Dual Duct Controller – One Air Velocity Sensor – Electronic Output

(Firmware Revision SD10)

Application 2064 Dual Duct Variable Air Volume – Two-Position Hot/Cold Damper and Volume Damper with Optional Reheat

Overview

In Application 2064, the controller provides control of mechanically linked hot duct and cold duct damper actuators and independent control of a modulating volume actuator. The controller modulates the volume damper to maintain the room temperature setpoint. See Figure 2064-1 and Figure 2064-2.

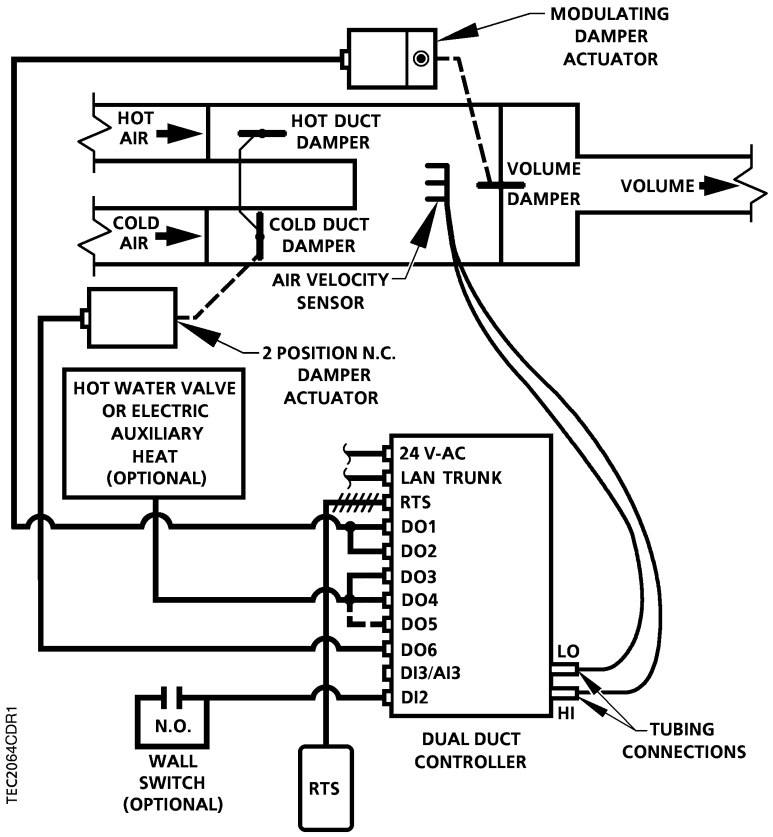
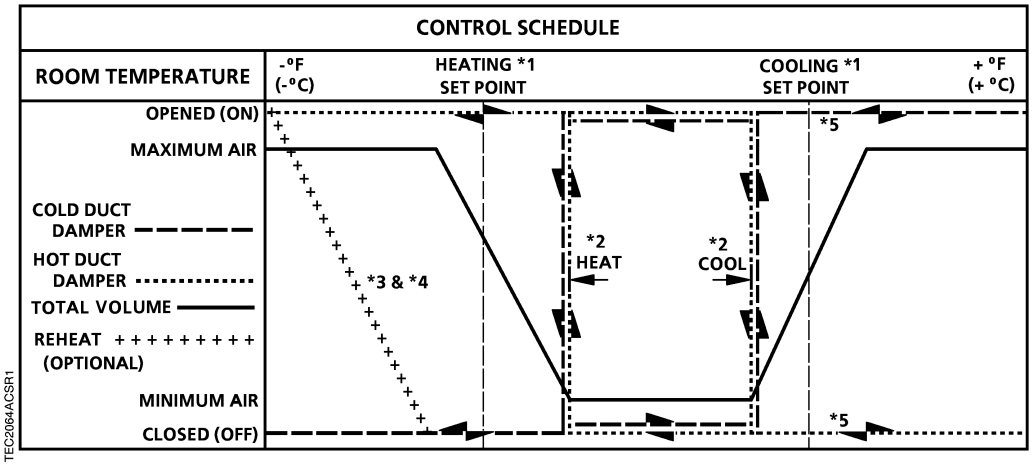


Figure 2064-1. Application 2064 Control Drawing.



