

Terminal Box BACnet ASC Controller

Application Notes

Application 2535 and Application 2537 — VAV Series or Parallel Fan and Hot Water Reheat

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Overview

In Application 2535, the controller modulates the supply air damper of the terminal box for cooling and modulates a hot water valve for heating. When in heating, the terminal box either maintains minimum airflow or modulates the supply air damper. The terminal box also has a series fan for air circulation. In order for the terminal box to work properly, the central air-handling unit must provide supply air (Figure 1).

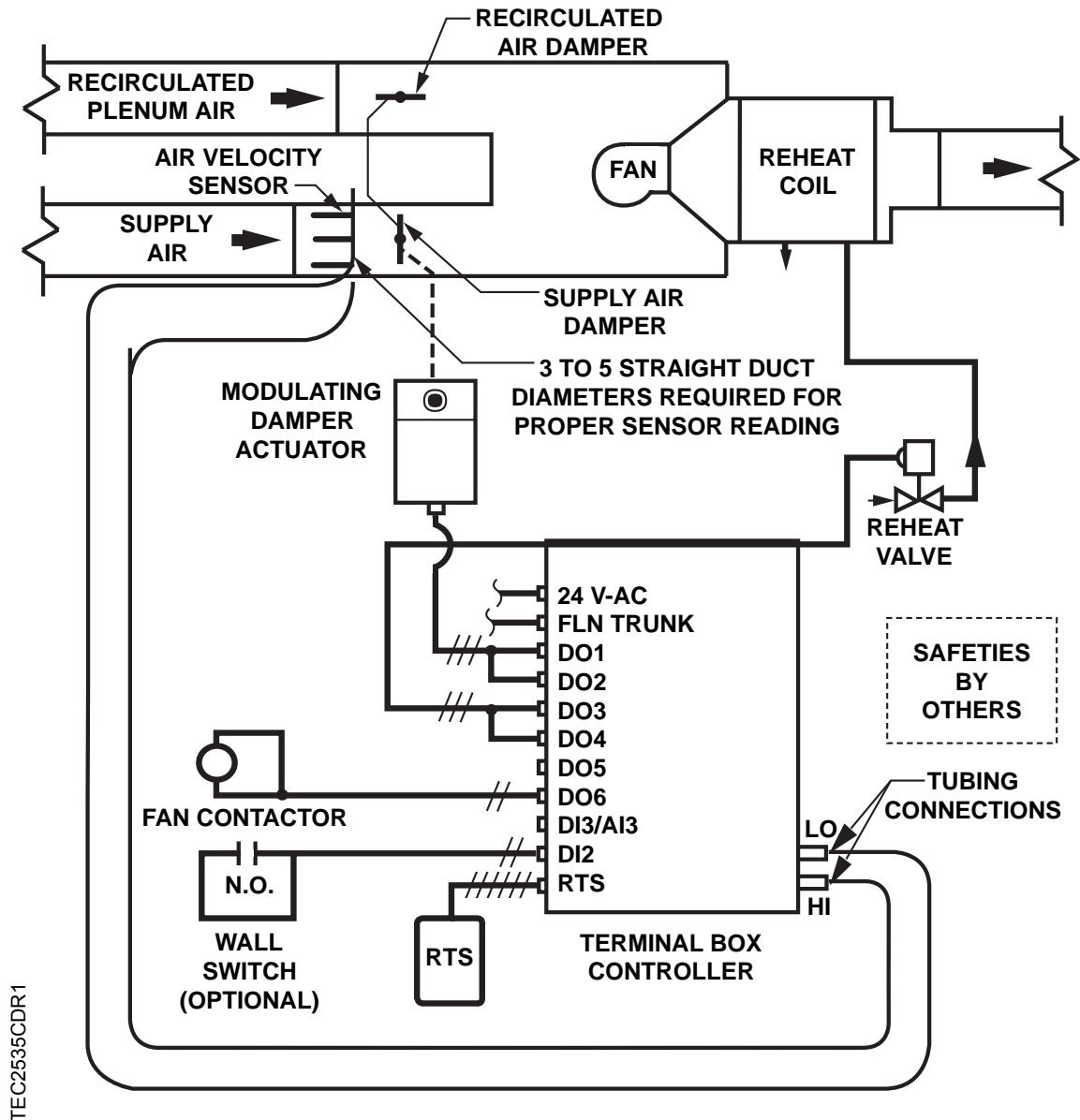


Figure 1. Application 2535 with Hot Water Heat Control Diagram.

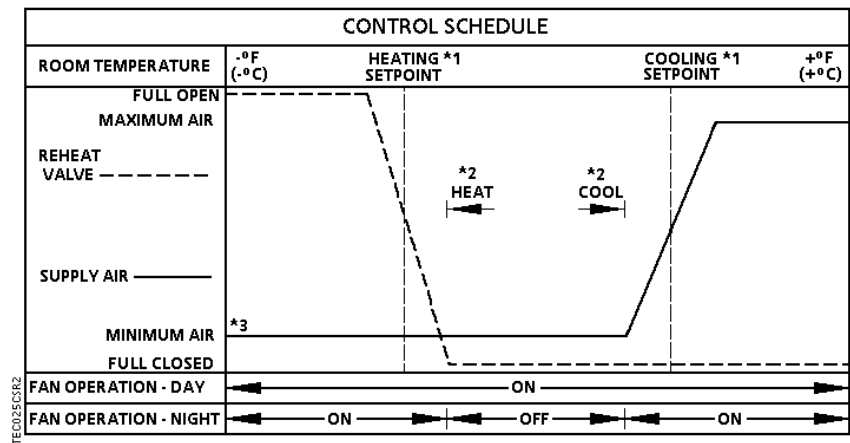


Figure 2. Application 2535 with Hot Water Heat Control Schedule.

