SIEMENS

Application 2333
VAV with Hot Water Reheat and Induction Damper

TEC-0108.08

This document contains the following topics:

- Application Notes
- Wiring Diagram
- Point Database

Overview

In Application 2333, the controller modulates the supply air damper of the terminal box for cooling and modulates a reheat valve for heating. An induction damper is also controlled inversely to the supply flow. When in heating, the terminal box either maintains minimum airflow or modulates the supply air damper. In order for the terminal box to work properly, the central air handling unit must provide supply air. Refer to Figures 2333-1 and 2333-2.

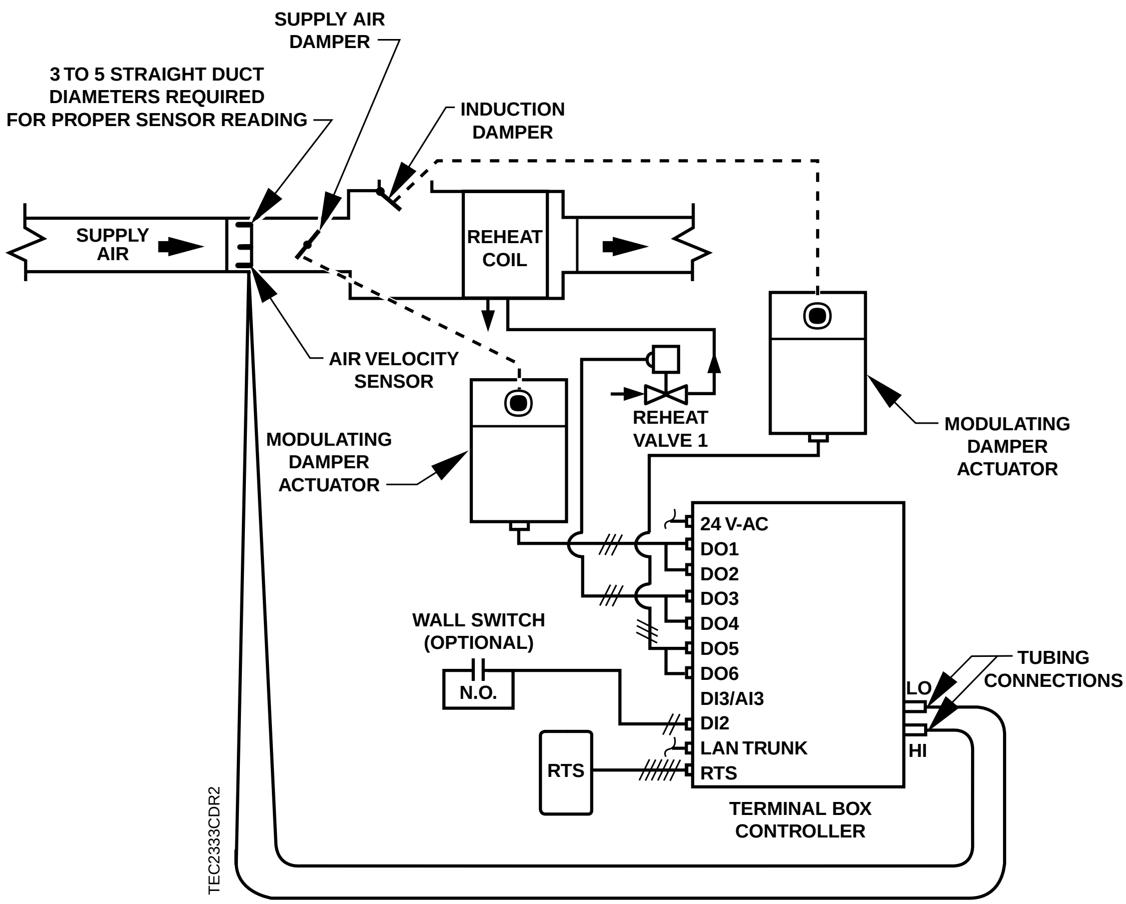
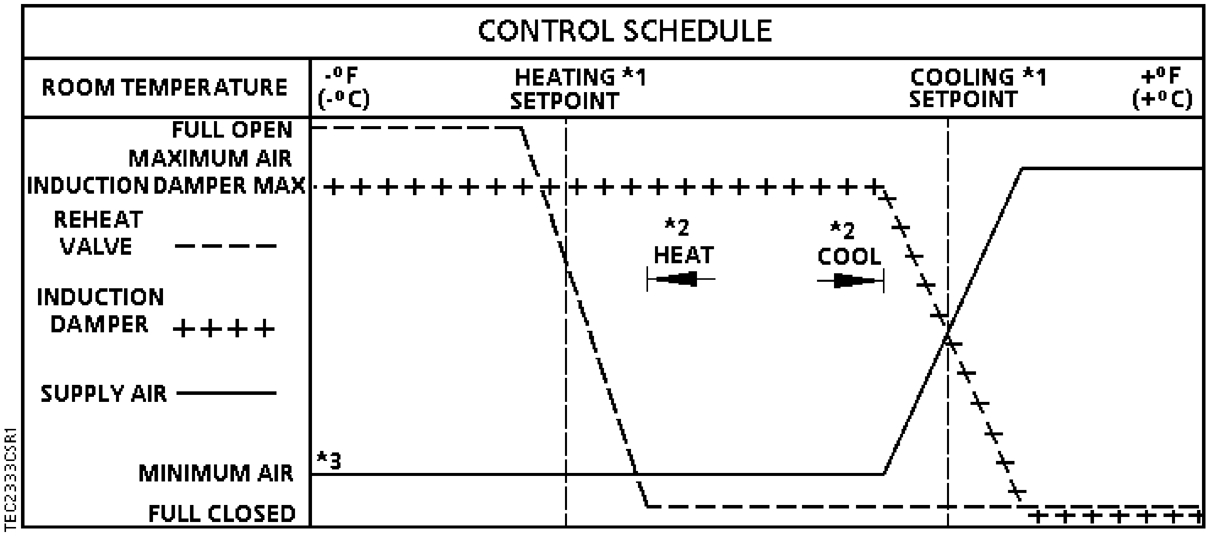


