

TEC Custom Solutions

Application 2448

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

TEC 0575.08

This document contains the following topics:

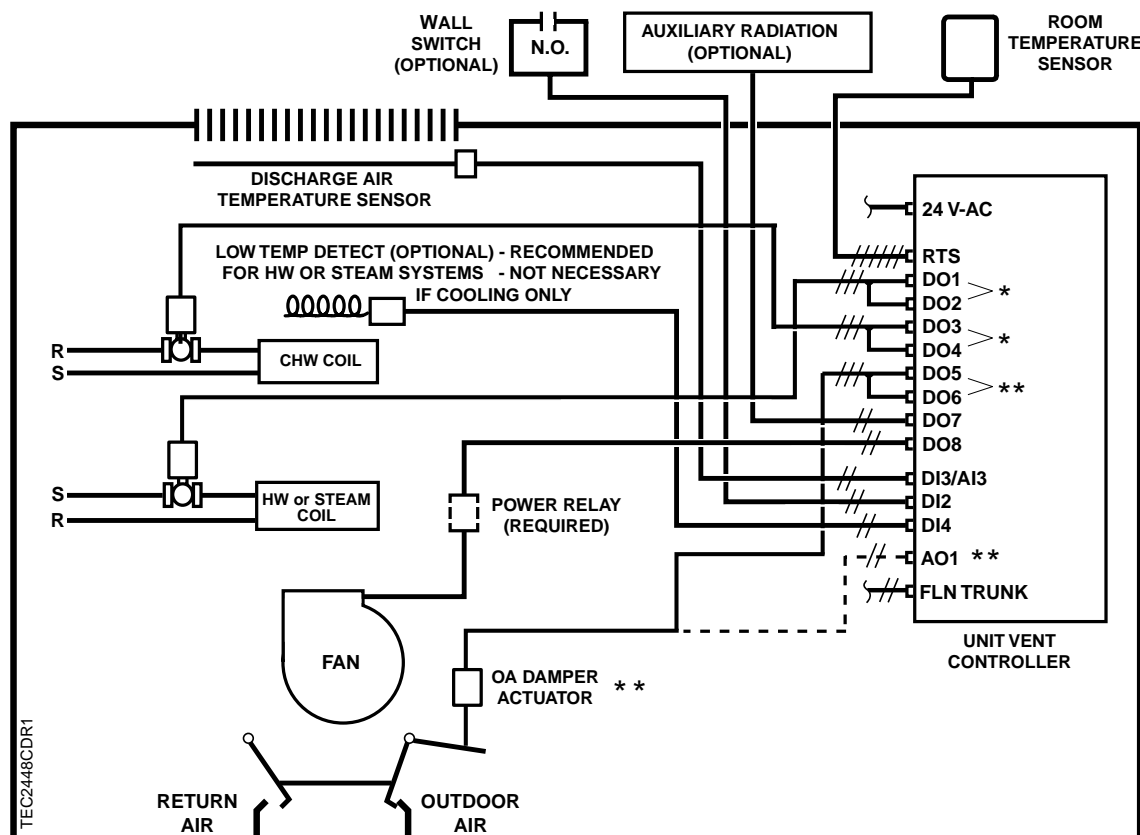
- Overview
 - Hardware Inputs
 - Hardware Outputs
 - Ordering Notes
- Sequence of Operation
 - Control Temperature Setpoints
 - Day and Night Modes
 - Night Mode Override Switch
 - Day Heating Operation
 - Day Cooling Operation
 - Night Heating Operation
 - Night Cooling Operation
 - Heating/Cooling Switchover
 - Control Loops
 - Morning Warm-Up/Cool-Down
 - Fan Operation
 - AO1 Control
 - Calibration
 - Fail-Safe Operation
- Application Notes
- Wiring Diagram
- Point Database
- Slave Mode

Overview

Application 2448 controls a unit ventilator fan and outdoor air damper (floating or analog) according to schedules defined by ASHRAE Cycles I and II, and uses floating-control actuation to control the heating and/or cooling coil(s). Room temperature is controlled by resetting discharge air temperature.

NOTE: Heating or Cooling Only units require overriding HEAT.COOL (Point 5). A low temperature detection thermostat (LTDT) is strongly recommended for hot water/steam systems.

