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- Calibrators & Ice Point References
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- Displacement Transducers
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M-3768 / 0102

User's Guide

OMEGA
An OMEGA Technologies Company

http://www.omega.com
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LVCN-160 Series
Ultrasonic Level Controller

MADE USA

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of 13 months from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal one (1) year product warranty to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit should malfunction, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting OMEGA:
1. PO. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR NON-WARRANTY REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:
1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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For immediate technical or application assistance:

USA and Canada: Sales Service: 1-800-826-6342 / 1-800-TC-OMEGA℠
Customer Service: 1-800-622-2378 / 1-800-622-BEST℠
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ISO 9002 Certified

It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, patient connected applications.

SPECIFICATIONS

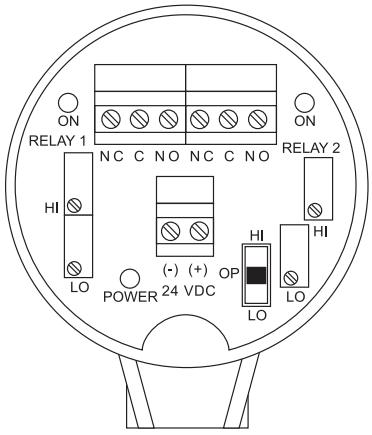
Step One

Range:	3.6" to 6' (9 cm to 1.8 m)
Accuracy:	± .25% of span in air
Resolution:	0.125” (3 mm)
Frequency:	83 kHz (nominal)
Pulse rate:	3 pulses per second
Beam width:	8° conical
Blocking distance:	3.6” (9 cm) minimum
LED Indication:	Power, relay & fail-safety
Fail-safety:	Power and echo fail-safe
Supply voltage:	LVCN-160-AC: 120 VAC
	LVCN-160-DC: 18-30 VDC
Set points:	2 per relay
Adjustments:	Potentiometer
Relay types	(2) latched, SPDT
Relay rating:	LVCN-160-AC: 250 VAC, 10A, 1/2 hp.
	LVCN-160-DC: 250 VAC, 10A, 1/4 hp.
Relay mode:	Selectable NO or NC
Relay latch:	ON or OFF
Hysteresis:	Adjustable over range
Temperature rating:	F: -40º to 140º
	C: -40º to 60º
Temp. compensation:	Automatic over entire range
Pressure rating:	30 psi (2 bar) @ 25 °C., derated @ 1.667 psi (0.113 bar) per °C. above 25 °C.
Enclosure rating:	NEMA 4X (IP65)
Enclosure material:	Polypropylene, U.L. 94VO
Transducer material:	PVDF
Mounting conn.:	3/4” NPT (3/4" G)
Mounting gasket:	Viton (3/4" G) metric only
Conduit connection:	1/2” NPT
CE compliance:	EN 50082-2 immunity *(LVCN-160-DC only)*
	EN 55011 emission *(LVCN-160-DC only)*

About Ultrasonic Technology:

An ultrasonic sound wave is pulsed three times per second from the base of the transducer. The sound wave reflects against the process medium below and returns to the transducer. The microprocessor based electronics measures the time of flight between the sound generation and receipt, and translates this figure into the distance between the transmitter and process medium below.

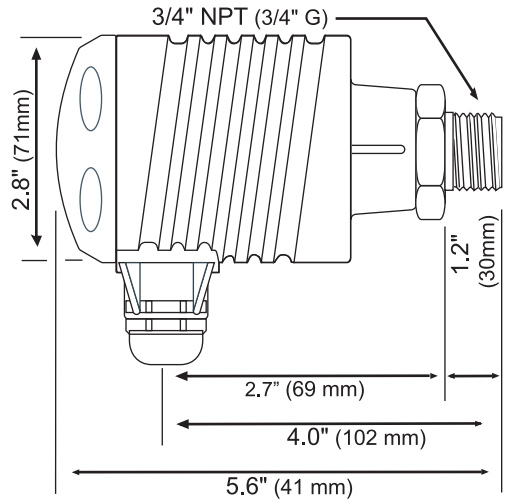
Faceplate:



