Constant Volume Box Fan Coil Controller with Optional VIV

This document presents start-up procedures for the Constant Volume Box Fan Coil Controller with Optional VIV (Variable Inlet Vane). 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 tuning, etc.).

Verify power to controller

Verify that the Constant Volume Box Fan Coil Controller with Optional VIV 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 Constant Volume Box Fan Coil Controller with Optional VIV must be Rev. 2.0 or greater. Voyager's point database may also be used for start-up.

Set controller address

Using the portable operator's terminal, set the controller address following these steps:

1. Display the STARTUP report.

2. Set the point CTLR ADDRESS (number 1) to the appropriate address number.

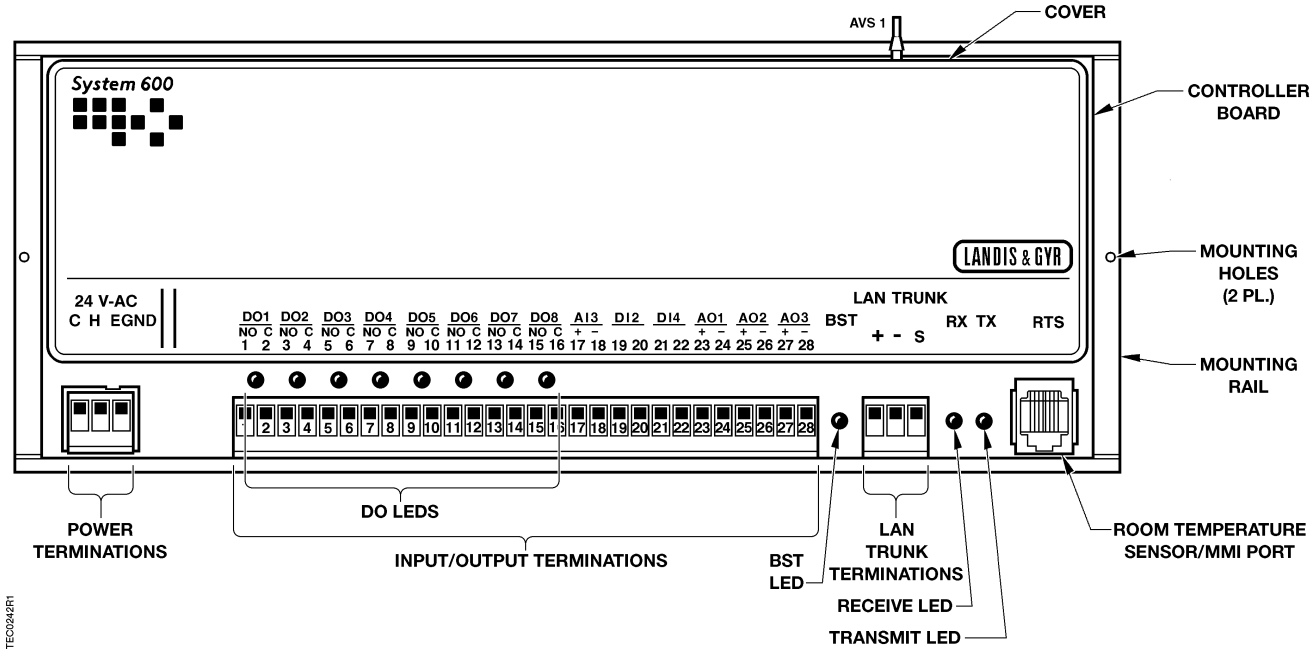

Figure 1. Constant Volume Box Fan Coil Controller with Optional VIV.

Set application

Set the point APPLICATION (number 2) to the appropriate Constant Volume Box Fan Coil Controller with Optional VIV application. Refer to Table 1 for application names and numbers.

Table 1. Constant Volume Box Fan Coil Controller with Optional VIV Applications.

Application	Revision UJ10 or higher
Variable Volume Fan with Flow, Temperature, and Static Pressure Control	2320
Constant Volume Fan with Flow and Temperature Control	2321
Slave Mode	2397

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 and the OVERVIEW report appears, continue with the following procedures.

Enable wall switch

Display the STARTUP report.

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

Otherwise, leave WALL SWITCH at its default value of NO.

Set motor timing and damper actuator rotation angle

The run time of each actuator is indicated by the points MTR1 TIMING (number 51), MTR2 TIMING (number 55), and MTR3 TIMING (number 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, then use Table 2 to set MTR1 TIMING and MTR2 TIMING.

2. If the damper rotation angles are values other than 90°, then set the points DPR1 ROT ANG (number 56) and DPR2 ROT ANG (number 57) to the appropriate values.

3. If Motor 3 is a valve actuator, then use Table 3 to set MTR3 TIMING.

Table 2. Damper Actuator Run Time.

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

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[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.