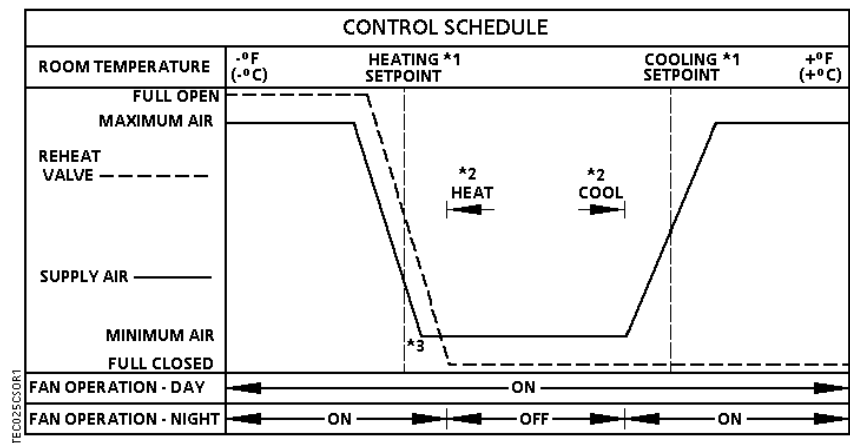


Figure 3. Application 2535 with Modulating Damper (Heating Mode) Control Schedule.

NOTES:

1. See Sequence of Operation, *Control Temperature Setpoints*.
2. See Sequence of Operation, *Heating/Cooling Switchover*.
3. The airflow is shown operating parallel with the reheat valve(optional). The airflow can operate at minimum flow throughout the entire heating mode (default setting). See *Sequencing Logic (Optional)*.

In Application 2537, the controller modulates the supply air damper of the terminal box to provide cooling and modulates a hot water valve for heating. When in heating, the supply air damper is set to a minimum position. 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. See Figure 4

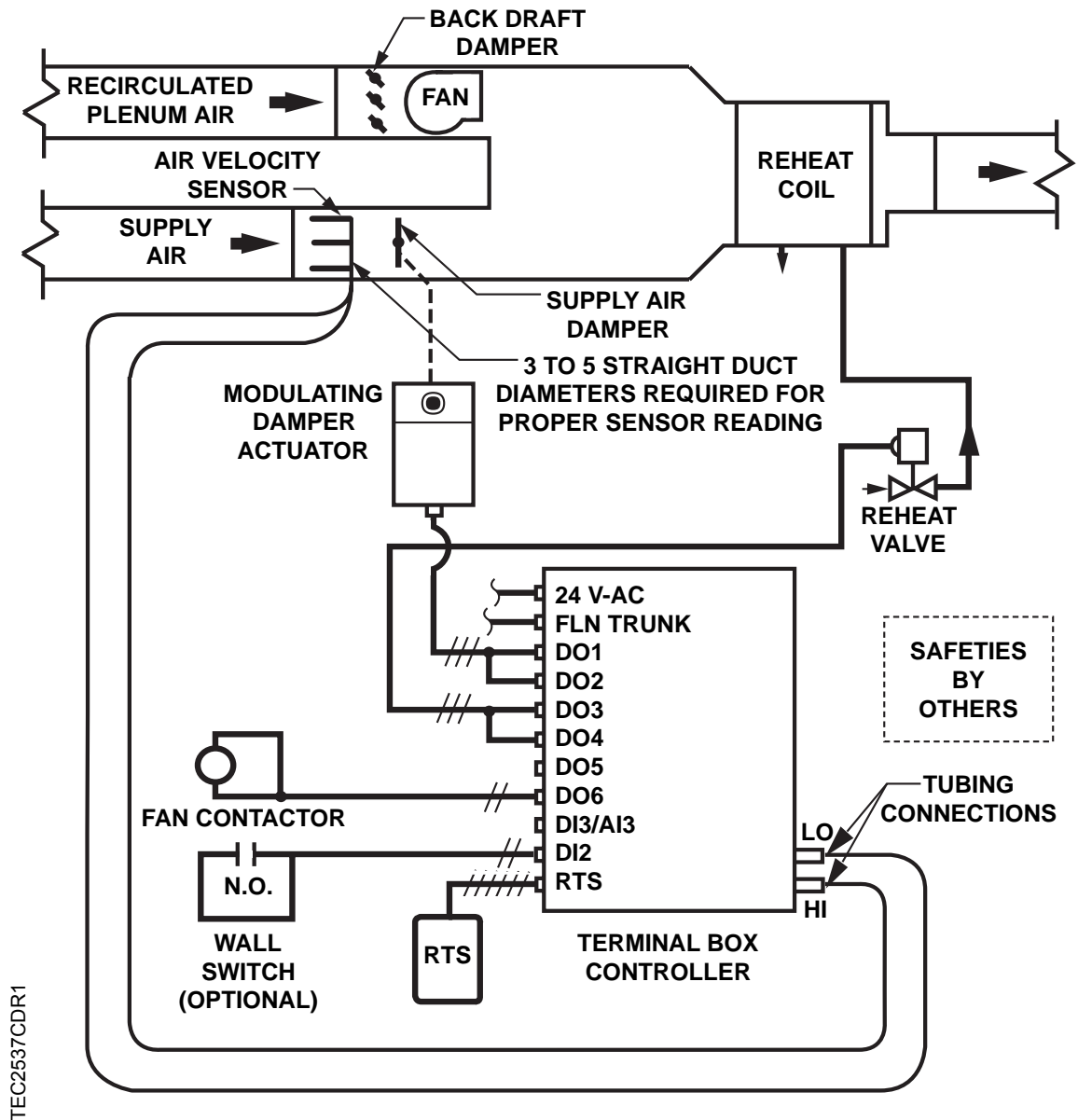


Figure 4. Application 2537 Control Diagram.

