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M-4465/0707



**LVCN700 Series  
Multi-Point Ultrasonic Level Switch**

**User's Guide**



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OMEGA's policy is to make running changes, whenever an improvement is possible. This policy is to make running changes, whenever an improvement is possible. This policy is to make running changes, whenever an improvement is possible.

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2. Model and serial number of the product under warranty, and
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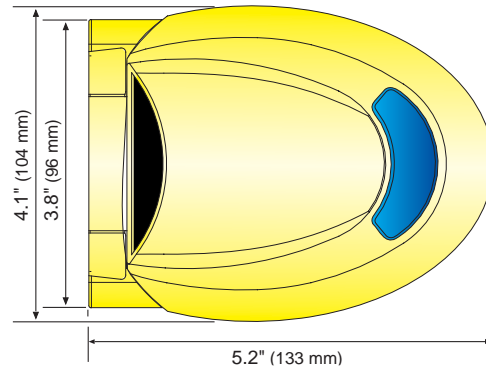


# SPECIFICATIONS

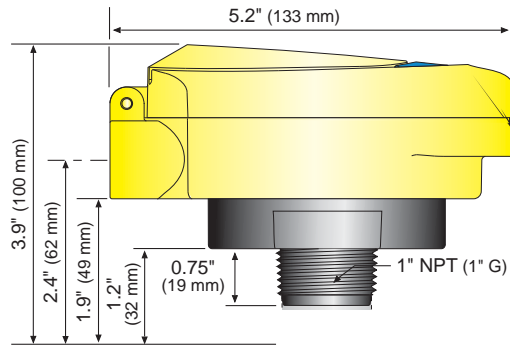
## Step One

Range:	LVCN704: 2" to 4' (5 cm to 1.2m) LVCN709: 4" to 9.8' (10 cm to 3m) LVCN716: 4" to 16.4' (10 cm to 5m) LVCN126: 8" to 26.2' (20 cm to 8m)
Repeatability:	0.25" (6 mm)
Adjustability:	Over entire range
Hysteresis:	LVCN704/709: 0.5" (1.2 cm) (single set point) LVCN716/726: 1" (2.5 cm) (single set point)
Beam width:	LVCN704/709: 2" (5 cm) dia. LVCN716/726: 3" (7.6 cm) dia.
Dead band:	LVCN704: 2" (5 cm) LVCN709/716: 4" (10 cm) LVCN726: 8" (20 cm)
LED indication:	Power, relay and echo status
Calibration:	Target, push button
Memory:	Non-volatile
Supply voltage:	AC: 95-250 VAC DC: 12-28 VDC (Optional)
Consumption:	AC: 20 watts max. DC: 100 mA @ 24 VDC (Optional)
Contact type:	(3) SPDT relays
Contact rating:	60 VA
Contact logic:	Single point: alarm Two point: latching or out of bounds alarms Duplex or Alternation: (Relays 1 and 2 only)
Contact fail-safety:	De-energizes during echo signal loss
Process temp.:	F: -4° to 140° C: -20° to 60°
Temp. comp.:	Automatic
Electronics temp.:	F: -40° to 160° C: -40° to 71°
Pressure:	30 psi (2 bar) @ 25° C., derated @ 1.667 psi (.113 bar) per °C. above 25° C.
Enclosure rating:	NEMA 4X (IP65)
Enclosure vent:	Water tight membrane
Encl. material:	PC/ABS FR
Trans. material:	PVDF Kynar®
Process mount:	LVCN704/709: 1" NPT (1" G) LVCN716/726: 2" NPT (2" G)
Mount. gasket:	Viton®
Conduit entrance:	Dual, 1/2" NPT
Classification:	General purpose
CE compliance:	EN 61326 EMC [DC series only (DC powered)]

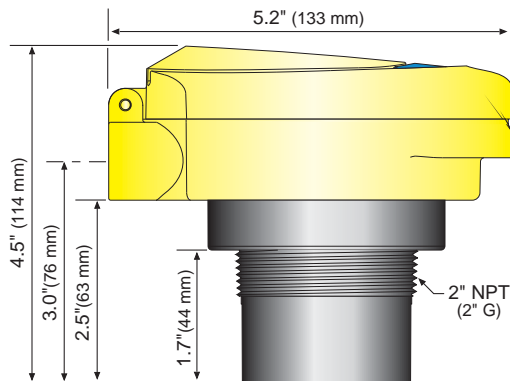
**LVCN700 Series  
Enclosure (Top View)**



**LVCN704  
LVCN709  
Enclosure (Side View)**



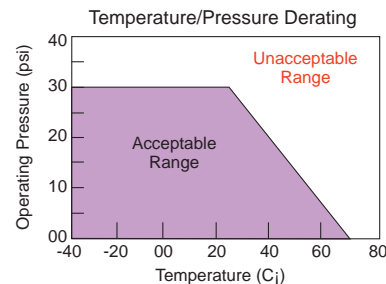
**LVCN716  
LVCN726  
Enclosure (Side View)**



### Handling Static-Sensitive Circuits/Devices:

When handling the Ultrasonic switch, the technician should follow these guidelines to reduce any possible electrostatic charge build-up on the technicians body and the electronic part.

1. Always touch a known good ground source before handling the part. This should be repeated while handling the part and more frequently after sitting down from a standing position, sliding across the seat or walking a distance.
2. Avoid touching electrical terminals of the part unless making connections.
3. DO NOT open the unit cover until it is time to calibrate.



# INTRODUCTION

## Step Two

**⚠ About this Manual:** PLEASE READ THE ENTIRE MANUAL PRIOR TO INSTALLING OR USING THIS PRODUCT. This manual includes information on the LVCN700 series Ultrasonic Level Switch. Please refer to the part number located on the switch label to verify the exact model configuration which you have purchased.

**⚠ User's Responsibility for Safety:** Omega manufactures a broad range of level sensing 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:** Only properly trained staff should install and/or repair this product. Install the switch with the included Viton gasket and never overtighten the switch within the fitting. Always check for leaks prior to system start-up.

