

Terminal Box BACnet ASC Controller

Application Notes

Application 2533 — VAV with Hot Water Heat

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Overview

In Application 2533, 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).

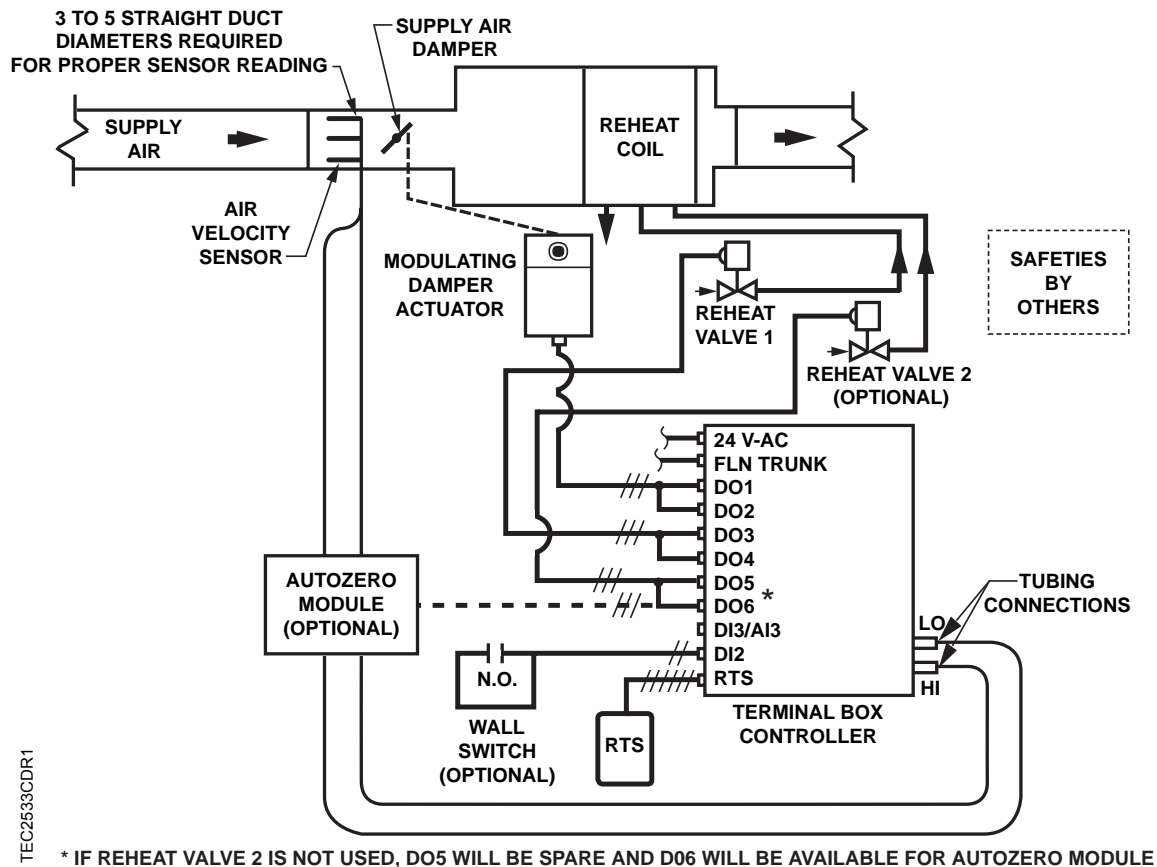


Figure 1. Application 2533 with Hot Water Heat Control Diagram.

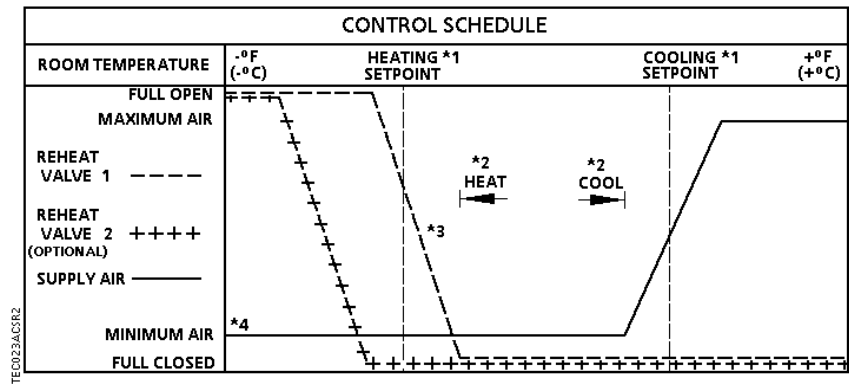


Figure 2. Application 2533 with Hot Water Heat Control Schedule.