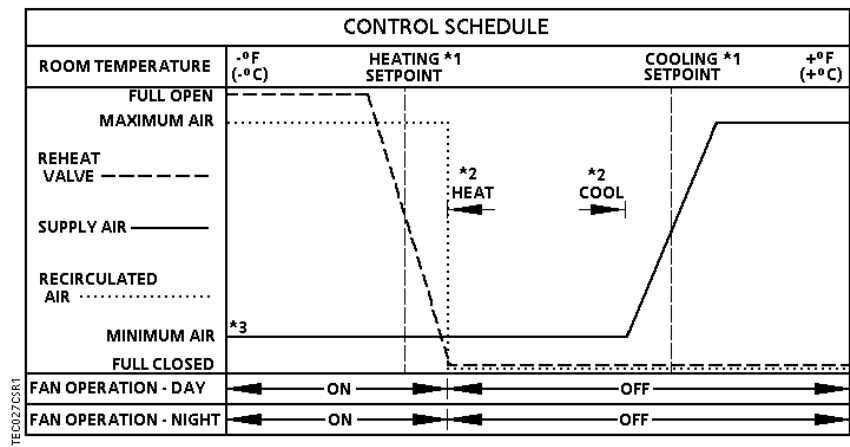


Figure 5. Application 2537 Control Schedule.

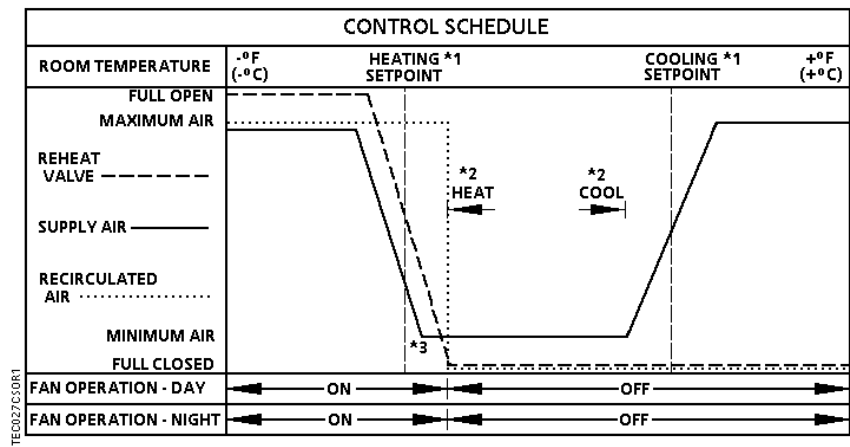


Figure 6. Application 2537 with Modulating Damper (Heating Mode) Control Schedule.

NOTES:

1. See Sequence of Operation, *Control Temperature Setpoints*.
2. See Sequence of Operation, *Heating/Cooling Switchover*.
3. The airflow is shown operating parallel with the reheat valve (optional). The airflow can operate at minimum flow throughout the entire heating mode (default setting). See *Sequencing Logic (Optional)*.

BACnet

The Terminal Box BACnet ASC Controller communicates using BACnet MS/TP protocol for open communications on BACnet MS/TP networks.

Table 1. Supported BIBBS.

Product	Supported BIBBs	BIBB Name
BTEC	DS-RP-B	Data Sharing-ReadProperty-B
	DS-RPM-B	Data Sharing-ReadPropertyMultiple-B
	DS-WP-B	Data Sharing-WriteProperty-B
	DM-DDB-B	Device Management-Dynamic Device Binding-B
	DM-DOB-B	Device Management-Dynamic Object Binding-B
	DM-DDC-B	Device Management-Device Communication Control-B

Hardware Inputs

Analog

- Air velocity sensor
- Room temperature sensor
- Room temperature setpoint dial (optional)

Digital

- Night mode override (optional)
- Wall switch (optional)

Hardware Outputs

Analog

- None

Digital

- Damper actuator
- Fan
- Valve actuator

Ordering Notes

Terminal Box BACnet ASC Controller

550-432

Related Equipment:

Damper Actuator

Terminal Equipment Controller Room Temperature Sensor

Valve Actuator

Point Database

Table 2 and Table 3 present the point database information for Application 2535 and Application 2537.

Sequence of Operation

The following paragraphs present the sequence of operation for Application 2535, "VAV with Hot Water Heat and Series Fan" and Application 2537, "VAV with Hot Water Heat and Parallel Fan".

Control Temperature Setpoints

Depending on the controller's current operational mode (day or night), CTL STPT holds the value of one of the following setpoints:

Day Mode – CTL STPT holds the value of DAY CLG STPT or DAY HTG STPT. If the room temperature sensor has a setpoint dial and STPT DIAL = YES, CTL STPT holds the value of RM STPT DIAL.

If the setpoint dial is used and RM STPT DIAL < RM STPT MIN, CTL STPT holds the value of RM STPT MIN. If RM STPT DIAL > RM STPT MAX, CTL STPT holds the value of RM STPT MAX.

Night Mode – CTL STPT holds the value of NGT CLG STPT or NGT HTG STPT.

Room Temperature Offset

Room Temperature Offset, RMTMP OFFSET, is a user-adjustable offset that will compensate for deviations between the value of ROOM TEMP and the actual room temperature. This corrected value is displayed in CTL TEMP.

$$\text{CTL TEMP} = \text{ROOM TMP} + \text{RMTMP OFFSET}$$

Day and Night Modes

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

When a wall switch is physically connected to the termination strip on the controller at DI 2 (see Figure 1 and Figure 4), and WALL SWITCH = YES, the controller monitors the status of DI 2. When DI 2 is ON (the switch is closed), DAY.NGT will be set to DAY indicating that the controller is in day mode. When DI 2 is OFF (the switch is open), DAY.NGT will be set to NIGHT indicating that the controller is in night mode.

When WALL SWITCH = NO, the controller does not monitor the status of the wall switch, even if one is connected to it. In this case, the controller is operating stand-alone, it stays in day mode all the time. If the controller is operating with centralized control, connected to a field panel, the field panel can send an operator or PPCL command to override the status of DAY.NGT.