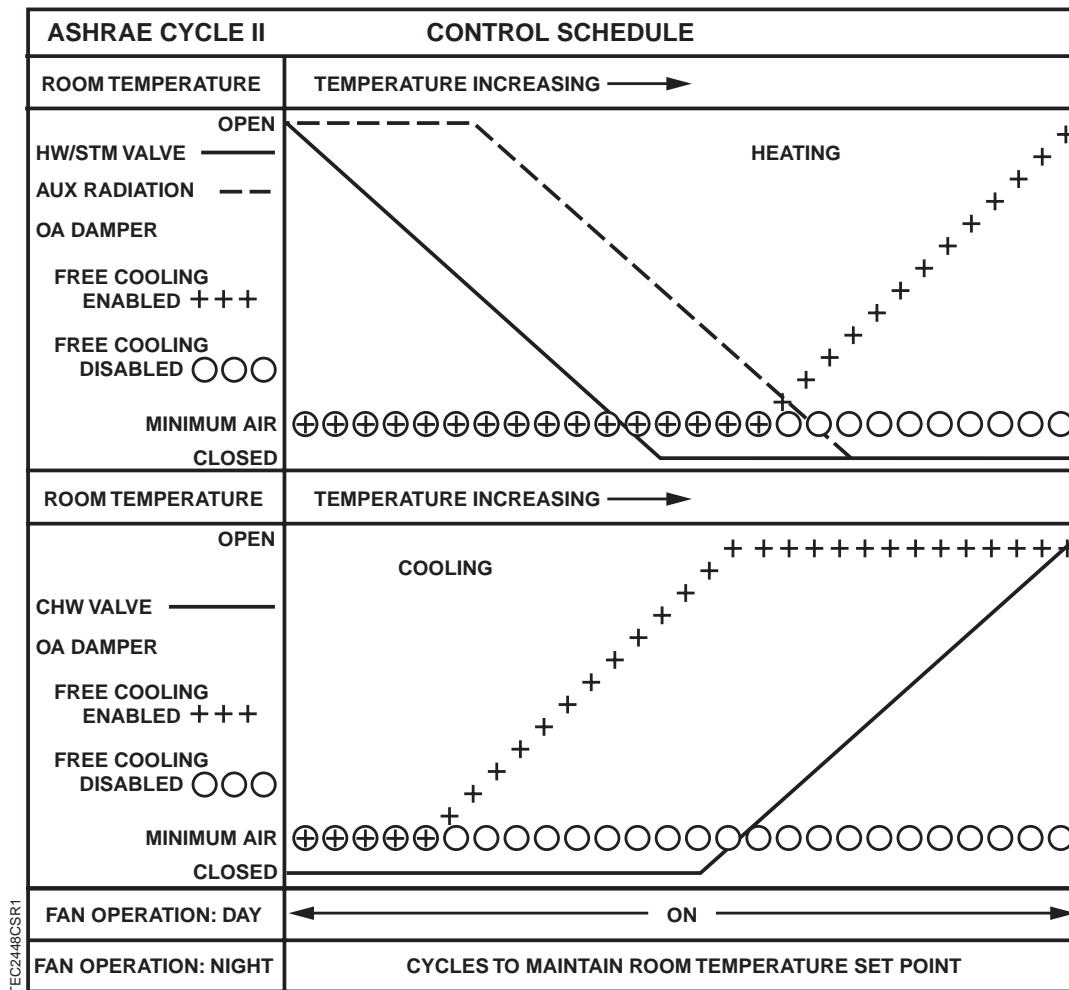
Other features include morning warm-up/cool-down, night mode override, and free-cooling. The free-cooling/ economizer function is turned on and off by the field panel using FREE CLG (Point 23). If free cooling is not available, the outdoor air damper is kept at minimum position; otherwise, it modulates in sequence with the heating and cooling actuators.



* Application 2448 can be configured to control heating only or cooling only Unit Ventilators by overriding HEAT.COOL (Point 5). If heating only, DOs 3 and 4 can be spare; if cooling only, DOs 1 and 2 can be spare.

** Application 2448 can be configured for floating (DOs 5 and 6) or modulating (0-10V from AO 1) damper control. Depending on the configuration, either AO 1 or DOs 5 and 6 can be spare.

Figure 1. Application 2448 Control Drawing.



Note: Auxiliary radiation is an independent loop that is not sequenced with other control loops.

Figure 2. Application 2448 Control Schedule.

Hardware Inputs

Analog

- Averaging air temperature sensor
- Room temperature sensor
- Room temperature setpoint dial (optional)

Digital

- Low Temperature Detection Thermostat (LTDT)
- Night mode override (optional)
- Wall switch (optional)

Hardware Outputs

Depending on your hardware configuration, the following devices can be used by this application:

Analog (0 to 10V)

- Outdoor air damper actuator (optional – use instead of DO5/6)

Digital

- Auxiliary radiation electric coil contact; or, auxiliary radiation 2-position valve actuator
- Fan
- Heating coil floating actuator (uses two DOs)
- Cooling coil floating actuator (uses two DOs)
- Outdoor/Return damper floating actuators (requires two Dos, or one 0 to 10V AOV)

Ordering Notes

Part Number 550-188A. You must order this product through the Custom Solutions Department: http://iknow.us.abatos.com/customsolutions/custom_solutions.htm

Sequence of Operation

The following paragraphs present the sequence of operation for Application 2448, *Unit Vent Heating and/or CW Cooling with Floating Control Actuation, ASHRAE Cycles I and II*.

