

Application 2376 VAV Parallel Fan Powered with Auxiliary Duct/Space Temperature Sensor and Electric Reheat

Overview

In Application 2376, the controller modulates the supply air damper of the terminal box for cooling and controls stages of electric reheat for heating. Duct or space temperature is controlled using a 100K Ω thermistor on AI 3. When in heating, the terminal box either maintains minimum airflow or modulates the supply air damper. The terminal box also has a parallel fan which recirculates the room air. In order for the terminal box to work properly, the central air handling unit must provide supply air. Refer to Figures 2376-1 through 2376-3.

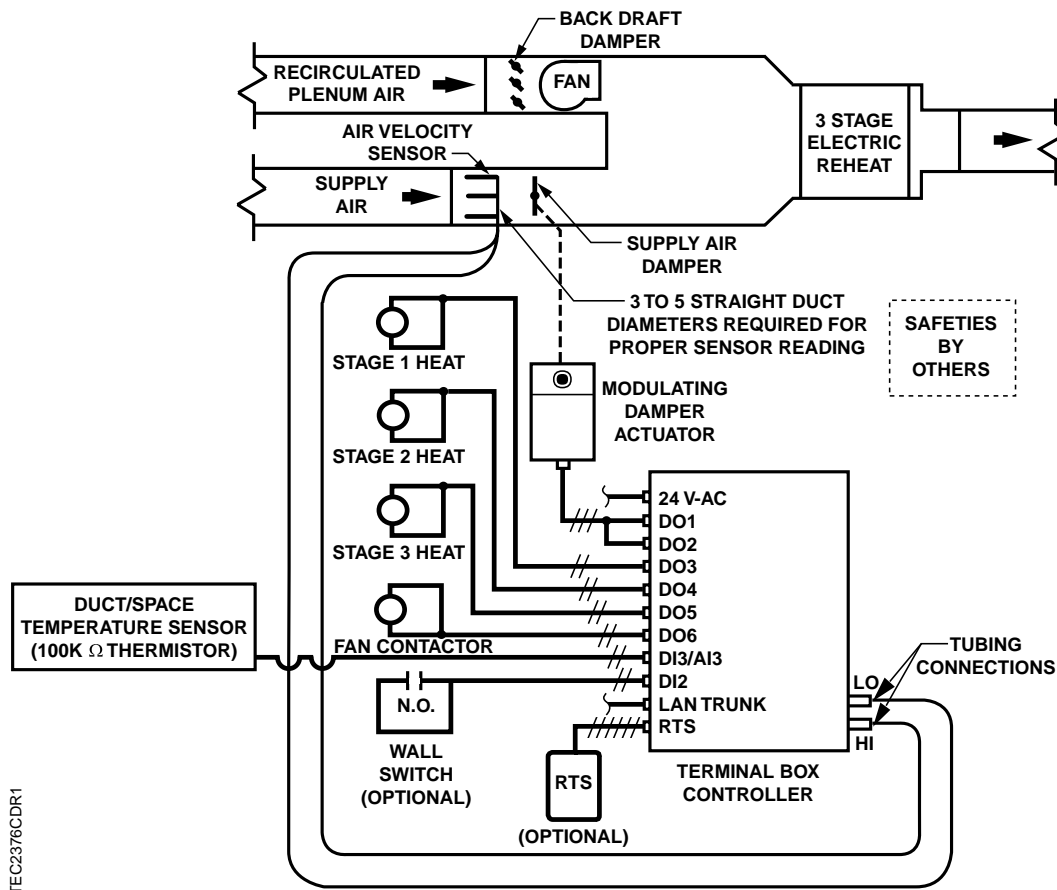
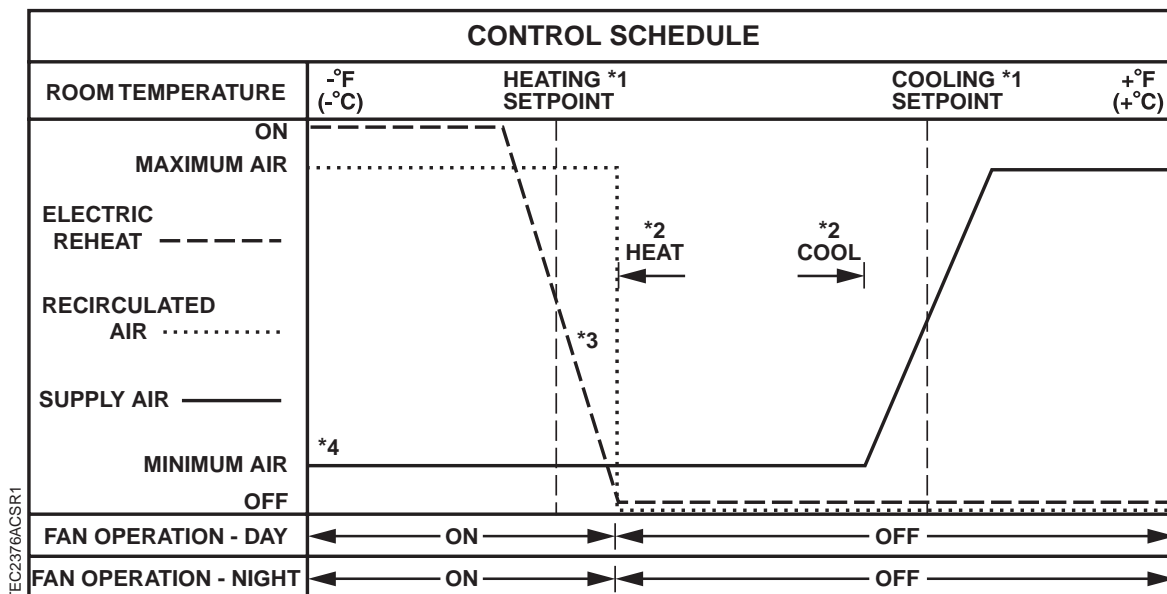


