TEC Custom Solutions Application 2422 VAV with Electric Reheat or Baseboard Radiation, Two-Inch Water Column Measurement Range — Electronic Output

This document contains the following topics:

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Overview

In Application 2422, the controller modulates the supply air damper of the terminal box for cooling and controls stages of electric reheat or baseboard radiation for heating. During heating mode, 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. Refer to Figures 2422-1 through 2422-6.

This Application will measure flows with differential pressure measurements up to 2 inches (up to a maximum of 5663 FPM).

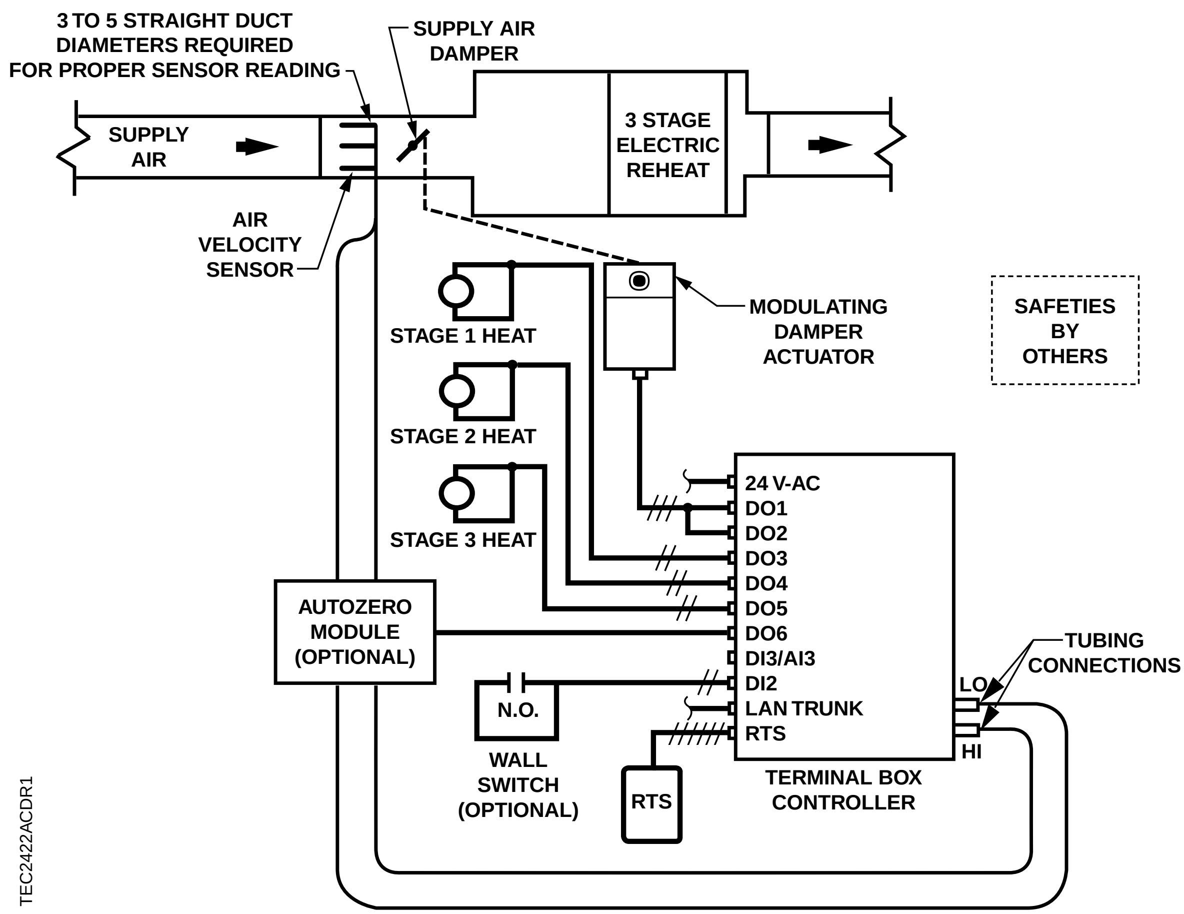
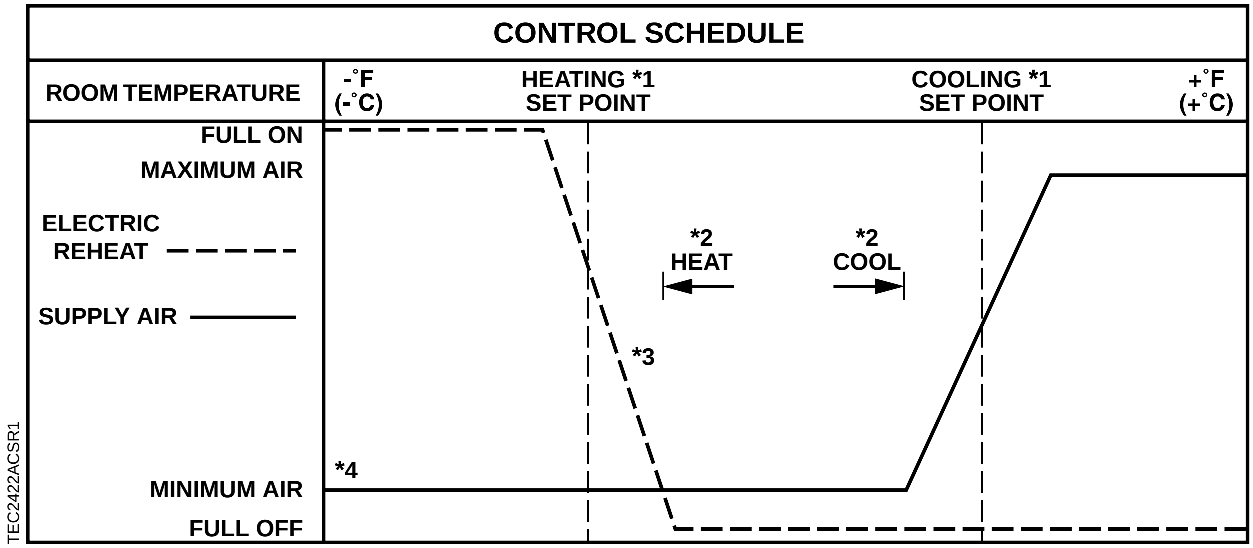
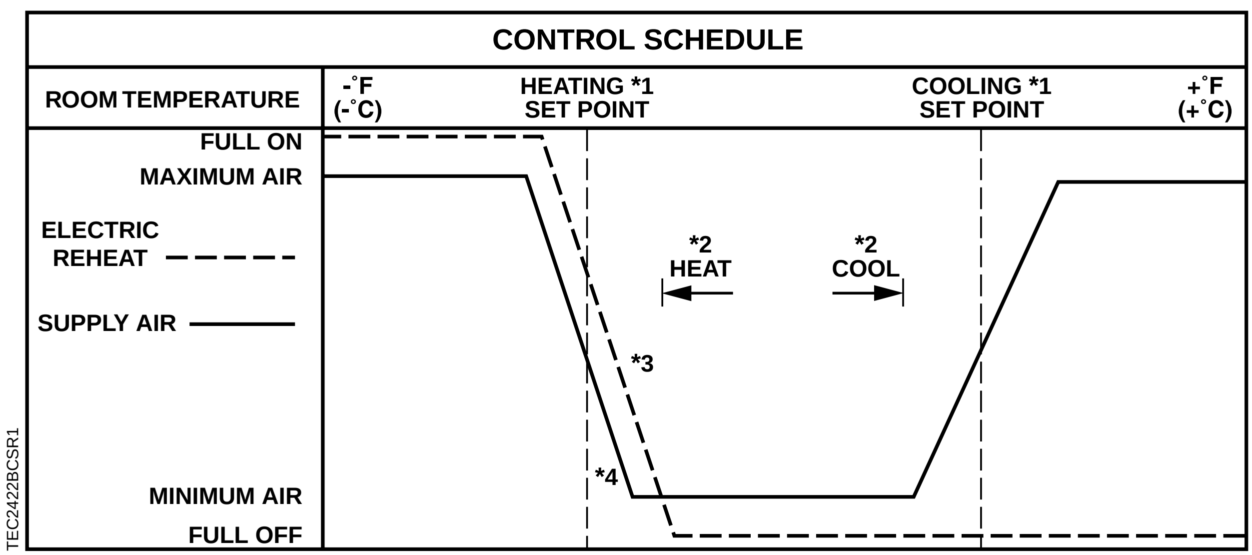


