

**TEC Start-up for Custom Solutions**  
**Application 2412**

Unit Vent with Mixed Air Sequence, Dehumidification, and  
Modulating Face & Bypass Damper

**TEC 0572.11**

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## Overview

This document presents start-up procedures for a TEC Custom Solutions Unit Vent Controller — 0-10V Output designed to run Application 2412: Unit Vent with Mixed Air Sequence, Dehumidification, and Modulating Face & Bypass Damper.

- NOTES:**
1. Update each controller at the field panel immediately after you have completed the controller start-up procedures and made all other changes to the controller's point database, including tuning, etc.
  2. If free cooling is desired, add the appropriate PPCL statements at the field panel to command FREE CLG (Point 23) to ON when free cooling is available and to OFF when it is not available.
  3. In order for application 2412 to work properly, it needs to know the outside air temperature. This is done by unbundling OA TEMP (point 25) at a field panel and writing PPCL statements setting OA TEMP equal to the outside air temperature.

## Verifying Power

Verify that the controller is powered up. Check that the BST LED on the controller is flashing (Figure 1). If the BST LED does not flash ON/OFF once per second, refer to the *APOGEE Automation Service Procedures Manual* on InfoLink for troubleshooting information.

- NOTE:** The Controller Interface Software (CIS) used with this TEC must be Rev. 2.0 or greater.

## Setting Address and Application

Using the portable operator's terminal, set the controller address and application following these steps:

1. Verify that APPLICATION (Point 2) is set to 2384 (slave mode).
2. Display the STARTUP report.
3. Set CTRLR ADDRESS (Point 1) to the appropriate address number.
4. Set APPLICATION (Point 2) to 2412.

After you set the application, the controller will go through a shut-down/load sequence as it switches from slave mode to the application selected. After the application loads and the OVERVIEW report appears, change to the main report (*UDCYC II*) and continue with the following procedures.

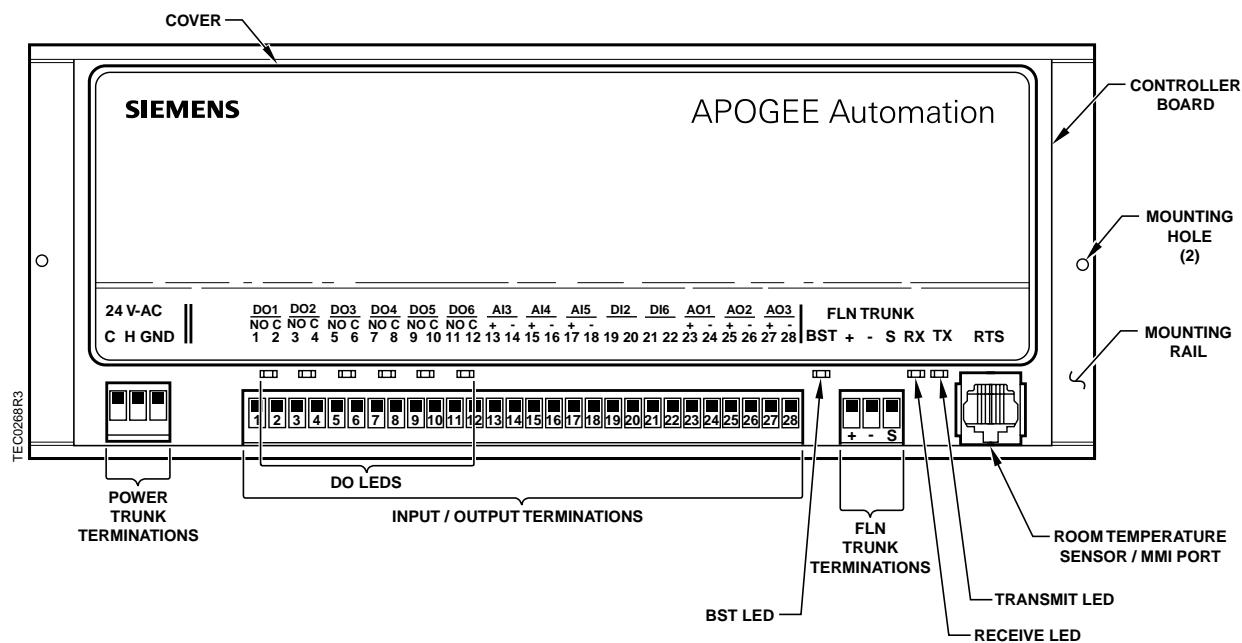


Figure 1. Unit Vent TEC with Mixed Air Sequence, Dehumidification, and Modulating Face & Bypass Damper — 0-10V Output.

