Application 2433
Constant Volume Hot Water Reheat with 2-Inch Water Column Measurement Range

This document contains the following topics:

Overview

In Application 2433, the controller provides a constant volume of air to the room during occupied periods, and a lower constant volume of air to the room during unoccupied periods. Reheat is provided by modulating a hot water valve. In order for the application to work properly, the central air handling unit must provide pre-conditioned air to the terminal box. This application will measure flows with differential pressure measurements up to two inches (up to a maximum of 5663 FPM). Refer to Figures 2433-1 and 2433-2.

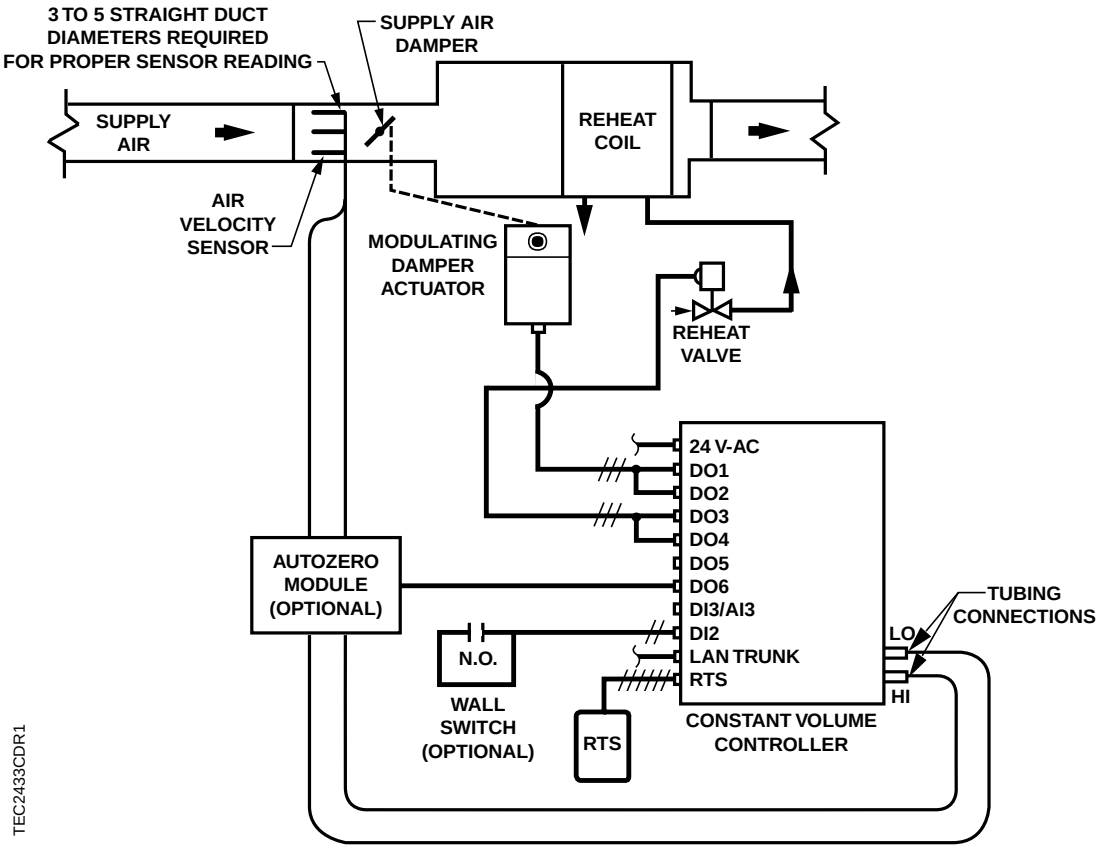
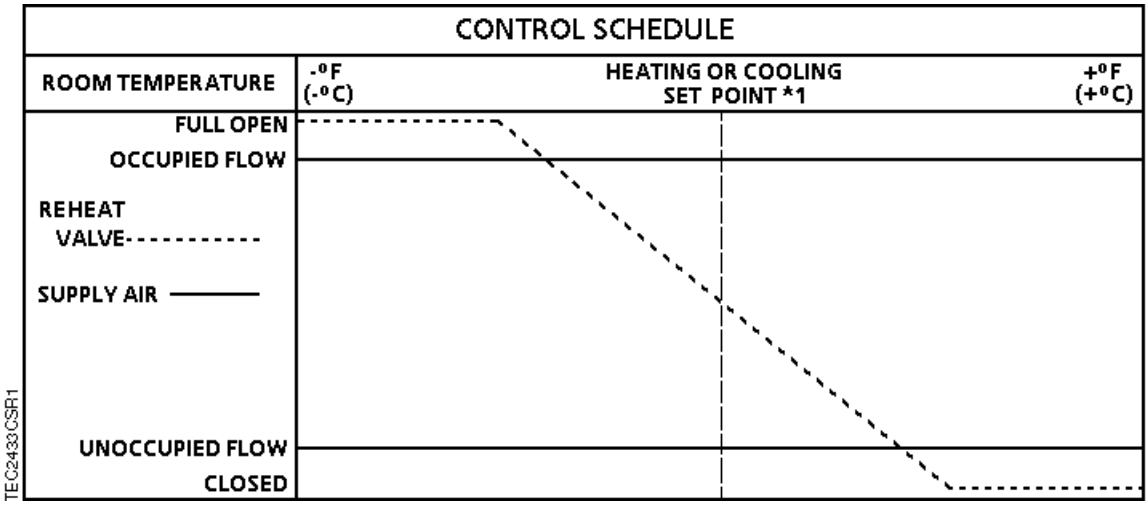


Figure 2433-1. Application 2433 Control Drawing.



