

Building HVAC Controls Learning System 594537 (3476-00)

FESTO

LabVolt Series

Datasheet



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General Description

Teach the fundamentals of modern building HVAC controls in a compact system

This system teaches modern HVAC direct digital controls (DDC) of commercial buildings using components from Johnson Controls. Devices from the system communicate over an SA bus or FC bus using the widespread open source BACnet MS/TP protocol.

Building HVAC controls in the digital age

Most commercial buildings incorporate heating, ventilation, and air conditioning systems that are automatically controlled to ensure occupant comfort and health while minimizing energy consumption. Modern installations use a technology called direct digital control (DDC), a microprocessor-based system that can be programmed for various control sequences. These complex HVAC systems require installation and maintenance technicians to have a strong understanding of their general operation.

The Building HVAC Controls Learning System assists instructors in teaching the fundamentals of modern controls using commercially available components from Johnson Controls, a manufacturer recognized worldwide.

Simulated signals, real control

A module that represents a typical air handling unit (AHU) and simplified building ductwork makes it easy to change simulated temperature, pressure, humidity, and carbon dioxide levels, as well as occupancy. Actuators, such as dampers, cooling and heating stages, blower, and humidifier are also represented on the module. Simulated sensors and actuators are connected to a real field controller to demonstrate how a building HVAC control system responds to varying conditions. The field controller algorithm is optimized to reduce delays and save laboratory time.

Web-based monitoring

A human machine interface (HMI) accessible from any web browser through a Wi-Fi or a wired connection displays an on-screen representation of the building AHU and ductwork printed on the hardware module. Other advanced functions, such as scheduling, trending, and alarm management are also available.

Features & Benefits

- Save time with pre-programmed scenarios
- Simulated sensors signals for switching rapidly between scenarios
- Uses industry standard BACnet communication protocol
- Includes components from Johnson Controls, a well-known and trusted brand
- Compact and expandable design

List of Equipment

Qty	Description	Model number
1	Programmable Controller Software _____	588274 (46257-00)
1	Multimeter _____	588288 (46290-00)
1	Power Source _____	594512 (46300-00)
1	Control Transformer _____	594514 (46308-00)
2	Programmable Controller _____	594516 (46356-00)
1	Temperature Network Sensor _____	594517 (46358-00)
1	Building HVAC Layout _____	594518 (46359-00)
1	Supervisory Controller _____	594519 (46360-00)
1	Test Lead Kit _____	594520 (46395-06)

Optional Equipment

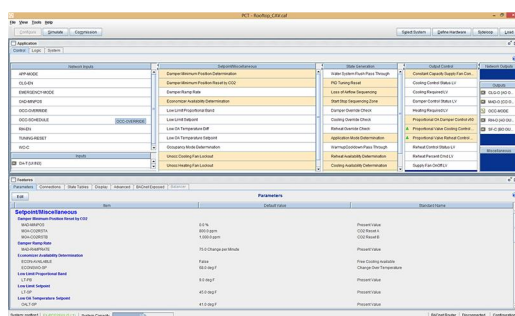
Qty	Description	Model number
1	Campus License _____	793119 (54697-0C)
1	Licencia universitaria _____	793122 (54697-0)

Optional Manual(s)

Qty	Description	Model number
1	Building HVAC (Student Manual) _____	594998 (54615-0C)
1	HVAC de edificios (Student Manual) _____	595001 (54615-0)
1	Building HVAC (Instructor Guide) _____	595002 (54615-1C)
1	HVAC de edificios (Instructor Guide) _____	595005 (54615-1)

Equipment Description

Programmable Controller Software 588274 (46257-00)



The programmable controller software allows the programming and configuration of the programmable controllers. It is an industrial HVAC software that allows students to become familiar with the HVAC industry standards. It is required to configure and download programs to the programmable controllers.

Specifications

Parameter	Value
Computer Requirements	A currently available personal computer running under one of the following operating systems: Windows® 7 or Windows® 8.

Multimeter 588288 (46290-00)



The multimeter is used to perform voltage, current, and resistance measurements. It is used for troubleshooting exercises requiring basic electrical measurements.

Specifications

Parameter	Value
Multimeter	
DC/AC Voltage	0.1 mV to 600 V
DC/AC Current	0.1 μ A to 10 A
Resistance	0.1 Ω to 40 M Ω
Capacitance	1 pF to 200 μ F
Frequency	0.001 Hz to 40 MHz
Temperature	750°C (1382°F)
Duty Cycle	0.1-99.9%
Autoranging Feature	Yes
Display Counts	4000
Basic Accuracy	0.5%
Physical Characteristics	
Dimensions (H x W x D)	147 x 76 x 42 mm (5.8 x 3.0 x 1.7 in)
Net Weight	260 g (0.57 lb)

Power Source 594512 (46300-00)



The power source module connects to a standard wall outlet to provide power to the other modules of the system. The voltage output of the power source depends on the local ac power network voltage. A thermal-magnetic circuit breaker provides over-current and short-circuit protection. If the intensity of the current flowing from the power source ever reaches a value greater than the breaker current rating for a certain length of time, the circuit breaker opens the circuit, thus preventing damage to the power source and other equipment.