Figure 2333-1. Application 2333 Control Drawing.



1. Refer to *Control Temperature Set Points*.
2. Refer to *Heating/Cooling Switchover*.
3. The airflow is shown at minimum flow throughout the entire heating mode (default setting). The airflow can operate sequenced, parallel, or overlapping with the reheat valve (optional). Refer to *Sequencing Logic*.

Figure 2333-2. Application 2333 Control Schedule.

Hardware Inputs

Analog

- Air Velocity Sensor
- Room Temperature Sensor
- Room Temperature Set Point Dial (optional)

Digital

- Night Mode Override (optional)
- Wall Switch (optional)

Hardware Outputs

Analog

- None

Digital

- Supply Damper Actuator
- Valve Actuator
- Induction Damper Actuator

Ordering Notes

VAV Controller with Hot Water Reheat and Induction Damper: Part Number 540-798.

Sequence of Operation

The following paragraphs present the sequence of operation for Application 2333, “VAV with Hot Water Reheat and Induction Damper.”

Control Temperature Set Points

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

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

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

Night Mode – In night mode, CTL STPT holds the value of NGT CLG STPT (Point 8) or NGT HTG STPT (Point 9).

NOTE: The value of CTL TEMP (Point 78) is the same as the value of ROOM TEMP (Point 4), unless CTL TEMP is overridden.

Day and Night Modes

The day/night status of the space is determined by the status of DAY.NGT (Point 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 2333-1 and 2333-4), and the WALL SWITCH (Point 18) equals YES, the controller monitors the status of DI 2. When the status of DI 2 (Point 24) is ON (the switch is closed), DAY.NGT is set to DAY, indicating that the controller is in day mode. When the status of DI 2 is OFF (the switch is open), DAY.NGT is set to NIGHT indicating that the controller is in night mode.

When the 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 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 OVRD TIME (Point 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 NGT OVRD (Point 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 during night mode that the override switch has any effect on the controller.

Heating/Cooling Switchover

The heating/cooling switchover determines whether the controller is in heating or cooling mode by monitoring the room temperature and the demand for heating and cooling (as determined by the temperature control loops).

