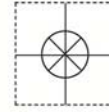


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# User's Guide



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# LVCN1700 Series Ultrasonic Level Controller



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It is the policy of OMEGA Engineering, Inc. 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 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, human applications.

The LVCN1700 Series is a general-purpose ultrasonic level switch that provides the end user the ability to control up to three unique devices (pump, valves and/or alarms) through an advanced non-contact technology. LVCN1700 Series features push button configuration that uses real engineering values for setting up the relay operation(s). One relay has SPDT Form “C” contacts useful for controlling a valve and the other two relays are SPST Form “A”. All of the relays can be used for controlling valves, pumps or alarms.

**Features**

- Simple digital push button configuration.
- Pump simplex, duplex and triplex option.
- Integrated timer for pump / valve delay and pump alternation.
- Available in a 3m (9.8’), 5.5m (18.0’) or 8m (26.2’) maximum range.
- Isolated 4/20 mA loop output for indicating level.
- AC powered

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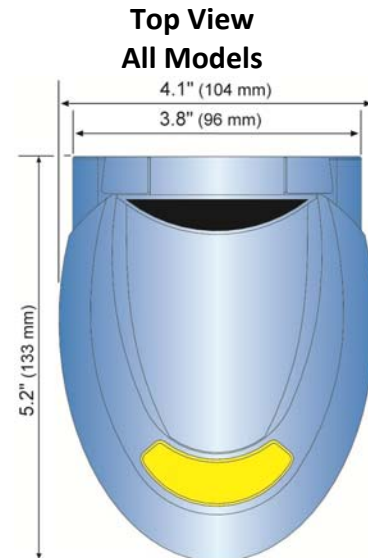
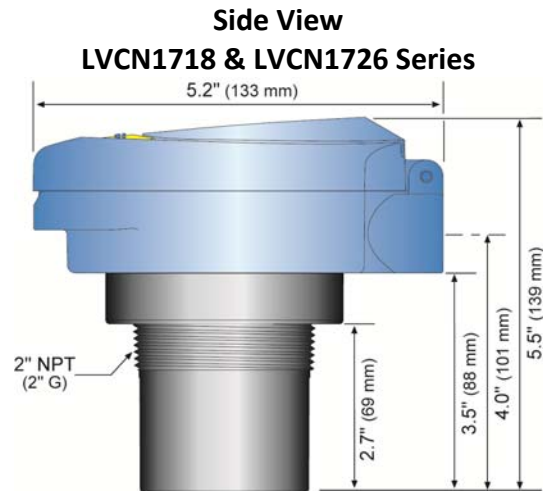
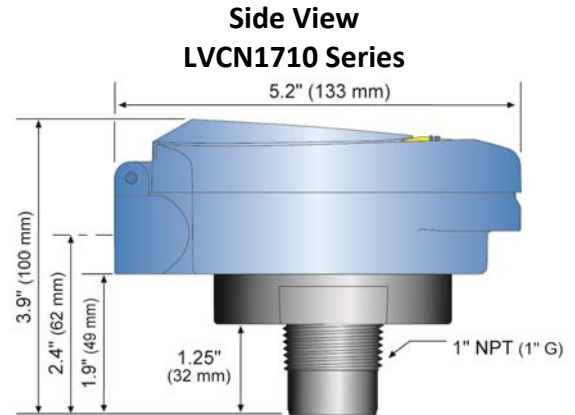
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**SPECIFICATIONS/DIMENSIONS**

**Step Two**

Range:	LVCN1710: 4" to 9.8' (10 cm to 3m)	LVCN1718: 8" to 18.0' (20 cm to 5.5m)	LVCN1726: 8" to 26.2' (20 cm to 8m)
Repeatability:	0.25" (6.35 mm)		
Loop Output:	Isolated, Sinking 12 to 28 VDC		
Dead band:	LVCN1710: 4" (10 cm) LVCN1718: 8" (20 cm) LVCN1726: 8" (20 cm)		
LCD indication:	Level and relay status, 6 character		
Configuration:	Push button, digital (3)		
Supply voltage:	95-250 VAC, 20W @ 120 VAC		
Contact type:	Relay 1, SPDT relays Relay 2 and 3, SPST, N.O. All commons connected together		
Contact rating:	2A, 30 VDC 60 W (DC), 125 VA 220 VDC, 250 VAC		
Contact fail-safety:	Programmable / selectable		
Temp. comp.:	Automatic		
Electronics temp.:	F: -40° to 140° C: -40° to 60°		
Pressure:	MWP = 30 PSI		
Enclosure rating:	NEMA 4X (IP65)		
Enclosure vent:	Water tight membrane		
Encl. material:	Polycarbonate		
Encl. hardware:	Brass and stainless		
Trans. material:	PVDF		
Process mount:	LVCN1710: 1" NPT (G) LVCN1718: 2" NPT (G) LVCN1726: 2" NPT (G)		
Mount. gasket:	FKM		
Conduit entrance:	Dual, 1/2" NPT		
Classification:	General purpose		
Compliance:	RoHS		
Approvals:	CE		



**About this Manual:** PLEASE READ THE ENTIRE MANUAL PRIOR TO INSTALLING OR USING THIS PRODUCT. This manual includes information on the LVCN1700 Series Ultrasonic Level Controller from OMEGA ENGINEERING. 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 ENGINEERING 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 FKM gasket and never over tighten 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 LVCN1700 Series. Electrical wiring of the switch should be performed in accordance with all applicable national, state, and local codes.

**Material Compatibility:** The enclosure is made of Polycarbonate (PC). 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 switch housing is liquid-resistant the LVCN1700 Series 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.

The enclosure has a flip cover with dual 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. Loosen the locking screw located at the top front of the enclosure. 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.

**Handling Static-Sensitive Circuits/Devices:** When handling the transmitter, the technician should follow these guidelines to reduce any possible electrostatic charge build-up on the technician's 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.
4. Wipe unit with a damp cloth when cleaning.

**Make a Fail-Safe System:** Design a fail-safe system that accommodates the possibility of switch and/or power failure. OMEGA ENGINEERING recommends the use of redundant backup systems and alarms in addition to the primary system. Adding a redundant high level float switch to the system is a cost effective means to prevent costly tank overflows.

The switch has (3) relay channels. Normally open (NO) or normally closed (NC) operation is user selected based on the desired system control and fail-safe logic when the ultrasonic instrument loses its return signal due to situations such as foam in the tank. Always design a fail-safe system that accommodates for the possibility of functional and/or power failure to the instrument. The "normal" relay state is where the relay coil is de-energized and the relay indicator 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.

**Flammable, Explosive or Hazardous Applications:** *LVCN1700 Series should not be used within classified hazardous environments.*

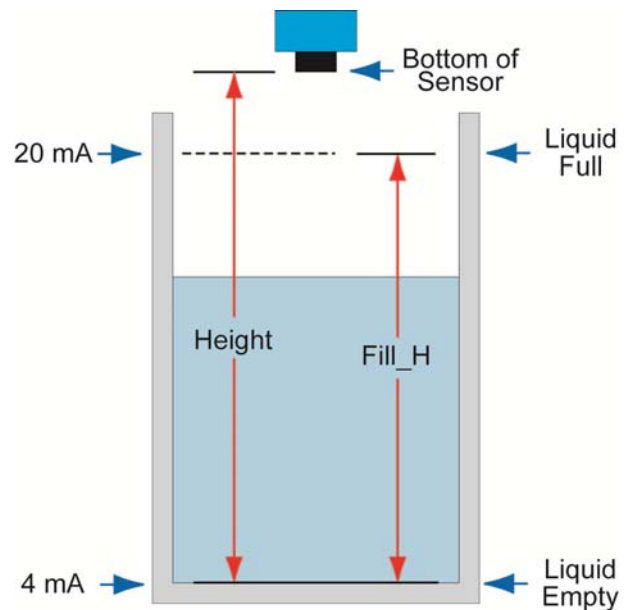
**Components:** LVCN1700 Series is offered in three different models. Come complete with LVCN1700 Series Level Controller, FKM Gasket and Owner's Manual.

