Application 2339 Two-Pipe Dual Zone Unit Cooling or Heating

Overview

In Application 2339, the controller controls temperature in two zones. A separate heating and cooling valve is modulated in each zone. In order for the unit to work properly, the central plant must provide chilled water in the cooling mode and hot water in the heating mode. Refer to Figures 2339-1 and 2339-2.

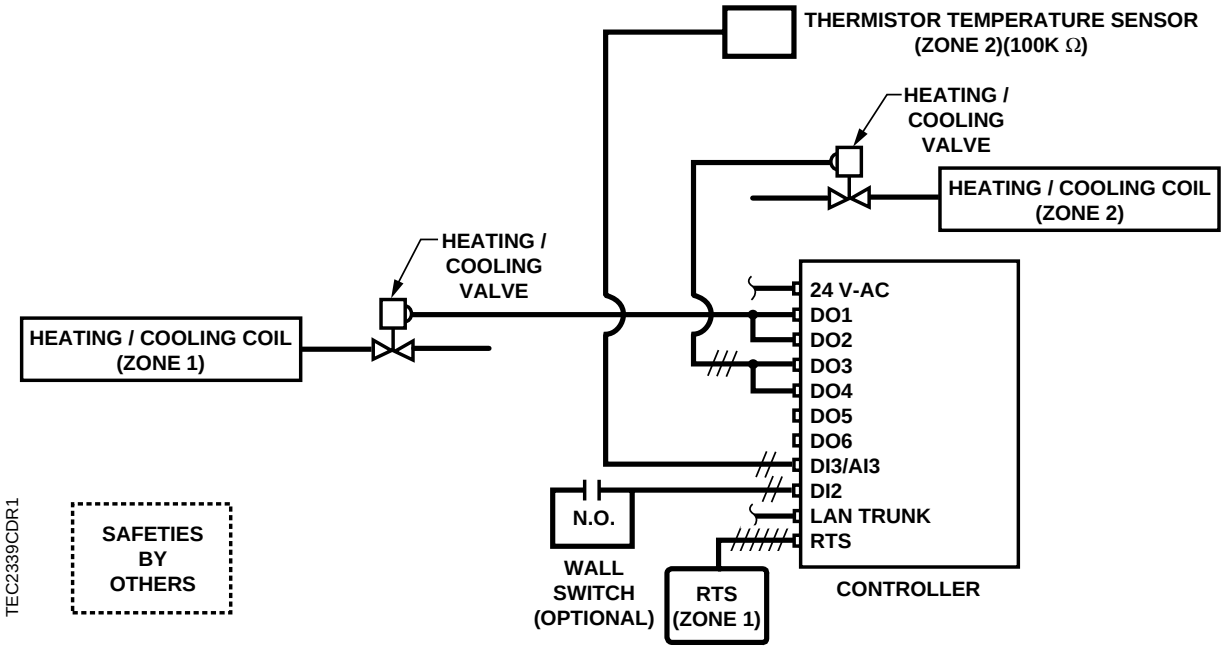
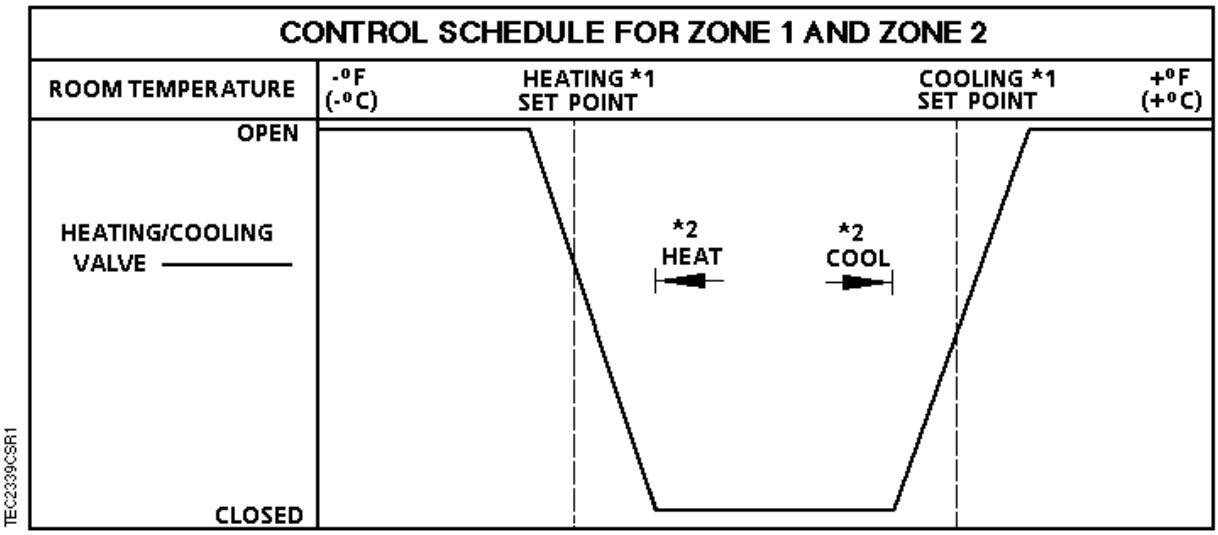


