

## Section 2.9

# Water Temperature Mixing

The Network System supports up to five mixing devices. These mixing devices are used in hydronic systems to deliver water at a temperature that is appropriate for the radiant panel (such as a concrete slab). For example, a boiler supplies 160°F (71°C) water, but the radiant floor only needs 110°F (43°C). A mixing device mixes cooler water from the return to the hotter water provided by the boiler to deliver the proper water temperature to the slab.

The Network System supports modulating valves and injection pumps as mixing devices. The Network System must include a Supply Water Temperature Control (SWT) (A9013000) to control mixing devices. Uponor offers three-way modulating valves in sizes from ¾" to 2" for mixing applications. If using third-party modulating valves, the actuators must be 0-10VDC (24V) rather than floating-action. The Network System can control standard pumps requiring less than 3 amps (115V) or pumps that accept a 0-10V signal (e.g., Grundfos® VS series).

The Network System handles mixing differently than other control systems. First, the Network System uses both supply and return sensors to determine whether to increase or decrease mixing. Second, the Network System uses the difference between actual room temperature and setpoint in mixing calculations.

### Using Supply and Return Sensors

Using both supply and return sensors, while adding minor expense and labor to install, provides much more information about system operation. If the difference between the supply and return temperatures is small, the heating requirement for the area serviced by the mixing device is low. In this situation, the Network System might shut down the heating plant, reducing fuel consumption. If the difference between the supply and return temperatures is large, the heating requirement for the area serviced by the mixing device is high.

High heat demand might be due to initial system startup or radical temperature swings. In the design of a system with mixing, the user needs to set the differential at which the system will operate. The contractor uses this information to size the pump, and the Network System uses the information to operate the mixing device. In a conventional system that uses

only a supply sensor, there is no indoor temperature feedback. The system delivers water temperature based on the outdoor temperature, and system startup takes longer than necessary.

In contrast, the Network System will use several data points to deliver a faster response to a high heat demand. Looking at an example for a late-fall startup of a radiant slab, the Network System evaluates these data points:

- Maximum water temperature = 140°F (60°C)
- Mixing target temperature = 100°F (38°C)
- Differential = 20°F (10°C)
- Supply temperature = 100°F (38°C)
- Return temperature = 70°F (21°C)

Even though the target is 100°F (38°C), the Network System will allow the supply temperature to increase to 130°F (54°C) based on how far the return sensor is away from the target. This increase will never go above the maximum limit for mixing supply temperature. Allowing the supply temperature to exceed the target (but never the maximum limit) enables the Network System to reach the room-temperature setpoint faster than a conventional control system.

### Using Room-to-setpoint Differential

The Network System also uses the difference between actual room temperature and setpoint in mixing calculations. Network System-communicating thermostats provide this temperature differential. When a mixing assignment is set for a thermostat and the room needs heating (through mixing), the differential is included in the mixing calculation. If more than one thermostat with the same water temperature assignment calls for heat, the Network System uses the largest differential and adjusts the target mix temperature accordingly.

**Note:** Mixing assignments are set during thermostat setup (**Sections 3.2 and 3.3**) or snow-melt setup (**Section 2.12**).

This section covers the following topics.

- Setting up device existence
- Setting up and viewing equipment
- Setting up mixing settings

Before proceeding, make sure the following steps are complete:

- All Uponor Configuration Tool (UCT) software (A9090000) components are installed (**Section 1.5**).
- The computer is correctly connected to the Network System (**Section 1.6**).
- The installer has reviewed the documentation on using UCT elements (**Section 1.7**).

**Important:** Remember to save all changes to flash memory. Unsaved changes will be lost if the SWT loses power. See **Section 5.1: Save to and Load from Flash**.

## Setting up Device Existence

When configuring the Network System to control mixing, the installer must first identify what devices are connected to which ports.

1. From the **Main Menu**, click on the **Water Channels** button shown in **Figure 2.9-1** to display the Water Channels screen shown in **Figure 2.9-2**. The Water Channels screen displays the existence settings for all five potential water channels.
2. Check the Mix Device Existence and Secondary Pump Existence boxes to indicate mixing for each water channel. If using multiple pumps after the mixing device (zone pumps), leave the Secondary Pump Existence box unchecked. After checking existence boxes, additional buttons will display.

