

SIEMENS



Terminal Box Controller— Electronic Output

VAV Cooling Only

Application 20

Application Note

(Firmware Revision VV06)



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Overview

In Application 20, the controller modulates the supply air damper of the terminal box for cooling. In order for it to work properly, the central air handling unit must provide cool supply air.

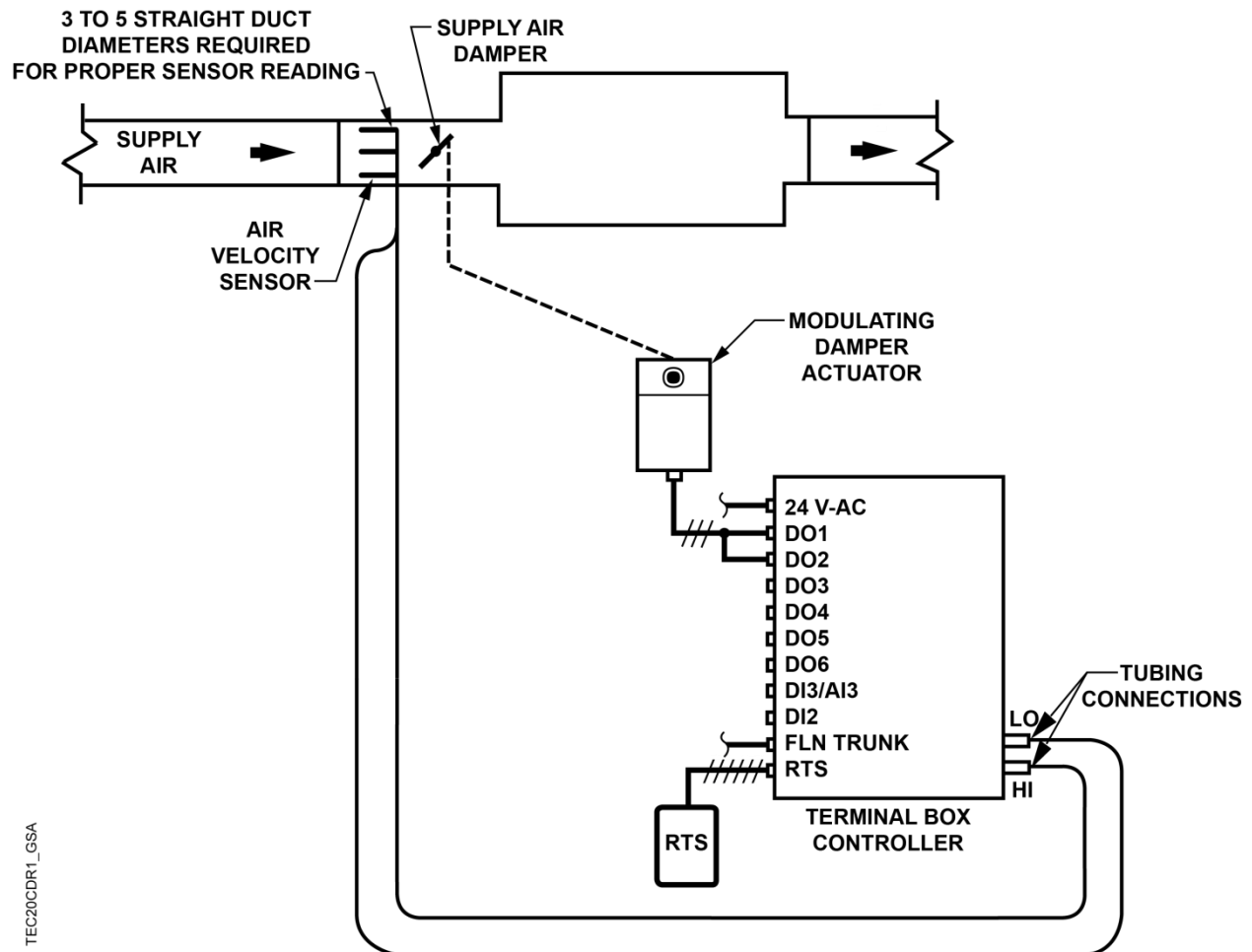
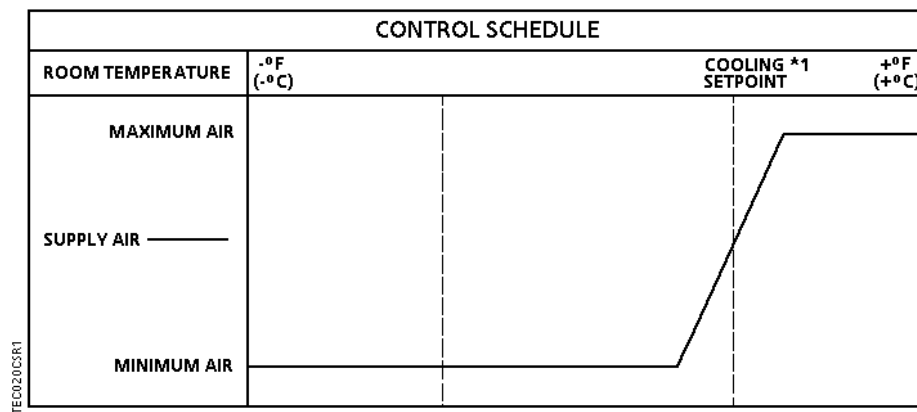


