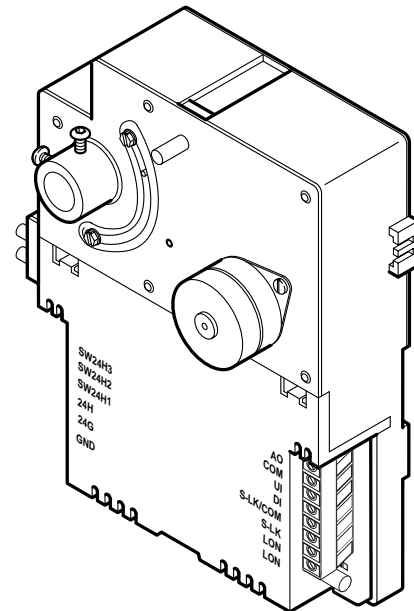


Application

Solidyne's sLON-V1 and sLON-V2 VAV Controllers are interoperable LONMARK®-compliant variable air volume controllers. These controllers provide pressure independent control for cooling and reheat applications. They feature a built-in actuator with over-the-shaft damper mounting, an integral velocity pressure transducer, LED indication, support for an sLON-WTSx digital sensor, push-button manual override, mechanical position indication, and an easy-to-set mechanical travel limit. They function in standalone mode or as part of a LonWorks network using the integral FTT-10 Free Topology communications transceiver. A direct connection to a sLON-ADPx Communication adapter and a PC with WPT Software Tool software is necessary to download and modify applications.



sLON-V2

Model Chart

Model		sLON-V1 ^a	sLON-V2 ^a
Inputs/ Outputs	Digital Inputs	1	1
	Digital Outputs	0	3
	Universal Inputs	1	1
	Analog Outputs	0	1
Control Strategies	Box Configuration	Cooling	<ul style="list-style-type: none"> Cooling Series Fan Induction Parallel Fan None
	Reheat Type	None	<ul style="list-style-type: none"> Staged Electric Time Proportioned Floating/Proportional Hydronic Reheat None
	Other	None	<ul style="list-style-type: none"> Occupancy Satellite

^aVX denotes LONMARK VAV (Variable Air Volume) profile and profile version number.

Installation

Inspection

Inspect carton for damage. If damaged, notify carrier immediately. Inspect controllers for damage. Return damaged products.

Requirements

(These items not provided)

- Installer must be a qualified technician
- Job wiring diagrams
- Tools:
 - AM-340, T-25 Torx® short arm key (L-shaped wrench), or AM-341, T-25 Torx bit with 1/4 in. hex shank (for use with socket wrenches)
 - 1/4 inch hex driver for travel adjustment screws
 - Pliers for turning damper shafts
 - Digital Volt-ohm meter (DVM)
 - Drill and bits for mounting screw
 - Static protection wrist strap
 - Torque wrench (capable of measuring at least 32 in-lb (0.37 Kg-meters))
- AM-135, 3/8 in. (9.5mm) to 1/2 in. (12.8mm) shaft adapter (optional)
- Class 2 power transformer supplying a nominal 24 Vac (20.4 to 30 Vac) with a minimum rating of 12 VA, 50/60 Hz per controller plus Digital Output (DO) loads. Each DO can be up to 24 VA. In European Community, transformer must conform to EN 60742
- Terminators:
 - One sLON-T1 terminator required for free topologies
 - Two sLON-T2 terminators required for bus topologies
- One #10 sheet metal screw
- 0.170 in. (17/100) I.D. FRPE polyethylene tubing or 0.125 in. (1/8) I.D. or 0.25 in. (1/4) O.D. tygon tubing for piping connections. Not more than five feet (1.52m) long.

Precautions



General

Warning: Electrical shock hazard! Disconnect power before installing or removing the cover.

- Follow Static precautions when installing this equipment.
- Use copper conductors that are suitable for 167°F (75°C).
- Make all connections according to electrical wiring diagram, national and local electrical codes.

Static Precautions

Static charges damage electronic components. The microprocessor and associated circuitry are extremely sensitive to static discharge. Use the following precautions when installing, servicing, or operating the system.

- Work in a static-free area.
- Discharge static electricity by touching a known, securely grounded object.
- Use a wrist strap connected to earth ground when handling the controller's printed circuit board.

Federal Communications Commission (FCC)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This equipment generates, uses, and can radiate radio frequency energy and may cause harmful interference if not installed and used in accordance with the instructions. Even when instructions are followed, there is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception—which can be determined by turning the equipment off and on—the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/television technician for help.

Canadian Department of Communications (DOC)

This class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

European Community Directives

This equipment meets all requirements of European Community Directives for Low Voltage (72/23/EEC), General Safety (92/59/EEC), and Electromagnetic Compatibility (89/336/EEC).

Location

These controllers are for indoor use only.

