SIEMENS

TEC Custom Solutions Application 2411:

Unit Conditioner Heating and Cooling with Multi-Speed Fan, ON/OFF Switch, and Occupancy Sensor

TEC-0354.08

This document contains the following topics:

Overview

In Application 2411, the customer can set up the controller in a variety of ways to provide temperature control, with the following features supported:

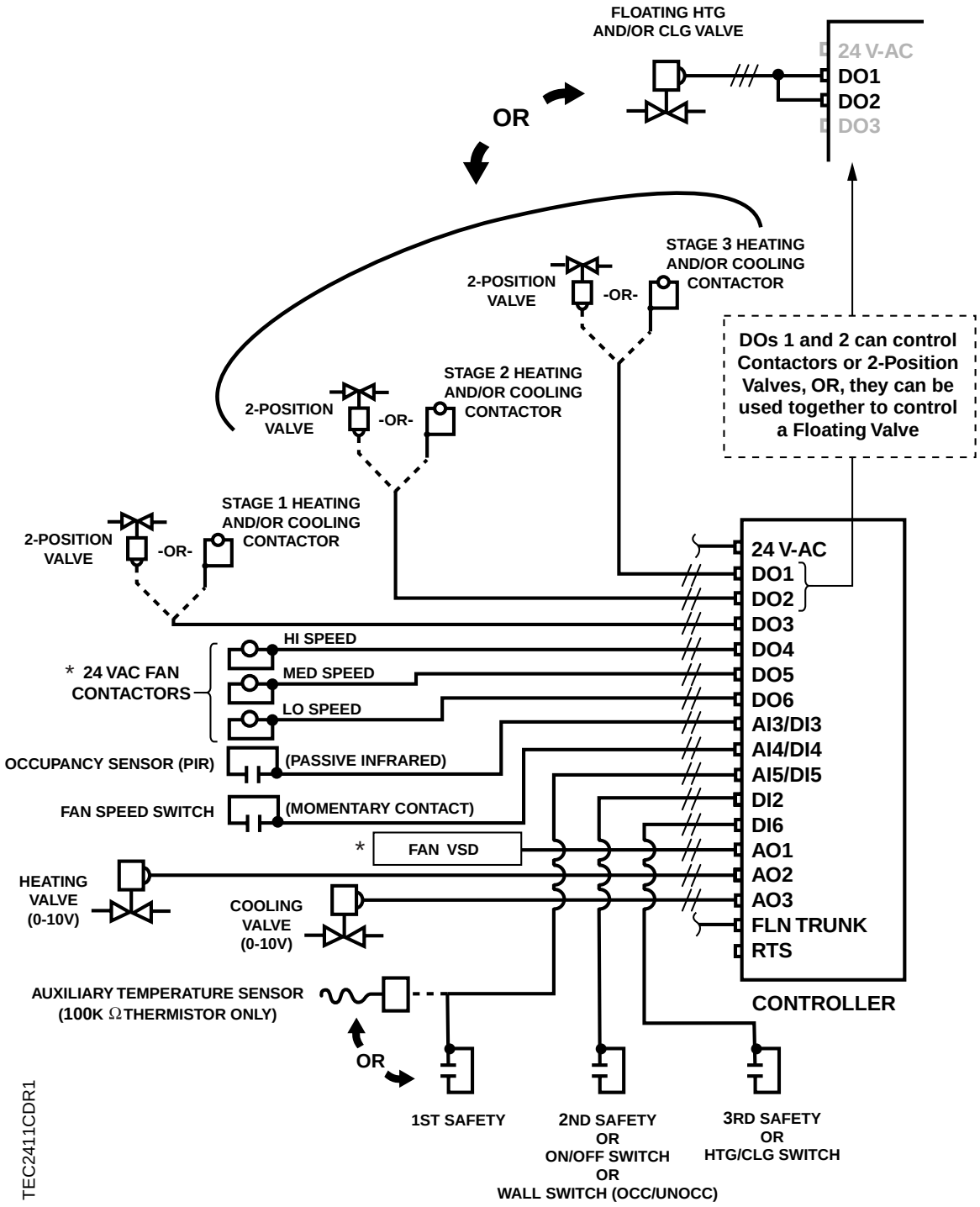
- Separate modulating, spring return heating and cooling valves (each one using a 0–10 Volt AOV).
- Up to 3 ON/OFF stages using DOs 1 through 3 that can either be heating stages, cooling stages, or combination heating and cooling stages used to control electric heat, DX cooling or 2-position valves; OR, a floating control valve (using DOs 1 and 2) which can be a heating valve, a cooling valve, or a combination heating/cooling valve.

The central plant must provide chilled water for any cooling valve being controlled and hot water for any heating valve being controlled. Also, if combination heating/cooling valves are used, the central plant must ensure that only hot water is provided in the heating season and chilled water in the cooling season.

Application 2411 controls a multi-speed fan to circulate room air. Fan speed is varied by using 3 DOs for low, medium, and high speed, or by using a 0–10 Volt AOV to operate a variable speed drive.

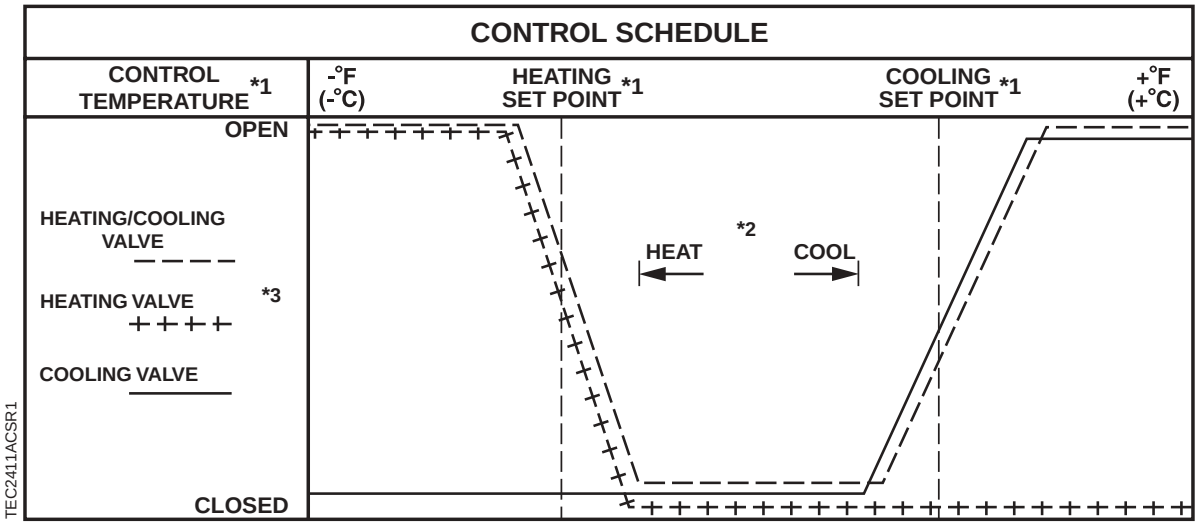
Application 2411 can also:

- Set controller ON and OFF modes with an ON/OFF switch.
- Set occupancy mode by using an occupancy sensor, a night override button, or a wall switch. (Different set points are used in the occupied and unoccupied modes.)
- Determine the heating/cooling mode by sensing the room load or by using the status of a DI contact.
- Use up to 3 DIs for three different alarms. Also, three different alarm levels are supported.
- Control the room temperature or an auxiliary temperature such as return air or supply air.
- Operate either as part of a network or stand-alone.



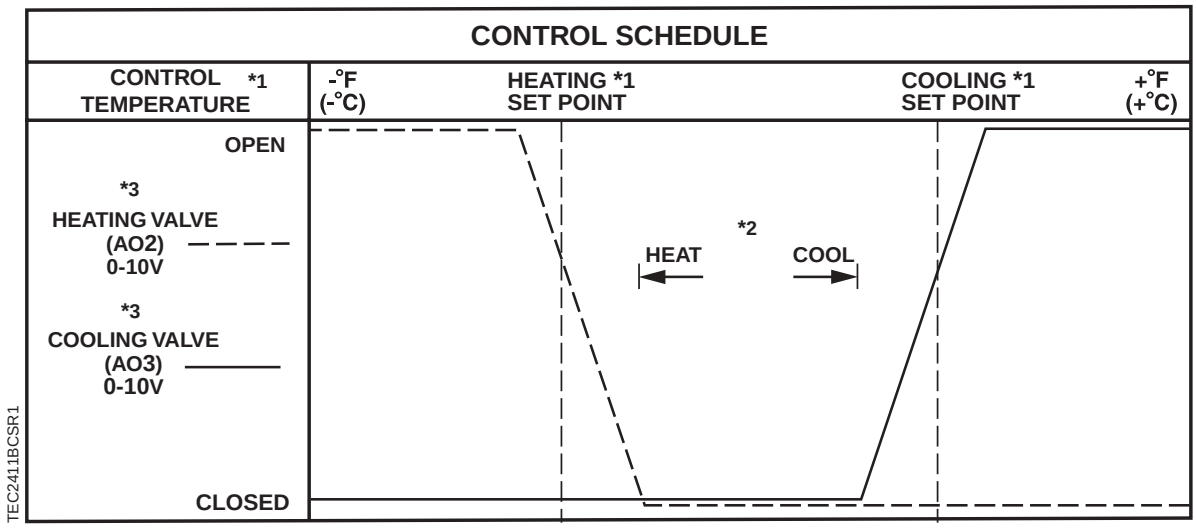
*Although the firmware for application 2411 allows DOs 4, 5, and 6 as well as AO1 to be used for fan speed control, box manufacturers may not readily support both types of fan control (digital and analog) on the same terminal box.