- LVCN1700 Series
  - LVCN1710 - 9.8' (3 m) range, Type 4X encl., 1" NPT
  - LVCN1710-G - 9.8' (3 m) range, Type 4X encl., 1" G
  - LVCN1718 - 18.0' (5.5 m) range, Type 4X encl., 2" NPT
  - LVCN1718 -G - 18.0' (5.5 m) range, Type 4X encl., 2" G
  - LVCN1726 - 26.2' (8 m) range, Type 4X encl., 2" NPT
  - LVCN1726-G - 26.2' (8 m) range, Type 4X encl., 2" G
- FKM Gasket
  - Part #200128 for LVCN1710 series
  - Part #220129 for LVCN1718 or LVCN1726 series
- Owner's Manual

LVCN1700 Series can be configured before installation. The switch features non-volatile memory, so the set points configured before installation will not be lost when the switch is powered down. To start, all you need is the following information:

- Basic Tank Information
  - HEIGHT – Distance from the transducer face to the bottom of the tank.
  - FILL-H – Maximum fill height of the liquid from the bottom of the tank.
- Set Points:
  - You will need the measured distance from the bottom of the tank to each set point. These values will all be in the same distance value (inches, centimeters, feet or meters) and will all be measured from the bottom of the tank.
- Power:
  - Provide input power to the LVCN1700 Series

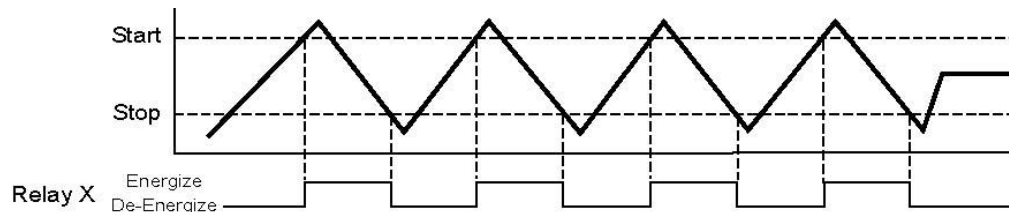
**Note:** The Height and Fill-Height settings also determine the 4 to 20 mA current span. The Height setting determines the 4mA position and the Fill-H setting determines the 20 mA position.



**Getting Around the Menu:** LVCN1700 Series is configured by the use of three push buttons (UP, DOWN and SELECT) and a LCD display. As a lockout feature, the buttons are inactive until the SELECT button is held down for 5 seconds, and then the display will begin to scroll through the top level of the configuration menu.

### Top Level

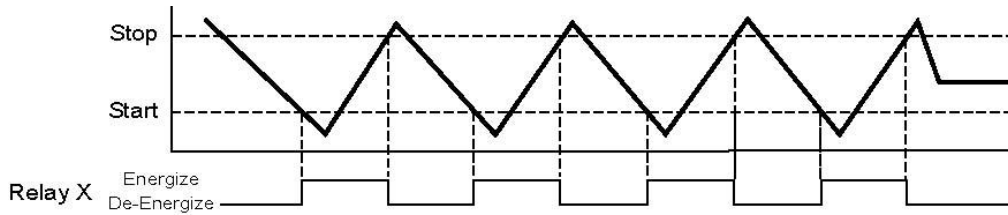
- The Configuration menu will continue to scroll through the items below until the **SELECT** button is pressed.
  - **UNITS – TANK – RELAY 1 – RELAY 2 – RELAY 3 – SAFE – (MPLEX) - HELP - RUN**
- To return to the Operational mode of LVCN1700 Series, press SELECT while RUN appears in the display.
- **UNITS** – Allows end user to select the units for configuration and operation. Select between Inches, Centimeters, Feet, Meters or Percent. Press EXIT to return to the Top Level menu.
- **TANK** – Allows the end user to configure the operational range for the switch.
  - **HEIGHT** – Distance from the transducer face to the bottom of the tank.
  - **FILL-H** – Maximum fill height of the liquid from the bottom of the tank.
  - **Note:** *The 4/20 mA points are set by setting these two points. The 20 mA point is at the Fill-H and the 4 mA point is at the bottom of the tank.*
  - Press Exit to return to the Top level Menu
  - **Note:** *if UNITS is set to Percent, then TANK will not appear. To view TANK, set UNITS to any of the following: Inches, Centimeters, Feet or Meters*
- **RELAY 1, RELAY 2 or RELAY 3** – Allows end user to configure the function and operation of each relay. Each relay has a small black circle that appears when the relay is energized. When the relay is de-energized, the black circle disappears.
  - **PUMP** – Pump operation allows for two separate level set points (Relay ON and Relay OFF). Choose between the EMPTY or FILL operation. Both operations require setting a level for ON and another level for OFF
    - **EMPTY** – used to control a pump that empties a tank.



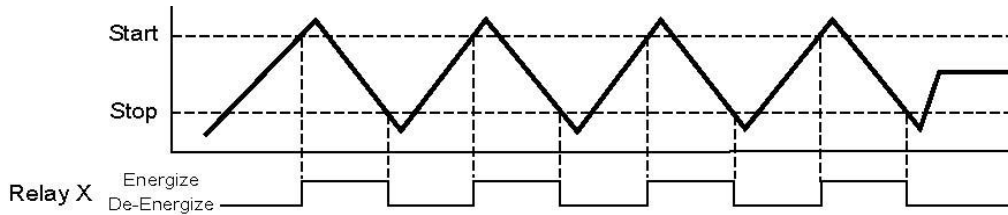
- Typically, Relay ON is the HIGH set point and Relay OFF the LOW set point. Relay will energize at the high set point (ON) and remain on until the level reaches the low set point (OFF) and will remain off until the level returns to the high set point (ON).



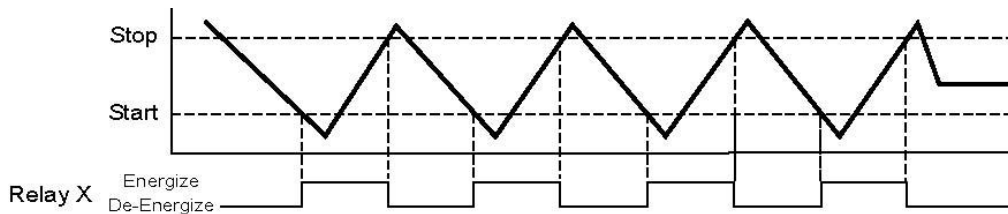
- **FILL** – used to control a pump that fills a tank.



- Typically, Relay ON is the LOW set point and Relay OFF the HIGH set point. Relay will energize at the low set point (ON) and remain on until the level reaches the high set point (OFF) and will remain off until the level returns to the low set point (ON).
- **DELAY** – used as a start pump delay when the ON setting is reached. The delay pump (in seconds) will delay the start of the value for this period.
- **VALVE** – Valve operation allows for two separate level set points (Relay ON and Relay OFF). Choose between the EMPTY or FILL operation. Both operations require setting a level for ON and another level for OFF
  - **EMPTY** – used to control a valve that empties a tank.

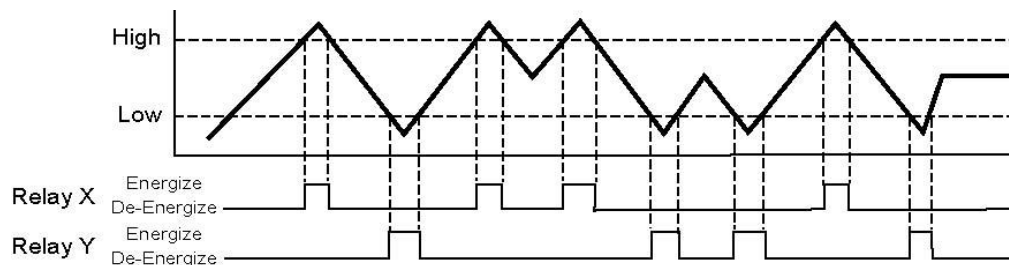


- Typically, Relay ON is the HIGH set point and Relay OFF the LOW set point. Relay will energize at the high set point (ON) and remain on until the level reaches the low set point (OFF) and will remain off until the level returns to the high set point (ON).
- **FILL** – used to control a valve that fills a tank.



