LX Series Variable Air Volume (VAV) LX-VAVCF-11 Controller

Product Bulletin

LX-VAVCF-11

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Refer to the QuickLIT website for the most up-to-date version of this document.

The LX-VAVCF-11 is a microprocessor-based, programmable Variable Air Volume (VAV) controller designed to control any variable air volume box. The controller uses the LonTalk® communication protocol and is LONMARK® certified as a Space Comfort Control (SCC) VAV device. The LX-VAVCF-11 supports various input types including resistance, voltage, and digital-based inputs. In addition, the controller provides digital, floating, pulse width modulation, and proportional control outputs for valves, heating elements, fans, and lighting applications. The device has an onboard airflow sensor with a range of 0 to 2 inches of water column (500 Pascal) and a built-in brushless actuator for precise damper positioning for loads requiring up to 35 inch-pounds (4 Newton-meters) of torque.

The LX-VAVCF-11 controller works with the LN Series Communicating Sensors, which feature a backlit display and graphical menus. These sensors are used for measuring indoor temperatures, adjusting setpoints, and overriding occupancy state.

Figure 1: LX-VAVCF-11 Controller

Table 1: Features and Benefits (Part 1 of 2)

Features	Benefits
Pre-loaded Applications	Save setup time. One technician can locally configure and troubleshoot the VAV controller with an LN Series Communicating Sensor without need for a programming interface.
Integrated VAV Performance Assessment Control Charts (VPACC) Control Sequences	Provide a way to automatically detect when the VAV controller is operating outside of its design parameters, including when the VAV controller is in a state such as Unstable Air Flow, Persistent High/Low Air Flow, Persistent High/Low Space Temperature, or Persistent High/Low Discharge Temperature.
LONMARK Certification	Guarantees interoperability with other suppliers of LONMARK approved controllers.
Accurate Onboard Airflow Sensor	Ensures precise airflow monitoring and control at low and high airflow rates, allowing you to design for maximum energy efficiency while maintaining an optimal comfort level.
Built-in Actuator with a Brushless Motor and Integrated Position Feedback System	Eliminates periodic damper re-initialization and ensures worry-free operation, providing increased occupant comfort and extended service life.
Optimized Air Balancing Process	Saves time during commissioning. The flow sensor requires no zero flow calibration, and its variable-speed motor goes to minimum and maximum flow settings in half the time of typical VAV actuators.
Highly Accurate Universal Inputs	Support thermistors and resistance temperature detectors (RTDs) that range from 0 to 350,000 ohms, giving you the freedom to use your preferred or engineer-specified sensors, in addition to any existing sensors.

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Table 1: Features and Benefits (Part 2 of 2)

Features	Benefits
Rugged Input and Output Hardware	Eliminates the need for external protection components, such as diodes for 12 VDC relays.

Overview

Factory pre-loaded applications allow this controller, straight out of the box, to operate standard VAV equipment with a proven energy-efficient sequence of operations, thereby eliminating the need for programming. For rapid deployment, you can select the preloaded application using an LN Series Communicating Sensor even before the network has been installed. The LX-VAVCF-11 controller is fully programmable, allowing you to create your own control sequences capable of meeting the most demanding control requirements.

LX Graphical Programming Interface (GPI) Wizard

The Johnson Controls® GPI Wizard is a programming tool that allows you to quickly create control sequences by dragging and dropping block objects and then linking the objects with a simple click, select, and release. Select objects from an extensive library of over 100 commonly used functions; you can also create your own custom blocks. With a user-friendly interface and intuitive programming environment, HVAC programming could not be easier. Refer to the *LX Graphical Interface Programming Tool (GPI) Technical Bulletin (LIT-12011489)* for more information.

The GPI Wizard offers these advantages:

- Johnson Controls supplies the wizard as freeware with no associated licensing costs.
- The wizard features live debugging, which allows you to view code execution and input/output values and to detect errors in real time.
- The wizard contains a code library for managing your favorite or most commonly used code and code sections.

