SIEMENS

BACnet ATEC

Application 2862 – VAV with 3-Stage Electric Heat or Baseboard Radiation

Application Note

Siemens Industry, Inc.

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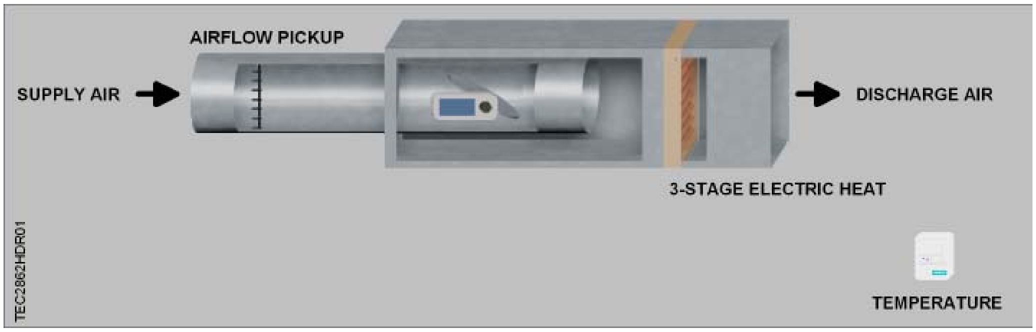
Overview

In Application 2862, the controller modulates the supply air damper of the terminal box for cooling and controls stages of electric reheat or baseboard radiation for heating. When in heating, the terminal box either maintains minimum airflow or modulates the supply air damper. In order for the terminal box to work properly, the central air-handling unit must provide supply air.



Application 2862 with 3-Stage Electric Heat or Baseboard Radiation Hardware Diagram.

BACnet ATEC Models

Part Number	Description
550-445	BACnet ATEC Model 2301, full feature (GDE)
550-446	BACnet ATEC Model 2301, full feature (GLB)

BACnet

The controller communicates using BACnet MS/TP protocol for open communications on BACnet MS/TP networks.

Product	Supported BIBBs	BIBB Name
BTEC	DS-RP-B B	Data Sharing-Read Property-B
	DS-RPM-B	Data Sharing-Read Property Multiple-B
	DS-WP-B	Data Sharing-Write Property-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

- Airflow sensor
- Room temperature sensor
- Room temperature setpoint dial (optional)
- Spare UI1 (temperature sensor (10K thermistor) or percentage (0-10V/4-20ma)) *
- Spare UI2 (temperature sensor (10K thermistor) or percentage (0-10V/4-20ma)) *

Digital

- Night mode override (optional)
- Wall switch (optional) or Spare UI2
- Spare UI1

Hardware Outputs

Analog

- none

Digital

- Damper actuator
- Stage 1 electric heat or 2-position heating valve (or Spare DO3)
- Stage 2 electric heat (optional) (or Spare DO4)
- Stage 3 electric heat (optional) (or Spare DO5)

Sequence of Operation

The following paragraphs present the sequence of operation for Application 2862, “VAV with Staged Electric Heat or two-position Baseboard Radiation“.

Control Temperature Setpoints

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

Day Mode - Room Temperature Setpoint dial disabled (STPT DIAL = NO) In the day mode when a setpoint dial has not been enabled, then CTL STPT holds the value of DAY CLG STPT or DAY HTG STPT.

Day Mode - Room Temperature Setpoint Dial Enabled (STPT DIAL = YES)

Setpoint dial configured with a heating/cooling deadband (default).

To allow the controller to operate with a heating/cooling deadband (functioning the same as provided when the setpoint dial is not present) the following configuration should be used.

Set the DAY HTG STPT less than the DAY CLG STPT by the deadband (or zero energy band) that is desired. (for example, DAY HTG STPT equals 70°F; DAY CLG STPT equals 74°F, providing a deadband of 4 degrees).

As described below, the setpoint(s) for heating/cooling will be 1/2 of the deadband above or below the setpoint dial value.

When HEAT.COOL equals HEAT, then:

CTL STPT will equal RM STPT DIAL – 0.5 * (DAY CLG STPT – DAY HTG STPT) and will be limited by RM STPT MIN and RM STPT MAX.