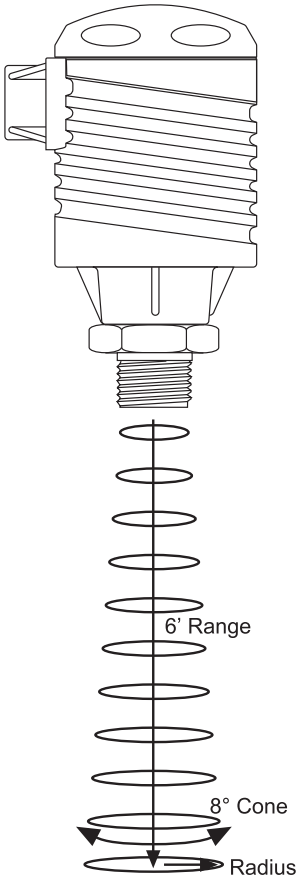
Model Chart:

Model	Power	Relay	Mounting
LVCN-161-AC	120 VAC	250 VAC, 10A, 1/2 Hp.	2” NPT
LVCN-161-DC	18-30 VDC	250 VAC, 10A, 1/4 Hp.	2” NPT
LVCN-162-AC	120 VAC	250 VAC, 10A, 1/2 Hp.	2” G
LVCN-162-DC	18-30 VDC	250 VAC, 10A, 1/4 Hp.	2” G

Dimensions:

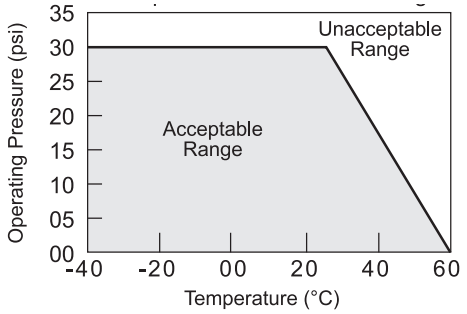


Beam Cone Radius:



Range Feet	Radius Inches	Radius cm
1	1.2	3.1
2	2.1	5.2
3	2.9	7.3
4	3.7	9.5
5	4.9	11.6
6	5.4	13.7

Temperature/Pressure Derating Chart:



SAFETY PRECAUTIONS

Step Two

⚠ About this Manual:

PLEASE READ THE ENTIRE MANUAL PRIOR TO INSTALLING OR USING THIS PRODUCT. This manual includes information on the small tank ultrasonic level controller from OMEGA: LVCN-161-__ and LVCN-162-__. Please refer to the part number located on the sensor label to verify the exact model which you have purchased.

⚠ User's Responsibility for Safety:

OMEGA has a wide range of liquid level sensors and technologies. While each of these sensors is designed to operate in a wide variety of applications, it is the user's responsibility to select a sensor model that is appropriate for the application, install it properly, perform tests of the installed system, and maintain all components. The failure to do so could result in property damage or serious injury.

⚠ Proper Installation and Handling:

Because this is an electrically operated device, only properly-trained staff should install and/or repair this product. Use a proper sealant with all installations. *Note: Always install the 3/4" Viton gasket with the LVCN-162-__. The G threaded version of the Controller will not seal unless the gasket is installed properly.* Never overtighten the transmitter within the fitting. Always check for leaks prior to system start-up.

⚠ Wiring and Electrical:

A supply voltage of 120 VAC is used to power the LVCN-160 series controller. The system should never exceed a maximum of 120 volts AC. The supply voltage used to power the LVCN-160-DC series should never exceed a maximum of 30 volts DC. Electrical wiring of the sensor should be performed in accordance with all applicable national, state, and local codes.

⚠ Material Compatibility:

The LVCN-160 series enclosure is made of Polypropylene (PP). The transducer is made of Polyvinylidene Fluoride (PVDF). Make sure that the model which you have selected is chemically compatible with the application liquids it will contact. *Note: even though the transmitter is a non-contact device, the effects of corrosion from chemical fumes and vapors should be checked.*

⚠ Enclosure:

While the transmitter housing is liquid-resistant when installed properly, it is not designed to be immersed. It should be mounted in such a way that the enclosure and diaphragm do not come into contact with fluid. *Note: use a proper sealant with the 1/2" NPT conduit connection.*

⚠ Make a Fail-Safe System:

Design a fail-safe system that accommodates the possibility of transmitter or power failure. In critical applications, OMEGA recommends the use of redundant backup systems and alarms in addition to the primary system.