Control Transformer 594514 (46308-00)



The control transformer module decreases the line voltage from the power source down to a voltage of 24 V, which is required by several modules of the training system. The connections to the primary winding of the control transformer are made through 4 mm test leads (high voltage), and the connections to the secondary winding are made through 2 mm test leads (low voltage). Fuses protect the primary and secondary winding. This module is also equipped with four fault switches and two ground terminals.

Programmable Controller 594516 (46356-00)



The programmable controller is a typical controller found in DDC systems. It has different types of inputs. These inputs receive signals from external devices such as sensors. The controller treats these signals according to the programmed logic, then sends signals to the appropriate devices connected to the controller outputs. It has six universal inputs, two binary inputs, two analog outputs, three binary outputs, and four configurable outputs. The logic of the controller determines how the inputs and outputs are used. A sensor/ actuator bus (SA bus) and a field

controller bus (FC bus) are also available on the controller.

Temperature Network Sensor 594517 (46358-00)



The temperature sensor module is usually networked with similar sensors to provide temperature information to the building controller(s). It is also used to adjust the temperature set point. The wiring of this sensor is done using special cables with RJ12 connectors. The temperature sensor module is also equipped with four fault switches and two ground terminals.

Building HVAC Layout 594518 (46359-00)



The HVAC layout represents the infrastructure of a building to which the programmable controller(s) connect. It is divided in two regions. The first shows an air-handling unit and the various temperature and pressure sensors. Adjusting the buttons allows you to simulate the output signals sent by the sensors normally available in a building HVAC system. The second region of the HVAC layout represents the infrastructure of the building,

including the zone damper, reheater, zone sensors, and baseboard heater. LEDs and bar meters indicate the status of the different elements. 2 mm leads relay the signals between the HVAC layout and the controller modules.

Supervisory Controller 594519 (46360-00)



The supervisory controller can be used to access the configuration and status of the programmable controller(s) from a remote computer. Any device connected to the supervisory controller can access a SCADA interface via a web browser. The supervisory controller module is powered using the local ac power network voltage, obtained from the power source module. It has M8 connectors to connect it to devices like programmable controllers via an FC bus.

**Test Lead Kit
594520 (46395-06)**



The test lead kit includes various lengths of safety leads to interconnect the HVAC layout to the controllers and temperature sensor. Protective earthing leads are also included to interconnect the PE terminals of each module.

Optional Equipment Description

**Campus License (Optional)
793119 (54697-0C)**

List of Manuals

Description	Manual number
Building HVAC (Student Manual)	594998 (54615-0C)
Building HVAC (Instructor Guide)	595002 (54615-1C)
Building HVAC (Student Manual)	595751 (54615-0C)
Building HVAC (Instructor Guide)	595755 (54615-1C)
(Job Sheets - Student)	595960 (54615-AC)

Table of Contents of the Manual(s)

Building HVAC (Student Manual) (594998 (54615-0C))

- 1 Familiarization with the Building HVAC Controls Training System
- 2 Supervisory Controller
- 3 Constant Air Volume Systems
- 4 Humidity Control of a CAV System
- 5 Pressure-Dependent Variable Air Volume Systems
- 6 Pressure-Independent Variable Air Volume Systems

Building HVAC (Instructor Guide) (595002 (54615-1C))

- 1 Familiarization with the Building HVAC Controls Training System
- 2 Supervisory Controller
- 3 Constant Air Volume Systems
- 4 Humidity Control of a CAV System
- 5 Pressure-Dependent Variable Air Volume Systems
- 6 Pressure-Independent Variable Air Volume Systems

**Licencia universitaria (Optional)
793122 (54697-0J)**

List of Manuals

Description	Manual number
HVAC de edificios (Student Manual) _____	595001 (54615-0))
HVAC de edificios (Instructor Guide) _____	595005 (54615-1))
HVAC de edificios (Student Manual) _____	595754 (54615-0))
HVAC de edificios (Instructor Guide) _____	595758 (54615-1))
(Job Sheets - Student) _____	595963 (54615-A))

Table of Contents of the Manual(s)

HVAC de edificios (Student Manual) (595001 (54615-0))

- 1 Familiarización con el Sistema didáctico en controles HVAC de edificios
- 2 Controlador de supervisión
- 3 Sistemas de volumen constante de aire
- 4 Control de humedad de un sistema HVAC de CAV
- 5 Sistemas de volumen variable de aire dependientes de la presión
- 6 Sistemas de volumen variable de aire independientes de la presión

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