LN Series Variable Air Volume (VAV) and Variable Volume Temperature (VVT) Controllers

Installation Instructions

LN-VAVLF-2, LN-VAVLN-2, LN-VVTLF-2, LN-VAVCF-2

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

Application

The LN Series Variable Air Volume (VAV) and Variable Volume Temperature (VVT) controller line is designed to control various types of Heating, Ventilating, and Air Conditioning (HVAC) equipment, such as baseboards, duct heaters, multi-stage heaters and fans, coolers, valves, and lights.

The controllers are based on LONWORKS® technology for peer-to-peer communication between controllers and are LONMARK® network certified.

North American Emissions Compliance

United States

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.

Canada

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.

Installation

For proper installation and subsequent operation of the LN-VAV/VVT controller, follow these recommendations:

- Upon unpacking your controller, inspect the contents of the carton for shipping damage. Do not install damaged devices.
- Allow for proper clearance of device casing, wiring terminals, and service pin for easy access, hardware configuration, and maintenance. Record the Neuron® ID located on top of the device. You need it for commissioning the device.
- The controllers are designed to operate under the following conditions:
  - Ambient temperature between 32 to 122°F (0 to 50°C)
  - Relative humidity from 0 to 90%, noncondensing
- Ensure proper ventilation of devices and avoid areas where corroding, deteriorating, or explosive vapors, fumes, or gasses may be present.

IMPORTANT: Work in a static-free area. Discharge any static electricity you may have accumulated. Discharge static electricity by touching a known, securely grounded object. Do not handle the controller without proper protection against static discharge. Use a wrist strap when handling the controller. Secure the wrist strap clamp to earth ground.

Dimensions

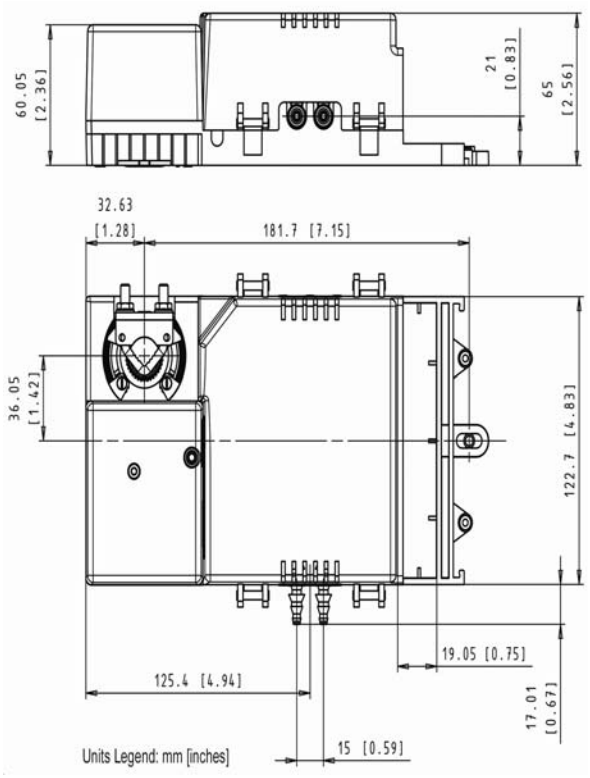

Figure 1: LN-VAVLF, LN-VAVCF, and LN-VVTLF Controller Dimensions, mm (in.)

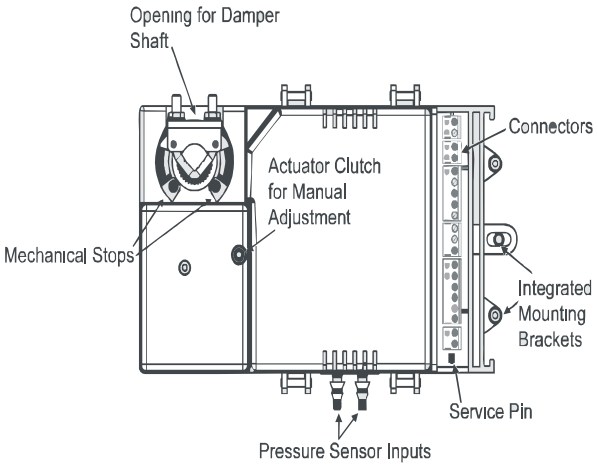

Figure 2: LN-VAVLF, LN-VVTLF, and LN-VAVCF Controller Components

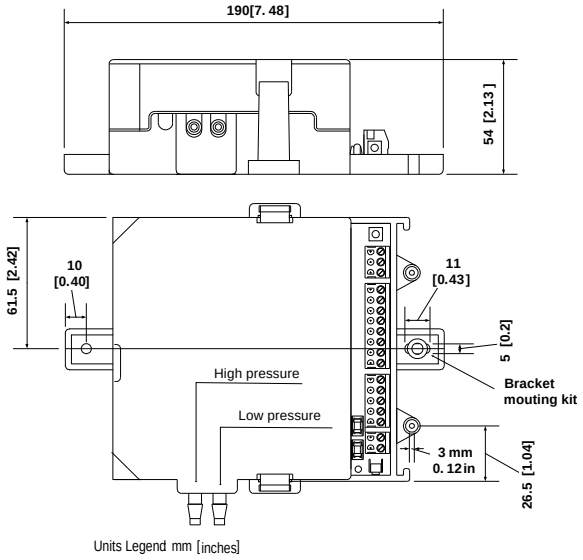

Figure 3: LN-VAVLN Controller Dimensions, mm (in.)

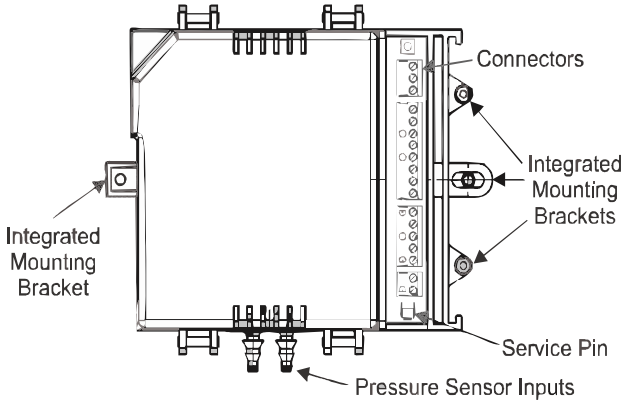

Figure 4: LN-VAVLN Controller Components

Mounting

Location Considerations

Use the provided screws and integrated mounting brackets on the LN-VAVLN-2 controller to mount.