Refer to Sequence of Operation, “Control Temperature Set Points”.

Figure 2433-2. Application 2433 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

- Autozero Module (optional)
- Damper actuator
- Valve actuator

Ordering Notes

Constant Volume Controller with 2-Inch Water Column Measurement Range — Electronic Output: 540-100A. Refer to *APOGEE Automation Configuration and Sizing Guidelines* on InfoLink for other product numbers:

- Autozero Module (optional)
- Damper actuator
- Terminal Equipment Controller room temperature sensor
- Valve actuator

Sequence of Operation

The following paragraphs present the sequence of operation for Application 2433, “Constant Volume Hot Water Reheat with 2-Inch Water Column Measurement Range.”

Control Temperature Set Points

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

NOTE: Application 2433 will not automatically switch between heating and cooling. If a seasonal switchover (e.g., summer to winter) is to occur, then the field panel must command HEAT.COOL (Point 5). This allows the controller to use the appropriate set points for the season.

Occupied Mode – In occupied mode, CTL STPT holds the value of OCC CLG STPT (Point 6) in cooling mode and OCC HTG STPT (Point 7) in heating mode. If the room temperature sensor has a set point dial and 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 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.

Unoccupied Mode – In unoccupied mode, CTL STPT holds the value of UOC CLG STPT (Point 8) in cooling mode and UOC HTG STPT (Point 9) in heating mode. The set point dial is not used in unoccupied mode.

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

Occupied and Unoccupied Modes

The occupied/unoccupied status of the space is determined by the status of OCC.UNOCC (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 2433-1 and 2433-3), and 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), then OCC.UNOCC will be set to OCC indicating that the controller is in occupied mode. When the status of DI 2 is OFF (the switch is open), then OCC.UNOCC will be set to UNOCC indicating that the controller is in unoccupied 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, and if the controller is operating stand-alone, then the controller stays in occupied 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 OCC.UNOCC. Refer to *Powers Process Control Language* (PPCL) *User's Manual* (125-1896) and *Field Panel User's Manual* (125-1895) for more information.

Unoccupied 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 OVRD TIME (Point 20), then by pressing the override switch a room occupant can reset the controller to occupied operational mode for the amount of time that is set in OVRD TIME. The status of UNOCC OVRD (Point 21) changes to OCC. After the override time elapses, the controller returns to unoccupied mode and the status of UNOCC OVRD changes back to UNOCC.

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

Control Loops

Flow Loop – The flow loop maintains FLOW STPT (Point 93) by modulating the supply air damper point, DMPR COMD (Point 48). The flow loop maintains the airflow at either OCC FLOW (Point 32) or UNOCC FLOW (Point 31) depending on the value of OCC.UNOCC.

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

- If AIR VOLUME equals 0 CFM (LPS), then FLOW is 0% flow.
- If AIR VOLUME equals OCC FLOW, then FLOW is 100% flow.

The FLOW STPT percentage that corresponds to UNOCC FLOW is calculated as:
(UNOCC FLOW ÷ OCC FLOW) × 100% flow.

For example, if UNOCC FLOW equals 250 CFM, and if OCC FLOW equals 1000 CFM, then, in unoccupied mode the FLOW STPT = (250 CFM ÷ 1000 CFM) × 100% flow = 0.25 × 100% flow = 25% flow.

Since 25% of 1000 CFM equals 250 CFM, the flow set point in unoccupied mode will be 25%. UNOCC FLOW can be set less than or equal to, but not greater than OCC FLOW.

Temperature Loop – The temperature loop will modulate the HTG LOOPOUT (Point 80) and control the hot water valve in order to maintain the room temperature in both heating and cooling modes.

Hot Water Reheat

The temperature loop modulates the heating valve in order to maintain the room temperature set point. The reheat valve will be modulated whenever necessary to maintain the room temperature regardless of the status of HEAT.COOL (Point 5).

Calibration

Air Velocity Transducer – Calibration of the controller's internal air velocity transducer is periodically required to maintain accurate air velocity readings. The CAL SETUP (Point 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 when the override switch is pressed on the room temperature sensor. If the value of CAL AIR (Point 94) is YES, then calibration is in progress.

- For a controller used without an Autozero Module (CAL MODULE (Point 87) = NO), the damper is commanded closed to get a zero airflow reading during calibration.
- For a controller used with an Autozero Module (CAL MODULE = YES), calibration occurs without closing the damper. (**Note:** The first time after start-up or initialization, the controller will calibrate the damper as if not using an Autozero Module, although the Autozero Module will be activated. All subsequent calibrations will use the Autozero Module only).

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.

The Autozero Module is enabled when it is wired to DO 6 and CAL MODULE (Point 87) is set to YES.

Hot Water Valve – Calibration of a hot water valve (if used) is performed along with calibration of the air velocity transducer and is accomplished by commanding the valve closed.

