SIEMENS

TEC Custom Solutions Application 2415:

VAV with Hot Water Reheat and 4-20mA Temperature Input

TEC-0905-1.08

This document contains the following topics:

- Overview
  - Hardware Inputs
  - Hardware Outputs
  - Ordering Notes
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  - Day and Night Modes
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  - Heating/Cooling Switchover
  - Control Loops
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Overview

In Application 2415, the controller modulates the supply air damper of the terminal box for cooling and modulates a reheat valve (or valves) 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 2415 is based on and has the same functionality as Application 2023 (*VAV with Hot Water Reheat*). **The difference is that the control loops in Application 2415 receive room temperature input from a 4-20mA sensor connected to AI 3 instead of from the room stat.** Also, Application 2415 runs on a Custom Solution controller that has a wider variety of spare I/O terminations than does the standard VAV Controller running Application 2023. Refer to Figures 2415-1 through 2415-3.

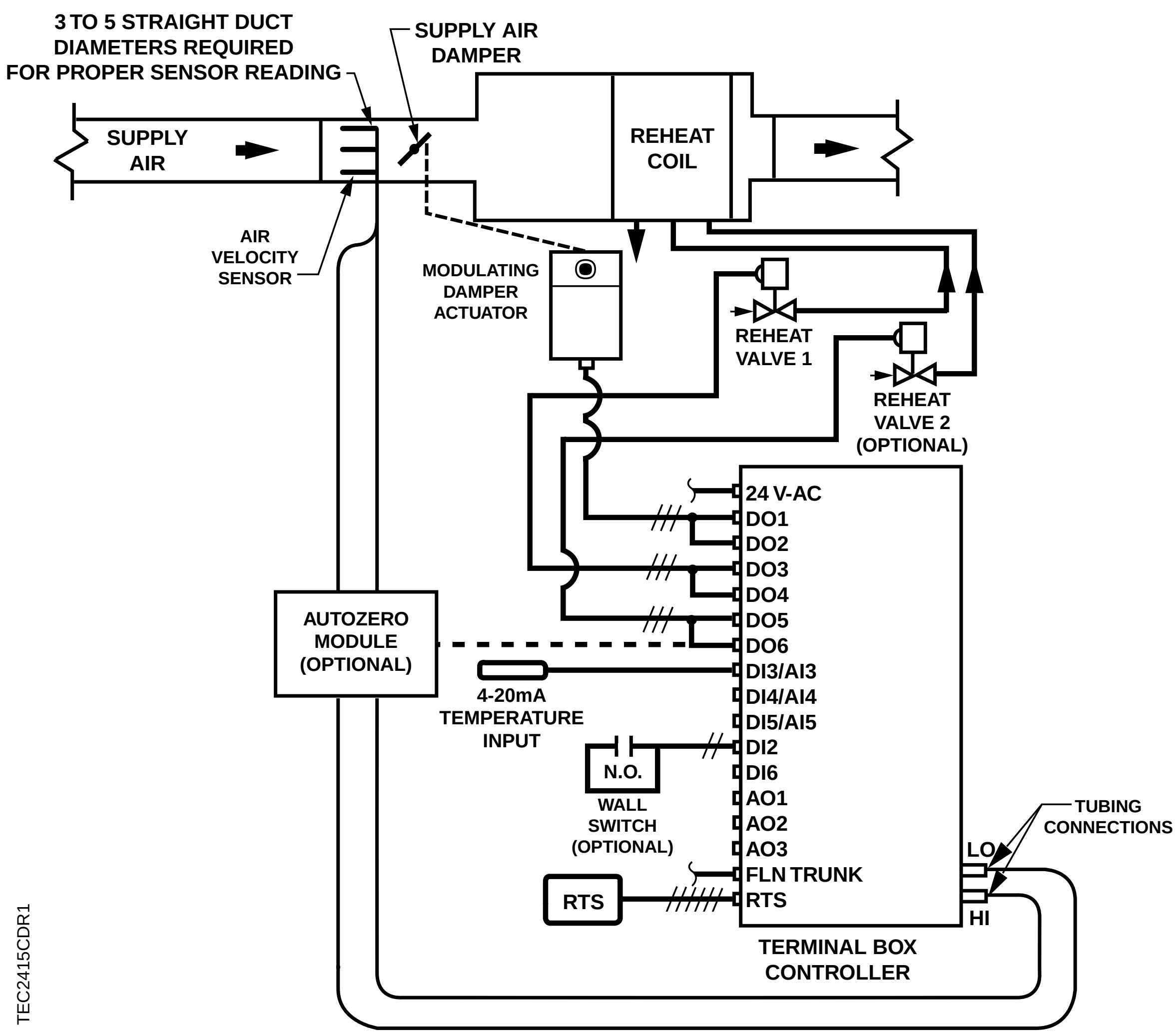
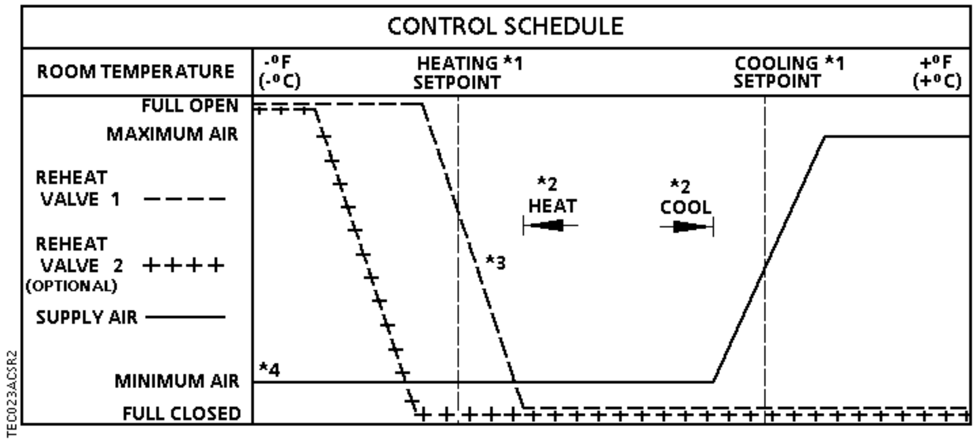