**⚠ Wiring and Electrical:** A supply voltage of 95-250 VAC is used to power the Ultrasonic switch, and a supply voltage of 12-28 VDC is used to power the optional DC version of the LVCN700 series Ultrasonic switch. Electrical wiring of the switch should be performed in accordance with all applicable national, state, and local codes.

**⚠ Material Compatibility:** The LVCN700 series enclosure is made of a flame retardant Polycarbonate (PC/ABS FR). The transducer is made of Polyvinylidene Fluoride (PVDF). Make sure that the model which you have selected is chemically compatible with the application media.

**⚠ Enclosure:** While the LVCN700 series housing is liquid-resistant, the unit is not designed to be operational when immersed. It should be mounted in such a way that the enclosure and transducer do not come into contact with the application media under normal operational conditions.

**⚠ Make a Fail-Safe System:** Design a fail-safe system that accommodates the possibility of switch and/or power failure. OMEGA recommends the use of redundant backup systems and alarms in addition to the primary system.

**⚠ Flammable, Explosive or Hazardous Applications:** The LVCN700 series should not be used within classified haz-

**⚠ Warning ⚠**

Always use the Viton gasket when installing the Ultrasonic switch, and make sure that all electrical wiring of the switch is in accordance with applicable codes.

# TECHNOLOGY

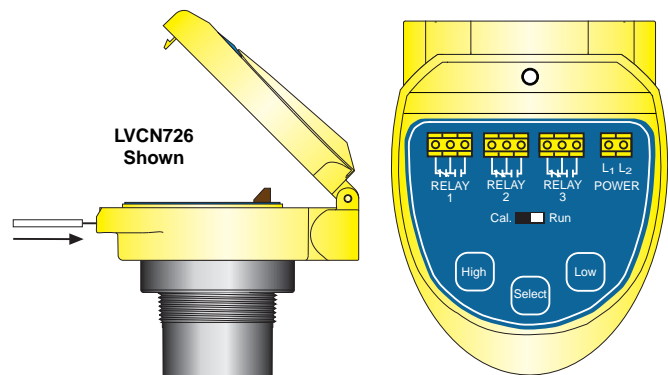
## Step Three

**A. Application:** The general purpose ultrasonic level switch provides non-contact level detection up to 26' or 8m with 3 relays. Each relay can be configured on a single set point alarm, two latched set points for automatic fill or empty, two set points for out of bounds alarms or three set point (relays 1 and 2 only) alternation / duplexing. The switch is well suited for a wide range of corrosive, waste and slurry type media, and is broadly selected for atmospheric day tank, pump lift station and waste sump applications.

**B. Part Number:** The part and serial numbers are located on the wrench flat. Check the part number on the product label and confirm which of the below model configurations you have purchased:

Part Number	Range	Supply	Mount
LVCN704	4' (1.2m)	95-250 VAC	1" NPT
LVCN704G	4' (1.2m)	95-250 VAC	1" NPT
LVCN704-DC	4' (1.2m)	12-28 VDC	1" NPT
LVCN704G-DC	4' (1.2m)	12-28 VDC	1" NPT
LVCN709	9.8' (3m)	95-250 VAC	1" NPT
LVCN709G	9.8' (3m)	95-250 VAC	1" NPT
LVCN709-DC	9.8' (3m)	12-28 VDC	1" NPT
LVCN709G-DC	9.8' (3m)	12-28 VDC	1" NPT
LVCN716	16.4' (5m)	95-250 VAC	1" NPT
LVCN716G	16.4' (5m)	95-250 VAC	1" NPT
LVCN716-DC	16.4' (5m)	12-28 VDC	1" NPT
LVCN716G-DC	16.4' (5m)	12-28 VDC	1" NPT
LVCN726	26.2' (8m)	95-250 VAC	2" NPT
LVCN726G	26.2' (8m)	95-250 VAC	2" NPT
LVCN726-DC	26.2' (8m)	12-28 VDC	2" NPT
LVCN726G-DC	26.2' (8m)	12-28 VDC	2" NPT

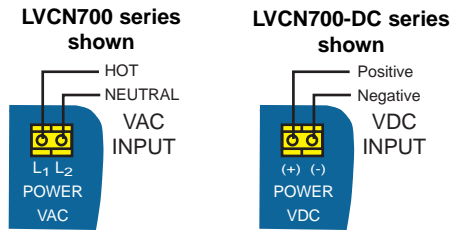
**C. NEMA 4X Enclosure:** The enclosure has a flip cover with two 1/2" NPT female conduit ports and an internal terminal strip for wiring. To open the enclosure, you will need a small insertion tool such as a screwdriver. Insert the tool into the hole located at the front of the enclosure and gently push on the latching mechanism to release the cover. Rotate the hinged cover up for 135° access to the faceplate and terminal strips. **Before closing the enclosure, make sure that the enclosure gasket is properly seated, and that any conduit fittings, cable connectors or plugs are installed correctly and sealed.**



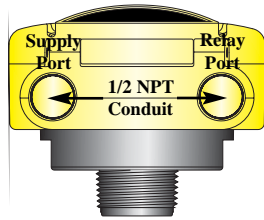
# PREPARATION

## Step Four

**A. Supply Voltage:** The power supply voltage should never exceed the maximum rating of 250 VAC for the LVCN700 series AC switch or 28 VDC for the LVCN700-DC series switch.



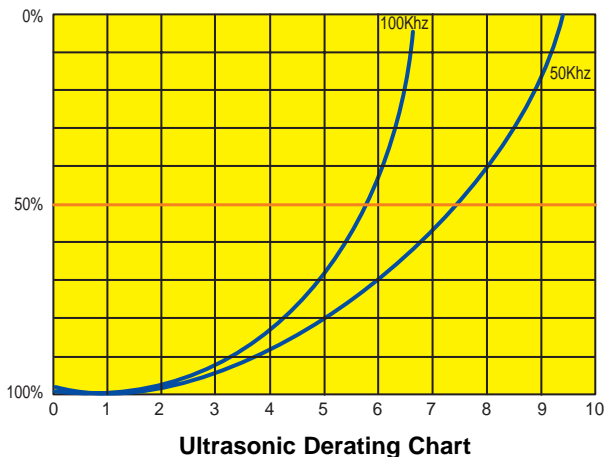
**B. Conduit Entrance:** The enclosure has two 1/2" NPT female conduit ports for routing of the switch supply and relay circuit wiring. **Do not run mixed AC and DC voltages through the same conduit port.** Route the supply voltage circuit through one port and the relay circuit(s) through the opposite port.



