

TEC Custom Solutions Application 2334

Unit Vent with Face-Bypass Damper, Heating Valve and DX Cooling ASHRAE Cycles I and II

NOTE: For the latest on Custom Solution Applications and Controllers, visit the [Custom Solutions website](#).

Overview

In Application 2334, the Unit Vent Controller with Face-Bypass Sequence controls a unit ventilator equipped with a DX coil for cooling, a heating coil, which may be hot water or steam for ASHRAE Cycles I and II. A face-bypass damper is also controlled. Heating only units can also be controlled with this application by overriding the point HEAT.COOL (number 5) to HEAT.

Other features available in this application include morning warm-up/cool-down, night mode override, free-cooling, and auxiliary radiation in heating mode.

NOTE: The use of a Low Temperature Detection Thermostat (LTDT) is strongly recommended for hot water and steam systems.

When the field panel commands the point OA TEMP (number 56) to WARM, the point DISCH TEMP (number 15) in heating is controlled by the face-bypass damper. When OA TEMP is set to COOL, the heating valve is used to maintain DISCH TEMP.

While in heating, this application controls room temperature by resetting the discharge air temperature. While in cooling, this application controls room temperature by cycling the DX unit. This application also controls an outdoor air damper according to the schedules as defined by ASHRAE Cycles I and II. The free-cooling/economizer function is turned on and off by the field panel using the point FREE CLG (number 23). If free-cooling is not available, then the outdoor air damper will be kept at minimum position; otherwise, the outdoor air damper will modulate open in sequence with the heating actuator or the DX. The unit ventilator fan is also controlled in this application. Refer to Figures 2334-1 and 2334-2.

