

## Controller Start-up for Custom Solutions Application 2448

### Unit Vent Heating and/or CW Cooling with Floating Control, ASHRAE Cycles I and II

TEC 0575.11

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## Before You Begin

Verify that the controller is powered up. The BST LED (Figure 1) should flash ON/OFF once per second. If it does not, see the *APOGEE Automation Service Procedures* on InfoLink.

**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.

If free cooling is desired, PPCL statements must be added at the field panel for FREE CLG (Point 23).

## Actuators

1. Set the motor timing points (Points 51, 54, and 39) to their correct run times. Check the actuators' installation instructions for run times.
2. Set MTR SETUP (Point 58) to its proper value (Table 1).
3. Verify that each actuator closes and remains closed using the damper and valve command points (48, 52, and 37). If an actuator does not close, try reversing its action by changing MTR SETUP.

If an actuator does not close completely, then it has been installed or set up incorrectly. See the actuator installation instructions, setup information, or the *APOGEE Automation Service Procedures* on InfoLink for more information.

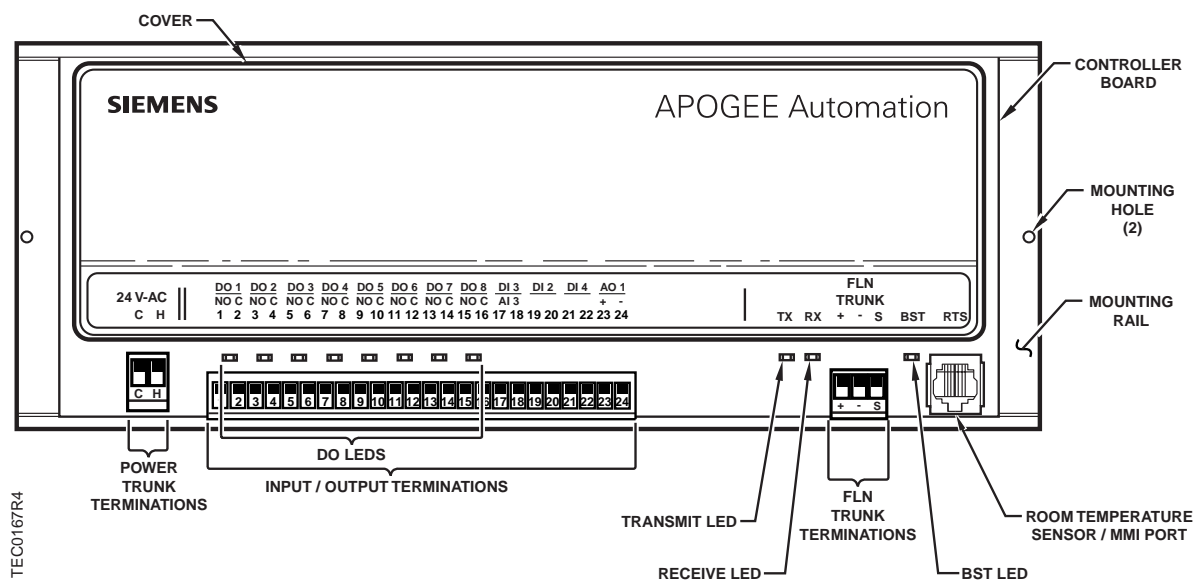


Figure 1. Unit Vent Controller with Floating Control.

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

## Controller Address and Application

1. Display the STARTUP report.
2. Set CTLR ADDRESS (Point 1) to the proper address.
3. Set APPLICATION (Point 2) to 2448.

The controller will go through a shut-down/load sequence as it switches from slave mode to application. Once the application loads, the calibration cycle begins. Wait for the calibration cycle to finish (CAL MTRS, Point 95 = NO) before continuing.

## Calibration

Review Table 2 and set CAL SETUP (Point 96) to the value that best meets your job requirements.

**Table 2. CAL SETUP Options.**

<b>CAL SETUP Options</b>	<b>Description</b>
0	Calibration occurs ONLY when CAL MTRS (Point 95) is set to YES.
1	Calibration occurs when the field panel commands a day/night mode changeover. Actual calibration is subject to a time delay of 0, 1, 2, or 3 minutes. The delay is determined by dividing the value of CTLR ADDRESS (Point 1) by 4 and using the remainder as the time delay in minutes.  <b>Example:</b> If CTLR ADDRESS = 11, then the controller will wait 3 minutes ( $11 \div 4 = 2 \text{ R}3$ ) after it receives the day/night mode changeover command before beginning the calibration routine.
2	Calibration occurs immediately after the override switch is depressed.
4 (factory default value)	Calibration occurs on the time interval set in CAL TIMER (Point 97). For example, if CAL TIMER = 12, the calibration period is 12 hours. Actual calibration is subject to a time delay based on the value of CTLR ADDRESS (see the example in Option 1).

**NOTE:** Options can be combined by summing their numbers. For example, to calibrate as in Options 1 and 2, set CAL SETUP to 3. (In all other cases, STPT DIAL should equal NO.)

