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LVU-800, & LVU-1100
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WARNING: These products are not designed for use in, and should not be used for, patient-connected applications.

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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 which wear are not warranted, including but not limited to contact points, fuses, and triacs.

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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.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

5 System Configuration Document

ZERO : _____ inches from sensor face

SPAN : _____ inches from zero

ALARM 1 : _____ inches from sensor face (K1-RELAY)

ALARM 2 : _____ inches from sensor face (K2-RELAY)

ALARM 3 : inches from sensor face

ALARM 4 : inches from sensor face

LINEAR CHARACTERIZATION - DISPLAY

LOW VALUE : ____ ____ ____ ____

HIGH VALUE: ____ ____ ____ ____

NOTE

If you select "SLFC" mode
1 = Automatic fill control
2 = Automatic empty control
Alarm #1 relay will act as a auto fill / auto empty control relay

Unpacking Instructions

Remove the Packing List and verify that you have received all equipment, including the following (quantities in parenthesis):

LVU-800 & LVU-1100 Ultrasonic Level Measurement System (1)

Operator's Manual (1)

If you have any questions about the shipment, please call OMEGA Customer Service Department.

When you receive the shipment, inspect the container and equipment for signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

The carrier will not honor damage claims unless all shipping material is saved for inspection. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

TABLEOF CONTENTS

LVU-800 & LVU-1100 Series
Ultrasonic Level Systems

5 System Configuration Document

SITE LOCATION ID: _____

JOB: _____

UNIT SERIAL NUMBER _____ DATE: _____

PROGRAMMABLE PARAMETERS, PROGRAMMED BY: _____

HEIGHT MODE: ❑

DISTANCE MODE: ❑

ANALOG OFFSET: ❑ Y ❑ 4-20 mA ❑ 2-10 V

❑ N ❑ 0-20 mA ❑ 0-10 V

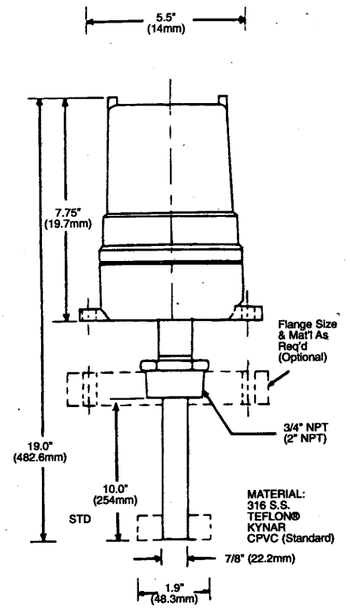
DISPLAY MODE: ❑ 0 ❑ 1 ❑ 2

LOST ECHO MODE: ❑ 0 ❑ 1 ❑ 2

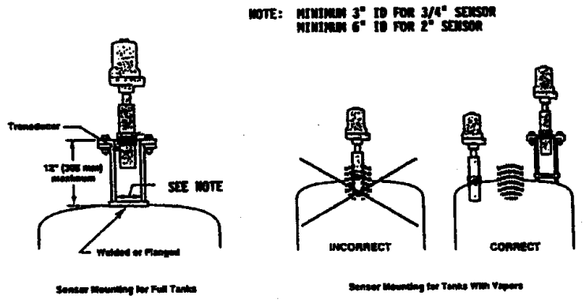
❑ STD. ALARM

❑ AUTOMATIC FILL

❑ AUTOMATIC EMPTY



***3/4" NPT Teflon® Sensor Length 2" (50.8mm) STD**



DIMENSIONAL DRAWINGS

1 System Description

SECTION I SYSTEM DESCRIPTION

1.1 GENERAL DESCRIPTION

The OMEGA Model, LVU-800 / LVU-1100 Series Liquid Level Systems are state-of-the-art level measurement instruments. Based on the latest ultrasonic technologies, the LVU-800 / LVU- 1 1 0 0 Series provide an efficient, reliable and cost effective means of level control.

The LVU-800 / LVU-1100 Series consist of 2 major components: a non-contacting ultrasonic sensor and a compact, remote electronic control.

The LVU-800 / LVU-1100 Series sensor is available in a variety of sizes and materials to suite virtually any application. Standard mounting configurations include $^{3}/_{4}$" and 2" NPT fittings. Sensor materials of construction include 316 SS, kynar or teflon.

LVU-1100 Series 4-20 MA Transmitter continuous output with two programmable alarm relay with auto fill / auto empty mode.

LVU-800 Series Two programmable alarm relay with independent alarm, auto fill / auto empty mode.