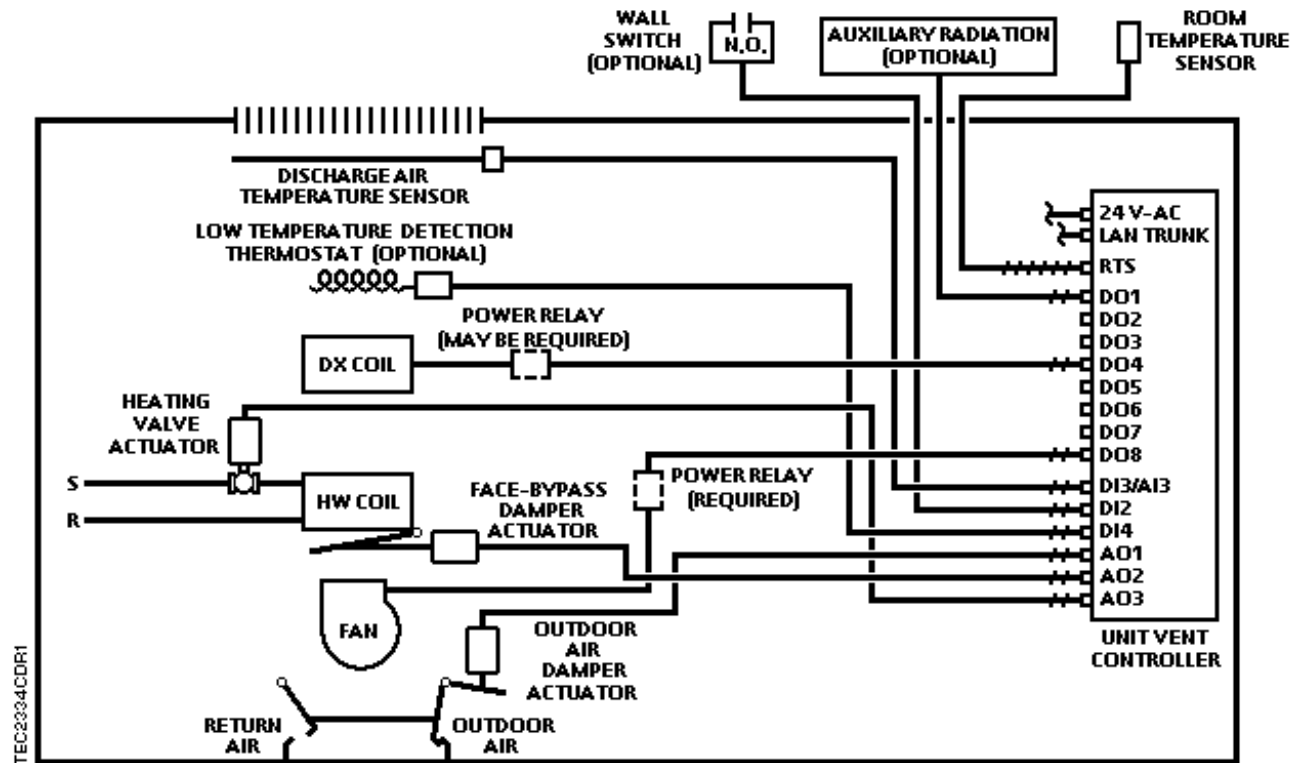
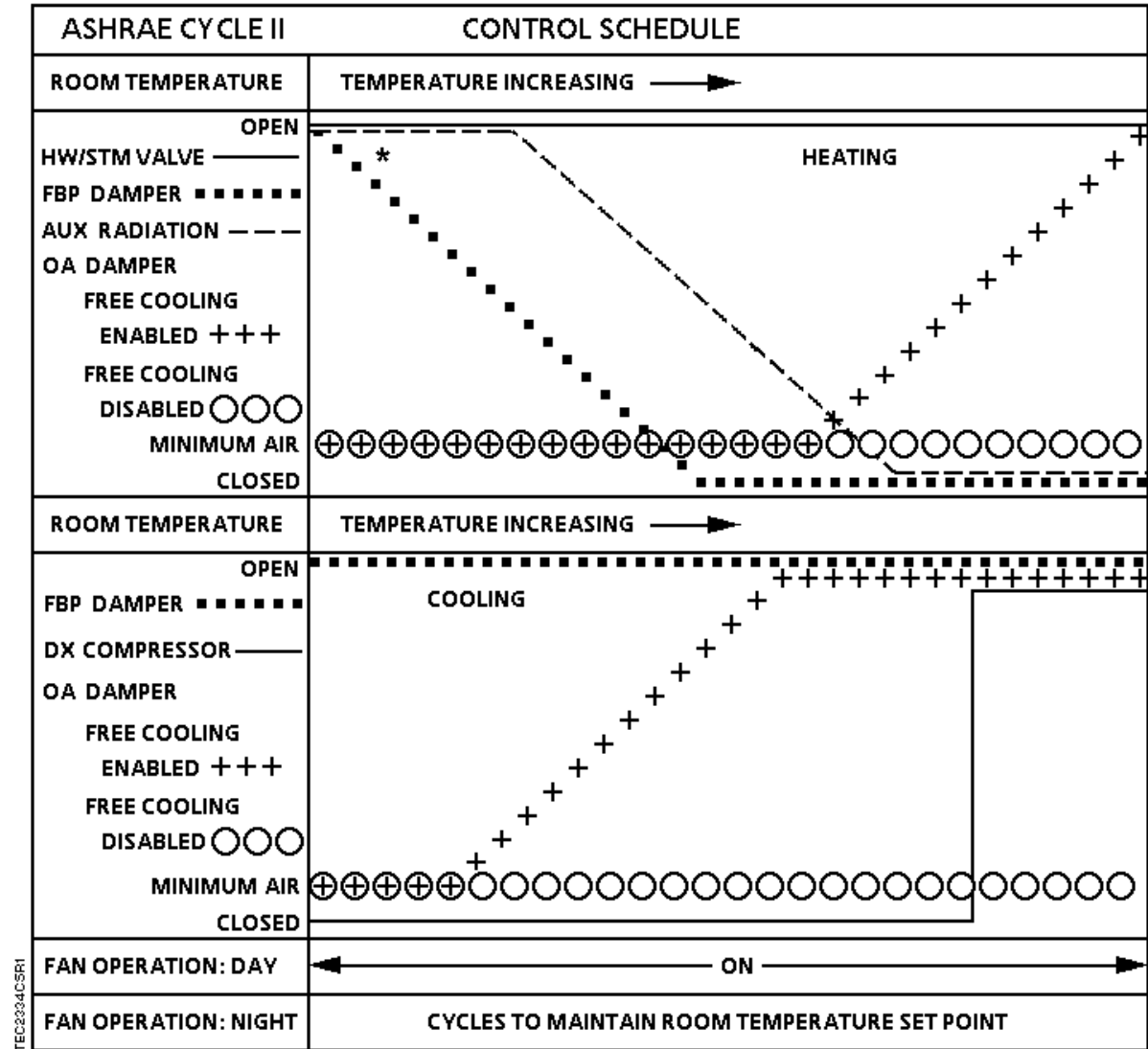