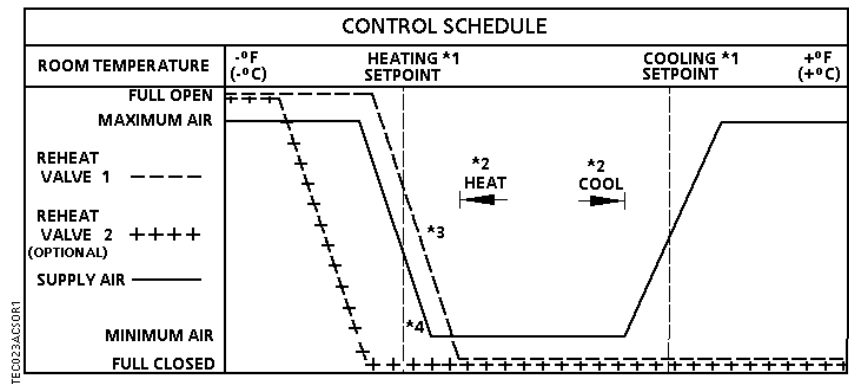


Figure 3. Application 2533 with Hot Water Heat and Modulating Damper (Heating Mode) Control Schedule.

NOTES:

- 1. See Sequence of Operation, Control Temperature Setpoints.
- 2. See Sequence of Operation, Heating/Cooling Switchover.
- 3. One or two reheat valves may be used. Operation in sequence (optional).
- 4. 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
- 1st valve actuator (required)
- 2 nd valve actuator (optional)
-or-
- Autozero Module (optional)

Ordering Notes

Terminal Box BACnet ASC Controller

550-432

Related Equipment:

Autozero Module (optional)

Damper Actuator

Terminal Equipment Controller Room Temperature Sensor

1st Valve Actuator (required)

2nd Valve Actuator (optional)

Point Database

presents the point database information for Application 2533.

Sequence of Operation

The following paragraphs present the sequence of operation for Application 2533, "VAV with Hot Water Heat".

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. 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.

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 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 (see Figure 1 and), 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). 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).

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.

In Application 2533, 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.

- If VALVE COUNT = 1,
When $(\text{HTG LOOPOUT} - \text{REHEAT START}) / (\text{REHEAT END} - \text{REHEAT START}) \times 100\%$ varies from 0 to 100% open of the reheat output range,
VLV1 COMD varies from 0 to 100% open, and VLV2 COMD is not used in the application.
- If VALVE COUNT = 2,
When HTG LOOPOUT varies from 0 to 50% of the reheat output range, VLV1 COMD varies from 0 to 100% open.
When HTG LOOPOUT varies from 50 to 100% of the reheat output range, VLV2 COMD varies from 0 to 100% open.

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 4 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.