⚠ Flammable, Explosive and Hazardous Applications:

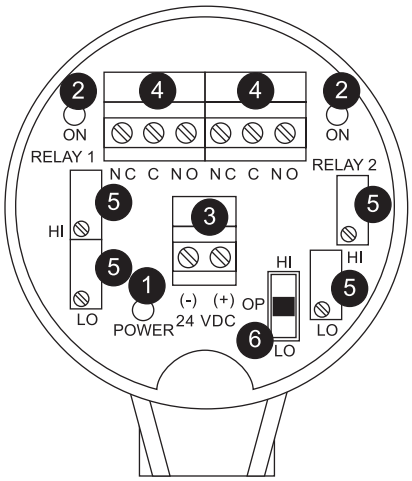
The LVCN-160 series controller systems should not be used within flammable or explosive applications.

⚠ Warning ⚠

Always install the 3/4" Viton gasket with all versions of the LVCN-162-__. The G threaded version of the Controller will not seal unless the gasket is installed properly.

GUIDE TO CONTROLS

Step Three



1. **Power indicator:** This green LED lights when DC power is ON. LED will also flask when a lost echo condition occurs.
2. **Relay indicators:** These red LED's will light whenever the transmitter energizes the relay, in response to the proper condition with the set points.
3. **AC Power terminals (LVCN-161-AC & LVCN-162-AC series only):** Connection of 120 VAC power to the controller. Polarity (hot and neutral) does not matter.

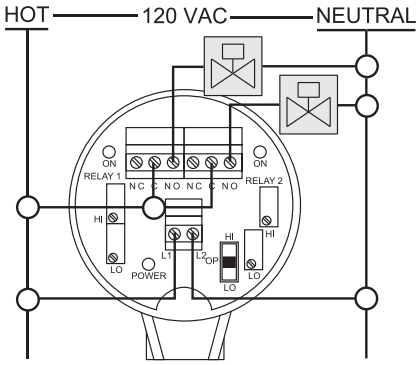
   DC Power terminals (LVCN-161-DC & LVCN-162-DC series only): Connection of 18 to 30 VDC power to the controller. Please observe the Polarity (positive and negative) of the terminal.
4. **Relay terminals (NC, C, NO):** Connect the device you wish to control (pump, valve, alarm etc.) to these terminals: supply to the COM terminal, and the device to the NO or NC terminal as required. The switched device should be a noninductive load of not more than 10 amps; for reactive loads the current must be derated or protection circuits used. When the red LED is ON and the relay is in the energized state, the NO terminal will be closed and the NC terminal will be open.
5. **Relay Potentiometer:** Adjusts the switching positions for each relay with its own independent Hi and Lo adjustment.
6. **Selector Switch:** Allows for independent adjustment of the Hi or Lo setting.

WIRING

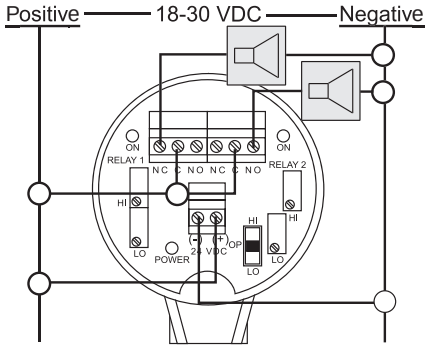
Step Four

Electrical wiring of the sensor should be performed in accordance with all applicable national, state, and local codes.

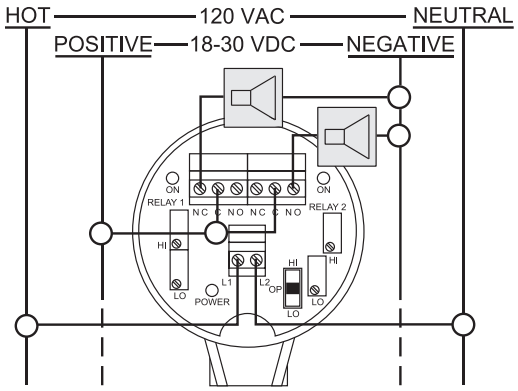
Wiring AC Power Controller (LVCN-160 series only):
Please does not matter for the LVCN-160 series. Do not exceed the 120 VAC power rating. The 2 relays can be connected to pumps, valves, alarms, PLC's, etc. as long as they do not exceed the 10A, 250 VAC, 1/2 Hp rating. Below illustrates using the same 120 VAC power suppling the LVCN-160 series to control two independent pumps directly.



Wiring DC Power Controller (LVCN-160-DC Series):
Please observe polarity for the LVCN-160-DC Series. The 2 relays can be connected to pumps, valves, alarms, PLC's, etc. as long as they do not exceed th 10A, 250 VAC, 1/4 Hp rating. Below illustrates using the same VDC power suppling the LVCN-160-DC Series to control a high level and low level alarm directly. The device can be wired either Normally Open (NO) or Normally Closed (NC).