Figure 2334-1. Application 2334 Control Drawing.

NOTE: The auxiliary radiation is an independent loop and is not sequenced with the other control loops. The graphical representation in this figure is an example of what may occur in your system.



* **NOTE:** Drawing depicts when the point OA TEMP (number 56) equals COOL. When OA TEMP equals WARM, the heating valve and face-bypass damper curves switch places (heating mode only).

Figure 2334-2. Application 2334 Control Schedule.

Hardware inputs

analog

- averaging air temperature sensor
- room temperature sensor
- room temperature set point dial (optional)

digital

- Low Temperature Detection Thermostat (LTDT)
- night mode override (optional)
- wall switch (optional)

Hardware outputs

analog (0-10V)

- face-bypass damper actuator
- heating valve actuator
- outdoor air damper actuator

digital

- auxiliary radiation electric coil contact; or, auxiliary radiation 2-position valve actuator
- DX coil (optional)
- unit fan

Point database

Table 2334-1 presents the point database information for Application 2334.

Ordering notes

You can order the Unit Vent Controller with Face-Bypass Sequence either as Part Number 540-841, or as TEC Custom Solution number 224.

Sequence of Operation

Control temperature set points

The following paragraphs present the sequence of operation for Application 2334, "Heating Valve, Face-Bypass Damper, and DX Cooling, ASHRAE Cycles I and II".

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

Day Mode – 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.

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).

NOTE: The value of the point CTL TEMP (number 78) is the same as the value of the point ROOM TEMP (number 4), unless CTL TEMP is 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 2334-1 and 2334-3), 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 of the time period 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.

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.

*Day heating
operation*

In day heating operation, the controller maintains the room temperature at the value stored in the point CTL STPT (number 92) by doing the following:

- Resetting the unit ventilator's discharge temperature set point, DISCH STPT (number 93), based on the difference between the points CTL TEMP (number 78) and CTL STPT. If CTL TEMP goes below CTL STPT, then the discharge temperature set point increases. If the reverse occurs, then the set point decreases. DISCH STPT may not drop below the value of the point DSH MIN TEMP (number 94), nor may it rise above the point DSH MAX TEMP (number 95).
- Modulating either the heating valve or the face-bypass damper depending on the value of the point OA TEMP (number 56) (COOL or WARM respectively) based on the difference between the discharge temperature point, DISCH TEMP (number 15), and DISCH STPT. The actuator that is not actively modulating is kept open. If DISCH TEMP goes below DISCH STPT, then the modulating actuator opens. If DISCH TEMP goes above DISCH STPT, then the reverse occurs.
- Controlling auxiliary radiation (if provided) using a pulse-width modulation algorithm. The auxiliary radiation will be on for a percentage of the time held in the point AUX HTG TIME (number 57). The on-time is based on the difference between DISCH STPT and the point AUX DSH STPT (number 91). If DISCH STPT goes below AUX DSH STPT, then the on-time of the auxiliary radiation valve decreases. If the reverse occurs, then the on-time increases.
- Positioning the outdoor air damper as follows:
 - ▶ For ASHRAE Cycle I, the point OADPR MINPOS (number 10), is set to 100%.
 - ▶ For ASHRAE Cycle II, OADPR MINPOS is set to a value less than 100% to satisfy the minimum outdoor air requirements.
 - ▶ When the coil or face-bypass damper is modulating, the damper is positioned at its minimum setting. When the coil or face-bypass damper is not modulating and the point FREE CLG (number 23) is set to ENABLE, the damper is positioned from minimum to maximum open to provide ventilation cooling. If FREE CLG is set to DISABL, then the damper is kept at minimum at all times.