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 OVRD TIME, pressing the override switch will reset the controller to day mode for the time period set in OVRD TIME. The status of NGT OVRD changes to DAY. After the override time elapses, the controller returns to night mode and NGT OVRD changes back to NIGHT.

The override switch on the room sensor will only affect the controller when in night mode.

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 SWITCH TIME, the controller switches from heating to cooling mode by setting HEAT.COOL to COOL:

- $HTG\ LOOPOUT < SWITCH\ LIMIT$.
- $CTL\ TEMP > CTL\ STPT$ by at least the value set in SWITCH DBAND.
- $CTL\ TEMP >$ the appropriate cooling setpoint minus SWITCH DBAND.

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

- $CLG\ LOOPOUT < SWITCH\ LIMIT$.
- $CTL\ TEMP < CTL\ STPT$ by at least the value set SWITCH DBAND.
- $CTL\ TEMP <$ the appropriate heating setpoint 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 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 (see Examples 1 through 3 in *Sequencing Logic (Optional)*). If the flow loop is used in heating mode just to meet minimum air requirements, the heating/cooling switchover mechanism operates as described in this section to control HEAT.COOL (see Example 4 in *Sequencing Logic (Optional)*).

Control Loops

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

The two temperature loops are a cooling loop and a heating loop. The active temperature loop maintains room temperature at the value in CTL STPT. See *Control Temperature Setpoints*.

Cooling Loop – Generates cooling loopout which is then used to generate FLOW STPT. FLOW STPT is the result of scaling the cooling loopout to the appropriate range of values determined by CLG FLOW MIN and CLG FLOW MAX. In order to scale it, the loopout is multiplied by the range (MAX – MIN) and then added to the minimum setpoint.

When CLG FLOW MIN \neq 0 cfm, FLOW STPT \neq CLG LOOPOUT. The minimum flow setpoint is (CLG FLOW MIN / CLG FLOW MAX) \times 100% flow. And FLOW STPT is [CLG LOOPOUT \times (100% – minimum setpoint)] + minimum setpoint.

Example

If CLG FLOW MIN = 200 cfm, and CLG FLOW MAX = 1000 cfm,
the minimum flow setpoint is (200 cfm / 1000 cfm) \times 100% flow = 20%.

When CLG LOOPOUT is 0%, FLOW STPT = 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 = 60% flow.

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

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

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

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

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

If the first option described above is chosen, HTG LOOPOUT will control the hot water valve in order to maintain the room temperature. If any one of the last three options is chosen, HTG LOOPOUT will control both the flow loop setpoint (FLOW STPT) and the hot water valve in order to maintain the room temperature. See *Sequencing Logic (Optional)* 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 is never set below $(\text{HTG FLOW MIN} / \text{HTG FLOW MAX}) \times 100\%$ flow or above 100% flow.

Flow Loop – Maintains minimum airflow and maximum airflow through CTL FLOW MIN and CTL FLOW MAX.

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

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

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, the flow loop becomes a constant volume loop and loses its ability to control temperature.

The flow loop maintains FLOW STPT by modulating the supply air damper, DMPR COMD. The flow loop maintains the airflow between CTL FLOW MIN and CTL FLOW MAX.

FLOW is the input value for the flow loop. It is calculated as a percentage based on where AIR VOLUME is between 0 cfm and CTL FLOW MAX. This percentage is referred to as % flow.

- If AIR VOLUME = 0 cfm, FLOW is 0% flow.
- If AIR VOLUME = CTL FLOW MAX, 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:

$$(\text{CTL FLOW MIN} / \text{CTL FLOW MAX}) \times 100\% \text{ flow}$$

The flow loop ensures that the supply air will not be less than CTL FLOW MIN.

Example

If CTL FLOW MIN = 250 cfm, and CTL FLOW MAX = 1000 cfm,
the low limit of FLOW STPT = $(250 \text{ cfm} / 1000 \text{ cfm}) \times 100\% \text{ flow}$
= $0.25 \times 100\% \text{ flow}$
= 25% flow.

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

Hot Water Heat



CAUTION:

Do not set HTG FLOW MIN to 0 CFM (0 LPS). Safeties provided by others should require a minimum airflow moving across the heating coils when the heating valve is open

The heating loop modulates the heating valve(s) to warm up the room.

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

Sequencing Logic (Optional)



The default setups for FLOW START and FLOW END are 0. This will provide minimum airflow during heating mode.

In heating mode, this application includes logic that allows the flow loop to operate in sequence, parallel, or overlapping with the hot water valve. Portions of the output of the heating loop, HTG LOOPOUT, will drive both the flow loop and the hot water valve from 0 to 100%. See the following three examples.

The ladder diagrams in Figure 7 show sequenced, parallel, and overlapping flow loop operations with hot water valve. 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.

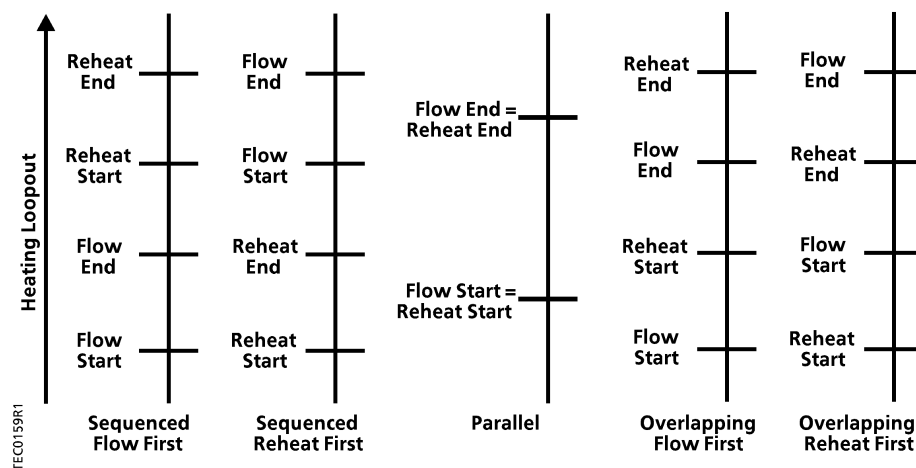


Figure 7. Sequenced, Parallel, and Overlapping Flow Loop Operations with Hot Water Heat.

