SIEMENS

Controller Start-up for Custom Solutions Application 2411

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

TEC 0354.11

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Verifying Power to Controller

NOTES: 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 balancing, tuning, etc.

The Controller Interface Software (CIS) must be Rev. 2.0 or greater.

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

Verify that APPLICATION (Point 2) is set to 2495 (slave mode).

Display the STARTUP report.

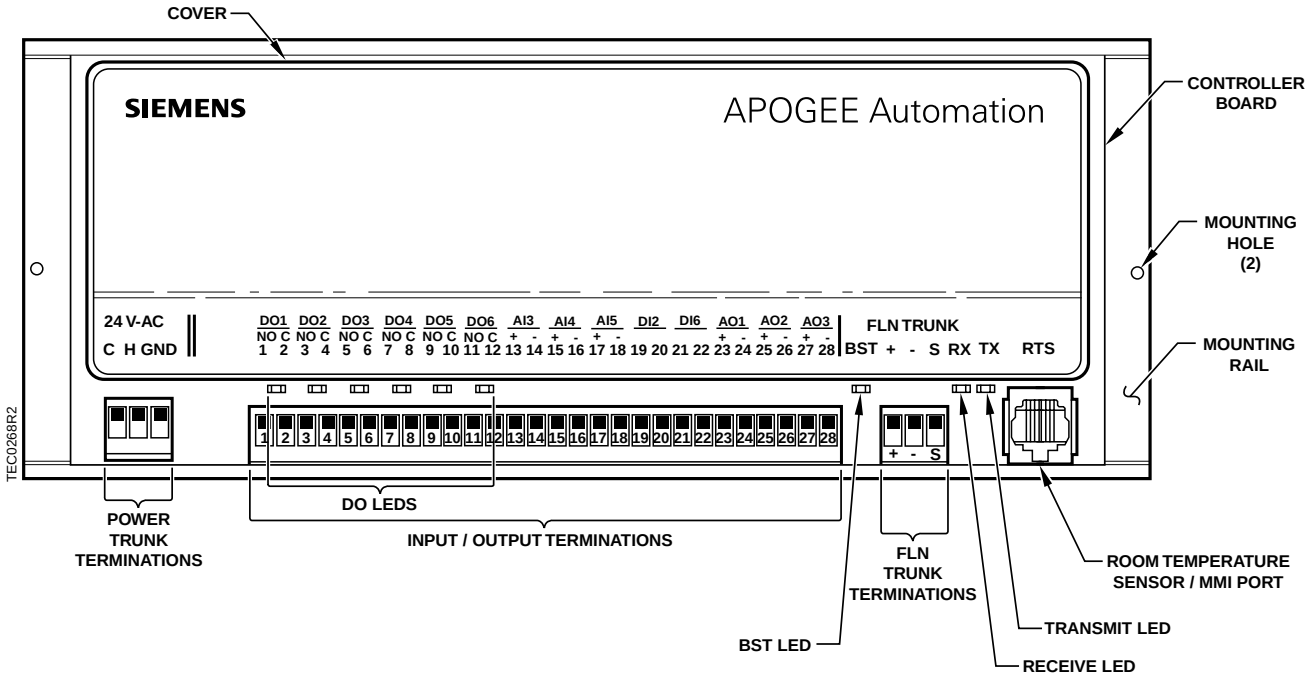

Figure 1. Heating and Cooling Unit Conditioner Controller with Multi-Speed Fan, ON/OFF Switch, and Occupancy Sensor.

Setting Application

NOTE: If you are going to enter an LCTLR point at the field panel, keep track of the application, override time, and controller address you enter at the portable operator's terminal. You will be required to enter these values again at the field panel.

Set APPLICATION (Point 2) to 2411.

After you set the application, the controller goes through a shut-down/load sequence as it switches from slave mode to the application selected. Once the OVERVIEW report appears, continue with the following procedures.

Trade-Offs

Application 2411 supports a number of different features. However, not all of these features can be used at the same time because several use the same Inputs and Outputs. Therefore, some trade-offs are involved. These trade-offs, listed here, should be kept in mind when starting up the controller in application 2411.

