Start-up for Custom Solutions Application 2368 RPC Pneumatic Damper, Hot Water Reheat, Relative Humidity, and 3-Position Switch

TEC-0628.11

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This document contains the Start-up Documentation that is provided to the branch when the controller is ordered.

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Key words: TEC, Custom Solutions, Start-up, Constant Volume, Room Pressurization, Hot Water Reheat, Relative Humidity, 3-Position Switch, Pneumatic

1. REVISION HISTORY

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SIEMENS

Start-up for Custom Solutions Application 2368

RPC Pneumatic Damper, Hot Water Reheat, Relative Humidity, and 3-Position Switch

TEC 0628.11

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Verify power to controller

Verify that the controller is powered up. Remove enclosure cover to view BST LED. Check that the BST LED on the controller is flashing. If the BST LED does not flash ON/OFF once per second, then refer to the A*pogee Automation Service Procedures Manual* (125-3013) for troubleshooting information.

NOTES: The Controller Interface Software (CIS) used with the Room Pressurization Controller (firmware revision RA10 or higher) must be Rev. 2.0 or greater. Voyager's point database may also be used for start-up.

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.

Verify slave mode application number

1. Verify that APPLICATION (point 2) is set to 2387 (slave mode).

2. Display the STARTUP report.

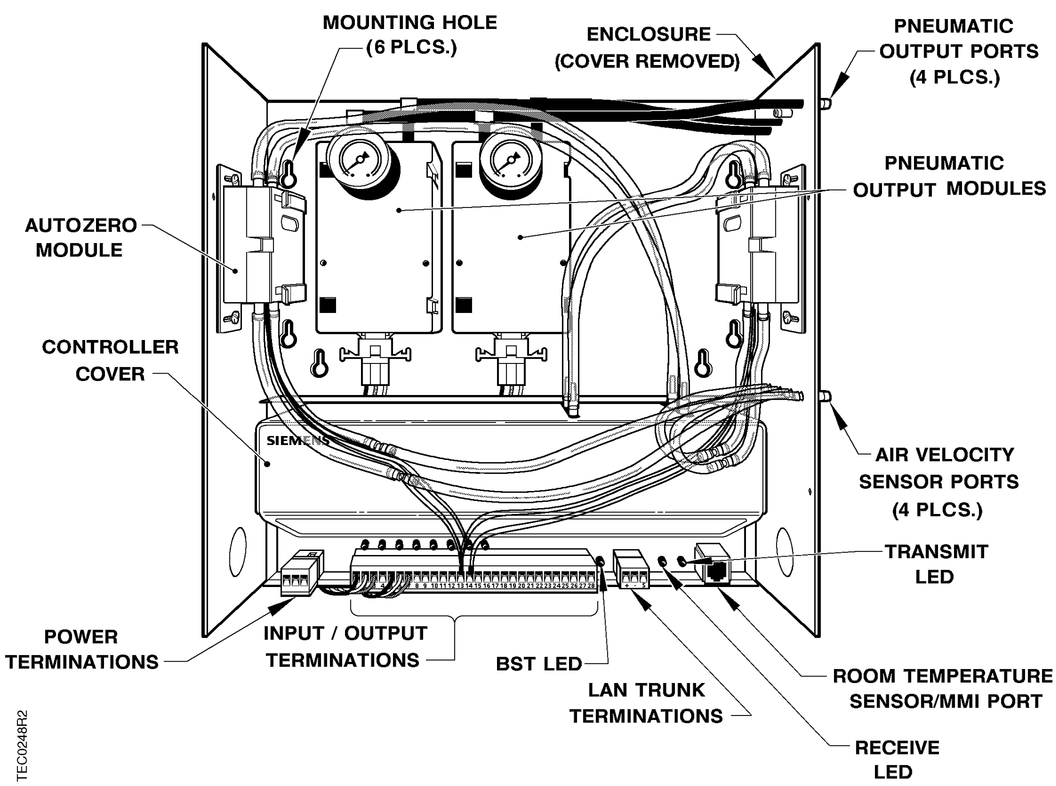

Figure 1. Room Pressurization – Pneumatic Output with Humidity Control and 3-Position Switch.