Control Temperature Setpoints

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

Day Mode – In day mode, CTL STPT holds the value of DAY CLG STPT (Point 6) or DAY HTG STPT (Point 7). If the room temperature sensor has a setpoint dial and STPT DIAL (Point 14) is set to YES, then CTL STPT holds the value of RM STPT DIAL (Point 13).

If the setpoint dial is used and the value of RM STPT DIAL is less than the value of RM STPT MIN (Point 11), then CTL STPT holds the value of RM STPT MIN. If the value of RM STPT DIAL is greater than the value of RM STPT MAX (Point 12), then CTL STPT holds the value of RM STPT MAX.

Night Mode – In night mode, CTL STPT holds the value of NGT CLG STPT (Point 8) or NGT HTG STPT (Point 9).

NOTE: The value of CTL TEMP (Point 78) is the same as the value of 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 and WALL SWITCH (Point 18) equals 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 DI 2 is OFF (the switch is open), DAY.NGT will be set to NIGHT indicating night mode.

When WALL SWITCH equals NO, the controller does not monitor the status of the wall switch, even if one is connected to it. In this case, and if the controller is operating stand-alone, the controller stays in day mode all the time. If the controller is operating with centralized control (connected to a field panel), the field panel can send an operator or PPCL command to override the status of DAY.NGT. See the *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), then by pressing the override switch a room occupant can reset the controller to day operational mode of 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.

Only when the controller is in night mode does the override switch on the room sensor have any effect on the controller.

Day Heating Operation

In day heating operation, the controller maintains the room temperature at the value stored in CTL STPT (Point 92) by doing the following:

- Resetting the unit ventilator's discharge temperature setpoint, DISCH STPT (Point 93), based on the difference between CTL TEMP (Point 78) and CTL STPT. If CTL TEMP goes below CTL STPT, then the discharge temperature setpoint increases. If the reverse occurs, then the setpoint decreases. DISCH STPT cannot drop below the value of DSH MIN TEMP (Point 94), nor can it rise above DSH MAX TEMP (Point 95).
- Modulating the available coil control device based on the difference between the discharge temperature point, DISCH TEMP (Point 15), and DISCH STPT. If DISCH TEMP goes below DISCH STPT, the heating valve actuator opens. If DISCH TEMP goes above DISCH STPT, the heating valve actuator closes.
- Controlling auxiliary radiation (if provided) using a pulse-width modulation algorithm. The auxiliary radiation will be on for a percentage of the time held in AUX HTG TIME (Point 57). The on-time is based on the difference between DISCH STPT and AUX DSH STPT (Point 91). If DISCH STPT goes below AUX DSH STPT, then the on-time of the auxiliary radiation valve decreases. If the reverse occurs, then the on-time increases.
- Positioning the outdoor air damper as follows:
 - For ASHRAE Cycle I, OADPR MINPOS (Point 10), is set to 100%.
 - For ASHRAE Cycle II, OADPR MINPOS is set to a value less than 100% to satisfy the minimum outdoor air requirements.
 - When the coil is providing heat, the damper is positioned at its minimum setting. When the coil is not providing heat and FREE CLG (Point 23) is set to ENABLE, the damper is positioned from minimum to maximum open to provide ventilation cooling. If FREE CLG is set to DISABL, the damper is kept at minimum at all times.

Day Cooling Operation

In day cooling operation, the controller maintains the room temperature at the value stored in CTL STPT (Point 92) by doing the following:

- Resetting the unit ventilator's discharge temperature setpoint, DISCH STPT (Point 93), based on the difference between CTL TEMP (Point 78) and CTL STPT. If CTL TEMP goes below CTL STPT, then the discharge temperature setpoint increases. If the reverse occurs, then the setpoint decreases. DISCH STPT cannot drop below the value of DSH MIN TEMP (Point 94), nor can it rise above DSH MAX TEMP (Point 95).
- Modulating the available coil control device based on the difference between the discharge temperature point, DISCH TEMP (Point 15), and DISCH STPT. If DISCH TEMP goes above DISCH STPT, the cooling valve actuator opens. If DISCH TEMP goes below DISCH STPT, the cooling valve actuator closes.
- Positioning the outdoor air damper as follows:
 - For ASHRAE Cycle I, OADPR MINPOS (Point 10), is set to 100%.
 - For ASHRAE Cycle II, OADPR MINPOS is set to a value less than 100% to satisfy the minimum outdoor air requirements.
 - When the coil is providing cooling and FREE CLG (Point 23) is set to ENABLE, the damper is kept open. When the coil is not providing cooling and FREE CLG is set to ENABLE, the damper is modulated between minimum and maximum. If FREE CLG is set to DISABL, the damper is kept at minimum at all times.