Damper Status Operation

Under normal operation DMPR STATUS (Point 84) reads "CAL". However, when using an Autozero Module, it is possible that the calculated damper position, DMPR POS (Point 49), may differ from the actual (physical) damper position after a long period of operation or after initialization or return from power loss.

If this occurs, the controller will automatically compensate for any difference by setting DMPR STATUS to "RECAL" which readjusts the value of DMPR POS. DMPR STATUS will be set to "RECAL" if one of the following two sets of conditions is true:

- DMPR POS = 100%
  Air velocity (AIR VOLUME (Point 35) ÷ DUCT AREA (Point 97)) >200 FPM
  FLOW (Point 75) < FLOW STPT (Point 93)
- DMPR POS = 0%
  Air velocity (AIR VOLUME ÷ DUCT AREA) > 200 FPM
  FLOW > FLOW STPT

If DMPR STATUS has been changed to “RECAL” in response to one of the conditions described above, then do one of the following:

- If flow is now being properly controlled, then set DMPR STATUS to **CAL** and release it.
- If flow is still not being properly controlled (i.e., one of the conditions described above is still present), then initialize the controller.

If these steps do not fix the problem of maintaining flow, then a mechanical problem might exist.

Fail-safe operation

If the air velocity sensor fails, then the controller determines the status of FAIL MODE (Point 40) and positions the damper accordingly. If FAIL MODE equals OPEN and the velocity sensor fails, then the damper will open. If FAIL MODE equals CLOSED (the default) and the velocity sensor fails, then the damper will close.

If the room temperature sensor fails, then the controller holds the last known temperature value. In this application, the room temperature is not controlled.

Application Notes

1. If the temperature swings in the room are excessive, or if there is trouble in maintaining the room temperature set point, then the temperature loop needs to be tuned. If FLOW (Point 75) is oscillating while FLOW STPT (Point 93) is constant, then the flow loop requires tuning. Refer to *APOGEE Automation Start-up Procedures* on InfoLink for more information.

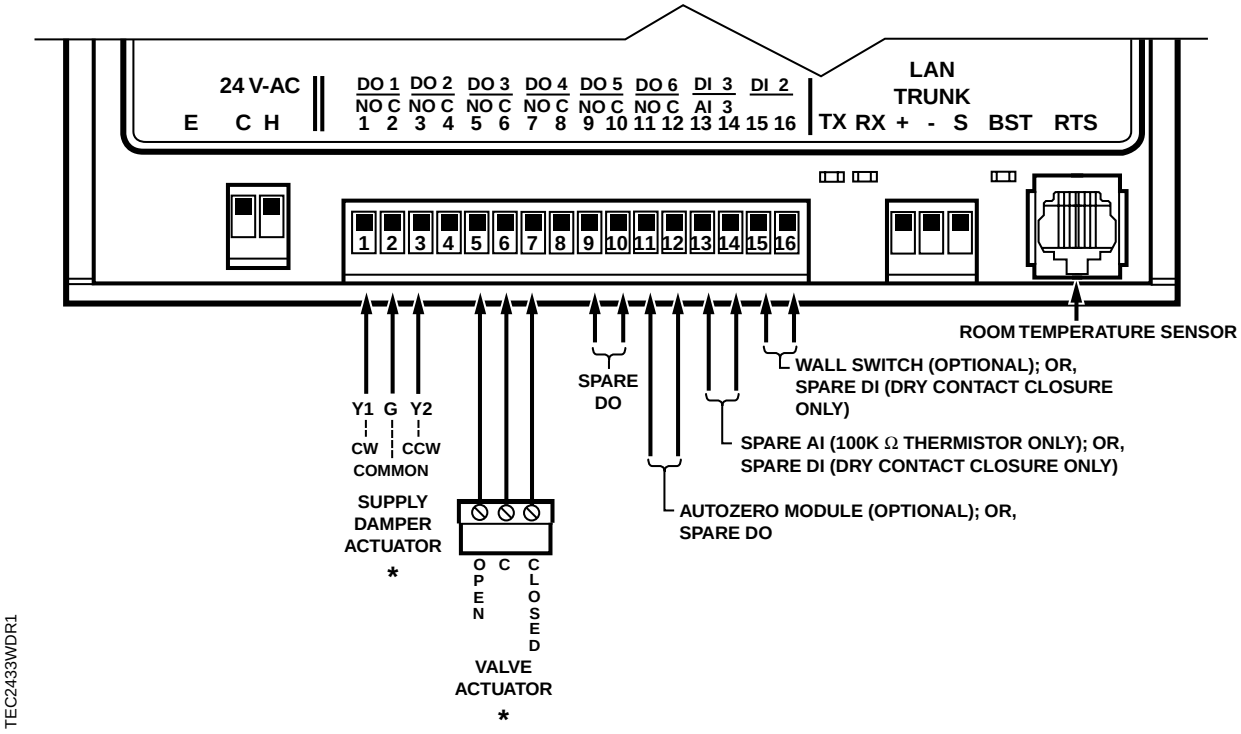
2. The Constant Volume Controller – Electronic Output, as shipped from the factory, keeps all associated equipment OFF. Refer to the *Equipment Controllers* section in *APOGEE Automation Start-up Procedures* on InfoLink for information on how to release the controller and its equipment to application 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. If not using a heating valve, then the combination of DO 3 and DO 4 may be used as auxiliary motor points. If using this pair of spare DOs to control a motor, you must unbundle MTR2 COMD (Point 52) and set MTR SETUP (Point 58) as described in the *APOGEE Automation Start-up Procedures* on InfoLink.