Set damper default positions

Set SUP SETUP (point 62) and EXH SETUP (point 59) to the default positions of their respective dampers (NCLOSE or NOPEN).

Enable Autozero Modules

If Autozero Modules are used, then enable them by setting CAL MODULE (point 87) to YES.

NOTE: For a controller used **without** Autozero Modules, the dampers are commanded closed to get zero airflow readings during calibration. For a controller used **with** Autozero Modules, the dampers are closed only for the first calibration after controller start-up, initialization, or return from power loss. Every subsequent calibration occurs without closing the dampers.

Select automatic calibration option

In order to choose the most efficient method of triggering the calibration routine, follow this procedure to set CAL SETUP (point 95):

NOTE: The air velocity sensor must be calibrated at least once every 24 hours. Make sure that the sensor has been calibrated before balancing takes place as this will affect the balancer's results.

1. Select the automatic calibration option desired from Table 1 that best meets your job requirements.

2. Set CAL SETUP to the value chosen.

Table 1. CAL SETUP Options.

CAL SETUP Options	Description
0	Calibration occurs ONLY when CAL AIR (point 94) is set to YES.
1	Calibration occurs when the field panel commands an occupied/unoccupied mode changeover. Actual calibration is subject to a time delay of 0, 1, 2, or 3 minutes. This delay is determined by CTLR ADDRESS (point 1) divided by 4 and the remainder is the time delay in minutes. **Example:** If CTLR ADDRESS = 11, then the controller will wait 3 minutes (11 ÷ 4 = 2 **R3**) after it receives the occupied/unoccupied mode changeover command before beginning the calibration routine.
2	Calibration occurs immediately after the override switch is depressed.
4 (factory default value)	Calibration occurs on the time interval set in CAL TIMER (point 96). For example, if CAL TIMER = 12, then the calibration period is 12 hours. Actual calibration is subject to a time delay based on the value of CTLR ADDRESS. Refer to the example in Option 1. This is the recommended option when using a controller with an Autozero Module.

NOTE: Options can be combined by summing their numbers. For example, to calibrate as in Options 1 and 2, set CAL SETUP to **3**.

Set controller address

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

Set the controller address by setting CTLR ADDRESS (point 1) to the appropriate number (00-31 if an LCTLR point will be defined for this controller).

Set application

Set APPLICATION (point 2) to 2368.

After you set the application, the controller will go through a shut-down/load sequence as it switches from slave mode to the application selected. After the application loads, the OVERVIEW report appears and the calibration cycle begins.

Wait for air velocity sensor calibration

The air velocity sensor calibration cycle begins within 3 minutes of an application start-up or initialization, depending on the address. After this delay, the calibration cycle takes 2 minutes to complete. The air damper closes during this first calibration.

At the start of the calibration cycle, the controller automatically sets CAL AIR (point 94) to YES. When the cycle is complete, CAL AIR is set to NO.

It is not necessary to wait until the calibration cycle is complete (CAL AIR set to NO) before continuing with this start-up procedure.

Set override time

Follow these steps to set the override time:

1. Display the STARTUP report.

2. If using night/unoccupied override, then set OVRD TIME (point 20) to the number of whole hours that an override should last. If set at zero (the default), then night/unoccupied override is disabled.

Enable wall switch or high humidity switch

DI 2 can be used for either the wall switch function (control of OCC.UNOCC) or as a humidity high limit switch. If DI 2 is used for day/night control (wall switch or occupancy sensor), then enable it by setting WALL SWITCH (point 18) to YES.

When WALL SWITCH is set to NO, DI 2 functions as an input for high humidity control. When DI 2 is ON, the humidifier valve will close and humidity control (PID) will be kept at its current value. Control will automatically return when DI 2 changes to OFF.

Set fail-safe mode

In the event that either air velocity sensor ceases to function, FAIL MODE (point 40) causes the dampers to either fail OPEN or CLOSED. Set FAIL MODE to the fail-safe position desired for the dampers.

Set tracking options

The tracking control strategy is determined by setting TRACK MODE (point 3) and TRACKING (point 84).

For set point tracking, set TRACKING to STPT.