### C. Relay Fail-Safe Design:

The switch has (3) relay channels. Each relay is a SPDT (single pole, double throw) type rated at 60 VA. Normally open (NO) or normally closed (NC) operation is user selected based on the desired system control and fail-safe logic. **Always design a fail-safe system that accommodates for the possibility of relay and/or power failure.** The "normal" relay state is where the relay coil is de-energized and the Red relay LED is OFF. Therefore, if power is cut OFF to the switch it will de-energize the relay. Make sure that the de-energized state is the safe state in your system design. As such, if switch power is lost, a pump will turn OFF if it is connected to the normally open side of the relay.

**E. Maximum Applied Range:** Individual or cumulative effects of agitation, vapor or foam can reduce the overall quality of signal return and shorten the maximum applied range of the switch. To determine the maximum applied range of the switch in your application, refer to the below derating chart.



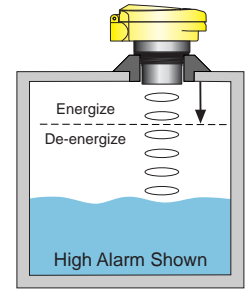
LVCN704/709	LVCN716/726
Agitation = 1-3 @ 100 kHz	Agitation = 1-3 @ 50 kHz
Vapor = 4-6 @ 100 kHz	Vapor = 3-5 @ 50 kHz
Foam = 5-6 @ 100 kHz	Foam = 4-6 @ 50 kHz

# CALIBRATION

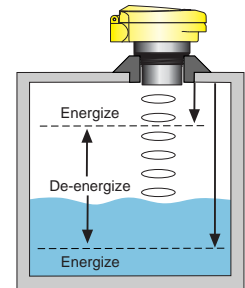
## Step Five

**A. Introduction:** The switch has two modes, the RUN and CAL modes. In the RUN mode, the switch is operational and the relay(s) will energize or de-energize at the calibrated set point distances. In the CAL mode, the relay set point distances and states may be target-calibrated into memory. **The switch arrives from the factory without any preset calibration.** Each relay channel may be user calibrated into one of the following configurations; 1) high or low level alarm, 2) high and low level out of bounds alarm, 3) automatic fill or empty, or 4) duplexing/Alternating.

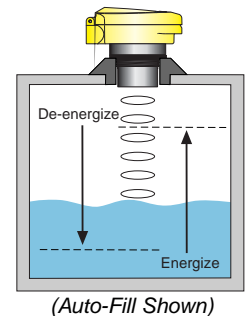
**High or Low Level Alarm:** The high or low level alarm is programmed with a single set point at the desired tank level. Configured as a high alarm, the relay will energize if the level rises above the set point. Configured as a low level alarm, the relay will energize if the level falls below the set point.



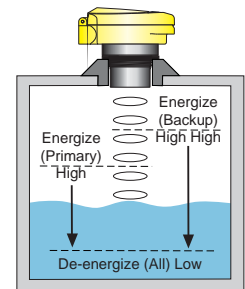
**High and Low Level Out of Bounds Alarm:** Programmed with two set points, the high and low level out of bounds alarm protects the top of the tank from overspill and the bottom of the tank from run-dry. If the level rises above or falls below the set points, the relay will energize. The relay will remain de-energized as long as the level is in between the set points.



**Automatic Fill or Empty:** Programmed with two set points, the latched automatic fill or empty will control a pump or valve. When the level reaches the energize set point, the latching relay will energize, and remain energized until the level reaches the de-energize set point.



**Duplex/Alternate:** Programmed with three set points and two relays, duplexing will automatically fill or empty the tank with two pump alternation for maintenance and lead-lag control for back up operation. When the level reaches the energize set point, the latching relay will energize, and remain energized until the level reaches the de-energize set point. Each time the level reaches the energize set point, the relays will alternate. If the level reaches the back-up energize set point, both relays will energize until the level reaches the de-energize set point. Alternation will automatically fill or empty the tank with two pumps switching after each cycle.

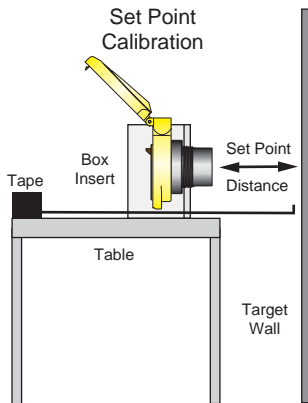


# CALIBRATION

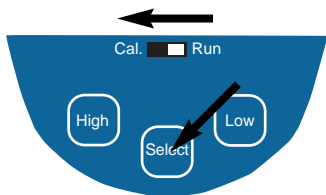
## Step Six

**B. Calibration Tools:** To target calibrate the switch set points, you will need the appropriate power supply (95-250 VAC or 12-28 VDC for DC version), tape measurer, flat reflective target such as a wall, and optional Omega box insert for use as a product holder.

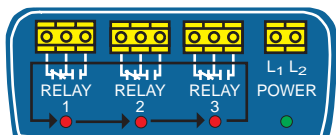
**C. Off Tank Target Calibration:** The switch's relay set points may be target calibrated OFF the tank or installed ON the tank. Generally, target calibration is done OFF the tank because it is easier to move the switch rather than raise or lower the liquid level to the desired relay set point distances. Locate a flat reflective calibration target such as a wall. Place the switch perpendicular to the target in the provided Omega box insert or equivalent holder. **Alternatively, you may hold the switch with your hand, but it is critical that prior to entering any relay set point distances, the product is held steady and perpendicular to the target for at least 15 seconds.** If calibrating against a wall, it is recommended that the switch be elevated 3' (1m) off the ground by placing it on a table or equivalent flat surface.