For simplicity, assume that in these examples:

- HTG FLOW MIN = 0 cfm.
- There is only one hot water valve (VALVE COUNT = 1).
- When this is done, FLOW STPT will equal 0 when HTG LOOPOUT = 0.

Example 1

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

- FLOW START = 0%
- FLOW END = 50%
- REHEAT START = 50%
- REHEAT END = 100%

then,

- When HTG LOOPOUT = 0%, FLOW STPT will equal 0% flow.
- When HTG LOOPOUT = 25%, FLOW STPT will equal 50% flow.
- When HTG LOOPOUT \geq 50%, FLOW STPT will equal 100% flow.
- When HTG LOOPOUT \leq 50%, VLV COMD will equal 0% open.
- When HTG LOOPOUT = 75%, VLV COMD will equal 50% open.
- When HTG LOOPOUT = 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 = 0%
- FLOW END = 100%
- REHEAT START = 0%
- REHEAT END = 100%

then,

- When HTG LOOPOUT = 0%, FLOW STPT will equal 0% flow.
- When HTG LOOPOUT = 50%, FLOW STPT will equal 50% flow.
- When HTG LOOPOUT = 100%, FLOW STPT will equal 100% flow.
- When HTG LOOPOUT = 0%, VLV COMD will equal 0% open.
- When HTG LOOPOUT = 50%, VLV COMD will equal 50% open.
- When HTG LOOPOUT = 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 = 0%
- FLOW END = 75%
- REHEAT START = 25%
- REHEAT END = 100%

then,

- When HTG LOOPOUT = 0%, FLOW STPT will equal 0% flow.
- When HTG LOOPOUT = 37.5%, FLOW STPT will equal 50% flow.
- When HTG LOOPOUT \geq 75%, FLOW STPT will equal 100% flow.
- When HTG LOOPOUT \leq 25%, VLV COMD will equal 0% open.
- When HTG LOOPOUT = 62.5%, VLV COMD will equal 50% open.
- When HTG LOOPOUT = 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 a value of 0%, resulting in the corresponding 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 = 170 cfm
- HTG FLOW MAX = 1000 cfm

If:

- FLOW START = 0%
- FLOW END = 0%
- REHEAT START = 0%
- REHEAT END = 100%

then,

- When HTG LOOPOUT = 0%,
FLOW STPT will equal $(170 \text{ cfm} / 1000 \text{ cfm}) \times 100\% \text{ flow} = 17\% \text{ flow}$. This will cause the flow loop to maintain airflow of 170 cfm out of the terminal box.
- When HTG LOOPOUT = 50%, FLOW STPT will equal 17% flow.
- When HTG LOOPOUT = 100%, FLOW STPT will equal 17% flow.
- When HTG LOOPOUT = 0%, VLV COMD will equal 0% open.
- When HTG LOOPOUT = 50%, VLV COMD will equal 50% open.
- When HTG LOOPOUT = 100%, VLV COMD will equal 100% open.

Calibration

Air Velocity Sensor – Calibration of the controller's internal air velocity sensor (AVS) is periodically required to maintain accurate air velocity readings. CAL SETUP is set with the desired calibration option during controller startup. Depending on the value of CAL SETUP, calibration may be set to take place automatically or manually. If CAL AIR = YES, calibration is in progress.

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

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

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

Series Fan Operation



CAUTION:

On series fan powered terminal boxes, the terminal box fan must be controlled/interlocked to start either before or at the same time as the central air handler. Failure to do so may cause the terminal box fan to rotate backwards and cause consequent damage at start up.

In day mode, FAN, is ON all the time.

In night mode, the fan is controlled as follows:

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

- The hot water valve, VLV COMD, is open greater than the value stored in STAGE FAN.
- The airflow out of the supply duct, FLOW, is greater than the value stored in SERIES ON.

The fan will turn OFF only when the following two conditions have been met:

- The hot water valve, VLV COMD, is open less than the value stored in SWITCH LIMIT.
- The airflow out of the supply duct, FLOW, is less than the value stored in SERIES OFF.

Parallel Fan Operation

When HEAT.COOL = COOL, FAN is OFF.

When HEAT.COOL = HEAT, the fan is controlled as follows:

The fan will turn ON only when the following two conditions have been met:

- The hot water valve, VLV COMD, is open greater than the value stored in STAGE FAN.
- The airflow out of the supply duct, FLOW, is less than the value stored in PARALLEL ON. (This means that there is not enough airflow out of the supply duct to allow the heat from the hot water valve to get into the room.)

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

- The hot water valve, VLV COMD, is open less than the value stored in SWITCH LIMIT.
- The airflow out of the supply duct, FLOW, is greater than the value stored in PARALLEL OFF. (This means that there is enough airflow out of the supply duct to allow the heat from the hot water valve to get into the room.)

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

Fail-safe Operation

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

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

Application Notes

1. If temperature swings in the room are excessive or there is trouble maintaining the setpoint, the cooling loop needs to be tuned. If FLOW is oscillating while FLOW STPT is constant, the flow loop requires tuning. See *iKnow Troubleshooting Tool* for more information.
2. In order for the heating loopout to work, MTR2 must be enabled using the correct setting for MTR SETUP.
3. Terminal Box BACnet ASC Controller, as shipped from the factory, keeps all associated equipment OFF. See the *BACnet Terminal Box Controller — Electronic Output Start-up Procedures* for information on how to release the controller and its equipment to application control.

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

Wiring Diagram

The point wiring for Application 2535 and Application 2537 is shown in Figure 8.



CAUTION:

The controller's DOs control 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
- Separate transformers used to power the load.