1.2 PRINCIPLES OF OPERATION

In operation, the electronics generates an electronic signal that is converted by the sensor (mounted on top of the vessel) to a burst of ultrasonic pulses. These pulses are transmitted through the air towards the liquid surface. As the pulses reach the liquid surface, they are reflected back to the sensor. These received echoes are converted back to an electronic signal, which is then sent to a microprocessor. The microprocessor uses the return signals to calculate the it takes for the pulses to travel to the liquid surface and back. This "Time of Flight" is directly proportional to the distance of the liquid surface from the sensor. The microprocessor then compares these calculated values with user programmed system parameters to provide the required control output.

SECTION II INSTALLATION

2.1 CONTROL UNIT INSTALLATION

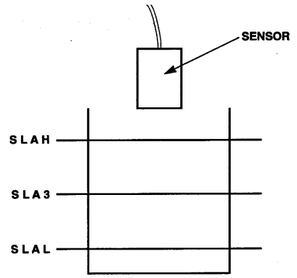
1. Open control unit enclosure and remove the printed circuit board.
2. Replace printed circuit board, and route power and control wiring to the enclosure. Observe all applicable local electrical codes and wiring procedures.
3. Connect power and control wiring to the control unit as shown in the wiring diagram (see figure 1).
4. Be sure that all wiring is carefully dressed to prevent pinching between the housing and the cover.

2.2 Sensor Installation

The sensor is mounted on the top of the vessel with the sensor facing downward. A clear path, free of any obstructions, must be provided between the sensor and the liquid surface. Due to the narrow sensor beam pattern, vertical-axis positioning of the sensor is important. The sensor must be installed so as to maintain perpendicularity to the liquid surface.

1. For sensors provided with an NPT threaded fitting, drill a suitable hole in the vessel top and tap for the correct NPT thread. In thin walled vessels, or vessels constructed of material not suitable for tapping, weld or braze a bushing to accept the sensor.
2. Screw the sensor into the threaded fitting, being careful not to cross thread the sensor. When possible, the use of a pipe compound or sealing tape is recommended.
   AVOIDOVER TIGHTENING!
3. For flange mounted sensors, simply bolt the sensor / flange assembly to the proper mating flange connection.
4. Route the sensor cable to the electronic control unit and connect per the Wiring diagram (see fig 1). IF ROUTING THE SENSOR CABLE THROUGH CONDUIT, A DEDICATED CONDUIT SHOULD BE UTILIZED. AVOID ROUTING THE SENSOR CABLE IN CLOSE PROXIMITY TO ANY SOURCEOF ALTERNATING CURRENT OR RFI.

PROMPT	DEFINITION	DESCRIPTION
S L _ S	SELECT SPAN	PROGRAMS THE SYSTEMS ANALOG OUTPUT SPAN MEASURED IN INCHES FROM THE ZERO POINT.
S L L E	SELECT LOST ANALOG OUTPUT	PROGRAM ONE OF THE THREE VARIABLES ON SIGNAL ECHO LOSS 0 = OUTPUT GOES TO 4 mA 1 = OUTPUT HOLDS LAST GOODVALUE 2 = OUTPUT GOES TO 20 mA



1. 1-3 OPERATION MODE: AUTOMATIC FILL / AUTO FILL WITH ALTERNATE PUMP CONTROL

2. 2-4 OPERATION MODE: AUTOMATIC FILL / AUTO FILL WITH ALTERNATE PUMP CONTROL
PROGRAM PARAMETER:
SLAH
SLAL

3. 5 OPERATION MODE BOTH PUMPS ARE OFF WHEN LEVEL IS BELOW “SLAL”. AS THE LEVEL INCREASES TO “SLA3” PUMP #1 / OR PUMP #2 STARTS, PUMP STAYS ON UNTIL THE LEVEL DECREASES BELOW “SLAL” THEN STOPS. IF THE LEVEL CONTINUES TO INCREASE UP TO “SLAH” PUMP #2 / OR PUMP #1 COMES ON AND DECREASES BELOW “SLAL”.
PROGRAM PARAMETER:
SLAH
SLAL
SLA3