1. See *Sequence of Operation, Control Temperature Setpoints*.
2. See *Sequence of Operation, Heating/Cooling Switchover*.
3. The reheat can be either a hot water valve or time modulated electric reheat. See Sequence of Operation, *Optional Auxiliary Heat*.
4. The reheat can be sequenced to operate either in series or parallel with the supply air. It is shown in series.
5. The hot duct and cold duct dampers are mechanically linked.

Figure 2064-2. Application 2064 Control Schedule.

Hardware Inputs

Analog

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

Digital

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

Hardware Outputs

Analog

- None

Digital

- Damper actuator
- Stage 1 electric auxiliary heat (optional)
- Stage 2 electric auxiliary heat (optional)
- Stage 3 electric auxiliary heat (optional)
- Two-position damper actuator or a solenoid air valve
- Valve actuator (optional)

Ordering Notes

Dual Duct Controller – One Air Velocity Sensor – Electronic Output 540-106

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

Damper actuator
Terminal Equipment Controller room temperature sensor
Valve actuator (optional)

Point Database

Table 2064-1 presents the point database information for Application 2064.

Sequence of Operation

The following paragraphs present the sequence of operation for Application 2064, "Dual Duct Variable Air Volume–Two-Position Hot/Cold Damper and Volume Damper with Optional Reheat".

Control Temperature Setpoints

Depending on the controller's current operational mode (day or night), CTL STPT (Point 92) holds the value of one of the following setpoints:

Day Mode – CTL STPT holds the value of DAY HTG STPT (Point 7) in heating mode or DAY 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 and 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.

Night Mode – CTL STPT holds the value of NGT HTG STPT (Point 9) in heating mode or NGT 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.

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 (Figure 2064-1, Figure 2064-3, and Figure 2064-4) 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), 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), 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, the controller stays in day 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 DAY.NGT. See *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), 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 (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 temperature sensor will have any effect on the controller.

Hot/Cold Duct Damper Operation

Heating Mode – In heating mode, HTG.CLG (Point 46) is set equal to HTG if the output of the heating loop, HTG LOOPOUT (Point 80) > 5%. This opens the hot duct damper and closes the cold duct damper.

Cooling Mode – In cooling mode, HTG.CLG (Point 46) is set equal to CLG if the output of the cooling loop, CLG LOOPOUT (Point 79), > 5%. This opens the cold duct damper and closes the hot duct damper.

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 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 < CTL STPT by at least the value set SWITCH DBAND.
- CTL TEMP < the appropriate heating setpoint plus SWITCH DBAND.

Control Loops

The dual duct controller 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). See *Sequence of Operation, Control Temperature Setpoints*.

The cooling temperature loop generates the cooling loopout which is 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 added to the minimum setpoint.

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

Example

If CLG FLOW MIN=200 CFM and CLG FLOW MAX=1000 CFM, the minimum flow setpoint is (200 CFM ÷ 1000 CFM) × 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%

The heating temperature loop generates the heating loopout which is used to generate the FLOW STPT. FLOW STPT is the result of scaling the heating loopout to the appropriate range of values determined by HTG FLOW MIN (Point 33) and HTG FLOW MAX (Point 34). In order to scale it, the loopout is multiplied by the range (MAX – MIN) and added to the minimum setpoint.

When HTG FLOW MIN does not equal 0 CFM, FLOW STPT does not equal HTG LOOPOUT (Point 80). The minimum flow setpoint = (HTG FLOW MIN ÷ HTG FLOW MAX) × 100% flow. And FLOW STPT = [HTG LOOPOUT × (100% – minimum setpoint)] + minimum setpoint.