Wiring Diagram

CAUTION:

The Constant Volume Controller 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 220V 4-relay module.



* REFER TO THE ACTUATOR INSTALLATION INSTRUCTIONS FOR SPECIFIC WIRING TERMINATIONS

Figure 2433-3. Application 2433 Wiring Diagram

Point Database

Table 2433-1. Point Database for Application 2433.

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	2092	--	1	0	--	--
{04}	ROOM TEMP	74.0 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
{05}	HEAT.COOL	COOL	--	--	--	HEAT	COOL
06	OCC CLG STPT	70.0 (21.20888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
07	OCC HTG STPT	70.0 (21.20888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
08	UOC CLG STPT	65.0 (18.40888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
09	UOC HTG STPT	65.0 (18.40888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
11	RM STPT MIN	55.0 (12.80888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
12	RM STPT MAX	90.0 (32.40888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
{13}	RM STPT DIAL	74.0 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
{14}	STPT DIAL	NO	--	--	--	YES	NO
{15}	AUX TEMP	74.0 (23.495556)	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}	UNOCC OVRD	UNOCC	--	--	--	UNOCC	OCC
{24}	DI 2	OFF	--	--	--	ON	OFF
{25}	DI 3	OFF	--	--	--	ON	OFF
{29}	OCC.UNOCC	OCC	--	--	--	UNOCC	OCC
{31}	UNOCC FLOW	220 (103.818)	CFM (LPS)	4 (1.8876)	0	--	--
{32}	OCC FLOW	2200 (1038.18)	CFM (LPS)	4 (1.8876)	0	--	--
{35}	AIR VOLUME	0 (0.0)	CFM (LPS)	4 (1.8876)	0	--	--
36	FLOW COEFF	1.0	--	0.01	0.0	--	--
40	FAIL MODE	CLOSED	--	--	--	CLOSED	OPEN
{41}	DO 1	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.

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Table 2433-1. Point Database for Application 2433.

Point Number	Descriptor	Factory Default (SI Units)	Engr Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{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}	DMPR COMD	0.0	PCT	0.4	0.0	--	--
{49}	DMPR POS	0.0	PCT	0.4	0.0	--	--
51	MTR1 TIMING	95	SEC	1	0	--	--
{52}	VLV COMD	0.0	PCT	0.4	0.0	--	--
{53}	VLV POS	0.0	PCT	0.4	0.0	--	--
55	MTR2 TIMING	130	SEC	1	0	--	--
56	DPR1 ROT ANG	90	--	1	0	--	--
58	MTR SETUP	0	--	1	0	--	--
59	DO DIR.REV	0	--	1	0	--	--
67	HTG P GAIN	10.0 (18.0)	--	0.25 (0.45)	0.0	--	--
68	HTG I GAIN	0.012 (0.0216)	--	0.001 (0.0018)	0.0	--	--
69	HTG D GAIN	0 (0.0)	--	2 (3.6)	0	--	--
70	HTG BIAS	0.0	PCT	0.4	0.0	--	--
71	FLOW P GAIN	0.25	--	0.05	0.0	--	--
72	FLOW I GAIN	0.018	--	0.001	0.0	--	--
73	FLOW D GAIN	0	--	2	0	--	--
74	FLOW BIAS	50.0	PCT	0.4	0.0	--	--
{75}	FLOW	0.0	PCT	0.25	0.0	--	--
{78}	CTL TEMP	74.0 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
{80}	HTG LOOPOUT	0.0	PCT	0.4	0.0	--	--
{84}	DMPR STATUS	CAL	--	--	--	RECAL	CAL

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 2433-1. Point Database for Application 2433.

Point Number	Descriptor	Factory Default (SI Units)	Engr Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
87	CAL MODULE	NO	--	--	--	YES	NO
{91}	TOTAL VOLUME	0 (0)	CF (L)	4 (113)	0	--	--
{92}	CTL STPT	74.0 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
{93}	FLOW STPT	0.0	PCT	0.25	0.0	--	--
{94}	CAL AIR	NO	--	--	--	YES	NO
95	CAL SETUP	4	--	1	0	--	--
96	CAL TIMER	12	HRS	1	0	--	--
97	DUCT AREA	1.0 (0.09292)	SQ. FT (SQ M)	0.025 (0.002323)	0.0	--	--
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.

Application 2416
Variable Volume Room Pressurization with Hot Water Reheat and 2-Inch Water Column Measurement Range

This document contains the following topics:

Unoccupied 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 OVRD TIME (Point 20), then by pressing the override switch a room occupant can reset the controller to occupied operational mode for the time period that is set in OVRD TIME. The status of UNOCC OVRD (Point 21) changes to OCC. After the override time elapses, the controller returns to unoccupied mode and the status of UNOCC OVRD changes back to UNOCC.

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

Tracking Mode

The TRACK MODE (Point 3) determines which airflow set point will lead and which will follow.