Caution:

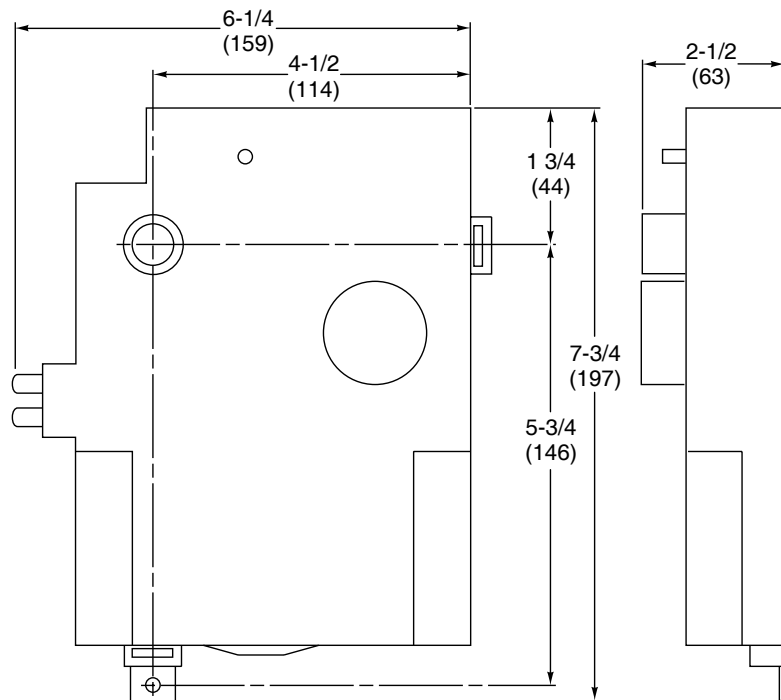
- Avoid locations where excessive moisture, corrosive fumes, vibration, or explosive vapors are present.
 - Avoid electrical noise interference. Do not install near large contactors, electrical machinery, or welding equipment.
 - Locate where ambient temperatures do not exceed 131°F (55°C) or fall below 32°F (0°C) and relative humidity does not exceed 85% or fall below 5%, non-condensing.
-

Mounting location must clear the maximum dimensions of the controller case and allow the controller to be mounted flush to the surface of the terminal box and perpendicular to the damper shaft.

Mounting

Mount controllers directly over the damper shaft in any direction and on any plane that is perpendicular to the damper shaft. Mounting dimensions are shown in Figure-1.

Some terminal boxes have sheet metal screw heads or other protrusions near the damper shaft. In these cases, a spacer or shim may be added under the mounting tab of the actuator to make the actuator perpendicular to the shaft.



Dimensions shown
are in inches (mm).

Figure-1 Mounting Dimensions.

Damper Shaft Requirements

Controllers are ready to mount on 1/2 in. (12.8 mm) diameter damper shafts that extend at least 2 in. (51mm) from the side of the terminal box.

To mount controller on 3/8 in. (9.5mm) diameter damper shafts, use AM-135 shaft adapter.

To mount controller on shorter damper shafts, between 3/4 in. (19.1mm) and 2 in. (51mm), do the following:

1. Remove set screws from actuator collar (Figure-2).

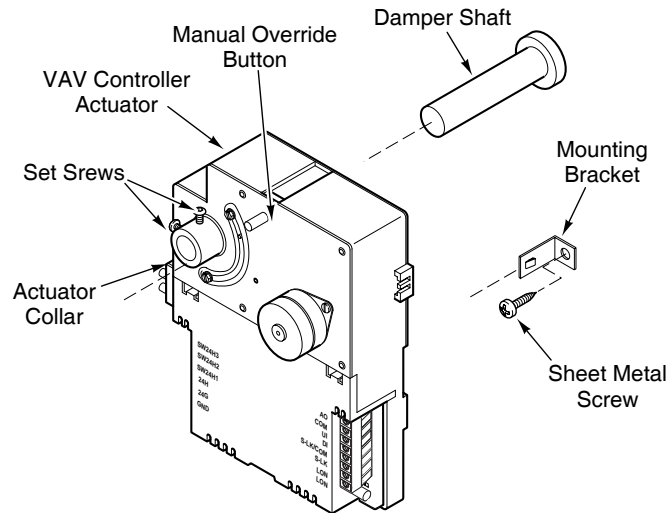


Figure-2 sLON VAV Controller Mounting.

2. Press manual override button and turn actuator collar to full counterclockwise position until short shaft set screw holes are accessible (Figure-3).

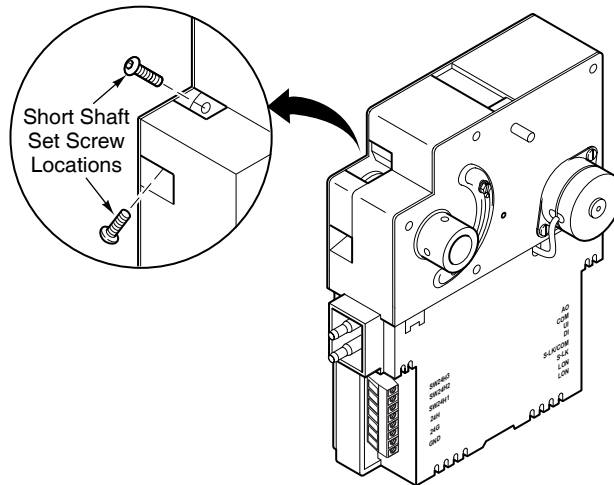


Figure-3 Short Shaft Set Screw Location.

3. Install set screws in short shaft set screw holes.

Mounting Controller with Damper Closed in Clockwise (CW) Position

1. Turn damper shaft to full closed (CW) position.
2. Press and hold manual override button and turn actuator collar to full CW position.
3. Release manual override button. If necessary, rotate actuator collar slightly to return button to fully extended position.
4. Loosen output shaft set screws and slide controller over damper shaft until mounting foot contacts mounting area on VAV terminal.

