



TEC Custom Solution Applications 2378 and 2090

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Application 2378

Damper with Dial Control — Electronic Output

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Overview

In Application 2378, the damper is adjusted as the damper dial is turned. In order for the terminal box to work properly, the central air handling unit must provide supply air. Refer to Figures 2378-1 and 2378-2.

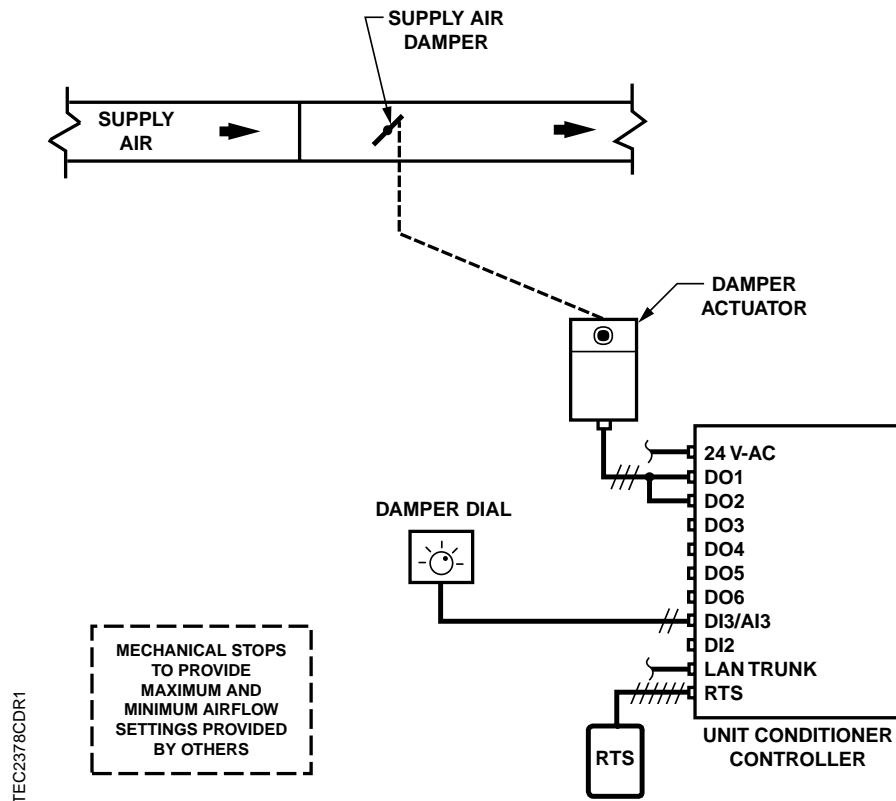
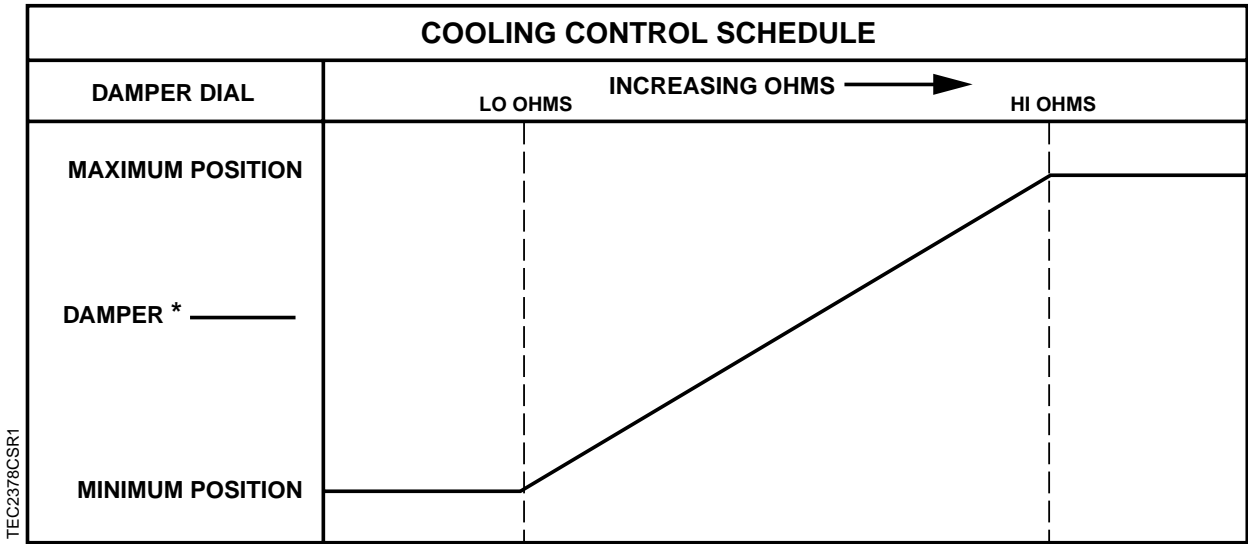


Figure 2378-1. Application 2378 Control Drawing.