Figure 2411-1. Application 2411 Control Drawing.



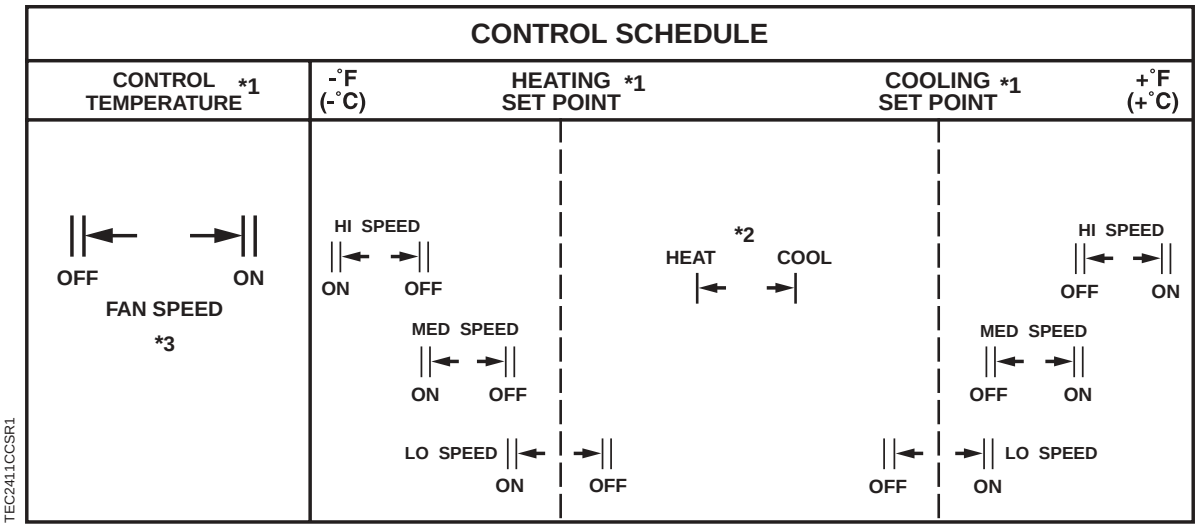
1. Refer to *Control Temperature Set Points.*
2. Refer to *Heating/Cooling Switchover.*
3. Refer to *Floating Valve Control.*

Figure 2411-2. Control Schedule for Floating Valve Controlled by DO1 and DO2.



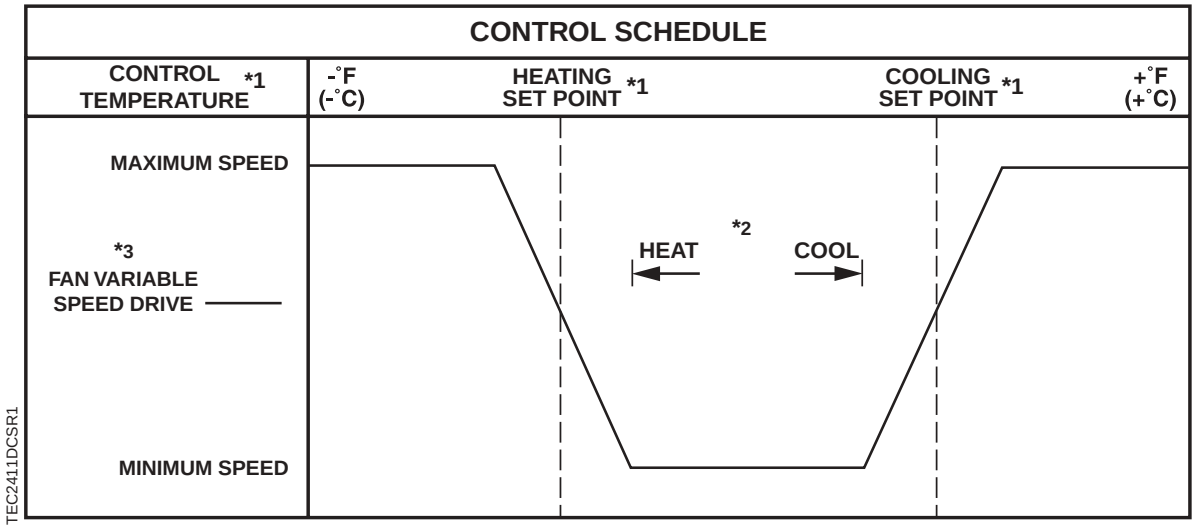
1. Refer to *Control Temperature Set Points.*
2. Refer to *Heating/Cooling Switchover.*
3. Refer to *Spring Return Valve Control.*

Figure 2411-3. Control Schedule for 0–10V Heating and Cooling Valves.



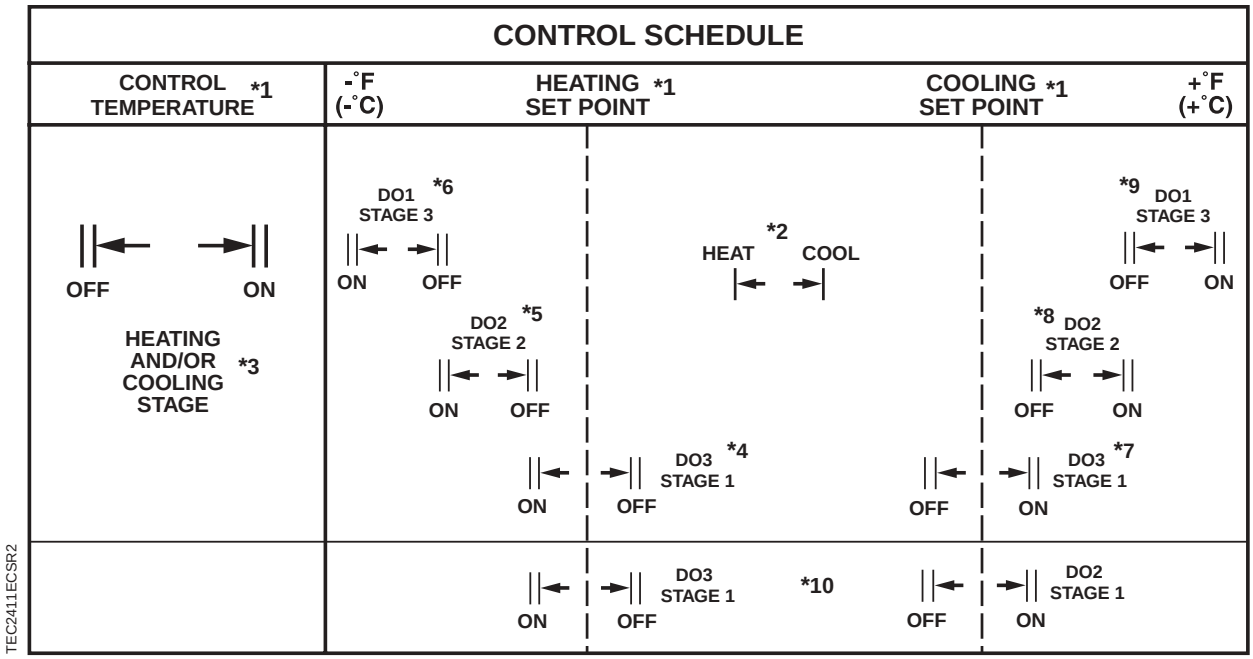
1. Refer to *Control Temperature Set Points.*
2. Refer to *Heating/Cooling Switchover.*
3. Refer to *Fan Control by DOs.*

Figure 2411-4. Multi-Speed Fan Control Schedule.



1. Refer to *Control Temperature Set Points.*
2. Refer to *Heating/Cooling Switchover.*
3. Refer to *Fan Control by Variable Speed Drive.*

Figure 2411-5. Fan Variable Speed Drive Control Schedule.



1. Refer to *Control Temperature Set Points.*
2. Refer to *Heating/Cooling Switchover.*
3. Refer to *Heating and Cooling Stages.*
4. DO3 configured as a heating stage or as a combination heating/cooling stage.
5. DO2 configured as a heating stage or as a combination heating/cooling stage.
6. DO1 configured as a heating stage or as a combination heating/cooling stage.
7. DO3 configured as a cooling stage or as a combination heating/cooling stage.
8. DO2 configured as a cooling stage or as a combination heating/cooling stage.
9. DO1 configured as a cooling stage or as a combination heating/cooling stage.
10. Controller is configured to have only 1 stage of heating and only 1 stage of cooling using DOs 3 and 2, respectively. Refer to the *Heating and Cooling Stages* section for more information.

Figure 2411-6. Control Schedule for Heating and/or Cooling Stages.

