Application 2238: Dual Duct Constant Volume – One Inlet and One Outlet Sensor with Optional Reheat

Overview

In Application 2238, the controller provides independent control of the hot duct and the cold duct inlet dampers to provide a constant volume of air to the space during occupied periods and a lower constant volume of air during unoccupied periods. In cooling mode, the cold duct damper is modulated to maintain the room temperature setpoint and the hot duct damper is modulated to maintain the volume setpoint. In heating mode, the hot duct damper is modulated to maintain the volume setpoint. The controller modulates an optional hot water valve or up to three stages of electric reheat to maintain the room temperature setpoint (Figure 2238-1 and Figure 2238-2).

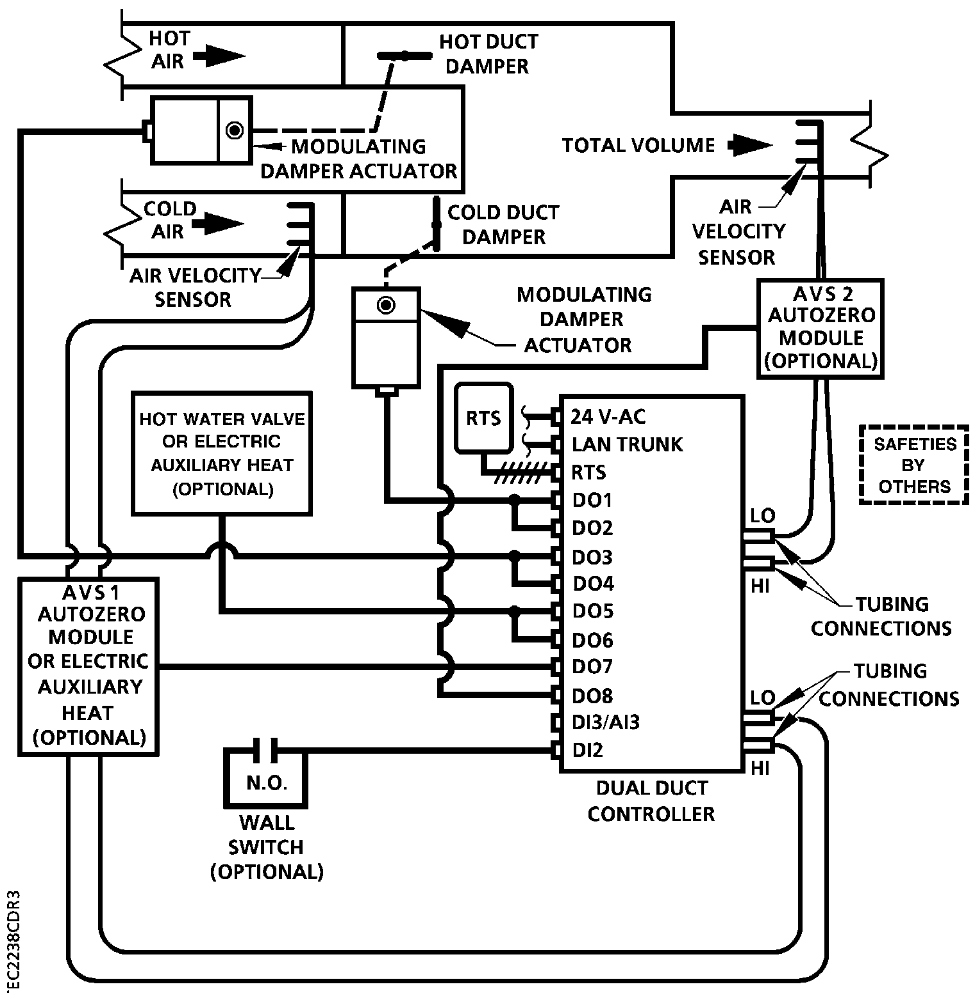
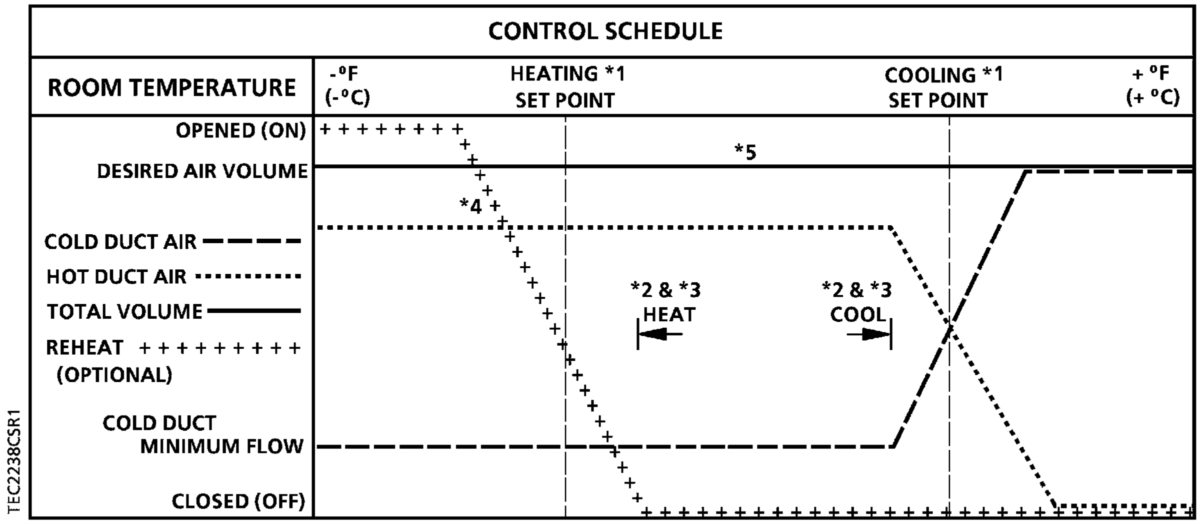