When HEAT.COOL equals COOL, then:

CTL STPT will equal RM STPT DIAL + 0.5 * (DAY CLG STPT – DAY HTG STPT) and will be limited by RM STPT MIN and RM STPT MAX.

NOTE:

A space where the deadband is used can be more energy efficient than a space where the deadband is not being used.

Setpoint dial configured for zero heating/cooling deadband.

When the job specification requires a common heating and cooling temperature setpoint, the following configuration should be used.

Set DAY HTG STPT equal to DAY CLG STPT. This will configure the setpoint deadband equal to zero.

In addition, with a setpoint deadband equals zero, then:

CTL STPT will equal RM STPT DIAL, and will be limited by RM STPT MIN and RM STPT MAX.

NOTE:

A space where the heating/cooling deadband is zero may be more comfortable than a space where the deadband is being used, but may use more energy.

Night Mode – In night mode, CTL STPT holds the value of NGT CLG STPT or NGT HTG STPT.

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 UI 2 (and UI 2 is configured for digital input) (see the *Control Diagram* in Overview [→ 4]), and WALL SWITCH = YES, the controller monitors the status of UI 2. When the status of UI 2 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 UI 2 OFF (the switch is open), then 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, if the controller is operating stand-alone, then the controller stays in day mode all the time. If the controller is operating with centralized control (that is, it is connected to a field panel), then the field panel can send an operator or PPCL command to override the status of DAY.NGT. See *Powers Process Control Language (PPCL) User's Manual* (125-1896) and *Field Panel User's Manual* (125-3019 or 125-3020) for more information.

See also

Overview [→ 4]

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 operational mode for the time period that is set in OVRD TIME. The status of NGT OVRD changes to DAY. After the override time elapses, the controller returns to night mode and the status of 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.

Room Temperature Offset (Optional)

TEMP 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.

CTL TEMP = ROOM TEMP + TEMP OFFSET

Example

If the actual room temperature is 72.0°F, and the value of ROOM TEMP is 73.0°F, then the value entered into TEMP OFFSET is –1.0. In this case, the value of ROOM TEMP would read 73.0°F, but the value of CTL TEMP would read 72.0°F.

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 [→ 6].

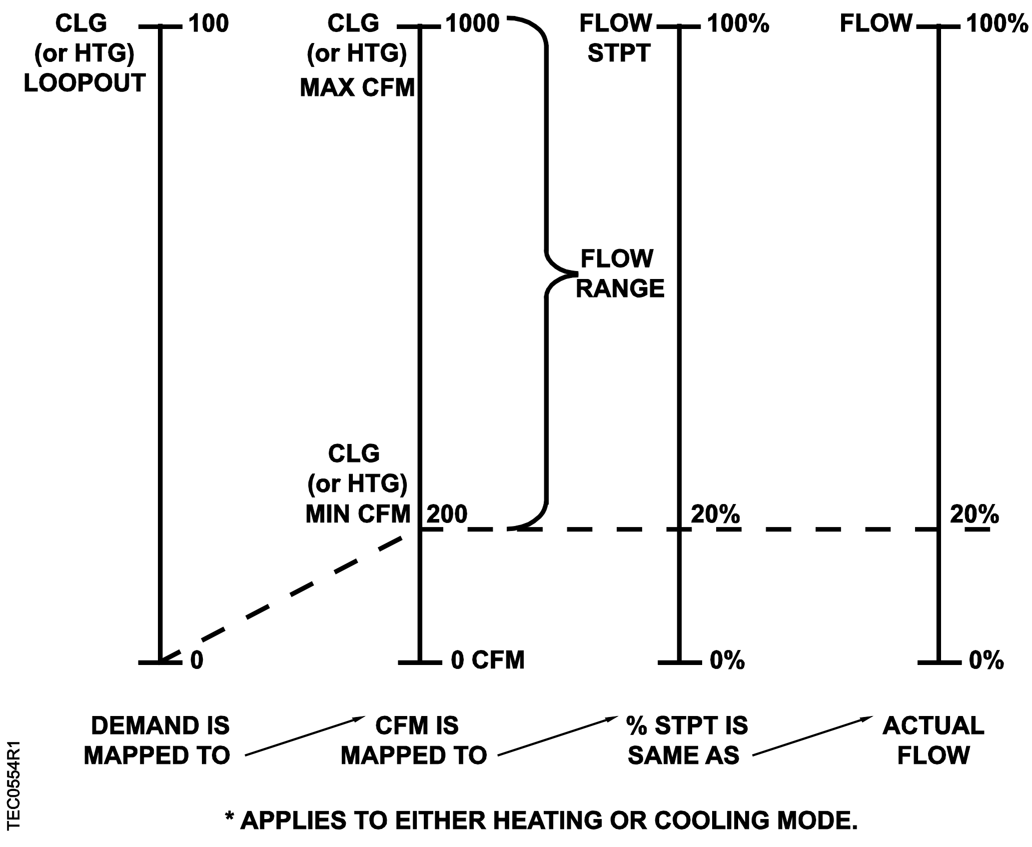
Cooling Loop – Generates cooling loopout which is then used to generate FLOW STPT. FLOW STPT is the result of scaling the cooling loopout to the appropriate range of values determined by CLG FLOW MIN and CLG FLOW MAX.