Note: Mounting foot can be moved from the factory shipped location to the side location.

5. Rotate controller CCW about three degrees off centerline of VAV terminal and tighten output shaft set screws to 25 in-lb (0.28 Kg-meters). See Figure-4.

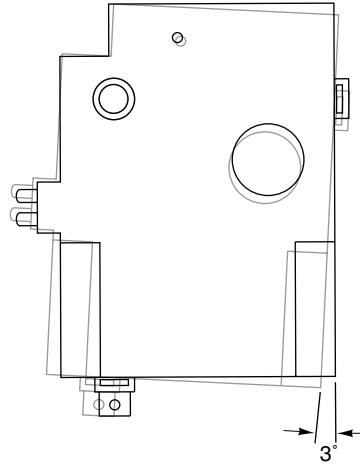


Figure-4 CW Mounting.

6. Rotate controller CCW to centerline of VAV terminal (damper should be sealed).
7. Using controller mounting foot as a template, mark and drill a pilot hole in VAV terminal.
8. Make certain mounting hole position does not affect performance of terminal box. If damper movement is affected, install mounting foot in side location.
9. Secure controller mounting foot using a #10 sheet metal screw.
10. Press and hold manual override button and rotate damper to full open position by turning damper shaft.
11. Release manual override button. If necessary, rotate actuator collar slightly to return button to fully extended position.
12. Loosen and slide CCW travel adjustment screw to travel indicator pin, and tighten screw to 28 to 32 in-lb (0.32 to 0.37 Kg-meter) (Figure-5).

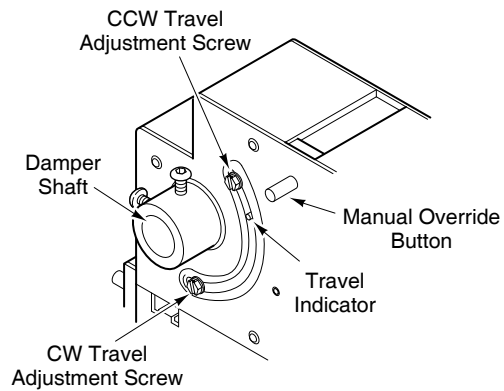


Figure-5 Travel Adjustment.

13. Verify damper moves freely between full open and full closed positions. There must be no binding between the actuator and damper, or obstructions hindering damper operation.

Mounting Controller with Damper Closed in Counter-Clockwise (CCW) Position

Note: The default setting for actuator rotation is CW Closes [0]. To reverse rotation, change to CW Opens [100].

1. If direction of actuator rotation needs to be changed, then do (a.) through (e.) below. If not go to Step 2.
 - a. Using WPT Software Tool, Open the project.
 - b. Select controller from network definition page.
 - c. Change "VAV Box Direction" property from CW Closes [0] to CW Opens [100].
 - d. Save and download changes.
 - e. Close WPT Software Tool.
2. Turn damper shaft to full closed (CCW) position.
3. Press and hold manual override button and turn actuator collar to full CCW position.
4. Release manual override button. If necessary, rotate actuator collar slightly to return button to fully extended position.
5. Loosen output shaft setscrew and slide controller over damper shaft until mounting foot contacts mounting area on VAV terminal.

Note: Mounting foot can be moved from the factory shipped location to side location.

6. Rotate controller Clockwise (CW) about three degrees off centerline of VAV terminal and tighten output shaft set screws to 25 in-lb (0.28 Kg-meter). See Figure-6.

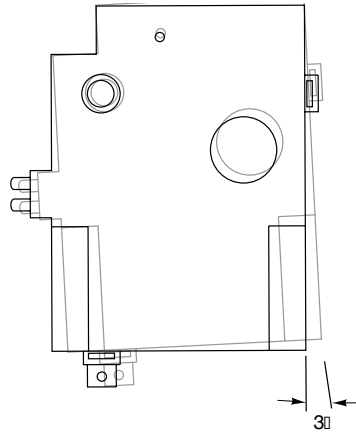


Figure-6 CCW Mounting.

7. Rotate controller CCW to centerline of VAV terminal (damper should be sealed).
8. Using controller mounting foot as a template, mark and drill a pilot hole in VAV terminal.
9. Make certain the mounting hole position does not affect performance of terminal box. If damper movement is affected, install mounting foot in side location.
10. Secure controller mounting foot using a #10 sheet metal screw.
11. Press and hold manual override button and rotate damper to full open position by turning damper shaft.
12. Release manual override button. If necessary, rotate actuator collar slightly to return button to fully extended position.
13. Loosen and slide CW travel adjustment screw to travel indicator pin, and tighten screw to 28 to 32 in-lb (0.32 to 0.37 Kg-meter) (Figure-5).
14. Verify damper moves freely between full open and full closed positions. There must be no binding between the actuator and damper, or obstructions hindering damper operation.

Differential (Velocity) Pressure Sensor Connections

Use either 0.170 in.(17/100) I.D. FRPE polyethylene tubing or 0.125 in.(1/8) I.D. or 0.25 in. (1/4) O.D. tygon tubing for piping connections. Maximum length of tubing is five feet (1.52 m).