**D. Entering the CAL Mode:** To enter the CAL mode, you must first disable the calibration lock out feature. *To do so, press and hold the SELECT button down. While holding the SELECT button, slide the RUN/CAL switch LEFT to the CAL position, and then release the SELECT button.* At this point, all relay LEDs should be OFF.



**E. Selecting a Relay Channel:** After entering the CAL mode, press the SELECT button once and the Relay 1 LED will turn ON indicating that the channel is now active for set point calibration. Press the SELECT button again until the desired Relay channel becomes active.



**F. Erasing a Relay Channel:** With the exception of new products out of the box, **all previously entered relay set points should be erased prior to new programming** with the following procedure:

1. Enter CAL mode and SELECT the relay channel to erase.
2. Simultaneously press and hold down both the HIGH and LOW buttons, and then release the buttons.
3. The Relay and Power LEDs will blink in an alternating pattern indicating that the relay set points have been erased.
4. At this point, once the LED becomes solid, you may either re-program the channel with new set points or leave it inactive.

# PROGRAMMING

## Step Seven

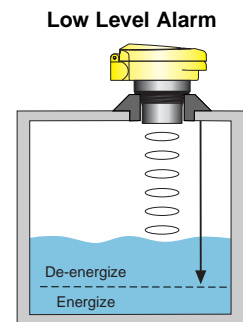
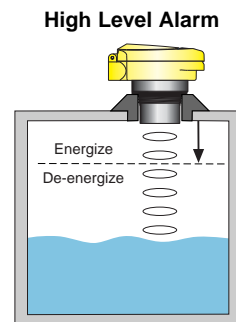
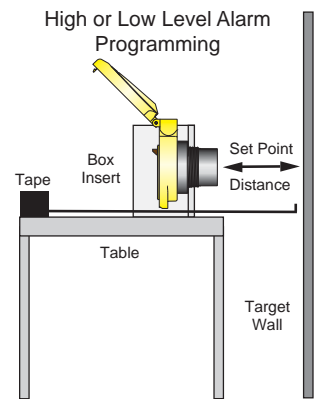
**A. Programming a Relay Channel:** The relay set points are target calibrated using the appropriate HIGH and/or LOW two key-stroke button sequence at each target distance (D1=distance one, D2 = distance two and D3 = Distance 3) per the following logic.

Relay Function	Button Sequence @ Distance(s)
1. High level alarm	High-High (D1)
2. Low level alarm	Low-Low (D1)
3. Out of bounds alarm	High-High (D1) & Low-Low (D2)
4. Automatic fill	Low-High (D1) & High-Low (D2)
5. Automatic empty	High-Low (D1) & Low-High (D2)
6. Duplexing/Alternation	[High-Low (D1) & Low-High (D2), Rly 1] & [High-High (D3), Rly 2]

**After the second High or Low button key-stroke, the Power LED will flash from AMBER to GREEN indicating that the set point has been accepted into memory. If all three Relay LEDs flash RED and remain ON, then the button sequence was done incorrectly. If so, press SELECT to return to the appropriate relay channel and erase the previous set points per the CALIBRATION section (Step #6-F) of this manual. Then re-program the channel with the correct button sequence.**

**B. Programming a High or Low Level Alarm:** After having powered the switch with the appropriate supply voltage, entered the CAL mode, selected a relay channel and erased any previously input set points, follow the below procedure (LOW level alarm instructions are in parenthesis):

1. Stretch the tape measurer out to the appropriate distance in between the switch and target.
2. Position the switch at the desired HIGH (LOW) set point distance defined as the air gap space between the transducer and the target. **Make sure that the switch is stationary and perpendicular to the target before continuing.**
3. Press the HIGH (LOW) button for the first key-stroke and the Relay LED will blink once.
4. Press the HIGH (LOW) button again for the second key-stroke and the Relay LED will blink twice.
5. The Power LED will flash from AMBER to GREEN when the set point has been accepted into memory.
6. Press SELECT to program the next relay channel or slide the RUN/CAL switch RIGHT to exit the CAL mode.



# PROGRAMMING

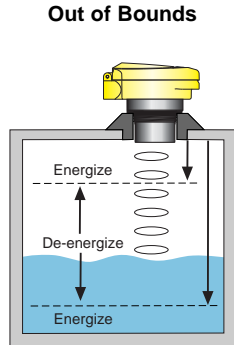
## Step Eight

### C. Programming a High and Low Level Out of Bounds Alarm

**Alarm:** After having powered the switch with the appropriate supply voltage, entered the CAL mode, selected a relay channel and erased any previously input set points, follow the below procedure:

1. Stretch the tape measurer out to the appropriate distance in between the switch and target.

2. Position the switch at the desired HIGH set point distance defined as the lesser of the two air gap spaces between the transducer and the target. **Make sure that the switch is stationary and perpendicular to the target before continuing.**



3. Press the HIGH button for the first key-stroke and the Relay LED will blink once.

4. Press HIGH again for the second key-stroke and the Relay LED will blink twice.

5. The Power LED will flash from AMBER to GREEN when the HIGH set point has been accepted into memory.

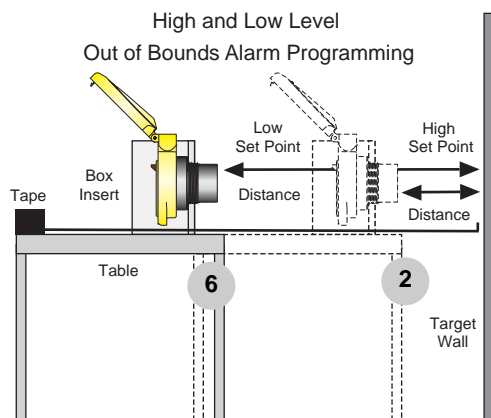
6. Position the switch at the desired LOW set point distance defined as the greater of the two air gap spaces between the transducer and the target. **Make sure that the switch is stationary and perpendicular to the target before continuing.**