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

- The HTG LOOPOUT (Point 80) is less than SWITCH LIMIT (Point 85).
- The CTL TEMP (Point 78) is above CTL STPT (Point 92) by at least the value set in SWITCH DBAND (Point 90).
- CTL TEMP is greater than the appropriate cooling set point minus SWITCH DBAND.

If all of 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 CLG LOOPOUT (Point 79) is less than SWITCH LIMIT.
- CTL TEMP is below CTL STPT by at least the value set SWITCH DBAND.
- CTL TEMP is less than the appropriate heating set point plus SWITCH DBAND.

Modulate Damper During Heating Mode (optional)

CAUTION:

This heating/cooling switchover mechanism is not affected by the air temperature in the supply duct.

To change the value of HEAT.COOL (Point 5) based on the supply air temperature, you must command HEAT.COOL through PPCL. This is required when the flow loop is used as a source of cooling in cooling mode and a source of heat in heating mode. (Refer to Examples 1 through 3 in *Sequencing Logic*.) If the flow loop is used in heating mode just to meet minimum air requirements, then the heating/cooling switchover mechanism operates as described in this section to control HEAT.COOL. (Refer to Example 4 in *Sequencing Logic*.)

Control Loops

The terminal box is controlled by three Proportional, Integral, and Derivative (PID) control loops; two temperature loops and a flow loop.

Temperature Loops – The two temperature loops are a cooling loop and a heating loop. The active temperature loop maintains room temperature at the value in the CTL STPT (Point 92). Refer to *Control Temperature Set Points*.

The cooling temperature loop generates cooling loopout which is then used to generate FLOW STPT (Point 93). FLOW STPT is the result of scaling the cooling loopout to the appropriate range of values determined by the CLG FLOW MIN (Point 31) and CLG FLOW MAX (Point 32). In order to scale it, the loopout is multiplied by the range (MAX–MIN) and then added to the minimum set point.

When CLG FLOW MIN does not equal 0 CFM, then FLOW STPT does not equal CLG LOOPOUT (Point 79). The minimum flow set point is (CLG FLOW MIN ÷ CLG FLOW MAX) × 100% flow. And FLOW STPT is [CLG LOOPOUT × (100% – minimum set point)] + minimum set point.

For example:

If CLG FLOW MIN=200 CFM and CLG FLOW MAX=1000 CFM

then, the minimum flow set point is

(200 CFM÷1000 CFM)×100% flow=20%

When CLG LOOPOUT is 0%, FLOW STPT equals 20% flow.

[0%×(100%–20%)]+20%=20%
This ensures that the airflow out of the terminal box is no less than CLG FLOW MIN.

When CLG LOOPOUT is 50%, FLOW STPT equals 60% flow.

[50%×(100%–20%)]+20%=60%

When CLG LOOPOUT is 100%, FLOW STPT equals 100% flow.1

[100%×(100%–20%)]+20%=100%

If the controller is in heating mode, then the operation of the flow loop is flexible. It can be set up to do one of the following:

- Constantly maintain an airflow out of the terminal box equal to HTG FLOW MIN (Point 33).
- Operate in sequence with the hot water valve(s).
- Operate parallel with the hot water valve(s).
- Have its operation overlap with the operation of the hot water valve(s). Refer to *Sequencing Logic* for more information.

If the first option described above is chosen, then HTG LOOPOUT (Point 80) controls the hot water valve(s) in order to maintain the room temperature. If any one of the last three options is chosen, then HTG LOOPOUT controls both the flow loop (FLOW STPT) and the hot water valve(s) in order to maintain the room temperature. Refer to *Sequencing Logic* for more information.

HTG LOOPOUT adjusts the value of FLOW STPT differently depending on which flow loop setup is chosen. However, the following rule applies no matter what setup is chosen:

In heating mode, FLOW STPT will never be set below (HTG FLOW MIN÷HTG FLOW MAX) × 100% flow or above 100% flow.

Flow Loop – The flow loop maintains the minimum airflow and maximum airflow through the CTL FLOW MIN (Point 76) and CTL FLOW MAX (Point 77).