- DI 2 (Point 47) can either be used as a Wall Switch, an ON/OFF Switch, or as the 2nd Alarm point.
- If DI 5 (point 50) is being used as the 1st Alarm point, AUX TMP AI5 (point 54) cannot be used in read the value of an auxiliary temperature sensor. Likewise, if AI 5 is being used to monitor the value of an auxiliary temperature sensor, DI 5 cannot be used as an Alarm point. (AI 5 and DI 5 are the same physical point on the controller.)
- DI 6 (Point 51) can either be used as a Heating/Cooling Switch or as the 3rd Alarm point.
- If DO 1 (Point 41) and DO 2 (Point 42) are being used to command a floating control valve, they cannot be used as stages 2 and 3 of heating, cooling, or heating/cooling. Likewise, if these DOs are being used by staged heating, cooling, or heating/cooling, they are not available to control the floating control valve.

Setting Room Temperature Set Points

Follow these steps to set the room temperature set points:

1. Display the SETPOINTS report.
2. Set STPT DIAL (Point 14).
    - If the room temperature sensor has a set point dial, and if RM STPT DIAL (Point 13) is to be used by the controller, set STPT DIAL (Point 14) to YES; otherwise, set STPT DIAL to NO. (If STPT DIAL is set to YES, the occupied cooling/heating set points are not used. RM STPT DIAL is used instead.)
    - If there is no set point dial on the room temperature sensor, verify that STPT DIAL is set to NO.

3. Set the following points to the appropriate values:
   - OCC CLG STPT (Point 6)
   - OCC HTG STPT (Point 7)
   - UOC CLG STPT (Point 8)
   - UOC HTG STPT (Point 9)
4. If the room temperature sensor has a set point dial that will be used, set RM STPT MIN (Point 11) and RM STPT MAX (Point 12) to the minimum and the maximum allowable room temperature set point values, respectively. Valid values range from 55° to 95°F (13° to 35°C). Common values for these points are 65°F (18°C) for RM STPT MIN and 80°F (27°C) for RM STPT MAX.

Setting Override Time

1. Display the STARTUP report.
2. If using night override, set OVRD TIME (Point 20) to the number of whole hours that an override should last. If set at zero (the default), night override is disabled.

NOTE: If both a DI override switch (see *Configuring DI 2*) and the PIR sensor (see *Configuring DI 3*) will be configured to send the controller into Unoccupied Override mode, this mode will be maintained for the length of time set in either OVRD TIME or PIR TIME (Point 72), respectively. OVRD TIME should be configured with this in mind.

Setting CAL TIMER

Set CAL TIMER (Point 96) to the desired time interval that will trigger calibration of the floating control valve (if one is being used). The default value for CAL TIMER is 12 hours.

Configuring DI 2

DI2 CONFIG (Point 73) determines how Application 2411 uses DI 2 (Point 47). Specify DI 2's usage by setting DI2 CONFIG according to the following table.

DI 2 Used As	Set DI2 CONFIG to
Spare DI or Wall Switch (Occ/Unocc Switch)	0
Normally Open Safety DI Contact	1
Normally Closed Safety DI Contact	2
ON/OFF Mode Switch	3

Configuring DI 2 Alarm Level

If DI2 CONFIG was set to either 1 or 2, DI 2 is being used by the application as a safety input. DI 2 can then be configured to trigger different types of alarms depending on the value of SAFETY SET 2 (Point 82).

If DI 2 is not to be used for alarming, set SAFETY SET 2 to 0.

If DI 2 is to trigger a low level alarm, set SAFETY SET 2 to 1. (Application 2411 only monitors low-level alarms; control is not affected.)

If DI 2 is to trigger a medium level alarm, set SAFETY SET 2 to 2. (When a medium level alarm occurs, application 2411 shuts down all equipment it is controlling except the fan.)

If DI 2 is to trigger a high level alarm, set SAFETY SET 2 to 3. (When a high level alarm occurs, application 2411 shuts down all equipment it is controlling including the fan.)

Enabling a Wall Switch

If DI2 CONFIG was set to 0, DI 2 can be used by the application as a wall switch. If DI 2 is being used as a wall switch for occ/unocc control, enable it by setting WALL SWITCH (Point 18) to YES. (If WALL SWITCH = NO and DI2 CONFIG = 0, then DI 2 is a spare DI.)

