SIEMENS

Start-up Procedures for Custom Solutions Application 2359

TEC 0407.11

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VAV Controller with Electric Reheat or Baseboard Radiation and Ventilation Duct – Electronic Output

The following material presents start-up procedures for a VAV Controller with Electric Reheat or Baseboard Radiation and Ventilation Duct – Electronic Output. Refer to Figure 1.

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.).

Verifying Power to Controller

Verify that the VAV Controller is powered up. 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 *Apogee Automation Service Procedures Manual* (125-3013) for troubleshooting information.

NOTE: The Controller Interface Software (CIS) used with the VAV Controller (firmware revision DA10 or higher) must be Rev. 2.0 or greater.

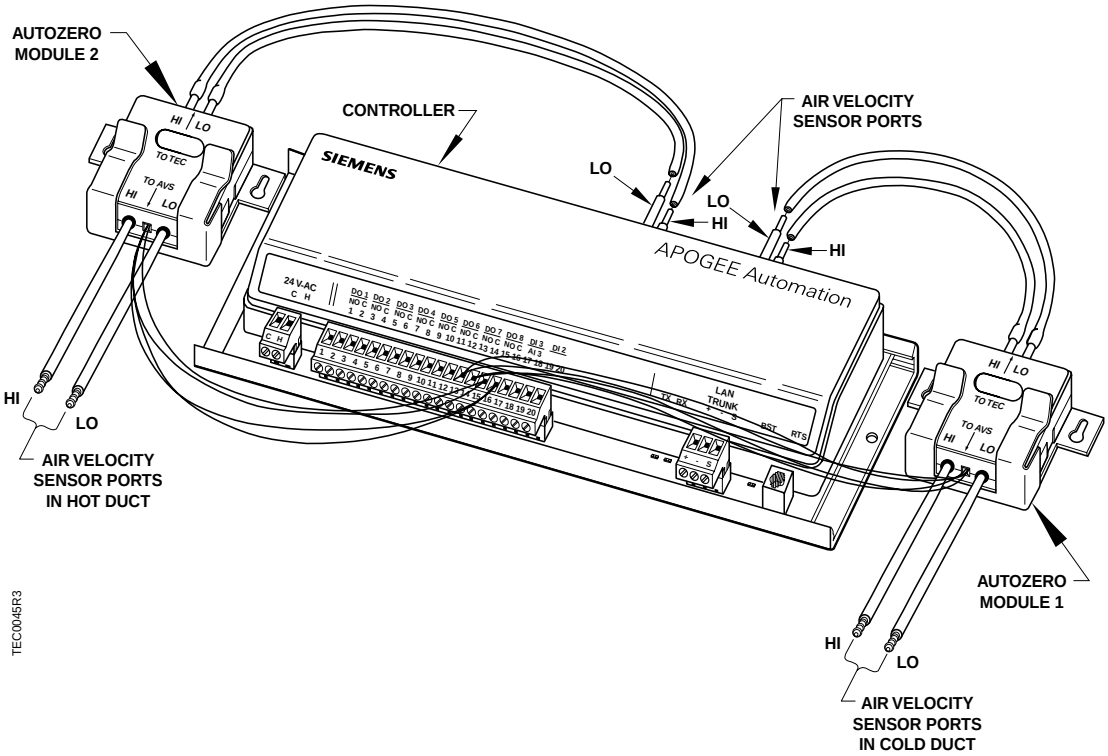

Figure 1. VAV Controller with Electric Reheat or Baseboard Radiation and Ventilation Duct – Electronic Output (shown with optional Autozero Modules).

Verifying Slave Mode Application Number

1. Verify that APPLICATION (Point 2) is set to 2293 for Rev. DA10 or higher (slave mode).
2. Display the STARTUP report.

Setting Motor Timing and Damper Actuator Rotation Angle

Actuator run times are indicated by MTR1 TIMING (Point 51), MTR2 TIMING (Point 55), and MTR3 TIMING (Point 39).

Follow these steps to set the point(s) for motor timing:

NOTE: Check with the box manufacturer's local representative and/or the terminal box submittals to confirm the damper actuator rotation angle.