Night Heating Operation

The controller maintains the room temperature at the value stored in CTL STPT (Point 92) by doing the following:

- If CTL TEMP (Point 78) drops below the value of NGT HTG STPT (Point 9) minus the value of NGT DBAND (Point 88), then the:
 - Fan turns ON
 - Heating turns ON
- If CTL TEMP rises above NGT HTG STPT, then the:
 - Fan turns OFF
 - Heating turns OFF

When the fan turns ON, the heating actuator is opened and auxiliary radiation, if present, is commanded ON. When the fan turns OFF, all heating and any auxiliary radiation are closed.

NOTE: If NGT HW HTG is set to YES, the heating actuator is kept open at all times at night, during both night heating and night cooling. This helps protect the coil if necessary.

In night heating operation, the controller operates as follows:

- For units with hot water coils, NGT HW HTG (Point 53) must be set to YES, so that the valve is positioned to full open.
- For units with steam coils, NGT HW HTG must be set to NO, so that the coils can be cycled.
- The controller may switch to cooling mode when appropriate if NGT CLG MODE (Point 54) is set to YES.
- Heating only is provided when NGT CLG MODE is set to NO.

Night Cooling Operation

In night cooling operation, the controller maintains the room temperature at the value stored in CTL STPT (Point 92) by doing the following:

- If CTL TEMP (Point 78) rises above the sum of NGT CLG STPT (8) and NGT DBAND (Point 88), then the:
 - Fan turns ON
 - Cooling turns ON
- If CTL TEMP drops below NGT CLG STPT, then the:
 - Fan turns OFF
 - Cooling turns OFF

NOTE: NGT CLG MODE (Point 54) must be set to YES or else the unit operates in night heating mode only.

During night cooling operation, units with hot water coils should have NGT HW HTG (Point 53) set to YES so that the valve will be positioned to full open. This helps protect the coil if necessary. For steam coil units, NGT HW HTG should be set to NO to keep the heating coils OFF.

Heating/Cooling Switchover

If all of 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) is below 50% if free cooling is disabled, or below SWITCH LIMIT if free cooling is enabled.
- CTL TEMP (Point 78) is greater than the sum of CTL STPT (Point 92) plus SWITCH DBAND (Point 90).
- CTL TEMP is greater than 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) is below 50% if free cooling is disabled, or below SWITCH LIMIT if free cooling is enabled.
- CTL TEMP is less than CTL STPT minus SWITCH DBAND.
- CTL TEMP is less than the appropriate heating setpoint plus SWITCH DBAND.

If night cooling is not available, as indicated by NGT CLG MODE (Point 54), then the controller remains in heating mode during the night.

Control Loops

The unit ventilator is controlled by four Proportional, Integral, and Derivative (PID) control loops; a room loop, a heating loop, a cooling loop, and an auxiliary loop.

Room Loop – The room loop uses the values of CTL STPT (Point 92) and CTL TEMP (Point 78) to set the discharge setpoint, DISCH STPT (Point 93), between the values of DSH MIN TEMP (Point 94) and DSH MAX TEMP (Point 95).

Heating Loop – The heating loop uses the value of DISCH STPT and DISCH TEMP (Point 15) to modulate the value of HTG LOOPOUT (Point 80).

Cooling Loop – The cooling loop uses the value of DISCH STPT and DISCH TEMP to modulate the value of CLG LOOPOUT (Point 79).

Auxiliary Loop – The auxiliary loop uses AUX DSH STPT (Point 91) and DISCH STPT (Point 93) to modulate the value of AUX LOOPOUT (Point 77).

Morning Warm-Up/Cool-Down

Morning warm-up or cool-down occurs after the controller switches from night mode to day mode, upon power-up, or if the controller is reset. During morning warm-up or cool-down, the controller provides maximum heating or cooling with the outdoor air damper closed until the temperature of the space reaches the value of CTL STPT (Point 92) plus or minus the value of MORN DBAND (Point 89). In morning cool-down, if FREE CLG (Point 23) is set to ENABLE, then the outdoor air damper is opened.

In heating mode, normal day heating operation begins when the temperature of the room reaches the value of CTL STPT minus MORN DBAND.

In cooling mode, normal day cooling operation begins when the temperature of the room reaches the value of CTL STPT plus MORN DBAND.

For example, in day heating mode, if CTL STPT is 72°F (22.2°C) and MORN DBAND is 3°F (1.6°C), then normal day heating operation begins when the temperature of the room reaches 69°F (20.6°C).

Fan Operation

In day mode, FAN (Point 50), is ON all of the time.

In night mode, the fan only operates when required for heating or cooling.

In night heating, the fan turns ON when the temperature drops below the value of CTL STPT (Point 92) minus NGT DBAND (Point 88). When the temperature rises above CTL STPT, the fan turns OFF.