Figure 2376-1. Application 2376 Control Drawing.



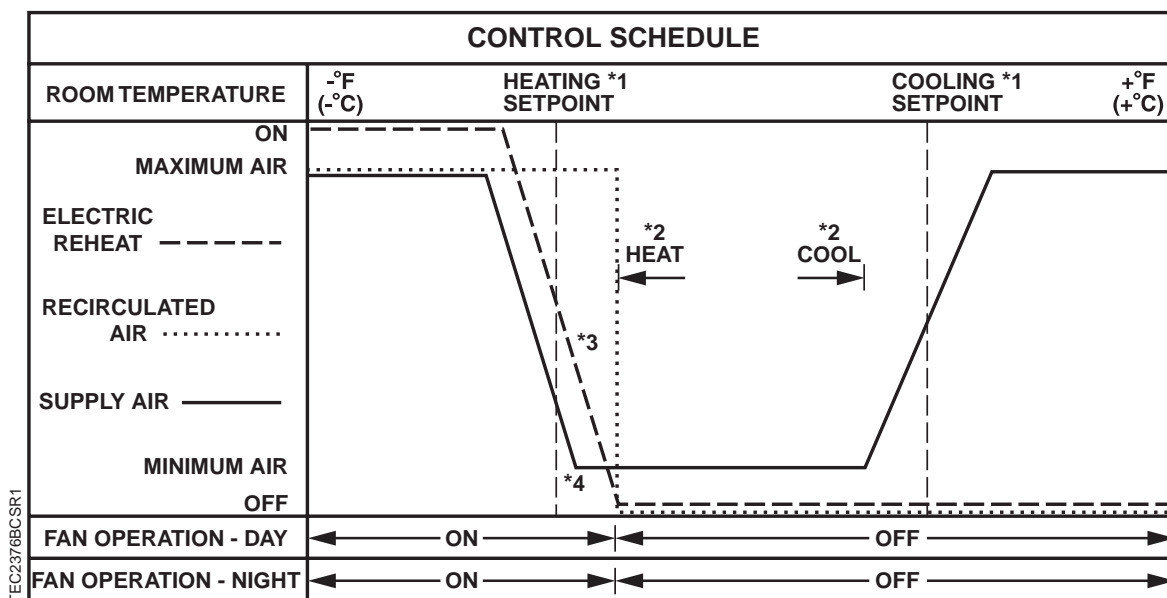
*1 Refer to Sequence of Operation, "Control temperature set points."