1. Remove yellow plastic fitting caps from barbed fittings.
2. Connect tubing to barbed fittings on VAV Controller. See Figure-7.

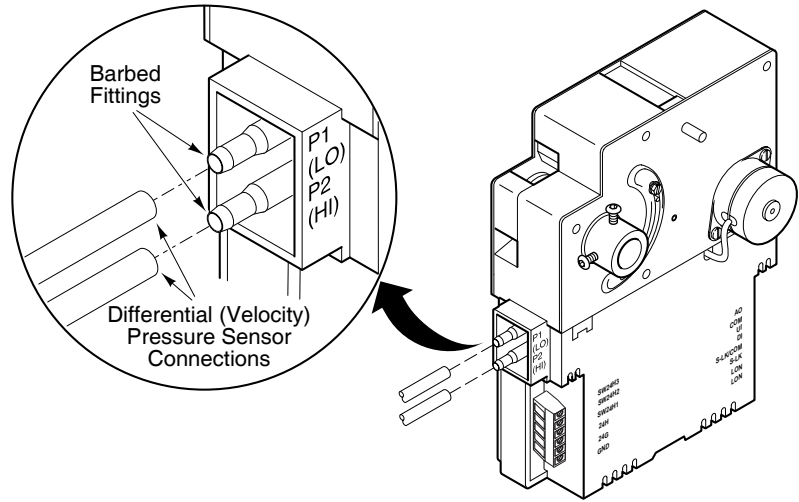


Figure-7 Differential (Velocity) Pressure Connections.

3. Connect tube from P1 fitting on controller to low pressure tap on VAV terminal. See Figure-8.
4. Connect tube from P2 fitting on controller to high pressure tap on VAV terminal. See Figure-8.

Differential (Velocity) Pressure Gauge

Use a differential (velocity) pressure gauge to calibrate and verify central system is delivering accurate pressure. Figure-8 shows connections for attaching gauge. When gauge is removed, restrictors must be plugged or removed from tubing.

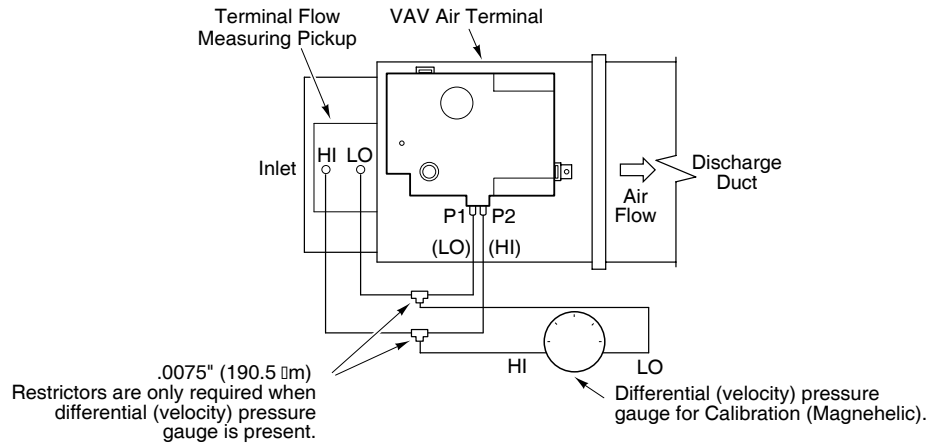


Figure-8 Typical VAV Terminal Piping Connections.