7. Press LOW for the first key-stroke and the Relay LED will blink three times.

8. Press LOW for the second key-stroke and the Relay LED will blink four times.

9. The Power LED will flash from AMBER to GREEN when the LOW set point has been accepted into memory.

10. Press SELECT to program the next relay channel or slide the RUN/CAL switch RIGHT to exit the CAL mode.



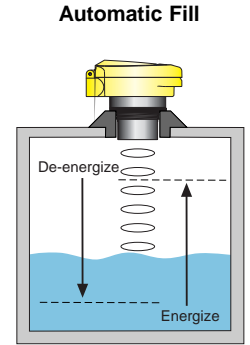
# PROGRAMMING

## Step Nine

**D. Programming Automatic Fill:** After having powered the switch with the appropriate supply voltage, entered the CAL mode, selected a relay channel and erased any previously input set points, follow the below procedure:

1. Stretch the tape measurer out to the appropriate distance in between the switch and target.

2. Position the switch at the desired LOW set point distance defined as the greater of the two air gap spaces between the transducer and the target. **Make sure that the switch is stationary and perpendicular to the target before continuing.**



3. Press the LOW button for the first key-stroke and the Relay LED will blink once.

4. Press the HIGH button for the second key-stroke and the Relay LED will blink twice.

5. The Power LED will flash from AMBER to GREEN when the LOW set point has been accepted into memory.

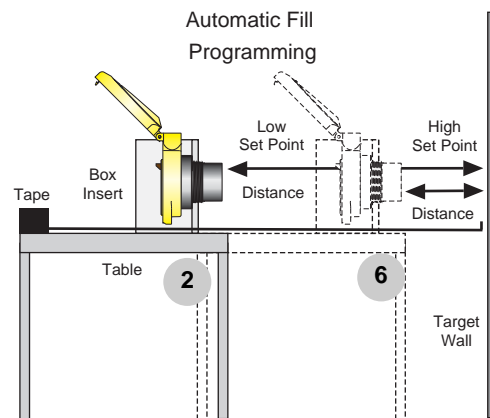
6. Position the switch at the desired HIGH set point distance defined as the lesser of the two air gap spaces between the transducer and the target. **Make sure that the switch is stationary and perpendicular to the target before continuing.**

7. Press the HIGH button for the first key-stroke and the Relay LED will blink three times.

8. Press the LOW button for the second key-stroke and the Relay LED will blink four times.

9. The Power LED will flash from AMBER to GREEN when the HIGH set point has been accepted into memory.

10. Press SELECT to program the next relay channel or slide the RUN/CAL switch RIGHT to exit the CAL mode.



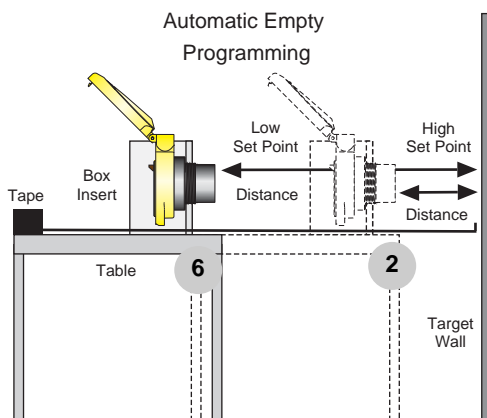
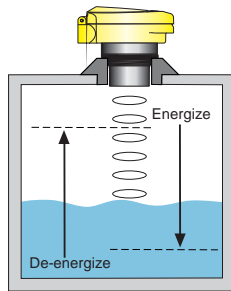
# PROGRAMMING

## Step Ten

**E. Programming Automatic Empty:** After having powered the switch with the appropriate supply voltage, entered the CAL mode, selected a relay channel and erased any previously input set points, follow the below procedure:

1. Stretch the tape measurer out to the appropriate distance in between the switch and target.
2. Position the switch at the desired HIGH set point distance defined as the lesser of the two air gap spaces between the transducer and the target. **Make sure that the switch is stationary and perpendicular to the target before continuing.**
3. Press the HIGH button for the first key-stroke and the Relay LED will blink once.
4. Press the LOW button for the second key-stroke and the Relay LED will blink twice.
5. The Power LED will flash from AMBER to GREEN when the HIGH set point has been accepted into memory.
6. Position the switch at the desired LOW set point distance defined as the greater of the two air gap spaces between the transducer and the target. **Make sure that the switch is stationary and perpendicular to the target before continuing.**
7. Press the LOW button for the first key-stroke and the Relay LED will blink three times.
8. Press the HIGH button for the second key-stroke and the Relay LED will blink four times.
9. The Power LED will flash from AMBER to GREEN when the LOW set point has been accepted into memory.
10. Press SELECT to program the next relay channel or slide the RUN/CAL switch RIGHT to exit the CAL mode.

Automatic Empty



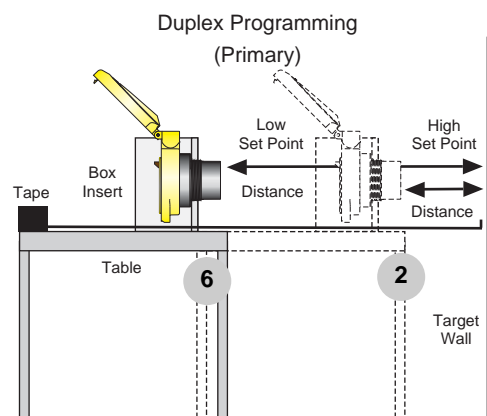
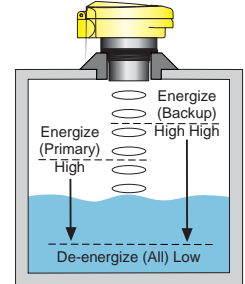
# PROGRAMMING