This mounting procedure pertains to the controllers with built-in actuators (LN-VAVLF, LN-VVTLF, and LN-VAVCF). Units with a damper actuator only have one screw.

The controllers are specially designed for mounting onto an air duct or within a panel using the integrated mounting collar and the provided screw. This mounting arrangement opposes the torque applied to the damper shaft.

1. Place the controller into position on the damper shaft so wiring connections are easily assessable.

Note: The controller must be fitted onto the damper shaft so the base of the controller is parallel to the VAV box and perpendicular to the damper shaft). If the damper shaft has an external bushing that prevents the controller from being mounted flush to the side of the VAV box, ensure the controller is at a right-angle to the shaft to prevent binding.

IMPORTANT: Protect the controller from dripping water, condensation, and other moisture. Water or moisture could result in an electrical short, which may damage or affect the operation of the controller.

2. Using a power screwdriver, attach the controller to the VAV box with the provided screw through the controller's mounting bracket. You may also mark the screw position on the VAV box, drill a hole, then attach the controller to the VAV box.

IMPORTANT: Do not overtighten the screws. Overtightening may strip the threads and will void the warranty.

3. Locate the damper position by the marking typically found on the end of the damper shaft (Figure 5).

Figure 5: Damper Shaft Markings

4. Determine the direction required to close the damper Clockwise (CW) or Counterclockwise (CCW). Turn the damper shaft with a pair of pliers to fully close the damper for 90° VAV boxes or fully open the damper for 45° or 60° VAV boxes.
5. Press and hold down the Actuator Clutch for Manual Adjustment button and turn the controller's shaft coupler until it touches the mechanical end-stop to either the fully closed position (90° VAV boxes) or the fully open position (45° or 60° VAV boxes). See Figure 5.
6. Position mechanical stops:
   a. For 90° VAV boxes: if the damper closes CCW, turn the coupler to the CCW mechanical stop limit. If the damper closes CW, turn the coupler to the CW mechanical stop limit. The open mechanical stop is factory preset for 90° VAV boxes.
   b. For 45° or 60° VAV boxes: the mechanical stops must be set for both the fully closed and fully open damper positions. By installing the controller at the fully open position, the controller provides the open mechanical stop for 45° and 60° VAV boxes. The closed damper seal provides the fully closed stop.
7. Tighten the U-Bolt clamp on to the damper shaft using an 8 mm (5/16 in.) wrench or socket. Tighten the bolts tween 11 and 15 N·m (100 and 130 lb·in).
8. Test for free damper shaft movement: Press and hold down the Actuator Clutch for Manual Adjustment button and manually turn the actuator coupling to ensure the actuator can rotate from fully closed to fully opened positions without binding.
9. Connect the VAV box flow sensor tubing to the controller's Pressure Sensor Inputs. Create a condensation trap in the pneumatic tubing by forming it into a vertical loop.
10. Finalize the installation by rotating the damper to the full open position.

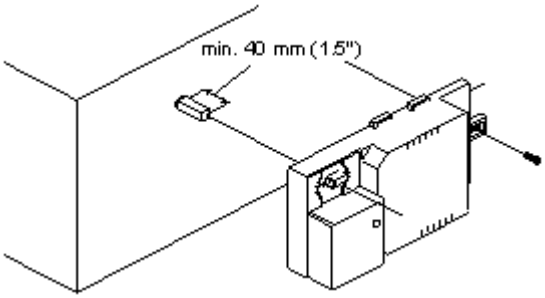

Figure 6: Mounting a VAV or VVT Device on a Damper Shaft

CAUTION: Risk of Property Damage. Rotate the damper to the full-open position before starting the air handler. Failure to rotate the damper to the full-open position may result in damage to the Variable Air Volume (VAV) box or ductwork when the air handler is started.

Wiring

IMPORTANT: Make all wiring connections in accordance with the National Electrical Code and all local regulations. Use copper conductors only. Do not exceed the control's electrical rating.

CAUTION: Risk of Electric Shock. Disconnect power supply before making electrical connections to avoid electric shock.

Recommendations:

- Use the removable terminal connectors to make all wiring connections.
- Disconnect the terminal connectors from the device for wiring.
- Use a small flat screwdriver to tighten the terminal connector screws once you have inserted the wires.
- Keep analog type cables (for power, voltage, current inputs, or triac outputs) apart from other types of wiring to avoid any ambient noise transmission among wires; however, unswitched power wiring can be in the same conduit as the LONWORKS communication cable.
- The board connectors accept wires or flat cables ranging from 22 to 12 AWG (0.645 - 2.052 mm diameter) per pole; however, power cables must remain between 18 and 14 AWG (1.024 - 1.628 mm diameter).
- The transformer powering the controller must be configured as a floating transformer. Do not ground the transformer.
- Keep all wires away from high-speed data transmission cables (for example, Ethernet).

IMPORTANT: Do not connect the analog/digital inputs or common terminals to ground (only if otherwise stated).

Power Wiring

Device power requirements: 24 VAC +/- 15%, Class 2

Note: To conform to Class 2 requirements in the United States, use transformers of 100 VA at 24 VDC or less to power the controller.

For power and ground wiring, use the heaviest gauge wire based on a maximum of 14 AWG and a minimum of 18 AWG.

If only one 24 VAC transformer is available, determine the maximum number of VAVs that can be supplied on a single power cable supplied by a 100 VA transformer, according to the cable's wire gauge and the total cable length from Table 1. Avoid installation conditions that fall outside the parameters of Table 1.

Table 1: Maximum Number of VAV Devices on a Power Run

AWG	Power Run Total Cable Length	Maximum Number of Devices at 7 VA per device[1]	Maximum Number of Devices at 10 VA per device[2]	Maximum Number of Devices at 15 VA per device[3]
14[4]	75 m (250 feet)	4	2	1
14	60 m (200 feet)	5	3	2
14	45 m (150 feet)	5	4	3
14	30 m (100 feet)	5	5	4
16	60 m (200 feet)	3	2	1
16	45 m (150 feet)	5	3	2
16	30 m (100 feet)	5	4	3
18	45 m (150 feet)	3	2	1
18	30 m (100 feet)	5	3	2

1. Typical VAV with 1 sensor and actuator active. No external loads.
2. Typical VAV with 1 sensor, 2 triac loads (1.6 VA each), 1 analog output (20 mA), and actuator active.
3. Typical VAV with 1 sensor, 4 triac loads (1.6 VA each), 2 analog outputs (20 mA each), and actuator active.
4. Device terminals are not capable of accepting two 14 AWG wires (when daisy-chaining devices). Use a wire nut with a pig tail to make such a connection.