Example

If HTG FLOW MIN=100 CFM, HTG FLOW MAX = 1000 CFM, FLOW START = 0%, and FLOW END = 100%

The minimum flow setpoint is (100 CFM ÷ 1000 CFM) × 100% flow = 10%

When HTG LOOPOUT is 0%, FLOW STPT = 10% flow.
[0% × (100% − 10%)] + 10% = 10%
This ensures that the airflow out of the terminal box is no less than HTG FLOW MIN.

When HTG LOOPOUT is 50%, FLOW STPT = 55% flow.
[50% × (100% − 10%)] + 10% = 55%

When HTG LOOPOUT is 100%, FLOW STPT = 100% flow.
[100% × (100% − 10%)] + 10% = 100%

Flow Loop – The flow loop maintains 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 = 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 2064, 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, 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 = 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.

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.

CAUTION:

If using electric heat, the 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 minimum airflows to zero.

Hot Water Auxiliary Heat – If AUX HTG TYPE = HW, the application controls auxiliary hot water heat. The heating loop modulates the heating valve point, VALVE COMD (Point 52) 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 = 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.

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

Sequencing Logic(optional)

NOTE: The default setup for FLOW START (Point 16) is 0 and FLOW END (Point 17) is 100%. 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 from 0 to 100%. See the following three examples.

The ladder diagrams in Figure 2064-3 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 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.

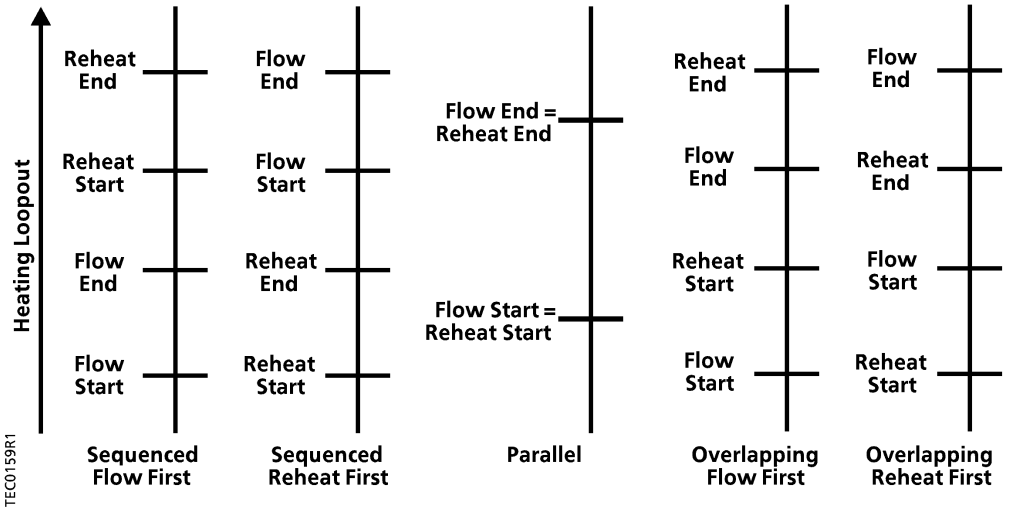


Figure 2064-3. Sequenced, Parallel, and Overlapping Flow Loop Operations with Hot Water Reheat.

For simplicity, assume that in these examples:

- HTG FLOW MIN (Point 33) = 0 CFM
- AUX HTG USED (Point 82) = YES,
- AUX HTG TYPE (Point 83) = HW
- There is a hot water valve for auxiliary heat. (When this is done, FLOW STPT (Point 93) will equal 0 when HTG LOOPOUT = 0).