Day cooling operation

In day cooling operation, the controller maintains the room temperature at the value stored in the point CTL STPT (number 92) by doing the following:

- The face-bypass damper (if present) is at full face all the time.
- Cycling the DX coil based on the difference between the control temperature point, CTL TEMP (number 78), and CTL STPT.
- Positioning the outdoor air damper as follows:
 - ▶ For ASHRAE Cycle I, the point OADPR MINPOS (number 10), is set to 100%.
 - ▶ For ASHRAE Cycle II, OADPR MINPOS is set to a value less than 100% to satisfy the minimum outdoor air requirements.
 - ▶ When the coil is providing cooling and the point FREE CLG (number 23) is set to ENABLE, the damper is kept open. When the coil is not providing cooling and FREE CLG is set to ENABLE, the damper is modulated between minimum and maximum. If FREE CLG is set to DISABL, then the damper is kept at minimum at all times.

Night heating operation

Heating operation at night is the same as day, except the auxiliary radiation turns ON when the fan turns ON, and turns OFF when the fan turns OFF. Also, the outdoor air damper is kept closed and the heating actuator (face-bypass damper or valve) is set equal to the point HTG LOOPOUT (number 80).

If the point NGT HW HTG (number 53) is set to YES, (for hot water coils), then the heating valve actuator is kept open at all times during the night, and the face-bypass damper modulates to maintain the point DISCH TEMP (number 15).

NOTE: Heating only is provided when the point NGT CLG MODE (number 54) is set to NO.

Night cooling operation

In night cooling operation, the controller maintains the room temperature at the value stored in the point CTL STPT (number 92) by doing the following:

- If the point CTL TEMP (number 78) rises above the sum of the points NGT CLG STPT (number 8) and NGT DBAND (number 88), then:
 - the fan turns ON
 - DX cooling turns ON
- If CTL TEMP drops below NGT CLG STPT, then:
 - the fan turns OFF
 - DX cooling turns OFF
- When the point NGT CLG MODE (number 54) is set to NO, the unit will operate in night heating mode only.

In night cooling operation, the controller operates as follows:

- For units with hot water coils, the point NGT HW HTG (number 53) must be set to YES, so that the valve will be positioned to full open.
- For units with steam or electric coils, NGT HW HTG must be set to NO, so that the heating coils can be kept OFF.
- The face-bypass damper is at full face when the fan is ON and at full bypass when the fan is OFF and the 2-position cooling valve actuator is open.

Face-bypass/valve sequence

If the point OA TEMP (number 56) is set by the field panel to be warm (typically if it is 40°F (4.4°C) or greater outside) then the valve is modulated and the face-bypass damper is kept open to the face. If OA TEMP is set to COOL (<40°F (4.4°C) outside) then the valve is set full open and the face-bypass damper is modulated.

Heating/cooling switchover

If the following conditions are met for the length of time set in the point SWITCH TIME (number 86), then the controller switches from heating to cooling mode by setting the point HEAT.COOL (number 5) to COOL:

- The point HTG LOOPOUT (number 80) is below 50% if free cooling is disabled, or below the point SWITCH LIMIT (number 85) if free cooling is enabled.
- The point CTL TEMP (number 78) is greater than the sum of the points CTL STPT (number 92) plus SWITCH DBAND (number 90).
- CTL TEMP is greater than the appropriate cooling set point minus SWITCH DBAND.

