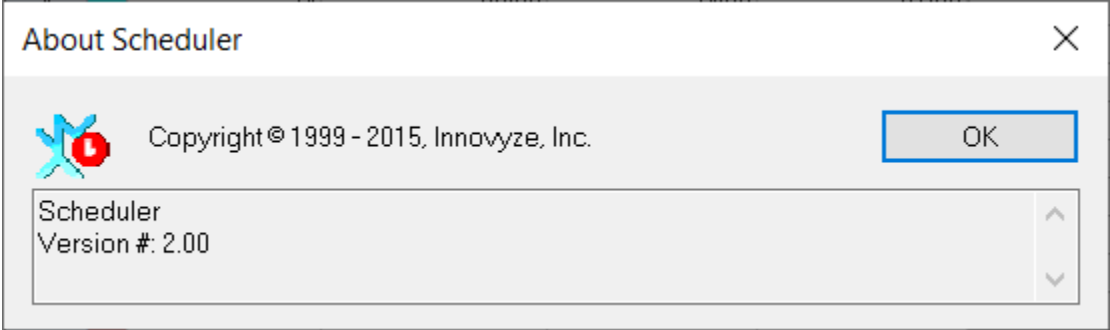


**Help**

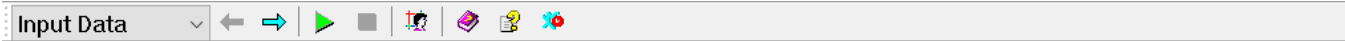
The Help menu allows you to access the Contents or Index page of the online Help file.



About Scheduler... Shows the Version of the Scheduler Module

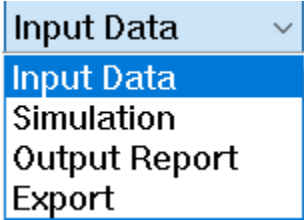


**Toolbar**

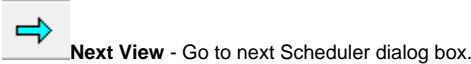
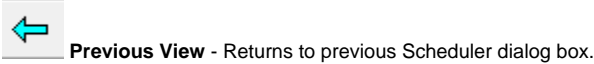


**View Menu**

The View Menu pull-down allows you to access the Input Data, Simulation Run Manager, Output Report Data and the Export Tab of the Scheduler Interface. The portion of the dialog box shown below shows you the choices available.



**Menus:** [Input Data](#), [Simulation](#), [Output Report](#), and [Export](#)



Abort



**Edit Domain** - Opens the Domain Editor. The Domain Manager can be used to select a sub-set of the network which you are analyzing to be placed in a certain group.



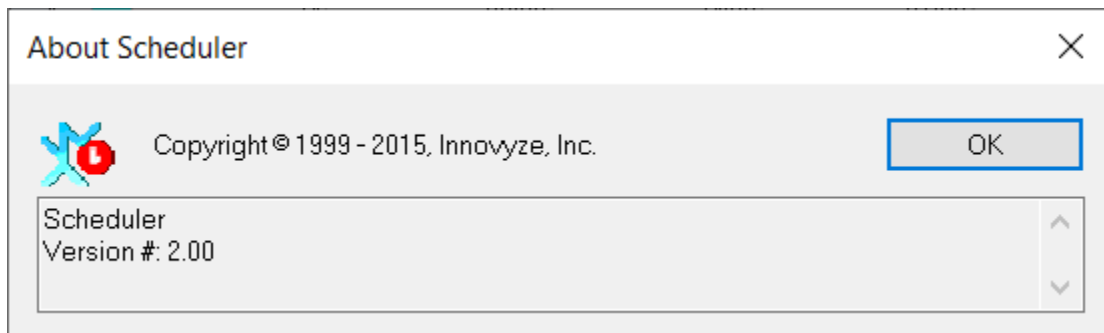
**Show Help Contents** - This button will take you directly to the Contents tab of this Help file.



**Show Help Index** - This button will take you directly to the Index tab of this Help file.



**Display Scheduler Information** - This button displays the Scheduler information.



**Input Data** - The Input Data view category specifies the desired pump, valve and pipe groupings, maximum number of switches, start time, simulation duration, minimum switching interval, source cost table, system constraints, and pertinent options to run a scheduling optimization run. The input data categories are as follows:

**Control Group** - You have the ability to define the control groups to be used in the optimization analysis. Each control group is identified as having one or more pumps, valves and pipes. In addition, you can modify any group previously identified, set the number of acceptable switches, start time, optimization duration, and switching interval for each group. Each pump, valve and pipe can belong to only one control group within a single data field column (e.g., Pump ID 10 cannot belong to both Pump Group 1 and Pump Group 2). You can create as many data field columns as desired to evaluate different grouping options (various operational improvement alternatives). Only pumps, valves and pipes that are candidate for optimization need to be associated with a group ID. Pumps, valves and pipes that do not belong to a particular group will remain unaffected (their operating status unchanged) by the optimization process. The Scheduler will determine a single combination of control rules (start and stop times) for all pumps, valves, and pipes within any particular group. If distinct control rules are desired for specific pumps, valves, and pipes, then these components must be placed in separate groups.

**Source Cost** - The Source Cost allows you to input the cost of supplying water either in the form of a single cost per volume of water or in the form of a curve describing the cost per total flow leaving the tanks or reservoir. The curve must be defined in the main model in order to be selected and it overrides any cost rate per volume already entered.

**Constraint** - There are several constraints that can be specified for tanks. These include minimum level, maximum level, final tank level, and a tolerance for matching the ending tank level. Final storage bounds are usually tightened (small tolerance) so that the storage in the tanks will be more or less the same as the initial states (hydraulic periodicity condition).

**Options** - The Options dialog box controls Genetic Algorithm optimization options during the optimization run. Within this dialog box, you specify the data units, penalty cost data, weighting factors, convergence parameters, and advanced GA options.

**Simulation** - Activates the Simulation view which provides detailed information on the convergence of the computed control policy.

**Output Report** - Activates the Output Report view category to review detailed output optimization results.

**Export** - Activates the Export view category to update the Control Data Sets in the main model with the calculated scheduling policy.