

Two-State Constant Volume Fume Hood Controller Owner's Manual

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SERVICE STATEMENT

Control devices are combined to make a system. Each control device is mechanical in nature and all mechanical components must be regularly serviced to optimize their operation. All Siemens Building Technologies branch offices and authorized distributors offer Technical Support Programs that will ensure your continuous, trouble-free system performance.

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TO THE READER

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How To Use This Manual

This section covers manual organization, conventions, and symbols used in the manual, and other information that will help you understand and use a Laboratory Room Controller — Electronic Output.

Manual Organization

This manual contains the following sections:

- *Chapter 1 Product Overview* describes the hardware components and the accessories that are used with the controller.
- *Chapter 2 Applications* describes the control applications available in the controller.
- *Chapter 3 Point Database* defines the point database descriptors and includes address and applications.
- The *Glossary* describes terms and acronyms.
- The *Index* helps you find information.

Manual Conventions

The following table lists conventions used in this manual.

Convention	Example
Actions that you should perform are specified in boldface font.	Type F for Field panels. Click OK to save changes and close the dialog box.
Error and system messages are displayed in Courier New font.	The message Report Definition successfully renamed appears in the status bar.
New terms appearing for the first time are italicized.	The Open Processor continuously executes a user-defined set of instructions called the <i>control program</i> .

Manual Symbols

The following table lists symbols that are used to draw your attention to important information.

Notation	Symbol	Meaning
CAUTION:		Indicates that equipment damage or loss of data may occur if the user does not follow a procedure as specified.
WARNING:		Indicates that personal injury or loss of life may occur to the user if a procedure is not performed as specified.

Datamate Software

Datamate is a customer software tool for all controller communications. There are two versions: *Datamate Base*, and *Datamate Advanced*. Datamate Base works on an IBM-compatible Personal Computer (PC), or a Handheld PC or Pocket PC™ running Windows CE. Datamate Advanced works only on an IBM-compatible Personal Computer. With Datamate, you can backup, restore, and edit any APOGEE database (but only Datamate Advanced allows you to edit points offline). Backing up and restoring a database can be accomplished while connected to any APOGEE field panel, or to the Building Level Network (BLN) or Floor Level Network (FLN) device in question. A modem and telephone lines can also be used. Databases can be saved to a hard or floppy disk and kept for permanent storage or used as backup.

For more information on Datamate software, refer to the appropriate user guide based on which version of Datamate you are using (Base or Advanced), or contact your local Siemens Building Technologies, Inc. representative.

Getting Help

If at any time you find that you need help with a Laboratory Room Controller issue not covered in this manual, contact your local Siemens Building Technologies, Inc. representative.

Where To Send Comments

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1

Product Overview

Introduction

The Fume Hood Controller is an equipment controller designed to provide Direct Digital Control (DDC) for 2 position fume hoods. The controller consists of a controller board and a controller enclosure. The controller board (Figure 1) is the central computing/controlling component of the system.

Related Equipment

- Operator Display Panel (ODP)
- Laboratory Exhaust Air Terminal
- Venturi Air Valve
- Differential Pressure Transmitter (See **NOTE**)
- Airflow Sensor (See **NOTE**)
- Cables

Electronic Actuation

- Electronic Actuator Assembly (See **NOTE**)

Pneumatic Actuation

- Analog Output-Pneumatic (AO-P) Module (See **NOTE**)
- Pneumatic Actuator (See **NOTE**)

NOTE: These components may be included in the Laboratory Exhaust Terminal or Venturi Air Valve.

Table 1. Fume Hood Controller – Electronic Output Applications.

Application	Description
940	2 Position Fume Hood Controller

Ordering Notes

Fume Hood Controller – Electronic Output (940)

546-00750

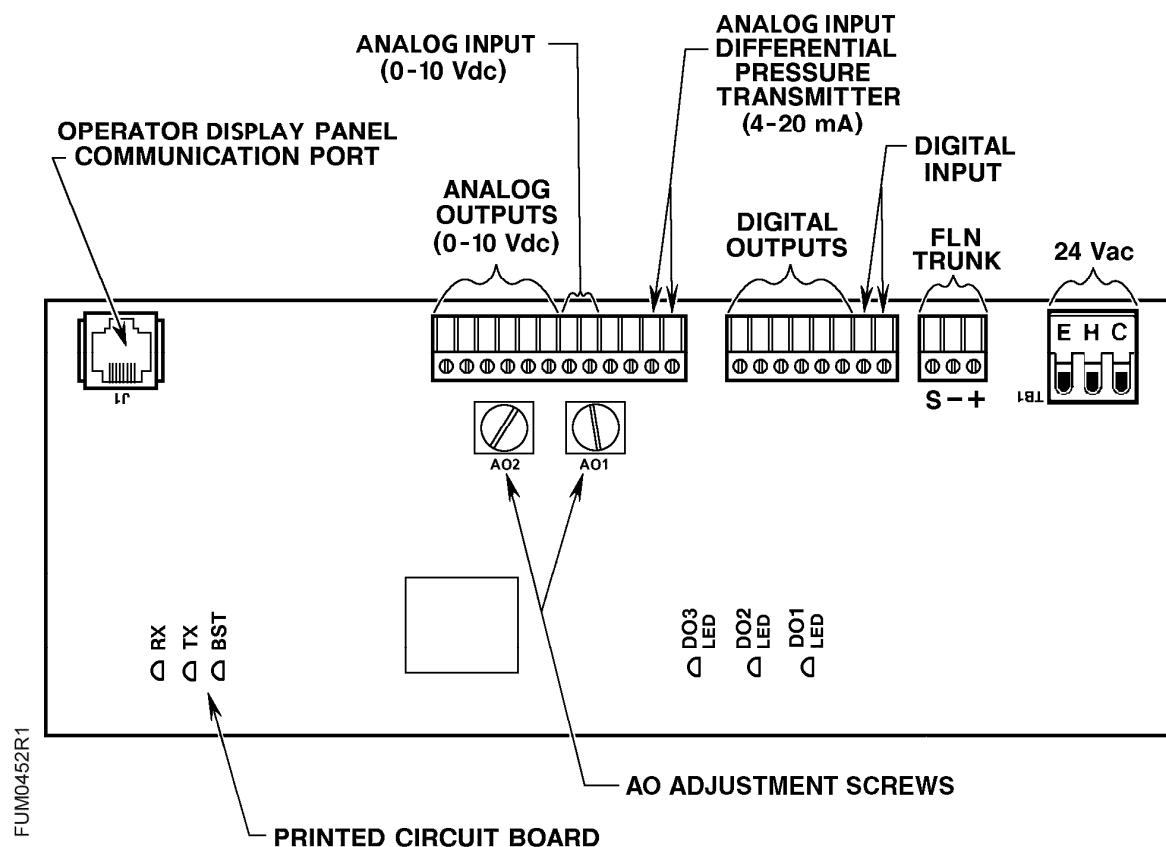


Figure 1. Fume Hood Controller Board .

