

Laboratory Room Controller

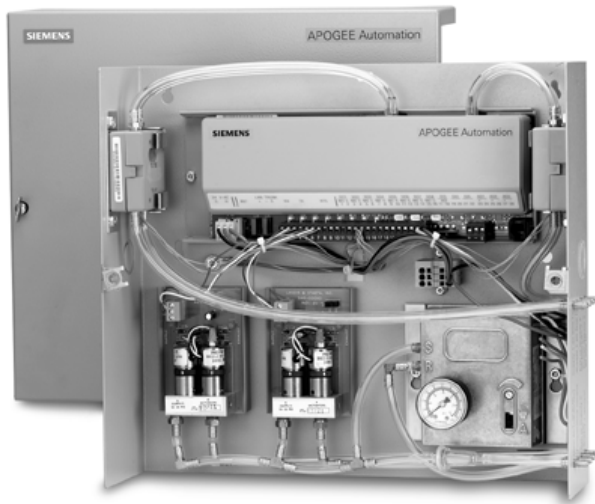


Figure 1. Laboratory Room Controller - Pneumatic Actuation.

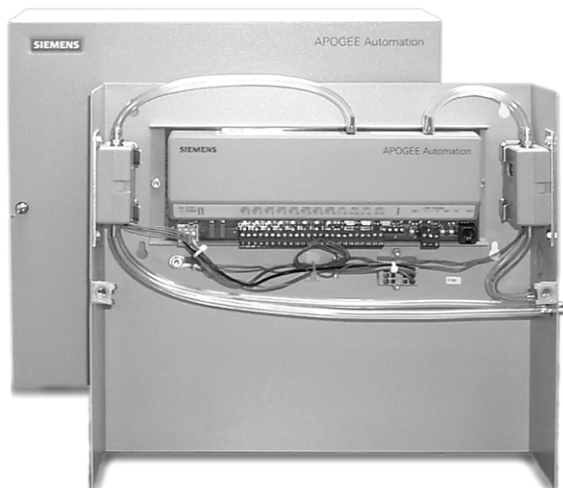


Figure 2. Laboratory Room Controller – Electronic Actuation.

Description

The APOGEE™ Automation System Laboratory Room Controller (LRC) provides Direct Digital Control (DDC) for laboratory space pressurization and temperature control. The controller maintains the user defined differential airflow between the room air supply and Fume Hood Controller exhaust and general exhaust terminals by measuring the airflow and controlling the damper position of the supply and general exhaust terminals. Temperature control is provided by measuring the room temperature and controlling the position of the reheat valve and adjusting the airflow.

The LRC operates as an independent, stand-alone DDC controller and can be connected on the Floor Level Network (FLN) with the APOGEE Automation System. This extends the benefits of DDC to all of the building's HVAC equipment. This approach to lab room control includes the following features.

Features

- Closed loop PID control of HVAC systems to maintain tighter air volume and temperature control
- Control sequences for both single duct and dual duct supply system applications
- Supports the use of wall switch input to change from occupied to unoccupied mode for increased energy savings
- Optional room pressurization alarm output to notify laboratory occupants,
- Reports airflow directly in actual cfm (lps)
- On-line, convenient HVAC diagnostics through communication with a Portable Operator's Terminal at the room sensor or any field panel

- Set points and control parameters easily assigned and changed using the Portable Operator’s Terminal
- Electrically Erasable Programmable Read Only Memory (EEPROM) used for storing set points and control parameters—no battery backup or re-entry of data required
- Quick return from power failure without operator intervention
- Maintains room pressurization during transient conditions, i.e., rapid hood sash movement
- Two controller options, both use the same air flow measurement technology while offering options for control of end devices
- Pneumatic Output – for control of pneumatic valve and damper actuators
- Electronic Output – for control of 0-10V hot water valves and the Laboratory Electronic Damper Actuators

Laboratory Room Controller – Pneumatic Actuation

The Laboratory Room Controller-Pneumatic Actuation consists of the Laboratory Control Module, two lab pneumatic transducers for pressure control, one AO-P Transducer for temperature control, two auto-zero modules for airflow measurement accuracy and an enclosure. All assemblies are pre-mounted and pre-terminated (electric and pneumatic connections) within the enclosure at the factory. External connections for the pneumatic damper actuators and flow sensors are located on the side of the enclosure. The LRC can be factory mounted to the Laboratory Room Supply Terminal or field mounted within the lab room.

The control algorithm is pre-programmed and controllers are ready to operate after selecting the application and assigning the controller’s address using the Portable Operator’s Terminal. If desired, the operator may use the Portable Operator’s Terminal to adjust the air velocity set points in flow, differential flow, room temperature set point and other set points.

Laboratory Controller Module- Pneumatic

The Laboratory Controller Module includes a microprocessor-based assembly with on-board differential pressure transducers for airflow measurement. Wiring termination for input and output points, FLN communications, and power are provided via removable terminal block connections. The room temperature sensor is connected to an on board RJ-11 jack.