Wiring to the Relays:
The 2 relays are isolated from the power required to operate the LVCN-160 Series. The relays can be used to control a device on a separate power system. The illustration below demonstrates the LVCN-160 Series controlling two alarms powered from a different power supply. All relay ratings will still apply.



INSTALLATION

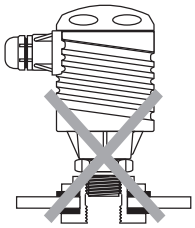
Step Five

OMEGA's LVCN-160 series controller may be installed through the top wall of a tank. Installation requires a 3/4" NPT fitting or drum adapter.

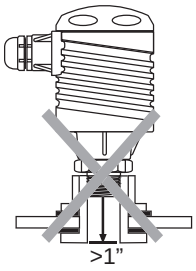
1. Install the appropriate 3/4" fitting in the top wall of the tank. Prior to installation, make sure that the fitting has been installed properly and checked for leaks. Use a proper sealant at the time of installation to ensure a liquid-tight seal. Secondly, make sure that the fittings threads are not damaged or worn.
2. Insert the controller into the fitting and tighten to hand tight.
3. Always check for leaks prior to system start-up. To ensure proper installation, a complete leak test and simulation of actual process conditions should be preformed.

Installation Tips:

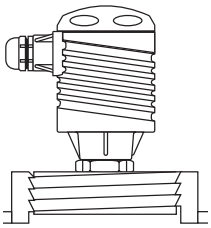
1. Avoid using a fitting where the opposite end of the fitting has pipe threads such as a T x T coupling. The unused threads causes interference with the sound pulses similar to a pipe that is not continuous and has been joined together with welded seams. For best results, use a S x T fitting.



2. Do not hide the LVCN-160 series within a fitting where the walls of the fitting will interfere with the beam angle. Hiding the LVCN-160 series more than an inch inside a fitting will reduce the transmitters overall distance reading. For best results, use a fitting which is shallow or even a 1/2 coupling.



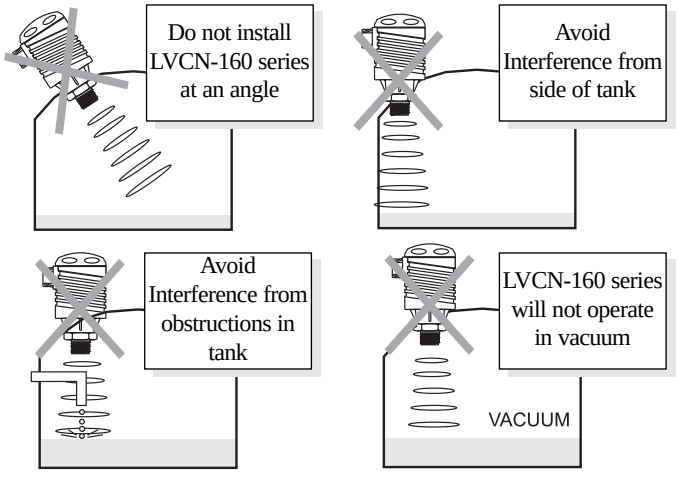
3. Before attaching the Controller to the Drum Adapter, cut open the sealed cap above the 3/4" female thread. Use a sharp knife to remove any plastic which would interfere with the sound pulses. Attach the controller to the Drum Adapter so it is hand tight. Turn the controller by the wrench flat and not by the housing.



⚠ Warning ⚠

Do not install the LVCN-160 Series in pressurized applications above 30 psi.

Always install the 3/4" Viton gasket with all versions of the LVCN-162-__. The G threaded version of the LVCN-162-__ will not seal unless the gasket is installed properly and checked for leaks.



CALIBRATION

Step Six

⚠ Warning ⚠

A supply voltage of 120 VAC is used to power the LVCN-160 series controller. A supply voltage of 18-30 VDC is used to power the LVCN-160-DC series controller. If making adjustments during powered operation, use extreme caution and use only insulated tools. Also, calibrate all models of the LVCN-160 series to a static liquid level or stationary object. Wiring should be preformed by qualified personnel in accordance with all applicable national, state and local electrical codes.