Hardware Inputs

Analog

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

Digital

- Night mode override (optional)
- ON/OFF switch (optional)
- Heat/Cool switch (optional)
- Occupancy sensor

- Alarms (up to 3) (optional)
- Wall switch (optional)

Hardware Outputs

Analog

- Fan variable speed drive (optional)
- Heating valve actuator
- Cooling valve actuator

Digital

- Valve actuator (uses 2 DOs) (optional)
- Fan (switched 24 Vac, pilot duty); up to 3 speeds; each speed uses 1 DO
- Staged heating, cooling, or heating/cooling; up to 3 stages; each stage uses 1 DO

Ordering Notes

You can order the Unit Conditioner controller (Heating and Cooling with Multi-Speed Fan, ON/OFF Switch, and Occupancy Sensor) either as Part Number 540-863L, or as TEC Custom Solution number 260. If push-button fan speed control is desired, you will need the Series 2000 Room Temperature Sensor with Fan-Speed Control, Part Number 540-652. (If push-button fan speed control is not desired, a regular Series 2000 Room Temperature Sensor can be used.)

TEC Custom Solution Number 260	
Unit Conditioner Controller	540-863L
Series 2000 Room Temperature Sensor with Fan-Speed Control	540-652A (beige) 540-652B (white)
Series 2000 Room Temperature Sensor (without Fan Speed Control)	540-650A (beige) 540-650B (white)

Sequence of Operation

The following paragraphs present the sequence of operation for Application 2411, "Unit Conditioner Heating and Cooling with Multi-Speed Fan, ON/OFF Switch, and Occupancy Sensor."

Point Limitations

Application 2411 supports a large number of features with a standard number of points. To do this, some inputs and outputs must support multiple features which cannot be in use at the same time (Table 1).

Table 1.

I/O Termination(s)	Can be Used for: either	or	or
DI2 (Point 47)	2nd alarm	ON/OFF switch	occ/unocc button
AI5/DI5 (same physical point)	DI 5 (Point 50) 1st alarm	AUX TMP AI5 (Point 54) auxiliary temp sensor	—
DI6 (Point 51)	3rd alarm	heating/cooling switch	—
DO1 (Point 41) **DO2** (Point 42)	floating control	staged heating and/or cooling	—

In the following text, it is assumed that the hardware needed to support the feature being described has been properly configured. Refer to the *Start-up* document for complete information on configuration.

Control Temperature Set Points

Depending on the controller's current operational mode (occupied or unoccupied), and regardless of the value of ON.OFF (Point 28), the control temperature set point, CTL STPT (Point 92), holds the value of one of the following set points:

Occupied Mode – In the occupied mode, CTL STPT holds the value of OCC CLG STPT (Point 6) or OCC HTG STPT (Point 7). If the room temperature sensor has a set point dial and STPT DIAL (Point 14) is set to YES, CTL STPT holds the value of RM STPT DIAL (Point 13). However, CTL STPT is not allowed to track RM STPT DIAL below the value of RM STPT MIN (Point 11) or above the value of RM STPT MAX (Point 12).

Unoccupied Mode – In the unoccupied mode, CTL STPT holds the value of UOC CLG STPT (Point 8) or UOC HTG STPT (Point 9).

NOTE: If CTL TEMP (Point 78) is not overridden, it is set either to the value of ROOM TEMP (Point 4) or to AUX TMP AI5 (Point 54), depending on the value (ROOM or AUX) of TEMP SOURCE (Point 59).

ON and OFF Modes

While in ON mode, the controller is engaged in normal space control. In OFF mode the controller provides no control at all, conserving energy.

Application 2411 allows ON.OFF (Point 28) to be commanded by an ON/OFF switch. If DI2 CONFIG (Point 73) has been set to 3, and an ON/OFF switch is physically connected to the controller's termination strip at DI2, the controller monitors DI 2 (Point 47) to determine its ON/OFF status. When DI 2 is ON (the switch is closed), ON.OFF is set to ON, indicating that the controller is ON and all equipment is being controlled according to the occupied or unoccupied sequences of operation. When DI 2 is OFF (the switch is open), ON.OFF is set to OFF, indicating that the controller is OFF.

If DI2 CONFIG does not equal 3, DI2 cannot be used for an ON/OFF switch. In this case, and if the controller is operating stand-alone, the controller remains OFF until the user commands the ON.OFF point to ON. Once this is done, the controller will remain ON until the user commands the ON.OFF point to OFF. 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 ON.OFF Refer to *Powers Process Control Language (PPCL) User's Manual* (125-1896) and *Field Panel User's Manual* (125-1895) for more information.

When the controller is commanded to OFF mode (both ON.OFF (Point 28) and OFF OVRD (Point 25) equal OFF), controlled equipment is staged OFF in a manner appropriate to protect the equipment.

OFF Override Mode

When ON.OFF (Point 28) = OFF, an occupancy sensor (passive infrared (PIR) or other) connected to DI3 (PIR DI 3, Point 48) can turn the controller back ON for a certain period of time if the following conditions are true:

- PIR ENABLE (Point 71) set to either 2 or 3.
- Value (in minutes) other than 0 has been entered into PIR TIME (Point 72).

If these conditions are met, then when PIR DI 3 is ON (the contact is closed), the controller is turned ON for the amount of time set in PIR TIME. The status of OFF OVRD (Point 25) changes to ON and remains there until PIR TIME elapses, at which point the controller returns to OFF mode and the status of OFF OVRD changes back to OFF.

Only when ON.OFF = OFF will an occupancy sensor connected to PIR DI 3 have any effect on the controller's ON /OFF status.

Occupied and Unoccupied Modes

Application 2411 allows OCC.UNOCC (Point 29) to be commanded by a wall switch. If DI2 CONFIG (Point 73) = 0 and WALL SWITCH (Point 18) = YES, and a wall switch is physically connected to the controller's termination strip at DI 2, then the controller monitors the status of DI 2 in order to determine the occupied/unoccupied status of the space. When the status of DI 2 is ON (the switch is closed), OCC.UNOCC is set to OCC indicating that the controller is in occupied mode. When the status of DI 2 is OFF (the switch is open), OCC.UNOCC is set to UNOCC indicating that the controller is in unoccupied mode.

When WALL SWITCH equals NO, the controller does not monitor the status of a wall switch, even if one is connected to it. In this case, and if the controller is operating stand-alone, the controller stays in occupied 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 OCC.UNOCC. Refer to *Powers Process Control Language (PPCL) User's Manual* (125-1896) and *Field Panel User's Manual* (125-1895) for more information.

If DI2 CONFIG does not equal 0, the controller will not use DI2 as a wall switch, even if WALL SWITCH is set to YES.

When the controller is in OFF mode (both ON.OFF (Point 28) and OFF OVRD (Point 25) = OFF), neither a wall switch nor OCC.UNOCC has any effect.

Unoccupied Override Mode

If OCC.UNOCC (Point 29) = UNOCC, the controller can, for a period of time, be sent back into occupied mode either by an override switch on the temperature sensor or by the occupancy sensor.

Override Switch

The room occupant can reset the controller to occupied mode by pressing the override switch, provided the following conditions are true:

1. Override switch present on the room temperature sensor.
2. Value (in hours) other than 0 has been entered into OVRD TIME (Point 20).
3. Either ON.OFF (Point 28) or OFF OVRD (Point 25) (or both) is/are ON.

When these conditions are met, a room occupant can reset the controller to occupied mode by pressing the override switch. The status of UNOCC OVRD (Point 21) changes to OCC and remains there until the amount of time set in OVRD TIME elapses, at which point the controller returns to unoccupied mode and the status of UNOCC OVRD changes back to UNOCC.

While the controller is in occupied mode, the override switch on the room temperature sensor has no effect on the controller's occ/unocc status.

Occupancy Sensor

An occupancy sensor can send the controller back into occupied mode in either of two ways, depending on the value of PIR ENABLE (Point 71). PIR ENABLE must equal 1 or 3. If PIR ENABLE = 1, the controller must be ON before PIR DI 3 (Point 71) can send it to occupied mode. If PIR ENABLE = 3, the controller does not need to be ON before PIR DI 3 can send it to occupied mode.

PIR ENABLE = 1: When PIR ENABLE equals 1, PIR DI 3 resets the controller to occupied mode provided the following conditions are true:

- PIR DI 3 detects people in the room (PIR DI 3 = ON (closed)).
- Value (in hours) other than zero has been entered into OVRD TIME (Point 20).
- Either ON.OFF (Point 28) or OFF OVRD (Point 25) (or both) is ON.

When these conditions are met, the controller is reset to occupied mode for the amount of time set in OVRD TIME. The status of UNOCC OVRD (Point 21) changes to OCC and remains there until the override time elapses, at which point the controller returns to unoccupied mode and the status of UNOCC OVRD changes back to UNOCC.

PIR ENABLE = 3: If PIR ENABLE equals 3 and ON.OFF = ON, the occupancy sensor behaves identically as when PIR ENABLE equals 1 and ON.OFF = ON (see above). But if PIR ENABLE = 3 and ON.OFF = OFF (the controller is OFF) when PIR DI 3 detects people, the application must first turn the controller ON by setting OFF OVRD (Point 25) to ON (this ON period lasts for the amount of time stored in PIR TIME, Point 72). Once OFF OVRD is set to ON and the controller is ON, the application then resets the controller to occupied mode for the amount of time set in OVRD TIME. The status of UNOCC OVRD (Point 21) changes to OCC and remains there until the override time elapses, at which point the controller returns to unoccupied mode as UNOCC OVRD changes back to UNOCC. (**Note:** If PIR TIME is less than OVRD TIME, the controller will shut OFF before UNOCC OVRD changes back to UNOCC, ending occupied mode prematurely. If the customer finds this undesirable, PIR TIME can be set $\geq$ OVRD TIME.)