Example 1

Assume that your system has a hot water valve that is to operate in *sequence* with the flow loop. If,

- FLOW START (Point 16) = 0%
- FLOW END (Point 17) = 50%
- REHEAT START (Point 22) = 50%
- REHEAT END (Point 23) = 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%, VALVE COMD (Point 52) will equal 0% open.
- When HTG LOOPOUT = 75%, VALVE COMD (Point 52) will equal 50% open.
- When HTG LOOPOUT = 100%, VALVE COMD (Point 52) 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) = 0%
- FLOW END (Point 17) = 100%
- REHEAT START (Point 22) = 0%
- REHEAT END (Point 23) = 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%, VALVE COMD (Point 52) will equal 0% open.
- When HTG LOOPOUT = 50%, VALVE COMD (Point 52) will equal 50% open.
- When HTG LOOPOUT = 100%, VALVE COMD (Point 52) 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) = 0%
- FLOW END (Point 17) = 75%
- REHEAT START (Point 22) = 25%
- REHEAT END (Point 23) = 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%, VALVE COMD (Point 52) will equal 0% open.
- When HTG LOOPOUT = 62.5%, VALVE COMD (Point 52) will equal 50% open.
- When HTG LOOPOUT = 100%, VALVE COMD (Point 52) 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 start-up. Depending on the value of CAL SETUP, calibration may be set to take place automatically or manually when the override switch on the room temperature sensor is pressed. If CAL AIR (Point 94) = YES, calibration is in progress. The dampers are commanded closed simultaneously to get zero airflow readings during calibration.

- For a controller without an Autozero Module (CAL MODULE (Point 87) = NO).

Hot Water Valve – Calibration of a hot water valve (if used) is performed simultaneously with calibration of the air velocity transducer and is accomplished by commanding the valve closed.

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

Fail-safe Operation

If the air velocity sensor point, AIR VOLUME (Point 35) is failed, TOT DMP CMD (Point 48) is set equal to FLOW STPT (Point 93). This causes the volume damper to be controlled pressure dependently by the temperature loop currently under control.

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

Application Notes

1. If temperature variations 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 FLOW (Point 75) is oscillating while FLOW STPT (Point 93) is constant, the flow loop requires tuning. See *APOGEE Automation Maintenance and Troubleshooting Procedures* on InfoLink for more information.

2. The Dual Duct Controller – One Air Velocity Sensor – Electronic Output, as shipped from the factory, keeps all associated equipment OFF. See the *Equipment Controllers* section in the *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 3 and DO 4 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 2064 is shown in Figure 2064-4 and Figure 2064-5.