Hardware Inputs

Analog

- Differential pressure transmitter

Digital

- Operator Display Panel (ODP)
- ATTN.UNATTN (through DI1)
- OCC.UNOCC (through DI1)

Hardware Outputs

Analog

- AO-E/AO-P module (Floating Control)
- Operator Display Panel (ODP)
- AO2 (Flow Signal, 1 to 10 Vdc)

Digital

- FLN communications trunk
- DO3 (24 Vac, Alarm/Hi.Low Output)

Power Wiring

The controller is powered by 24 Vac. Power wiring connects to the three screw terminals on the controller labeled "C" (Common), "H" (Hot) and "E" (Ground) on the terminal block labeled "TB1". Earth ground connection is required (Figure 2).

Communication Wiring

The controller connects to the field panel by means of a Field Level Network (FLN) trunk. Communication wiring connects to the three screw terminals on the controller labeled "+" (positive), "-" (negative), and "S" (Shield) (Figure 3).

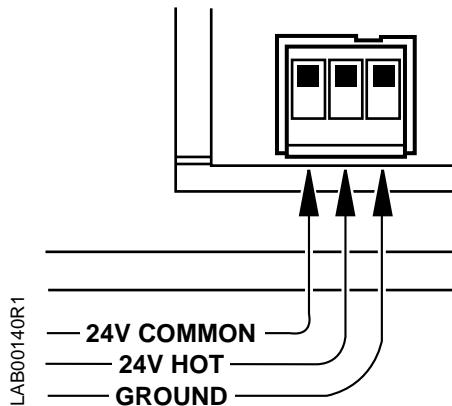


Figure 2. Power Wiring.

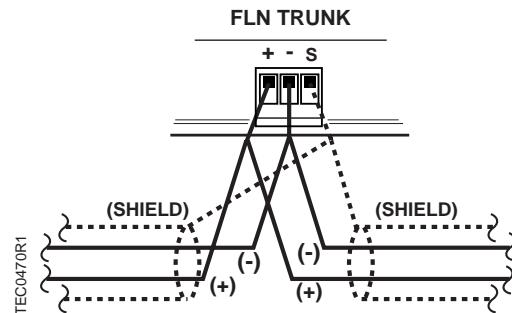


Figure 3. Communication Wiring.

Controller LED Indicators

The controller has six Light Emitting Diode (LED) indicators. See Table 2.

Table 2. Controller LEDs.

LED Type	Label (if present)*	Indication
DO	LED 1 - LED 3	Indicates the ON/OFF status of the DO associated with it. A glowing LED indicates that the DO is energized.
Transmit	TX	Indicates, when flashing, that the controller is transmitting information to the field panel.
Receive	RX	Indicates, when flashing, that the controller is receiving information from the field panel.
BST "Basic Sanity Test"	BST	Indicates, when flashing ON and OFF once per second, that the controller is functioning properly.

Operator Display Panel (ODP)

The Operator Display Panel (ODP) is the interface device between the Fume Hood Controller and the operator. Its main functions are to display normal, warning, and alarm conditions to the operator. The ODP consists of a housing, three Light Emitting Diodes (LEDs), a liquid crystal display (LCD), four buttons, and a portable operator's terminal port. See Figure 4. The ODP buttons function as follows:

Horn Silence button – Pressing the Horn Silence button turns the audible alarm off for the current alarm event.

Emergency Purge button – Pressing the Emergency Purge button removes contaminated air from the fume hood by switching to an emergency exhaust flow level. The internal audible alarm will sound. Emergency Purge automatically overrides any other control mode in the Fume Hood Controller.

Pressing the Emergency Purge button a second time reverts the Fume Hood Controller to normal operation for the current conditions.

HI/LO: HI/OFF Select button – Pressing this button changes the controller from a high flow setpoint to a low flow setpoint and back again or changes the controller from a high flow setpoint to an OFF state and back again.

Auxiliary Button – The Auxiliary buttons are not used currently.

For more information on the ODP, see the *Fume Hood Controller Operator Display Panel User's Card* (125-1976).

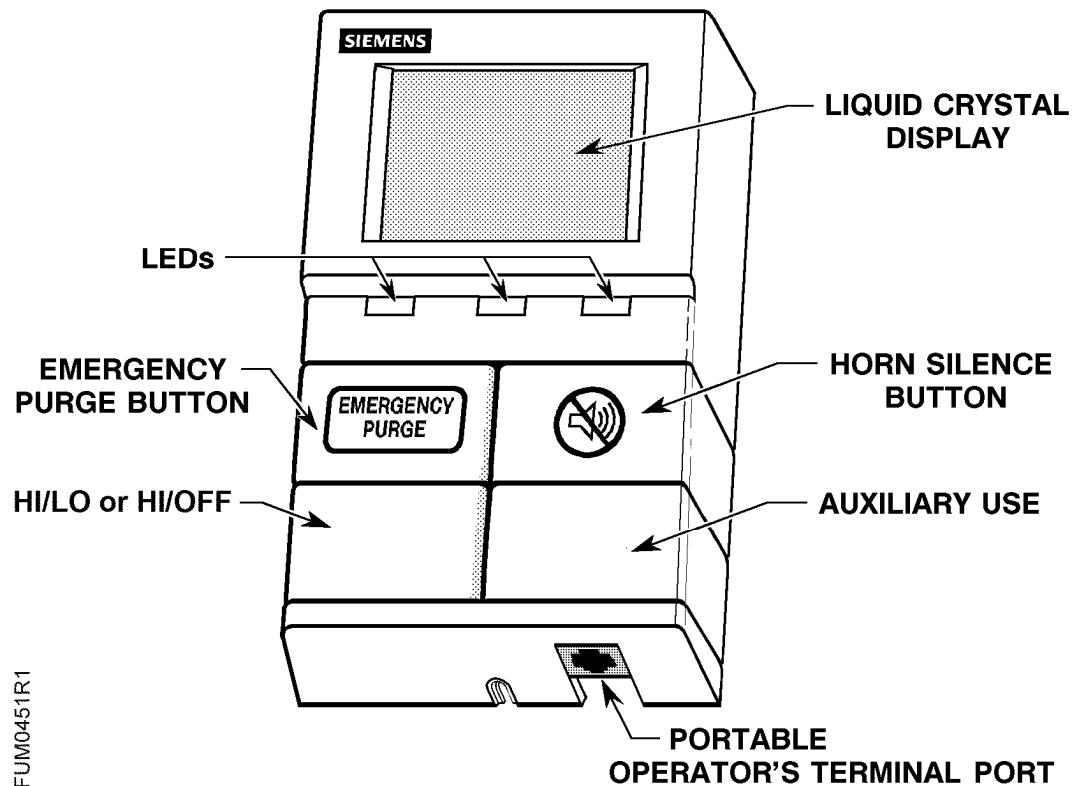


Figure 4. Operator Display Panel.