Wiring

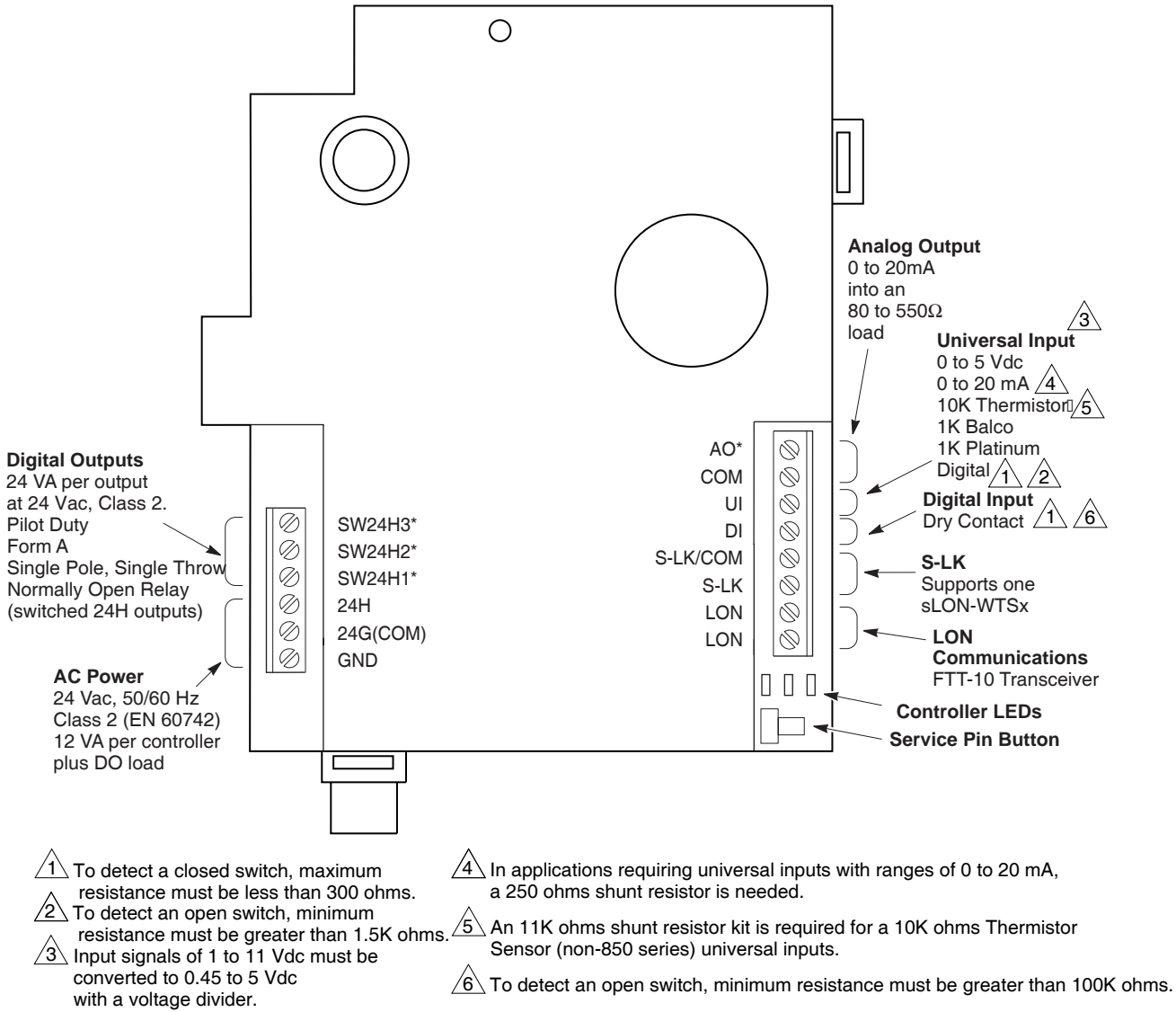


Figure-9 sLON-V1 and sLON-V2 Series Terminal Connections.

The following electrical connections can be made to sLON VAV controllers:

- Sensor Link (S-LK) connection to an sLON-WTS Sensor (sLON-WTSx)
- LONWORKS network (LON) connection
- LON connection from controller to an sLON-WTS Sensor
- I/O connections including:
 - One Universal Input (UI)
 - One Digital Input (DI)
 - One Analog Output (AO) (sLON-V2 model only)
 - Three Digital Outputs (DO) (sLON-V2 model only)
- Power connection to a 24 Vac nominal Class 2 (EN 60742) power source and earth ground.

Communications Wiring

Caution:

- Communication wire pairs must be dedicated to S-LK and LONWORKS network (LON) communications. They cannot be part of an active, bundled telephone trunk.
 - Shielded cable is not required for S-LK or LON wiring.
 - If the cable is installed in areas of high RF/EMI, the cable must be in conduit.
 - If shielded wire is used, the shield must be connected to earth ground at one end only by a 470K ohm 1/4 watt resistor. Shield must be continuous from one end of the trunk to the other.
-

Communications wiring includes a connection between the controller and an sLON-WTS Sensor via the S-LK and a connection between the controller and the LONWORKS Network (LON). An optional LON connection between the controller and one sLON-WTS Sensor is also possible. Figure-9 shows S-LK and LON wiring terminations.

Sensor Link (S-LK) Wiring

S-LK wiring powers and enables the sLON-WTSx sensor. The S-LK needs at least 24 gage (0.51mm), twisted pair, voice grade telephone wire. The capacitance between conductors cannot be more than 32 pF per foot (0.3m). If shielded cable is used, the capacitance between any one conductor and the others, connected to the shield, cannot be more than 60 pF per foot (0.3m). Maximum wire length is 200 ft. (61m).

Note:

- Controller supports one sLON-WTS Sensor (sLON-WTSx).
- S-LK wiring is polarity insensitive.
- If conduit is used between an sLON-WTS Sensor and a controller, the LONWORKS network and S-LK wiring can be in the same conduit. S-LK wiring (*not* LON wiring) can be in the same conduit with UI, AO, and DI Wiring.

LONWORKS Network (LON) Wiring

An approved two-pair cable may be used for both S-LK and optional LON connection between the controller and sLON-WTSx sensor. LON wiring is polarity insensitive.

Caution: Do not mix with UI, AO, DO, DI, or power types of wiring. If conduit is used between an sLON-WTS Sensor and a controller, LON wiring and S-LK wiring can be in the same conduit.

sLON VAV controllers use a LONWORKS Free Topology Transceiver (FTT-10) and support polarity insensitive bus (daisy-chain) and free (all combinations of star, tee, and loop) wiring topologies. A maximum of 62 nodes can be connected per segment.

I/O Wiring

I/O connections include universal input, digital input, analog output, and digital (relay) outputs. See Figure-9 for wire terminal information.

Caution: If shielded cable is used, connect one end only of the shield to earth ground at controller.