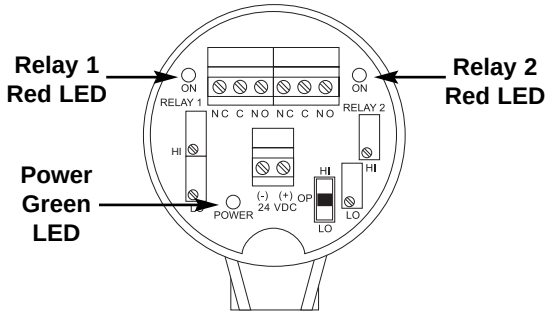
Power LED Indication

The LVCN-160 series features a single Green LED which indicates power and fail-safe conditions. During normal operation, the LED will be ON continuously to indicate that the controller has power and a strong echo signal return strength.

Should the LED begin to FLASH, this indicates that the LVCN-160 series has lost the acoustic signal and has gone into a fail-safe condition. During the lost echo condition, both relays will energize indicating a full tank condition. Once re-acquired, the LED will turn back ON continuously and the relays will return to their proper state. Note: during a fail-safe condition, both relays will energize. Design your system such that an energized relay state is a fail-safe condition.

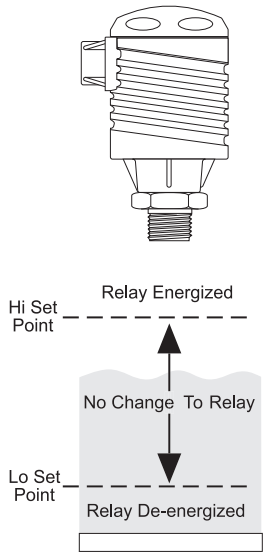
Relay LED Indication

The LVCN-160 series features dual Red LED's which indicate relay status. When the LED is On, the corresponding relay is energized. When the LED is Off, the corresponding relay is de-energized.



Relay LED Indication II

The relay's in the LVCN-160 series will energize when the liquid level is above both Hi and Lo points. The relay will de-energize when the level falls below both the Hi and Lo points.



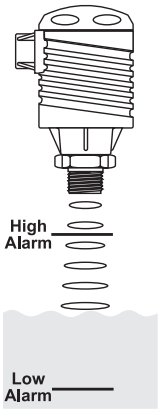
CALIBRATION

Step Seven

Note: If making adjustments during powered operation, go slow, use extreme caution and use only insulated tools.

Note: A dry calibration is possible when using a solid target. Position the LVCN-160 series in a secure location at the exact distances required.

Low Level Alarm



The goal is to make sure that the liquid level does not fall below a certain point. If it does, an alarm is supposed to sound, alerting the operator of a low level condition.

To do this, connect the alarm to the NC side of the relay. Connect the source of power to the Com terminal of the relay.

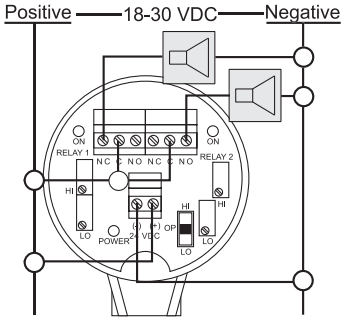
In this application, the switch point is normally wet. In this condition, the relay will be energized so the alarm will not sound: i.e., the Red relay LED will be On. If the fluid level falls below the low switch point, the relay de-energizes, which closes the alarm circuit and the alarm sounds.

High Level Alarm

In the same manor, this system can be used to sound an alarm when fluid reaches a high level, with just a change in the location of the switch point and the reversing of the relay.

The alarm is now connected to the NO side of the relay.

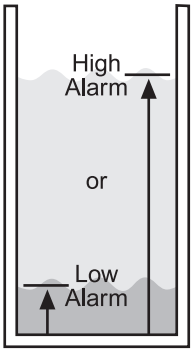
The sensor is normally dry. In this condition, the relay will be de-energized so the alarm does not sound: i.e., the Red relay LED should be Off. If the fluid level rises to the high sensor point, the sensor goes on, the relay energizes, and the alarm sounds.



Note: Low level alarm is wired NC and the high level alarm is wired NO.

Single Point Relay

Each relay can be used as a high or low level alarm. The instructions below can be used for either function.