Laboratory Exhaust Air Terminal

The Laboratory Exhaust Air Terminal is a pre-packaged, easy to install, airflow measurement and control station. See Figure 5. It combines an orifice plate flow sensor, differential pressure transmitter, an electronic actuator assembly, or No. 3 pneumatic actuator, and Analog Output-Pneumatic (AO-P) Module, and butterfly damper in a 20 gauge 316 stainless steel duct section.

This arrangement provides fast acting, stable, and precise VAV fume hood exhaust airflow control.

The terminal is available in diameters ranging from 4 to 18 inches. The terminal is available in a variety of end configurations to match the ductwork construction. It is also available in TEFLON® coated 18-gauge steel for highly corrosive environments.

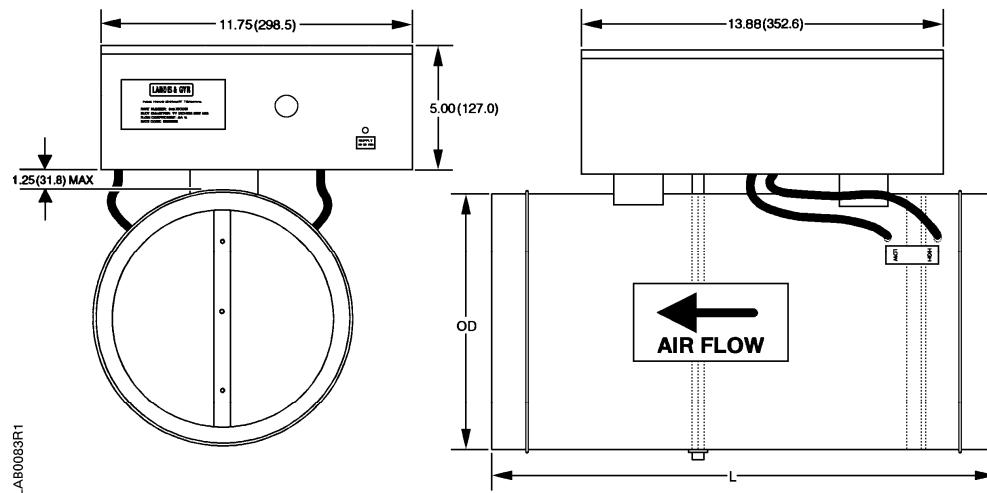


Figure 5. Laboratory Exhaust Air Terminal.

Venturi Air Valves

The Venturi Air Valve is a pre-packaged, easy to install airflow measurement and control station. See Figure 6. This assembly combines the orifice plate flow sensor, differential pressure transmitter, Electronic actuator and a Venturi Air Valve.

This arrangement provides fast acting, stable, and precise exhaust airflow control.

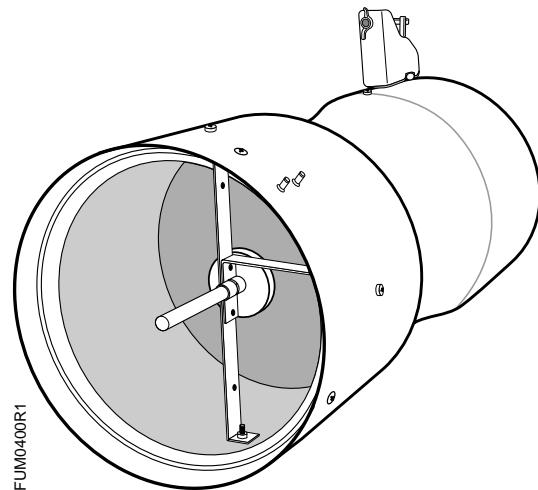


Figure 6. Single-Body Venturi Air Valve.

High Speed Electronic Actuation

The High speed electronic actuator assembly consists of two parts, the electronic actuator and the interface board. The actuator is connected to the exhaust flow control device in the fume hood exhaust duct. The electronic actuator assembly is used because of its small size and quick response time.



CAUTION:

Due to the design parameters and the response time required by the Fume Hood Controller, the assembly must be replaced with the same part or a Siemens Building Technologies, Inc. approved equivalent. Any modifications that are not approved may affect the safety and performance of the Fume Hood Controller.

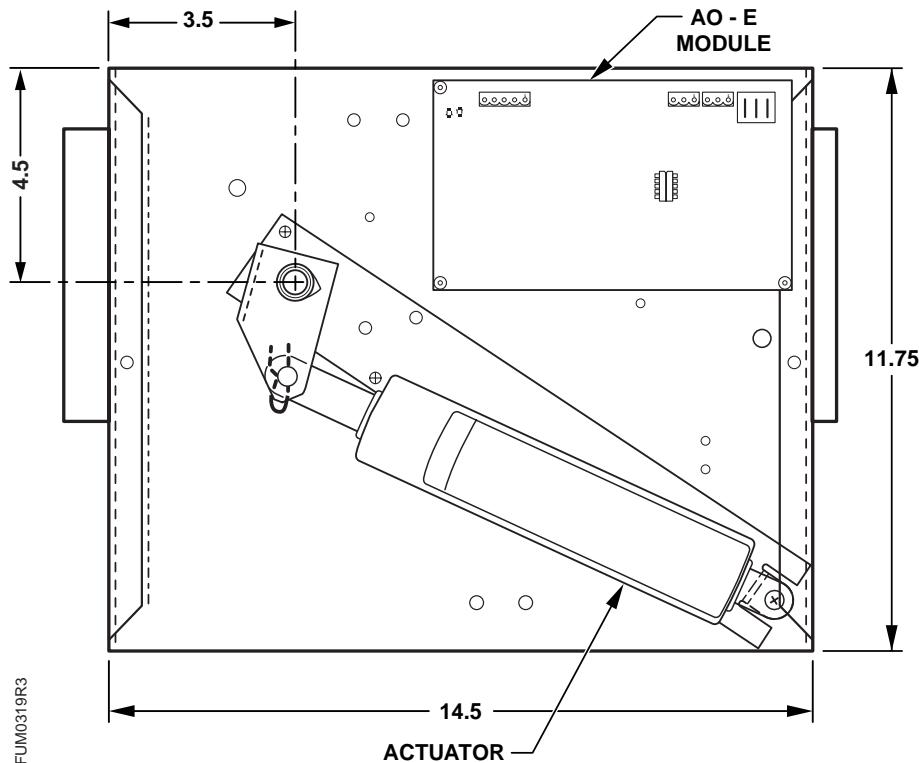
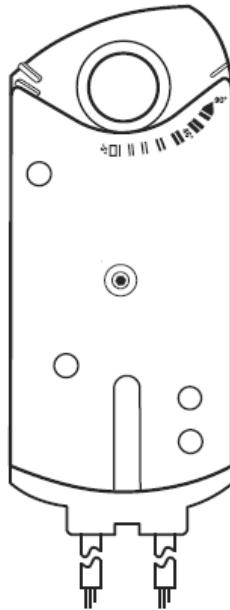