As described in the following figure, the flow setpoint is calculated by:

FLOW STPT = [CLG LOOPOUT × (100% – % minimum setpoint)] + % minimum setpoint.

Where percent minimum setpoint is:

% minimum setpoint = (CLG FLOW MIN / CLG FLOW MAX) x 100 %



FLOW STPT and FLOW % are relative to MIN and MAX STPTS of corresponding heating or cooling mode.

Example

If CLG FLOW MIN = 200 cfm, and CLG FLOW MAX = 1000 cfm, the minimum flow setpoint is
(200 cfm /1000 cfm) × 100% flow = 20%.
When CLG LOOPOUT is 0%, FLOW STPT = 20% flow.
[0% × (100% – 20%)] + 20% = 20%
This ensures that the airflow out of the terminal box is no less than CLG FLOW MIN.
When CLG LOOPOUT is 50%, FLOW STPT = 60% flow.
[50% × (100% – 20%)] + 20% = 60%
When CLG LOOPOUT is 100%, FLOW STPT = 100% flow.
[100% × (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:

- Option 1: Constantly maintain airflow out of the terminal box equal to HTG FLOW MIN.
- Option 2: Operate in sequence with the reheat.
- Option 3: Operate parallel with the reheat.
- Option 4: Have its operation overlap with the operation of the electric reheat. See Sequencing Logic (Optional) for more information.

If the option 1 is chosen, HTG LOOPOUT will control the electric reheat in order to maintain the room temperature. If option 2 through4 is chosen, HTG LOOPOUT will control both the flow loop setpoint (FLOW STPT) and the electric reheat in order to maintain the room temperature. See Sequencing Logic [→ 14] 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 (HTG FLOW MIN/HTG FLOW MAX) × 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 2862, 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:

(CTL FLOW MIN/CTL FLOW MAX) × 100% 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 cfm / 1000 cfm) × 100% flow
= 0.25 × 100% flow
= 25% flow.
Since 25% of 1000 cfm = 250 cfm, the minimum airflow out of the terminal box will be 250 cfm.

See also

Control Temperature Setpoints [→ 6]

Staged Heating Coil - Terminal Unit

CAUTION

Verify that the equipment is supplied with safeties by others.

Ensure 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 *Staged Heating* table.

When the heating coil is located in the terminal unit, supply airflow is required to allow heat transfer from the coil to the room. EHEAT FLOW provides a means to ensure that there is sufficient airflow present before activating any heating stage.

If the flow setpoints for HTG MIN FLOW and HTG MAX FLOW results in a flow that is less than as set in EHEAT FLOW, the electric stages of heat will not be energized regardless of the heating demand. (for example, If HTG MAX FLOW is 1000 cfm and HTG MIN FLOW is 200 cfm, setting EHEAT FLOW to any percentage less than 20% will prevent activation of any heating stage.)

When the controller is in cooling mode, the electric heat is OFF at all times.

Example

When energized, the heating coils will respond to the heating demand based on the configuration and duty cycle time.