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

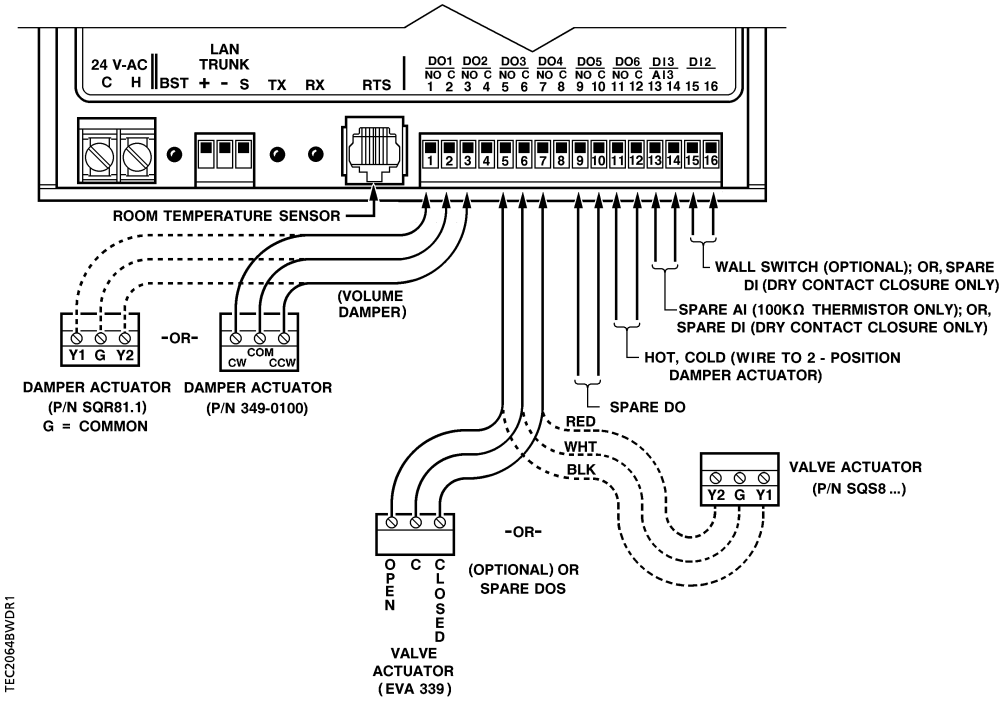


Figure 2064-4. Application 2064 Wiring Diagram with Hot Water Auxiliary Heat.

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

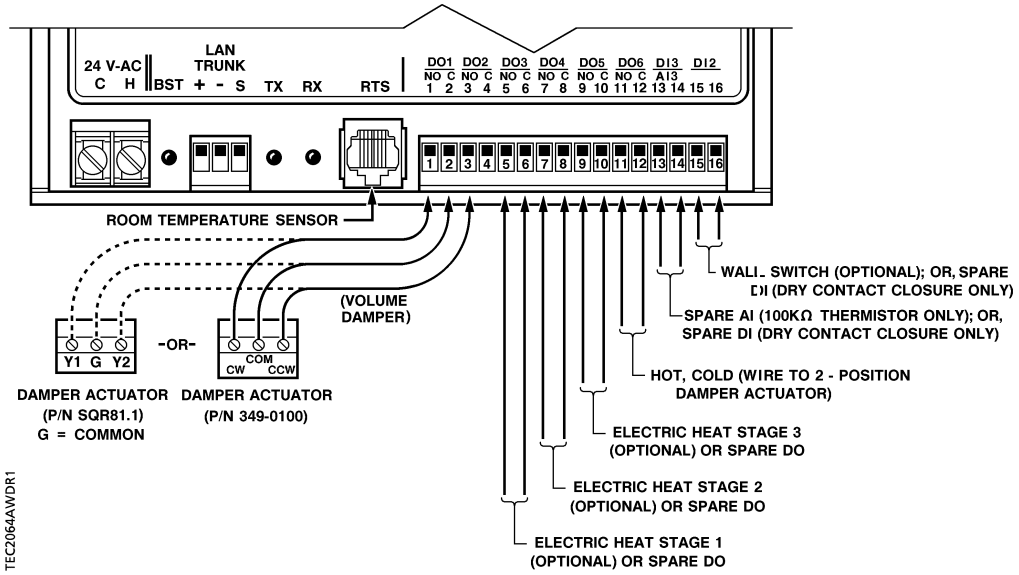


Figure 2064-5. Application 2064 Wiring Diagram with Electric Auxiliary Heat.

Table 2064-1. Point Database for Application 2064.

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	2092	–	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	DAY CLG STPT	74.000 (23.449)	DEG F (DEG C)	0.250 (0.140)	48.000 (8.889)	–	–
07	DAY HTG STPT	70.000 (21.209)	DEG F (DEG C)	0.250 (0.140)	48.000 (8.889)	–	–
08	NGT CLG STPT	82.000 (27.929)	DEG F (DEG C)	0.250 (0.140)	48.000 (8.889)	–	–
09	NGT 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)	–	–
16	FLOW START	0.000	PCT	0.400	0.000	–	–
17	FLOW END	100.000	PCT	0.400	0.000	–	–
18	WALL SWITCH	NO	–	–	–	YES	NO
{19}	DI OVRD SW	OFF	–	–	–	ON	OFF
20	OVRD TIME	0.000	HRS	1.000	0.000	–	–
21	NGT OVRD	NIGHT	–	–	–	NIGHT	DAY
22	REHEAT START	50.000	PCT	0.400	0.000	–	–
23	REHEAT END	100.000	PCT	0.400	0.000	–	–
{24}	DI 2	OFF	–	–	–	ON	OFF
{25}	DI 3	OFF	–	–	–	ON	OFF

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.