When the controller is in cooling mode, CTL FLOW MIN equals CLG FLOW MIN and CTL FLOW MAX equals CLG FLOW MAX.

When the controller is in heating mode, CTL FLOW MIN equals HTG FLOW MIN and CTL FLOW MAX equals HTG FLOW MAX.

In Application 2333, you can set CLG FLOW MIN equal to, but not greater than, CLG FLOW MAX and set HTG FLOW MIN equal to, but not greater than, HTG FLOW MAX. If the minimum and maximum values are set equal, then the flow loop becomes a constant volume loop and its ability to control temperature is lost.

The flow loop maintains FLOW STPT by modulating the supply air damper, SUP DMPR CMD (Point 48). The flow loop maintains the airflow between CLG FLOW MIN and CLG FLOW MAX in cooling mode and between HTG FLOW MIN and HTG FLOW MAX in heating mode.

The FLOW (Point 75) is the input value for the flow loop. It is calculated as a percentage based on where AIR VOLUME (Point 35) is between 0 CFM and CTL FLOW MAX. In the following text, this percentage is referred to as *% flow*.

- If AIR VOLUME equals 0 CFM, then FLOW is 0% flow.
- If AIR VOLUME equals CTL FLOW MAX, then FLOW is 100% flow.

The low limit of FLOW STPT is the percentage that corresponds to the volume given in CLG FLOW MIN. This percentage can be calculated as: (CTL FLOW MIN÷CTL FLOW MAX) × 100% flow. The flow loop ensures that the supply air will not be less than CTL FLOW MIN.

For example, if CTL FLOW MIN equals 250 CFM, and if CTL FLOW MAX equals 1000 CFM, then,

the low limit of FLOW STPT = (250 CFM÷1000 CFM)×100% flow
= 0.25×100% flow
= 25% flow

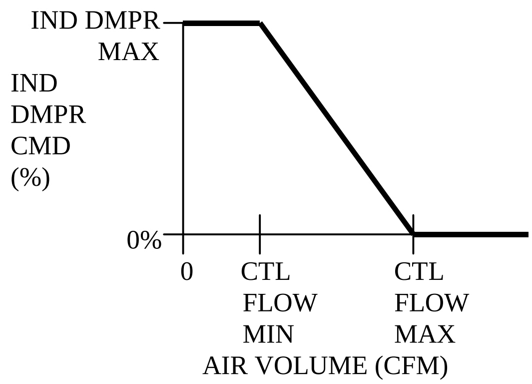
Since 25% of 1000 CFM equals 250 CFM, the minimum airflow out of the terminal box will be 250 CFM.

Induction Damper Control

The induction damper position is set according to the following formula:

IND DMPR CMD = (AIR VOLUME – CTL FLOW MIN) ÷ (CTL FLOW MAX – CTL FLOW MIN) × IND DMPR MAX

This formula is represented graphically in the following diagram:



In addition, to prevent excess damper movement due to fluctuating airflow, a deadband is used, IND DBAND (Point 54). The induction damper will not move until the air volume has changed by more than the value of IND DBAND since the last time the damper moved.

Hot Water Reheat

CAUTION:

Do not set HTG FLOW MIN (Point 33) to 0 CFM (0 LPS). A minimum airflow should be provided across the heating coils when the heating valve is open.

The heating loop modulates the heating valve(s) in order to warm up the space as follows:

When (HTG LOOPOUT–REHEAT START)÷(REHEAT END–REHEAT START)×100% varies from 0 to 100% open of the reheat output range, the VALVE COMD (Point 52) varies from 0 to 100% open.

When the controller is in cooling mode, the heating valve is closed.

Sequencing Logic (optional)

NOTE: The default setups for FLOW START (Point 16) and FLOW END (Point 17) are 0. This provides minimum supply airflow during heating mode.