- Typically, Relay ON is the LOW set point and Relay OFF the HIGH set point. Relay will energize at the low set point (ON) and remain on until the level reaches the high set point (OFF) and will remain off until the level returns to the low set point (ON).
- **DELAY** – used as a start valve delay when the ON setting is reached. The delay value (in seconds) will delay the start of the value for this period.

- **ALARM** – Alarm operation allows for a single set point (Relay ON and OFF at the same level). Choose between HIGH and LOW operation. Both operations will require a single set point and a setting for the Hysteresis (HYSTER)



- **HIGH** – used to control a High Level alarm. Relay will energize (ON) when the level is above the setting and will de-energize (OFF) when the level falls below the setting plus the added distance from the hysteresis (HYSTER).
  - **LOW** – used to control a Low Level alarm. Relay will energize (ON) when the level is below the setting and will de-energize (OFF) when the level rises above the setting plus the added distance from the hysteresis (HYSTER).
  - **HYSTER** – Used to reduce chatter by creating a hysteresis or differential for the Alarm set point. The HYSTER value will adjust the OFF position of the Alarm setting by the HYSTER value.
- **SAFE** – Each relay can be individually configured to its independent fail-safe setting. Choose between ON, OFF or HOLD
  - **ON** – Energizes the relay when a fail-safe condition occurs
  - **OFF** – De-energizes the relay when a fail-safe condition occurs
  - **HOLD** – Keeps the relay in its current state when a fail-safe condition occurs
  - **OUTPUT** – Sets the 4/20 mA output state when the echo is lost. The options are 4mA, 21mA and hold last value.
- **M-PLEX** – when two or three relays are configured as pumps, they can be inter-connected to alternate between each cycle. M-PLEX is only available when 2 or more relays are set for pumps. M-PLEX will not appear when only 1 relay is set for a pump or when the relay functions do not match (ex: Relay 1 set for a filling pump and Relay 2 set for an emptying pump). Selecting NO-ALT will turn OFF the M-PLEX.
- **HELP** – Provides setup information, the ability to reset the LVCN1700 Series and a simulation mode to test the relay function
  - **SETUP** – Will display the setting for all functions of LVCN1700 Series
  - **RESET** – Will reset the LVCN1700 Series back to its original factory setting
  - **SIM-T** – SIM (ulation)-T(est) will allow the end user to simulate changes to level to verify the relay settings. Using the UP and DOWN buttons will increase
  - **TEST P** – This is a production test feature used by the factory to confirm operation. ***This mode should only be used when supervised by a OMEGA Engineering representative.***
- **RUN** – Returns the unit to normal measurement and control mode

This section will take you through the key steps in the setup and configuration of the LVCN1700 Series:

- 1) *Select the units for configuration.*
  - a. Determine the measurement units that will be used to configure the sensor.
- 2) *Measure the distance from the bottom of the tank (empty level) to the bottom of the sensor.*
  - a. Be sure to include the added height of installation fittings.
- 3) *Measure the distance from the bottom of the tank (empty level) to the full level of liquid.*
  - a. Take into account the dead band of the sensor.
- 4) *Determine how many relays you will use and what each of their functions will be.*
  - a. Example: relay will fill a tank with a pump and relay 2 will provide a high alarm.
- 5) *Measure the distances from the bottom of the tank (empty level) to the positions for all of the relay functions.*
  - a. Pump and Valve functions will have typically have two set points, the level where the pump turns on and where it turns off or the level where the valve opens and closes.

#### **How to enter the MENU**

1. Press and hold SELECT key (approximately 5 seconds) until MENU is displayed.
2. The menu items will rotate through display.
3. Press SELECT to change an item.

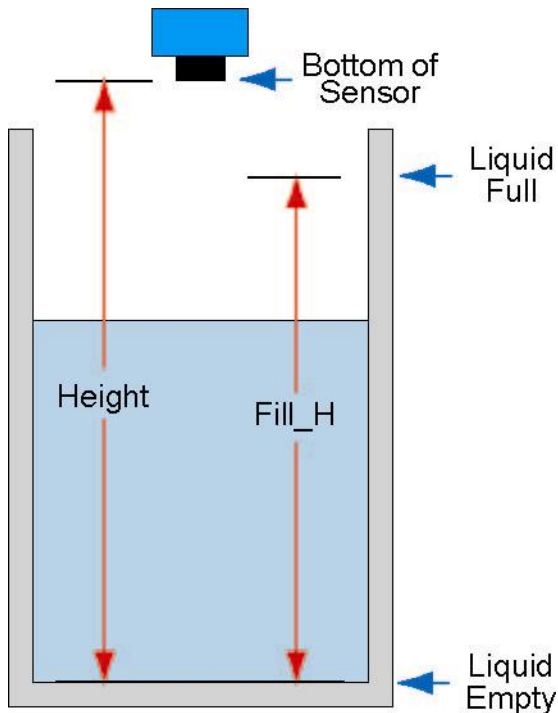
#### **How to configure UNITS**

1. In the MENU mode, press select when UNITS is display.
2. Press SELECT to choose between INCHES, CM (centimeter), FEET, METERS or PERCENT.
3. Select EXIT to return to the Top Level Menu.

#### **Note: Reading the level of liquid in Percent**

- OMEGA Engineering recommends that when selecting PERCENT, configure the Height and Fill\_H settings before selecting PERCENT in order to span the LVCN1700 Series for your application requirements.
- When in PERCENT, the operational span will be based upon the last TANK settings, 100% will occur at the Fill-H level and 0 percent at the bottom of the tank.
- When PERCENT is selected, the TANK settings (Height and Fill\_H) will be disabled.

## How to configure the Operational range of LVCN1700 Series



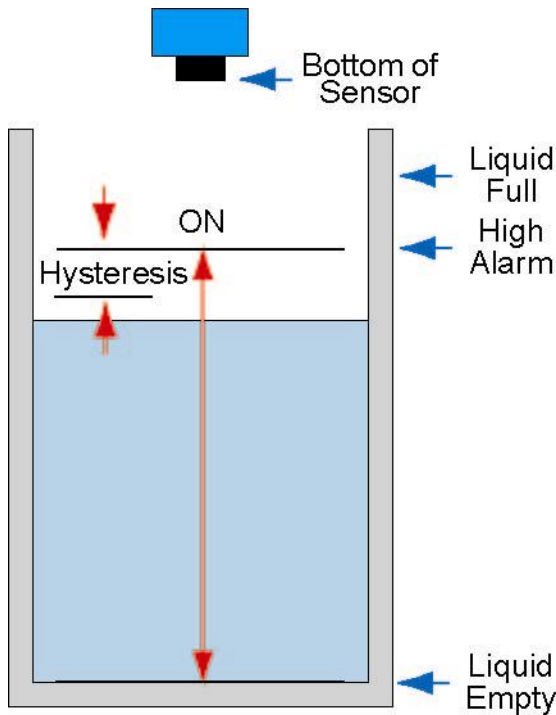
No cumbersome measurement is required via Target Calibration to establish set points. All set point distances are relative to the tank bottom

1. In MENU mode, select the TANK item
2. Select HEIGHT.
3. Using the UP and DOWN buttons, set the HEIGHT of the tank from the transducer face to the bottom of the tank.
4. To enter the value, press and hold SELECT (Approximately 2 seconds) until SAVED is displayed.
5. When FILL-H appears, press SELECT.
6. Using the UP and DOWN buttons, set the Fill Height (FILL-H) to the maximum fill height of the liquid from the bottom of the tank.
7. Press and hold SELECT (2 seconds) to enter the value.
8. Select EXIT to return to Top Level Menu.

**Note:** The Height and Fill-Height settings also determine the 4 to 20 mA current span. The Height setting determines the 4mA position and the Fill-H setting determines the 20 mA position.

**Note:** To speed up the scrolling of the values on the display, hold down the SELECT button while holding down the UP or DOWN buttons.

