Taco Radiant Made Easy Application Guide

Setpoint Temperature: 2–Way/3–Way/4–Way Mixing Valves

Operating Mode

OM06

EFFECTIVE: August 15, 2005

SUPERSEDES: March 1, 2004

OVERVIEW

2–way/3–way/4–way Mixing

A mixing valve is used to supply or maintain a specific temperature to the radiant loop. The position of the valve is modulated in order to inject different rates of hot water from the boiler loop into the cooler system return water. Temperature control can be accomplished by using a thermostatic mixing valve, such as a Taco 5000 Series, that blends hot and cold water supplies to distribute a mixed temperature based on the valve's indicated dial setting. A 2-way, 3-way, or 4-way iSeries-S (Setpoint) Mixing Valve can be used to maintain a specific mixed temperature at a sensor location no matter the load applied within the zone. Since most boilers cannot operate at low temperatures, the iSeries-S can be modulated back in order to prevent the boiler from operating at cold temperatures by installing the optional boiler sensor. All wiring is done directly to the iSeries-S valve.

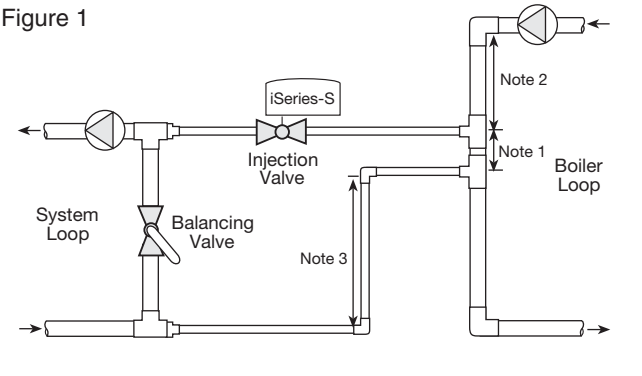
When deciding between valve styles and number of ports, maximum flow rates must be considered. See the charts on page 2 before selecting style of valve/piping.

DESIGN

When using a Mixing Valve, the following piping requirements must be considered for proper operation (see Figure 1, Figure 2 and Figure 3).

1. In order to hydraulically isolate the boiler loop from the injection or system loop, primary/secondary piping must be used. There must be no more than 4 pipe diameters between the tees in the boiler loop (Note 1).
2. There must be at least 6 pipe diameters of straight pipe on either side of the tees (Note 2) in order to prevent the momentum of water in the boiler loop from pushing flow through the injection loop.
3. There should be a minimum of 1 foot drop on the return pipe of the injection loop, in order to create a thermal trap (Note 3) and prevent unwanted heat transfer.
4. If using a 2-way iSeries-S Mixing Valve, a balancing valve must be located between the tees in the system loop, in order to provide a pressure drop to induce flow through the mixing loop.

Figure 1



Benefits:

iSeries:

- **2-way, 3-way or 4-way**
- **Wide setpoint temperature range (80° - 150°F)**
- **Optional boiler protection**
- **Fast response time**
- **One actuator fits all valve sizes**
- **Compact design**
- **Operates off constant power or relay end switch**
- **All wiring done directly to the valve**

5000 Series:

- **ASSE 1017 fail-safe**
- **Dual purpose mixing or diverting valve**
- **Lockable handle**
- **Sweat union connections**

Products:

5000 Series - Thermostatic Mixing Valves
iSeries-S - Setpoint Mixing Valves

Figure 2

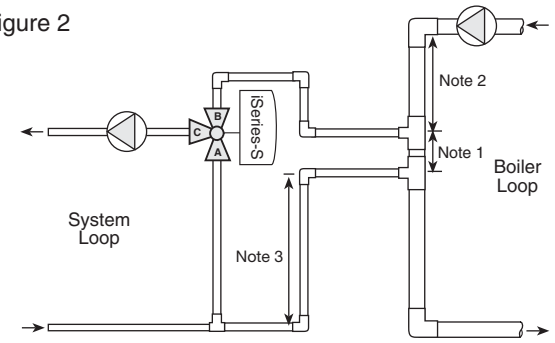
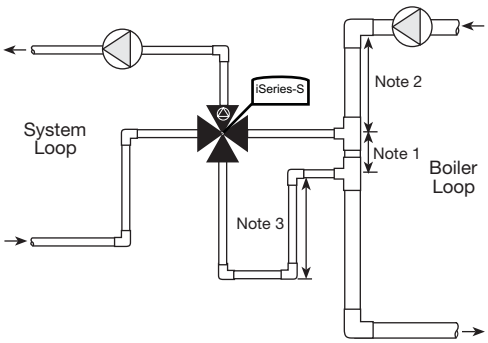