If the duty cycle is 10 minutes (STAGE TIME = 10 minutes), and the heating loop is calling for 60% of heating (HTG LOOPOUT = 60%) for every 10-minute period, the stages of electric auxiliary heat cycle are as follows:

Staged Heating						
	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

AVERAGE HEAT OUT

When the controller is in heating mode, AVG HEAT OUT indicates the percentage of the heating loop that is used for control and cycles the heating stages, independent of the number of stages enabled. The selected range for the heating stages (REHEAT START and REHEAT END) is applied to the HTG LOOPOUT to determine the AVG HEAT OUT.

For example, if REHEAT START = 0, and REHEAT END = 50%, then:

When HTG LOOPOUT = 0%, AVG HEAT OUT = 0%;

HTG LOOPOUT = 25%, AVG HEAT OUT = 50%

HTG LOOPOUT = 50% (or higher), AVG HEAT OUT = 100%

Staged Heating Coil - Baseboard Radiation

The application can be set up to control a 2-position heating coil or a stage of electric heat that is located outside of the air terminal unit. The staged heat is time modulated using a duty cycle as shown in the following example.

When the heating coil is external to the terminal unit (for example, baseboard radiation, perimeter heating coil or stage), airflow from the terminal unit is not required for the heat transfer to the room.

In this configuration, the setpoint for HTG FLOW MIN can be set (per job specification) for the required ventilation air. To prevent excessive cold air during heating, the maximum heating flow should also be set to this value (for example, HTG FLOW MAX = HTG FLOW MIN).

To insure that the external heating can be activated by heating demand and not dependent on airflow, set the flow interlock, EHEAT FLOW, to a percentage value less than the HTG FLOW MIN (e.g. if HTG FLOW MIN = 200 and HTG FLOW MAX = 1000, set EHEAT FLOW to a percentage less than 20%, such as 15%, or, to allow it to operate with minimum interlock, set = 0 %).

If the controller is in cooling mode, the heating stages will be off.

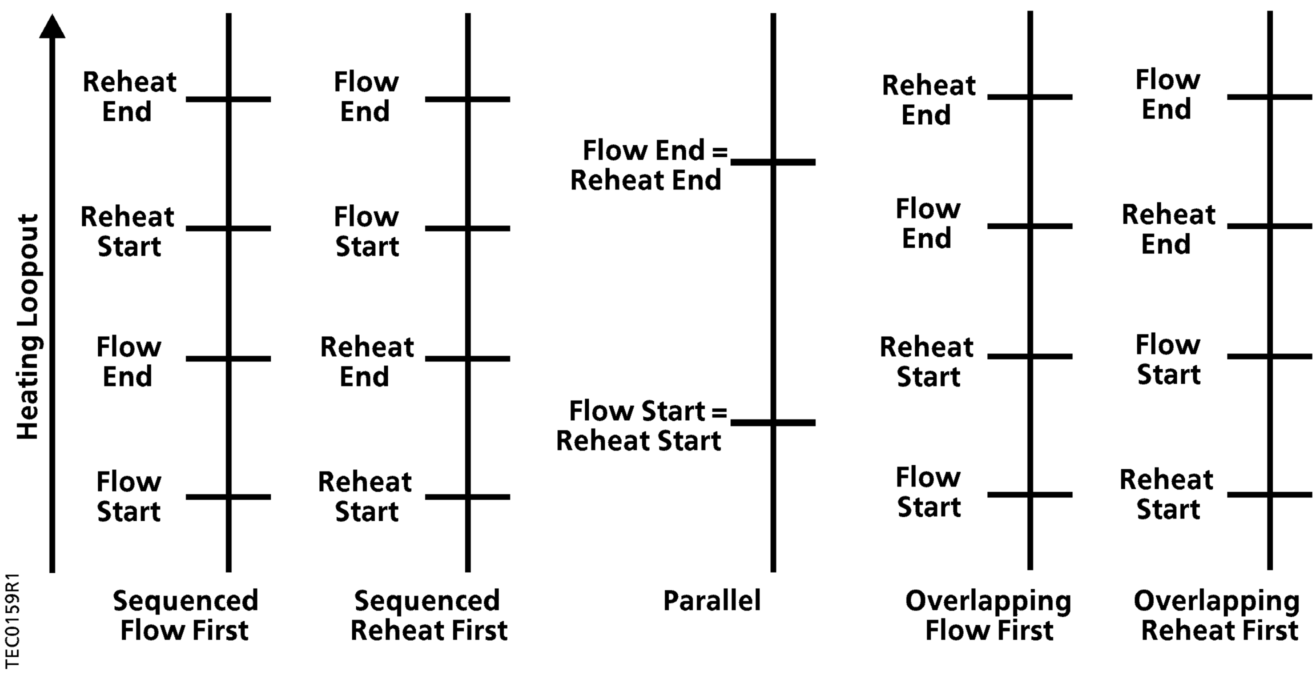
Sequencing Logic

NOTE:

The default setpoints, FLOW START = 0 and FLOW END =100, will provide modulating supply airflow during heating mode (HTG FLOW MIN to HTG FLOW MAX).

In heating mode, this application includes logic that allows the flow loop to operate in sequence, parallel, or overlapping with the heating. Selected portions of the output of the heating loop, HTG LOOPOUT, will drive both the flow loop and the heating from 0 to 100%. See the *Examples* section.

The ladder diagrams show sequenced, parallel, and overlapping flow loop operations with heating stages. 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.



For simplicity, assume that in these examples:

- HTG FLOW MIN = 0 cfm.
- There is one stage of electric heat (STAGE COUNT = 1).
- The cycle time of the electric heat is 10 minutes (STAGE TIME = 10). (When this is done, FLOW STPT will equal 0 when HTG LOOPOUT = 0).

Example 1 (Airflow Sequenced First)

Assume that your system has electric heat 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 ≥ 50%, FLOW STPT will equal 100% flow.
- When HTG LOOPOUT ≤ 50%, the electric heat will be off all the time.
- When HTG LOOPOUT = 75%, for every 10-minute period the electric heat will be on for 5 minutes and off for 5 minutes.
- When HTG LOOPOUT = 100%, the electric heat will be on all the time.

Example 2 (Airflow and Heat Sequenced Together)

Assume that your system has electric 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%, the electric heat will be off all the time.
- When HTG LOOPOUT = 50%, for every 10-minute period the electric heat will be on for 5 minutes and off for 5 minutes.
- When HTG LOOPOUT = 100%, the electric heat will be on all the time.

Example 3 (Airflow Sequenced First with Overlap for Heating)

Assume that your system has electric 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 ≥ 75%, FLOW STPT will equal 100% flow.
- When HTG LOOPOUT ≤ 25%, the electric heat will be off all the time.
- When HTG LOOPOUT = 62.5%, for every 10-minute period the electric heat will be on for 5 minutes and off for 5 minutes.
- When HTG LOOPOUT = 100%, 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 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 (Airflow Remains Fixed; Heating Modulates)

If the job requirement specifies that the supply airflow in heating will remain fixed, set HTG FLOW MIN = HTG FLOW MAX so that the fixed value in heating is indicated. An alternative setting, would be to set FLOW START = FLOW MIN = 0, which would fix the flow at HTG FLOW MIN.

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.

- HTG FLOW MIN = 170 cfm
- HTG FLOW MAX = 1000 cfm
- STAGE COUNT = 1
- STAGE TIME = 10 Minutes

If:

- FLOW START=0%
- FLOW END=0% (or/and HTG FLOW MIN = HTG FLOW MAX)
- REHEAT START = 0%
- REHEAT END = 100%

then,

- When HTG LOOPOUT = 0%, FLOW STPT will equal (170 cfm/1000 cfm) × 100% flow = 17% flow. This will cause the flow loop to maintain an airflow of 170 cfm out of the terminal box.
- When HTG LOOPOUT = 50%, FLOW STPT will equal 17% flow.
- When HTG LOOPOUT = 100%, FLOW STPT will equal 17% flow.

- When HTG LOOPOUT = 0%, the electric heat will be off all the time.
- When HTG LOOPOUT = 50%, for every 10-minute period the electric heat will be on for 5 minutes and off for 5 minutes.
- When HTG LOOPOUT = 100%, the electric heat will be on all the time.

Electric Heat Interlock

Terminal unit heat stages:

The electric heat stages will be enabled as long as FLOW > EHEAT FLOW. The electric heat stages will not be disabled (turned OFF) until FLOW < EHEAT FLOW - 5%. Once disabled, FLOW must become greater than EHEAT FLOW before the electric heat stages will return to normal control.