If the following conditions are met for the length of time set in SWITCH TIME, then the controller switches from cooling to heating mode by setting HEAT.COOL to HEAT:

- The point CLG LOOPOUT (number 79) is below 50% if free cooling is disabled, or below SWITCH LIMIT if free cooling is enabled.
- CTL TEMP is less than CTL STPT minus SWITCH DBAND.
- CTL TEMP is less than the appropriate heating set point plus SWITCH DBAND.

If night cooling is not available, as indicated by the point NGT CLG MODE (number 54), then the controller remains in heating mode during the night.

Control loops

The unit ventilator is controlled by four Proportional, Integral, and Derivative (PID) control loops; a room loop, a heating loop, a DX loop, and an auxiliary loop.

Room Loop – The room loop uses the values of the points CTL STPT (number 92) and CTL TEMP (number 78) to set the discharge set point, DISCH STPT (number 93), between the values of the points DSH MIN TEMP (number 94) and DSH MAX TEMP (number 95). This loop runs in the heating mode during both day and night modes.

Heating Loop – The heating loop uses the value of DISCH STPT and the point DISCH TEMP (number 15) to modulate the value of the point HTG LOOPOUT (number 80). This loop runs in the heating mode during both day and night modes.

DX Loop – The DX loop uses the value of CTL STPT and CTL TEMP to modulate the value of the point CLG LOOPOUT (number 79). This loop runs during day cooling mode only.

Auxiliary Loop – The auxiliary loop uses the points AUX DSH STPT (number 91) and DISCH STPT (number 93) to modulate the value of the point AUX LOOPOUT (number 77). This loop runs during day heating mode only.

*Morning warm-up/
cool-down*

Morning warm-up or cool-down occurs after the controller switches from night mode to day mode, upon power-up, or if the controller is reset. During morning warm-up or cool-down, the controller provides maximum heating or cooling with the outdoor air damper closed until the temperature of the space reaches the value of the point CTL STPT (number 92) plus or minus the value of the point MORN DBAND (number 89). In morning cool-down, if the point FREE CLG (number 23) is set to ENABLE, then the outdoor air damper is opened.

In heating mode, normal day heating operation begins when the temperature of the room reaches the value of CTL STPT minus MORN DBAND.

In cooling mode, normal day cooling operation begins when the temperature of the room reaches the value of CTL STPT plus MORN DBAND.

For example, in day heating mode, if CTL STPT is 72°F (22.2°C) and MORN DBAND is 3°F (1.6°C), then normal day heating operation begins when the temperature of the room reaches 69°F (20.6°C).

*DX cooling
operation*

DX cooling is controlled as follows:

- If the point CLG OUTPUT (number 61) is greater than 75%, then the DX turns ON.
- If CLG OUTPUT is less than 75%, then the DX turns OFF.
- The DX may not turn ON or OFF until the number of minutes held in the point CMP MIN ON (number 76) or the point CMP MIN OFF (number 75) have expired.

Fan operation

In day mode, the point FAN (number 50), is ON all of the time.

In night mode, the fan only operates when required for heating or cooling.

In night heating, the fan turns ON when the temperature drops below the value of the points CTL STPT (number 92) minus NGT DBAND (number 88). When the temperature rises above CTL STPT, the fan turns OFF. If any stage of electric heat is ON, then the fan will be ON. The fan will remain ON for 30 seconds after the last stage of electric heat is turned OFF.

In night cooling, the fan turns ON when the temperature rises above the value of CTL STPT plus NGT DBAND. When the temperature drops below CTL STPT, the fan turns OFF. If the DX coil is ON, then the fan will be ON. The fan will remain ON for 30 seconds after the DX coil is turned OFF.

Fail-safe operation

The Unit Vent Controller has a fail-safe operation that can be triggered by several occurrences.

A Low Temperature Detection Thermostat (LTDT) can be used to signal the controller when the temperature sensed by the LTDT is below the low temperature limit. The normal status of the LTDT DI can be changed using the point LTDT NO.NC (number 3). If set to NCLOSE, then the LTDT contact must be normally closed. If set to NOPEN, then the LTDT contact must normally open.