When TRACK MODE is set to ETS (Exhaust Tracks Supply), the exhaust volume set point is calculated as the supply volume set point plus/minus VOLUME OFFST (point 88).

When TRACK MODE is set to STE (Supply Tracks Exhaust), the supply volume set point is calculated as the exhaust volume set point plus/minus VOLUME OFFST. If TRACK MODE is set to STE, then the flow minimums and maximums will apply to the exhaust flow.

Set TRACK MODE to the appropriate value.

For flow tracking, set TRACKING to FLOW.

When TRACK MODE is set to ETS (Exhaust Tracks Supply), the exhaust volume set point is calculated as the actual supply flow plus/minus VOLUME OFFST.

When TRACK MODE is set to STE (Supply Tracks Exhaust), the supply volume set point is calculated as the actual exhaust flow plus/minus VOLUME OFFST. If TRACK MODE is set to STE, then the flow minimums and maximums will apply to the exhaust flow.

Set TRACK MODE to the appropriate value.

NOTE: Set point tracking provides smoother control. Flow tracking provides an additional safety – if the lead flow (supply if ETS, exhaust if STE) cannot make its set point for mechanical reasons, then the tracking flow will track the actual lead flow and flow differential can be maintained. Flow tracking is more difficult and time consuming to tune.

Set pressure control

Follow these steps to set the pressure control:

CAUTION:

Do not set VOLUME OFFST (point 88) greater than CTL FLOW MAX (point 77).

1. Set VOLUME OFFST to the flow difference between supply and exhaust required to maintain the specified pressure differential.

2. Set POS.NEG (point 23) as follows:
   - If positive pressure is to be maintained, then set POS.NEG to POS.
   - If negative pressure is to be maintained, then set POS.NEG to NEG.

Set alarm function

Follow these steps to set the alarm function:

1. The alarming function works as follows:

ALARM OUT (point 46) will turn ON if ACTUAL OFFST (point 83) is more than the value of OFFSET LMT (point 38) away from VOLUME OFFST (point 88) (with the correct sign) for longer than ALARM DELAY (point 39).

Example: If VOLUME OFFST = 100 CFM, POS.NEG = NEG, OFFSET LMT = 50, and ALARM DELAY = 20 seconds, then the alarm DO will turn ON if ACTUAL OFFST is above –50 or below –150 CFM for more than 20 seconds.

Set OFFSET LMT and ALARM DELAY as appropriate.

2. Set ACTIVE.NTRAL (point 10) as follows:
   - To enable alarming and positive or negative pressure control, set ACTIVE.NTRAL to **ACTIVE**.
   - To disable alarming and use neutral pressure control, set ACTIVE.NTRAL to **NTRAL**.

Set UNOCC and OCC airflow set points

NOTE: UNOCC FLOW (point 31) must be set equal to or less than OCC FLOW (point 32).

Follow these steps to set the unoccupied and occupied airflow set points:

1. Set UNOCC FLOW to the desired/specified unoccupied airflow set point. (See *Set LOW FLOW and UNOCC FLOW*)
2. Set OCC FLOW to the desired/specified occupied airflow set point.

For example, if the controller is required to maintain a constant volume of 2500 CFM during occupied mode and 1500 CFM during unoccupied mode, then set OCC FLOW to 2500 CFM and set UNOCC FLOW to 1500 CFM.

NOTE: If TRACK MODE (point 3) equals Supply Tracks Exhaust (STE), then these airflow set points apply to the exhaust flow calculations. If the specifications call for the occupied and unoccupied flows to apply to the supply flow and negative pressurization is to be used, then set the occupied and unoccupied flow points higher by the amount of VOLUME OFFST (point 88).

Set duct areas

Set the duct areas by following these steps:

1. Using the portable operator's terminal, press **<F4>** to display the **Duct Dimensions Menu**.
2. At the Duct Dimensions Menu, use the arrow keys to select the applicable duct shape of the exhaust duct. Press **<ENTER>**. The software prompts you for the dimensions of the duct.

3. Enter the exhaust duct dimensions as prompted. Press **<ENTER>** after each dimension you enter.

4. At the Duct Dimensions Menu, use the arrow keys to select the applicable duct shape of the supply duct. Press **<ENTER>**. The software prompts you for the dimensions of the duct.