Figure 2: Block Objects

Configure Schedules and Holidays

Configure the controller's built-in schedules and holidays directly from the LX GPI Wizard with an easy-to-use point, drag, and click interface. It features a weekly schedule for regular, repeating, events by time of day and day of week, while a holiday schedule is available to define events for specific days. The LX-VAVCF-11 controller allows you to:

- configure schedules using a graphical slider
- copy and paste entries, and duplicate a schedule entry for Monday to Friday
- set exceptions to a schedule, such as holidays, with special events
- set holidays for recurring events such as the ninth day, or the third Thursday of a given month
- create a schedule as an effective period during which the schedule is active
- create a schedule that provides Next State and Time to Next State — ideal for use with programming functions such as Optimum Start and morning Warm Up.

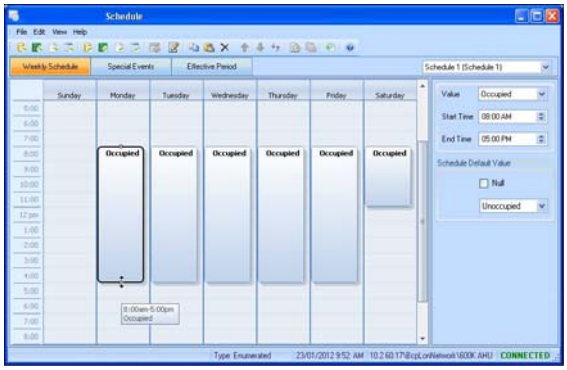

Figure 3: LX GPI Wizard Screen

LN Series Communicating Sensors

This line of communicating sensors features a backlit display and graphical menus.

Because you can use the sensor as a handheld tool, you can start VAV commissioning immediately after installation. Use the sensor to select the appropriate VAV controller application for the VAV box configuration in use, to perform air balancing of the system without requiring an on-site controls engineer, and to troubleshoot the system.

The LN Communicating Sensor capabilities include a leaf icon that indicates the efficiency of your setpoints.

Figure 4: Leaf Icon

The LN Series Communicating Sensors are available in two versions:

- The LN-SVSEN-0 room temperature sensor with backlight display, graphic menus, and leaf icon
- The LN-SVSENH-0 room temperature and humidity sensor with backlight display, graphic menus, and leaf icon

Figure 5: LN Series Communicating Sensor

Dimensions

Figure 6 shows the dimensions for the LX-VAVCF-11 Controller.