Figure 2238-1. Application 2238 Control Drawing.



1. See Sequence of Operation, *Control Temperature Setpoints*.
2. See Sequence of Operation, *Heating/Cooling Switchover*.
3. If reheat is not used, this application operates only in cooling mode.
4. The reheat can be either a modulating valve or time modulated electric reheat. See Sequence of Operation, *Optional Auxiliary Heat*.
5. This application supports two volume setpoints; one for occupied periods and one for unoccupied periods. See Sequence of Operation, *Control Volume Setpoints*.

Figure 2238-2. Application 2238 Control Schedule.

Hardware Inputs

Analog

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

Digital

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

Hardware Outputs

Analog

- None

Digital

- Damper actuator (two required)
- Stage 1 electric auxiliary heat (optional)
- Stage 2 electric auxiliary heat (optional)
- Stage 3 electric auxiliary heat (optional) or autozero modules (optional)
- Valve actuator (optional)

Ordering Notes

Dual Duct Controller–Two Air Velocity Sensors–Electronic Output (540-506)

Dual Duct Controller–Two Air Velocity Sensors–Electronic Output with Autozero Module* (540-507*)

*This controller is used in applications:

- Where it is not possible, due to operational restrictions, to calibrate the air velocity transducer by fully closing the damper (for example, clean rooms, laboratories).
- When there is a minimum position damper stop.

See *APOGEE Automation Configuration and Sizing Guidelines* on InfoLink for product numbers.

Autozero Modules (optional)

Damper actuator (two required)

Terminal Equipment Controller room temperature sensor

Valve actuator (optional)

Point Database

Table 2238-1 presents the point database information for Application 2238.

Sequence of Operation

The following paragraphs present the sequence of operation for Application 2238, “Dual Duct Constant Volume–One Inlet and One Outlet Sensor with Optional Reheat.”

NOTE: The controller first meets the volume setpoint requirement of the space and then it controls to the room temperature setpoint requirement. The controller satisfies the airflow requirement of the dual duct even if doing so causes the temperature of the space to drift from its temperature setpoint.

Control Volume Setpoints

NOTE: The following guidelines apply to the control volume setpoints, OCC FLOW (Point 32) and UNOCC FLOW (Point 31):

- Do not set OCC FLOW to 0 cfm (0 lps).
- The value of OCC FLOW must be greater than or equal to the value of UNOCC FLOW.
- If desired, the values of OCC FLOW and UNOCC FLOW may be set equal to each other.

Depending on the controller's current operational mode (occupied or unoccupied), the control volume setpoints are as follows.

Occupied Cooling Mode – In occupied cooling mode, the controller resets the value of CLG FLO STPT (Point 93) to ensure that the room temperature setpoint is satisfied, provided that the airflow from cold duct does not exceed the value of OCC FLOW (Point 32). The controller then resets the value of HTG FLO STPT (Point 85) to ensure that the total flow provided by the dual duct is equal to the value of OCC FLOW.

Occupied Heating Mode – The cold duct will provide the air in CLG FLOW MIN (Point 91). The controller will then try to provide enough air from the hot duct to ensure that the total airflowing out of the dual duct terminal box equals OCC FLOW (Point 32). If the hot duct is unable to provide enough airflow to satisfy this requirement, the controller modulates the cold duct damper to make up the difference.

Unoccupied Cooling Mode – In unoccupied cooling mode, the controller resets the value of CLG FLO STPT (Point 93) to ensure that the room temperature setpoint is satisfied, provided that the airflow from the cold duct does not exceed the value of UNOCC FLOW (Point 31). The controller then resets the value of HTG FLO STPT (Point 85) to ensure that the total flow provided by dual duct is equal to the value of UNOCC FLOW.

Unoccupied Heating Mode – In unoccupied heating mode, the controller provides as much airflow as possible from the hot duct to satisfy the flow requirements of UNOCC FLOW (Point 31). If the hot duct is unable to provide enough airflow to satisfy this requirement, the controller modulates the cold duct damper to make up the difference.