The controller connects to the following external devices:

- Fume Hood Controller
- Fume Hood Flow Module
- Pneumatic Damper Actuators
- Pneumatic Hot Water Valve
- Room Temperature Sensor
- Portable Operators Terminal
- APOGEE Automation System
- Digital Input Devices (e.g., wall switches)
- Digital Output Devices (e.g., alarm horn)
- Laboratory Room Air Terminals boxes

Controller Specifications

Power Requirements	
Operating Range	19 to 28 VAC 50 or 60 Hz
Power Consumption:	12 VA (Nominal) to 24 VA (Peak) @ 24 VAC (plus loads)

Inputs	
Analog	
Room Temperature	1 temperature sensor
Supply Airflow	1 air velocity sensor
Exhaust or 2 nd supply airflow	1 air velocity sensor
Fume Hood Exhaust Flow	1 (0 –10) Vdc flow signal
Digital	
Occupied Switch (optional)	1 DI
Alarm Switch (optional)	1 DI

Note: All Digital Input (DI) points are dry contact.

Outputs	
Digital	
Auto-zero	1 DO
Pressure Alarm (optional)	1 DO
Room Occupied Status (optional)	1 DO
Supply Airflow Control	2 DOs to pneumatic
General Exhaust Airflow Control	2 DOs to pneumatic
Spare	1 DO

Note: All Digital Output (DO) points are 24 VAC optically isolated solid state switches @ 0.5A.

Analog	
Temperature Control	1 pneumatic output
Dimensions	13.5"W x 14.5"L x 4"D
Enclosure	(320 mm x 340 mm x 102 mm)
Weight	Approx. 10 lbs (4 kg)

Control Performance	
Controlled Temperature	$\pm 1.0^{\circ}\text{F}$ (0.6°C)
	Accuracy, Heating or Cooling
Flow Control Speed of Response	1.5 sec.
Environmental Conditions	
Storage Temperature	-40°F to 167°F (-40°C to 75°C)
Operating Temperature	32°F to 104°F (0°C to 40°C)
Humidity Range	10 to 95% (non-condensing)
Agency Listings	
FCC	Class B, subpart J
UL	916 PA ZX 864-UDTZ
Communications	
Remote	FLN Trunk
Local	Portable Operator's Terminal



Figure 3. Laboratory Pneumatic Output Module.

Laboratory Pneumatic Output Module

The Laboratory Pneumatic Output Module (Figure 3) contains the transducers that provide the signal conversion from electronic to pneumatic. Two modules are used within the Laboratory Room Controller to interface to pneumatic dampers for room airflow control.

Specifications

Maximum Input Pressure	30 psi
Air Consumption	38 SCIM (ml/sec)
Power Consumption	5 VA @ 24 VAC max.
Dimensions	2-1/2"W x 4-1/2"H x 1-1/4"D (64 mm x 114 mm x 32 mm)
Weight	0.5 lb. (0.2 kg)



Figure 4. AO-P Transducer.

AO-P Transducer

The AO-P Transducer (Figure 4) contains the devices that provide the signal conversion from electronic to pneumatic. One transducer is used within the LRC to interface to a pneumatic valve actuator for room temperature control.

Specifications

Maximum Input Pressure	30 psi
Air Consumption	8 SCIM (ml/sec)
Power Consumption	1.0 VA @ 24 VAC max
Dimensions	7-1/4"W x 4-1/4"H x 3-1/16"D (184 mm x 108 mm x 78 mm)
Weight	0.5 lb. (0.2 kg)

Laboratory Room Controller – Electronic Actuation

The Laboratory Room Controller-Electronic Actuation consists of the Laboratory Control Module, two auto-zero modules for airflow measurement accuracy and an enclosure. All assemblies are pre-mounted and pre-terminated within the enclosure at the factory. External connections for flow sensors are located on the side of the enclosure. The LRC can be factory mounted to the Laboratory Room Supply Terminal or field mounted within the lab room.

The control algorithm is pre-programmed and controllers are ready to operate after selecting the application and assigning the controller's address using the Portable Operator's Terminal. If desired, the operator may use the Portable Operator's Terminal to adjust the air velocity set points in CFM, differential flow, room temperature set point and other set points.

Laboratory Controller Module- Electronic

The Laboratory Controller Module includes a microprocessor-based assembly with on-board differential pressure transducers for airflow measurement. Wiring termination for input and output points, FLN communications, and power are provided via removable terminal block connections. The room temperature sensor is connected to an on board RJ-11 jack.