If the override switch is pressed after the occupancy sensor has sent the controller into occupied mode, the amount of time that the controller remains in occupied mode is reset to the full amount of time set in OVRD TIME. The same is true if the occupancy sensor detects people in the room after the override switch has been pressed—the amount of time is reset to the full OVRD TIME.

Heating/Cooling Switchover

The heating/cooling switchover determines whether the controller is in heating or cooling mode. The application makes this determination in one of three ways:

1. By a command from the field panel.
2. By using DI 6 (Point 51) to control the status of HEAT.COOL (Point 5).
3. By monitoring room load.

Field Panel Command – HEAT.COOL can, if desired, be commanded at any time by using the field panel. But, if either VALVE TYPE (Point 35) or STAGE TYPE (Point 89) = 3, indicating that a control element might either heat or cool the space, then HEAT.COOL **must** be set by the field panel.

DI 6 – If DI6 CONFIG (Point 74) = 3, the application commands HEAT.COOL based on the status of DI 6. This method of heating/cooling switchover is useful when controlling htg/clg stages or a combination htg/clg valve. DI 6 could be connected to a two-position temperature sensor monitoring water temp in the valve. HEAT.COOL would be set to HEAT when hot water is detected, and to COOL when cold water is detected.

Room Load – When neither DI6 CONFIG, VALVE TYPE nor STAGE TYPE equals 3, then the heating/cooling switchover will determine whether the controller is in heating or cooling mode by monitoring the room temperature and the demand for heating and cooling (as determined by the temperature control loops). The way this happens is as follows:

If all of the following conditions are met for the length of time set in SWITCH TIME (Point 86), then the controller switches from heating to cooling mode by setting HEAT.COOL (Point 5) to COOL:

- HTG LOOPOUT (Point 80) is less than SWITCH LIMIT (Point 85).
- CTL TEMP (Point 78) is above CTL STPT (Point 92) by at least the value set in SWITCH DBAND (Point 34).
- CTL TEMP is greater than the appropriate cooling set point minus SWITCH DBAND.

If all of the following conditions are met for the length of time set in SWITCH TIME, then the controller switches from cooling to heating mode by setting HEAT.COOL to HEAT:

- CLG LOOPOUT (Point 79) is less than SWITCH LIMIT.
- CTL TEMP is below CTL STPT by at least the value set in SWITCH DBAND.
- CTL TEMP is less than the appropriate heating set point plus SWITCH DBAND.

Control Loops

The unit conditioner is controlled by two Proportional, Integral, and Derivative (PID) temperature loops.

Temperature Loops – The two temperature loops are a cooling loop and a heating loop. The active temperature loop maintains the temperature measured by CTL TEMP at the value in CTL STPT (Point 92). Refer to *Control Temperature Set Points* for more information on how CTL STPT and CTL TEMP are determined.

Both the heating and cooling loops will be disabled and their outputs will equal 0 under any of the following circumstances:

- Both ON.OFF (Point 28) and OFF OVRD (Point 25) equal OFF.
- ALARM (Point 27) is greater than 1. (A medium or high-level alarm has occurred.)
- The fan speed (FAN SPEED, Point 26) is manually set to OFF.

If none of the above conditions is true, the heating and cooling loops are controlled as follows:

Cooling Loop Operation – In cooling mode (HEAT.COOL, Point 5 equals COOL), the controller uses CTL STPT (Point 92) and CTL TEMP (Point 78) as the inputs to the cooling loop. The output of the cooling loop is CLG LOOPOUT (Point 79), which varies from 0 to 100% as the cooling load goes from light to heavy.

When in heating mode (HEAT.COOL equals HEAT), the cooling loop is disabled and CLG LOOPOUT is set equal to 0%.

Heating Loop Operation – In heating mode, the controller uses CTL STPT (Point 92) and CTL TEMP (Point 78) as the inputs to the heating loop. The output of the heating loop is HTG LOOPOUT (Point 80), which varies from 0 to 100% as the heating load goes from light to heavy.

When in cooling mode the heating loop is disabled and HTG LOOPOUT is set equal to 0%.

Floating Valve Control

Application 2411 can be set up such that DOs 1 and 2 are used together to operate a floating valve. That is, if the valve loses power, it stays in its last position rather than going fully opened or fully closed. This valve can be a heating only valve, a cooling only valve, or a heating/cooling valve. The operation of the valve depends on the value of VALVE TYPE as show in Table 2.

Table 2. Application 2411 Modulating (Floating) Valve Configuration

Value of VALVE TYPE (Point 35)	Modulating (Floating) Valve Configuration

0	No valve is used (DOs 1, 2 are available for stages)
1	Heating Valve only
2	Cooling Valve only
3	Heating and Cooling Valve

NOTE: If the valve is enabled, MTR SETUP (Point 36) must be set to enable the floating motor driver. Also, MTR TIMING (Point 37) must be set to the proper value for the specific valve model used. Refer to the Start-up document for how to set MTR SETUP and MTR TIMING.

When the valve is used, it modulates to the position that is stored in VALVE COMD (Point 38). VALVE COMD ranges from 0% Opened to 100% Opened. (For example, if VALVE COMD equals 58, the valve will go to a position of 58% opened. If VALVE COMD equals 0, the valve will completely shut and if VALVE COMD equals 100 the valve will fully open.)

The valve will be completely shut (VALVE COMD will equal zero) under either of the following circumstances:

- ON.OFF (Point 28) and OFF OVRD (Point 25) both equal OFF.
- ALARM (Point 27) is greater than 1 (a medium or high-level alarm has occurred).

If neither of the above two conditions is true, the valve will be controlled as follows:

If the valve is a heating valve (VALVE TYPE = 1), then VALVE COMD equals HTG LOOPOUT (Point 80) when HEAT.COOL (Point 5) equals HEAT, and 0 when HEAT.COOL equals COOL.

If the valve is a cooling valve (VALVE TYPE equals 2), then VALVE COMD equals 0 when HEAT.COOL equals HEAT and VALVE COMD equals CLG LOOPOUT (Point 79) when HEAT.COOL equals COOL.

If the valve is a heating/cooling valve (VALVE TYPE equals 3), then VALVE COMD equals HTG LOOPOUT when HEAT.COOL equals HEAT and VALVE COMD equals CLG LOOPOUT when HEAT.COOL equals COOL.

Spring Return Valve Control

In application 2411, AOs 2 and 3 can be used as 0-10 Volt AOVs to control a spring return heating valve and a spring return cooling valve.

The application will:

- Close the heating valve by sending HTG AOV 2 (Point 57) to the voltage value that is stored in AOV 2 CLOSE (Point 30).
- Open the heating valve by sending HTG AOV 2 to the voltage value that is stored in AOV 2 OPEN (Point 31).

- Close the cooling valve by sending CLG AOV 3 (Point 58) to the voltage value that is stored in AOV 3 CLOSE (Point 32).
- Open the cooling valve by sending CLG AOV 3 to the voltage value that is stored in AOV 3 OPEN (Point 33).

Both the heating and cooling valves will be completely shut (HTG AOV 2 will equal AOV 2 CLOSE and CLG AOV 3 will equal AOV 3 CLOSE) under either of the following circumstances:

- Both ON.OFF (Point 28) and OFF OVRD (Point 25) equal OFF.
- ALARM (Point 27) = 2 or 3 (a medium or high-level alarm, respectively, has occurred).

If neither of the above two conditions is true, the spring-return heating and cooling valves are controlled as follows:

When HEAT.COOL equals HEAT, the voltage for the heating valve connected to HTG AOV 2 is scaled between AOV 2 CLOSE and AOV 2 OPEN as HTG LOOPOUT (Point 80) goes from 0% to 100%. The equation for this scaling is:

HTG AOV 2 = [(HTG LOOPOUT/100) × (AOV 2 OPEN – AOV 2 CLOSE)] + AOV 2 CLOSE.

An example will clarify how this equation is used:

Example: Assume AOV 2 CLOSE equals 8 Volts and AOV 2 OPEN equals 2 Volts. Then:

If HTG LOOPOUT equals 0%, HTG AOV 2 will equal 8 Volts.

If HTG LOOPOUT equals 30%, HTG AOV 2 will equal 6.2 Volts.

If HTG LOOPOUT equals 80%, HTG AOV 2 will equal 3.2 Volts.

If HTG LOOPUT equals 100%, HTG AOV 2 will equal 2 Volts.

When HEAT.COOL equals COOL, the heating valve will be shut (HTG AOV 2 will equal AOV 2 CLOSE).

When HEAT.COOL equals COOL the voltage for the cooling valve connected to CLG AOV 3 is scaled between AOV 3 CLOSE and AOV 3 OPEN as CLG LOOPOUT (Point 79) goes from 0% to 100%. The equation for this scaling is:

CLG AOV 3 = [(CLG LOOPOUT/100) × (AOV 3 OPEN – AOV 3 CLOSE)] + AOV 3 CLOSE.