Figure 2422-1. Application 2422 Control Drawing for Electric Reheat.



1. Refer to the *Control Temperature Set Points* section.
2. Refer to the *Heating/Cooling Switchover* section.
3. The electric reheat is time modulated. This allows it to be controlled proportionally rather than with deadbands.
4. The airflow is shown at minimum flow throughout the entire heating mode (default setting). The airflow can operate sequenced, parallel, or overlapping with the electric reheat (optional). Refer to the *Sequencing Logic* section.

Figure 2422-2. Application 2422 Control Schedule for Electric Reheat.



1. Refer to the *Control Temperature Set Points* section.
2. Refer to the *Heating/Cooling Switchover* section.
3. The electric reheat is time modulated. This allows it to be controlled proportionally rather than with deadbands.
4. The airflow is shown operating parallel with the electric reheat (optional). The airflow can operate at minimum flow throughout the entire heating mode (default setting). Refer to the *Sequencing Logic* section.

Figure 2422-3. Application 2422 Control Schedule for Electric Reheat with Modulating Damper in Heating Mode.

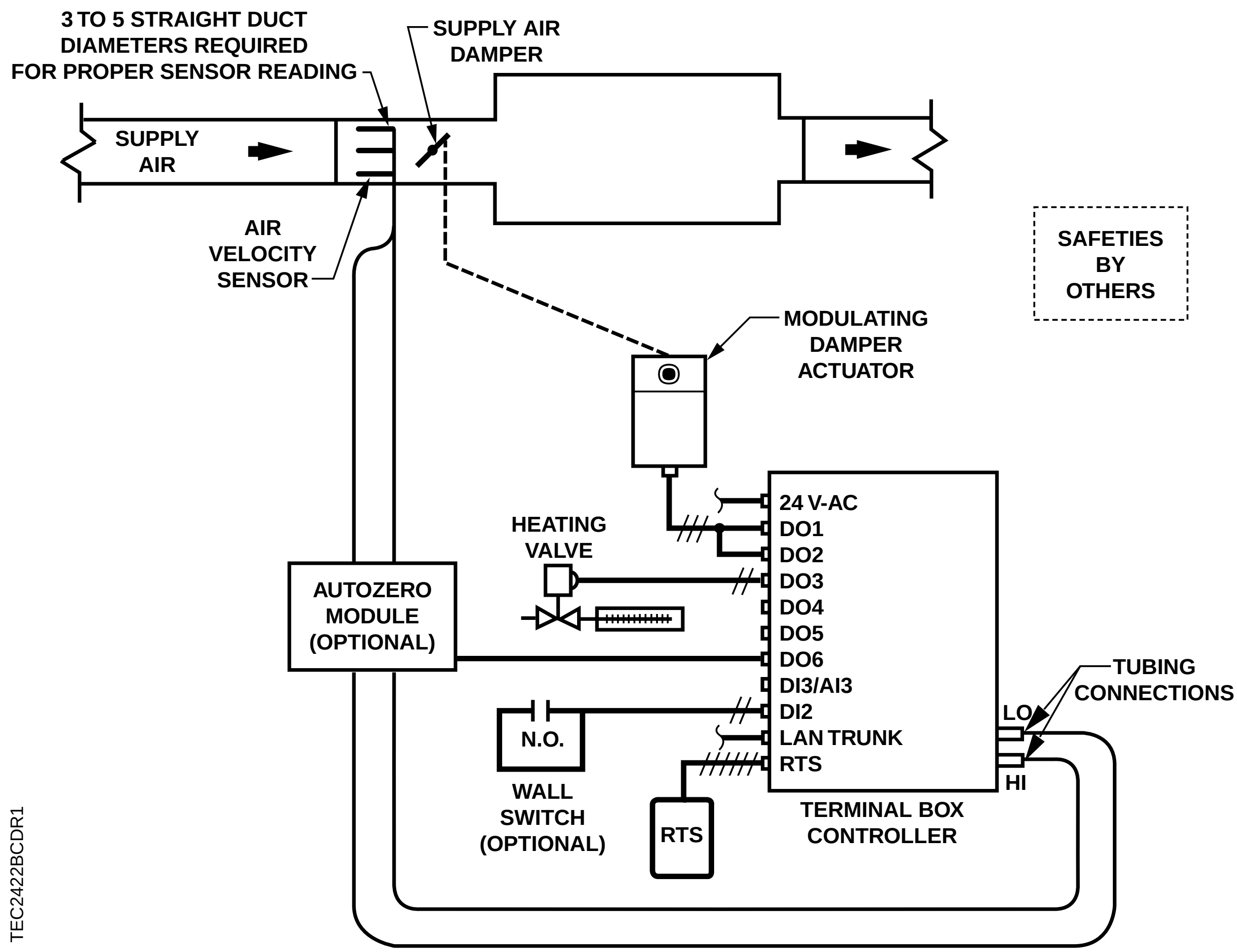
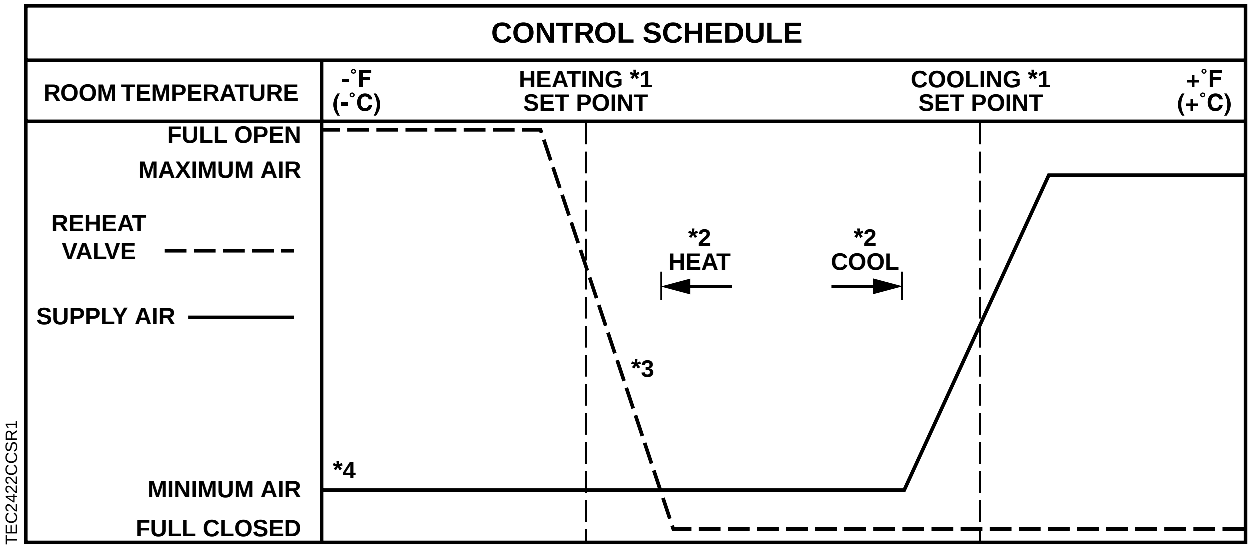
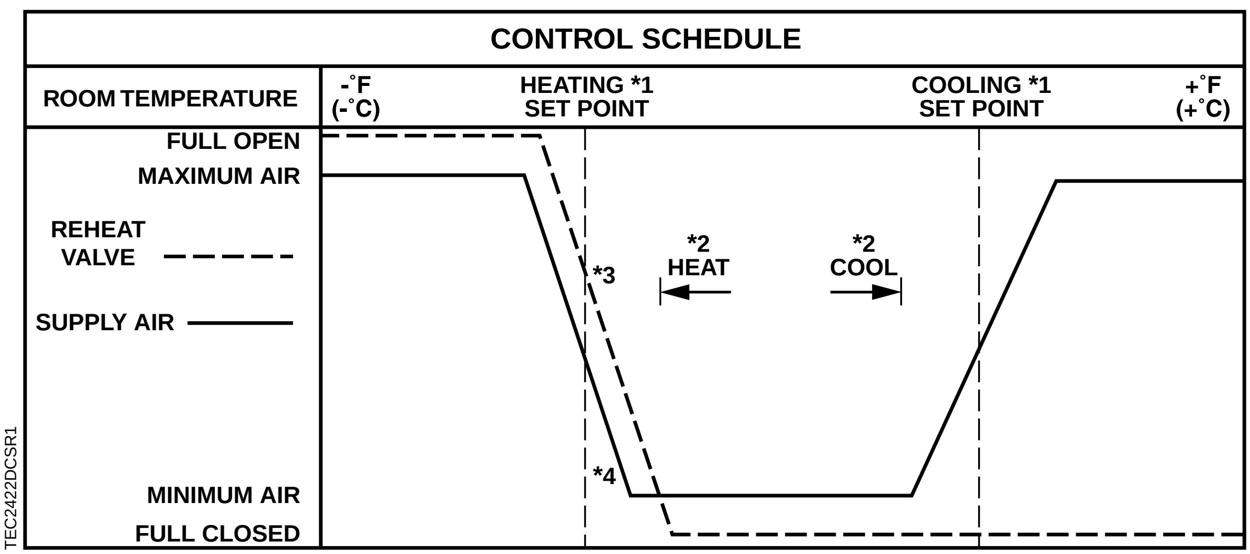