CAUTION

Do not set EHEAT FLOW to less than 5%,otherwise the electric heat interlock will be disabled.

Baseboard heat stage(s):

The electric or 2-position valve heat stages that are located outside the terminal unit do not require supply airflow. When there is only baseboard heating coils, the supply airflow interlock can be effectively disable (EHEAT FLOW = 0).

Calibration

Calibration of the controller's internal air velocity transducers 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.

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.

During normal operation: To ensure that the damper closes fully, the controller will provide additional closing time when the DMPR POS = 0%.

Fail Mode 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.

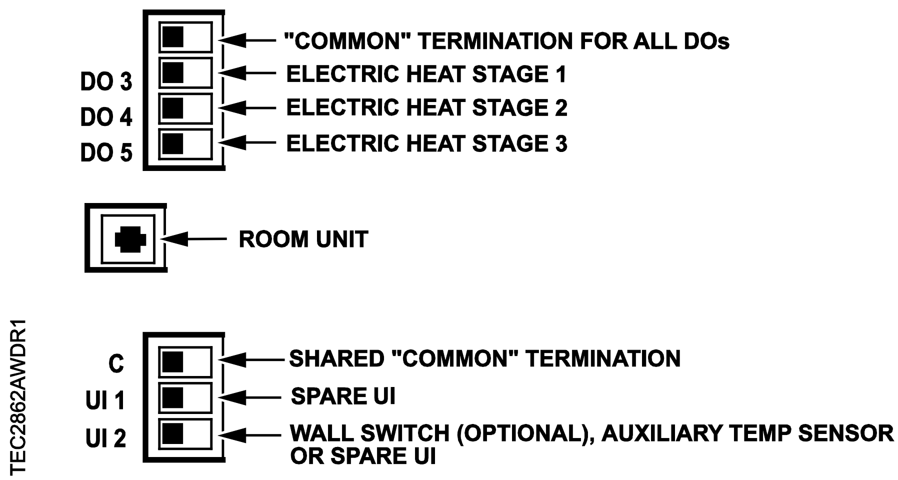
Application Notes

- 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.
- Siemens BACnet Actuator, as shipped from the factory, keeps all associated equipment OFF. See the *BACnet Actuator 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.

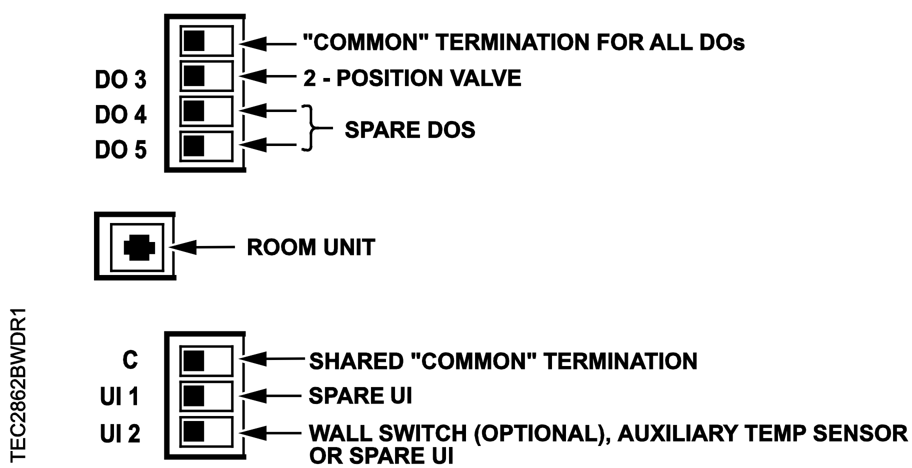
Wiring Diagram

Application 2862 point wiring.

	CAUTION
	The controller’s DOs control 24 Vac loads only. The maximum rating is 12 VA for each DO. An external interposing relay is required 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. (for example part number 540-147, Terminal Equipment Controller Relay Module)



Application 2862 - Electric Heat Stages.



Application 2862 - Baseboard Radiation.