5. Enter the supply duct dimensions as prompted. Press **<ENTER>** after each dimension you enter.

NOTE: When entering the LCTLR point for this TEC at the field panel, do not enter a duct area. (Choose **N**, for None, when asked for the duct shape.) This controller does not send the value of air volume to the field panel in velocity (FPM). Instead, it uses volume (CFM) so a conversion is not necessary.

Set room temperature set points

Follow these steps to set the room temperature set points:

1. Display the SETPOINTS report.

2. If the room temperature sensor has a set point dial, and if it is to be used by the controller, then set STPT DIAL (point 14) to YES; otherwise, set STPT DIAL to NO.

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

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

2. If there is no set point dial on the room temperature sensor or if the existing set point dial is not to be used, then verify that STPT DIAL is set to NO.

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)

Set relative humidity set point

Set the relative humidity set point by changing the value of ROOM RH STPT (point 16) to the appropriate value.

Set flow coefficient

Follow these steps to set the flow coefficient:

1. Display the BALANCING report.
2. Set SUP FLO COEF (point 36) and EXH FLO COEF (point 54) to the appropriate values found in Tables 2 through 4 depending on the shape of ductwork, or Table 5. These values are starting points for the air balancer.

   To fine tune the flow coefficient use the following formula:

   new flow coefficient = (actual volume ÷ TEC volume) × old flow coefficient

   The actual volume is the actual value obtained from the balancer’s measurements. The TEC volume is the value obtained from EXH AIR VOL (point 30) and SUP AIR VOL (point 35). If the TEC volume is not within 5% of the actual volume, then repeat the procedure until it is within 5%.

   NOTE: It is extremely important that the flow readings are accurate.

Table 2. Box Manufacturer Flow Coefficients, Round Ductwork.

	Air velocity sensor type	Round ductwork (inlet) sizes in inches.												
		4	5	6	7	8	9	10	12	14	16	18	19	20
Anemostat	**PX-2 cross, "P" range**		0.77	0.74	0.75	0.78	0.74	0.81	0.81	0.85	0.80			
Anemostat	**Traverse, "H" range**		0.77	0.74	0.75	0.78	0.74	0.81	0.81	0.85	0.80			
Anemostat	**PX-2 cross, "Q" range**		0.56	0.51	0.56	0.57	0.59	0.60	0.64	0.65	0.72			
Anemostat	**Traverse, "L" range**		0.51	0.51	0.56	0.57	0.59	0.60	0.64	0.65	0.72			
Carrier	**Linear averaging**	0.75	0.71	0.64	0.63	0.62	0.62	0.61	0.61	0.58	0.54	0.58		
Carnes	**"Standard sensor"**		0.77	0.70	0.69	0.68		0.67	0.69	0.69	0.70			
Carnes	**"Cross-flow sensor"**		0.68	0.60	0.65	0.68		0.65	0.68	0.70	0.69			
Continental	**AVS model "RSZ"**			0.73		0.67		0.72	0.64	0.62	0.57		0.99	0.99
E.H. Price	**CP101**	1.04	0.83	0.64	0.68	0.66	0.72	0.75	0.80	0.85	0.80			
Environmental Tech.	**sdr,vfr,cfr**	0.79	0.78	0.59		0.62		0.64	0.65	0.66	0.66		0.59	0.66
H&C/Tuttle&Bailey	**"Flo-cross" sensor**	0.69	0.67	0.60	0.56	0.57		0.56	0.60	0.57	0.60	0.58		
H&C/Tuttle&Bailey	**Flo-cross W/ total.**	0.59	0.55	0.50							0.51			
Krueger	**general sensor**	0.77	0.73	0.66	0.68	0.70	0.68	0.69		0.67				
Metal Ind. Fan powered only.	**fvi,fc,sv,rt,th,ct,dd**									0.70	0.70			
	(6 DO)													
Metal Ind. VAV & dual duct.	**fvi,fc,sv,rt,th,ct,dd**								0.50					
	(6 DO)													
***Metal Ind. Dual duct only**	**fvi,fc,sv,rt,th,ct,dd**			0.74		0.68		0.72						
	(8 DO)													
Nailor Industries	**flow sensor**	0.74		0.73		0.75		0.64						
Pottorff Inc.	**TU-100**			0.85		0.95		0.82	0.91	0.89	0.88			
Reddi-I-Inc.	**Flowmaster**			0.66		0.60		0.61	0.55	0.58	0.65			
Titus Inc.	**Flowcross**	0.92	0.81	0.63	0.61	0.64	0.62	0.63	0.64					
Trane(Rushville)	**Air-valve (ring type)**		0.64	0.60		0.64		0.65	0.65	0.65				
Tempmaster/York	**All VAV,DD round**	0.81	0.76		0.70	0.71		0.65	0.65	0.72	0.73			
Tempmaster/York	**All VAV, DD Oval**													
Warren Tech.	**Kreuter SSS series**			1.00		1.00		1.00	1.00	1.00	1.00			