*2 Refer to Sequence of Operation, "Heating/cooling switchover."

*3 The electric reheat is time modulated. This allows it to be controlled proportionally rather than with deadbands.

*4 The airflow is shown at minimum flow throughout the entire heating mode (default setting). The airflow can operate sequenced, parallel, or overlapping with the electric reheat (optional). Refer to "Sequencing logic."

Figure 2376-2. Application 2376 Control Schedule.



*1 Refer to Sequence of Operation, "Control temperature set points."

*2 Refer to Sequence of Operation, "Heating/cooling switchover."

*3 The electric reheat is time modulated. This allows it to be controlled proportionally rather than with deadbands.

*4 The airflow is shown operating parallel with the electric reheat (optional). The airflow can operate at minimum flow throughout the entire heating mode (default setting). Refer to "Sequencing logic."

Figure 2376-3. Application 2376 Control Schedule with Modulating Damper in Heating Mode.

Hardware inputs

analog

- air velocity sensor
- room temperature sensor (optional, for monitoring only)
- room temperature set point dial (optional, for monitoring only)
- duct/space temperature sensor (100K Ω thermistor)

digital

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

Hardware outputs

analog

- none

digital

- damper actuator
- fan
- stage 1 electric reheat
- stage 2 electric reheat (optional)
- stage 3 electric reheat (optional)

Point database

Table 2376-1 presents the point database information for Application 2376. Each point number is represented on a line in the point database table.

Sequence of Operation

The following paragraphs present the sequence of operation for Application 2376, "VAV Parallel Fan Powered with Auxiliary Duct/Space Temperature Sensor and Electric Reheat."

Control temperature set points

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 DAY HTG STPT (number 7).

Night Mode – In night mode, CTL STPT holds the value of the point NGT CLG STPT (number 8) or 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 15), 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 2376-1 and 2376-5), 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.

It is only when the controller is in night mode that the override switch on the room temperature sensor will have 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 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:

- HTG LOOPOUT (number 80) is less than the point SWITCH LIMIT (number 85).
- CTL TEMP (number 78) is above the point CTL STPT (number 92) by at least the value set in the point 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:

- CLG LOOPOUT (number 79) is less than SWITCH LIMIT.
- CTL TEMP is below CTL STPT by at least the value set in 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 the point HEAT.COOL (number 5) based on the supply air temperature, you must command HEAT.COOL through PPCL. This is required when the flow loop will be 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 point CTL STPT (number 92). Refer to “Control Temperature Set Points.”

The cooling temperature loop generates cooling loopout which is then used to generate the point FLOW STPT (number 93). FLOW STPT is the result of scaling the cooling loopout to the appropriate range of values determined by the points CLG FLOW MIN (number 31) and CLG FLOW MAX (number 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 the point CLG LOOPOUT (number 79). The minimum flow set point is $(\text{CLG FLOW MIN} \div \text{CLG FLOW MAX}) \times 100\% \text{ flow}$. FLOW STPT is $[\text{CLG LOOPOUT} \times (100\% - \text{minimum set point})] + \text{minimum set point}$.

Examples:

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

then, the minimum flow set point is
 $(200 \text{ CFM} \div 1000 \text{ CFM}) \times 100\% \text{ flow} = 20\%$

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

$$[0\% \times (100\% - 20\%)] + 20\% = 20\%$$

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.

$$[50\% \times (100\% - 20\%)] + 20\% = 60\%$$

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

$$[100\% \times (100\% - 20\%)] + 20\% = 100\%$$

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 the point HTG FLOW MIN (number 33).
- Operate in sequence with the electric reheat.
- Operate parallel with the electric reheat.
- Have its operation overlap with the operation of the electric reheat. Refer to “Sequencing logic” for more information.