How to set a HIGH ALARM

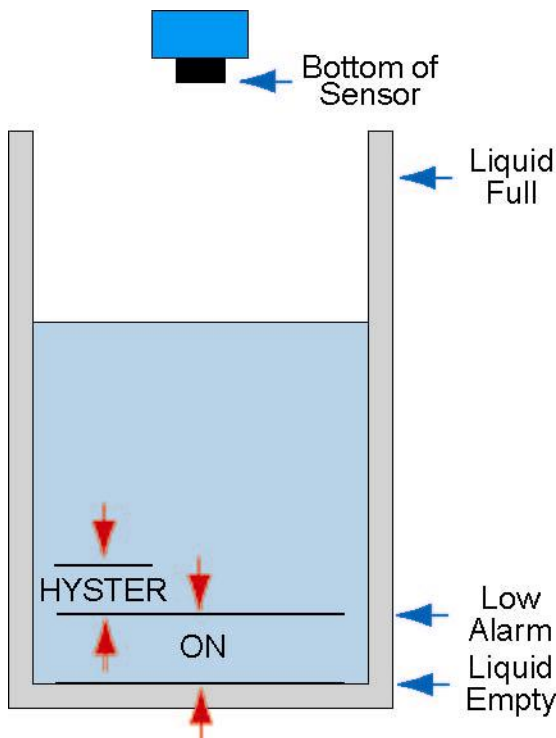


1. In MENU mode, when the relay you wish to program is appears, press SELECT.
2. When ALARM appears, press SELECT.
3. When HIGH appears, press SELECT.
4. Using the UP and DOWN buttons, set the HIGH (ON) set point for the relay.
5. To enter the value, press and hold SELECT (Approximately 2 seconds) until SAVED is displayed.
6. When HYSTER appears, press SELECT.
7. Hysteresis [HYSTER] is the distance away from the original ON setting where the Alarm will turn OFF.
8. Using the UP and DOWN buttons, set the HYSTER (OFF) set point for the relay.
9. Press and hold SELECT (2 seconds) to enter the value.
10. Select EXIT to return to Top Level Menu.

**Note:** The hysteresis (HYSTER) setting can be used to eliminate chattering of the relay.

**Note:** To speed up the scrolling of the values on the display, hold down the SELECT button while holding down the UP or DOWN buttons.

How to set a LOW ALARM

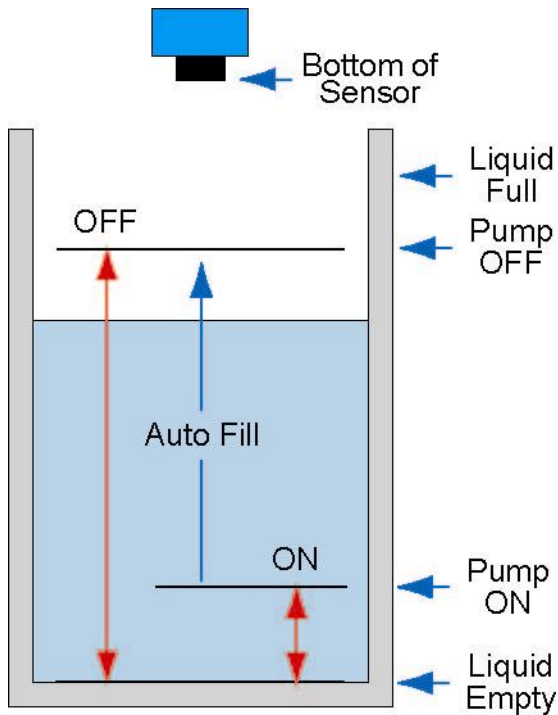


1. In MENU mode, when the relay you wish to program is appears, press SELECT.
2. When ALARM appears, press SELECT.
3. When LOW appears, press SELECT.
4. Using the UP and DOWN buttons, set the LOW (ON) set point for the relay.
5. To enter the value, press and hold SELECT (Approximately 2 seconds) until SAVED is displayed.
6. When HYSTER appears, press SELECT.
7. Hysteresis [HYSTER] is the distance away from the original ON setting where the Alarm will turn OFF.
8. Using the UP and DOWN buttons, set the HYSTER (OFF) set point for the relay.
9. Press and hold SELECT (2 seconds) to enter the value.
10. Select EXIT to return to Top Level Menu.

**Note:** The hysteresis (HYSTER) setting can be used to eliminate chattering of the relay.

**Note:** To speed up the scrolling of the values on the display, hold down the SELECT button while holding down the UP or DOWN buttons.

## How to Fill a tank/vessel with a pump.



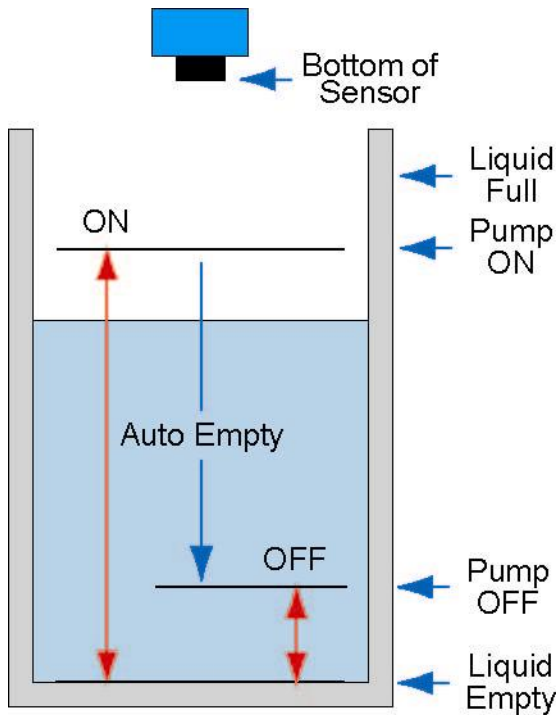
1. In MENU mode, when the relay you wish to program is appears, press SELECT.
2. When PUMP appears, press SELECT.
3. When FILL appears, press SELECT.
4. When ON appears, press SELECT.
5. Using the UP and DOWN buttons, set the ON set point for the relay. The ON setting is always the level where the relay will energize and will be the lower level between the two set points.
6. To enter the value, press and hold SELECT (Approximately 2 seconds) until SAVED is displayed.
7. When OFF appears, press SELECT.
8. Using the UP and DOWN buttons, set the OFF set point for the relay. The OFF setting is always the level where the relay will de-energize and will be the higher level between the two set points.
9. Press and hold SELECT (2 seconds) to enter the value.

If you want to add a delay when the PUMP starts, continue on to step 10. If no delay is required, jump to step 13.

10. When DELAY appears, press SELECT.
11. Using the UP and DOWN buttons, set the DELAY time in seconds. Pump delay can be set from 0 to 600 seconds.
12. Press and hold SELECT (2 seconds) to enter the value.
13. Select EXIT to return to Top Level Menu.

**Note:** To speed up the scrolling of the values on the display, hold down the SELECT button while holding down the UP or DOWN buttons.

## How to Empty a tank/vessel with a pump.



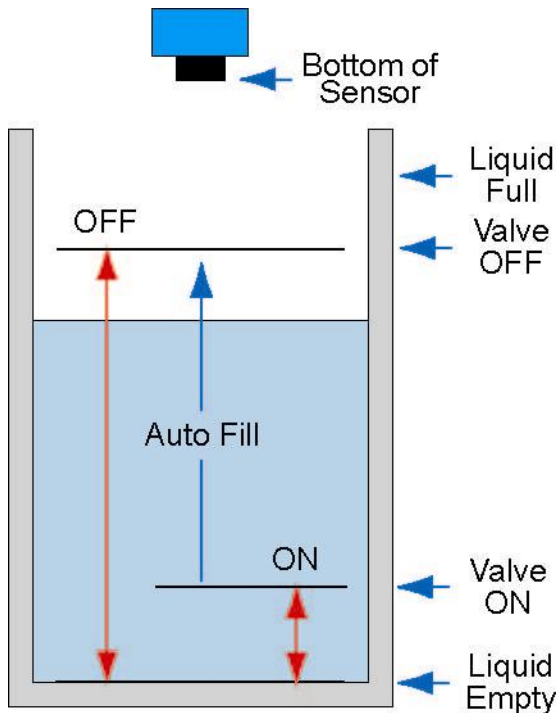
1. In MENU mode, when the relay you wish to program is appears, press SELECT.
2. When PUMP appears, press SELECT.
3. When EMPTY appears, press SELECT.
4. When ON appears, press SELECT.
5. Using the UP and DOWN buttons, set the ON set point for the relay. The ON setting is always the level where the relay will energize and will be the higher level between the two set points.
6. To enter the value, press and hold SELECT (Approximately 2 seconds) until SAVED is displayed.
7. When OFF appears, press SELECT.
8. Using the UP and DOWN buttons, set the OFF set point for the relay. The OFF setting is always the level where the relay will de-energize and will be the lower level between the two set points.
9. Press and hold SELECT (2 seconds) to enter the value.