## Enabling Auxiliary Radiation

If the unit has auxiliary radiation that will be controlled by DO 1, set AUX.NOAUX (Point 50) to AUX. For all other units, leave AUX.NOAUX at its default value of NOAUX.

## Setting Room Temp Set Points

Follow these steps to set the room temperature set points:

1. Display the STARTUP report.
2. If the room temperature sensor has a set point dial, and if RM STPT DIAL (Point 13) will be used by the controller, set STPT DIAL (Point 14) to YES; otherwise, set it to NO.

**NOTE:** If STPT DIAL is set to YES, DAY HTG STPT (Point 7) and DAY CLG STPT (Point 6) will not be used. Instead, the value of RM STPT DIAL will be used.

3. Display the SETPOINTS report and set the following points to the appropriate values:
  - DAY CLG STPT (Point 6)
  - DAY HTG STPT (Point 7)
  - NGT CLG STPT (Point 8)
  - NGT HTG STPT (Point 9)

4. If the room temperature sensor has a set point dial and the set point dial is to be used, set RM STPT MIN (Point 11) and RM STPT MAX (Point 12) for the minimum and the maximum allowable room temperature set point values, respectively. Valid values range from 55° to 95°F (13° to 35°C). Common values for these points are 65°F (18°C) for RM STPT MIN and 80°F (27°C) for RM STPT MAX.

## Setting OA Damper Min Position

1. Display the STARTUP report.
2. If the minimum position for the outdoor air damper is a value other than the default value of 14.8%, set OADPR MINPOS (Point 10) to the desired value.

## Setting Override Time

If using night override, set OVRD TIME (Point 20) to the number of whole hours that an override should last. Otherwise, leave OVRD TIME at its default value of 1 (night override is disabled).

## Setting LTDT Contact Value

The TEC needs to know whether the low temperature detector is Normally Closed or Normally Opened. If it is Normally Closed, set LTDT CONTACT (Point 87) to NCLOSE. If it is Normally Opened, set LTDT CONTACT to NOPEN.

**NOTE:** If a low temperature detector is not being used, set LTDT CONTACT (Point 87) to NOPEN.

## Enabling Fan Proof

If the fan is being proofed, set PROOF USED (Point 51) to YES. Otherwise, leave PROOF USED at its default value of NO.

## Setting Fan Proof Time

If the fan is being proofed, set PROOF TIME (Point 22) to desired value. The default is 30 seconds. (PROOF TIME is the amount of time that the fan DI has to proof before the fan goes into alarm.)

## Setting Start and Span Voltages for 0-10V Actuators

Set the points listed in Table 1 to the appropriate starting voltage position and voltage range for the actuators you are using.

**NOTE:** The maximum voltage output for an AO is 10V. Therefore, the sum of the starting voltage and voltage range must not exceed 10V. The controller **will not** control the valve or damper actuator beyond 10V.

**Table 1. Start and Span Voltages for Actuators.**

	Siemens Building Technologies Actuators	Other Manufacturer's Actuators	Descriptors and Point Nos.
<b>Starting Voltage</b>	0 (default)	Check with the manufacturer	AOV1 START – 32 AOV2 START – 34 AOV3 START – 36
<b>Voltage Range</b>	10 (default)	Check with the manufacturer	AOV1 SPAN – 31 AOV2 SPAN – 33 AOV3 SPAN – 35

## Setting AO DIR.REV

If the normal (de-energized) state of all devices controlled by AOs is direct acting, leave AO DIR.REV (Point 37) at its default value of 0. Otherwise, reverse the action of the appropriate AO, or combination of AOs, as follows:

1. Add the values in Table 2 for each AO you wish to make reverse acting.
2. Set AO DIR.REV to this value.

**Table 2. AO DIR.REV Values.**

Reverse-Acting AO	Value
AO1	1
AO2	2
AO3	4

## Enabling Night Heating

If using hot water heat, leave NGT HW HTG (Point 53) at its default position of YES, which will open the hot water valve during night mode.

If using steam or electric heat, set NGT HW HTG to NO.

## Enabling Night Cooling

If cooling is desired during night mode, set NGT CLG MODE (Point 54) to YES. Otherwise, leave it at its default value of NO.

**NOTE:** For cooling only units, NGT CLG MODE **must** be set to YES to enable cooling in the night mode.

## Setting Relative Humidity HI/LO Limits

Set RH HI LIMIT (Point 16) to the highest relative humidity desired before dehumidification is used. Set RH LO LIMIT (Point 17) to the lowest relative humidity desired before dehumidification is shut off.