PROMPT	DEFINITION	DESCRIPTION
S L A 1	SELECT ALARM RELAY 1	PROGRAM ALARM RELAY #1 TRIP AS DESIRED, MEASURED IN INCHES FROM FACE OF PROBE EXAMPLE: 18" = '0 1 8.0' (THIS PROMPT NOT AVAILABLE IF "S L F C" IS SET TO 1 OR 2)
S L A 2	SELECT ALARM RELAY 2	PROGRAM ALARM RELAY # 2 AS AS DESCRIBED ABOVE
S L A H	SELECT ALARM HIGH LEVEL	(THIS PROMPT ONLY AVAILABLE IF "S L F C" IS SET TO 1 OR 5) PROGRAM THE HIGHEST LEVEL POINT AS MEASURE IN INCHES FROM THE SENSOR FACE FOR ALL 2-5 OPERATIONS.
S L A L	SELECT ALARM LOW LEVEL	(THIS PROMPT ONLY AVAILABLE IF "S L F C" IS SET TO 1 OR 5) PROGRAM THE LOW LEVEL POINT AS MEASURE IN INCHES FROM THE SENSOR FACE FOR ALL 2-5 OPERATIONS.
S L A 3	PUMP START LEVEL	PROGRAM PUMP START LEVEL POINT AS MEASURED IN INCHES FROM THE SENSOR FACE. THIS PROMPT IS ONLY AVAILABLE IF SLFC IS SET TO 5
S L D H	SELECT DISTANCE MEASUREMENT MODES	THE HEIGHT MODE PROVIDES AN ANALOG OUTPUT PROPOTTIONAL TO THE LIQUID LEVEL, AND THE DISTANCE MODE PROVIDES AN INVERSE OUTPUT. H = HEIGHT MEASUREMENT d = DISTANCE MEASUREMENT
S L O S	SELECT ANALOG	ALLOWS FOR AN ANALOG OFFSET REFERENCED TO 0mA OR 4 mA EXAMPLE: 0-20 mA VERSUS 4-20 mA OR 0-10 Vdc OR 2-10 Vdc 1 = 4-20 mA dc 0 = 0-20 mA dc
S L _ 0	SELECT ZERO	PROGRAMS THE SYSTEM ZERO POINT FOR THE ANALOG OUTPUT AS MEASURED IN INCHES FROM THE FACE OF THE SENSOR

NOTE

THE SYSTEM ZERO SETTING IS THE POINT CLOSET TO THE SENSOR FACE. THE ZERO POINT WILL BE 20 mA IN HEIGHT MODE AND 4mA IN DISTANCE MODE.

2.3 WIRING DIAGRAM

CAUTION

DO NOT ATTEMPT TO REMOVE A THREADED SENSOR FROM THE VESSEL WITH THE CABLE ATTACHED TO THE CONTROL UNIT, OTHERWISE CABLE MAY BE DAMAGED.