*** Inlet "Low Flow" air sensors should not be used if flow is less than 300 FPM.**

Table 3. Box Manufacturer Flow Coefficients, Rectangular Ductwork.

	Air velocity sensor type	Rectangular ductwork (inlet) sizes in inches													
		4x7	4x10	6x9	6x12	6x15	8x11	8x14	8x17	8x20	8x24	9x12	9x14	19(-3)	22(-3)
Anemostat	PX-2 cross, "P" range														
Anemostat	Traverse, "H" range														
Anemostat	PX-2 cross, "Q" range														
Anemostat	Traverse, "L" range														
Carrier	Linear averaging														
Carnes	"Standard sensor"											0.68			
Carnes	"Cross-flow sensor"											0.65			
Continental	AVS model "RSZ"														
E.H. Price	CP101														
***Environmental Tech.	sdr,vfr,cfr													0.61	0.64
H&C/Tuttle&Bailey	"Flo-cross" sensor														
H&C/Tuttle&Bailey	Flo-cross W/ total.														
Krueger	general sensor														
Metal Ind. Fan powered only.	fvi,fc,sv,rt,th,ct,dd														
	(6 DO)														
Metal Ind. VAV & dual duct.	fvi,fc,sv,rt,th,ct,dd														
	(6 DO)														
* Metal Ind. Dual duct only.	fvi,fc,sv,rt,th,ct,dd														
	(8 DO)														
Nailor Industries	flow sensor														
Pottorff Inc.	TU-100														
Reddi-I-Inc.	Flowmaster														
Titus Inc.	Flowcross														
Trane(Rushville)	Air-valve (ring type)														
Tempmaster/York	All VAV,DD round														
** Tempmaster/York	All VAV, DD Oval	0.72	0.73	0.73	0.73	0.72	0.73	0.74	0.72	0.72	0.74				
Warren Tech.	Kreuter SSS series														

*** Inlet "Low Flow" air sensors should not be used if flow is less than 300 FPM.**
**** Tempmaster oval duct area and COF were calculated as rectangular duct shapes.**
*****ETI 19" has a rectangular area of 2.72 sq/ft. ETI 22" (32.25" X 15.875") rectangular area is 3.555 sq/ft.**

Table 4. Box Manufacturer Flow Coefficients, Rectangular and Oval Ductwork.

	Air velocity sensor type	Rectangular ductwork (inlet) sizes In Inches									Oval sizes		
		12x14	12x16	12x18	12x28	12x24	16x18	16x24	16x28	20x26	12"	14"	16"
Anemostat	PX-2 cross, "P" range							0.79					
Anemostat	Traverse, "H" range												
Anemostat	PX-2 cross, "Q" range												
Anemostat	Traverse, "L" range												
Carrier	Linear averaging												
Carnes	"Standard sensor"						0.68	0.75					
Carnes	"Cross-flow sensor"						0.70	0.75					
Continental	AVS model "RSZ"												
E.H. Price	CP101		0.76					0.76					
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Metal Ind. VAV & dual duct.	fvi,fc,sv,rt,th,ct,dd	0.56	0.57	0.58	0.62	0.57				0.58	0.50	0.70	0.70
	(6 DO)												
* Metal Ind. Dual duct only	fvi,fc,sv,rt,th,ct,dd									0.60	0.64	0.67	0.68
	(8 DO)												
Nailor Industries	flow sensor										0.58	0.63	0.68
Pottorff Inc.	TU-100							0.80					
Reddi-I-Inc.	Flowmaster												
Titus Inc.	Flowcross												
Trane(Rushville)	Air-valve (ring type)												
Tempmaster/York	All VAV,DD round												
**Tempmaster/York	All VAV, DD Oval												
Warren Tech.	Kreuter SSS series												