Control Temperature Setpoints

Depending on the controller’s current operational mode (occupied or unoccupied), the control temperature setpoint, CTL STPT (Point 92), holds the value of one of the following setpoints:

Occupied Mode – In occupied mode, CTL STPT holds the value of OCC HTG STPT (Point 7) in heating mode or OCC CLG STPT (Point 6) in cooling mode. However, if the room temperature sensor has a setpoint dial and STPT DIAL (Point 14) = YES, CTL STPT holds the value of RM STPT DIAL (Point 13).

If the setpoint dial is used RM STPT DIAL < RM STPT MIN (Point 11), CTL STPT holds the value of RM STPT MIN. If RM STPT DIAL > RM STPT MAX (Point 12), CTL STPT holds the value of RM STPT MAX.

Unoccupied Mode – In unoccupied mode, CTL STPT (Point 92) holds the value of UOC HTG STPT (Point 9) in heating mode or UOC CLG STPT (Point 8) in cooling mode.

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

Occupied and Unoccupied Modes

The occupied/unoccupied status of the space is determined by the status of OCC.UNOCC (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 (Figure 2238-1, Figure 2238-3, and Figure 2238-4), and WALL SWITCH (Point 18) = YES, the controller monitors the status of DI 2. When the status of DI 2 (Point 24) is ON (the switch is closed), OCC.UNOCC (Point 29) will be set to OCC indicating that the controller is in occupied mode. When the status of DI 2 is OFF (the switch is open), OCC.UNOCC will be set to UNOCC indicating that the controller is in unoccupied mode.

When WALL SWITCH (Point 18) = 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, the controller stays in occupied mode all the time. If the controller is operating with centralized control (that is, connected to a field panel), the field panel can send an operator or PPCL command to override the status of OCC.UNOCC (Point 29). See the *Powers Process Control Language (PPCL) User's Manual* (125-1896) and the *Field Panel User's Manual* (125-1895) for more information.

Unoccupied 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), by pressing the override switch a room occupant can reset the controller to occupied operational mode of the time period that is set in OVRD TIME. The status of UNOCC OVRD (Point 21) changes to OCC. After the override time elapses, the controller returns to unoccupied mode and the status of UNOCC OVRD changes back to UNOCC.

It is only when the controller is in unoccupied mode that the override switch on the room temperature 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), the controller switches from heating to cooling mode by setting HEAT.COOL (Point 5) to COOL:

- HTG LOOPOUT (Point 80) < 5.2%.
- CTL TEMP (Point 78) > CTL STPT (Point 92) by at least the value set in SWITCH DBAND (Point 90).
- CTL TEMP > the appropriate cooling setpoint minus SWITCH DBAND.

If AUX HTG USED (Point 82) = YES, and 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 (Point 79) < 5.2%.
- CTL TEMP (Point 78) < CTL STPT (Point 92) by at least the value set SWITCH DBAND.
- CTL TEMP < the appropriate heating setpoint plus SWITCH DBAND.

Control Loops

The dual duct is controlled by four Proportional, Integral, and Derivative (PID) control loops: two temperature loops and two flow loops.

Temperature Loops – The two temperature loops are a cooling loop and a heating loop. The active temperature loop maintains CTL STPT (Point 92). See *Control Temperature Setpoints*.

In cooling mode, CLG LOOPOUT (Point 79) resets CLG FLO STPT (Point 93) to satisfy the space temperature setpoint, provided that the airflow out of the cold duct does not exceed the value of OCC FLOW (Point 32) in occupied mode or UNOCC FLOW (Point 31) in unoccupied mode. The controller resets HTG FLO STPT (Point 85) in order to make sure that the airflow out of the box is equal to OCC FLOW in occupied mode or UNOCC FLOW in unoccupied mode.

In heating mode, the output of the heating loop, HTG LOOPOUT (Point 80), controls the auxiliary heat (if used). If auxiliary heat is not used, this application only operates in cooling mode (that is, the application sets HEAT.COOL (Point 5) to COOL) and the heating loop is disabled.

During occupancy for heating and cooling modes, the minimum amount of air allowed from the cold duct is CLG FLOW MIN (Point 91). During unoccupied periods for these modes, the airflow from the cold duct will be allowed to reach 0 cfm.

Flow Loops – The two flow loops are a cooling flow loop and a heating flow loop.

The cooling flow loop maintains CLG FLO STPT (Point 93) by modulating the cold duct damper point, CLG DMP CMD (Point 48). During occupancy, the cooling flow loop maintains the cold duct airflow between the value of CLG FLOW MIN (Point 91) and the value of OCC FLOW (Point 32). During unoccupied periods, the cooling flow loop maintains the cold duct airflow between 0 cfm and the value of UNOCC FLOW (Point 31).