Use an external fuse on the 24 VAC side (secondary side) of the transformer to protect all devices against power line spikes (Figure 7).

Maintain consistent polarity when connecting controllers and devices to the transformer. Connect the COM of each controller and each peripheral to the same terminal on the secondary side of the transformer.

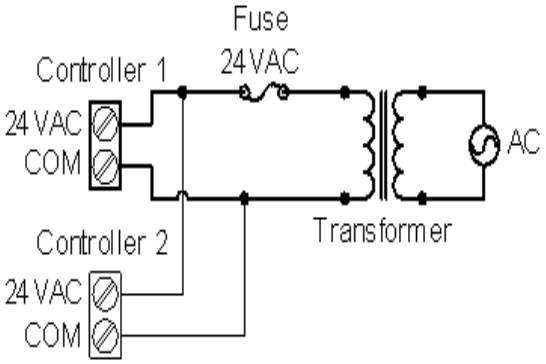

Figure 7: Power Wiring

IMPORTANT: Maintain proper polarity and voltage or current ratings. Improper polarity or exceeding the voltage or current ratings will void the warranty.

Input Wiring

The LN-VAVLF, LN-VAVCF, and LN-VVTLF controllers have physical connections for four inputs that are software configurable from within the device's LNS® plug-in. Each input can be configured for digital, resistive, current, or voltage signals. You must configure the input types properly in the software plug-in or wizard to ensure proper input readings.

Wiring Digital Inputs

Use this input configuration to monitor digital dry contacts, as well as pulsed contacts (LN-VAVCF-2 only).

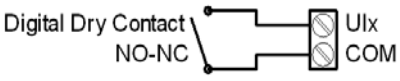

Figure 8: Digital Dry Contact (NO and NC)

Resistive 10k ohm Inputs

Use this input configuration to monitor 100k ohm and 1000k ohms RTDs, 10k ohm Type 2 and Type 3 thermistors, and potentiometers (10k or 100k ohms on LN-VAVCF-2 only).

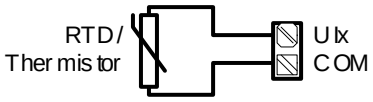

Figure 9: RTD/Thermistor Input

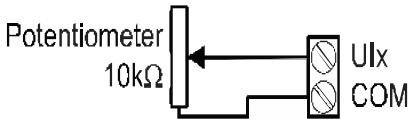

Figure 10: 10k ohm Potentiometer Input

Note: When you use a 100k ohm input, keep the wire length short to avoid a possible temperature offset; for example, 18AWG wire, 25 feet (7.6 m) in length creates an offset of 2°F (1.1°C).

Wiring Current Inputs

Current inputs can have a range of 4 to 20 mA. Connect the current input if the transducer is externally powered. Use a transducer with 2-wire, 4-20 mA. See Figure 11.

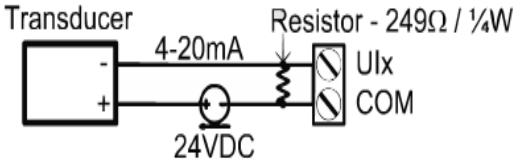

Figure 11: Current Input - 2 Wire Transducer

Connect the current input if the transducer is powered with 3-wire, 4-20 mA. See Figure 12.

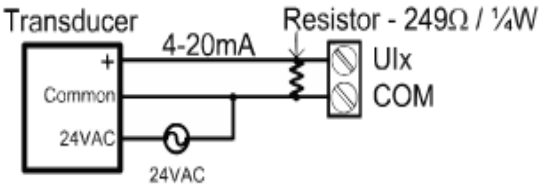

Figure 12: Current Input with Internal Power Source

Connect the current input according to Figure 13 if the transducer is powered by its own power source.

Figure 13: Current Input - Transducer with Its Own Power Source

Wiring Voltage Inputs

Voltage inputs have a range of 0 to 10 VDC. Connect the voltage input according to Figure 14 if you are using a 3-wire, 0-10 V transducer.

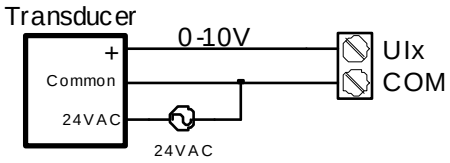

Figure 14: Voltage Input - 3-wire Transducer

Connect the voltage input according to Figure 15 if the transducer is powered by its own power source.

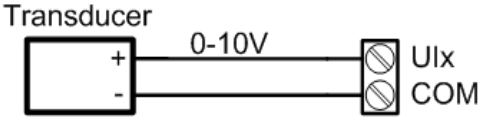

Figure 15: Voltage Input - Transducer with its own Power Source

Output Wiring

The LN VAV/VVT controllers have physical connections for either digital outputs and universal outputs, depending on the type and model. The power source type for digital outputs is hardware configurable and must be configured by changing the jumper settings on the printed circuit board. The universal outputs are software configurable.

Note: For a wire length less than 75 ft (23 m), use either a shielded or unshielded 18 AWG wire.

Note: For a wire length up to 200 ft (61 m) long, we recommend using a shielded 18 AWG wire.

Note: The wire should be shielded on the controller side and keep the shield length as short as possible.

Wiring Digital Outputs (DOx)

You can configure the digital outputs as either powered outputs or non-powered outputs. When wiring digital outputs:

- the non-powered output type does not have any voltage on the output terminals when the output is active. Power must be supplied externally.
- the powered output type has 24 VAC on the output terminals when the output is active. Power is therefore supplied internally by the controller.

Note: The LN VAV/VVT controllers are shipped with all digital outputs configured as powered outputs. Maximum output current for all digital outputs (powered or non-powered) is 1 A.

DO1 and DO2 share the same C1-2 common terminal and are controlled by a single jumper; therefore, they must be set identically. Similarly, DO3 and D04 share the same C3-4 common terminal and are controlled by a single jumper and must be set identically. The jumpers specify whether an internal or external power source is being used.

If a 24 VAC relay is being controlled, connect the digital output according to Figure 16 (external power supply) and Figure 17 (internal power supply).