## Setting DO DIR.REV

If the normal (de-energized) state of all of the devices controlled by DOs is direct acting, leave DO DIR.REV (Point 59) at its default value of 0. Otherwise, reverse the action of the devices as follows:

1. Add the values in Table 3 for each DO you wish to make reverse acting.
2. Set DO DIR.REV to this value.

**Table 3. DO DIR.REV Values.**

Reverse-Acting DO	Value
DO1	32
DO2	16
DO3	8
DO4	4
DO5	2
DO6	1

## Setting Discharge Air Temp Min Values

In the heating mode, DSH MIN TEMP (Point 94) will be set equal to HTG DIS MIN (Point 74). In the cooling mode, DSH MIN TEMP will be set equal to CLG DIS MIN (Point 75). Enter the desired values for HTG DIS MIN and CLG DIS MIN.

## Setting OAT TIME

Application 2412 will modify it's control sequence depending upon whether or not the Outside Air Temperature is greater than or less than 40 Deg. F.. This modification does not take place right away; the OA temperature must stay above (or below) 40 deg. F. for at least the amount of time stored in OAT TIME (point 27) before this modification will take place. Enter the desired value for OAT TIME.

## Setting CLG TIME

In order to minimize wear and tear on the cooling valve and in order to minimize excessive cycling, the cooling valve in Application 2412 will not be opened (or shut) as soon as the command is given to open (or shut) it. Instead, this command must remain in effect for at least the amount of time that is store in CLG TIME (point 73) before this command will take effect. Enter the desired value for CLG TIME.

## Setting OA Damper Control Type

Display the STARTUP report. Set MA CONTROL (Point 58) according to how you want the outside air damper to be controlled:

- If you want the outside air damper controlled by the mixed air PID loop, set MA CONTROL to ENABLE.
- If you want the outside air damper controlled by the heating PID LOOP in the heating mode and the cooling PID loop in the cooling mode, set MA CONTROL to DISABL.

## Setting Mixed Air Set Points

If MA CONTROL is set to ENABLE, choose the desired mixed air set points. Change to the SETPOINTS menu. Set MAX MA STPT (Point 81) to the warmest mixed air set point desired. Set MIN MA STPT (Point 82) to the coldest mixed air set point desired.

When free cooling is needed least, MA STPT (Point 03) will be set equal to MAX MA STPT. When free cooling is needed most, MA STPT will be set equal to MIN MA STPT.

## Setting Gains

Display the TUNING report. Set the P, I, and D gains for the system. Refer to Table 4.

**Table 4. Recommended P, I, and D Gains.**

<b>Hardware Configuration</b>	<b>Cooling Loop</b>	<b>Heating Loop</b>	<b>Room Loop</b>
	63 CLG P GAIN	67 HTG P GAIN	70 ROOM P GAIN
	64 CLG I GAIN	68 HTG I GAIN	71 ROOM I GAIN
	65 CLG D GAIN	69 HTG D GAIN	72 ROOM D GAIN
<b>VALVES</b>			
Steam	Does not apply.	0.4 (0.72) 0.015 (0.027) 5 (9)	2.3 (4.14) 0.00504 (0.009072) 76 (136.8)
HW	Does not apply.	0.06 (1.08) 0.02 (0.036) 15 (27)	2.3 (4.14) 0.00504 (0.009072) 76 (136.8)
CHW	1.6 (2.88) 0.05 (0.09) 10 (18)	Does not apply.	2.3 (4.14) 0.00504 (0.009072) 76 (136.8)
<b>DAMPERS</b>			
FBP Steam	Does not apply.	0.3 (0.54) 0.02 (0.036) 0	2.3 (4.14) 0.00504 (0.009072) 76 (136.8)
FBP HW	Does not apply.	0.5 (0.9) 0.03 (0.054) 0	2.3 (4.14) 0.00504 (0.009072) 76 (136.8)
FBP CHW	0.6 (1.08) 0.04 (0.072) 0	Does not apply.	2.3 (4.14) 0.00504 (0.009072) 76 (136.8)
<b>DX</b>			
DX	10 (18) 0.02 (0.036) 200 (360)	Does not apply.	Does not apply.

## Setting Mixed Air Gains

If MA CONTROL is set to ENABLE, set the P, I, and D mixed air gains for the system. Refer to Table 5.

**Table 5. Recommended Mixed Air P, I, and D Gains.**

<b>Point Number</b>	<b>Point Name</b>	<b>Value (Metric)</b>
55	MA P GAIN	5.0 (9.0)
56	MA I GAIN	0.02 (0.036)
57	MA D GAIN	0.0 (0.0)

**NOTE:** Update each controller at the field panel immediately after you have completed the controller start-up procedures and made all other changes to the controller's point database, including tuning, etc.

The Start-up is complete.