Figure 2422-4. Application 2422 Control Drawing for Baseboard Radiation.



1. Refer to the *Control Temperature Set Points* section.
2. Refer to the *Heating/Cooling Switchover* section.
3. The 2-position reheat valve is time modulated. This allows it to be controlled proportionally rather than with deadbands.
4. The airflow is shown at minimum flow throughout the entire heating mode (default setting). The airflow can operate sequenced, parallel, or overlapping with the reheat valve (optional). Refer to the *Sequencing Logic* section.

Figure 2422-5. Application 2422 Control Schedule for Baseboard Radiation.



1. Refer to the *Control Temperature Set Points* section.
2. Refer to the *Heating/Cooling Switchover* section.
3. The 2-position reheat valve is time modulated. This allows it to be controlled proportionally rather than with deadbands.
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). Refer to the *Sequencing Logic* section.

Figure 2422-6. Application 2422 Control Schedule for Baseboard Radiation with Modulating Damper in Heating Mode.

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
- Stage 1 electric reheat; or, 2-position heating valve
- Stage 2 electric reheat (optional)
- Stage 3 electric reheat (optional)

Ordering Notes

Custom Solution number 246.

Point Database

Table 2422-1 presents the point database information for Application 2422.

Sequence of Operation

The following paragraphs present the sequence of operation for Application 2422, “VAV with Electric Reheat or Baseboard Radiation, Two-Inch Water Column Measurement Range — Electronic Output.”

Control Temperature Set Points

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

Day Mode – In day mode, CTL STPT holds the value of DAY CLG STPT (Point 6) or DAY HTG STPT (Point 7). 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.

Night Mode – In night mode, CTL STPT holds the value of NGT CLG STPT (Point 8) or NGT HTG STPT (Point 9).

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

Day and Night Modes

The day/night status of the space is determined by the status of DAY.NGT (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 2422-1, 2422-3, 2422-8, and 2422-9), 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), DAY.NGT is set to DAY indicating that the controller is in day mode. When the status of DI 2 is OFF (the switch is open), DAY.NGT is set to NIGHT indicating that the controller is in night mode.

When WALL SWITCH equals NO, the controller does not monitor the status of the wall switch, even if one is connected to it. In this case, and 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 (connected to a field panel), then the field panel can send an operator or PPCL command to override the status of DAY.NGT. Refer to the *Powers Process Control Language (PPCL) User’s Manual* (125-1896) and the *Field Panel User’s Manual* (125-1895) for more information.

Night Mode Override Switch

If an override switch is present on the room temperature sensor and a value (in hours) other than zero has been entered into OVRD TIME (Point 20), then by pressing the override switch a room occupant can reset the controller to day operational mode for the amount of time set in OVRD TIME. The status of NGT OVRD (Point 21) changes to DAY and remains there until the override time elapses, at which point the controller returns to night mode and the status of NGT OVRD changes back to NIGHT.

Only when the controller is in night mode will the override switch on the room sensor have any effect on the controller.

Heating/Cooling Switchover

The heating/cooling switchover determines whether the controller is in heating or cooling mode by monitoring room temperature and the demand for heating or cooling (as determined by the temperature control loops).

If all of the following conditions are met for the length of time set in SWITCH TIME (Point 86), then the controller switches from heating to cooling mode by setting HEAT.COOL (Point 5) to COOL:

- HTG LOOPOUT (Point 80) is less than SWITCH LIMIT (Point 85).
- CTL TEMP (Point 78) is above CTL STPT (Point 92) by at least the value set in SWITCH DBAND (Point 90).
- CTL TEMP is greater than the appropriate cooling set point minus SWITCH DBAND.

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

- CLG LOOPOUT (Point 79) is less than SWITCH LIMIT.
- CTL TEMP is below CTL STPT by at least the value set SWITCH DBAND.
- CTL TEMP is less than the appropriate heating set point plus SWITCH DBAND.

Modulate Damper During Heating Mode (optional)

CAUTION:

This heating/cooling switchover mechanism is not affected by the air temperature in the supply duct.

To change the value of HEAT.COOL (Point 5) based on the supply air temperature, you must command HEAT.COOL through PPCL. This is required when the flow loop will be used as a source of cooling in cooling mode and a source of heat in heating mode. (Refer to Examples 1 through 3 in the *Sequencing Logic* section.) If the flow loop is used in heating mode just to meet minimum air requirements, then the heating/cooling switchover mechanism operates as described in this section to control HEAT.COOL. (Refer to Example 4 in the *Sequencing Logic* section.)