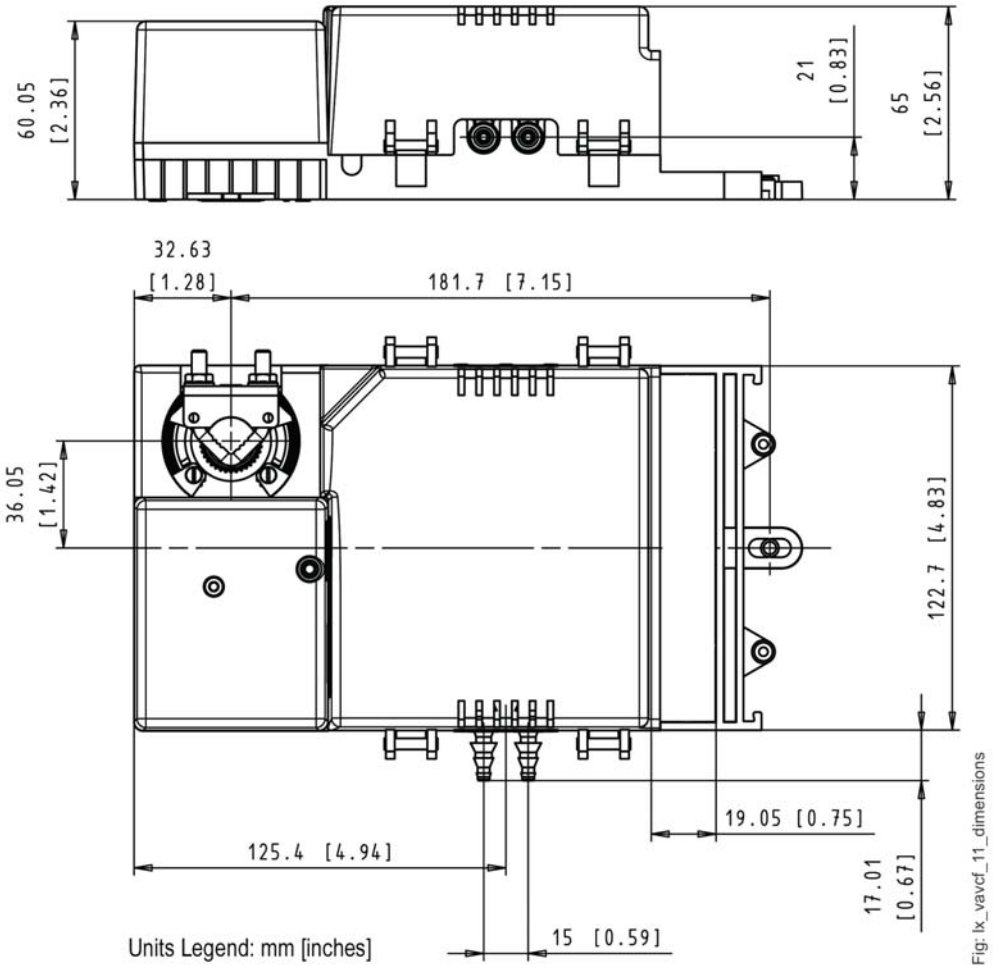

Figure 6: LX-VAVCF-11 Dimensions, mm (in.)

LONMARK Objects and Network Variables

Figure 7 shows the LX-VAVCF-11 LONMARK Objects and Network Variables when you program the controller with LX GPI Wizard.