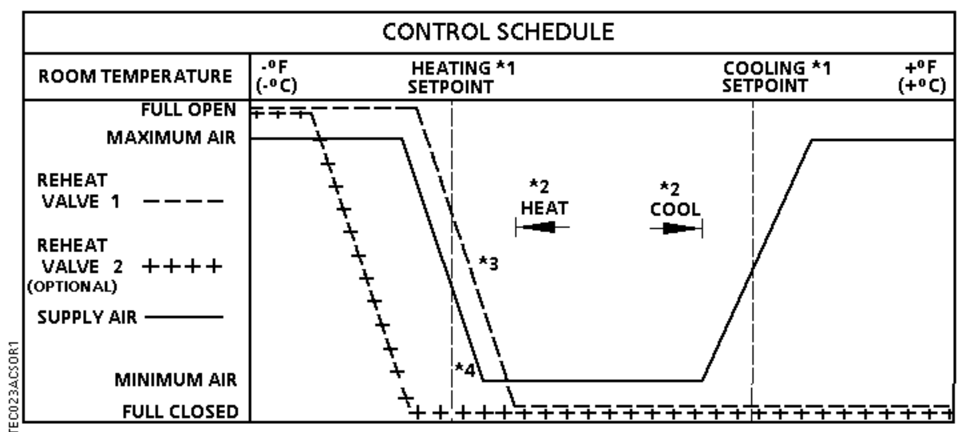
Figure 2415-1. Application 2415 Control Drawing.



Notes:

1. Refer to Sequence of Operation, “Control Temperature Set Points”.
2. Refer to 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). Refer to “Sequencing Logic”.

Figure 2415-2. Application 2415 Control Schedule.



Notes:

1. Refer to Sequence of Operation, “Control Temperature Set Points”.
2. Refer to 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). Refer to “Sequencing Logic”.

Figure 2415-3. Modulating Damper in Heating Mode.

Hardware Inputs

Analog

- 4-20mA RTD
- 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

- damper actuator
- 1st valve actuator (required)
- 2nd valve actuator (optional)
  or
  Autozero Module (optional)

Ordering Notes

Custom Solution VAV Controller with Hot Water Reheat and 4-20mA Temperature Input — Part No. 540-865B (Custom Solution 264)

- 4-20mA Temperature Sensor 536-200

Sequence of Operation

The following paragraphs present the sequence of operation for Application 2415, “VAV with Hot Water Reheat and 4-20mA Temperature Input.”