In heating mode, this application includes logic that allows the flow loop to operate either in sequence, parallel, or overlapping with the hot water valve. This algorithm is similar to the spring range sequencing of valves and dampers. Portions of the output of the heating loop, HTG LOOPOUT (Point 80), drive both the flow loop and the hot water valve from 0 to 100%. Refer to the ladder diagrams in *Figure 2333-3* and to the three examples that follow shortly. For simplicity, assume that in these examples HTG FLOW MIN (Point 33) equals 0 CFM. (When this is done, FLOW STPT (Point 93) = 0 when HTG LOOPOUT = 0). The ladder diagrams in *Figure 2333-3* show sequenced, parallel, and overlapping flow loop operations with hot water reheat. The vertical bars show the output of heating loopout from 0 to 100%. The horizontal bars (reheat start, flow start, etc.) show the action that occurs when the loop output rises above the horizontal bar. The relative positions shown on the graphs are for illustration purposes only and may differ from the examples.

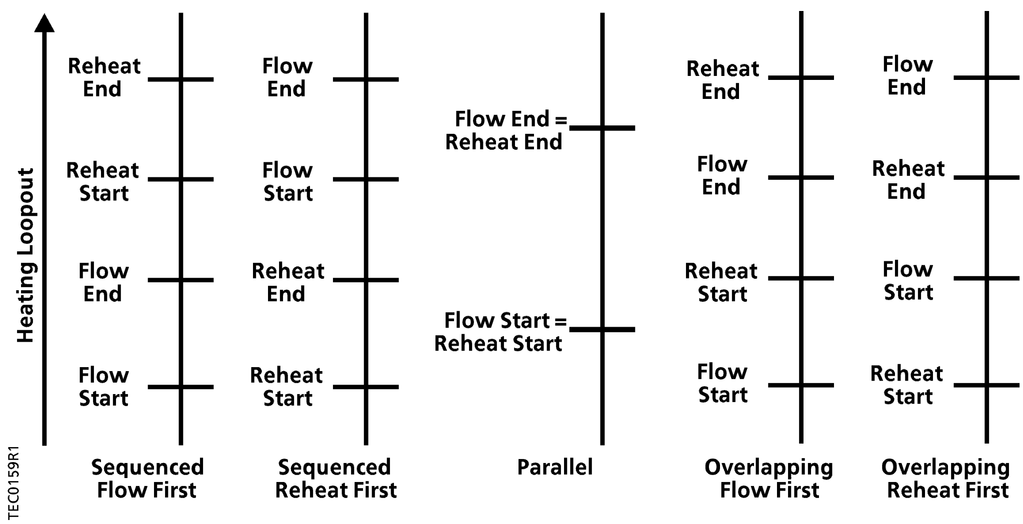


Figure 2333-3. Sequenced, Parallel, and Overlapping Flow Loop Operations with Hot Water Reheat.

Example 1: Assume that your system has a hot water valve that is to operate in *sequence* with the flow loop. If,

- FLOW START (Point 16) equals 0%
- FLOW END (Point 17) equals 50%
- REHEAT START (Point 22) equals 50%
- REHEAT END (Point 23) equals 100%

then,

- When HTG LOOPOUT equals 0%, FLOW STPT will equal 0% flow.
- When HTG LOOPOUT equals 25%, FLOW STPT will equal 50% flow.
- When HTG LOOPOUT is greater than or equal to 50%, FLOW STPT will equal 100% flow.
- When HTG LOOPOUT is less than or equal to 50%, VLV COMD will equal 0% open.
- When HTG LOOPOUT equals 75%, VLV COMD will equal 50% open.
- When HTG LOOPOUT equals 100%, VLV COMD will equal 100% open.

Example 2: Assume that your system has a hot water valve that is to operate in *parallel* with the flow loop. If,

- FLOW START (Point 16) equals 0%
- FLOW END (Point 17) equals 100%
- REHEAT START (Point 22) equals 0%
- REHEAT END (Point 23) equals 100%

then,

- When HTG LOOPOUT equals 0%, FLOW STPT will equal 0% flow.
- When HTG LOOPOUT equals 50%, FLOW STPT will equal 50% flow.
- When HTG LOOPOUT equals 100%, FLOW STPT will equal 100% flow.
- When HTG LOOPOUT equals 0%, VLV COMD will equal 0% open.
- When HTG LOOPOUT equals 50%, VLV COMD will equal 50% open.
- When HTG LOOPOUT equals 100%, VLV COMD will equal 100% open.