Universal Input (UI), Digital Inputs (DI), and Analog Output (AO)

Caution:

- Input and output devices cannot share common wiring. Each connected device requires a separate signal and return conductor.
 - Power wiring cannot share conduit with UI, AO, S-LK, LON, or DI wiring.
-

Note:

- If maximum closed switch voltage is not more than 1.0 V *and* minimum open switch voltage is at least 4.5 V, then solid state switches may be used for a UI or a DI.
 - UI, AO, DI, and S-LK wiring can share a single conduit.
-

UI, AO, DI, wiring needs at least 24 gage (0.51mm), twisted pair, voice grade telephone wire. The capacitance between conductors cannot be more than 32 pF per foot (0.3m). If shielded cable is used, the capacitance between any one conductor and the others, connected to the shield, cannot be more than 60 pF per foot (0.3m). Table-1 provides wiring specifications.

Table-1 UI, AO, and DI Wiring Specifications.

Connection	Gage AWG (mm)	Maximum Distance ft. (m)
UI, AO, and DI	18 (1.02)	300 (91)
	20 (.81)	200 (61)
	22 (.65)	125 (38)
	24 (.51)	75 (23)

Digital Outputs (DO) (sLON-V2 only)

Caution:

- DO terminals accept one 16 gage (1.29mm) wire or two 18 gage (1.02mm) wires. The selected wire gage must be consistent with the load current rating.
 - DO wiring cannot be intermixed with DI, UI, AO, S-LK, or LON wiring.
 - sLON VAV controllers are Class 2 (EN 60742) only devices.
-

Note:

- Digital Output wiring can be intermixed with power wiring.
 - The minimum permissible load for Digital Outputs is 10mA at 5 Vdc.
-

Three relay outputs on controller are used for pilot duty control of electrical contactors and floating or two-position reheat actuators. See Figure-10. Digital output load specifications for controller are shown in Table-2.

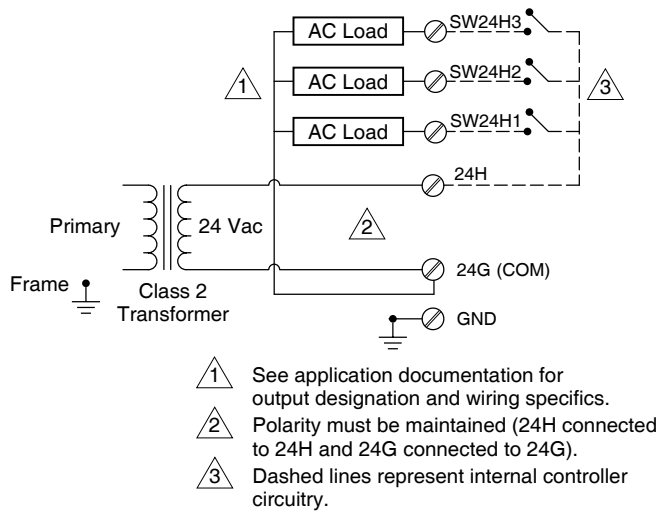


Figure-10 Relay Output Field Wiring.

Table-2 Relay Output Load Specifications.

Specification	Value
Maximum Relay Contact Switched Output Voltage	24H terminal voltage ^a
Maximum Output Load @ 24 Vac, Pilot Duty	24 VA
Minimum Controllable Load	10.0 mA
Maximum Off-state Leakage Current	3.5 mA
Minimum Relay Cycles at Rated Load (Power Factor = 0.4)	300,000 cycles

^aSwitched output voltage is equivalent to value of input voltage.

Power Supply Wiring

Caution:

- This product contains a non-isolated half-wave rectifier power supply and must not be powered by transformers used to power other devices containing non-isolated full-wave rectifier power supplies.
- Power wiring cannot be intermixed with LON, S-LK, UI, AO, or DI wiring.
- Use a Class 2 (EN 60742) power transformer supplying a nominal 24 Vac (20.4 to 30 Vac) with a minimum rating of 12 VA at 50/60 Hz plus digital output loads (84 VA, 12 VA plus DO loads at 24 VA each). The supply to the transformer must be provided with a breaker or disconnect.
- The Class 2 (EN 60742) power transformer may be used to power multiple Class 2 powered devices provided that the transformer is properly sized to power all equipment simultaneously and all devices contain the same type of rectifier power supplies or internal isolation.
- The transformer frame must be grounded.
- When powering multiple Class 2 devices from the same Class 2 (EN 60742) power transformer, polarity must be observed (24H connected to 24H and 24G connected to 24G).

Note:

- Power wiring terminals accept one 16 gage (1.29mm) or two 18 gage (1.02mm) wires.
- Power wiring can be intermixed with DO wiring.
- Twisted or untwisted cable can be used for power wiring.

Figure-11 and Figure-12 are acceptable wiring configurations.

