SIEMENS

Start-up Procedures for LRC Electronic Application 2458

Variable Air Volume with BTU Compensation on OAVS – One Exhaust, One Supply

TEC 0659.11

Table of Contents

Before You Begin

- At the job site, locate the major control system and the mechanical and electrical drawings. These components include dampers, motors, and any other components working in conjunction with the LRC.
- Verify that the Laboratory Controller Module (LCM) input/output (I/O) points are wired per the installation instructions.

NOTES: 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.

See the *Manufacturer's Installed Controls* (MIC) web page on Landscape (http://landscape.us.abatos.com/mic/) for specific manufacturer's information.

Verifying Power

1. Verify that the controller has 24 Vac power and that the fuse has been inserted into the trunk or that power to the transformer is ON. See *Figure 1*.

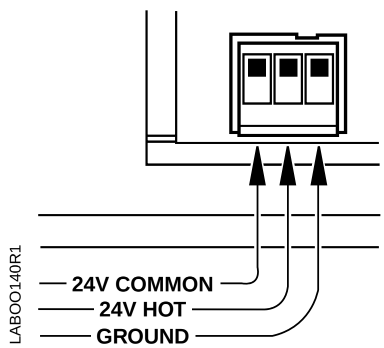


Figure 1. Power Trunk Connection to the Lab Controller Module.

2. Verify that the Basic Sanity Test (BST) LED on the LCM flashes once per second. See *Figure 2*.

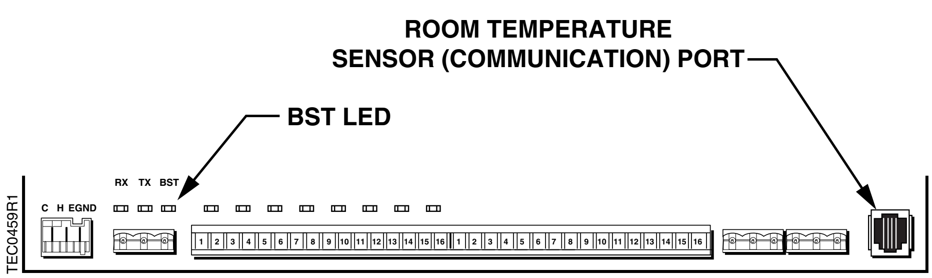


Figure 2. OAVS LRC Board Showing Location of BST LED and RTS Port.

Verifying Slave Mode Application Number

1. Plug the MMI into the Room Temperature Sensor port. See *Figure 2*.

2. Verify that Application 2380 (Slave Mode) is running at the controller.

Configuring the Controller

This section presents the steps for configuring each controller with the proper application number and initial values. All values are set using an appropriate software tool for controller communication.

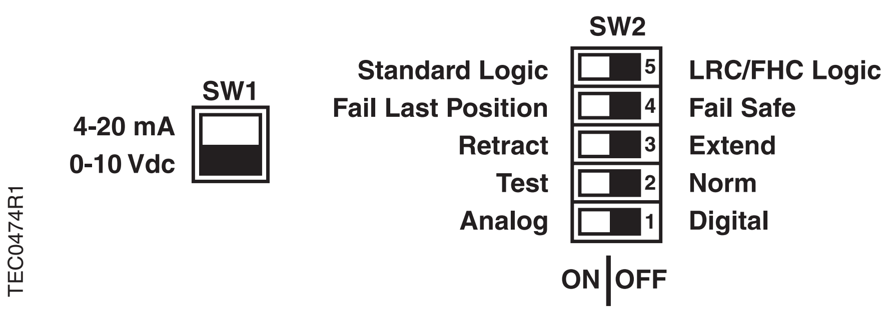
Setting the Application

1. Set APPLICATION (Point 2) to **2458**.

2. Set CTLR ADDRESS (Point 1) to the correct value obtained from the controller schedule. Each controller must have a unique address. Normal values are **00** to **31**, but the controller will accept values as high as 98.

Setting Up Dampers

1. Make sure the switch settings for switches SW1 and SW2 on the AO-E module(s) are set correctly. Refer to *Figure 3.*



The switch selections are shown in black; for example, switch SW1 is set to 0-10 Vdc.

Figure 3. Switch Settings for the AO-E Module.

2. Select the direction of the supply damper actuator according to the specification. Set SUP DMPR DIR (Point 62) to **NCLOSED** (default) if the damper is normally closed (closed when the actuator is retracted). If the damper is normally open, set the point to **NOPEN**.

