Dual Duct Controller—One Air Velocity Sensor—Electronic Output Start-up Procedures

This document presents start-up procedures for Dual Duct Controllers—One Air Velocity Sensor (1AVS)—Electronic Output. See 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.).

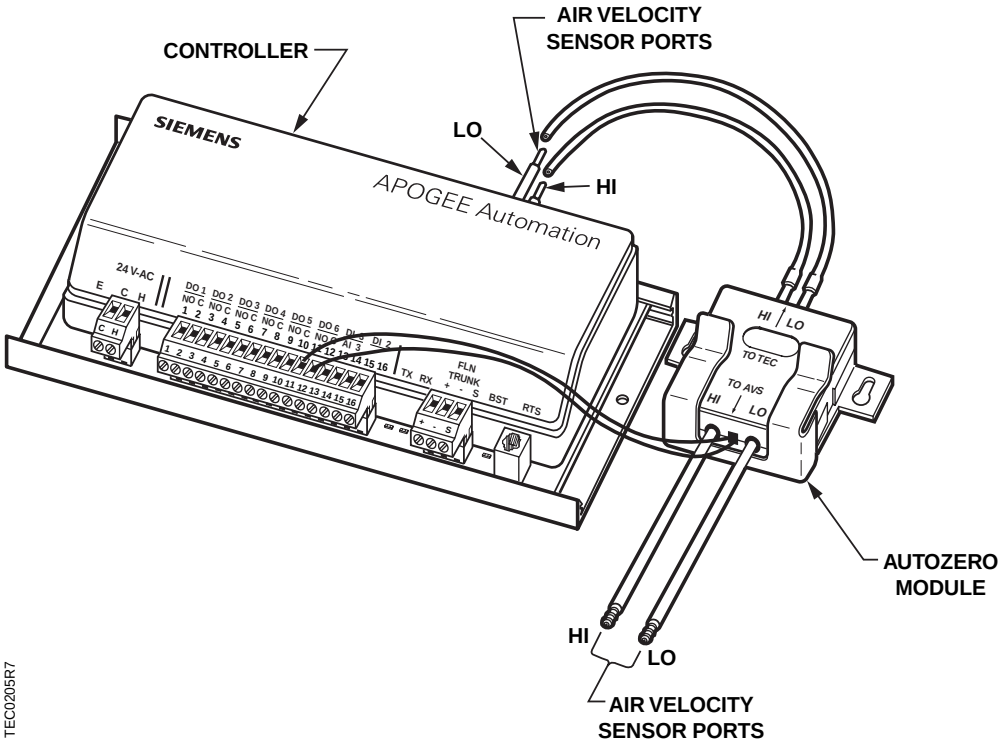

Figure 1. Dual Duct Controller—One Air Velocity Sensor—Electronic Output with Optional Autozero Module.

Verifying Power to Controller

Verify that the Dual Duct 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, see the iKnow troubleshooting tool or contact Field Support for troubleshooting information.

Verifying Slave Mode Application

1. Verify that APPLICATION (Point 2) is set to **2092** for Rev. SD10 or later, and **92** for Rev. SD01–SD02 (slave mode).

2. Display the STARTUP report.

Enabling Actuators

CAUTION:

The controller's DOs control 24 Vac loads only. The maximum rating is 12 VA for each DO.

Setting Motor Timing and Damper Actuator Rotation Angle

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/or Motor 2 is a damper actuator, use Table 1 to set MTR1 TIMING (Point 51) and/or MTR2 TIMING (Point 55).

Table 1. Damper Actuator Run Time.

Damper Actuator	Setting (seconds)	
	50 Hz	60 Hz
GDE131.1P	125	90
GLB131.1P	150	125
PTS4 electronic-to-pneumatic transducer from ACT	–	90

2. If the damper rotation angles are values other than 90°, set DPR1 ROT ANG (Point 56) and DPR2 ROT ANG (Point 57) to the appropriate values. (Rotation angle for the PTS4 is 90°.)