- If TRACK MODE is set to ETS (exhaust tracks supply), then the supply set point will be set to maintain occupancy requirements, and based on the supply, the exhaust flow set point will be calculated to maintain the volume offset. The supply leads and the exhaust follows.
- If TRACK MODE is set to STE (supply tracks exhaust), then the exhaust set point will be set to maintain occupancy requirements, and based on the exhaust, the supply flow set point will be calculated to maintain the volume offset. The exhaust leads and the supply follows.

Control Volume Set Points

The CTL FLOW MIN (Point 76) holds the value of UNOCC FLOW (Point 31). CTL FLOW MAX (Point 77) holds the value of OCC FLOW (Point 32).

The supply and exhaust flows are each maintained by modulating the supply and exhaust dampers, respectively. One flow is determined by the occupancy requirements, while the other is determined by the differential flow requirements for pressurization. The TRACK MODE (Point 3) determines which is which. Refer to *Tracking Mode* for details on ETS and STE.

CAV Flow Set Point – If TRACK MODE = ETS, then SUP FLO STPT (Point 93) is calculated as follows:

In occupied mode, SUP FLO STPT = 100%, which corresponds to the value of OCC FLOW.
In unoccupied mode, SUP FLO STPT = [(UNOCC FLOW ÷ OCC FLOW) × 100%], which corresponds to the value of UNOCC FLOW.

If TRACK MODE = STE, then EXH FLO STPT (Point 85) is calculated as shown above.

Differential Flow Set Point – If TRACK MODE = ETS and ACTIVE.NTRAL (Point 10) = ACTIVE, then EXH FLO STPT is calculated as follows:

The exhaust flow loop maintains a fixed VOLUME OFFST (Point 88) in CFM (LPS) with a positive or negative, POS.NEG (Point 25), differential between the supply and exhaust air volumes. This is accomplished using one of two tracking algorithms, determined by the value of TRACKING (Point 82). If TRACKING is set to STPT, the exhaust set point tracks the supply set point.

For example:

- If OCC FLOW = 1000 CFM, and VOLUME OFFST = 100 CFM with POS.NEG set to NEG, then EXH FLO STPT is 10% more than SUP FLO STPT.
  (100 CFM ÷ 1000 CFM) × 100% flow = 10%.
  - When SUP FLO STPT is 100%, EXH FLO STPT is 110%.
  - When SUP FLO STPT is 50%, EXH FLO STPT is 60%.
  - When SUP FLO STPT is 0%, EXH FLO STPT is 10%.
- With POS.NEG set to POS, the EXH FLO STPT is 10% less than the SUP FLO STPT.
  (100 CFM ÷ 1000 CFM) × 100% flow = 10%.
  - When SUP FLO STPT is 100%, EXH FLO STPT is 90%.
  - When SUP FLO STPT is 50%, EXH FLO STPT is 40%.
  - When SUP FLO STPT is 10%, EXH FLO STPT is 0%.

NOTE: In this example, the controller would not allow SUP FLO STPT to fall below 10% because EXH FLO STPT cannot be less than 0%.

If ACTIVE.NTRAL = NTRAL, then EXH FLO STPT = SUP FLO STPT and VOLUME OFFST is not used.

If TRACKING equals FLOW, the exhaust set point tracks the actual supply flow, not the flow set point. Set point tracking typically provides more stable control. If the supply flow loop cannot maintain its set point, the flow tracking algorithm will maintain the flow differential.

If TRACK MODE = STE, then SUP FLO STPT is calculated as shown above.

Control Loops

The Room Pressurization Controller uses three Proportional, Integral, and Derivative (PID) control loops: a temperature loop and two flow loops.

Temperature Loop – The temperature loop is a heating loop which operates in both heating and cooling modes. The heating loop generates HTG LOOPOUT (Point 80) which is then used to control the heating valve in order to maintain the room temperature set in CTL STPT (Point 92). Refer to *Control Temperature Set Points*.

Flow Loops – The supply flow loop maintains SUP FLO STPT (Point 93) by modulating supply air damper. The SUPPLY FLOW (Point 75) is the input value for the supply flow loop and is dependent upon SUP AIR VOL (Point 35) and OCC FLOW (Point 32) according to the following formula:

$$\frac{\text{SUP AIR VOL}}{\text{OCC FLOW}} \times 100\% = \text{SUPPLY FLOW}$$

- If SUP AIR VOL equals 0 CFM, then SUPPLY FLOW equals 0% flow.
- If SUP AIR VOL equals OCC FLOW, then SUPPLY FLOW equals 100% flow.

The exhaust flow loop maintains EXH FLO STPT (Point 85) by modulating the exhaust air damper. The EXHAUST FLOW (Point 74) is the input value for the exhaust flow loop and is dependent upon the EXH AIR VOL (Point 30) and OCC FLOW according to the following formula:

$$\frac{\text{EXH AIR VOL}}{\text{OCC FLOW}} \times 100\% = \text{EXHAUST FLOW}$$

- If EXH AIR VOL equals 0 CFM, then EXHAUST FLOW equals 0% flow.
- If EXH AIR VOL equals OCC FLOW, then EXHAUST FLOW equals 100% flow.

Positive/Negative Pressure Switchover

An optional pressure mode switch can be connected to the termination strip on the controller at AI 3. This switch is designed to let the controller know which pressure mode to use.