Set MTR SETUP

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

Standard Configuration – Refer to Table 4 to set MTR SETUP as follows:

1. Refer to Table 4 for the MTR SETUP values for the most common configuration based on each application.

2. Find the application you are setting up in Table 4.

3. Set MTR SETUP 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)

Non-Standard Configuration – If your application does not use one of the listed actuators in Table 4, if one of your actuators has a different normal position than that listed in Table 4, or if you want to use a spare motor, then refer to Table 5 to set MTR SETUP as follows:

1. Table 5 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 4. MTR SETUP (number 58) Value for Most Common Configurations.

Applications	Configurations			Value for MTR SETUP
	Motor 1	Motor 2	Motor 3	
all applications	VAV damper (normally closed)	transfer damper (normally closed)	aux. reheat valve (normally open)	53

If any of the actuators do not close completely, then the actuators have been installed or set up incorrectly. Refer to the 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
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

Set DO DIR.REV

If the normal (de-energized) state of all of the devices controlled by DOs is off, then leave the point DO DIR.REV (number 59) at its default value of 0.

Otherwise, reverse the action of the devices as follows:

1. Add the values in Table 6 for each DO you wish to make reverse-acting.

2. Set DO DIR.REV to this value.

Table 6. DO DIR.REV Values.

Reverse-Acting DO	Value
DO1	32
DO2	16
DO3	8
DO4	4
DO5	2
DO6	1
DO7	64
DO8	128

NOTE: DO DIR.REV only affects DOs not being used for floating control actuators. Use the point MTR SETUP (number 58) to reverse the operation of an actuator.

Set AO DIR.REV

If the normal (de-energized) state of all of the devices controlled by AOs is closed, then leave the point AO DIR.REV (number 91) at its default value of 0.

Otherwise, reverse the action of the appropriate AO, or combination of AOs, as follows:

1. Add the values in Table 7 for each AO you wish to make reverse-acting.

2. Set AO DIR.REV to this value.

Table 7. AO DIR.REV Values.

Reverse-Acting AO	Value
AO1	1
AO2	2
AO3	4

Set transfer damper occupied position

Set the transfer damper position to be used during occupied mode by setting the point TRANS POS (number 76) to the appropriate value.

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 of the supply duct. Press **<ENTER>.** The software prompts you for the dimensions of the duct.

3. Enter the duct dimensions as prompted. Press **<ENTER>** after each dimension you enter.

NOTE: When entering the LCTLR point for a Constant Volume Box Fan Coil Controller with Optional VIV 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 override time

If using unoccupied override, then set the point OVRD TIME (number 20) to the number of whole hours that an override should last.

Otherwise, leave OVRD TIME at its default value of 0 (unoccupied override is disabled).

Set room temperature set points

Follow these steps to set the room temperature set points:

1. Display the SETPOINTS report.

2. **Application 2321 only:** 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 HTG STPT (number 7) and DAY CLG STPT (number 6) will not be used. The value of RM STPT DIAL will be used.

   If there is no set point dial on the room temperature sensor, then verify that STPT DIAL is set to NO.

3. **Applications 2320 and 2321:** 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)

4. **Application 2321 only:** 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.

5. **Application 2320 only:** Display the TUNING report. Set the value of the point AUX STPT (number 83) to the appropriate value, typically greater than the point NGT HTG STPT (number 9).

Set airflow set points

Follow these steps to set the unoccupied and occupied airflow set points:

1. Display the SETPOINTS report.
2. Set the point OCC FLOW (number 32) to the desired/specified occupied airflow set point.
3. Set the point UNOCC FLOW (number 31) to the desired/specified unoccupied airflow set point.
4. Set the point PARTL OCCFLO (number 33) to the desired/specified unoccupied override airflow set point.
5. Set the point SMOKE FLOW (number 34) to the desired/specified smoke airflow set point.
6. Set the point EXHAUST FLOW (number 40) to the desired/specified exhaust (make-up) airflow set point.

Set flow coefficient

Follow these steps to set 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.

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 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 2-pipe sensor with orifice Spider sensor without orifice Spider sensor with orifice	0.79 0.59 0.73 0.39
Carnes	2-pipe sensor Flow cross	0.66 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 Orifice	0.59 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

Select automatic calibration option

Display the MAIN report (Toronto VAV/CV).

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. Select the automatic calibration option desired from Table 9 that best meets your job requirements.

2. Set CAL SETUP to the value chosen.

Table 9. CAL SETUP Options.

CAL SETUP Options	Description
0	Calibration occurs ONLY when the point CAL AIR (number 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 the point CTLR ADDRESS (number 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 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 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**.

Enable fan proof

If fan proof is to be used, then set the point USE PROOF (number 27) to YES.

Set static pressure sensor range

Application 2320 only: Set the point PRES RANGE (number 77) to the value corresponding to 20 mA from the static pressure sensor (4 mA must correspond to 0 in. H_20).

Set static pressure set point

Application 2320 only: Set the point STAPRES STPT (number 92) to the desired/specified set point for the static pressure control loop.

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 tuning, etc.).

Constant Volume Box Fan Coil Controller with Optional VIV start-up is complete.