Control Loops

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

Temperature Loops – The two temperature loops are a cooling loop and a heating loop. The active temperature loop maintains room temperature at the value in CTL STPT (Point 92). Refer to the *Control Temperature Set Points* section.

The cooling temperature loop generates cooling loopout which is then used to generate FLOW STPT (Point 93). FLOW STPT is the result of scaling the cooling loopout to the appropriate range of values determined by CLG FLOW MIN (Point 31) and CLG FLOW MAX (Point 32). In order to scale it, the loopout is multiplied by the range (MAX – MIN) and then added to the minimum set point.

When CLG FLOW MIN does not equal 0 CFM, FLOW STPT does not equal CLG LOOPOUT (Point 79). The minimum flow set point is (CLG FLOW MIN ÷ CLG FLOW MAX) × 100% flow, and FLOW STPT is [CLG LOOPOUT × (100% – minimum set point)] + minimum set point.

For example:

If CLG FLOW MIN = 200 CFM and CLG FLOW MAX = 1000 CFM, then the minimum flow set point is:

(200 CFM ÷ 1000 CFM) × 100% flow = 20%

When CLG LOOPOUT is 0%, FLOW STPT equals 20% flow.
[0% × (100% – 20%)] + 20% = 20%
This ensures that the airflow from the terminal box is no less than CLG FLOW MIN.

When CLG LOOPOUT is 50%, FLOW STPT equals 60% flow.
[50% × (100% – 20%)] + 20% = 60%

When CLG LOOPOUT is 100%, FLOW STPT equals 100% flow.
[100% × (100% – 20%)] + 20% = 100%

When 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 an airflow out of the terminal box equal to HTG FLOW MIN (Point 33).
- Operate in sequence with the electric reheat.
- Operate parallel with the electric reheat.
- Operate overlapping with the electric reheat.

Refer to the *Sequencing Logic* section for more information.

In the first option, HTG LOOPOUT (Point 80) controls the electric reheat in order to maintain the room temperature. If any of the remaining three options is chosen, HTG LOOPOUT controls both the flow loop set point (FLOW STPT) and the electric reheat in order to maintain the room temperature. Refer to the *Sequencing Logic* section for more information.

HTG LOOPOUT adjusts the value of FLOW STPT differently depending on which flow loop setup is chosen. However, the following rule applies no matter what setup is chosen:

- In heating mode, FLOW STPT will never be set below (HTG FLOW MIN ÷ HTG FLOW MAX) × 100% flow or above 100% flow.

Flow Loop – The flow loop maintains minimum airflow and maximum airflow using CTL FLOW MIN (Point 76) and CTL FLOW MAX (Point 77).

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

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

In Application 2422, CLG FLOW MIN can be set equal to but not greater than CLG FLOW MAX, and HTG FLOW MIN can be set equal to but not greater than HTG FLOW MAX. If the minimum and maximum values are set equal, then the flow loop becomes a constant volume loop and its ability to control temperature is lost.

The flow loop maintains FLOW STPT by modulating the supply air damper point, DMPR COMD (Point 48). The flow loop maintains the airflow between CTL FLOW MIN and CTL FLOW MAX.

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

- If AIR VOLUME equals 0 CFM, then FLOW is 0% flow.
- If AIR VOLUME equals CTL FLOW MAX, then FLOW is 100% flow.

The low limit of FLOW STPT will be the percentage that corresponds to the volume given in CTL FLOW MIN. This percentage can be calculated as:
(CTL FLOW MIN ÷ CTL FLOW MAX) × 100% flow. The flow loop ensures that the supply air is not less than CTL FLOW MIN.

For example:

If CTL FLOW MIN equals 250 CFM and if CTL FLOW MAX equals 1000 CFM, then the low limit of FLOW STPT equals:

(250 CFM ÷ 1000 CFM) × 100% flow
= 0.25 × 100% flow
= 25% flow

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

Electric Reheat

CAUTION:

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

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

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

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

Baseboard Radiation

The baseboard radiation can be either a 2-position valve or electrical resistance heating. If the controller is in cooling mode, then the heating valve is closed.

When in heating mode, the controller operates the heating valve to maintain the heating set point as if it were a single stage of reheat.

Sequencing Logic (optional)

NOTE: The default setups for FLOW START (Point 16) and FLOW END (Point 17) are **0**. This provides minimum airflow during heating mode.

In heating mode, this application includes logic that allows the flow loop to operate either in sequence, parallel, or overlapping with the electric reheat. Portions of the output of the heating loop, HTG LOOPOUT (Point 80), drive both the flow loop and the electric reheat from 0 to 100%. Refer to the three examples that follow shortly. For simplicity, assume in these examples that HTG FLOW MIN (Point 33) equals 0 CFM, there is one stage of electric heat (STAGE COUNT (Point 88) equals 1), and the cycle time of the electric heat is 10 minutes (STAGE TIME (Point 89) equals 10). (When this is done, FLOW STPT (Point 93) equals 0 when HTG LOOPOUT equals 0).

The ladder diagrams in Figure 2422-7 show sequenced, parallel, and overlapping flow loop operations with electric reheat. The vertical bars show the output of heating loopout from 0 to 100%. The horizontal bars (reheat start, flow start, etc.) show the action that occurs as loop output rises. The relative positions shown on the graphs are for illustration purposes only and may differ from the examples.