Configuring DI 3

Application 2411 supports the use of an occupancy sensor connected to DI 3 (In application 2411, DI 3 is called PIR DI 3 (Point 48). This sensor can be used to send the application into the Off Override mode and/or the Unoccupied Override mode. The way Application 2411 uses DI 3 depends on the value of PIR ENABLE (Point 71).

- If DI 3 is to be used as a spare DI, set PIR ENABLE to 0.
- If DI 3 is to be used for the Unoccupied Override mode only, set PIR ENABLE to 1.
- If DI 3 is to be used for the Off Override mode only, set PIR ENABLE to 2.
- If DI 3 is to be used for both the Unoccupied Override mode and the Off Override mode, set PIR ENABLE to 3.

Setting PIR TIME

PIR TIME (Point 72) works with the occupancy sensor connected to DI 3. If the sensor detects occupancy, the application will remain in the configured mode(s)—Off Override, Unocc Override, or both—for the amount of time stored in PIR TIME.

Enter the desired value for PIR TIME.

NOTE: If both the DI override switch and the PIR sensor have been configured to send the controller into Unoccupied Override mode, this mode will be maintained for the length of time set in either OVRD TIME (Point 20) or PIR TIME, respectively. OVRD TIME and PIR TIME should be configured with this in mind.

Configuring AI 5/DI 5

AUX TMP AI5 (Point 54) and DI 5 (Point 50) occupy the same physical point on the controller; therefore, AI 5 and DI 5 cannot both be used at the same time. The way Application 2411 uses AI 5/DI 5 depends on the value of AIDI5 CONFIG (Point 75).

- If AI 5/DI 5 is to be used as a spare, set AIDI5 CONFIG to 0.
- If DI 5 will be used as a Normally Opened safety DI contact, set AIDI5 CONFIG to 1.
- If DI 5 is to be used as a Normally Closed safety DI contact, set AIDI5 CONFIG to 2.
- If AI 5 is to be used as an auxiliary temperature sensor input (whose value is stored in AUX TMP AI5), set AIDI5 CONFIG to 3.

Setting the Alarm Level of DI 5

If AIDI5 CONFIG was set to either 1 or 2, DI 5 is being used by the application as a safety input. DI 5 can then be configured to trigger different types of alarms depending on the value of SAFETY SET 1 (Point 81).

- If DI 5 is not to be used for alarming, set SAFETY SET 1 to 0.
- If DI 5 is to trigger a low level alarm, set SAFETY SET 1 to 1.
- If DI 5 is to trigger a medium level alarm, set SAFETY SET 1 to 2.
- If DI 5 is to trigger a high level alarm, set SAFETY SET 1 to 3.

Specifying which Temperature the Application is to Control

If AIDI5 CONFIG was set to 3, AI 5 is being used by the application as an auxiliary temperature input (whose value is stored in AUX TMP AI5). If desired, application 2411 can control this temperature by using it an input into application 2411's heating and cooling temperature PID loops.

If application 2411 is to control AUX TMP AI5, set TEMP SOURCE (Point 59) to AUX.

If application 2411 only monitors AUX TMP AI5 or if AI 5 is not being used, set TEMP SOURCE (Point 59) to ROOM. (When TEMP SOURCE equals ROOM, the application uses ROOM TEMP (Point 4) as an input into the heating and cooling temperature PID loops.)

Configuring DI 6

The way Application 2411 uses DI 6 (Point 51) depends on the value of DI6 CONFIG (Point 74).

- If DI 6 is to be used as a spare DI, set DI6 CONFIG to 0.
- If DI 6 is to be used as a Normally Opened safety DI contact, set DI6 CONFIG to 1.
- If DI 6 is to be used as a Normally Closed safety DI contact, set DI6 CONFIG to 2.
- If DI 6 is to be used as an HEAT/COOL Switch, set DI6 CONFIG to 3.

Configuring DI 6 Alarm Level

If DI6 CONFIG was set to either 1 or 2, DI 6 is being used by the application as a safety input. DI 6 can be configured to trigger different types of alarms depending on the value of SAFETY SET 3 (Point 83).