Example 3: Assume that your system has a hot water valve that is to operate *overlapping* with the flow loop. If,

- FLOW START (Point 16) equals 0%
- FLOW END (Point 17) equals 75%
- REHEAT START (Point 22) equals 25%
- REHEAT END (Point 23) equals 100%

then,

- When HTG LOOPOUT equals 0%, FLOW STPT will equal 0% flow.
- When HTG LOOPOUT equals 37.5%, FLOW STPT will equal 50% flow.
- When HTG LOOPOUT is greater than or equal to 75%, FLOW STPT will equal 100% flow.

- When HTG LOOPOUT is less than or equal to 25%, VLV COMD will equal 0% open.
- When HTG LOOPOUT equals 62.5%, VLV COMD will equal 50% open.
- When HTG LOOPOUT equals 100%, VLV COMD will equal 100% open.

Another option that the sequencing logic provides is to have the flow loop provide an airflow equal to HTG FLOW MIN throughout the heating mode with all of the temperature control being done by the hot water valve(s). The airflow minimum will be maintained by setting the FLOW START and FLOW END to 0% which will cause FLOW STPT to hold the value corresponding to minimum flow throughout the entire heating mode, regardless of the value of HTG LOOPOUT. Example 4 clarifies this:

Example 4: Assume that your system has a hot water valve that provides the temperature control in the heating mode, while the flow loop provides for the minimum air requirements. Assume,

- HTG FLOW MIN equals 170 CFM
- HTG FLOW MAX equals 1000 CFM

If,

- FLOW START (Point 16) equals 0%
- FLOW END (Point 17) equals 0%
- REHEAT START (Point 22) equals 0%
- REHEAT END (Point 23) equals 100%

then,

when HTG LOOPOUT equals 0%, FLOW STPT will equal (170 CFM–1000 CFM)×100% flow=17% flow. This will cause the flow loop to maintain an airflow of 170 CFM out of the terminal box.

- When HTG LOOPOUT equals 50%, FLOW STPT will equal 17% flow.
- When HTG LOOPOUT equals 100%, FLOW STPT will equal 17% flow.
- When HTG LOOPOUT equals 0%, VLV COMD will equal 0% open.
- When HTG LOOPOUT equals 50%, VLV COMD will equal 50% open.
- When HTG LOOPOUT equals 100%, VLV COMD will equal 100% open.

Calibration

Air Velocity Transducer – Calibration of the controller’s internal air velocity transducers is periodically required to maintain accurate air velocity readings. The CAL SETUP (Point 95) is set with the desired calibration option during controller startup. Depending upon the value of CAL SETUP, calibration may be set to take place automatically or manually. If the status of CAL AIR (Point 94) is YES, then calibration is in progress.

The dampers are commanded closed to get a zero airflow reading during calibration.

Hot Water Valve – Calibration of a hot water valve(s) is done by commanding the valve to closed.

At the end of a calibration sequence, CAL AIR returns to NO automatically. A status of NO indicates that the controller is not in a calibration sequence.

Fail-Safe Operation

If the air velocity sensor fails, then the controller uses pressure dependent control. The temperature loop controls the operation of the supply damper, and the induction damper is set to [IND DMPR MAX – SUP DMPR CMD × (IND DMPR MAX ÷ 100%)].

If the room temperature sensor fails, then the controller operates using the last known temperature value.

Application Notes

1. 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. If the FLOW (Point 75) is oscillating while the FLOW STPT (Point 93) is constant, then the flow loop requires tuning. Refer to *APOGEE Automation Service Procedures* on InfoLink for more information.

2. The VAV Controller with Induction Damper, 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.

Wiring Diagram

CAUTION:

The VAV with Induction Damper controls 24 Vac loads only. The maximum rating is 12 VA for each DO. Use an interposing 220V 4-relay module for any of the following:

- VA requirements higher than the maximum
- 110 or 220 Vac requirements
- DC power requirements