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 15), 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 2415-1 and 2415-5), and WALL SWITCH (Point 18) equals YES, the controller monitors the status of DI 2. When the status of DI 2 (Point 24) is ON (the switch is closed), then DAY.NGT will be set to DAY indicating that the controller is in day mode. When the status of DI 2 is OFF (the switch is open), then DAY.NGT will be 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, 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. Refer to *Powers Process Control Language (PPCL) User’s Manual* (125-1896) and *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 of the time period that is set in OVRD TIME. The status of NGT OVRD (Point 21) changes to DAY. After the override time elapses, the controller returns to night mode and the status of NGT OVRD changes back to NIGHT.

It is only when the controller is in night mode that the override switch on the room sensor will 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 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 (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 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.

Damper Modulation in Heating Mode (optional)

CAUTION:
The heating/cooling switchover mechanism explained above 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 1-3 in “Sequencing Logic”.) 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 “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.

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 “Control Temperature Set Points”.

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, then 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 out of 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%

If the controller is in heating mode, then 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 the point HTG FLOW MIN (Point 33).
- Operate in sequence with the hot water valve(s).
- Operate parallel with the hot water valve(s).
- Have its operation overlap with the operation of the hot water valve(s). Refer to “Sequencing Logic” for more information.

If the first option described above is chosen, then HTG LOOPOUT (Point 80) will control the hot water valve(s) in order to maintain the room temperature. If any one of the last three options is chosen, then
HTG LOOPOUT will control both the flow loop set point (FLOW STPT) and the hot water valve(s) in order to maintain the room temperature. Refer to “Sequencing Logic” 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 will never be set below
(HTG FLOW MIN÷HTG FLOW MAX)×100% flow or above 100% flow.

Flow Loop – The flow loop maintains the minimum airflow and maximum airflow through 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 2415, 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, 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 CLG FLOW MIN and CLG FLOW MAX in cooling mode and between HTG FLOW MIN and HTG FLOW MAX in heating mode.

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 will be 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 CLG 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.

For example:

If CTL FLOW MIN equals 250 CFM, and if CTL FLOW MAX equals 1000 CFM

Then the low limit of FLOW STPT=(250 CFM÷1000 CFM)×100% flow

=0.25×100% flow
=25% flow

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

Hot Water Reheat

CAUTION:

Do not set HTG FLOW MIN (Point 33) to 0 CFM (0 LPS). A minimum airflow should be provided across the heating coils when the heating valve is open.

The heating loop modulates the heating valve(s) in order to warm up the space as follows:

- If VALVE COUNT (Point 88) is equal to 1, then when (HTG LOOPOUT–REHEAT START) –(REHEAT END– REHEAT START)×100% varies from 0 to 100% open of the reheat output range, VLV1 COMD (Point 52) varies from 0 to 100% open, and VLV2 COMD (Point 37) is not used in the application.
- If VALVE COUNT is equal to 2, then when HTG LOOPOUT (Point 80) 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)

NOTE: The default setups for FLOW START (Point 16) and FLOW END (Point 17) are 0. This will provide 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 hot water valve(s). This algorithm is very similar to the spring range sequencing of valves and dampers. Portions of the output of the heating loop, point HTG LOOPOUT (Point 80), will drive both the flow loop and the hot water valve(s) from 0 to 100%. Refer to the following three examples. For simplicity, assume that in these examples HTG FLOW MIN (Point 33) equals 0 CFM and there is only one hot water valve (VALVE COUNT (Point 88) equals 1). When this is done, FLOW STPT (Point 93) will equal 0 when HTG LOOPOUT equals 0. The ladder diagrams in Figure 2415-4 shows sequenced, parallel, and overlapping flow loop operations with hot water 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 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.