- If DI 6 is not to be used for alarming, set SAFETY SET 3 to 0.
- If DI 6 is to trigger a low level alarm, set SAFETY SET 3 to 1.
- If DI 6 is to trigger a medium level alarm, set SAFETY SET 3 to 2.
- If DI 6 is to trigger a high level alarm, set SAFETY SET 3 to 3.

Setting the Number of Fan Speeds

Application 2411 can control from 1 to 3 fan speeds using DOs 4, 5 and 6. Enter the desired number of fan speeds into FAN SPD CNT (Point 84).

NOTE: DO 4 can be spare if the high fan speed is not used; DO 5 can be spare if the medium fan speed is not used. Application 2411's firmware does not support the use of DO 6 as a spare even if the application is configured to keep the fan completely OFF (FAN SPD CNT = 0).

Specifying the Fan Mode

Any available fan speed can either be controlled automatically by Application 2411, or, with the proper type of thermostat, cycled manually by using a pushbutton connected to DI 4. If automatic fan speed control is desired, set FAN MODE (Point 97) to AUTO. If manual control is desired, set FAN MODE to MANUAL.

NOTE: The next four sections only apply if FAN MODE equals AUTO. If FAN MODE equals MANUAL, they can be skipped.

Specifying Control of Fan Speed in Heating Mode

On some jobs, the fan speed needs to be controlled automatically based on temperature PID loop outputs in both the heating and cooling modes. (The loop outputs are HTG LOOPOUT (Point 80) for the heating mode, and CLG LOOPOUT (Point79) for the cooling mode.) On other jobs, this type of automatic fan speed control is only required in the cooling mode (HEAT.COOL = COOL). On these other jobs, when HEAT.COOL (Point 5) equals HEAT, application 2411 will set the fan at a particular speed (low, medium or high) and keep it there throughout the entire heating mode.

If application 2411 is to control the fan speed automatically off of HTG LOOPOUT while in heating mode, set HTG MOD FAN (Point 90) to YES. If the fan speed is to remain constant while in heating mode, set HTG MOD FAN to NO.

Setting Fan Speed in Heating Mode

If HTG MOD FAN was set equal to NO in the previous section, the application needs to know at what speed to set the fan when HEAT.COOL equals HEAT:

- Set HTG FAN SPD (Point 91) to 0 for OFF (all fan speed DOs being used are OFF)
- Set HTG FAN SPD to 1 for low speed
- Set HTG FAN SPD to 2 for medium speed
- Set HTG FAN SPD to 3 for high speed

Setting Fan Speed Switching Values

The application needs to know what values of CLG LOOPOUT to use to change the fan speed from OFF to low speed, then to medium speed, and then to high speed while the application is in cooling mode. (If HTG MOD FAN was set to YES, HTG LOOPOUT will use these same fan switching values in the heating mode.)

In the cooling mode:

1. The fan will go from OFF to low speed when CLG LOOPOUT rises above FAN LO ON (Point 93). Enter the desired value for FAN LO ON. The fan will shut back off again when CLG LOOPOUT drops below FAN LO ON – 5%. Example: if FAN LO ON equals 20%, the fan will go to low speed when CLG LOOPOUT rises above 20%, and will shut back off when CLG LOOPOUT drops below 15%.

2. The fan will go from low speed to medium speed when CLG LOOPOUT rises above FAN MED ON (Point 94). Enter the desired value for FAN MED ON. The fan will go back to low speed when CLG LOOPOUT drops below FAN MED ON – 5%.

3. The fan will go from medium speed to high speed when CLG LOOPOUT rises above FAN HI ON (Point 95). Enter the desired value for FAN HI ON. The fan will go back to low speed when CLG LOOPOUT drops below FAN HI ON – 5%.

Setting Fan Override Time

If the occupancy sensor connected to PIR DI 3 (Point 48) sends the application into either the OFF override mode (OFF OVRD, Point 25 equals ON) or the unoccupied override mode (UNOCC OVRD, Point 21 equals OCC), then, if the space temperature is far away from the set point, the fan will be set to its highest available speed for the amount of time stored in FAN OVRD TIM (Point 87) before it is released back to normal control. Enter the desired time value for FAN OVRD TIM.