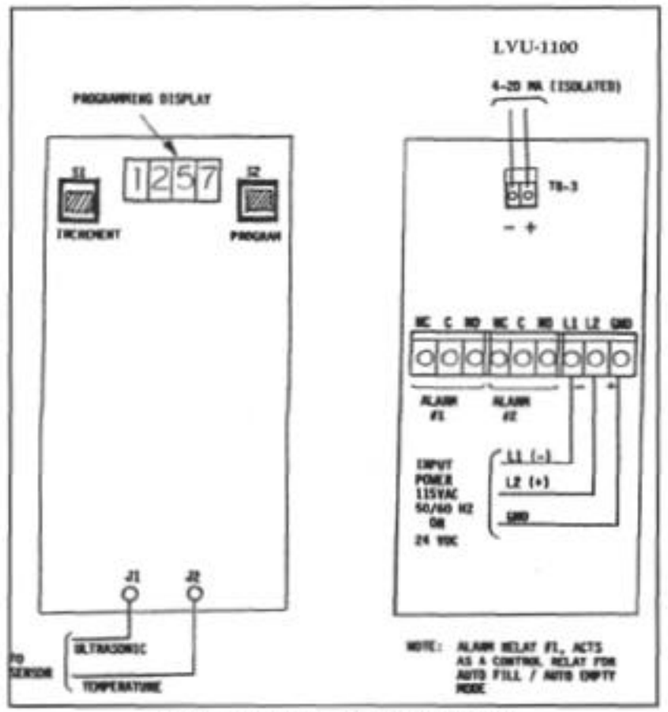


Figure 1 Wiring Diagram LVU-1100/LVU-800

2.4 CALIBRATION DIAGRAM

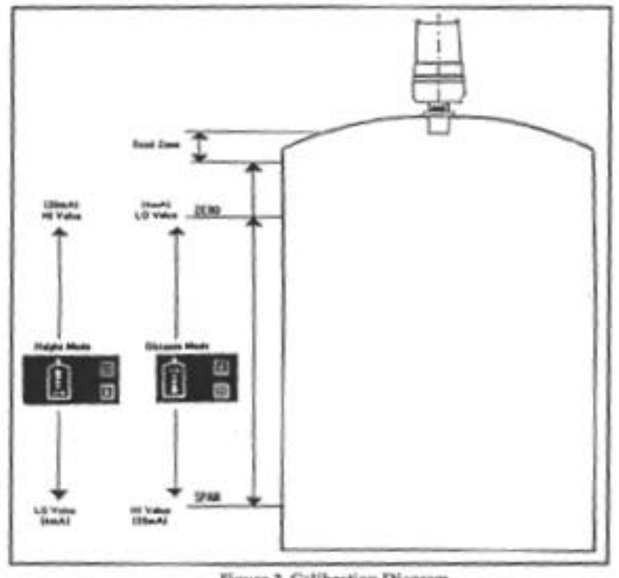


Figure 2. Calibration Diagram

NOTE

1. Zero calibrated in inches from face of sensor.
2. Span calibrated in inches from the Zero point.
3. Alarm points calibrated in inches from face of sensor
4. The system Range equals Zero plus Span in inches.

SECTION IV LVU-800 PROGRAMMING DESCRIPTION AND PROMPT LIST

4.1 GENERAL

The LVU-800 Series is calibrated via push-button entry switches (Program & Increment) and an onboard digital display, which provides the necessary programming prompts. All data entered during the calibration procedure is stored in a non volatile memory to prevent loss of data in the event of a power failure.

During the calibration procedure you may refer to the programming Prompt List and the calibration diagram in this manual.

NOTE

DURING THE CALIBRATION PROCEDURE, IF NO BUTTONS ARE PUSHED FOR MORE THAN 60 SECONDS, THE SYSTEM WILL AUTOMATICALLY RETURN TO THE OPERATING MODE-SAVING THOSE PARAMETERS ALREADY ENTERED.

4.2 CALBRATION PROCEDURE

Unscrew the control unit cover and simultaneously depress and hold the ***Program*** and ***Increment*** buttons. After approximately three (3) seconds, the onboard programming display will issue the prompt “COdE”. Release both buttons and press the ***Program*** button.
Follow chart below for programming setup.

PROMPT	DEFINITION	DESCRIPTION
S L F C	SELECT RELAY FUNCTIONS	DEFINES THE OPERATIONAL MODE ALARM RELAY #1, AS FOLLOWS 0=STD (INDEPENDENT ALARMS) 1=AUTOMATIC FILL CONTROLS 2=AUTOMATIC EMPTY CONTROL 3=LEAD/LAG WITH ALTERNATE PUMP AND AUTOMATIC FILL PUMP CONTROL 4=LEAD/LAG WITH ALTERNATE PUMP AND AUTOMATIC EMPTY PUMP CONTROL 5=ALTERNATE PUMP CONTROL WITH THREE SETTING, AUTO EMPTY MODE

3.2 CALIBRATION PROCEDURE Con't

S L _ S	SELECT SPAN	PROGRAMS THE SYSTEM ANALOG OUTPUT SPAN MEASURED IN INCHES FROM THE ZERO POINT.
S L L E	SELECT LOST ANALOG OUTPUT	PROGRAM ONE OF THE THREE VARIABLES ON SIGNAL ECHO LOSS 0 = OUTPUT GOES TO 4 mA 1 = OUTPUT HOLDS LAST GOODVALUE 2 = OUTPUT GOES TO 20 mA

2.5 SPECIFICATIONS

Range:	1 - 12 feet 1 - 30 feet ("30 ft" option)
Repeatability:	1/8 inch typical
Accuracy:	Analog output - 1/4% of full scale
Temperature Compensation:	Automatic over full range of sensor operating temperature
Input Power:	115 V ac, 50/60 Hz, 24 Vdc or 230 V ac optional
Output Signal:	4-20 ma dc (isolated) or 0-10 Vdc
Alarm Setpoints:	Two independent programmable 10A SPOT relays increments of 0.1" over entire span
Temperature Range:	Sensor - 20°F to + 180° F Electronics - 10°F to + 170°F
Sensor Pressure Rating:	250 psig - 316 SS 100 psig - Teflon, Kynar, CPVC
Sensor Construction:	CPCV 316 SS, Kynar or Teflon
Electronics Enclosures:	NEMA 7 explosion-proof Class I, Division 1 & 2 Groups B, C&D Class II, Division 1 & 2 Groups E, F&G Class III, NEMA 3, 4, 7, & 9
Mountings:	3/4" NPT: Range up to 12 Ft 2" NPT: Range up to 30 Ft

3 LVU-1100 Programming Description and Prompt List

SECTION III LVU-1100 PROGRAMMING DESCRIPTION AND PROMPT LIST

3.1 GENERAL

The LVU-1100 Series is calibrated via push-button entry switches (Program & Increment) and an onboard digital display, which provides the necessary programming prompts. All data entered during the calibration procedure is stored in a non volatile memory to prevent loss of data in the event of a power failure.