* DAYTIME DAMPER OPERATION. AT NIGHT, DAMPER IS 100% OPEN.

Figure 2378-2. Application 2378 Control Schedule.

Hardware Inputs

Analog

- Room temperature sensor (optional)
- Room temperature set point dial (optional)

Digital

- Night mode override (optional)
- Damper dial

Hardware Outputs

Analog

- None

Digital

- Damper actuator

Ordering Notes

TEC Custom Solution number 245.

Point Database

Table 2378-1 presents the point database information for Application 2378.

Sequence of Operation

The following paragraphs present the sequence of operation for Application 2378, “Damper with Dial Control — Electronic Output.”

Day and Night Modes

The day/night status of the space is determined by DAY.NGT (Point 29). If the controller is operating stand-alone, then the controller stays in day mode all the time. If the controller is operating with centralized control (connected to a field panel), then the field panel can send an operator or PPCL command to override the status of DAY.NGT. Refer to *Powers Process Control Language (PPCL) User's Manual* (125-1896) and *Field Panel User's Manual* (125-1895) for more information.

In this application, the DAY.NGT point is only an input into the night override feature. It does not do anything else.

Night Mode Override Switch

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

The night override feature controls the value of NGT OVRD, but this application does not use NGT OVRD for anything.

Damper Control Logic

Turning the damper dial adjusts the resistance value of a potentiometer. The damper control logic converts the potentiometer resistance value into a damper position.

When the potentiometer's resistance value is equal to or less than LO OHMS (Point 30), DMPR COMD (Point 48) is set equal to DMPR MIN POS (Point 32).

When the potentiometer's resistance value is equal to or greater than HI OHMS (Point 31), DMPR COMD is set equal to DMPR MAX POS (Point 33).

When the potentiometer's resistance value is between LO OHMS and HI OHMS, DMPR COMD will be set between DMPR MIN POS and DMPR MAX POS using linear interpolation.

**CAUTION:**

If LO OHMS is set greater than HI OHMS, the damper dial works backwards.

Calibration

The controller will regularly calibrate the damper based on the value of CAL TIMER (Point 96). A value of 12 (the default setting) indicates that the controller will calibrate the actuators once every 12 hours.

Calibration consists of driving the damper closed and then resetting the value of DMPR POS (Point 49). The damper is then released to normal control.

NOTE: If mechanical stops are installed to provide minimum airflow, then the damper cannot be correctly calibrated.

Fail-safe Operation

If the damper dial fails, then the controller operates using the last known resistance value.

Application Notes

1. The Unit Conditioner Controller, as shipped from the factory, keeps all associated equipment OFF. Refer to *Equipment Controllers* in the *APOGEE Automation Start-up Procedures* in InfoLink for information on how to release the controller and its equipment to application control.
2. 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. DO 5 and DO 6 may also be used as auxiliary motor points. If using a pair of spare DOs to control a motor, make sure that the motor setup, motor timing, and motor rotation angle are enabled correctly before unbundling MTR 2 COMD (Point 52) or MTR 3 COMD (Point 37). Refer to the *APOGEE Automation Start-up Procedures* in InfoLink for more information.

Wiring Diagram

The point wiring for Application 2378 is shown in Figure 2378-3.