Configuring the Variable Speed Drive.

If application 2411 is controlling a fan variable speed drive, it needs to know the corresponding voltages the drive will use to control the speed of the fan. Set AOV 1 FN HI (Point 62) to the voltage value that corresponds to the highest desired speed. Set AOV 1 FN OFF (Point 61) to the voltage value that turns the variable speed drive OFF.

Application 2411 also needs to know the desired speed at which to run the variable speed drive when the application detects a high-level alarm (ALARM, Point 27 = 3). Set AOV 1 FN ALM (Point 60) to this voltage value.

Setting Voltages for the Modulating Spring-Return Heating Valve

Application 2411 can control a modulating, spring-return heating valve off of AOV 2. If so, it needs to know the voltages at which the valve is fully opened and fully closed. Enter the voltage value that sends the valve completely opened into AOV 2 OPEN (Point 31). Enter the voltage value that completely closes the valve into AOV 2 CLOSE (Point 30).

Setting Voltages for the Modulating Spring-Return Cooling Valve

Application 2411 can control a modulating, spring-return cooling valve off of AOV 3. If so, it needs to know the voltages at which the valve is fully opened and fully closed. Enter the voltage value that sends the valve completely opened into AOV 3 OPEN (Point 33). Enter the voltage value that completely closes the valve into AOV 3 CLOSE (Point 32).

Setting the Number of Heating, Cooling, or Heating/Cooling Stages

Application 2411 can control up to 3 ON/OFF (2-position) stages for temperature control. These stages can be heating only stages, cooling only stages, or heating/cooling stages (for example: electric heat; DX cooling; or 2-position valves). Enter the number of stages that this application will control into STAGE COUNT (Point 88).

NOTE: If a floating control valve has been configured to use DOs 1 and 2, STAGE COUNT can only be set to 0 or 1. If a floating control valve has not been configured, STAGE COUNT can be set to any value from 0 to 3.

Specifying the Stage Type

NOTE: This section and the five that follow only apply if STAGE COUNT is not 0. If STAGE COUNT = 0, you can skip forward to the section titled *Setting VALVE TYPE* and continue from there.

As previously stated, Application 2411 can control up to 3 ON/OFF stages that can be heating only stages, cooling only stages, or heating/cooling stages. The application knows what type of ON/OFF stage it is controlling by looking at the value of STAGE TYPE (Point 89).

- If no ON/OFF stages are being controlled, set STAGE TYPE to 0.
- If heating only stages are being controlled, set STAGE TYPE to 1.
- If cooling only stages are being controlled, set STAGE TYPE to 2.
- If heating/cooling stages are being controlled, set STAGE TYPE to 3.

If STAGE TYPE is set to 4, the application will use DO 2 as a cooling stage and DO 3 as a heating stage.

Setting H STG TIME

If the application is controlling any heating stages, they must stay ON for at least the amount of time stored in H STG TIME (Point 77) before they are allowed to change state. For example, if stages 1 and 2 are ON and stage 3 is OFF, the amount of time in H STG TIME must elapse before the heating stages can change to all stages ON, or to stage 1 ON and stages 2 and 3 OFF.

Enter the desired time value into H STG TIME.

Setting C STG TIME

If the application is controlling any cooling stages, they must stay ON for at least the amount of time stored in C STG TIME (Point 76) before they are allowed to change state. For instance, if stage 1 is ON, stage 2 is OFF, and stage 3 is OFF, the amount of time in C STG TIME must elapse before the cooling stages can change to all stages OFF, or to stages 1 and 2 ON and stage 3 OFF.

Enter the desired time value into C STG TIME.

Setting STG OFF DLAY

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. 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 heating or cooling stage change 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 fan plus any heating or cooling stage(s) that may be ON are turned OFF.

Enter the desired Fan OFF stage delay value into STG OFF DLAY. (Entering a value of 0 would allow the fan and stages to always turn OFF immediately, possibly damaging equipment.)

Setting the Cooling Stage Switching Values

The application needs to know the values of CLG LOOPOUT it can use to turn ON and OFF the cooling stages it is controlling.