If the PRES SWITCH (Point 81) is set to YES, then in one position, “protective isolation”, the POS.NEG (Point 25) is set to POS, indicating that the controller is in the positive pressure mode and ACTIVE.NTRAL (Point 10) is set to ACTIVE. In the second position, “neutral isolation”, ACTIVE.NTRAL is set to NTRAL. In the third position, “infectious isolation”, POS.NEG is set to NEG, indicating that the controller is in the negative pressure mode, and ACTIVE.NTRAL is set to ACTIVE.

When ACTIVE.NTRAL is set to ACTIVE, the differential flow alarm feature is enabled. When ACTIVE.NTRAL is set to NTRAL, then the differential flow alarm feature is disabled (refer to *Differential Flow Alarm*).

If the pressure mode switch fails, the PT FAIL COND (Point 89) is set to ALARM. The controller continues to operate in the last known mode of operation (positive, negative, or neutral). Overriding POS.NEG will return PT FAIL COND (Point 89) back to NORMAL.

If PRES SWITCH is set to NO, then an auxiliary temperature sensor can be monitored on AI 3. The AUX TEMP (Point 15) holds the temperature reading.

Differential Flow Alarm

When ALARM OUT (Point 50) is enabled (ACTIVE.NTRAL = ACTIVE), then its value changes from OFF to ON and DO8 turns on if either of the following conditions persists longer than the time value of ALARM DELAY (Point 62):

- the value of ACTUAL OFFST (Point 83) is greater than the sum of VOLUME OFFST (Point 88) plus OFFSET LMT (Point 61)
- the value of ACTUAL OFFST is less than the difference of VOLUME OFFST minus OFFSET LMT.

Hot Water Reheat

CAUTION:

Do not set UNOCC FLOW (Point 31) to 0 CFM. A minimum airflow should be provided across the heating coils when the heating valve is open.

The heating loop modulates the heating valve in both heating and cooling modes.

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 start-up. Depending upon the value of CAL SETUP, calibration may be set to take place automatically or manually when the override switch is pressed on the room temperature sensor. If the value of CAL AIR (Point 94) is YES, then calibration is in progress.

- For a controller used without Autozero Modules (CAL MODULE (Point 87) = NO), the dampers are commanded closed simultaneously to get a zero airflow reading during calibration.
- For a controller used with Autozero Modules (CAL MODULE = YES), calibration occurs without closing the dampers. (**Note:** The first time after start-up or initialization, the controller will calibrate the dampers as if not using Autozero Modules, although the Autozero Modules will be activated. All subsequent calibrations will use the Autozero Modules only).

Hot Water Valve – Calibration of a hot water valve (if used) is performed simultaneously with calibration of the air velocity transducers and is accomplished by commanding the valve closed. Calibration of the valve is not affected by the presence of the Autozero Modules.

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.

The Autozero Modules are used during calibration when they are wired DO 7 and CAL MODULE (Point 87) is set to YES.

Damper Status Operation

Under normal operation DMPR STATUS (Point 84) reads **CAL**. However, when using Autozero Modules, it is possible that a calculated damper position may differ from the actual (physical) damper position after a long period of operation or after initialization or return from damper loss.

If this occurs, the controller will automatically compensate for any difference by setting DMPR STATUS to **RECAL**, which readjusts the value of the damper positions. DMPR STATUS will be set to RECAL if all of the following conditions are true:

- SUPPLY POS (Point 49) = 100%

- the supply air velocity > 200 FPM (FPM = SUP AIR VOL (Point 35) ÷ SUPDUCT AREA (Point 97))
- SUPPLY FLOW (Point 75) < SUP FLO STPT (Point 93)

  In this case, the controller resets the value of SUPPLY POS to 75%, strokes the damper to 100%, and then checks to see if SUPPLY FLOW ≥ SUP FLO STPT. If not, the controller repeats this sequence. If after the fourth attempt the conditions are unchanged, DMPR STATUS remains set to RECAL, but the controller discontinues attempts to re-calibrate the damper position.

The other way that DMPR STATUS will be set to RECAL is if all of the following conditions are true:

- SUPPLY POS = 0%
- the supply air velocity > 200 FPM (FPM = SUP AIR VOL ÷ SUPDUCT AREA)
- SUPPLY FLOW > SUP FLO STPT

  In this case, the controller resets the value of SUPPLY POS to 25%, strokes the damper to 0%, and then checks to see if SUPPLY FLOW ≤ SUP FLO STPT. If not, the controller repeats this sequence. If after the fourth attempt the conditions are unchanged, DMPR STATUS remains set to RECAL, but the controller discontinues attempts to re-calibrate the damper position.

DMPR STATUS will also be set to RECAL if these same conditions exist for the exhaust damper.

If DMPR STATUS has been changed to **RECAL** in response to one of the conditions described above, then do one of the following:

- If flow is now being properly controlled, then set DMPR STATUS to **CAL** and release it.
- If flow is still not being properly controlled (i.e., one of the conditions described above is still present), then initialize the controller.

If these steps do not fix the problem of maintaining flow, then a mechanical problem might exist.

Fail-safe Operation

If either one of the air velocity sensors fails (SUP AIR VOL (Point 35) or EXH AIR VOL (Point 30)), then the supply and exhaust dampers are controlled as follows:

- If FAIL MODE (Point 40) is set at OPEN, then the controller sets the supply and exhaust dampers open.
- If FAIL MODE is set at CLOSED, then the controller sets the supply and exhaust dampers closed.