An example will clarify how this equation is used:

Example: Assume AOV 3 CLOSE equals 5 Volts and AOV 3 OPEN equals 10 Volts. Then:

If CLG LOOPOUT equals 0%, CLG AOV 3 will equal 5 Volts.

If CLG LOOPOUT equals 30%, CLG AOV 3 will equal 6.5 Volts.

If CLG LOOPOUT equals 70%, CLG AOV 3 will equal 8.5 Volts.

If CLG LOOPUT equals 100%, CLG AOV 3 will equal 10 Volts.

When HEAT.COOL equals HEAT, the cooling valve will be shut (CLG AOV 3 will equal AOV 3 CLOSE).

Fan Control

NOTE: Although the firmware for application 2411 allows DOs 4, 5, and 6 as well as AO1 to be used for fan speed control, box manufacturers do not readily support both types of fan control (digital and analog) on the same terminal box.

Determining Fan Speed

Fan control priority goes in the following order, from highest to lowest:

1. User Override (local or from field panel)
2. ALARM
3. Manual control
4. OFF mode
5. Automatic control, occupancy sensor
6. Automatic control, htg/clg loopout

User Override – The user can directly control the fan speed either locally or via PPCL at the field panel by setting FAN SPEED (Point 26) to 0, 1, 2 or 3 (OFF, low, medium, or high respectively).

Alarms – If ALARM (Point 27) equals 3, the fan speed is set to OFF. The ALARM point has no effect on the fan when ALARM equals 0, 1 or 2.

Manual Control – (FAN MODE, Point 97 = MANUAL) When the fan operates under manual control, DI 4 (Point 49) monitors a momentary contact that cycles the fan speed when pressed. The pattern of this cycle depends on the value of FAN SPD CNT (Point 84). If FAN SPD CNT = 3, fan speed toggles from OFF to Low to Medium to High and back to OFF. If FAN SPD CNT = 2, fan speed toggles from OFF to Low to Medium and back to OFF. If FAN SPD CNT = 1, fan speed toggles between OFF and Low. The fan remains OFF if FAN SPD CNT = 0.

OFF Mode - If the unit is turned OFF (both ON.OFF, Point 28 and OFF OVRD, Point 25 are OFF), FAN SPEED is set to 0 (OFF). (If any heating stages were ON, then the fan must stay ON until the safeties have finished the shutdown sequence of the stages.) If desired, the fan can be commanded back on manually while the unit is OFF. When the unit returns to ON mode after being OFF, the fan will remain in whatever state it was just in. That is, if it was ON it stays ON, but if the fan had not been commanded manually back ON while the controller was OFF, then the fan does **not** automatically turn back ON when the controller returns to ON mode. (ON mode means that ON.OFF and/or OFF OVRD = ON.)

Automatic Control, Occupancy Sensor – (FAN MODE = AUTO) When the fan operates under automatic control, the application first checks whether the occupancy sensor has sent the application into OFF override or unoccupied override mode. If it has (OFF OVRD = ON or UNOCC OVRD = OCC), then the fan runs at the highest available speed as determined by FAN SPD CNT until the room temperature (CTL TEMP, Point 78) comes within SWITCH DBAND's (Point 34) value of the desired room temperature set point (CTL STPT, Point 92), or until the amount of time set in FAN OVRD TIM (Point 87) elapses, whichever comes first. Fan speed is then released to normal automatic control, which varies depending on whether HEAT.COOL (Point 5) equals "HEAT" OR "COOL" and is explained shortly.

NOTE: If unocc override is initiated by the override button (DI OVRD SW, Point 19), the application does not control the fan at its maximum speed for a period of time as described in the above paragraph. Instead, the fan is released to normal automatic control immediately.

Automatic Control, HTG LOOPOUT – (HEAT.COOL = HEAT) If HTG MOD FAN (Point 90) equals NO, FAN SPEED is set to HTG FAN SPD (Point 91). If HTG MOD FAN equals YES, HTG LOOPOUT controls FAN SPEED as follows. If:

- HTG LOOPOUT reaches FAN LO ON (Point 93), fan speed is set to low. (HTG LOOPOUT must drop at least 5% below FAN LO ON before the fan will turn OFF; if FAN LO ON is set to 5% or less, the fan will not turn OFF.)
- HTG LOOPOUT reaches FAN MED ON (Point 94), fan speed is set to medium. (HTG LOOPOUT must drop at least 5% below FAN MED ON (or to 0, whichever is larger) to return the fan to low speed.)
- If HTG LOOPOUT reaches FAN HI ON (Point 95), fan speed is set to high. (HTG LOOPOUT must drop at least 5% below FAN HI ON (or to 0, whichever is larger) to return the fan to medium speed.)

Automatic Control, CLG LOOPOUT – (HEAT.COOL = COOL) When HEAT.COOL = COOL, CLG LOOPOUT controls the fan speed as follows. If:

- CLG LOOPOUT reaches FAN LO ON (Point 93), fan speed is set to low. (CLG LOOPOUT must drop at least 5% below FAN LO ON before the fan will turn OFF; if FAN LO ON is set to 5% or less, the fan will not turn back OFF.)
- CLG LOOPOUT reaches FAN MED ON (Point 94), fan speed is set to medium. (CLG LOOPOUT must drop at least 5% below FAN MED ON (or to 0, whichever is larger) to return the fan to low speed.)
- CLG LOOPOUT reaches FAN HI ON (Point 95), fan speed is set to high. (CLG LOOPOUT must drop at least 5% below FAN HI ON (or to 0, whichever is larger) to return the fan to medium speed.)

NOTE: If FAN SPEED (Point 26) is set to OFF while any configured heating and/or cooling stage(s) are ON, the fan does stop running, but instead is kept ON until all stages are OFF. An exception exists if ALARM (Point 27) equals 3, in which case the fan turns OFF immediately.

Fan Control by DOs

Application 2411 can control up to 3 fan speeds using DOs 4, 5, and 6. The value of FAN SPEED (Point 26) indicates which of these DOs are ON and which are OFF, with the different configurations determining fan speed as shown in Table 3.

Table 3: Fan Speed Controlled by DOs.

FAN SPEED (Point 26)	FAN HI DO 4 (Point 44)	FAN MED DO 5 (Point 45)	FAN LO DO 6 (Point 46)
0 (OFF)	OFF	OFF	OFF
1 (Low)	OFF	OFF	**— ON —**
2 (Medium)	OFF	**— ON —**	OFF
3 (High)	**— ON —**	OFF	OFF

NOTE: FAN SPD CNT (Point 84) defines the number of fan speeds used. Normal values are from 1 to 3. (Setting FAN SPD CNT to 0 disables the fan.) If 1 speed is defined, DOs 4 and 5 are spare. If 2 speeds are defined, only DO4 is spare. (Note: The firmware for application 2411 prohibits using DO6 as a spare.)

Fan Control by AOV

Application 2411 can control fan speed by modulating a variable speed drive connected to FAN AOV 1 (Point 55).

If ALARM (Point 27) equals 3, FAN AOV 1 is set to the voltage value held by AOV 1 FN ALM (Point 60).

Manual Fan Control – When FAN MODE = MANUAL, FAN AOV 1 is set to different values depending on the value of FAN SPEED (Point 26) as shown in Table 4.

Table 4. FAN SPEED and FAN AOV 1.

FAN SPEED (Point 26)	FAN AOV 1 (Point 55)
0 (Off)	AOV 1 FN OFF (Point 61)
1 (Low)	AOV 1 FN LOW (Point 3)
2 (Med)	AOV 1 FN MED (Point 10)
3 (Hi)	AOV 1 FN HI (Point 62)

Auto Fan Control – When FAN MODE = AUTO, FAN AOV 1 is controlled as follows:

HEAT.COOL (Point 5) = HEAT – If HTG MOD FAN (Point 90) equals NO, FAN SPEED (Point 26) is set equal to HTG FAN SPD (Point 91) and FAN AOV 1 is set according to Table 4. If HTG MOD FAN equals YES, the voltage for FAN AOV 1 is scaled between AOV 1 FN OFF (Point 61) and AOV 1 FN HI (Point 62) as HTG LOOPOUT (Point 80) goes from 0% to 100%. The equation for this scaling is:

FAN AOV 1 = [(HTG LOOPOUT/100) × (AOV 1 FAN HI – AOV 1 FAN OFF)] + AOV 1 FAN OFF.

An example will clarify how this equation is used. If:

AOV 1 FAN OFF equals 3 Volts and AOV 1 FAN HI equals 8 Volts, then:

- If HTG LOOPOUT equals 0%, FAN AOV 1 will equal 3 Volts.
- If HTG LOOPOUT equals 40%, FAN AOV 1 will equal 5 Volts.
- If HTG LOOPOUT equals 70%, FAN AOV 1 will equal 6.5 Volts.
- If HTG LOOPUT equals 100%, FAN AOV 1 will equal 8 Volts.

HEAT.COOL (Point 5) = COOL –The voltage for FAN AOV 1 is scaled between AOV 1 FN OFF and AOV 1 FN HI as CLG LOOPOUT (Point 79) goes from 0% to 100%. The equation for this scaling is:

FAN AOV 1 = [(CLG LOOPOUT/100) × (AOV 1 FAN HI – AOV 1 FAN OFF)] + AOV 1 FAN OFF.