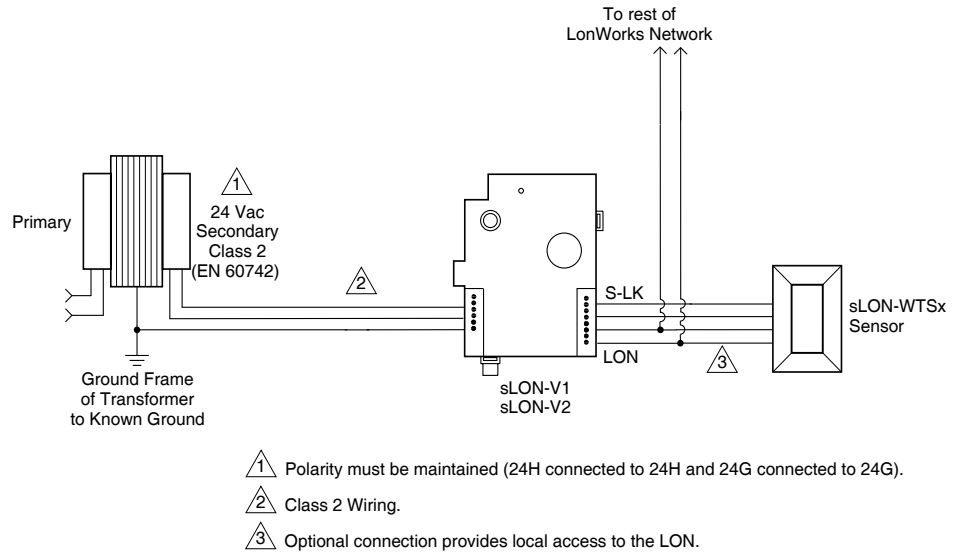


Figure-11 Single Controller Powered from a Separate Class 2 (EN 60742) Power Source.

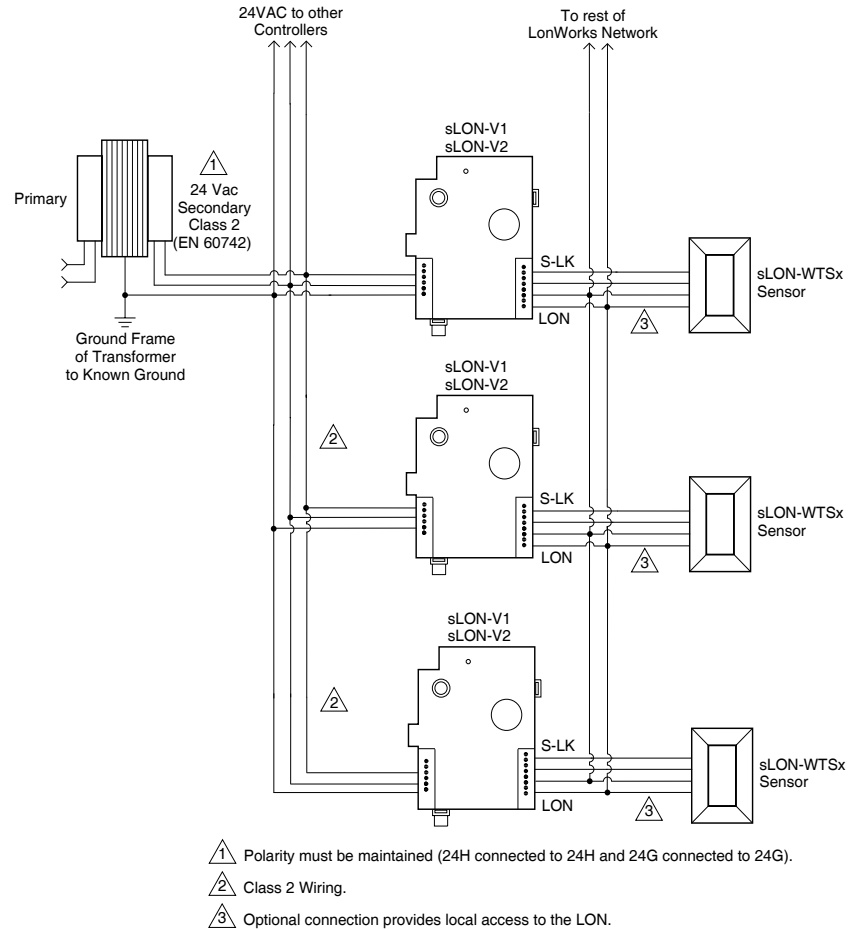


Figure-12 Multiple Controllers Powered from a Single Class 2 (EN 60742) Power Source and Sharing Communications in a Free Topology Segment.

Checkout

Mechanical Hardware Checkout

1. Verify both set screws are tightened to damper shaft.
2. Press and hold manual override button and rotate damper by turning damper shaft. Verify damper moves freely between full open and full closed positions.
3. Verify wiring between the sLON-WTS Sensor and controller is installed according to job wiring diagram and national and local electrical codes.
4. If controller is part of a LONWORKS network, verify the FTT-10 LONWORKS network wiring between controller and other devices is installed according to job wiring diagram and national and local electrical codes.

Note: Wiring of the S-LK and LONWORKS network between the sensor and the controller is not polarity sensitive.

5. Verify 24 Vac power is provided from a Class 2 (EN 60742) power transformer and wiring is installed according to job wiring diagrams and with national and local electrical codes.
6. If multiple devices are powered from the same transformer, verify wiring polarity has been maintained between all connected devices (24H connected to 24H and 24G connected to 24G).
7. If multiple devices are powered from a common transformer, verify all issues associated with powering multiple devices from a common transformer have been addressed.
8. For sLON-V2x models, verify digital outputs are wired according to job wiring diagram and with national and local electrical codes.
9. Make certain current requirements of the controlled device do not exceed rating of controller's digital outputs (sLON-V2x only).
10. Verify piping from air station velocity pressure sensor is properly connected to P1 LO and P2 HI fittings on controller.

