

# Taco Radiant Made Easy Application Guide

## Operating Modes Overview

EFFECTIVE: August 15, 2005

SUPERSEDES: March 1, 2004

### OUTDOOR BOILER RESET OPERATING MODE

Outdoor boiler reset controls take over the boiler firing operation from the high limit control. As the outside air temperature changes, the control continually adjusts the boiler supply water temperature by cycling the boiler on and off. Using this approach, the heat loss from the building is matched by the heat provided to the building.

#### Key Benefits

- Increased Comfort
- Less Fluctuation of Indoor Temperature
- Reduced Expansion Noises
- Evens Out Heat Delivery, Reducing Cold Spots
- Reduces Possibility of Thermal Shock
- Energy Savings

#### Application

Best suited for high temperature hydronic systems. Since the boiler is sized to provide adequate heat during the coldest day of the year, every other day the boiler is running inefficiently if a reset control is not used.

GUIDE SECTION	DOCUMENT TITLE	DOCUMENT SECTION
Operating Modes (OM)	Outdoor Boiler Reset	OM01
Products & Applications (PA)	PC700 and PC702 Outdoor Boiler Reset Controls	PA01
Technical Documents (TD)	Combining Outdoor Boiler Reset with Outdoor Mixing Reset	TD04

### OUTDOOR MIXING RESET OPERATING MODE

A variable speed "00" circulator or iSeries Mixing Valve is piped between the primary boiler loop and a secondary distribution loop. The position of the valve or speed of the pump is modulated in order to inject different rates of hot water, based on outdoor temperature, into the distribution loop. This allows for virtually any water temperature to be supplied to the heating system. Boiler protection is also provided.

#### Key Benefits

Outdoor mixing reset allows the water temperature supplied to the heating zones to be reduced all the way down to room air temperature (full reset), even when a non-condensing boiler is being used. This allows for optimal control of the heating zone no matter the load requirements.

#### Application

Best suited for systems where there is one or more zones of reduced temperature or radiant heating. Can be used very effectively on systems combining high and low temperature zones.

GUIDE SECTION	DOCUMENT TITLE	DOCUMENT SECTION
Operating Modes (OM)	Outdoor Mixing Reset: Variable Speed Injection Circulators Outdoor Mixing Reset: 2-way / 3-way / 4-way Mixing Valves	OM02 OM03
Products & Applications (PA)	PC705 Variable Speed Injection Mixing Control Variable Speed Outdoor Reset "00" Circulator (00-VR) iSeries-R (Outdoor Reset) Mixing Valve Radiant Mixing Block X - Pump Block	PA02 PA03 PA04 PA09 PA10
Technical Documents (TD)	Combining Outdoor Boiler Reset with Outdoor Mixing Reset Pumps vs. Valves for Injection	TD04 TD06

## ZONE-BY-ZONE OUTDOOR MIXING RESET OPERATING MODE

Takes all the benefits of Outdoor Mixing Reset and integrates them into a product (valve or pump) that is used to supply each individual zone with dedicated outdoor reset for the changing load of that particular zone.

### Key Benefits

Allows for the ultimate in control, based on outdoor temperature, of each individual zone, independent of the load demands of any other loop. The Radiant Mixing Block combines zone-by-zone Outdoor Mixing Reset with Load Reset of the primary loop for even greater control and efficiency.

### Application

Any radiant system where there may be a difference in load (i.e. room usage, solar gain during different parts of the day) from zone to zone. Makes each zone a dedicated control system unto itself.

GUIDE SECTION	DOCUMENT TITLE	DOCUMENT SECTION
Operating Modes (OM)	Zone-by-Zone Outdoor Mixing Reset	OM04
Products & Applications (PA)	Variable Speed Outdoor Reset “00” Circulator (00-VR) iSeries-R (Outdoor Reset) Mixing Valve Radiant Mixing Block X - Pump Block	PA03 PA04 PA09 PA10
Technical Documents (TD)	Go All the Way: Zone-by-Zone Outdoor Reset Pumps vs. Valves for Injection	TD05 TD06

## LOAD RESET OPERATING MODE

Load reset combines Outdoor Boiler Reset with Outdoor Mixing Reset. The control calculates the required boiler supply water temperature for the primary loop based on the calculated load requirements of the secondary piping. As the load of the secondary piping changes, the control continually adjusts the boiler supply water temperature by cycling the boiler on and off. At the same time, it varies the speed of an injection circulator, based on outdoor temperature, to inject different rates of hot water between the primary loop and the secondary piping.

### Key Benefits

Combines the benefits of Outdoor Boiler reset with Outdoor Mixing Reset. Provides full reset to the reduced temperature heating zones and partial reset to the boiler loop. Helps prevent large water temperature swings. Increases efficiency.

### Application

Best suited for primary / secondary piped systems where there are one or more zones of reduced temperature along with a high temperature or domestic hot water loop. Load reset allows for separate control of both loops to maximize efficiency and comfort.

GUIDE SECTION	DOCUMENT TITLE	DOCUMENT SECTION
Operating Modes (OM)	Outdoor Mixing Reset: Variable Speed Injection Circulators	OM02
Products & Applications (PA)	PC705 Variable Speed Injection Mixing Control Radiant Mixing Block X - Pump Block	PA02 PA09 PA10
Technical Documents (TD)	Combining Outdoor Boiler Reset with Outdoor Mixing Reset	TD04

## SETPOINT TEMPERATURE OPERATING MODE

Maintains a specific temperature at a given sensor location.