In night cooling, the fan turns ON when the temperature rises above the value of CTL STPT plus NGT DBAND. When the temperature drops below CTL STPT, the fan turns OFF.

AO1 Control

Application 2448 provides two options for commanding the OA damper: floating control actuation using DOs 5 and 6, and modulating control using AO 1. Analog control requires setting OA DMPR AOV1 (Point 28) to ENABLE, and configuring the start and span voltages with AOV1 START (Point 32) and AOV1 SPAN (Point 31).

To use AO 1 as a spare, OA DMPR AOV1 must equal DISABL with the start and span points configured as required.

NOTES: **AO 1 configured as Spare:** On power failure recovery, AOV1 (Point 27) will initiate and remain at 0 volts until a network command is received.

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

Calibration

Floating Control Actuators – To maintain accurate positioning of the floating control damper and valve actuators, Application 2448 provides a calibration feature that is configurable by setting CAL SETUP (Point 96) to the desired calibration option. If the status of CAL MTRS (Point 95) is YES, calibration is in progress; a status of NO indicates the controller is not in a calibration sequence.

During calibration, the OA damper is commanded closed and the chill and/or hot water valve actuator(s) are commanded closed. The actuators are released to normal control at the end of the calibration sequence and CAL MTRS returns to NO automatically.

NOTE: Calibration for floating control actuators works as follows: Whenever the drive signal for a floating control actuator is 0%, the 'close' DO stays on for an additional 10% of the actuator's configured running time, ensuring full actuator travel. This is true even if the controller is not in a calibration sequence and the status of CAL MTRS is NO—for instance, during Heat/Cool Switchover.

Fail-Safe Operation

Room Temperature Sensor Failure and/or LTDT = ON

If the room temperature sensor input to the controller fails, or if the temperature sensed by the low temperature detection thermostat (LTDT) is below the low temperature limit of the LTDT, then the controller goes through the following shutdown sequence:

1. Outdoor air damper is closed
2. Heating is full ON
3. Cooling is full OFF
4. Fan is OFF
5. Auxiliary radiation is OFF

Normal control resumes if the room temperature sensor returns or if the LTDT turns OFF.

Discharge Air Temperature Sensor Failure

If the discharge air temperature sensor fails, then how the controller shuts down depends on the last valid value of the discharge air temperature:

- If the last valid value is less than 150 degrees, then the controller shuts down as described in the above shutdown sequence.
- If the last valid value is greater than 150 degrees, then the heat is turned OFF, the outdoor air damper closes, and the fan turns ON. If the sensor does not come back within 10 minutes, the controller then shuts down as described in the above shutdown sequence.

Normal control resumes if the discharge air temperature sensor returns.

NOTE: If the controller is in fail-safe mode, the application is unable to provide any analog or digital output commands. But failed points can be overridden allowing the controller to return from fail-safe mode. However, even if failed points are overridden bringing the controller back from fail-safe mode, room temperature control is not possible.

Application Notes

1. If the unit ventilator cycles excessively, if the temperature swings in the room are excessive or if there is trouble in maintaining the setpoint, then either the cooling loop, the heating loop or both need to be tuned. See the *APOGEE Automation Service Procedures* on InfoLink for more information.
2. As shipped from the factory, the controller keeps all associated equipment OFF. See the *APOGEE Automation Start-up Procedures* on InfoLink for information on how to release the controller and its equipment to application control.
3. The outdoor damper actuator should be wired so that it will return to its closed state when the fan is manually switched OFF at the unit fan speed switch.

Wiring Diagram



CAUTION:

The Unit Vent Controller's Digital Outputs (DOs) control 24 Vac loads only. The maximum rating is 12 VA for each DO. Use an interposing 220 V 4-relay module (P/N 550-048) 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