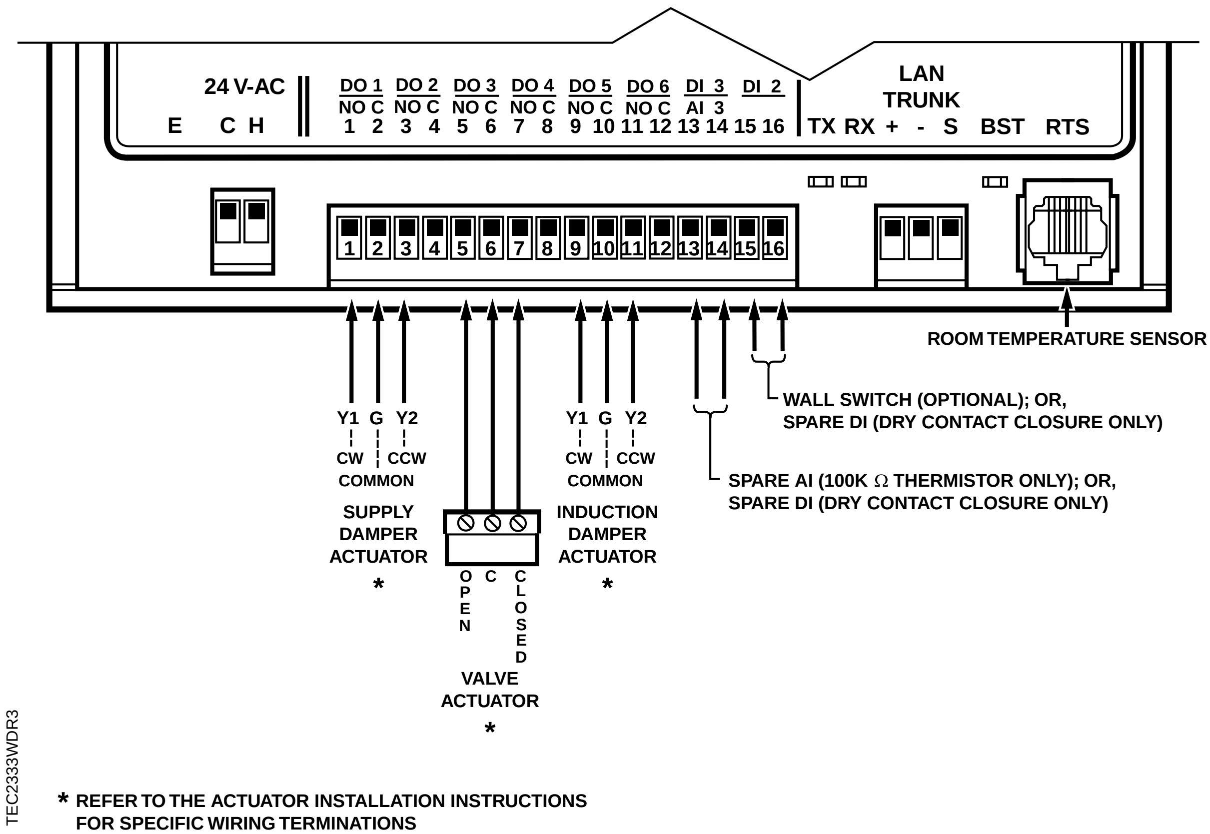


Figure 2333-4. Application 2333 Wiring Diagram.

Point Database

Table 2333-1. Point Database for Application 2333.

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	2091	--	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}	AUX TEMP	74.0 (23.495560)	DEG F (DEG C)	0.5 (0.28)	37.5 (3.055556)	--	--
16	FLOW START	0.0	PCT	0.4	0	--	--
17	FLOW END	0.0	PCT	0.4	0	--	--
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
22	REHEAT START	0.0	PCT	0.4	0	--	--
23	REHEAT END	100.0	PCT	0.4	0	--	--
{24}	DI 2	OFF	--	--	--	ON	OFF
{25}	DI 3	OFF	--	--	--	ON	OFF
{29}	DAY.NGT	DAY	--	--	--	NIGHT	DAY
31	CLG FLOW MIN	220 (103.8180)	CFM (LPS)	4 (1.8876)	0	--	--
32	CLG FLOW MAX	2200 (1038.1800)	CFM (LPS)	4 (1.8876)	0	--	--

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.

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Table 2333-1. Point Database for Application 2333.