If the room temperature sensor input to the Unit Vent Controller fails or the LTDT equals ON, then the controller goes through the following shutdown sequence:

- Outdoor air damper is closed.
- Heating valve is full open.
- DX cooling is OFF.
- Face-bypass damper is open to face.
- Fan is OFF.
- Auxiliary radiation is OFF.

NOTE: DO 2 will not be commanded by the fail-safe mode, all other DOs can be affected.

If the discharge air temperature sensor fails, then the following conditions occur:

- If the last valid value is greater than 150°F (65.6°C), then the heat is turned OFF, the outdoor air damper is closed, and the fan is turned ON.
- If the sensor does not come back within 10 minutes or if the last valid value is less than 150°F (65.6°C), then the controller shuts down as described above.

If a failed sensor returns or if the LTDT turns OFF, then normal control resumes.

Analog and digital outputs cannot be commanded when the controller is in fail-safe mode, however, failed points may be overridden, allowing the controller to return from fail-safe mode. In this instance, room temperature control is not possible.

Application notes

1. If the unit ventilator cycles excessively, if the temperature swings in the room are excessive or if there is trouble in maintaining the set point, 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 Unit Vent Controller with Face-Bypass Sequence, 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. When the fan is manually switched OFF at the unit fan speed switch, the actuators should be wired so they return to their normal state.

Wiring diagram

The point wiring for Application 2334 is shown in Figure 2334-3.



CAUTION:

The controller's DOs control 24 Vac loads only. The maximum rating is 12 VA for each DO. Use an interposing 220V relay module for any of the following:

- VA requirements higher than the maximum
- 110 or 220 Vac requirements
- DC power requirements
- Separate transformers used to power the load

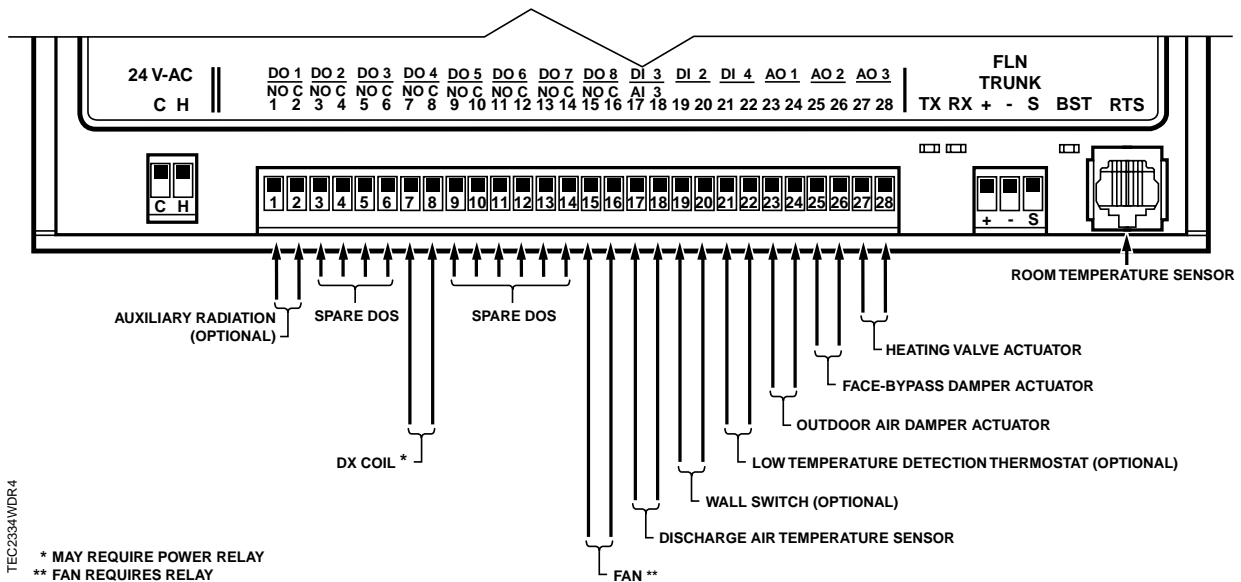


Figure 2334-3. Application 2334 Wiring Diagram.