During the calibration procedure you may refer to the programming Prompt List and the calibration diagram in this manual.

NOTE

DURING THE CALIBRATION PROCEDURE, IF NO BUTTONS ARE PUSHED FOR MORE THAN 60 SECONDS,THE SYSTEM WILL AUTOMATICALLY RETURN TO THE OPERATING MODE-SAVING THOSE PARAMETERS ALREADY ENTERED.

3.2 CALBRATION PROCEDURE

Unscrew the control unit cover and simultaneously depress and hold the ***Program*** and ***Increment*** buttons. After approximately three (3) seconds, the onboard programming display will issue the prompt "COdE". Release both buttons and press the ***Program*** button.
Follow chart below for programming setup.

PROMPT	DEFINITION	DESCRIPTION
S L F C	SELECT RELAY FUNCTIONS	DEFINES THE OPERATIONAL MODE ALARM RELAY #1, AS FOLLOWS 0=STD (INDEPENDENT ALARMS) 1=AUTOMATIC FILL CONTROLS 2=AUTOMATIC EMPTY CONTROL 3=LEAD/LAG WITH ALTERNATE PUMP AND AUTOMATIC FILL PUMP CONTROL 4=LEAD/LAG WITH ALTERNATE PUMP AND AUTOMATIC EMPTY PUMP CONTROL 5=ALTERNATE PUMP CONTROL WITH THREE SETTING, AUTO EMPTY MODE.
S L A 1	SELECT ALARM RELAY 1	PROGRAM ALARM RELAY #1 TRIP AS DESIRED, MEASURED IN INCHES FROM FACE OF PROBE EXAMPLE: 18" = '0 1 8.0' (THIS PROMPT NOT AVAILABLE IF "S L F C" IS SET TO 1 OR 2)

3.2 CALIBRATION PROCEDURE Con't

PROMPT	DEFINITION	DESCRIPTION
S L A 2	SELECT ALARM RELAY 2	PROGRAM ALARM RELAY # 2 AS AS DESCRIBED ON PAGE 6.
S L A H	SELECT ALARM HIGH LEVEL	(THIS PROMPT ONLY AVAILABLE IF "S L F C" IS SET TO 1 OR 5) PROGRAM THE HIGHEST LEVEL POINT AS MEASURE IN INCHES FROM THE SENSOR FACE FOR ALL 2-5 OPERATIONS.
S L A L	SELECT ALARM LOW LEVEL	(THIS PROMPT IS ONLY AVAILABLE IF "S L F C" IS SET TO 1 OR 5) PROGRAM THE LOW LEVEL POINT AS MEASURE IN INCHES FROM THE SENSOR FACE FOR ALL 2-5 OPERATION.
S L A 3	PUMP START LEVEL	PROGRAM PUMP START LEVEL POINT AS MEASURED IN INCHES FROM THE SENSOR FACE. THIS PROMPT IS ONLY AVAILABLE IF SLFC IS SET TO 5
S L D H	SELECT DISTANCE MEASUREMENT MODES	THE HEIGHT MODE PROVIDES AN ANALOG OUTPUT PROPOTTIONAL TO THE LIQUID LEVEL, AND THE DISTANCE MODE PROVIDES AN INVERSE OUTPUT. H = HEIGHT MEASUREMENT d = DISTANCE MEASUREMENT
S L O S	SELECT ANALOG	ALLOWS FOR AN ANALOG OFFSET REFERENCED TO 0mA OR 4 mA EXAMPLE: 0-20 mA VERSUS 4-20 mA OR 0-10 Vdc OR 2-10 Vdc 1 = 4-20 mA dc 0 = 0-20 mA dc
S L _ 0	SELECT ZERO	PROGRAMS THE SYSTEM ZERO POINT FOR THE ANALOG OUTPUT AS MEASURED IN INCHES FROM THE FACE OF THE SENSOR

NOTE

THE SYSTEM ZERO SETTING IS THE POINT CLOSET TO THE SENSOR FACE. THE ZERO POINT WILL BE 20 mA IN HEIGHT MODE AND 4mA IN DISTANCE MODE.