Figure 7. Electronic Actuator Assembly in an Exhaust Air Terminal Enclosure.

Low Speed Electronic Actuation

Alternately, when speed of response is not an issue, slower speed electronic actuation may be used. This can be used when the change-of-state between High and Low can take place in 15 seconds or more.



Low Speed Actuator (GMA13x).

Pneumatic Actuation

The pneumatic actuator is connected to an exhaust flow control device in the fume hood exhaust duct. The standard pneumatic actuator (Figure 8) used with the Fume Hood Controller is the No. 3 unit. The No. 3 actuator is used because of its small size and quick response time. The actuator has a deep drawn aluminum housing, a rubber diaphragm, and a spring return rated at 8 to 13 psi. Pneumatic actuation requires two components, the actuator and the transducer (AO-P module).



WARNING:

Due to the design, parameters and the response times required by the Fume Hood Controller, the No. 3 actuator always must be replaced with the same part or a Siemens Building Technologies, Inc. approved equivalent. Any modifications that are not approved may affect the safety and performance of the Fume Hood Controller.

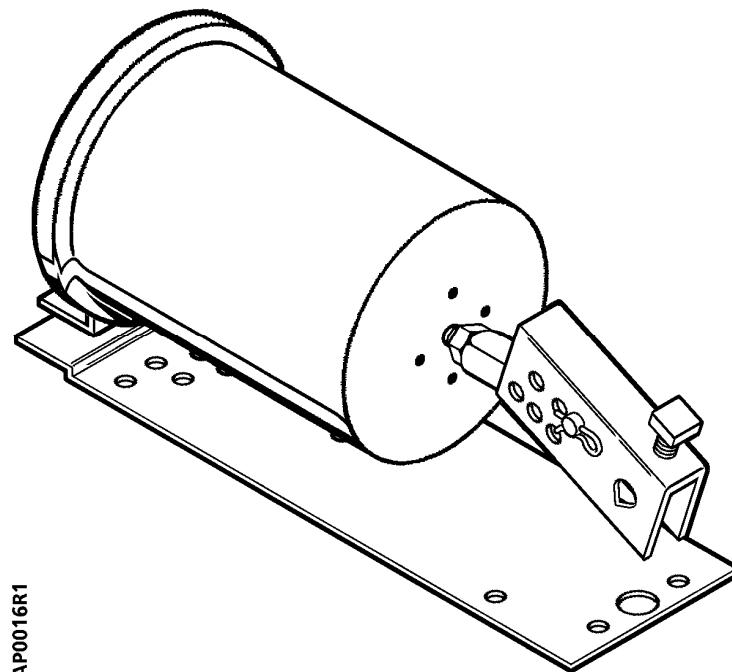


Figure 8. Pneumatic Actuator.

Analog Output-Pneumatic (AO-P) Module

The Analog Output-Pneumatic (AO-P) Module is an electric-to-pneumatic interface between the Fume Hood Controller and the pneumatic actuator. The AO-P Module translates electrical signals from the Fume Hood Controller into pneumatic signals that command the actuator. The AO-P Module consists of two industrial grade solenoids that supply or bleed air to the actuator by using a pulse modulation technique. See Figure 9. Minimum air supply to the AO-P Module is 18 psi and the maximum is 30 psi. The valves are rated for 24 Vac.

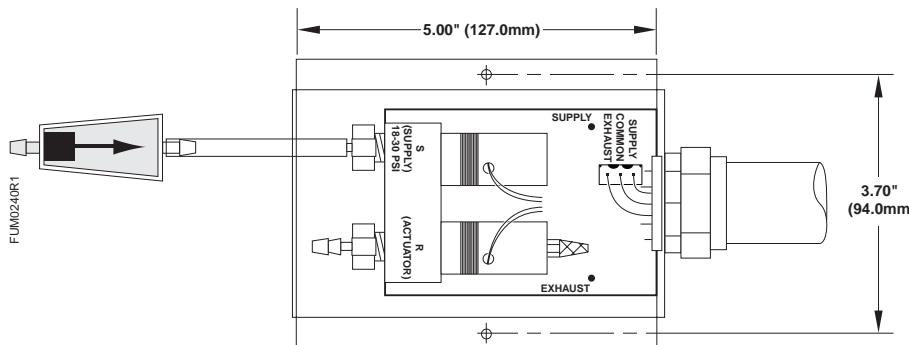


Figure 9. AO-P Module.

NOTE: While the pneumatic actuator is being commanded, you may hear a hissing or clicking sound coming from the AO-P module. This is due to the movement of the air valves and the bleeding of air from the actuator. This is normal operation.

Differential Pressure Transmitter

The differential pressure transmitter is used to send a signal that represents the velocity of air in the duct to the controller. The differential pressure transmitter receives the velocity pressure signal from the airflow sensor (orifice plate). The transmitter is a dead-end device which prevents the exhausted fume hood air from flowing through the transmitter or the sensor.

NOTE: In accordance with laboratory ventilation safety standards and regulatory agencies, the performance of the fume hood should be checked annually, as a minimum, to ensure continued safe and proper operation. Consult Siemens Building Technologies for more information about a comprehensive laboratory ventilation system evaluation and associated test programs.