If you want to add a delay when the PUMP starts, continue on to step 10. If no delay is required, jump to step 13.

10. When DELAY appears, press SELECT.
11. Using the UP and DOWN buttons, set the DELAY time in seconds. Pump delay can be set from 0 to 600 seconds.
12. Press and hold SELECT (2 seconds) to enter the value.
13. Select EXIT to return to Top Level Menu.

**Note:** To speed up the scrolling of the values on the display, hold down the SELECT button while holding down the UP or DOWN buttons.

## How to Fill a tank/vessel with a valve.



1. In MENU mode, when the relay you wish to program is appears, press SELECT.
2. When VALVE appears, press SELECT.
3. When FILL appears, press SELECT.
4. When ON appears, press SELECT.
5. Using the UP and DOWN buttons, set the ON set point for the relay. The ON setting is always the level where the relay will energize and will be the lower level between the two set points.
6. To enter the value, press and hold SELECT (Approximately 2 seconds) until SAVED is displayed.
7. When OFF appears, press SELECT.
8. Using the UP and DOWN buttons, set the OFF set point for the relay. The OFF setting is always the level where the relay will de-energize and will be the higher level between the two set points.
9. Press and hold SELECT (2 seconds) to enter the value.

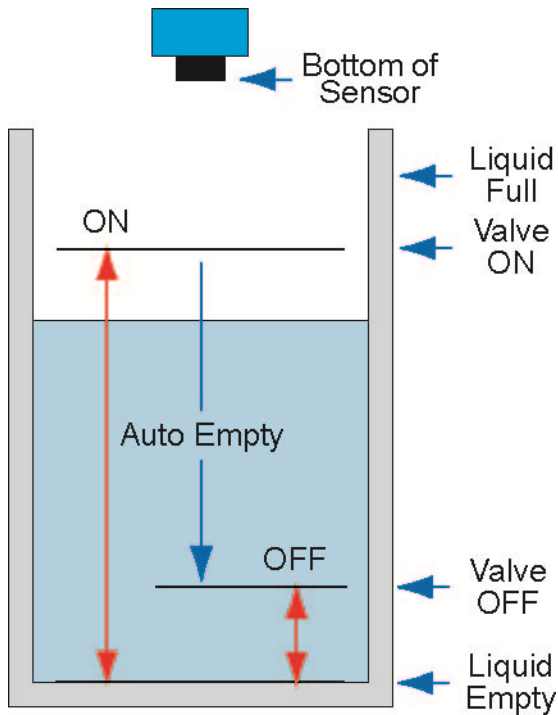
If you want to add a delay when the VALVE starts, continue on to step 10. If no delay is required, jump to step 13.

10. When DELAY appears, press SELECT.
11. Using the UP and DOWN buttons, set the DELAY time in seconds. Valve delay can be set from 0 to 600 seconds.
12. Press and hold SELECT (2 seconds) to enter the value.
13. Select EXIT to return to Top Level Menu.

**Note:** To speed up the scrolling of the values on the display, hold down the SELECT button while holding down the UP or DOWN buttons.



## How to Empty a tank/vessel with a valve.



1. In MENU mode, when the relay you wish to program is appears, press SELECT.
2. When VALVE appears, press SELECT.
3. When EMPTY appears, press SELECT.
4. When ON appears, press SELECT.
5. Using the UP and DOWN buttons, set the ON set point for the relay. The ON setting is always the level where the relay will energize and will be the higher level between the two set points.
6. To enter the value, press and hold SELECT (Approximately 2 seconds) until SAVED is displayed.
7. When OFF appears, press SELECT.
8. Using the UP and DOWN buttons, set the OFF set point for the relay. The OFF setting is always the level where the relay will de-energize and will be the lower level between the two set points.
9. Press and hold SELECT (2 seconds) to enter the value.

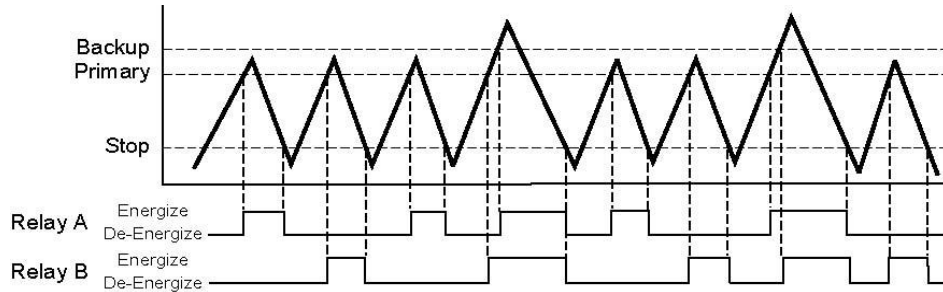
If you want to add a delay when the VALVE starts, continue on to step 10. If no delay is required, jump to step 13.

10. When DELAY appears, press SELECT.
11. Using the UP and DOWN buttons, set the DELAY time in seconds. Valve delay can be set from 0 to 600 seconds.
12. Press and hold SELECT (2 seconds) to enter the value.
13. Select EXIT to return to Top Level Menu.

**Note:** To speed up the scrolling of the values on the display, hold down the SELECT button while holding down the UP or DOWN buttons.

**How to Duplex two relays**

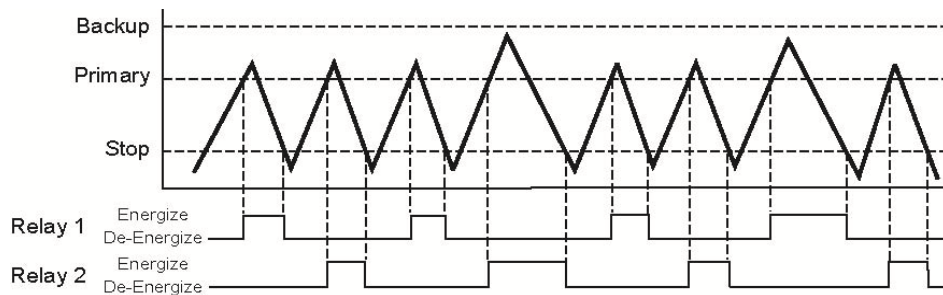
Duplex enables LVCN1700 Series to use two relays to alternate after each cycle while performing a lead-lag operation. To begin, configure two relays in the same mode (ex: two relays are set as PUMPS that FILL or two relays set as PUMPS that EMPTY). Be sure to set one relay with an ON Set Point at the Primary Level and the other relay ON Set Point at the Backup Level. Setting the relays with the same ON level will have cause both relays to turn on at the same time. Once this is completed, see the steps below. Example below shows two relays (A and B) used to Auto Empty a tank:



1. Make sure at least two relays are in the same mode for pumps. If this is not true, then M-PLEX will not appear.
  2. When M-PLEX appears, press SELECT.
  3. When DUPLEX appears, press SELECT.
- If three relays are configured in the same mode, continue to step 4. If not, jump to step 5.
4. LVCN1700 Series will allow you to select which two of three relays you would like to duplex. When the correct combination of relays (R1\_R2, R2\_R3 or R1\_R3) is shown, press SELECT.
  5. Select EXIT to return to Top Level Menu.