If the first option described above is chosen, then the point HTG LOOPOUT (number 80) will control the electric reheat in order to maintain the room temperature. If any one of the last three options is chosen, then HTG LOOPOUT will control both the flow loop set point (FLOW STPT) and the electric reheat in order to maintain the room temperature. Refer to "Sequencing logic" for more information.

HTG LOOPOUT will adjust 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 $(\text{HTG FLOW MIN} \div \text{HTG FLOW MAX}) \times 100\%$ flow or above 100% flow.

Flow Loop – The flow loop maintains the minimum airflow and maximum airflow through the points CTL FLOW MIN (number 76) and CTL FLOW MAX (number 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 2376, 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 point, DMPR COMD (number 48). The flow loop maintains the airflow between CLG FLOW MIN and CLG FLOW MAX.

The point FLOW (number 75) is the input value for the flow loop. It is calculated as a percentage based on where the point AIR VOLUME (number 35) is between 0 CFM and CTL FLOW MAX. In the following text, this percentage will be 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 will be the percentage that corresponds to the volume given in CTL FLOW MIN. This percentage can be calculated as: $(\text{CTL FLOW MIN} \div \text{CTL FLOW MAX}) \times 100\%$ flow. The flow loop ensures that the supply air will not be less than CTL FLOW MIN.

Example:

If CTL FLOW MIN equals 250 CFM, and if CTL FLOW MAX equals 1000 CFM,

then,

$$\begin{aligned}\text{the low limit of FLOW STPT} &= (250 \text{ CFM} \div 1000 \text{ CFM}) \times 100\% \text{ flow} \\ &= 0.25 \times 100\% \text{ flow} \\ &= 25\% \text{ flow}\end{aligned}$$

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

Electric reheat



CAUTION:

Verify that the equipment is supplied with safeties by others to ensure that there is airflow across the heating coils when they are to be energized.

The heating loop controls up to three stages of electric reheat to warm up the room. The electric reheat is time modulated using a duty cycle as shown in the following example. When the controller is in cooling mode, the electric heat is OFF at all times.

Example: If the duty cycle is 10 minutes (point STAGE TIME (number 89) is set to 10 minutes) and the heating loop is calling for 60% of heating (point HTG LOOPOUT (number 80) is set to 60%), then for every 10 minute period, the stages of electric auxiliary heat cycle as follows:

	Stage 1: minutes		Stage 2: minutes		Stage 3: minutes	
	ON	OFF	ON	OFF	ON	OFF
With 1 stage of electric heat:	6	4	--	--	--	--
With 2 stages of electric heat:	10	0	2	8	--	--
With 3 stages of electric heat:	10	0	8	2	0	10

Sequencing logic (optional)

NOTE: The default setups for the points FLOW START (number 16) and FLOW END (number 17) are 0. This will provide minimum 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 electric reheat. This algorithm is very similar to the spring range sequencing of valves and dampers. Portions of the output of the heating loop, point HTG LOOPOUT (number 80), will drive both the flow loop and the electric reheat from 0 to 100%. Refer to the following three examples. For simplicity, assume that in these examples the point HTG FLOW MIN (number 33) equals 0 CFM, there is one stage of electric heat (point STAGE COUNT (number 88) equals 1), and the cycle time of the electric heat is 10 minutes (point STAGE TIME (number 89) equals 10). (When this is done, the point FLOW STPT (number 93) will equal 0 when HTG LOOPOUT equals 0). The ladder diagrams in Figure 2376-4 shows sequenced, parallel, and overlapping flow loop operations with electric 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.