Communications Hardware Checkout

1. Verify controller is in a manually controlled, safe state.
2. Place controller power breaker in the ON position. See job wiring diagrams.
3. Observe green Data Transmission LED (Figure-13) and do the following:
 - a. If green Data Transmission LED is steady on or blinking, go to step 4.
 - b. If green Data Transmission LED is off, check power.
4. Observe red Service LED (Figure-13) and do the following:
 - a. If red Service LED is blinking (1/sec), use WPT Software Tool to download the appropriate application to controller.
 - b. If red Service LED is steady on, turn power to controller OFF, wait five seconds, and turn power ON. If red Service LED is still steady on, turn power OFF and replace controller.
5. If connected to a LonWorks network (LON), verify Reception and Transmission LEDs (Figure-13) indicate normal operation. See Table-3.

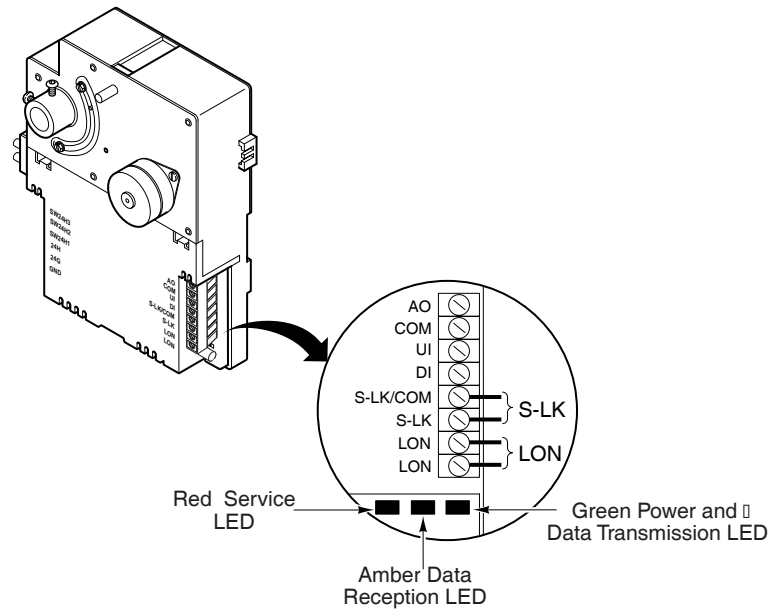


Figure-13 Location of sLON-V1 and sLON-V2 LEDs.

Table-3 LED Indication.

Indicator	Context	Status	Corrective Action
Data Reception LED – Amber	Anytime	Blinks when the controller receives data from the LON.	None required.
		On indicates one LonWorks network wire may be disconnected	Check connections on all nodes
		Off indicates that data reception is not taking place.	None required
Data Transmission LED – Green	Anytime	Blinks when the controller transmits data to the LON.	
		On indicates that the controller is not transmitting data. On also indicates that power is being applied to the controller.	
Service LED – Red	Power-up	If a valid application is loaded, the LED blinks once to indicate successful power-up.	None required
	Wink mode	Blinks on and off five times to indicate physical location of the controller.	
	Power-up	On indicates that the neuron application is not running. Neuron applications are not field replaceable.	Replace the controller.
	Power-up	Blinks (1/sec) to indicate that the neuron application is loaded, but the neuron's communication parameters are not loaded, are being reloaded, or have been corrupted. Communication parameters cannot be configured by field personnel.	Use the WPT Software Tool (or third party network management tool) to download the appropriate application. If the red service LED continues to blink, download the application two to three more times. If the red LED is still blinking, replace the controller.
	Power-up	Off indicates that the neuron application is loaded but the device is off-line. In this state, a pre-loaded HVAC application will not run, and you will be unable to download an application to the controller.	If you are unable to download and/or run an HVAC application, use the WPT Software Tool (or third party network management tool) to put the controller online. When the controller is online, it will be possible to download and/or run an HVAC application.
	Power-up	Off may also indicate a normal state. In this state, the controller operates normally, and you can download and/or run HVAC applications.	If the controller is able to accept and/or run a downloaded HVAC application, no action is required.

Controller Selection

Identical pairs of factory barcode labels are attached to each controller. The labels can be used to select controllers for application downloading purposes. Each pair of labels contains a unique Neuron ID. One of the labels remains on the controller permanently; the other label can be placed on a job site node list plan. The Neuron ID can then be entered into a job network profile through the WPT Software Tool. The WPT Software Tool (or third party network management tool) can then download an application to the selected controller.

The service pin button is also used to select controllers. When this button is pressed, the controller sends a broadcast message containing its Neuron ID to the online or connected WPT Software Tool (or third party network management tool). After the message is received, the controller can be selected for application downloading.

Service

Components within sLON VAV controllers can not be field repaired. If there is a problem with a controller, follow the steps below before contacting Solidyne Technical Support.

1. Make sure controllers are connected and communicating to desired devices.
2. Check all sensors and controlled devices are properly connected and responding correctly.
3. If controller is operating, make sure the correct profile and application is loaded by checking the LonMark Program ID and the nciSECMoDelNum using WPT Software Tool (or third party network management tool).
4. Record precise hardware setup indicating the following:
 - Version numbers of applications software.
 - Controller firmware version number.
 - Information regarding the WPT Software Tool.
 - A complete description of difficulties encountered.

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