

## Start-up Procedures for Project NJE-090997-1

### TEC 0120.11

Overview .....	2
Verifying power to controller .....	2
Enabling the damper actuator .....	2
Enabling valve 1 actuator .....	4
Enabling valve 2 actuator .....	5
Setting the application .....	6
Waiting for air velocity sensor calibration .....	7
Selecting automatic calibration option.....	8
Setting the room temperature set points .....	9
Setting the override time.....	9
Setting stages of electric reheat.....	9
Setting number of valves .....	10
Setting controller address .....	10
Setting the duct area .....	10
Setting the flow coefficient .....	11
Setting the MIN and MAX airflow set points.....	12
Enabling wall switch.....	12
Enabling Autozero Module.....	12
Setting the CO <sub>2</sub> sensor.....	13

## Overview

This section presents start-up procedures for the Terminal Box Controller with CO<sub>2</sub> Monitoring – 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.).

## Verifying power to controller

Verify that the Terminal Box Controller with CO<sub>2</sub> Monitoring – Electronic Output 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 System *600 Maintenance and Troubleshooting Manual* (125-1855) for troubleshooting information.

**NOTE:** The Controller Interface Software (CIS) used with the Terminal Box Controller with CO<sub>2</sub> Monitoring – Electronic Output firmware revision VC10 or higher must be Rev. 2.0 or greater. Voyager's point database may also be used for start-up.

## Enabling the damper actuator

Using the portable operator's terminal, follow these steps to set the damper actuator running time:

1. Verify that the point APPLICATION (number 2) is set to 2385 (slave mode).
2. Display the STARTUP report.
3. Set the point MTR1 TIMING (number 51) to the correct running time of the actuator. Refer to Table 1.

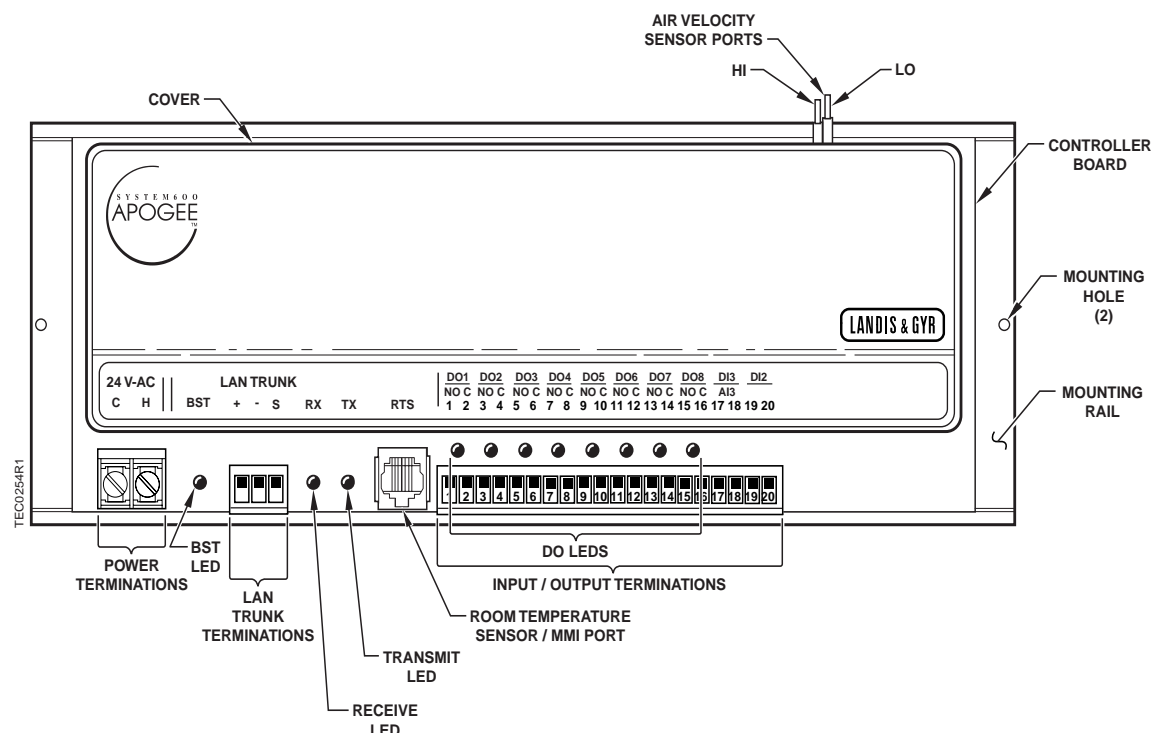
Figure 1. Terminal Box Controller with CO<sub>2</sub> Monitoring – Electronic Output.

Table 1. Damper Actuator Run Time.

Damper Actuator	Setting (seconds)	
	50 Hz	60 Hz
349-0100	113	90
SQR 81.1	155	130

- If the damper rotation angle is a value other than 90°, then set the point DMPR1 ROT ANG (number 56) to the appropriate value.
- Enable the damper actuator by setting the point MTR SETUP (number 58) to 1. Verify that the damper closes completely. If it does not close completely, reverse the action of the damper actuator by setting MTR SETUP to 3.

