Constant Volume with Humidity Control – Electronic Output

This document presents start-up procedures for Constant Volume with Humidity Control – Electronic Output. Refer to Figure 1.

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.).

Verify power to controller

Verify that the 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* on InfoLink for troubleshooting information.

NOTE: The Controller Interface Software (CIS) used with the Constant Volume with Humidity Control – Electronic Output firmware revision HC10 or higher must be Rev. 2.0 or greater.

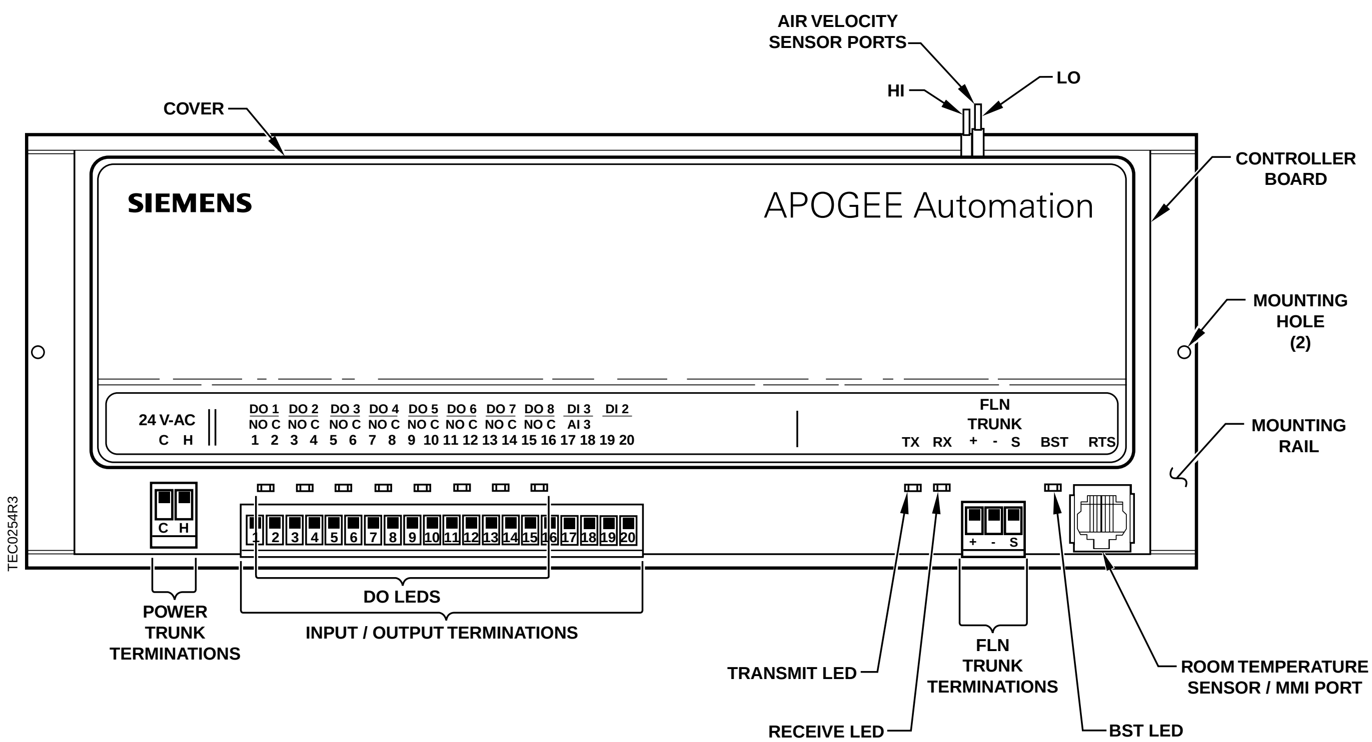

Figure 1. Constant Volume with Humidity Control – Electronic Output.

Verify slave mode application number

1. Verify that APPLICATION (Point 2) is set to 2390 for Rev. HC10 or higher (slave mode).
2. Display the STARTUP report.

Set motor timing and damper actuator rotation angle

The run time of each actuator is 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. Use Table 1 to set MTR1 TIMING.
2. If the damper rotation angle is a value other than 90°, set DPR1 ROT ANG (Point 56) to the appropriate value.
3. If Motor 2 is a valve actuator, then use Table 2 to set MTR2 TIMING.
4. If Motor 3 is a humidity valve actuator, then use Table 2 to set MTR3 TIMING. If Motor 3 is an ACT device, set MTR3 to the stroke rate of the ACT device.

Table 1. Damper Actuator Run Time.

Damper Actuator	Setting (seconds)	
	50 Hz	60 Hz
349-0101	106	88
GDE 131.1U	108	90
GDE 131.1P	108	90
GLB 131.1P	150	125
[1]GBB 171.1U	150	150
[2]GDE 161.1P	108	90
[2]GLB 161.1P	150	125

[1] GBB 171.1U run time is independent of Hz.
[2] Analog output 0-10V.