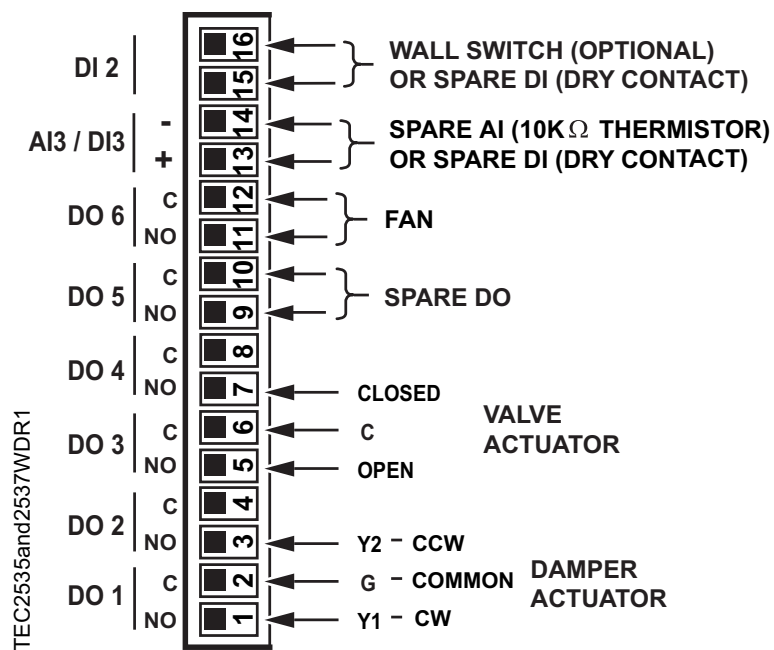


Figure 8. Application 2535 and Application 2537 Wiring Diagram.

Table 2. Point Database for Application 2535.

Object Type ^a	Object Instance (Point Number) ^b	Object Name and Description	Factory Default (SI Units) ^c	Eng Units (SI Units) ^c	Range	Active Text	Inactive Text
AO	1	CTLR ADDRESS	99	–	0-255	–	–
AO	2	APPLICATION	2586	–	2530 through 2537	–	–
AO	3	RMTMP OFFSET	0.0 (0.0)	DEG F (DEG C)	-31.75-32	–	–
AI	{04} ^d	ROOM TEMP	74.0 (23.44888)	DEG F (DEG C)	48-111.75	–	–
BO	{05}	HEAT.COOL	COOL	–	Binary	HEAT	COOL
AO	6	DAY CLG STPT	74.0 (23.44888)	DEG F (DEG C)	48-111.75	–	–
AO	7	DAY HTG STPT	70.0 (21.20888)	DEG F (DEG C)	48- 111.75	–	–
AO	8	NGT CLG STPT	82.0 (27.92888)	DEG F (DEG C)	48- 111.75	–	–
AO	9	NGT HTG STPT	65.0 (18.40888)	DEG F (DEG C)	48- 111.75	–	–
AO	11	RM STPT MIN	55.0 (12.80888)	DEG F (DEG C)	48- 111.75	–	–
AO	12	RM STPT MAX	90.0 (32.40888)	DEG F (DEG C)	48- 111.75	–	–
AI	{13}	RM STPT DIAL	74.0 (23.44888)	DEG F (DEG C)	48- 111.75	–	–
BO	14	STPT DIAL	NO	–	Binary	YES	NO
AI	{15}	AUX TEMP AI3	74.0 (23.495556)	DEG F (DEG C)	37.5- 165	–	–
AO	16	FLOW START	0	PCT	0- 102	–	–
AO	17	FLOW END	0	PCT	0- 102	–	–
BO	18	WALL SWITCH	NO	–	Binary	YES	NO
BI	{19}	DI OVRD SW	OFF	–	Binary	ON	OFF
AO	20	OVRD TIME	0	HRS	0- 255	–	–
BO	{21}	NGT OVRD	NIGHT	–	Binary	NIGHT	DAY
AO	22	REHEAT START	0	PCT	0- 102	–	–
AO	23	REHEAT END	100	PCT	0- 102	–	–

continued on next page...

Table 2. Point Database for Application 2535. (continued)

Object Type ^a	Object Instance (Point Number) ^b	Object Name and Description	Factory Default (SI Units) ^c	Eng Units (SI Units) ^c	Range	Active Text	Inactive Text
BI	{24}	DI 2	OFF	–	Binary	ON	OFF
BI	{25}	DI 3	OFF	–	Binary	ON	OFF
AO	26	SERIES ON	20	PCT	0- 102	–	–
AO	27	SERIES OFF	10	PCT	0- 102	–	–
BO	{29}	DAY.NGT	DAY	–	Binary	NIGHT	DAY
AO	31	CLG FLOW MIN	220 (103.818)	CFM (LPS)	0- 131068	–	–
AO	32	CLG FLOW MAX	2200 (1038.18)	CFM (LPS)	0- 131068	–	–
AO	33	HTG FLOW MIN	220 (103.818)	CFM (LPS)	0- 131068	–	–
AO	34	HTG FLOW MAX	2200 (1038.18)	CFM (LPS)	0- 131068	–	–
AI	{35}	AIR VOLUME	0 (0.0)	CFM (LPS)	0- 131068	–	–
AO	36	FLOW COEFF	1	–	0- 2.55	–	–
BO	{41}	DO 1	OFF	–	Binary	ON	OFF
BO	{42}	DO 2	OFF	–	Binary	ON	OFF
BO	{43}	DO 3	OFF	–	Binary	ON	OFF
BO	{44}	DO 4	OFF	–	Binary	ON	OFF
BO	{45}	DO 5	OFF	–	Binary	ON	OFF
BO	{46}	FAN	OFF	–	Binary	ON	OFF
AO	{48}	DMPR COMD	0	PCT	0- 102	–	–
AO	{49}	DMPR POS	0	PCT	0- 102	–	–
AO	51	MTR1 TIMING	95	SEC	0- 511	–	–
AO	{52}	VLV COMD	0	PCT	0- 102	–	–
AO	{53}	VLV POS	0	PCT	0- 102	–	–
AO	55	MTR2 TIMING	130	SEC	0- 511	–	–
AO	56	DMPR ROT ANG	90	–	0- 255	–	–
AO	58	MTR SETUP	0	–	0- 255	–	–
AO	59	DO DIR. REV	0	–	0- 255	–	–