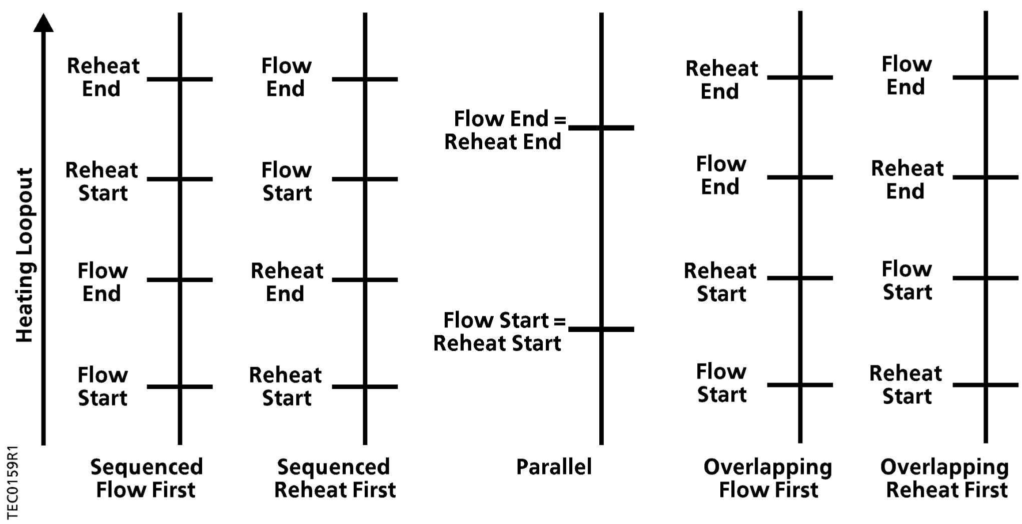


Figure 2415-4. Sequenced, Parallel, and Overlapping Flow Loop Operations with Hot Water Reheat.

Example 1: Assume that your system has a hot water valve that is to operate 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 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%, VLV1 COMD will equal 0% open.
- when HTG LOOPOUT equals 75%, VLV1 COMD will equal 50% open.
- when HTG LOOPOUT equals 100%, VLV1 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 (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%, VLV1 COMD will equal 0% open.
- when HTG LOOPOUT equals 50%, VLV1 COMD will equal 50% open.
- when HTG LOOPOUT equals 100%, VLV1 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 (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%, VLV1 COMD will equal 0% open.
- when HTG LOOPOUT equals 62.5%, VLV1 COMD will equal 50% open.
- when HTG LOOPOUT equals 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 0% which will cause FLOW STPT to hold the value corresponding to 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 equals 170 CFM
- HTG FLOW MAX equals 1000 CFM
- VALVE COUNT equals 1

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%, VLV1 COMD will equal 0% open.

- when HTG LOOPOUT equals 50%, VLV1 COMD will equal 50% open.
- when HTG LOOPOUT equals 100%, VLV1 COMD will equal 100% open.

Assume,

- VALVE COUNT equals 2

then,

- when HTG LOOPOUT equals 0%, VLV2 COMD will equal 0% open, VLV 1COMD equals 0%.
- when HTG LOOPOUT equals 50%, VLV2 COMD will equal 0% open, VLV 1COMD equals 0%.
- when HTG LOOPOUT equals 100%, VLV2 COMD will equal 100% open.

Calibration

Air Velocity Transducer – Calibration of the controller's internal air velocity transducers is periodically required to maintain accurate air velocity readings. CAL SETUP (Point 95) is set with the desired calibration option during controller startup. Depending upon the value of CAL SETUP, calibration may be set to take place automatically or manually. If the status of CAL AIR (Point 94) is YES, then calibration is in progress.

- For a controller used without an Autozero Module (point 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(s) 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 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 (Point 35) > 0 CFM
- FLOW < FLOW STPT

-or-

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

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

The Autozero Module is enabled when it is wired to DO 6 and CAL MODULE (Point 87) is set to 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 *APOGEE Automation Service Procedures* (125-3013) on InfoLink for more information.

2. In order for the heating loopout to work, MTR2 and MTR3 must be enabled using the correct setting for VALVE COUNT (Point 88).

3. The Terminal Box Controller – Electronic Output, as shipped from the factory, keeps all associated equipment OFF. Refer to the "Equipment Controllers" section in *APOGEE Automation Start-up Procedures* (125-3014) on InfoLink 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 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.