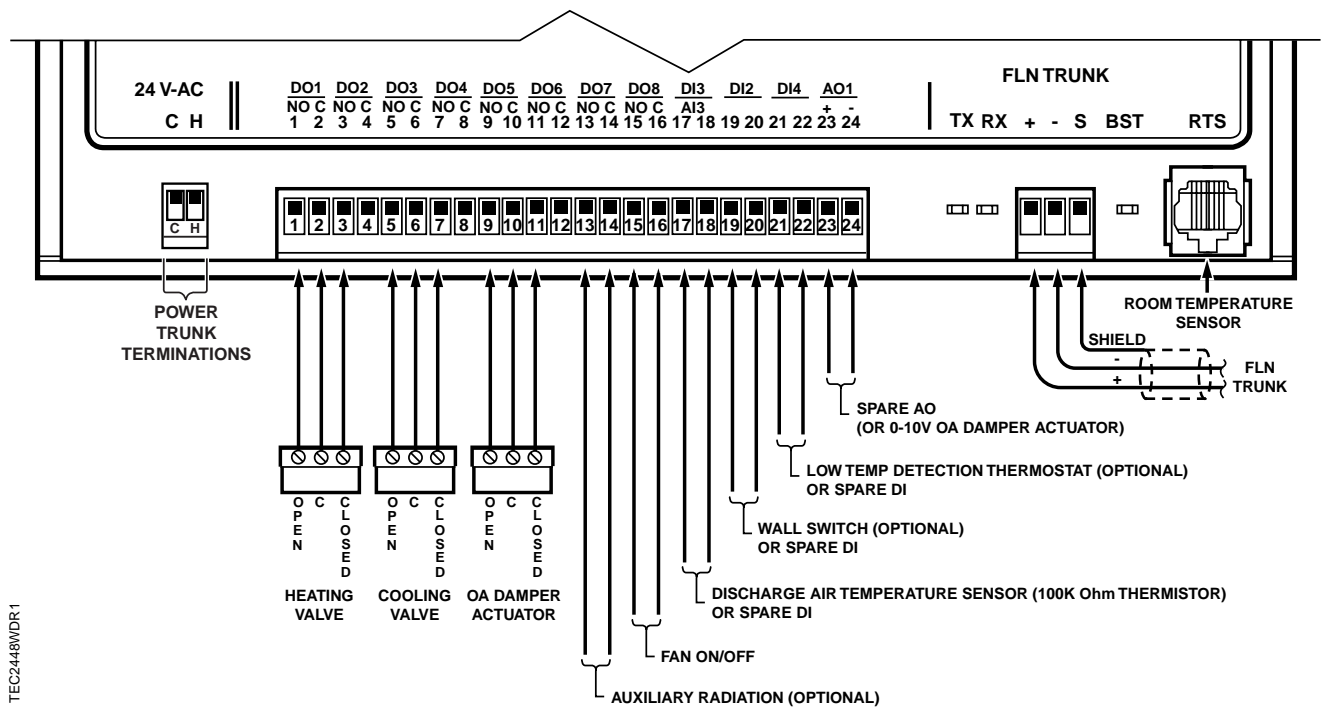


Figure 3. Application 2448 Wiring Diagram.

Point Database

Table 1. Point Database for Application 2448.

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	2476	--	1	0	--	--
{04}	ROOM TEMP	74.0 (23.45)	DEG F (DEG C)	0.25 (0.14)	48.0(8.89)	--	--
{05}	HEAT.COOL	COOL	--	--	--	HEAT	COOL
06	DAY CLG STPT	74.0 (23.45)	DEG F (DEG C)	0.25 (0.14)	48.0(8.89)	--	--
07	DAY HTG STPT	70.0 (21.21)	DEG F (DEG C)	0.25 (0.14)	48.0(8.89)	--	--
08	NGT CLG STPT	82.0 (27.93)	DEG F (DEG C)	0.25 (0.14)	48.0(8.89)	--	--
09	NGT HTG STPT	65.0 (18.41)	DEG F (DEG C)	0.25 (0.14)	48.0(8.89)	--	--
10	OADPR MINPOS	14.8	PCT	0.4	0.0	--	--
11	RM STPT MIN	55.0 (12.81)	DEG F (DEG C)	0.25 (0.14)	48.0(8.89)	--	--
12	RM STPT MAX	90.0 (32.41)	DEG F (DEG C)	0.25 (0.14)	48.0(8.89)	--	--
{13}	RM STPT DIAL	74.0 (23.45)	DEG F (DEG C)	0.25 (0.14)	48.0(8.89)	--	--
14	STPT DIAL	NO	--	--	--	YES	NO
{15}	DISCH TEMP	74.0 (23.496)	DEG F (DEG C)	0.5 (0.28)	37.5(3.056)	--	--
18	WALL SWITCH	NO	--	--	--	YES	NO
{19}	DI OVRD SW	OFF	--	--	--	ON	OFF
20	OVRD TIME	1	HRS	1	0	--	--
{21}	NGT OVRD	DAY	--	--	--	NIGHT	DAY
22	AUX.NOAUX	NOAUX	--	--	--	AUX	NOAUX
{23}	FREE CLG	DISABL	--	--	--	ENABLE	DISABL
{24}	DI 2	OFF	--	--	--	ON	OFF
{25}	DI 3	OFF	--	--	--	ON	OFF
{26}	LOW TEMP DET	ON	--	--	--	OFF	ON
{27}	AOV1	0.0	VOLTS	0.01	0.0	--	--
28	OA DMPR AOV1	DISABL	--	--	--	ENABLE	DISABL
{29}	DAY.NGT	DAY	--	--	--	NIGHT	DAY
{30}	WRMUP.COOLDN	ON	--	--	--	ON	OFF
31	AOV1 SPAN	10.0	VOLTS	0.01	0.0	--	--
32	AOV1 START	0.0	VOLTS	0.01	0.0	--	--
{37}	DMPR COMD	0.0	PCT	0.4	0.0	--	--
{38}	DMPR POS	0.0	PCT	0.4	0.0	--	--

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 1. Point Database for Application 2448.