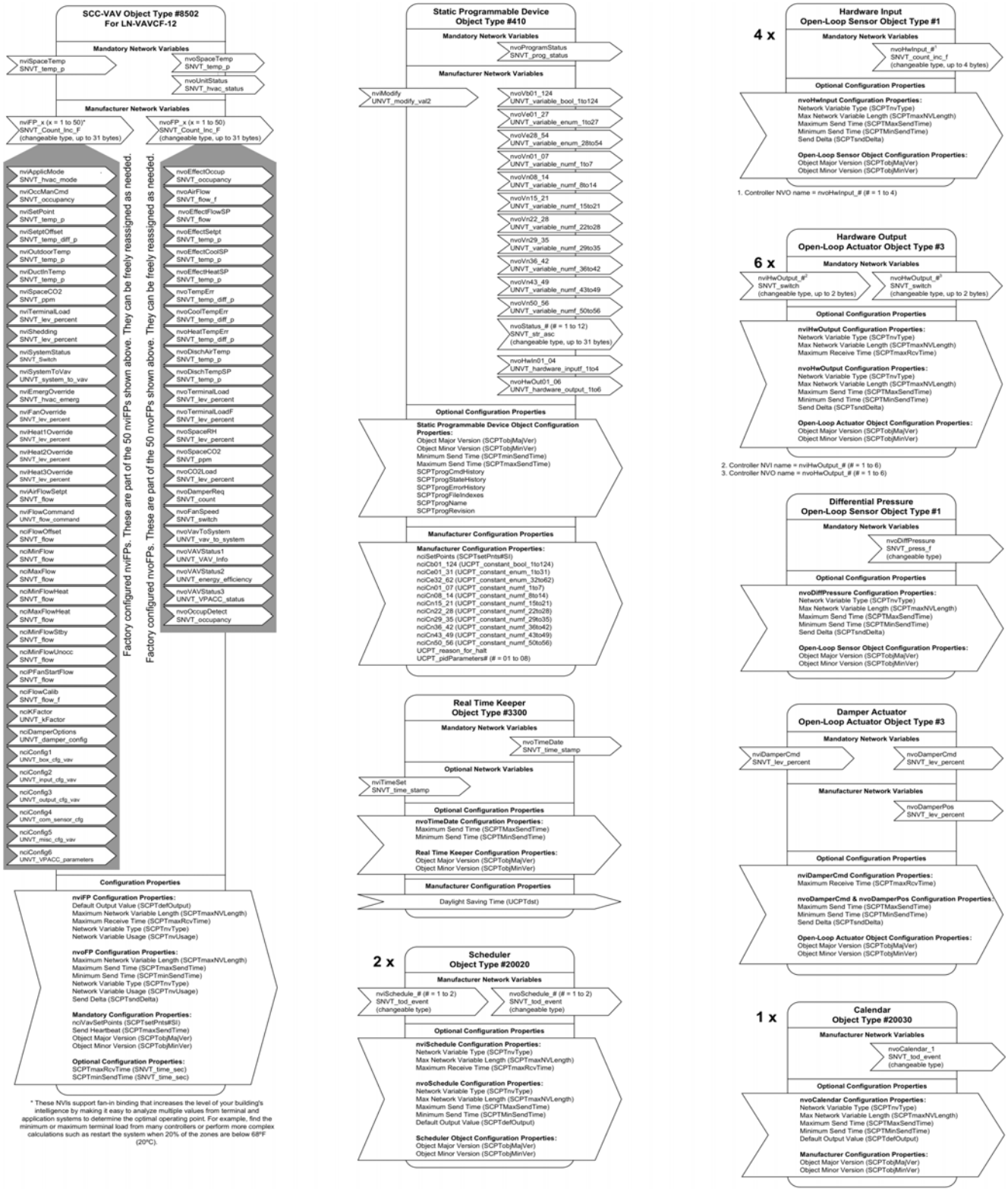

Figure 7: GPI LONMARK Objects and Network Variables – LX-VAVCF-11

Controller Inputs and Outputs

Table 2 shows the number of inputs and outputs on the LX-VAVCF-11.

Table 2: LX-VAVCF-11 Inputs/Outputs

Controller Features	LX-VAVCF-11
Universal Inputs	4
Universal Outputs	2
Digital Outputs	4

Ordering Information

Contact the nearest Johnson Controls® representative to order the LX Series Variable Air Volume (VAV) LX-VAVCF-11 Controller. See Table 3 for ordering codes.

Repair Information

If the LX Series Variable Air Volume (VAV) LX-VAVCF-11 Controller fails to operate within specifications, replace the unit. For a replacement unit, contact the nearest Johnson Controls® representative.

Table 3: LN Series Variable Air Volume (VAV) LN-VAVCF-11 Controller

Product Code Number	Description
LN-VAVCF-11	LONMARK® Certified Programmable Controller with 4 Universal Inputs (UI), 2 Universal Outputs (UO), 4 Digital Outputs (DO), 24 VAC

Technical Specifications

LX-VAVCF-11 (Part 1 of 3)

Product Code	LX-VAVCF-11
Power Requirement	**Voltage:** 24 VAC/DC; ±15%, 50/60 Hz, Class 2 **Protection:** 2 A user-replaceable fuse; 3 A user-replaceable fuse for triac when using the internal power supply **Consumption:** 10 VA typical, all external loads **Maximum Consumption:** 85 VA
Environmental	**Operating Temperature:** 0 to 50ºC (32 to 122ºF) **Storage Temperature:** -20 to 50ºC (-4 to 122ºF) **Relative Humidity:** 0 to 90% noncondensing
Interoperability	**Communication:** LonTalk® protocol **Transceiver:** FT 5000 Free Topology Transceiver **Channel:** TP/FT-10, 78 Kbps **LONMARK® Interoperability:** Version 3.4 **Guidelines:** Device Class: SCC VAV LONMARK Functional Profile (pending) Input objects: Open Loop Sensor #1 Output objects: Open Loop Actuator #3 Node object: Node object #0 Real-Time Clock: Real Time Keeper #3300 Scheduler: Scheduler #20020 Calendar: Calendar #20030 Programmable Device: Static Programmable Device #410 SCC VAV #8502

LX-VAVCF-11 (Part 2 of 3)