CLG FLOW (Point 75) is the input value for the cooling flow loop. It is calculated as a percentage based on where CLG VOLUME (Point 35) is between 0 cfm and the value of OCC FLOW (Point 32).

- If CLG VOLUME (Point 35) = 0 cfm, CLG FLOW (Point 75) is 0%.
- If CLG VOLUME (Point 35) = OCC FLOW (Point 32), CLG FLOW (Point 75) is 100%.

The heating flow loop maintains HTG FLO STPT (Point 85) by modulating the hot duct damper point, HTG DMP CMD (Point 52). During occupancy, the heating flow loop maintains the hot duct airflow between 0 cfm and the value of OCC FLOW (Point 32). During unoccupied periods, the heating flow loop maintains the hot duct airflow between 0 cfm and UNOCC FLOW (Point 31).

HTG FLOW (Point 74) is the input value for the heating flow loop. It is calculated as a percentage based on where TOT VOLUME (Point 30) is between 0 cfm and the value of OCC FLOW.

- If TOT VOLUME (Point 30) = 0 cfm, HTG FLOW (Point 74) is 0%.
- If TOT VOLUME (Point 30) = OCC FLOW (Point 32), HTG FLOW (Point 74) is 100%.

Cooling Operation

In occupied cooling mode, the output of the cooling loop, CLG LOOPOUT (Point 79), is used to calculate the setpoint for the cooling flow loop, CLG FLO STPT (Point 93). This flow loop maintains the space temperature. In this mode, the cooling flow loop limits the airflow supplied by the cold duct to the value of OCC FLOW (Point 32). The minimum airflow from the cold duct will be CLG FLOW MIN (Point 91) in the occupied cooling mode. The heating flow loop provides any make up air that is necessary to ensure that the airflow from the dual duct box is equal to OCC FLOW. When the cooling loop provides an airflow equal to OCC FLOW from the cold duct, the heating flow loop sets HTG DMP CMD (Point 52) to 0% open, causing the hot duct damper to close.

In unoccupied cooling mode, CLG LOOPOUT (Point 79), multiplied by a scaling factor, becomes the setpoint for CLG FLO STPT (Point 93). This flow loop maintains the space temperature. In this mode, the scaling factor, UNOCC FLOW ÷ OCC FLOW, limits the airflow supplied by the cold duct to the value of UNOCC FLOW (Point 31). This limit is in effect even if it means that the space gets too warm. The heating flow loop provides any make up air that is necessary to ensure that the airflow from the dual duct box is equal to UNOCC FLOW. When the cooling loop provides an airflow equal to UNOCC FLOW from the cold duct, the heating flow loop modulates HTG DMP CMD (Point 52) to 0% open, causing the hot duct damper to close.

The following two situations could occur in cooling mode. However, they are most likely to occur in occupied periods.

1. When the cooling load is light, the cooling loop calls for the cold duct to provide very little air. To maintain a constant volume from the dual duct box, the majority of the air volume from the dual duct box must come from the hot duct. If the hot duct is unable to provide this air, the cold duct makes up the difference, even though the cooling loop calls for the cold duct to close.

2. When the cooling load is heavy, the hot duct must be closed or nearly closed to allow the space to be cooled. The majority of the air volume from the dual duct box must be supplied by the cold duct. If the cold duct is unable to provide this air, the hot duct makes up the difference, even though the temperature requirements of the space call for the hot duct to close.

Heating Operation

In occupied heating mode, the heating flow loop modulates the hot duct damper point, HTG DMP CMD (Point 52), to ensure that the airflow from the dual duct box is equal to the value of OCC FLOW (Point 32). The cold duct damper is set to provide the cooling minimum flow. If the hot duct is unable to provide enough flow so that the total flow is equal to occupied flow, the cooling flow damper will open to make up the difference.

In unoccupied heating mode, the heating flow loop modulates the HTG DMP CMD (Point 52) to ensure that the airflow from the dual duct box is equal to the value of UNOCC FLOW (Point 31). If the hot duct is unable to provide this airflow, the cold duct damper is modulated in order to make up the difference. If the hot duct is able to provide this airflow on its own, CLG DMP CMD (Point 48) is set to 0% open, causing the cold duct damper to close.

In heating mode, the output of the heating loop, HTG LOOPOUT (Point 80), controls the auxiliary heat (if used). If auxiliary heat is not used, the application sets HEAT.COOL (Point 5) to COOL. The application then operates in cooling mode and the heating loop is disabled. See *Optional Auxiliary Heat* for more information.

Optional Auxiliary Heat

If AUX HTG USED (Point 82) = YES, this application also controls auxiliary heat. The value of AUX HTG TYPE (Point 83) indicates the type of auxiliary heat control. If AUX HTG USED = NO, no auxiliary heat is used and HEAT.COOL (Point 5) is automatically set to COOL.

CAUTION:

If using electric heat, 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 or equipment damage may result.

Do not set UNOCC FLOW (Point 31) to zero.