Figure 2339-1. Application 2339 Control Drawing.



NOTES:
1. Refer to Sequence of Operation, “Control temperature set points”.
2. Refer to Sequence of Operation, “Heating/cooling switchover”.

Figure 2339-2. Application 2339 Control Schedule.

Hardware inputs

analog

- room temperature sensor
- room temperature set point dial (optional)
- thermistor temperature sensor (zone 2) (100K Ω)

digital

- night mode override (optional)
- wall switch (optional)

Hardware outputs

analog

- none

digital

- heating/cooling valve actuator (zone 1)
- heating/cooling valve actuator (zone 2)

Point database

Table 2339-1 presents the point database information for Application 2339.

Sequence of Operation

The following paragraphs present the sequence of operation for Application 2339, “Two-Pipe Dual Zone Unit Cooling or Heating”.

Control temperature set points

Depending on the controller’s current operational mode (day or night), the control temperature set point, CTL STPT (number 92) and CTL STPT2 (number 93) holds the value of one of the following set points:

Day Mode (zone 1) – In day mode, CTL STPT holds the value of the point DAY CLG STPT (number 6) or the point DAY HTG STPT (number 7). If the room temperature sensor has a set point dial and the point STPT DIAL (number 14) is set to YES, then CTL STPT holds the value of the point RM STPT DIAL (number 13).

If the set point dial is used and the value of RM STPT DIAL is less than the value of the point RM STPT MIN (number 11), then CTL STPT holds the value of RM STPT MIN. If the value of RM STPT DIAL is greater than the value of the point RM STPT MAX (number 12), then CTL STPT holds the value of RM STPT MAX.

Day Mode (zone 2) – In day mode, CTL STPT2 holds the value of the point DAY CLG STP2 (number 31) or the point DAY HTG STP2 (number 32).

Night Mode – In night mode, CTL STPT holds the value of the point NGT CLG STPT (number 8) or the point NGT HTG STPT (number 9), and CTL STPT2 holds the value of the point NGT CLG STP2 (number 33) or the point NGT HTG STP2 (number 34).

NOTE: The values of the points CTL TEMP (number 78) and CTL TEMP2 (number 79) are the same as the values of the points ROOM TEMP (number 4) and ZONE 2 TEMP (number 15) respectively, unless the control points are overridden.

Day and night modes

The day/night status of the space is determined by the status of the point DAY.NGT (number 29). The control of this point differs depending on whether the controller is monitoring the status of a wall switch or if the controller is connected to a field panel.

When a wall switch is physically connected to the termination strip on the controller at DI 2 (Figures 2339-1 and 2339-3), and the point WALL SWITCH (number 18) equals YES, the controller monitors the status of DI 2. When the status of the point DI 2 (number 24) is ON (the switch is closed), then DAY.NGT will be set to DAY indicating that the controller is in day mode. When the status of DI 2 is OFF (the switch is open), then DAY.NGT will be set to NIGHT indicating that the controller is in night mode.

When WALL SWITCH equals NO, the controller does not monitor the status of the wall switch, even if one is connected to it. In this case, if the controller is operating stand-alone, then the controller stays in day mode all the time. If the controller is operating with centralized control (that is, it is connected to a field panel), then the field panel can send an operator or PPCL command to override the status of the point DAY.NGT. Refer to *Powers Process Control Language (PPCL) User’s Manual* (125-1896) and *Field Panel User’s Manual* (125-1895) for more information.

Night mode override switch

If an override switch is present on the room temperature sensor and a value (in hours) other than zero has been entered into the point OVRD TIME (number 20), then by pressing the override switch a room occupant can reset the controller to day operational mode for the amount of time that is set in OVRD TIME. The status of the point NGT OVRD (number 21) changes to DAY. After the override time elapses, the controller returns to night mode and the status of NGT OVRD changes back to NIGHT. NGT OVRD affects both zone 1 and zone 2.