## Step Eleven

**Programming Duplexing Pump Control:** After having powered the switch with the appropriate supply voltage, entered the CAL mode, **selected relay channel 1** and erased any previously input set points, follow the below procedure:

1. Stretch the tape measurer out to the appropriate distance in between the switch and target.
2. Position the switch at the desired HIGH set point distance defined as the lesser of the two air gap spaces between the transducer and the target. **Make sure that the switch is stationary and perpendicular to the target before continuing.**
3. Press the HIGH button for the first key-stroke and the Relay LED will blink once.
4. Press the LOW button for the second key-stroke and the Relay LED will blink twice.
5. The Power LED will flash from AMBER to GREEN when the HIGH set point has been accepted into memory.
6. Position the switch at the desired LOW set point distance defined as the greater of the two air gap spaces between the transducer and the target. **Make sure that the switch is stationary and perpendicular to the target before continuing.**
7. Press the LOW button for the first key-stroke and the Relay LED will blink three times.
8. Press the HIGH button for the second key-stroke and the Relay LED will blink four times.
9. The Power LED will flash from AMBER to GREEN when the LOW set point has been accepted into memory.
10. Press SELECT to program relay channel 2.

Duplex

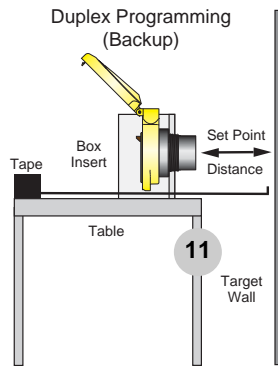


11. Position the switch at the desired HIGH HIGH set point distance defined as the air gap space between the transducer and the target. **Make sure that the switch is stationary and perpendicular to the target before continuing.**

# PROGRAMMING

## Step Twelve

### Programming Duplex Pump Control (continued):

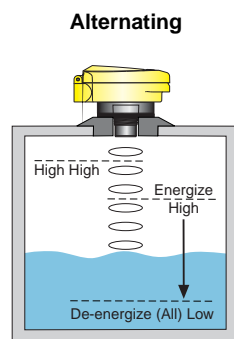


12. Press the HIGH button for the first key-stroke and the Relay LED will blink once.
13. Press the HIGH button again for the second key-stroke and the Relay LED will blink twice.
14. The Power LED will flash from AMBER to GREEN when the set point has been accepted into memory.
15. Press the SELECT switch repeatedly until BOTH LEDs for Relay 1 and Relay 2 are ON (after Relay 3).
16. Press the HIGH button for the first key-stroke and Relay LED will blink once.
17. Press the HIGH button again for the second key-stroke and Relay LED will blink twice.
18. Press SELECT to program the next relay channel or slide the RUN/CAL switch RIGHT to exit the CAL mode.

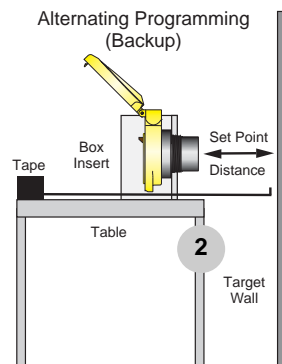
**Note:** The duplexing mode can be disabled by repeating Steps #15-18 and pressing the LOW button instead of the HIGH button in the HIGH/HIGH combination.

### Programming Alternating Control Only:

1. To program the switch for alternating control only without the lead-lag function, follow the instructions for Programming Duplexing Pump Control (Steps 11 and 12). The difference between Duplexing and Alternation is the location of the Relay 2 set point. Set Relay 2 close to the deadband without crossing into the deadband and above the highest level of expected liquid.

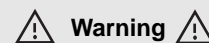
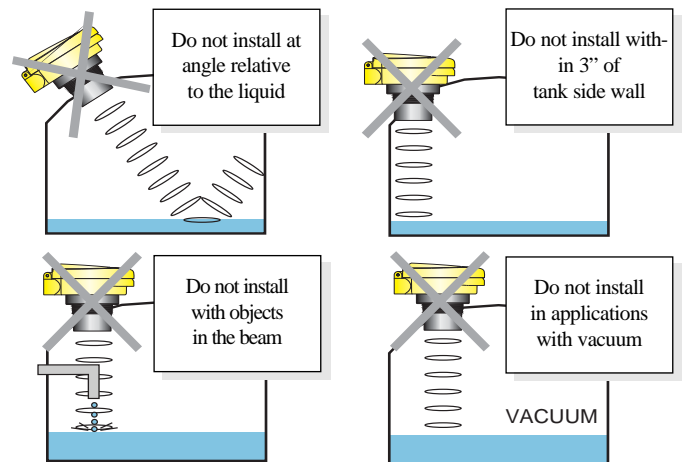


**Note:** The alternation mode can be disabled by repeating Steps #15-18 and pressing the LOW button instead of the HIGH button in the HIGH/HIGH combination.



# INSTALLATION

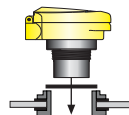
## Step Thirteen



**Warning**

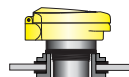
**Install the appropriate installation fitting. Make sure that the fitting and switch threads are not damaged or worn. Install the switch with the included Viton mounting gasket. Hand tighten the switch within the fitting. Perform an installed leak test under normal process conditions prior to system start up.**

### Gasket



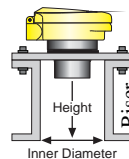
**A. Fitting Selection:** Check the switch part number to determine the required fitting mount size and thread type. The switch is commonly installed in tank adapters, flanges, brackets or stand pipes.

### Adapter



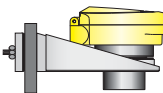
1. **Adapter:** Select a tank adapter fitting with minimal height so as to ensure that the installed transducer will not be substantially elevated into the fitting. Avoid tank adapter styles with threads and/or pipe stops forward of the installed transducer.