Figure 20-1. Application 20 Control Drawing.



1. See Sequence of Operation, *Cooling Setpoints*.

Figure 20-2. Application 20 Control Schedule.

Hardware Outputs

Damper Actuator

Hardware Inputs

Air Velocity Sensor

Room Temperature Sensor

Point Display

Table 20-1 presents point display information for Application 20.

Ordering Notes

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

Terminal Box Controller—Electronic Output (540-100N-GS)

Room Temperature Sensor

Damper Actuator

Sequence of Operation

Application 20 modulates the supply air damper of the terminal box for cooling. In order for it to work properly, the central air handling unit must provide cool supply air.

Day and Night Modes

In STAND-ALONE mode, the Terminal Box Controller—Electronic Output, stays in DAY mode all the time. If the controller is connected to a field panel, the field panel can automatically send a command to switch the controller between DAY and NIGHT modes.

When the override switch on the room sensor is pressed during NIGHT mode, the controller switches to DAY mode for the time set in OVRD TIME (Point 20). The controller returns to NIGHT mode after OVRD TIME elapses.

The override switch on the room sensor will only have an effect on the controller when the controller is in NIGHT mode.

Cooling Setpoints

In NIGHT mode, the cooling setpoint is NGT CLG STPT (Point 8).

In DAY mode, the cooling setpoint is determined by whether or not there is a setpoint dial on the room sensor.

If there is not a setpoint dial, the cooling setpoint is DAY CLG STPT (Point 6).

If there is a setpoint dial, its value is stored in RM STPT DIAL (Point 13). To use this value, STPT DIAL (Point 14) must be set to YES. The cooling setpoint is then set equal to RM STPT DIAL, provided the value shown on the dial is between RM STPT MIN (Point 11) and RM STPT MAX (Point 12). If the value is less than RM STPT MIN, RM STPT MIN will be the setpoint. If the value is greater than RM STPT MAX, RM STPT MAX will be the setpoint. The current setpoint is then stored in CTL STPT (Point 92) and is the temperature setpoint used by the controller.

Control Loops

The terminal box is controlled by two PID control loops: a temperature loop and a flow loop.

Temperature Loop

The temperature loop is a cooling loop that maintains the cooling setpoint, CTL STPT (Point 92). The output of the cooling loop, CLG LOOPOUT (Point 79), becomes the setpoint for the flow loop, FLOW STPT (Point 93).

Advanced PID algorithm for the temperature control loops is employed to provide stability and to reduce unnecessary changes in the Flow setpoint when the room temperature is at or near the room temperature setpoint.

Flow Loop

The flow loop maintains FLOW STPT (Point 93) by modulating the supply air damper, DMPR COMD (Point 48). The flow loop maintains the airflow between the limits set in CTL FLOW MIN (Point 76) and CTL FLOW MAX (Point 77).

FLOW (Point 75) is the input value of the flow loop. It is calculated as a percentage based on where AIR VOLUME (Point 35) is between CTL FLOW MIN (Point 76) and CTL FLOW MAX (Point 77).

If AIR VOLUME (Point 35) = CTL FLOW MIN (Point 76), FLOW (Point 75) = 0%

If AIR VOLUME (Point 35) = CTL FLOW MAX (Point 77), FLOW (Point 75) = 100%

In addition to the existing options for floating control actuator full stroke actions; all floating control actuators are provided with additional logic to fully drive open or closed when commanded to 100% or 0%.