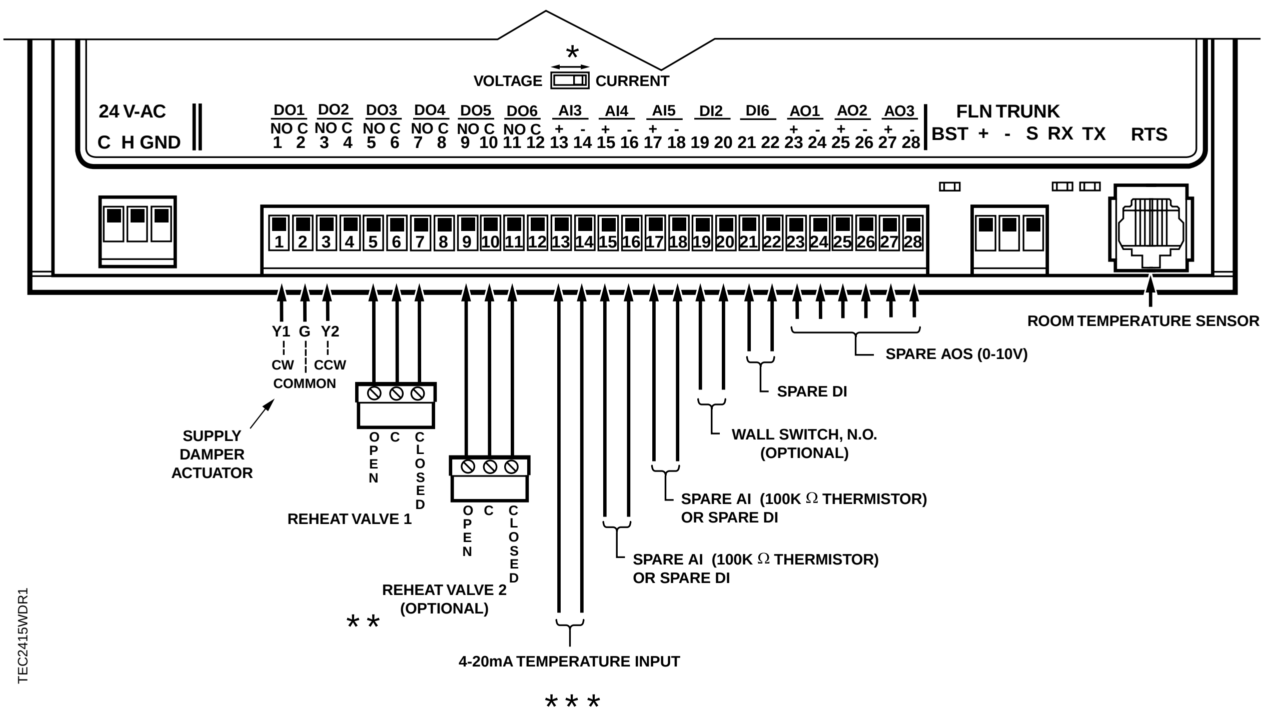
Wiring Diagrams

CAUTION:

The controller's DOs control 24 Vac loads only. The maximum rating is 12 VA for each DO. Use an interposing 220V 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

Consult with the local representative if terminations are missing or different.

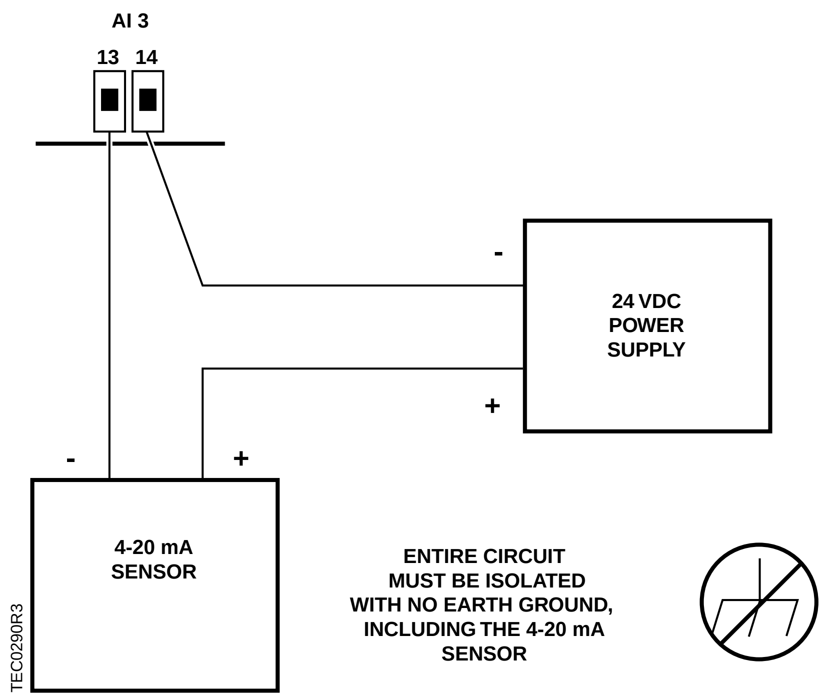


* Dipswitch for AI 3 on controller's circuit board (under controller's cover) must be in *current* position.
** If a second reheat valve is not used, DO6 can be used for an Autozero Module.
*** Refer to Figure 2415-6 for how to wire the 4-20mA sensor connected to AI 3. Failure to follow instructions will cause equipment damage.