The hot water valve continues to operate as normal.

If the room temperature sensor fails, ROOM TEMP (Point 4) and CTL TEMP (Point 78) are not overridden, the hot water valve moves to fully open. In ETS mode, the supply damper moves to the minimum airflow position while the exhaust damper continues to maintain a fixed CFM differential between the supply air volume and exhaust air volume. (In STE mode, exhaust moves to the minimum position while the supply follows to maintain the airflow differential.)

The PT FAIL COND (Point 89) is set to ALARM if:

- Either one of the air velocity sensors fail
- The room temperature sensor fails (and neither ROOM TEMP nor CTL TEMP are overridden)
- The PRES SWITCH (Point 81) is set to YES and the pressure mode switch fails
- There is no pressure mode switch attached to AI 3 and POS.NEG (Point 25) is not overridden.

Otherwise a NORMAL value will be displayed.

If RM STPT DIAL (Point 13) fails, the controller operates with the last known set point dial value.

Application Notes

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 SUPPLY FLOW (Point 75) is oscillating while SUP FLO STPT (Point 93) is constant, then the supply flow loop requires tuning. If EXHAUST FLOW (Point 74) is oscillating while EXH FLO STPT (Point 85) is constant, then the exhaust flow loop requires tuning.

Wiring Diagram

CAUTION:

The Room Pressurization Controller 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 220V 4-relay module.

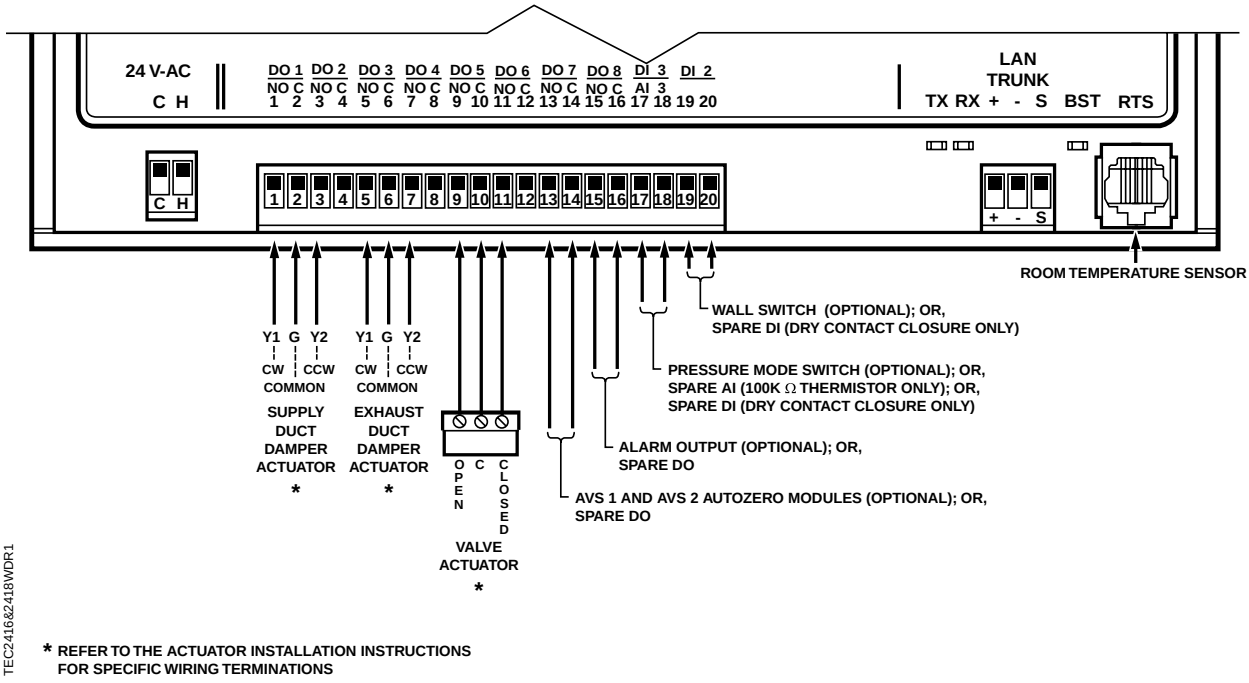

Figure 2418-3. Application 2418 Wiring Diagram.

Point Database

Table 2418-1. Point Database for Application 2418.