3. If Motor 2 and/or Motor 3 is a valve actuator, use Table 2 to set MTR2 TIMING (Point 55) and/or MTR3 TIMING (Point 39).

Table 2. Valve Actuator Run Time.

Valve Actuator	Setting (seconds)[1]	
	50 Hz	60 Hz
SSB81U, floating control fail in place	180	150
SSC81U, floating control fail in place	150	125
SSC81.5U, floating control fail-safe	125	125
SQS85.53U, floating control spring return	35	30
PTS4 electronic-to-pneumatic transducer from ACT	–	90

[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.

Specifying Motor Setup

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

Standard Configuration

1. Find the application you are using in Table 3.
2. Set MTR SETUP (Point 58) to the value given for that application.

NOTE: The assumptions for this table are:

- Dampers are Normally Closed (NC)
- Heating valves are Normally Open (NO)

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

Applications	Configurations			Value for
	Motor 1	Motor 2	Motor 3	MTR SETUP
2035, 35	cooling damper (normally closed)	heating damper (normally closed)	heating valve (normally open) (optional)	with valve: 53 without valve: 5
2036, 36	cooling/heating damper (normally closed)	total damper (normally closed)	heating valve (normally open) (optional)	with valve: 53 without valve: 5
2064, 64	total damper (normally closed)	heating valve (normally open) (optional)	N/A	with valve: 13 without valve: 1
2065, 65	cooling damper (normally closed)	heating damper (normally closed)	heating valve (normally open) (optional)	with valve: 53 without valve: 5
2066, 66	cooling/heating damper (normally closed)	N/A	N/A	1

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, set MTR SETUP (Point 58) according to Table 4.

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

Verifying Actuator Setup

1. Command all actuators closed. Verify that they close and remain closed. If not, adjust the setting for MTR SETUP according to Table 4.

2. If any of the actuators still does not close completely, then the actuators have been installed or set up incorrectly. See the installation instructions or the iKnow troubleshooting tool, or contact Field Support.

Setting the Application

Set APPLICATION (Point 2) to the appropriate Dual Duct Controller application. See Table 5 for application names and numbers.

Table 5. Dual Duct Controller—1AVS—Electronic Output Applications.

Application	Revision SD01–SD02	Revision SD10 or later
Dual Duct Constant Volume with Two Inlet Damper Actuators with Optional Reheat	35	2035
Dual Duct Constant Volume with One Inlet and One Outlet Damper Actuator with Optional Reheat	36	2036
Dual Duct VAV with Two-Position Hot/Cold Damper and Volume Damper with Optional Reheat	64	2064
Dual Duct VAV with Two Inlet Damper Actuators with Optional Reheat	65	2065
Dual Duct VAV with One Inlet and One Outlet Damper Actuator with Optional Reheat	66	2066
Slave Mode	92	2092

After you set the application, the controller goes through a shut-down/load sequence as it switches from slave mode to the application selected. After the application loads, the OVERVIEW report displays 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.

NOTE: You must wait until the calibration cycle is complete (CAL AIR is set to NO) before continuing with this start-up procedure.

Setting Auxiliary Heat Options

1. If not using auxiliary heat (hot water or electric), then set AUX HTG USED (Point 82) to **NO** and skip to *Enabling Autozero Module.*

2. If using auxiliary heat (hot water or electric), then set AUX HTG USED to **YES**.

3. If the auxiliary heat is hot water, then set AUX HTG TYPE (Point 83) to **HW** and skip to *Enabling Autozero Module.*

4. If the auxiliary heat is electric, set AUX HTG TYPE to **ELEC**.

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.

NOTE: Do not set STAGE COUNT to 0. If this installation has no heat, leave STAGE COUNT at the default of 1.

CAUTION:

If using electric reheat, **do not** set HTG FLOW MIN (Point 33) or TOT FLOW MIN (Point 33) to 0 cfm (0 lps). Equipment damage may occur if the electric heat is on while the box is controlling at a total flow minimum of 0 cfm (0 lps).