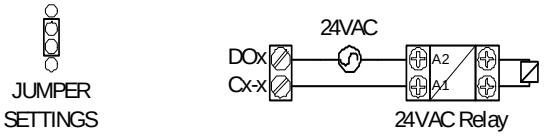

Figure 16: Digital Output with External Power Supply

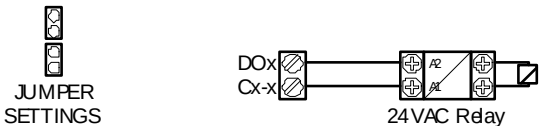

Figure 17: Digital Output with External Power Supply

If a floating actuator is being controlled, connect the digital output according to Figure 18 and Figure 19.

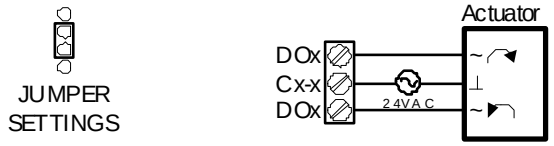

Figure 18: Digital Output with External Power Supply - Floating Actuator

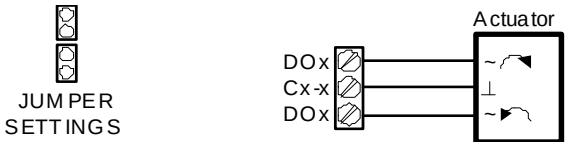

Figure 19: Digital Output with Internal Power Supply - Floating Actuator

Wiring Universal Outputs (UOx)

The universal outputs can be configured to provide either a linear signal ranging from 0 to 10 VDC or a discrete signal of 0 to 12 VDC.

The discrete signal can be use to generate a Pulse Wave Modulation (PWM) signal or a simple two-state signal. These outputs are protected by an auto-reset fuse.

Wiring Discrete Outputs

If a 12 VDC relay is being controlled, connect it to a universal output (Figure 21). When a relay with universal output, a diode be connected in parallel to protect the controller from back-emf current, which occurs when the relay is turned off. It is recommended to use diodes that are part of the 1N4004x family and place them close to the relay.

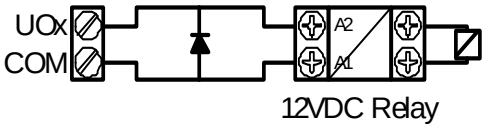

Figure 21: Discrete 0 or 12 VDC Universal Output - Relay

Wiring Voltage Outputs

Connect the 0 to 10 VDC output according to Figure 22.

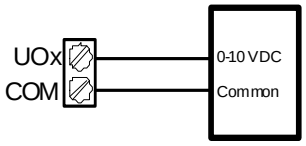

Figure 22: Voltage 0 to 10 VDC Universal Output - Analog Actuator

If an analog actuator is being controlled, connect the 0 to 10 VDC output, along with an external 24 VAC power source, to the analog actuator (Figure 23).

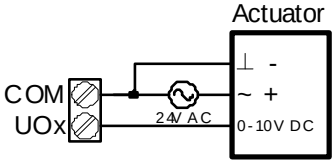

Figure 23: Voltage 0 to 10 VDC Universal Output - Analog Actuator

Communications Wiring

Approved cable types for LONWORKS communications are 22 AWG (0.65 mm), twisted pair, unshielded. The LONWORKS communication wire is polarity insensitive, and can be laid out in a bus, star, loop, or free topology. For loop topology, polarity is important; take special care when connecting the LON network to avoid short circuit.

Note: We recommend the Bus topology network configuration because it allows for easy network troubleshooting for LONWORKS communication wiring.

Connect both wires to the LON1 and LON2 terminals of the controller. If you are inserting multiple wires in the terminals, make sure to properly twist wires together prior to inserting them in the terminal connectors (Figure 24).

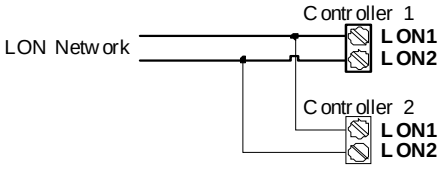

Figure 24: Communications WIring

For additional information and detailed explanations on network topology and wire length restrictions, refer to the Echelon® *Junction Box and Wiring Guideline for Twisted Pair LONWORKS Networks (Part No. 005-0023-01).*

Note: Use proper network terminators depending on the type of network topology used. Failure to do so may result in communication errors between controllers. Do not use multiple gauges of cable on the same communication bus, as this may also result in communication errors.

Selecting Network Terminators

For bus topology, two network terminators are required (one at each end of the bus topology channel). For a free topology, one network terminator is required. You can put it anywhere on the channel.

LN-VSTAT Sensor for VAV Wiring

The LN-VAVLF-2 and LN-VVTLF-2 controllers are compatible with the LN-Sensor line of standard room sensors. The LN-VAVCF-2 controller does not support the LN-VSTAT sensor. Refer to the *LN-VSTAT Installation Instructions (LIT-12011302)*.

Networking Guide

To commission a device and add it to a LONWORKS network, you need to use the device plug-in as well as the.xif and.apb files. To obtain the files:

Note: These commissioning steps only apply when you are using an LNS network management tool, such as LN-Builder 3.

1. Visit the Johnson Controls® intranet site (www.my.johnsoncontrols.com) and download the latest version of the plug-in installation setup. You can also contact your Johnson Controls representative to obtain the file.
2. Run the installation setup to install the device plug-in and latest version of the .xif and .apb files. The .xif and .apb files install in the C:\LONWORKS\Import\JCI folder.
3. Register the plug-in in the network database. This step creates a new device template that you use to commission your device.
4. Add and commission the device with LN-Builder 3 using the proper device template and .apb file.

IMPORTANT: Downloading an improper .apb file into the device may damage the Neuron® chip in your controller. The controller may become unusable.

Neuron ID and Service Pin

To commission a device and add it to a LONWORKS network, you need the Neuron ID of the device. To obtain the Neuron ID:

- manual entry: the Neuron ID address and bar code ar local on a sticker on the device.
- service pin: pressing the service pin on the device broadcasts the Neuron ID on the LONWORKS network.

Memory Erase Jumper

The LN VAV/VVT controllers feature an E-Blank jumper which can be used to erase the Neuron chip. If you load an incorrect .apb file into the controller, the Neuron chip's memory becomes corrupt. Use the E-blank jumper to correct the problem by returning the chip to an application-less state. The E-Blank jumper is labelled J22 on the PCB board.