## Room Temperature Setpoints

1. Display the SETPOINTS report.
2. Do one of the following:
  - If the room temperature sensor has no setpoint dial—or has one that will not be used—skip to step 5.
  - If the room temperature sensor has a setpoint dial—and this setpoint dial will be used—set STPT DIAL (Point 14) to YES and proceed with step 3.

**NOTE:** When STPT DIAL = YES, the values of DAY CLG STPT and DAY HTG STPT (Points 6 and 7) are not used. RM STPT DIAL (Point 13) is used instead.

3. Set NGT CLG STPT (Point 8) and NGT HTG STPT (Point 9) to the desired values.

4. Set RM STPT MIN (Point 11) and RM STPT MAX (Point 12) for the minimum and maximum allowable room temperature setpoint values. Valid values range from 55°F to 95°F (13°C to 35°C). Common values are 65°F (18°C) and 80°F (27°C).
5. If the room temperature sensor has no setpoint dial—or has one that will not be used—verify that STPT DIAL = NO and set the following points to the desired values:
  - DAY CLG STPT (Point 6)
  - DAY HTG STPT (Point 7)
  - NGT CLG STPT (Point 8)
  - NGT HTG STPT (Point 9)

## Damper Minimum 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) as follows:
  - ASHRAE Cycle I: OADPR MINPOS = 100%
  - ASHRAE Cycle II or III (or Nesbitt W): Consult the job documentation for the appropriate value.

## Wall Switch

If a wall switch is used for day/night control, enable it by setting WALL SWITCH (Point 18) to YES. Otherwise, verify that WALL SWITCH is set to NO (default).

## Override Time

If using night override, set OVRD TIME (Point 20) to the number of whole hours an override should last. The default value is 1. A value of zero disables night override.

## Auxiliary Radiation

If the unit has auxiliary radiation controlled by DO 7, set AUX.NOAUX (Point 22) to AUX. Otherwise, verify that AUX.NOAUX is set to NOAUX (default).

## AO 1

To use AO 1 for modulating damper control, set OA DMPR AOV1 (Point 28) to ENABLE and configure the start and span voltage points. Check the actuator's installation instructions to determine start and span voltages.

**NOTE:** The maximum output for AO 1 is 10V. The controller will not control AO 1 above 10V.

- AOV1 START (Point 32): default = 0V
- AOV1 SPAN (Point 31): default = 10V

To use AO 1 as a spare, OA DMPR AOV1 (Point 28) must be set to DISABL (default) and the start and span voltage points configured as required.

**NOTES:** For DOs 5 and 6: Unless PPCL specifies that their default firmware coding should be disabled, they will continue to output a digital floating control signal as if they were still controlling the OA damper.

On power failure recovery, AOV1 (Point 27) initiates and remains at 0 volts until a network command is received.

## AO DIR.REV

If the normal (de-energized) state of a device controlled by AO 1 is direct-acting, verify that AO DIR.REV (Point 40) is set to 0 (default). Otherwise, set AO DIR.REV to 1 to reverse the action of AO 1.

## Night Heating

For HW heat, verify that NGT HW HTG (Point 75) is set to YES (default).

For steam heat, set NGT HW HTG to NO.

## Night Cooling

To enable night cooling—even for cooling only units—set NGT CLG MODE (Point 76) to YES.

## DO DIR.REV

**NOTE:** DO DIR.REV (Point 59) configures DOs individually for direct or reverse action. To configure the action of DOs used in tandem for floating control, see Table 1 and MTR SETUP (Point 58).

If the normal (de-energized) state of all devices controlled by individual DOs is direct-acting, then leave DO DIR.REV at its default value of 0. Otherwise, see Table 3 and do the following:

1. Add the values of the DOs you want to make reverse-acting.
2. Set DO DIR.REV to this sum.

### Example

To reverse DOs 5 and 6, set DO DIR.REV to 3.

**Table 3. DO DIR.REV (Point 59) Values.**

DO 1	32
DO 2	16
DO 3	8
DO 4	4
DO 5	2
DO 6	1
DO 7	64
DO 8	128

## PID Gains

Display the TUNING report and set the P, I, and D gains.

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

Hardware Configuration	ASHRAE Cycles I and II (SI Units)							
	Cooling Loop		Heating Loop		Room Loop		Auxiliary Loop	
	63	CLG P GAIN	67	HTG P GAIN	71	ROOM P GAIN	81	AUX P GAIN
	64	CLG I GAIN	68	HTG I GAIN	72	ROOM I GAIN	82	AUX I GAIN
	65	CLG D GAIN	69	HTG D GAIN	73	ROOM D GAIN	83	AUX D GAIN
	66	CLG BIAS	70	HTG BIAS	74	ROOM BIAS	84	AUX BIAS
VALVES								
Steam	Does not apply.		0.4 (0.72) 0.015 (0.027) 5 (9) 50		2.3 (4.14) 0.00504 (0.009072) 76 (136.8) 72 (22.38)		0.4 (0.72) 0.00099 (0.001782) 50 (80) 0	
HW	Does not apply.		0.06 (1.08) 0.02 (0.036) 15 (27) 50		2.3 (4.14) 0.00504 (0.009072) 76 (136.8) 72 (22.38)		0.04 (0.72) 0.00099 (0.001782) 50 (80) 0	
CHW	1.6 (2.88) 0.05 (0.09) 10 (18) 50		Does not apply.		2.3 (4.14) 0.00504 (0.009072) 76 (136.8) 72 (22.38)		Does not apply.	

