Terminal Box Controller—Electronic Output Start-up Procedures

This document presents start-up procedures for Terminal Box Controllers—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.)

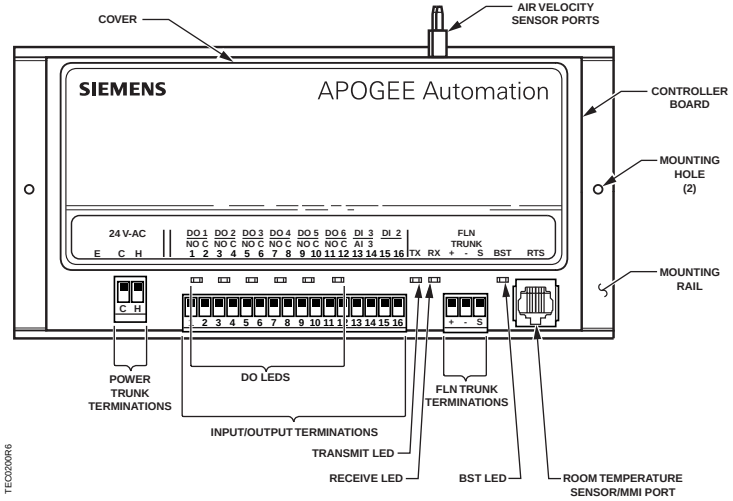

Figure 1. Terminal Box Controller—Electronic Output.

Verifying Power to Controller

Verify that the Terminal Box 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.

Enabling Actuators

CAUTION:

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

Setting up Damper Actuator

1. Using the portable operator's terminal, verify APPLICATION (Point 2) is set to **2091** (slave mode) for Rev. VV10 or later, or **91** for Revs. VV01–VV05.
2. Display the STARTUP report.
3. Set MTR1 TIMING (Point 51) to the running time of the actuator. See Table 1.

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

4. If the damper rotation angle is a value other than 90°, set DPR1 ROT ANG (Point 56) to the appropriate value. (Rotation angle for the PTS4 is 90°.)

Setting Timing for Valve 1 (Motor 2) and Valve 2 (Motor 3)

1. If applicable, set MTR2 TIMING (Point 55) to the running time of the valve 1 actuator. See Table 2.

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.

2. **Applications 2020–2023:** If applicable, set MTR3 TIMING (Point 39) to the running time of the valve 2 actuator. See Table 2.

Specifying Motor Setup

CAUTION:

If an Autozero Module is used, then do not enable MTR3 (valve 2).

MTR SETUP (Point 58) determines which actuators will be controlled by the application and whether they are direct or reverse acting. If needed, change MTR SETUP according to Table 3.

NOTE: When MTR SETUP is changed, all enabled actuators will calibrate. Wait until each actuator has completed its calibration.

Table 3. 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

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 3.

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

NOTE: If you are going to enter an LCTLR point at the field panel, keep track of the application, override time, controller address, duct shape, and duct dimensions 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 the appropriate Terminal Box Controller application. See Table 4 for application names and numbers.

Table 4. Terminal Box Controller—Electronic Output Applications.

Application	Revision VV01–VV05	Revision VV10 or later
VAV Cooling Only	20	2020
VAV Cooling or Heating	21	2021
VAV with Electric Reheat or Baseboard Radiation	22	2022
VAV with Hot Water Reheat	23	2023
VAV Series Fan Powered with Electric Reheat	24	2024
VAV Series Fan Powered with Hot Water Reheat	25	2025
VAV Parallel Fan Powered with Electric Reheat	26	2026
VAV Parallel Fan Powered with Hot Water Reheat	27	2027
Slave Mode	91	2091

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 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 controller's 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, CAL AIR returns to NO.

NOTE: You can continue the start-up procedure while calibration is underway. However, the controller will ignore commands to control end devices (such as the damper) until calibration of the air velocity sensor is finished.

Setting Stages of Electric Reheat

Applications 2022, 2024, and 2026, and 22, 24, and 26: Check the hardware to verify the number of stages of electric reheat used. Set STAGE COUNT (Point 88) to this value.

Setting Number of Valves

Application 2023 only: Set VALVE COUNT (Point 88) to the number of valves used (enabled).

Enabling Autozero Module

Applications 2020–2023 only: If using the controller with an Autozero Module, set CAL MODULE (Point 87) to **YES**.

CAUTION:

If an Autozero Module is used, do not enable MTR3 (valve 2).

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 initialization or power up.

Selecting Automatic Calibration Option

1. Display the first report in the REPORTS selection box. (The report is named "VAV*app*", where *app* is a description of the particular application you are using.)
2. Using Table 5, set CAL SETUP (Point 95) to the value that best meets your job requirements.
3. 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 5. CAL SETUP Options.

CAL SETUP Options	Description
0	Calibration occurs ONLY when the point CAL AIR (Point 94) is set to YES.
1	Calibration occurs when the field panel commands 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 the point 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 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 the point 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 as in 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 RM STPT DIAL (Point 13) is used by the controller, set STPT DIAL (Point 14) to **YES**.

   NOTE: If STPT DIAL is set to YES, DAY HTG STPT (Point 7) and DAY CLG STPT (Point 6) are not used; the value of RM STPT DIAL is used.
3. Set night setpoints to the appropriate values:
   - NGT CLG STPT (Point 8)
   - NGT HTG STPT (Point 9) (not used in Application 20 or 2020)
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:
   - DAY CLG STPT (Point 6)
   - DAY HTG STPT (Point 7) (not used in Application 20 or 2020)
   - NGT CLG STPT (Point 8)
   - NGT HTG STPT (Point 9) (not used in Application 20 or 2020)

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.

Enabling Wall Switch

Applications 2020–2027: If a wall switch is used for day/night control, enable it by setting WALL SWITCH (Point 18) to **YES**.

Setting Duct Area

- 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).

Setting Flow Coefficient

1. Display the BALANCING report.
2. Set FLOW COEFF (Point 36) to the appropriate value found in Table 6. This value is a starting point for the air balancer.
3. 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 AIR VOLUME (Point 35).
4. If the TEC volume is not within 5% of the actual volume, repeat the procedure until it is within 5%.

Table 6. 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 MIN and MAX Airflow Setpoints

NOTE: The maximum flow must be greater than or equal to the minimum flow.

1. Set CLG FLOW MIN (Point 31) to the desired minimum cooling airflow setpoint.
2. Set CLG FLOW MAX (Point 32) to the desired maximum cooling airflow setpoint.

Applications 2021–2027 and 21–27:

3. Set HTG FLOW MIN (Point 33) to the desired minimum heating airflow setpoint.
4. Set HTG FLOW MAX (Point 34) to the desired maximum heating airflow setpoint.

CAUTION:

If using electric reheat, **do not** set HTG FLOW MIN (Point 33) to 0 cfm (0 lps). Equipment damage may occur at 0 cfm (0 lps) with electric heat ON.

Setting Controller Address

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

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 Terminal Box Controller—Electronic Output is complete.