The controller connects to the following external devices:

- Fume Hood Controller
- Fume Hood Flow Module
- Lab Electronic Damper Actuator Assemblies
- Electronic Hot Water Valve
- Room Temperature Sensor
- Portable Operators Terminal
- APOGEE Automation System
- Digital Input Devices (e.g., wall switches)
- Digital Output Devices (e.g., alarm horn)
- Laboratory Room Air Terminals boxes

Controller Specifications

Power Requirements

Operating Range	19 to 28 VAC 50 or 60 Hz
Power Consumption:	3.9 VA (Nominal) to 5.3 VA (Peak) @ 24 VAC (plus loads)

Inputs

Analog	
Room Temperature	1 temperature sensor
Supply Airflow	1 air velocity sensor
Exhaust or 2 nd supply Airflow	1 air velocity sensor
Fume Hood Exhaust Flow	1 (0 -10) Vdc flow signal

Digital

Occupied Switch (optional)	1 DI
Alarm Switch (optional)	1 DI

Outputs

Digital	
Auto-zero	1 DO
Pressure Alarm (optional)	1 DO
Room Occupied Status (optional)	1 DO
Supply Airflow Control	1 floating – 2 DOs
General Exhaust or 2 nd Supply Airflow Control	1 floating – 2 DOs
Spare	1 DO

Note: All Digital Output (DO) points are 24 VAC optically isolated solid state switch @ 0.5A.

Analog

Temperature Control	0 - 10V
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Dimensions	13.5"W x 14.5"L x 4"D
Enclosure	(320 mm x 340 mm x 102 mm)
Weight	Approx. 10 lbs (4 kg)

Control Performance

Controlled Temperature	±1.0°F (0.6°C)
Flow Control Speed of Response	Accuracy, Heating or Cooling 1.5 sec.

Environmental Conditions

Storage Temperature	-40°F to 167°F (-40°C to 75°C)
Operating Temperature	32°F to 104°F (0°C to 40°C)
Humidity Range	10 to 95% (non-condensing)

Agency Listings

FCC	Class B, subpart J
UL	916 PA ZX 864-UDTZ

Communications

Remote	FLN Trunk
Local	Portable Operator's Terminal

Laboratory Room Controller Flow Measurement

Laboratory Room Controller airflow measurement consists of the controller module A/D conversion circuitry, on-board differential pressure transducers (2) and auto-zero modules (2). Air velocity sensors (within the air terminal) send the velocity signal to the LRC differential pressure transmitter. Auto-zero modules are connected to the air velocity pressure transducer's inlet ports to enable automatic periodic re-calibration. This re-calibration ensures accurate, drift-free and stable airflow measurement. Automatic re-calibration of the differential pressure transducers occurs upon system power-up and when airflows are stable.

Air Flow Measurement Specifications

Range	0 to 2.0" wc
Accuracy @ low flow (0.008" wc to 0.01" wc)	±3.5%
Accuracy @ high flow (0.01" wc to 2.0" wc)	±2.0%
Maximum distance of the LRC from the air velocity sensor	50ft (12.2m)

Lab Room Controller Communication

Up to 32 LRCs or other Terminal Equipment Controllers can be connected to each of a field panel's 3 FLN trunks for a total of 96 per field panel. Communication with the LRC can be initiated from any APOGEE Automation System field panel on the system network. The APOGEE Automation System network does not require additional hardware to connect Terminal Equipment Controllers. When Terminal Equipment Controllers are wired to a field panel, features such as energy management programs, alarm reporting, centralized control, modification of the system database, system-wide troubleshooting and the global commanding of devices are available to them.

Portable Operator's Terminal

The computer serving as the Portable Operator's Terminal can communicate with LRCs or any field panel. The terminal connects to the controller via a plug-in jack on either the controller, the room temperature sensor associated with the LRC, or a field panel. The terminal can be used to remotely adjust air volume settings or temperature set points, to troubleshoot, and to start up the system. When connected to the RS-232 port of a field panel, the terminal provides system-wide communication. The terminal uses full English language for all functions, eliminating the need to remember coded commands.

Ordering Information

Description	Part Number
Laboratory Room Controller-Pneumatic Actuation	546-00360
Laboratory Room Controller-Electronic Actuation	546-00362
Fume Hood Flow Module	546-00351
Single Duct Supply Terminal	LGSn....n
Dual Duct Supply Terminal	LGDn....n
Exhaust Terminal	LGE n....n
Air Flow Measurement Station	LGF n....n
#3 Pneumatic Actuator	546-00020
Laboratory Electronic Damper Actuator Assembly (floating control)	546-00439
FHET Spec Sheet	149-278P25
VAV FHC Spec Sheet	149-245P25
Laboratory Room Single Duct Supply Air Terminal Spec Sheet	149-319P25
Laboratory Room General Exhaust Air Terminal Spec Sheet	149-320P25
Laboratory Room Dual Duct Supply Air Terminal Spec Sheet	149-338P25
Laboratory Room Air Flow Measurement Station Spec Sheet	149-317P25
Fume Hood Flow Module Spec Sheet	149-339P25

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