Hot Water Auxiliary Heat – If AUX HTG TYPE (Point 83) = HW, the application controls auxiliary hot water heat. The heating loop modulates the heating valve point, VALVE COMD (Point 37) in order to warm the space. When the controller is in cooling mode, the heating valve is closed.

Electric Auxiliary Heat – If AUX HTG TYPE (Point 83) = ELEC, 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 following example. When the controller is in cooling mode, the electric heat is OFF at all times. STAGE COUNT (Point 88) must be set equal to the number of stages of electric reheat being used.

Example

If the duty cycle is 10 minutes (STAGE TIME (Point 89) = 10 minutes) and the heating loop is calling for 60% of heating (HTG LOOPOUT (Point 80) = 60%), 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

NOTE: If three stages of electric heat are used, Autozero Modules cannot be used. If two stages or less are used, Autozero Modules can be used.

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 start-up. Depending upon the value of CAL SETUP, calibration may be set to take place automatically or manually when the override switch is pressed on the room temperature sensor. If the value of CAL AIR (Point 94) is YES, calibration is in progress.

- For a controller used without Autozero Modules (CAL MODULE (Point 87) = NO), the dampers are commanded closed simultaneously to get zero airflow readings during calibration.
- For a controller used with Autozero Modules (CAL MODULE (Point 87) = YES), calibration occurs without closing the dampers.

NOTE: The first time after start-up or initialization, the controller will calibrate the dampers as if not using Autozero Modules, although the Autozero Modules will be activated. All subsequent calibrations will use the Autozero Modules only.

Hot Water Valve – Calibration of a hot water valve (if used) is performed simultaneously with calibration of the air velocity transducers and is accomplished by commanding the valve closed. Calibration of the valve is not affected by the presence of Autozero Modules.

At the end of a calibration sequence, CAL AIR (Point 94) returns to NO automatically. A value of NO indicates that the controller is not in a calibration sequence.

The Autozero Modules are used during calibration when they are wired to DO 7 and DO 8 and CAL MODULE (Point 87) = YES.

Damper Status Operation

Under normal operation DMPR STATUS (Point 84) reads CAL. However, when using Autozero Modules, it is possible after a period of operation for the calculated damper position points, CLG DMP POS (Point 49) and HTG DMP POS (Point 53), to differ from the actual (physical) damper position.

If this occurs, the controller will *automatically* compensate for any difference by setting DMPR STATUS (Point 84) to RECAL which readjusts the value of the damper position points.

DMPR STATUS (Point 84) will be set to RECAL and the cooling damper will be adjusted if the following conditions are true:

- CLG DMP POS (Point 49) and HTG DMP POS (Point 53) = 100%
- Cooling air velocity (CLG VOLUME (Point 35) ÷ CLGDUCT AREA (Point 97)) > 200 fpm (1.016 meters per second)
- CLG FLOW (Point 75) < CLG FLO STPT (Point 93)

- or -

- CLG DMP POS (Point 49) and HTG DMP POS (Point 53) = 0%
- Cooling air velocity (CLG VOLUME (Point 35) ÷ CLGDUCT AREA (Point 97)) > 200 fpm (1.016 meters per second)
- CLG FLOW (Point 75) > CLG FLO STPT (Point 93)

DMPR STATUS (Point 84) will be set to RECAL and the heating damper will be adjusted if the following conditions are true:

- CLG DMP POS (Point 49) and HTG DMP POS (Point 53) = 100%
- Total air velocity (TOT VOLUME (Point 30) ÷ TOTDUCT AREA (Point 60)) > 200 fpm (1.016 meters per second)
- HTG FLOW (Point 74) < HTG FLO STPT (Point 85)

\- or -

- CLG DMP POS (Point 49) and HTG DMP POS (Point 53) = 0%
- Total air velocity (TOT VOLUME (Point 30) ÷ TOTDUCT AREA (Point 60)) > 200 fpm (1.016 meters per second)
- HTG FLOW (Point 74) > HTG FLO STPT (Point 85)

If DMPR STATUS (Point 84) has been changed to RECAL in response to one of the conditions described above, do one of the following:

1. If both flows are now being properly controlled, set DMPR STATUS to CAL and release it.
2. If one of the flows is still not being properly controlled (i.e., one of the conditions described above is still present) or if it is important that the damper positions be accurate, initialize the controller.

If these steps do not fix the problem of maintaining either flow, a mechanical problem, such as insufficient airflow or static pressure, might exist.

Fail-safe Operation

If the air velocity sensor points, TOT VOLUME (Point 30) and CLG VOLUME (Point 35) are failed, the dampers are controlled in one of two ways:

- If FAIL MODE (Point 40) = OPEN, the controller sets CLG DMP CMD (Point 48) and HTG DMP CMD (Point 52) to 100% open.
- If FAIL MODE = CLOSED, the controller sets CLG DMP CMD and HTG DMP CMD to 0% open.