1. The 1st stage of cooling will turn ON when CLG LOOPOUT rises above CLG 1 ON (Point 22). Enter the desired value for CLG 1 ON. (This cooling stage will shut OFF when CLG LOOPOUT drops below CLG 1 ON after C STG TIME has expired.)

2. The 2nd stage of cooling will turn ON when CLG LOOPOUT rises above CLG 2 ON (Point 23). Enter the desired value for CLG 2 ON. (This cooling stage will shut OFF when CLG LOOPOUT drops below CLG 2 ON after C STG TIME has expired.)

3. The 3rd stage of cooling will turn ON when CLG LOOPOUT rises above CLG 3 ON (Point 24). Enter the desired value for CLG 3 ON. (This cooling stage will shut OFF when CLG LOOPOUT drops below CLG 3 ON after C STG TIME has expired.)

Setting the Heating Stage Switching Values

The application needs to know the values of HTG LOOPOUT it can use to turn ON and OFF the heating stages it is controlling.

1. The 1st stage of heating will turn ON when HTG LOOPOUT rises above HTG 1 ON (Point 15). Enter the desired value for HTG 1 ON. (This heating stage will shut OFF when HTG LOOPOUT drops below HTG 1 ON after H STG TIME has expired.)

2. The 2nd stage of heating will turn ON when HTG LOOPOUT rises above HTG 2 ON (Point 16). Enter the desired value for HTG 2 ON. (This heating stage will shut OFF when HTG LOOPOUT drops below HTG 2 ON after H STG TIME has expired.)

3. The 3rd stage of heating will turn ON when HTG LOOPOUT rises above HTG 3 ON (Point 17). Enter the desired value for HTG 3 ON. (This heating stage will shut OFF when HTG LOOPOUT drops below HTG 3 ON after H STG TIME has expired.)

The next four sections apply only if a floating control valve is being used (STAGE COUNT must be 0 or 1). If a floating control valve is not being used, set MTR SETUP (Point 36) to 0 and skip these sections.

Setting VALVE TYPE

Application 2411 can control a floating control valve that is run off of DO 1 (Point 41) and DO 2 (Point 42). This valve can either be a heating only valve, a cooling only valve, or a heating/cooling valve. The application knows the type of valve by looking at the value of VALVE TYPE (Point 35).

- If a modulating floating control valve is not being used, set VALVE TYPE to 0.
- If the valve is a heating only valve, set MTR SETUP to 1.
- If the valve is a cooling only valve, set MTR SETUP to 2.
- If the valve is a combination heating/cooling valve, set MTR SETUP to 3.

Setting MTR SETUP

The point MTR SETUP (Point 36) determines whether or not a modulating floating control valve is being used and if it is direct acting or reverse acting.

- If a modulating floating control valve is not being used, set MTR SETUP to 0.
- If a modulating floating control valve is being used and is direct acting, set MTR SETUP to 1.
- If a modulating floating control valve is being used and is reverse acting, set MTR SETUP to 3.

Setting Motor Timing

If a modulating, floating control valve is being used, then run time needs to be specified. The run time is the time it takes the valve to go from completely closed to completely open (and vice versa). This time is stored in MTR TIMING (Point 37). The following table lists run times of some commonly used valves. Set MTR TIMING to the proper value.

Valve Actuator Run Times

Valve Actuator	Setting (seconds)	
	50 Hz	60 Hz
SSB81U (Powermite – MZ Series)	180	150
SQS 82	155	130

Verifying Actuator Setup

If used, verify that that the floating control valve closes when commanded and remains closed as follows:

- If the valve is enabled as direct acting and does not close, reverse the action of the valve by setting MTR SETUP (Point 36) to 3.
- If the valve is enabled as reversed and does not close, reverse the action of the valve by setting MTR SETUP to 1.

If the floating control valve still does not close completely, then it has been installed or set up incorrectly. Refer to the actuator installation instructions and set-up information, or to the *APOGEE Automation Service Procedures Manual* for more information.

Setting Controller Address

Set the controller address by setting CTLR ADDRESS (Point 1) to the appropriate number.

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 balancing, tuning, etc.