To erase the Neuron chip's memory using the E-Blank jumper:

1. Disconnect the power to the controller.
2. Place a jumper on the pins labelled J22 on the board (Figure 25).
3. Reconnect power to the controller.The amber colored service Light-Emitting Diode (LED) blinks rapidly indicating that it is erasing the Neuron chip's memory. When the light becomes solid (and stops blinking), the erase procedure is complete.
4. Disconnect the power to the controller and remove the jumper.

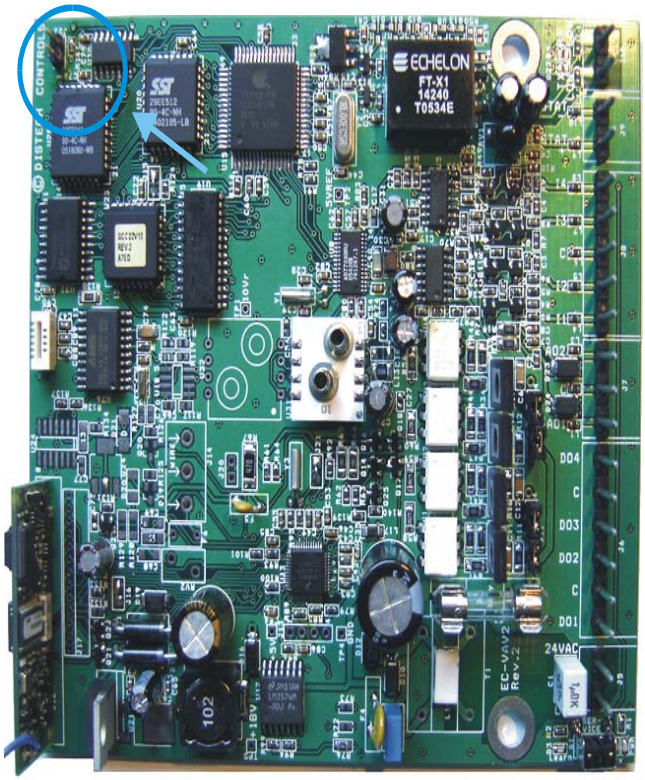

Figure 25: E-Blank Jumper (J22) Location

5. Reconnect the power. The service LED blinks twice and becomes solid indicating the controller is application-less.
6. Load the proper .apb file into the controller.

Note: If the device already exists in the LNS database, you must use the Load or Commission option in LN-Builder 3 to download the .apb file. Do not use the Replace option.

Wireless Installation

The LN VAV/VVT controllers can receive input signals from wireless devices when connected to a wireless receiver and programmed with LN GPI software.

For information on selecting mounting locations for the LN Series wireless controllers, refer to the *LN Series Wireless Solution Guide Technical Bulletin (LIT-120116828)*.

Mounting the Wireless Receiver

You have three mounting options: on a wall or ceiling with double-sided tape, on a wall or ceiling with mounting screws, or on a metal enclosure using a 1/2 inch National Pipe Thread (NPT) hub.

Regardless of the mounting method, the wireless receiver should be 16 inches (41 cm) or more away from the controller or any other network cables.

Wall or Ceiling Mount with Double-Sided Tape

To mount on a wall using double-sided tape, first apply the tape to the back of the receiver and then stick the receiver onto the desired wall or ceiling location.

Wall or Ceiling Mount with Screws

To mount the wireless receiver with screws:

1. Separate the front and back plates on the receiver to open it.
2. Use the mounting holes on the back plate to mark the wall or ceiling location.
3. Drill the holes.
4. Clean the holes, insert wall anchors, and fasten the back plate with the screws.

Metal Enclosure Mount

To mount onto a metal enclosure:

1. Affix the 1/2 inch NPT hub to the bottom of the Wireless Receiver. Ensure the cap of the NPT hub is undone.
2. Place the Wireless Receiver onto the metal enclosure and align the NPT hub to the hole.
3. Use the cap to tighten the Wireless Receiver onto the enclosure.

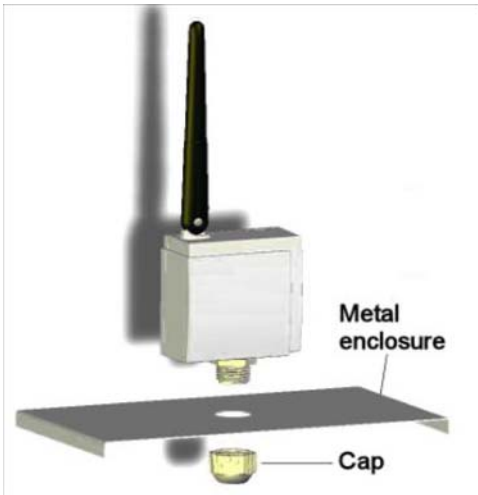

Figure 26: Metal Enclosure Mount

Connecting the Wireless Receiver

Connect the wireless receiver to the controller with the included telephone cable (4P4C modular connectors). Locate the telephone socket inside the device (Figure 27).

Figure 27: Telephone Socket Location

Connecting to the Controller Wireless Port

The wireless-option controllers have a wireless port where you connect the telephone cable. Locate the wireless port on the bottom of the controller.

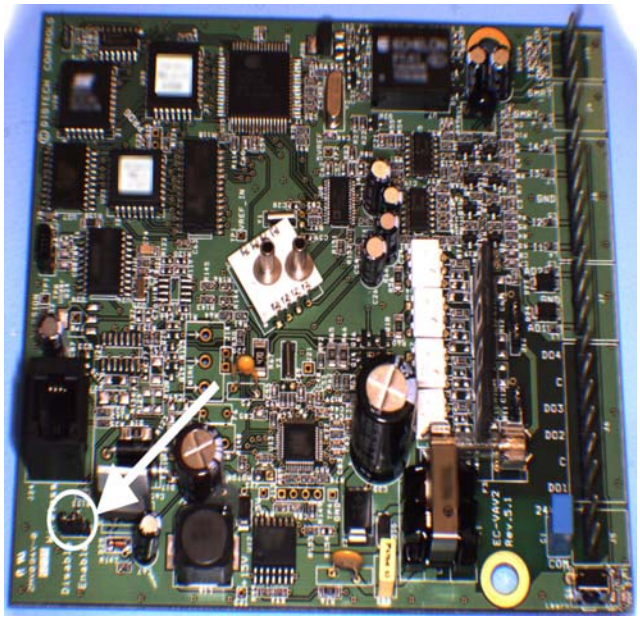

Figure 28: Enable Wireless Jumper (J16) Location

To enable the wireless jumper, remove the jumper J16 between the left and middle **Disable** pins and connect it between the middle and right **Enable** pins.