**How to Alternate two relays**

Alternate enables LVCN1700 Series to use two relays to alternate after each cycle. The configuration of Alternate is identical to Duplex with the exception of the Backup level is at a setting where the level will never achieve set point. To begin, configure two relays in the same mode (ex: two relays are set as PUMPS that FILL or two relays set as PUMPS that EMPTY). Be sure to set one relay with an ON Set Point at the Primary Level and the other relay ON Set Point at the Backup Level. Setting the relays with the same ON level will have cause both relays to turn on at the same time. The Backup level must be set to a level out of range (level will never reach this setting). Once this is completed, see the steps below. Example below shows two relays (A and B) used to Auto Empty a tank:



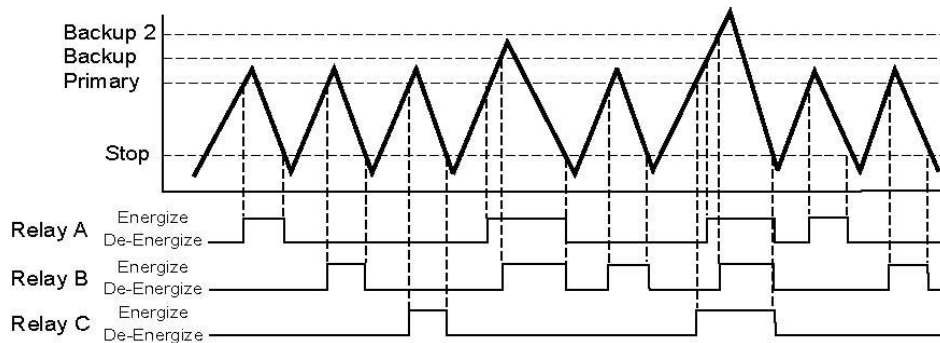
1. Make sure at least two relays are in the same mode for pumps. If this is not true, then M-PLEX will not appear.
2. When M-PLEX appears, press SELECT.
3. When DUPLEX appears, press SELECT.

If three relays are configured in the same mode, continue to step 4. If not, jump to step 5.

4. LVCN1700 Series will allow you to select which two of three relays you would like to duplex. When the correct combination of relays (R1\_R2, R2\_R3 or R1\_R3) is shown, press SELECT.
5. Select EXIT to return to Top Level Menu.

**How to Triplex three relays**

Triplex enables LVCN1700 Series to use three relays to alternate after each cycle while performing a lead lag-lag operation. To begin, configure all three relays in the same mode (ex: all relays are set as PUMPS that FILL or all relays set as PUMPS that EMPTY). Be sure to set all three relays with different ON Set Point, one for Primary, one for Backup and the other for Backup 2). Setting all three relays with the same ON level will have cause the relays to all turn on at the same time. Example below shows three relays (A, B and C) used to Auto Empty a tank:



1. Make sure all three relays are in the same mode. If this is not true, then TRIPLX will not appear.
2. When M-PLEX appears, press SELECT.
3. When TRIPLX appears, press SELECT.
4. Select EXIT to return to Top Level Menu.

**How to turn off M-PLEX (DUPLEX or TRIPLEX).**

1. When M-PLEX appears, press SELECT.
2. When NO ALT appears, press SELECT.
3. Select EXIT to return to Top Level Menu.

**How to Time Alternate relays**

This function is only operational when two or more relays are configured as pumps performing the same function (either filling or emptying). This function is useful when a complete cycle of the pumps cannot be guaranteed such as a continuous inflow to a sump. Thus one pump may run longer than the other pump. To insure equal wear of both pumps, the alternating cycle can be set up on a timer. Thus the lead and lag pumps will be switched based on time rather than a cycle basis.

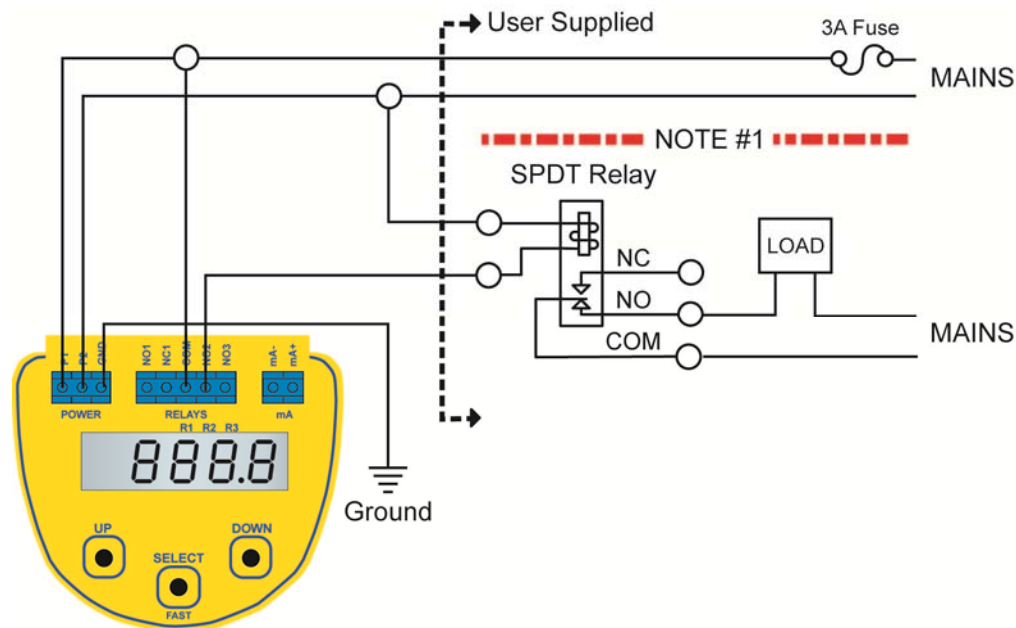
1. Make sure at least two relays are in the same mode. (ex: two relays are set as PUMPs that FILL or three relays are set as PUMPs that EMPTY. If this is not true, then M-PLEX will not appear.
2. When M-PLEX appears, press SELECT.
3. Choose between DUPLEX or TRIPLEX and press SELECT.
4. When A-TIME appears, press SELECT.
5. When HOURS appears, press SELECT.
6. Using the UP and DOWN buttons, set the Alternating Time in Hours. Alternating Time can be set from 0 to 600 hours.
7. Press SELECT to enter the value.
8. Select EXIT to return to Top Level Menu.

### Input Power and Relay Connections

The LVCN1700 Series is powered from 95 to 250 VAC power. Power is applied to the L1 and L2 terminals. Typically, Hot is applied to L1 and Neutral to L2. The Gnd terminal should be connected to a solid earth ground to help shield the sensor from external EMI/RFI interference.

The LVCN1700 Series features three 60 VA, 2A max relays. Relay 1 has both the Normally Open and Normally Closed contacts available. Relays 2 and 3 have the Normally Open contacts available. All three relays have their commons connected and are isolated. The example below shows Relay 2 wired NO. Make sure to select a relay state that is fail-safe and takes into account when power is lost to the LVCN1700 Series.

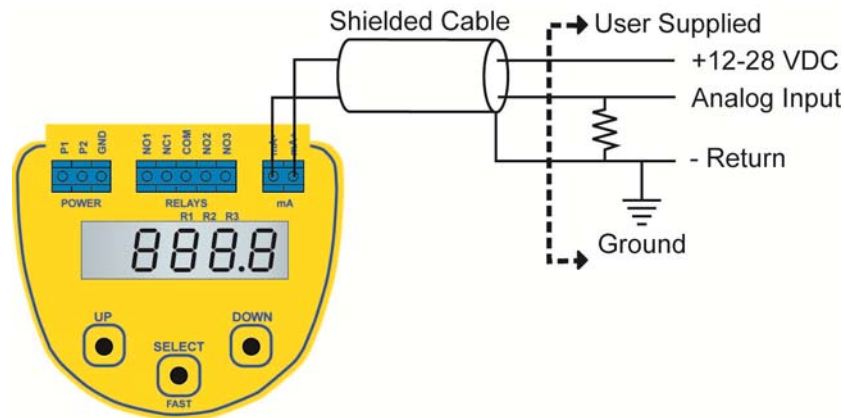
The switching of heavy inductive loads such as pump motors can create voltage spikes in the many thousands of volts. It is recommended that the power to the LVCN1700 Series and to the coils of the isolation relays be sourced from a main that is not switching inductive loads as shown below.



- **Note #1** – Isolate power to instrument from power to load (pumps, etc.) as much as possible by running power to the sensor directly from main power source.

### Analog Output (4/20 mA)

The analog output of the LVCN1700 Series is a sinking 4/20 mA control circuit. The typical way to use this feature is to connect a positive supply to the MA+ input and to sense the current flow out of the MA- output with a sampling resistor as shown in the following diagram.