It is only when the controller is in night mode that the override switch on the room sensor will have any effect on the controller.

Heating/cooling switchover

The controller will only switch between heating and cooling modes when the point HEAT.COOL (number 5) is commanded by the field panel. This should only be done when the water temperature in the coils is changed over.

Control loops

The fan coil unit is controlled by four Proportional, Integral, and Derivative (PID) temperature loops.

Temperature Loops – The four temperature loops are a cooling loop and a heating loop for each zone. The active temperature loop in each zone maintains room temperature at the value in the points CTL STPT (number 92) and CTL STPT2 (number 93). Refer to “Control temperature set points”.

Cooling operation

In cooling mode, the controller uses the points CTL STPT (number 92) and CTL TEMP (number 78) as the inputs to the cooling loop to control zone 1. The central plant must provide chilled water. The output of the zone 1 cooling loop is the point CLG LOOPOUT (number 80) which modulates the heating/cooling valve point, VLV 1 COMD (number 48). The point HTG LOOPOUT (number 81) is set to 0%.

The inputs to the cooling loop for zone 2 are the points CTL STPT2 (number 93) and ZONE 2 TEMP (number 15). The output of the zone 2 cooling loop is the point CLG LOOPOUT2 (number 82) which modulates the heating/cooling valve point, VLV 2 COMD (number 52). The point HTG LOOPOUT2 (number 83) is set to 0%.

Heating operation

In heating mode, the controller uses the points CTL STPT (number 92) and CTL TEMP (number 78) as the inputs to the heating loop to control zone 1. The central plant must provide hot water. The output of the heating loop is the point HTG LOOPOUT (number 81) which modulates the heating/cooling valve point, VLV 1 COMD (number 48). The point CLG LOOPOUT (number 80) is set to 0%.

The inputs to the cooling loop for zone 2 are the points CTL STPT2 (number 93) and ZONE 2 TEMP (number 15). The output of the zone 2 cooling loop is the point HTG LOOPOUT2 (number 83) which modulates the heating/cooling valve point, VLV 2 COMD (number 52). The point CLG LOOPOUT2 (number 82) is set to 0%.

Calibration

The controller will regularly calibrate the valves based on the value of the point CAL TIMER (number 96). A value of 12 indicates that the controller will calibrate the valves once every 12 hours.

The calibration consists of driving the valves closed, and then resetting the value of the points VLV 1 POS (number 49) and VLV 2 POS (number 53) to 0. The actuators are then released to normal control.

Fail-safe operation

If the zone 1 room temperature sensor fails or the zone 2 temperature sensor fails, then the controller operates using the last known temperature value.

Application notes

1. If the temperature swings in either zone are excessive, or if there is trouble in maintaining the set points, then either the cooling loop, the heating loop or both need to be tuned. Refer to *System 600 Maintenance and Troubleshooting Manual* (125-1855) for more information.

2. The Dual Zone Controller – Electronic Output, as shipped from the factory, keeps all associated equipment OFF. Refer to the Start-up document for this controller for information on how to release the controller and its equipment to application control.

3. Spare DOs can be used as auxiliary points that are controlled by the field panel after being defined in the field panel's database.

Wiring diagram

The point wiring for Application 2339 is shown in Figure 2339-3.

CAUTION:

The Dual Zone Controller – Electronic Output controls 24 Vac loads only. The maximum rating is 12 VA for each DO. For higher VA requirements, 110 or 220 Vac requirements, or DC power requirements, use an interposing 220 V 4-relay module (P/N 540-147).