Figure 3



VALVE SIZING AND SELECTION

2-way iSeries-S Mixing Valve Selection

In order to properly size the 2-way iSeries-S Mixing Valve, follow the design procedure below:

1. Determine the design radiant heating load.
2. Determine the design boiler supply temperature.
3. Determine the radiant system return temperature which is based on the design temperature drop across the radiant system.
4. Determine the design injection flow rate using the following equation:

$$\text{Eq. 1:}\quad \text{Design Injection Flow Rate (US GPM)} = \frac{\text{Design Radiant Heating Load (BTU/hr)}}{500 \times (\text{Boiler Supply - Radiant System Return})}$$

5. From the 2-way Cv chart below, select the valve size with the closest Cv value to the injection flow rate calculated in step 4. Do not size the 2-way iSeries-S Mixing Valve based solely on pipe size.

iSeries: 2-way Cv	
Size	Cv
½"	4.9
¾"	10.3
1"	8.9

3-way iSeries-S Mixing Valve Selection

Select the 3-way iSeries-S Mixing Valve based on the 3-way pressure drop chart below.

Flow	iSeries: 3-way Valve Pressure Drop					
	½" (Cv = 1.5)		¾" (Cv = 3.3)		1" (Cv = 3.0)	
GPM	PSI	Ft. Head	PSI	Ft. Head	PSI	Ft. Head
½	0.11	0.26	0.02	0.05	0.03	0.06
1	0.44	1.03	0.09	0.21	0.11	0.26
1½	1.00	2.31	0.21	0.48	0.25	0.58
2	1.78	4.11	0.37	0.85	0.44	1.03
4	—	—	1.47	3.39	1.78	4.11
6	—	—	3.31	7.64	4.00	9.24
8	—	—	5.88	13.58	—	—

4-way iSeries-S Mixing Valve Selection

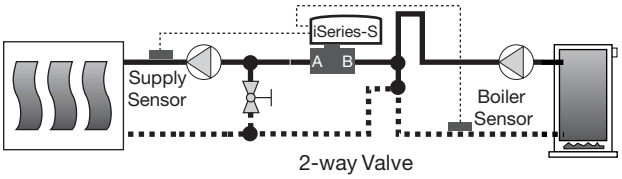
Select the 4-way iSeries-S Mixing Valve based on the 4-way Pressure Drop chart below:

Flow	iSeries: 4-way Valve Pressure Drop					
	¾" (Cv = 7.0)		1" (Cv = 9.3)		1 ¼" (Cv = 17.5)	
GPM	PSI	Ft. Head	PSI	Ft. Head	PSI	Ft. Head
½	0.01	0.01	0.00	0.01	0.00	0.00
1	0.02	0.05	0.01	0.03	0.00	0.01
2	0.08	0.19	0.05	0.11	0.01	0.03
4	0.33	0.75	0.18	0.43	0.05	0.12
6	0.73	1.69	0.42	0.96	0.12	0.27
8	1.31	3.01	0.74	1.71	0.21	0.48
10	2.04	4.71	1.16	2.67	0.33	0.75
12	2.94	6.79	1.66	3.84	0.47	1.08
14	4.00	9.24	2.28	5.27	0.64	1.48
16	—	—	2.96	6.84	0.84	1.93
18	—	—	3.76	8.70	1.06	2.44
20	—	—	—	—	2.30	5.31

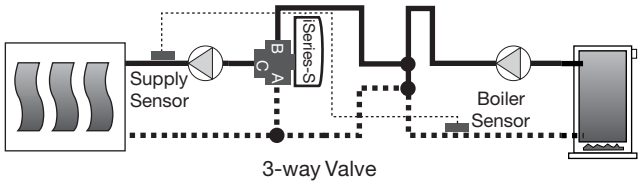
5000 Mixing Valve Selection

Select the 5000 Mixing Valve based on the pressure drop chart below.