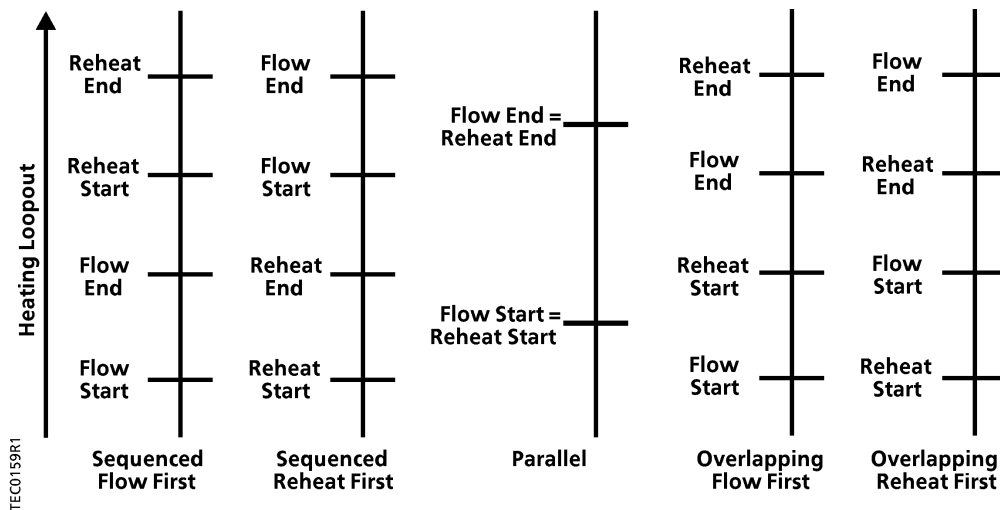


Figure 2376-4. Sequenced, Parallel, and Overlapping Flow Loop Operations with Electric Reheat.

Example 1:

Assume that your system has electric heat that is to operate in *sequence* with the flow loop. If,

- FLOW START (number 16) equals 0%
- FLOW END (number 17) equals 50%
- REHEAT START (number 22) equals 50%
- REHEAT END (number 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%, then the electric heat will be off all the time.
- when HTG LOOPOUT equals 75%, then for every 10 minute period the electric heat will be on for 5 minutes and off for 5 minutes.
- when HTG LOOPOUT equals 100%, then the electric heat will be on all the time.

Example 2:

Assume that your system has electric heat that is to operate in *parallel* with the flow loop. If,

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

- REHEAT END (number 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%, then the electric heat will be off all the time.
- when HTG LOOPOUT equals 50%, then for every 10 minute period the electric heat will be on for 5 minutes and off for 5 minutes.
- when HTG LOOPOUT equals 100%, then the electric heat will be on all the time

Example 3:

Assume that your system has electric heat that is to operate *overlapping* with the flow loop. If,

- FLOW START (number 16) equals 0%
- FLOW END (number 17) equals 75%
- REHEAT START (number 22) equals 25%
- REHEAT END (number 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%, then the electric heat will be off all the time.
- when HTG LOOPOUT equals 62.5%, then for every 10 minute period the electric heat will be on for 5 minutes and off for 5 minutes.
- when HTG LOOPOUT equals 100%, then the electric heat will be on all the time.

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 electric heat. 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 electric heat 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
- STAGE COUNT equals 1

- STAGE TIME equals 10 Minutes

If,

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

then,

- when HTG LOOPOUT equals 0%, FLOW STPT will equal $(170 \text{ CFM} \div 1000 \text{ CFM}) \times 100\% \text{ flow} = 17\% \text{ flow}$. 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%, then the electric heat will be off all the time.
- when HTG LOOPOUT equals 50%, then for every 10 minute period the electric heat will be on for 5 minutes and off for 5 minutes.
- when HTG LOOPOUT equals 100%, then the electric heat will be on all the time.

Calibration

Calibration of the controller's internal air velocity transducers is periodically required to maintain accurate air velocity readings. The point CAL SETUP (number 95) is set with the desired calibration option during controller start-up. Depending upon the value of CAL SETUP, calibration may be set to take place automatically or manually. If the status of the point CAL AIR (number 94) is YES, then calibration is in progress.

- The damper is commanded closed to get a zero airflow reading during calibration.

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.

Fan operation

The fan is controlled as follows:

The point FAN (number 46) will turn ON only when the following two conditions have been met:

1. The first stage of electric heat, point HEAT STAGE 1 (number 43), turns ON.
2. The airflow out of the supply duct, point FLOW (number 75), is less than the value stored in the point PARALLEL ON (number 28). (This means that there is not enough airflow out of the supply duct to allow for safe operation of the electric heat.)