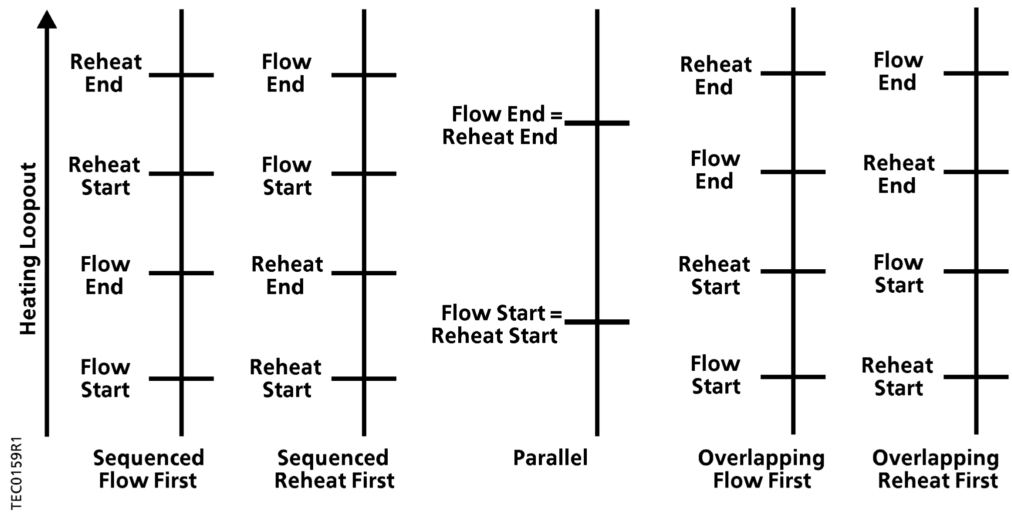


Figure 2422-7. Sequenced, Parallel, and Overlapping Flow Loop Operations with Electric Reheat.

Example 1*:* Assume that your system has electric heat operating *in sequence* with the flow loop.

If:

- FLOW START (Point 16) equals 0%
- FLOW END (Point 17) equals 50%
- REHEAT START (Point 22) equals 50%
- REHEAT END (Point 23) equals 100%

then,

- When HTG LOOPOUT (Point 80) equals 0%, FLOW STPT will equal 0% flow.
- When HTG LOOPOUT equals 25%, FLOW STPT will equal 50% flow.
- When HTG LOOPOUT is greater than or equal to 50%, FLOW STPT will equal 100% flow.
- When HTG LOOPOUT is less than or equal to 50%, the electric heat will be OFF all the time.
- When HTG LOOPOUT equals 75%, for every 10 minute period the electric heat will be ON for 5 minutes and OFF for 5 minutes.
- When HTG LOOPOUT equals 100%, the electric heat will be ON all the time.

Example 2*:* Assume that your system has electric heat operating *parallel* with the flow loop.

If,

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

then,

- When HTG LOOPOUT equals 0%, FLOW STPT will equal 0% flow.
- When HTG LOOPOUT equals 50%, FLOW STPT will equal 50% flow.
- When HTG LOOPOUT equals 100%, FLOW STPT will equal 100% flow.
- When HTG LOOPOUT equals 0%, the electric heat will be OFF all the time.
- When HTG LOOPOUT equals 50%, for every 10 minute period the electric heat will be ON for 5 minutes and OFF for 5 minutes.
- When HTG LOOPOUT equals 100%, the electric heat will be ON all the time.

Example 3*:* Assume that your system has electric heat that will operate *overlapping* with the flow loop.

If,

- FLOW START (Point 16) equals 0%
- FLOW END (Point 17) equals 75%
- REHEAT START (Point 22) equals 25%
- REHEAT END (Point 23) equals 100%

then,

- When HTG LOOPOUT equals 0%, FLOW STPT will equal 0% flow.
- When HTG LOOPOUT equals 37.5%, FLOW STPT will equal 50% flow.
- When HTG LOOPOUT is greater than or equal to 75%, FLOW STPT will equal 100% flow.
- When HTG LOOPOUT is less than or equal to 25%, the electric heat will be OFF all the time.
- When HTG LOOPOUT equals 62.5%, for every 10 minute period the electric heat will be ON for 5 minutes and OFF for 5 minutes.
- When HTG LOOPOUT equals 100%, the electric heat will be ON all the time.

Another option the sequencing logic provides is to have the flow loop provide an airflow equal to HTG FLOW MIN throughout the heating mode with all temperature control being done by the electric heat. This is accomplished by setting FLOW START and FLOW END to 0% which causes FLOW STPT to hold the value corresponding to minimum flow regardless of the value of HTG LOOPOUT. Example 4 clarifies this:

Example 4*:* Assume your system has electric heat that provides temperature control in heating mode while the flow loop provides for minimum air requirements. Assume also that:

- HTG FLOW MIN equals 170 CFM
- HTG FLOW MAX equals 1000 CFM
- STAGE COUNT equals 1
- STAGE TIME equals 10 Minutes

If,

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

then,

- When HTG LOOPOUT equals 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 equals 50%, FLOW STPT will equal 17% flow.
- When HTG LOOPOUT equals 100%, FLOW STPT will equal 17% flow.
- When HTG LOOPOUT equals 0%, the electric heat will be OFF all the time.
- When HTG LOOPOUT equals 50%, for every 10 minute period the electric heat will be ON for 5 minutes and OFF for 5 minutes.
- When HTG LOOPOUT equals 100%, the electric heat will be ON all the time.

Electric Heat Interlock

The electric heat stages will be enabled as long as FLOW (Point 75) is greater than EHEAT FLOW (Point 60). The electric heat stages will not be disabled (turned OFF) until the FLOW is less than 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.