3. Check the operation of the supply damper. Verify that the damper opens quickly (full travel time of 3 seconds or less) when the damper command point SUP DMPR CMD (Point 81) is set to 100%. Also, verify that it closes quickly when SUP DMPR CMD is set to –100%.

4. Release SUP DMPR CMD.

5. Select the direction of the general exhaust damper according to the specification. If the general exhaust damper is normally open (open when the actuator is retracted), then set GEX DMPR DIR (Point 59) to **NOPEN** (default). If the damper is normally closed, set the point to **NCLOSED**.

6. Check the operation of the exhaust damper. Verify that the damper opens quickly (full travel time of 3 seconds or less) when the damper command point GEX DMPR CMD (Point 82) is set to 100%. Also, verify that it closes quickly when the point is set to –100%.

7. Release GEX DMPR CMD.

Setting Up Reheat Valve

1. Find the value of REHEAT AO1 (Point 48) that closes the valve by commanding REHEAT AO1 and observing the motion of the valve actuator. Set VALVE CLOSED (Point 57) to this voltage value.

   NOTE: The nominal range in volts is half of the spring range in PSI. This is a good starting point.

2. Find the value of REHEAT AO1 that opens the valve all the way. Set VALVE OPEN (Point 58) to this voltage value.

3. Release REHEAT AO1.

4. Verify operation of the reheat valve. Override VALVE CMD (Point 49) to **0** and verify that the valve closes. Set VALVE CMD to **100%** and verify that the valve opens. Release VALVE CMD.

Setting Up MIN and MAX Airflow Set Points

Using values from the job specification(s), enter the minimum and maximum flow limits for occupied and unoccupied conditions in each air terminal. Enter values for the following points:

OCC SUP MAX (Point 31)	OCC SUP MIN (Point 32)	OCC GEX MAX (Point 33)
OCC GEX MIN (Point 34)	UOC GEX MAX (Point 67)	UOC GEX MIN (Point 68)
UOC SUP MAX (Point 71)	UOC SUP MIN (Point 72)	

If no unoccupied mode is specified, set the UOC values equal to the OCC values.

Setting Duct Areas

Set the duct areas by completing the following steps:

1. Display the Duct menu.

2. Select and enter the applicable duct shape of the exhaust duct.

3. Enter the exhaust duct dimensions as prompted.

4. At the Duct Dimensions menu, select and enter the applicable duct shape of the supply duct.

5. Enter the supply duct dimensions as prompted.

   NOTE: When entering the LCTLR point for an LRC at the field panel, **do not** enter a duct area. (Choose **N** for none when prompted 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.

Setting Flow Coefficients

NOTE: Make sure the airflow sensors are calibrated before determining the flow coefficients. This is done by setting CAL AIR (Point 94) to **YES** and waiting for it to switch back to NO on its own.)

Set coefficient values for Siemens prepackaged laboratory boxes as follows:

NOTE: These values are starting points for the air balancer.

1. Set SUP FLO COEF (Point 36) in the range of **0.60** to **0.70**.

2. Set GEX FLO COEF (Point 54) in the range of **0.60** to **0.70**.

3. Work with a balancer to obtain the exact value for Points 36 and 54. Use the following formula to fine-tune the flow coefficient:

   New flow coefficient = (actual volume ÷ LRC volume) x old flow coefficient

The actual volume is the actual value obtained from the balancer’s measurements. The LRC volume is the value obtained from GEX AIR VOL (Point 30) and SUP AIR VOL (Point 35). If the Controller volume is not within 2% of the actual volume, then repeat the procedure until it is within 2%.

NOTE: It is extremely important that the flow readings are accurate.

Setting Fume Hood Maximum CFM

Set MAX HOOD VOL (Point 52) to the flow corresponding to 10 volts from the input signal source. If there is more than one fume hood in the room, the signals must be averaged using a Fume Hood Flow Module (FFM).

If using an FFM:

Set MAX HOOD VOL to the following: (A02 Range x Number of Hoods). The A02 RANGE in the FHC point must be set to the same value in each FHC (maximum of four fume hoods per LRC). If there is more than one fume hood in the room, the AO2 range of each fume hood must be set to the same value that is the highest max value. For example, if one fume hood is 700 CFM and the second is 1200 CFM, each FHC AO2 range should be set to 1200 CFM, while the MAX HOOD VOL in the LRC would be set to 2400 CFM.