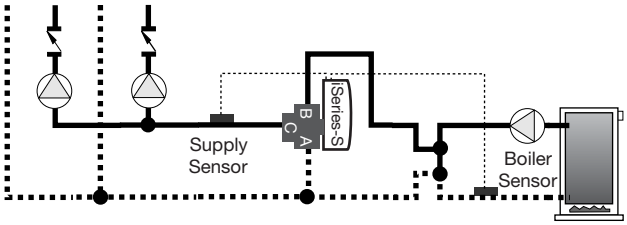
Flow	5000 Series Mixing Valve Pressure Drop					
	½" 5002-C1 (Cv = 3.3)		¾" 5003-C1 (Cv = 3.5)		1" 5004-C1 (Cv = 3.8)	
GPM	PSI	Ft Head	PSI	Ft Head	PSI	Ft Head
½	0.02	0.05	0.02	0.05	0.02	0.04
1	0.09	0.21	0.08	0.19	0.07	0.16
1½	0.21	0.48	0.18	0.42	0.16	0.36
2	0.37	0.85	0.33	0.75	0.28	0.64
4	1.47	3.39	1.30	3.01	1.11	2.56
6	3.31	7.64	2.94	6.79	2.50	5.76
8	5.88	13.58	5.22	12.07	4.43	10.24



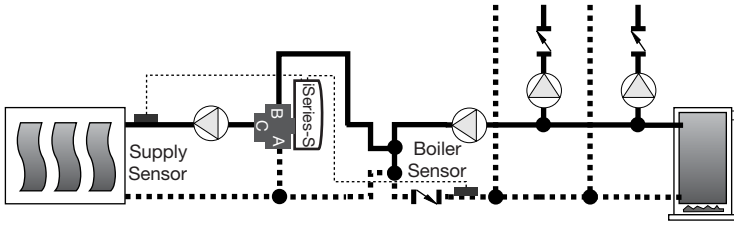
2-way Valve



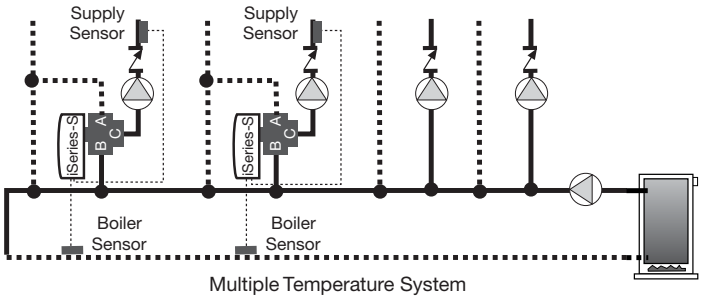
3-way Valve



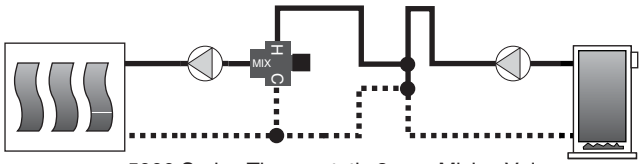
3-way Valve with Low Temperature Zones



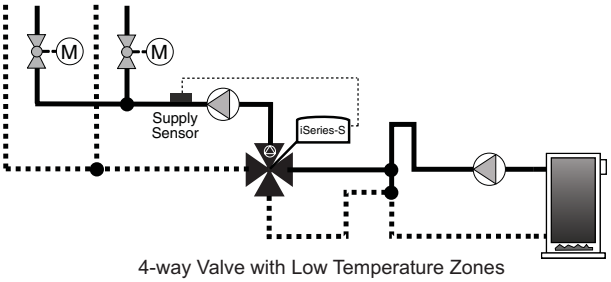
3-way Valve with High Temperature Zones



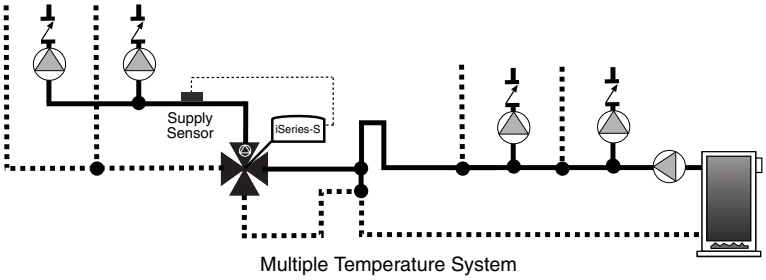
Multiple Temperature System



5000 Series Thermostatic 3-way Mixing Valve



4-way Valve with Low Temperature Zones



Multiple Temperature System

For installations where boiler protection is **NOT** required, the optional boiler sensor does not need to be installed. For additional installation diagrams, refer to the appropriate product's Products & Application documentation.

Radiant Made Easy™

TACO, INC., 1160 Cranston Street, Cranston, RI 02920 Telephone: (401) 942-8000 FAX: (401) 942-2360.

TACO (Canada), Ltd., 6180 Ordan Drive, Mississauga, Ontario L5T 2B3. Telephone: 905/564-9422. FAX: 905/564-9436.

Visit our web site at: http://www.taco-hvac.com

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