If the 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, the heating loop, or both need to be tuned. If CLG FLOW (Point 75) is oscillating while CLG FLO STPT (Point 93) is constant, the cooling flow loop requires tuning. If HTG FLOW (Point 74) is oscillating while HTG FLO STPT (Point 85) is constant, the heating flow loop requires tuning. See *APOGEE Automation Service Procedures* on InfoLink for more information.

2. The Dual Duct Controller–Two Air Velocity Sensors–Electronic Output, as shipped from the factory, keeps all associated equipment OFF. See the *Equipment Controllers* section in *APOGEE Automation Start-up Procedures* on 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 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

Figure 2238-3 and Figure 2238-4 show the point wiring for Application 2238.

CAUTION:

The controller's DOs control 24 Vac loads only. The maximum rating is 12 VA for each DO. Use an interposing 220V 4-relay module for any of the following:

- VA requirements higher than the maximum
- 110 or 220 Vac requirements
- DC power requirements
- Separate transformers used to power the load

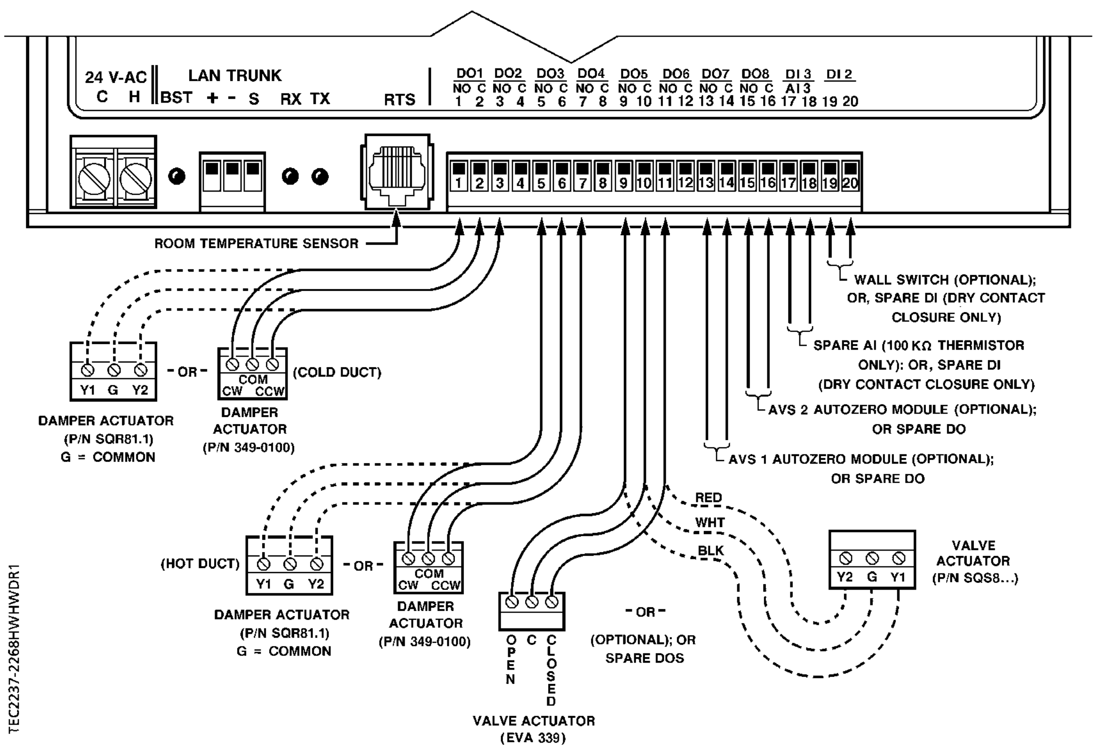


Figure 2238-3. Application 2238 Wiring Diagram with Hot Water Reheat.

CAUTION:

The controller's DOs control 24 Vac loads only. The maximum rating is 12 VA for each DO. Use an interposing 220V 4-relay module for any of the following:

- VA requirements higher than the maximum
- 110 or 220 Vac requirements
- DC power requirements
- Separate transformers used to power the load