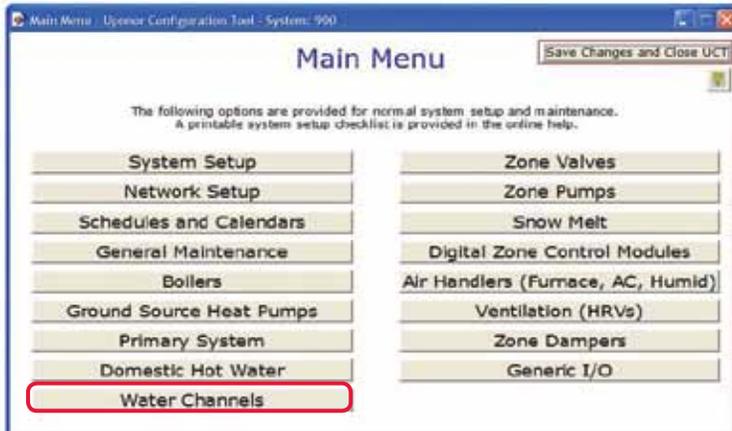


Figure 2.9-1: Main Menu Screen



Figure 2.9-2: Water Channels Screen



Figure 2.9-3: Water Channel Equipment Screen

## Setting up and Viewing Equipment

Refer to the following steps to setup and view the mixing equipment.

1. Click on a **Water Channel** button (located below the Setup and View Equipment heading) to display the Water Channel Equipment screen shown in **Figure 2.9-3**.

In this example, Water Channel 1 is set up using a three-way mixing valve and a secondary pump. The Water Channel Equipment screen displays the following items.

- **Name or Service Area:** This field identifies the device or the area that is receiving mixing. Enter a name that is less than 40 characters; do not use symbols. The name will display in pink text when first entered and change to black text when accepted by the SWT.
- **Target:** This field displays the mixing target calculated by the SWT based on settings, outdoor temp, etc. A value of Off indicates there is not a current heating call for the water channel.
- **Actual:** This field displays the actual average of the supply and return temperatures based on the current sensor readings. When the Target value is Off, Actual is not calculated.

- **Return Sensor:** This field displays the temperature of the water returning to the mixing device from the radiant floor, baseboard, air handler or other device.
- **Supply Sensor:** This field displays the temperature of the water being supplied by the mixing device to the radiant floor, baseboard, air handler or other device.
- **Mix Water Equipment Existence:** This field indicates to the Network System that the water channel will be used to mix water. Unchecking this box causes the following changes:
  - The Mix Device Existence box on the Water Channel screen will be unchecked.
  - The Water Channel buttons on the Water Channel screen will no longer display.
  - On the Water Channel Equipment screen, the graphic will change to that shown in **Figure 2.9-4**.
- **Secondary Pump Existence:** This field indicates to the Network System that a single secondary pump will pump water from this mixing device. If the system includes multiple zone pumps after the mixing device, do not check this box. Unchecking this box causes the following changes:
  - The Secondary Pump Existence box on the Water Channel screen will be unchecked.
  - On the Water Channel Equipment screen, the graphic will change to that shown in **Figure 2.9-4**.
- **Injection Pump Not Mixing Valve:** This checkbox tells the Network System whether an injection mixing pump or a three-way mixing valve is the mixing device for the water channel. Check the box to select an injection pump. Clear the box to select a mixing valve. If the box is checked, the graphic will change to look like **Figure 2.9-5**.

## Setting up Mixing Settings

After specifying that the installation includes mixing equipment, the next step is to set mix-channel settings. These settings specify how the mixing equipment operates under various conditions.

Refer to the following steps to setup the mix settings for a water channel.

1. From the **Main Menu**, click on the **Water Channels** button shown in **Figure 2.9-1** to display the Water Channels screen.