**CAUTION:**

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

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

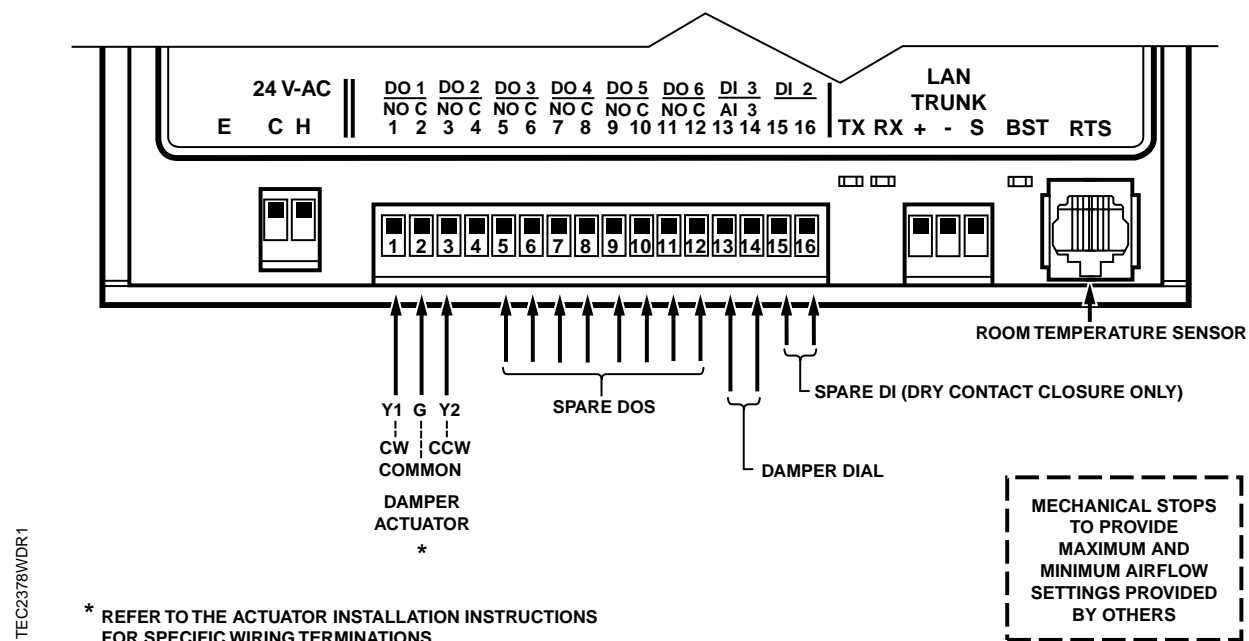


Figure 2378-3. Application 2378 Wiring Diagram.

Table 2378-1. Point Database for Application 2378.

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	2090	--	1	0	--	--
{04}	ROOM TEMP	74.0 (23.44888)	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)	--	--
{15}	DMPR DIAL	73	K OHM	1	0	--	--
{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
{29}	DAY.NGT	DAY	--	--	--	NIGHT	DAY
30	LO OHMS	20	K OHM	1	0	--	--
31	HI OHMS	120	K OHM	1	0	--	--
32	DMPR MIN POS	0.0	PCT	0.4	0.0	--	--
33	DMPR MAX POS	100.0	PCT	0.4	0.0	--	--
{37}	MTR 3 COMD	0.0	PCT	0.4	0.0	--	--
{38}	MTR 3 POS	0.0	PCT	0.4	0.0	--	--
39	MTR 3 TIMING	130	SEC	1	0	--	--
{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
{48}	DMPR COMD	0.0	PCT	0.4	0.0	--	--
{49}	DMPR POS	0.0	PCT	0.4	0.0	--	--
51	MTR 1 TIMING	130	SEC	1	0	--	--
{52}	MTR 2 COMD	0.0	PCT	0.4	0.0	--	--
{53}	MTR 2 POS	0.0	PCT	0.4	0.0	--	--
55	MTR 2 TIMING	130	SEC	1	0	--	--
56	MTR1 ROT ANG	90	--	1	0	--	--
57	MTR2 ROT ANG	90	--	1	0	--	--

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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Table 2378-1. Point Database for Application 2378.

Point Number	Descriptor	Factory Default (SI Units)	Engr Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
57	MTR2 ROT ANG	90	--	1	0	--	--
58	MTR SETUP	0	--	1	0	--	--
59	DO DIR. REV	0	--	1	0	--	--
96	CAL TIMER	12	HRS	1	0	--	--
98	LOOP TIME	5	SEC	1	0	--	--
{99}	ERROR STATUS	0	--	1	0	--	--

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.