Airflow Sensor

Airflow sensors are used in conjunction with the differential pressure transmitter. The airflow sensor senses an average air velocity across the duct section. Using the average air velocity and the duct area, the controller calculates the airflow.



CAUTION:

Ensure that the sensor and exhaust system materials match the fume hood usage. Exhausting corrosive fumes may corrode the sensor and exhaust system.

Cables

The Fume Hood Controller connects to the portable operator's terminal with the controller interface cable (P/N 540-143). This cable has an RJ-11 connector (similar to a phone jack) on one end, and a larger, 9-pin connector on the other end. The RJ-11 connector plugs into the bottom of the ODP. For more information, see the *Fume Hood Controller Operator Display Panel User's Card* (125-1976). The 9-pin connector plugs in the communication port of the portable operator's terminal. For more cable information, contact your local Siemens Building Technologies, Inc. representative.

2

Applications

Fume Hood Controller: 2-Position Constant Volume

Application 940 is designed for use with a constant volume or two-position fume hood in a manifold fume hood exhaust system. In this application, two position fume hoods have an individual exhaust damper or venturi air valve connected to a central fan. The application modulates the exhaust flow control device to maintain a high or low flow setpoint based on inputs from the ODP (Operators Display Panel), Digital Input, an exhaust airflow sensor, and the controller setpoints (Figure 10).

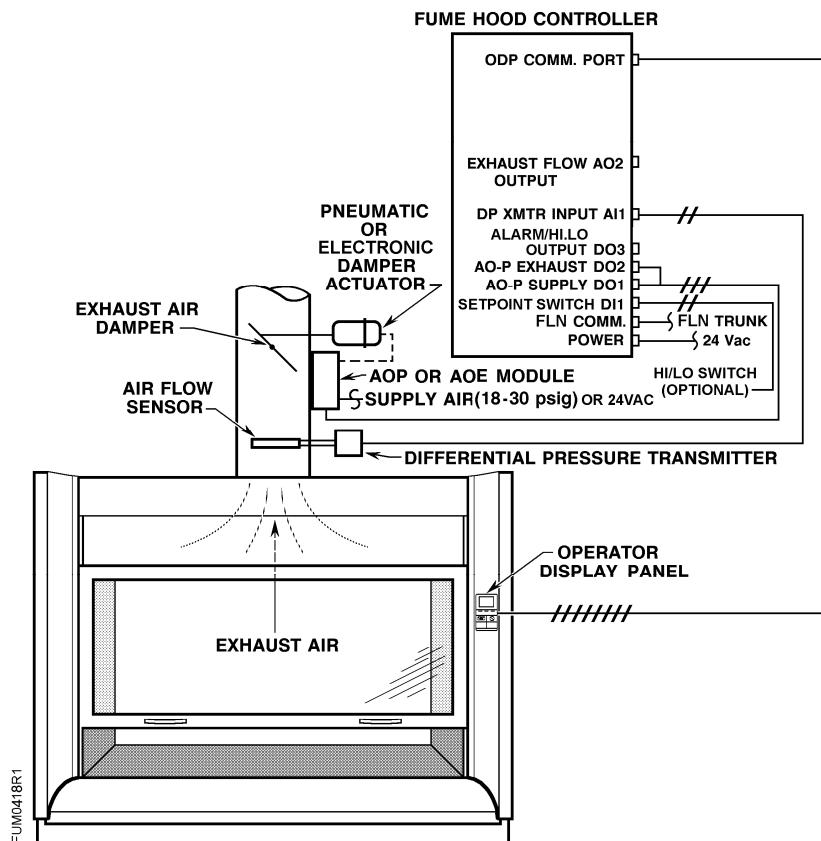


Figure 10. Application 940 Control Drawing shown using a damper.

Basic Operation

The Fume Hood Controller provides Direct Digital Control (DDC) technology for controlling fume hood face velocities in a manifolded fume hood exhaust system.

High and Low Exhaust Flow Control

The Fume Hood Controller can operate at two different setpoints, described as HI flow and LOW flow setpoints. The low setpoint can be set to zero to send the controller into an OFF mode. The OFF mode shuts off the flow alarms and closes the exhaust flow control device and allows the controller to go into a standby mode of operation.

The Operators Display Panel (ODP) can display HI/LOW setpoint or output exhaust flow in CFM. Due to display limits, the actual number displayed is CFM divided by 10.

Control Loops

The PID loop controls the exhaust flow control device based on the values of the exhaust flow and the flow setpoint. The loop output controls the supply and exhaust through a time modulation scheme. The control loopout ranges from -100 to 100%.

- -100% is the maximum supply that closes the exhaust flow control device at full speed.
- 0% holds the exhaust flow control device at its current position.
- 100% is the maximum exhaust that opens the exhaust flow control device at full speed.

Electronic

The controller sends a separate signal to each of the two inputs that reside on the AO-E module. For values of 100% to 0%, the controller sends a decreasing percentage of the full signal length to the retract input. For values of 0% to -100%, the controller sends an increasing percentage of the full signal to the extend input.

Pneumatic

The controller sends a separate signal to each of the two solenoids that reside on the AO-P module. For values of 100% to 0%, the controller sends a decreasing percentage of the full signal length to the exhaust solenoid. For values of 0% to -100%, the controller sends an increasing percentage of the full signal length to the supply solenoid.

Calibration

Air Velocity Sensor - Calibration of the controller's air velocity sensor is periodically required to maintain accurate air velocity readings.

DO3 Output Functionality

DO3 is designed to operate in two different modes. DO3 can follow the alarm status of the controller by turning ON during alarm conditions and OFF during normal operation; or DO3 can follow the HI/LOW setpoint status of the controller by turning ON while the controller is in LOW flow operation and OFF when the controller is in HI flow operation.

Warning and Alarm Features

The Fume Hood Controller indicates fume hood performance problems at two levels, WARNING and ALARM. The two levels are available so different procedures can be instituted for each condition. Both levels are indicated locally at the ODP and, if connected to a field panel, centrally through the APOGEE alarm features.

NOTE: Central alarms only work if the field panel is specifically set up to receive and distribute the alarm information. Consult your local Siemens Building Technologies, Inc. representative for more information on central alarming.

Warning Operation

The Fume Hood Controller announces warning conditions at the ODP. The ODP indicates a warning condition by illuminating the yellow LED.

If the fume hood is operating and the exhaust volume exceeds the high or low warning limit for a period greater than the delay timer a warning condition occurs.