An example will clarify how this equation is used. If:

AOV 1 FAN OFF equals 9 Volts and AOV 1 FAN HI equals 2 Volts, then:

- If CLG LOOPOUT equals 0%, FAN AOV 1 will equal 9 Volts.
- If CLG LOOPOUT equals 20%, FAN AOV 1 will equal 7.6 Volts.
- If CLG LOOPOUT equals 80%, FAN AOV 1 will equal 3.4 Volts.
- If CLG LOOPUT equals 100%, FAN AOV 1 will equal 2 Volts.

Heating and Cooling Stages

Application 2411 can control a variety of configurations of heating and/or cooling stages. These stages can be heating only, cooling only, both heating and cooling, or 1 stage of heating and 1 stage of cooling. The exact configuration of the heating and cooling stages depends on the values of STAGE COUNT (Point 88) and STAGE TYPE (Point 89).

Since so many variations of heating and cooling stages are possible, it would be cumbersome to explain which DOs turn ON and OFF for each stage control circumstance. Therefore, heating and cooling stages will be referred to in general terms in the text (heating stage 1, cooling stage 3, etc.). To find out specifically which DOs are being controlled, refer to Table 5. (Table 5 uses abbreviations for heating and cooling stages. Cooling stage 1 is abbreviated clg 1, cooling stage 2 is clg 2 and so on. Heating stages are treated the same.)

The table does not have any examples of STAGE COUNT or STAGE TYPE equaling 0. When STAGE COUNT or STAGE TYPE = 0, no heating or cooling stages are controlled. DO3 would be a spare while DOs 1 and 2 would be, depending on the value of MTR SETUP (Point 36), either spare or working together to control a valve.

When STAGE TYPE = 4, DO2 is the cooling stage and DO3 is the heating stage regardless of the value of STAGE COUNT, as long as STAGE COUNT does not equal 0. (If STAGE COUNT = 0, the application will not control any heating or cooling stages.)

Each DO in Table 5 has 2 columns associated with it (one column for HEAT and another for COOL). These descriptors refer to the value of HEAT.COOL (Point 5) and show how each DO is controlled in the heating mode and in the cooling mode.

Table 5: Application 2411 Heating and Cooling Stages Configuration

STAGE TYPE (Point 89)	**STAGE COUNT** (Point 88)	**DO 1** (Point 41)		**DO 2** (Point 42)		**DO 3** (Point 43)	
		HEAT	COOL	HEAT	COOL	HEAT	COOL
1	1					htg 1	OFF
	2			htg 2	OFF	htg 1	OFF
	3	htg 3	OFF	htg 2	OFF	htg 1	OFF
2	1					OFF	clg 1
	2			OFF	clg 2	OFF	clg 1
	3	OFF	clg 3	OFF	clg 2	OFF	clg 1
3	1					htg 1	clg 1
	2			htg 2	clg 2	htg 1	clg 1
	3	htg 3	clg 3	htg 2	clg 2	htg 1	clg 1
4	NOT 0			OFF	clg 1	htg 1	OFF

Heating and Cooling Stage Control Priority goes in the following order, highest too lowest:

1. User Override (local or from field panel)
2. ALARM

3. OFF mode or fan turning OFF

4. Automatic control, htg/clg loopout

User Override – The user can directly control the heating and cooling stages either locally or via PPCL at the field panel by overriding HTG LOOPOUT (Point 80) or CLG LOOPOUT (Point 79).

Alarms – If ALARM (Point 27) equals 3 or 2, all stages of heating and cooling are immediately turned OFF. The ALARM point has no effect on the heating and cooling stages when ALARM equals 0 or 1.

OFF Mode or Fan turning OFF – When FAN SPEED (Point 26) changes to 0 (OFF), or when the controller changes from ON to OFF mode (both ON.OFF, Point 28 and OFF OVRD, Point 25 = OFF), the fan remains ON until any configured heating or cooling stages turn OFF. These stage(s) may or may not turn OFF immediately depending on whether the time set in STG OFF DLAY (Point 56) has elapsed—the time must elapse before the stage(s) turn OFF.

The amount of time stored in STG OFF DLAY is reset every time a heating or cooling stage changes status (turns ON or OFF). If the amount of time since a change in the status of a heating or cooling stage is **less** than the amount of time set in STG OFF DLAY (at a time when FAN SPEED is set to 0 or the controller is sent to OFF mode), the time remaining in STG OFF DLAY must elapse before the heating or cooling stage(s) and fan are turned OFF.

Automatic Control, HTG LOOPOUT – When HEAT.COOL equals HEAT and all cooling stages have been shut OFF, the heating stages are controlled as follows: (**Note:** This description describes what happens as the heating load goes from light to heavy and back to light. It is assumed that STAGE COUNT (Point 88) equals 3.)

- If heating stage 1 has been OFF for at least the amount of time set in H STG TIME (Point 77), it turns ON as soon as HTG LOOPOUT (Point 80) reaches HTG 1 ON (Point 15).
- If heating stage 1 has been ON for at least the amount of time set in H STG TIME, stage 2 turns ON as soon as HTG LOOPOUT reaches HTG 2 ON (Point 16).
- If heating stage 2 has been ON for at least the amount of time set in H STG TIME, stage 3 turns ON as soon as HTG LOOPOUT reaches HTG 3 ON (Point 17).
- If heating stage 3 has been ON for at least the amount of time set in H STG TIME, it turns OFF as soon as HTG LOOPOUT drops below HTG 3 ON.
- If heating stage 3 has been OFF for at least the amount of time set in H STG TIME, stage 2 turns OFF as soon as HTG LOOPOUT drops below HTG 2 ON.
- If heating stage 2 has been OFF for at least the amount of time set in H STG TIME, stage 1 turns OFF as soon as HTG LOOPOUT drops below HTG 1 ON.

CLG LOOPOUT – When HEAT.COOL equals COOL and all heating stages have been shut OFF, the cooling stages are controlled as follows: (**Note:** This description describes what happens as the cooling load goes from light to heavy and back to light. It is assumed that STAGE COUNT (Point 88) equals 3.)

- If cooling stage 1 has been OFF for at least the amount of time set in C STG TIME (Point 76), it turns ON as soon as CLG LOOPOUT (Point 79) reaches CLG 1 ON (Point 22).
- If cooling stage 1 has been ON for at least the amount of time set in C STG TIME, stage 2 turns ON as soon as CLG LOOPOUT reaches CLG 2 ON (Point 23).
- If cooling stage 2 has been ON for at least the amount of time set in C STG TIME, stage 3 turns ON as soon as CLG LOOPOUT reaches CLG 3 ON (Point 24).
- If cooling stage 3 has been ON for at least the amount of time set in C STG TIME, it turns OFF as soon as CLG LOOPOUT drops below CLG 3 ON.
- If cooling stage 3 has been OFF for at least the amount of time set in C STG TIME, stage 2 turns OFF as soon as CLG LOOPOUT drops below CLG 2 ON.
- If cooling stage 2 has been OFF for at least the amount of time set in C STG TIME, stage 1 turns OFF as soon as CLG LOOPOUT drops below CLG 1 ON.

Operation of Heating and Cooling Stages during Heating/Cooling Switchover

If any heating stages are ON when HEAT.COOL (Point 5) changes from HEAT to COOL, they are shut OFF in a timed, orderly fashion as follows: The highest stage of heat that is ON (stage 3, 2, or 1) is immediately shut OFF if it has been ON for at least the full amount of time set in H STG TIME (Point 77). If it has not been ON for the full amount of time, it stays ON until H STG TIME elapses and then it is shut OFF. The timer associated with H STG TIME gets reset and the next highest remaining stage of heat stays ON until the amount time set in H STG TIME elapses, after which it too is shut OFF. This process continues until all heating stages are OFF. Regardless of how high the value of CLG LOOPOUT is, no cooling stages will turn ON until all heating stages are OFF.

If any cooling stages are ON when HEAT.COOL (Point 5) changes from COOL to HEAT, they are shut OFF in a timed, orderly fashion in the same manner as the heating stages described above. The full explanation is repeated here for convenience: The highest stage of cooling that is ON (stage 3, 2, or 1) will be shut OFF immediately if it has been ON for at least the full amount of time set in C STG TIME (Point 76). If it has not been ON for the full amount of time, then it stays ON until C STG TIME elapses and then is shut OFF. The application resets the timer associated with C STG TIME and the next highest remaining stage of cooling stays ON until the time set in C STG TIME elapses, after which it too is shut OFF. This process continues until all cooling stages are OFF. Regardless of how high the value of HTG LOOPOUT is, no heating stages will turn ON until all cooling stages are OFF.

Alarms

DI 2 (Point 47), DI 5 (Point 50), and DI 6 (Point 51) can be configured as safety inputs. Each safety input is also configured to have an associated alarm level.

The alarm point (ALARM, Point 27) is set to the highest level of alarm detected. DIs may also be monitored individually for specific alarms. Refer to the *Start-up* document for how to configure these safety points and their alarm levels.

The alarm levels determine the application's alarm sequence, as shown in the following table:

Table 6. Application 2411 Alarm Levels.