The start-up is complete.

**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.



## Application 2448 Individual Reports

**Table 5. UECYC I.II Report.**

UECYC I.II	Point Number	Descriptor
1	1	CTLR ADDRESS
2	2	APPLICATION
3	14	STPT DIAL
4	18	WALL SWITCH
5	22	AUX.NOAUX
6	76	NGT CLG MODE
7	75	NGT HW HTG
8	10	OADPR MINPOS
9	31	AOV1 SPAN
10	32	AOV1 START
11	58	MTR SETUP
12	59	DO DIR.REV
13	40	AO DIR.REV
14	51	MTR1 TIMING
15	54	MTR2 TIMING
16	39	MTR3 TIMING
18	20	OVRD TIME
19	28	OA DMPR AOV1

**Table 6. Start-up Report.**

STARTUP	Point Number	Descriptor
1	{04}	ROOM TEMP
2	{13}	RM STPT DIAL
3	{15}	DISCH TEMP
4	{05}	HEAT.COOL
5	{30}	WRMUP.COOLDN
6	{29}	DAY.NGT
7	{21}	NGT OVRD
8	{26}	LOW TEMP DET

9	{41}	DO 1
10	{42}	DO 2
11	{43}	DO 3
12	{44}	DO 4
13	{45}	DO 5
14	{46}	DO 6
15	{47}	AUX RAD
16	{50}	FAN
17	{48}	HTG VLV COMD
18	{49}	HTG VLV POS
19	{52}	CLG VLV COMD
20	{53}	CLG VLV POS
21	{37}	DMPR COMD
22	{38}	DMPR POS
23	{27}	AOV1

**Table 7. Control Report.**

CONTROL	Point Number	Descriptor
1	{29}	DAY.NGT
2	{05}	HEAT.COOL
3	6	DAY CLG STPT
4	8	NGT CLG STPT
5	7	DAY HTG STPT
6	9	NGT HTG STPT
7	11	RM STPT MIN
8	12	RM STPT MAX
9	{13}	RM STPT DIAL
10	{92}	CTL STPT
11	{94}	AUX DSH STPT
12	{93}	DISCH STPT
13	87	DSH MIN TEMP
14	88	DSH MAX TEMP
15	89	NGT DBAND
16	90	MORN DBAND
17	28	OA DMPR AOV1

Table 8. Overview Report.

OVERVIEW	Point Number	Descriptor
1	{78}	CTL TEMP
2	{92}	CTL STPT
3	{15}	DISCH TEMP
4	{93}	DISCH STPT
5	{29}	DAY.NGT
6	{05}	HEAT.COOL
7	{79}	CLG LOOPOUT
8	{80}	HTG LOOPOUT
9	{77}	AUX LOOPOUT
10	{60}	HTG OUTPUT
11	{61}	CLG OUTPUT
12	{62}	OA DMPR POS
13	{57}	AUX OUTPUT
14	{27}	AOV1
15	{41}	DO 1
16	{42}	DO 2
17	{43}	DO 3
18	{44}	DO 4
19	{45}	DO 5
20	{46}	DO 6
21	{47}	AUX RAD
22	{50}	FAN
23	{48}	HTG VLV COMD
24	{49}	HTG VLV POS
25	{52}	CLG VLV COMD
26	{53}	CLG VLV POS
27	{37}	DMPR COMD
28	{38}	DMPR POS

Table 9. Setpoints Report.

SET POINTS	Point Number	Descriptor
1	{78}	CTL TEMP
2	{92}	CTL STPT
3	{05}	HEAT.COOL
4	71	ROOM P GAIN
5	72	ROOM I GAIN
6	73	ROOM D GAIN
7	74	ROOM BIAS
8	{15}	DISCH TEMP
9	{93}	DISCH STPT
10	{94}	AUX DSH STPT
11	{79}	CLG LOOPOUT
12	63	CLG P GAIN
13	64	CLG I GAIN
14	65	CLG D GAIN
15	66	CLG BIAS
16	{80}	HTG LOOPOUT
17	67	HTG P GAIN
18	68	HTG I GAIN
19	69	HTG D GAIN
20	70	HTG BIAS
21	{77}	AUX LOOPOUT
22	{81}	AUX P GAIN
23	{82}	AUX I GAIN
24	{83}	AUX D GAIN
25	{84}	AUX BIAS
26	98	LOOP TIME