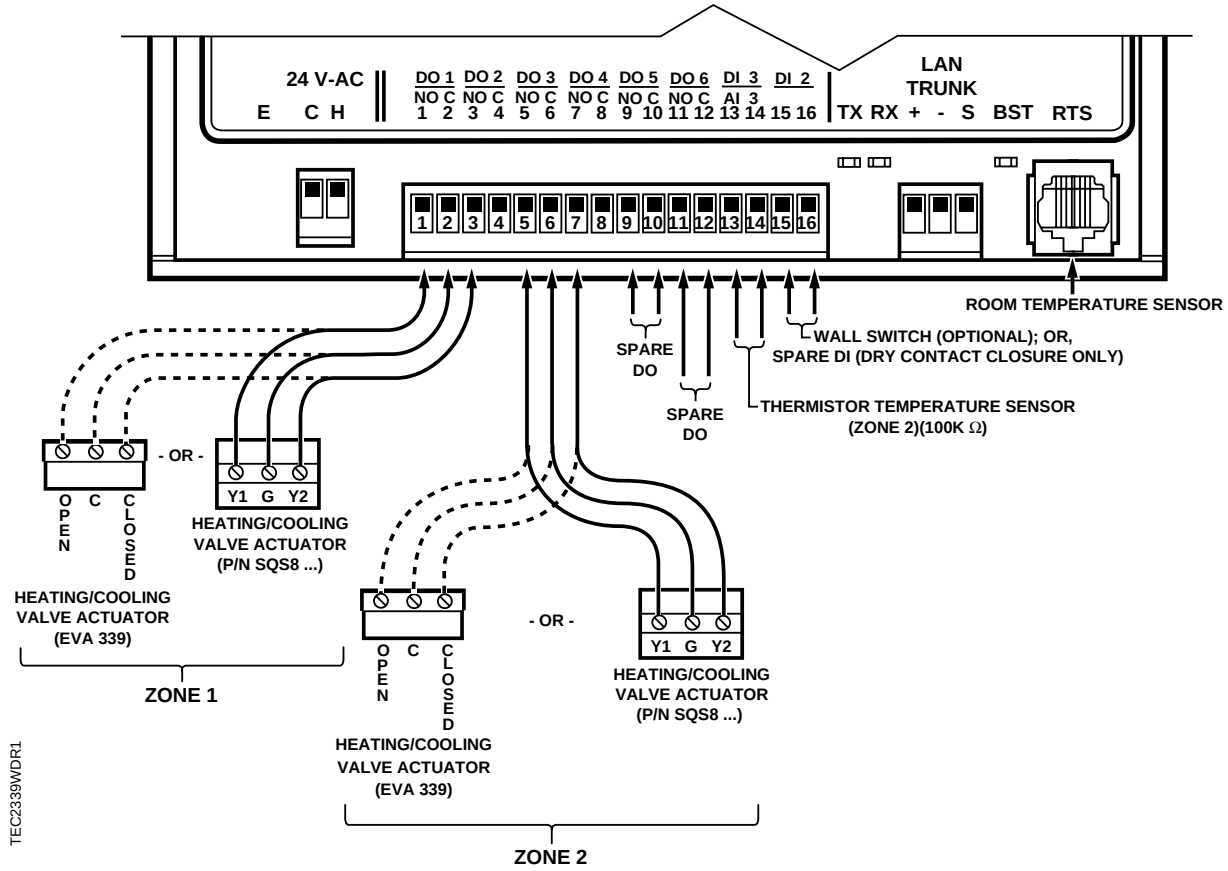


Figure 2339-3. Application 2339 Wiring Diagram.

Table 2339-1. Point Database for Application 2339.

Point Number	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
01	CTLR ADDRESS	99	--	1	0	--	--
02	APPLICATION	2090	--	1	0	--	--
{04}	ROOM TEMP	74.00 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48 (8.88888)	--	--
{05}	HEAT.COOL	COOL	--	--	--	HEAT	COOL
06	DAY CLG STPT	74.00 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48 (8.88888)	--	--
07	DAY HTG STPT	70.00 (21.20888)	DEG F (DEG C)	0.25 (0.14)	48 (8.88888)	--	--
08	NGT CLG STPT	82.00 (27.92888)	DEG F (DEG C)	0.25 (0.14)	48 (8.88888)	--	--
09	NGT HTG STPT	65.00 (18.40888)	DEG F (DEG C)	0.25 (0.14)	48 (8.88888)	--	--
11	RM STPT MIN	55.00 (12.80888)	DEG F (DEG C)	0.25 (0.14)	48 (8.88888)	--	--
12	RM STPT MAX	90.00 (32.40888)	DEG F (DEG C)	0.25 (0.14)	48 (8.88888)	--	--
{13}	RM STPT DIAL	74.00 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48 (8.88888)	--	--
14	STPT DIAL	NO	--	--	--	YES	NO
{15}	ZONE 2 TEMP	74.0 (23.495560)	DEG F (DEG C)	0.5 (0.28)	37.5 (3.055556)	--	--
18	WALL SWITCH	NO	--	--	--	YES	NO
{19}	DI OVRD SW	OFF	--	--	--	ON	OFF
20	OVRD TIME	0	HRS	1	0	--	--
{21}	NGT OVRD	NIGHT	--	--	--	NIGHT	DAY
{24}	DI 2	OFF	--	--	--	ON	OFF
{29}	DAY.NGT	DAY	--	--	--	NIGHT	DAY
31	DAY CLG STP2	74.0 (23.495560)	DEG F (DEG C)	0.5 (0.28)	37.5 (3.055556)	--	--
32	DAY HTG STP2	70.0 (21.255560)	DEG F (DEG C)	0.5 (0.28)	37.5 (3.055556)	--	--
33	NGT CLG STP2	82.0 (27.975560)	DEG F (DEG C)	0.5 (0.28)	37.5 (3.055556)	--	--
34	NGT HTG STP2	65.0 (18.455560)	DEG F (DEG C)	0.5 (0.28)	37.5 (3.055556)	--	--
{41}	DO 1	OFF	--	--	--	ON	OFF
{42}	DO 2	OFF	--	--	--	ON	OFF
{43}	DO 3	OFF	--	--	--	ON	OFF
{44}	DO 4	OFF	--	--	--	ON	OFF
{45}	DO 5	OFF	--	--	--	ON	OFF
{46}	DO 6	OFF	--	--	--	ON	OFF
{48}	VLV 1 COMD	0.0	PCT	0.4	0	--	--
{49}	VLV 1 POS	0.0	PCT	0.4	0	--	--
51	VLV 1 TIMING	130	SEC	1	0	--	--
{52}	VLV 2 COMD	0.0	PCT	0.4	0	--	--
{53}	VLV 2 POS	0.0	PCT	0.4	0	--	--
55	VLV 2 TIMING	130	SEC	1	0	--	--
56	MTR1 ROT ANG	90	--	1	0	--	--