1. If Motor 1 and Motor 2 are damper actuators, use Table 1 to set MTR1 TIMING and MTR2 TIMING.

Table 1. Damper Actuator Run Times.[1]

Possible Damper Actuators	Settings (seconds)	
	50 Hz	60 Hz
GDE 131.1U	108	90
GBB 171.1U	150	[2]150

[1] The run times are for 90° of travel—the actuators are capable of 95° of travel.
[2] The GBB 171.1U run time is independent of Hz.

2. If the damper rotation angles are values other than 90°, then set DMPR ROT ANG (Point 56) and VENT ROT ANG (Point 57) to the appropriate values.
3. If Motor 3 is a valve actuator, then use Table 2 to set MTR3 TIMING.

Table 2. Valve Actuator Run Time.

Possible Valve Actuators	Setting (seconds)	
	50 Hz	**60 Hz**
SQS 82	155	130
Powers VE 339 series actuator with a 1/2 in. (13 mm) stroke (used with Powertop valves)	25	21
Powers VE 339 series actuator with a 3/4 in. (19 mm) stroke[1]	38	32

[1] Settings given are for Johnson and Honeywell valves with a 3/4" stroke. Stroke may be from 1/2" to 3/4", depending on the model. Consult the manufacturer's valve literature for actual stroke and calculate the setting accordingly.

Enabling 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 a zero airflow reading 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.

Selecting 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 sensors must be calibrated at least once every 24 hours. Make sure that the sensors have been calibrated before balancing takes place. Otherwise the balancer's results may be inaccurate.

1. Select the automatic calibration option desired from Table 3 that best meets your job requirements.

2. Set CAL SETUP to the value chosen.

Table 3. 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 or a day/night 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 01) 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 or day/night mode changeover command before beginning the calibration routine.
2	Calibration occurs immediately after the override switch is depressed.
4 (factory default value)	Calibration occurs on the time interval set in CAL TIMER (Point 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**.

Setting MTR SETUP

MTR SETUP (Point 58) determines which actuators will be controlled by the application and whether they are direct or reverse acting. Refer to Table 4 to set MTR SETUP as follows:

1. Table 4 is divided into 3 main sections based on how Motor 1 is to be used. Choose the section that corresponds to how Motor 1 will be used in your application.

2. The section you have chosen is divided into 3 columns based on how Motor 2 is to be used. Choose the column that corresponds to how Motor 2 will be used in your application.

3. The column you have chosen is further divided into 3 rows based on how Motor 3 is to be used. Choose the row that corresponds to how Motor 3 will be used in your application.

4. Set MTR SETUP to the value of the number in the row and column you have chosen.

If any of the actuators still do not close completely, then the actuators have been installed or set up incorrectly. Refer to the actuator installation instructions (set up information), Table 4, or the *Apogee Automation Service Procedures Manual* (125-3013) for more information.

Table 4. Motor Enable/Reverse Values for MTR SETUP.

	Motor 1 Enabled			Motor 1 Enabled and Reversed			Motor 1 Not Used		
	Motor 2 Not Used	**Motor 2 Enabled**	**Motor 2 Enabled and Reversed**	**Motor 2 Not Used**	**Motor 2 Enabled**	**Motor 2 Enabled and Reversed**	**Motor 2 Not Used**	**Motor 2 Enabled**	**Motor 2 Enabled and Reversed**
Motor 3 Not Used	1	5	13	3	7	15	0	4	12
Motor 3 Enabled	17	21	29	19	23	31	16	20	28
Motor 3 Enabled and Reversed	49	53	61	51	55	63	48	52	60

Setting Controller Address

Set the controller address by setting CTLR ADDRESS (Point 01) to the appropriate number (00 through 31 if an LCTLR point will be defined for this controller).

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.

Setting Application

Set APPLICATION (Point 2) to the appropriate VAV Controller application. Refer to Table 5 for application names and numbers.

Table 5. VAV Controller – 2AVS – Electronic Output Applications.

Application	Revision DA10 or higher
VAV Controller with Electric Reheat or Baseboard Radiation and Ventilation Duct	2359
Slave Mode	2293

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.

The air velocity sensor calibration cycle begins within three minutes of an application start-up or initialization, depending on the address. After this delay, the calibration cycle takes from 2 to 5 minutes to complete. The air dampers close 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, it sets CAL AIR to NO.

Setting 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.

Enabling Wall Switch

If a wall switch is used for day/night or occupied/unoccupied control, then enable it by setting WALL SWITCH (Point 18) to YES.