Application Note

If temperature swings in the room are excessive or if there is trouble maintaining the setpoint, the cooling loop will require tuning. If the damper is oscillating while FLOW STPT (Point 93) is constant, the flow loop requires tuning. See *APOGEE Automation Service Procedures* on InfoLink for more information.

**NOTE:**

The Terminal Box Controller, as shipped from the factory, keeps all associated equipment OFF. The controller and its equipment are released to application control at startup.

**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

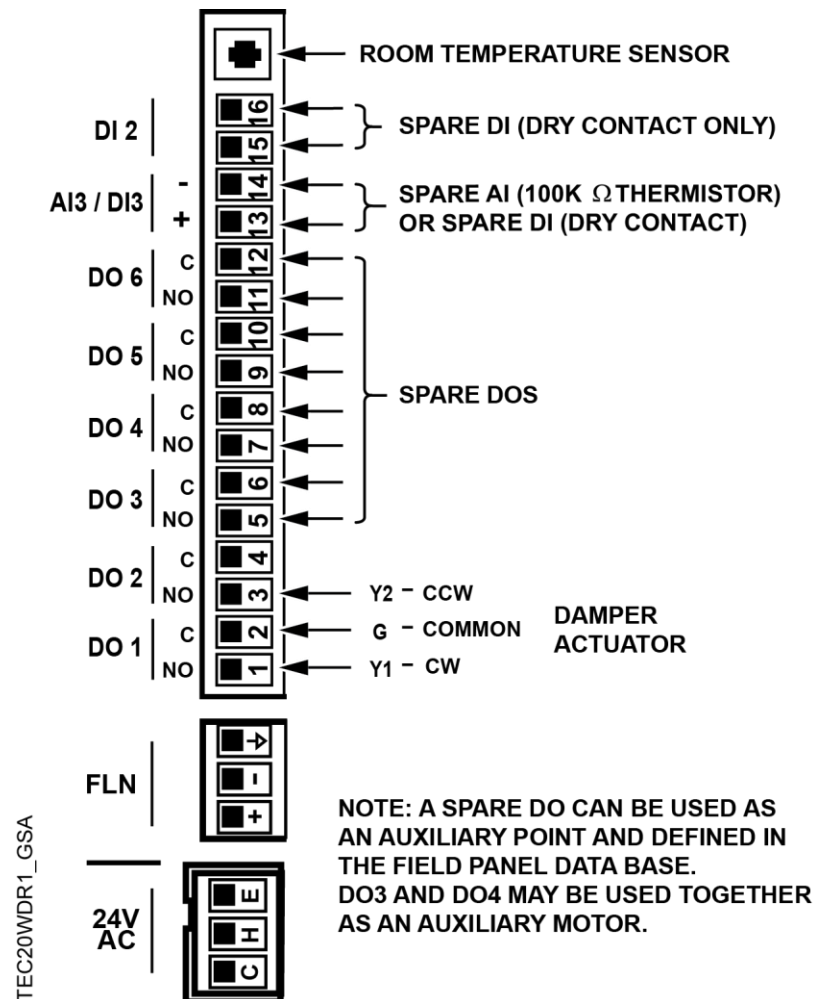


Figure 20-3. Wiring Diagram for Application 20.

Table 20-1. Point Database for Application 20.