For more information on ODP messages, see the *Fume Hood Controller Operator Display Panel User's Card* (125-1976).

Alarm Operation

The Fume Hood Controller announces alarm conditions at the ODP. The ODP indicates an alarm condition in the following three ways:

- The red LED illuminates.
- The horn sounds.
- A text message indicating the specific alarm condition displays.

If the fume hood exhaust flow exceeds the high or low alarm limit for a period greater than the delay timer an alarm condition occurs. The text message FLO HI or FLO LO displays.

The fume hood operator may silence the horn for the current alarm event by pressing the Horn Silence button.

Alarm Strategies

One approach is to use the ALARMS to indicate a condition that requires immediate attention and the WARNINGS to indicate a condition that may require attention but is not urgent. In that case, the alarm limits would be set to indicate that it is unsafe to work at the fume hood. The warning limits would be set at a level that is safe, but indicates that the system may not be operating correctly. These values should be selected by the person responsible for laboratory safety.

The delay timer is adjustable and should be selected with safety in mind. Laboratory safety procedures will not be effective if there are numerous nuisance alarms. The delay timer should be set at a sufficiently large interval to prevent nuisance alarms. However, if the delay timer interval is excessively large, there is a risk of having a laboratory worker standing in front of an ineffective fume hood for a prolonged period. The delay timer interval should be selected by the laboratory safety officer with the above considerations in mind.

Emergency Purge Feature

Under certain emergency conditions, such as a spill in the fume hood, it may be necessary to purge the air from the fume hood. The Emergency Purge sequence enables the fume hood user to override normal airflow setpoint and temporarily increase the airflow beyond the value needed to maintain the airflow setpoint.

The Emergency Purge overrides any other control mode in the Fume Hood Controller and has two modes of operation; maximum purge, and controlled purge.

The maximum purge moves the exhaust airflow control device to full open and holds it there regardless of airflow. This mode has the advantage of providing immediate expulsion of the contaminating agent, but may cause airflow problems in the fume hood and reduce the airflow capacity at other fume hoods.

The controlled purge continues to modulate the exhaust airflow control device and controls the airflow, but at a higher than normal level.

The Fume Hood Controller can be set up to purge in either mode or to start in maximum purge and then switch to a controlled purge after an adjustable amount of time.

Emergency Purge Operation

The Emergency Purge sequence is initiated by pressing the Emergency Purge button on the ODP. When the Emergency Purge button is pressed, the fume hood will go to the maximum purge for the time selected in the emergency timer. After the emergency timer elapses, the Fume Hood Controller will begin actively controlling the airflow, but at an increased setpoint. The Emergency Purge sequence is canceled by pressing the Emergency Purge button a second time. The ODP indicates an Emergency Purge sequence in three ways:

- The red LED illuminates.
- The horn sounds.
- EMERGENCY PURGE and EEE display.

The fume hood operator may silence the horn by pressing the Horn Silence button on the ODP without affecting the Emergency Purge sequence.

In addition to the ODP indicators, the emergency alarm point will toggle to ON and will remain ON until the sequence is canceled. If the emergency alarm is alarmable in the field panel, the condition can be indicated at selected terminals if the APOGEE Automation System is set up for it.

Emergency Purge Strategies

The use of the Emergency Purge button is determined by the work practices established by the laboratory safety officer. As a general rule, there are two groups that should be aware of the use of the Emergency Purge button: the laboratory worker and the laboratory safety officer.

Laboratory worker – In most cases, the laboratory worker uses the Emergency Purge button to increase the fume hood airflow to minimize a dangerous situation.

The Emergency Purge button should not be used as a way to work around the established face velocity and minimum flow setpoints in an effort to make the fume hood "even safer".

Laboratory safety officer – For the safety department personnel to use the Emergency Purge feature effectively, they must select the purge mode that best suits their needs. The selection may be based on knowledge of industrial hygiene, the chemicals used in the laboratory, the organization's emergency procedures, and the capacity of the central exhaust system.

If the maximum purge mode is selected, the emergency timer and the emergency setpoint to their maximum values.

If the controlled purge mode is selected, the emergency timer is set to **0**. Select the value for the emergency setpoint to indicate how much you want the emergency airflow to increase over the normal airflow. For example, if your emergency procedures call for closing the fume hood and starting the emergency purge, decide how much airflow you want compared to the minimum airflow. If you want twice as much airflow, set the emergency setpoint to 200%; if you want a 50% increase, set the emergency setpoint to 150%. If you do not intend to have the laboratory worker close the fume hood, then select the face velocity you want the fume hood to control to in an emergency. Compare that value to the normal face velocity setpoint and calculate the emergency setpoint in percent.

NOTE: During a controlled purge, the increased airflow called for in the controlled purge may exceed the range of the flow sensor. If so, the system cannot accurately regulate the airflow and the controller will open the exhaust flow control device 100%.

If a sequence initially employing maximum purge with a switch to controlled purge is desired, set the emergency setpoint as described for the controlled purge. Select a value for the emergency timer to tell the system how long to leave the exhaust flow control device open before switching to controlled purge. Base this on the types of accidents anticipated, the reason you require a maximum purge, and the reason you want to switch it down to a controlled purge.

In addition to setting up the purge sequence to effectively handle the exhaust needs, decisions must be made on how to use the information available at the central reporting station. Consult your local Siemens Building Technologies, Inc. representative for more information on central reporting and trending of emergency purge information.

Fail-safe Operation

If the Fume Hood Controller or one of its accessories fails, then a failure mode sequence will be initiated.

Fume Hood Controller

If the Fume Hood Controller power fails, the exhaust flow control device will go to the full open position. Since there would be no power to the controller, no LEDs or display will be available on the ODP.

NOTE: If the power fails to both the exhaust fan and the controller, there will be no indication except for the absence of the noise that the air makes during normal operation.

ODP

If the ODP fails, the controller will continue to control the fume hood face velocity. However, no display or audible alarming will be available.

Differential Pressure Transmitter

If the differential pressure transmitter fails, the controller will control the exhaust flow control device to the fully open position. The ODP will display FFF and GENERAL FAILURE.

Electronic Actuator Assembly

If the electronic actuator or interface board fails then alarms are displayed on the ODP indicating unsafe operating conditions.

Pneumatic Actuator

If the actuator fails due to a leak, then the exhaust flow control device will go to the full open position. Alarms will be displayed on the ODP indicating unsafe operating conditions.

AO-P Module

If the AO-P module fails, alarms will be displayed on the ODP indicating unsafe operating conditions.