### Key Benefits

Allows for a specific temperature to be selected by the installer. That set temperature is maintained to the heating zone no matter the load applied within the zone.

### Application

Radiant heating where a specific temperature needs to be delivered based on the design of the system or materials used. Ideal for floor warming or snowmelt. The 00-VS can be set up in linear or equal percentage mode for fan coils based on a room or duct sensor, or fresh air intake on commercial heating or cooling systems. Can be reverse acting for cooling applications or direct acting for heating applications or boiler protection.

GUIDE SECTION	DOCUMENT TITLE	DOCUMENT SECTION
Operating Modes (OM)	Setpoint Temperature: Variable Speed Injection Circulators Setpoint Temperature: 2-way / 3-way / 4-way Mixing Valves	OM05 OM06
Products & Applications (PA)	Variable Speed Setpoint "00" Circulator (00-VS) iSeries-S (Setpoint) Mixing Valve 5000 Series Mixing Valve Radiant Mixing Block X - Pump Block	PA05 PA06 PA07 PA09 PA10
Technical Documents (TD)	When Zone Valves Close Simplify Boiler Protection Replace the 3-way Thermostatic Valve	TD01 TD02 TD03

## SETPOINT WITH DELTA T MAX OPERATING MODE

Maintains a specific differential temperature between two given sensor locations as temperature increases to the mixing supply target temperature.

### Key Benefits

All the benefits of Setpoint Operating Mode but also offers protection for surfaces by limiting the maximum differential temperature between the mix supply and mix return. Prevents a sudden increase in temperature being delivered into a zone. Can provide boiler protection as well as controlling or enabling the boiler.

### Application

Where you want all the benefits of setpoint operation but need to limit the rate at which the supply water temperature increases to protect flooring from possible damage such as buckling, warping or cracking of slabs.

GUIDE SECTION	DOCUMENT TITLE	DOCUMENT SECTION
Operating Modes (OM)	Delta T (Temperature) & Setpoint with Delta T Max	OM07
Products & Applications (PA)	Radiant Mixing Block X - Pump Block	PA09 PA10
Technical Documents (TD)	When Zone Valves Close Delta T	TD01 TD07

## DELTA T OPERATING MODE

Maintains a specific differential temperature between two given sensor locations.

### Key Benefits

A specific delta T can be maintained no matter the load applied. Extremely versatile, not overpumping system, matches boiler output to load of the system, replaces a differential by-pass valve.

### Application

Snowmelt slabs where a specific temperature differential needs to be maintained across a heat exchanger. Provides a “soft start” of a heating system when sensors are placed across the boiler. Can maintain differential across any device or between system loops (i.e. boiler loop or heat exchanger). Increases efficiencies in condensing boilers by slowing down the flow to the heating loop, increasing heat transfer. Helps eliminate thermal shock and increases efficiencies in cold start boilers.

GUIDE SECTION	DOCUMENT TITLE	DOCUMENT SECTION
Operating Modes (OM)	Delta T & Delta T with Limit	OM07
Products & Applications (PA)	Variable Speed Setpoint “00” Circulator (00-VS) Variable Speed Variable Voltage “00” Circulator (00-VV)	PA05 PA06
Technical Documents (TD)	When Zone Valves Close Delta T Across a Boiler – Condensing vs Non-Condensing Boilers Smart Products for Hydronic Snowmelting	TD01 TD07 TD08

## DELTA P OPERATING MODE

Maintains a specific differential pressure between two given sensor locations

### Key Benefits

Produces the ideal flat pump curve, the circulator can deliver constant differential pressure regardless of the flow rate through it. Performance and efficiency is maximized no matter the load conditions.

### Application

Usually found in commercial systems, the speed of the pump is controlled by a DDC or building management system that gives the pump a 0-10 volts or 4-20 milliamp signal based on feedback from the pressure sensors. Cost of these pressure transducers is the main reason these are not utilized more in residential systems.

GUIDE SECTION	DOCUMENT TITLE	DOCUMENT SECTION
Operating Modes (OM)	Delta P	OM08
Products & Applications (PA)	Variable Speed Variable Voltage “00” Circulator (00-VV)	PA08
Technical Documents (TD)	When Zone Valves Close	TD01

## BOILER PROTECTION

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Most conventional boilers need to be protected against thermal shock and flue gas condensation within the boiler due to low return water temperatures.

### Key Benefits

Essential equipment protection.

### Application

Depending on the product and piping method used, the control monitors the boiler return temperature and varies the speed of a pump or opening percentage of a valve to keep the return water temperature above the manufacturers recommended minimums. Usually combined with primary / secondary piping.

GUIDE SECTION	DOCUMENT TITLE	DOCUMENT SECTION
Products & Applications (PA)	PC705 Variable Speed Injection Mixing Control Variable Speed Outdoor Reset "00" Circulator (00-VR) iSeries-R (Outdoor Reset) Mixing Valve Variable Speed Setpoint "00" Circulator (00-VS) iSeries-S (Setpoint) Mixing Valve Variable Speed Variable Voltage "00" Circulator (00-VV) Radiant Mixing Block X - Pump Block	PA02 PA03 PA04 PA05 PA06 PA08 PA09 PA10
Technical Documents (TD)	Simplify Boiler Protection	TD02

# Radiant Made Easy™

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