If the damper still does not close completely, then the actuator has been installed or set up incorrectly. Refer to the damper actuator installation instructions, set up information, Table 2, or the *System 600 Maintenance and Troubleshooting Manual* (125-1855) for more information.

**CAUTION:**

If an Autozero Module or a fan is used, then do not enable MTR3 or valve 2.

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

## Enabling valve 1 actuator

If applicable, then follow these steps to enable the valve 1 actuator:

**CAUTION:**

If an Autozero Module or a fan is used, then do not enable MTR3 or valve 2.

1. Set the point MTR2 TIMING (number 55) to the correct running time of the valve 1 actuator. Refer to Table 3.

**Table 3. Valve Actuator Run Time.**

Valve Actuator	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 <sup>1</sup>	38	32

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. Enable the valve 1 actuator by changing the point MTR SETUP (number 58) as follows:
  - If a damper actuator is present and is enabled (MTR SETUP = 1), then enable the valve 1 actuator by changing MTR SETUP to **5**.
  - If a damper actuator is present, enabled, and reverse acting (MTR SETUP = 3), then enable the valve 1 actuator by changing MTR SETUP to **7**.
3. Verify that valve 1 closes and remains closed. If the valve does not close, then reverse the action of the valve 1 actuator by changing MTR SETUP as follows:
  - If the damper actuator is enabled, then change MTR SETUP to **13**.
  - If the damper actuator is enabled and reverse acting, then change MTR SETUP to **15**.

## Enabling valve 2 actuator

**Application 2363 only:** If applicable, then follow these steps to enable the valve 2 actuator:

1. Set the point MTR3 TIMING (number 39) to the correct running time of the valve 2 actuator. Refer to Table 4.

**Table 4. Valve Actuator Run Time.**

Valve Actuator	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 <sup>1</sup>	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.

2. Enable the valve 2 actuator by changing the point MTR SETUP (number 58) as follows:
  - If a damper actuator is present and is enabled (MTR SETUP = 1), then enable the valve 2 actuator by changing MTR SETUP to **17**.
  - If a damper actuator is present, enabled, and reverse acting (MTR SETUP = 3), then enable the valve 2 actuator by changing MTR SETUP to **19**.
  - If a damper and a valve 1 actuator are both present, enabled (MTR SETUP = 5), then also enable the valve 2 actuator by changing MTR SETUP to **21**.

- If a damper actuator is present and is enabled, and a valve 1 actuator is present, enabled, and reverse acting (MTR SETUP = 13), then enable the valve 2 actuator by changing MTR SETUP to **29**.
  - If a damper actuator is present, enabled, reverse acting, and a valve 1 actuator is present and is enabled (MTR SETUP = 7), then enable the valve 2 actuator by changing MTR SETUP to **23**.
  - If a damper and a valve 1 actuator are both present, enabled, and reverse acting (MTR SETUP = 15), then enable the valve 2 actuator by changing MTR SETUP to **31**.
3. Verify that valve 2 actuator closes and remains closed when commanded. If valve 2 does not close, then reverse the action of the valve 2 actuator by adding the value 32 to the MTR SETUP.

If the valve 2 actuator still does not close completely, then the actuator has been installed incorrectly. Refer to the valve actuator installation instructions, set up information, Table 5, or the *System 600 Maintenance and Troubleshooting Manual* (125-1855) for more information.

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

## Setting the application

**NOTE:** If you are going to enter an LCTLR point at the field panel, then 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 the point APPLICATION (number 2) to the appropriate Terminal Box Controller with CO<sub>2</sub> Monitoring – Electronic Output application. Refer to Table 6 for application names and numbers.

**Table 6. Terminal Box Controller with CO<sub>2</sub> Monitoring – Electronic Output Applications**

<b>Application</b>	<b>Revision VC10 or higher</b>
VAV Cooling Only and CO <sub>2</sub> Monitoring	2360
VAV Cooling or Heating and CO <sub>2</sub> Monitoring	2361
VAV with Electric Reheat or Baseboard Radiation and CO <sub>2</sub> Monitoring	2362
VAV with Hot Water Reheat and CO <sub>2</sub> Monitoring	2363
VAV Series Fan Powered with Electric Reheat and CO <sub>2</sub> Monitoring	2364
VAV Series Fan Powered with Hot Water Reheat and CO <sub>2</sub> Monitoring	2365
VAV Parallel Fan Powered with Hot Water Reheat and CO <sub>2</sub> Monitoring	2366
VAV Parallel Fan Powered with Hot Water Reheat and CO <sub>2</sub> Monitoring	2367
Slave Mode	2385

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.

## Waiting for air velocity sensor calibration

The air velocity sensor calibration cycle takes from 2 to 5 minutes to complete. The air damper closes during calibration.