Point Number	Descriptor	Factory Default (SI Units)	Engr Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
39	MTR3 TIMING	130	SEC	1	0	--	--
40	AO DIR.REV	0	--	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
{47}	AUX RAD	OFF	--	--	--	ON	OFF
{48}	HTG VLV COMD	0.0	PCT	0.4	0.0	--	--
{49}	HTG VLV POS	0.0	PCT	0.4	0.0	--	--
{50}	FAN	OFF	--	--	--	ON	OFF
51	MTR1 TIMING	95	SEC	1	0	--	--
{52}	CLG VLV COMD	0.0	PCT	0.4	0.0	--	--
{53}	CLG VLV POS	0.0	PCT	0.4	0.0	--	--
54	MTR2 TIMING	130	SEC	1	0	--	--
56	AUX HTG TIME	10	MIN	1	0	--	--
{57}	AUX OUTPUT	0.0	PCT	0.4	0.0	--	--
58	MTR SETUP	0	--	1	0	--	--
59	DO DIR.REV	0	--	1	0	--	--
{60}	HTG OUTPUT	0.0	PCT	0.4	0.0	--	--
{61}	CLG OUTPUT	0.0	PCT	0.4	0.0	--	--
{62}	OA DMPR POS	0.0	PCT	0.4	0.0	--	--
63	CLG P GAIN	1.6 (2.88)	--	0.2 (0.36)	0.0	--	--
64	CLG I GAIN	0.05 (0.09)	--	0.0005 (0.0009)	0.0	--	--
65	CLG D GAIN	10 (18.0)	--	2 (3.6)	0	--	--
66	CLG BIAS	50.0	PCT	0.2	0.0	--	--
67	HTG P GAIN	0.4 (0.72)	--	0.05 (0.09)	0.0	--	--
68	HTG I GAIN	0.015 (0.027)	--	0.0002 (0.00036)	0.0	--	--
69	HTG D GAIN	5 (9.0)	--	1 (1.8)	0	--	--
70	HTG BIAS	50.0	PCT	0.2	0.0	--	--

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 1. Point Database for Application 2448.

Point Number	Descriptor	Factory Default (SI Units)	Engr Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
71	ROOM P GAIN	2.3 (4.14)	--	0.05 (0.09)	0.0	--	--
72	ROOM I GAIN	0.00504 (0.009072)	--	0.00009 (0.000162)	0.0	--	--
73	ROOM D GAIN	76 (136.8)	--	2 (3.6)	0	--	--
74	ROOM BIAS	72.0 (22.376)	DEG F (DEG C)	0.5 (0.28)	37.5(3.056)	--	--
75	NGT HW HTG	YES	--	--	--	YES	NO
76	NGT CLG MODE	NO	--	--	--	YES	NO
{77}	AUX LOOPOUT	0.0	PCT	0.2	0.0	--	--
{78}	CTL TEMP	74.0 (23.45)	DEG F (DEG C)	0.25 (0.14)	48.0(8.89)	--	--
{79}	CLG LOOPOUT	0.0	PCT	0.2	0.0	--	--
{80}	HTG LOOPOUT	0.0	PCT	0.2	0.0	--	--
{81}	AUX P GAIN	0.2 (0.36)	--	0.02 (0.036)	0.0	--	--
{82}	AUX I GAIN	0.00054 (0.000972)	--	0.00009 (0.000162)	0.0	--	--
{83}	AUX D GAIN	24 (43.2)	--	1 (1.8)	0	--	--
{84}	AUX BIAS	0.0	PCT	0.2	0.0	--	--
85	SWITCH LIMIT	4.8	PCT	0.4	0.0	--	--
86	SWITCH TIME	10	MIN	1	0	--	--
87	DSH MIN TEMP	60.0 (15.656)	DEG F (DEG C)	0.5 (0.28)	37.5(3.056)	--	--
88	DSH MAX TEMP	110.0 (43.656)	DEG F (DEG C)	0.5 (0.28)	37.5(3.056)	--	--
89	NGT DBAND	3.0 (1.68)	DEG F (DEG C)	0.25 (0.14)	0.0	--	--
90	MORN DBAND	2.0 (1.12)	DEG F (DEG C)	0.25 (0.14)	0.0	--	--
91	SWITCH DBAND	2.0 (1.12)	DEG F (DEG C)	0.25 (0.14)	0.0	--	--
{92}	CTL STPT	74.0 (23.45)	DEG F (DEG C)	0.25 (0.14)	48.0(8.89)	--	--
{93}	DISCH STPT	74.0 (23.496)	DEG F (DEG C)	0.5 (0.28)	37.5(3.056)	--	--
{94}	AUX DSH STPT	80.0 (26.856)	DEG F (DEG C)	0.5 (0.28)	37.5(3.056)	--	--
{95}	CAL MTRS	NO	--	--	--	YES	NO
96	CAL SETUP	4	--	1	0	--	--
97	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.