Point Number	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
33	HTG FLOW MIN	220 (103.8180)	CFM (LPS)	4 (1.8876)	0	--	--
34	HTG FLOW MAX	2200 (1038.1800)	CFM (LPS)	4 (1.8876)	0	--	--
{35}	AIR VOLUME	0 (0.0000)	CFM (LPS)	4 (1.8876)	0	--	--
36	FLOW COEFF	1.00	--	0.01	0	--	--
{37}	IND DMPR CMD	0.0	PCT	0.4	0	--	--
{38}	IND DMPR POS	0.0	PCT	0.4	0	--	--
39	MTR3 TIMING	130	SEC	1	0	--	--
40	DPR3 ROT ANG	90	--	1	0	--	--
{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}	SUP DMPR CMD	0.0	PCT	0.4	0	--	--
{49}	SUP DMPR POS	0.0	PCT	0.4	0	--	--
{50}	IND DMPR MAX	100.0	PCT	0.4	0	--	--
51	MTR1 TIMING	95	SEC	1	0	--	--
{52}	VALVE COMD	0.0	PCT	0.4	0	--	--
{53}	VALVE POS	0.0	PCT	0.4	0	--	--
54	IND DBAND	16 (7.5504)	CFM (LPS)	4 (1.8876)	0	--	--
55	MTR2 TIMING	130	SEC	1	0	--	--
56	DMPR ROT ANG	90	--	1	0	--	--
58	MTR SETUP	0	--	1	0	--	--
59	DO DIR. REV	0	--	1	0	--	--
63	CLG P GAIN	20.00 (36.00)	--	0.25 (0.45)	0	--	--
64	CLG I GAIN	0.010 (0.0180)	--	0.001 (0.0018)	0	--	--
65	CLG D GAIN	0 (0.0)	--	2 (3.6)	0	--	--

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.

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Table 2333-1. Point Database for Application 2333.

Point Number	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
66	CLG BIAS	0.0	PCT	0.4	0	--	--
67	HTG P GAIN	10.00 (18.00)	--	0.25 (0.45)	0	--	--
68	HTG I GAIN	0.010 (0.0180)	--	0.001 (0.0018)	0	--	--
69	HTG D GAIN	0 (0.0)	--	2 (3.6)	0	--	--
70	HTG BIAS	0.0	PCT	0.4	0	--	--
71	FLOW P GAIN	0.00	--	0.05	0	--	--
72	FLOW I GAIN	0.010	--	0.001	0	--	--
73	FLOW D GAIN	0	--	2	0	--	--
74	FLOW BIAS	50.0	PCT	0.4	0	--	--
{75}	FLOW	0.00	PCT	0.25	0	--	--
{76}	CTL FLOW MIN	220 (103.8180)	CFM (LPS)	4 (1.8876)	0	--	--
{77}	CTL FLOW MAX	2200 (1038.1800)	CFM (LPS)	4 (1.8876)	0	--	--
{78}	CTL TEMP	74.00 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48 (8.88888)	--	--
{79}	CLG LOOPOUT	0.0	PCT	0.4	0	--	--
{80}	HTG LOOPOUT	0.0	PCT	0.4	0	--	--
{84}	DMPR STATUS	CAL	--	--	--	RECAL	CAL
85	SWITCH LIMIT	5.2	PCT	0.4	0	--	--
86	SWITCH TIME	10	MIN	1	0	--	--
87	CAL MODULE	NO	--	--	--	YES	NO
90	SWITCH DBAND	1.00 (0.56)	DEG F (DEG C)	0.25 (0.14)	0	--	--
{91}	TOTAL VOLUME	0 (0)	CF (L)	4 (113)	0	--	--
{92}	CTL STPT	74.00 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48 (8.88888)	--	--
{93}	FLOW STPT	0.00	PCT	0.25	0	--	--
{94}	CAL AIR	NO	--	--	--	YES	NO
95	CAL SETUP	4	--	1	0	--	--
96	CAL TIMER	12	HRS	1	0	--	--
97	DUCT AREA	1.000 (0.092920)	SQ. FT (SQ M)	0.025 (0.002323)	0	--	--
98	LOOP TIME	5	SEC	1	0	--	--
{99}	ERROR STATUS	0	--	1	0	--	--

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