### Flange on Riser



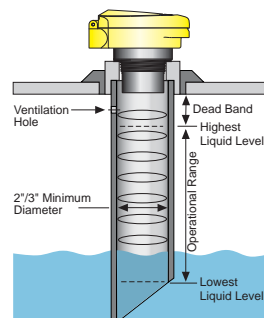
2. **Flange:** Tall flanges with narrow risers impede the acoustic signal. Select a fitting with the right riser height versus inner diameter geometry. The switch may be elevated up to 12" (30 cm) in a 6" (15 cm) riser, 8" (20 cm) in a 4" (10 cm) riser and 3" (7.6 cm) in a 2" (5 cm) riser.

### Bracket



3. **Bracket:** A LVM-30 side mount bracket or equivalent can be used for open tank top installations against the side wall.

### Stand Pipe

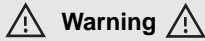


4. **Stand Pipe:** A stand pipe may be used to dampen turbulence or separate surface foam. Select a 2" or larger pipe for model LVCN704/709. Select a 3" or larger pipe for model LVCN716/726. The pipe length should run the measurement span. Cut a 45° notch at the bottom of the pipe and drill a 1/4" pressure equalization hole high in the dead band.



# WIRING

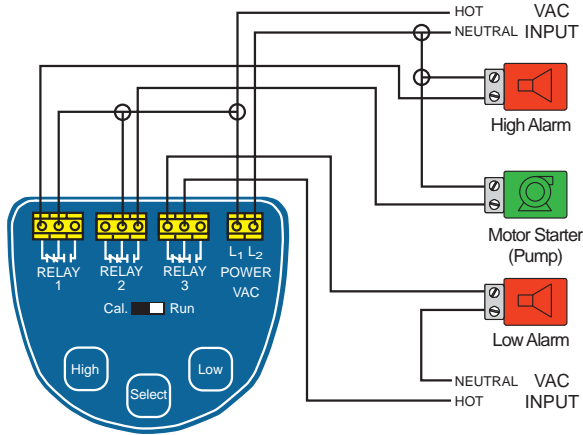
## Step Fourteen



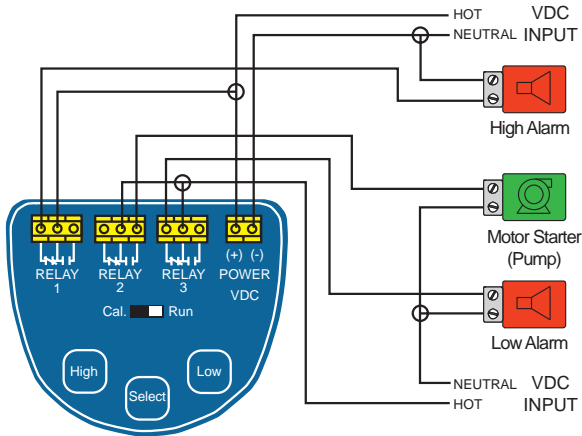
**Warning**

To prevent damaging the relays, the use of an appropriate motor starter or secondary relay is ALWAYS recommended when actuating pumps or valves.

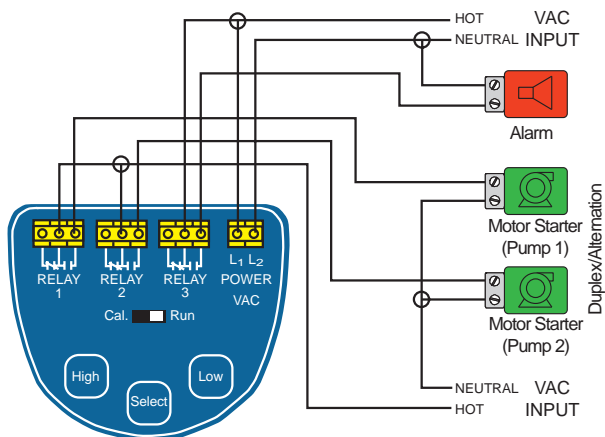
### A. Wiring a LVCN700 series (95-250 VAC) to a Pump (Automatic Fill or Empty) and (Independent High and Low) Alarms



### B. Wiring a LVCN700-DC (12-28 VDC) to a Pump (Automatic Fill or Empty) and (Independent High and Low) Alarms



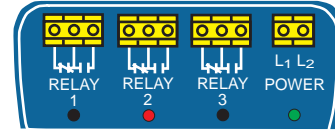
### C. Wiring a LVCN700 (95-250 VAC) to Pumps (Duplex or Alternating) and Alarm (Out of Bounds, High or Low)



# TROUBLESHOOTING

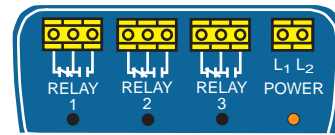
## Step Fifteen

**A. Power LED SOLID GREEN in RUN Mode:** During normal operation in the RUN mode, the Power LED will remain solid GREEN indicating that the switch has power and is tracking the level. The RED Relay LEDs will be ON or OFF as programmed per the current level state.



**RED** (Solid ON or OFF) **Green** (Solid ON)

**B. Power LED AMBER in RUN Mode:** If while in the RUN mode, the Power LED turns solid AMBER, this indicates that the switch has power, but is not tracking the level and has entered into its FAIL-SAFE mode. Coincidentally, all Relay LEDs will be OFF, indicating that the relays are in their de-energized safe-state. The switch will remain in the FAIL-SAFE mode until such time that it re-acquires the level and automatically returns to normal operation as programmed. Check the following points in determining why the switch is not tracking the level:



**RED** (All OFF) **Amber** (Solid ON)

**Application** 1. Observe and attempt to correlate an application event such as foaming, substantial vapor and/or turbulence that may reduce or eliminate the acoustic signal strength. Read the Maximum Applied Range (Step #4-E) and consider reinstalling the switch in a Stand-Pipe (Step #11-A-4) to dampen turbulence and/or separate the point of measurement from surface foam and/or vapor.