Enabling Autozero Module

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

NOTE: For a controller without an Autozero Module, the damper is commanded closed to get a zero airflow reading during calibration. For a controller with an Autozero Module, the damper is closed only for the first calibration after controller start-up, initialization, or return from power loss.

Selecting Automatic Calibration Option

1. Using Table 6, set CAL SETUP (Point 95) to the value that best meets your job requirements.

2. If appropriate, change CAL TIMER (Point 96) from the default of 12 hours. This setting applies only if your choice for CAL SETUP includes Option 4.

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.

Table 6. 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 1) divided by 4. 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. See 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 for Options 1 and 2, set CAL SETUP to **3**.

Setting Room Temperature Setpoints

If the Controller is to Use a Setpoint Dial

1. Display the SETPOINTS report.

2. If the room temperature sensor has a setpoint dial, and if it is to be used by the controller, set STPT DIAL (Point 14) to **YES.**

   Applications 2035, 2036, 35, and 36:

   NOTE: If STPT DIAL is set to YES, OCC CLG STPT (Point 6) and OCC HTG STPT (Point 7) are not used. The value of RM STPT DIAL is used.

   Applications 2064, 2065, 2066, 64, 65, and 66:

   NOTE: If STPT DIAL is set to YES, then DAY CLG STPT (Point 6) and DAY HTG STPT (Point 7) are not used. The value of RM STPT DIAL (Point 13) is used.

3. Set the unoccupied/night setpoints to the appropriate values:

   Applications 2035, 2036, 35, and 36:

   - UOC CLG STPT (Point 8)
   - UOC HTG STPT (Point 9)

Applications 2064, 2065, 2066, 64, 65, and 66:

- NGT CLG STPT (Point 8)
- NGT HTG STPT (Point 9)

4. Set RM STPT MIN (Point 11) and RM STPT MAX (Point 12) for the minimum and the maximum allowable room temperature setpoint values, respectively. Valid values range from 55°F to 95°F (13°C to 35°C).

If No Setpoint Dial is Used

1. Display the SETPOINTS report.
2. Verify that STPT DIAL (Point 14) is set to **NO**.
3. Set the following points to the appropriate values:

Applications 2035, 2036, 35, and 36:

- OCC CLG STPT (Point 6)
- OCC HTG STPT (Point 7)
- UOC CLG STPT (Point 8)
- UOC HTG STPT (Point 9)

Applications 2064, 2065, 2066, 64, 65, and 66:

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

Setting Override Time

1. Display the STARTUP report.
2. If using night/unoccupied override, 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, enable it by setting WALL SWITCH (Point 18) to **YES**.

Setting Fail-Safe Mode

Applications 2035, 2036, 35, and 36: In the event that either air velocity sensor ceases to function, FAIL MODE (Point 40) causes the dampers to either **OPEN** or **CLOSE**. Set FAIL MODE to the fail-safe position desired for the dampers.

Setting Duct Areas

- If provided, enter the duct area (sq ft or sq m) into DUCT AREA (Point 97) and continue to *Setting Flow Coefficient*.
- If you do not know the duct area, follow these steps:

  1. Using *Voyager*; click the **HVAC Technical Reference** button (bottom of main screen).
  2. Click the **Air & Water Distribution** button.
  3. Select **Air Distribution** and then **Duct Areas**.
  4. Enter the dimensions and click **Calculate**.
  5. Enter the duct area calculations into DUCT AREA (Point 97).

Applications 2035, 2036, 2064, 2065, and 2066:

NOTE: When entering the LCTLR point for a Dual Duct Controller—One Air Velocity Sensor at the field panel, do not enter a duct area. (When asked for the duct shape, choose **N** for None.) 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 Flow Coefficient

1. Display the BALANCING report.
2. Set FLOW COEFF (Point 36) to the appropriate value found in Table 7. This value is a starting point for the air balancer.
3. 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).
4. If the TEC volume is not within 5% of the actual volume, then repeat the procedure until it is within 5%.

Table 7. Box Manufacturer Flow Coefficients.