Application 2862 Point Database

Object Type [a]	Object Instance (Point Number)	Object Name (Descriptor)	Factory Default (SI Units)[b]	Eng Units (SI Units)	Range	Active Text	Inactive Text
AO	1	CTLR ADDRESS	99	--	0-255	--	--
AO	2	APPLICATION	2897	--	0-32767	--	--
AO	3	RMTMP OFFSET	0.0 (0.0)	DEG F (DEG C)	-255.75	--	--
AI	{04}[c]	ROOM TEMP	74.0 (23.32)	DEG F (DEG C)	-255.75	--	--
BO	{05}	HEAT.COOL	COOL	--	Binary	HEAT	COOL
AO	6	DAY CLG STPT	74.0 (23.32)	DEG F (DEG C)	-255.75	--	--
AO	7	DAY HTG STPT	70.0 (21.08)	DEG F (DEG C)	-255.75	--	--
AO	8	NGT CLG STPT	82.0 (27.8)	DEG F (DEG C)	-255.75	--	--
AO	9	NGT HTG STPT	65.0 (18.28)	DEG F (DEG C)	-255.75	--	--
AO	11	RM STPT MIN	55.0 (12.68)	DEG F (DEG C)	-255.75	--	--
AO	12	RM STPT MAX	90.0 (32.28)	DEG F (DEG C)	-255.75	--	--
AI	{13}	RM STPT DIAL	74.0 (23.32)	DEG F (DEG C)	-255.75	--	--
BO	{14}	STPT DIAL	NO	--	Binary	YES	NO
AI	{15}	AUX TEMP UI1	74.0 (23.32)	DEG F (DEG C)	-255.75	--	--
AO	16	FLOW START	0	PCT	0-102	--	--
AO	17	FLOW END	100	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}	DIGITAL UI2	OFF	--	Binary	ON	OFF
BI	{25}	DIGITAL UI1	OFF	--	Binary	ON	OFF
BO	{29}	DAY.NGT	DAY	--	Binary	NIGHT	DAY
AO	31	CLG FLOW MIN	220	CFM (LPS)	0-131068	--	--

Object Type [a]	Object Instance (Point Number)	Object Name (Descriptor)	Factory Default (SI Units)[b]	Eng Units (SI Units)	Range	Active Text	Inactive Text
			(103.818)				
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	1100 (519.09)	CFM (LPS)	0-131068	--	--
AI	{35}	AIR VOLUME	0 (0.0)	CFM (LPS)	0-131068	--	--
AO	36	FLOW COEFF	1	--	0-2.55	--	--
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
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	58	MTR SETUP	1	--	0-255	--	--
AO	59	DO DIR. REV	0	--	0-255	--	--
AO	60	EHEAT FLOW	20	PCT	0-102	--	--
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	--	--
BO	{66}	CHK OUT	NO	--	Binary	YES	NO
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	70	CHK STATUS	-1	--	-32767	--	--
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 (23.32)	DEG F (DEG C)	-255.75	--	--
AO	79	CLG LOOPOUT	0	PCT	0-102	--	--
AO	80	HTG LOOPOUT	0	PCT	0-102	--	--
AO	81	AVG HEAT OUT	0	PCT	0-409.2	--	--

Object Type [a)]	Object Instance (Point Number)	Object Name (Descriptor)	Factory Default (SI Units)[b)]	Eng Units (SI Units)	Range	Active Text	Inactive Text
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 (23.32)	DEG F (DEG C)	-255.75	--	--
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	--	--
AO	102	UI1 CFG	1	--	0-255	--	--
AI	{103}	PERCENT UI1	0	PCT	0-6.375	--	--
AO	104	UI2 CFG	1	--	0-255	--	--
AI	{105}	PERCENT UI2	0	PCT	0-6.375	--	--
AO	106	AIR ALTITUDE	700 (213.36)	FEET (METERS)	0-16383	--	--
AO	107	TUBE LEN	6.0 (1.8288)	FEET (METERS)	0-102.3	--	--
AO	108	TUBE DIAMETE	0.187 (0.47498)	INCH (CM)	0-0.255	--	--
AI	{109}	AUX TEMP UI2	74.0 (23.32)	DEG F (DEG C)	-255.75	--	--
AO	126	STAT SUPV	0	--	0-255	--	--
AO	127	RM RH	50	PCT	0-102	--	--

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

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

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

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