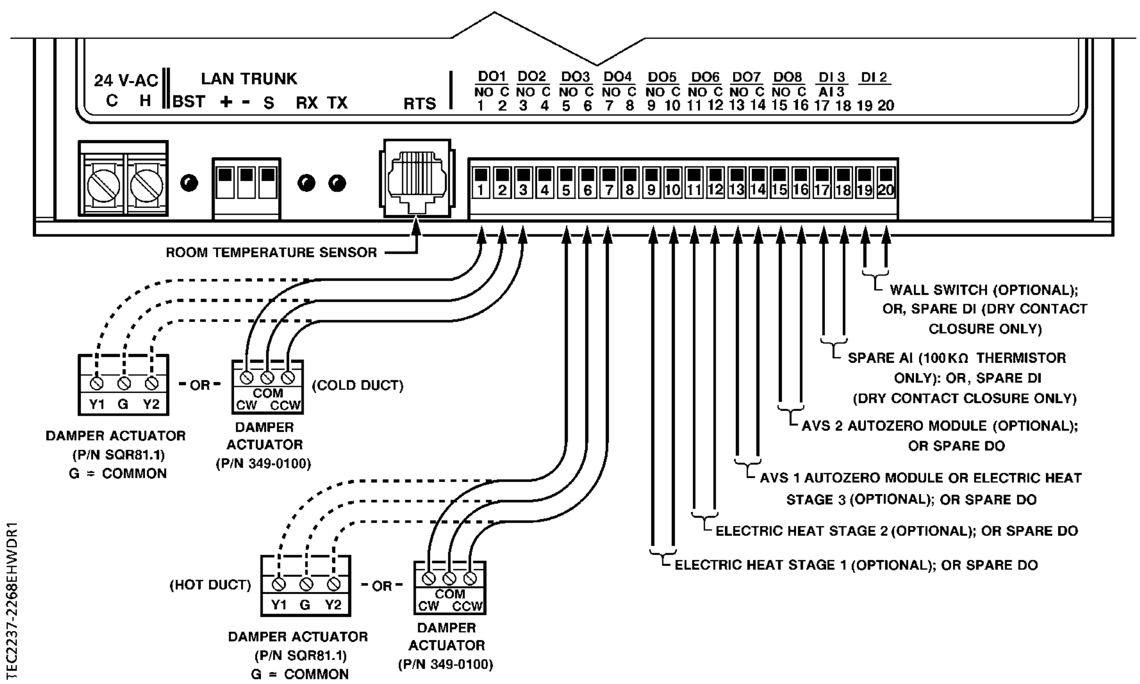


Figure 2238-4. Application 2238 Wiring Diagram with Electric Auxiliary Reheat.

Table 2238-1. Point Database for Application 2238.

Point Number	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
01	CTLR ADDRESS	99.000	–	1.000	0.000	–	–
02	APPLICATION	2293	–	1.000	0.000	–	–
{04}	ROOM TEMP	74.000 (23.449)	DEG F (DEG C)	0.250 (0.140)	48.000 (8.889)	–	–
{05}	HEAT.COOL	COOL	–	–	–	HEAT	COOL
06	OCC CLG STPT	74.000 (23.449)	DEG F (DEG C)	0.250 (0.140)	48.000 (8.889)	–	–
07	OCC HTG STPT	70.000 (21.209)	DEG F (DEG C)	0.250 (0.140)	48.000 (8.889)	–	–
08	UOC CLG STPT	82.000 (27.929)	DEG F (DEG C)	0.250 (0.140)	48.000 (8.889)	–	–
09	UOC HTG STPT	65.000 (18.409)	DEG F (DEG C)	0.250 (0.140)	48.000 (8.889)	–	–
11	RM STPT MIN	55.000 (12.809)	DEG F (DEG C)	0.250 (0.140)	48.000 (8.889)	–	–
12	RM STPT MAX	90.000 (32.409)	DEG F (DEG C)	0.250 (0.140)	48.000 (8.889)	–	–
{13}	RM STPT DIAL	74.000 (23.449)	DEG F (DEG C)	0.250 (0.140)	48.000 (8.889)	–	–
14	STPT DIAL	NO	–	–	–	YES	NO
{15}	AUX TEMP	74.000 (23.496)	DEG F (DEG C)	0.500 (0.280)	37.500 (3.056)	–	–
18	WALL SWITCH	NO	–	–	–	YES	NO
{19}	DI OVRD SW	OFF	–	–	–	ON	OFF
20	OVRD TIME	0.000	HRS	1.000	0.000	–	–
{21}	UNOCC OVRD	UNOCC	–	–	–	UNOCC	OCC
{24}	DI 2	OFF	–	–	–	ON	OFF
{25}	DI 3	OFF	–	–	–	ON	OFF
26	HTGFLO PGAIN	0.000	–	0.250	0.000	–	–
27	HTGFLO IGAIN	0.018	–	0.006	0.000	–	–
28	HTGFLO DGAIN	0.000	–	2.000	0.000	–	–
{29}	OCC.UNOCC	OCC	–	–	–	UNOCC	OCC
{30}	TOT VOLUME	0.000	CFM (LPS)	4.000 (1.8876)	0.000	–	–

1. Points not listed are not used in this application.
2. A single value in a column means that the value is the same in English units and in SI units.
3. Point numbers that appear in brackets { } may be unbundled at the field panel.

Table 2238-1. Point Database for Application 2238.