Slave Mode

Application **2476** is the slave mode for the TEC Custom Solutions Unit Vent Controller with Heating and/or CW Cooling and Floating Control Actuation, ASHRAE Cycles I and II. Slave Mode is the default application that comes up when power is first applied to the controller. It provides no control. Its purpose is to allow the operator to perform equipment checkout before a control application is put into effect and to set some basic control parameters (CTLR ADDRESS, APPLICATION, etc.).

See Table 2 for motor enable/reverse values.

Table 2. 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

Wiring Diagram



CAUTION:

The Unit Vent Controller's Digital Outputs (DOs) control 24 Vac loads only. The maximum rating is 12 VA for each DO. Use an interposing 220 V 4-relay module (P/N 550-048) 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

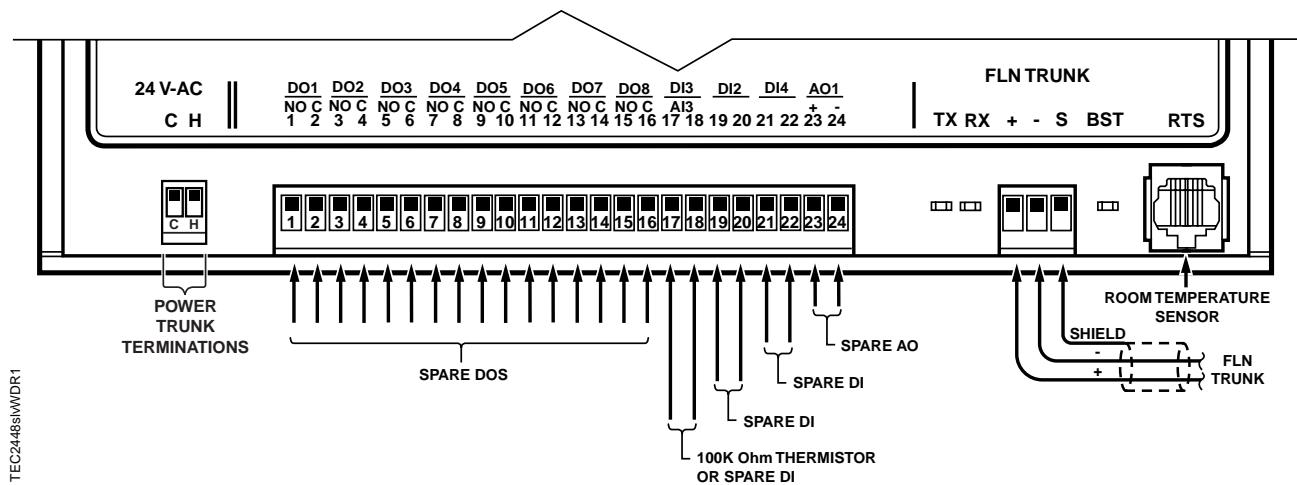


Figure 4. Application 2476 Slave Mode Wiring Diagram.

Slave Mode Point Database

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	2476	--	1	0	--	--
{04}	ROOM TEMP	74.0 (23.45)	DEG F (DEG C)	0.25 (0.14)	48.0(8.89)	--	--
{13}	RM STPT DIAL	74.0 (23.45)	DEG F (DEG C)	0.25 (0.14)	48.0(8.89)	--	--
{15}	AUX TEMP	74.0 (23.496)	DEG F (DEG C)	0.5 (0.28)	37.5(3.056)	--	--
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
{26}	DI 4	OFF	--	--	--	ON	OFF
{27}	AOV1	0.0	VOLTS	0.01	0.0	--	--
{29}	DAY.NGT	DAY	--	--	--	NIGHT	DAY
{37}	MTR3 COMD	0.0	PCT	0.4	0.0	--	--
{38}	MTR3 POS	0.0	PCT	0.4	0.0	--	--
39	MTR3 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
{47}	DO 7	OFF	--	--	--	ON	OFF
{48}	MTR1 COMD	0.0	PCT	0.4	0.0	--	--
{49}	MTR1 POS	0.0	PCT	0.4	0.0	--	--
{50}	DO 8	OFF	--	--	--	ON	OFF
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	--	--
54	MTR2 TIMING	130	SEC	1	0	--	--
58	MTR SETUP	0	--	1	0	--	--
59	DO DIR.REV	0	--	1	0	--	--
{95}	CAL MTRS	NO	--	--	--	YES	NO
96	CAL SETUP	4	--	1	0	--	--
97	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.