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Table 2. Point Database for Application 2535. (continued)

Object Type ^a	Object Instance (Point Number) ^b	Object Name and Description	Factory Default (SI Units) ^c	Eng Units (SI Units) ^c	Range	Active Text	Inactive Text
AO	63	CLG P GAIN	20.0 (36.0)	–	0- 63.75	–	–
AO	64	CLG I GAIN	0.01 (0.018)	–	0- 1.023	–	–
AO	65	CLG D GAIN	0 (0.0)	–	0- 510	–	–
AO	67	HTG P GAIN	10.0 (18.0)	–	0- 63.75	–	–
AO	68	HTG I GAIN	0.01 (0.018)	–	0- 1.023	–	–
AO	69	HTG D GAIN	0 (0.0)	–	0- 510	–	–
AO	71	FLOW P GAIN	0	–	0- 51.15	–	–
AO	72	FLOW I GAIN	0.01	–	0- 1.023	–	–
AO	73	FLOW D GAIN	0	–	0- 510	–	–
AO	74	FLOW BIAS	50	PCT	0- 102	–	–
AO	{75}	FLOW	0	PCT	0- 1023.75	–	–
AO	{76}	CTL FLOW MIN	220 (103.818)	CFM (LPS)	0- 131068	–	–
AO	{77}	CTL FLOW MAX	2200 (1038.18)	CFM (LPS)	0- 131068	–	–
AO	{78}	CTL TEMP	74.0 (23.44888)	DEG F (DEG C)	48- 111.75	–	–
AO	{79}	CLG LOOPOUT	0	PCT	0- 102	–	–
AO	{80}	HTG LOOPOUT	0	PCT	0- 102	–	–
AO	83	STAGE FAN	10	PCT	0- 102	–	–
AO	85	SWITCH LIMIT	5.2	PCT	0- 102	–	–
AO	86	SWITCH TIME	10	MIN	0- 255	–	–
AO	90	SWITCH DBAND	1.0 (0.56)	DEG F (DEG C)	0- 63.75	–	–
AO	{92}	CTL STPT	74.0 (23.44888)	DEG F (DEG C)	48- 111.75	–	–
AO	{93}	FLOW STPT	0	PCT	0- 255.75	–	–
BO	{94}	CAL AIR	NO	–	Binary	YES	NO
AO	95	CAL SETUP	4	–	0- 255	–	–
AO	96	CAL TIMER	12	HRS	0- 255	–	–

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Table 2. Point Database for Application 2535. (continued)

Object Type ^a	Object Instance (Point Number) ^b	Object Name and Description	Factory Default (SI Units) ^c	Eng Units (SI Units) ^c	Range	Active Text	Inactive Text
AO	97	DUCT AREA	1.0 (0.09292)	SQ. FT (SQ M)	0- 6.375	–	–
AO	98	LOOP TIME	5	SEC	0- 255	–	–
AO	{99}	ERROR STATUS	0	–	0- 255	–	–

^a Object Types are; Analog Input (AI), Analog Output (AO), Binary Input (BI) and Binary Output (BO).

^b Points not listed are not used in this application.

^c A single value in a column means that the value is the same in English units and in SI units.

^d Point numbers that appear in brackets {} may be unbundled at the field panel.

Table 3. Point Database for Application 2537.

Object Type ^a	Object Instance (Point Number) ^b	Object Name and Description	Factory Default (SI Units) ^c	Eng Units (SI Units) ^c	Range	Active Text	Inactive Text
AO	1	CTLR ADDRESS	99	–	0-255	–	–
AO	2	APPLICATION	2586	–	2530 through 2537	–	–
AO	3	RMTMP OFFSET	0.0 (0.0)	DEG F (DEG C)	-31.75-32	–	–
AI	{04} ^d	ROOM TEMP	74.0 (23.44888)	DEG F (DEG C)	48-111.75	–	–
BO	{05}	HEAT.COOL	COOL	–	Binary	HEAT	COOL
AO	6	DAY CLG STPT	74.0 (23.44888)	DEG F (DEG C)	48-111.75	–	–
AO	7	DAY HTG STPT	70.0 (21.20888)	DEG F (DEG C)	48- 111.75	–	–
AO	8	NGT CLG STPT	82.0 (27.92888)	DEG F (DEG C)	48- 111.75	–	–
AO	9	NGT HTG STPT	65.0 (18.40888)	DEG F (DEG C)	48- 111.75	–	–
AO	11	RM STPT MIN	55.0 (12.80888)	DEG F (DEG C)	48- 111.75	–	–

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Table 3. Point Database for Application 2537. (continued)