Point Number	Descriptor	Factory Default (metric)	Engr. Units (metric)	Slope (metric)	Intercept (metric)	On Text	Off Text
01	CTLR ADDRESS	99	–	1	0	–	–
02	APPLICATION	91	–	1	0	–	–
{04}	ROOM TEMP	74.00 (23.45)	DEG F (DEG C)	0.25 (0.14)	48.00 (8.89)	–	–
06	DAY CLG STPT	74.00 (23.45)	DEG F (DEG C)	0.25 (0.14)	48.00 (8.89)	–	–
08	NGT CLG STPT	82.00 (27.93)	DEG F (DEG C)	0.25 (0.14)	48.00 (8.89)	–	–
11	RM STPT MIN	55.00 (12.81)	DEG F (DEG C)	0.25 (0.14)	48.00 (8.89)	–	–
12	RM STPT MAX	90.00 (32.41)	DEG F (DEG C)	0.25 (0.14)	48.00 (8.89)	–	–
{13}	RM STPT DIAL	74.00 (23.45)	DEG F (DEG C)	0.25 (0.14)	48.000 (8.89)		–
14	STPT DIAL	NO	–	–	–	YES	NO
{15}	AUX TEMP	74.00 (23.66)	DEG F (DEG C)	0.5 (0.28)	37.5 (3.06)	–	–
{19}	DI OVRD SW	OFF	–	–	–	ON	OFF
20	OVRD TIME	0	HRS	1	0	–	–
{21}	NGT OVRD	NIGHT	–	–	–	NIGHT	DAY
{24}	DI 2	OFF	–	–	–	ON	OFF
{25}	DI 3	OFF	–	–	–	ON	OFF
{29}	DAY.NGT	DAY	–	–	–	NIGHT	DAY
31	CLG FLOW MIN	219.607849 (1115.576538)	CFM (LPS)	15.686275 (79.684036)	0.000000	–	–
32	CLG FLOW MAX	2196.078369 (11155.764648)	CFM (LPS)	15.686275 (79.684036)	0.000000	–	–
{35}*	AIR VOLUME *	0.000000	CFM (LPS)	15.686275 (79.684036)	0.000000	–	–
36	FLOW COEFF	1.00	–	0.01	0.00	–	–
{41}	DO 1	OFF	–	–	–	ON	OFF
{42}	DO 2	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. * If this point is unbundled, you must enter a new slope at the field panel in order to display accurate readings in cfm (lps). Calculate the new slope as follows: New Slope = Default Slope × Duct Area.
4. Point numbers that appear in brackets { } may be unbundled at the field panel.

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Table 20-1. Point Database for Application 20.

Point Number	Descriptor	Factory Default (metric)	Engr. Units (metric)	Slope (metric)	Intercept (metric)	On Text	Off Text
{43}	DO 3	OFF	–	–	–	ON	OFF
{44}	DO 4	OFF	–	–	–	ON	OFF
{45}	DO 5	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	–	–
{52}	MTR2 COMD	0.0	PCT	0.4	0.0	–	–
{53}	MTR2 POS	0.0	PCT	0.4	0.0	–	–
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	20.00 (36.00)	–	0.25 (0.45)	0.00	–	–
64	CLG I GAIN	0.012 (0.02 16)	–	0.006 (0.0108)	0.000	–	–
65	CLG D GAIN	0	–	2 (3.600)	0	–	–
66	CLG BIAS	0.0	PCT	0.4	0.0	–	–
71	FLOW P GAIN	0.25	–	0.25	0.000	–	–
72	FLOW I GAIN	0.018	–	0.006	0.000	–	–
73	FLOW D GAIN	0	–	2	0	–	–
74	FLOW BIAS	50.0	PCT	0.4	0.0	–	–
{75}	FLOW	-100	PCT	2	-100	–	–
{76}*	CTL FLOW MIN*	219.607849 (1115.576538)	CFM (LPS)	15.686275 (79.684036)	0.000000	–	–
{77}*	CTL FLOW MAX*	2196.078369 (11155.764648)	CFM (LPS)	15.686275 (79.684036)	0.000000	–	–

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. * If this point is unbundled, you must enter a new slope at the field panel in order to display accurate readings in cfm (lps). Calculate the new slope as follows: New Slope = Default Slope × Duct Area.
4. Point numbers that appear in brackets { } may be unbundled at the field panel.

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Table 20-1. Point Database for Application 20.

Point Number	Descriptor	Factory Default (metric)	Engr. Units (metric)	Slope (metric)	Intercept (metric)	On Text	Off Text
{78}	CTL TEMP	74.00 (23.45)	DEG F (DEG C)	0.25 (0.14)	48.00 (8.89)	–	–
{79}	CLG LOOPOUT	0.0	PCT	0.4	0.0	–	–
{91}	TOTAL VOLUME	0.000000	CF (L)	15.686275 (4781.176758)	0.000000	–	–
{92}	CTL STPT	74.00 (23.45)	DEG F (DEG C)	0.25 (0.14)	48.00 (8.89)	–	–
{93}	FLOW STPT	76	PCT	2	-100	–	–
{94}	CAL AIR	NO	–	–	–	YES	NO
95	CAL SETUP	1	–	1	0	–	–
96	CAL TIMER	12	HRS	1	0	–	–
97	DUCT AREA	1.000 (0.092903)	SQ FT (SQ M)	0.025 (0.002323)	0.000000	–	–
98	LOOP TIME	5	SEC	1	0	–	–
{99}	ERROR STATUS	–	–	–	–	–	–

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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