Table 2334-1. Point Database for Application 2334.

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	2299	--	1	0	--	--
03	LTDT NO.NC	NOPEN	--	--	--	NCLOSE	NOPEN
{04}	ROOM TEMP	74.00 (23.45)	DEG F (DEG C)	0.25 (0.14)	48 (8.89)	--	--
{05}	HEAT.COOL	COOL	--	--	--	HEAT	COOL
06	DAY CLG STPT	74.00 (23.45)	DEG F (DEG C)	0.25 (0.14)	48 (8.89)	--	--
07	DAY HTG STPT	70.00 (21.21)	DEG F (DEG C)	0.25 (0.14)	48 (8.89)	--	--
08	NGT CLG STPT	82.00 (27.93)	DEG F (DEG C)	0.25 (0.14)	48 (8.89)	--	--
09	NGT HTG STPT	65.00 (18.41)	DEG F (DEG C)	0.25 (0.14)	48 (8.89)	--	--
10	OADPR MINPOS	14.8	PCT	0.4	0	--	--
11	RM STPT MIN	55.00 (12.81)	DEG F (DEG C)	0.25 (0.14)	48 (8.89)	--	--
12	RM STPT MAX	90.00 (32.41)	DEG F (DEG C)	0.25 (0.14)	48 (8.89)	--	--
{13}	RM STPT DIAL	74.00 (23.45)	DEG F (DEG C)	0.25 (0.14)	48 (8.89)	--	--
14	STPT DIAL	NO	--	--	--	YES	NO
{15}	DISCH TEMP	74.0 (23.496)	DEG F (DEG C)	0.5 (0.28)	37.5 (3.056)	--	--
{17}	FBP.MODVALVE	VALVE	--	--	--	FBP	VALVE
18	WALL SWITCH	NO	--	--	--	YES	NO
{19}	DI OVRD SW	OFF	--	--	--	ON	OFF
20	OVRD TIME	1	HRS	1	0	--	--
{21}	NGT OVRD	DAY	--	--	--	NIGHT	DAY
22	AUX.NOAUX	NOAUX	--	--	--	AUX	NOAUX
{23}	FREE CLG	DISABL	--	--	--	ENABLE	DISABL
{24}	DI 2	OFF	--	--	--	ON	OFF
{25}	DI 3	OFF	--	--	--	ON	OFF
{26}	DI 4	OFF	--	--	--	ON	OFF
{29}	DAY.NGT	DAY	--	--	--	NIGHT	DAY
{30}	WRMUP.COOLDN	ON	--	--	--	ON	OFF
31	AOV1 SPAN	10.00	VOLTS	0.01	0	--	--
32	AOV1 START	0.00	VOLTS	0.01	0	--	--
33	AOV2 SPAN	10.00	VOLTS	0.01	0	--	--
34	AOV2 START	0.00	VOLTS	0.01	0	--	--
35	AOV3 SPAN	10.00	VOLTS	0.01	0	--	--
36	AOV3 START	0.00	VOLTS	0.01	0	--	--
37	AO DIR.REV	0	--	1	0	--	--
{38}	AOV1	0.00	VOLTS	0.01	0	--	--
{39}	AOV2	0.00	VOLTS	0.01	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 2334-1. Point Database for Application 2334.