*** Inlet "Low Flow" air sensors should not be used if flow is less than 300 FPM.**
**** Tempmaster oval duct area and COF were calculated as rectangular duct shapes.**
*****ETI 19" has a rectangular area of 2.72 sq/ft. ETI 22" (32.25" X 15.875") rectangular area is 3.555 sq/ft.**

Table 5. Box Manufacturer Flow Coefficients.

Box Manufacturer	Sensor Type	Flow Coefficient
Anemostat	2-pipe sensor without orifice 2-pipe sensor with orifice Spider sensor without orifice Spider sensor with orifice	0.79 0.59 0.73 0.39
Carnes	2-pipe sensor Flow cross	0.66 0.59
Carrier		0.59
Continental Air Products		0.79
E.H. Price		0.78
Environmental Technologies		0.79
Hart & Cooley/Tuttle & Bailey	Flow cross Orifice	0.59 0.73
Krueger		0.68
Metal Aire		0.72
Nailor Industries		0.69
Redd-I-Inc.		0.59
Tempmaster		0.73
Titus		0.60
Trane		0.66

Set AO DIR.REV

Display the AOP RP CV report. If the normal (de-energized) state of all of the devices controlled by AOs is closed, then leave AO DIR.REV (point 55) at its default value of 0.

Otherwise, reverse the action of the appropriate AO, or combination of AOs, as follows:

1. Add the values in Table 6 for each AO you wish to make reverse acting.

2. Set AO DIR.REV to this value.

Table 6. AO DIR.REV Values.

Reverse-Acting AO	Value
AO1	1
AO2	2
AO3	4

Example: Reheat valve (AO 1) and humidity valve (AO 2) are both normally open: set AO DIR.REV = 3.

Set start and span of voltages for the 0-10V actuators

Depending on the actuators you are using, set the points listed in Table 7 to the appropriate starting voltage position and the voltage range for the actuators.

NOTE: The maximum voltage output for the AOs is 10V. Therefore, the starting voltages and voltage ranges **must not** exceed 10V. The controller **will not** control the valve or damper actuator beyond 10V.

Table 7. Start and Span Voltages for Actuators.

Descriptor	Point Number	Damper Actuator
		Starting Voltage
AOV1 START AOV2 START	48 56	0 (default)
		Voltage Range
AOV1 SPAN AOV2 SPAN	49 66	10 (default)

Set LOW FLOW and UNOCC FLOW

Set LOW FLOW (point 79) to the supply CFM value below which the humidification will be turned OFF (humidifier valve closes and control (PID) will be kept at its current value. Control will automatically return when the air volume (SUP AIR FLOW) rises above UNOCC FLOW. .

Set PRES SWITCH

If a pressure switch is being used, then leave PRES SWITCH (point 91) at its default value (YES). If a pressure switch is not being used, then set PRES SWITCH to NO.

Commissioning

After all the points have been set up, follow these procedures to verify that the application is controlling properly:

1. Confirm that the differential flow control is acceptable at minimum and maximum cooling by monitoring ACTUAL OFFST (point 83).

2. Confirm that EXH AIR VOL (point 30) and SUP AIR VOL (point 35) match the true flows (as measured with other instrumentation) at both minimum and maximum cooling.

3. Confirm acceptable pressure control by using a differential pressure sensor, air velocity measurement in cracked doorway, a slip of paper in a cracked doorway, etc. If pressure is not great enough, increase the value of VOLUME OFFST (point 88).

4. Confirm that the alarm indication (alarm light or DO 6) goes ON when an alarm condition is simulated. (Command one of the flow set points to an out of range value to create an alarm condition.) Confirm that the alarm indication goes away when the alarm condition is removed (flow set point is released).

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.

Start-up is complete.