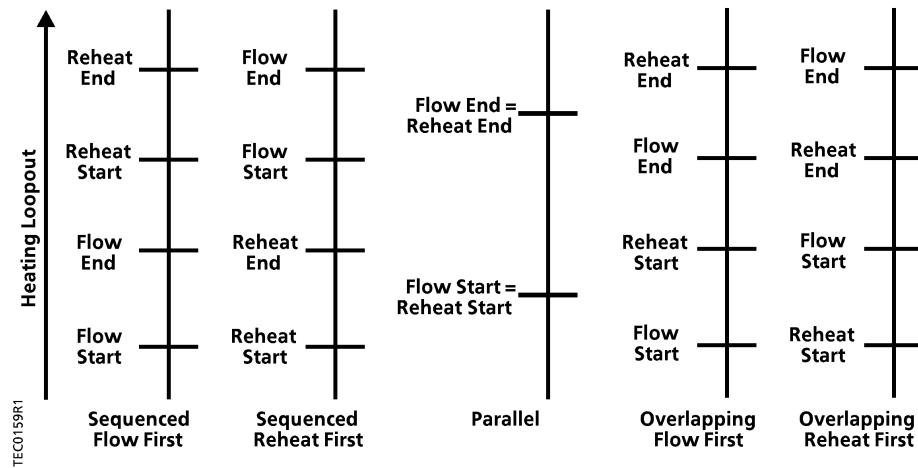


Figure 4. Sequenced, Parallel, and Overlapping Flow Loop Operations with hot water heat.

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%, VLV1 COMD will equal 0% open.
- When HTG LOOPOUT = 75%, VLV1 COMD will equal 50% open.

- When HTG LOOPOUT = 100%, VLV1 COMD will equal 100% open.

Example 2

Assume that your system has hot water heat 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%, VLV1 COMD will equal 0% open.
- When HTG LOOPOUT = 50%, VLV1 COMD will equal 50% open.
- When HTG LOOPOUT = 100%, VLV1 COMD will equal 100% open.

Example 3

Assume that your system has hot water heat 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%, VLV1 COMD will equal 0% open.
- When HTG LOOPOUT = 62.5%, VLV1 COMD will equal 50% open.

- When HTG LOOPOUT = 100%, VLV1 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 hot water heat 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
- VALVE COUNT = 1

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%, VLV1 COMD will equal 0% open.
- When HTG LOOPOUT = 50%, VLV1 COMD will equal 50% open.
- When HTG LOOPOUT = 100%, VLV1 COMD will equal 100% open.

If:

- VALVE COUNT = 2

then,

- When HTG LOOPOUT = 0%, VLV2 COMD will equal 0% open, VLV1 COMD = 0%.
- When HTG LOOPOUT = 50%, VLV2 COMD will equal 0% open, VLV1 COMD = 100%.
- When HTG LOOPOUT = 100%, VLV2 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.

- For a controller used without an Autozero Module (CAL MODULE = 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.

Hot Water Valve – Calibration of a hot water valve (if used) 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.

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

Damper Status Operation

Under normal operation DMPR STATUS reads CAL. However, if using an Autozero Module, it is possible after a period of operation for the calculated damper position, DMPR POS, to differ from the actual (physical) damper position.

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 all of the following conditions are true:

- DMPR POS = 100%
- AIR VOLUME > 0 cfm
- FLOW < FLOW STPT

OR

- DMPR POS = 0%
- AIR VOLUME > 0 cfm
- FLOW > FLOW STPT



To change DMPR STATUS from RECAL back to CAL, set DMPR STATUS to CAL, and then release it.

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 and MTR3 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.
4. Spare DOs can be used as auxiliary points that are controlled by the field panel after being defined in the field panel's database. DO 5 and DO 6 may be used as auxiliary motor points. If using a pair of spare DOs to control a motor, you must unbundle the corresponding motor command point.

Wiring Diagram

The point wiring for Application 2533 is shown in Figure 5 and Figure 6.



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.

Table 2. Point Database for Application 2533.

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	–	–

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Table 2. Point Database for Application 2533. (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
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	–	–
AO	{37}	VLV2 COMD	0	PCT	0- 102	–	–
AO	{38}	VLV2 POS	0	PCT	0- 102	–	–
AO	39	MTR3 TIMING	130	SEC	0- 511	–	–
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}	DO 6	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}	VLV1 COMD	0	PCT	0- 102	–	–
AO	{53}	VLV1 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 2533. (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	–	–
BO	{84}	DMPR STATUS	CAL	–	Binary	RECAL	CAL
AO	85	SWITCH LIMIT	5.2	PCT	0- 102	–	–
AO	86	SWITCH TIME	10	MIN	0- 255	–	–
BO	87	CAL MODULE	NO	–	Binary	YES	NO
AO	88	VALVE COUNT	1	–	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

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Table 2. Point Database for Application 2533. (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	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.							