Value of ALARM (Point 27)	Result
0	Alarm level 0 – No Alarm
1	Alarm level 1 (low level alarm) – No response, monitoring only
2	Alarm level 2 (medium level alarm) – All controls set to OFF except fan
3	Alarm level 3 (high level alarm) – All controls set to OFF including fan

Alarms are configured by setting the input parameters as in the following table:

Table 7. Alarm Levels in Application 2411.

Setup Point	Value	Result
SAFETY SET 1 (Point 81)	0	DI 5 is not used for alarming
	1	DI 5 will trigger a low level alarm
	2	DI 5 will trigger a medium level alarm
	3	DI 5 will trigger a high level alarm
SAFETY SET 2 (Point 82)	0	DI 2 is not used for alarming
	1	DI 2 will trigger a low level alarm
	2	DI 2 will trigger a medium level alarm
	3	DI 2 will trigger a high level alarm
SAFETY SET 3 (Point 83)	0	DI 6 is not used for alarming
	1	DI 6 will trigger a low level alarm
	2	DI 6 will trigger a medium level alarm
	3	DI 6 will trigger a high level alarm
AIDI5 CONFIG (Point 75)	0	DI 5 is a spare input
	1	DI 5 is a N.O. Safety (DI 5 alarms when closed)
	2	DI 5 is a N.C. Safety (DI 5 alarms when opened)
	3	AI/DI 5 is an Aux temperature sensor
DI2 CONFIG (Point 73)	0	DI 2 is a spare input or available for use as a wall switch
	1	DI 2 is a N.O. Safety (DI 2 alarms when closed)
	2	DI 2 is a N.C. Safety (DI 2 alarms when opened)
	3	DI 2 is an ON/OFF Switch
DI6 CONFIG (Point 74)	0	DI 6 is a spare input
	1	DI 6 is a N.O. Safety (DI 6 alarms when closed)
	2	DI 6 is a N.C. Safety (DI 6 alarms when opened)
	3	DI 6 is a HEAT/COOL switch (typically used when a coil or stage can be either heating or cooling, and the unit is operating standalone)

ALARM Point Values

ALARM (Point 27) has several different values it can assume (0,1,2 and 3) each of which has a different meaning.

When ALARM has a value of zero, it can mean any one of the following:

- None of the DIs are being used as safeties.
  AIDI5 CONFIG (Point 75) = 0 or 3, DI2 CONFIG = 0 or 3, and DI6 CONFIG = 0 or 3.
- None of the safeties have been enabled.
  SAFETY SET 1 (Point 81) = 0, SAFETY SET 2 (Point 82) = 0, and SAFETY SET 3 (Point 83) = 0.
- No alarms have been detected.

When ALARM has a value of 1 it means that **all** of the following are true:

- At least 1 low level alarm has been detected.
- No medium level alarms have been detected.
- No high level alarms have been detected.

When ALARM has a value of 2, **all** of the following are true:

- At least 1 medium level alarm has been detected.
- No high level alarms have been detected.
- Any low level alarms (if they have occurred) are being ignored.

When ALARM has a value of 3, **all** of the following are true:

- At least 1 high level alarm has been detected.
- Any medium level alarms (if they have occurred) are being ignored.
- Any low level alarms (if they have occurred) are being ignored.

ALARM Point Reset

Whenever ALARM (Point 27) has a non-zero value, an alarm has occurred somewhere in the system. If the DI that caused the alarm goes back to its non-alarm state, the application automatically resets ALARM to zero provided no other DIs are in alarm.

Fail-Safe Operation

If the room temperature sensor fails, the controller operates using the last known temperature value.

Application Notes

1. If the temperature swings in the room are excessive, or if there is trouble in maintaining the set point, then either the cooling loop, the heating loop or both need to be tuned. Refer to *APOGEE Automation Service Procedures* on InfoLink for more information.

2. The Unit Conditioner Controller, as shipped from the factory, keeps all associated equipment OFF. Refer to Equipment Controllers in *APOGEE Automation Start-up Procedures* on InfoLink for information on how to release the controller and its equipment to application control.

3. Spare DOs can be used as auxiliary points that are controlled by the field panel after being defined in the field panel's database. If a modulating, floating control valve is not being controlled by the application and DO1 and DO2 are not being used to control staged heating and/or cooling, then DO 1 and DO 2 may be used as auxiliary motor points. If using a pair of spare DOs to control a motor, you must make sure that the motor setup and motor timing are enabled correctly before you unbundle VLV COMD (Point 38) for DO 1 and DO 2. Refer to *APOGEE Automation Start-up Procedures* on InfoLink for more information.

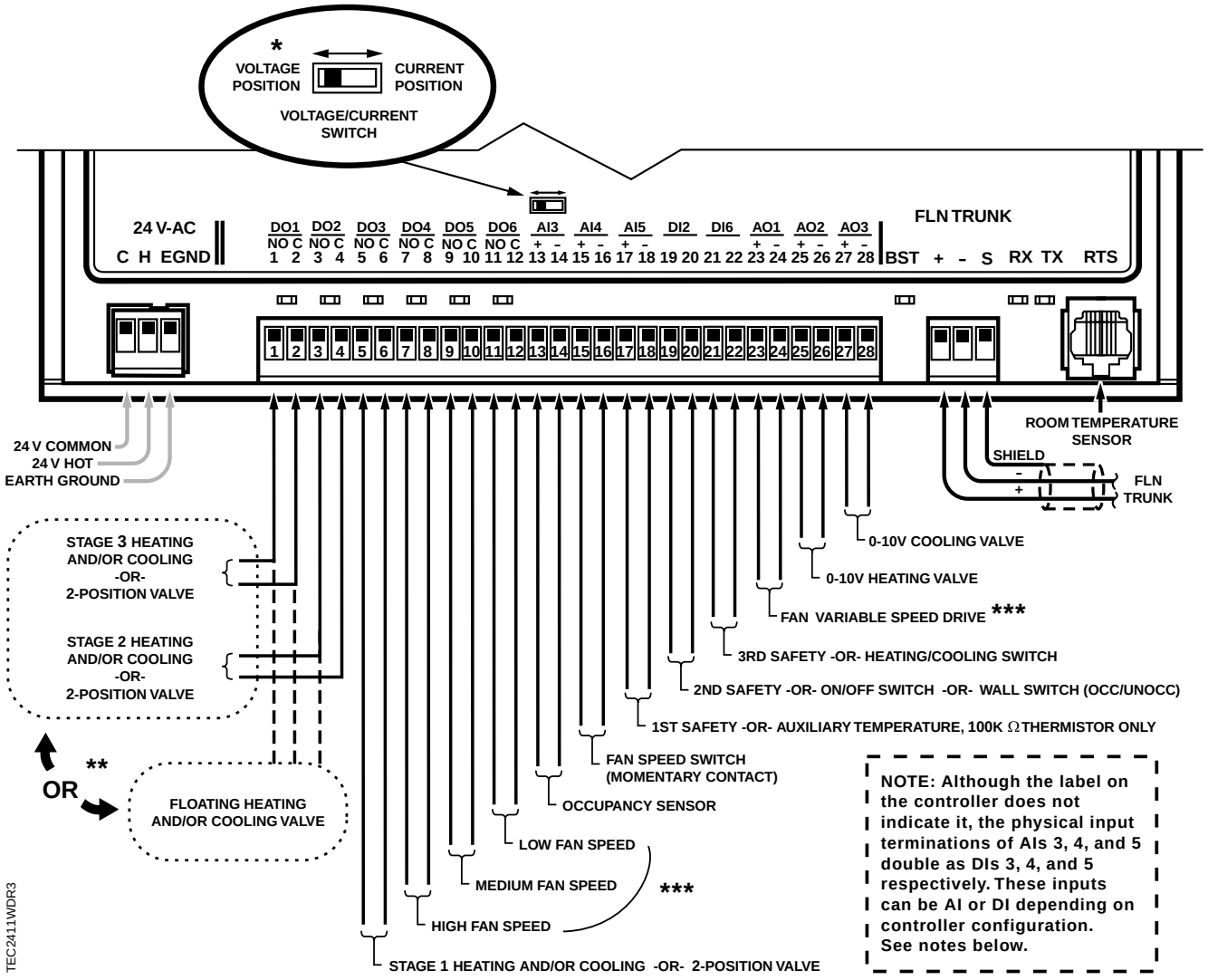
Wiring Diagram

The point wiring for Application 2411 is shown in Figure 2411-7.

Wiring Diagram

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 VA requirements higher than the maximum, 110 or 220 Vac requirements, DC power requirements, or separate transformers used to power the load.