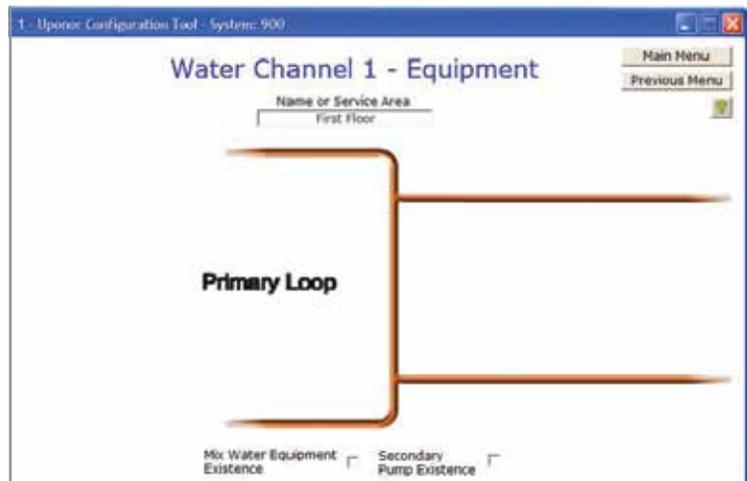


Figure 2.9-4: No Mixing Screen



Figure 2.9-5: Injection Pump Mixing Screen

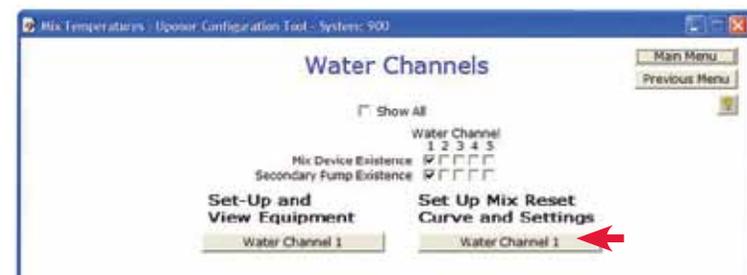


Figure 2.9-6: Water Channels Screen

2. Click on the **Water Channel** button under the Set Up Mix Reset Curve and Settings heading shown in **Figure 2.9-6**. The Water Channel Reset Curve Settings screen, shown in **Figure 2.9-7**, will display.

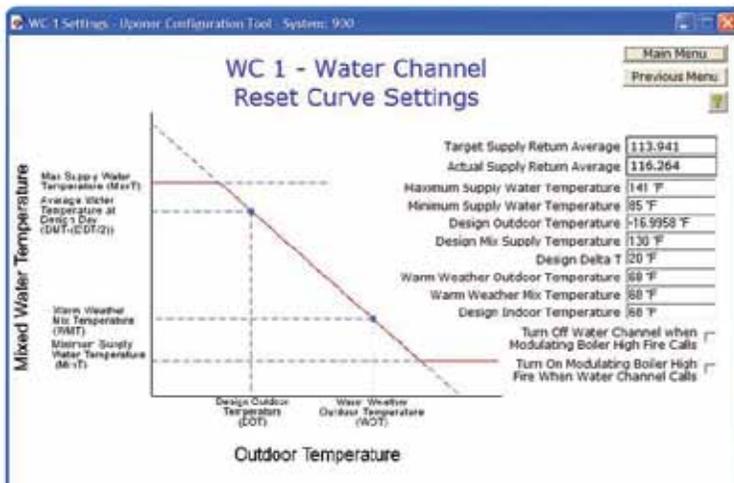


Figure 2.9-7: Water Channel Reset Curve Settings Screen

Use the following fields to adjust the mixing settings.

- Target Supply Return Average:** The Network System controls the mixing device to the average of the supply and return temperature sensors for a water channel. This field displays the target for this average, and it is calculated by the Network System based on the other settings on this page. A value of OFF indicates the thermostats (or snow-melt zones) assigned to water channel do not need heat.
- Actual Supply Return Average:** This field displays the current real-time average of the supply and return temperature sensors for the water channel. When the Target Supply Return Average value is OFF, Actual Supply Return Average is not calculated.
- Maximum Supply Water Temperature:** Use this field to set the protection limit for the output (or supply) water temperature of the water channel. The water temperature from this channel will never exceed this value.
- Minimum Supply Water Temperature:** Use this field to set the minimum water temperature that this channel will produce regardless of the outdoor temperature.
- Design Outdoor Temperature:** Use this field to enter the outdoor temperature on design day, which is the coldest day of the year at which the heating system is designed to meet the heat load.
- Design Mix Supply Temperature:** Use this field to enter the temperature of the water that must be supplied to a water channel service area on design day to meet the heating load for the area. This value is different than Maximum Supply Water Temperature. If the outdoor temperature falls below the Design Outdoor Temperature, the Network System will calculate a new mix target up to the limit of the Maximum Supply Water Temperature.
- Design Delta T:** Use this field to adjust the expected Delta T of the water being supplied to and returning from a water channel service area on design day. The default setting is 30°F (15°C).
- Warm Weather Outdoor Temperature:** Use this field to adjust the outdoor temperature at which it is expected that building heat will no longer be needed. The default setting is 68°F (20°C).
- Warm Weather Mix Temperature:** Use this field to adjust the temperature of water required to meet the heat demand at the Warm Weather Outdoor Temperature. The default setting is 68°F (20°C).
- Design Indoor Temperature:** Use this field to adjust the indoor temperature to be met on design day. The default setting is 68°F (20°C).
- Turn Off Water Channel When Modulating Boiler High Fire Calls:** If using a modulating boiler, it will supply only a slightly higher water temperature than that required by the highest water channel. During a domestic hot water (DHW) or high-fire call, the boiler will ramp up to its highest allowed temperature until the call is satisfied. Check this box to shutdown this water channel until a high-fire boiler call has ended; this action prioritizes DHW production.
- Turn On Modulating Boiler High Fire When Water Channel Calls:** The Network System can control a modulating boiler with an On/Off Boiler Relay and High Fire on the boiler connected to the TT-B contacts. Check this box so the TT-B contacts close and allow the boiler to go to High Fire when the water channel calls for heat.