Manufacturer	Sensor Type	Value
Anemostat	2-pipe without orifice 2-pipe with orifice Spider without orifice Spider with orifice	0.79 0.59 0.73 0.39
Carnes	2-pipe Flow cross	0.66 0.59
Carrier		0.59
E.H. Price / Siemens Building Technologies Lab Terminal Boxes		0.78
Environmental Technologies		0.79
Krueger		0.68
Metal Aire		0.72
Nailor Industries		0.69
Titus		0.60
Trane		0.66

Setting Airflow Setpoints

Applications 2035, 2036, 35, and 36

Use job specifications to set:

- OCC FLOW (Point 32), the setpoint for airflow in occupied mode
- UNOCC FLOW (Point 31), the setpoint for airflow in unoccupied mode

NOTE: The controller will not use a setting for UNOCC FLOW that is greater than the setting for OCC FLOW. If UNOCC FLOW is greater than OCC FLOW, the controller uses the setting OCC FLOW at all times.

NOTE: For Applications 35 and 36, it is recommended that UNOCC FLOW be set no greater than 0.3 times OCC FLOW. If UNOCC FLOW is set greater than this value, the flow loop becomes less stable.

For example, if the controller must maintain a constant volume of 2500 cfm during occupied mode, UNOCC FLOW should be set to no more than 750 cfm.

NOTE: If the application will always be in occupied mode, then set UNOCC FLOW to 0 cfm or to a value that is 10 percent of the value of OCC FLOW.

Applications 2064 and 64

Use job specifications to set:

- CLG FLOW MIN (Point 31), the minimum airflow in cooling mode
- CLG FLOW MAX (Point 32), the maximum airflow in cooling mode
- HTG FLOW MIN (Point 33), the minimum airflow in heating mode
- HTG FLOW MAX (Point 34), the maximum airflow in heating mode

NOTE: For Application 2064, CLG FLOW MIN must be less than or equal to CLG FLOW MAX, and HTG FLOW MIN must be less than or equal to HTG FLOW MAX.

NOTE: For Application 64, it is recommended that CLG FLOW MIN be no greater than 0.3 times CLG FLOW MAX and that HTG FLOW MIN be no greater than 0.3 times HTG FLOW MAX. If the minimums are set too high, the flow loop becomes less stable.

Applications 2065 and 65

Use job specifications to set:

- CLG FLOW MAX (Point 32), the maximum airflow in heavy cooling mode
- TOT FLOW MIN (Point 33), the minimum airflow needed for ventilation from the dual-duct box
- HTG FLOW MAX (Point 34), the maximum airflow in heating mode

NOTE: For Application 65, it is recommended that TOT FLOW MIN be no greater than 0.3 times CLG FLOW MAX and also no greater than 0.3 times HTG FLOW MAX. If the minimum is set too high, the flow loop becomes less stable.

Applications 2066 and 66

Use job specifications to set:

- CLG FLOW MIN (Point 31), the minimum airflow from the cold-duct damper
- CLG FLOW MAX (Point 32), the maximum airflow from the cold-duct damper
- TOT FLOW MIN (Point 33), the minimum airflow needed for ventilation from the dual-duct box
- TOT FLOW MAX (Point 34), the maximum airflow from the dual-duct box

NOTE: For Application 66, it is recommended that CLG FLOW MIN be no greater than 0.3 times CLG FLOW MAX and that TOT FLOW MIN be no greater than 0.3 times TOT FLOW MAX. If the minimums are set too high, the flow loop becomes less stable.

Setting Minimum Position of the Cold-Duct Damper

Applications 2035, 2036, 2065, and 2066: Set CLG DMP MIN (Point 60) to the minimum position to which the cold-duct damper will be allowed to close during normal operation. This value should be chosen based on outside air requirements to the space.

Setting Controller Address

NOTE: If you are going to enter an LCTLR point at the field panel, 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 to 31 if an LCTLR point will be defined for this controller).

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.).

Start-up of the Dual Duct Controller—One Air Velocity Sensor—Electronic Output is complete.