Setting VENT PID

The Ventilation Damper can use 2-position control or it can be controlled by a PID loop. If PID control of the ventilation damper is desired, then set VENT PID (Point 91) to YES. If 2-position control of the ventilation damper is desired, then set VENT PID to NO.

Setting MIN Airflow Set Points

Follow these steps to set the minimum airflow set points:

1. Set CLG FLOW MIN (Point 31) to the desired/specified minimum cooling airflow set point.
2. Set HTG FLOW MIN (Point 33) to the desired/specified minimum cooling airflow set point.
3. Set VENT FLO MIN (Point 76) to the desired/specified minimum cooling airflow set point.

Setting MAX Airflow Set Points

Follow these steps to set the minimum airflow set points:

1. Set CLG FLOW MAX (Point 32) to the desired/specified minimum cooling airflow set point.

2. Set HTG FLOW MAX (Point 34) to the desired/specified minimum cooling airflow set point.

3. Set VENT FLO MAX (Point 77) to the desired/specified minimum cooling airflow set point.

Setting Duct Areas

Set the duct areas by following these steps:

1. Determine the area of the temperature control duct (in square feet) and enter this value into DUCT AREA (Point 97).

2. Determine the area of the ventilation duct (in square feet) and enter this value into DUCT AREA 2 (Point 60).

   NOTE: When entering the LCTLR point for a VAV Controller – Two Air Velocity Sensors at the field panel, do not enter a duct area. (Make sure that both DUCT AREA and DUCT AREA 2 are set to 1 SQ. FT.). 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.

Setting Stages of Electric Reheat

Check the hardware to verify the number of stages of electric reheat used. Set STAGE COUNT (Point 88) to this value.

CAUTION:

If using electric reheat, then do not set HTG FLOW MIN (Point 33) to 0 CFM (0 LPS). If the electric heat is on while the box is controlling at a heating flow minimum of 0 CFM (0 LPS), then equipment damage may occur.

Setting 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 the points DAY CLG STPT (Point 06) and DAY HTG STPT (Point 07) will not be used. Instead, the value of RM STPT DIAL (Point 13) will be used.

3. 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.

4. If there is no set point dial on the room temperature sensor or if the existing set point dial will not be used, then verify that STPT DIAL is set to NO and set the following points to the appropriate values.

    - DAY CLG STPT (Point 6)
    - DAY HTG STPT (Point 7)
    - NGT CLG STPT (Point 8)
    - NGT HTG STPT (Point 9)

Setting Ventilation CFM Set Point

If VENT PID (Point 91) equals YES, then set VENT CFM STP (Point 10) to the desired value. When using VENT CFM STP, make sure that VENT FLO STP (Point 61) has a priority of NONE. (If VENT FLO STP is not at NONE priority, VENT CFM STP has no effect on ventilation flow control.)

Skip this section if VENT PID equals NO.

Setting Flow Coefficients

Follow these steps to set the flow coefficients:

1. Display the BALANCING report.

2. Set the points FLOW COEFF (Point 36—Temperature Control Duct) and FLOW COEFF 2 (Point 54—Ventilation Duct) to the appropriate values found in Tables 6 through 8. This is a starting point for the air balancer.

Use the following formula to fine-tune the flow coefficient:

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 points AIR VOLUME 1 (Point 35—Temperature Control Duct Air Volume) and AIR VOLUME 2 (Point 30—Ventilation Duct Air Volume) of the TEC. If the TEC volume is not within 5% of the actual volume, then repeat the procedure until it is within 5%. **It is extremely important that the flow readings are accurate.**

NOTE: Update each controller at the field panel immediately after you complete the controller start-up procedures, and have made all other changes to the controller's point database (including balancing, tuning, etc.).

Table 6. Suggested TEC Initial Flow Coefficients for VAV manufacturer and Box Sizes.

	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 7. Suggested TEC Initial Flow Coefficients for VAV manufacturer and Box Sizes.

	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 8. Suggested TEC Initial Flow Coefficients for VAV manufacturer and Box Sizes.

	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					
H&C/Tuttle&Bailey	**"Flo-cross" sensor**												
H&C/Tuttle&Bailey	**Flo-cross W/ total.**												
Krueger	**General sensor**							0.71					
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**	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.**

VAV Controller with Electric Reheat or Baseboard Radiation and Ventilation Duct – Electronic Output start-up is complete.