Selecting the Automatic Calibration Option

To set CAL SETUP (Point 95), select the automatic calibration option that best meets the job's requirements from Table 1. It is highly recommended that option **4**, the factory default mode, be used.

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: The air velocity sensor must be calibrated at least once every 24 hours. Also, the sensor **must** be calibrated before balancing takes place, as this will affect the balancer's results.

Table 1. CAL SETUP Options.

Option Numbers	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. CTLR ADDRESS (Point 1) divided by 4 determines this delay (the remainder is the time delay in minutes). **Example:** If CTLR ADDRESS = 10, then the controller waits 2 minutes (10 ÷ 4 = 2 x **R2**) 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 pressed.
4 (factory default mode)	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: Summing their numbers can combine Options. For example, to calibrate as in Options 1 and 2, set CAL SETUP to **3**.

Setting Up Airflow Control

Checking Range of Damper Control

NOTE: It is very important that the minimum and maximum airflows specified can be reached.

Using the flow tuning report, check the range of damper control by reducing airflow to its minimum and then increasing it to maximum. Close the supply damper by setting SUP DMPR CMD (Point 81) to –100% and then open the damper by setting the same point to 100%. Verify that you can reach minimum and maximum airflow and then release the damper command.

If it is not possible to achieve minimum and maximum airflow, the fan system must be adjusted.

Repeat this process for the general exhaust damper using GEX DMP CMD (Point 82).

Tuning the Flow Loops

To tune the supply flow loop, change the flow by commanding SUP FLO STPT (Point 93) and then examine the response. If the airflow oscillates or overshoots significantly, reduce the gain. If it takes too long to reach the set point, increase the gain. Try different values; it should move accurately and with stability. When the desired performance is achieved, release the set point. Repeat this process for the general exhaust flow loop by changing GEX FLO STPT (Point 85).

CAUTION:

Prior to tuning the supply or exhaust flow loops, set VOL DIF STPT (Point 88) to **zero** to disable the flow tracking algorithm. After tuning these loops, release VOL DIF STPT.

Discharge Temperature Control

If the discharge temperature limits are called out in the specification, then set DISCH MIN (Point 11) and DISCH MAX (Point 14) according to the specification. If they are not called out, then set the limits according to the desired HVAC system operation. For example, from 55 °F to 80 °F.

1. Set DISCH MIN to match the temperature supplied by the air handler. It should be set a few degrees lower than the air handler temperature. This will prevent undesired heating if there is some discrepancy between the sensor in the air handler and the one in the supply terminal.

2. Set DISCH MAX according to the heating function required. Many lab rooms do not need "heat," meaning they never need supply air to come in above the room temperature set point. The reheat equipment only serves to reduce the cooling effect of the supply airflow. In this case, set DISCH MAX a few degrees higher than the room temperature set point. Rooms with significant exposure to cold outside conditions may call for discharge temperatures significantly above the room temperature. In these rooms, DISCH MAX should be set to the warmest discharge temperature desired for the heating function—for example, 90 degrees.

3. Check the operation of the discharge temperature loop and tune if necessary. It is more sensitive at low airflow than at high airflow. Check tuning at a low flow (such as minimum) by overriding the set point and observing the response of the discharge temperature.

   Overshoot is acceptable as a suggested response (even 5 to 10 degrees), but it should damp out within 1 or 2 cycles. Small sustained oscillations may be acceptable if they do not overwork the valve. If acceptable performance is achieved at low flow, then the system should be stable, but not too slow at high flow.

4. Release DISCH STPT (Point 3).

NOTE: Advanced PID algorithms have been implemented at and near set point to minimize actuator repositioning.

Room Temperature Control

To set room temperature control, enter the room temperature set point (ROOM STPT, Point 13) or set the thermostat dial. The room temperature should settle at the set point with very little oscillation within an hour. If it does not settle out or reach the set point, adjust the room temperature loop gains (Points 63 through 65). Refer to the *APOGEE Automation Service Procedures* on InfoLink for additional information on room temperature control problems.

NOTE: Advanced PID algorithms have been implemented at and near the set point to minimize actuator repositioning.

Room Pressurization

To set up the room pressurization, complete the following steps using the pressure report:

1. Enter the point VOL DIF STPT (Point 88) from the job specification.

   NOTE: This difference is defined as total exhaust minus supply. This is a *positive* number for a room that is negatively pressurized and a *negative* number for a room that is positively pressurized.