Note: See the Manufacturer Installed Controls (MIC) web page on Landscape (http://landscape.us.abatos.com/mic/) for specific manufacturers' damper opening details (90°/60°/etc.).

Table 2. Valve Actuator Run Time.

Valve Actuator	Setting (seconds)	
	50 Hz	60 Hz
SSB81U (Powermite – MZ Series)	180	150
SQS 82	155	130
SQS 65U (analog output 0 to 10V)	35	30
SQS 65.5U (analog output 0 to 10V)	35	30
SSB 61U (analog output 0 to 10V)	N/A	150

Enable actuators

MTR SETUP (Point 58) determines which actuators will be controlled by the application and whether they are direct or reverse acting.

Standard Configuration – Table 3 contains values for the most common configurations based on each application.

1. Find the hardware configuration you are using in Table 3.
2. Set MTR SETUP to the value given for that application.

Non-Standard Configuration – If your application does not use one of the listed actuators in Table 3, if one of your actuators has a different normal position than that listed in Table 3, or if you want to use a spare motor, then 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.

Table 3. MTR SETUP (Point 58) Value for Most Common Configurations.

Application Number	Configurations			Value for MTR SETUP
	Motor 1	Motor 2	Motor 3	
2300	damper (normally closed)	heating valve (normally open)	humidity valve (normally closed)	29
2300	damper (normally closed)	heating valve (normally closed)	humidity valve (normally closed)	21

Table 4. Motor Enable/Reverse Values for MTR SETUP (Point 58).

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

Enable Autozero Module

If an Autozero Module is used, then enable it by setting CAL MODULE } (Point 87) to YES.

NOTE: For a controller used without an Autozero Module, the damper is commanded closed to get a zero airflow reading during calibration. For a controller used with an Autozero Module, the damper is closed only for the first calibration after controller initialization or power up. Every subsequent calibration occurs without closing the damper. Calibration of a hot water valve (if used) is done by commanding the valve to closed. Calibration of the valve is not affected by the presence of an Autozero Module.

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 5 that best meets your job requirements.
2. Set CAL SETUP to the value chosen.

Table 5. CAL SETUP Options.

CAL SETUP Options	Description
0	Calibration occurs ONLY when CAL AIR (Point 94) is set to YES.
1	Calibration occurs when OCC.UNOCC (Point 29) 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, application, override time, and duct area 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.

Set application

Set APPLICATION (Point 2) to the appropriate Constant Volume with Humidity Control application. Refer to Table 6 for application names and numbers.

Table 6. Constant Volume with Humidity Control – Electronic Output Applications.

Application	Revision HC10 or higher
Constant Volume with Hot Water Reheat and Humidity control	2300
Slave Mode	2390

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 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, it sets CAL AIR to NO.

It is not necessary to wait until the calibration cycle is complete (CAL AIR is 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 unoccupied override, set OVRD TIME (Point 20) to the number of whole hours that an override should last. If set at zero (the default), unoccupied override is disabled.

Set UNOCC and OCC airflow set points

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 OCC FLOW to the desired occupied airflow set point.
2. Set UNOCC FLOW to the desired unoccupied airflow set point.

Enable wall switch

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

Set fail-safe mode

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

Set duct area

Set the duct area 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. Press **<ENTER>.** The software prompts you for the dimensions of the duct.
3. Enter the dimensions as prompted. Press **<ENTER>** after each dimension you enter.

NOTE: When entering the LCTLR point for a Constant Volume with Humidity Control 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 Humidity Sensor Type

The humidity sensor may be of current (4-20mA) or voltage (0-10V) type. Set the value of AI3 VOLT.CUR (Point 54) to the appropriate value.

Set Relative Humidity Setpoint

Set the Relative Humidity setpoint by changing the value of ROOM RH STPT (Point 16) to the appropriate value.

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 RM STPT DIAL (Point 13) 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 in occupied mode.

3. If the room temperature sensor has a set point dial and the set point dial 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 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 flow coefficient

Follow these steps to set the flow coefficient:

1. Display the BALANCING report.

2. Set FLOW COEFF (Point 36) to the appropriate value found in Tables 7 through 9. This value 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 AIR VOLUME (Point 35). If the TEC volume is not within 5% of the actual volume, then repeat the procedure until it is within 5%.

Table 7. 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
Tuttle & Bailey/ SIEMENS	**"Flo-cross" sensor (supply)**	0.69	0.67	0.60	0.56	0.57		0.56	0.60	0.57	0.60	0.58		
Tuttle & Bailey/ SIEMENS	**Flo-cross w/ total**	0.59	0.55	0.50							0.51			
Tuttle & Bailey/ SIEMENS	**Orifice ring flow sensor (exhaust)**	0.70		0.70		0.75		0.75	0.67	0.67	0.67			
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.

NOTE: Refer to Voyager for additional flow coefficient information.

Table 8. 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
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.

NOTE: Refer to Voyager for additional flow coefficient information.

Table 9. 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					
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.

NOTE: Refer to Voyager for additional flow coefficient information.

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.)