Application 2090

Unit Conditioner with Dial Control of Damper — Electronic Output (Slave Mode)

This document contains the following topics:

- Overview
- Using Auxiliary Points
- Using the Controller as a Point Extension Device
- Point Database

Overview

Application 2090 is the slave mode application for the Unit Conditioner Controller with Dial Control of Damper – Electronic Output (P/N 540-408). Slave mode is the default application that comes up when power is first applied to the controller. Slave mode provides no control. Its purpose is to allow the operator to check equipment before a control application is put in effect and to set some basic controller parameters (CTLR ADDRESS, APPLICATION, etc.).

Using Auxiliary Points

It is possible to have extra points available on a Unit Conditioner Controller with Dial Control of Damper – Electronic Output in addition to the ones used by the current application that is running in the controller. If these extra points are to be controlled by a field panel, then they must be unbundled at the field panel.

Using the Controller as a Point Extension Device

If the controller is *only* used as a point extension device, with no control application in affect, then its application must be set to slave mode **and** the points must be unbundled at the field panel. All of these points must be controlled from the field panel to be used. Refer to Table 2090-2 for point database information.

All DOs may be used as separate DOs. They may also be used in pairs (DO 1 and DO 2; DO 3 and DO 4; DO 5 and DO 6) to control a motor as shown in the example following Table 2090-1.

NOTE: If using either a motor or DOs as auxiliary points, then MTR SETUP (Point 58) must be set to the correct value. Refer to Table 2090-1. If using a pair of DOs to control a motor, then the DOs cannot be unbundled or commanded separately. Only MTR 1 COMD (Point 48), MTR 2 COMD (Point 52), and MTR3 COMD (Point 37) can be unbundled to control the motors.

Table 2090-1. Motor Enable/Reverse Values for MTR SETUP (Point 58).

	Motor 1 Enabled			Motor 1 Enabled and Reversed			Motor 1 Not Used		
	Motor 2 Not Used	Motor 2 Enabled	Motor 2 Enabled and Reversed	Motor 2 Not Used	Motor 2 Enabled	Motor 2 Enabled and Reversed	Motor 2 Not Used	Motor 2 Enabled	Motor 2 Enabled and Reversed
Motor 3 Not Used	1	5	13	3	7	15	0	4	12
Motor 3 Enabled	17	21	29	19	23	31	16	20	28
Motor 3 Enabled and Reversed	49	53	61	51	55	63	48	52	60

Example

If using DO 1 and DO 2 as the physical terminations for a direct acting motor, then follow these steps:

1. Set MTR SETUP to **1** to enable the motor.
2. Unbundle MTR 1 COMD at the field panel to command the motor from the field panel.

For other combinations of DOs and motors, refer to the *APOGEE Automation Start-up Procedures* in InfoLink for complete motor enable/reverse procedures.

Table 2090-2. Point Database for Application 2090.

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	2090	--	1	0	--	--
{04}	ROOM TEMP	74.0 (23.44888)	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)	--	--
{15}	AUX TEMP	74.0 (23.495556)	DEG F (DEG C)	0.5 (0.28)	37.5(3.055556)	--	--
18	WALL SWITCH	NO	--	--	--	YES	NO
{19}	DI OVRD SW	OFF	--	--	--	ON	OFF
{24}	DI 2	OFF	--	--	--	ON	OFF
{25}	DI 3	OFF	--	--	--	ON	OFF
{29}	DAY.NGT	DAY	--	--	--	NIGHT	DAY
{37}	MTR 3 COMD	0.0	PCT	0.4	0.0	--	--
{38}	MTR 3 POS	0.0	PCT	0.4	0.0	--	--
{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
{48}	MTR 1 COMD	0.0	PCT	0.4	0.0	--	--
{49}	MTR 1 POS	0.0	PCT	0.4	0.0	--	--
51	MTR 1 TIMING	130	SEC	1	0	--	--
{52}	MTR 2 COMD	0.0	PCT	0.4	0.0	--	--
{53}	MTR 2 POS	0.0	PCT	0.4	0.0	--	--
55	MTR 2 TIMING	130	SEC	1	0	--	--
56	MTR1 ROT ANG	90	--	1	0	--	--
57	MTR2 ROT ANG	90	--	1	0	--	--
58	MTR SETUP	0	--	1	0	--	--
59	DO DIR. REV	0	--	1	0	--	--
96	CAL TIMER	12	HRS	1	0	--	--
{99}	ERROR STATUS	0	--	1	0	--	--

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.