Figure 2415-5. Application 2415 Wiring Diagram.

CAUTION:

Refer to Figure 2415-6 for how to wire the 4-20mA temperature sensor. Failure to follow instructions will cause equipment damage.



NOTE: You can NOT use the same transformer to power the controller and a 4-20 mA sensor. The 4-20 mA sensor requires a <u>SEPARATE</u> dedicated power supply.

Figure 2415-6. Special Wiring Requirements for 4-20 mA Temperature Sensor.

CAUTION:

Equipment damage or loss of data may occur if the user does not follow procedure as specified.

Point Database

Table 2415-1. Point Database for Application 2415.

The point numbers of Points that can be unbundled appear in brackets { }

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	2481	--	1	0	--	--
{04}	RTS 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 (23.33144)	DEG F (DEG C)	0.2 (0.1111)	40.0(4.44444)	--	--
07	DAY HTG STPT	70.0 (21.10944)	DEG F (DEG C)	0.2 (0.1111)	40.0(4.44444)	--	--
08	NGT CLG STPT	82.0 (27.77544)	DEG F (DEG C)	0.2 (0.1111)	40.0(4.44444)	--	--
09	NGT HTG STPT	65.0 (18.33194)	DEG F (DEG C)	0.2 (0.1111)	40.0(4.44444)	--	--
{10}	DI 5	OFF	--	--	--	ON	OFF
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}	ROOM TEMP	40.0 (4.44444)	DEG F (DEG C)	0.2 (0.1111)	40.0(4.44444)	--	--
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	--	--
{35}	AIR VOLUME	0 (0.0)	CFM (LPS)	4 (1.8876)	0	--	--
36	FLOW COEFF	1.0	--	0.01	0.0	--	--
{37}	VLV2 COMD	0.0	PCT	0.4	0.0	--	--
{38}	VLV2 POS	0.0	PCT	0.4	0.0	--	--

39	MTR3 TIMING	130	SEC	1	0	--	--
{40}	DI 4	OFF	--	--	--	ON	OFF
{41}	DO 1	OFF	--	--	--	ON	OFF
{42}	DO 2	OFF	--	--	--	ON	OFF
{43}	DO 3	OFF	--	--	--	ON	OFF
{44}	DO 4	OFF	--	--	--	ON	OFF
{45}	DO 5	OFF	--	--	--	ON	OFF
{46}	DO 6	OFF	--	--	--	ON	OFF
{47}	DI 6	OFF	--	--	--	ON	OFF
{48}	DMPR COMD	0.0	PCT	0.4	0.0	--	--
{49}	DMPR POS	0.0	PCT	0.4	0.0	--	--
{50}	AUX TEMP	37.5 (3.055556)	DEG F (DEG C)	0.5 (0.28)	37.5(3.055556)	--	--
51	MTR1 TIMING	95	SEC	1	0	--	--
{52}	VLV1 COMD	0.0	PCT	0.4	0.0	--	--
{53}	VLV1 POS	0.0	PCT	0.4	0.0	--	--
{54}	AI 5	37.5 (3.055556)	DEG F (DEG C)	0.5 (0.28)	37.5(3.055556)	--	--
55	MTR2 TIMING	130	SEC	1	0	--	--
56	DMPR ROT ANG	90	--	1	0	--	--
58	MTR SETUP	0	--	1	0	--	--
59	DO DIR. REV	0	--	1	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}	AOV 1	0.0	VOLTS	0.01	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}	AOV 2	0.0	VOLTS	0.01	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	--	--
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 (23.33144)	DEG F (DEG C)	0.2 (0.1111)	40.0(4.44444)	--	--
{79}	CLG LOOPOUT	0.0	PCT	0.4	0.0	--	--
{80}	HTG LOOPOUT	0.0	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	VALVE COUNT	1	--	1	0	--	--
90	SWITCH DBAND	0.8 (0.4444)	DEG F (DEG C)	0.2 (0.1111)	0.0	--	--
{91}	AOV 3	0.0	VOLTS	0.01	0.0	--	--
{92}	CTL STPT	74.0 (23.33144)	DEG F (DEG C)	0.2 (0.1111)	40.0(4.44444)	--	--
{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	--	--