The fan will turn OFF when at least one of the following two conditions has been met:

1. The first stage of electric heat is OFF for at least 1 full duty cycle. (point HEAT STAGE 1 (number 43) is OFF longer than the point STAGE TIME (number 89).)
2. The airflow out of the supply duct, FLOW, is greater than the value stored in the point PARALLEL OFF (number 30). (This means that there is enough airflow out of the supply duct to allow for safe operation of the electric heat.)

If the conditions have not been satisfied to turn the fan either ON or OFF, then the state of the fan will remain unchanged. (That is, if the fan is ON it will remain ON, while if the fan is OFF it will remain OFF.)

Fail-safe operation

If the air velocity sensor fails, then the controller uses pressure dependent control. The temperature loop controls the operation of the damper.

If the duct/space temperature sensor (AI 3) fails, then the controller operates using the last known temperature value.

Application notes

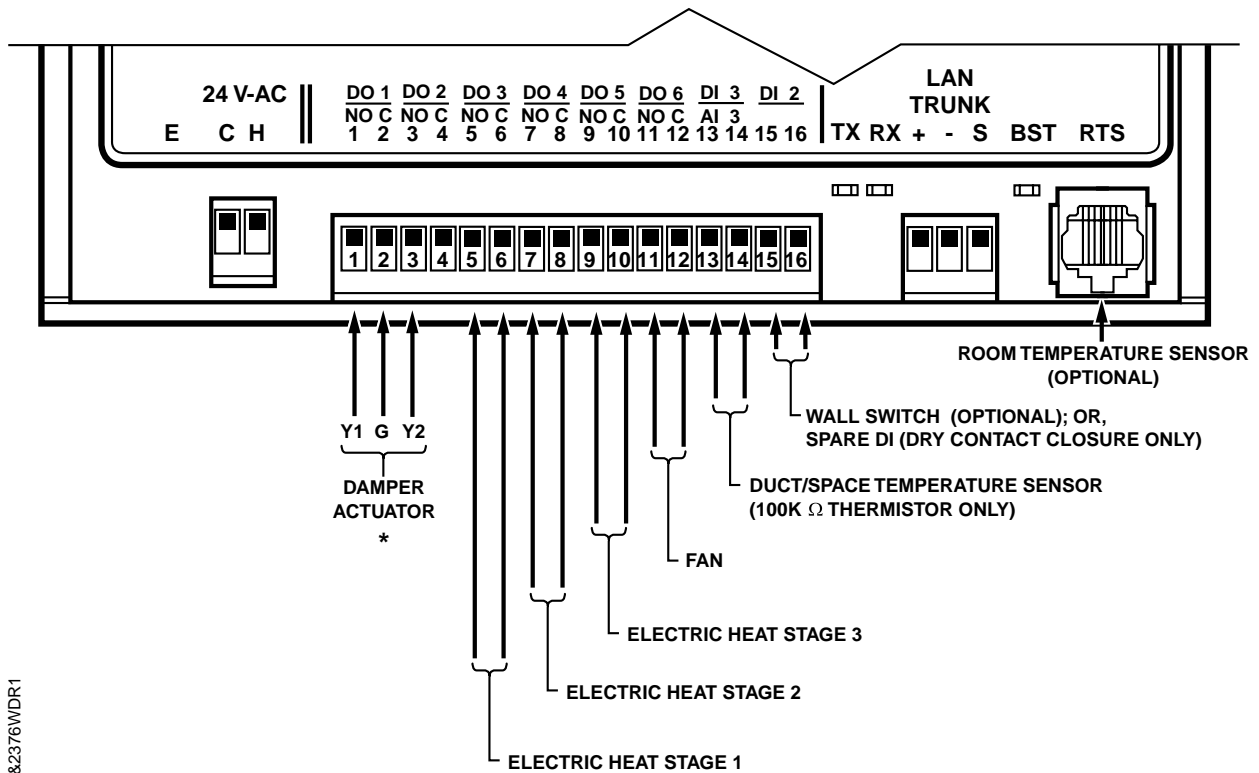
1. If the temperature swings in the room are excessive or if there is trouble in maintaining the set point, then either the cooling loop, the heating loop or both need to be tuned. If the point FLOW (number 75) is oscillating while the point FLOW STPT (number 93) is constant, then the flow loop requires tuning. Refer to *APOGEE Automation Service Procedures Manual* (125-3013) for more information.
2. The Terminal Box Controller with Auxiliary Duct/Space Temperature Sensor and Electric Reheat – 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.