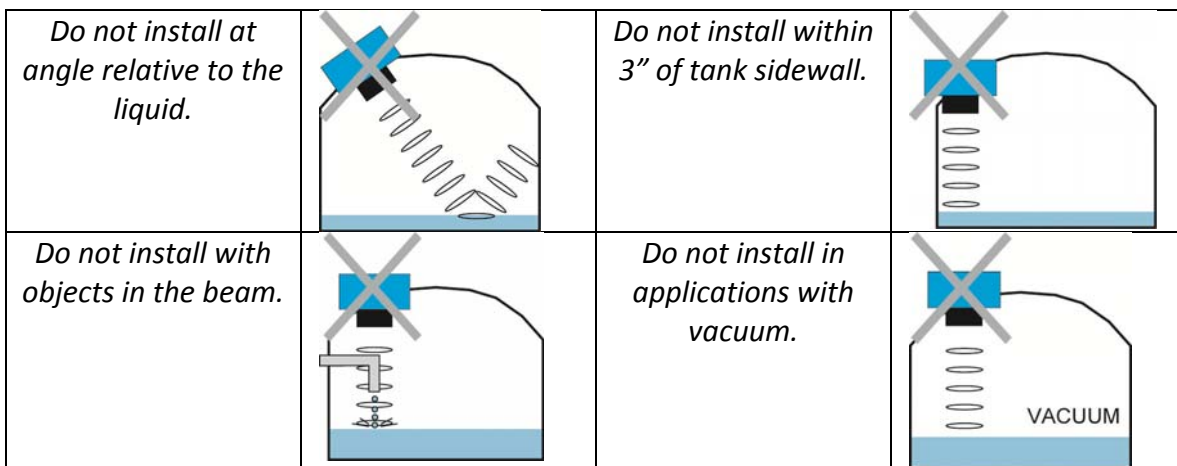
The cabling should be a shielded twisted pair to minimize EMI interference. Typically 20 to 24 gauge wire is used in this application. The analog output of the LVCN1700 Series is isolated from the AC power via optocoupler isolation.

- **Note** – 95 to 250 VAC power is required to provide power to the LVCN1700 Series for basic operation.

The LVCN1700 Series should always be mounted perpendicular to the liquid surface and installed using the provided Viton mounting gasket. Make sure that the fitting and transmitter threads are not damaged or worn. Always *hand-tighten* the transmitter within the fitting. Perform an installed leak test under normal process conditions prior to system start up. **Note:** *The preferred mounting fitting for the LVCN1710 series is a plastic (2" thread x 1" thread) reducer bushing.*

**Mounting Guide**

1. Do not mount at an angle.
2. Liquid should never enter the dead band.
3. Side Wall:
  - a. For LVCN1710 Series - mount at least 2" from the side wall.
  - b. For LVCN1718 & LVCN1726 Series - mount at least 3" from the side wall.
4. Do not mount where obstacles will intrude on sensor's beam width.
  - a. See Specifications, Step Two
5. Do not mount in a vacuum.
6. Avoid mounting in the center of a dome top tank.
7. In cone bottom tank, position the sensor over the deepest part of the tank.



**Installation in existing fittings**

If the existing fitting is larger than the threads of the LVU2700 Series, add a reducer bushing.

**Metal Tanks (LVCN1710 series only)**

OMEGA Engineering ultrasonic transmitters have been optimized for use in non-metallic fittings.

1. For best performance, avoid the use of metallic fittings.
  - a. Use a plastic 2" x 1" reducer bushing (such as LVU800-2N80) or a plastic 1" tank adapter (such as LVU800-1B).
2. While installations directly into a 1" metal fitting are not recommended, acceptable results may be obtained if the 1" fitting is a half coupling in form and the outer diameter of the coupling is tightly wrapped in vinyl tape to dampen vibrations.

**Fitting Selection:** Check the part number to determine the required fitting mount size and thread type. LVCN1700 Series is commonly installed in tank adapters, flanges, brackets or standpipes. Note: Always include the gasket when installing the LVCN1700 Series.

1. **Tank Adapter:** Select a tank adapter fitting, 1" or larger for the LVCN1710 series or 2" or larger for the LVCN1718 & LVCN1726 series.
  - a. *For best results with the LVCN1710 Series, select a 2" tank adapter and add a plastic 2" by 1" reducer bushing.*
  - b. Avoid tank adapter (thread x thread) styles and/or pipe stops forward of the installed transducer.
  - c. Always mount the tank adapter so the majority of fitting is outside the tank.
    - i. Never mount the tank adapter upside down or the bulk of the material is inside the tank.

**2" Tank Adapter  
Socket x Thread  
(LVU800-2B shown)**



**Tank Adapter (LVU800-2B)  
w/ 2"x1" Reducer Bushing  
(LVU800-2N80 shown)**

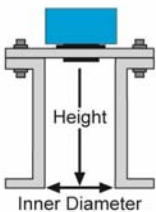


**Tank Adapter  
Thread x Thread**



**Do not use thread x thread**

2. **Riser:** Installations with tall, narrow risers can impede the acoustic signal.
  - a. **LVCN1718 & LVCN1726 Series:** 2" (5 cm) diameter risers should be no taller than 5" (12.7 cm). Larger diameter risers should be no taller than 12" (30.5 cm).
  - b. **LVCN1710 Series:**

	Riser Specifications	
	Inner Diameter	Maximum Height
2" (5 cm)	3" (7.6 cm)	
4" (10 cm)	8" (20 cm)	
6" (15 cm)	12" (30 cm)	

**Note:** Do not exceed the dimensions listed above



3. **Flange (LVCN1710 series):** When installing on a flange, select a flange with a thread that is above the plane of the flange.
  - a. *The LVCN1718 & LVCN1726 series works well with Flange installations.*
  - b. Avoid the use of blind flanges with tapped threads or flanges where the threads are even with the plane of the flange, such as the Banjo 1" Poly ANSI Flange (series AF100).
  - c. Use a flange with a 2" thread and add a 2" to 1" reducer bushing to complete the installation.

**2" Flange w/  
thread out of plane  
(LVU800-2F shown)**



**2" Flange w/  
thread in plane**

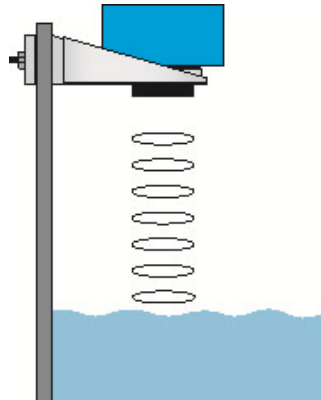


**Do not use thread in plane**

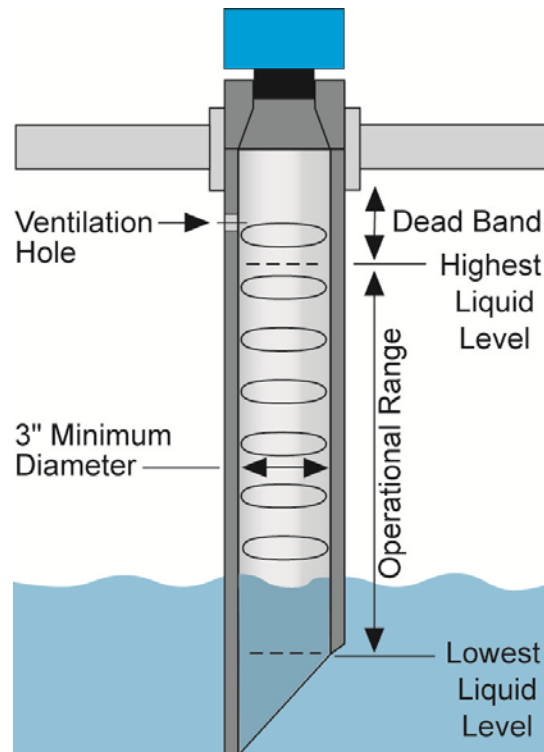
**2" Flange w/  
Reducer Bushing  
(LVU800-2N80 shown)**



4. **Side Mount Bracket:** For installations in open tanks and sumps, use the LVM-30 series side mount bracket.
  - a. For the LVCN1710 series, order the LVM-30 side mount bracket and add a plastic 2" x 1" Reducer bushing.
  - b. For the LVCN1718 & LVCN1726, series, order the LVM-30 side mount bracket.