Disconnecting the Wireless Port

To disconnect the plugged-in telephone cable from the controller's wireless port, pass a pointed object through the hole above the wireless port and press on the top of the connector while gently pulling out the cable.

Typical Variable Air Volume Application Wiring Diagram

Figure 29 shows the typical power and network connections with a floating actuator output and sensor. Figure 30 shows the typical power and network connections with a two-stage digital output.

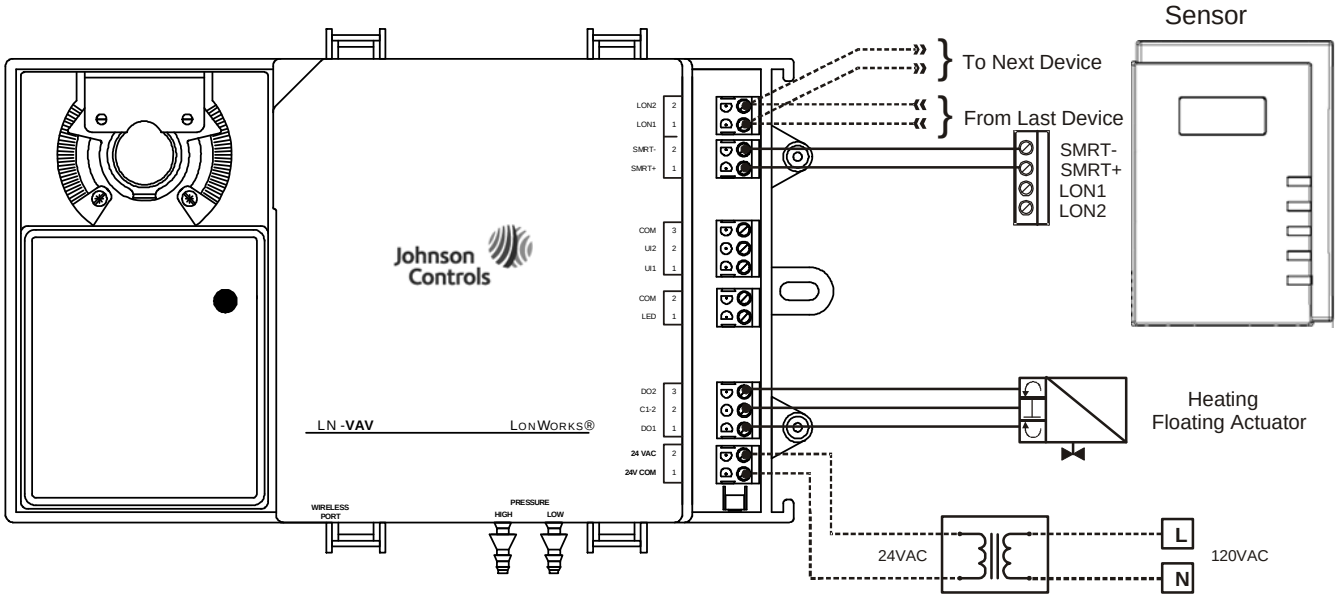

Figure 29: LN-VAVxx Typical Wiring Diagram and Network Connections - Sensor Input and Floating Actuator Output

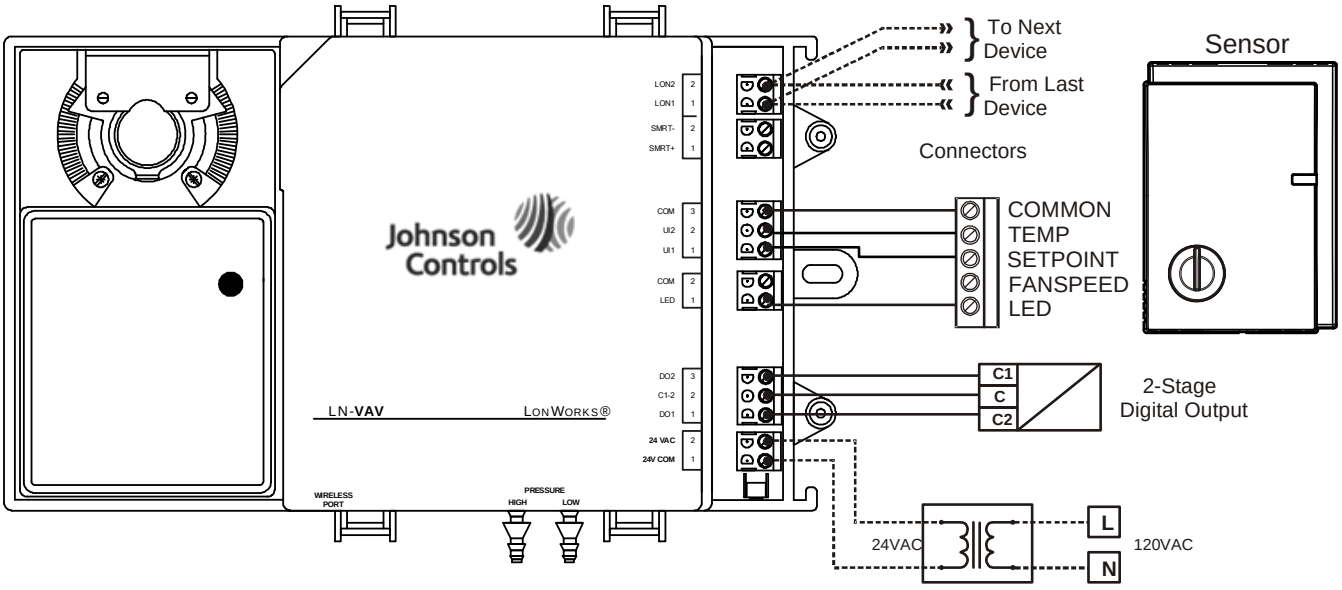

Figure 30: LN-VAVxx Typical Wiring Diagram and Network Connections - Sensor Input and Two-Stage Digital Output

Troubleshooting

Table 2: Troubleshooting (Part 1 of 2)