Calibration

Air Velocity Transducer – Calibration of the controller's internal air velocity transducer is periodically required to maintain accurate air velocity readings. Calibration may be set to take place automatically or manually by setting CAL SETUP (Point 95) to the desired calibration option during controller startup. If the status 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.

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 returns to NO automatically. A status of NO indicates that the controller is not in a calibration sequence.

Damper Status Operation

Under normal operation DMPR STATUS (Point 84) reads **CAL**. However, if using an Autozero Module, it is possible after a period of operation for the calculated damper position point, DMPR POS (Point 49), to differ from the actual (physical) damper position.

If this occurs, the controller automatically compensates for any difference by setting DMPR STATUS to **RECAL**, which readjusts the value of DMPR POS. DMPR STATUS is set to RECAL if all of the following conditions are true:

- DMPR POS = 100%
- AIR VOLUME (Point 35) > 0 CFM
- FLOW (Point 75) < FLOW STPT (Point 93)

-or-

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

NOTE: To change the value of DMPR STATUS from RECAL back to CAL, set DMPR STATUS to **CAL**, then release it.

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

Fail-safe Operation

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

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

Application Notes

1. If the temperature swings in the room are excessive or if there is trouble in maintaining the set point, then either the cooling loop, the heating loop or both need to be tuned. If FLOW (Point 75) is oscillating while FLOW STPT (Point 93) is constant, then the flow loop requires tuning. Refer to the *APOGEE Automation Service Procedures Manual* in InfoLink for more information.

2. The controller as shipped from the factory keeps all associated equipment OFF. Refer to the *Equipment Controllers* section in the *APOGEE Automation Start-up Procedures Manual* in 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. DO 3 and DO 4, or 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 Diagrams

The point wiring for Application 2422 is shown in Figures 2422-8 and 2422-9.

CAUTION:

The Terminal Box Controller controls 24 Vac loads only. The maximum rating is 12 VA for each DO. Use an interposing 220 V 4-relay module for any of the following:

- VA requirements higher than the maximum
- 110 or 220 Vac
- DC power requirements

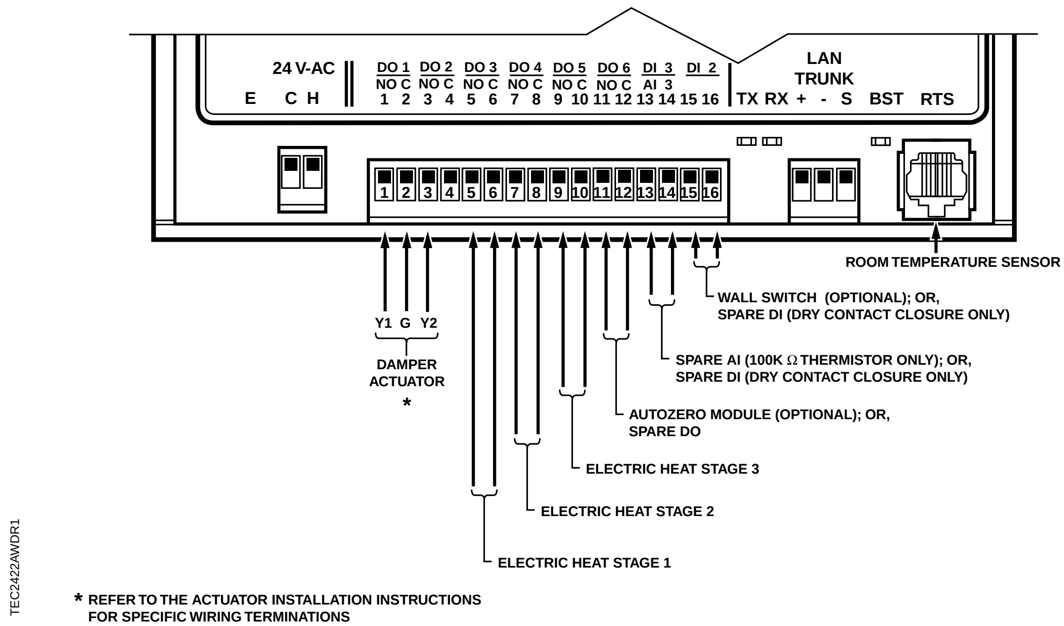


Figure 2422-8. Application 2422 Wiring Diagram for Electric Reheat.