Hardware	**Processor:** STM32 (ARM Cortex™ M3) MCU, 32 bit **CPU Speed:** 68 MHz **Memory:** 384 KB nonvolatile flash (applications), 1 MB nonvolatile flash (storage), 64 KB RAM **Status Indicator:** Green LEDs, power status and LAN Tx Orange LEDs, controller status and LAN Rx
Enclosure	**Material:** FR/ABS **Dimensions (with screws):** 4.8 x 8.4 x 2.5 in. (122.7 x 214.3 x 63.0 mm) **Shipping Weight:** 2.30 lbs (1.05 kg)
Inputs	**Quantity of Points:** 4; universal, software configurable **Input Types:** Voltage: 0 to 10 VDC (40 ohm input impedance), 0 to 5 VDC (high input impedance) Digital: Dry Contact Current: 0 to 20 mA with 249 ohms external resistor (wired in parallel) Resistor: 0 to 350 k ohms. All thermistor types that operate in this range are supported. The following temperature sensors are pre-configured: **Thermistor:** 10 ohms Type, 2, 3 (10k ohms at 25°C [77°F]) **Platinum:** Pt1000 (1k ohms at 0°C [32°F]) **Nickel:** RTD Ni1000 (1k ohms at 0°C [32°F]); RTD Ni1000 (1k ohms at 21°C [69.8°F]) **Input Resolution:** 16-bit analog/digital converter **Differential Pressure:** 0 to 500 Pa (0 to 2 in. H_2O) Input Resolution: 0.0167 Pa (0.00007 in. H_2O) Airflow Accuracy: $\pm$4.0% at more than 12.5 Pa (0.05 in. H_2O); $\pm$1.5% once calibrated through airflow balancing at more than 12.5 Pa (0.05 in. H_2O) **Power Supply Output:** 15 VDC; maximum 80 mA (4 inputs x 20 mA each)
Outputs	**Quantity of Points:** 4; 24 VAC Triac, digital (on/off), PWM, or floating[1]; software configurable 0.5 A continuous 1.0 A at 15% duty cycle for a 10-minute period PWM control: adjustable period from 2 seconds to 65 seconds Floating control: requires two consecutive outputs Minimum pulse on/off: 500 milliseconds Adjustable drive time period External or Internal power supply (jumper selectable) **Universal:** quantity: 2; 0 to 10 VDC linear, digital 0 to 12 VDC (on/off), floating[1] or PWM; software configurable. Built-in snubbing diode to protect against back EMF (for example, when used with a 12 VDC relay). PWM control: adjustable period from 2 seconds to 65 seconds Floating control: requires two consecutive outputs[1] Minimum pulse on/off: 500 milliseconds Adjustable drive time period 20 mA max at 12 VDC, Minimum load 600 ohms **Output Resolution:** 10-bit digital/analog converter
Damper Actuator	**Motor:** Belimo® LMZS-H brushless DC motor **Torque:** 35 in·lb, 4 N·m **Degree of Rotation:** 95° adjustable **Fits Shaft Diameter:** 5/16 to 3/4 in. (8.5 to 18.2 mm) **Acoustic Noise Level:** less than 35 dB (A)
Electromagnetic Compatibility	**CE Emission:** EN61000-6-3: 2007; Generic standards for residential, commercial, and light-industrial environments. **CE Immunity:** EN61000-6-1: 2007; Generic standards for residential, commercial, and light-industrial environments. **FCC:** This device complies with FCC rules part 15, subpart B, class B (pending)

LX-VAVCF-11 (Part 3 of 3)

LN Series Communicating Sensors	**Quantity of Points:** 4 **Models Supported:** LN-SVSEN-0, LN-SVSENH-0 **Communication:** RS-485 **Number of Sensors per controller:** up to 4, in daisy-chain configuration **Cable:** Cat 5e, 8 conductor twisted pair **Connector:** RJ-45
Compliance CE	**United States:** UL Listed: 6EA7 Energy management equipment **Material[2]:** UL94-5VA
	Canada: UL Listed: 6EA7 Energy management equipment **Material[2]:** UL94-5VA

1. Floating only available when controller is programmed with LX GPI Wizard.
2. All materials and manufacturing processes comply with the RoHS directive and are marked according to the Waste Electrical and Electronic Equipment (WEEE) directive.

The performance specifications are nominal and conform to acceptable industry standard. For application at conditions beyond these specifications, consult the local Johnson Controls® office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

United States Emissions Compliance

Compliance Statement (Part 15.19)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and

2. This device must accept any interference received, including interference that may cause undesired operation.

Warning (Part 15.21)

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Canadian Emissions Compliance

Industry Canada Statement(s)

The term **IC** *before the certification/registration number only signifies that the Industry Canada technical specifications were met.*

Le terme « IC » précédant le numéro d'accréditation/inscription signifie simplement que le produit est conforme aux spécifications techniques d'Industry Canada.

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