Point Number	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{40}	AOV3	0.00	VOLTS	0.01	0	--	--
{41}	AUX RAD	OFF	--	--	--	ON	OFF
{42}	DO 2	OFF	--	--	--	ON	OFF
{43}	DO 3	OFF	--	--	--	ON	OFF
{44}	DX	OFF	--	--	--	ON	OFF
{45}	DO 5	OFF	--	--	--	ON	OFF
{46}	DO 6	OFF	--	--	--	ON	OFF
{47}	DO 7	OFF	--	--	--	ON	OFF
{50}	FAN	OFF	--	--	--	ON	OFF
53	NGT HW HTG	YES	--	--	--	YES	NO
54	NGT CLG MODE	NO	--	--	--	YES	NO
{55}	AUX OUTPUT	0.0	PCT	0.4	0	--	--
{56}	OA TEMP	COOL	--	--	--	WARM	COOL
57	AUX HTG TIME	10	MIN	1	0	--	--
59	DO DIR.REV	0	--	1	0	--	--
{60}	HTG OUTPUT	0.0	PCT	0.4	0	--	--
{61}	CLG OUTPUT	0.0	PCT	0.4	0	--	--
{62}	OA DMPR POS	0.0	PCT	0.4	0	--	--
63	CLG P GAIN	1.6 (2.88)	--	0.2 (0.36)	0	--	--
64	CLG I GAIN	0.0500 (0.0900)	--	0.0005 (0.0009)	0	--	--
65	CLG D GAIN	10 (18.0)	--	2 (3.6)	0	--	--
66	CLG BIAS	50.0	PCT	0.2	0	--	--
67	HTG P GAIN	0.40 (0.72)	--	0.05 (0.09)	0	--	--
68	HTG I GAIN	0.0150 (0.02700)	--	0.0002 (0.00036)	0	--	--
69	HTG D GAIN	5 (9.0)	--	1 (1.8)	0	--	--
70	HTG BIAS	50.0	PCT	0.2	0	--	--
71	ROOM P GAIN	2.30 (4.14)	--	0.05 (0.09)	0	--	--
72	ROOM I GAIN	0.00504 (0.009072)	--	0.00009 (0.000162)	0	--	--
73	ROOM D GAIN	76 (136.8)	--	2 (3.6)	0	--	--
74	ROOM BIAS	72.0 (22.376)	DEG F (DEG C)	0.5 (0.28)	37.5 (3.056)	--	--
75	CMP MIN OFF	5	MIN	1	0	--	--
76	CMP MIN ON	5	MIN	1	0	--	--
{77}	AUX LOOPOUT	0.0	PCT	0.2	0	--	--
{78}	CTL TEMP	74.00 (23.45)	DEG F (DEG C)	0.25 (0.14)	48 (8.89)	--	--
{79}	CLG LOOPOUT	0.0	PCT	0.2	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 2334-1. Point Database for Application 2334.

Point Number	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{80}	HTG LOOPOUT	0.0	PCT	0.2	0	--	--
{81}	AUX P GAIN	0.20 (0.360)	--	0.02 (0.036)	0	--	--
{82}	AUX I GAIN	0.00054 (0.000972)	--	0.00009 (0.000162)	0	--	--
{83}	AUX D GAIN	24 (43.2)	--	1 (1.8)	0	--	--
{84}	AUX BIAS	0.0	PCT	0.2	0	--	--
85	SWITCH LIMIT	4.8	PCT	0.4	0	--	--
86	SWITCH TIME	10	MIN	1	0	--	--
{87}	LOW TEMP DET	OFF	--	--	--	ON	OFF
88	NGT DBAND	3.00 (1.68)	DEG F (DEG C)	0.25 (0.14)	0	--	--
89	MORN DBAND	2.00 (1.12)	DEG F (DEG C)	0.25 (0.14)	0	--	--
90	SWITCH DBAND	2.00 (1.12)	DEG F (DEG C)	0.25 (0.14)	0	--	--
{91}	AUX DSH STPT	80.0 (26.856)	DEG F (DEG C)	0.5 (0.28)	37.5 (3.056)	--	--
{92}	CTL STPT	74.00 (23.45)	DEG F (DEG C)	0.25 (0.14)	48 (8.89)	--	--
{93}	DISCH STPT	74.0 (23.496)	DEG F (DEG C)	0.5 (0.28)	37.5 (3.056)	--	--
94	DSH MIN TEMP	60.0 (15.656)	DEG F (DEG C)	0.5 (0.28)	37.5 (3.056)	--	--
95	DSH MAX TEMP	110.0 (43.656)	DEG F (DEG C)	0.5 (0.28)	37.5 (3.056)	--	--
98	LOOP TIME	5	SEC	1	0	--	--
{99}	ERROR STATUS	0	--	1	0	--	--

NOTES:

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