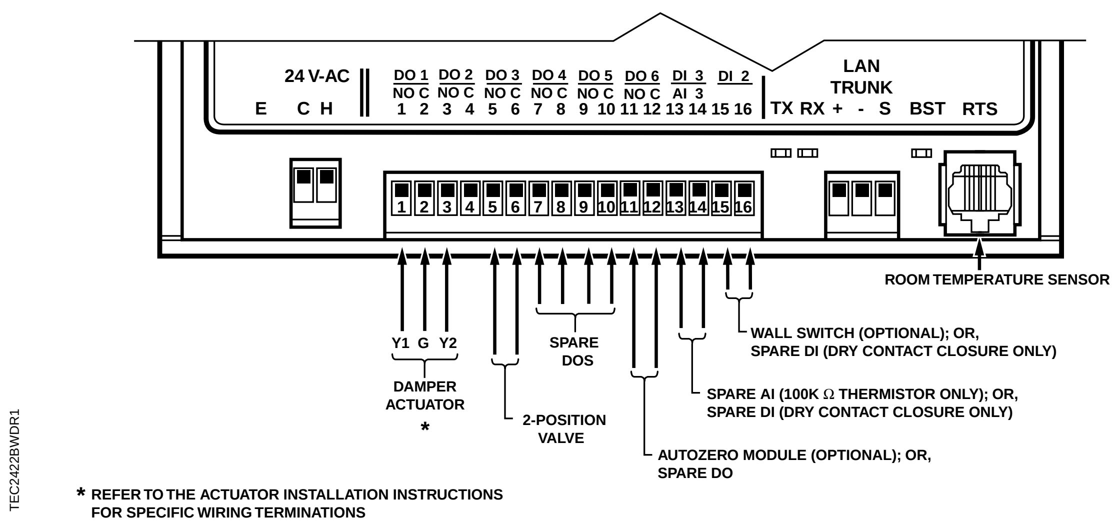


Figure 2422-9. Application 2422 Wiring Diagram for Baseboard Radiation.

Table 2422-1. Point Database for Application 2422.

Point Number	Descriptor	Factory Default (SI Units)	Engr Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
01	CTLR ADDRESS	99	--	1	0	--	--
02	APPLICATION	2091	--	1	0	--	--
{04}	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	DAY CLG STPT	74.0 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
07	DAY HTG STPT	70.0 (21.20888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
08	NGT CLG STPT	82.0 (27.92888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
09	NGT 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)	--	--
16	FLOW START	0.0	PCT	0.4	0.0	--	--
17	FLOW END	0.0	PCT	0.4	0.0	--	--
18	WALL SWITCH	NO	--	--	--	YES	NO
{19}	DI OVRD SW	OFF	--	--	--	ON	OFF
20	OVRD TIME	0	HRS	1	0	--	--
{21}	NGT OVRD	NIGHT	--	--	--	NIGHT	DAY
22	REHEAT START	0.0	PCT	0.4	0.0	--	--
23	REHEAT END	100.0	PCT	0.4	0.0	--	--
{24}	DI 2	OFF	--	--	--	ON	OFF
{25}	DI 3	OFF	--	--	--	ON	OFF
{29}	DAY.NGT	DAY	--	--	--	NIGHT	DAY
31	CLG FLOW MIN	220 (103.818)	CFM (LPS)	4 (1.8876)	0	--	--
32	CLG FLOW MAX	2200 (1038.18)	CFM (LPS)	4 (1.8876)	0	--	--
33	HTG FLOW MIN	220 (103.818)	CFM (LPS)	4 (1.8876)	0	--	--
34	HTG FLOW MAX	2200 (1038.18)	CFM (LPS)	4 (1.8876)	0	--	--

1. Points not listed are not used in this application.
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3. Point numbers that appear in brackets { } may be unbundled at the field panel.

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Table 2422-1. Point Database for Application 2422.

Point Number	Descriptor	Factory Default (SI Units)	Engr Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{35}	AIR VOLUME	0 (0.0)	CFM (LPS)	4 (1.8876)	0	--	--
36	FLOW COEFF	1.0	--	0.01	0.0	--	--
{37}	MTR3 COMD	0.0	PCT	0.4	0.0	--	--
{38}	MTR3 POS	0.0	PCT	0.4	0.0	--	--
39	MTR3 TIMING	130	SEC	1	0	--	--
{41}	DO 1	OFF	--	--	--	ON	OFF
{42}	DO 2	OFF	--	--	--	ON	OFF
{43}	HEAT STAGE 1	OFF	--	--	--	ON	OFF
{44}	HEAT STAGE 2	OFF	--	--	--	ON	OFF
{45}	HEAT STAGE 3	OFF	--	--	--	ON	OFF
{46}	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	--	--
56	DMPR ROT ANG	90	--	1	0	--	--
58	MTR SETUP	0	--	1	0	--	--
59	DO DIR. REV	0	--	1	0	--	--
60	EHEAT FLOW	20.0	PCT	0.4	0.0	--	--
63	CLG P GAIN	20.0 (36.0)	--	0.25 (0.45)	0.0	--	--
64	CLG I GAIN	0.01 (0.018)	--	0.001 (0.0018)	0.0	--	--
65	CLG D GAIN	0 (0.0)	--	2 (3.6)	0	--	--
66	CLG BIAS	0.0	PCT	0.4	0.0	--	--
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	FLOW P GAIN	0.0	--	0.05	0.0	--	--
72	FLOW I GAIN	0.01	--	0.001	0.0	--	--
73	FLOW D GAIN	0	--	2	0	--	--

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

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Table 2422-1. Point Database for Application 2422.

Point Number	Descriptor	Factory Default (SI Units)	Engr Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
74	FLOW BIAS	50.0	PCT	0.4	0.0	--	--
{75}	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)	--	--
{79}	CLG LOOPOUT	0.0	PCT	0.4	0.0	--	--
{80}	HTG LOOPOUT	0.0	PCT	0.4	0.0	--	--
{81}	AVG HEAT OUT	0	--	2	0	--	--
82	STAGE MAX	90.0	PCT	0.4	0.0	--	--
83	STAGE MIN	10.0	PCT	0.4	0.0	--	--
{84}	DMPR STATUS	CAL	--	--	--	RECAL	CAL
85	SWITCH LIMIT	5.2	PCT	0.4	0.0	--	--
86	SWITCH TIME	10	MIN	1	0	--	--
87	CAL MODULE	NO	--	--	--	YES	NO
88	STAGE COUNT	1	--	1	0	--	--
89	STAGE TIME	10	MIN	1	0	--	--
90	SWITCH DBAND	1.0 (0.56)	DEG F (DEG C)	0.25 (0.14)	0.0	--	--
{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	--	--

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