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	2293	--	1	0	--	--
03	TRACK MODE	ETS	--	--	--	STE	ETS
{04}	ROOM TEMP	74.0 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
{05}	HEAT.COOL	COOL	--	--	--	HEAT	COOL
06	OCC CLG STPT	74.0 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
07	OCC HTG STPT	70.0 (21.20888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
08	UOC CLG STPT	82.0 (27.92888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
09	UOC HTG STPT	65.0 (18.40888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
{10}	ACTIVE.NTRAL	NTRAL	--	--	--	ACTIVE	NTRAL
11	RM STPT MIN	55.0 (12.80888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
12	RM STPT MAX	90.0 (32.40888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
{13}	RM STPT DIAL	74.0 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
14	STPT DIAL	NO	--	--	--	YES	NO
{15}	AUX TEMP	74.0 (23.495556)	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	1	HRS	1	0	--	--
{21}	UNOCC OVRD	UNOCC	--	--	--	UNOCC	OCC
{24}	DI 2	OFF	--	--	--	ON	OFF
{25}	POS.NEG	NEG	--	--	--	POS	NEG
26	EXHFLO PGAIN	0.0	--	0.05	0.0	--	--
27	EXHFLO IGAIN	0.01	--	0.001	0.0	--	--
28	EXHFLO DGAIN	0	--	2	0	--	--
{29}	OCC.UNOCC	OCC	--	--	--	UNOCC	OCC
{30}	EXH AIR VOL	0 (0.0)	CFM (LPS)	4 (1.8876)	0	--	--
31	UNOCC FLOW	220 (103.818)	CFM (LPS)	4 (1.8876)	0	--	--
32	OCC FLOW	2200 (1038.18)	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.

Continue on next page …

Table 2418-1. Point Database for Application 2418.

Point Number	Descriptor	Factory Default (SI Units)	Engr Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{35}	SUP AIR VOL	0 (0.0)	CFM (LPS)	4 (1.8876)	0	--	--
36	SUP FLO COEF	1.0	--	0.01	0.0	--	--
{37}	VALVE COMD	0.0	PCT	0.4	0.0	--	--
{38}	VALVE POS	0.0	PCT	0.4	0.0	--	--
39	MTR3 TIMING	130	SEC	1	0	--	--
40	FAIL MODE	OPEN	--	--	--	CLOSED	OPEN
{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
{47}	AUTOZERO MOD	OFF	--	--	--	ON	OFF
{48}	SUPPLY COMD	0.0	PCT	0.4	0.0	--	--
{49}	SUPPLY POS	0.0	PCT	0.4	0.0	--	--
{50}	ALARM OUT	OFF	--	--	--	ON	OFF
51	MTR1 TIMING	95	SEC	1	0	--	--
{52}	EXHAUST COMD	0.0	PCT	0.4	0.0	--	--
{53}	EXHAUST POS	0.0	PCT	0.4	0.0	--	--
54	EXH FLO COEF	1.0	--	0.01	0.0	--	--
55	MTR2 TIMING	95	SEC	1	0	--	--
56	DPR1 ROT ANG	90	--	1	0	--	--
57	DPR2 ROT ANG	90	--	1	0	--	--
58	MTR SETUP	0	--	1	0	--	--
59	DO DIR.REV	0	--	1	0	--	--
60	EXHDUCT AREA	1.0 (0.09292)	SQ. FT (SQ M)	0.025 (0.002323)	0.0	--	--
61	OFFSET LMT	16 (7.5504)	CFM (LPS)	4 (1.8876)	0	--	--
62	ALARM DELAY	10	SEC	1	0	--	--

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Table 2418-1. Point Database for Application 2418.

Point Number	Descriptor	Factory Default (SI Units)	Engr Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
67	HTG P GAIN	10.0 (18.0)	--	0.25 (0.45)	0.0	--	--
68	HTG I GAIN	0.01 (0.018)	--	0.001 (0.0018)	0.0	--	--
69	HTG D GAIN	0 (0.0)	--	2 (3.6)	0	--	--
70	HTG BIAS	0.0	PCT	0.4	0.0	--	--
71	SUPFLO PGAIN	0.0	--	0.05	0.0	--	--
72	SUPFLO IGAIN	0.01	--	0.001	0.0	--	--
73	SUPFLO DGAIN	0	--	2	0	--	--
{74}	EXHAUST FLOW	0.0	PCT	0.25	0.0	--	--
{75}	SUPPLY FLOW	0.0	PCT	0.25	0.0	--	--
{76}	CTL FLOW MIN	220 (103.818)	CFM (LPS)	4 (1.8876)	0	--	--
{77}	CTL FLOW MAX	2200 (1038.18)	CFM (LPS)	4 (1.8876)	0	--	--
{78}	CTL TEMP	74.0 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
{80}	HTG LOOPOUT	0.0	PCT	0.4	0.0	--	--
81	PRES SWITCH	YES	--	--	--	YES	NO
82	TRACKING	STPT	--	--	--	FLOW	STPT
{83}	ACTUAL OFFST	0 (0.0)	CFM (LPS)	4 (1.8876)	-8000(-3775.2)	--	--
{84}	DMPR STATUS	CAL	--	--	--	RECAL	CAL
{85}	EXH FLO STPT	0.0	PCT	0.25	0.0	--	--
87	CAL MODULE	NO	--	--	--	YES	NO
{88}	VOLUME OFFST	0 (0.0)	CFM (LPS)	4 (1.8876)	0	--	--
{89}	PT FAIL COND	NORMAL	--	--	--	ALARM	NORMAL
{92}	CTL STPT	74.0 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
{93}	SUP FLO STPT	0.0	PCT	0.25	0.0	--	--
{94}	CAL AIR	NO	--	--	--	YES	NO
95	CAL SETUP	4	--	1	0	--	--
96	CAL TIMER	12	HRS	1	0	--	--
97	SUPDUCT AREA	1.0 (0.09292)	SQ. FT (SQ M)	0.025 (0.002323)	0.0	--	--
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.