NOTES:
1. Points not listed are not used in this application.
2. A single value in a column means that the value is the same in English units and in SI units.
3. Point numbers that appear in brackets {} may be unbundled at the field panel.

Table 2339-1. Point Database for Application 2339.

Point Number	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
57	MTR2 ROT ANG	90	--	1	0	--	--
58	MTR SETUP	0	--	1	0	--	--
59	DO DIR. REV	0	--	1	0	--	--
62	CLG P GAIN	20.00 (36.00)	--	0.25 (0.45)	0	--	--
63	CLG I GAIN	0.010 (0.0180)	--	0.001 (0.0018)	0	--	--
64	CLG D GAIN	0 (0.0)	--	2 (3.6)	0	--	--
65	CLG BIAS	0.0	PCT	0.4	0	--	--
66	HTG P GAIN	10.00 (18.00)	--	0.25 (0.45)	0	--	--
67	HTG I GAIN	0.010 (0.0180)	--	0.001 (0.0018)	0	--	--
68	HTG D GAIN	0 (0.0)	--	2 (3.6)	0	--	--
69	HTG BIAS	0.0	PCT	0.4	0	--	--
70	CLG P GAIN2	20.00 (36.00)	--	0.25 (0.45)	0	--	--
71	CLG I GAIN2	0.010 (0.0180)	--	0.001 (0.0018)	0	--	--
72	CLG D GAIN2	0 (0.0)	--	2 (3.6)	0	--	--
73	CLG BIAS2	0.0	PCT	0.4	0	--	--
74	HTG P GAIN2	10.00 (18.00)	--	0.25 (0.45)	0	--	--
75	HTG I GAIN2	0.010 (0.0180)	--	0.001 (0.0018)	0	--	--
76	HTG D GAIN2	0 (0.0)	--	2 (3.6)	0	--	--
77	HTG BIAS2	0.0	PCT	0.4	0	--	--
{78}	CTL TEMP	74.00 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48 (8.88888)	--	--
{79}	CTL TEMP2	74.0 (23.495560)	DEG F (DEG C)	0.5 (0.28)	37.5 (3.055556)	--	--
{80}	CLG LOOPOUT	0.0	PCT	0.4	0	--	--
{81}	HTG LOOPOUT	0.0	PCT	0.4	0	--	--
{82}	CLG LOOPOUT2	0.0	PCT	0.4	0	--	--
{83}	HTG LOOPOUT2	0.0	PCT	0.4	0	--	--
{92}	CTL STPT	74.00 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48 (8.88888)	--	--
{93}	CTL STPT2	74.0 (23.495560)	DEG F (DEG C)	0.5 (0.28)	37.5 (3.055556)	--	--
96	CAL TIMER	12	HRS	1	0	--	--
98	LOOP TIME	5	SEC	1	0	--	--
{99}	ERROR STATUS	0	--	1	0	--	--

NOTES:
1. Points not listed are not used in this application.
2. A single value in a column means that the value is the same in English units and in SI units.
3. Point numbers that appear in brackets {} may be unbundled at the field panel.