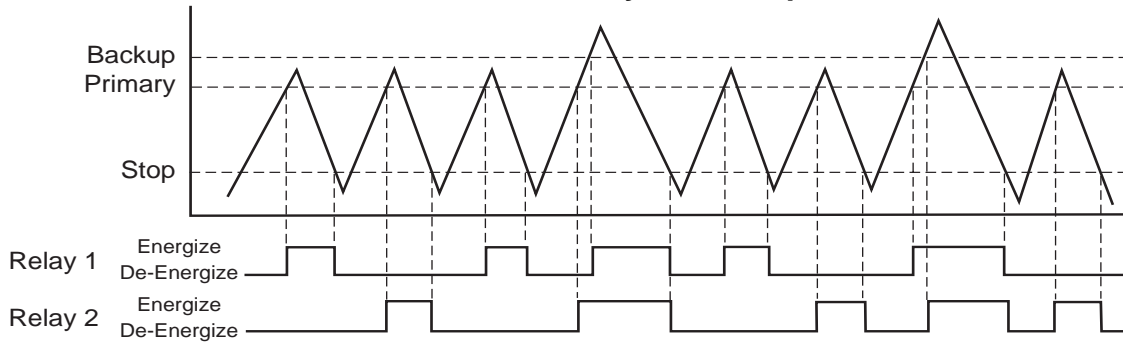
**Installation** 2. Verify the switch is installed correctly per the INSTALLATION section (Step #11) of this manual. Initially focus on the fitting and/or obstructions within the beam that may reduce or eliminate the acoustic signal transmission-receipt. Consider changing the fitting or relocating the switch to another area of the tank.

3. Verify that the tank height is not greater than the maximum range of the switch. If so, purchase and install a switch with the appropriate range for your tank height or level distance.

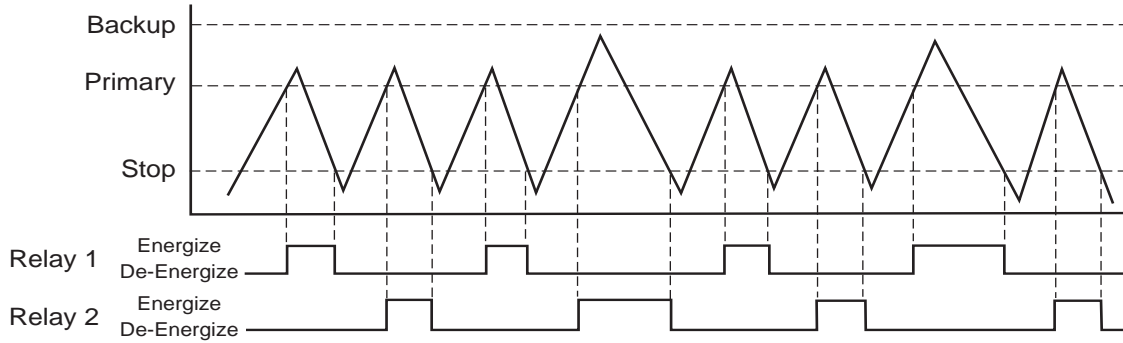
**C. Relay LED Changes State, But Relay Doesn't Change:** Verify that the switch is wired correctly per the WIRING section (Step #12) of this manual. If so, the Relays may have been damaged due to a high inductive load or carbon build-up over time.

**Functional Chart for Relay On/Off Operations**

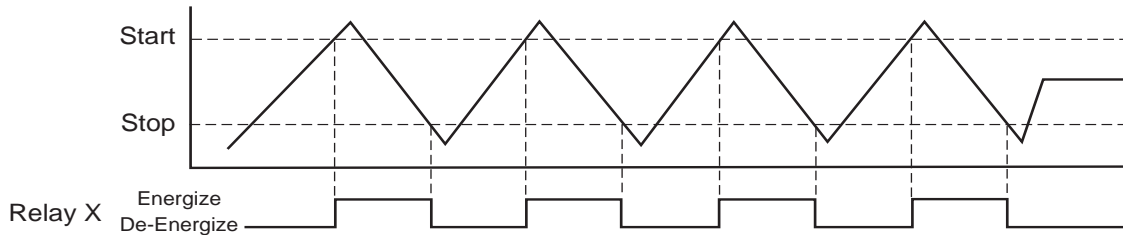
**Duplexing Control Operation**



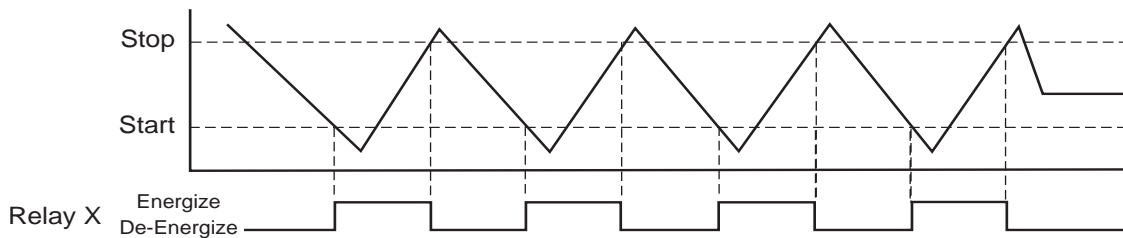
**Alternating Control Operation**



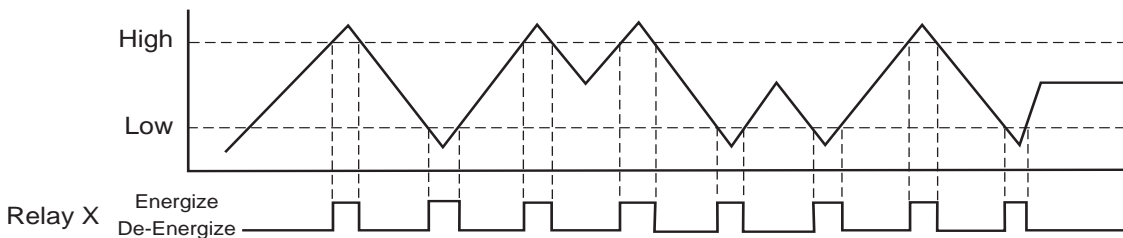
**Automatic Empty Operation**



**Automatic Fill Operation**



**Out of Bounds Operation**



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