Object Type ^a	Object Instance (Point Number) ^b	Object Name and Description	Factory Default (SI Units) ^c	Eng Units (SI Units) ^c	Range	Active Text	Inactive Text
AO	12	RM STPT MAX	90.0 (32.40888)	DEG F (DEG C)	48- 111.75	–	–
AI	{13}	RM STPT DIAL	74.0 (23.44888)	DEG F (DEG C)	48- 111.75	–	–
BO	14	STPT DIAL	NO	–	Binary	YES	NO
AI	{15}	AUX TEMP AI3	74.0 (23.495556)	DEG F (DEG C)	37.5- 165	–	–
AO	16	FLOW START	0	PCT	0- 102	–	–
AO	17	FLOW END	0	PCT	0- 102	–	–
BO	18	WALL SWITCH	NO	–	Binary	YES	NO
BI	{19}	DI OVRD SW	OFF	–	Binary	ON	OFF
AO	20	OVRD TIME	0	HRS	0- 255	–	–
BO	{21}	NGT OVRD	NIGHT	–	Binary	NIGHT	DAY
AO	22	REHEAT START	0	PCT	0- 102	–	–
AO	23	REHEAT END	100	PCT	0- 102	–	–
BI	{24}	DI 2	OFF	–	Binary	ON	OFF
BI	{25}	DI 3	OFF	–	Binary	ON	OFF
AO	26	SERIES ON	20	PCT	0- 102	–	–
AO	27	SERIES OFF	10	PCT	0- 102	–	–
AO	28	PARALLEL ON	20	PCT	0- 102	–	–
BO	{29}	DAY.NGT	DAY	–	Binary	NIGHT	DAY
AO	30	PARALLEL OFF	30	PCT	0- 102	–	–
AO	31	CLG FLOW MIN	220 (103.818)	CFM (LPS)	0- 131068	–	–
AO	32	CLG FLOW MAX	2200 (1038.18)	CFM (LPS)	0- 131068	–	–
AO	33	HTG FLOW MIN	220 (103.818)	CFM (LPS)	0- 131068	–	–
AO	34	HTG FLOW MAX	2200 (1038.18)	CFM (LPS)	0- 131068	–	–
AI	{35}	AIR VOLUME	0 (0.0)	CFM (LPS)	0- 131068	–	–
AO	36	FLOW COEFF	1	–	0- 2.55	–	–

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Table 3. Point Database for Application 2537. (continued)

Object Type ^a	Object Instance (Point Number) ^b	Object Name and Description	Factory Default (SI Units) ^c	Eng Units (SI Units) ^c	Range	Active Text	Inactive Text
BO	{41}	DO 1	OFF	–	Binary	ON	OFF
BO	{42}	DO 2	OFF	–	Binary	ON	OFF
BO	{43}	HEAT STAGE 1	OFF	–	Binary	ON	OFF
BO	{44}	HEAT STAGE 2	OFF	–	Binary	ON	OFF
BO	{45}	HEAT STAGE 3	OFF	–	Binary	ON	OFF
BO	{46}	FAN	OFF	–	Binary	ON	OFF
AO	{48}	DMPR COMD	0	PCT	0- 102	–	–
AO	{49}	DMPR POS	0	PCT	0- 102	–	–
AO	51	MTR1 TIMING	95	SEC	0- 511	–	–
AO	56	DMPR ROT ANG	90	–	0- 255	–	–
AO	58	MTR SETUP	0	–	0- 255	–	–
AO	59	DO DIR. REV	0	–	0- 255	–	–
AO	63	CLG P GAIN	20.0 (36.0)	–	0- 63.75	–	–
AO	64	CLG I GAIN	0.01 (0.018)	–	0- 1.023	–	–
AO	65	CLG D GAIN	0 (0.0)	–	0- 510	–	–
AO	67	HTG P GAIN	10.0 (18.0)	–	0- 63.75	–	–
AO	68	HTG I GAIN	0.01 (0.018)	–	0- 1.023	–	–
AO	69	HTG D GAIN	0 (0.0)	–	0- 510	–	–
AO	71	FLOW P GAIN	0	–	0- 51.15	–	–
AO	72	FLOW I GAIN	0.01	–	0- 1.023	–	–
AO	73	FLOW D GAIN	0	–	0- 510	–	–
AO	74	FLOW BIAS	50	PCT	0- 102	–	–
AO	{75}	FLOW	0	PCT	0- 1023.75	–	–
AO	{76}	CTL FLOW MIN	220 (103.818)	CFM (LPS)	0- 131068	–	–
AO	{77}	CTL FLOW MAX	2200 (1038.18)	CFM (LPS)	0- 131068	–	–
AO	{78}	CTL TEMP	74.0 (23.44888)	DEG F (DEG C)	48- 111.75	–	–
AO	{79}	CLG LOOPOUT	0	PCT	0- 102	–	–

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Table 3. Point Database for Application 2537. (continued)

Object Type ^a	Object Instance (Point Number) ^b	Object Name and Description	Factory Default (SI Units) ^c	Eng Units (SI Units) ^c	Range	Active Text	Inactive Text
AO	{80}	HTG LOOPOUT	0	PCT	0- 102	–	–
AO	{81}	AVG HEAT OUT	0	PCT	0- 409.2	–	–
AO	82	STAGE MAX	90	PCT	0- 102	–	–
AO	83	STAGE MIN	10	PCT	0- 102	–	–
AO	85	SWITCH LIMIT	5.2	PCT	0- 102	–	–
AO	86	SWITCH TIME	10	MIN	0- 255	–	–
AO	88	STAGE COUNT	1	–	0- 255	–	–
AO	89	STAGE TIME	10	MIN	0- 255	–	–
AO	90	SWITCH DBAND	1.0 (0.56)	DEG F (DEG C)	0- 63.75	–	–
AO	{92}	CTL STPT	74.0 (23.44888)	DEG F (DEG C)	48- 111.75	–	–
AO	{93}	FLOW STPT	0	PCT	0- 255.75	–	–
BO	{94}	CAL AIR	NO	–	Binary	YES	NO
AO	95	CAL SETUP	4	–	0- 255	–	–
AO	96	CAL TIMER	12	HRS	0- 255	–	–
AO	97	DUCT AREA	1.0 (0.09292)	SQ. FT (SQ M)	0- 6.375	–	–
AO	98	LOOP TIME	5	SEC	0- 255	–	–
AO	{99}	ERROR STATUS	0	–	0- 255	–	–
^a Object Types are; Analog Input (AI), Analog Output (AO), Binary Input (BI) and Binary Output (BO). ^b Points not listed are not used in this application. ^c A single value in a column means that the value is the same in English units and in SI units. ^d Point numbers that appear in brackets {} may be unbundled at the field panel.							