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{29}	DAY.NGT	DAY	–	–	–	NIGHT	DAY

Table 2064-1. Point Database for Application 2064.

Point Number	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
31	CLG FLOW MIN	220.000 (103.818)	CFM (LPS)	4.000 (1.888)	0.000	–	–
32	CLG FLOW MAX	2200.000 (1038.180)	CFM (LPS)	4.000 (1.888)	0.000	–	–
33	HTG FLOW MIN	220.000 (103.818)	CFM (LPS)	4.000 (1.888)	0.000	–	–
34	HTG FLOW MAX	2200.000 (1038.180)	CFM (LPS)	4.000 (1.888)	0.000	–	–
{35}	AIR VOLUME	0.000	CFM (LPS)	4.000 (1.888)	0.000	–	–
36	FLOW COEFF	1.000	–	0.010	0.000	–	–
{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}	HTG.CLG	CLG	–	–	–	HTG	CLG
{48}	TOT DMP CMD	0.000	PCT	0.400	0.000	–	–
{49}	TOT DMP POS	0.000	PCT	0.400	0.000	–	–
51	MTR1 TIMING	95.000	SEC	1.000	0.000	–	–
{52}	VALVE COMD	0.000	PCT	0.400	0.000	–	–
{53}	VALVE POS	0.000	PCT	0.400	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	–	–
63	CLG P GAIN	20.000 (36.000)	–	0.250 (0.450)	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.

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64	CLG I GAIN	0.012 (0.022)	–	0.006 (0.011)	0.000	–	–
65	CLG D GAIN	0.000	–	2.000 (3.600)	0.000	–	–

Table 2064-1. Point Database for Application 2064.

Point Number	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
66	CLG BIAS	50.000	PCT	0.400	0.000	–	–
67	HTG P GAIN	10.000 (18.000)	–	0.250 (0.450)	0.000	–	–
68	HTG I GAIN	0.012 (0.022)	–	0.006 (0.011)	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	FLOW P GAIN	0.000	–	0.250	0.000	–	–
72	FLOW I GAIN	0.018	–	0.006	0.000	–	–
73	FLOW D GAIN	0.000	–	2.000	0.000	–	–
{75}	FLOW	0.000	PCT	1.000	0.000	–	–
{76}	CTL FLOW MIN	220.000 (103.818)	CFM (LPS)	4.000 (1.888)	0.000	–	–
{77}	CTL FLOW MAX	2200.000 (1038.180)	CFM (LPS)	4.000 (1.888)	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	HW	–	–	–	ELEC	HW
86	SWITCH TIME	10.000	MIN	1.000	0.000	–	–
88	STAGE COUNT	1.000	–	1.000	0.000	–	–
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	–	–

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.

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{92}	CTL STPT	74.000 (23.449)	DEG F (DEG C)	0.250 (0.140)	48.000 (8.889)	–	–
{93}	FLOW STPT	0.000	PCT	1.000	0.000	–	–
{94}	CAL AIR	NO	–	–	–	YES	NO
95	CAL SETUP	4.000	–	1.000	0.000	–	–

Table 2064-1. Point Database for Application 2064.

Point Number	Descriptor	Factory Default (SI Units)	Engr. Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
96	CAL TIMER	12.000	HRS	1.000	0.000	–	–
97	DUCT AREA	1.000 (0.093)	SQ. FT (SQ M)	0.025 (0.002)	0.000	–	–
98	LOOP TIME	5.000	SEC	1.000	0.000	–	–
{99}	ERROR STATUS	0.000	–	1.000	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.