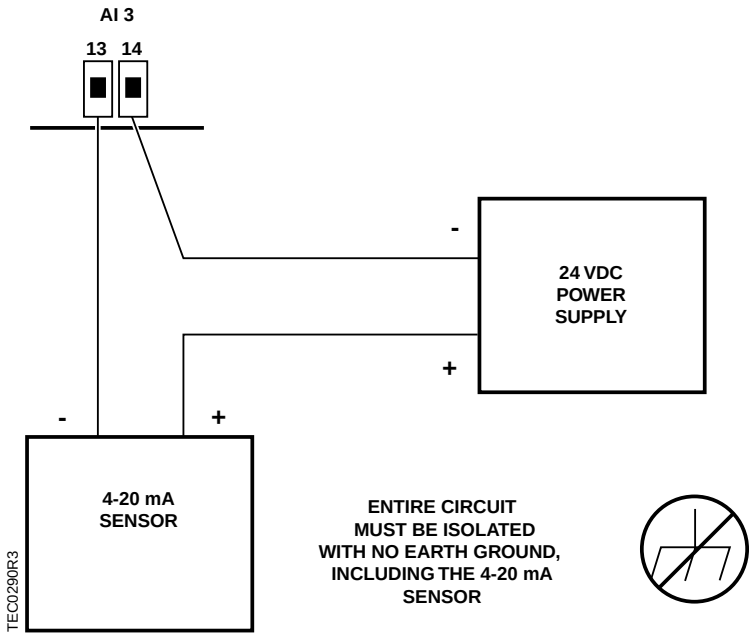


***Dipswitch for AI3 (under controller cover on circuit board) must be in *voltage* (V) position.
Note: AI3 can be a spare input (4-20 mA or 0-10V). The voltage/current dipswitch must be set accordingly and PIR ENABLE (Point 71) must = 0. (**IMPORTANT:** If AI3 is used as 4-20 mA sensor input, special wiring instructions **must** be followed (Figure 2411-8.)
Note: Certain other I/O points can be spare as well. Refer to the application documentation and/or the *Start-up* document. (AI/DI4 and AI/DI5, if used for spare analog input, are 100K Ω thermistor only.)

****DOs 1 and 2 can control contactors or 2-position valves, OR, they can be used together to control a floating valve.

*****Although the firmware for application 2411 allows DOs 4, 5, and 6 as well as AO1 to be used for fan speed control, box manufacturers do not readily support both types of control (digital and analog) on the same terminal box.

Figure 2411-7. Wiring Diagram for Application 2411.



NOTE: You can NOT use the same transformer to power the controller and a 4-20 mA sensor. The 4-20 mA sensor requires a SEPARATE dedicated power supply.

Figure 2411-8. Special Wiring Requirements if 4-20 mA Sensor is used at AI3.

CAUTION:

Equipment damage or loss of data may occur if the user does not follow procedure as specified.

Point Database

Point Database for Application 2411.

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	2495	--	1	0	--	--
03	AOV 1 FN LOW	2.0	VOLTS	0.01	0.0	--	--
{04}	ROOM TEMP	74.0 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
{05}	HEAT.COOL	COOL	--	--	--	HEAT	COOL
06	OCC CLG STPT	74.0 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
07	OCC HTG STPT	70.0 (21.20888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
08	UOC CLG STPT	82.0 (27.92888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
09	UOC HTG STPT	65.0 (18.40888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
10	AOV 1 FN MED	6.0	VOLTS	0.01	0.0	--	--
11	RM STPT MIN	55.0 (12.80888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
12	RM STPT MAX	90.0 (32.40888)	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)	--	--
14	STPT DIAL	NO	--	--	--	YES	NO
15	HTG 1 ON	0.0	PCT	0.4	0.0	--	--
16	HTG 2 ON	34.0	PCT	0.4	0.0	--	--
17	HTG 3 ON	68.0	PCT	0.4	0.0	--	--
18	WALL SWITCH	NO	--	--	--	YES	NO
{19}	DI OVRD SW	OFF	--	--	--	ON	OFF
20	OVRD TIME	0	HRS	1	0	--	--
{21}	UNOCC OVRD	UNOCC	--	--	--	UNOCC	OCC
22	CLG 1 ON	0.0	PCT	0.4	0.0	--	--
23	CLG 2 ON	34.0	PCT	0.4	0.0	--	--
24	CLG 3 ON	68.0	PCT	0.4	0.0	--	--
{25}	OFF OVRD	OFF	--	--	--	ON	OFF
{26}	FAN SPEED	0	--	1	0	--	--
{27}	ALARM	0	--	1	0	--	--
{28}	ON.OFF	OFF	--	--	--	ON	OFF
{29}	OCC.UNOCC	UNOCC	--	--	--	UNOCC	OCC
30	AOV 2 CLOSE	0.0	VOLTS	0.01	0.0	--	--
31	AOV 2 OPEN	10.0	VOLTS	0.01	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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Point Database for Application 2411.

Point Number	Descriptor	Factory Default (SI Units)	Engr Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
32	AOV 3 CLOSE	0.0	VOLTS	0.01	0.0	--	--
33	AOV 3 OPEN	10.0	VOLTS	0.01	0.0	--	--
34	SWITCH DBAND	1.0 (0.56)	DEG F (DEG C)	0.25 (0.14)	0.0	--	--
35	VALVE TYPE	2	--	1	0	--	--
36	MTR SETUP	0	--	1	0	--	--
37	MTR TIMING	130	SEC	1	0	--	--
{38}	VALVE COMD	0.0	PCT	0.4	0.0	--	--
{39}	VALVE POS	0.0	PCT	0.4	0.0	--	--
40	DO DIR. REV	0	--	1	0	--	--
{41}	DO 1	OFF	--	--	--	ON	OFF
{42}	DO 2	OFF	--	--	--	ON	OFF
{43}	DO 3	OFF	--	--	--	ON	OFF
{44}	FAN HI DO 4	OFF	--	--	--	ON	OFF
{45}	FAN MED DO 5	OFF	--	--	--	ON	OFF
{46}	FAN LO DO 6	OFF	--	--	--	ON	OFF
{47}	DI 2	OFF	--	--	--	ON	OFF
{48}	PIR DI 3	OFF	--	--	--	ON	OFF
{49}	DI 4	OFF	--	--	--	ON	OFF
{50}	DI 5	OFF	--	--	--	ON	OFF
{51}	DI 6	OFF	--	--	--	ON	OFF
{52}	AI 3	0.0	PCT	0.4	0.0	--	--
{53}	AI 4	37.5 (3.055556)	DEG F (DEG C)	0.5 (0.28)	37.5(3.055556)	--	--
{54}	AUX TMP AI5	110.5 (43.935556)	DEG F (DEG C)	0.5 (0.28)	37.5(3.055556)	--	--
{55}	FAN AOV 1	0.0	VOLTS	0.01	0.0	--	--
56	STG OFF DLAY	0	MIN	1	0	--	--
{57}	HTG AOV 2	0.0	VOLTS	0.01	0.0	--	--
{58}	CLG AOV 3	0.0	VOLTS	0.01	0.0	--	--
59	TEMP SOURCE	ROOM	--	--	--	ROOM	AUX
60	AOV 1 FN ALM	0.0	VOLTS	0.01	0.0	--	--
61	AOV 1 FN OFF	0.0	VOLTS	0.01	0.0	--	--
62	AOV 1 FN HI	10.0	VOLTS	0.01	0.0	--	--
63	CLG P GAIN	20.0 (36.0)	--	0.25 (0.45)	0.0	--	--
64	CLG I GAIN	0.01 (0.018)	--	0.001 (0.0018)	0.0	--	--
65	CLG D GAIN	0 (0.0)	--	2 (3.6)	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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Point Database for Application 2411.

Point Number	Descriptor	Factory Default (SI Units)	Engr Units (SI Units)	Slope (SI Units)	Intercept (SI Units)	On Text	Off Text
66	CLG BIAS	0.0	PCT	0.4	0.0	--	--
67	HTG P GAIN	10.0 (18.0)	--	0.25 (0.45)	0.0	--	--
68	HTG I GAIN	0.01 (0.018)	--	0.001 (0.0018)	0.0	--	--
69	HTG D GAIN	0 (0.0)	--	2 (3.6)	0	--	--
70	HTG BIAS	0.0	PCT	0.4	0.0	--	--
71	PIR ENABLE	0	--	1	0	--	--
72	PIR TIME	0	MIN	1	0	--	--
73	DI2 CONFIG	0	--	1	0	--	--
74	DI6 CONFIG	0	--	1	0	--	--
75	AIDI5 CONFIG	0	--	1	0	--	--
76	C STG TIME	1	MIN	1	0	--	--
77	H STG TIME	1	MIN	1	0	--	--
{78}	CTL TEMP	74.0 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
{79}	CLG LOOPOUT	0.0	PCT	0.4	0.0	--	--
{80}	HTG LOOPOUT	0.0	PCT	0.4	0.0	--	--
81	SAFETY SET 1	0	--	1	0	--	--
82	SAFETY SET 2	0	--	1	0	--	--
83	SAFETY SET 3	0	--	1	0	--	--
84	FAN SPD CNT	3	--	1	0	--	--
85	SWITCH LIMIT	5.2	PCT	0.4	0.0	--	--
86	SWITCH TIME	10	MIN	1	0	--	--
87	FAN OVRD TIM	0	MIN	1	0	--	--
88	STAGE COUNT	0	--	1	0	--	--
89	STAGE TYPE	0	--	1	0	--	--
90	HTG MOD FAN	NO	--	--	--	YES	NO
91	HTG FAN SPD	1	--	1	0	--	--
{92}	CTL STPT	74.0 (23.44888)	DEG F (DEG C)	0.25 (0.14)	48.0(8.88888)	--	--
93	FAN LO ON	0.0	PCT	0.4	0.0	--	--
94	FAN MED ON	34.0	PCT	0.4	0.0	--	--
95	FAN HI ON	68.0	PCT	0.4	0.0	--	--
96	CAL TIMER	12	HRS	1	0	--	--
97	FAN MODE	AUTO	--	--	--	AUTO	MANUAL
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.