Point Number	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
{31}	UNOCC FLOW	220.000 (103.818)	CFM (LPS)	4.000 (1.8876)	0.000	–	–
{32}	OCC FLOW	2200.000 (1038.180)	CFM (LPS)	4.000 (1.8876)	0.000	–	–
{35}	CLG VOLUME	0.000	CFM (LPS)	4.000 (1.8876)	0.000	–	–
36	CLG FLO COEF	1.000	–	0.010	0.000	–	–
{37}	VALVE COMD	0.000	PCT	0.400	0.000	–	–
{38}	VALVE POS	0.000	PCT	0.400	0.000	–	–
39	MTR3 TIMING	130.000	SEC	1.000	0.000	–	–
40	FAIL MODE	OPEN	–	–	–	CLOSE	OPEN
{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}	DO 7	OFF	–	–	–	ON	OFF
{48}	CLG DMP CMD	0.000	PCT	0.400	0.000	–	–
{49}	CLG DMP POS	0.000	PCT	0.400	0.000	–	–
{50}	DO 8	OFF	–	–	–	–	–
51	MTR1 TIMING	95.000	SEC	1.000	0.000	–	–
{52}	HTG DMP CMD	0.000	PCT	0.400	0.000	–	–
{53}	HTG DMP POS	0.000	PCT	0.400	0.000	–	–
54	TOT FLO COEF	1.000	–	0.010	0.000	–	–
55	MTR2 TIMING	95.000	SEC	1.000	0.000	–	–
56	DPR1 ROT ANG	90.000	–	1.000	0.000	–	–
57	DPR2 ROT ANG	90.000	–	1.000	0.000	–	–
58	MTR SETUP	0.000	–	1.000	0.000	–	–
59	DO DIR.REV	0.000	–	1.000	0.000	–	–

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

Table 2238-1. Point Database for Application 2238.

Point Number	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
60	TOTDUCT AREA	1.000 (0.093)	SQ. FT (SQ. M)	0.025 (0.002323)	0.000	–	–
63	CLG P GAIN	20.000 (36.000)	–	0.250 (0.140)	0.000	–	–
64	CLG I GAIN	0.012 (0.022)	–	0.006 (0.0108)	0.000	–	–
65	CLG D GAIN	0.000	–	2.000 (3.600)	0.000	–	–
66	CLG BIAS	50.000	PCT	0.400	0.000	–	–
67	HTG P GAIN	10.000 (18.000)	–	0.250 (0.140)	0.000	–	–
68	HTG I GAIN	0.012 (0.022)	–	0.006 (0.0108)	0.000	–	–
69	HTG D GAIN	0.000	–	2.000 (3.600)	0.000	–	–
70	HTG BIAS	50.000	PCT	0.400	0.000	–	–
71	CLGFLO PGAIN	0.000	–	0.250	0.000	–	–
72	CLGFLO IGAIN	0.018	–	0.006	0.000	–	–
73	FLOW D GAIN	0.000	–	2.000	0.000	–	–
{74}	HTG FLOW	0.000	PCT	1.000	0.000	–	–
{75}	CLG FLOW	0.000	PCT	1.000	0.000	–	–
{78}	CTL TEMP	74.000 (23.449)	DEG F (DEG C)	0.250 (0.140)	48.000 (8.889)	–	–
{79}	CLG LOOPOUT	50.000	PCT	0.400	0.000	–	–
{80}	HTG LOOPOUT	0.000	PCT	0.400	0.000	–	–
{81}	AVG HEAT OUT	0.000	–	2.000	0.000	–	–
82	AUX HTG USED	NO	–	–	–	YES	NO
83	AUX HTG TYPE	ELEC	–	–	–	ELEC	HW
{84}	DMPR STATUS	CAL	–	–	–	RECAL	CAL
{85}	HTG FLO STPT	0.000	PCT	1.000	0.000	–	–
86	SWITCH TIME	10.000	MIN	1.000	0.000	–	–
87	CAL MODULE	NO	–	–	–	YES	NO
88	STAGE COUNT	1.000	–	1.000	0.000	–	–

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Table 2238-1. Point Database for Application 2238.

Point Number	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
89	STAGE TIME	10.000	MIN	1.000	0.000	–	–
90	SWITCH DBAND	1.000 (0.560)	DEG F (DEG C)	0.250 (0.140)	0.000	–	–
{91}	CLG FLOW MIN	220.000 (103.818)	CFM (LPS)	4.000 (1.8876)	0.000	–	–
{92}	CTL STPT	74.000 (23.449)	DEG F (DEG C)	0.250 (0.140)	48.000 (8.889)	–	–
{93}	CLG FLO STPT	0.000	PCT	1.000	0.000	–	–
{94}	CAL AIR	NO	–	–	–	YES	NO
95	CAL SETUP	4.000	–	1.000	0.000	–	–
96	CAL TIMER	12.000	HRS	1.000	0.000	–	–
97	CLGDUCT AREA	1.000 (0.093)	SQ. FT (SQ. M)	0.025 (0.002323)	0.000	–	–
98	LOOP TIME	5.000	SEC	1.000	0.000	–	–
{99}	ERROR STATUS	0.000	–	1.000	0.000	–	–

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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.