Problem	Possible Cause	Solution
Device is powered but does not turn on.	Fuse is blown.	Check the fuse integrity; also ensure the green power LED next to the service pin is on.
	Power supply polarity	Verify consistent polarity is maintained between all controllers and the transformer.
Device cannot communicate on an FTT network.	Absent or incorrect supply voltage	Check power supply voltage between 24 VAC and COM pins to ensure it is within acceptable limits. Check for a tripped fuse or circuit breaker.
	Overloaded power transformer	Verify the transformer used is powerful enough to supply all controlled devices.
	Network not wired property	Double-check the wire connections are correct.
	Absent or incorrect network terminators	Check the network terminators.
Device communicates well over a short network but does not communicate on a large network.	Network length	Check that the total wire length does not exceed the specifications of the *FTT User's Guide*.
	Wire type	Check that the wire type agrees with the specification of the FTT User's Guide. Verify your wire is UNSHIELDED.
	Network wiring problem	Verify the wire connections are correct.
	Absent or incorrect network terminators	Check the network terminators. Incorrect or broken terminators make the communication integrity dependent upon a device's location on the network.
	Extra capacitance	Verify that no extra capacitances are connected to the network other than the standard FTT circuit, and a maximum of 3 meter stub (in bus topology).
	Number of devices on network segment exceeded	The number of devices on a channel should never exceed 64. Use a router or a repeater in accordance to the FTT User's Guide.
	Network traffic	Query node statistics to check for errors. Use a LON protocol analyzer to check network traffic.
Hardware input is not reading the correct value.	Input wiring problem	Check that the wiring is correct according to this manual and according to the peripheral device's manufacturer.
	Open circuit or short circuit	Using a voltmeter, check the voltage on the input terminal. Short circuit (0 V) and open circuit (10 V).
	Configuration problem	Using a device configuration plug-in or wizard, check the configuration of the input. Refer to the device's user guide for additional information.
Hardware output is not operating correctly.	Output wiring problem	Check that the wiring is correct according to this manual and according to the peripheral device's manufacturer.
	Configuration problem	Using the device configuration plug-in, check the configuration of the output. refer to the device user's guide for more information.
	0-10 V output, 24 VAC powered actuator is not moving	Check the polarity of the 24 VAC power supply connected to the actuator while connect to the device. Reverse the 24 VAC wire if necessary. Check the jumper setting for the external power supply as shown in Figure 18.
Flow sensor is not giving proper readings.	Tubing connection problem	Verify the tubing is installed properly and that the tubing is not bent. Ensure the high and low pressure sensors are not inverted.
	Device is not calibrated properly	Recalibrate the VAV controller. Refer to the controller user guide for more information about VAV controller calibration.

Table 2: Troubleshooting (Part 2 of 2)

Problem	Possible Cause	Solution
Wireless Device is not working correctly.	Device not associated to controller	Using the device configuration plug-in or wizard, check the configuration of the input.
	Power discharge	1. Recharge the device with light (if solar-powered) or replace the battery (if battery-powered). 2. Ensure sufficient light intensity (200lx for 4 hours/day).
	Device too far from the Wireless Receiver	Reposition the device to be within the range of the Wireless Receiver. Refer to the *LN Series Wireless Solution Guide Technical Bulletin (LIT-120116828)*.
	Configuration Problem	Using the device configuration plug-in or wizard, check the configuration of the input. Refer to the *LN Series Wireless Solution Guide Technical Bulletin (LIT-120116828).*
Damper is not opening or closing properly	Mechanical stops not in proper position	The two mechanical stops must be positioned to stop the damper motion when it is completely closed and completely opened. The mechanical stops can be moved by increments of 5°.
	Rotation time not set up correctly for external damper	Ensure the external damper drive time is set to the correct value (in the plug-in or wizard).
	VAV still in Calibration mode	Complete the calibration process in LN-Builder 3.
	Controller in Override	Set the Override OFF in the object manage screen in LN-Builder 3.

Service LED

Table 3: Service LED (Amber Color)

Service LED	Operation Status
OFF (does not apply to LN-VAVCF-2)	The device is in normal operation.
Repeated Blink (LN-VAVCF-2 only)	The device is in normal operation. The LED blinks according to the device code execution time.
On	The device is application-less. Reload the application file (.apb).
Slow Blink (1 second On, 1 second Off)	The device is unconfigured. Commission the device.
Fast Blink (0.3 second On, 1 second Off)	Watchdog time out. Application corrupted. Use the E-Blank jumper to wipe the Neuron chip's memory. Then load the proper .apb into the device using a LN-Builder 3.

Technical Specifications

Table 4: LN-VAVLF, LN-VAVLN, and LN-VVTLF (Part 1 of 2)

Product Codes	LN-VAVLF-2, LN-VAVLN-2, and LN-VVTLF-2
Power Requirement	Voltage: 24 VAC/DC; +/- 15%, 50/60 Hz, Class 2 Protection: 3 A user-replaceable fuse for triac when using the internal power supply Consumption: 18 VA Maximum Consumption: 70 VA if internal power supply is used
Ambient Storage Conditions	Ambient Operating Temperature: 0 to 50°C, (32 to 122°F) Ambient Storage Temperature: -20 to 50°C, (-4 to 122°F) Ambient Relative Humidity: 0 to 90% noncondensing
General	LONMARK Functional Profile: Space Comfort Controller (SCC) VAV #8502 Processor: Neuron® 3150™, 8 bits, 10 MHz Memory: Nonvolatile Flash 64k (APB application) Media Channel: TP/FT-10; 78 Kbps Communication: LonTalk® protocol LONMARK Interoperability Guidelines: Version 3.4
Enclosure	Material: FR/ABS Resin Dimensions (with screws): LN-VAVLN-2: 4.8 x 5.9 x 2.5 in. (122.7 x 149.1 x 63 mm) LN-VAV-LF-2/LN-VVT-LF-2: 4.8 x 8.4 x 2.5 in. (122.7 x 214.3 x 63 mm) Shipping Weight: LN-VAVLN-2: 0.92 lb (0.42 kg) LN-VAV-LF-2/LN-VVT-LF-2: 2.30 lb (1.05 kg)
Inputs	Universal software configurable Input Types: Digital: Dry Contact Analog Voltage: 0 to 10 VDC Analog current: 4 to 20 mA with 249 ohms external resistor (wired in parallel) Pulse: Dry contact; 500 milliseconds minimum ON/OFF Resistor Support: Thermistor: 10k ohms Type 2, Type 3 (10k ohms at 25°C [77°F]) Range: -40° to 153°C (-40° to 302°F) Platinum: PT1000 (1k ohms at 0°C [32°F]) Range: -40 to 150°C (-40 to 302°F) PT100 (100 ohms at 0°C [32°F]) Range: -40 to 135°C (-40 to 275°F) Potentiometer: Translation table configurable on several points Input Resolution: 16-bit analog/digital converter Differential: Range 0 to 250 Pa (0 to 1 in. H_20) Resolution 0.000162 milli-inches H_20, Accuracy ±0.3% full scale