Wiring diagrams

The point wiring for Application 2376 is shown in Figure 2376-5.

**CAUTION:**

The Controller's Digital Outputs (DOs) control 24 Vac loads only. The maximum rating is 12 VA for each DO. For higher VA requirements, 110 or 220 Vac requirements, separate transformers used to power the load, or DC power requirements, use an interposing 220 V 4-relay module (P/N 540-147).



TEC2374&2376WDR1

* REFER TO THE ACTUATOR INSTALLATION INSTRUCTIONS
FOR SPECIFIC WIRING TERMINATIONS

Figure 2376-5. Application 2376 Wiring Diagram.

Table 2376-1. Point Database for Application 2376.

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}	RTS 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	74.0 (23.495556)	DEG F (DEG C)	0.5 (0.28)	37.5(3.055556)	--	--
07	DAY HTG STPT	70.0 (21.255556)	DEG F (DEG C)	0.5 (0.28)	37.5(3.055556)	--	--
08	NGT CLG STPT	82.0 (27.975556)	DEG F (DEG C)	0.5 (0.28)	37.5(3.055556)	--	--
09	NGT HTG STPT	65.0 (18.455556)	DEG F (DEG C)	0.5 (0.28)	37.5(3.055556)	--	--
{13}	RTS STPT	74.00 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48(8.88888)	--	--
{15}	ROOM TEMP	74.0 (23.495556)	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
26	SERIES ON	20.0	PCT	0.4	0	--	--
27	SERIES OFF	10.0	PCT	0.4	0	--	--
28	PARALLEL ON	20.0	PCT	0.4	0	--	--
{29}	DAY.NGT	DAY	--	--	--	NIGHT	DAY
30	PARALLEL OFF	30.0	PCT	0.4	0	--	--
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	--	--
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	--	--
{41}	DO 1	OFF	--	--	--	ON	OFF
{42}	DO 2	OFF	--	--	--	ON	OFF
{43}	HEAT STAGE 1	OFF	--	--	--	ON	OFF
{44}	HEAT STAGE 2	OFF	--	--	--	ON	OFF
{45}	HEAT STAGE 3	OFF	--	--	--	ON	OFF
{46}	FAN	OFF	--	--	--	ON	OFF

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 2376-1. Point Database for Application 2376.

Point Number	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{48}	DMPR COMD	0.0	PCT	0.4	0	--	--
{49}	DMPR POS	0.0	PCT	0.4	0	--	--
51	MTR1 TIMING	95	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	--	--
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	74.0 (23.495556)	DEG F (DEG C)	0.5 (0.28)	37.5(3.055556)	--	--
{79}	CLG LOOPOUT	0.0	PCT	0.4	0	--	--
{80}	HTG LOOPOUT	0.0	PCT	0.4	0	--	--
{81}	AVG HEAT OUT	0.0	PCT	0.4	0	--	--
82	STAGE MAX	90.0	PCT	0.4	0	--	--
83	STAGE MIN	10.0	PCT	0.4	0	--	--
85	SWITCH LIMIT	5.2	PCT	0.4	0	--	--
86	SWITCH TIME	10	MIN	1	0	--	--
88	STAGE COUNT	1	--	1	0	--	--
89	STAGE TIME	10	MIN	1	0	--	--
90	SWITCH DBAND	1.0 (0.56)	DEG F (DEG C)	0.5 (0.28)	0	--	--
{91}	TOTAL VOLUME	0 (0)	CF (L)	4 (113)	0	--	--
{92}	CTL STPT	74.0 (23.495556)	DEG F (DEG C)	0.5 (0.28)	37.5(3.055556)	--	--
{93}	FLOW STPT	0.00	PCT	0.25	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.

Table 2376-1. Point Database for Application 2376.

Point Number	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{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.