2. Set OTHER EXH (Point 89) and OTHER SUP (Point 61) using actual airflow values for any supply or exhaust equipment not connected to the LRC that will remain constant. (These values can also be updated across the network.)

3. Verify pressurization in at least four airflow operating conditions. Make sure that the system operates at the VOL DIF STPT (Point 88) and that the room is pressurized properly. Use the following operating conditions:

   - Hoods open, minimum cooling
   - Hoods closed, minimum cooling
   - Hoods open, maximum cooling
   - Hoods closed, maximum cooling

   (To achieve the required conditions, set TEMP CTL VOL (Point 9) equal to the supply maximum for maximum cooling and to supply minimum for minimum cooling.)

4. When all conditions have been checked, release TEMP CTL VOL.

Setting-up Alarms

Using the job specification, determine which alarms are required and set them up accordingly.

Pressurization Alarm

1. Set DIF ALM LVL (Point 38) to the alarm level specified. If no value is specified, use 0 cfm (default). VOL DIF ALM (Point 22) is the output point that indicates an alarm condition.

2. Set DIF ALM DEL (Point 39) to the value specified. This is the delay time. If no value is specified, start with the default value of 30 seconds. Adjust as required to eliminate nuisance alarms.

3. Set DIF ALM ENA (Point 37) to **YES** if the specification requires annunciation of the pressurization alarm through a local alarm device connected to ALARM DO6 (Point 46).

Ventilation Alarm

1. To set the ventilation alarm, VENT ALM (Point 92), set OC V ALM LVL (Point 90) to the specified alarm level for the occupied mode. It may be specified in air changes per hour; if so, convert to CFM (LPS).

   If no ventilation alarm is required, set OC V ALM LVL to **zero**.

2. To set the ventilation alarm for the unoccupied mode, set UC V ALM LVL (Point 91) to the specified value. If there is no unoccupied mode specified then use the same value as OC V ALM LVL.

   If ventilation alarms are not required during unoccupied mode, set UC V ALM LVL to **zero**.

3. Set VENT ALM DEL (Point 16) to the value specified. This is the alarm delay. If no value is specified, start with the default value.

4. Set VENT ALM ENA (Point 17) to **YES** if the job specification requires annunciation of the ventilation alarm through a local alarm device connected to ALARM DO6.

Hardware Switch

The hardware switch is ALM SWIT DI6 (Point 27). If the specification requires that the controller pass alarms from other equipment (connected to ALM SWIT DI6) to a local alarm device via ALARM DO6, then set ALM SWIT ENA (Point 28) to **YES**.

Network alarms

If there are other alarms to be indicated in the local ALARM DO6, they may be programmed in the field panel to operate through NET ALM CMD (Point 23). No setup is required at the LRC to enable this function.

Setting up Occupancy Control

To set up occupancy control, determine the occupancy triggers required by the job specification.

- If occupancy is set according to flow through the fume hoods, do the following:
  a. Set HOOD OCC VOL (Point 55) to the proper value. When the total flow through the hoods exceeds this value, the controller operates in the occupied mode. (Default for HOOD OCC VOL = 600 CFM.)

b. Set HOOD UOC VOL (Point 56) to the proper value. When the total flow through the hoods is less than this value, the controller operates in the unoccupied mode. (Default for HOOD UOC VOL = 100 CFM.)

- If the controller must set occupancy according to the state of a switch connected to OCC SWIT DI2 (Point 24), set OCC SWIT ENA (Point 18) to **YES**.
- If the controller must set occupancy according to the push button on the room thermostat, set BUTTON ENA (Point 12) to **YES**.

  NOTE: The controller cannot use both OCC SWIT DI2 and the button on the thermostat. If OCC SWIT ENA is set to YES, then the button on the thermostat is not used.

- If there are other occupancy criteria, they may be programmed at the field panel to work through NET OCC CMD (Point 29). The controller requires no set-up to make this possible. (If network commands are not required and occupancy will be set by sources in the room, set NET OCC CMD to UNOCC. If it is set to OCC, the controller will stay in occupied mode.)

If there is no unoccupied mode specified, do the following:

1. Set BUTTON ENA (Point 12) to NO (default).
2. Set OCC SWIT ENA (Point 18) to NO (default).
3. Set HOOD OCC VOL (Point 55) to 0 (default).

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.

The start-up is complete.