Table 4: LN-VAVLF, LN-VAVLN, and LN-VVTLF (Part 2 of 2) (Continued)

Outputs	Digital: 24 VAC Triac, digital (on/off), Pulse Width Modulation (PWM), or floating 0.5 A continuous PWM control: adjustable period from 2 seconds to 15 minutes Floating control: requires two consecutive outputs Minimum pulse on/off: 500 milliseconds Adjustable drive time period External or internal power supply (jumper selectable) Digital LED Occupancy: 0 to 10 VDC dedicated output for occupancy sensor LED, Maximum 20 mA Universal: 0 to 10 VDC, digital 0 to 12 VDC (on/off), floating for PWM PWM control: adjustable period from 2 seconds to 15 minutes Floating control: requires two consecutive outputs Minimum pulse on/off: 500 milliseconds Adjustable drive time period 20 mA maximum at 12 VDC Minimum load resistance 600 ohms Output Resolution: 10-bit digital/analog converter
Damper Actuator	Torque: 35 in·lb, 4 N·m Angle of Rotation: 95º adjustable Fits Shaft Diameter: 5/16 to 3/4 in. (8.5 to 18.2 mm) Power Supply: from controller
Agency	UL Listed: UL916 Energy management equipment Material: UL94-5VA[1]
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.
Wireless[2]	Communication: EnOcean® Wireless standard Number of Wireless Inputs[3]: 14 (some sensors may require more than one wireless input) Supported Wireless Receivers: Wireless Receiver 315 (LN-WMOD315-0) and Wireless Receiver 868 (LN-WMOD868-0) Cable: Connector: 4P4C modular jack, Length: 3 ft (0.91 m)

1. All materials and manufacturing processes comply with the RoHS directive and are marked according to the Waste Electrical and Electronic Equipment (WEEE) directive.
2. Available when an optional external Wireless Receiver is connected to the controller. Some wireless inputs may use more than one wireless input from the controller.
3. Some wireless sensors may use more than one wireless input from the controller.

Table 5: LN-VAVCF (Part 1 of 2)

Product Code	LN-VAVCF-2
Power Requirements	Voltage: 24 VAC/DC; ±15%, 50/60 Hz, Class 2 Protection: 3 A user-replaceable fuse for triac when using the internal power supply Consumption: 18 VA; triac outputs (2 valves at 4 VA) and 2 outputs with 20 mA load at 12 VDC Maximum Consumption: 70 VA if internal power supply is used
Ambient Storage Conditions	Ambient Operating Temperature: 0 to 50°C (32 to 122°F) Ambient Storage Temperature: -20 to 50°C (-4 to 122°F) Ambient Storage Conditions: 0 to 90% noncondensing
General	Processor: Neuron® 3150™, 8 bits, 10 MHz Memory: Non-volatile Flash 128k (storage) Non-volatile Flash 64k (APB application) Media Channel: TP/FT-10, 78 Kbps Communication: LonTalk® protocol LONMark Interoperability: Version 3.4 Device Class: Multi Input/Output (I/O) Module LONMARK Functional Profile: Input Objects: Open-Loop Sensor #1, Output Objects: Open-Loop Sensor #3
Enclosure (Housing)	Material: FR/ABS Resin Dimensions (with screws): 4.8 x 8.4 x 2.5 in. (12.7 x 214.3 x 63.0 mm) Shipping Weight: 2.30 lb (1.05 kg)
Inputs	Universal, software configurable Input Types: Voltage: 0 to 10 VDC Digital: Dry Contact, Analog current: 4-20 mA with 249 ohms external resistor Resistor Support: Thermistor: 10 ohms Type, 2, 3 (1k ohms at 25°C [302°F]) Range: -40 to 150°C (-40 to 302°F) Platinum: Pt1000 (1k ohms at 0°C [32°F]) Range: -40 to 150°C (-40 to 302°F) Pt100 (1k ohms at 0°C [32°F]) Range: -40 to 150°C (-40 to 302°F) Nickel: RTD Ni1000 (1k ohms at 0°C [32°F]) Range: -40 to 150°C (-40 to 302°F) Potentiometer: translation table configurable on several points Differential Pressure: Range 0 to 250 Pa (0 to 1 in. H_20) Resolution: 0.000162 milli-in. H_20 Accuracy: ±3% full scale Input Resolution: 16-bit analog/digital converter

Table 5: LN-VAVCF (Part 2 of 2)

Outputs	Digital: 24 VAC Triac, digital (on/off), PWM, or floating[1], software configurable 0.5 A continuous PWM control: adjustable period from 2 seconds to 15 minutes Floating control: requires two consecutive outputs[1] Minimum pulse on/off: 500 milliseconds Adjustable drive time period External or Internal power supply (jumper selectable) Digital LED occupancy output: 0-10 VDC dedicated output for occupancy sensor LED Maximum 20 mA Universal: 0-10 VDC linear, digital 0-12 VDC (on/off), floating or PWM PWM control: adjustable period from 2 seconds to 15 minutes 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-bits digital/analog converter
Damper Actuator	Torque: 35 in·lb, 4 N·m Degree of Rotation: 95º adjustable Fits Shaft Diameter: 5/16 to 3/4 in. (8.5 to 18.2 mm)
Wireless Receiver	Communication: EnOcean wireless standard[2], Wireless Inputs: 14[3] Wireless Receivers: Wireless Receiver 315, Wireless Receiver 868 Cable: telephone cord, connector: 4P4C modular jack, length: 6.5 ft (2m)
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
Compliance	UL Listed (US and CDN): UL916 Energy Management Equipment, Material: UL94-5VA

1. Floating only available when controller is programmed with LN GPI software.
2. Available when an optional external Wireless Receiver is connected to the controller. Refer to the LN Wireless Location Guide for a list of supported EnOcean wireless modules.
3. Some wireless sensors may use more than one input from the controller.

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.

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