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

**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, calibration occurs without closing the damper. Calibration of a hot water valve (if used) is done while the controller is calibrating the transducer by commanding the valve to closed. Calibration of the valve is not affected by the presence of an Autozero Module.

Wait until the calibration cycle is complete (CAL AIR is set to NO) before continuing with this start-up procedure.

## Selecting automatic calibration option

In order to choose the most efficient method of triggering the calibration routine, follow this procedure to set the point CAL SETUP (number 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. Display the first report in the REPORTS selection box.
2. Select the automatic calibration option desired from Table 7 that best meets your job requirements.
3. Set CAL SETUP to the value chosen.

**Table 7. CAL SETUP Options.**

<b>CAL SETUP Options</b>	<b>Description</b>
0	Calibration occurs ONLY when the point CAL AIR (number 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 (number 1) divided by 4 and the remainder is the time delay in minutes.  <b>Example:</b> If CTLR ADDRESS = 11, then the controller will wait 3 minutes ( $11 \div 4 = 2 \text{ R}3$ ) 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 (number 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 the room temperature set points

1. Display the SETPOINTS report.
2. If the room temperature sensor has a set point dial, and if the point RM STPT DIAL (number 13) is to be used by the controller, then set the point STPT DIAL (number 14) to **YES**; otherwise, set STPT DIAL to **NO**.

**NOTE:** If STPT DIAL is set to YES, then the points DAY CLG STPT (number 6) and DAY HTG STPT (number 7) will not be used. The value of RM STPT DIAL will be used

3. If there is no set point dial on the room temperature sensor, then verify that STPT DIAL is set to NO.
4. Set the following points to the appropriate values:
  - DAY CLG STPT (number 6)
  - DAY HTG STPT (number 7)
  - NGT CLG STPT (number 8)
  - NGT HTG STPT (number 9)
5. If the room temperature sensor has a set point dial and the set point dial is to be used, then set the points RM STPT MIN (number 11) and RM STPT MAX (number 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.

## Setting the override time

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

## Setting stages of electric reheat

**Applications 2362, 2364, and 2366:** Check the hardware to verify the number of stages of electric reheat used. Set the point STAGE COUNT (number 88) to this value.

## Setting number of valves

**Application 2363 only:** Set the point VALVE COUNT (number 88) to the number of valves used (enabled).

## Setting controller address

Set the controller address by setting the point CTRL ADDRESS (number 1) to the appropriate number.

## Setting the duct area

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.

## Setting the flow coefficient

1. Display the **BALANCING** report.
2. Set the point **FLOW** COEFF (number 36) to the appropriate value found in Table 8. This value is a starting point for the air balancer.
3. To fine tune the flow coefficient use the following formula:

$$\text{new flow coefficient} = (\text{actual volume} \div \text{TEC volume}) \times \text{old flow coefficient}$$

The actual volume is the actual value obtained from the balancer's measurements. The TEC volume is the value obtained from the point AIR VOLUME (number 35) of the TEC. If the TEC volume is not within 5% of the actual volume, then repeat the procedure until it is within 5%.

**Table 8. Box Manufacturer Flow Coefficients.**

Box Manufacturer	Sensor Type	Flow Coefficient
Anemostat	2-pipe sensor without orifice	0.79
	2-pipe sensor with orifice	0.59
	Spider sensor without orifice	0.73
	Spider sensor with orifice	0.39
Carnes	2-pipe sensor	0.66
	Flow cross	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	0.59
	Orifice	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

## Setting the MIN and MAX airflow set points

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

Follow these steps to set the minimum and maximum airflow set points:

1. Set the point CLG FLOW MIN (number 31) to the desired minimum cooling airflow set point.
2. Set the point CLG FLOW MAX (number 32) to the desired maximum cooling airflow set point.

### Applications 2361-2367:

1. Set the point HTG FLOW MIN (number 33) to the desired minimum heating airflow set point.
2. Set the point HTG FLOW MAX (number 34) to the desired maximum heating airflow set point.



**CAUTION:**

If using electric reheat, then do not set HTG FLOW MIN to 0 CFM (0 LPS). At 0 CFM (0 LPS) during day mode, the electric heat is ON while there is no airflow across the heating coils in the terminal box. Equipment damage may occur.

## Enabling wall switch

If a wall switch is used for day/night control, then enable it by setting the point WALL SWITCH (number 18) to **YES**.

## Enabling Autozero Module

Applications **2360-2363 only:** If using the controller with an Autozero Module, then set the point CAL MODULE (number 87) to **YES**.



**CAUTION:**

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

## Setting the CO<sub>2</sub> sensor

1. Set the point CO2 SCALE (number 10) to the value, in PPM, represented by a sensor reading of 10V or 20 mA.
2. Set the point AI3 VOLT.CUR (number 40) to indicate the sensor type, either current or voltage.

**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.).

The Terminal Box Controller with CO<sub>2</sub> Monitoring — Electronic Output start-up is complete.