3

Point Database

Chapter 3 presents a description of the Fume Hood Controller point database including point descriptors, point addresses, and a listing of applications in which each point is found.

Address	Descriptor	Description
01	CTLR ADDRESS	Identifies the controller on the FLN trunk. Valid values: 0 through 98.
02	APPLICATION	The identification number of the Application running in the controller.
05	LOW ALM	This point displays an ON or OFF status. When the exhaust flow goes below the value specified at LOW ALM LMT for the time specified in ALARM TIME, the point goes into an alarm state (ON); the red LED is illuminated, the alarm sounds, and the message "FLOW LOW" displays at the ODP.
06	HIGH ALM	This point displays an ON or OFF status. When the exhaust flow goes above the value specified at HI ALM LMT for the item specified in ALARM TIME, the point goes into an alarm state (ON); the red LED is illuminated, the alarm sounds, and the message "FLOW HI" displays at the ODP.
07	EMER ALM	This point displays an ON or OFF status that indicates if the EMERGENCY PURGE button on the ODP has been pressed. When the operator presses the EMERGENCY PURGE button, the point is ON, the red LED is illuminated, the alarm sounds, and EEE and EMERGENCY MODE display at the ODP. If pressed again, then the point is OFF. This point can be commanded by a field panel.
08	GEN FAILURE	Indicates a hardware failure (e.g., the pressure sensor) with an ON or OFF status. The red LED is illuminated; the alarm sounds, and FFF and GENERAL FAILURE display at the ODP.
10	HI ALM LMT	The value above FLOW STPT, in percent, at which the red LED and audible alarm are activated on the ODP. This point is the setpoint for HIGH ALM. Valid values: 100 through 255%.
11	HI WARN LMT	The value above FLOW STPT, in percent, at which the yellow LED is illuminated on the ODP. Valid values: 100 through 255%.
12	LOW WARN LMT	The value below FLOW STPT, in percent, at which the yellow LED is illuminated on the ODP. Valid values: 0 through 100%.
13	LOW ALM LMT	The value below FLOW STPT, in percent, at which the red LED and audible alarm are activated on the ODP. This point is the setpoint for LOW ALM. Valid values: 0 through 100%.
14	EMER TIMER	When EMER ALM is set to ON, the time set for EMER TIMER is used as the length of time the EXH FLOW is commanded to full flow (the exhaust flow control device is full open). After the time in EMER TIMER times out, the EXH FLOW is controlled to the value set in EMER STPT. Valid values: 0 through 32, 767 seconds.

Address	Descriptor	Description
15	EMER STPT	A value of the preset FLOW STPT, in percent, that the controller uses as the setpoint when EMER ALM is ON.
16	LOW WARN	This point displays an ON or OFF status. When the exhaust flow goes below the value specified at LOW WARN LMT for the time specified in ALARM TIME, the point goes into a warning state (ON); the yellow LED is illuminated at the ODP.
17	HIGH WARN	This point displays an ON or OFF status. When the exhaust flow goes above the value specified at HI WARN LMT for the time specified in ALARM TIME, the point goes into a warning state (ON), the yellow LED is illuminated at the ODP.
19	ALM AKNLG	This point displays an ON or OFF status that indicates the Horn Silence button has been pressed at the ODP to acknowledge an alarm condition. The point will reset when the alarm condition clears or another alarm is initiated.
27	AO2 DEADBAND	When EXH FLOW and FLOW STPT are different by more than the AO2 DEADBAND, the AO2 FLOW SIG changes from setpoint to actual flow.
30	AO2 RANGE	Scaling for the Analog Output (AO2) point. To get the correct output, the slope and intercept of this point must match the point database of the room controller.
34	TRANS RANGE	The maximum range, in inches of water (PA), of the differential pressure transmitter. Standard values are 0.1 (25.3), 0.25 (62.275), 0.5 (124.55), and 1.0 (253).
35	EXH FLOW	The calculated value, in CFM (LPS), of the exhaust airflow as measured with the differential pressure transmitter sensor.
36	FLOW COEFF	Gain factor for the flow sensor.
37	FLOW STPT	Setpoint, in CFM (LPS), that the airflow is controlled to.
38	FLOW LO STPT	The low flow setpoint used in FLOW STPT.
40	CAL DP TRANS	YES or NO point used to calibrate the zero point of the differential pressure transmitter.
41	DO1 SUP	Digital output 1 is used to control the analog output-pneumatic (AO-P) supply valve or the AO-E module supply input.
42	DO2 EXH	Digital output 2 is used to control the analog output-pneumatic (AO-P) exhaust valve or the AO-E module exhaust input.
43	DO3	Digital output 3 is a spare output.
44	AI1 DP TRANS	Analog input 1, a 4 to 20 mA signal from the differential pressure transmitter. The point displays the mA value of input from the sensor.
45	AI2 0.10V	Analog input 2 is a 0 to 10 Vdc spare input.
46	AO1 0.10V	Spare analog output is a 0 to 10 Vdc output.
47	AO2 FLOW SIG	Analog output 2 signal is used to indicate the exhaust flow setpoint. The output is 1 to 10 Vdc, which corresponds to 0 to A02 RANGE (Point 30).
48	DI1 STPT SW	Digital input for dry contact connection to control the HI/LOW flow setpoint of the controller.
54	ODP DISPLAY	Controls the function of the ODP display. It will display either CFM divided by 10 or HI FLOW / LO FLOW.
55	DO3 MODE	Controls the function of the DO3. It will follow either the HI/LO setpoint or the alarm status.