5. **Stand Pipe:** A standpipe may be used to dampen turbulence or when foam is present in the application.
- Pipe can be made of any material.
  - Select a minimum 3" ID pipe for the stand pipe.
    - A 2" pipe is usable with the LVCN1710 series, but is the minimum size allowable.
    - Pipes larger than 3" can also be used.
  - Use a coupling or tank adapter to attach the LVCN1700 Series to the pipe.
    - With the LVCN1710 series, be sure to use a plastic reducing bushing such as 2" Thread x 1" Thread fitting (ex: LVU800-2N80) or 2" Slip x 1" Thread fitting (ex: LVU800-2S80).
    - With the LVCN1718 and LVCN1726 series, be sure to use a plastic reducing bushing such as 3" Thread x 2" Thread fitting (ex: LVU800-3N80) or 3" Slip x 2" Thread fitting (ex: LVU800-3S80).
  - The pipe length should run the measurement span and the bottom of the pipe should remain submerged at all times to prevent foam from entering the pipe.
  - Cut a 45° notch at the bottom of the pipe and drill a 1/4" pressure equalization hole in the dead band.
  - The pumps should not drive liquid past the open end of the stand pipe which causes the liquid in the pipe to oscillate.



**Setup:**

You can view how the LVCN1700 Series is configured.

1. From the main MENU level, press SELECT when HELP appears.
2. When SETUP appears, press the SELECT key.
3. Setup will display the following information:
  - a. Units, Height, Fill\_H, Relay 1, Relay 2, Relay 3
  - b. The following will be shown for each relay
    - i. Relay Function, On Setting, Off Setting, Safe Setting and Delay
4. When completed, press SELECT when appears EXIT to return to the main program level.

**Reset:**

LVCN1700 Series enables the end user to reset specific relays or the entire configuration within the level controller.

**R All** – Resets the entire LVCN1700 Series

**RST R1** – Resets only the settings associated with Relay 1

**RST R2** – Resets only the settings associated with Relay 2

**RST R3** – Resets only the settings associated with Relay 3

Follow the instructions below to reset LVCN1700 Series

1. From the main MENU level, press SETUP when HELP appears.
2. When RESET appears, press the SELECT key.
3. Select the type of Reset required (Rall, RST 1, RST 2 or RST 3) and press SELECT
4. When completed, press SELECT when appears EXIT to return to the main program level.

**Simulation (SIM-T)**

This mode enables the end user to simulate changes in level without having the level of liquid move. The display will simulate level of liquid and will turn the relays ON and OFF according to how they were configured. For example, if Relay 1 is set as a High Alarm with an ON setting for 100.0 inches and a Hysteresis of 2.0 inches, then when the display goes above 100.0, Relay 1 will energize and when the level falls below 98.0, Relay 1 will de-energize. This function can be used to test the wiring and to verify if the configuration is set accordingly.

**Please note:** *Simulation mode will energize and de-energize all configured relays. Any devices wired to the relays will become active during simulation mode.*

Follow the instructions below to begin the Simulation mode (SIM-T)

1. From the main MENU level, press SETUP when HELP appears.
2. When SIM-T appears, press the SELECT key.
3. The display will start at 0.0. Press the UP button to begin increasing the level of liquid. Use the DOWN button to simulate the lowering of liquid in the tank.
4. To increase speed, hold the SELECT button while hold the UP or DOWN keys.
5. To exit, press and hold the SELECT key.
6. Press SELECT when appears EXIT to return to the main program level.

**Test Parameters**

This mode runs diagnostic tests that confirm operation of LVCN1700 Series. ***This mode should only be used when supervised by a OMEGA Engineering representative.***

## Troubleshooting

PROBLEM	SOLUTION
TANK does not appear on the main menu	Units function is set for PERCENT on LVCN1700 Series: When Units is set for PERCENT, the TANK function is disabled. To re-enable TANK, change units to INCHES, CM, FEET or METERS.
Display always jumps to the LOST condition	Check the dimensional configuration ( <b>Height</b> and <b>Fill-H</b> ) of the LVCN1700 Series. Make sure that the <b>Fill-H</b> setting corresponds to the full level of liquid (from the bottom up) and not the distance from the sensor to the liquid (top down).
M-PLEX does not appear on the main menu	None of the relays are configured the same: M-PLEX will only appear when 2 or 3 relays are configured as the same function. For example, two or more relays are configured as Pumps that Auto Fill. M-PLEX will not appear if a relay is configured as an Auto Empty Pump and an Auto Empty Valve.
Display shows FULL	Level of liquid is above the FILL_H setting: Check the FILL_H setting, making sure the FILL_H setting is high enough so the level of liquid is below the FILL_H setting
Display shows EMPTY	Level of liquid is beyond the HEIGHT setting: Check the HEIGHT setting, making sure the HEIGHT setting is low enough so the level of liquid is above the HEIGHT setting
Pumps or Valves do not alternate	<ol style="list-style-type: none"> <li>1. M-PLEX is set for NO-ALT or A-TIME is set above 0: <ol style="list-style-type: none"> <li>a. If M-PLEX is set for NO-ALT, then the relays will not alternate. Change M-PLEX to either DUPLEX or TRIPLX to begin alternation.</li> <li>b. If A-TIME is set for anything above 0 hours, then the pumps will only alternate after the A_TIME set has been reached. For example, if A-TIME is set for 3 hours, then the relays will only switch after each 3 hour period. To alternate after each cycle, change A-TIME to 0 hours</li> </ol> </li> <li>2. The ON levels for the relays are set to the same setting. Change the ON set point to another value.</li> </ol>
Relay closes, but does not open again	An inductive kick may be holding the relay closed. If switching 24 VDC, make sure a diode has been installed to act as a snubber.
Relay chatters on and off repeatedly	Most likely the turbulence in the tank is causing the chatter. Increase the Hysteresis setting to correct.

**User Settings:**

Fill out the chart below and keep as a record of your configuration.

*Tank*

Height =	Fill-H =
----------	----------

*Relay #1*

Pump		Valve		Alarm	
Fill	Empty	Fill	Empty	High	Low
ON =		ON =		ON =	
OFF =		OFF =		Hysteresis =	
Delay =		Delay =			

*Relay #2*

Pump		Valve		Alarm	
Fill	Empty	Fill	Empty	High	Low
ON =		ON =		ON =	
OFF =		OFF =		Hysteresis =	
Delay =		Delay =			

*Relay #3*

Pump		Valve		Alarm	
Fill	Empty	Fill	Empty	High	Low
ON =		ON =		ON =	
OFF =		OFF =		Hysteresis =	
Delay =		Delay =			

*M-Plex*

No-Alt	Duplex	Triplex
Relays 1 & 2	Relays 2 & 3	Relays 3 & 1
A-Time	ON OFF	Hours:



## 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's 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 malfunctions, 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 having been 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 in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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## 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. Purchase Order 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. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the 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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- M Turbine/Paddlewheel Systems
- M Totalizers & Batch Controllers

## **pH/CONDUCTIVITY**

- M pH Electrodes, Testers & Accessories
- M Benchtop/Laboratory Meters
- M Controllers, Calibrators, Simulators & Pumps
- M Industrial pH & Conductivity Equipment

## **DATA ACQUISITION**

- M Data Acquisition & Engineering Software
- M Communications-Based Acquisition Systems
- M Plug-in Cards for Apple, IBM & Compatibles
- M Datalogging Systems
- M Recorders, Printers & Plotters

## **HEATERS**

- M Heating Cable
- M Cartridge & Strip Heaters
- M Immersion & Band Heaters
- M Flexible Heaters
- M Laboratory Heaters

## **ENVIRONMENTAL MONITORING AND CONTROL**

- M Metering & Control Instrumentation
- M Refractometers
- M Pumps & Tubing
- M Air, Soil & Water Monitors
- M Industrial Water & Wastewater Treatment
- M pH, Conductivity & Dissolved Oxygen Instruments