1. Apply applicable power.
2. Turn the Hi and Lo Potentiometer for the relay fully clockwise (about 18 turns).
3. Set the input level to its set point.
4. Flip selector switch to Hi.
5. Adjust Hi potentiometer counter-clockwise until the LED for that relay just turns ON.
6. Turn Lo potentiometer for the relay fully counter-clockwise (about 18 turns).
7. Flip selector switch to Lo.
8. Adjust Lo potentiometer clockwise until the LED for that relay turns OFF.
9. Adjust Lo potentiometer counter-clockwise 1/4 turn, LED will turn ON.
10. Repeat steps 3 to 9 for the other relay.
11. Flip selector switch to OP.

Note: to protect the loads, the relay set points should be adjusted before the loads are connected.

Note: calibrate the LVCN-160 series to a static liquid level or stationary object.

CALIBRATION

Step Eight

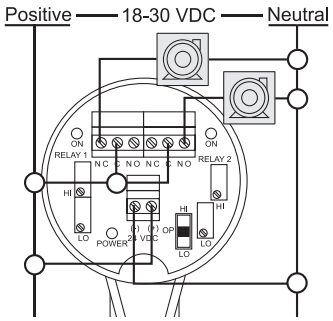
Note: If making adjustments during powered operation, go slow, use extreme caution and use only insulated tools.

Note: A dry calibration is possible when using a solid target. Position the LVCN-160 series in a secure location at the exact distances required.

Automatic Fill:

This system consists of a tank with a pump that is controlled by the LVCN-160 series. We connect the pump to the NC side of the relay. When the relay is de-energized, the pump will turn On and fill the tank. When the relay is energized, the pump will turn Off and stop filling the tank.

NOTE: If the pump motor load exceeds the rating of the controller's relay, a stepper relay of higher capacity must be used as part of the system design.



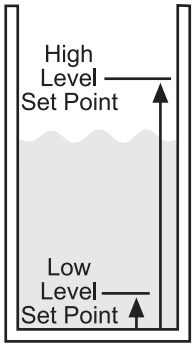
Note: Auto fill pumps are wired NC and auto empty pumps are wired NO.

Automatic Empty:

Note that a similar system logic can be used for an automatic empty operation simply by controlling a pump that pumps fluid out of the tank instead of into it. However, note that the pump will now be connected to the NO side of the relay. When the relay is energized, the pump will turn On and empty the tank. When the relay is de-energized, the pump will turn Off and stop emptying the tank.

Latching Relay

1. Apply applicable power.
2. Turn the Hi and Lo Potentiometer for the relay fully counter-clockwise (about 18 turns).
3. Set the input level to its low set point.
4. Flip selector switch to Lo.
5. Adjust Lo potentiometer clockwise until the LED for that relay just turns OFF.
6. Turn Hi potentiometer for the relay fully clockwise (about 18 turns)
7. Flip selector switch to Hi.
8. Set input level to its highest point.
9. Adjust Hi potentiometer counter-clockwise until the LED for that relay turns ON.
10. Repeat steps 3 to 9 for the other relay.
11. Flip selector switch to OP.



Note: to protect the loads, the relays should be adjusted before the loads are connected.

Note: calibrate the LVCN-160 series to a static liquid level or stationary object.

MAINTENANCE

Step Nine

General:

The LVCN-160 series series controller itself requires no periodic maintenance except cleaning as required. It is the responsibility of the user to determine the appropriate maintenance schedule, based on the specific characteristics of the application liquids.

Cleaning Procedure:

1. **Power:** Make Sure that all power to the transmitter, controller and/or power supply is completely disconnected.
2. **Sensor Removal:** In all through-wall installations, make sure that the tank is drained well below the sensor prior to removal. Carefully, remove the sensor from the installation.
3. **Cleaning the Sensor:** Use a soft bristle brush and mild detergent, carefully wash the transducer of the LVCN-160 series. Do not use a harsh abrasive such as steel wool or sandpaper, which might damage the surface of the transmitter. Do not use incompatible solvents which may damage the PVDF transducer or the transmitters PP body.
4. **Sensor Installation:** Follow the appropriate steps of installation as outlined in the installation section of this manual.

Controller Logic

For all controllers, please use the following guide to understand the operation of the LVCN-160 series.

1. **Power LED:** Make sure the Green power LED is On when power is supplied to the controller.
2. **Relay LED(s):** The relay(s) LED(s) on the LVCN-160 series will be energized when the level is above the Hi point and de-energized when the level is below the Lo point. When the level is between the Hi and Lo points, the relay will no change its state.

Relay Logic:

The relay can either be an independent relay (high or low level alarm) or can be a latching relay (automatic fill or empty).