Address	Descriptor	Description
56	ODP STPT SW	Indicates if the lower left button on the ODP has been pressed. This is a toggle action digital input; when pressed, the controller changes between HI and LOW flow setpoints.
57	RIGHT SW	Indicates if the right auxiliary button on the ODP has been pressed. This is a toggle action digital input; when pressed, the point is ON. If pressed again, the point is OFF.
63	FLOW P GAIN	The proportional gain value for the fume hood flow control loop.
64	FLOW I GAIN	The integral gain value for the fume hood flow control loop.
66	FLOW D GAIN	The derivative gain value for the fume hood flow control loop.
67	FLOW BIAS	The bias, in percent, of the fume hood flow control loop.
68	CTRL LOOPOUT	Control output of the flow loop. Range: -100% to 100%.
87	FLOW HI STPT	The hi flow setpoint used in FLOW STPT.
89	HORN	When this point is set to DISABLE, the audible alarm will not sound. All other alarm functionality is still operational.
91	BLANK DSPLY	When set to YES, the exhaust flow is not displayed at the ODP.
92	DO2 INVERTER	Setting to NCLOSE allows the controller to operate industry standard floating control actuators. Setting this point may stop the failsafe operation from functioning.
93	ENG UNITS	Toggles the display of the ODP from CFM to LPS. Toggling this point does not change the displayed value at the portable operators terminal.
94	LAMP TEST	Turns on all lights, prompts, and the audible alarm at the ODP.
96	ALARM TIME	Time delay for the red and yellow alarm LEDs used to eliminate sudden changes and false alarms. The exhaust flow must rise above any of the set limits (for example, HI ALM LMT) for the amount of time specified at this point before the ODP indicates an alarm condition.
97	DUCT AREA	Area of the duct, in square feet (SQM), where the air velocity sensor is located.
98	LOOP TIME	The time, in tenths of a second, between control loop calculations.
99	ERROR STATUS	The status code that indicates any errors detected during controller power-up.

4

Troubleshooting

This chapter describes corrective measures you can take should you encounter a problem when using the Fume Hood Controller. For issues not covered in this section, contact your local Siemens Building Technologies, Inc. representative.

You are not required to do any controller troubleshooting. Contact your local Siemens Building Technologies, Inc. representative if a problem occurs or you have any questions about the controller.

NOTE: When troubleshooting, record what the problem is and what actions were performed immediately before the problem occurred. Being able to describe the problem in detail is important should you need assistance from your local Siemens Building Technologies, Inc. representative.

Basic Service Information

Always remove power to the controller when installing or replacing it. Since the controller does not have a power switch, the recommended method of removing power to a locally powered controller is to turn OFF the power to the 24 Vac transformer. The recommended method of removing power to a controller on a power cable (even to service a single controller) is to turn OFF the power at the transformer.

NOTE: When removing power to a controller to perform maintenance or service, make sure that the person in charge of the facility is aware of this and that appropriate steps are taken to keep the building in control.

Never remove the cover from the controller. There are no serviceable parts inside. If a problem is found with a controller, contact your local Siemens Building Technologies representative for replacement. An anti-static wrist strap is recommended when installing or replacing controllers.

Preventive Maintenance

Most controller components are designed so that, under normal circumstances, they do not require preventive maintenance. However, devices that are exposed to dusty or dirty environments may require periodic cleaning to function properly. To ensure optimum system performance, it is recommended that you discuss the operating requirements of your application with your Siemens Building Technologies, Inc. representative to determine the best service support program for your needs.

Safety Features

The controller board stores the controller's address, applications, and point values. In the event of a power failure or a reset, these values are retrieved from the controller's permanent memory and are used by the controller unless overridden by a field panel.

Controller LEDs

To determine if the controller is powered up and working, verify that the Basic Sanity Test (BST) Light Emitting Diode (LED) is flashing ON/OFF once per second. The controller contains six LEDs located on the circuit board. See the *Controller LED Indicators* section of *Chapter 1, Product Overview* for more information about LEDs.

NOTE: The TX and RX LEDs indicate communication over the FLN.

Glossary

The glossary contains terms and acronyms that are used in this manual. For definitions of point database descriptors, see *Chapter 3 - Point Database*, in this manual. For definitions of commonly used terms as well as acronyms and abbreviations associated with the APOGEE Automation System, see the *Technical Glossary of Building Controls Terminology and Acronyms*, (125-2185). This book is available from your local Siemens Building Technologies, Inc. representative.

AI

Analog Input. An AI point is a physical point which accepts a continuous variable signal.

algorithm

Mathematical formula used to calculate an output value using varying inputs.

centralized control

The type of control offered by a controller that is connected, by means of a Floor Level Network (FLN), with an APOGEE field panel.

control loop

A PID algorithm which is used to control an output based on a setpoint and an input reading from a sensor.

CV

Constant Volume.

DDC

Direct Digital Control.

DI

Digital Input. A DI point is a physical output point which accepts a two-state signal (that is, ON/OFF, OPEN/CLOSED, YES/NO, etc.).

DO

Digital Output. A DO point is a physical output point which generates a two-state signal (that is, ON/OFF, OPEN/CLOSED, YES/NO, etc.).

English units

The foot-pound-second system of units for weights and measurements.

equipment controller

A FLN device which provides additional point capacity to a field panel or provides DDC to individual room or mechanical equipment control. The FHC is a specialized equipment controller.

field panel

A device containing a microprocessor for centralized control of system components and equipment controllers. A field panel samples and processes field data, initiates control actions, communicates with its operators, and generates reports, displays and warnings.

FLN

Field Level Network (formerly known Floor Level Network).

Fume Hood Controller

Multi-application equipment controller designed to provide Direct Digital Control for various types of Variable Air Volume (VAV) fume hoods. The controller consists of a controller board and a controller enclosure.

intercept

Factor which converts analog values (used by the controller) to a form which the user can understand (engineering units). Slope and intercept constants are determined by the type of field input/output represented by the physical or virtual point.

loopout

Output of the control loop expressed as a percentage.

LPS

Liters Per Second.

OCC mode

OCCupied mode.

OFF text

Text indicating the de-energized state of a digital point (for example, OFF, CLOSED, NO).

ON text

Text indicating the energized state of a digital point (for example, ON, OPEN, YES).

override switch

Button on room temperature sensor which can be pressed by an occupant to change the status of a room from night mode to day mode for a predetermined time.

PID

Proportional, Integral, Derivative.

Portable Operator's Terminal

DOS capable laptop computer used along with the Controller Interface Software to monitor and communicate with Terminal Equipment Controllers.

RTS

Room Temperature Sensor.

sash sensor actuator

Device that rides along the sash sensor strip to vary the resistance reading to the Fume Hood Controller.

SI units

Systeme International d'Unites. The international metric system.

slave mode

Default application that comes up when power is first applied to a Terminal Equipment Controller.

slope

Factor which converts analog values (used by the controller) to a form which the user can understand (engineering units). Slope and intercept constants are determined by the type of field input/output represented by the physical or virtual point.

stand-alone control

The type of control offered by a controller that is providing independent DDC control to a space.

Terminal Equipment Controller

Siemens Building Technologies, Inc. product family of equipment controllers (one is the Unit Conditioner Controller – Electronic Output) that house the applications software used to control terminal units, such as heat pumps, VAV terminal boxes, fan coil units, unit ventilators, etc.

UNOCC mode

UNOCCupied mode.

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